Groundwater Monitoring Report (Year 8)

Former Shell Oil Tank Farm Site
Anacortes, Washington
Ecology Consent Decree No. 14-2-01249-0

for

Washington State Department of Ecology on Behalf of Port of Anacortes

September 12, 2023

GeoEngineers
Earth Science + Technology

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GeoEngineers

2101 4th Avenue, Suite 950
Seattle, Washington 98121
206.728.2674

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Former Shell Oil Tank Farm Site
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Ecology Consent Decree
No. 14-2-01249-0

File No. 5147-012-09

September 12, 2023

Prepared for:

Washington State Department of Ecology
PO Box 47600
Olympia, Washington 98504-7600

Attention: Chris Maurer

On Behalf of:

Port of Anacortes
100 Commercial Avenue
Anacortes, Washington 98221

Prepared by:

GeoEngineers, Inc.
2101 4th Avenue, Suite 950
Seattle, Washington 98121
206.728.2674

Robert S. Trahan, LG
Sr. Environmental Scientist

John M. Herzog, PhD, LG
Principal

KRA:RST:JMH:kjb

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1.0 INTRODUCTION

This report presents the results of the post-construction confirmation groundwater monitoring completed for the Former Shell Oil Tank Farm Site (Site; Facility/Site Identification No. 4781157) located between 13th and 14th Streets west of Q Avenue in Anacortes, Washington (Figure 1). Pursuant to Washington State Department of Ecology (Ecology) Consent Decree No. 14-2-01249-0 (Consent Decree) filed with the Skagit County Superior Court on July 14, 2014 and Ecology Opinion Letter data November 30, 2018 (Ecology 2018), long-term confirmation groundwater monitoring activities were completed by the Port of Anacortes (Port) to confirm:

- Compliance with the site-specific groundwater cleanup levels following completion of the cleanup construction;
- Natural attenuation performance; and
- Stability of the residual soil contamination that remains in-place as part of the final Cleanup Action for the Site.

Historically, the Site was used for bulk fuel storage and distribution. Between October 2014 and March 2015, cleanup construction activities were completed in accordance with Ecology's Cleanup Action Plan (CAP; Ecology 2014) to remove contaminated soil within the readily accessible portions of the Site (i.e., gravel paved area) followed by the placement of an oxygen releasing agent during backfilling activities to enhance the biological degradation of residual soil contamination potentially present beneath the inaccessible portions of the Site (i.e., Q Avenue and 14th Street Rights-of-Way). Exposure to residual soil contamination that may remain in-place at the Site is being managed utilizing a combination of engineering (paved surfaces) and institutional (environmental covenant) controls.

To evaluate the long-term effectiveness of the completed remedial action and assess the need for future monitoring requirements, two years of annual groundwater monitoring (Rounds 5 and 6) were completed following one year of quarterly groundwater monitoring (Rounds 1 through 4) at the Site. Annual groundwater monitoring activities for Rounds 5 and 6 were completed in accordance with the Compliance Monitoring Plan Addendum (GeoEngineers 2015) and Ecology Opinion Letter dated May 24, 2017 (Ecology 2017). Based on the groundwater monitoring results for Rounds 1 through 6, Ecology required that sampling be performed on a 5-year interval, during the month of June to document groundwater conditions and confirm that contaminant concentrations remain below site-specific cleanup levels at the conditional point of compliance (i.e., shoreline interface where groundwater discharges to surface water)

The location of the Site relative to surrounding physical features is shown on Figure 1. The general layout of the Site and surrounding area is shown on Figure 2. Sampling activities and chemical analytical data for annual groundwater monitoring are summarized in the following sections.

2.0 GROUNDWATER MONITORING

Groundwater monitoring well GEI-MW-7 is being used to monitor groundwater conditions downgradient of the cleanup action area (Figure 2) and is positioned at the conditional point of compliance along the Fidalgo Bay shoreline groundwater/surface water interface downgradient from the Site. In accordance with the

Compliance Monitoring Plan Addendum and Ecology Opinion Letter, groundwater samples were collected from monitoring well GEI-MW-7 in June 2023 to meet the 5-year monitoring requirement.

The location of monitoring well GEI-MW-7 is shown relative to the Site on Figures 2 and 3. Well construction details for this well is presented in Appendix A. Groundwater performance criteria and monitoring activities are summarized in the following sections.

2.1. Groundwater Performance Criteria

Groundwater cleanup criteria were developed to be protective of aquatic organisms and of humans that may ingest these marine organisms. Except for petroleum hydrocarbons (gasoline, diesel and heavy oil), Model Toxics Control Act (MTCA) Method B marine surface water preliminary cleanup levels were developed in accordance with Washington Administrative Code (WAC) 173-340-730(3). Because groundwater cleanup levels are based on protection of marine surface water and not protection of groundwater as drinking water, a conditional point of compliance for the groundwater was established by Ecology as the point of at which groundwater discharges to Fidalgo Bay—within the Cap Sante Marina. This conditional point of compliance corresponds to the groundwater/surface water interface east of the Site at the Fidalgo Bay shoreline.

2.2. Completed Groundwater Monitoring Events

Monitoring well GEI-MW-7 was sampled on June 27, 2023. The well was sampled at or within one hour of the predicted daytime low tide to best capture groundwater downgradient of the Site and minimize tidal inundation effects. Predicted tide elevations were based on U.S. National Oceanic and Atmospheric Administration (NOAA) Tide Station No. 9448794 located within Guemes Channel.

2.3. Groundwater Sampling and Analysis

Prior to collecting samples, the groundwater level was measured from the top of the surveyed well casing rim to the nearest 0.01 foot using a decontaminated electronic water level indicator (e-tape). Decontamination procedures are described in the Compliance Monitoring Plan Addendum. Measured water levels for this and previous monitoring events are summarized in Table 1.

Groundwater samples were obtained using low-flow/low-turbidity sampling techniques to minimize the suspension of sediment in groundwater samples. Using a peristaltic pump, groundwater was pumped from the well at a rate not exceeding 0.5 liter per minute through dedicated polyethylene tubing. A water quality meter (YSI-Pro or similar) with flow-through-cell was used to monitor the following parameters during purging:

- Acidity (pH);
- Electrical conductivity (EC);
- Turbidity;
- Dissolved oxygen (DO);
- Temperature;
- Total dissolved solids (TDS);
- Oxygen reduction potential (ORP); and
- Salinity.

Collection of water samples began once these parameters were observed to vary by less than 10 percent on three consecutive measurements. The stabilized field measurements for this and previous monitoring events are summarized in Table 2.

Purge and decontamination water generated during these activities was placed in a sealed and labeled 55-gallon drum located on the Port's Pier 2 Facility pending waste characterization and permitted disposal. Incidental waste generated during sampling activities such as gloves, plastic sheeting, paper towels and similar expended and discarded field supplies were disposed of in a local trash receptacle.

Groundwater conditions observed at the time of sampling and chemical analytical results are summarized in the following sections.

2.3.1. Groundwater Conditions

Historically, the groundwater level near the shoreline (GEI-MW-7) ranged in elevation between +5.47 and +7.49 feet mean lower low water (MLLW). During this round of monitoring, the groundwater level was measured to be 6.56 feet MLLW. Further inland, historical groundwater levels range in elevation between +7.13 and +9.07 feet MLLW (Table 1). Based on the measured groundwater elevations and previous groundwater investigations, the inferred predominant groundwater flow direction is to the east toward the shoreline of Fidalgo Bay as shown on Figure 2.

Groundwater elevations measured during this and previous monitoring events are summarized in Table 1. Stabilized groundwater water quality parameters measured during this and previous sampling events are summarized in Table 2.

2.3.2. Chemical Analytical Results

Groundwater samples (parent and duplicate sample) during the June 2023 monitoring event were submitted to OnSite Environmental, Inc. in Redmond, Washington (OnSite), for the following chemical analysis:

- Gasoline-range hydrocarbons using Ecology Method NWTPH-Gx;
- Diesel- and heavy oil-range hydrocarbons using Ecology Method NWTPH-Dx;

Based on a review of the chemical analytical results, contaminants either were not detected or were detected at concentrations less than the site-specific groundwater cleanup levels. Groundwater analytical results for monitoring wells GEI-MW-7 during this and previous monitoring events are summarized in Table 3. A trend plot analysis for contaminants including gasoline-, diesel- and heavy oil-range petroleum hydrocarbons at GEI-MW-7 is presented on Figure 3.

Field procedures, including sample handling, labeling, container and preservation are described in the Quality Assurance Project Plan (QAPP) presented as Appendix A to the Compliance Monitoring Plan (CMP; GeoEngineers 2014). Copies of laboratory reports are presented in Appendix B. Laboratory data presented in Appendix B were subjected to a United States Environmental Protection Agency (EPA)-defined Stage 2B validation (EPA Document 540-R-08-005; EPA 2009) and were determined to be acceptable for their intended use as qualified. The data validation report is presented in Appendix C.

3.0 CONCLUSIONS

Long-term groundwater monitoring activities were completed by the Port of Anacortes for the Former Shell Oil Tank Farm Site as required by Ecology to document groundwater conditions and demonstrate compliance with the cleanup criteria established by the CAP. Based on a review of the groundwater monitoring results, groundwater conditions for the Site demonstrate compliance with the established performance criteria for the cleanup action at the conditional point of compliance (i.e., shoreline). These results provide supporting evidence of the continued stability of the post-construction condition of the Site.

In accordance with the Compliance Monitoring Plan Addendum, the performance criteria established for the Site has been achieved and the current Ecology-required groundwater monitoring for the Site has been completed. Future groundwater monitoring will be determined by Ecology based on review of the groundwater monitoring data presented in this report.

4.0 LIMITATIONS

We have prepared this report for the exclusive use by the Port of Anacortes (Port), their authorized agents and regulatory agencies for the Former Shell Oil Tank Farm Site. This report is not intended for use by others and the information contained herein is not applicable to other sites. No other party may rely on the product of our services unless we agree in advance, and in writing, to such reliance. This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with our general agreement with Port and generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood. Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

5.0 REFERENCES

GeoEngineers, Inc., "Compliance Monitoring Plan Addendum, Former Shell Oil Tank Farm, Anacortes, Washington, Ecology Consent Decree No. 14-2-01249-0," GEI File No. 5147-012-07, prepared for the Washington State Department of Ecology on behalf of Port of Anacortes, July 14, 2015.

GeoEngineers, Inc., "Compliance Monitoring Plan, Former Shell Oil Tank Farm, Anacortes, Washington," GEI File No. 5147-012-04, prepared for the Washington State Department of Ecology on behalf of Port of Anacortes, July 29, 2014.

GeoEngineers, Inc., "Groundwater Monitoring Report, Former Shell Oil Tank Farm, Anacortes, Washington, Ecology Agreed Order No. DE-08TCPHQ-5474," GEI File No. 5147-012-02, prepared for the Washington State Department of Ecology on behalf of Port of Anacortes, October 26, 2016.

Washington State Department of Ecology (Ecology; 2018), "Re: Request for review of submitted Groundwater Monitoring Report and determination for future conformational monitoring

requirements for the Shell Oil Tank Farm site (FSID: 4781157)," by the Washington State Department of Ecology, Toxics Cleanup Program, Lacey, Washington, November 30, 2018.

Washington State Department of Ecology (Ecology; 2017), "Re: Request for review of submitted Groundwater Monitoring Report and determination for future conformational monitoring requirements for the Shell Oil Tank Farm site (FSID: 4781157)," by the Washington State Department of Ecology, Toxics Cleanup Program, Lacey, Washington, May 24, 2017.

Washington State Department of Ecology (Ecology; 2014), "Cleanup Action Plan (CAP), Former Shell Oil Tank Farm Site, Anacortes, Washington," by the Washington State Department of Ecology, Toxics Cleanup Program, Lacey, Washington, February 3, 2014.

U.S. Environmental Protection Agency (EPA). "Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use," EPA-540-R-08-005. January 2009.

Table 1

Summary of Groundwater Elevation Data

Former Shell Oil Tank Farm Site

Anacortes, Washington

Groundwater Monitoring Well[1]	Groundwater Monitoring Event	Date Measured	Top of Casing Elevation[2] (feet)	Depth to Water from Top of Casing (feet)	Groundwater Elevation[2] (feet)
GEI-MW-2	Round 1	08/28/15	12.98	5.69	7.29
	Round 2	12/17/15		3.91	9.07
	Round 3	03/24/16		4.81	8.17
	Round 4	06/29/16		5.04	7.94
	Round 5[3]	--		--	--
	Round 6[3]	--		--	--
	Round 7[4]	--		--	--
GEI-MW-4	Round 1	08/28/15	12.98	5.84	7.14
	Round 2	12/17/15		3.91	9.07
	Round 3	03/24/16		4.91	8.07
	Round 4	06/29/16		5.29	7.69
	Round 5[3]	--		--	--
	Round 6[3]	--		--	--
	Round 7[4]	--		--	--
GEI-MW-5	Round 1	08/28/15	12.67	5.54	7.13
	Round 2	12/17/15		3.82	8.85
	Round 3	03/24/16		4.72	7.95
	Round 4	06/29/16		4.81	7.86
	Round 5	06/28/17		4.76	7.91
	Round 6	06/13/18		4.90	7.77
	Round 7[4]	--		--	--
GEI-MW-7	Round 1	08/28/15	11.65	5.91	5.74
	Round 2	12/17/15		4.16	7.49
	Round 3	03/24/16		5.51	6.14
	Round 4	06/29/16		4.95	6.70
	Round 5	06/28/17		4.89	6.76
	Round 6	06/13/18		5.06	6.59
	Round 7	06/27/23		5.09	6.56

Notes:

[1] Monitoring well locations are shown on Figure 2.

[2] Elevation is referenced to Mean Lower Low Water (MLLW).

[3] Groundwater monitoring activities were discontinued following Round 4 in accordance with Washington States Department of Ecology's (Ecology's) May 24, 2017 opinion letter (Ecology 2017).

[4] Groundwater monitoring activities were discontinued following Round 6 in accordance with Ecology's November 30, 2018 opinion letter (Ecology 2018).

Table 2

Summary of Groundwater Field Parameters

Former Shell Oil Tank Farm Site
Anacortes, Washington

Groundwater Monitoring Well[1]	Groundwater Monitoring Event	Date Measured	pH	Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Temp. (°C)	Total Dissolved Solids (g/L)	Oxidation Reduction Potential (mV)	Salinity (ppt)
GEI-MW-2	Round 1	08/28/15	7.15	2.38	5.8	0.26	18.1	1.54	-95.5	1.22
	Round 2	12/17/15	7.18	0.92	1.43	1.25	10.1	0.50	159.8	0.42
	Round 3	03/24/16	7.20	2.10	2.05	0.28	9.9	1.89	-70.1	1.51
	Round 4	06/29/16	7.17	2.67	2.01	0.47	15.1	2.21	-96.5	1.62
	Round 5[2]	--	--	--	--	--	--	--	--	--
	Round 6[2]	--	--	--	--	--	--	--	--	--
	Round 7[3]	--	--	--	--	--	--	--	--	--
GEI-MW-4	Round 1	08/28/15	7.39	8.18	14.2	0.81	17.0	6.10	-129.3	4.12
	Round 2	12/17/15	7.00	1.18	2.05	0.28	12.2	0.76	65.1	0.59
	Round 3	03/24/16	7.13	1.54	0.62	0.17	10.7	1.38	-115.3	1.08
	Round 4	06/29/16	7.21	3.88	0.82	0.28	14.4	3.15	-141.9	2.62
	Round 5[2]	--	--	--	--	--	--	--	--	--
	Round 6[2]	--	--	--	--	--	--	--	--	--
	Round 7[3]	--	--	--	--	--	--	--	--	--
GEI-MW-5	Round 1	08/28/15	6.93	13.8	10.5	0.22	17.2	8.84	-135.2	7.82
	Round 2	12/17/15	6.91	7.37	2.11	0.25	14.2	5.00	-58.1	4.35
	Round 3	03/24/16	6.80	6.02	1.91	0.16	11.7	5.23	-88.9	4.48
	Round 4	06/29/16	6.82	10.95	6.41	0.19	15.3	8.72	-205.3	7.70
	Round 5	06/28/17	6.58	8.30	4.91	-0.03	14.5	6.74	-33.5	5.97
	Round 6	06/13/18	6.90	14.59	11.90	0.34	14.2	9.50	-263.2	8.54
	Round 7[3]	--	--	--	--	--	--	--	--	--
GEI-MW-7	Round 1	08/28/15	7.38	34.1	1.1	0.19	17.0	22.52	-201.8	21.32
	Round 2	12/17/15	7.33	18.82	3.01	0.65	12.2	12.20	-371.5	11.10
	Round 3	03/24/16	7.20	16.91	2.51	0.15	10.4	15.45	-147.4	14.29
	Round 4	06/29/16	7.11	20.69	0.67	0.18	15.1	16.38	-240.1	14.93
	Round 5	06/28/17	7.11	23.88	2.84	0.03	14.9	93.35	-300.1	18.49
	Round 6	06/13/18	7.28	34.82	0.00	0.44	13.2	21.92	-353.7	20.40
	Round 7	06/27/23	7.45	26.28	4.81	1.29	13.61	21.84	-173.2	21.08

Notes:

[1] Monitoiring well locations are shown on Figure 2.

[2] Groundwater monitoring activities were discontinued following Round 4 in accordance with Ecology's May 24, 2017 opinion letter (Ecology 2017).

[3] Groundwater monitoring activities were discontinued following Round 6 in accordance with Ecology's November 30, 2018 opinion letter (Ecology 2018).

°C = degrees Celsius

g/L = grams per liter

mg/L = milligrams per liter

mS/cm = microSiemens per centimeter

mV = millivolts

NTU = Nephelometric Turbidity Units

ppt = parts per thousand

Table 3

Summary of Groundwater Chemical Analytical Data

Former Shell Oil Tank Farm Site

Anacortes, Washington

Groundwater Monitoring Well[1]	Groundwater Monitoring Event	Date Measured	Petroleum Hydrocarbons (µg/L)			Benzene (EPA 8021)	Metals (µg/L)	
			Gasoline-Range (NWTPH-Gx)	Diesel-Range (NWTPH-Dx)	Heavy Oil-Range (NWTPH-Dx)		Total Cadmium (EPA 6010)	Cadmium (EPA 6010)
GEI-MW-2	Round 1	08/28/15	100 U	260 U	410 U	1 U	--	--
	Round 2	12/17/15	100 U	260 U	410 U	1 U	--	--
	Round 3	03/24/16	100 U	250 U	410 U	0.2 U	--	--
	Round 4	06/29/16	100 U	260 U	410 U	0.2 U	--	--
	Round 5[4]	--	--	--	--	--	--	--
	Round 6[4]	--	--	--	--	--	--	--
	Round 7[5]	--	--	--	--	--	--	--
GEI-MW-4	Round 1	08/28/15	100 U	260 U	420 U	1 U	--	--
	Round 2	12/17/15	100 U	250 U	410 U	1 U	--	--
	Round 3	03/24/16	100 U	260 U	410 U	0.2 U	--	--
	Round 4	06/29/16	500 U	260 U	410 U	0.2 U	--	--
	Round 5[4]	--	--	--	--	--	--	--
	Round 6[4]	--	--	--	--	--	--	--
	Round 7[5]	--	--	--	--	--	--	--
GEI-MW-5	Round 1	08/28/15	100 U	**280**	410 U	1 U	0.5 U	0.5 U
	Round 2	12/17/15	100 U	260 U	410 U	1 U	0.4 U	0.4 U
	Round 3	03/24/16	100 U	**340**	410 U	0.2 U	4.4 U	4.0 U
	Round 4	06/29/16	500 U	**260**	470	0.2 U	4.4 U	4.0 U
	Round 5	06/28/17	400 U	**300**	400 U	--[4]	--[4]	--[4]
	Round 6	06/13/18	100 U	**260**	410 U	--[4]	--[4]	--[4]
	Round 7[5]	--	--	--	--	--	--	--
Duplicate (GEI-MW-5)	Round 1	08/28/15	100 U	250 U	410 U	1 U	0.5 U	0.5 U
	Round 2	12/17/15	100 U	**340**	410 U	1 U	0.4 U	0.4 U
	Round 3	03/24/16	100 U	**350**	410 U	0.2 U	4.4 U	4.0 U
	Round 4	06/29/16	500 U	**300**	410 U	0.2 U	4.4 U	4.0 U
	Round 5	06/28/17	100 U	**270**	410 U	--[4]	--[4]	--[4]
	Round 6	06/13/18	100 U	**260**	420 U	--[4]	--[4]	--[4]
	Round 7[5]	--	--	--	--	--	--	--

Groundwater Monitoring Well[1]	Groundwater Monitoring Event	Date Measured	Petroleum Hydrocarbons (µg/L)			Benzene (EPA 8021)	Metals (µg/L)	
			Gasoline-Range (NWTPH-Gx)	Diesel-Range (NWTPH-Dx)	Heavy Oil-Range (NWTPH-Dx)		Total Cadmium (EPA 6010)	Cadmium (EPA 6010)
GEI-MW-7	Round 1	08/28/15	100 U	250 U	**440**	1 U	--	--
	Round 2	12/17/15	100 U	**280**	410 U	1 U	--	--
	Round 3	03/24/16	100 U	250 U	400 U	0.2 U	--	--
	Round 4	06/29/16	500 U	250 U	400 U	0.2 U	--	--
	Round 5	06/28/17	100 U	250 U	400 U	--[4]	--[4]	--[4]
	Round 6	06/13/18	100 U	260	410 U	--[4]	--[4]	--[4]
	Round 7	06/27/23	100 U	200 U	200 U	--[5]	--[5]	--[5]
Duplicate (GEI-MW-7)	Round 1	--	--	--	--	--	--	--
	Round 2	--	--	--	--	--	--	--
	Round 3	--	--	--	--	--	--	--
	Round 4	--	--	--	--	--	--	--
	Round 5	--	--	--	--	--	--	--
	Round 6	--	--	--	--	--	--	--
	Round 7	06/27/23	100 U	200 U	200 U	--[5]	--[5]	--[5]
Site-Specific Cleanup Level (µg/L)			800/1,000[3]	500	500	23	8.8	8.8

Notes:

[1] Groundwater monitoring well locations are shown on Figure 2.

[2] Site-specific groundwater cleanup levels are referenced from Table 1 of the Groundwater Sampling and Analysis Plan for the Cap Sante Marine Site (GeoEngineers 2014).

[3] Cleanup level is 800 micrograms per liter (µg/L) when benzene is present.

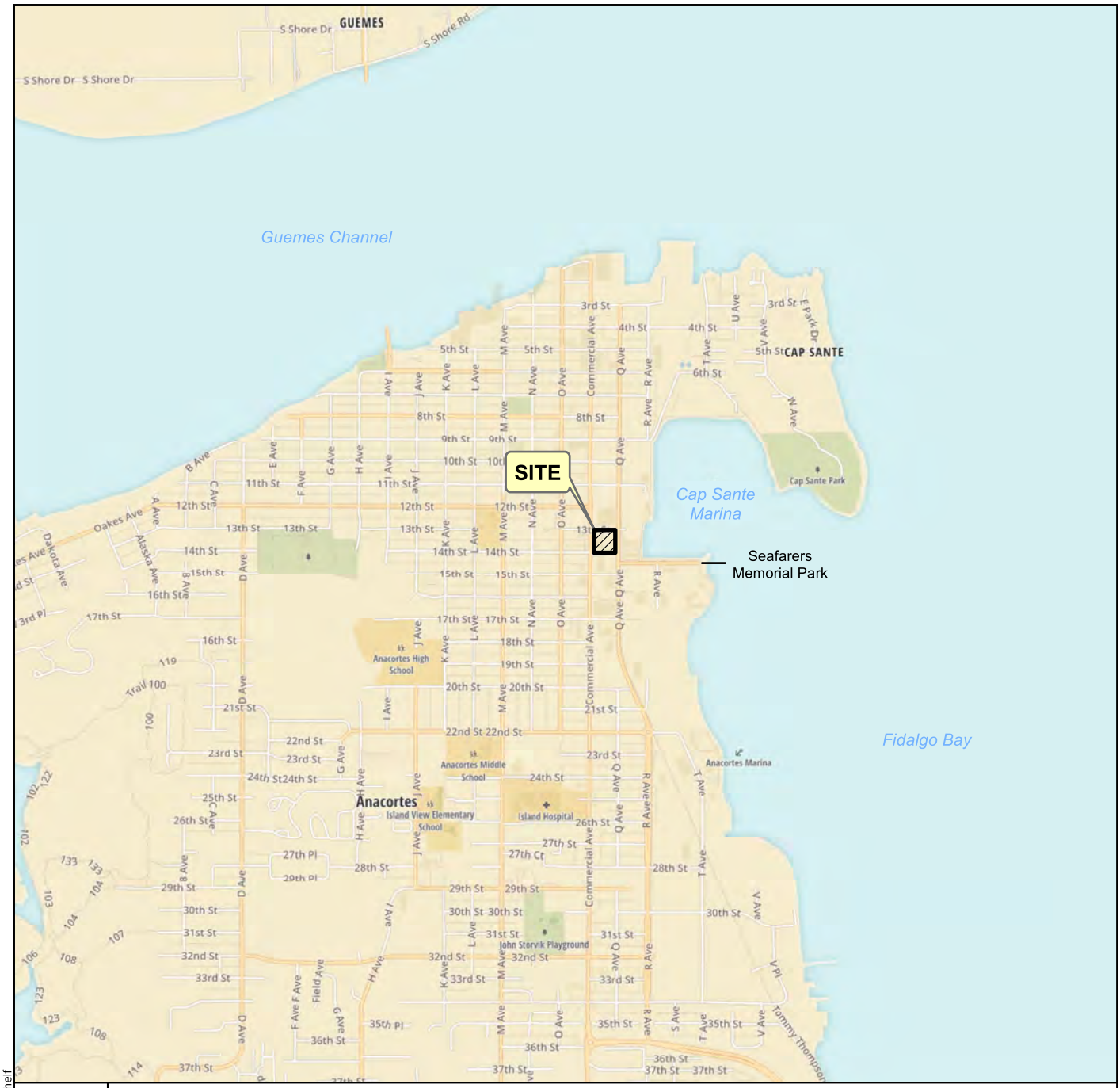
[4] Groundwater monitoring activities were discontinued following Round 4 in accordance with Ecology's May 24, 2017 opinion letter (Ecology 2017).

[5] Groundwater monitoring activities were discontinued following Round 6 in accordance with Ecology's November 30, 2018 opinion letter (Ecology 2018).

EPA = United States Environmental Protection Agency

U = qualifier indicating analyte not detected at level above listed practical quantitation limit

Chemical analyses performed by OnSite Environmental Inc. of Redmond, Washington.



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Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Mapbox Open Street Map, 2016

Projection: NAD 1983 UTM Zone 10N

Vicinity Map

Former Shell Oil Tank Farm
Anacortes, Washington

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Figure 1

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Cap Sante Marine
A Dock
B Dock
T Dock
GEI-MW-7
Historical Bulhead
(Approximate)
Marine Storage
Warehouse
Marine Storage
Warehouse
GEI-MW-5
Historical Bulhead
(Approximate)
Q Avenue
GEI-MW-4
GEI-MW-2
Substation
Safeway
13th Street
14th Street
McDonalds

Legend

- Former Shell Oil Tank Farm Area (Approximate)
- GEI-MW-4 — Post Contrsuction Groundwater Monitoring Well
- Cleanup Action Remedial Excavation Limit
- Approximate Area of Residual TPH, Benzene and/or Cadmium Contaminated Soil
- TPH — Petroleum Hydrocarbons (Gasoline, Diesel, and/or Heavy Oil)
- Inferred Groundwater Flow Arrow

Groundwater Chemical Analytical Results

Gas
Diesel
Heavy Oils

- Detected at a concentration greater than the cleanup level
- Not detected or detected at a concentration less than the cleanup level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Aerial imagery provided by the Port of Anacortes.
Imagery date: 2014..

Projection: WA State Plane, N Zone, NAD83, US Foot

N E S W

60 0 60
Feet

June 2023
Groundwater Monitoring Event

Former Shell Oil Tank Farm
Anacortes, Washington

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Figure 2

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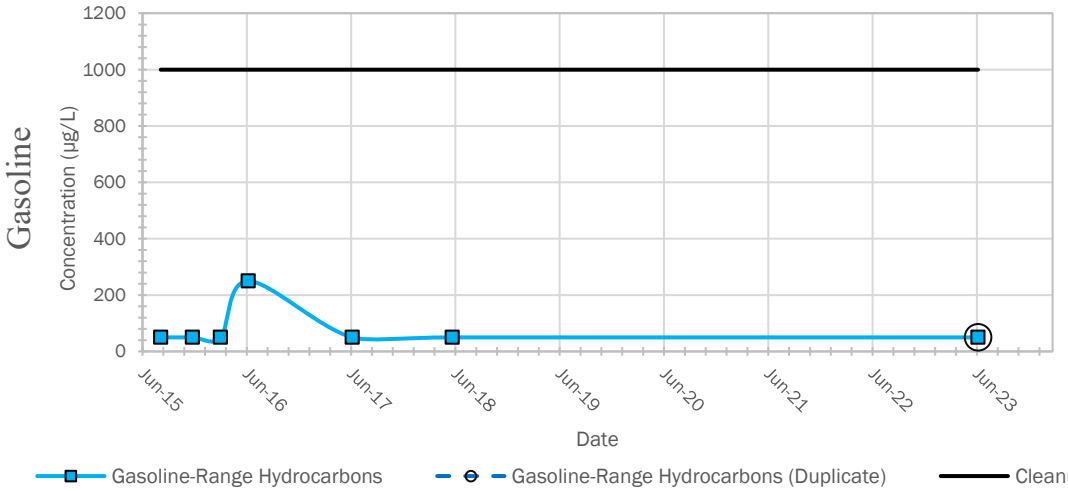
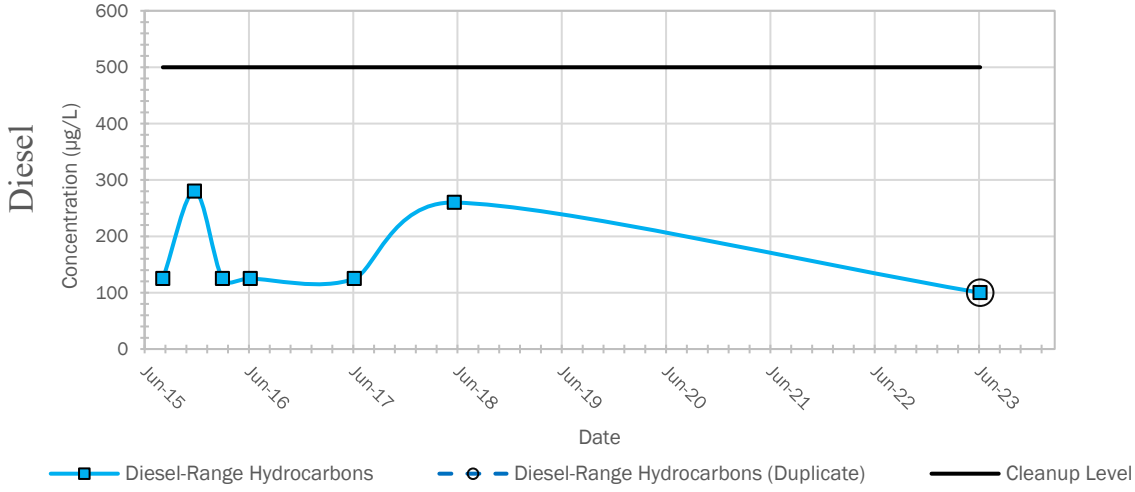
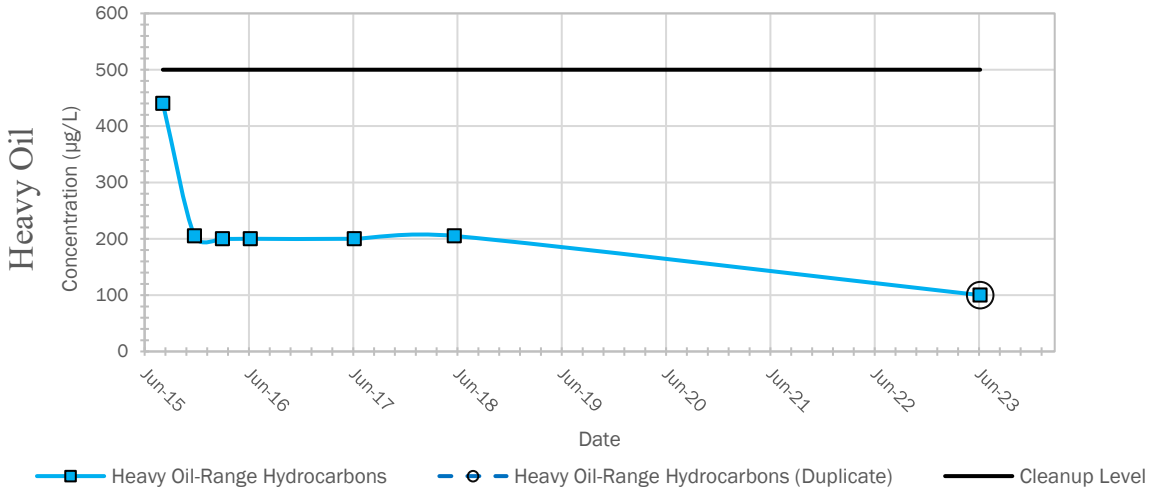






Notes:

1. Non-detect result reported as ½ the reporting limit.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Shell Tank Farm Year 8 groundwater chemical analytical data (see Table 3).

GEI-MW-7
Trend Plot Analysis

Former Shell Oil Tank Farm
Anacortes, Washington

GeoEngineers

Figure 3

APPENDIX A
Well Completion Logs

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	CC	Cement Concrete
	AC	Asphalt Concrete
	CR	Crushed Rock/ Quarry Spalls
	TS	Topsoil/ Forest Duff/Sod

Measured groundwater level in exploration, well, or piezometer

Groundwater observed at time of exploration

Perched water observed at time of exploration

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Material Description Contact

Distinct contact between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Sampler Symbol Descriptions

2.4-inch I.D. split barrel

Standard Penetration Test (SPT)

Shelby tube

Piston

Direct-Push

Bulk or grab

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

A "P" indicates sampler pushed using the weight of the drill rig.

Laboratory / Field Tests

%F	Percent fines
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
OC	Organic content
PM	Permeability or hydraulic conductivity
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen
NT	Not Tested

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

KEY TO EXPLORATION LOGS

GeoEngineers

FIGURE A-1

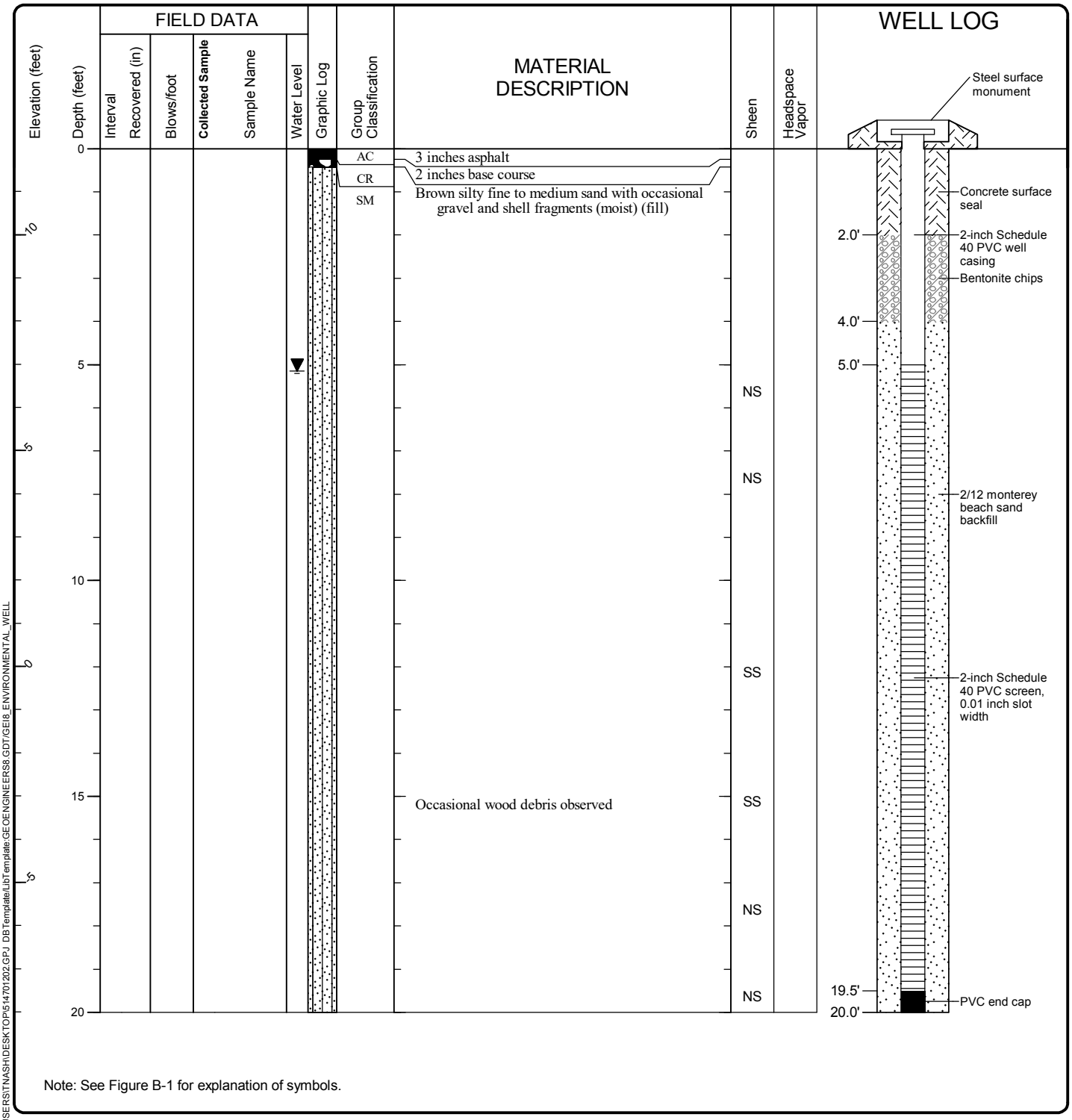
Drilled	Start	End	Total Depth (ft)	Logged By	Checked By	Driller	Drilling Method
	2/10/2012	2/10/2012	20	AJ	RST	Cascade Drilling, LP	Hollow Stem Auger

Hammer Data	N/A	Drilling Equipment	CME 75
Surface Elevation (ft) Vertical Datum	12.0 MLLW	Top of Casing Elevation (ft)	11.7
Easting (X) Northing (Y)	1209845.159 556436.0145	Horizontal Datum	NAD83

Licensing agency well number: **BHM147**
A 2 (in) well was installed on 2/10/2012 to a depth of 20 (ft).

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
3/6/2012	5.2	6.50

Notes: Air knife from 0 to 5 feet. No samples obtained, soil descriptions based on drill cuttings. PID malfunction - No head space vapor readings.



Note: See Figure B-1 for explanation of symbols.

Log of Monitoring Well GEI-MW-7

GeoEngineers

Project: Former Shell Oil Tank Farm
Project Location: Anacortes, Washington
Project Number: 5147-012-02

Figure A-2
Sheet 1 of 1

APPENDIX B
Chemical Analytical Data

OnSite Environmental Inc.
14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

July 6, 2023

Robert Trahan
GeoEngineers, Inc.
2101 4th Avenue, Suite 950
Seattle, WA 98121

Re: Analytical Data for Project 5147-012-09
Laboratory Reference No. 2306-324

Dear Robert:

Enclosed are the analytical results and associated quality control data for samples submitted on June 27, 2023.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

Date of Report: July 6, 2023
Samples Submitted: June 27, 2023
Laboratory Reference: 2306-324
Project: 5147-012-09

Case Narrative

Samples were collected on June 27, 2023 and received by the laboratory on June 27, 2023. They were maintained at the laboratory at a temperature of 2°C to 6°C.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

Date of Report: July 6, 2023
Samples Submitted: June 27, 2023
Laboratory Reference: 2306-324
Project: 5147-012-09

ANALYTICAL REPORT FOR SAMPLES

Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Notes
GEI-MW-7_062723	06-324-01	Water	6-27-23	6-27-23	
GEI-DUP_062723	06-324-02	Water	6-27-23	6-27-23	
TRIP BLANK	06-324-03	Water	---	6-27-23	

Date of Report: July 6, 2023
Samples Submitted: June 27, 2023
Laboratory Reference: 2306-324
Project: 5147-012-09

GASOLINE RANGE ORGANICS
NWTPH-Gx

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**GEI-MW-7_062723**					
Laboratory ID:	06-324-01					
Gasoline	**ND**	100	NWTPH-Gx	6-29-23	6-29-23	
Surrogate:	*Percent Recovery*	*Control Limits*				
Fluorobenzene	*91*	*65-122*				
Client ID:	**GEI-DUP_062723**					
Laboratory ID:	06-324-02					
Gasoline	**ND**	100	NWTPH-Gx	6-29-23	6-29-23	
Surrogate:	*Percent Recovery*	*Control Limits*				
Fluorobenzene	*92*	*65-122*				
Client ID:	**TRIP BLANK**					
Laboratory ID:	06-324-03					
Gasoline	**ND**	100	NWTPH-Gx	6-29-23	6-29-23	
Surrogate:	*Percent Recovery*	*Control Limits*				
Fluorobenzene	*98*	*65-122*				

Date of Report: July 6, 2023
Samples Submitted: June 27, 2023
Laboratory Reference: 2306-324
Project: 5147-012-09

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**GEI-MW-7_062723**					
Laboratory ID:	06-324-01					
Diesel Range Organics	**ND**	0.20	NWTPH-Dx	6-29-23	6-29-23	
Lube Oil Range Organics	**ND**	0.20	NWTPH-Dx	6-29-23	6-29-23	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*77*	*50-150*				
Client ID:	**GEI-DUP_062723**					
Laboratory ID:	06-324-02					
Diesel Range Organics	**ND**	0.20	NWTPH-Dx	6-29-23	6-29-23	
Lube Oil Range Organics	**ND**	0.20	NWTPH-Dx	6-29-23	6-29-23	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*79*	*50-150*				

Date of Report: July 6, 2023
Samples Submitted: June 27, 2023
Laboratory Reference: 2306-324
Project: 5147-012-09

GASOLINE RANGE ORGANICS
NWTPH-Gx
QUALITY CONTROL

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0629W1					
Gasoline	**ND**	100	NWTPH-Gx	6-29-23	6-29-23	
Surrogate:	*Percent Recovery*	*Control Limits*				
Fluorobenzene	*92*	*65-122*				

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	06-324-01										
	ORIG	DUP									
Gasoline	**ND**	**ND**	NA	NA		NA		NA	NA	30	
Surrogate:											
Fluorobenzene						*91*	*84*	*65-122*			

Date of Report: July 6, 2023
Samples Submitted: June 27, 2023
Laboratory Reference: 2306-324
Project: 5147-012-09

GASOLINE RANGE ORGANICS
NWTPH-Gx
CONTINUED CALIBRATION SUMMARY

Lab ID	True Value (ppm)	Calc. Value	Percent Difference	Control Limits
CCVH0629G-1	5.00	5.21	-4	+/- 20%
CCVH0629G-2	5.00	5.06	-1	+/- 20%

Date of Report: July 6, 2023
Samples Submitted: June 27, 2023
Laboratory Reference: 2306-324
Project: 5147-012-09

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx
QUALITY CONTROL

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0629W1					
Diesel Range Organics	**ND**	0.16	NWTPH-Dx	6-29-23	6-29-23	
Lube Oil Range Organics	**ND**	0.16	NWTPH-Dx	6-29-23	6-29-23	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*84*	*50-150*				

Analyte	Result		Spike Level		Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE										
Laboratory ID:	SB0629W1									
	ORIG	DUP								
Diesel Fuel #2	**0.404**	**0.324**	NA	NA		NA	NA	22	40	
Surrogate:										
o-Terphenyl						*81*	*70*	*50-150*		

Date of Report: July 6, 2023
Samples Submitted: June 27, 2023
Laboratory Reference: 2306-324
Project: 5147-012-09

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx
CONTINUING CALIBRATION SUMMARY

Lab ID	True Value (ppm)	Calc. Value	Percent Difference	Control Limits
CCV0629F-V1	100	97.8	2.2	+/-15%
CCV0629F-V2	100	99.9	0.1	+/-15%

OnSite Environmental Inc.

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1 - Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

X2 - Sample extract treated with a silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in methods 8260 & 8270, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Y1 - Negative effects of the matrix from this sample on the instrument caused values for this analyte in the bracketing continuing calibration verification standard (CCVs) to be outside of 20% acceptance criteria. Because of this, quantitation limits and sample concentrations should be considered estimates.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

Chain of Custody

OnSite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Company: GeoEngineers
Project Number: 5147-012-09
Project Name: Port of Anacortes
Project Manager: Robert Treffan
Sampled By: Paul Robinette

Turnaround Request (in working days)

(Check One)

- ☐ Same Day
- ☐ 1 Day
- ☐ 2 Days
- ☐ 3 Days
- ☒ Standard (7 Days)
- ☐ _____ (other)

Laboratory Number: 06-324

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX (8021☐ 8260☐)	NWTPH-Gx	NWTPH-Dx (SG Clean-up ☐)	Volatiles 8260	Halogenated Volatiles 8260	EDB EPA 8011 (Waters Only)	Semivolatiles 8270/SIM (with low-level PAHs)	PAHs 8270/SIM (low-level)	PCBs 8082	Organochlorine Pesticides 8081	Organophosphorus Pesticides 8270/SIM	Chlorinated Acid Herbicides 8151	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664					% Moisture
1	GEI-MW-7_062723	6/27/23	0800	GW	3			X	X																		
2	GEI-DUP_062723	6/27/23	0715	GW	3			X	X																		
3	TRIP BLANK			W	3			X																			
					06																						
					6/27																						

	Signature	Company	Date	Time
Relinquished		GEI	6/27/23	1046
Received		GEI	6/27/23	1046
Relinquished				
Received				
Relinquished				
Received				

Comments/Special Instructions

Data Package: Standard ☐ Level III ☐ Level IV ☐

Reviewed/Date

Reviewed/Date

Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

Sample/Cooler Receipt and Acceptance Checklist

Client: GES

Client Project Name/Number: 5147-012-09

Initiated by: KP

OnSite Project Number: 06-324

Date Initiated: 6/27/23

1.0 Cooler Verification

1.1 Were there custody seals on the outside of the cooler?	Yes	(No)	N/A	1 2 3 4	
1.2 Were the custody seals intact?	Yes	No	(N/A)	1 2 3 4	
1.3 Were the custody seals signed and dated by last custodian?	Yes	No	(N/A)	1 2 3 4	
1.4 Were the samples delivered on ice or blue ice?	(Yes)	No	N/A	1 2 3 4	
1.5 Were samples received between 0-6 degrees Celsius?	(Yes)	No	N/A	Temperature:	4.6°
1.6 Have shipping bills (if any) been attached to the back of this form?	Yes	(N/A)			
1.7 How were the samples delivered?	(Client)	Courier	UPS/FedEx	OSE Pickup	Other

2.0 Chain of Custody Verification

2.1 Was a Chain of Custody submitted with the samples?	(Yes)	No		1 2 3 4
2.2 Was the COC legible and written in permanent ink?	(Yes)	No		1 2 3 4
2.3 Have samples been relinquished and accepted by each custodian?	(Yes)	No		1 2 3 4
2.4 Did the sample labels (ID, date, time, preservative) agree with COC?	(Yes)	No		1 2 3 4
2.5 Were all of the samples listed on the COC submitted?	(Yes)	No		1 2 3 4
2.6 Were any of the samples submitted omitted from the COC?	Yes	(No)		1 2 3 4

3.0 Sample Verification

3.1 Were any sample containers broken or compromised?	Yes	(No)		1 2 3 4
3.2 Were any sample labels missing or illegible?	Yes	(No)		1 2 3 4
3.3 Have the correct containers been used for each analysis requested?	Yes	No		1 2 3 4
3.4 Have the samples been correctly preserved?	(Yes)	No	N/A	1 2 3 4
3.5 Are volatiles samples free from headspace and bubbles greater than 6mm?	(Yes)	No	N/A	1 2 3 4
3.6 Is there sufficient sample submitted to perform requested analyses?	Yes	No		1 2 3 4
3.7 Have any holding times already expired or will expire in 24 hours?	Yes	(No)		1 2 3 4
3.8 Was method 5035A used?	Yes	No	(N/A)	1 2 3 4
3.9 If 5035A was used, which sampling option was used (#1, 2, or 3).	#		(N/A)	1 2 3 4

Explain any discrepancies:

#1 d+e, #2 d+e pH 5

#3 only one VOA - COC states 3 Containers - Limited

1 - Discuss issue in Case Narrative

2 - Process Sample As-is

3 - Client contacted to discuss problem

4 - Sample cannot be analyzed or client does not wish to proceed

RAW DATA

- Gasoline Range Organics NWTPH-Gx
- Diesel And Heavy Oil Range Organics NWTPH-Dx

Gasoline Range Organics
NWTPH-Gx Data

Quantitation Report (Not Reviewed)

Data File : X:\BTEX\HOPE\DATA\H230629\0629006.D Vial: 6
Acq On : 29 Jun 2023 17:34 Operator:
Sample : 06-324-01a Inst : Hope
Misc : Multiplr: 1.00
Sample Amount: 0.00

IntFile : EVENTS1.E

Quant Time: Jun 29 17:42 2023 Quant Results File: 230606G.RES

Quant Method : E:\ARCHON\METHODS\230606G.M (Chemstation Integrator)
Title : Fid calibration
Last Update : Thu Jun 22 11:36:05 2023
Response via : Initial Calibration
DataAcq Meth : 230606G.M

Volume Inj. :
Signal Phase :
Signal Info :

		Compound	R.T.	Response	Conc	Units
		System Monitoring Compounds				
6)	S	FLUOROBENZENE #2	6.38	2527200	36.470	PPB
11)	S	BROMOFLUOROBENZENE #2	12.10	4227656	37.088	PPB
		Target Compounds				
2)	H	Entire GAS Envelope #2	9.97	1087232	N.D.	PPM
3)	H	GASOLINE #2	11.07	540939	N.D.	PPM
4)		MTBE #2	0.00	0	N.D.	PPB
5)		BENZENE #2	6.14	1115	N.D.	PPB
7)		TOLUENE #2	8.70	17503	N.D.	PPB
8)		ETHYLBENZENE #2	10.88	1495	N.D.	PPB
9)		m,p-XYLENE #2	11.09	2281	N.D.	PPB
10)		o-XYLENE #2	11.64	3015	N.D.	PPB

(f)=RT Delta > 1/2 Window (m)=manual int

Quantitation Report (Not Reviewed)

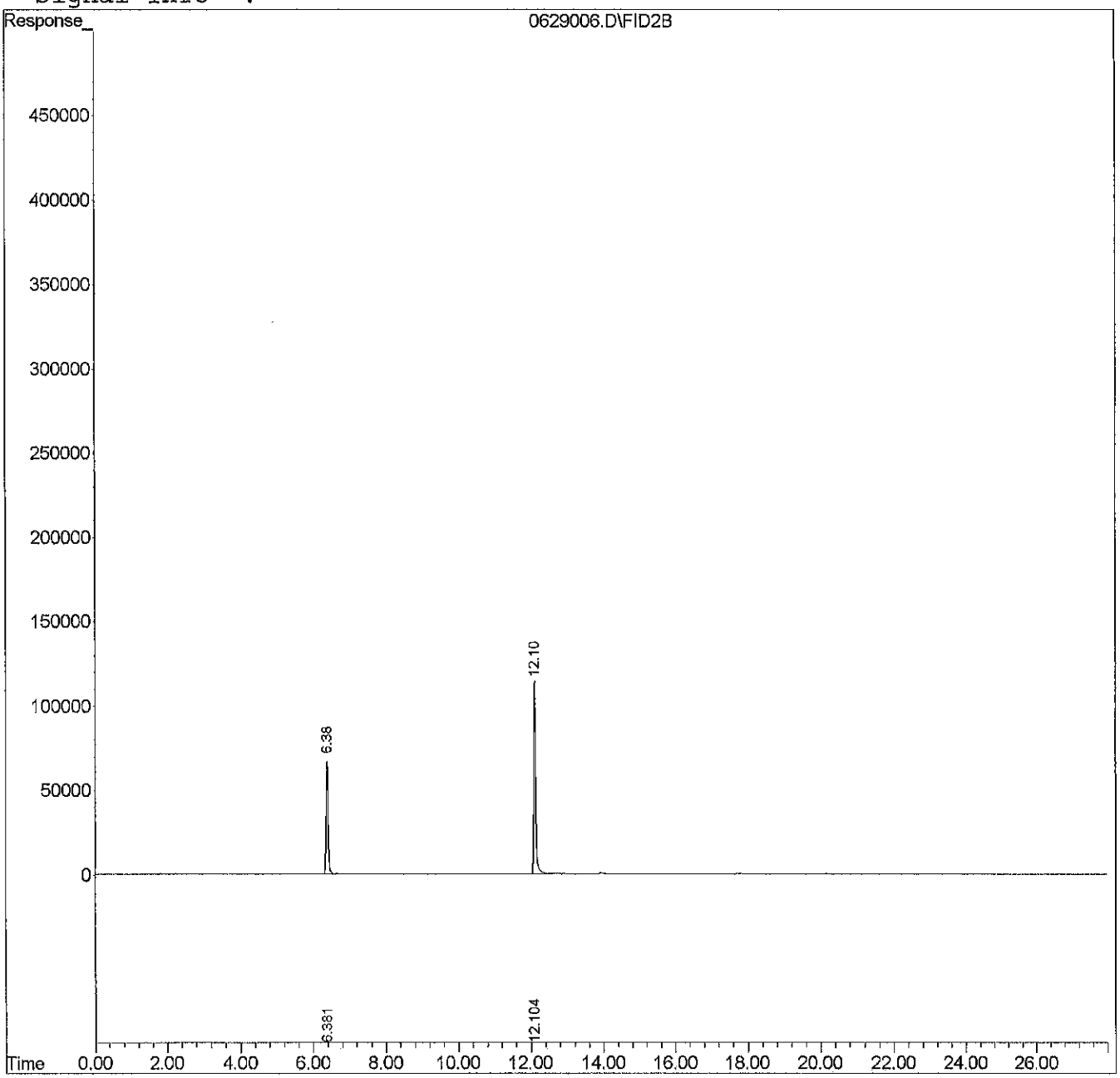
Data File : X:\BTEX\HOPE\DATA\H230629\0629006.D Vial: 6
Acq On : 29 Jun 2023 17:34 Operator:
Sample : 06-324-01a Inst : Hope
Misc : Multiplr: 1.00
Sample Amount: 0.00

IntFile : EVENTS1.E

Quant Time: Jun 29 17:42 2023 Quant Results File: 230606G.RES

Quant Method : E:\ARCHON\METHODS\230606G.M (Chemstation Integrator)
Title : Fid calibration
Last Update : Thu Jun 22 11:36:05 2023
Response via : Multiple Level Calibration
DataAcq Meth : 230606G.M

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (Not Reviewed)

Data File : X:\BTEX\HOPE\DATA\H230629\0629008.D Vial: 8
Acq On : 29 Jun 2023 18:34 Operator:
Sample : 06-324-02a Inst : Hope
Misc : Multiplr: 1.00
Sample Amount: 0.00

IntFile : EVENTS1.E

Quant Time: Jun 29 18:49 2023 Quant Results File: 230606G.RES

Quant Method : E:\ARCHON\METHODS\230606G.M (Chemstation Integrator)
Title : Fid calibration
Last Update : Thu Jun 22 11:36:05 2023
Response via : Initial Calibration
DataAcq Meth : 230606G.M

Volume Inj. :
Signal Phase :
Signal Info :

		Compound	R.T.	Response	Conc	Units
		System Monitoring Compounds				
6)	S	FLUOROBENZENE #2	6.38	2551573	36.822	PPB
11)	S	BROMOFLUOROBENZENE #2	12.10	4258796	37.361	PPB
		Target Compounds				
2)	H	Entire GAS Envelope #2	9.97	977200	N.D.	PPM
3)	H	GASOLINE #2	11.07	465293	N.D.	PPM
4)		MTBE #2	0.00	0	N.D.	PPB
5)		BENZENE #2	6.17	1129	N.D.	PPB
7)		TOLUENE #2	8.69	28421	0.062	PPB
8)		ETHYLBENZENE #2	10.75	1036	N.D.	PPB
9)		m,p-XYLENE #2	11.14	9523	N.D.	PPB
10)		o-XYLENE #2	11.64	3478	N.D.	PPB

(f)=RT Delta > 1/2 Window (m)=manual int

Quantitation Report (Not Reviewed)

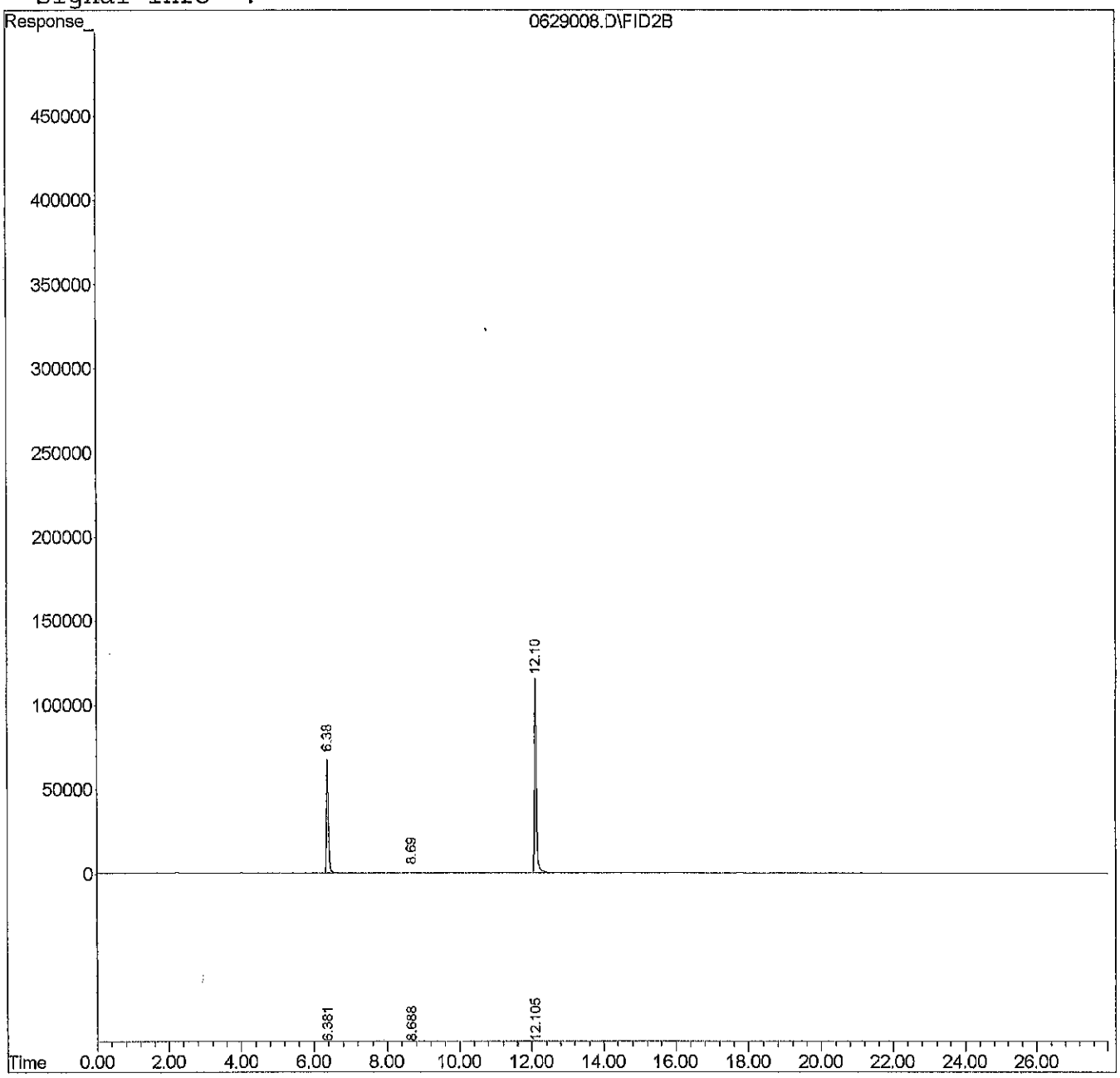
Data File : X:\BTEX\HOPE\DATA\H230629\0629008.D Vial: 8
Acq On : 29 Jun 2023 18:34 Operator:
Sample : 06-324-02a Inst : Hope
Misc : Multiplr: 1.00
Sample Amount: 0.00

IntFile : EVENTS1.E

Quant Time: Jun 29 18:49 2023 Quant Results File: 230606G.RES

Quant Method : E:\ARCHON\METHODS\230606G.M (Chemstation Integrator)
Title : Fid calibration
Last Update : Thu Jun 22 11:36:05 2023
Response via : Multiple Level Calibration
DataAcq Meth : 230606G.M

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (Not Reviewed)

Data File : X:\BTEX\HOPE\DATA\H230629\0629005.D Vial: 5
Acq On : 29 Jun 2023 17:04 Operator:
Sample : 06-324-03 Inst : Hope
Misc : TRIP BLANK Multiplr: 1.00
Sample Amount: 0.00

IntFile : EVENTS1.E

Quant Time: Jun 29 17:08 2023 Quant Results File: 230606G.RES

Quant Method : E:\ARCHON\METHODS\230606G.M (Chemstation Integrator)
Title : Fid calibration
Last Update : Thu Jun 22 11:36:05 2023
Response via : Initial Calibration
DataAcq Meth : 230606G.M

Volume Inj. :
Signal Phase :
Signal Info :

		Compound	R.T.	Response	Conc	Units
		System Monitoring Compounds				
6)	S	FLUOROBENZENE #2	6.38	2724995	39.324	PPB
11)	S	BROMOFLUOROBENZENE #2	12.11	4560649	40.004	PPB
		Target Compounds				
2)	H	Entire GAS Envelope #2	9.97	1271195	N.D.	PPM
3)	H	GASOLINE #2	11.07	788708	N.D.	PPM
4)		MTBE #2	4.16	1587	0.016	PPB
5)		BENZENE #2	6.15	4567	N.D.	PPB
7)		TOLUENE #2	8.69	17942	N.D.	PPB
8)		ETHYLBENZENE #2	10.84	5597	0.027	PPB
9)		m,p-XYLENE #2	11.10	25202	0.091	PPB
10)		o-XYLENE #2	11.62	10953	0.042	PPB

Quantitation Report (Not Reviewed)

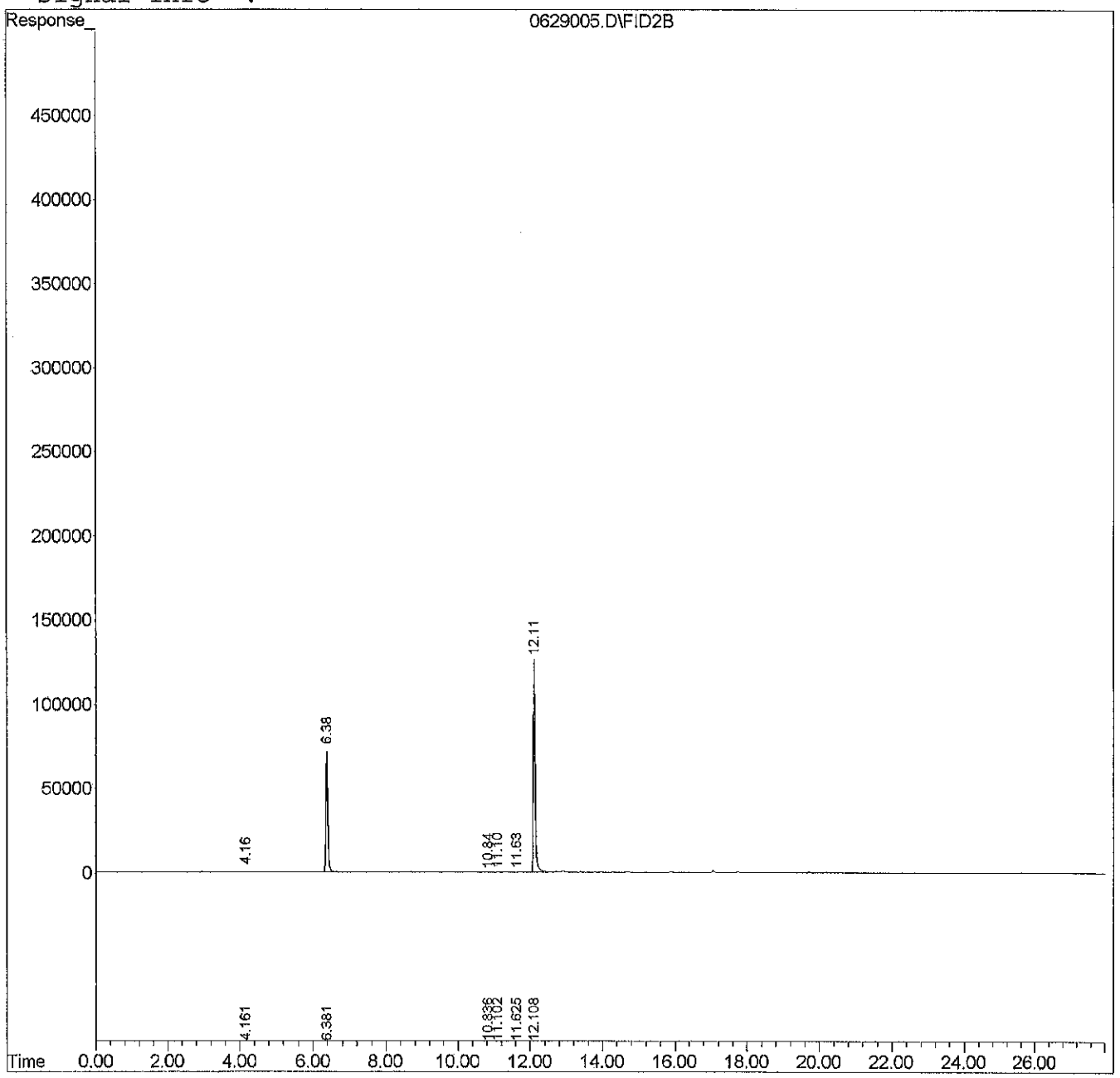
Data File : X:\BTEX\HOPE\DATA\H230629\0629005.D Vial: 5
Acq On : 29 Jun 2023 17:04 Operator:
Sample : 06-324-03 Inst : Hope
Misc : TRIP BLANK Multiplr: 1.00
Sample Amount: 0.00

IntFile : EVENTS1.E

Quant Time: Jun 29 17:08 2023 Quant Results File: 230606G.RES

Quant Method : E:\ARCHON\METHODS\230606G.M (Chemstation Integrator)
Title : Fid calibration
Last Update : Thu Jun 22 11:36:05 2023
Response via : Multiple Level Calibration
DataAcq Meth : 230606G.M

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (Not Reviewed)

Data File : X:\BTEX\HOPE\DATA\H230629\0629003.D Vial: 3
Acq On : 29 Jun 2023 11:32 Operator:
Sample : MB0629W1 Inst : Hope
Misc : Multiplr: 1.00
Sample Amount: 0.00

IntFile : EVENTS1.E

Quant Time: Jun 29 11:49 2023 Quant Results File: 230606G.RES

Quant Method : E:\ARCHON\METHODS\230606G.M (Chemstation Integrator)
Title : Fid calibration
Last Update : Thu Jun 22 11:36:05 2023
Response via : Initial Calibration
DataAcq Meth : 230606G.M

Volume Inj. :
Signal Phase :
Signal Info :

		Compound	R.T.	Response	Conc	Units
		System Monitoring Compounds				
6)	S	FLUOROBENZENE #2	6.38	2540330	36.660	PPB
11)	S	BROMOFLUOROBENZENE #2	12.11	4207334	36.910	PPB
		Target Compounds				
2)	H	Entire GAS Envelope #2	9.97	1629474	0.001	PPM
3)	H	GASOLINE #2	11.07	531561	N.D.	PPM
4)		MTBE #2	4.13	1209	0.005	PPB
5)		BENZENE #2	6.16	3623	N.D.	PPB
7)		TOLUENE #2	8.70	17988	N.D.	PPB
8)		ETHYLBENZENE #2	10.80	1020	N.D.	PPB
9)		m,p-XYLENE #2	11.12	9997	N.D.	PPB
10)		o-XYLENE #2	11.62	8381	0.016	PPB

(f)=RT Delta > 1/2 Window (m)=manual int

Quantitation Report (Not Reviewed)

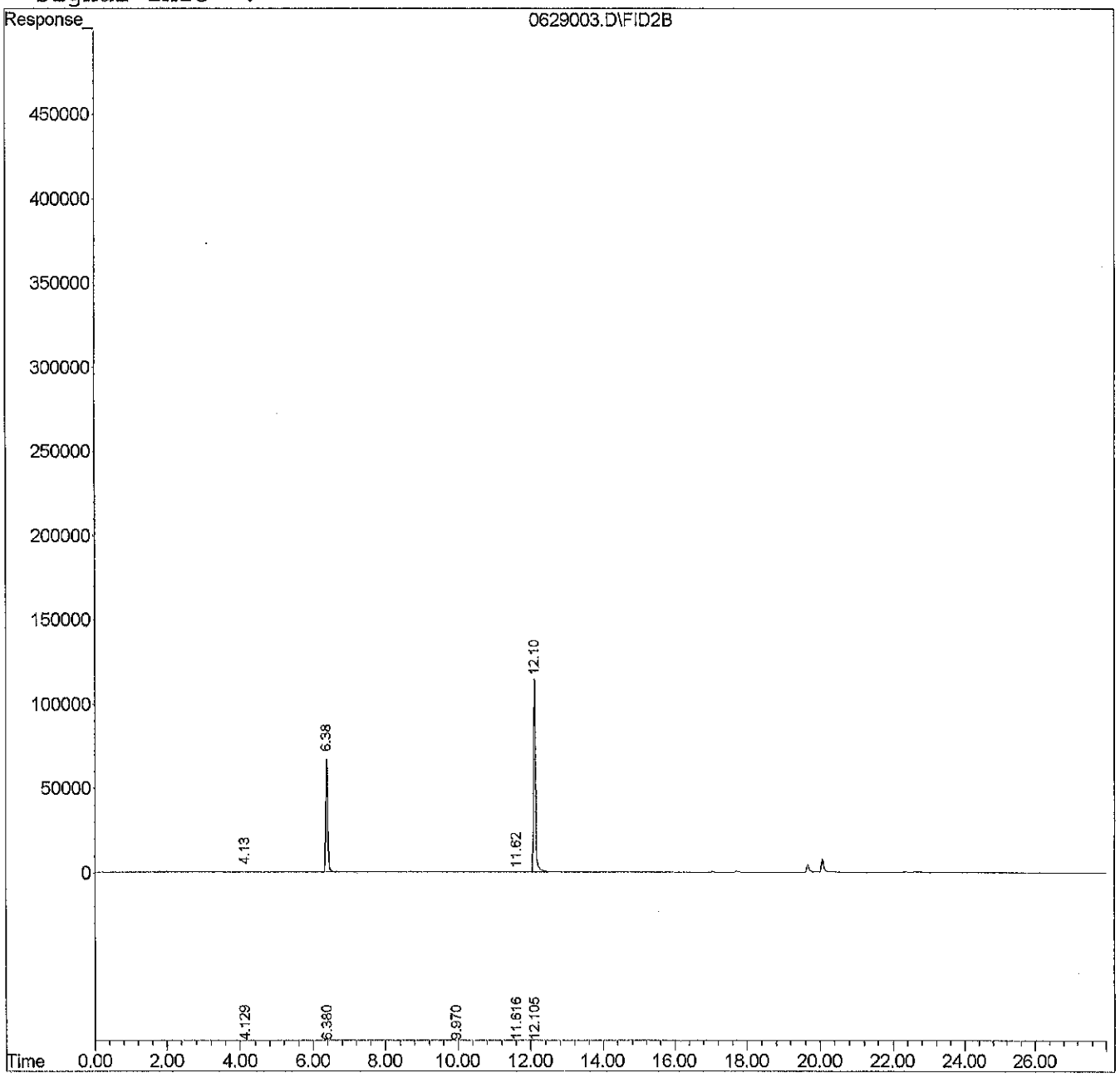
Data File : X:\BTEX\HOPE\DATA\H230629\0629003.D Vial: 3
Acq On : 29 Jun 2023 11:32 Operator:
Sample : MB0629W1 Inst : Hope
Misc : Multiplr: 1.00
Sample Amount: 0.00

IntFile : EVENTS1.E

Quant Time: Jun 29 11:49 2023 Quant Results File: 230606G.RES

Quant Method : E:\ARCHON\METHODS\230606G.M (Chemstation Integrator)
Title : Fid calibration
Last Update : Thu Jun 22 11:36:05 2023
Response via : Multiple Level Calibration
DataAcq Meth : 230606G.M

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (Not Reviewed)

Data File : X:\BTEX\HOPE\DATA\H230629\0629006.D Vial: 6
Acq On : 29 Jun 2023 17:34 Operator:
Sample : 06-324-01a Inst : Hope
Misc : Multiplr: 1.00
Sample Amount: 0.00

IntFile : EVENTS1.E

Quant Time: Jun 29 17:42 2023 Quant Results File: 230606G.RES

Quant Method : E:\ARCHON\METHODS\230606G.M (Chemstation Integrator)
Title : Fid calibration
Last Update : Thu Jun 22 11:36:05 2023
Response via : Initial Calibration
DataAcq Meth : 230606G.M

Volume Inj. :
Signal Phase :
Signal Info :

		Compound	R.T.	Response	Conc	Units
		System Monitoring Compounds				
6)	S	FLUOROBENZENE #2	6.38	2527200	36.470	PPB
11)	S	BROMOFLUOROBENZENE #2	12.10	4227656	37.088	PPB
		Target Compounds				
2)	H	Entire GAS Envelope #2	9.97	1087232	N.D.	PPM
3)	H	GASOLINE #2	11.07	540939	N.D.	PPM
4)		MTBE #2	0.00	0	N.D.	PPB
5)		BENZENE #2	6.14	1115	N.D.	PPB
7)		TOLUENE #2	8.70	17503	N.D.	PPB
8)		ETHYLBENZENE #2	10.88	1495	N.D.	PPB
9)		m,p-XYLENE #2	11.09	2281	N.D.	PPB
10)		o-XYLENE #2	11.64	3015	N.D.	PPB

(f)=RT Delta > 1/2 Window (m)=manual int

Quantitation Report (Not Reviewed)

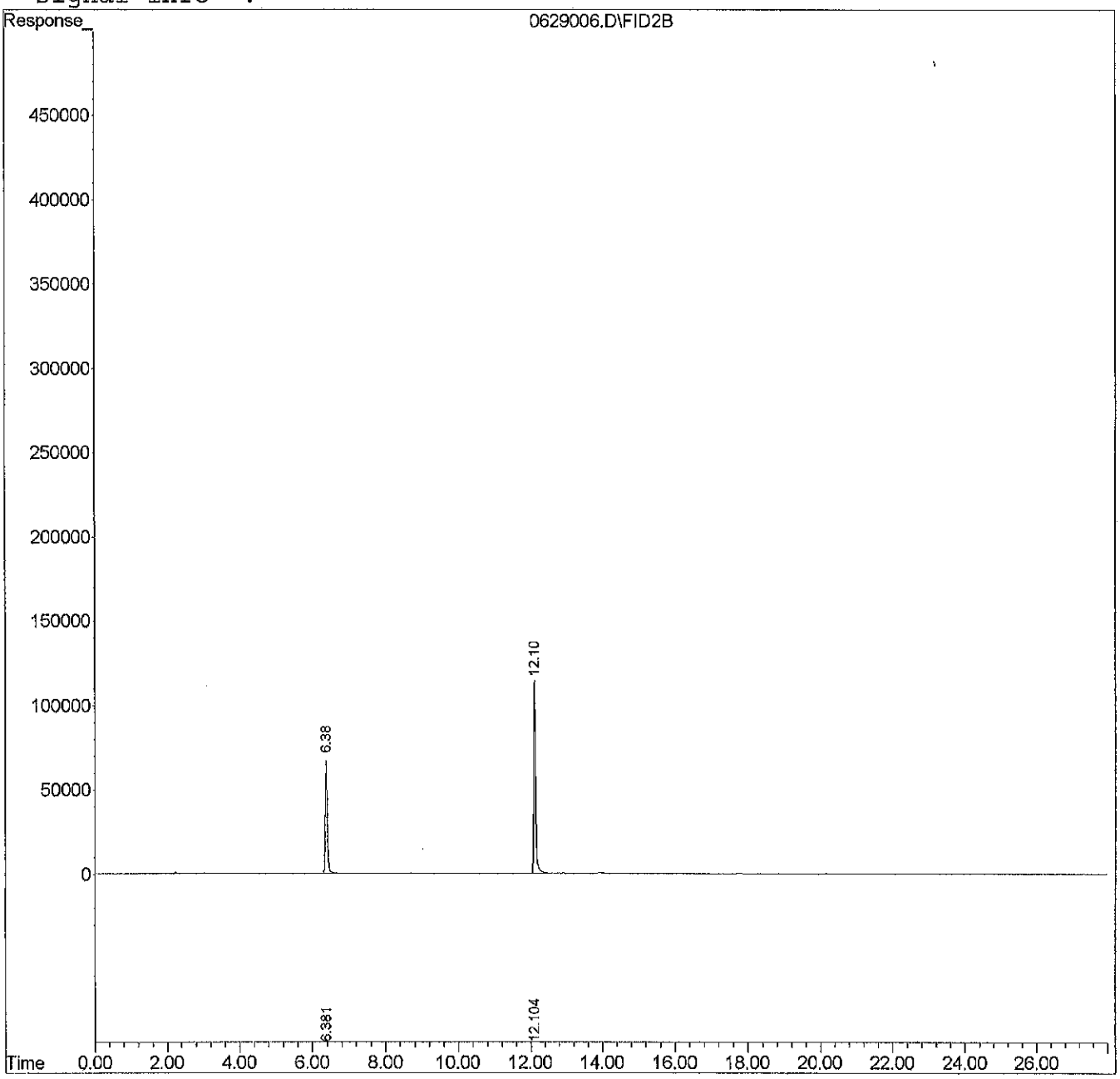
Data File : X:\BTEX\HOPE\DATA\H230629\0629006.D Vial: 6
Acq On : 29 Jun 2023 17:34 Operator:
Sample : 06-324-01a Inst : Hope
Misc : Multiplr: 1.00
Sample Amount: 0.00

IntFile : EVENTS1.E

Quant Time: Jun 29 17:42 2023 Quant Results File: 230606G.RES

Quant Method : E:\ARCHON\METHODS\230606G.M (Chemstation Integrator)
Title : Fid calibration
Last Update : Thu Jun 22 11:36:05 2023
Response via : Multiple Level Calibration
DataAcq Meth : 230606G.M

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (Not Reviewed)

Data File : X:\BTEX\HOPE\DATA\H230629\0629007.D Vial: 7
Acq On : 29 Jun 2023 18:04 Operator:
Sample : 06-324-01a DUP Inst : Hope
Misc : Multiplr: 1.00
Sample Amount: 0.00

IntFile : EVENTS1.E

Quant Time: Jun 29 18:15 2023 Quant Results File: 230606G.RES

Quant Method : E:\ARCHON\METHODS\230606G.M (Chemstation Integrator)
Title : Fid calibration
Last Update : Thu Jun 22 11:36:05 2023
Response via : Initial Calibration
DataAcq Meth : 230606G.M

Volume Inj. :
Signal Phase :
Signal Info :

		Compound	R.T.	Response	Conc	Units
		System Monitoring Compounds				
6)	S	FLUOROBENZENE #2	6.38	2329304	33.615	PPB
11)	S	BROMOFLUOROBENZENE #2	12.10	3841789	33.709	PPB
		Target Compounds				
2)	H	Entire GAS Envelope #2	9.97	1211261	N.D.	PPM
3)	H	GASOLINE #2	11.07	569839	N.D.	PPM
4)		MTBE #2	4.14	2062	0.030	PPB
5)		BENZENE #2	6.17	2113	N.D.	PPB
7)		TOLUENE #2	8.69	18788	N.D.	PPB
8)		ETHYLBENZENE #2	10.82	1504	N.D.	PPB
9)		m,p-XYLENE #2	11.13	6916	N.D.	PPB
10)		o-XYLENE #2	11.62	1767	N.D.	PPB

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (Not Reviewed)

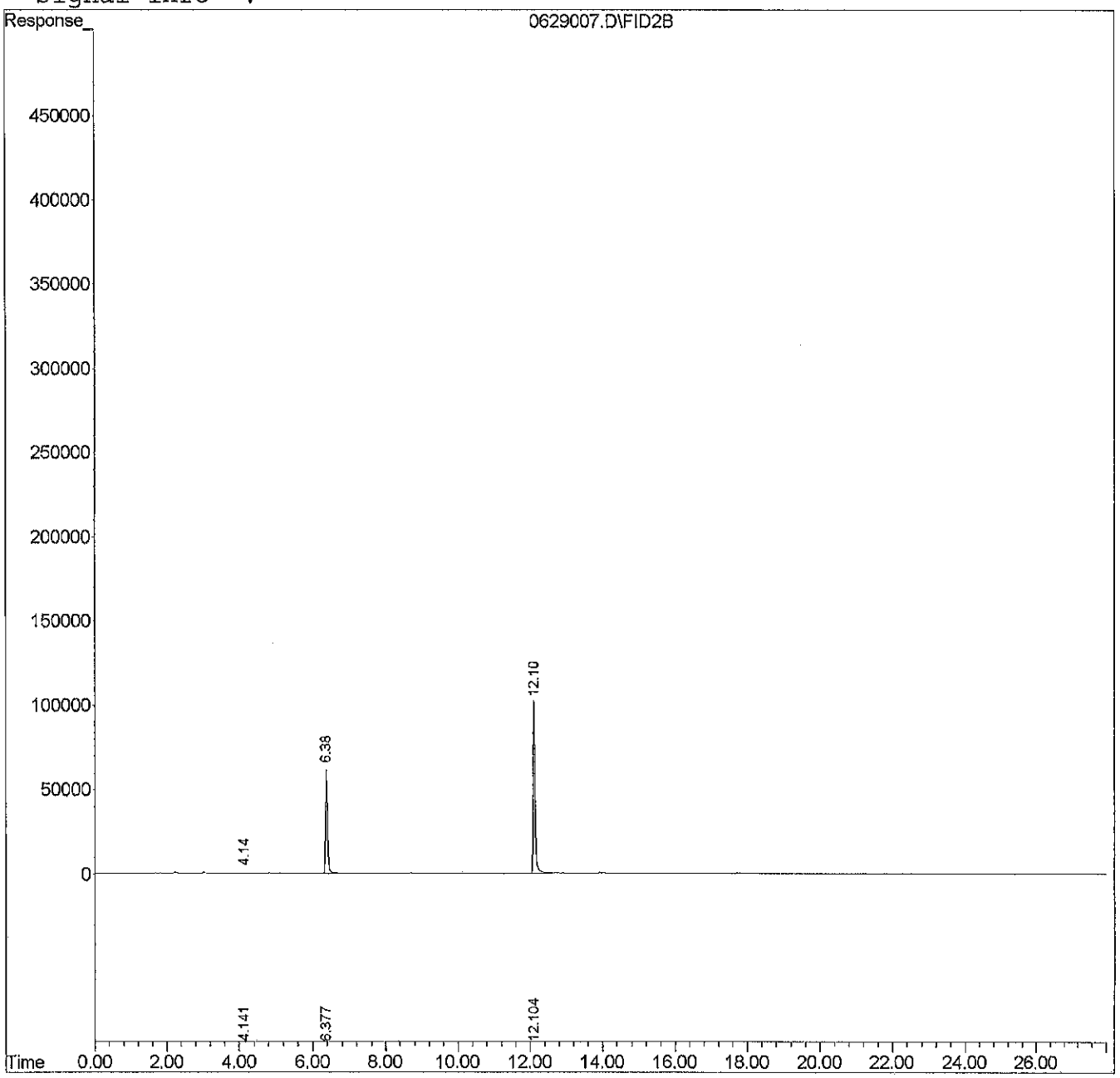
Data File : X:\BTEX\HOPE\DATA\H230629\0629007.D Vial: 7
Acq On : 29 Jun 2023 18:04 Operator:
Sample : 06-324-01a DUP Inst : Hope
Misc : Multiplr: 1.00
Sample Amount: 0.00

IntFile : EVENTS1.E

Quant Time: Jun 29 18:15 2023 Quant Results File: 230606G.RES

Quant Method : E:\ARCHON\METHODS\230606G.M (Chemstation Integrator)
Title : Fid calibration
Last Update : Thu Jun 22 11:36:05 2023
Response via : Multiple Level Calibration
DataAcq Meth : 230606G.M

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (Not Reviewed)

Data File : X:\BTEX\HOPE\DATA\H230629\0629001.D Vial: 1
Acq On : 29 Jun 2023 10:31 Operator:
Sample : CCVH0629G-1 Inst : Hope
Misc : V2-068-13 Multiplr: 1.00
Sample Amount: 0.00

IntFile : EVENTS1.E

Quant Time: Jun 29 10:41 2023 Quant Results File: 230606G.RES

Quant Method : E:\ARCHON\METHODS\230606G.M (Chemstation Integrator)
Title : Fid calibration
Last Update : Thu Jun 22 11:36:05 2023
Response via : Initial Calibration
DataAcq Meth : 230606G.M

Volume Inj. :
Signal Phase :
Signal Info :

		Compound	R.T.	Response	Conc	Units
		System Monitoring Compounds				
6)	S	FLUOROBENZENE #2	6.39	2901806	41.875	PPB
11)	S	BROMOFLUOROBENZENE #2	12.11	5549603	48.665	PPB
		Target Compounds				
2)	H	Entire GAS Envelope #2	9.97	214447058	5.132	PPM
3)	H	GASOLINE #2	11.07	175842934	5.209	PPM
4)		MTBE #2	0.00	0	N.D.	PPB
5)		BENZENE #2	6.14	11508036	119.939	PPB
7)		TOLUENE #2	8.64	40247494	412.151	PPB
8)		ETHYLBENZENE #2	10.75	8891324	92.986	PPB
9)		m,p-XYLENE #2	11.03	36300903	318.853	PPB
10)		o-XYLENE #2	11.56	12838501	131.868	PPB

(f)=RT Delta > 1/2 Window (m)=manual int

Quantitation Report (Not Reviewed)

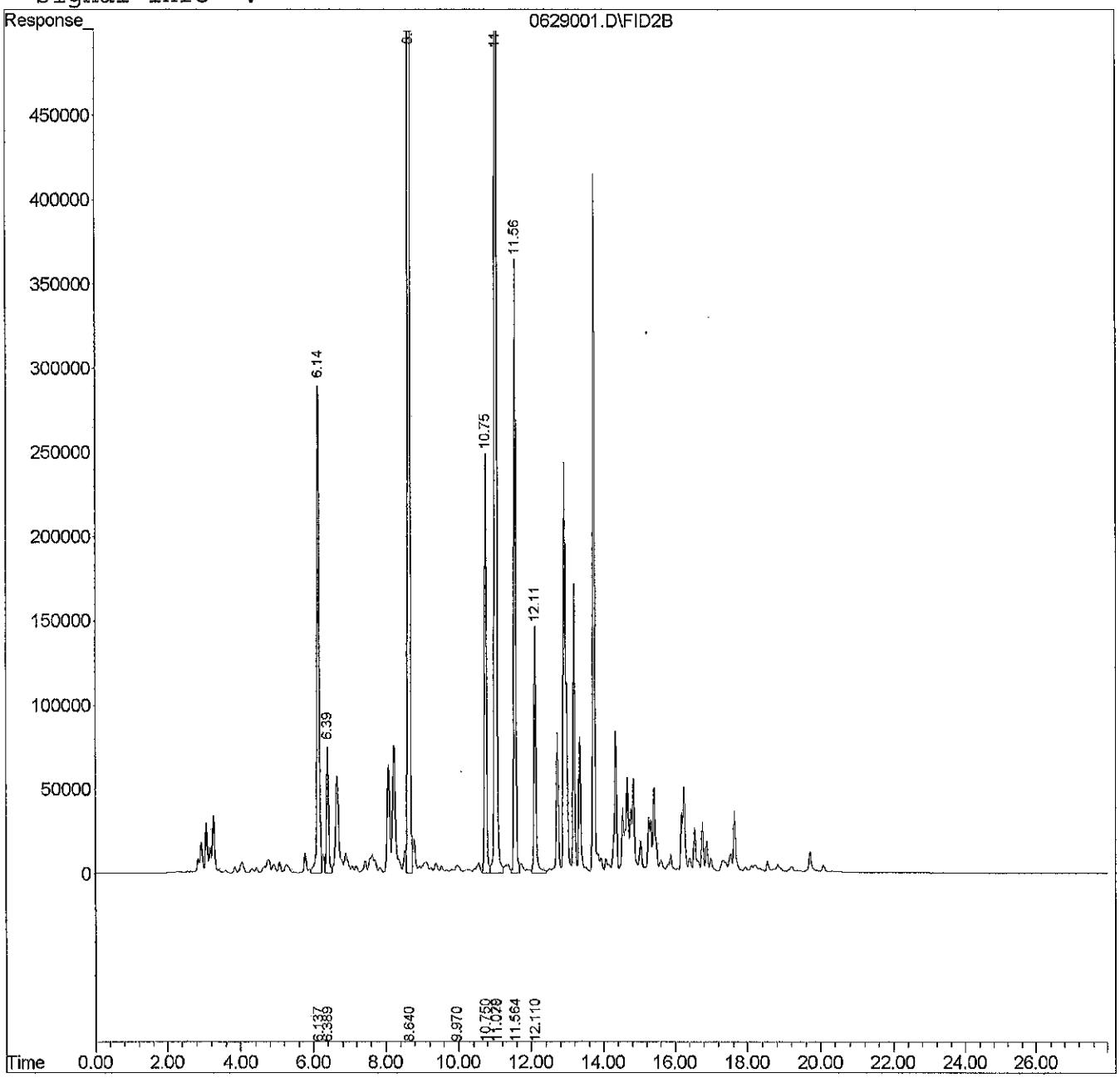
Data File : X:\BTEX\HOPE\DATA\H230629\0629001.D Vial: 1
Acq On : 29 Jun 2023 10:31 Operator:
Sample : CCVH0629G-1 Inst : Hope
Misc : V2-068-13 Multiplr: 1.00
Sample Amount: 0.00

IntFile : EVENTS1.E

Quant Time: Jun 29 10:41 2023 Quant Results File: 230606G.RES

Quant Method : E:\ARCHON\METHODS\230606G.M (Chemstation Integrator)
Title : Fid calibration
Last Update : Thu Jun 22 11:36:05 2023
Response via : Multiple Level Calibration
DataAcq Meth : 230606G.M

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (Not Reviewed)

Data File : X:\BTEX\HOPE\DATA\H230629\0629012.D Vial: 12
Acq On : 29 Jun 2023 20:50 Operator:
Sample : CCVH0629G-2 Inst : Hope
Misc : V2-068-13 Multiplr: 1.00
Sample Amount: 0.00

IntFile : EVENTS1.E

Quant Time: Jun 29 21:03 2023 Quant Results File: 230606G.RES

Quant Method : E:\ARCHON\METHODS\230606G.M (Chemstation Integrator)
Title : Fid calibration
Last Update : Thu Jun 22 11:36:05 2023
Response via : Initial Calibration
DataAcq Meth : 230606G.M

Volume Inj. :
Signal Phase :
Signal Info :

		Compound	R.T.	Response	Conc	Units
		System Monitoring Compounds				
6)	S	FLUOROBENZENE #2	6.38	2784134	40.177	PPB
11)	S	BROMOFLUOROBENZENE #2	12.10	5240379	45.957	PPB
		Target Compounds				
2)	H	Entire GAS Envelope #2	9.97	208011812	4.977	PPM
3)	H	GASOLINE #2	11.07	170709960	5.056	PPM
4)		MTBE #2	0.00	0	N.D.	PPB
5)		BENZENE #2	6.12	11452132	119.356	PPB
7)		TOLUENE #2	8.63	40060978	410.240	PPB
8)		ETHYLBENZENE #2	10.74	8784143	91.864	PPB
9)		m,p-XYLENE #2	11.02	35884063	315.190	PPB
10)		o-XYLENE #2	11.55	12700122	130.446	PPB

(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (Not Reviewed)

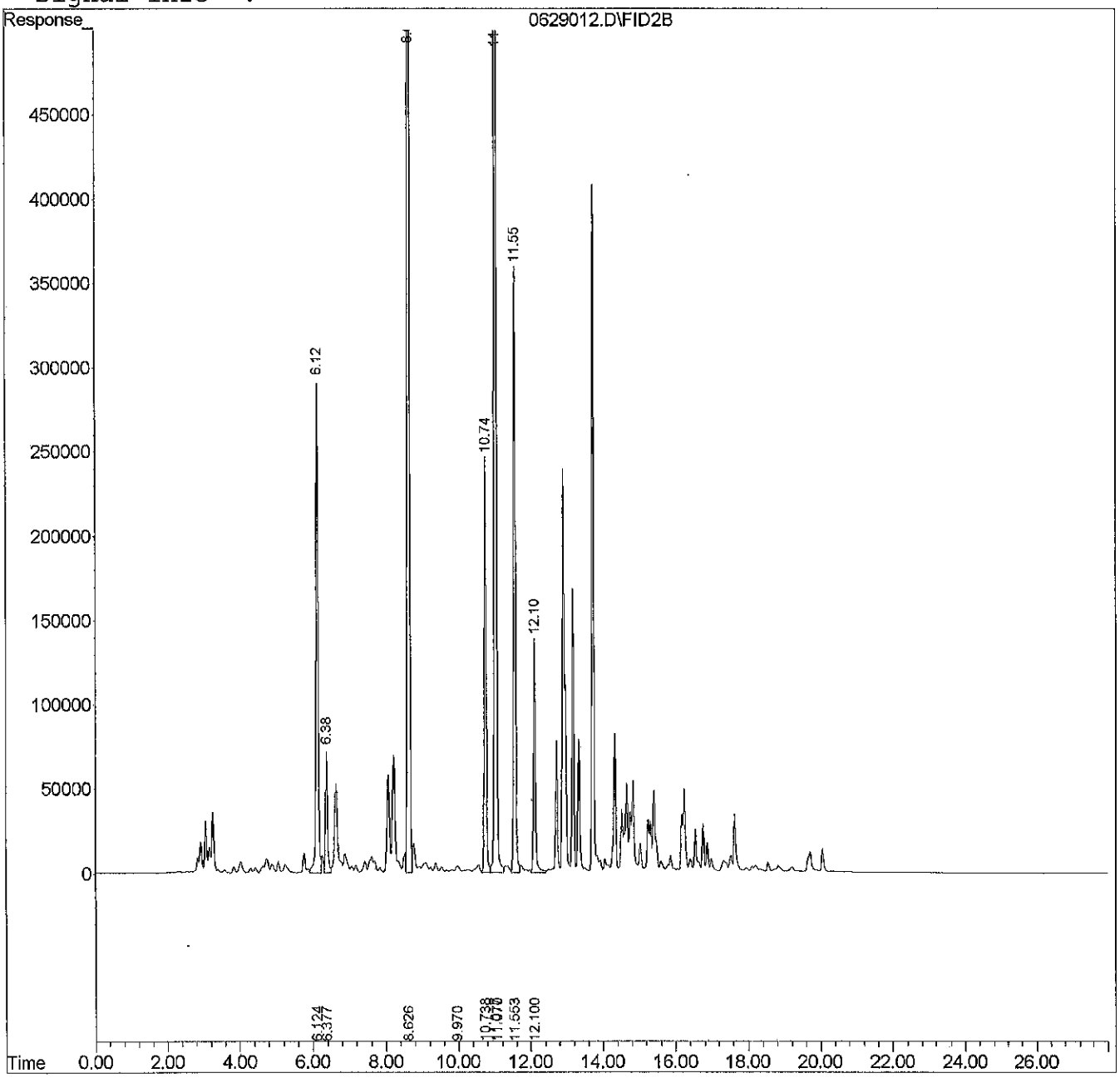
Data File : X:\BTEX\HOPE\DATA\H230629\0629012.D Vial: 12
Acq On : 29 Jun 2023 20:50 Operator:
Sample : CCVH0629G-2 Inst : Hope
Misc : V2-068-13 Multiplr: 1.00
Sample Amount: 0.00

IntFile : EVENTS1.E

Quant Time: Jun 29 21:03 2023 Quant Results File: 230606G.RES

Quant Method : E:\ARCHON\METHODS\230606G.M (Chemstation Integrator)
Title : Fid calibration
Last Update : Thu Jun 22 11:36:05 2023
Response via : Multiple Level Calibration
DataAcq Meth : 230606G.M

Volume Inj. :
Signal Phase :
Signal Info :



Diesel And Heavy Oil Range Organics
NWTPH-Dx Data

Quantitation Report (Not Reviewed)

Data Path : C:\msdchem\2\data\V230629\
Data File : 0629-V08.D
Signal(s) : FID1A.ch
Acq On : 29 Jun 2023 15:48
Operator : LW
Sample : 06-324-01
Misc : Sample
ALS Vial : 8 Sample Multiplier: 1

Integration File: events.e
Quant Time: Jun 29 16:24:24 2023
Quant Method : C:\MSDCHEM\2\METHODS\V230113F.M
Quant Title : GCTPH
QLast Update : Thu Jan 19 08:49:09 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1)	S O-Terphenyl (01-13-23)	14.664	101660173	38.402	PPM
Spiked Amount	50.000		Recovery =	76.80%	
	Target Compounds				
2)	1-Chlorooctadecane	0.000	0	N.D.	PPM
3)	H Gasoline	3.500	1888384	NoCal	PPM
4)	H Diesel Fuel #1 (01-14...	10.000	16568579	5.955	PPM
5)	H Diesel Fuel #2 (01-1...	14.000	22804688	9.494	PPM
6)	H Oil (01-13-23)	22.000	54519898	24.789	PPM
7)	H Oil Acid Clean (01-1...	22.000	54519898	21.243	PPM
8)	H Diesel Fuel #2 Combo ...	14.000	19123945	8.299	PPM
9)	H Oil Combo (01-13-23)	22.000	51164313	23.331	PPM
10)	H Oil Acid Clean Combo ...	22.000	51164313	19.999	PPM
11)	H HAWAII 8015M DF2 (01...	14.000	22448797	9.483	PPM
12)	H HAWAII 8015M Oil (01...	22.000	47480715	22.092	PPM
13)	H Mineral Oil (01-14-23)	16.000	25048156	11.117	PPM
14)	H Diesel Fuel #2 ACU (0...	14.000	22804688	8.411	PPM
15)	H Diesel Fuel #2 ACU CO...	14.000	19123945	7.263	PPM
16)	H Hydraulic Oil (01-14-23)	14.000	53628508	19.745	PPM
17)	H Hydraulic Oil ACU (01...	14.000	53628508	14.925	PPM
18)	H Mineral Oil Combo (01...	16.000	16489238	7.818	PPM
19)	H Oil Acid Clean MO Com...	22.000	47728009	19.006	PPM
20)	H Oil MO Combo (01-13-23)	22.000	47728009	22.166	PPM

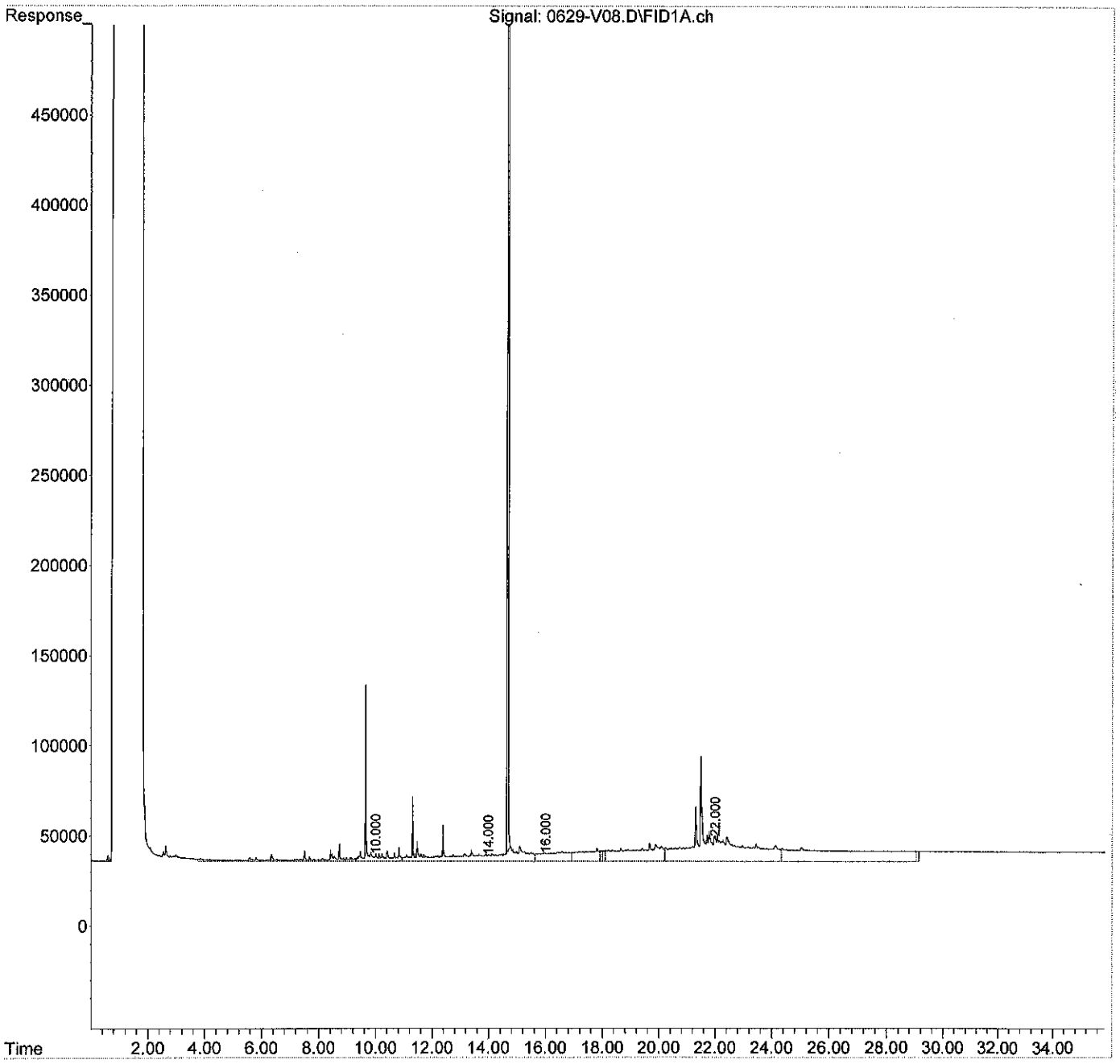
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (Not Reviewed)

Data Path : C:\msdchem\2\data\V230629\
Data File : 0629-V08.D
Signal(s) : FID1A.ch
Acq On : 29 Jun 2023 15:48
Operator : LW
Sample : 06-324-01
Misc : Sample
ALS Vial : 8 Sample Multiplier: 1

Integration File: events.e
Quant Time: Jun 29 16:24:24 2023
Quant Method : C:\MSDCHEM\2\METHODS\V230113F.M
Quant Title : GCTPH
QLast Update : Thu Jan 19 08:49:09 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (Not Reviewed)

Data Path : C:\msdchem\2\data\V230629\
Data File : 0629-V09.D
Signal(s) : FID1A.ch
Acq On : 29 Jun 2023 16:29
Operator : LW
Sample : 06-324-02
Misc : Sample
ALS Vial : 9 Sample Multiplier: 1

Integration File: events.e
Quant Time: Jun 29 17:05:05 2023
Quant Method : C:\MSDCHEM\2\METHODS\V230113F.M
Quant Title : GCTPH
QLast Update : Thu Jan 19 08:49:09 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1)	S O-Terphenyl (01-13-23)	14.665	104945403	39.646	PPM
Spiked Amount	50.000		Recovery =	79.29%	
	Target Compounds				
2)	1-Chlorooctadecane	0.000	0	N.D.	PPM
3)	H Gasoline	3.500	1669167	NoCal	PPM
4)	H Diesel Fuel #1 (01-14...	10.000	16741576	6.030	PPM
5)	H Diesel Fuel #2 (01-1...	14.000	24915021	10.419	PPM
6)	H Oil (01-13-23)	22.000	66265432	32.072	PPM
7)	H Oil Acid Clean (01-1...	22.000	66265432	27.245	PPM
8)	H Diesel Fuel #2 Combo ...	14.000	20268476	8.816	PPM
9)	H Oil Combo (01-13-23)	22.000	62121688	30.226	PPM
10)	H Oil Acid Clean Combo ...	22.000	62121688	25.677	PPM
11)	H HAWAII 8015M DF2 (01...	14.000	24473732	10.380	PPM
12)	H HAWAII 8015M Oil (01...	22.000	57546940	28.651	PPM
13)	H Mineral Oil (01-14-23)	16.000	31469476	13.839	PPM
14)	H Diesel Fuel #2 ACU (0...	14.000	24915021	9.261	PPM
15)	H Diesel Fuel #2 ACU CO...	14.000	20268476	7.738	PPM
16)	H Hydraulic Oil (01-14-23)	14.000	64925517	24.345	PPM
17)	H Hydraulic Oil ACU (01...	14.000	64925517	19.104	PPM
18)	H Mineral Oil Combo (01...	16.000	19955184	9.310	PPM
19)	H Oil Acid Clean MO Com...	22.000	57861466	24.420	PPM
20)	H Oil MO Combo (01-13-23)	22.000	57861466	28.751	PPM

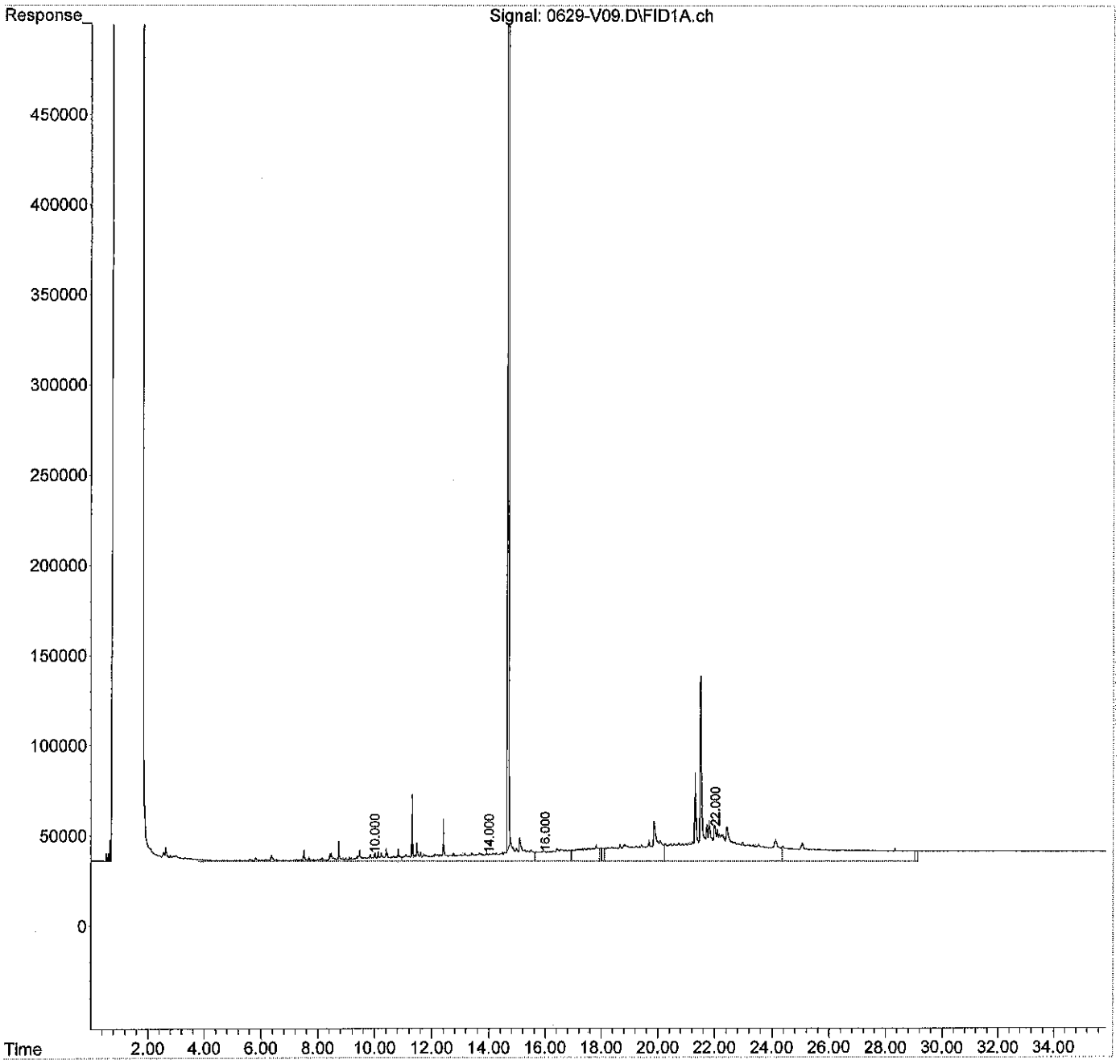
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (Not Reviewed)

Data Path : C:\msdchem\2\data\V230629\
Data File : 0629-V09.D
Signal(s) : FID1A.ch
Acq On : 29 Jun 2023 16:29
Operator : LW
Sample : 06-324-02
Misc : Sample
ALS Vial : 9 Sample Multiplier: 1

Integration File: events.e
Quant Time: Jun 29 17:05:05 2023
Quant Method : C:\MSDCHEM\2\METHODS\V230113F.M
Quant Title : GCTPH
QLast Update : Thu Jan 19 08:49:09 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (Not Reviewed)

Data Path : C:\msdchem\2\data\V230629\
Data File : 0629-V07.D
Signal(s) : FID1A.ch
Acq On : 29 Jun 2023 15:07
Operator : LW
Sample : MB0629W1
Misc : Sample
ALS Vial : 7 Sample Multiplier: 1

Integration File: events.e
Quant Time: Jun 29 15:43:52 2023
Quant Method : C:\MSDCHEM\2\METHODS\V230113F.M
Quant Title : GCTPH
QLast Update : Thu Jan 19 08:49:09 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1) S	O-Terphenyl (01-13-23)	14.669	138617005	52.396	PPM
Spiked Amount	50.000		Recovery =	104.79%	
	Target Compounds				
2)	1-Chlorooctadecane	0.000	0	N.D.	PPM
3) H	Gasoline	3.500	1478977	NoCal	PPM
4) H	Diesel Fuel #1 (01-14...	10.000	2804289	N.D.	PPM
5) H	Diesel Fuel #2 (01-1...	14.000	2935342	0.782	PPM
6) H	Oil (01-13-23)	22.000	27302348	7.912	PPM
7) H	Oil Acid Clean (01-1...	22.000	27302348	7.335	PPM
8) H	Diesel Fuel #2 Combo ...	14.000	2631176	0.839	PPM
9) H	Oil Combo (01-13-23)	22.000	26927246	8.079	PPM
10) H	Oil Acid Clean Combo ...	22.000	26927246	7.439	PPM
11) H	HAWAII 8015M DF2 (01...	14.000	2892827	0.826	PPM
12) H	HAWAII 8015M Oil (01...	22.000	26347018	8.320	PPM
13) H	Mineral Oil (01-14-23)	16.000	4736961	2.508	PPM
14) H	Diesel Fuel #2 ACU (0...	14.000	2935342	0.412	PPM
15) H	Diesel Fuel #2 ACU CO...	14.000	2631176	0.423	PPM
16) H	Hydraulic Oil (01-14-23)	14.000	14988655	4.011	PPM
17) H	Hydraulic Oil ACU (01...	14.000	14988655	0.633	PPM
18) H	Mineral Oil Combo (01...	16.000	2453464	1.774	PPM
19) H	Oil Acid Clean MO Com...	22.000	26371039	7.595	PPM
20) H	Oil MO Combo (01-13-23)	22.000	26371039	8.288	PPM

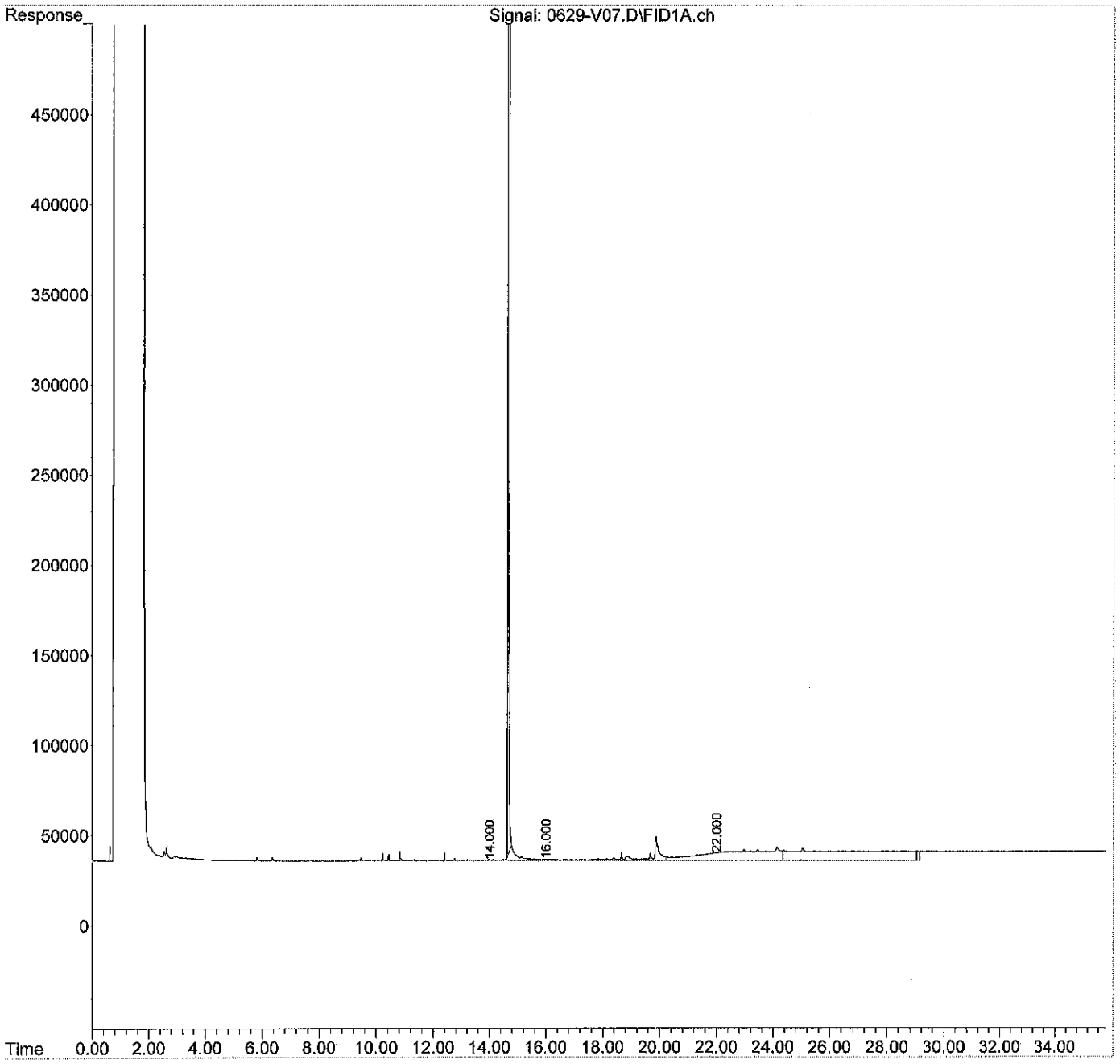
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (Not Reviewed)

Data Path : C:\msdchem\2\data\V230629\
Data File : 0629-V07.D
Signal(s) : FID1A.ch
Acq On : 29 Jun 2023 15:07
Operator : LW
Sample : MB0629W1
Misc : Sample
ALS Vial : 7 Sample Multiplier: 1

Integration File: events.e
Quant Time: Jun 29 15:43:52 2023
Quant Method : C:\MSDCHEM\2\METHODS\V230113F.M
Quant Title : GCTPH
QLast Update : Thu Jan 19 08:49:09 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (Not Reviewed)

Data Path : C:\msdchem\2\data\V230629\
Data File : 0629-V05.D
Signal(s) : FID1A.ch
Acq On : 29 Jun 2023 13:45
Operator : LW
Sample : SB0629W1 DUP
Misc : Sample
ALS Vial : 5 Sample Multiplier: 1

Integration File: events.e
Quant Time: Jun 29 14:21:31 2023
Quant Method : C:\MSDCHEM\2\METHODS\V230113F.M
Quant Title : GCTPH
QLast Update : Thu Jan 19 08:49:09 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

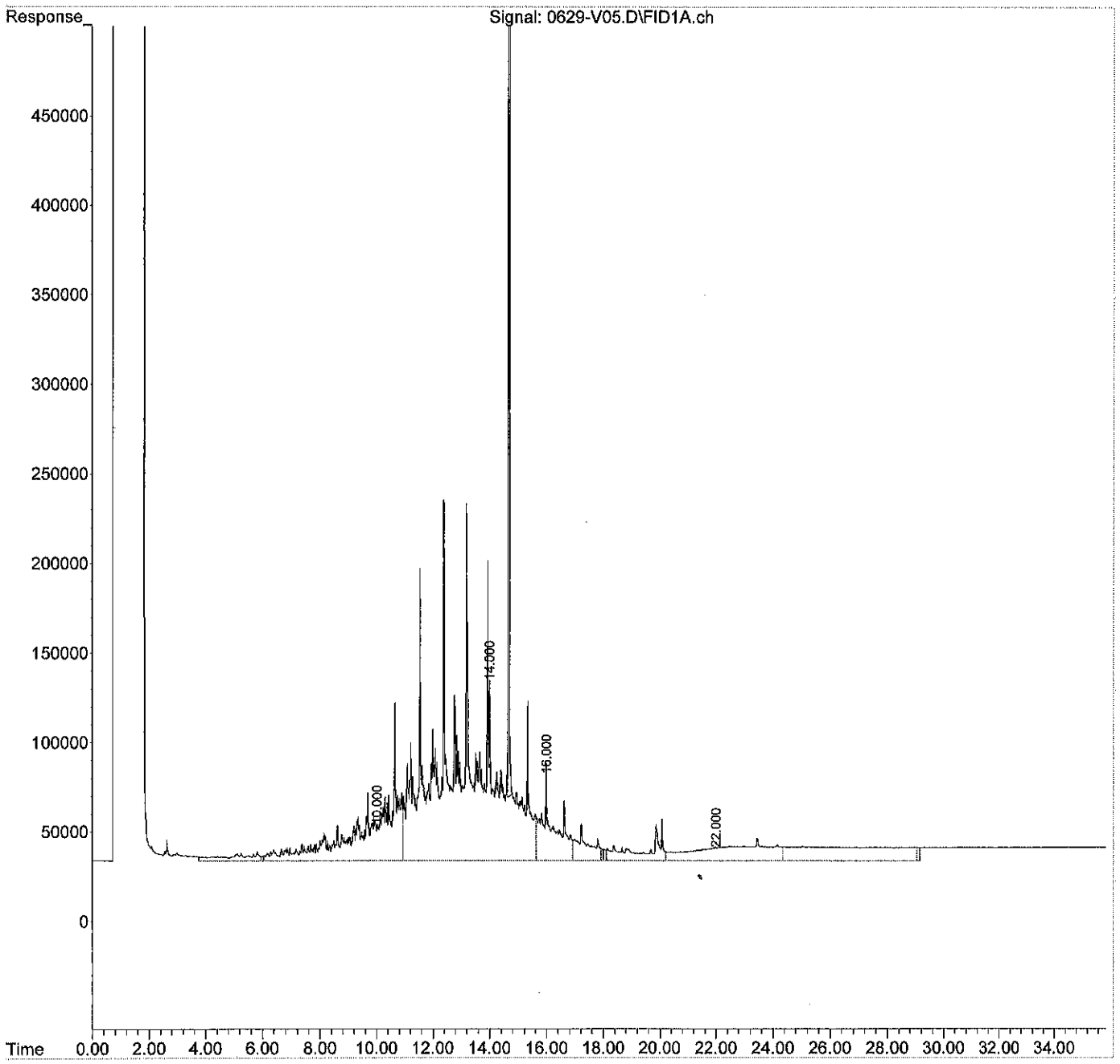
	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1)	S O-Terphenyl (01-13-23)	14.668	106719424	40.318	PPM
Spiked Amount	50.000		Recovery =	80.64%	
	Target Compounds				
2)	1-Chlorooctadecane	0.000	0	N.D.	PPM
3)	H Gasoline	3.500	4695791	NoCal	PPM
4)	H Diesel Fuel #1 (01-14...	10.000	167561155	72.083	PPM
5)	H Diesel Fuel #2 (01-1...	14.000	185296622	80.736	PPM
6)	H Oil (01-13-23)	22.000	66210102	32.038	PPM
7)	H Oil Acid Clean (01-1...	22.000	66210102	27.217	PPM
8)	H Diesel Fuel #2 Combo ...	14.000	178895234	80.559	PPM
9)	H Oil Combo (01-13-23)	22.000	51882740	23.783	PPM
10)	H Oil Acid Clean Combo ...	22.000	51882740	20.371	PPM
11)	H HAWAII 8015M DF2 (01...	14.000	184791950	81.349	PPM
12)	H HAWAII 8015M Oil (01...	22.000	45404258	20.739	PPM
13)	H Mineral Oil (01-14-23)	16.000	154828169	66.127	PPM
14)	H Diesel Fuel #2 ACU (0...	14.000	185296622	73.824	PPM
15)	H Diesel Fuel #2 ACU CO...	14.000	178895234	73.524	PPM
16)	H Hydraulic Oil (01-14-23)	14.000	209254960	83.117	PPM
17)	H Hydraulic Oil ACU (01...	14.000	209254960	72.488	PPM
18)	H Mineral Oil Combo (01...	16.000	146863927	63.953	PPM
19)	H Oil Acid Clean MO Com...	22.000	45691616	17.918	PPM
20)	H Oil MO Combo (01-13-23)	22.000	45691616	20.843	PPM

(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : C:\msdchem\2\data\V230629\
Data File : 0629-V05.D
Signal(s) : FID1A.ch
Acq On : 29 Jun 2023 13:45
Operator : LW
Sample : SB0629W1 DUP
Misc : Sample
ALS Vial : 5 Sample Multiplier: 1

Integration File: events.e
Quant Time: Jun 29 14:21:31 2023
Quant Method : C:\MSDCHEM\2\METHODS\V230113F.M
Quant Title : GCTPH
QLast Update : Thu Jan 19 08:49:09 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (Not Reviewed)

Data Path : C:\msdchem\2\data\V230629\
Data File : 0629-V06.D
Signal(s) : FID1A.ch
Acq On : 29 Jun 2023 14:27
Operator : LW
Sample : SB0629W1
Misc : Sample
ALS Vial : 6 Sample Multiplier: 1

Integration File: events.e
Quant Time: Jun 29 15:03:16 2023
Quant Method : C:\MSDCHEM\2\METHODS\V230113F.M
Quant Title : GCTPH
QLast Update : Thu Jan 19 08:49:09 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

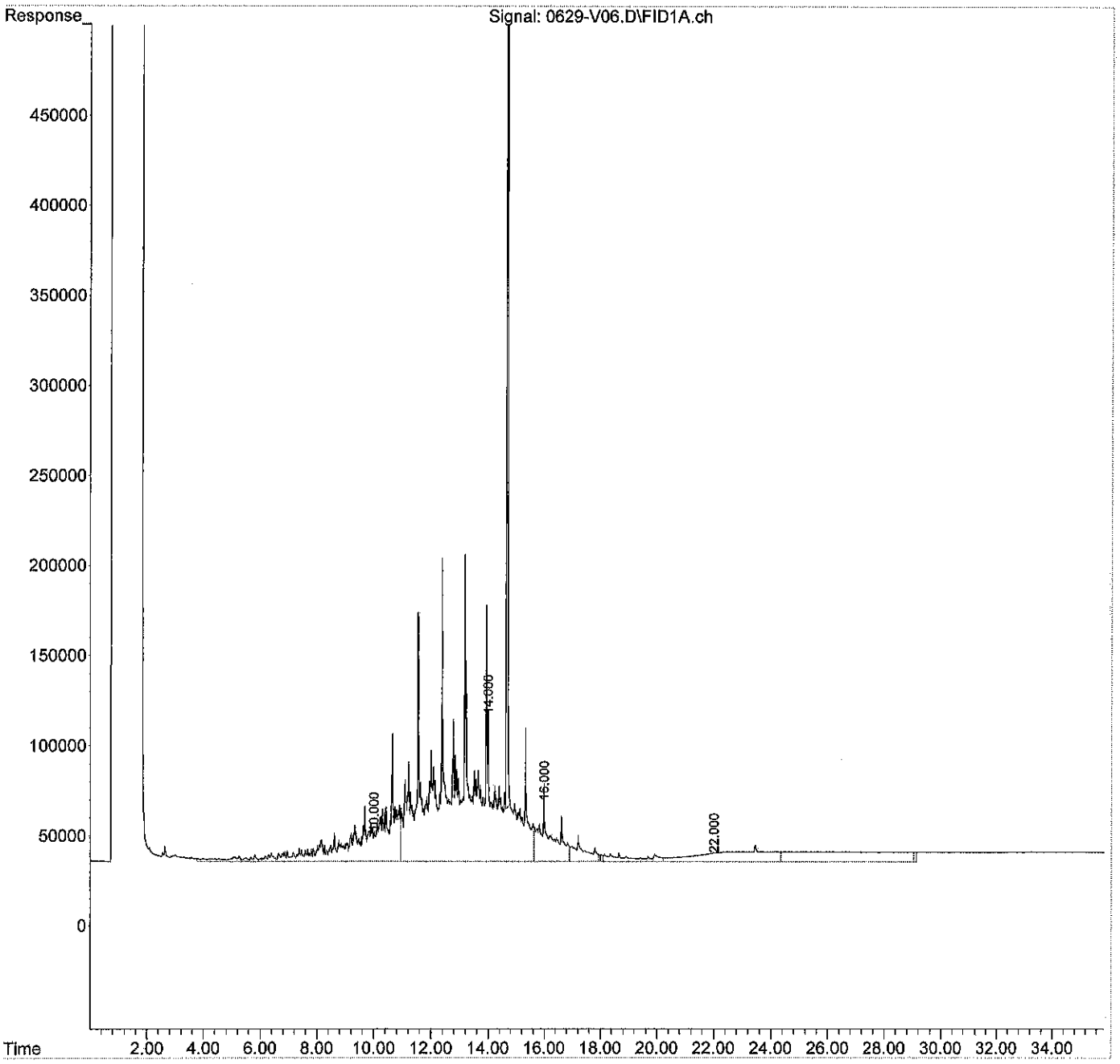
	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1) S	O-Terphenyl (01-13-23)	14.663	93279498	35.228	PPM
Spiked Amount	50.000		Recovery =	70.46%	
	Target Compounds				
2)	1-Chlorooctadecane	0.000	0	N.D.	PPM
3) H	Gasoline	3.500	3202028	NoCal	PPM
4) H	Diesel Fuel #1 (01-14...	10.000	135851101	58.195	PPM
5) H	Diesel Fuel #2 (01-1...	14.000	149123381	64.876	PPM
6) H	Oil (01-13-23)	22.000	43728118	18.097	PPM
7) H	Oil Acid Clean (01-1...	22.000	43728118	15.729	PPM
8) H	Diesel Fuel #2 Combo ...	14.000	144940381	65.202	PPM
9) H	Oil Combo (01-13-23)	22.000	32790275	11.768	PPM
10) H	Oil Acid Clean Combo ...	22.000	32790275	10.477	PPM
11) H	HAWAII 8015M DF2 (01...	14.000	148841481	65.435	PPM
12) H	HAWAII 8015M Oil (01...	22.000	28500658	9.723	PPM
13) H	Mineral Oil (01-14-23)	16.000	122342042	52.357	PPM
14) H	Diesel Fuel #2 ACU (0...	14.000	149123381	59.262	PPM
15) H	Diesel Fuel #2 ACU CO...	14.000	144940381	59.442	PPM
16) H	Hydraulic Oil (01-14-23)	14.000	162540160	64.094	PPM
17) H	Hydraulic Oil ACU (01...	14.000	162540160	55.209	PPM
18) H	Mineral Oil Combo (01...	16.000	119124418	52.009	PPM
19) H	Oil Acid Clean MO Com...	22.000	28665708	8.821	PPM
20) H	Oil MO Combo (01-13-23)	22.000	28665708	9.779	PPM

(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : C:\msdchem\2\data\V230629\
Data File : 0629-V06.D
Signal(s) : FID1A.ch
Acq On : 29 Jun 2023 14:27
Operator : LW
Sample : SB0629W1
Misc : Sample
ALS Vial : 6 Sample Multiplier: 1

Integration File: events.e
Quant Time: Jun 29 15:03:16 2023
Quant Method : C:\MSDCHEM\2\METHODS\V230113F.M
Quant Title : GCTPH
QLast Update : Thu Jan 19 08:49:09 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (Not Reviewed)

Data Path : C:\msdchem\2\data\V230629\
Data File : 0629-V02.D
Signal(s) : FID1A.ch
Acq On : 29 Jun 2023 9:25
Operator : LW
Sample : CCV0629F-V1
Misc : Sample
ALS Vial : 2 Sample Multiplier: 1

Integration File: events.e
Quant Time: Jun 29 10:01:43 2023
Quant Method : C:\MSDCHEM\2\METHODS\V230113F.M
Quant Title : GCTPH
QLast Update : Thu Jan 19 08:49:09 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1)	S O-Terphenyl (01-13-23)	0.000	0	N.D.	PPM
Spiked Amount	50.000		Recovery =	0.00%	
	Target Compounds				
2)	1-Chlorooctadecane	0.000	0	N.D.	PPM
3)	H Gasoline	3.500	9097592	NoCal	PPM
4)	H Diesel Fuel #1 (01-14...	10.000	212916005	91.946	PPM
5)	H Diesel Fuel #2 (01-1...	14.000	224317800	97.844	PPM
6)	H Oil (01-13-23)	22.000	56755567	26.175	PPM
7)	H Oil Acid Clean (01-1...	22.000	56755567	22.386	PPM
8)	H Diesel Fuel #2 Combo ...	14.000	219418374	98.887	PPM
9)	H Oil Combo (01-13-23)	22.000	43723062	18.648	PPM
10)	H Oil Acid Clean Combo ...	22.000	43723062	16.143	PPM
11)	H HAWAII 8015M DF2 (01...	14.000	223831098	98.631	PPM
12)	H HAWAII 8015M Oil (01...	22.000	38661805	16.345	PPM
13)	H Mineral Oil (01-14-23)	16.000	158279866	67.590	PPM
14)	H Diesel Fuel #2 ACU (0...	14.000	224317800	89.532	PPM
15)	H Diesel Fuel #2 ACU CO...	14.000	219418374	90.330	PPM
16)	H Hydraulic Oil (01-14-23)	14.000	243398140	97.020	PPM
17)	H Hydraulic Oil ACU (01...	14.000	243398140	85.117	PPM
18)	H Mineral Oil Combo (01...	16.000	154544968	67.261	PPM
19)	H Oil Acid Clean MO Com...	22.000	38848993	14.262	PPM
20)	H Oil MO Combo (01-13-23)	22.000	38848993	16.396	PPM

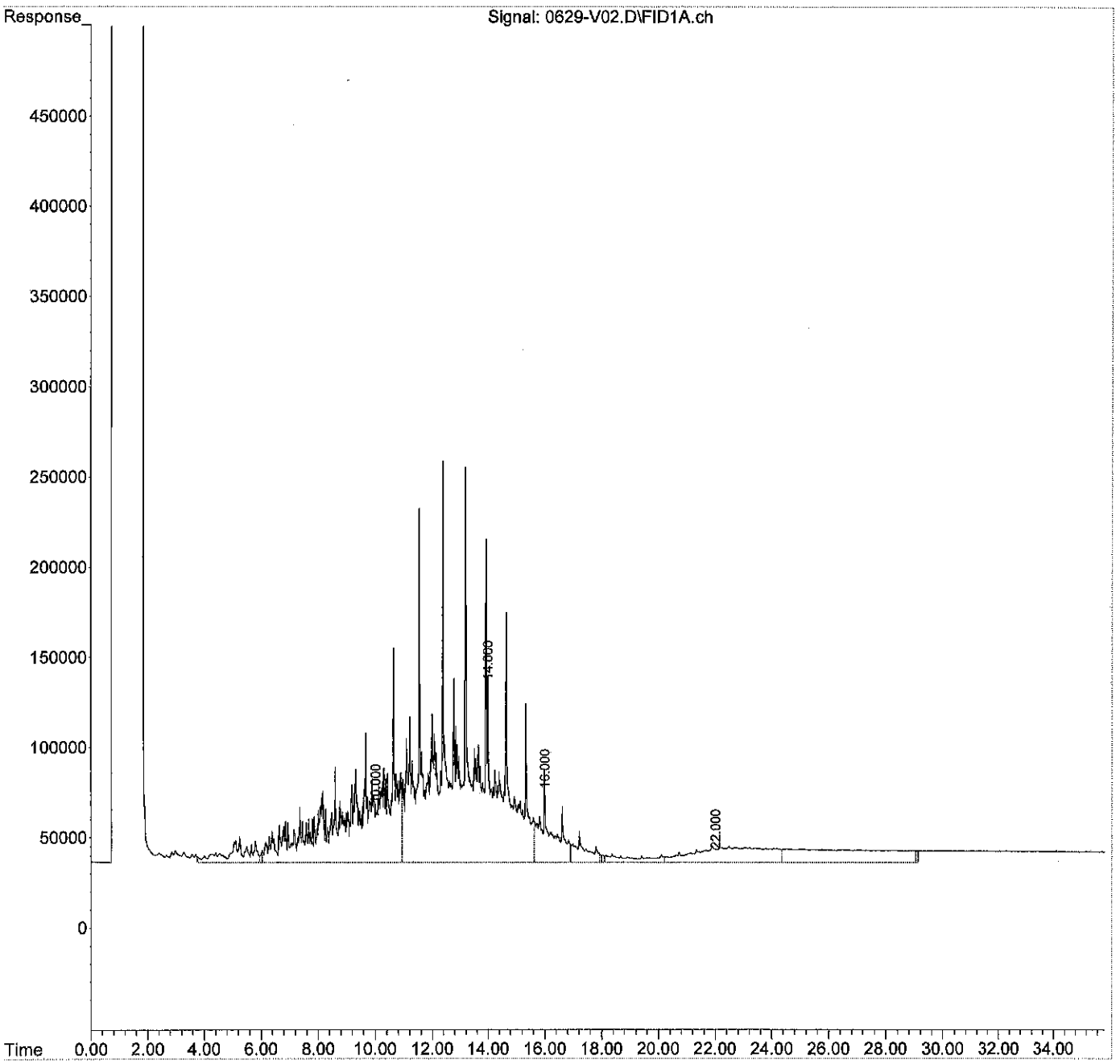
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (Not Reviewed)

Data Path : C:\msdchem\2\data\V230629\
Data File : 0629-V02.D
Signal(s) : FID1A.ch
Acq On : 29 Jun 2023 9:25
Operator : LW
Sample : CCV0629F-V1
Misc : Sample
ALS Vial : 2 Sample Multiplier: 1

Integration File: events.e
Quant Time: Jun 29 10:01:43 2023
Quant Method : C:\MSDCHEM\2\METHODS\V230113F.M
Quant Title : GCTPH
QLast Update : Thu Jan 19 08:49:09 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report (Not Reviewed)

Data Path : C:\msdchem\2\data\V230629\
Data File : 0629-V13.D
Signal(s) : FID1A.ch
Acq On : 29 Jun 2023 19:56
Operator : LW
Sample : CCV0629F-V2
Misc : Sample
ALS Vial : 13 Sample Multiplier: 1

Integration File: events.e
Quant Time: Jun 29 20:32:14 2023
Quant Method : C:\MSDCHEM\2\METHODS\V230113F.M
Quant Title : GCTPH
QLast Update : Thu Jan 19 08:49:09 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :

	Compound	R.T.	Response	Conc	Units
	System Monitoring Compounds				
1) S	O-Terphenyl (01-13-23)	0.000	0	N.D.	PPM
Spiked Amount	50.000		Recovery =	0.00%	
	Target Compounds				
2)	1-Chlorooctadecane	0.000	0	N.D.	PPM
3) H	Gasoline	3.500	8886854	NoCal	PPM
4) H	Diesel Fuel #1 (01-14...	10.000	217682670	94.034	PPM
5) H	Diesel Fuel #2 (01-1...	14.000	229108050	99.944	PPM
6) H	Oil (01-13-23)	22.000	41626324	16.794	PPM
7) H	Oil Acid Clean (01-1...	22.000	41626324	14.655	PPM
8) H	Diesel Fuel #2 Combo ...	14.000	224422303	101.150	PPM
9) H	Oil Combo (01-13-23)	22.000	28497819	9.067	PPM
10) H	Oil Acid Clean Combo ...	22.000	28497819	8.253	PPM
11) H	HAWAII 8015M DF2 (01...	14.000	228649284	100.764	PPM
12) H	HAWAII 8015M Oil (01...	22.000	23742316	6.622	PPM
13) H	Mineral Oil (01-14-23)	16.000	160444475	68.507	PPM
14) H	Diesel Fuel #2 ACU (0...	14.000	229108050	91.461	PPM
15) H	Diesel Fuel #2 ACU CO...	14.000	224422303	92.405	PPM
16) H	Hydraulic Oil (01-14-23)	14.000	239585812	95.468	PPM
17) H	Hydraulic Oil ACU (01...	14.000	239585812	83.707	PPM
18) H	Mineral Oil Combo (01...	16.000	157984235	68.741	PPM
19) H	Oil Acid Clean MO Com...	22.000	23913103	6.282	PPM
20) H	Oil MO Combo (01-13-23)	22.000	23913103	6.691	PPM

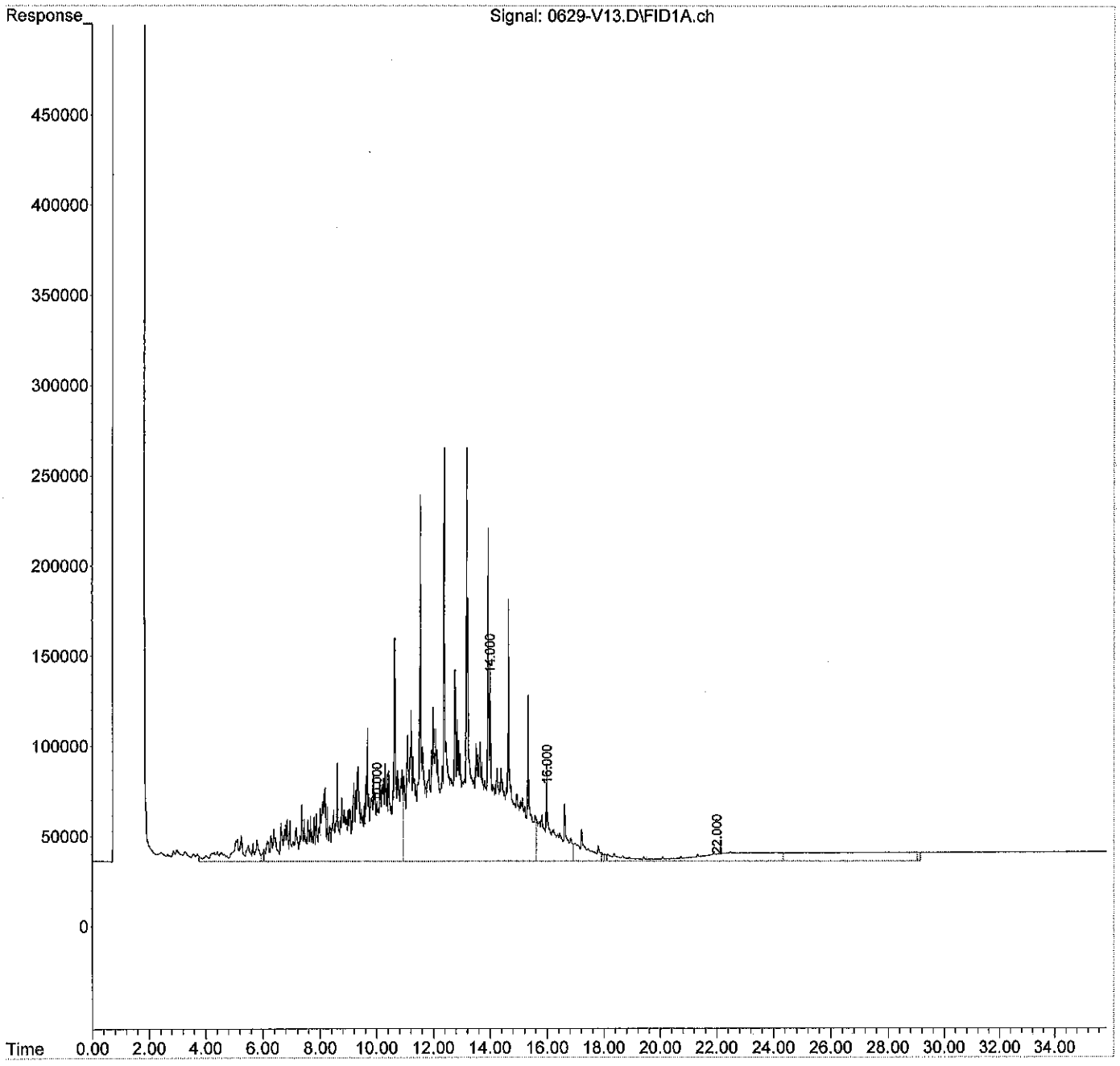
(f)=RT Delta > 1/2 Window (m)=manual int.

Quantitation Report (Not Reviewed)

Data Path : C:\msdchem\2\data\V230629\
Data File : 0629-V13.D
Signal(s) : FID1A.ch
Acq On : 29 Jun 2023 19:56
Operator : LW
Sample : CCV0629F-V2
Misc : Sample
ALS Vial : 13 Sample Multiplier: 1

Integration File: events.e
Quant Time: Jun 29 20:32:14 2023
Quant Method : C:\MSDCHEM\2\METHODS\V230113F.M
Quant Title : GCTPH
QLast Update : Thu Jan 19 08:49:09 2023
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal Phase :
Signal Info :



APPENDIX C
Data Validation Report

DATA VALIDATION REPORT

FORMER SHELL TANK FARM SITE
ANACORTES, WASHINGTON

Prepared for:

GeoEngineers
17425 NE Union Hill Road, Suite 250
Redmond, WA 98052

Prepared by:

EcoChem, Inc.
500 Union Street, Suite 1010
Seattle, WA 98101

EcoChem Project: C2218-1

September 7, 2023

Approved for Release:

Christine Ransom
Senior Project Chemist
EcoChem, Inc.

PROJECT NARRATIVE

Basis for the Data Validation

This report summarizes the results of summary data validation (EPA Stage 2B) performed on groundwater and associated quality control (QC) sample data for the Former Shell Tank Farm Site. A cross reference of client and laboratory IDs is provided in the Sample Index.

The samples were analyzed by OnSite Environmental, Redmond, Washington. The analytical method and EcoChem project chemists are noted below.

ANALYSIS	METHOD	PRIMARY REVIEW	SECONDARY REVIEW
Gas Range Organics	NWTPH-Gx	I. Hooper	C. Ransom
Diesel Range Organics	NWTPH-Dx		

The data were reviewed using guidance and quality control criteria documented in the analytical method; *Quality Assurance Project Plan (SAP) Former Shell Oil Tank Farm, Anacortes, Washington* (GeoEngineers, July 2014); *and National Functional Guidelines for Organic Data Review* (USEPA 2017, 2020).

EcoChem's goal in assigning data assessment qualifiers is to assist in proper data interpretation. If values are estimated (J or UJ), data may be used for site evaluation and risk assessment purposes but reasons for data qualification should be taken into consideration when interpreting sample concentrations. If values are assigned an R or DNR, the data should not be used for any site evaluation purposes. If values have no data qualifier assigned, then the data meet the data quality objectives as stated in the documents and methods referenced above.

Data qualifier definitions, reason codes, and validation criteria are included as Appendix A. Data Validation Worksheets will be kept on file at EcoChem, Inc. Verified laboratory electronic data deliverables (EDD) are also submitted with this report.

Sample Index
Former Shell Tank Farm Site

SDG	Client ID	Lab ID	NWTPH-Gx	NWTPH-Dx
2306-324	GEI-MW-7_062723	06-324-01	✓	✓
2306-324	GEI-DUP_062723	06-324-02	✓	✓
2306-324	TRIP BLANK	06-324-03	✓	

DATA VALIDATION REPORT
Former Shell Oil Tank Farm Site
Gasoline Range Organics by Method NWTPH-Gx

This report documents the review of the data from the analysis of groundwater samples and the associated laboratory and field quality control (QC) samples. All data received a compliance screening level of review (EPA Stage 2B). The samples were analyzed by OnSite Environmental, Inc., Redmond, Washington. Refer to the Sample Index for a complete list of samples.

SDG	NUMBER OF SAMPLES	VALIDATION LEVEL
2306-324	2 Groundwater & 1 Trip Blank	EPA Stage 2B

DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

Initial calibration data for diesel and motor oil calibrations were missing from the PDF sent by the laboratory. The laboratory was contacted and provided calibration summary forms.

EDD TO HARDCOPY VERIFICATION

All sample IDs reported in the electronic data deliverable (EDD) were verified (100%) by comparing the EDD to the hardcopy laboratory data package. Sample results were also verified (10%).

TECHNICAL DATA VALIDATION

The QC requirements that were reviewed are listed below.

✓	Sample Preservation and Holding Times	1	Laboratory Control Samples (LCS)
✓	Initial Calibration (ICAL)	1	Laboratory Duplicates
✓	Continuing Calibration (CCAL)	1	Field Duplicates
✓	Laboratory Blanks	✓	Reporting Limits
1	Field Blanks	✓	Reported Results
✓	Surrogate Compounds		

✓Stated method quality objectives (MQO) and QC criteria have been met. No outliers are noted or discussed.
1 Quality control outliers are discussed below, but no data were qualified.
2 Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.

Field Blanks

One field blank, "TRIP BLANK", was submitted. Gasoline range organics were not detected in this blank.

Laboratory Control Samples

A laboratory control sample was not analyzed. It is not required by the method. Laboratory accuracy was evaluated using the surrogate results.

Laboratory Duplicates

A Laboratory duplicate was analyzed using Sample GEI-MW-7_062723. No target analytes were detected in either sample. Precision was acceptable.

Field Duplicates

Samples GEI-MW-7_062723 and GEI-DUP_062723 were submitted as field duplicates. No target analytes were detected in either sample. Field precision was acceptable.

OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate percent recovery values. Precision was also acceptable as demonstrated by the laboratory duplicate and field duplicate results.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

DATA VALIDATION REPORT
Former Shell Oil Tank Farm Site
Diesel Range Hydrocarbons and Motor Oil by Method NWTPH-Dx

This report documents the review of the data from the analysis of groundwater samples and the associated laboratory and field quality control (QC) samples. All data received a compliance screening level of review (EPA Stage 2B). The samples were analyzed by OnSite Environmental, Inc., Redmond, Washington. Refer to the Sample Index for a complete list of samples.

SDG	NUMBER OF SAMPLES	VALIDATION LEVEL
2306-324	2 Groundwater	EPA Stage 2B

DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

Initial calibration data for diesel and motor oil calibrations were missing from the PDF sent by the laboratory. The laboratory was contacted and provided calibration summary forms.

EDD TO HARDCOPY VERIFICATION

All sample IDs reported in the electronic data deliverable (EDD) were verified (100%) by comparing the EDD to the hardcopy laboratory data package. Sample results were also verified (10%).

TECHNICAL DATA VALIDATIOND

The QC requirements that were reviewed are listed below.

✓	Sample Preservation and Holding Times	1	Laboratory Control Samples (LCS/LCSD)
✓	Initial Calibration (ICAL)	1	Laboratory Duplicates
✓	Continuing Calibration (CCAL)	1	Field Duplicates
✓	Laboratory Blanks	✓	Reporting Limits
1	Field Blanks	✓	Reported Results
✓	Surrogate Compounds		

✓Stated method quality objectives (MQO) and QC criteria have been met. No outliers are noted or discussed.
1 Quality control outliers are discussed below, but no data were qualified.
2 Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.

Field Blanks

No field blanks were submitted.

Laboratory Control Samples

The laboratory analyzed laboratory control sample/laboratory control sample duplicates. The percent recoveries and relative percent difference (RPD) values were acceptable.

Laboratory Duplicates

A sample duplicate was not analyzed. The LCS/LCSD results were used to evaluate laboratory precision.

Field Duplicates

Samples GEI-MW-7_062723 and GEI-DUP_062723 were submitted as field duplicates. No target analytes were detected in either sample. Field precision was acceptable.

OVERALL ASSESSMENT

As determined by this evaluation, the laboratory followed the specified analytical method. Accuracy was acceptable, as demonstrated by the surrogate and LCS/LCSD percent recovery values. Precision was also acceptable as demonstrated by the LCS/LCSD and field duplicate RPD values.

No data were qualified for any reason.

All data, as reported, are acceptable for use.

ECOCHEM
Data Quality

APPENDIX A

DATA QUALIFIER DEFINITIONS
REASON CODES
AND CRITERIA TABLES

DATA VALIDATION QUALIFIER CODES
Based on National Functional Guidelines

The following definitions provide brief explanations of the qualifiers assigned to results in the data review process.

U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents the approximate concentration.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

The following is an EcoChem qualifier that may also be assigned during the data review process:

DNR	Do not report; a more appropriate result is reported from another analysis or dilution.

DATA QUALIFIER REASON CODES

Group	Code	Reason for Qualification
Sample Handling	1	Improper Sample Handling or Sample Preservation (i.e., headspace, cooler temperature, pH, summa canister pressure); Exceeded Holding Times
Instrument Performance	24	Instrument Performance (i.e., tune, resolution, retention time window, endrin breakdown, lock-mass)
	5A	Initial Calibration (RF, %RSD, r^2)
	5B	Calibration Verification (CCV, CCAL; RF, %D, %R) Use bias flags (H,L)[1] where appropriate
	5C	Initial Calibration Verification (ICV %D, %R) Use bias flags (H,L)[1] where appropriate
Blank Contamination	6	Field Blank Contamination (Equipment Rinsate, Trip Blank, etc.)
	7	Lab Blank Contamination (i.e., method blank, instrument blank, etc.) Use low bias flag (L)[1] for negative instrument blanks
Precision and Accuracy	8	Matrix Spike (MS and/or MSD) Recoveries Use bias flags (H,L)[1] where appropriate
	9	Precision (all replicates: LCS/LCSD, MS/MSD, Lab Replicate, Field Replicate)
	10	Laboratory Control Sample Recoveries (a.k.a. Blank Spikes) Use bias flags (H,L)[1] where appropriate
	12	Reference Material Use bias flags (H,L)[1] where appropriate
	13	Surrogate Spike Recoveries (a.k.a. labeled compounds, recovery standards) Use bias flags (H,L)[1] where appropriate
Interferences	16	ICP/ICP-MS Serial Dilution Percent Difference
	17	ICP/ICP-MS Interference Check Standard Recovery Use bias flags (H,L)[1] where appropriate
	19	Internal Standard Performance (i.e., area, retention time, recovery)
	22	Elevated Detection Limit due to Interference (i.e., chemical and/or matrix)
	23	Bias from Matrix Interference (i.e. diphenyl ether, PCB/pesticides)
Identification and Quantitation	2	Chromatographic pattern in sample does not match pattern of calibration standard
	3	2nd column confirmation (RPD or %D)
	4	Tentatively Identified Compound (TIC) (associated with NJ only)
	20	Calibration Range or Linear Range Exceeded
	25	Compound Identification (i.e., ion ratio, retention time, relative abundance, etc.)
Miscellaneous	11	A more appropriate result is reported (multiple reported analyses i.e., dilutions, re-extractions, etc. Associated with "R" and "DNR" only)
	14	Other (See DV report for details)
	26	Method QC information not provided

[1] H = high bias indicated
L = low bias indicated

EcoChem Validation Guidelines for Total Petroleum Hydrocarbons-Gasoline Range

(Based on EPA National Functional Guidelines as applied to criteria in NWTPH-Gx, June 1997, Wa DOE & Oregon DEQ)

QC Element	Acceptance Criteria	Action for Non-Conformance	Reason Code	Discussion and Comments
Sample Handling				
Cooler Temperature & Preservation	4°C±2°C Water: HCl to pH < 2	J(+)/UJ(-) if greater than 6°C	1	
Holding Time	Waters: 14 days preserved 7 days unpreserved Solids: 14 Days	J(+)/UJ(-) if hold times exceeded J(+)/R(-) if exceeded > 3X	1	Professional Judgement
Instrument Performance				
Initial Calibration	5 calibration points (All within 15% of true value) Linear Regression: $r^2 \geq 0.990$ If used, RSD of response factors ≤20%	Narrate if fewer than 5 calibration levels or if %R >15% J(+)/UJ(-) if r^2 <0.990 J(+)/UJ(-) if %RSD > 20%	5A	
Mid-range Calibration Check Std.	Analyzed before and after each analysis shift & every 20 samples. Recovery range 80% to 120%	Narrate if frequency not met. J(+)/UJ(-) if %R < 80% J(+) if %R >120%	5B	
Blank Contamination				
Method Blank	At least one per batch (≤10 samples) No results >RL	U (at the RL) if sample result is < RL & < 5X blank result.	7	
		U (at reported sample value) if sample result is ≥ RL and < 5X blank result	7	
Trip Blank (if required by project)	No results >RL	Action is same as method blank for positive results remaining in trip blank after method blank qualifiers are assigned.	18	
Field Blanks (if required by project)	No results > RL	Action is same as method blank for positive results remaining in field blank after method **and** trip blank qualifiers are assigned.	6	

EcoChem Validation Guidelines for Total Petroleum Hydrocarbons-Gasoline Range

(Based on EPA National Functional Guidelines as applied to criteria in NWTPH-Gx, June 1997, Wa DOE & Oregon DEQ)

QC Element	Acceptance Criteria	Action for Non-Conformance	Reason Code	Discussion and Comments
Precision and Accuracy				
MS samples (accuracy) (if required by project)	%R within lab control limits	Qualify parent only, unless other QC indicates systematic problems. J(+) if both %R > upper control limit (UCL) J(+)/UJ(-) if both %R < lower control limit (LCL) No action if parent conc. >5X the amount spiked.	8	Use Professional Judgement if only one %R outlier
Precision: MS/MSD or LCS/LCSD or sample/dup	At least one set per batch (≤10 samples) RPD ≤ lab control limit	J(+) if RPD > lab control limits	9	
LCS (not required by method)	%R within lab control limits	J(+)/UJ(-) if %R < LCL J(+) if %R > UCL J(+)/R(-) if any %R <10%	10	Professional Judgement
Surrogates	Bromofluorobenzene and/or 1,4-difluorobenzene added to all samples (inc. QC samples). %R = 50-150%	J(+)/UJ(-) if %R < LCL J(+) if %R >UCL J(+)/R(-) if any %R <10% No action if 2 or more surrogates are used, and only one is outside control limits.	13	Professional Judgement
Pattern Identification	Compare sample chromatogram to standard chromatogram to ensure range and pattern are reasonable match. Laboratory may flag results which have poor match.	J(+)	2	
Field Duplicates	Use project control limits, if stated in QAPP **EcoChem default:** water: RPD < 35% solids: RPD < 50%	Narrate outliers **If required by project**, qualify with J(+)/UJ(-)	9	
Compound ID and Calculation				
Two analyses for one sample (e.g., dilution)	Report only one result per analyte	"DNR" (or client requested qualifier) all results that should not be reported.	11	See EcoChem TM-04

EcoChem Validation Guidelines for Total Petroleum Hydrocarbons-Diesel & Residual Range

(Based on EPA National Functional Guidelines as applied to criteria in NWTPH-Dx, June 1997, Wa DOE & Oregon DEQ)

QC Element	Acceptance Criteria	Action for Non-Conformance	Reason Code	Discussion and Comments
Sample Handling				
Cooler Temperature & Preservation	4°C±2°C Water: HCl to pH < 2	J(+)/UJ(-) if greater than 6 deg. C	1	
Holding Time	Ext. Waters: 14 days preserved 7 days unpreserved Ext. Solids: 14 Days Analysis: 40 days from extraction	J(+)/UJ(-) if hold times exceeded J(+)/R(-) if exceeded > 3X	1	Professional Judgement
Instrument Performance				
Initial Calibration	5 calibration points (All within 15% of true value) Linear Regression: $r^2 \geq 0.990$ If used, RSD of response factors ≤20%	Narrate if fewer than 5 calibration levels or if %R >15% J(+)/UJ(-) if r^2 <0.990 J(+)/UJ(-) if %RSD > 20%	5A	
Mid-range Calibration Check Std.	Analyzed before and after each analysis shift & every 20 samples. Recovery range 85% to 115%	Narrate if frequency not met. J(+)/UJ(-) if %R < 85% J(+) if %R >115%	5B	
Blank Contamination				
Method Blank	At least one per batch (≤20 samples) No results >RL	U (at the RL) if sample result is < RL & < 5X blank result.	7	
		U (at reported sample value) if sample result is ≥ RL and < 5X blank result	7	
Field Blanks (if required by project)	No results > RL	Action is same as method blank for positive results remaining in the field blank after method blank qualifiers are assigned.	6	

EcoChem Validation Guidelines for Total Petroleum Hydrocarbons-Diesel & Residual Range

(Based on EPA National Functional Guidelines as applied to criteria in NWTPH-Dx, June 1997, Wa DOE & Oregon DEQ)

QC Element	Acceptance Criteria	Action for Non-Conformance	Reason Code	Discussion and Comments
Precision and Accuracy				
MS samples (accuracy) (if required by project)	%R within lab control limits	Qualify parent only, unless other QC indicates systematic problems. J(+) if both %R > upper control limit (UCL) J(+)/UJ(-) if both %R < lower control limit (LCL) No action if parent conc. >5X the amount spiked.	8	Use Professional Judgement if only one %R outlier
Precision: MS/MSD or LCS/LCSD or sample/dup	At least one set per batch (≤10 samples) RPD ≤ lab control limit	J(+) if RPD > lab control limits	9	
LCS (not required by method)	%R within lab control limits	J(+)/UJ(-) if %R < LCL J(+) if %R > UCL J(+)/R(-) if any %R <10%	10	Professional Judgement
Surrogates	2-fluorobiphenyl, p-terphenyl, o-terphenyl, and/or pentacosane added to all samples (inc. QC samples). %R = 50-150%	J(+)/UJ(-) if %R < LCL J(+) if %R > UCL J(+)/R(-) if any %R <10% No action if 2 or more surrogates are used, and only one is outside control limits.	13	Professional Judgement
Pattern Identification	Compare sample chromatogram to standard chromatogram to ensure range and pattern are reasonable match. Laboratory may flag results which have poor match.	J(+)	2	
Field Duplicates	Use project control limits, if stated in QAPP **EcoChem default:** water: RPD < 35% solids: RPD < 50%	Narrate (Use Professional Judgement to qualify)	9	

EcoChem Validation Guidelines for Total Petroleum Hydrocarbons-Diesel & Residual Range

(Based on EPA National Functional Guidelines as applied to criteria in NWTPH-Dx, June 1997, Wa DOE & Oregon DEQ)

QC Element	Acceptance Criteria	Action for Non-Conformance	Reason Code	Discussion and Comments
Compound ID and Calculation				
Two analyses for one sample (dilution)	Report only one result per analyte	"DNR" (or client requested qualifier) all results that should not be reported.	11	See EcoChem TM-04