Appendix B
Regulatory Context

Regulatory Context

Several provincial and federal regulatory agencies share authority for assessing and managing contaminated sites in British Columbia (BC). The agencies that have regulatory power include Fisheries and Oceans Canada (DFO), Environment Canada (EC), and the BC Ministry of Environment and Climate Change Strategy (ENV). The Parkland Burnaby Refinery is a tenant of the Port of Vancouver (POV), and is, therefore, also under the jurisdiction of the POV. POV operates under the *Canada Marine Act*, and is a responsible agency under the *Canadian Environmental Assessment Act*. The BC ENV has taken the lead role in reviewing the remediation of the contamination at the Site.

Federal statutes and regulations that apply to the Foreshore area marine sediment include:

- Canadian Environmental Protection Act, 1999 (S.C. 1999, c.33) and associated regulations;
- Canada Marine Act, 1998 (S.C. 1998, c.10) and associated regulations; and,
- Fisheries Act (R.S.C. 1985, c. F-14) and associated regulations.

Provincial statues and regulations that apply to the management of soil, groundwater, sediment and porewater quality include:

- BC Environmental Management Act (EMA) (S.B.C. 2003, c 53), effective July 8, 2004;
- Contaminates Sites Regulation (CSR), BC Reg. 375/96, effective April 1, 1997 (including Stage 11 amendments, November 1, 2017 and Stage 12 amendments, January 24, 2019); and
- Hazardous Waste Regulation (HWR), BC Reg. 63/88, effective April 1, 1988 (including amendments up to B.C. Reg. 243/2016).

For surface water and porewater below the high water mark, the BC ENV Approved and Working Water Quality Guidelines (WQG) for marine aquatic life apply.

CANADIAN ENVIRONMENTAL ASSESSMENT ACT

Section 67 of the *Canadian Environmental Assessment Act, 2012* requires federal authorities to determine that projects will not likely cause significant adverse environmental effects (or, if a project is likely to cause significant adverse environmental effects, requires the Governor in Council to decide whether those effects are justified in the circumstances). The Project and Environmental Review (PER) process provides that assurance. The Port Authority also considers other interests, impacts, and mitigation measures through the PER process.

CANADIAN ENVIRONMENTAL PROTECTION ACT

Within the federal government, the *Canadian Environmental Protection Act (CEPA)* is the primary element of the legislative framework for preventing pollution and protecting the environment and human health. In general, CEPA:

- Makes pollution prevention the cornerstone of national efforts to reduce toxic substances in the environment;
- Sets out processes to assess the risks to the environment and human health posed by substances in commerce (in use) or used for manufacturing purposes in Canada;
- Imposes time frames for managing toxic substances;
- Provides a wide range of tools to manage toxic substances, other pollution and wastes; and
- Ensures the most harmful substances are phased out or not released into the environment in any measurable quantity.

CANADIAN MARINE ACT

- The *Canada Marine Act (CMA)* created Canadian Port Authorities. The CMA allows POV, under the Port Authorities Operations Regulations, to provide authorization to complete works within its jurisdiction. The Site is located within the jurisdiction of POV.

FISHERIES ACT

Under the authority of the *Fisheries Act*, DFO has decision-making authority for the conservation and protection of fish and fish habitat. The fish and fish habitat protection provisions of the Fisheries Act provide mechanisms to allow development of projects to occur while providing for the protection of fish and fish habitat.

The key sections within the act that directly apply to this project are:

- Section 35(1) of the Fisheries Act which prohibits the harmful alteration, disruption or destruction of fish habitat; and
- Section 36(3) of the Fisheries Act which prohibits the discharge of deleterious substances to water frequented by fish either directly or indirectly.

CONTAMINATED SITES REGULATION

The CSR under the EMA is the principal regulatory document defining requirements for contaminated sites management in BC. The CSR came into effect on April 1, 1997; twelve amendments to the CSR have been completed since 1997, with the most recent being the Stage 12, which came into effect on January 24, 2019. The EMA and CSR have provisions for both the numerical standards and risk-based standards approaches to managing site contamination. They outline the procedures for site assessment, remediation and application for environmental closure for a property. Numerical standards are key components of the requirements in the CSR as they define whether or not a site is contaminated. Land Remediation staff of the ENV currently oversee the ongoing investigation and remediation.

Under the CSR, there are three types of numerical remediation standards. 1) The Generic Numerical Standards refer to concentrations of given substances in soil or water for a particular land use. 2) Matrix Numerical Standards are applied for some substances in soil, taking into account various site-specific factors such as proximity to receiving waters, likelihood of human ingestion, and use of land for livestock rearing. 3) Site-Specific Numerical Standards involve the generation of a standard for a specific site, based on a protocol outlined by BC ENV (Protocol 2).

The CSR is simplified into four new schedules:

- Schedule 3.1 – Part 1, Matrix Numerical Soil Standards;
- Schedule 3.1 – Part 2, Generic Numerical Soil Standards to Protect Human Health;
- Schedule 3.1 – Part 3, Generic Numerical Soil Standards to Protect Ecological Health;
- Schedule 3.2, Generic Numerical Water Standards;
- Schedule 3.3, Generic Numerical Vapour Standards; and
- Schedule 3.4, Generic Numerical Sediment Standards.

APPLICABLE SCREENING LEVELS FOR WATER

GROUNDWATER

In accordance with BC CSR Protocol 21, standards for the protection of drinking water are applicable at sites either where groundwater is currently used as a drinking water source (current use), or could be used as a drinking water source (future use).

Current drinking water use is applicable at sites where drinking water wells or surface water intakes are present within a radial distance of 500 m from the outer extent of the groundwater contamination source. If the groundwater flow direction is reliably known, the distance is refined to drinking water wells or surface water intakes located 100 metres upgradient and 500 metres downgradient of the outer extent of the contamination source.

Future drinking water use is applicable at sites where the hydraulic conductivity is greater than 1×10^{-6} metres per second (m/s), has a yield greater than or equal to 1.3 litres per minute and where the natural concentration of total dissolved solids is less than 4,000 milligrams per litre (mg/L). Future drinking water use is applicable at sites where a saturated unit exists at depth that meets the above criteria and does not have a protective five metre thick confining unit with a bulk hydraulic conductivity less than 1×10^{-7} m/s that is continuous and unfractured[6]. Saturated geological units that are located within 500 metres of a marine and estuarine foreshore are considered to have unsuitable water quality for domestic water supply. In accordance with BC CSR Protocol 21, future drinking water use does not apply to the Foreshore.

The Site is located on the foreshore of Burrard Inlet, in the north part of Burnaby where all properties are connected to the municipal potable water supply. There are no known drinking water wells in the vicinity of the Site; therefore, there is no current drinking water use at, or in the vicinity of the Site.

A letter requesting a drinking water standards exemption for Area 2 of the Refinery, located up-gradient of the Foreshore, was submitted to the British Columbia Ministry of Environment and Climate Change Strategyon December 19, 2011 and re-submitted on November 9, 2012. The drinking water exemption was provided by the BC ENV on May 15, 2017.

Standards for aquatic life water use apply to all groundwater located within 500 m of a surface water body containing aquatic life unless groundwater at the site flows to another surface water body located greater than 500 m from the source. Standards for aquatic life water use also apply where there is the potential for contaminated groundwater to flow through preferential corridors that discharge directly to a surface water body containing marine or freshwater aquatic life.

POREWATER

The MoE's January 24, 2011 letter outlined the previous screening standards applied to the Site for porewater regardless of the depth (BC WQG or where they do not exist, 1/10 of the Schedule 6 CSR aquatic life [AW] Marine standard – see below for further details). For simplicity, surface water screening followed the same procedure as porewater.

Since surface water and porewater sampling locations are at the Foreshore (within 10 m of the high water mark), the water screening cannot assume the dilution factor used in the development of CSR groundwater standards. Concentrations of potential contaminants of concern (PCOCs) reported in surface water and porewater samples are currently screened against Ambient BC WQG for marine waters. For PCOCs where BC WQG do not exist, 1/10 of the Schedule 6 CSR AW Marine standards were used for screening purposes. For contaminants with no BC WQG or 1/10 CSR AW standard, a reference site approach was used with background concentrations used for screening as described in Protocol 9.

[6] BC Ministry of Environment, 2010. Technical Guidance 6. Water Use Determination. Victoria, BC. http://www.env.gov.bc.ca/epd/remediation/guidance/technical/pdf/tg06.pd

The Reference Area for water samples was the PR2 sampling location (Figure 1). If the background concentrations did not fall within a single statistical population, conservative estimates were used. The reference water concentrations for many PCOCs are below their respective standard laboratory reporting limit. In these cases, the laboratory reporting limit from the reference locations was considered the reference standard and used for this screening. An exception in using the 1/10 of the CSR AW standard as the reference concentration is for $LEPH_w$. Since $LEPH_w$ does not have BC WQG standard and the common laboratory reporting limit is five times greater than 1/10 CSR AW standard, the reference location laboratory detection limit was used for $LEPH_w$ screening.

SITE SPECIFIC STANDARDS

In their memorandum dated May 9, 2013, SLR Consulting Canada Ltd. (SLR) proposed harmonizing the two sets of screening levels, i.e. those standards previously described in this section and the screening levels proposed by SLR in the problem formulation report (SLR, 2011). The rationale supporting the updated screening levels is provided by SLR in their memorandum entitled *Updated Screening Levels (USLs) for Foreshore Monitoring* including an addendum included as an appendix within the Foreshore 2012 Second Semi-Annual Report (URS, 2013). The USLs were deemed satisfactory by the MoE in email correspondence to SLR on September 4, 2013 (MoE, 2013). The porewater and surface water samples in this report were screened against the updated SLR screening levels with the exception of HEPHw.

The MoE's June 21, 2013 letter indicated that HEPHw is not a regulated parameter under the CSR and is, therefore, not normally characterized or otherwise assessed for the regulatory purposes of the CSR in groundwater or porewater. Therefore porewater and surface water samples in this report were not screened against a standard for HEPHw.

On February 27, 2014, SLR submitted a Human Health and Ecological Risk Assessment (HHERA) to determine Risk-Based Management Targets (RBMTs) for PCOCs associated with the Foreshore seeps. The RBMTs were developed to be protective of aquatic plants and invertebrates at the community level and fish at the population level. The HHERA did not find any significant risk to human health; therefore, RBMTs were not needed for human receptors. In the HHERA, SLR derived RBMTs for the following PHCs and PAHs: BTEX, benzo(a)pyrene, naphthalene, VPH_w, and $LEPH_w$. In the HHERA, SLR derived RBMTs for only two metals, copper and zinc, which were identified as porewater PCOCs for the Site (SLR, 2014b).

Appendix C

Water Laboratory Reports

AECOM CANADA LTD.
ATTN: Leslie Southern
3292 Production Way
Suite 330
Burnaby BC V5A 4R4

Date Received: 04-JUN-19
Report Date: 19-JUN-19 19:24 (MT)
Version: FINAL REV. 2

Client Phone: 604-444-6608

Certificate of Analysis

Lab Work Order #: L2285149

Project P.O. #:	0015243589
Job Reference:	60601814
C of C Numbers:	17-827491
Legal Site Desc:	Burnaby Refinery

Comments: 19-JUN-2019 Metals analysis added using seawater method for samples 1, 2, 4, and 9.

Dean Watt, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2285149-1 Porewater 04-JUN-19 12:56 PW17-3-20190604|REG|GW	L2285149-2 Porewater 04-JUN-19 12:50 PW17-8-20190604|REG|GW	L2285149-4 Porewater 04-JUN-19 12:32 PW17-12-20190604|REG|GW	L2285149-9 Porewater 04-JUN-19 12:03 PW17-25-20190604|REG|GW	
SEAWATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
	Copper (Cu)-Dissolved (ug/L)	0.58	0.63	0.64	1.56	
	Zinc (Zn)-Dissolved (ug/L)	<1.0	<1.0	<1.0	2.6	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2285149-1	L2285149-2	L2285149-3	L2285149-4	L2285149-5
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19
	Sampled Time	12:56	12:50	12:41	12:32	12:28
	Client ID	PW17-3-20190604|REG|GW	PW17-8-20190604|REG|GW	PW17-11-20190604|REG|GW	PW17-12-20190604|REG|GW	PW17-15-20190604|REG|GW
Grouping	**Analyte**					
WATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Copper (Cu)-Dissolved (ug/L)			<4.0 DLA		<4.0 DLA
	Zinc (Zn)-Dissolved (ug/L)			<20 DLA		<20 DLA
Volatile Organic Compounds	Benzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Ethylbenzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Styrene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Toluene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	ortho-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	meta- & para-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Xylenes (ug/L)	<0.75	<0.75	<0.75	<0.75	<0.75
Hydrocarbons	EPH10-19 (ug/L)	<250	<250	<250	<250	<250
	EPH19-32 (ug/L)	<250	<250	<250	<250	<250
	LEPH (ug/L)	<250	<250	<250	<250	<250
	HEPH (ug/L)	<250	<250	<250	<250	<250
	Volatile Hydrocarbons (VH6-10) (ug/L)	<100	<100	<100	<100	<100
	VPH (C6-C10) (ug/L)	<100	<100	<100	<100	<100
	Surrogate: 2-Bromobenzotrifluoride (%)	98.0	101.8	96.2	93.0	96.8
Polycyclic Aromatic Hydrocarbons	Acenaphthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acenaphthylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acridine (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benz(a)anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(a)pyrene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Benzo(b&j)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(b+j+k)fluoranthene (ug/L)	<0.015	<0.015	<0.015	<0.015	<0.015
	Benzo(g,h,i)perylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(k)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Chrysene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Dibenz(a,h)anthracene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Fluorene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	1-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	2-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Naphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Phenanthrene (ug/L)	<0.020	<0.020	<0.020	<0.020	<0.020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2285149-6	L2285149-7	L2285149-8	L2285149-9	L2285149-10
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19
	Sampled Time	12:13	12:15	11:59	12:03	11:46
	Client ID	PW17-19-20190604|REG|GW	PW17-20-20190604|REG|GW	PW17-24-20190604|REG|GW	PW17-25-20190604|REG|GW	PW17-29-20190604|REG|GW
Grouping	**Analyte**					
WATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Copper (Cu)-Dissolved (ug/L)	2.9	<2.0 DLA	<4.0 DLA		<2.0 DLA
	Zinc (Zn)-Dissolved (ug/L)	<10 DLA	<10 DLA	<20 DLA		<10 DLA
Volatile Organic Compounds	Benzene (ug/L)	<0.50	<0.50	<0.50	<0.50	7.64
	Ethylbenzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Styrene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Toluene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	ortho-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	meta- & para-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Xylenes (ug/L)	<0.75	<0.75	<0.75	<0.75	<0.75
Hydrocarbons	EPH10-19 (ug/L)	<250	<250	<250	<250	<250
	EPH19-32 (ug/L)	<250	<250	<250	<250	<250
	LEPH (ug/L)	<250	<250	<250	<250	<250
	HEPH (ug/L)	<250	<250	<250	<250	<250
	Volatile Hydrocarbons (VH6-10) (ug/L)	<100	<100	<100	<100	<100
	VPH (C6-C10) (ug/L)	<100	<100	<100	<100	<100
	Surrogate: 2-Bromobenzotrifluoride (%)	103.7	96.8	95.5	97.2	97.5
Polycyclic Aromatic Hydrocarbons	Acenaphthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acenaphthylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acridine (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benz(a)anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(a)pyrene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Benzo(b&j)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(b+j+k)fluoranthene (ug/L)	<0.015	<0.015	<0.015	<0.015	<0.015
	Benzo(g,h,i)perylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(k)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Chrysene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Dibenz(a,h)anthracene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Fluorene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	1-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	2-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Naphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Phenanthrene (ug/L)	<0.020	<0.020	<0.020	<0.020	<0.020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2285149-11	L2285149-12	L2285149-13	L2285149-14	L2285149-15
Description	Porewater	Porewater	Porewater	Other	Other
Sampled Date	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19
Sampled Time	11:46	11:06	11:24	11:32	13:50
Client ID	PW17-30-20190604|REG|GW	PW17-31-20190604|REG|GW	PW17-32-20190604|REG|GW	PW17-33-20190604|REG|GW	R_BLANK_1_20190604|REG|GW
Grouping / **Analyte**					
WATER					
Dissolved Metals					
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Copper (Cu)-Dissolved (ug/L)	<4.0 DLA	<4.0 DLA	1.3	<1.0 DLA	<0.20
Zinc (Zn)-Dissolved (ug/L)	<20 DLA	<20 DLA	6.1	<5.0 DLA	<1.0
Volatile Organic Compounds					
Benzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Ethylbenzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Styrene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
ortho-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
meta- & para-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Xylenes (ug/L)	<0.75	<0.75	<0.75	<0.75	<0.75
Hydrocarbons					
EPH10-19 (ug/L)	<250	<250	<250	<250	<250
EPH19-32 (ug/L)	<250	<250	<250	<250	<250
LEPH (ug/L)	<250	<250	<250	<250	<250
HEPH (ug/L)	<250	<250	<250	<250	<250
Volatile Hydrocarbons (VH6-10) (ug/L)	<100	<100	<100	<100	<100
VPH (C6-C10) (ug/L)	<100	<100	<100	<100	<100
Surrogate: 2-Bromobenzotrifluoride (%)	90.0	95.8	89.4	99.6	98.8
Polycyclic Aromatic Hydrocarbons					
Acenaphthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Acenaphthylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Acridine (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Anthracene (ug/L)	<0.010	0.014	<0.010	<0.010	<0.010
Benz(a)anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(a)pyrene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Benzo(b&j)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(b+j+k)fluoranthene (ug/L)	<0.015	<0.015	<0.015	<0.015	<0.015
Benzo(g,h,i)perylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(k)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Chrysene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Dibenz(a,h)anthracene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Fluorene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
1-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
2-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Naphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Phenanthrene (ug/L)	<0.020	<0.020	<0.020	<0.020	<0.020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2285149-16	L2285149-17			
	Description	Other	Other			
	Sampled Date	04-JUN-19	04-JUN-19			
	Sampled Time					
	Client ID	TRAVEL BLANK-1	TRAVEL BLANK-2			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Dissolved Metals Filtration Location					
	Copper (Cu)-Dissolved (ug/L)					
	Zinc (Zn)-Dissolved (ug/L)					
Volatile Organic Compounds	Benzene (ug/L)	<0.50	<0.50			
	Ethylbenzene (ug/L)	<0.50	<0.50			
	Styrene (ug/L)	<0.50	<0.50			
	Toluene (ug/L)	<0.50	<0.50			
	ortho-Xylene (ug/L)	<0.50	<0.50			
	meta- & para-Xylene (ug/L)	<0.50	<0.50			
	Xylenes (ug/L)	<0.75	<0.75			
Hydrocarbons	EPH10-19 (ug/L)					
	EPH19-32 (ug/L)					
	LEPH (ug/L)					
	HEPH (ug/L)					
	Volatile Hydrocarbons (VH6-10) (ug/L)	<100	<100			
	VPH (C6-C10) (ug/L)	<100	<100			
	Surrogate: 2-Bromobenzotrifluoride (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (ug/L)					
	Acenaphthylene (ug/L)					
	Acridine (ug/L)					
	Anthracene (ug/L)					
	Benz(a)anthracene (ug/L)					
	Benzo(a)pyrene (ug/L)					
	Benzo(b&j)fluoranthene (ug/L)					
	Benzo(b+j+k)fluoranthene (ug/L)					
	Benzo(g,h,i)perylene (ug/L)					
	Benzo(k)fluoranthene (ug/L)					
	Chrysene (ug/L)					
	Dibenz(a,h)anthracene (ug/L)					
	Fluoranthene (ug/L)					
	Fluorene (ug/L)					
	Indeno(1,2,3-c,d)pyrene (ug/L)					
	1-Methylnaphthalene (ug/L)					
	2-Methylnaphthalene (ug/L)					
	Naphthalene (ug/L)					
	Phenanthrene (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2285149-1	L2285149-2	L2285149-3	L2285149-4	L2285149-5
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19
	Sampled Time	12:56	12:50	12:41	12:32	12:28
	Client ID	PW17-3-20190604|REG|GW	PW17-8-20190604|REG|GW	PW17-11-20190604|REG|GW	PW17-12-20190604|REG|GW	PW17-15-20190604|REG|GW
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Quinoline (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Surrogate: Acridine d9 (%)	74.6	94.6	67.2	61.4	77.3
	Surrogate: Chrysene d12 (%)	114.0	108.6	115.7	115.1	118.9
	Surrogate: Naphthalene d8 (%)	101.6	103.0	103.3	101.1	104.0
	Surrogate: Phenanthrene d10 (%)	102.0	116.0	105.1	100.6	103.3
	Total PAHs (ug/L)	<0.11	<0.11	<0.11	<0.11	<0.11

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2285149-6	L2285149-7	L2285149-8	L2285149-9	L2285149-10
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19
	Sampled Time	12:13	12:15	11:59	12:03	11:46
	Client ID	PW17-19-20190604|REG|GW	PW17-20-20190604|REG|GW	PW17-24-20190604|REG|GW	PW17-25-20190604|REG|GW	PW17-29-20190604|REG|GW
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Quinoline (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Surrogate: Acridine d9 (%)	89.7	86.9	82.7	87.3	82.4
	Surrogate: Chrysene d12 (%)	121.2	113.7	115.8	124.7	116.9
	Surrogate: Naphthalene d8 (%)	108.5	101.6	103.2	109.4	105.5
	Surrogate: Phenanthrene d10 (%)	108.1	103.4	103.3	110.6	103.6
	Total PAHs (ug/L)	<0.11	<0.11	<0.11	<0.11	<0.11

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2285149-11	L2285149-12	L2285149-13	L2285149-14	L2285149-15
	Description	Porewater	Porewater	Porewater	Other	Other
	Sampled Date	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19	04-JUN-19
	Sampled Time	11:46	11:06	11:24	11:32	13:50
	Client ID	PW17-30-20190604|REG|GW	PW17-31-20190604|REG|GW	PW17-32-20190604|REG|GW	PW17-33-20190604|REG|GW	R_BLANK_1_20190604|REG|GW
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Quinoline (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Surrogate: Acridine d9 (%)	87.9	84.3	84.9	103.3	86.5
	Surrogate: Chrysene d12 (%)	117.7	121.2	123.4	103.3	123.6
	Surrogate: Naphthalene d8 (%)	100.1	104.9	104.0	89.4	105.4
	Surrogate: Phenanthrene d10 (%)	103.9	105.1	109.2	102.1	103.2
	Total PAHs (ug/L)	<0.11	<0.11	<0.11	<0.11	<0.11

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2285149-16	L2285149-17			
	Description	Other	Other			
	Sampled Date	04-JUN-19	04-JUN-19			
	Sampled Time					
	Client ID	TRAVEL BLANK-1	TRAVEL BLANK-2			
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Pyrene (ug/L)					
	Quinoline (ug/L)					
	Surrogate: Acridine d9 (%)					
	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					
	Total PAHs (ug/L)					

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual
EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.			
LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LEPH/HEPH
LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure. LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene. HEPHw = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-D-F-HMI-CCMS-VA	Seawater	Diss. Metals in Seawater by CRC ICPMS	APHA 3030B/EPA 6020B (mod)
Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS (HMI Mode).			
PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)
PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.			
PAH-SUM-CALC-VA	Water	TOTAL PAH's	CALCULATION
Total PAH represents the sum of all PAH analytes reported for a given sample. Note that regulatory agencies and criteria differ in their definitions of Total PAH in terms of the individual PAH analytes to be included.			
VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.			
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.			
VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE VPH
VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure. VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene			
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION
Calculation of Total Xylenes Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

17-827491

Reference Information

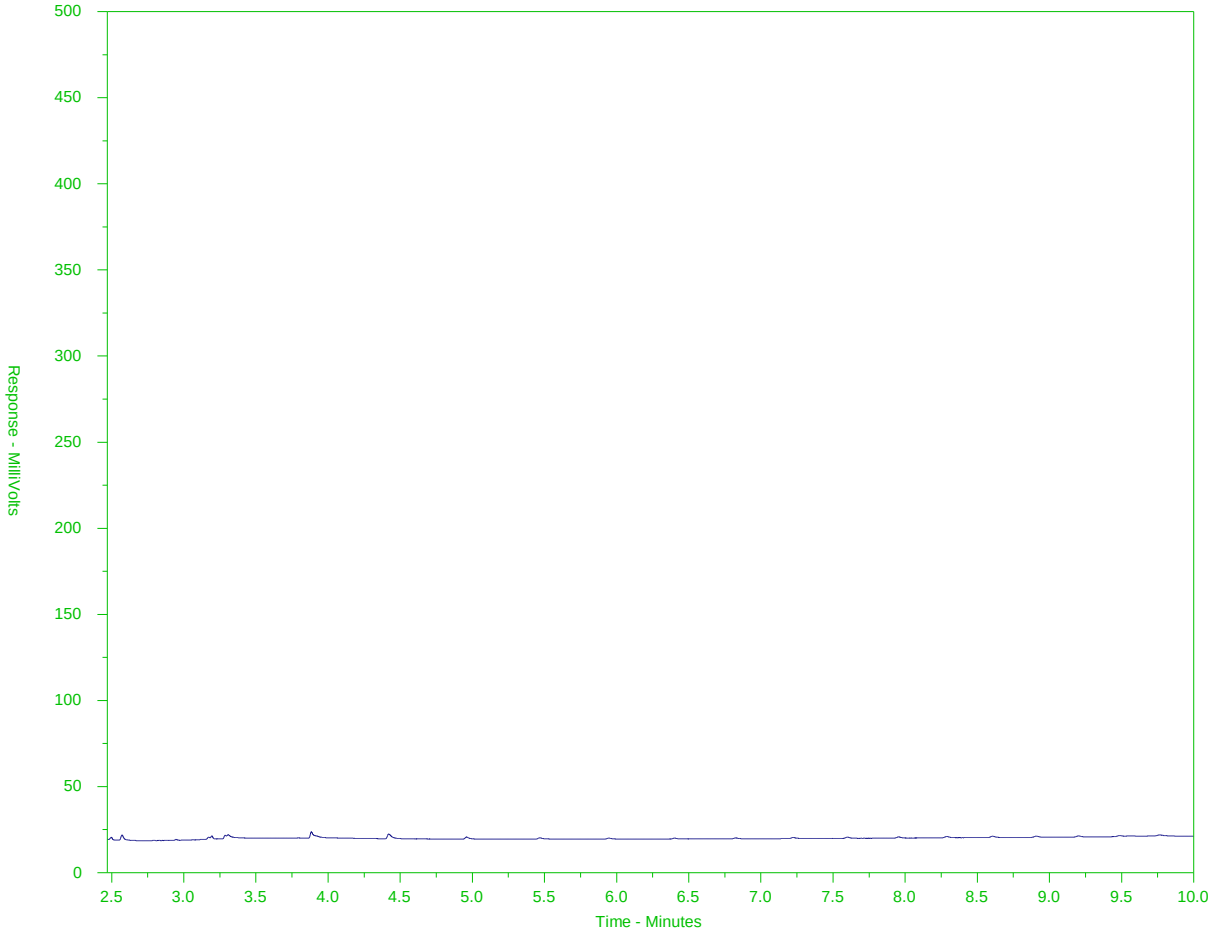
GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2285149-1
Client Sample ID: PW17-3-20190604|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

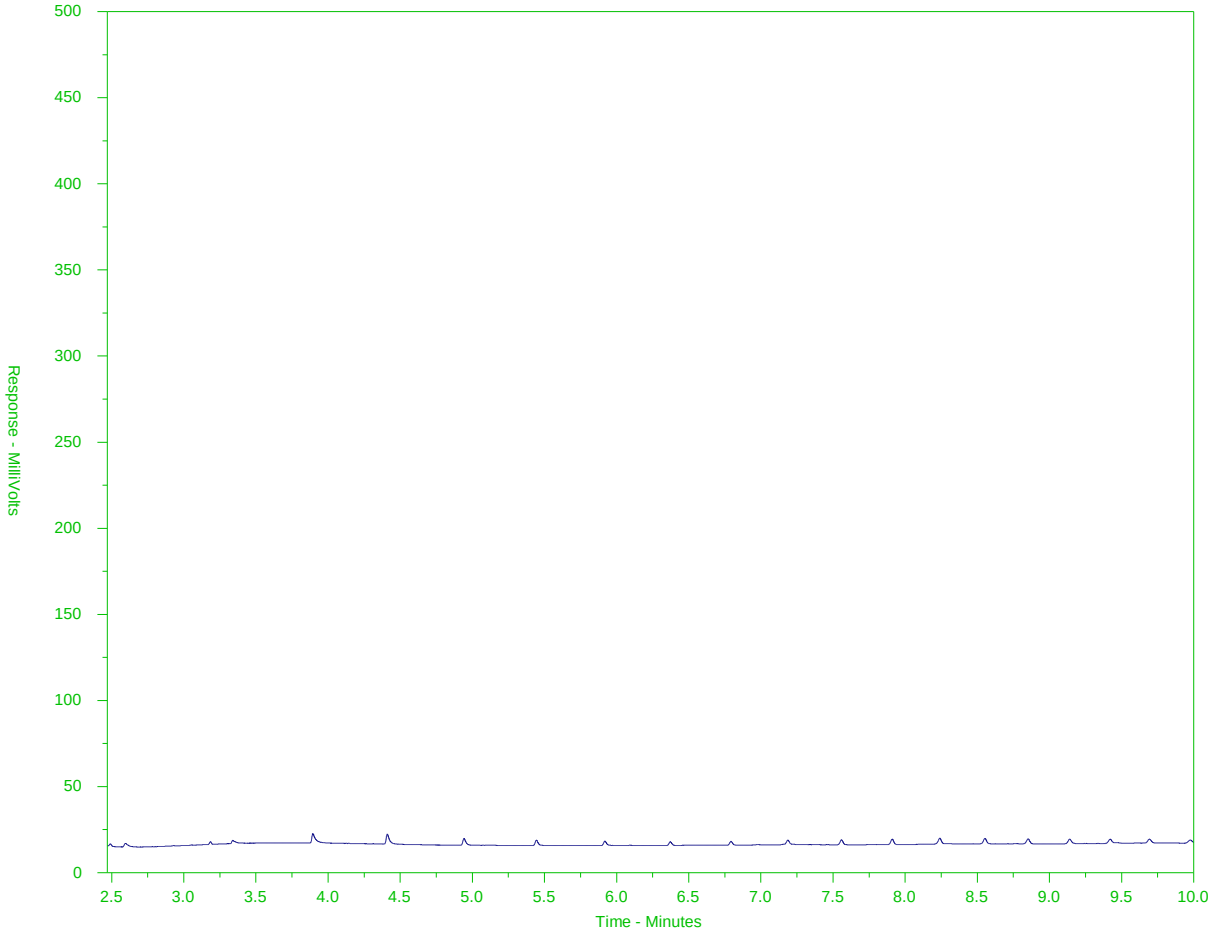
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2285149-2
Client Sample ID: PW17-8-20190604|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

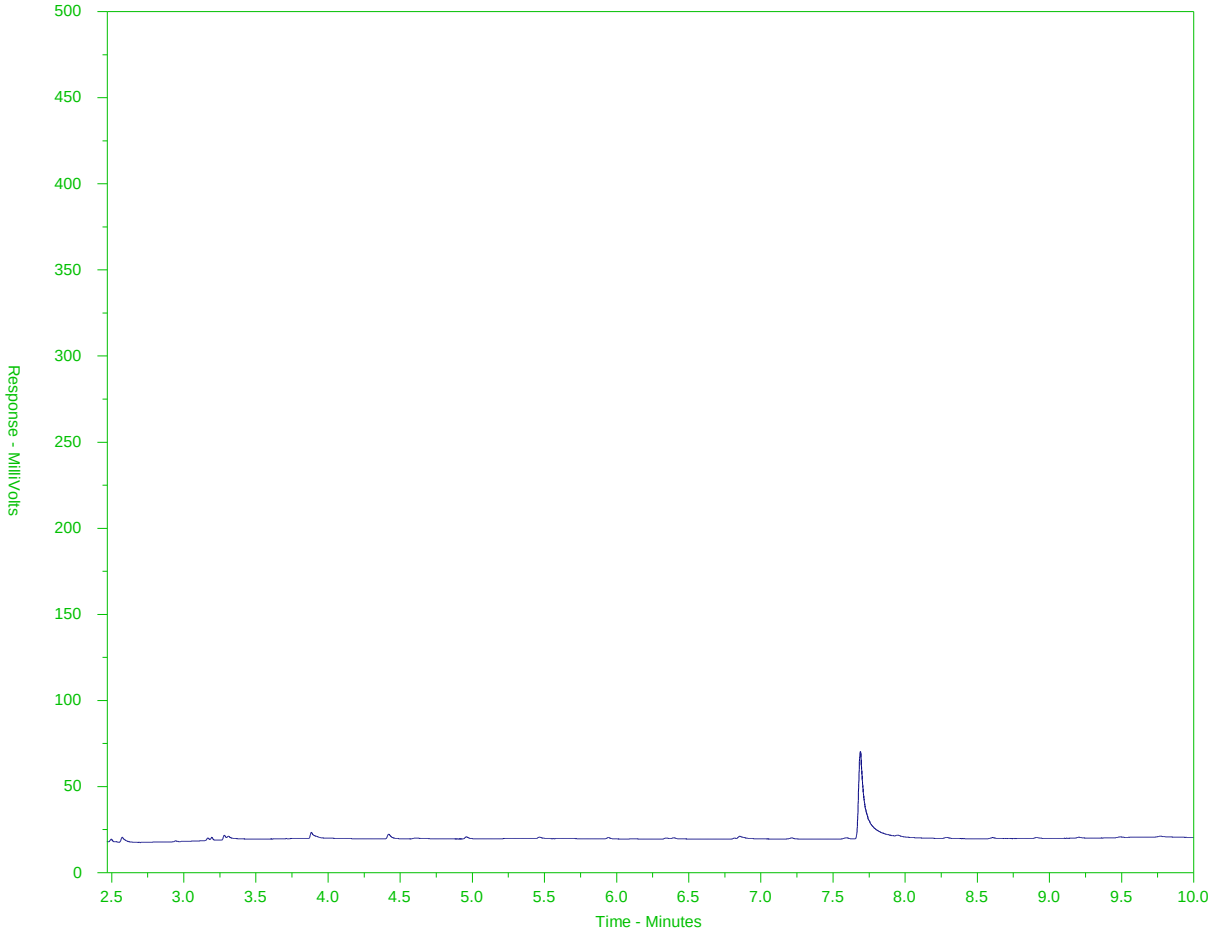
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2285149-3
Client Sample ID: PW17-11-20190604|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

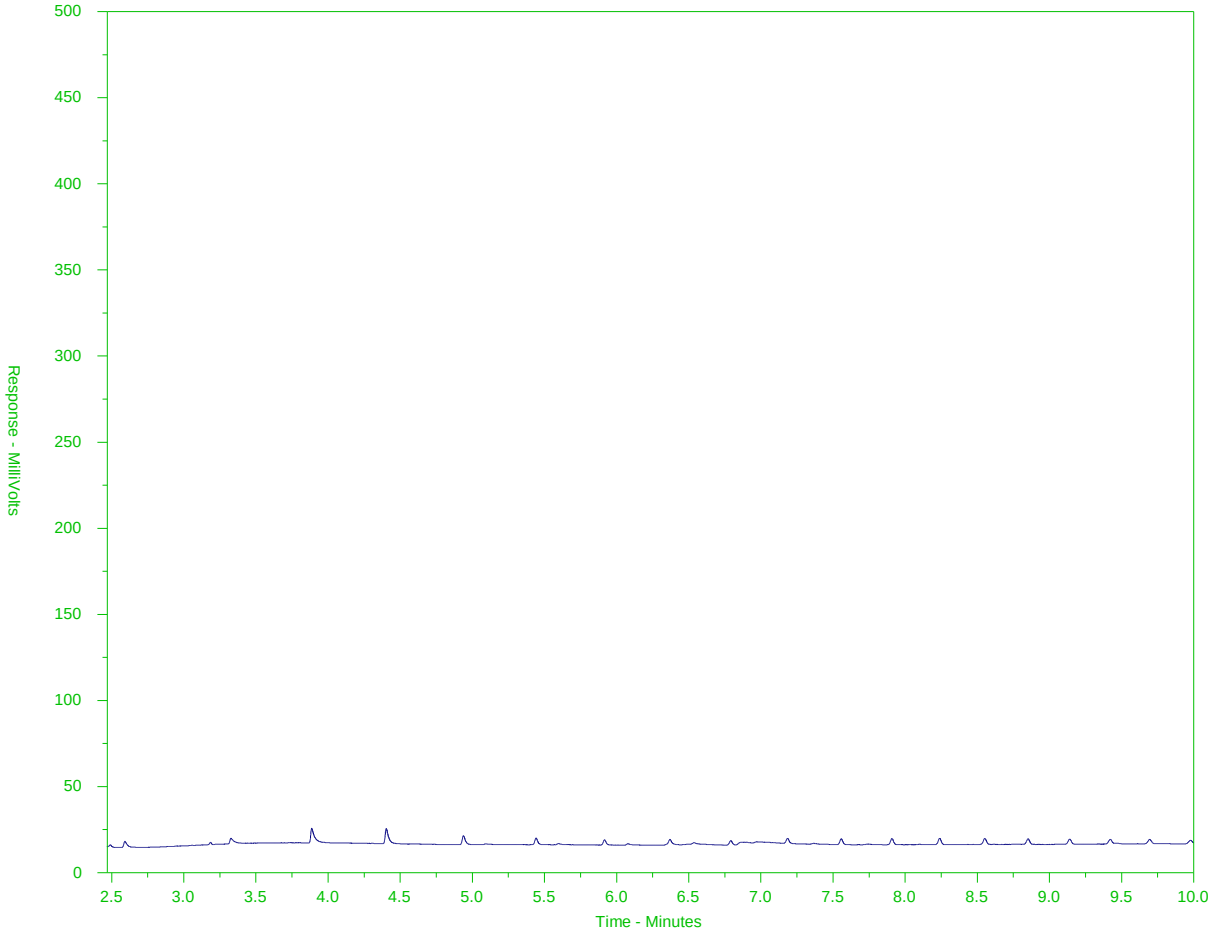
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2285149-4
Client Sample ID: PW17-12-20190604|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

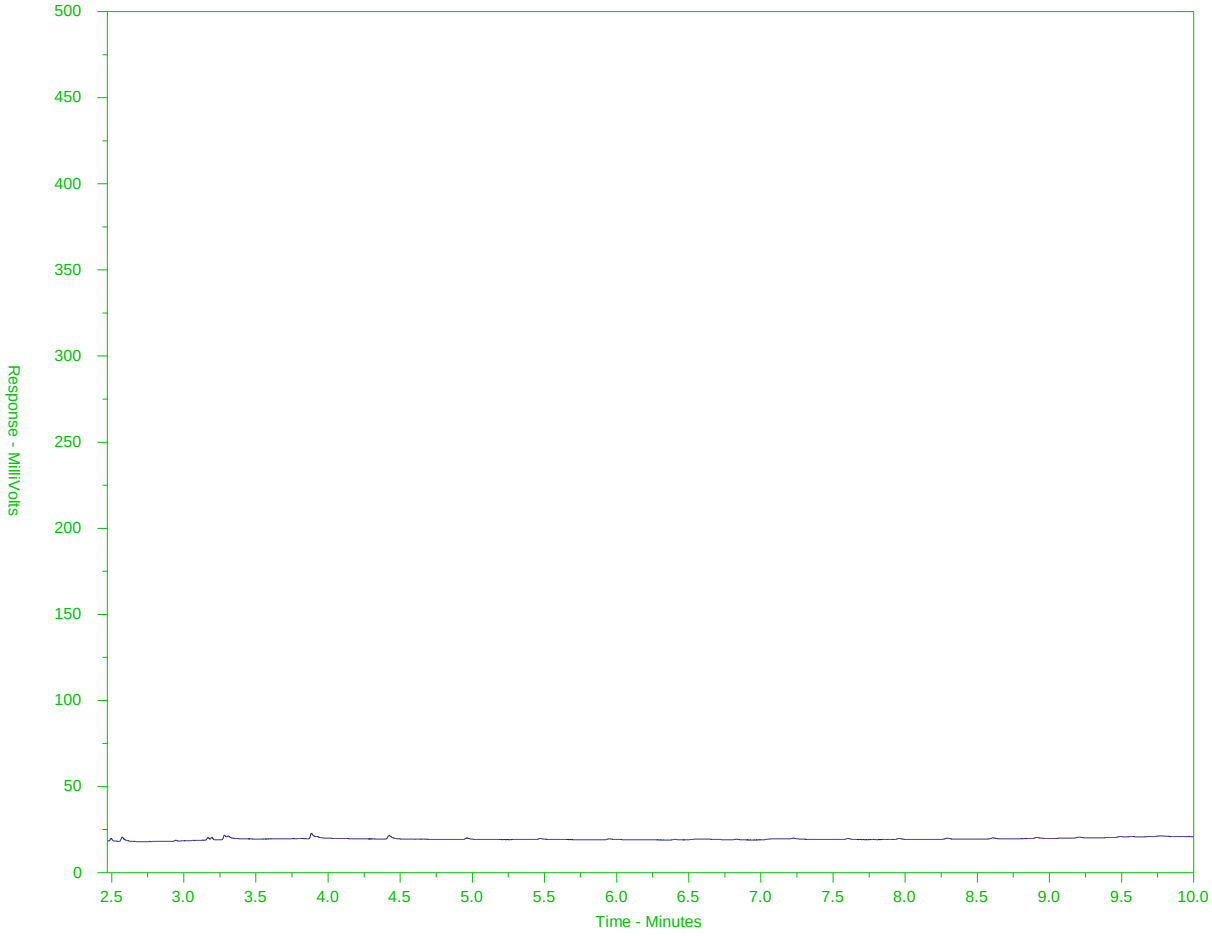
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2285149-5
Client Sample ID: PW17-15-20190604|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

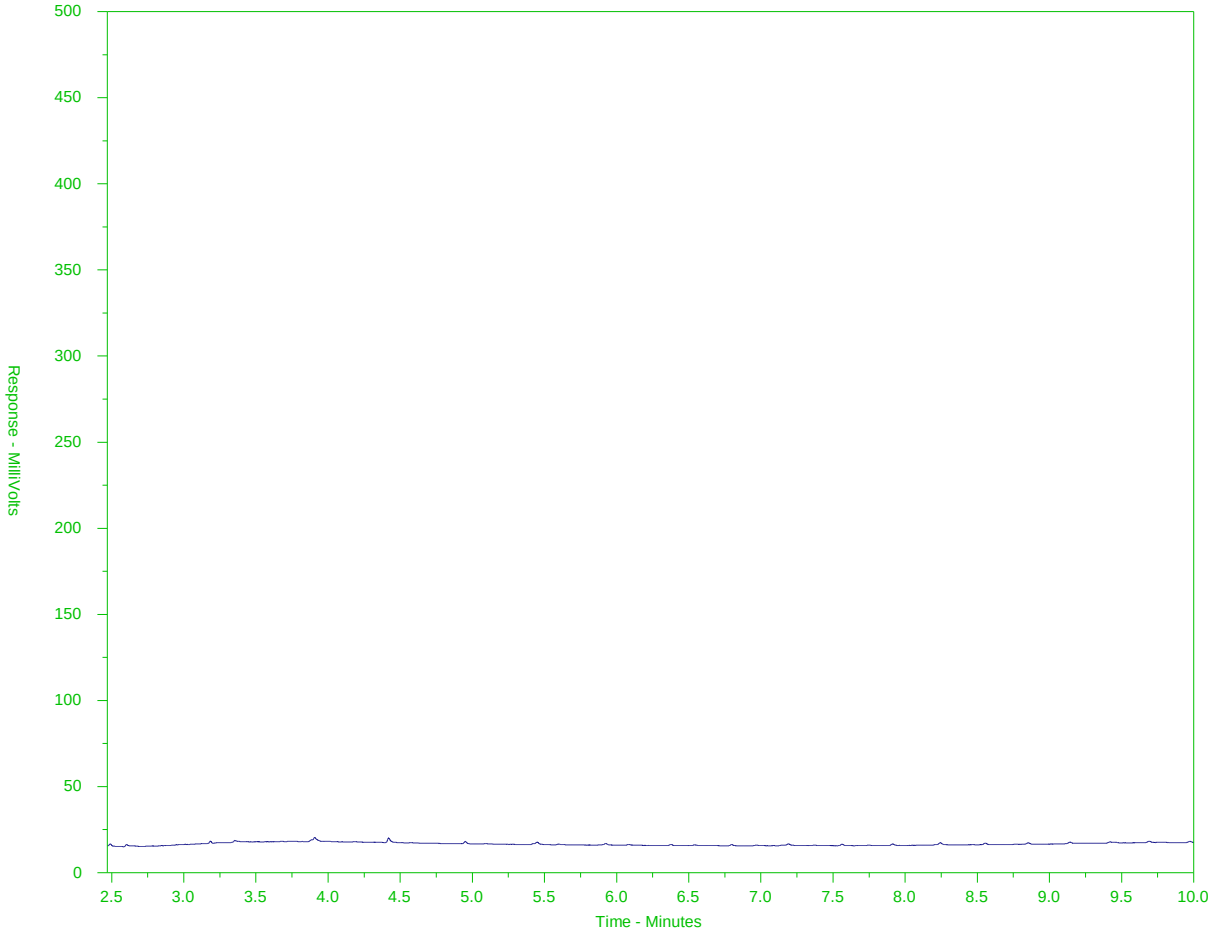
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2285149-6
Client Sample ID: PW17-19-20190604|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

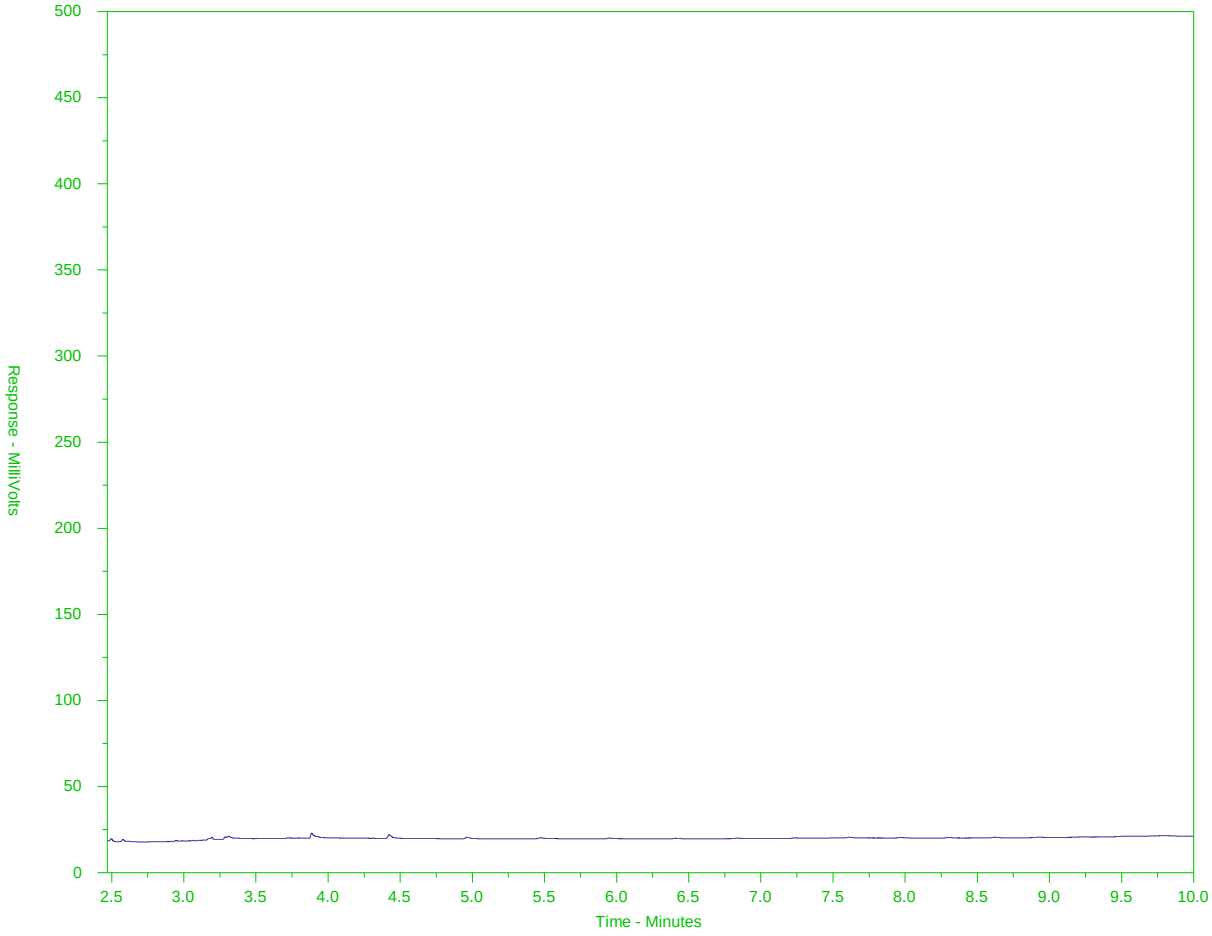
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2285149-7
Client Sample ID: PW17-20-20190604|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

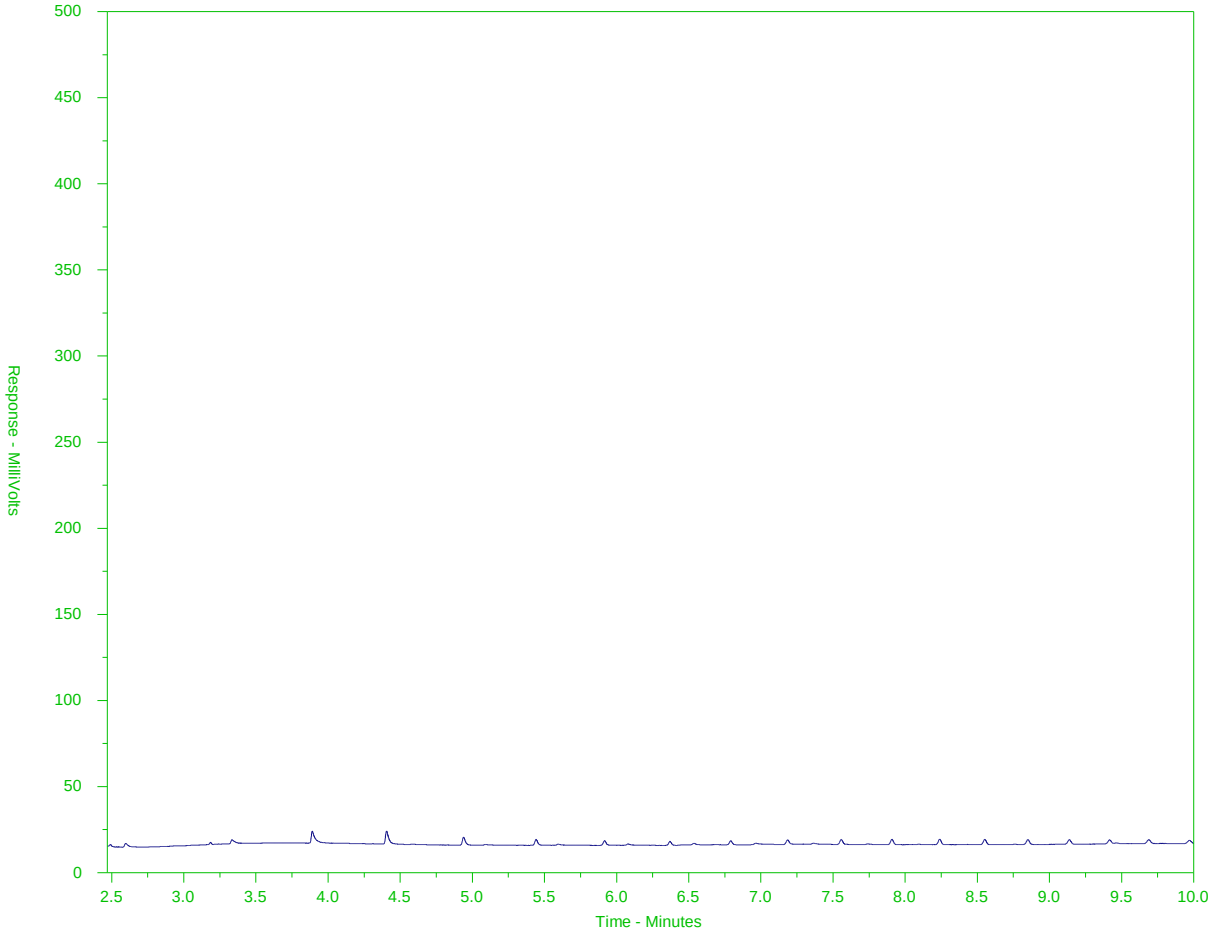
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2285149-8
Client Sample ID: PW17-24-20190604|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

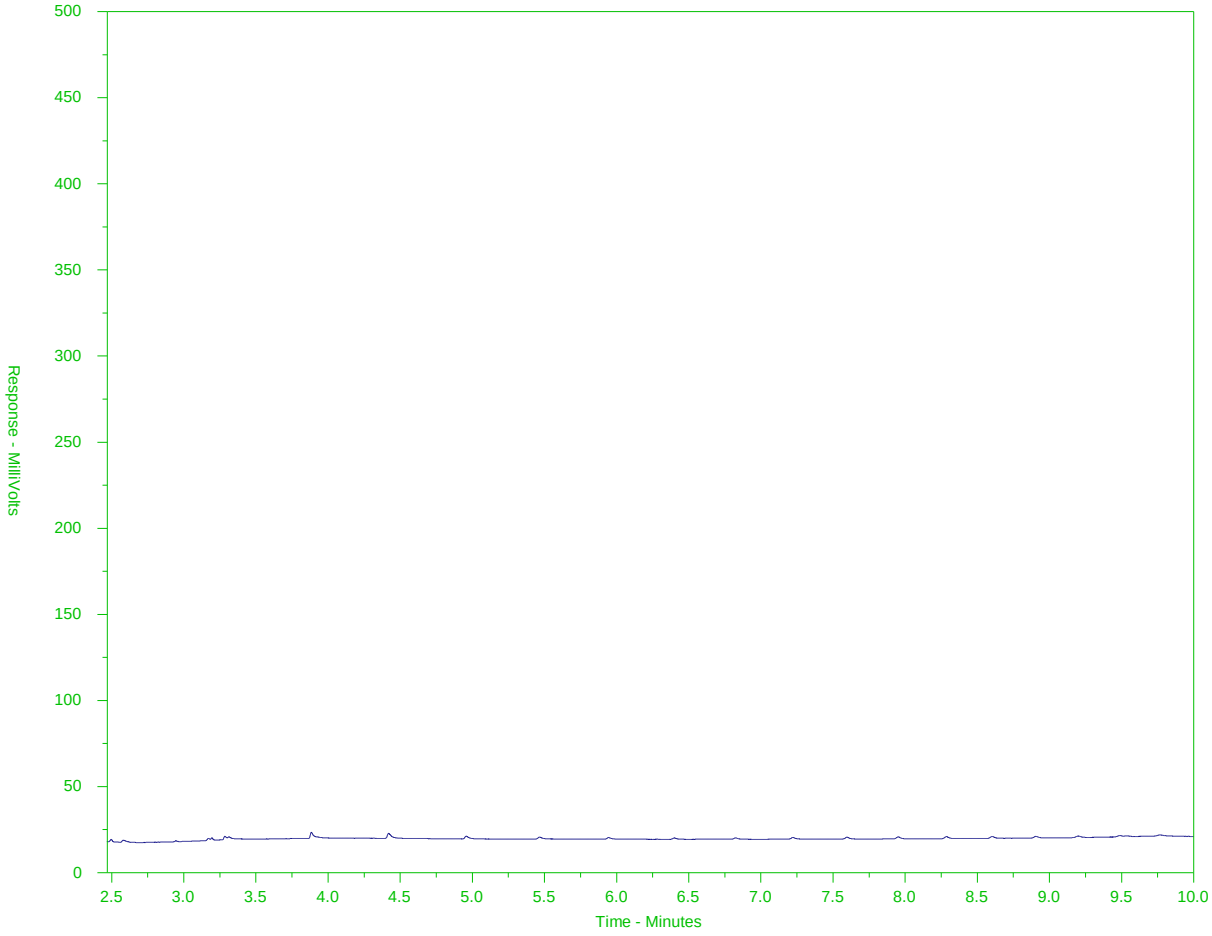
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2285149-9
Client Sample ID: PW17-25-20190604|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

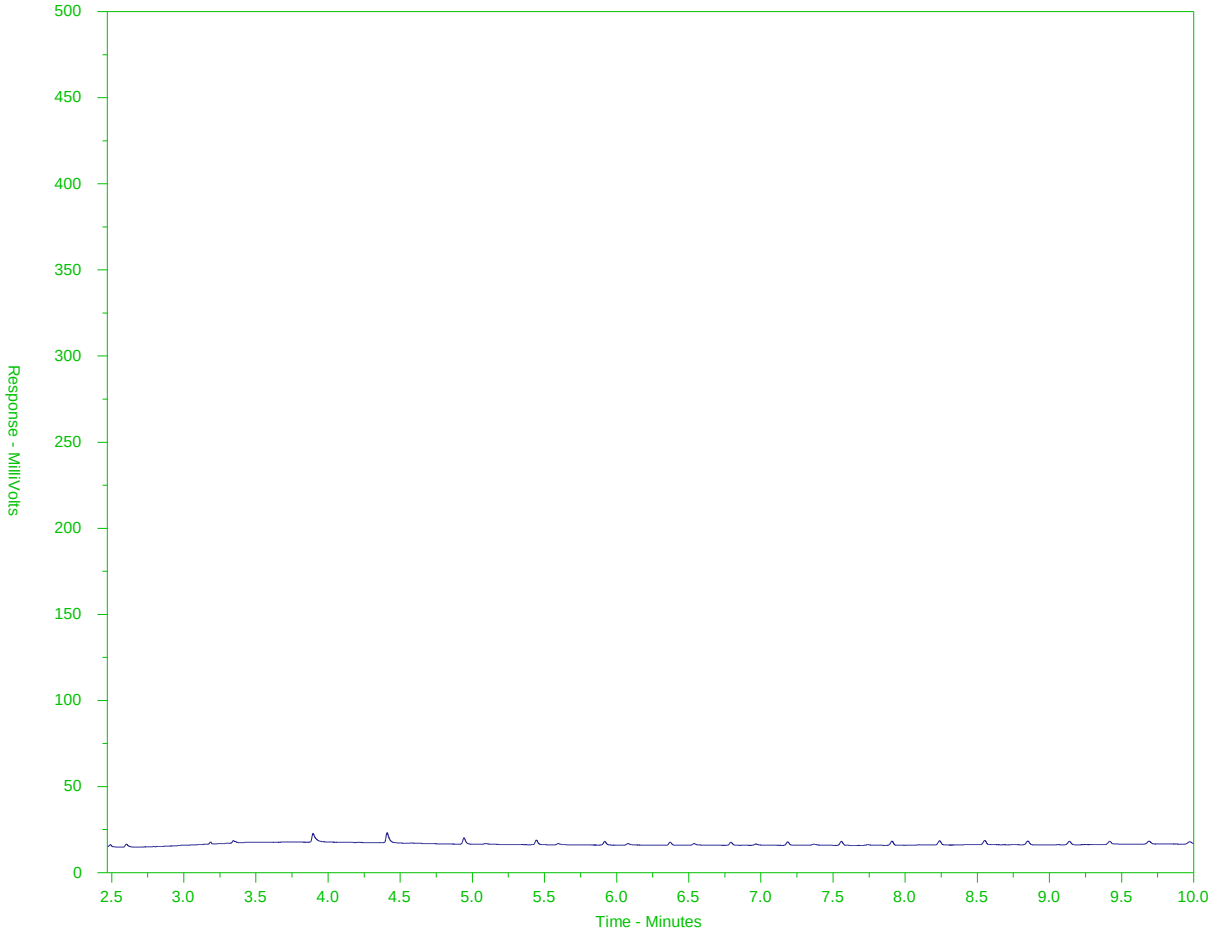
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2285149-10
Client Sample ID: PW17-29-20190604|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

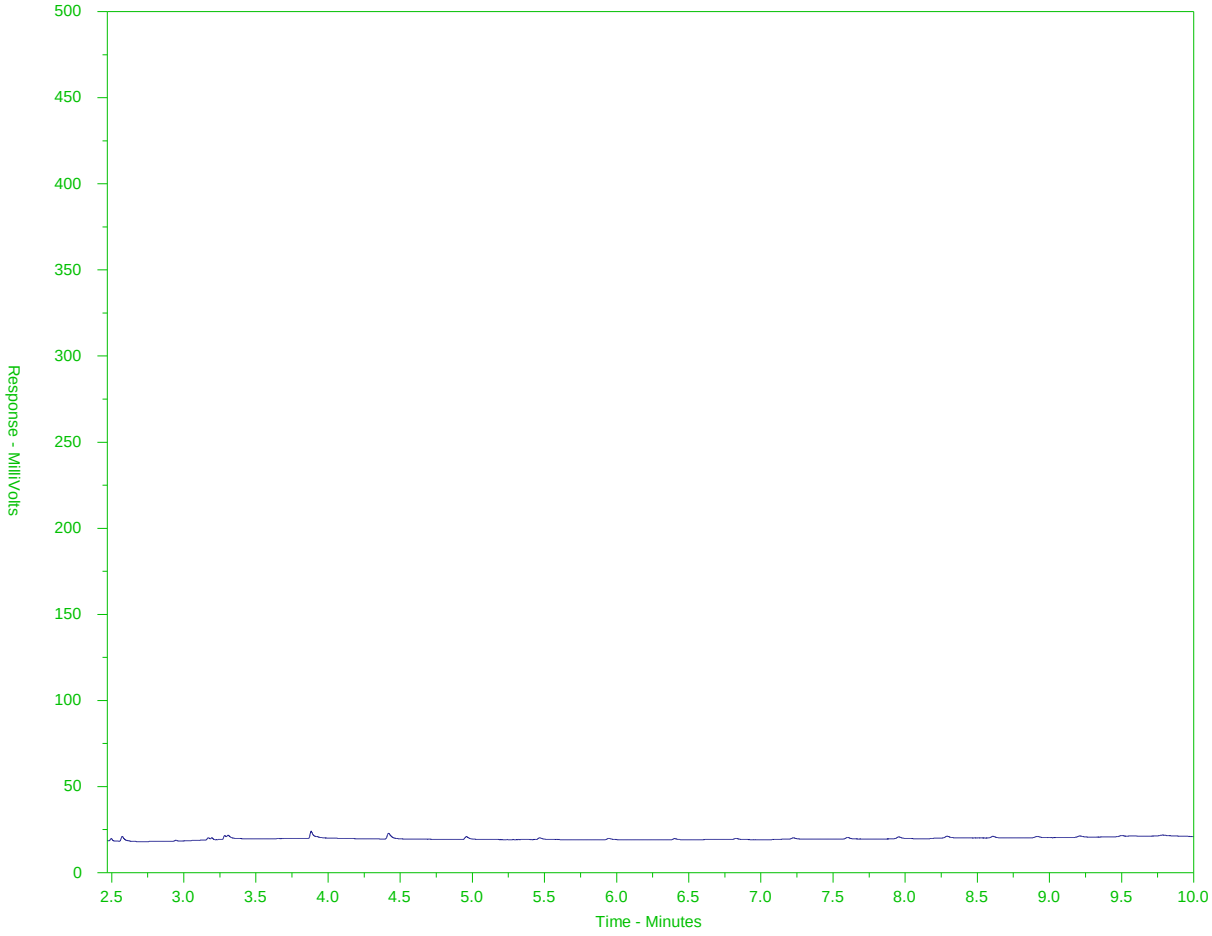
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2285149-11
Client Sample ID: PW17-30-20190604|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

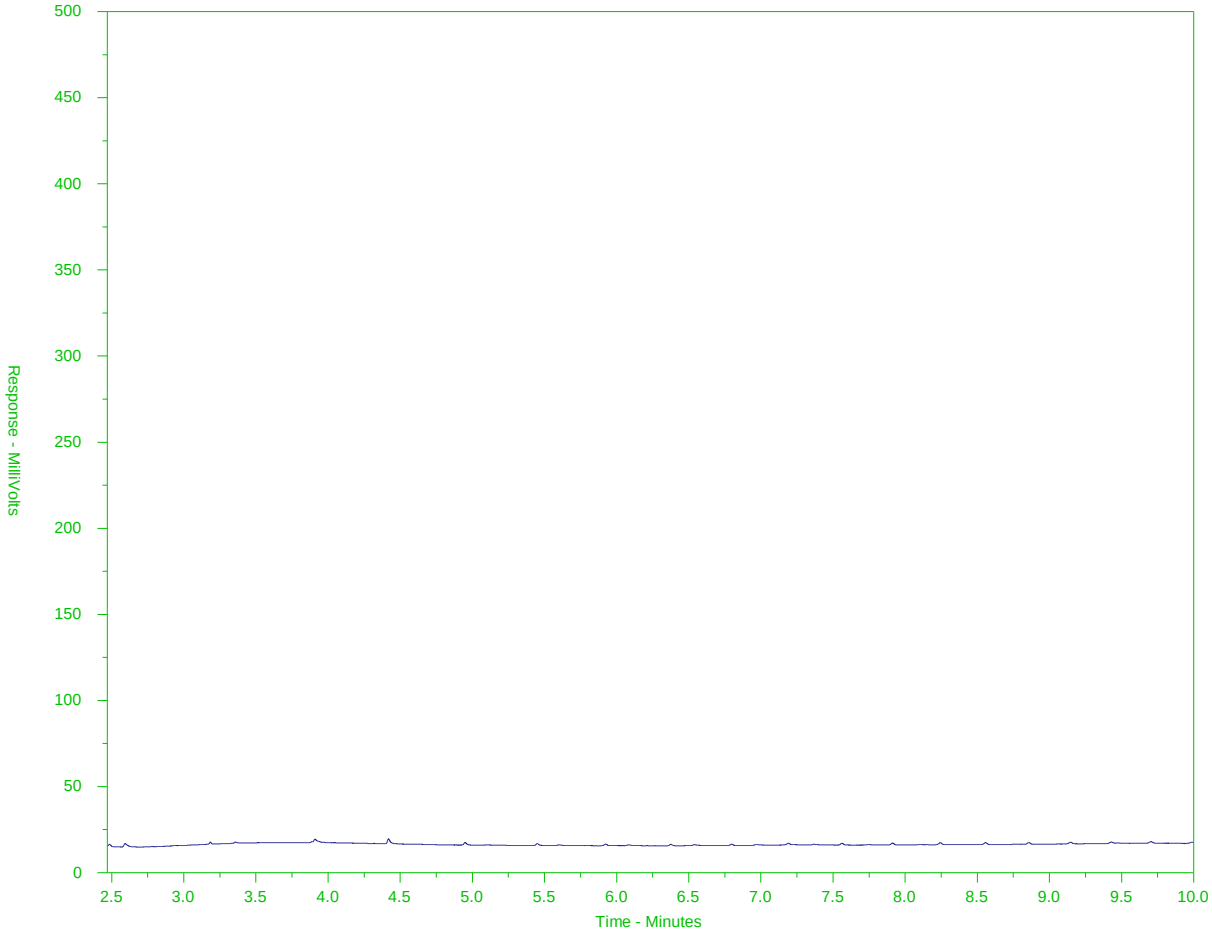
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2285149-12
Client Sample ID: PW17-31-20190604|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

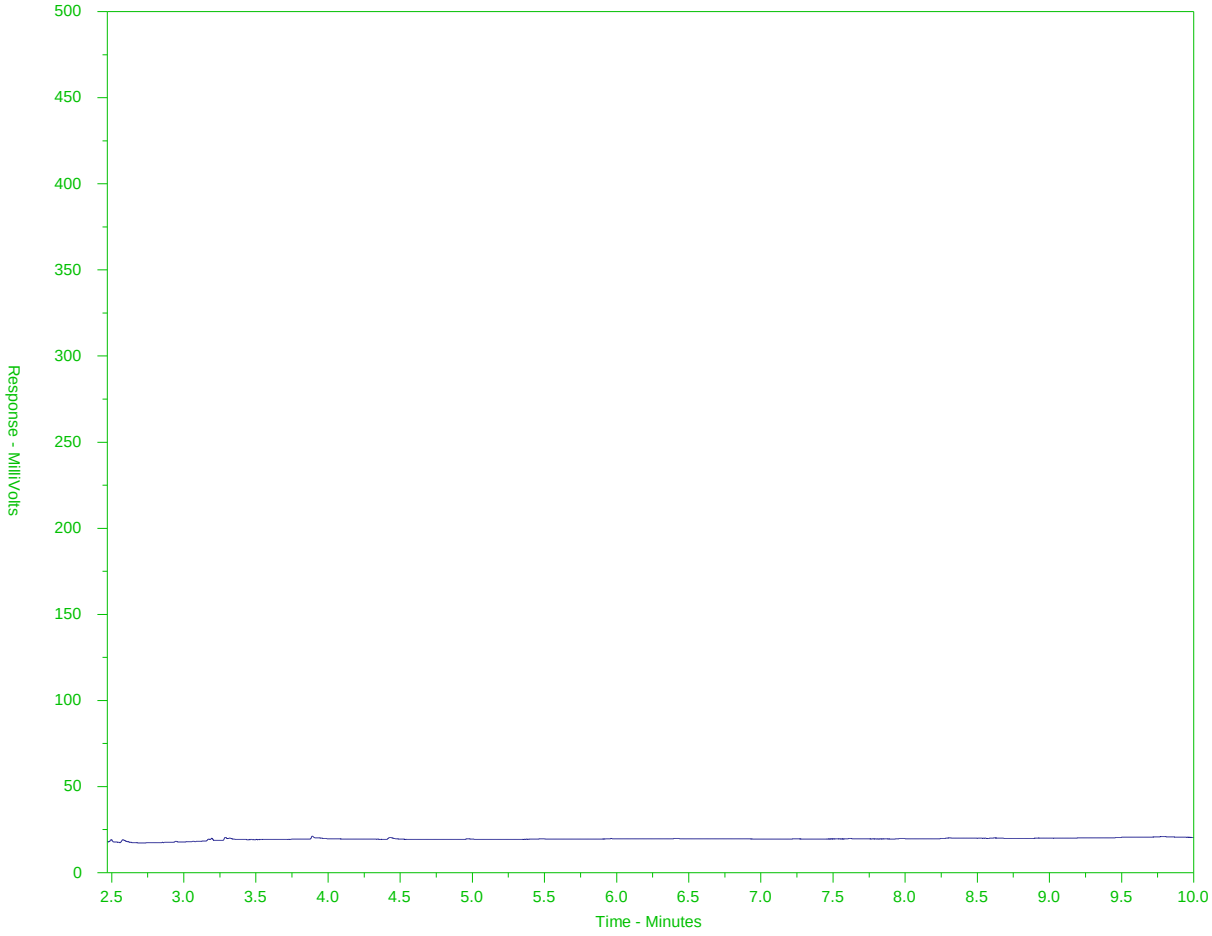
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2285149-13
Client Sample ID: PW17-32-20190604|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

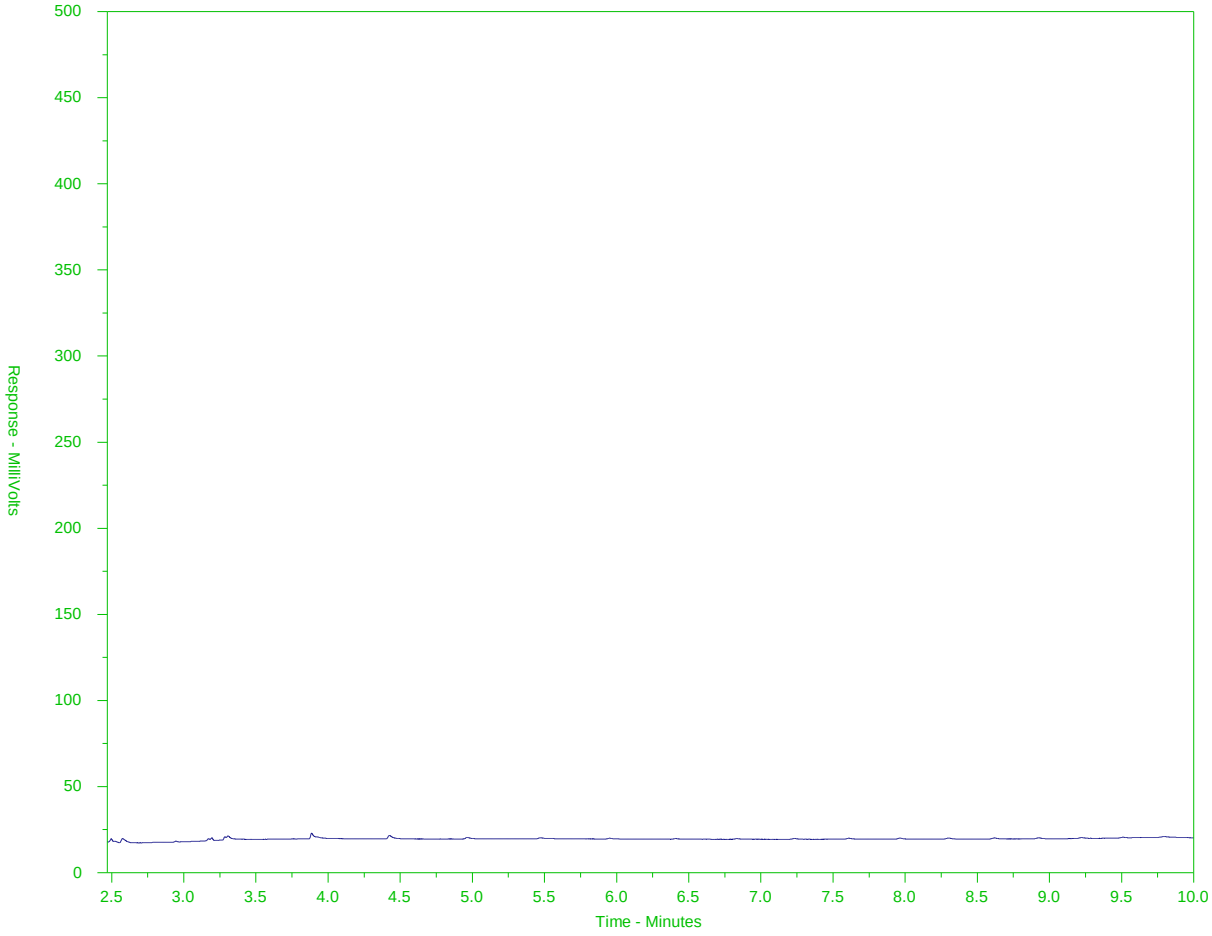
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2285149-14
Client Sample ID: PW17-33-20190604|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

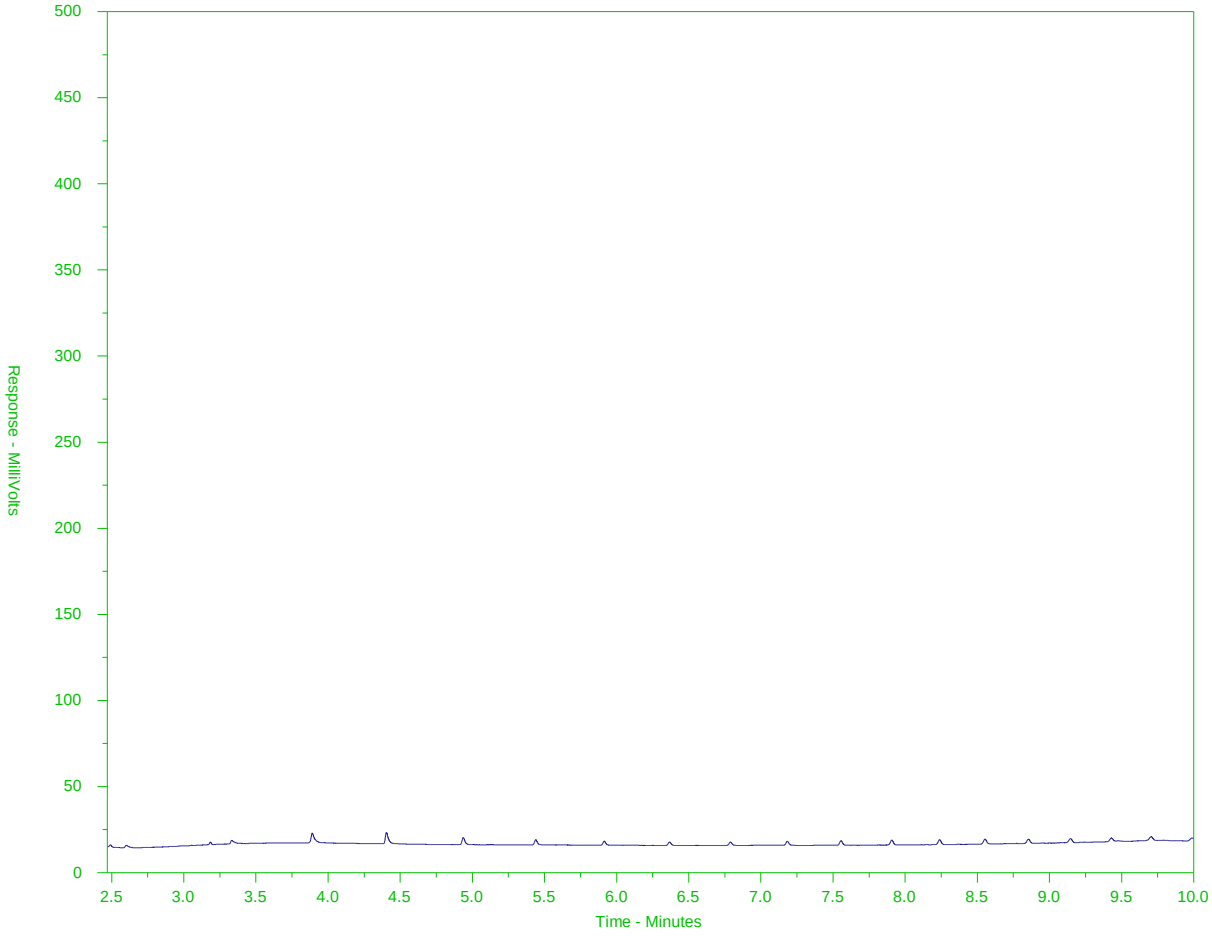
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2285149-15
Client Sample ID: R_BLANK_1_20190604|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2285149-COFC

COC Number: 17 - 827491

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	AECOM Canada Ltd.	Select Report Format: ☒ PDF ☒ EXCEL ☒ EDD (DIGITAL)	Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Leslie Southern	Quality Control (QC) Report with Report ☒ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐
Phone:	604-444-6608	☒ Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E - 100%] ☐ / Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐
	Company address below will appear on the final report	Select Distribution: ☒ EMAIL ☐ MAIL ☐ FAX	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
Street:	3292 Production Way,	Email 1 or Fax Leslie.Southern@AECOM.com	For tests that can not be performed according to the service level selected, you will be contacted.
City/Province:	Burnaby, BC	Email 2 justin.becker@aecom.com	
Postal Code:	V5A 4R4	Email 3	

Invoice To		Invoice Distribution	
	Same as Report To ☐ YES ☒ NO	Select Invoice Distribution: ☒ EMAIL ☐ MAIL ☐ FAX	
	Copy of Invoice with Report ☐ YES ☒ NO	Email 1 or Fax leslie.southern@aecom.com	
Company:	Parkland Refining (B.C.) Ltd.	Email 2	
Contact:	Christopher Boys		

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	60601814	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:	Burnaby Refinery	Location:	
ALS Lab Work Order # (lab use only):		ALS Contact: Dean Watt	Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	BTEX/VPH (P)	LEPH/HEPH (P)	Benzo(a)Pyrene (P)	Naphthalene (P)	Dissolved Copper (F/P)	Dissolved Zinc (F/P)	Nitrates/Sulfates/Alkalinity	Methane	Silty Sample	Brackish Water	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	PW17-3_20190604	04-June-19	12:56	Porewater	5	X	X	X	X	X	X						
	PW17-8_20190604		12:50														
	PW17-11_20190604		12:41														
	PW17-12_20190604		12:32														
	PW17-15_20190604		12:28														
	PW17-19_20190604		12:13														
	PW17-20_20190604		12:15														
	PW17-24_20190604		11:59														
	PW17-25_20190604		12:03														
	PW17-29_20190604		11:46														
	PW17-30_20190604		11:46														
	PW17-31_20190604		11:06														

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☒ NO	BC CSR
Are samples for human consumption/ use? ☐ YES ☒ NO	Only analyze for copper and zinc for metals

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☒ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C			
						2

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Justin Becker	Date: June 4th 2019	Time: 15:30	Received by:	Date:	Time:	Received by: HA	Date: 6/4	Time: 3:30p

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2018 FRONT

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

White Paper Co. 604 861-3900

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2285149-COFC

COC Number: 17 - 827491

Page 2 of 2

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	AECOM Canada Ltd.	Select Report Format: ☒ PDF ☒ EXCEL ☒ EDD (DIGITAL)	Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Leslie Southern	Quality Control (QC) Report with Report ☒ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐
Phone:	604-444-6608	☒ Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E - 100%] ☐ / Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐
	Company address below will appear on the final report	Select Distribution: ☒ EMAIL ☐ MAIL ☐ FAX	
Street:	3292 Production Way,	Email 1 or Fax Leslie.Southern@AECOM.com	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
City/Province:	Burnaby, BC	Email 2 justin.beeker@aecom.com	For tests that can not be performed according to the service level selected, you will be contacted.
Postal Code:	V5A 4R4	Email 3	

Invoice To		Invoice Distribution	
	Same as Report To ☐ YES ☒ NO	Select Invoice Distribution: ☒ EMAIL ☐ MAIL ☐ FAX	
	Copy of Invoice with Report ☐ YES ☒ NO	Email 1 or Fax leslie.southern@aecom.com	
Company:	Parkland Refining (B.C.) Ltd.	Email 2	
Contact:	Christopher Boys		

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	[redacted] 60601814	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:	Burnaby Refinery	Location:	
ALS Lab Work Order # (lab use only):		ALS Contact: Dean Watt	Sampler:

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	BTEX/VPH (P)	LEPH/HEPH (P)	Benzo(a)Pyrene (P)	Naphthalene (P)	Dissolved Copper (F/P)	Dissolved Zinc (F/P)	Nitrates/Sulfates/Alkalinity	Methane	Silty Sample	Brackish Water	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	PW17-32_20190604	04-Jun-19	11:24	Porewater	5	X	X	X	X	X	X						
	PW17-33_20190604	04-Jun-19	11:32	↓	5	↓	↓	↓	↓	↓	↓						
	R_Blank_1_20190604	↓	13:50	Other	5	X	X			X	X						
	T-Blank-1		~~Blank~~ N/A	Other	1	X											
	T-Blank-2		N/A	↓	1	X											

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☒ NO	BC CSR
Are samples for human consumption/ use? ☐ YES ☒ NO	Only ~~analyze~~ analyze for copper and zinc for metals

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No	☐
Ice Packs	☐	Ice Cubes ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☑				

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
							21

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: HA	Date: 6/4	Time: 3:30p
Justin Beeker	June 4, 2019	15:30						

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2018 FRONT

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

White Paper Co. 604 951-3900

AECOM CANADA LTD.
ATTN: Leslie Southern
3292 Production Way
Suite 330
Burnaby BC V5A 4R4

Date Received: 05-JUN-19
Report Date: 13-JUN-19 18:07 (MT)
Version: FINAL

Client Phone: 604-444-6608

Certificate of Analysis

Lab Work Order #: L2286145

Project P.O. #:	0015243589
Job Reference:	60601814 WATER ANALYSIS
C of C Numbers:	17-827491
Legal Site Desc:	Burnaby Refinery

Dean Watt, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2286145-1	L2286145-2	L2286145-3	L2286145-4	L2286145-5
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
	Sampled Time	11:26	11:39	12:01	12:30	12:48
	Client ID	PW17-1_20190605|REG|GW	PW17-2_20190605|REG|GW	PW17-4_20190605|REG|GW	PW17-5_20190605|REG|GW	PW17-6_20190605|REG|GW
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Copper (Cu)-Dissolved (ug/L)	0.63	0.64	<0.20	1.60	<0.20
	Zinc (Zn)-Dissolved (ug/L)	2.7	1.2	1.3	3.7	<1.0

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2286145-6	L2286145-7	L2286145-8	L2286145-9	L2286145-10
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
	Sampled Time	11:24	11:05	11:07	10:44	10:50
	Client ID	PW17-7_20190605|REG|GW	PW17-9_20190605|REG|GW	PW17-10_20190605|REG|GW	PW17-13_20190605|REG|GW	PW17-14_20190605|REG|GW
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Copper (Cu)-Dissolved (ug/L)	0.48	<0.20	0.72	1.25	0.60
	Zinc (Zn)-Dissolved (ug/L)	3.3	1.2	3.5	1.7	3.6

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2286145-11				
	Description	Porewater				
	Sampled Date	05-JUN-19				
	Sampled Time	13:07				
	Client ID	PW17-16_20190605|REG|GW				
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD				
	Copper (Cu)-Dissolved (ug/L)	0.33				
	Zinc (Zn)-Dissolved (ug/L)	3.7				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2286145-1	L2286145-2	L2286145-3	L2286145-4	L2286145-5
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
	Sampled Time	11:26	11:39	12:01	12:30	12:48
	Client ID	PW17-1_20190605|REG|GW	PW17-2_20190605|REG|GW	PW17-4_20190605|REG|GW	PW17-5_20190605|REG|GW	PW17-6_20190605|REG|GW
Grouping	**Analyte**					
WATER						
Dissolved Metals	Dissolved Metals Filtration Location					
	Copper (Cu)-Dissolved (ug/L)					
	Zinc (Zn)-Dissolved (ug/L)					
Volatile Organic Compounds	Benzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Ethylbenzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Styrene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Toluene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	ortho-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	meta- & para-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Xylenes (ug/L)	<0.75	<0.75	<0.75	<0.75	<0.75
Hydrocarbons	EPH10-19 (ug/L)	<250	<250	<250	<250	<250
	EPH19-32 (ug/L)	<250	<250	<250	<250	<250
	LEPH (ug/L)	<250	<250	<250	<250	<250
	HEPH (ug/L)	<250	<250	<250	<250	<250
	Volatile Hydrocarbons (VH6-10) (ug/L)	<100	<100	<100	<100	<100
	VPH (C6-C10) (ug/L)	<100	<100	<100	<100	<100
	Surrogate: 2-Bromobenzotrifluoride (%)	101.7	93.3	94.7	95.3	85.4
Polycyclic Aromatic Hydrocarbons	Acenaphthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acenaphthylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acridine (ug/L)	<0.010	<0.010	<0.030 DLCI	<0.010	<0.010
	Anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benz(a)anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(a)pyrene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Benzo(b&j)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(b+j+k)fluoranthene (ug/L)	<0.015	<0.015	<0.015	<0.015	<0.015
	Benzo(g,h,i)perylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(k)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Chrysene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Dibenz(a,h)anthracene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Fluorene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	1-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	2-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Naphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Phenanthrene (ug/L)	<0.020	<0.020	<0.020	<0.020	<0.020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2286145-6 Porewater 05-JUN-19 11:24 PW17-7_20190605|REG|GW	L2286145-7 Porewater 05-JUN-19 11:05 PW17-9_20190605|REG|GW	L2286145-8 Porewater 05-JUN-19 11:07 PW17-10_20190605|REG|GW	L2286145-9 Porewater 05-JUN-19 10:44 PW17-13_20190605|REG|GW	L2286145-10 Porewater 05-JUN-19 10:50 PW17-14_20190605|REG|GW
WATER						
Dissolved Metals	Dissolved Metals Filtration Location					
	Copper (Cu)-Dissolved (ug/L)					
	Zinc (Zn)-Dissolved (ug/L)					
Volatile Organic Compounds	Benzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Ethylbenzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Styrene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Toluene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	ortho-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	meta- & para-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Xylenes (ug/L)	<0.75	<0.75	<0.75	<0.75	<0.75
Hydrocarbons	EPH10-19 (ug/L)	<250	<250	<250	<250	<250
	EPH19-32 (ug/L)	<250	<250	<250	<250	<250
	LEPH (ug/L)	<250	<250	<250	<250	<250
	HEPH (ug/L)	<250	<250	<250	<250	<250
	Volatile Hydrocarbons (VH6-10) (ug/L)	<100	<100	<100	<100	<100
	VPH (C6-C10) (ug/L)	<100	<100	<100	<100	<100
	Surrogate: 2-Bromobenzotrifluoride (%)	81.6	101.3	92.6	95.2	96.8
Polycyclic Aromatic Hydrocarbons	Acenaphthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acenaphthylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acridine (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benz(a)anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(a)pyrene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Benzo(b&j)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(b+j+k)fluoranthene (ug/L)	<0.015	<0.015	<0.015	<0.015	<0.015
	Benzo(g,h,i)perylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(k)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Chrysene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Dibenz(a,h)anthracene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Fluorene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	1-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	2-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Naphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Phenanthrene (ug/L)	<0.020	<0.020	<0.020	<0.020	<0.020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2286145-11	L2286145-12	L2286145-13	L2286145-14	L2286145-15
Description	Porewater	Porewater	Porewater	Porewater	Porewater
Sampled Date	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
Sampled Time	13:07	13:10	13:25	13:28	13:47
Client ID	PW17-16_20190605|REG|GW	PW17-17_20190605|REG|GW	PW17-18_20190605|REG|GW	PW17-21_20190605|REG|GW	PW17-22_20190605|REG|GW
Grouping / **Analyte**					
WATER					
Dissolved Metals					
Dissolved Metals Filtration Location		FIELD	FIELD	FIELD	FIELD
Copper (Cu)-Dissolved (ug/L)		<1.0 DLA	<2.0 DLA	<1.0 DLA	<2.0 DLA
Zinc (Zn)-Dissolved (ug/L)		<5.0 DLA	15	<5.0 DLA	<10 DLA
Volatile Organic Compounds					
Benzene (ug/L)	8.85	24.0	<0.50	<0.50	<0.50
Ethylbenzene (ug/L)	7.33	0.84	<0.50	<0.50	<0.50
Styrene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
ortho-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
meta- & para-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Xylenes (ug/L)	<0.75	<0.75	<0.75	<0.75	<0.75
Hydrocarbons					
EPH10-19 (ug/L)	<250	<250	<250	<250	<250
EPH19-32 (ug/L)	<250	<250	<250	<250	<250
LEPH (ug/L)	<250	<250	<250	<250	<250
HEPH (ug/L)	<250	<250	<250	<250	<250
Volatile Hydrocarbons (VH6-10) (ug/L)	410	210	<100	<100	<100
VPH (C6-C10) (ug/L)	390	190	<100	<100	<100
Surrogate: 2-Bromobenzotrifluoride (%)	93.5	89.1	96.2	92.3	86.1
Polycyclic Aromatic Hydrocarbons					
Acenaphthene (ug/L)	0.190	<0.010	<0.010	<0.010	<0.010
Acenaphthylene (ug/L)	<0.030 DLCI	<0.010	<0.010	<0.010	<0.010
Acridine (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Benz(a)anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(a)pyrene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Benzo(b&j)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(b+j+k)fluoranthene (ug/L)	<0.015	<0.015	<0.015	<0.015	<0.015
Benzo(g,h,i)perylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(k)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Chrysene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Dibenz(a,h)anthracene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Fluorene (ug/L)	0.203	<0.010	<0.010	<0.010	<0.010
Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
1-Methylnaphthalene (ug/L)	4.08	<0.050	<0.050	<0.050	<0.050
2-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Naphthalene (ug/L)	<0.70 DLCI	<0.060 DLCI	<0.050	<0.10 DLCI	<0.050
Phenanthrene (ug/L)	0.080	<0.020	<0.020	<0.020	<0.020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2286145-16	L2286145-17	L2286145-18	L2286145-19	L2286145-20
	Description	Porewater	Other	Other	Other	Porewater
	Sampled Date	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
	Sampled Time	13:44	15:00			12:00
	Client ID	PW17-23_20190605|REG|GW	R-BLANK-2_20190605|REG|GW	TRAVEL BLANK-3	TRAVEL BLANK-4	DUP-2_20190605|FD|GW
Grouping	**Analyte**					
WATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD			FIELD
	Copper (Cu)-Dissolved (ug/L)	<2.0 DLA	<0.20			<4.0 DLA
	Zinc (Zn)-Dissolved (ug/L)	16	<1.0			<20 DLA
Volatile Organic Compounds	Benzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Ethylbenzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Styrene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Toluene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	ortho-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	meta- & para-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Xylenes (ug/L)	<0.75	<0.75	<0.75	<0.75	<0.75
Hydrocarbons	EPH10-19 (ug/L)	<250	<250			<250
	EPH19-32 (ug/L)	<250	<250			<250
	LEPH (ug/L)	<250	<250			<250
	HEPH (ug/L)	<250	<250			<250
	Volatile Hydrocarbons (VH6-10) (ug/L)	<100	<100	<100	<100	<100
	VPH (C6-C10) (ug/L)	<100	<100	<100	<100	<100
	Surrogate: 2-Bromobenzotrifluoride (%)	97.8	70.9			85.2
Polycyclic Aromatic Hydrocarbons	Acenaphthene (ug/L)	<0.010	<0.010			<0.010
	Acenaphthylene (ug/L)	<0.010	<0.010			<0.010
	Acridine (ug/L)	<0.010	<0.010			<0.010
	Anthracene (ug/L)	<0.010	<0.010			<0.010
	Benz(a)anthracene (ug/L)	<0.010	<0.010			<0.010
	Benzo(a)pyrene (ug/L)	<0.0050	<0.0050			<0.0050
	Benzo(b&j)fluoranthene (ug/L)	<0.010	<0.010			<0.010
	Benzo(b+j+k)fluoranthene (ug/L)	<0.015	<0.015			<0.015
	Benzo(g,h,i)perylene (ug/L)	<0.010	<0.010			<0.010
	Benzo(k)fluoranthene (ug/L)	<0.010	<0.010			<0.010
	Chrysene (ug/L)	<0.010	<0.010			<0.010
	Dibenz(a,h)anthracene (ug/L)	<0.0050	<0.0050			<0.0050
	Fluoranthene (ug/L)	<0.010	<0.010			<0.010
	Fluorene (ug/L)	<0.010	<0.010			<0.010
	Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010	<0.010			<0.010
	1-Methylnaphthalene (ug/L)	<0.050	<0.050			<0.050
	2-Methylnaphthalene (ug/L)	<0.050	<0.050			<0.050
	Naphthalene (ug/L)	<0.050	<0.050			<0.050
	Phenanthrene (ug/L)	<0.020	<0.020			<0.020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2286145-21				
	Description	Porewater				
	Sampled Date	05-JUN-19				
	Sampled Time	12:00				
	Client ID	DUP-3_20190605|FD|GW				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD				
	Copper (Cu)-Dissolved (ug/L)	<4.0 DLA				
	Zinc (Zn)-Dissolved (ug/L)	<20 DLA				
Volatile Organic Compounds	Benzene (ug/L)	<0.50				
	Ethylbenzene (ug/L)	<0.50				
	Styrene (ug/L)	<0.50				
	Toluene (ug/L)	<0.50				
	ortho-Xylene (ug/L)	<0.50				
	meta- & para-Xylene (ug/L)	<0.50				
	Xylenes (ug/L)	<0.75				
Hydrocarbons	EPH10-19 (ug/L)	<250				
	EPH19-32 (ug/L)	<250				
	LEPH (ug/L)	<250				
	HEPH (ug/L)	<250				
	Volatile Hydrocarbons (VH6-10) (ug/L)	<100				
	VPH (C6-C10) (ug/L)	<100				
	Surrogate: 2-Bromobenzotrifluoride (%)	79.6				
Polycyclic Aromatic Hydrocarbons	Acenaphthene (ug/L)	<0.010				
	Acenaphthylene (ug/L)	<0.010				
	Acridine (ug/L)	<0.010				
	Anthracene (ug/L)	<0.010				
	Benz(a)anthracene (ug/L)	<0.010				
	Benzo(a)pyrene (ug/L)	<0.0050				
	Benzo(b&j)fluoranthene (ug/L)	<0.010				
	Benzo(b+j+k)fluoranthene (ug/L)	<0.015				
	Benzo(g,h,i)perylene (ug/L)	<0.010				
	Benzo(k)fluoranthene (ug/L)	<0.010				
	Chrysene (ug/L)	<0.010				
	Dibenz(a,h)anthracene (ug/L)	<0.0050				
	Fluoranthene (ug/L)	<0.010				
	Fluorene (ug/L)	<0.010				
	Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010				
	1-Methylnaphthalene (ug/L)	<0.050				
	2-Methylnaphthalene (ug/L)	<0.050				
	Naphthalene (ug/L)	<0.050				
	Phenanthrene (ug/L)	<0.020				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2286145-1	L2286145-2	L2286145-3	L2286145-4	L2286145-5
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
	Sampled Time	11:26	11:39	12:01	12:30	12:48
	Client ID	PW17-1_20190605|REG|GW	PW17-2_20190605|REG|GW	PW17-4_20190605|REG|GW	PW17-5_20190605|REG|GW	PW17-6_20190605|REG|GW
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Quinoline (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Surrogate: Acridine d9 (%)	116.1	90.5	102.7	103.3	63.6
	Surrogate: Chrysene d12 (%)	129.4	126.8	125.5	129.6	122.2
	Surrogate: Naphthalene d8 (%)	107.1	99.5	100.4	104.4	95.3
	Surrogate: Phenanthrene d10 (%)	127.8	105.3	117.3	110.2	101.0
	Total PAHs (ug/L)	<0.11	<0.11	<0.11	<0.11	<0.11

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2286145-6	L2286145-7	L2286145-8	L2286145-9	L2286145-10
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
	Sampled Time	11:24	11:05	11:07	10:44	10:50
	Client ID	PW17-7_20190605|REG|GW	PW17-9_20190605|REG|GW	PW17-10_20190605|REG|GW	PW17-13_20190605|REG|GW	PW17-14_20190605|REG|GW
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Quinoline (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Surrogate: Acridine d9 (%)	93.5	91.0	93.1	103.6	93.3
	Surrogate: Chrysene d12 (%)	124.3	123.0	129.4	128.5	123.2
	Surrogate: Naphthalene d8 (%)	102.1	100.4	104.0	104.2	108.8
	Surrogate: Phenanthrene d10 (%)	108.9	103.2	106.4	111.3	109.7
	Total PAHs (ug/L)	<0.11	<0.11	<0.11	<0.11	<0.11

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2286145-11	L2286145-12	L2286145-13	L2286145-14	L2286145-15
Sample ID		L2286145-11	L2286145-12	L2286145-13	L2286145-14	L2286145-15
Description		Porewater	Porewater	Porewater	Porewater	Porewater
Sampled Date		05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
Sampled Time		13:07	13:10	13:25	13:28	13:47
Client ID		PW17-16_20190605|REG|GW	PW17-17_20190605|REG|GW	PW17-18_20190605|REG|GW	PW17-21_20190605|REG|GW	PW17-22_20190605|REG|GW
WATER						
Polycyclic Aromatic Hydrocarbons	Pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Quinoline (ug/L)	<0.80 DLCI	<0.050	<0.050	<0.070 DLCI	<0.050
	Surrogate: Acridine d9 (%)	96.1	97.0	85.4	92.0	90.4
	Surrogate: Chrysene d12 (%)	129.9	122.1	123.5	123.7	126.9
	Surrogate: Naphthalene d8 (%)	113.4	89.1	103.5	98.8	101.7
	Surrogate: Phenanthrene d10 (%)	108.3	103.9	105.5	104.6	109.5
	Total PAHs (ug/L)	4.6	<0.11	<0.11	<0.15	<0.11

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2286145-16	L2286145-17	L2286145-18	L2286145-19	L2286145-20
	Description	Porewater	Other	Other	Other	Porewater
	Sampled Date	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19	05-JUN-19
	Sampled Time	13:44	15:00			12:00
	Client ID	PW17-23_20190605|REG|GW	R-BLANK-2_20190605|REG|GW	TRAVEL BLANK-3	TRAVEL BLANK-4	DUP-2_20190605|FD|GW
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Pyrene (ug/L)	<0.010	<0.010			<0.010
	Quinoline (ug/L)	<0.050	<0.050			<0.050
	Surrogate: Acridine d9 (%)	57.3 SURR-ND	78.4			93.7
	Surrogate: Chrysene d12 (%)	121.8	124.7			128.9
	Surrogate: Naphthalene d8 (%)	105.0	95.6			103.9
	Surrogate: Phenanthrene d10 (%)	102.3	102.4			111.1
	Total PAHs (ug/L)	<0.11	<0.11			<0.11

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2286145-21				
	Description	Porewater				
	Sampled Date	05-JUN-19				
	Sampled Time	12:00				
	Client ID	DUP-3_20190605|FD|GW				
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Pyrene (ug/L)	<0.010				
	Quinoline (ug/L)	<0.050				
	Surrogate: Acridine d9 (%)	55.8 SURR-ND				
	Surrogate: Chrysene d12 (%)	120.1				
	Surrogate: Naphthalene d8 (%)	98.5				
	Surrogate: Phenanthrene d10 (%)	99.9				
	Total PAHs (ug/L)	<0.11				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLCI	Detection Limit Raised: Chromatographic Interference due to co-elution.
SURR-ND	Surrogate recovery marginally exceeded ALS DQO. Reported non-detect results for associated samples were deemed to be unaffected.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual
EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.			
LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LEPH/HEPH
LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure. LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene. HEPHw = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.			
MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
MET-D-F-HMI-CCMS-VA	Seawater	Diss. Metals in Seawater by CRC ICPMS	APHA 3030B/EPA 6020B (mod)
Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS (HMI Mode).			
PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)
PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.			
PAH-SUM-CALC-VA	Water	TOTAL PAH's	CALCULATION
Total PAH represents the sum of all PAH analytes reported for a given sample. Note that regulatory agencies and criteria differ in their definitions of Total PAH in terms of the individual PAH analytes to be included.			
VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.			
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.			
VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE VPH
VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure. VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene			
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION
Calculation of Total Xylenes Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

17-827491

Reference Information

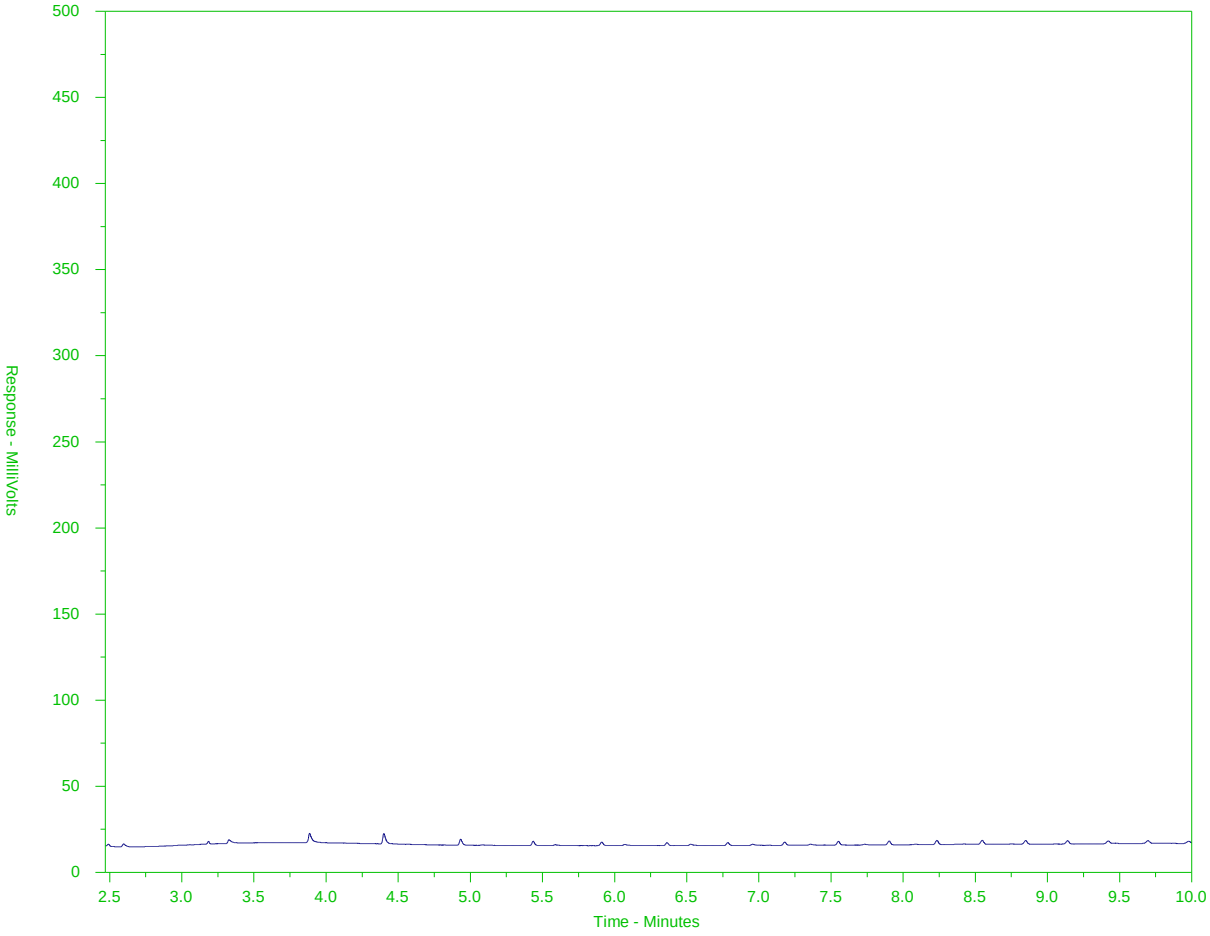
GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-1
Client Sample ID: PW17-1_20190605|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

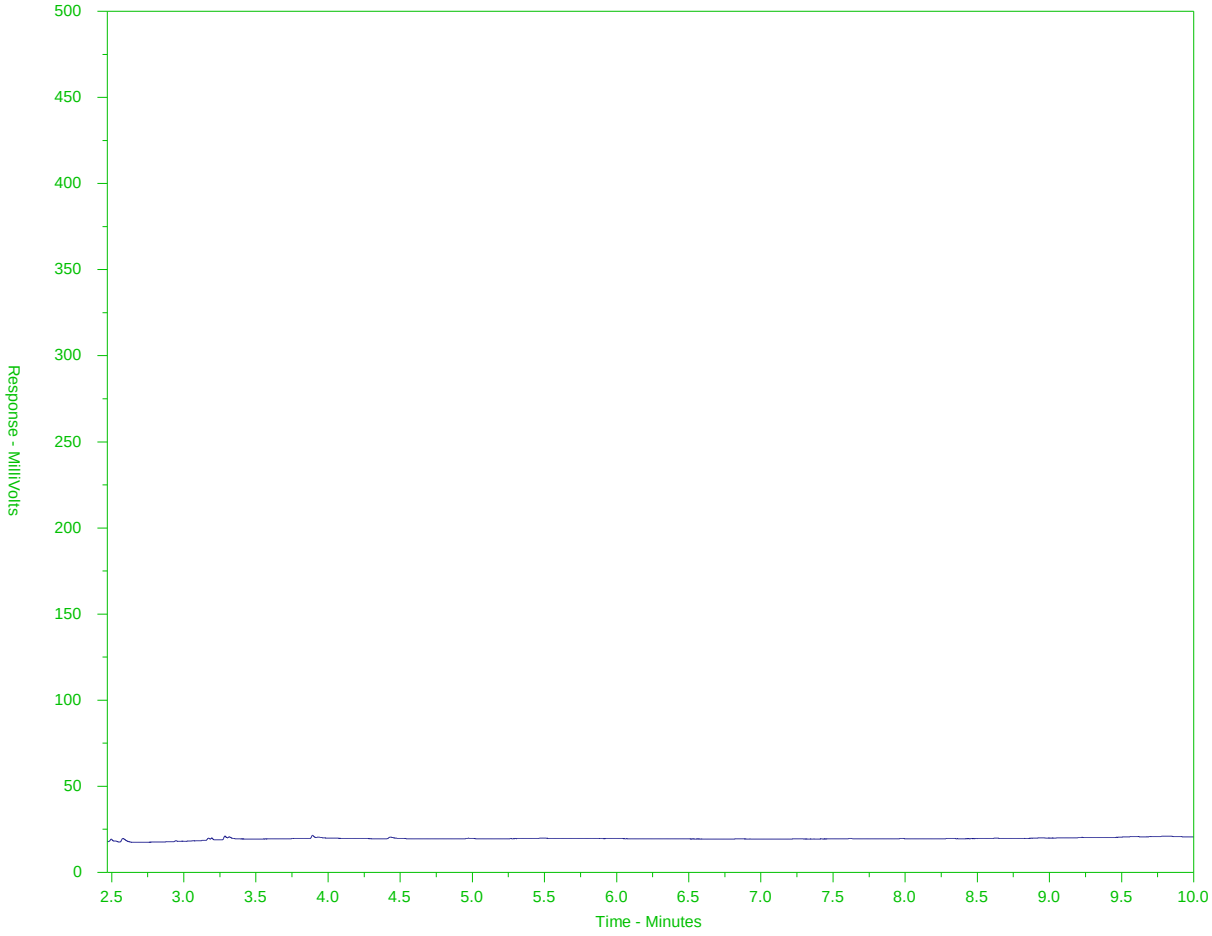
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-2
Client Sample ID: PW17-2_20190605|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

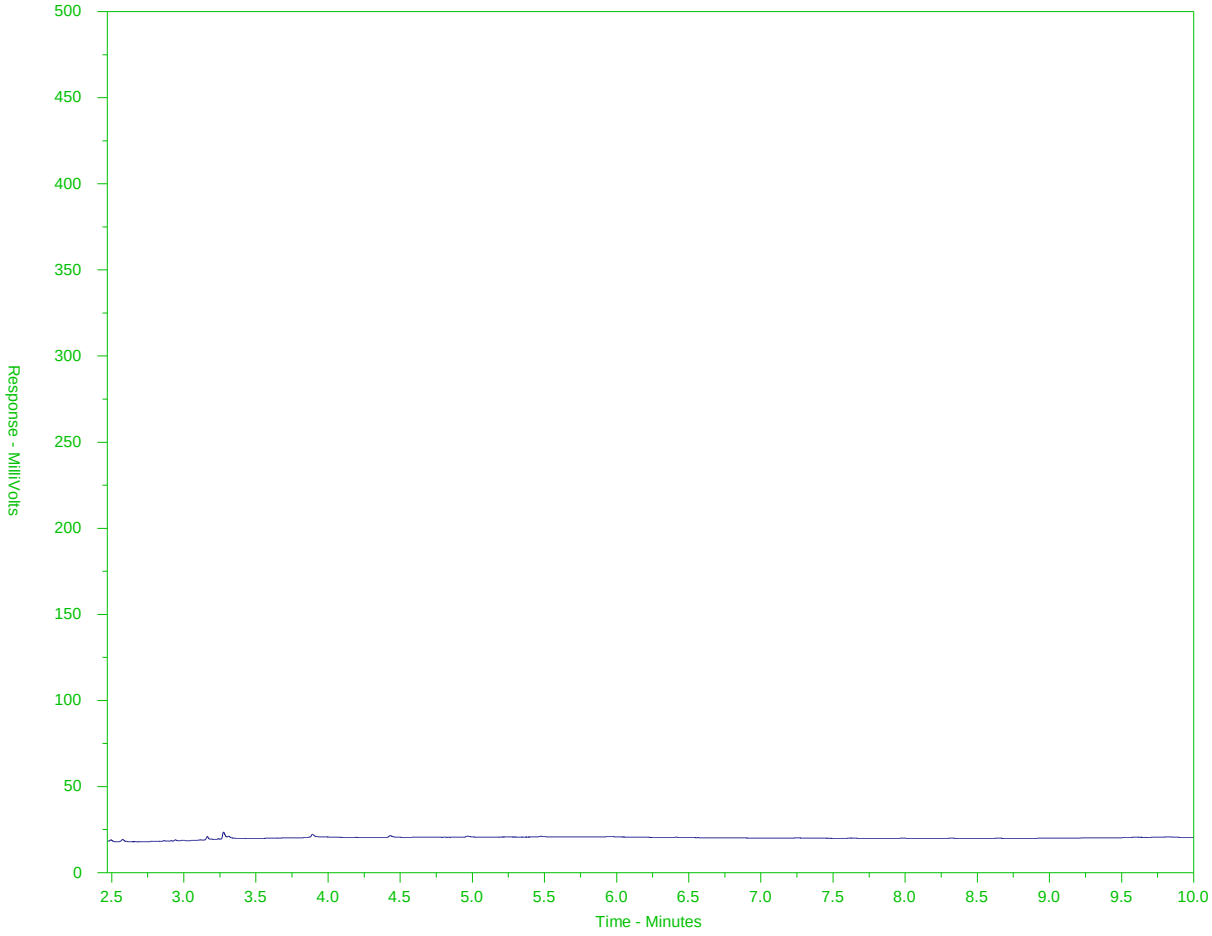
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-3
Client Sample ID: PW17-4_20190605|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

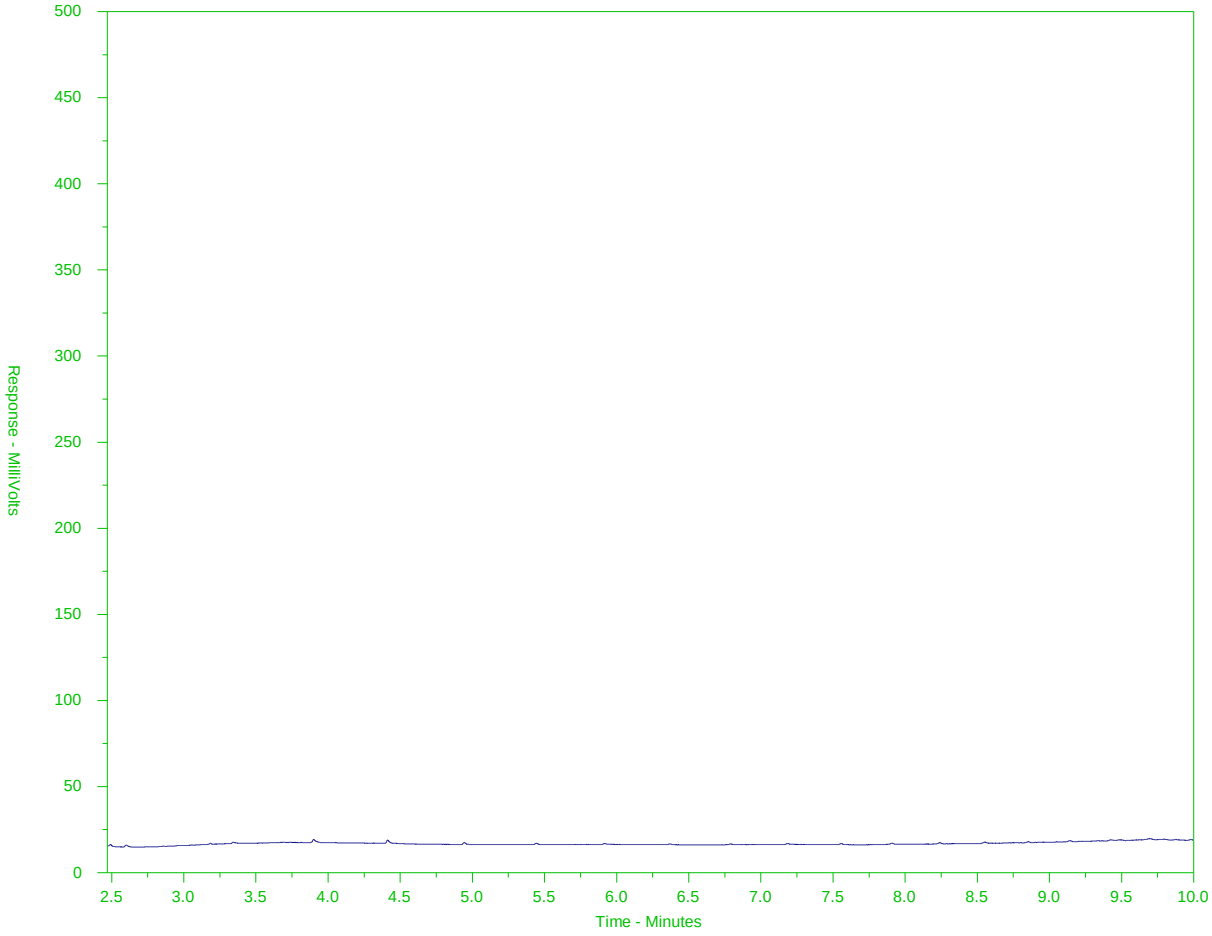
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-4
Client Sample ID: PW17-5_20190605|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

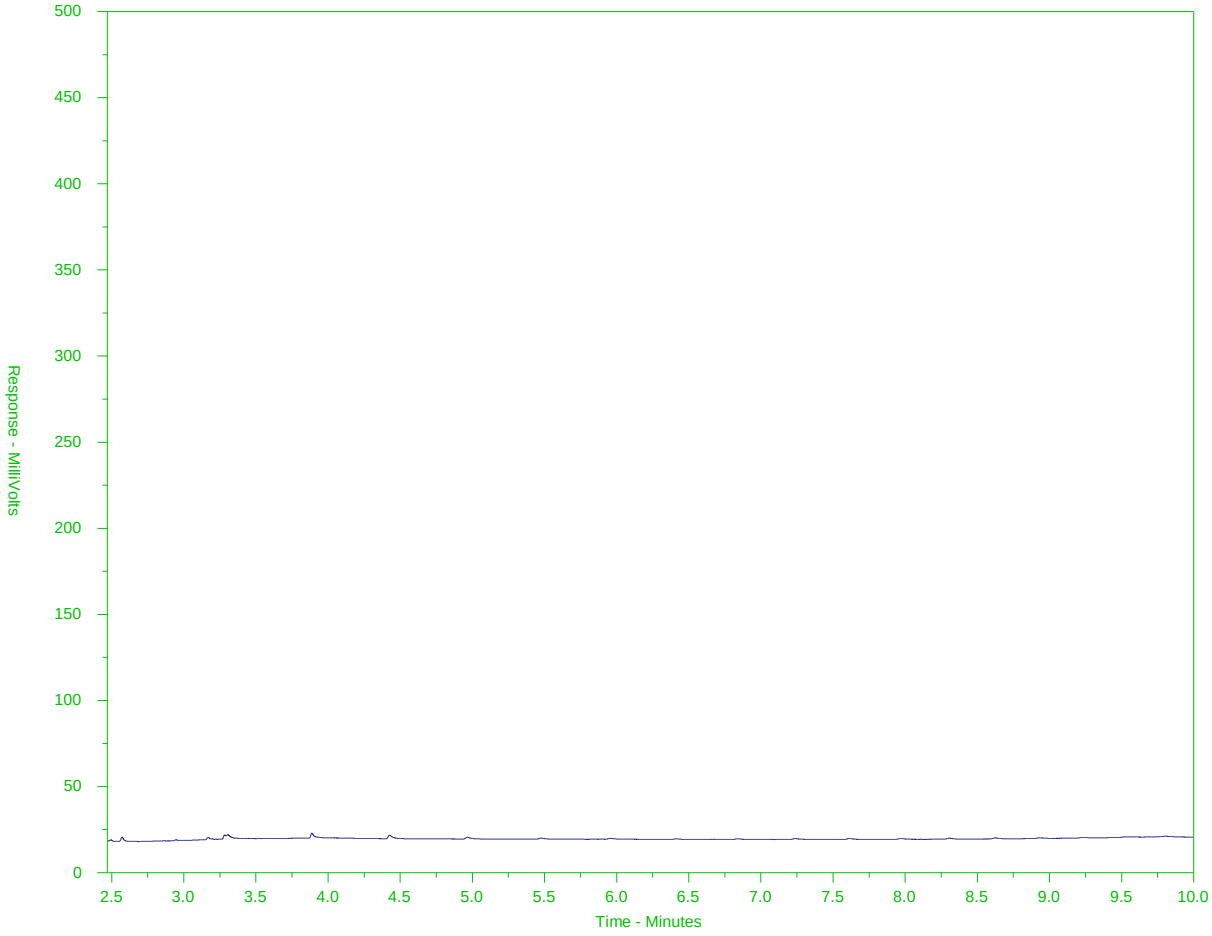
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-5
Client Sample ID: PW17-6_20190605|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

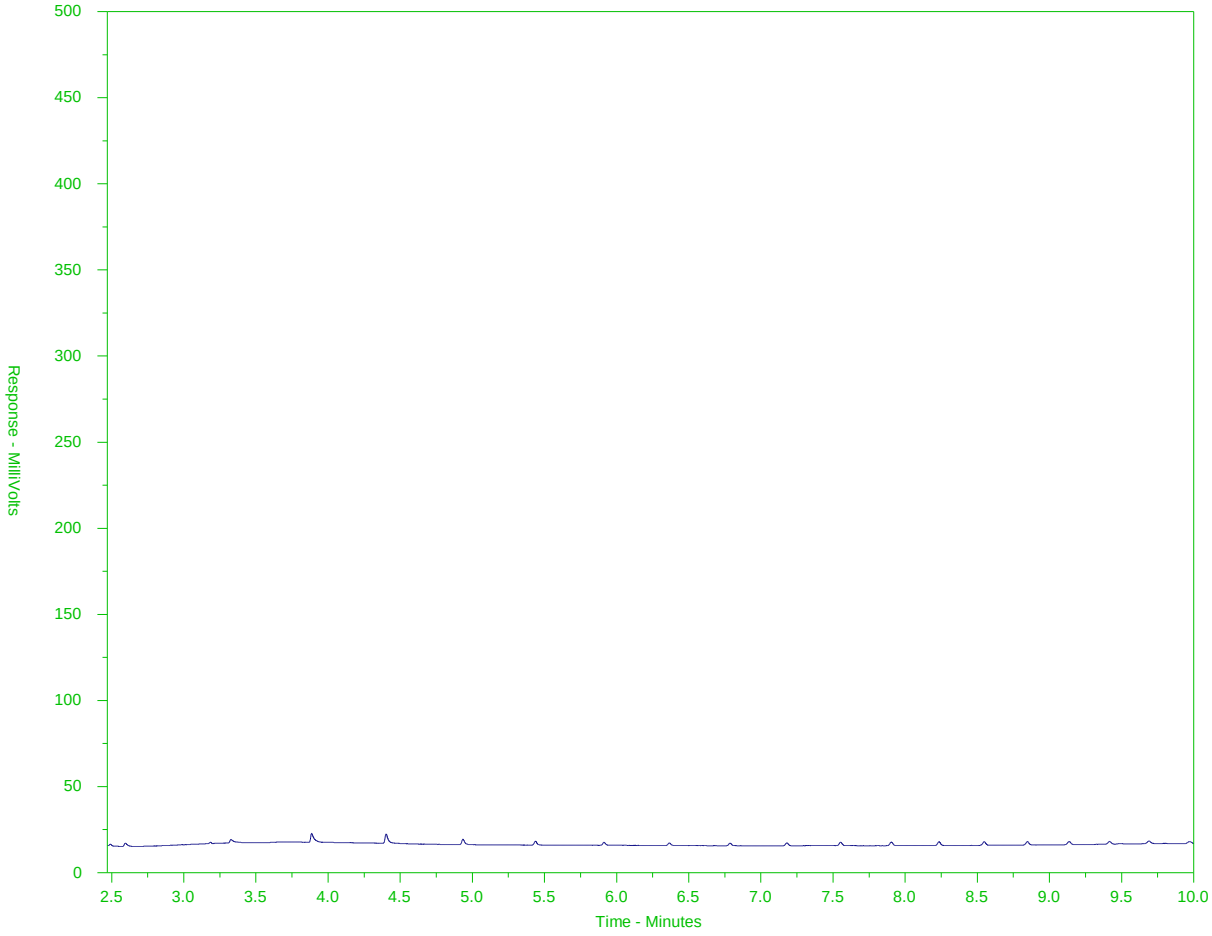
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-6
Client Sample ID: PW17-7_20190605|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

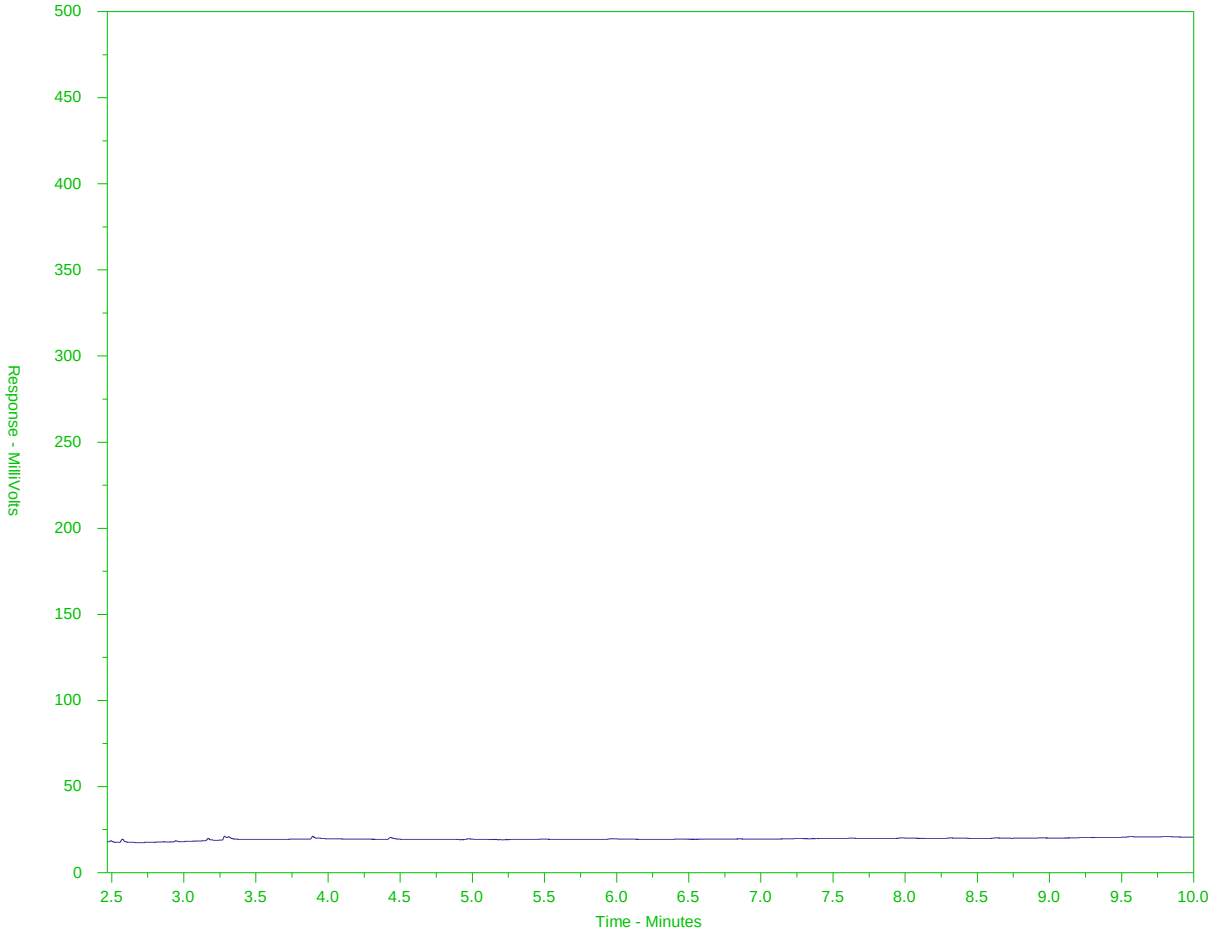
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-7
Client Sample ID: PW17-9_20190605|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

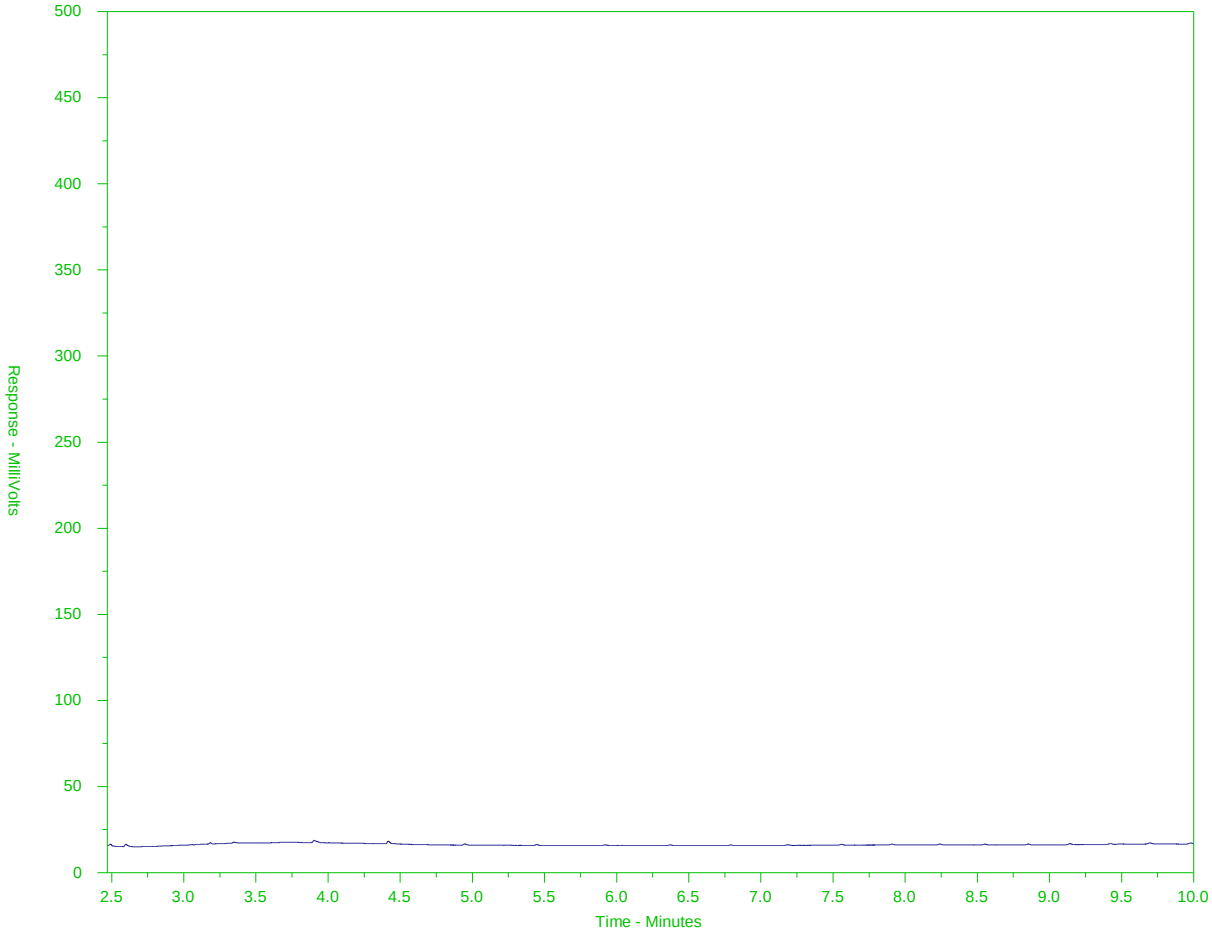
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-8
Client Sample ID: PW17-10_20190605|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

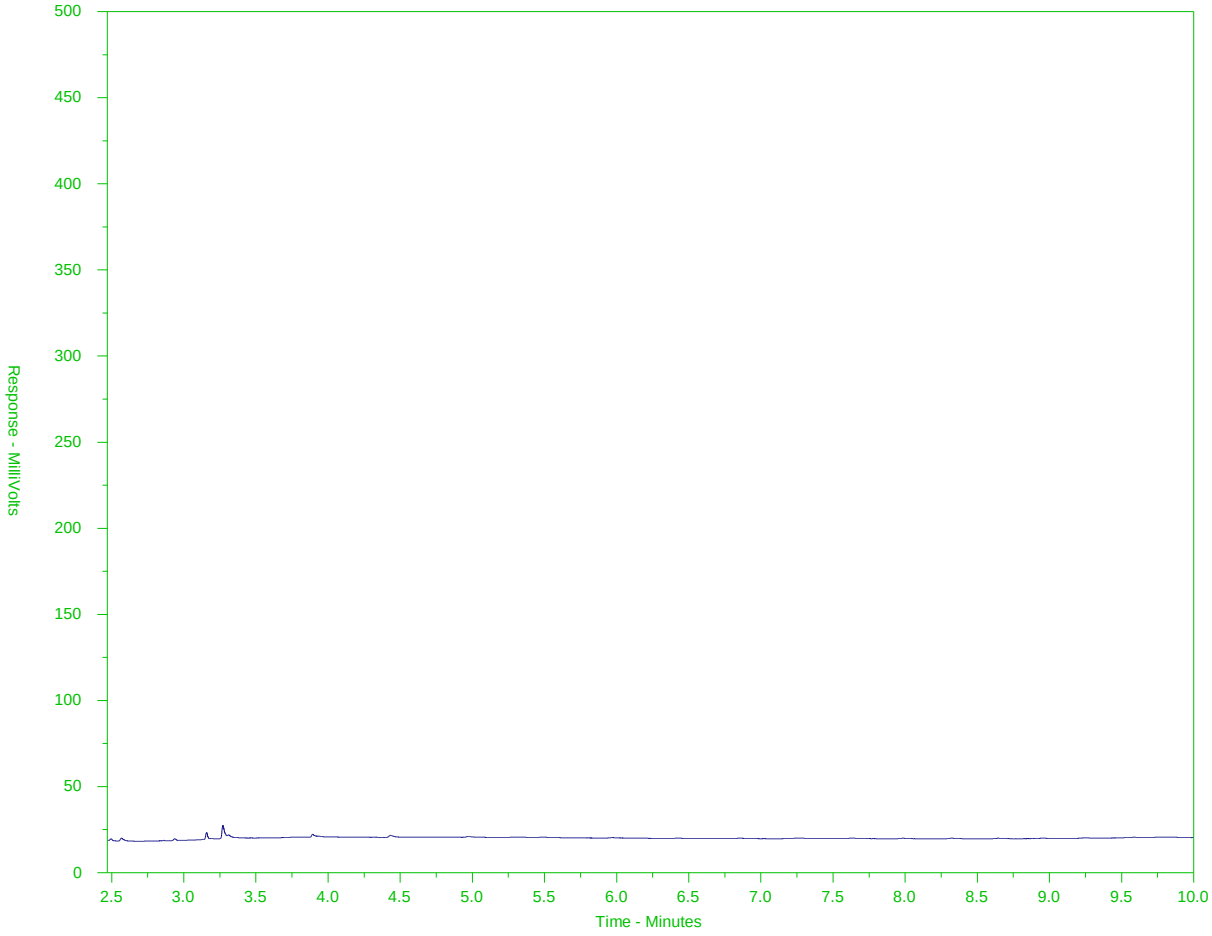
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-9
Client Sample ID: PW17-13_20190605|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

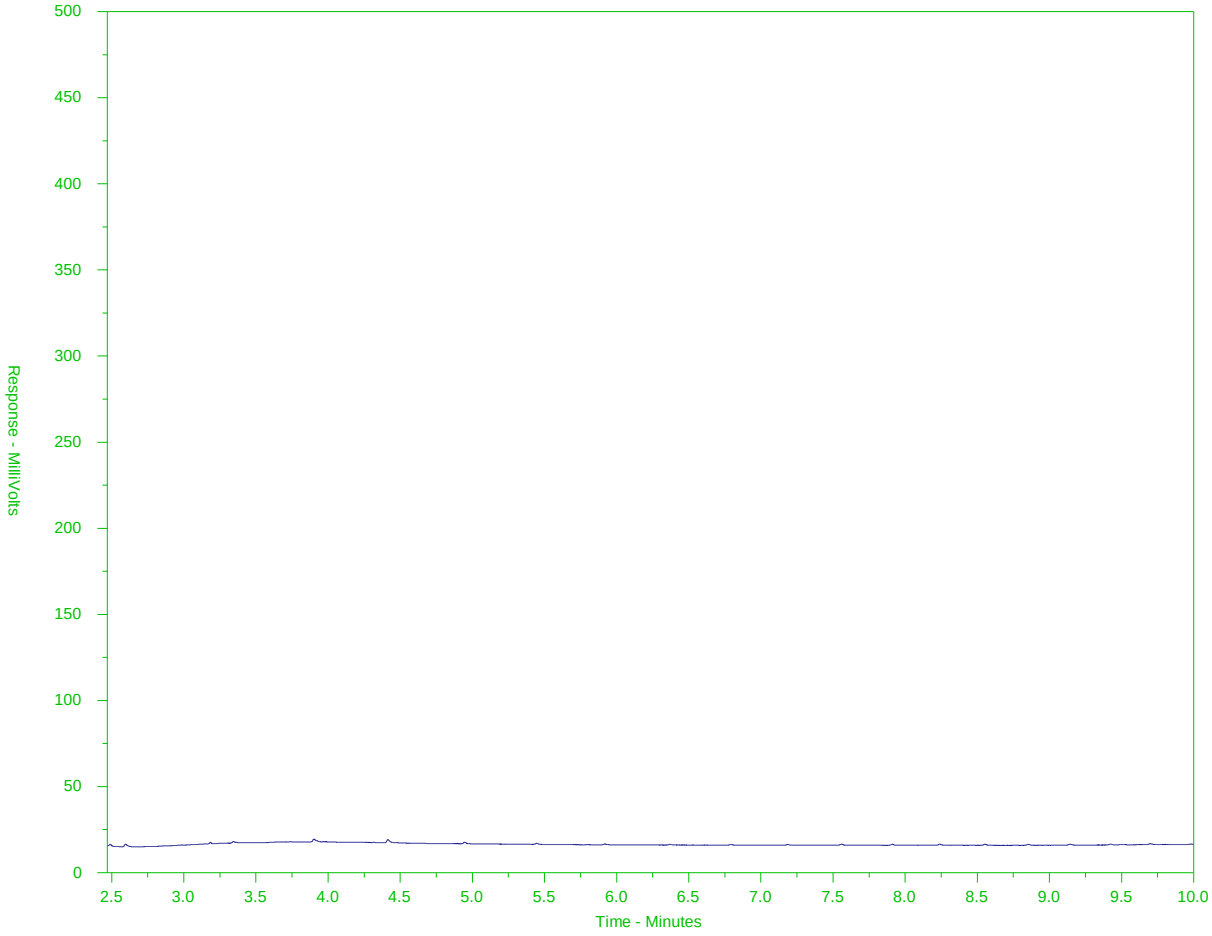
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-10
Client Sample ID: PW17-14_20190605|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

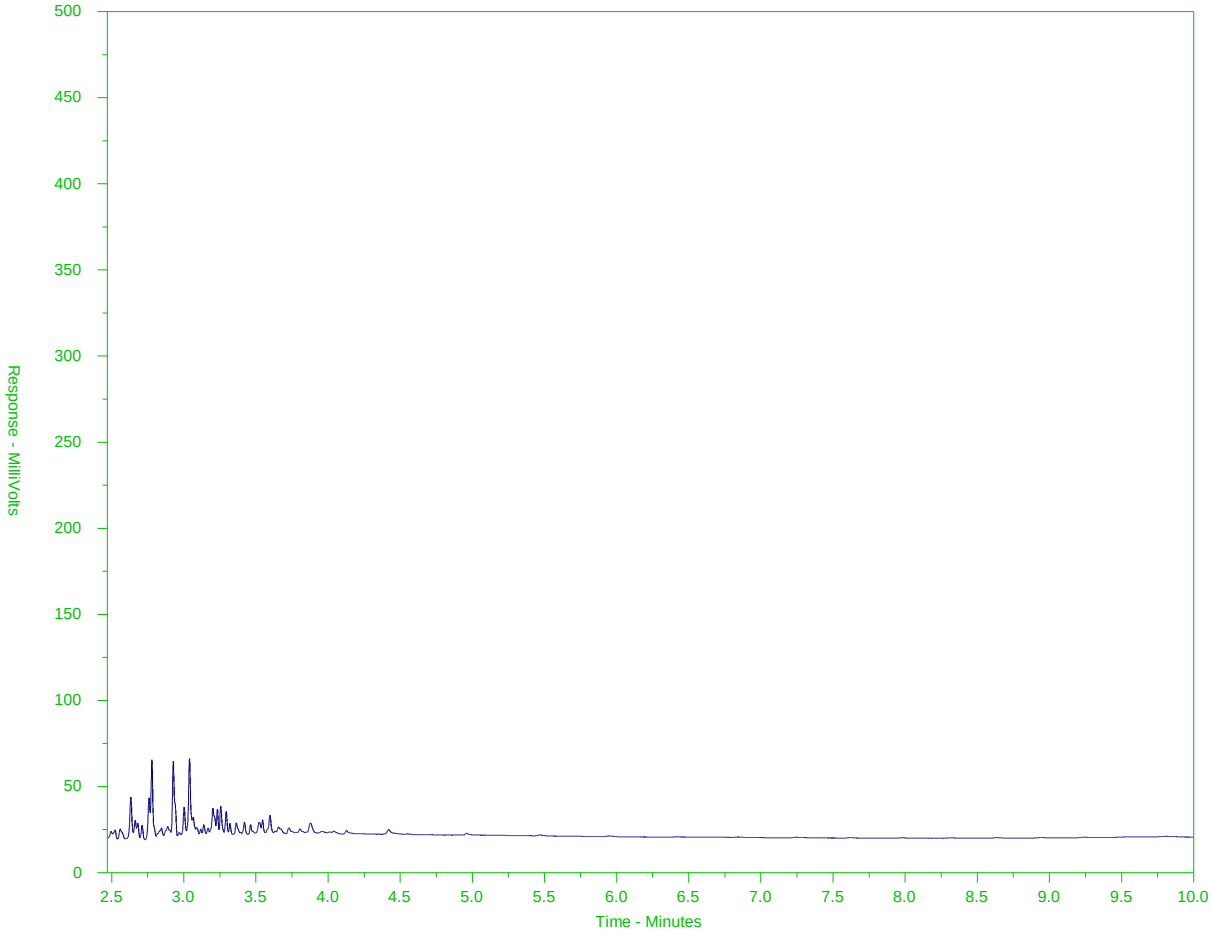
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-11
Client Sample ID: PW17-16_20190605|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

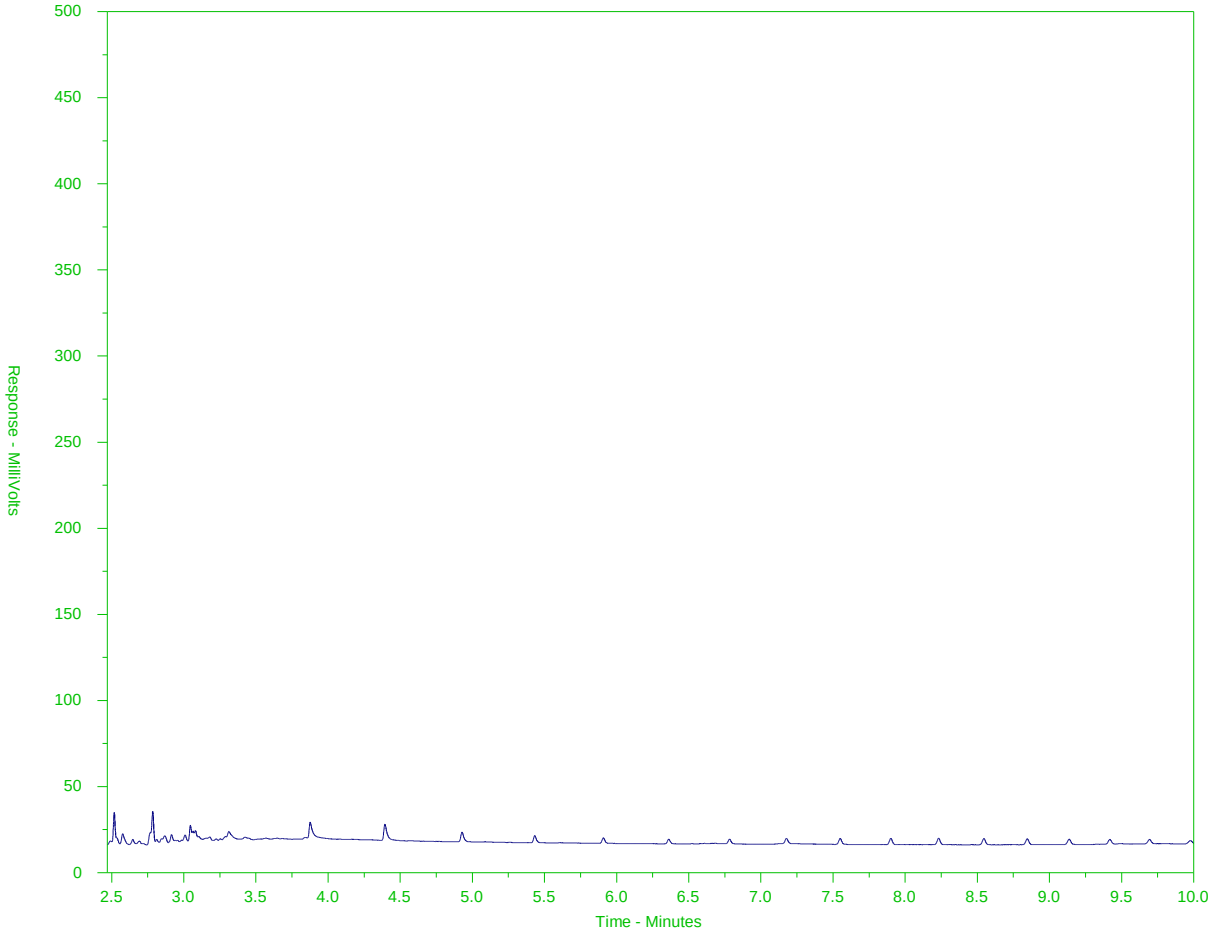
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-12
Client Sample ID: PW17-17_20190605|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

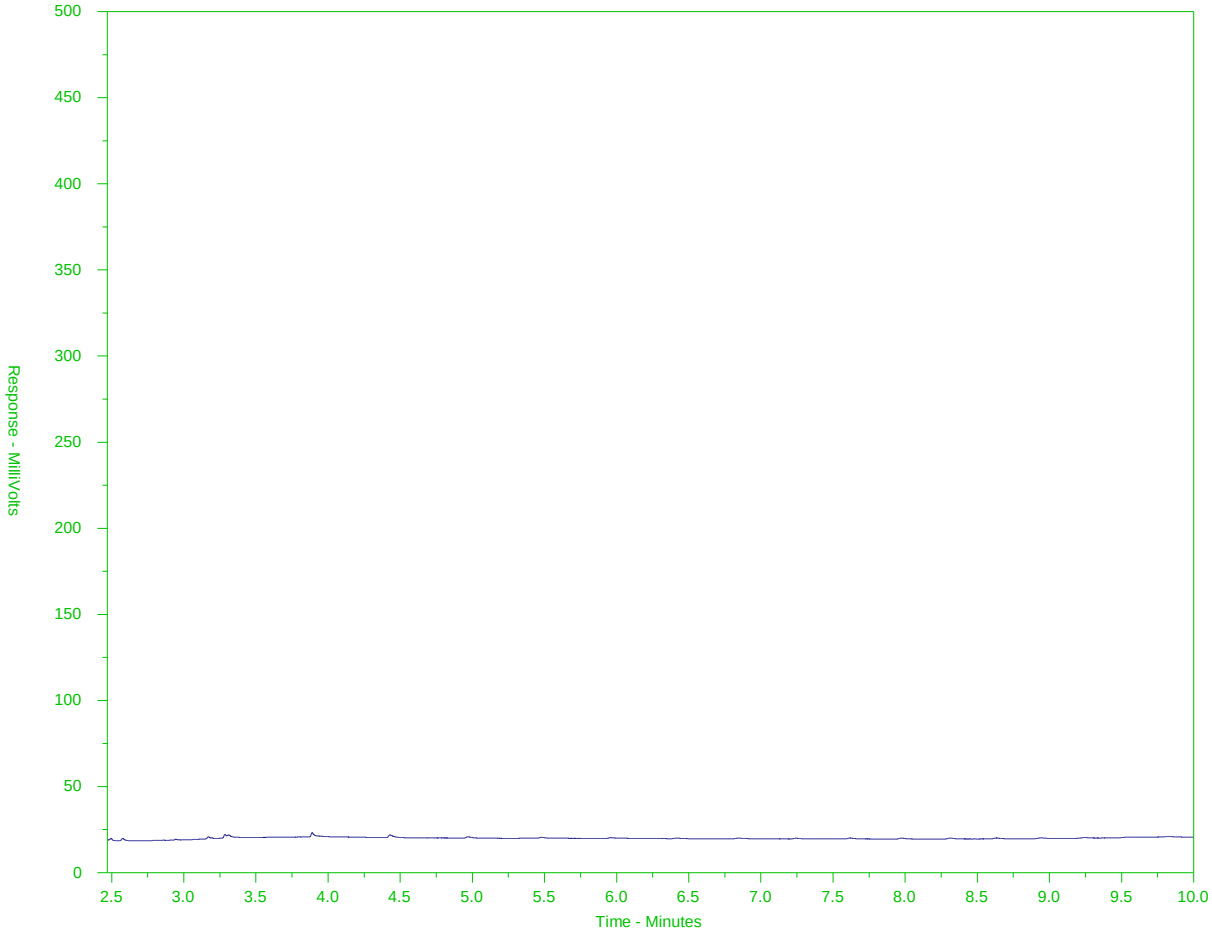
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-13
Client Sample ID: PW17-18_20190605|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

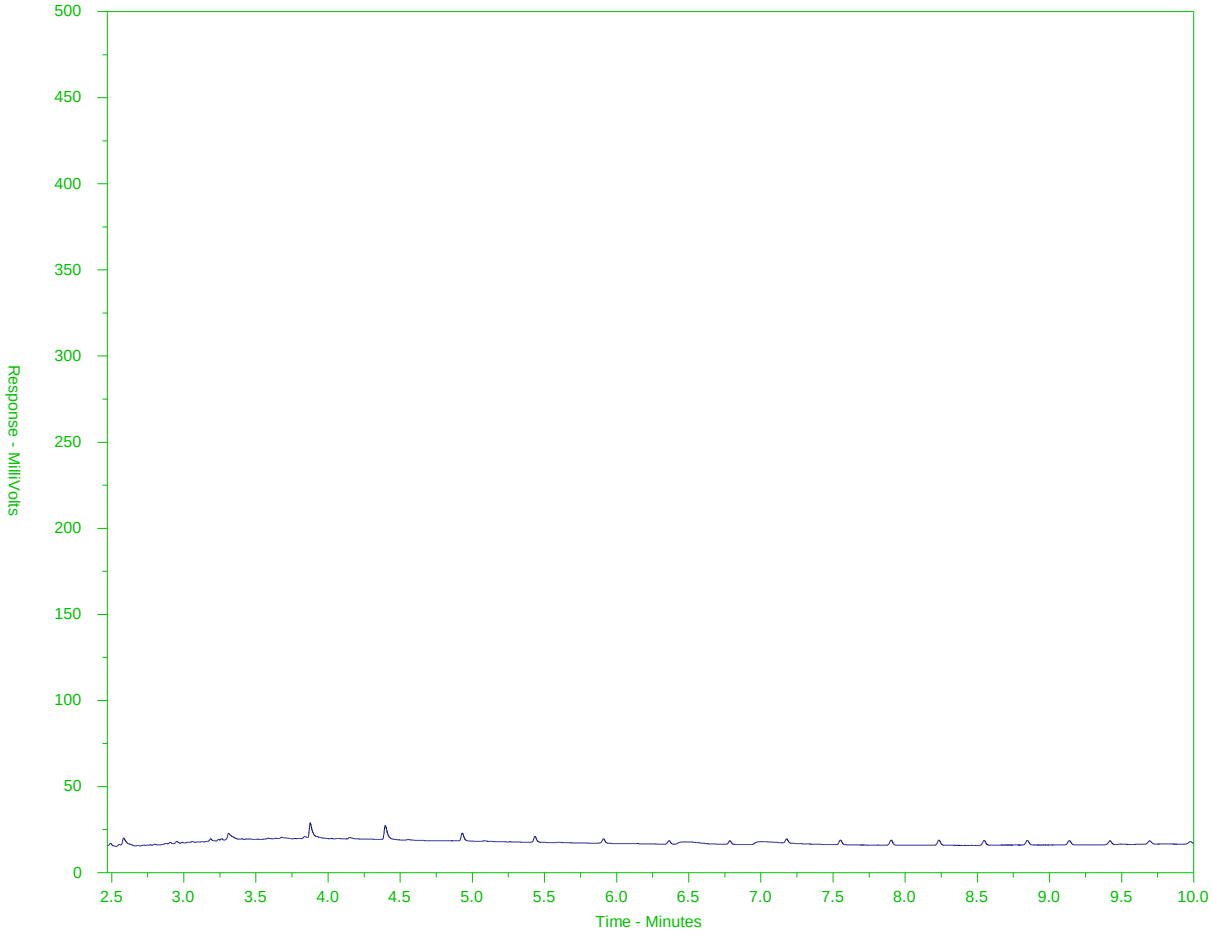
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-14
Client Sample ID: PW17-21_20190605|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

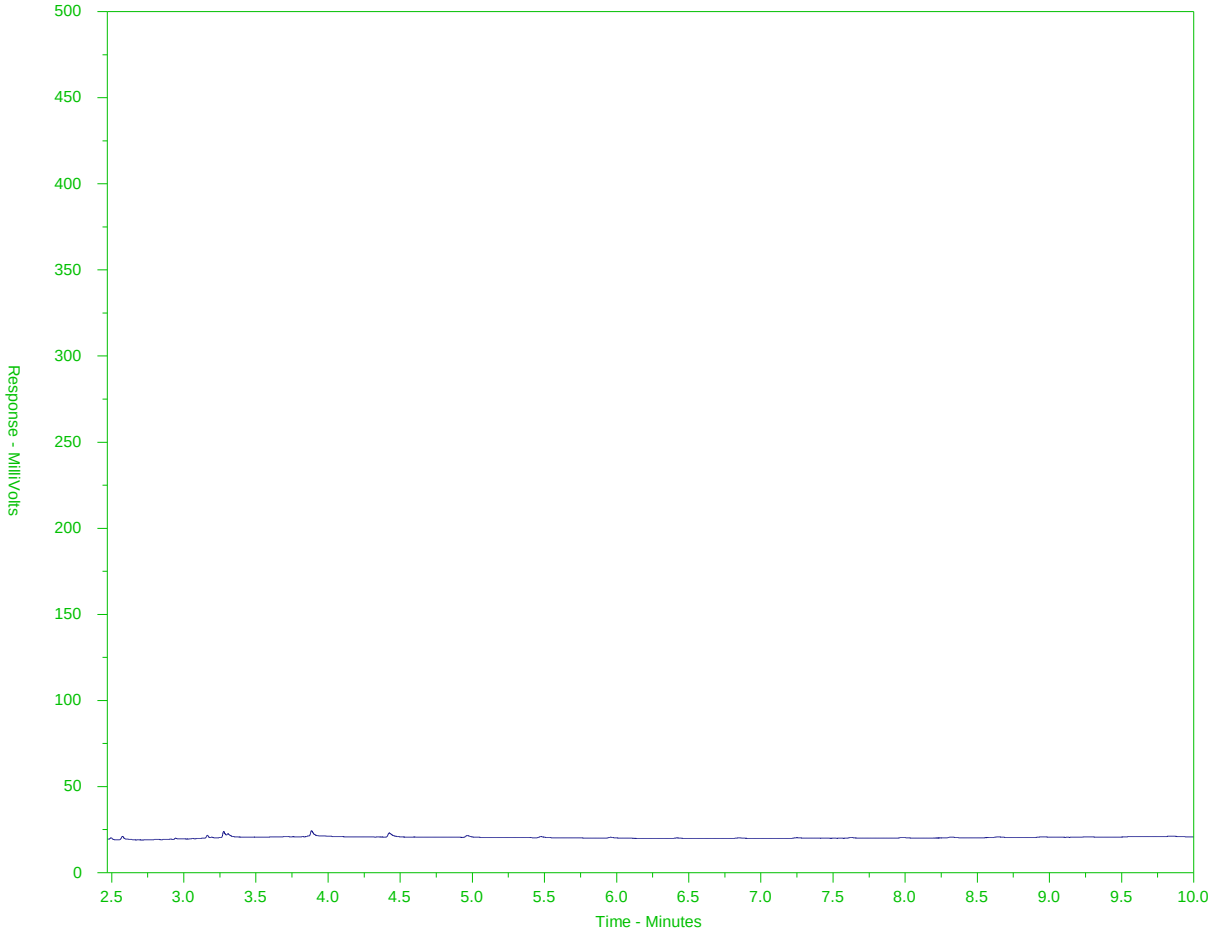
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-15
Client Sample ID: PW17-22_20190605|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

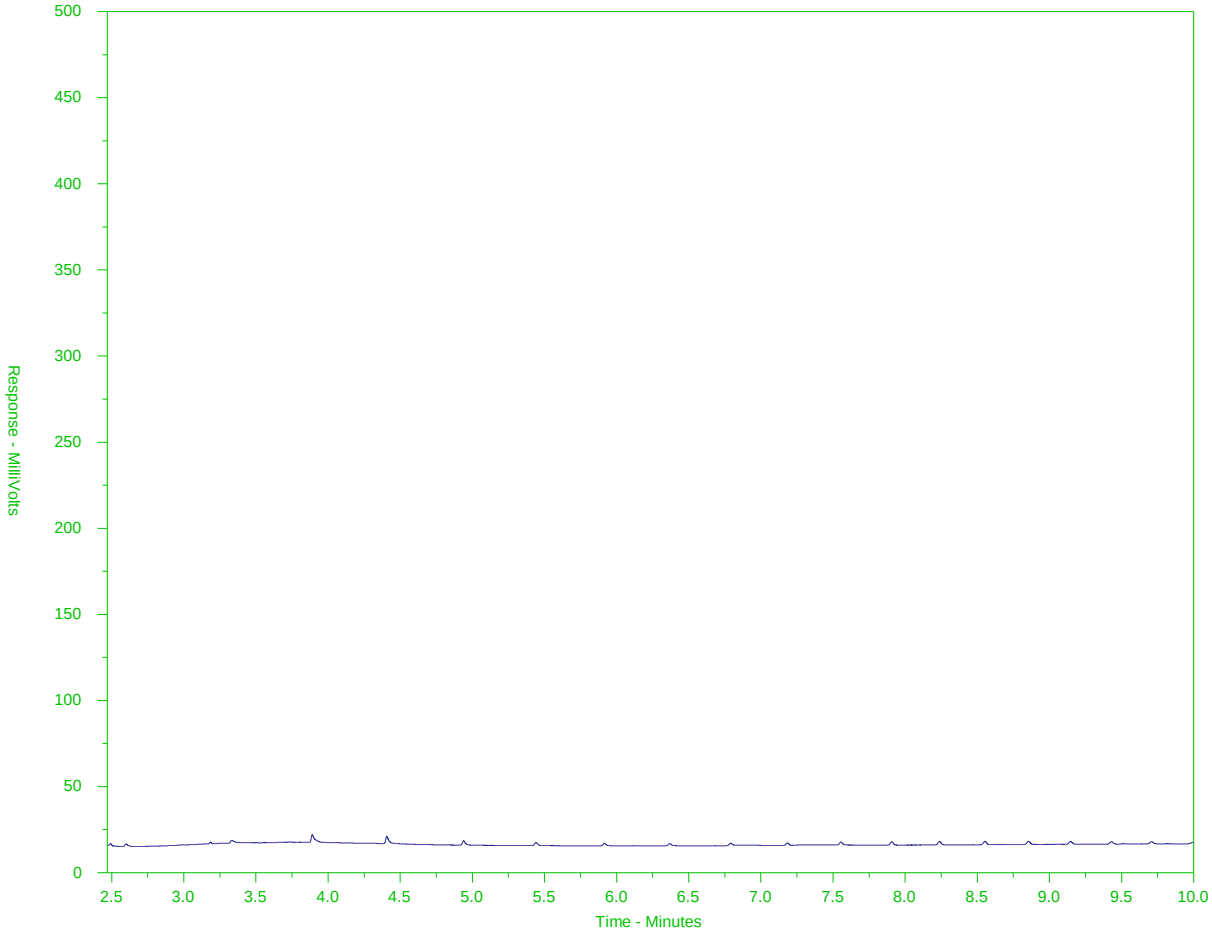
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-16
Client Sample ID: PW17-23_20190605|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

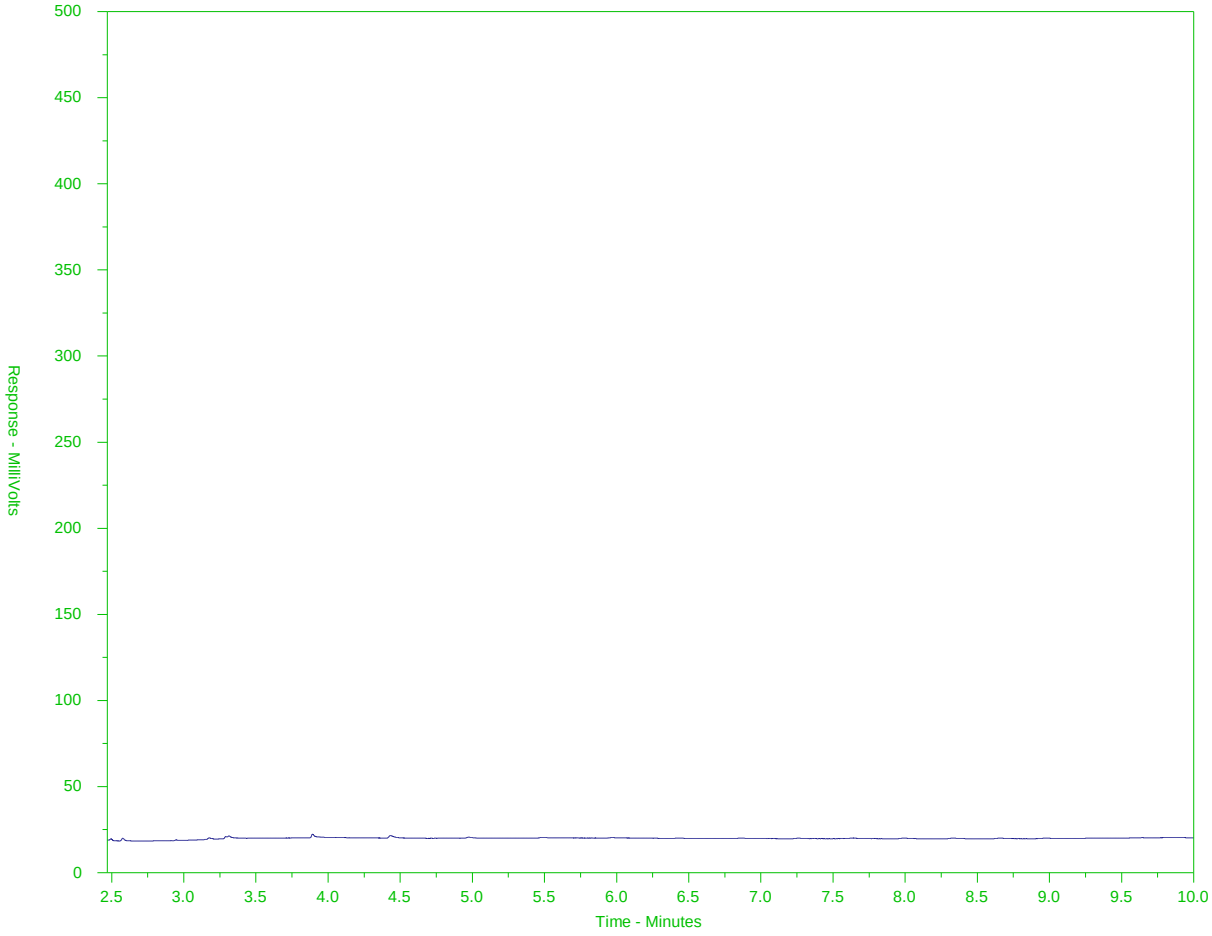
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-17
Client Sample ID: R-BLANK-2_20190605|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

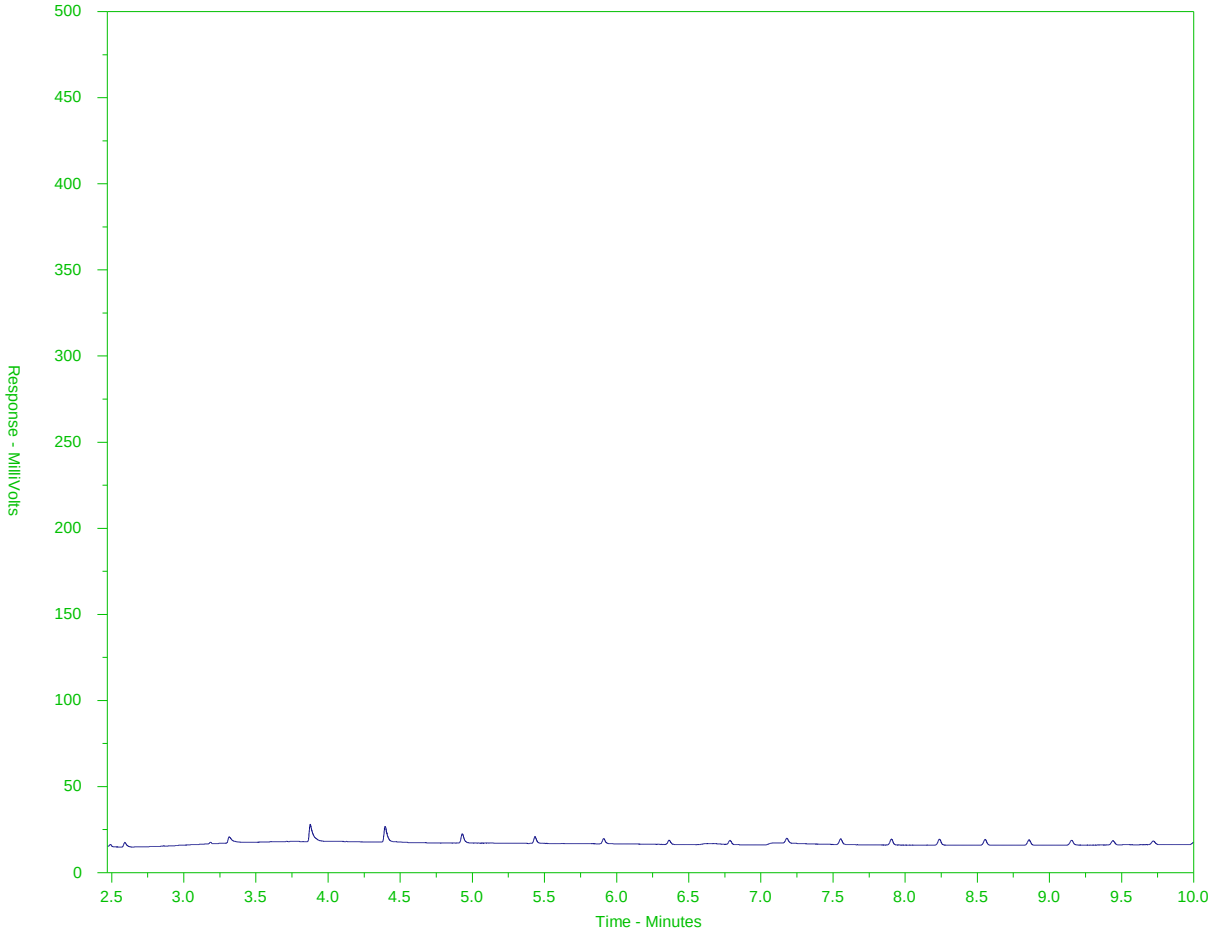
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-20
Client Sample ID: DUP-2_20190605|FD|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

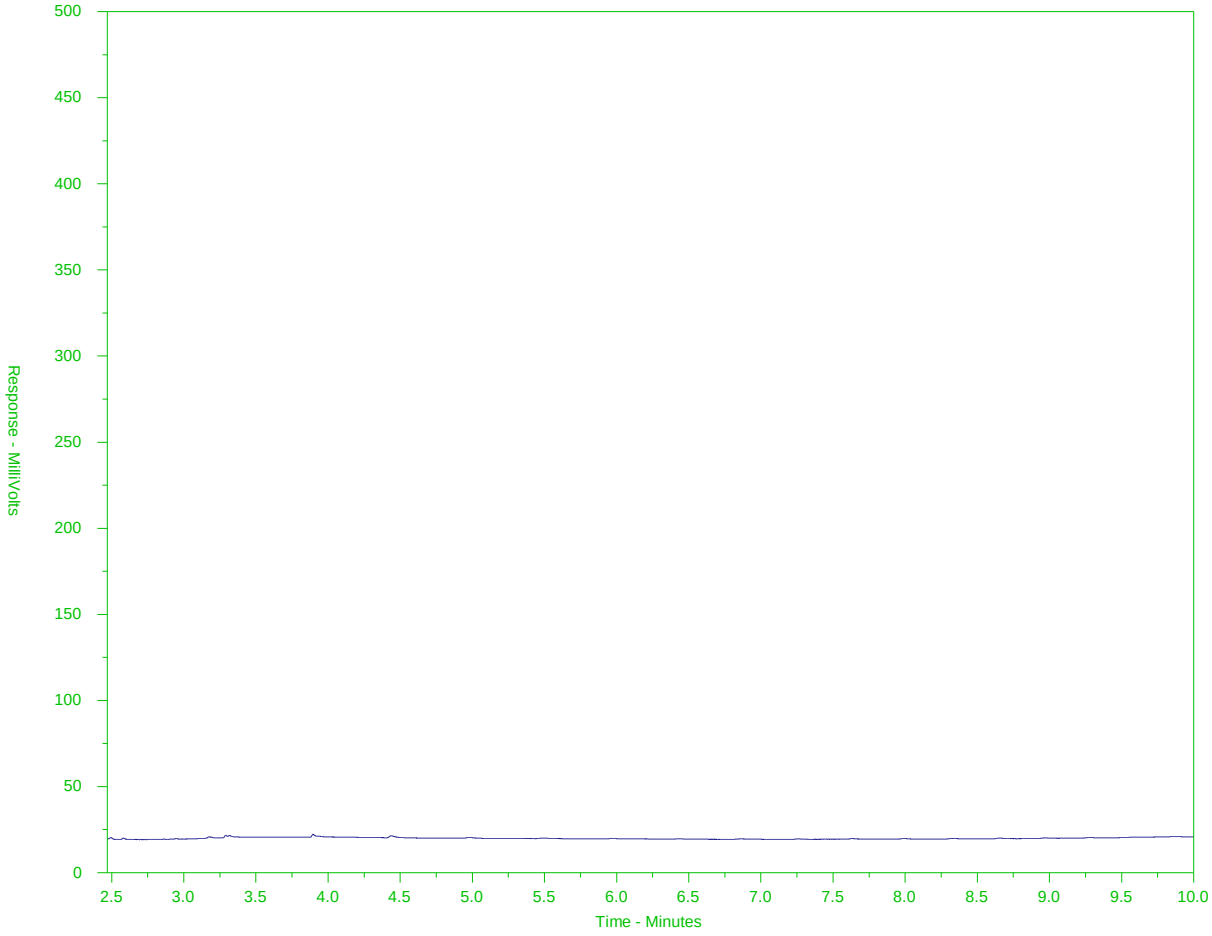
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2286145-21
Client Sample ID: DUP-3_20190605|FD|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2286145-COFC

COC Number: 17 - 827491

Page 1 of 2

Report To	Contact and company name below will appear on the final report
Company:	AECOM Canada Ltd.
Contact:	Leslie Southern
Phone:	604-444-6608
	Company address below will appear on the final report
Street:	3292 Production Way,
City/Province:	Burnaby, BC
Postal Code:	V5A 4R4
Invoice To	Same as Report To ☐ YES ☒ NO
	Copy of Invoice with Report ☐ YES ☒ NO
Company:	Parkland Refining (B.C.) Ltd.
Contact:	Christopher Boys

Report Format / Distribution	
Select Report Format:	☒ PDF ☒ EXCEL ☒ EDD (DIGITAL)
Quality Control (QC) Report with Report	☒ YES ☐ NO
☒ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☒ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	Leslie.Southern@AECOM.com
Email 2	justin.becker@aecom.com
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☒ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	leslie.southern@aecom.com
Email 2	

Project Information	
ALS Account # / Quote #:	
Job #:	60601814
PO / AFE:	
LSD:	Burnaby Refinery
ALS Lab Work Order # (lab use only):	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#:
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact: Dean Watt	Sampler:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): ☐ 4 day [P4-20%] ☐ 3 day [P3-25%] ☐ 2 day [P2-50%]

EMERGENCY: ☐ 1 Business day [E - 100%] ☐ Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	BTEX/VPH (P)	LEPH/HEPH (P)	Benzo(a)pyrene (P)	Naphthalene (P)	Dissolved Copper (F)	Dissolved Zinc (F)	Nitrates/Sulfates/Alkalinity	Methane	Silty Sample	Brackish Water	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	PW17-1_20190605	05-Jun-19	11:26	Porewater	5	X	X	X	X	X	X				X		
	PW17-2_20190605		11:39												X		
	PW17-4_20190605		12:01												X		
	PW17-5_20190605		12:30												X		
	PW17-6_20190605		12:48												X		
	PW17-7_20190605		11:24												X		
	PW17-9_20190605		11:05												X		
	PW17-10_20190605		11:07												X		
	PW17-13_20190605		10:44												X		
	PW17-14_20190605		10:50												X		
	PW17-16_20190605		13:07												X		
	PW17-17_20190605		13:10												X		

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☒ NO	BC CSR
Are samples for human consumption/ use? ☐ YES ☒ NO	Only ~~comp~~ analyze for copper and zinc for metals

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
					17	17	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Justin Becker	Date: June 5 2019	Time:	Received by:	Date:	Time:	Received by: JL	Date: JUN - 5 2019	Time: 4:30pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2016 FRONT

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

White Paper Co. 604 951-3900

4, 6, 16, 18

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2286145-COFC

C Number: 17 - 827491

Page 2 of 2

Report To	Contact and company name below will appear on the final report
Company:	AECOM Canada Ltd.
Contact:	Leslie Southern
Phone:	604-444-6608
	Company address below will appear on the final report
Street:	3292 Production Way,
City/Province:	Burnaby, BC
Postal Code:	V5A 4R4
Invoice To	Same as Report To ☐ YES ☒ NO
	Copy of Invoice with Report ☐ YES ☒ NO
Company:	Parkland Refining (B.C.) Ltd.
Contact:	Christopher Boys

Report Format / Distribution	
Select Report Format:	☒ PDF ☒ EXCEL ☒ EDD (DIGITAL)
Quality Control (QC) Report with Report	☒ YES ☐ NO
☒ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☒ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	Leslie.Southern@AECOM.com
Email 2	justin.becker@aecom.com
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☒ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	leslie.southern@aecom.com
Email 2	

Project Information	
ALS Account # / Quote #:	
Job #:	60601814
PO / AFE:	
LSD:	Burnaby Refinery
ALS Lab Work Order # (lab use only):	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#:
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact: Dean Watt	Sampler:

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)	EMERGENCY
☐ 4 day [P4-20%]	☐ 1 Business day [E - 100%]
☐ 3 day [P3-25%]	☐ Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]
☐ 2 day [P2-50%]	

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	BTEX/VPH (F/P)	LEPH/HEPH (F/P)	Benzo(a)Pyrene (F/P)	Naphthalene (F/P)	Dissolved Copper (F/P)	Dissolved Zinc (F/P)	Nitrates/Sulfates/Alkalinity (P)	Methane (P)	Silty Sample	Brackish Water	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	PW17-18_20190605	05-Jun-19	13:25	Porewater	5	X	X	X	X	X	X						
	PW17-21_20190605		13:28														
	PW17-22_20190605		13:47														
	PW17-23_20190605		13:44														
	R-Blank-2_20190605		15:00	Other		X	X			X	X						
	T-Blank-3		N/A	Other	1	X											
	T-Blank-4		N/A	Other	1	X											
	DUP-2_20190605	05-Jun-19	PM	Porewater	5	X	X	X	X	X	X						
	DUP-3_20190605		PM		5	X	X	X	X	X	X						

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☒ NO T4-16,17,23,18	BC CSR
Are samples for human consumption/ use? ☐ YES ☒ NO DUP-2; DUP3	Only analyze for copper and zinc for metals

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations ☐ Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact ☐ Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C		
				17	17	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Justin Becker	Date: 5 June 2019	Time:	Received by:	Date:	Time:	Received by: JC	Date: JUN - 5 2019	Time: 4:30PM

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2016 FRONT

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

White Paper Co. 604 951-3900

AECOM CANADA LTD.
ATTN: Leslie Southern
3292 Production Way
Suite 330
Burnaby BC V5A 4R4

Date Received: 06-JUN-19
Report Date: 17-JUN-19 17:56 (MT)
Version: FINAL

Client Phone: 604-444-6608

Certificate of Analysis

Lab Work Order #: L2287095

Project P.O. #: 0015243589
Job Reference: 60601814 WATER ANALYSIS
C of C Numbers: 17-827491
Legal Site Desc:

Dean Watt, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287095-2				
	Description	Porewater				
	Sampled Date	06-JUN-19				
	Sampled Time	11:50				
	Client ID	PW17-27_20190606|REG|GW				
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD				
	Copper (Cu)-Dissolved (ug/L)	0.40				
	Zinc (Zn)-Dissolved (ug/L)	1.9				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287095-1	L2287095-2	L2287095-3	L2287095-4	L2287095-5
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	06-JUN-19	06-JUN-19	06-JUN-19	06-JUN-19	06-JUN-19
	Sampled Time	11:21	11:50	12:18		12:00
	Client ID	PW17-26_20190606|REG|GW	PW17-27_20190606|REG|GW	PW17-28_20190606|REG|GW	DUP-1_20190606|FD|GW	TRAVEL BLANK-5
Grouping	**Analyte**					
WATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD		FIELD	FIELD	
	Copper (Cu)-Dissolved (ug/L)	0.41		<4.0 DLA	<0.40 DLA	
	Zinc (Zn)-Dissolved (ug/L)	3.4		<20 DLA	3.5	
Volatile Organic Compounds	Benzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Ethylbenzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Styrene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Toluene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	ortho-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	meta- & para-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Xylenes (ug/L)	<0.75	<0.75	<0.75	<0.75	<0.75
Hydrocarbons	EPH10-19 (ug/L)	<250	<250	<250	<250	
	EPH19-32 (ug/L)	<250	<250	<250	<250	
	LEPH (ug/L)	<250	<250	<250	<250	
	HEPH (ug/L)	<250	<250	<250	<250	
	Volatile Hydrocarbons (VH6-10) (ug/L)	<100	<100	<100	<100	<100
	VPH (C6-C10) (ug/L)	<100	<100	<100	<100	<100
	Surrogate: 2-Bromobenzotrifluoride (%)	102.4	97.4	94.2	99.2	
Polycyclic Aromatic Hydrocarbons	Acenaphthene (ug/L)	<0.010	<0.010	<0.010	<0.010	
	Acenaphthylene (ug/L)	<0.010	<0.010	<0.010	<0.010	
	Acridine (ug/L)	<0.020 DLCI	<0.010	<0.010	<0.010	
	Anthracene (ug/L)	<0.020 DLCI	<0.010	<0.010	<0.010	
	Benz(a)anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	
	Benzo(a)pyrene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	
	Benzo(b&j)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	
	Benzo(b+j+k)fluoranthene (ug/L)	<0.015	<0.015	<0.015	<0.015	
	Benzo(g,h,i)perylene (ug/L)	<0.010	<0.010	<0.010	<0.010	
	Benzo(k)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	
	Chrysene (ug/L)	<0.010	<0.010	<0.010	<0.010	
	Dibenz(a,h)anthracene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	
	Fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	
	Fluorene (ug/L)	<0.010	<0.010	<0.010	<0.010	
	Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	
	1-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	
	2-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	
	Naphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	
	Phenanthrene (ug/L)	<0.020	<0.020	<0.020	<0.020	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2287095-1	L2287095-2	L2287095-3	L2287095-4	L2287095-5
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	06-JUN-19	06-JUN-19	06-JUN-19	06-JUN-19	06-JUN-19
	Sampled Time	11:21	11:50	12:18		12:00
	Client ID	PW17-26_20190606|REG|GW	PW17-27_20190606|REG|GW	PW17-28_20190606|REG|GW	DUP-1_20190606|FD|GW	TRAVEL BLANK-5
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	
	Quinoline (ug/L)	<0.10 DLCI	<0.050	<0.050	<0.080 DLCI	
	Surrogate: Acridine d9 (%)	121.6	122.2	109.6	122.6	
	Surrogate: Chrysene d12 (%)	118.8	116.1	111.6	116.9	
	Surrogate: Naphthalene d8 (%)	88.5	88.4	83.3	89.1	
	Surrogate: Phenanthrene d10 (%)	116.2	112.5	106.9	108.1	
	Total PAHs (ug/L)	<0.14	<0.11	<0.11	<0.13	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLCI	Detection Limit Raised: Chromatographic Interference due to co-elution.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual

EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.

LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LEPH/HEPH

LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure.

LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene.

HEPHw = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.

MET-D-F-HMI-CCMS-VA	Seawater	Diss. Metals in Seawater by CRC ICPMS	APHA 3030B/EPA 6020B (mod)

Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS (HMI Mode).

MET-D-XXX-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020B (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)

PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.

PAH-SUM-CALC-VA	Water	TOTAL PAH's	CALCULATION

Total PAH represents the sum of all PAH analytes reported for a given sample. Note that regulatory agencies and criteria differ in their definitions of Total PAH in terms of the individual PAH analytes to be included.

VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE VPH

VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure.
VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene

XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

17-827491

Reference Information

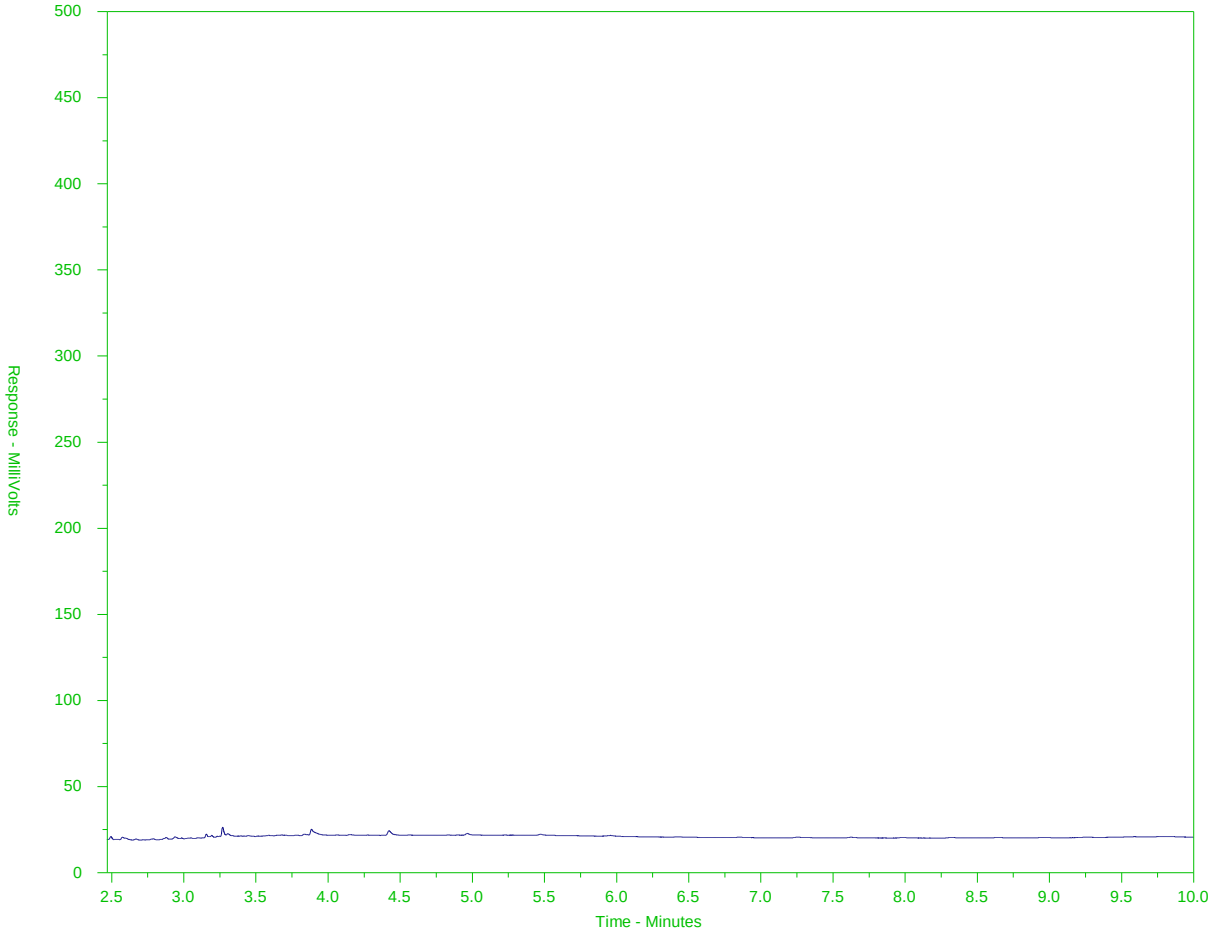
GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2287095-1
Client Sample ID: PW17-26_20190606|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

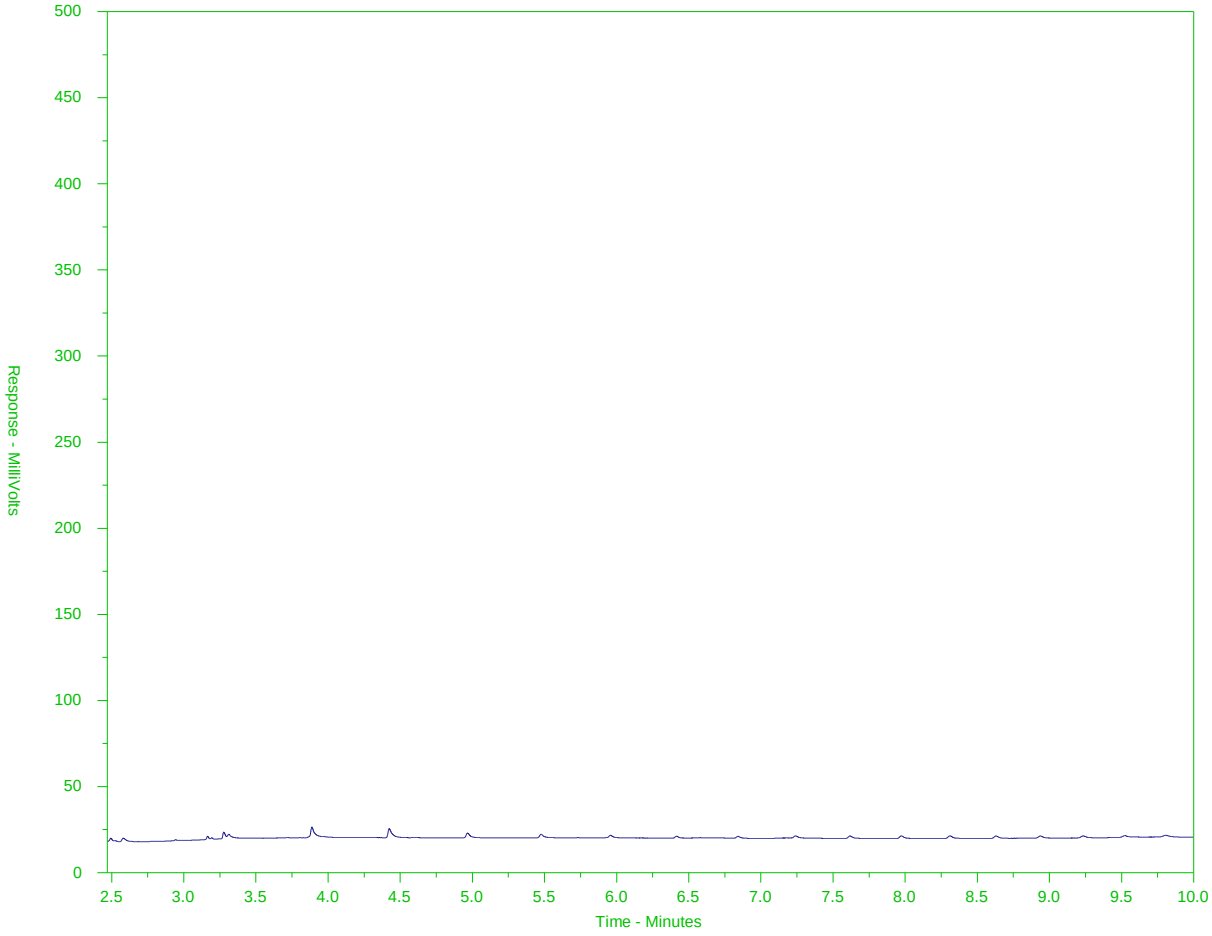
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2287095-2
Client Sample ID: PW17-27_20190606|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

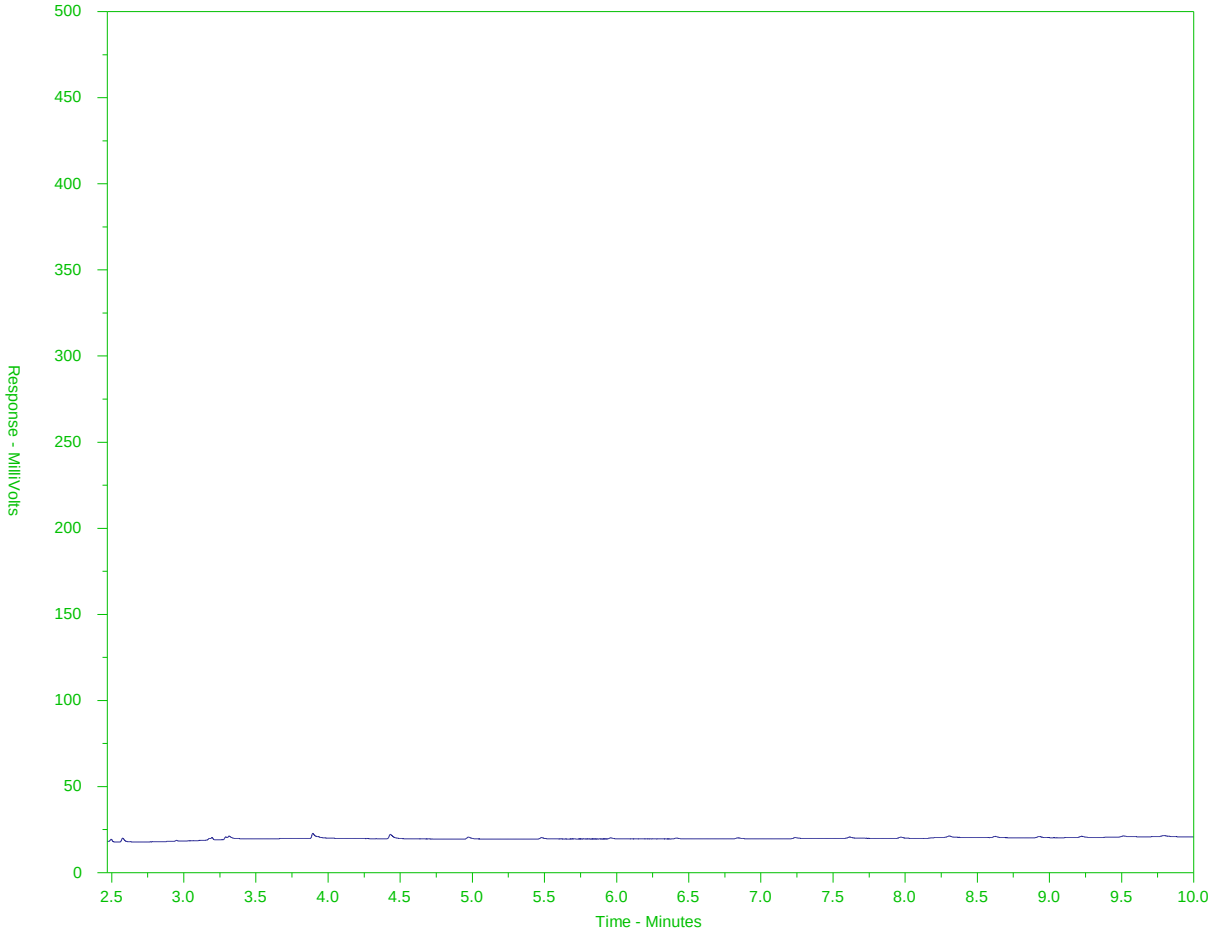
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2287095-3
Client Sample ID: PW17-28_20190606|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

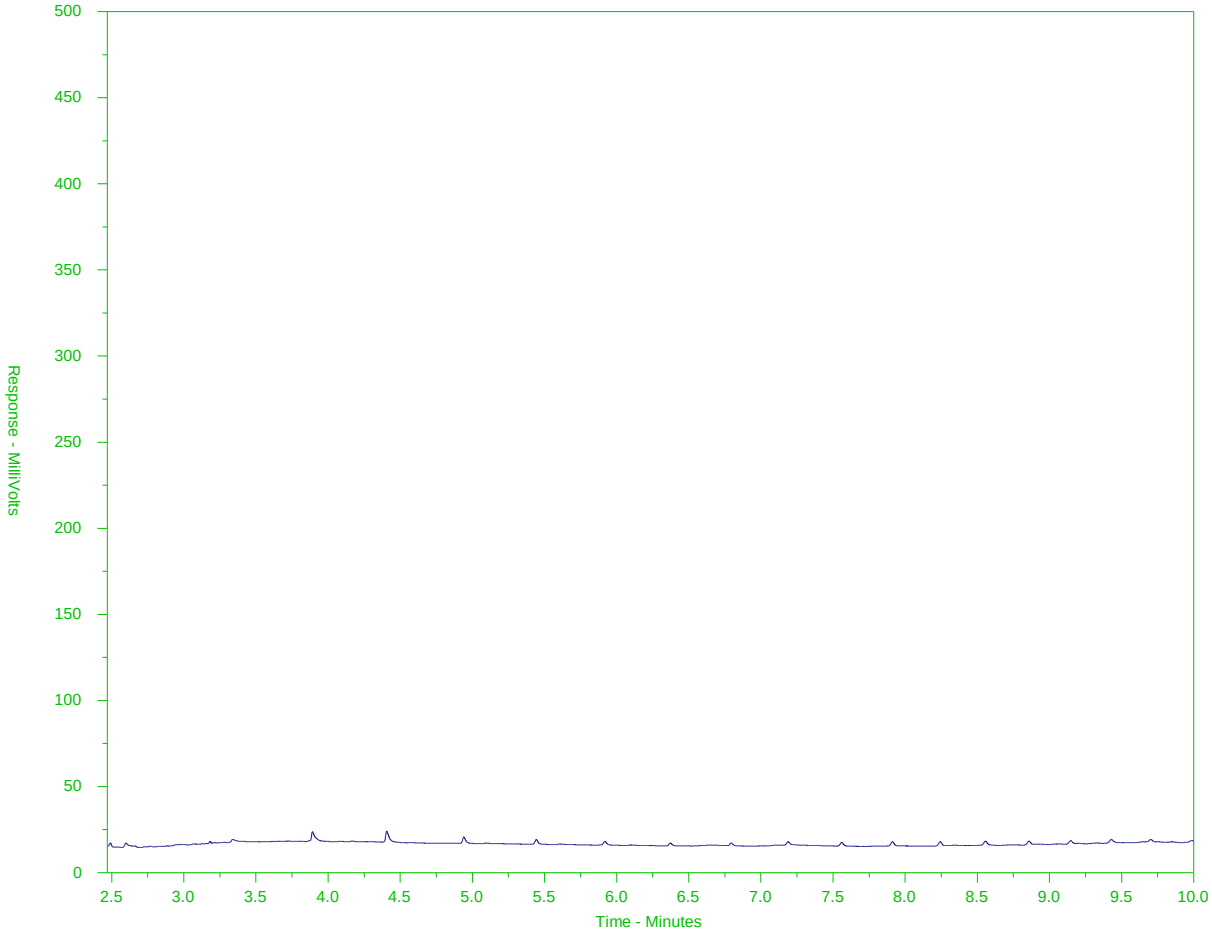
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2287095-4
Client Sample ID: DUP-1_20190606|FD|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2287095-COFC

COC Number: 17 - 827491

Page 1 of 1

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	AECOM Canada Ltd.	Select Report Format: ☒ PDF ☒ EXCEL ☒ EDD (DIGITAL)	Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Leslie Southern	Quality Control (QC) Report with Report ☒ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐
Phone:	604-444-6608	☒ Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E - 100%] ☐ / Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐
	Company address below will appear on the final report	Select Distribution: ☒ EMAIL ☐ MAIL ☐ FAX	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
Street:	3292 Production Way,	Email 1 or Fax: Leslie.Southern@AECOM.com	For tests that can not be performed according to the service level selected, you will be contacted.
City/Province:	Burnaby, BC	Email 2: justin.becker@aecom.com	
Postal Code:	V5A 4R4	Email 3:	

Invoice To		Invoice Distribution	
	Same as Report To ☐ YES ☒ NO	Select Invoice Distribution: ☒ EMAIL ☐ MAIL ☐ FAX	
	Copy of Invoice with Report ☐ YES ☒ NO	Email 1 or Fax: leslie.southern@aecom.com	
Company:	Parkland Refining (B.C.) Ltd.	Email 2:	
Contact:	Christopher Boys		

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#:
Job #:	60601814	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:	Burnaby Refinery	Location:	
ALS Lab Work Order # (lab use only):		ALS Contact: Dean Watt	Sampler: AR

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	BTEX/VPH (P)	LEPH/HEPH (P)	Benzo(a)pyrene (P)	Naphthalene (F/P)	Dissolved Copper (F/P)	Dissolved Zinc (F/P)	Nitrates/Sulfates/Alkalinity	Methane	Silty Sample	Brackish Water	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	PW17-26_20190606	06-Jun-19	11:21	Porewater	5	X	X	X	X	X	X						
	PW17-27_20190606	↓	11:50	↓	↓	↓	↓	↓	↓	↓	↓				X		
	PW17-28_20190606	↓	12:18	↓	↓	↓	↓	↓	↓	↓	↓						
	DUP-1_20190606	06-Jun-19	AM	↓	↓	↓	↓	↓	↓	↓	↓						
	T-Blank-5	06-June-19	N/A	Other	1	X											

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☒ NO	BC CSR
Are samples for human consumption/ use? ☐ YES ☒ NO	Only ~~any~~ analyze for copper and zinc for metals

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No ☐
Ice Packs	☐	Ice Cubes ☐	Custody seal intact	Yes ☐ No ☐
Cooling Initiated	☐			

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C			
						7.2

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Justin Becker	Date: June 6th, 2019	Time: 16:00	Received by:	Date:	Time:	Received by: LIA	Date: 6/6	Time: 3758

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2018 FRONT

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

White Paper Co. 604-951-3900

AECOM CANADA LTD.
ATTN: Leslie Southern
3292 Production Way
Suite 330
Burnaby BC V5A 4R4

Date Received: 11-DEC-19
Report Date: 19-DEC-19 18:15 (MT)
Version: FINAL

Client Phone: 604-444-6608

Certificate of Analysis

Lab Work Order #: L2395326

Project P.O. #: 0015243589
Job Reference: 60601814/ARO-0005
C of C Numbers:
Legal Site Desc: Burnaby Refinery

Dean Watt, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2395326-1	L2395326-2	L2395326-3	L2395326-4	L2395326-5
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	10-DEC-19	10-DEC-19	10-DEC-19	10-DEC-19	10-DEC-19
	Sampled Time	22:15	22:04	22:45	22:30	21:48
	Client ID	PW17-11_20191210|REG|GW	PW17-12_20191210|REG|GW	PW17-13_20191210|REG|GW	PW17-14_20191210|REG|GW	PW17-15_20191210|REG|GW
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Copper (Cu)-Dissolved (ug/L)	<0.20	0.32	1.20	0.83	0.21
	Zinc (Zn)-Dissolved (ug/L)	<1.0	<1.0	1.6	3.5	1.2

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2395326-6 Porewater 10-DEC-19 21:15 PW17-19_20191210|REG|GW	L2395326-7 Porewater 10-DEC-19 21:29 PW17-20_20191210|REG|GW	L2395326-8 Porewater 10-DEC-19 20:01 PW17-29_20191210|REG|GW	L2395326-9 Porewater 10-DEC-19 20:58 PW17-25_20191210|REG|GW	L2395326-10 Porewater 10-DEC-19 20:30 PW17-24_20191210|REG|GW
SEAWATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Copper (Cu)-Dissolved (ug/L)	1.02	0.76	<0.20	0.68	<0.20
	Zinc (Zn)-Dissolved (ug/L)	2.6	2.5	2.0	<1.0	<1.0

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2395326-11	L2395326-12	L2395326-13	L2395326-14	L2395326-15
Description	Porewater	Porewater	Porewater	Porewater	Other
Sampled Date	10-DEC-19	10-DEC-19	10-DEC-19	10-DEC-19	10-DEC-19
Sampled Time	20:52	19:36	19:51	20:32	
Client ID	PW17-30_20191210|REG|GW	PW17-31_20191210|REG|GW	PW17-32_20191210|REG|GW	PW17-33_20191210|REG|GW	R-BLANK-1_20191210|REG|GW
Grouping **Analyte**					
SEAWATER					
Dissolved Metals Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
Copper (Cu)-Dissolved (ug/L)	0.63	0.75	2.22	<0.20	<0.20
Zinc (Zn)-Dissolved (ug/L)	<1.0	2.6	6.8	1.7	<1.0

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2395326-1 Porewater 10-DEC-19 22:15 PW17-11_20191210|REG|GW	L2395326-2 Porewater 10-DEC-19 22:04 PW17-12_20191210|REG|GW	L2395326-3 Porewater 10-DEC-19 22:45 PW17-13_20191210|REG|GW	L2395326-4 Porewater 10-DEC-19 22:30 PW17-14_20191210|REG|GW	L2395326-5 Porewater 10-DEC-19 21:48 PW17-15_20191210|REG|GW
WATER						
Volatile Organic Compounds	Benzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Ethylbenzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Styrene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Toluene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	ortho-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	meta- & para-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Xylenes (ug/L)	<0.75	<0.75	<0.75	<0.75	<0.75
Hydrocarbons	EPH10-19 (ug/L)	<250	<250	<250	<250	<250
	EPH19-32 (ug/L)	<250	<250	<250	<250	<250
	LEPH (ug/L)	<250	<250	<250	<250	<250
	HEPH (ug/L)	<250	<250	<250	<250	<250
	Volatile Hydrocarbons (VH6-10) (ug/L)	<100	<100	<100	<100	<100
	VPH (C6-C10) (ug/L)	<100	<100	<100	<100	<100
	Surrogate: 2-Bromobenzotrifluoride (%)	97.3	92.9	94.0	98.0	97.9
Polycyclic Aromatic Hydrocarbons	Acenaphthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acenaphthylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acridine (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benz(a)anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(a)pyrene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Benzo(b&j)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(b+j+k)fluoranthene (ug/L)	<0.015	<0.015	<0.015	<0.015	<0.015
	Benzo(g,h,i)perylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(k)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Chrysene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Dibenz(a,h)anthracene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Fluorene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	1-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	2-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Naphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Phenanthrene (ug/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Quinoline (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Surrogate: Acridine d9 (%)	86.4	71.6	81.1	81.3	94.7

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2395326-6 Porewater 10-DEC-19 21:15 PW17-19_20191210|REG|GW	L2395326-7 Porewater 10-DEC-19 21:29 PW17-20_20191210|REG|GW	L2395326-8 Porewater 10-DEC-19 20:01 PW17-29_20191210|REG|GW	L2395326-9 Porewater 10-DEC-19 20:58 PW17-25_20191210|REG|GW	L2395326-10 Porewater 10-DEC-19 20:30 PW17-24_20191210|REG|GW
WATER						
Volatile Organic Compounds	Benzene (ug/L)	7.23	<0.50	27.4	<0.50	<0.50
	Ethylbenzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Styrene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Toluene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	ortho-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	meta- & para-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Xylenes (ug/L)	<0.75	<0.75	<0.75	<0.75	<0.75
Hydrocarbons	EPH10-19 (ug/L)	<250	<250	<250	<250	<250
	EPH19-32 (ug/L)	<250	<250	<250	<250	<250
	LEPH (ug/L)	<250	<250	<250	<250	<250
	HEPH (ug/L)	<250	<250	<250	<250	<250
	Volatile Hydrocarbons (VH6-10) (ug/L)	<100	<100	<100	<100	<100
	VPH (C6-C10) (ug/L)	<100	<100	<100	<100	<100
	Surrogate: 2-Bromobenzotrifluoride (%)	94.9	91.6	91.6	95.1	91.9
Polycyclic Aromatic Hydrocarbons	Acenaphthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acenaphthylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acridine (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benz(a)anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(a)pyrene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Benzo(b&j)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(b+j+k)fluoranthene (ug/L)	<0.015	<0.015	<0.015	<0.015	<0.015
	Benzo(g,h,i)perylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(k)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Chrysene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Dibenz(a,h)anthracene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Fluorene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	1-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	2-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Naphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Phenanthrene (ug/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Quinoline (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Surrogate: Acridine d9 (%)	86.7	86.1	80.6	83.3	85.7

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2395326-11	L2395326-12	L2395326-13	L2395326-14	L2395326-15
Description	Porewater	Porewater	Porewater	Porewater	Other
Sampled Date	10-DEC-19	10-DEC-19	10-DEC-19	10-DEC-19	10-DEC-19
Sampled Time	20:52	19:36	19:51	20:32	
Client ID	PW17-30_20191210|REG|GW	PW17-31_20191210|REG|GW	PW17-32_20191210|REG|GW	PW17-33_20191210|REG|GW	R-BLANK-1_20191210|REG|GW
Grouping / **Analyte**					
WATER					
Volatile Organic Compounds					
Benzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Ethylbenzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Styrene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Toluene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
ortho-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
meta- & para-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
Xylenes (ug/L)	<0.75	<0.75	<0.75	<0.75	<0.75
Hydrocarbons					
EPH10-19 (ug/L)	<250	<250	<250	<250	<250
EPH19-32 (ug/L)	<250	<250	<250	<250	<250
LEPH (ug/L)	<250	<250	<250	<250	<250
HEPH (ug/L)	<250	<250	<250	<250	<250
Volatile Hydrocarbons (VH6-10) (ug/L)	<100	<100	<100	<100	<100
VPH (C6-C10) (ug/L)	<100	<100	<100	<100	<100
Surrogate: 2-Bromobenzotrifluoride (%)	99.5	90.6	93.5	93.6	87.6
Polycyclic Aromatic Hydrocarbons					
Acenaphthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Acenaphthylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Acridine (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Anthracene (ug/L)	<0.010	0.018	0.012	<0.010	<0.010
Benz(a)anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(a)pyrene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Benzo(b&j)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(b+j+k)fluoranthene (ug/L)	<0.015	<0.015	<0.015	<0.015	<0.015
Benzo(g,h,i)perylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Benzo(k)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Chrysene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Dibenz(a,h)anthracene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Fluorene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
1-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
2-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Naphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Phenanthrene (ug/L)	<0.020	<0.020	<0.020	<0.020	<0.020
Pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
Quinoline (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Surrogate: Acridine d9 (%)	91.0	77.0	79.6	84.6	82.9

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2395326-16	L2395326-17			
	Description	Other	Other			
	Sampled Date	10-DEC-19	10-DEC-19			
	Sampled Time					
	Client ID	TRAVEL BLANK-1	TRAVEL BLANK-2			
Grouping	**Analyte**					
WATER						
Volatile Organic Compounds	Benzene (ug/L)	<0.50	<0.50			
	Ethylbenzene (ug/L)	<0.50	<0.50			
	Styrene (ug/L)	<0.50	<0.50			
	Toluene (ug/L)	<0.50	<0.50			
	ortho-Xylene (ug/L)	<0.50	<0.50			
	meta- & para-Xylene (ug/L)	<0.50	<0.50			
	Xylenes (ug/L)	<0.75	<0.75			
Hydrocarbons	EPH10-19 (ug/L)					
	EPH19-32 (ug/L)					
	LEPH (ug/L)					
	HEPH (ug/L)					
	Volatile Hydrocarbons (VH6-10) (ug/L)	<100	<100			
	VPH (C6-C10) (ug/L)	<100	<100			
	Surrogate: 2-Bromobenzotrifluoride (%)					
Polycyclic Aromatic Hydrocarbons	Acenaphthene (ug/L)					
	Acenaphthylene (ug/L)					
	Acridine (ug/L)					
	Anthracene (ug/L)					
	Benz(a)anthracene (ug/L)					
	Benzo(a)pyrene (ug/L)					
	Benzo(b&j)fluoranthene (ug/L)					
	Benzo(b+j+k)fluoranthene (ug/L)					
	Benzo(g,h,i)perylene (ug/L)					
	Benzo(k)fluoranthene (ug/L)					
	Chrysene (ug/L)					
	Dibenz(a,h)anthracene (ug/L)					
	Fluoranthene (ug/L)					
	Fluorene (ug/L)					
	Indeno(1,2,3-c,d)pyrene (ug/L)					
	1-Methylnaphthalene (ug/L)					
	2-Methylnaphthalene (ug/L)					
	Naphthalene (ug/L)					
	Phenanthrene (ug/L)					
	Pyrene (ug/L)					
	Quinoline (ug/L)					
	Surrogate: Acridine d9 (%)					

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2395326-1	L2395326-2	L2395326-3	L2395326-4	L2395326-5
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	10-DEC-19	10-DEC-19	10-DEC-19	10-DEC-19	10-DEC-19
	Sampled Time	22:15	22:04	22:45	22:30	21:48
	Client ID	PW17-11_20191210|REG|GW	PW17-12_20191210|REG|GW	PW17-13_20191210|REG|GW	PW17-14_20191210|REG|GW	PW17-15_20191210|REG|GW
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Surrogate: Chrysene d12 (%)	92.4	90.9	89.0	85.9	93.7
	Surrogate: Naphthalene d8 (%)	100.8	101.0	95.8	96.6	102.3
	Surrogate: Phenanthrene d10 (%)	103.9	108.7	101.3	102.6	110.1
	Total PAHs (ug/L)	<0.11	<0.11	<0.11	<0.11	<0.11

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2395326-6	L2395326-7	L2395326-8	L2395326-9	L2395326-10
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	10-DEC-19	10-DEC-19	10-DEC-19	10-DEC-19	10-DEC-19
	Sampled Time	21:15	21:29	20:01	20:58	20:30
	Client ID	PW17-19_20191210|REG|GW	PW17-20_20191210|REG|GW	PW17-29_20191210|REG|GW	PW17-25_20191210|REG|GW	PW17-24_20191210|REG|GW
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Surrogate: Chrysene d12 (%)	87.5	83.1	84.0	84.2	87.3
	Surrogate: Naphthalene d8 (%)	95.7	106.7	104.8	102.5	108.1
	Surrogate: Phenanthrene d10 (%)	107.1	103.2	102.6	102.9	105.1
	Total PAHs (ug/L)	<0.11	<0.11	<0.11	<0.11	<0.11

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2395326-11	L2395326-12	L2395326-13	L2395326-14	L2395326-15
	Description	Porewater	Porewater	Porewater	Porewater	Other
	Sampled Date	10-DEC-19	10-DEC-19	10-DEC-19	10-DEC-19	10-DEC-19
	Sampled Time	20:52	19:36	19:51	20:32	
	Client ID	PW17-30_20191210|REG|GW	PW17-31_20191210|REG|GW	PW17-32_20191210|REG|GW	PW17-33_20191210|REG|GW	R-BLANK-1_20191210|REG|GW
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Surrogate: Chrysene d12 (%)	90.9	87.8	88.0	87.3	84.4
	Surrogate: Naphthalene d8 (%)	110.8	97.0	96.9	106.7	104.8
	Surrogate: Phenanthrene d10 (%)	110.5	102.6	103.9	100.4	100.5
	Total PAHs (ug/L)	<0.11	<0.11	<0.11	<0.11	<0.11

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2395326-16	L2395326-17			
	Description	Other	Other			
	Sampled Date	10-DEC-19	10-DEC-19			
	Sampled Time					
	Client ID	TRAVEL BLANK-1	TRAVEL BLANK-2			
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Surrogate: Chrysene d12 (%)					
	Surrogate: Naphthalene d8 (%)					
	Surrogate: Phenanthrene d10 (%)					
	Total PAHs (ug/L)					

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual
EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.			
LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LEPH/HEPH
LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure. LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene. HEPHw = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.			
MET-D-F-HMI-CCMS-VA	Seawater	Diss. Metals in Seawater by CRC ICPMS	APHA 3030B/EPA 6020B (mod)
Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS (HMI Mode).			
PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)
PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.			
PAH-SUM-CALC-VA	Water	TOTAL PAH's	CALCULATION
Total PAH represents the sum of all PAH analytes reported for a given sample. Note that regulatory agencies and criteria differ in their definitions of Total PAH in terms of the individual PAH analytes to be included.			
VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.			
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.			
VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE VPH
VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure. VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene			
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION
Calculation of Total Xylenes Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

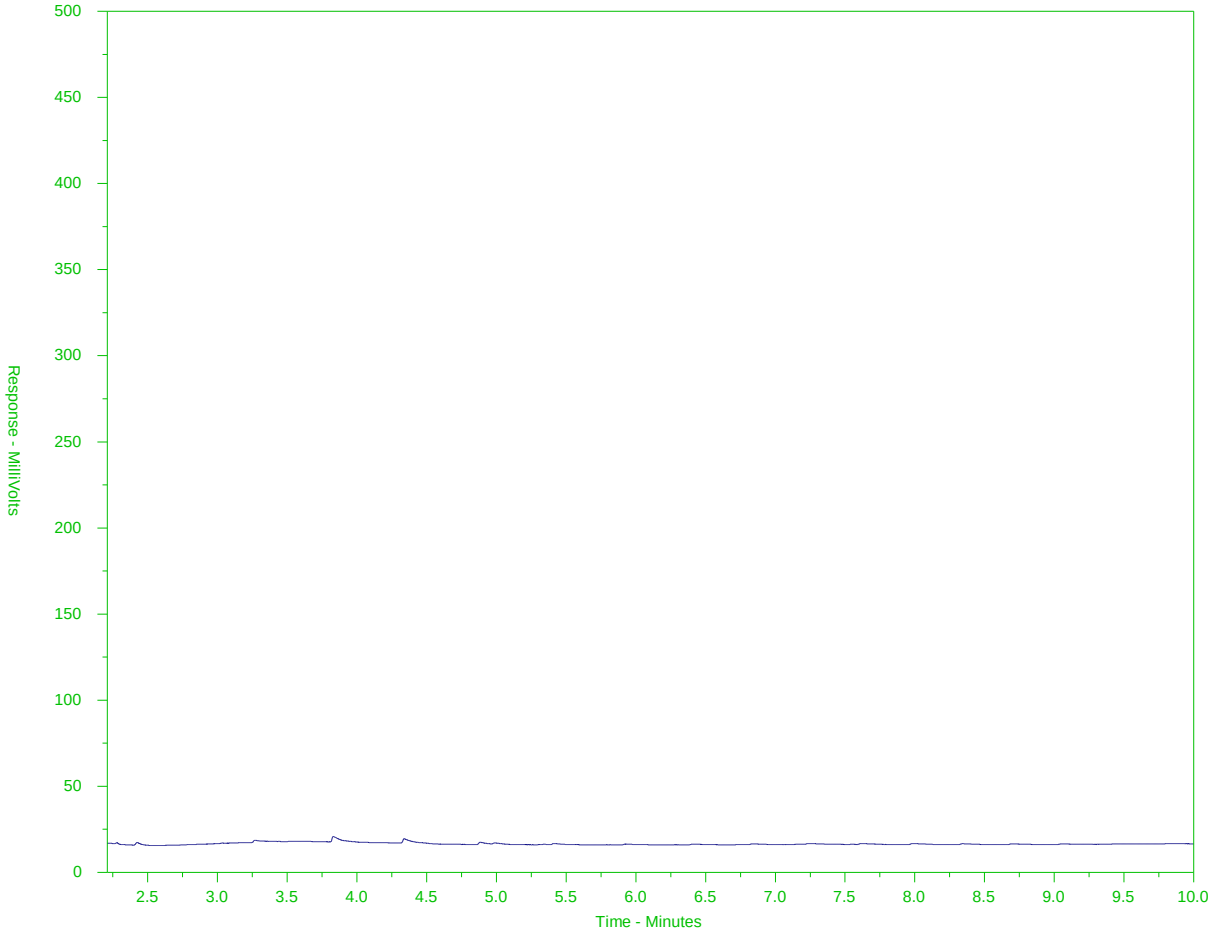
GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395326-1
Client Sample ID: PW17-11_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

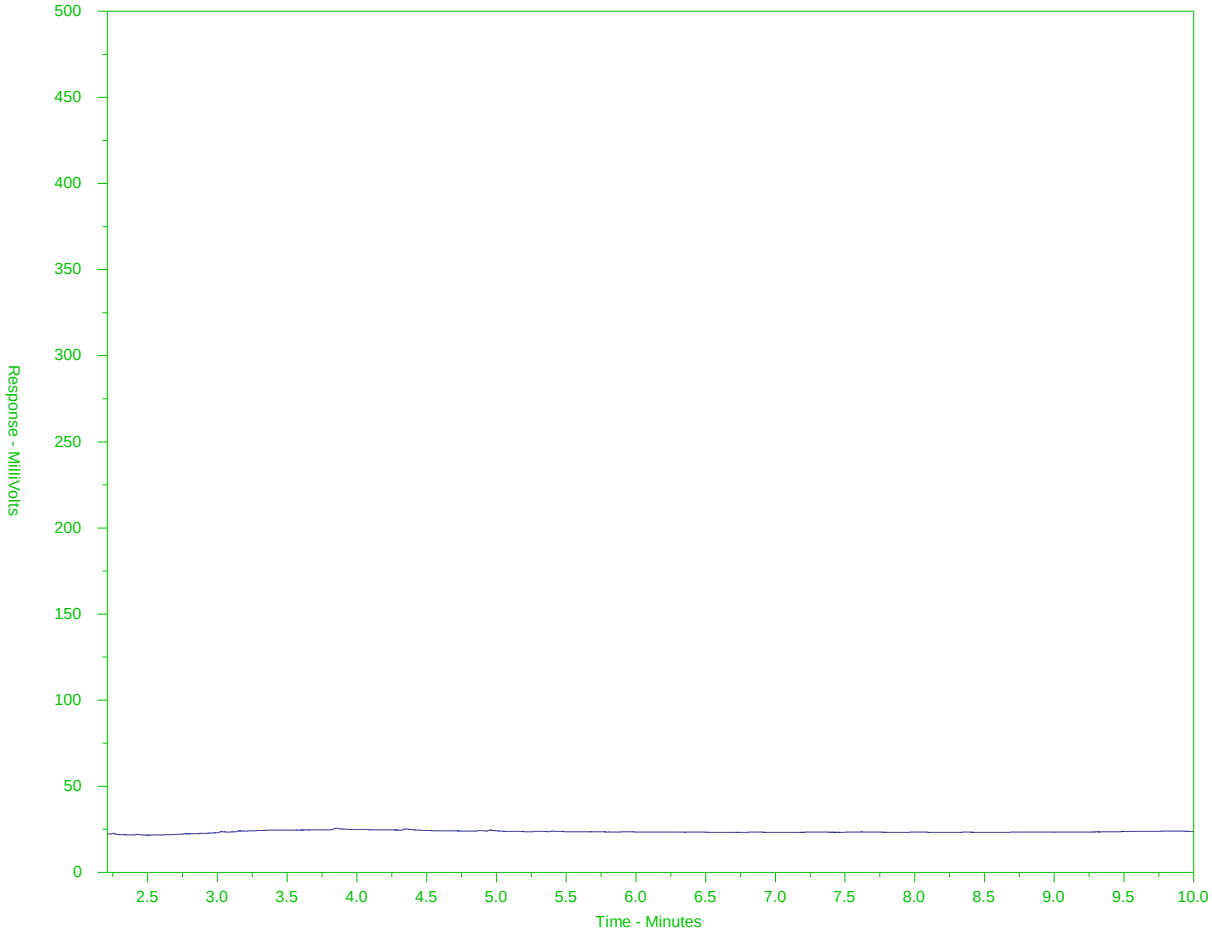
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395326-2
Client Sample ID: PW17-12_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

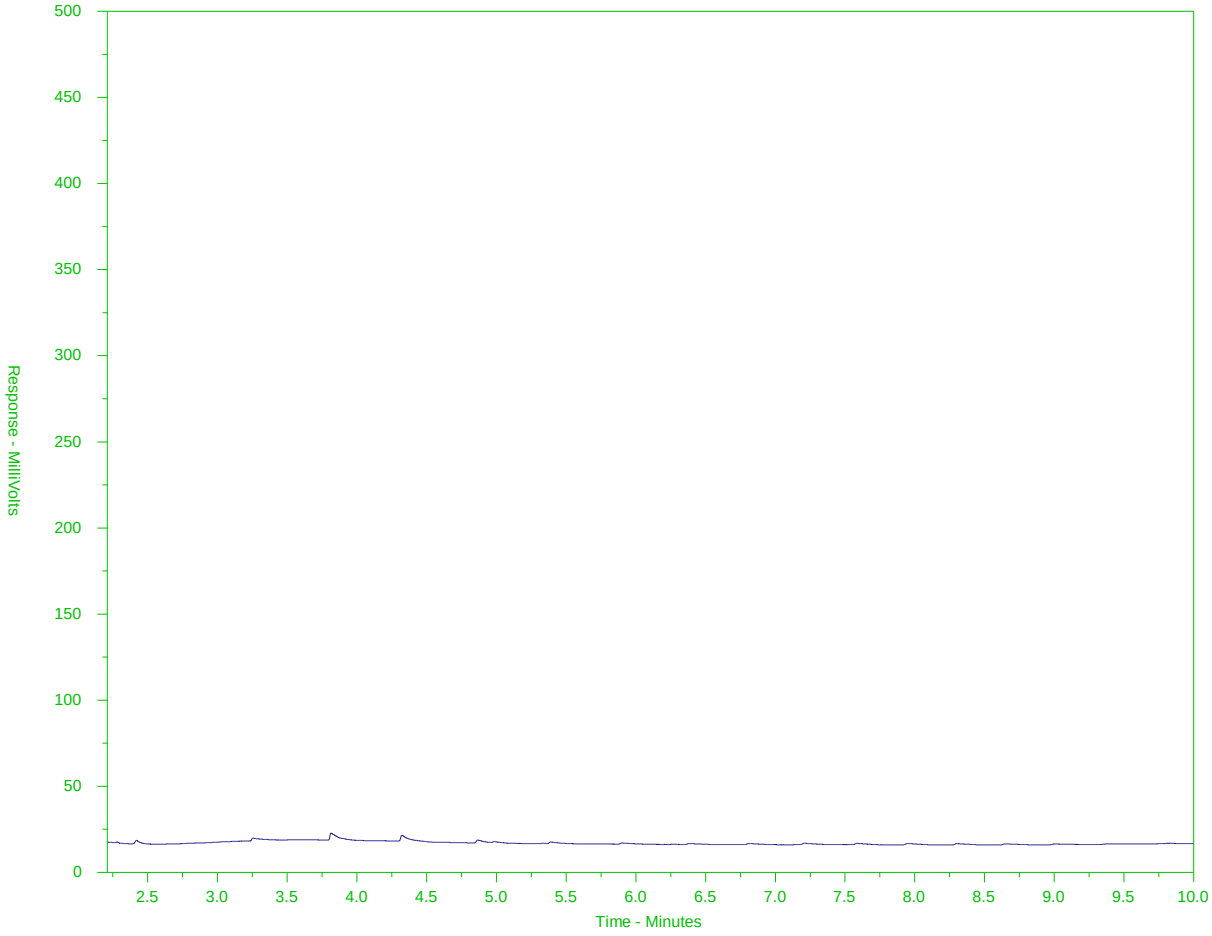
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395326-3
Client Sample ID: PW17-13_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

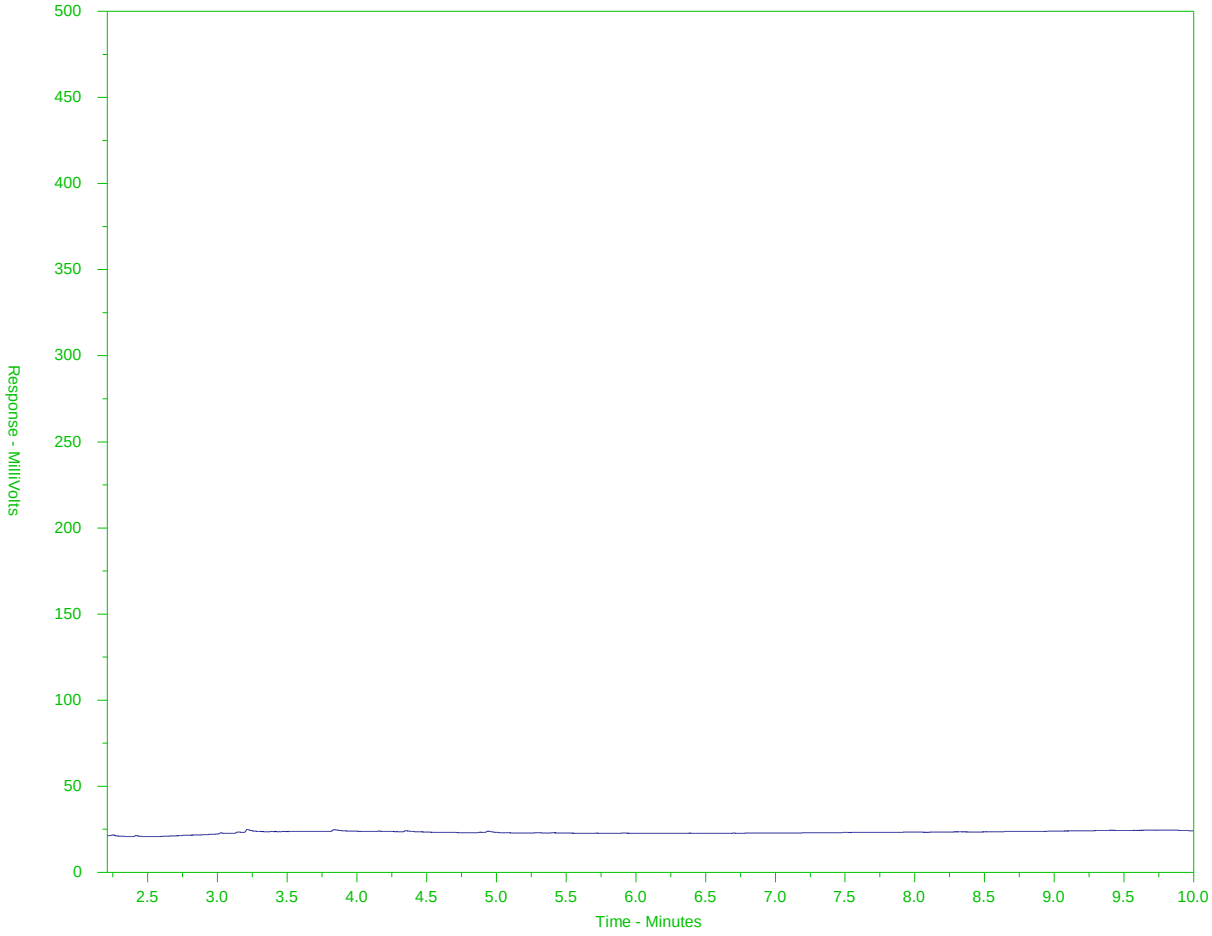
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395326-4
Client Sample ID: PW17-14_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

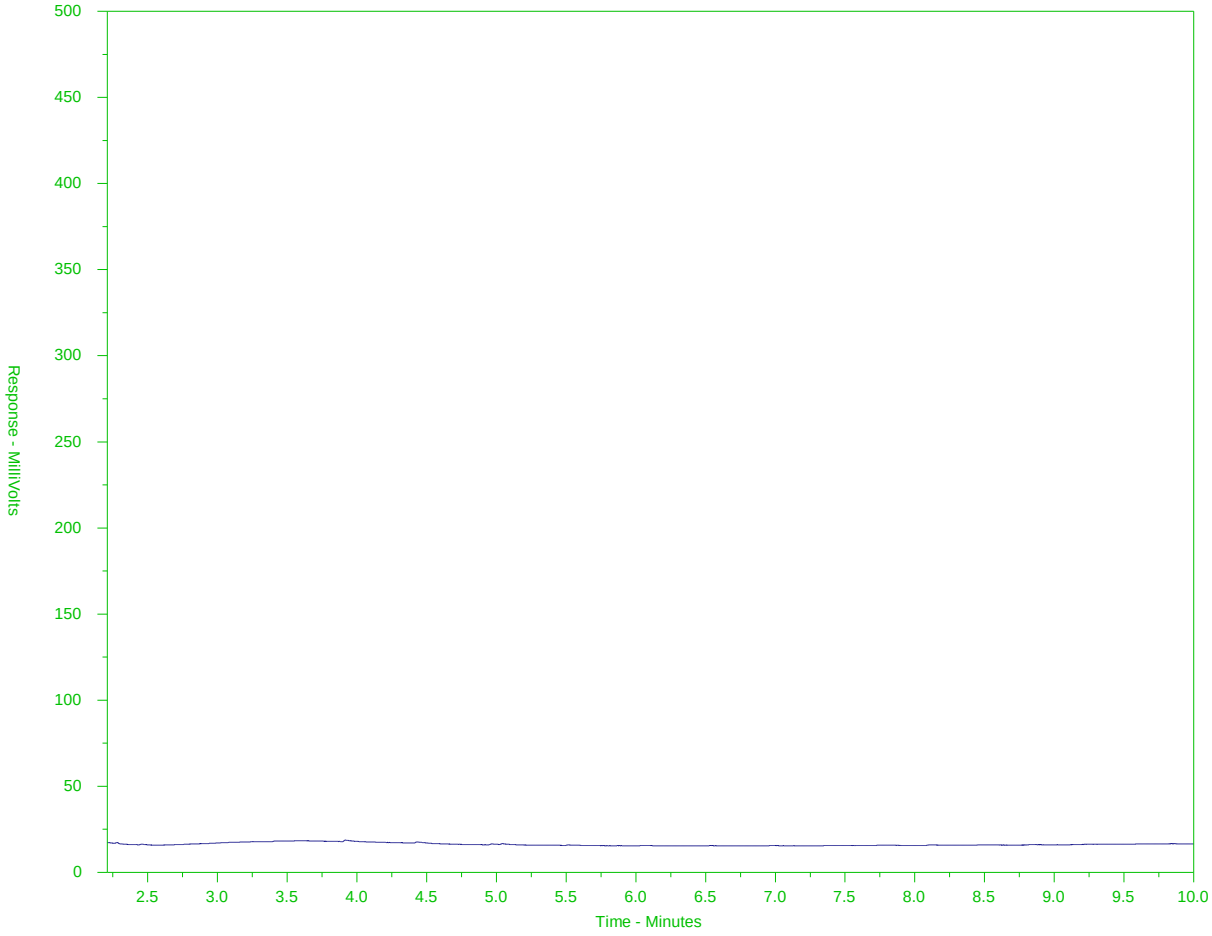
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395326-5
Client Sample ID: PW17-15_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

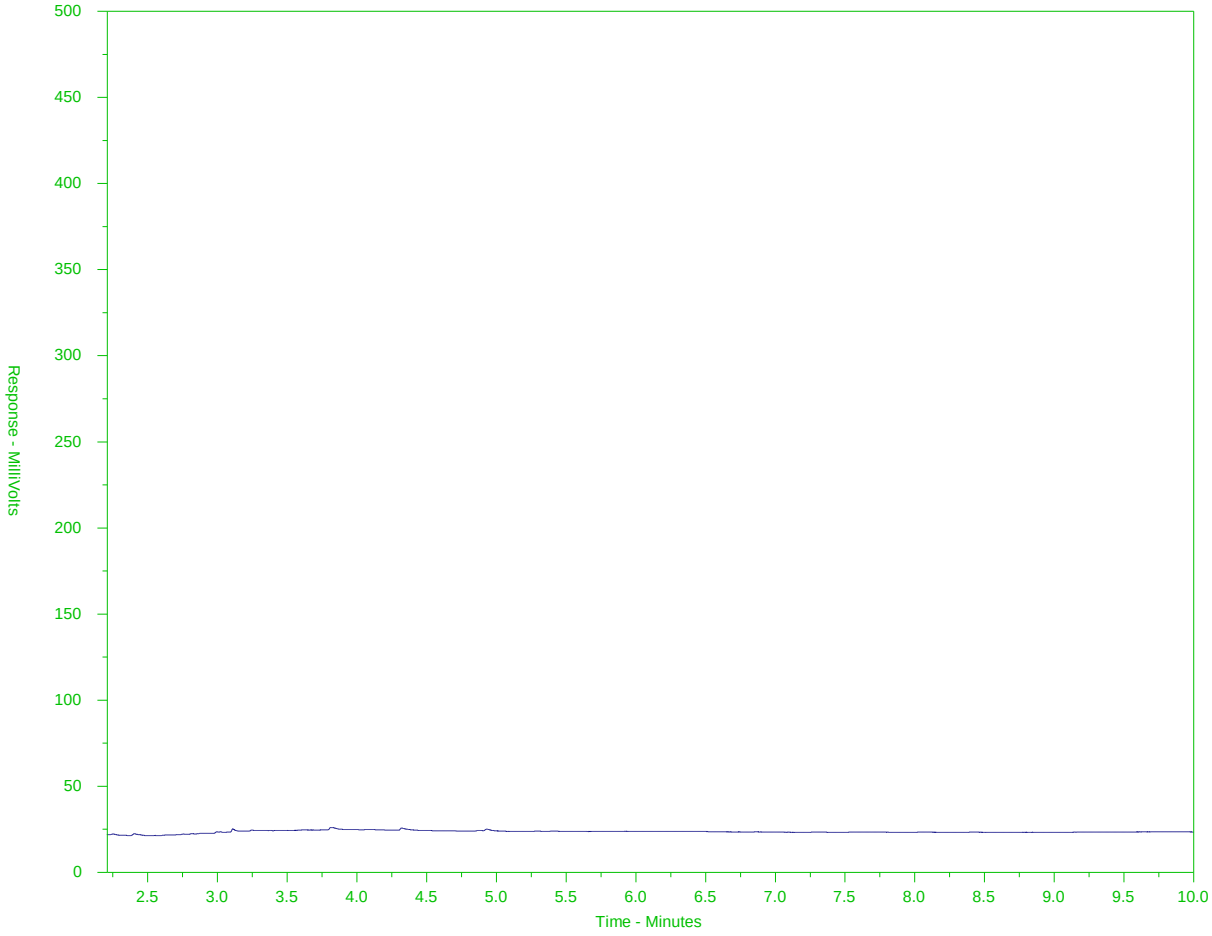
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395326-6
Client Sample ID: PW17-19_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

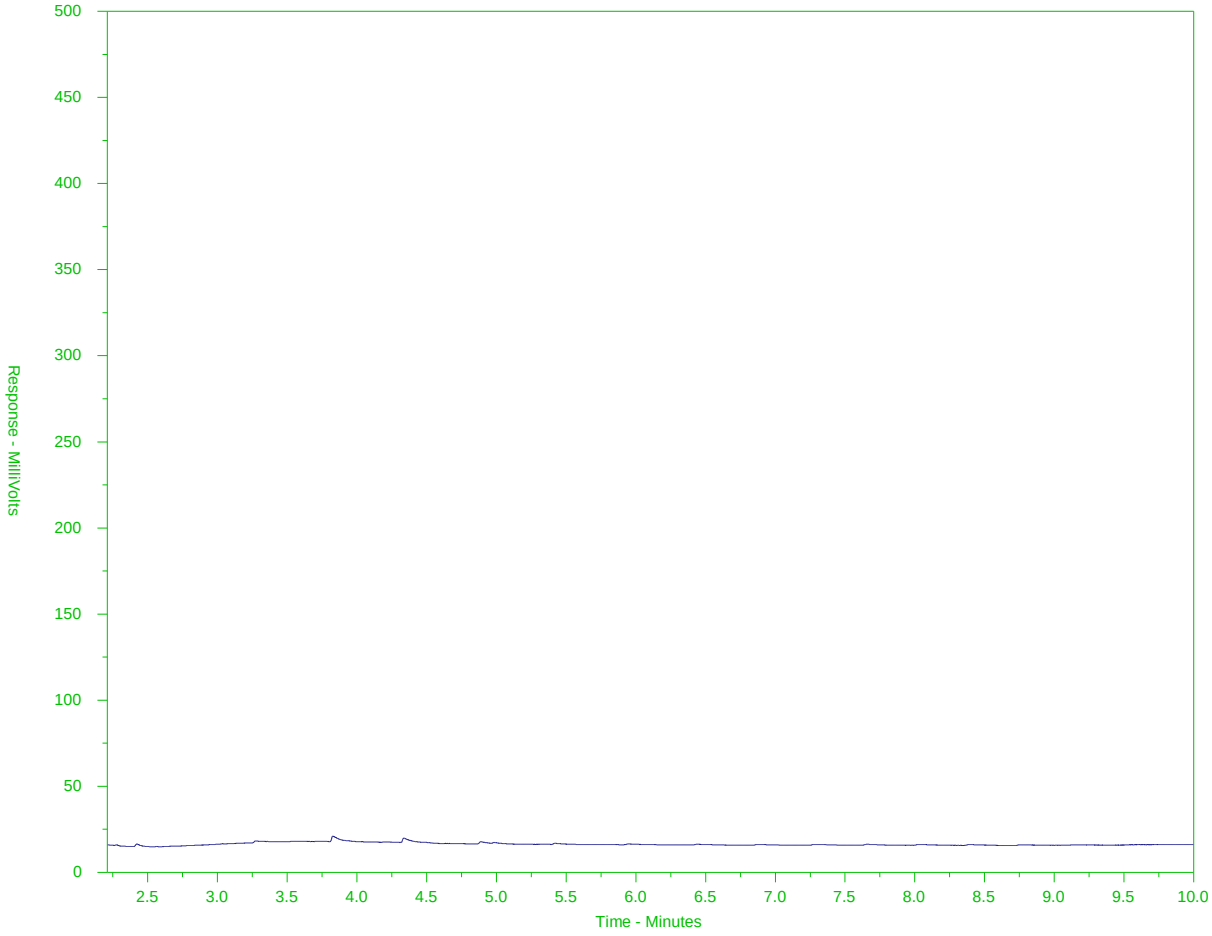
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395326-7
Client Sample ID: PW17-20_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

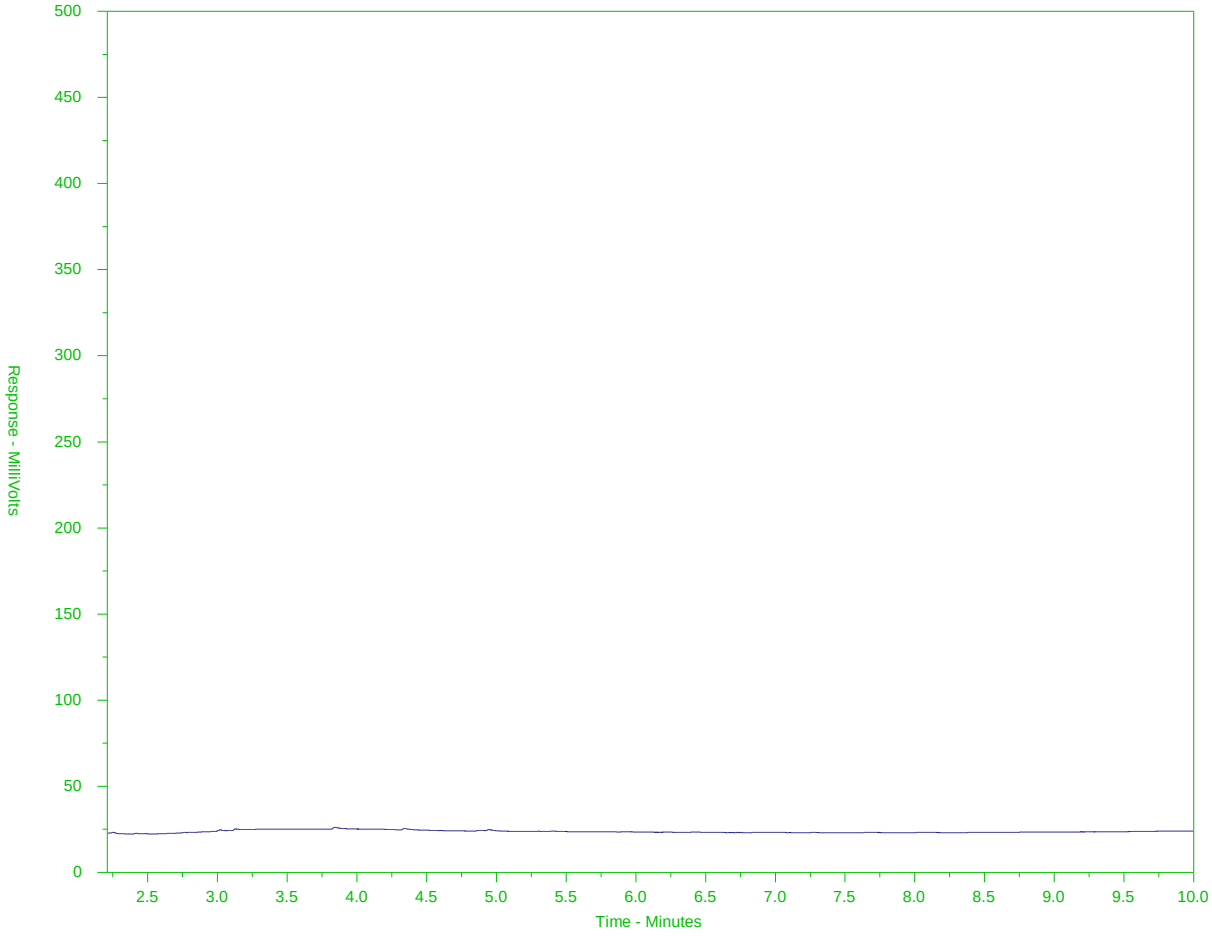
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395326-8
Client Sample ID: PW17-29_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

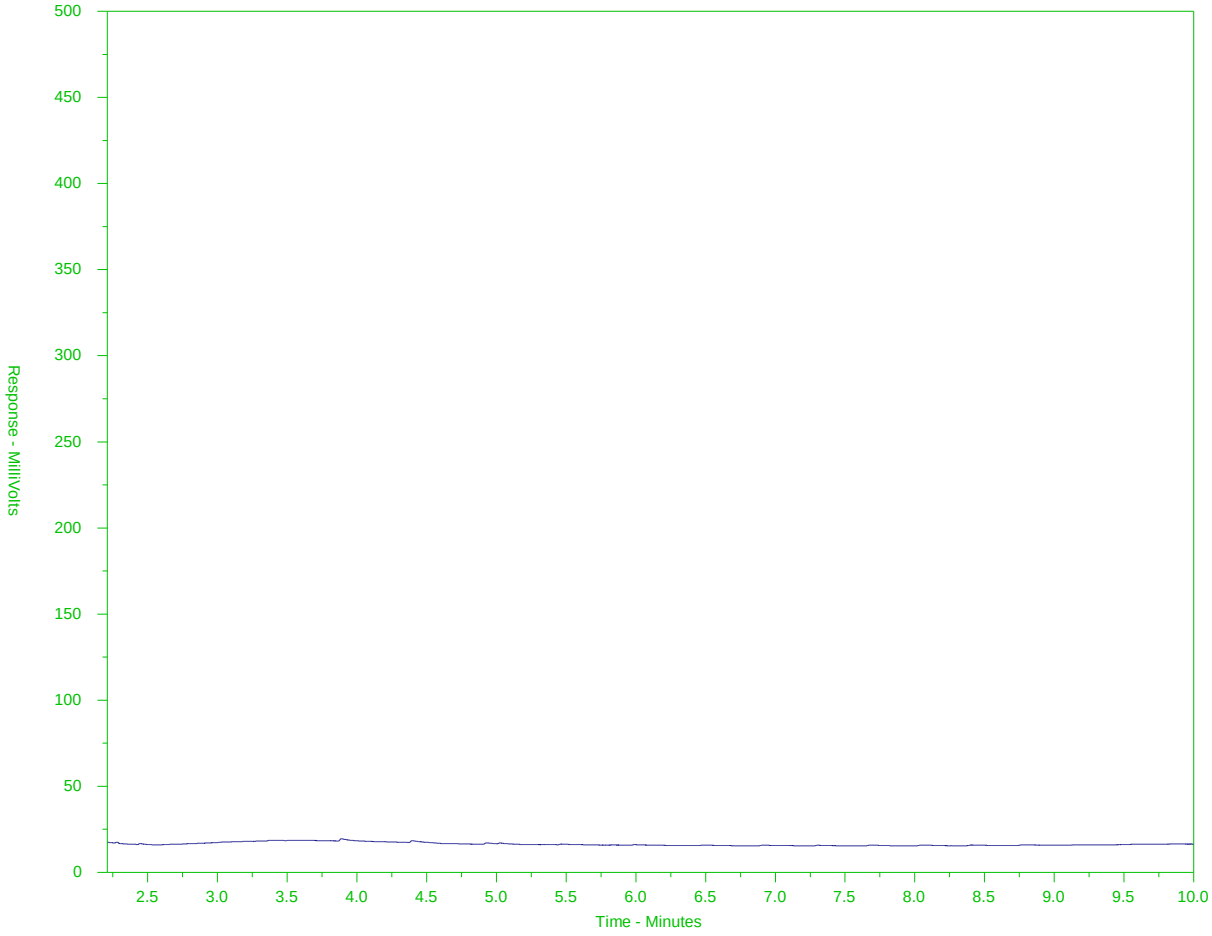
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395326-9
Client Sample ID: PW17-25_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

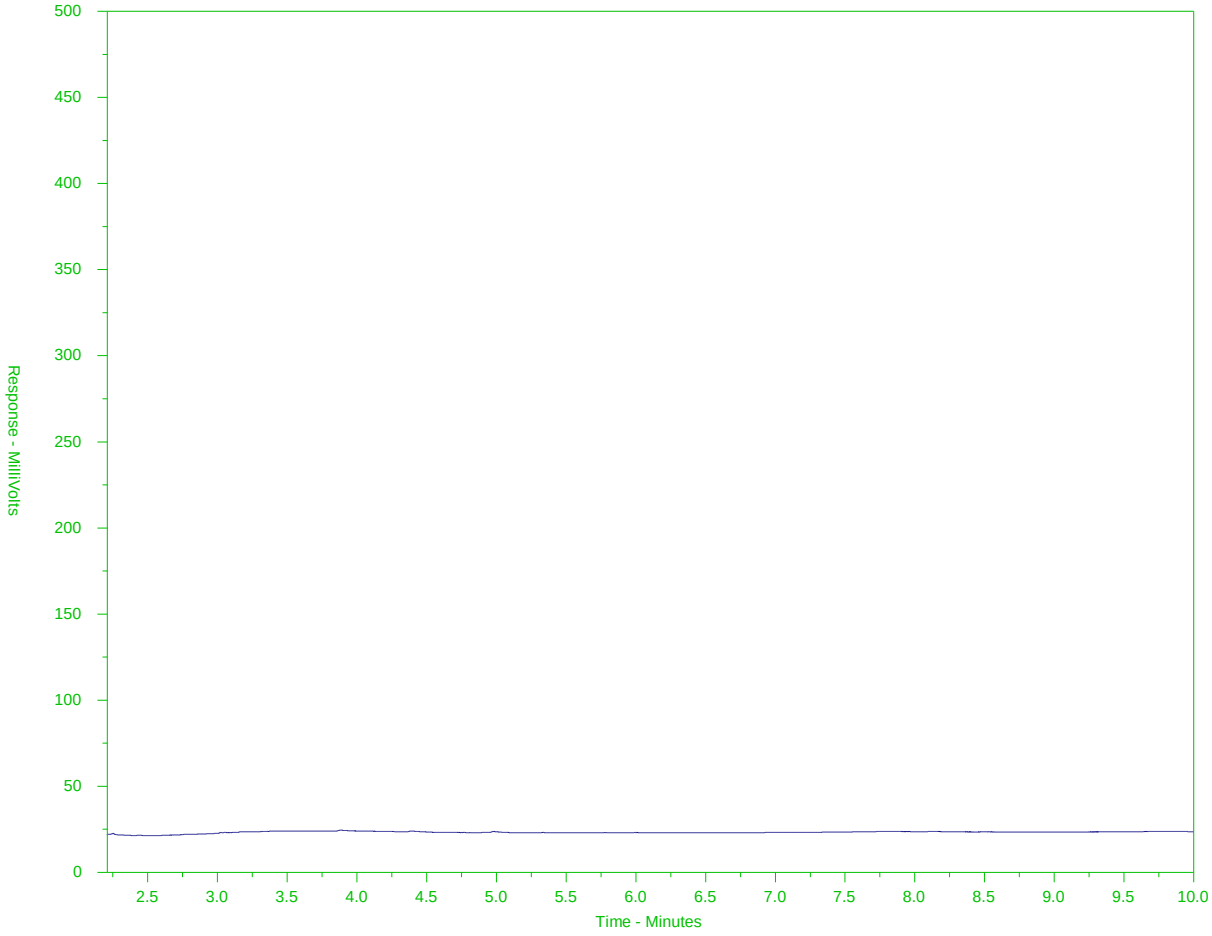
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395326-10
Client Sample ID: PW17-24_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

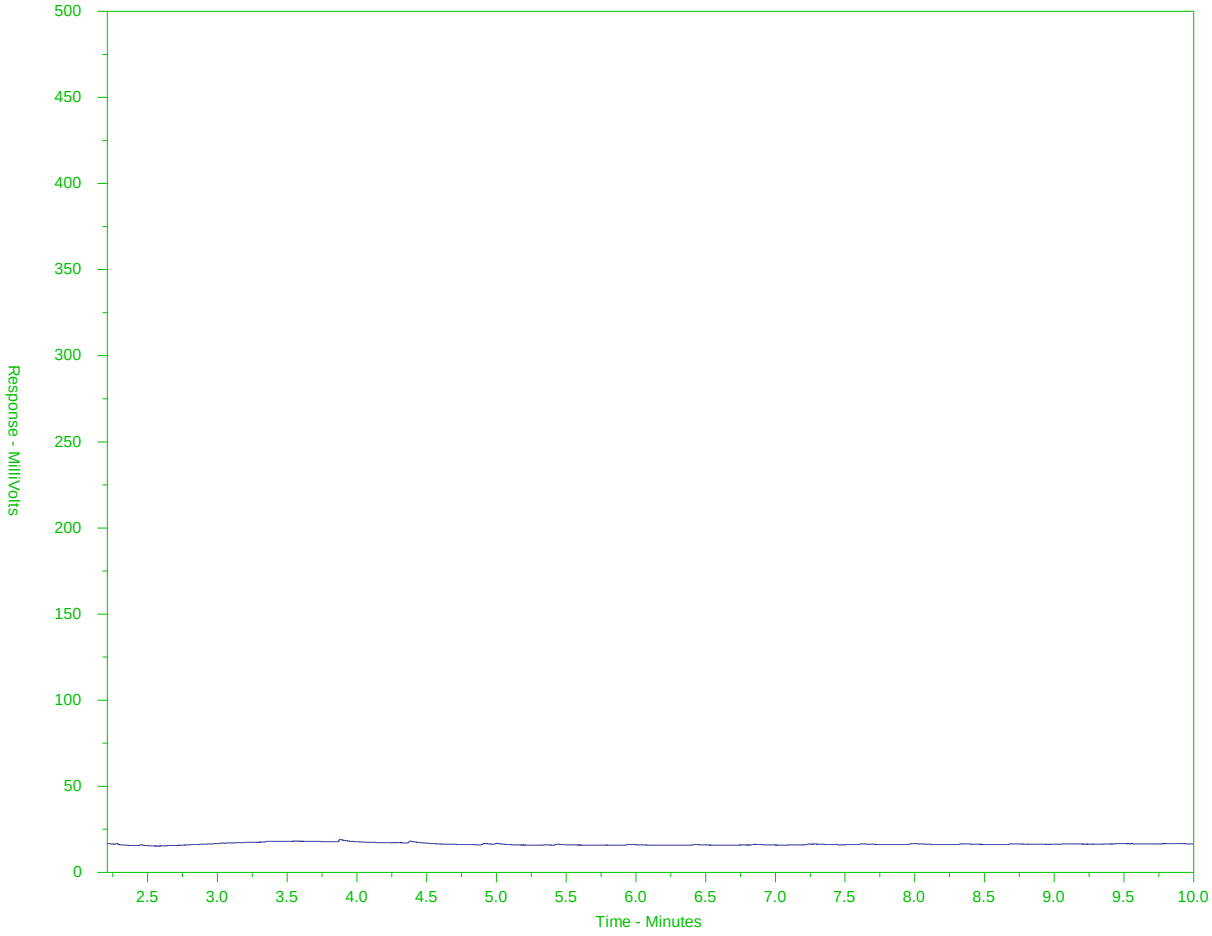
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395326-11
Client Sample ID: PW17-30_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

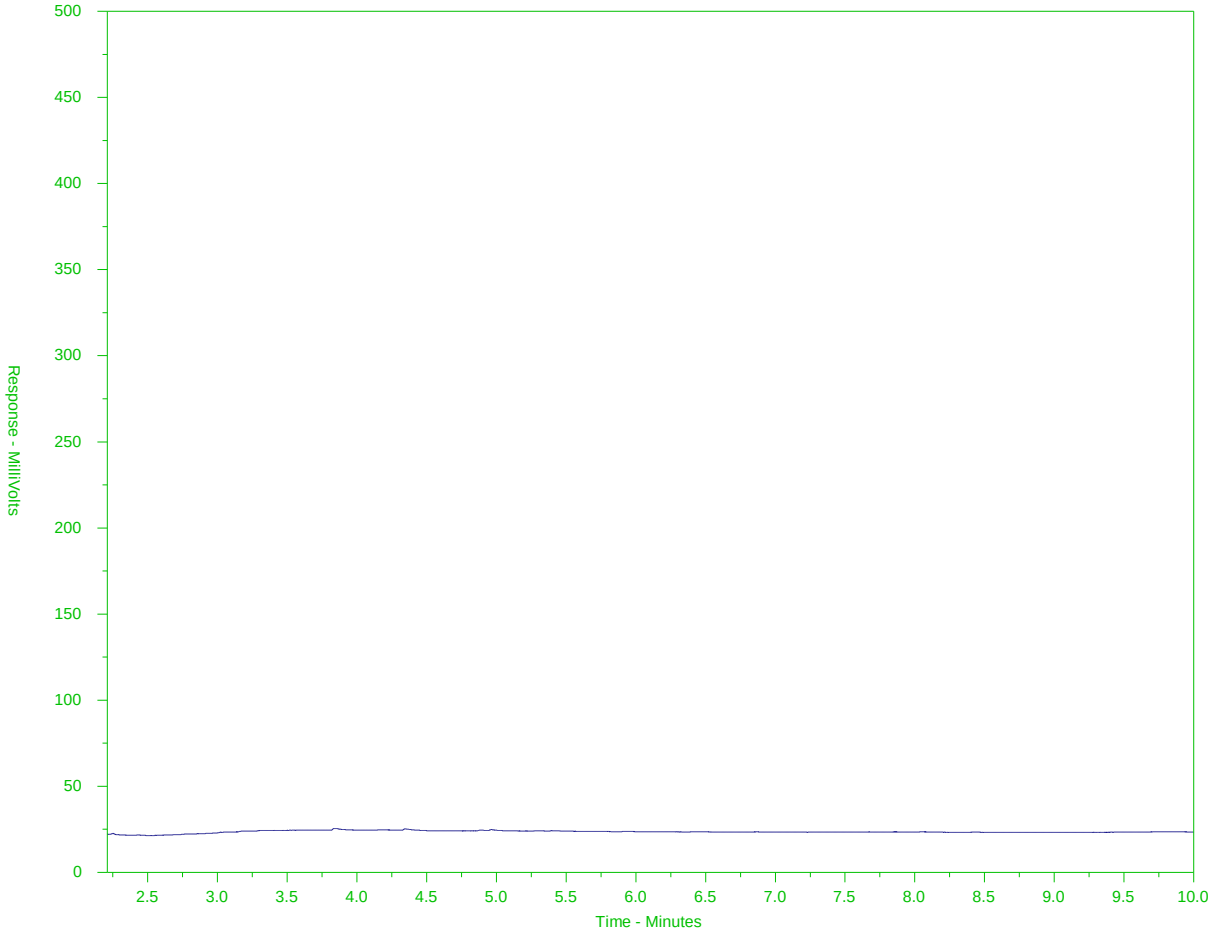
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395326-12
Client Sample ID: PW17-31_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

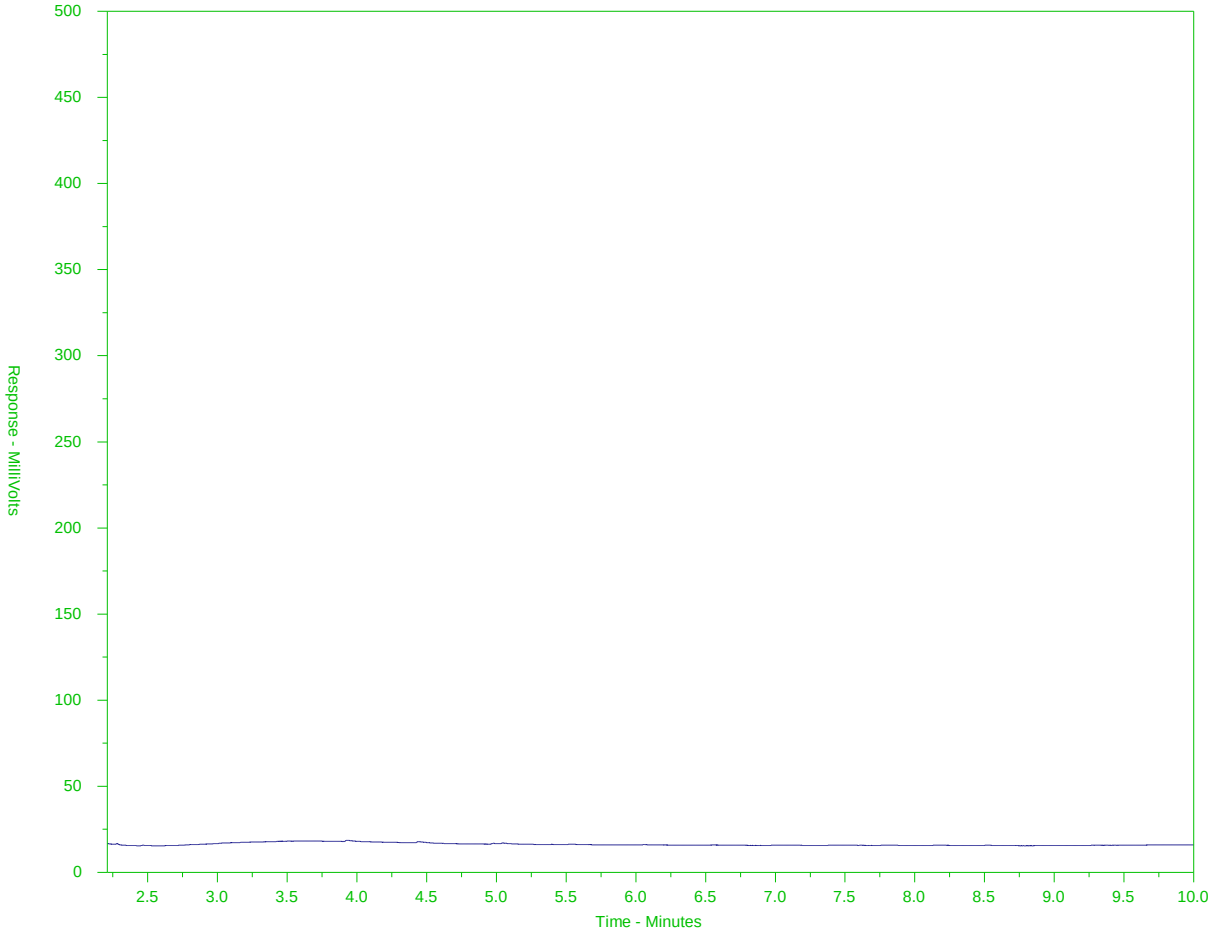
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395326-13
Client Sample ID: PW17-32_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

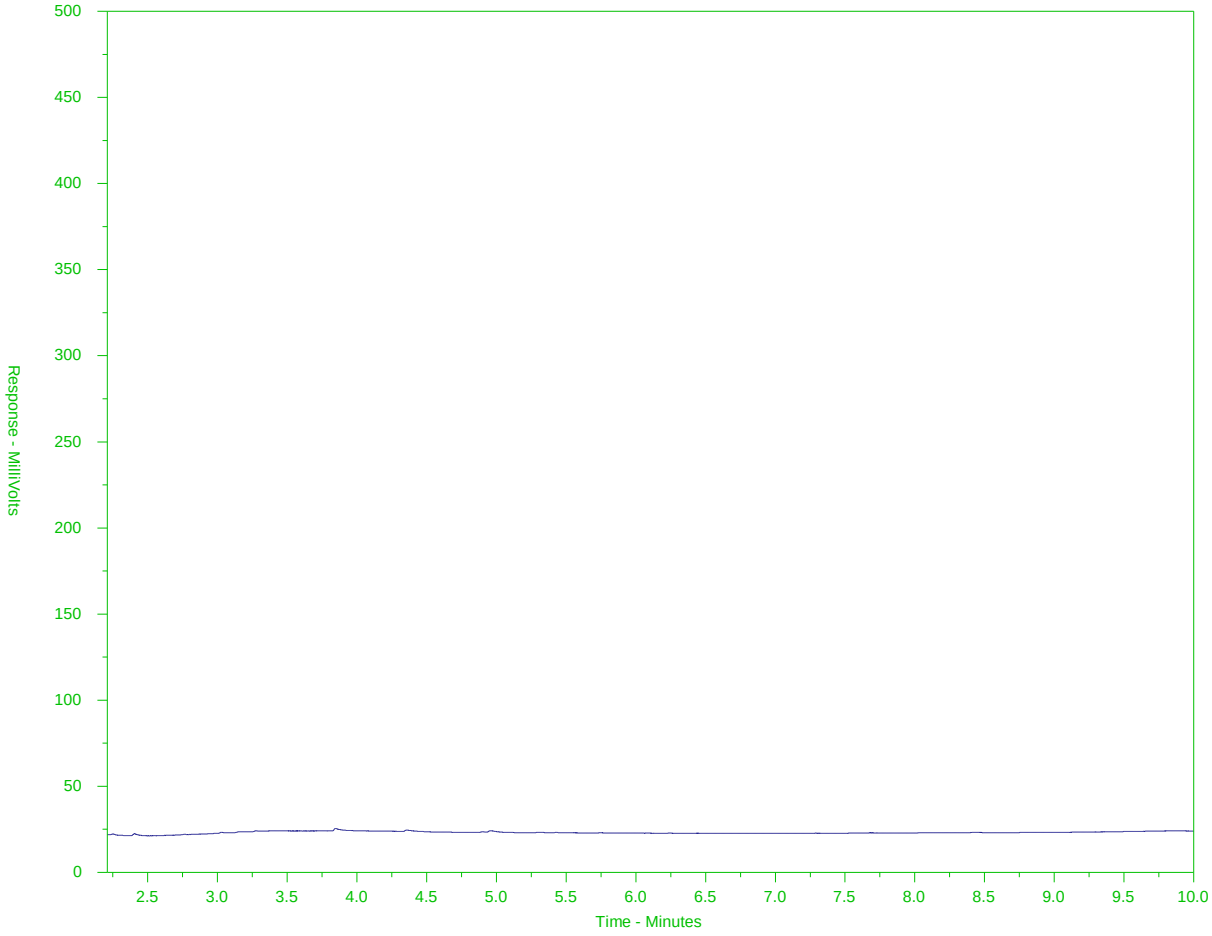
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395326-14
Client Sample ID: PW17-33_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

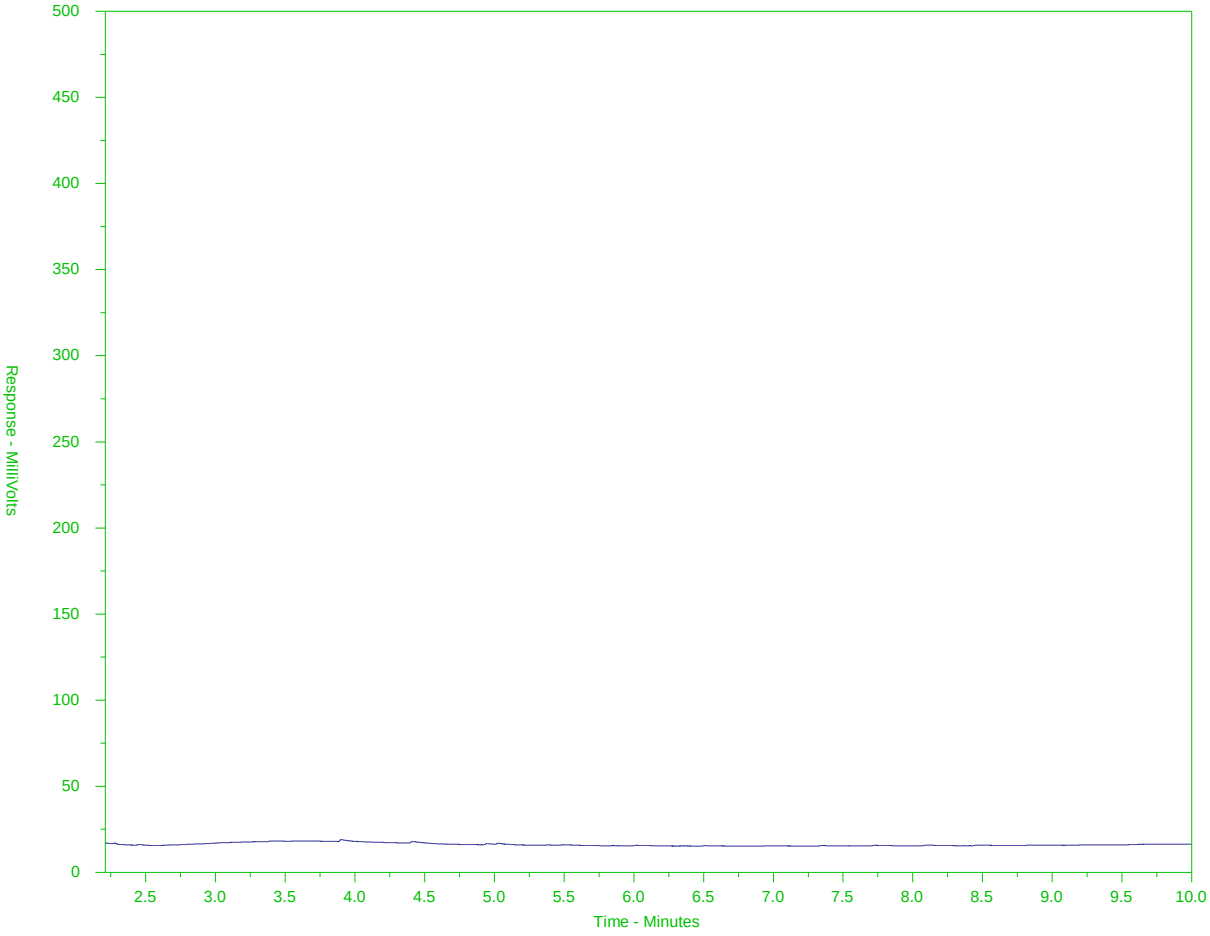
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395326-15
Client Sample ID: R-BLANK-1_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2395326-COFC

COC Number: 17 - 784765

Page 1 of 2

Report To	Contact and company name below will appear on the final report
Company:	AECOM Canada Ltd.
Contact:	Leslie Southern
Phone:	604-444-6608
	Company address below will appear on the final report
Street:	3292 Production Way
City/Province:	Burnaby, BC
Postal Code:	V5A 4R4

Report Format / Distribution	
Select Report Format:	[X] PDF [X] EXCEL [X] EDD (DIGITAL)
Quality Control (QC) Report with Report	[X] YES [ ] NO
[X] Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	[X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	Leslie.Southern@aecom.com
Email 2	Justin.Becker@aecom.com
Email 3	

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)	
Regular [R]	[X] Standard TAT if received by 3 pm - business days - no surcharges apply
PRIORITY (Business Days): 4 day [P4-20%]	[ ]
3 day [P3-25%]	[ ]
2 day [P2-50%]	[ ]
EMERGENCY: 1 Business day [E - 100%]	[ ]
Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]	[ ]
Date and Time Required for all E&P TATs:	dd-mmm-yy hh:mm
For tests that can not be performed according to the service level selected, you will be contacted.	

Invoice To		
	Same as Report To	[ ] YES [X] NO
	Copy of Invoice with Report	[ ] YES [X] NO
Company:	Parkland Refining (B.C.)	
Contact:	Christopher Boys	

Invoice Distribution	
Select Invoice Distribution:	[X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	Leslie_Southern@aecom.com
Email 2	

Project Information	
ALS Account # / Quote #:	
Job #:	60601814 / ARO-0005
PO / AFE:	
LSD:	Burnaby Refinery
ALS Lab Work Order # (lab use only):	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact: Dean Watt	Sampler: AAK + CXW

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	BTEX / VPH (P)	LEPH / HEPH (P)	Benzo(a)pyrene (P)	Naphthalene (P)	HRMS Dissolved Copper (F/P)	HRMS Dissolved Zinc (F/P)	Nitrates / Sulfates / Alkalinity	Methane (Dissolved)	Silty Sample	Brackish Water (>4000 µS/cm)	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	PW17-11_20191210	10-Dec-19	22:15	Porewater	5	X	X	X	X	X	X				X		
	PW17-12_20191210		22:04		5										X		
	PW17-13_20191210		22:45		5										X		
	PW17-14_20191210		22:30		5										X		
	PW17-15_20191210		21:48		5										X		
	PW17-19_20191210		21:15		5										X		
	PW17-20_20191210		21:29		5										X		
	PW17-29_20191210		20:01		5										X		
	PW17-25_20191210		20:58		5										X		
	PW17-24_20191210		20:30		5										X		
	PW17-30_20191210		20:52		5										X		
	PW17-31_20191210		19:36		5										X		

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? [ ] YES [X] NO	BC CSR *Metals need preservative
Are samples for human consumption/ use? [ ] YES [X] NO	Only analyze for copper and zinc for metals

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	[ ]	SIF Observations	Yes [ ] No [ ]
Ice Packs [X]	Ice Cubes [ ]	Custody seal intact	Yes [ ] No [ ]
Cooling Initiated	[ ]		

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
9.9	8.6	6.3	8.2				

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
Justin Becker	Dec 11, 2019	1:23	Samia Yashir	12/11/2019	1:24	Samia Yashir	12/11/2019	

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2018 FRONT

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2395326-COFC

COC Number: 17 - 784765

Report To	Contact and company name below will appear on the final report
Company:	AECOM Canada Ltd.
Contact:	Leslie Southern
Phone:	604-444-6608
	Company address below will appear on the final report
Street:	3292 Production Way
City/Province:	Burnaby, BC
Postal Code:	V5A 4R4

Report Format / Distribution	
Select Report Format:	[X] PDF [X] EXCEL [X] EDD (DIGITAL)
Quality Control (QC) Report with Report	[X] YES [ ] NO
[X] Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	[X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	Leslie.Southern@aecom.com
Email 2	Justin.Becker@aecom.com
Email 3	

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] [X] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] [ ] | 3 day [P3-25%] [ ] | 2 day [P2-50%] [ ]

EMERGENCY: 1 Business day [E - 100%] [ ] | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] [ ]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Invoice To		
	Same as Report To	[ ] YES [X] NO
	Copy of Invoice with Report	[ ] YES [X] NO
Company:	Parkland Refining (B.C.)	
Contact:	Christopher Boys	

Invoice Distribution	
Select Invoice Distribution:	[X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	Leslie_Southern@aecom.com
Email 2	

Project Information	
ALS Account # / Quote #:	
Job #:	60601814 / ARO-0005
PO / AFE:	
LSD:	Burnaby Refinery
ALS Lab Work Order # (lab use only):	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact: Dean Watt	Sampler: AAR + CxW

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	BTEX / VPH (P)	LEPH / HEPH (P)	Benzo(a)pyrene (P)	Naphthalene (P)	HRMS Dissolved Copper (F)	HRMS Dissolved Zinc (F)	Nitrates/Sulfates/Alkalinity	Methane (Dissolved)	Silty Sample	Brackish Water (≥4000 µS/cm)	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	PW17-32_20191210	10-Dec-19	19:51	Porewater	5	X	X	X	X	X	X				X		
	PW17-33_20191210	↓	20:32	↓	5	X	X	X	X	X	X				X		
	R-Blank-1_20191210	10-Dec-19	N/A	Other	5	X	X	[illegible]	[illegible]	X	X						
	T-Blank-1	↓	↓	Other	1	X											
	T-Blank-2	↓	↓	Other	1	X											

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? [ ] YES [X] NO	BC CSR ✓Metals need preservative✓
Are samples for human consumption/ use? [ ] YES [X] NO	Only analyze for copper and zinc for metals (24, 31, 14, 13, 15, 33, 19) - T-Blank-1 + (R-Blank-1)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [X] | SIF Observations Yes [ ] No [ ] | Ice Packs [X] Ice Cubes [ ] | Custody seal intact Yes [ ] No [ ] | Cooling Initiated [ ]

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
9.9	8.6	6.3	8.2				

SHIPMENT RELEASE (client use)		
Released by:	Date:	Time:
Justin Becker	Dec. 11, 2019	1:23

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date:	Time:
Jennie Yoshida	12/11/2019	1:27

FINAL SHIPMENT RECEPTION (lab use only)		
Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2018 FRONT

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

AECOM CANADA LTD.
ATTN: Leslie Southern
3292 Production Way
Suite 330
Burnaby BC V5A 4R4

Date Received: 12-DEC-19
Report Date: 19-DEC-19 18:16 (MT)
Version: FINAL

Client Phone: 604-444-6608

Certificate of Analysis

Lab Work Order #: L2395640

Project P.O. #: 0015243589
Job Reference: 60601814/ARO-0005
C of C Numbers:
Legal Site Desc: Burnaby Refinery

Dean Watt, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2395640-1	L2395640-2	L2395640-3	L2395640-4	L2395640-5
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	11-DEC-19	11-DEC-19	11-DEC-19	11-DEC-19	11-DEC-19
	Sampled Time	21:01	20:35	21:59	21:52	22:04
	Client ID	PW17-1_20191210|REG|GW	PW17-2_20191210|REG|GW	PW17-3_20191210|REG|GW	PW17-4_20191210|REG|GW	PW17-5_20191210|REG|GW
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Copper (Cu)-Dissolved (ug/L)	0.36	0.38	0.40	<0.20	3.23
	Zinc (Zn)-Dissolved (ug/L)	2.0	<1.0	<1.0	<1.0	<1.0

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2395640-6	L2395640-7	L2395640-8	L2395640-9	L2395640-10
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	11-DEC-19	11-DEC-19	11-DEC-19	11-DEC-19	11-DEC-19
	Sampled Time	22:20	21:36	22:34	20:20	21:25
	Client ID	PW17-6_20191210|REG|GW	PW17-7_20191210|REG|GW	PW17-8_20191210|REG|GW	PW17-9_20191210|REG|GW	PW17-10_20191210|REG|GW
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Copper (Cu)-Dissolved (ug/L)	<0.20	0.27	0.39	<0.20	0.77
	Zinc (Zn)-Dissolved (ug/L)	<1.0	1.4	<1.0	1.3	1.4

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2395640-11				
	Description	Other				
	Sampled Date	11-DEC-19				
	Sampled Time					
	Client ID	R-BLANK-2_20191210|REG|GW				
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD				
	Copper (Cu)-Dissolved (ug/L)	<0.20				
	Zinc (Zn)-Dissolved (ug/L)	<1.0				

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2395640-1	L2395640-2	L2395640-3	L2395640-4	L2395640-5
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	11-DEC-19	11-DEC-19	11-DEC-19	11-DEC-19	11-DEC-19
	Sampled Time	21:01	20:35	21:59	21:52	22:04
	Client ID	PW17-1_20191210|REG|GW	PW17-2_20191210|REG|GW	PW17-3_20191210|REG|GW	PW17-4_20191210|REG|GW	PW17-5_20191210|REG|GW
Grouping	**Analyte**					
WATER						
Volatile Organic Compounds	Benzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Ethylbenzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Styrene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Toluene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	ortho-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	meta- & para-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Xylenes (ug/L)	<0.75	<0.75	<0.75	<0.75	<0.75
Hydrocarbons	EPH10-19 (ug/L)	<250	<250	<250	<250	<250
	EPH19-32 (ug/L)	<250	<250	<250	<250	<250
	LEPH (ug/L)	<250	<250	<250	<250	<250
	HEPH (ug/L)	<250	<250	<250	<250	<250
	Volatile Hydrocarbons (VH6-10) (ug/L)	<100	<100	<100	<100	<100
	VPH (C6-C10) (ug/L)	<100	<100	<100	<100	<100
	Surrogate: 2-Bromobenzotrifluoride (%)	95.3	103.0	101.6	106.4	102.8
Polycyclic Aromatic Hydrocarbons	Acenaphthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acenaphthylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acridine (ug/L)	<0.010	<0.010	<0.010	0.013	<0.010
	Anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benz(a)anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(a)pyrene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Benzo(b&j)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(b+j+k)fluoranthene (ug/L)	<0.015	<0.015	<0.015	<0.015	<0.015
	Benzo(g,h,i)perylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(k)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Chrysene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Dibenz(a,h)anthracene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Fluorene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	1-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	2-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Naphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Phenanthrene (ug/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Quinoline (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Surrogate: Acridine d9 (%)	85.2	83.2	82.6	92.0	84.9

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2395640-6	L2395640-7	L2395640-8	L2395640-9	L2395640-10
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	11-DEC-19	11-DEC-19	11-DEC-19	11-DEC-19	11-DEC-19
	Sampled Time	22:20	21:36	22:34	20:20	21:25
	Client ID	PW17-6_20191210|REG|GW	PW17-7_20191210|REG|GW	PW17-8_20191210|REG|GW	PW17-9_20191210|REG|GW	PW17-10_20191210|REG|GW
Grouping	**Analyte**					
WATER						
Volatile Organic Compounds	Benzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Ethylbenzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Styrene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Toluene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	ortho-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	meta- & para-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Xylenes (ug/L)	<0.75	<0.75	<0.75	<0.75	<0.75
Hydrocarbons	EPH10-19 (ug/L)	<250	<250	<250	<250	<250
	EPH19-32 (ug/L)	<250	<250	<250	<250	<250
	LEPH (ug/L)	<250	<250	<250	<250	<250
	HEPH (ug/L)	<250	<250	<250	<250	<250
	Volatile Hydrocarbons (VH6-10) (ug/L)	<100	<100	<100	<100	<100
	VPH (C6-C10) (ug/L)	<100	<100	<100	<100	<100
	Surrogate: 2-Bromobenzotrifluoride (%)	101.8	104.3	94.8	97.5	96.8
Polycyclic Aromatic Hydrocarbons	Acenaphthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acenaphthylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acridine (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benz(a)anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(a)pyrene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Benzo(b&j)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(b+j+k)fluoranthene (ug/L)	<0.015	<0.015	<0.015	<0.015	<0.015
	Benzo(g,h,i)perylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(k)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Chrysene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Dibenz(a,h)anthracene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Fluorene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	1-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	2-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Naphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Phenanthrene (ug/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Quinoline (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Surrogate: Acridine d9 (%)	84.1	91.1	83.4	81.4	81.1

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2395640-11	L2395640-12	L2395640-13		
	Description	Other	Other	Other		
	Sampled Date	11-DEC-19	11-DEC-19	11-DEC-19		
	Sampled Time					
	Client ID	R-BLANK-2_20191210|REG|GW	TRAVEL BLANK-3	TRAVEL BLANK-4		
Grouping	**Analyte**					
WATER						
Volatile Organic Compounds	Benzene (ug/L)	<0.50	<0.50	<0.50		
	Ethylbenzene (ug/L)	<0.50	<0.50	<0.50		
	Styrene (ug/L)	<0.50	<0.50	<0.50		
	Toluene (ug/L)	<0.50	<0.50	<0.50		
	ortho-Xylene (ug/L)	<0.50	<0.50	<0.50		
	meta- & para-Xylene (ug/L)	<0.50	<0.50	<0.50		
	Xylenes (ug/L)	<0.75	<0.75	<0.75		
Hydrocarbons	EPH10-19 (ug/L)	<250				
	EPH19-32 (ug/L)	<250				
	LEPH (ug/L)	<250				
	HEPH (ug/L)	<250				
	Volatile Hydrocarbons (VH6-10) (ug/L)	<100	<100	<100		
	VPH (C6-C10) (ug/L)	<100	<100	<100		
	Surrogate: 2-Bromobenzotrifluoride (%)	100.2				
Polycyclic Aromatic Hydrocarbons	Acenaphthene (ug/L)	<0.010				
	Acenaphthylene (ug/L)	<0.010				
	Acridine (ug/L)	<0.010				
	Anthracene (ug/L)	<0.010				
	Benz(a)anthracene (ug/L)	<0.010				
	Benzo(a)pyrene (ug/L)	<0.0050				
	Benzo(b&j)fluoranthene (ug/L)	<0.010				
	Benzo(b+j+k)fluoranthene (ug/L)	<0.015				
	Benzo(g,h,i)perylene (ug/L)	<0.010				
	Benzo(k)fluoranthene (ug/L)	<0.010				
	Chrysene (ug/L)	<0.010				
	Dibenz(a,h)anthracene (ug/L)	<0.0050				
	Fluoranthene (ug/L)	<0.010				
	Fluorene (ug/L)	<0.010				
	Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010				
	1-Methylnaphthalene (ug/L)	<0.050				
	2-Methylnaphthalene (ug/L)	<0.050				
	Naphthalene (ug/L)	<0.050				
	Phenanthrene (ug/L)	<0.020				
	Pyrene (ug/L)	<0.010				
	Quinoline (ug/L)	<0.050				
	Surrogate: Acridine d9 (%)	76.4				

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2395640-1	L2395640-2	L2395640-3	L2395640-4	L2395640-5
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	11-DEC-19	11-DEC-19	11-DEC-19	11-DEC-19	11-DEC-19
	Sampled Time	21:01	20:35	21:59	21:52	22:04
	Client ID	PW17-1_20191210|REG|GW	PW17-2_20191210|REG|GW	PW17-3_20191210|REG|GW	PW17-4_20191210|REG|GW	PW17-5_20191210|REG|GW
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Surrogate: Chrysene d12 (%)	94.9	102.8	95.3	102.2	97.2
	Surrogate: Naphthalene d8 (%)	110.3	104.5	110.4	105.4	102.5
	Surrogate: Phenanthrene d10 (%)	103.1	103.1	102.3	107.5	101.2
	Total PAHs (ug/L)	<0.11	<0.11	<0.11	<0.11	<0.11

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2395640-6	L2395640-7	L2395640-8	L2395640-9	L2395640-10
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	11-DEC-19	11-DEC-19	11-DEC-19	11-DEC-19	11-DEC-19
	Sampled Time	22:20	21:36	22:34	20:20	21:25
	Client ID	PW17-6_20191210|REG|GW	PW17-7_20191210|REG|GW	PW17-8_20191210|REG|GW	PW17-9_20191210|REG|GW	PW17-10_20191210|REG|GW
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Surrogate: Chrysene d12 (%)	97.4	98.8	97.8	93.2	94.5
	Surrogate: Naphthalene d8 (%)	112.5	108.6	119.3	101.6	101.5
	Surrogate: Phenanthrene d10 (%)	106.7	107.3	105.0	99.9	99.8
	Total PAHs (ug/L)	<0.11	<0.11	<0.11	<0.11	<0.11

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2395640-11	L2395640-12	L2395640-13		
	Description	Other	Other	Other		
	Sampled Date	11-DEC-19	11-DEC-19	11-DEC-19		
	Sampled Time					
	Client ID	R-BLANK-2_20191210|REG|GW	TRAVEL BLANK-3	TRAVEL BLANK-4		
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Surrogate: Chrysene d12 (%)	99.1				
	Surrogate: Naphthalene d8 (%)	114.9				
	Surrogate: Phenanthrene d10 (%)	104.1				
	Total PAHs (ug/L)	<0.11				

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual
EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.			
LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LEPH/HEPH
LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure. LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene. HEPHw = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.			
MET-D-F-HMI-CCMS-VA	Seawater	Diss. Metals in Seawater by CRC ICPMS	APHA 3030B/EPA 6020B (mod)
Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS (HMI Mode).			
PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)
PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.			
PAH-SUM-CALC-VA	Water	TOTAL PAH's	CALCULATION
Total PAH represents the sum of all PAH analytes reported for a given sample. Note that regulatory agencies and criteria differ in their definitions of Total PAH in terms of the individual PAH analytes to be included.			
VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.			
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.			
VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE VPH
VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure. VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene			
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION
Calculation of Total Xylenes Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

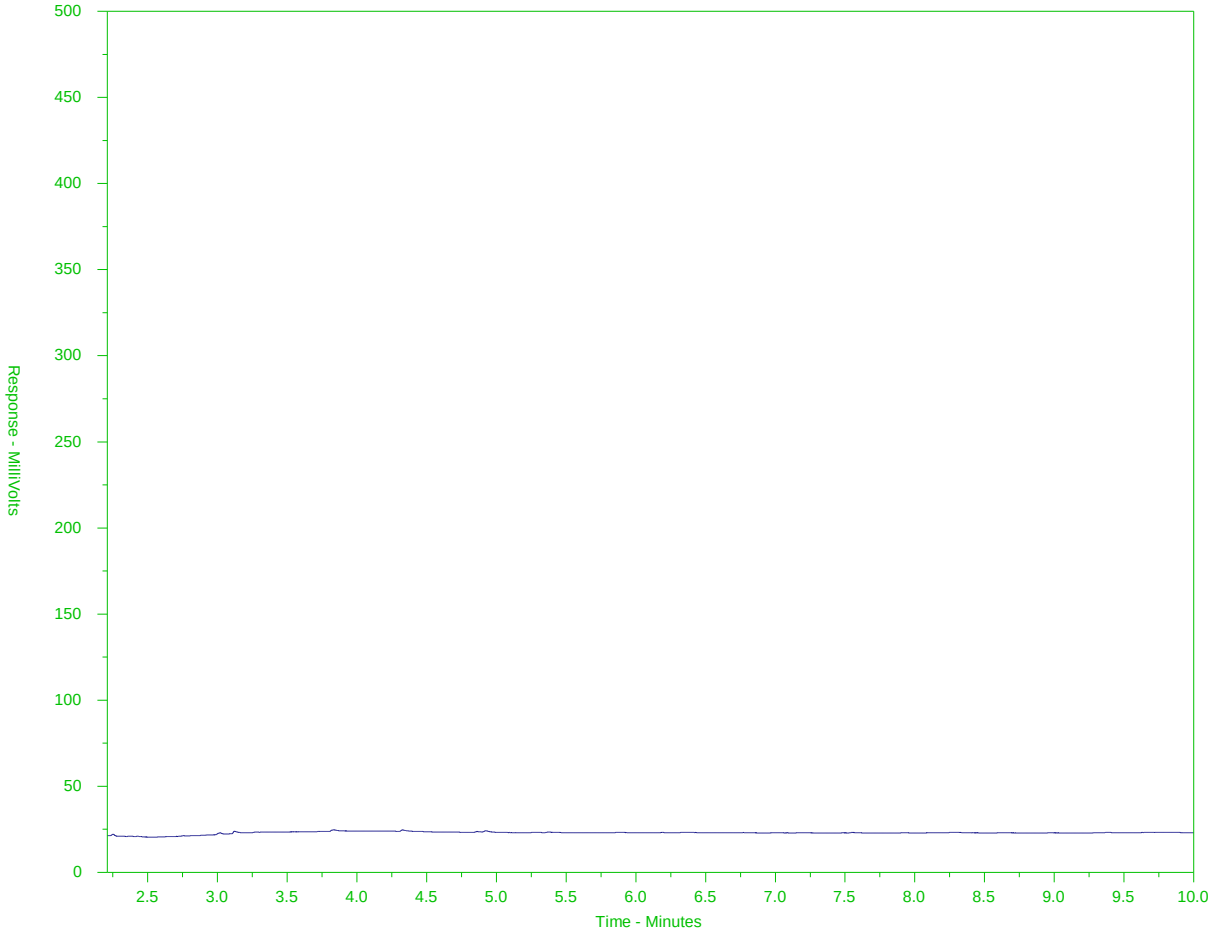
GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395640-1
Client Sample ID: PW17-1_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

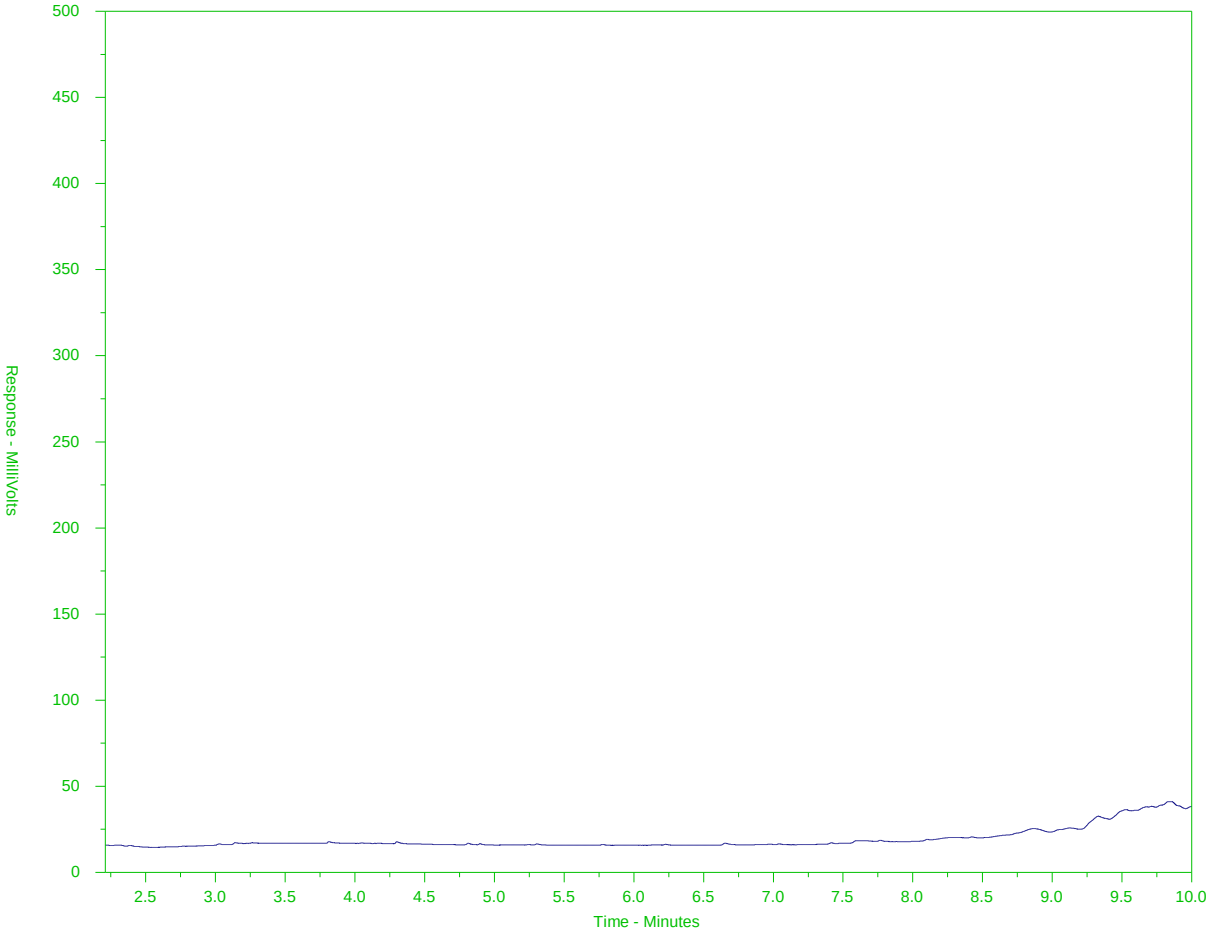
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395640-2
Client Sample ID: PW17-2_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

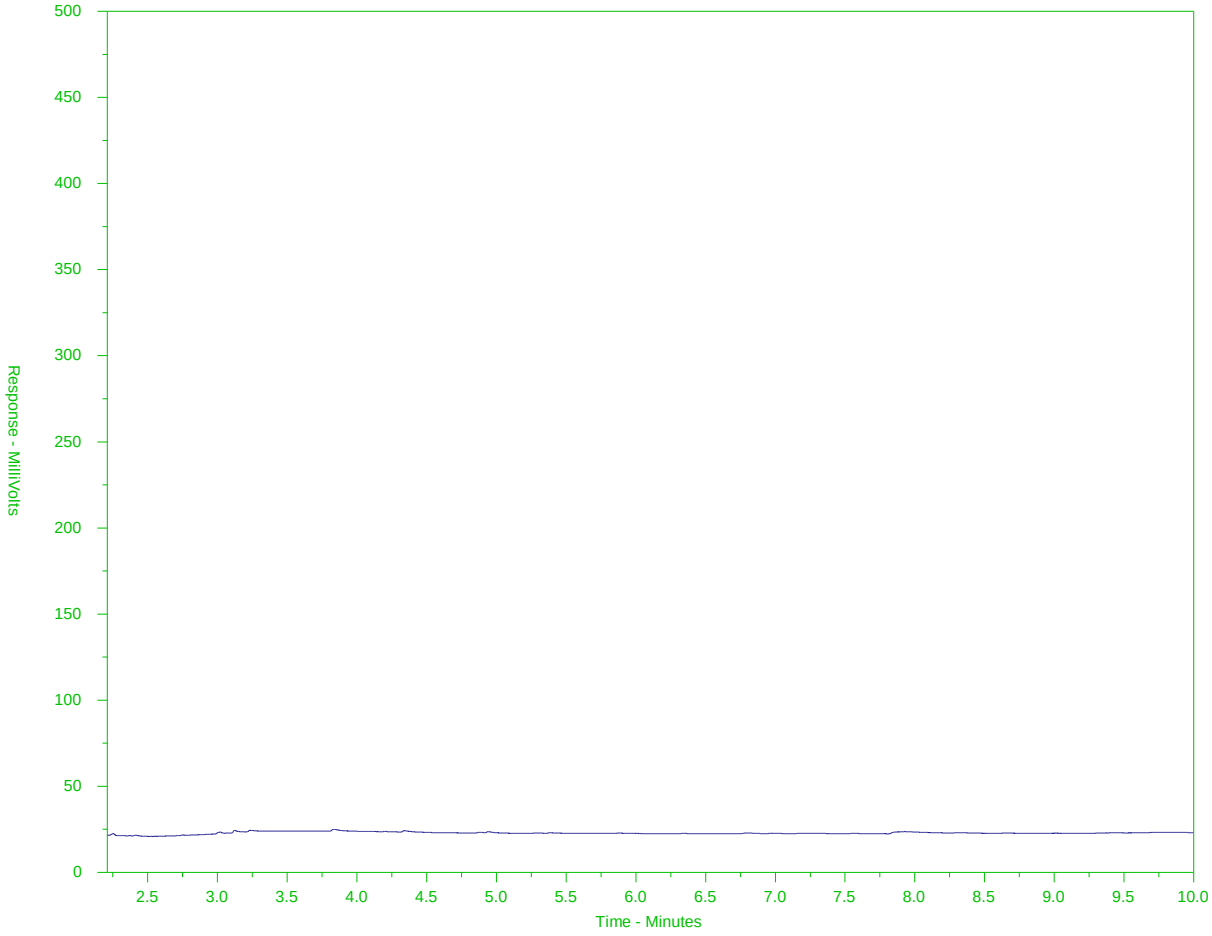
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395640-3
Client Sample ID: PW17-3_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

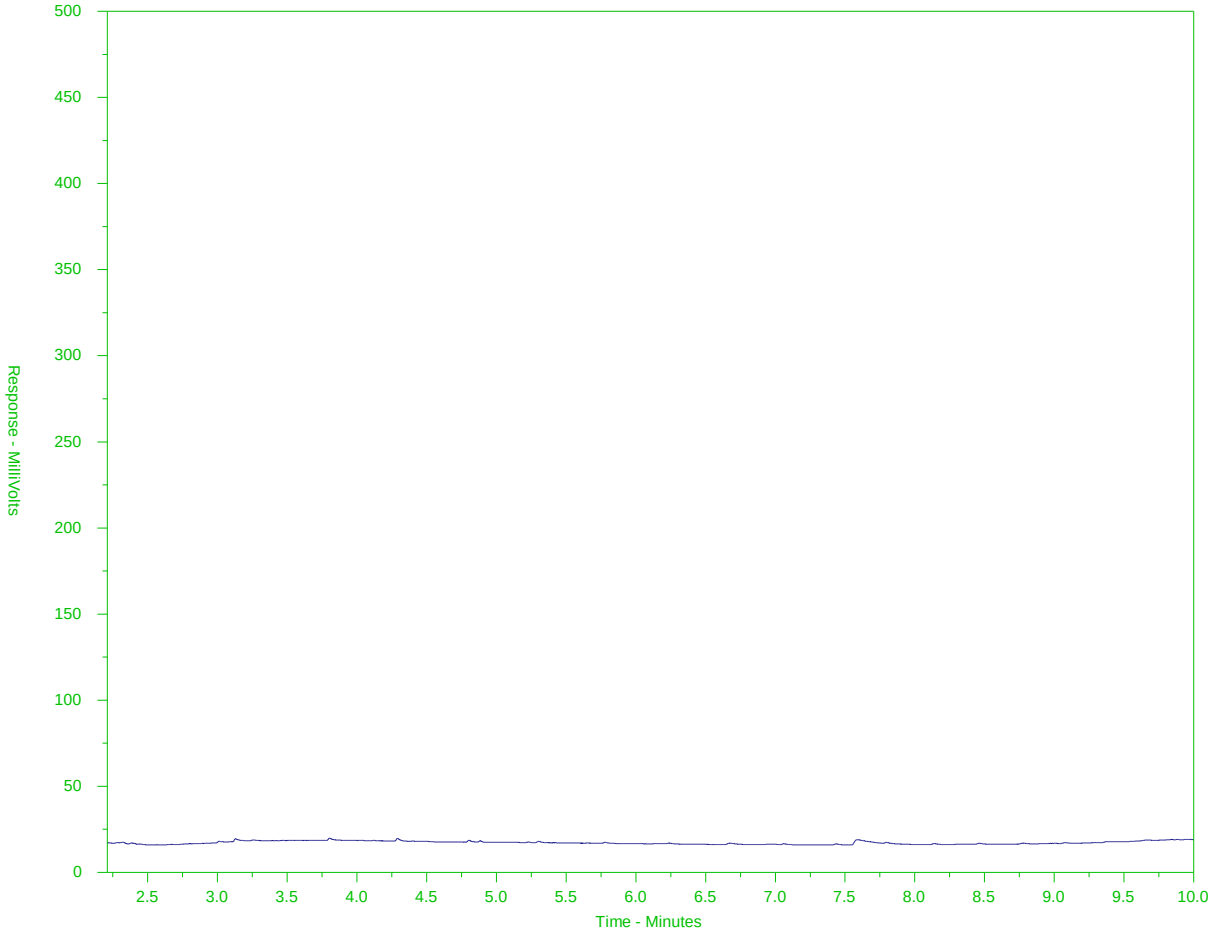
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395640-4
Client Sample ID: PW17-4_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

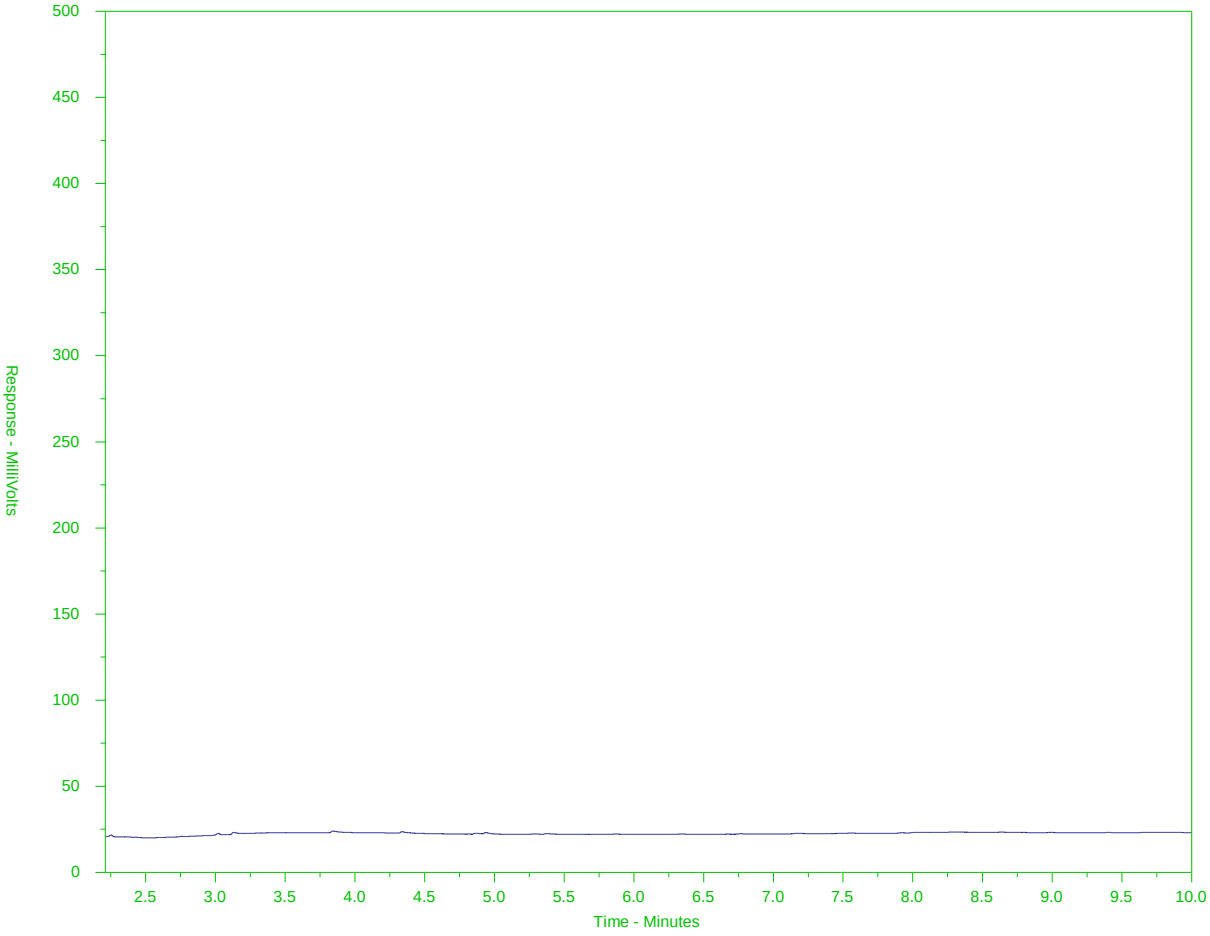
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395640-5
Client Sample ID: PW17-5_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

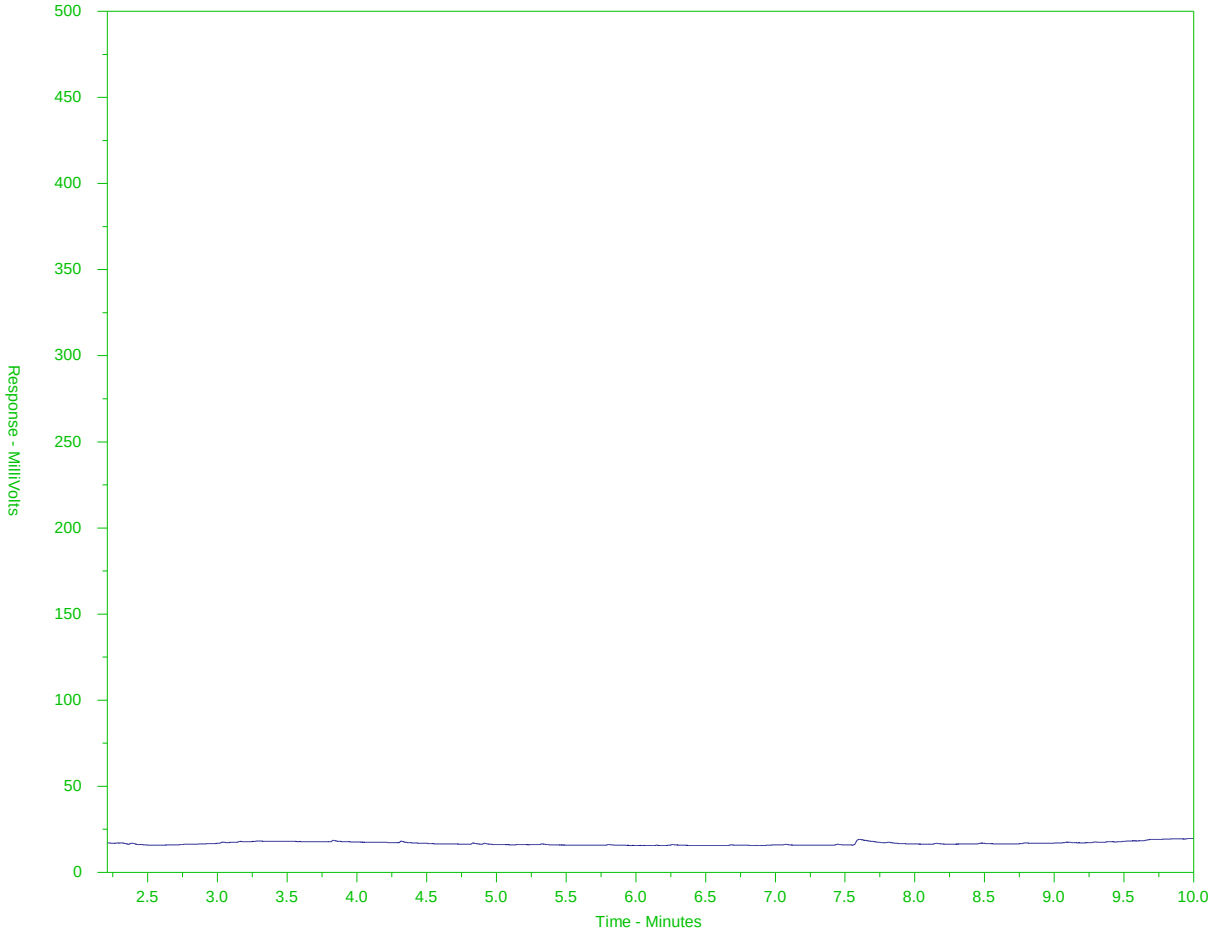
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395640-6
Client Sample ID: PW17-6_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

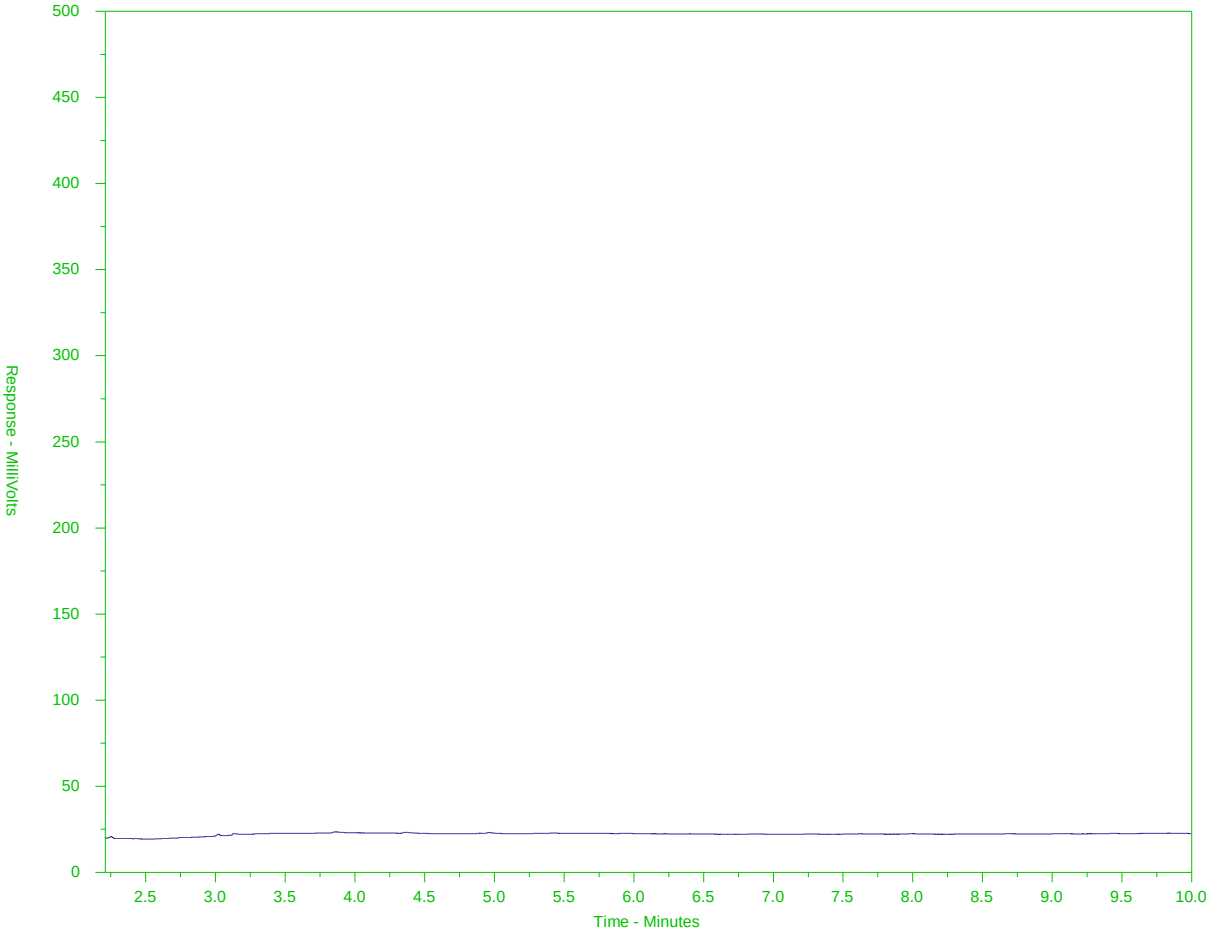
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395640-7
Client Sample ID: PW17-7_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

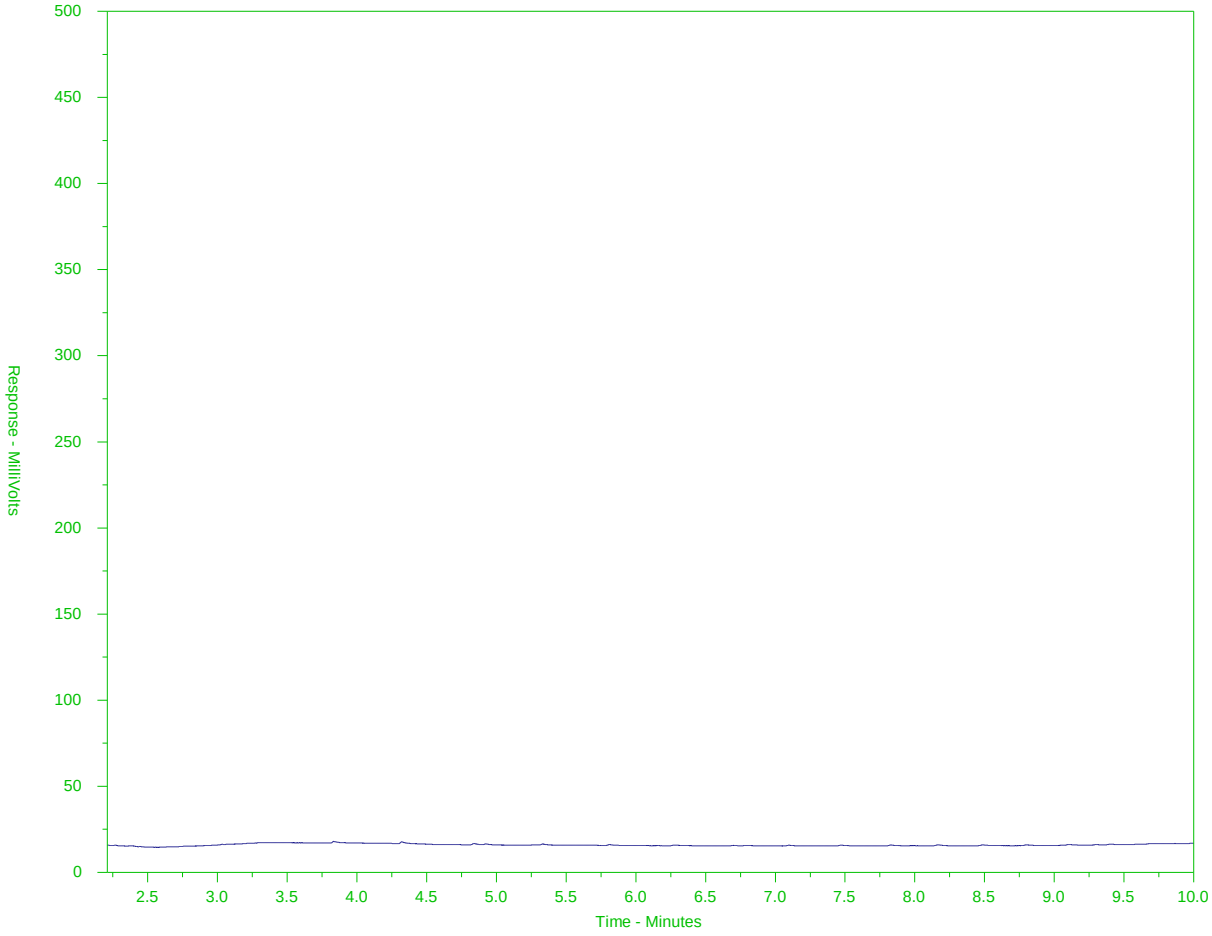
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395640-8
Client Sample ID: PW17-8_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

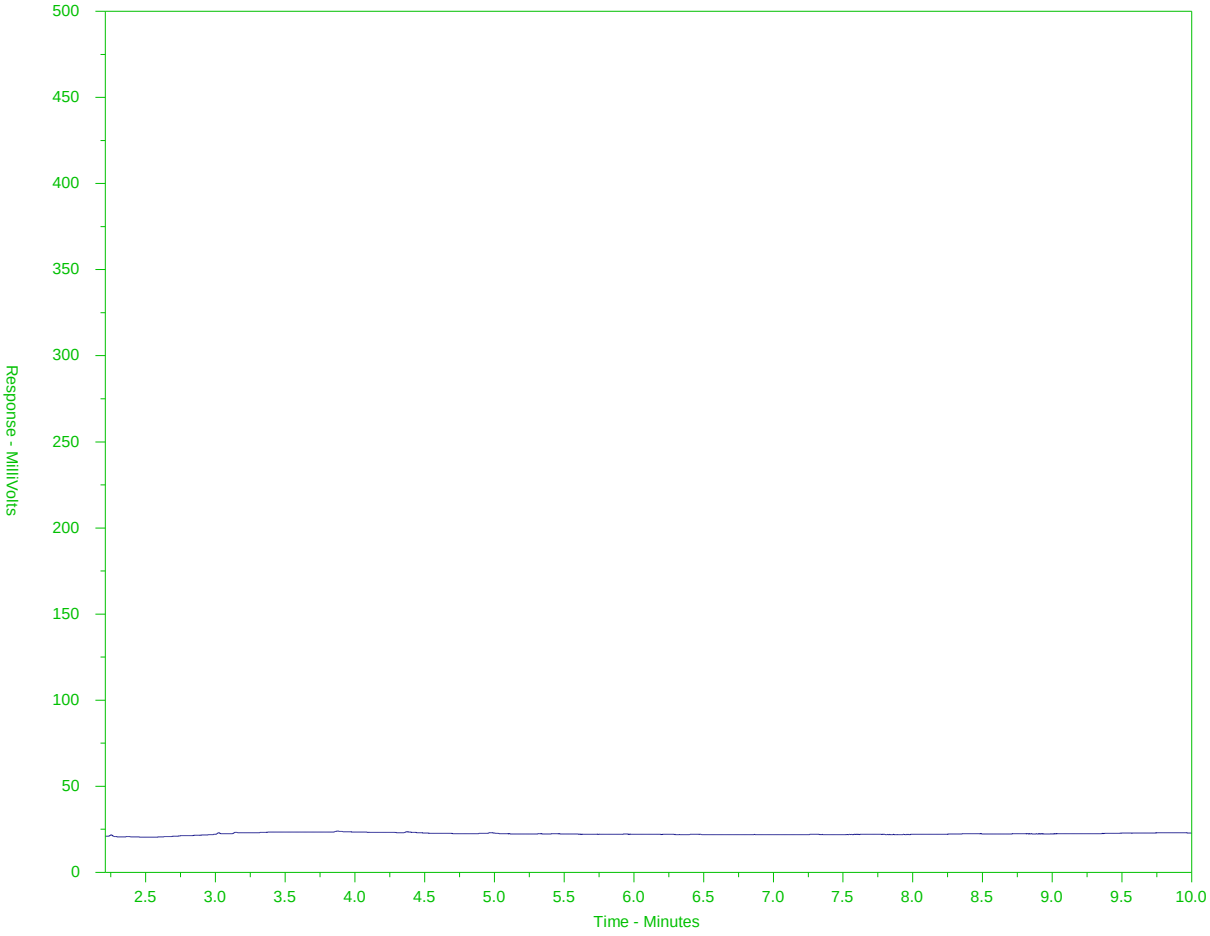
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395640-9
Client Sample ID: PW17-9_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

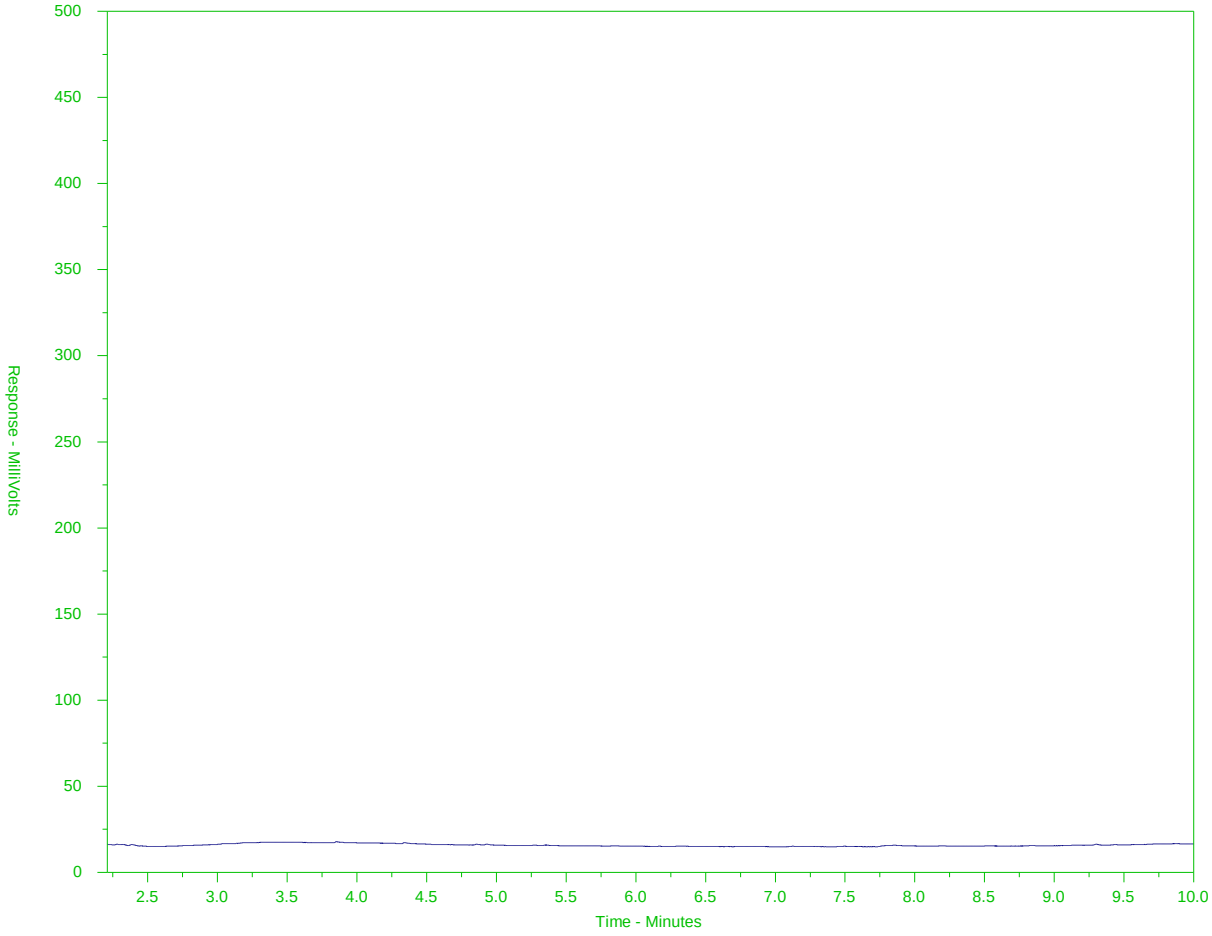
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395640-10
Client Sample ID: PW17-10_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

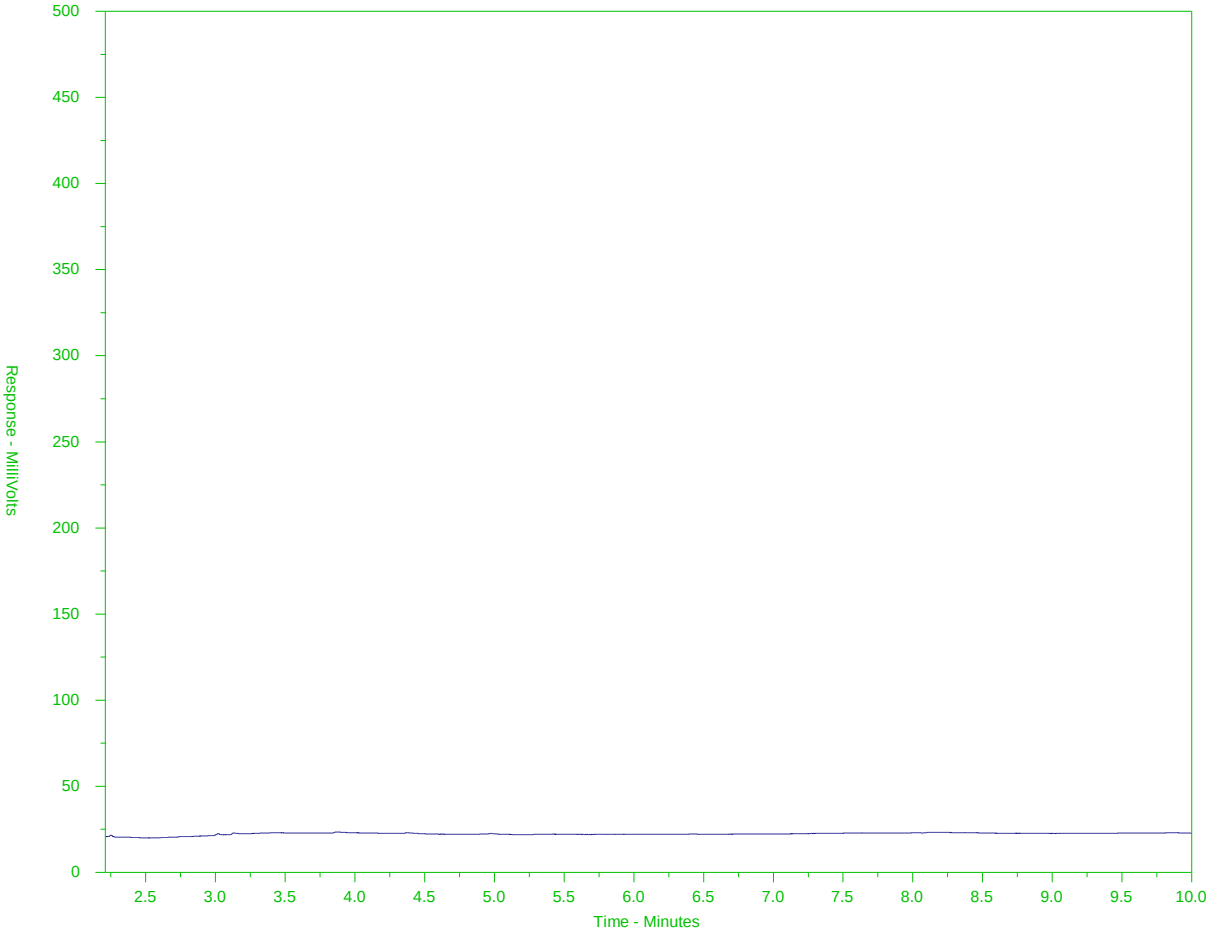
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2395640-11
Client Sample ID: R-BLANK-2_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2395640-COFC

COC Number: 17 - 784765

Page 1 of 2

Report To	Contact and company name below will appear on the final report
Company:	AECOM Canada Ltd.
Contact:	Leslie Southern
Phone:	604-444-6608
Company address below will appear on the final report	
Street:	3292 Production Way
City/Province:	Burnaby, BC
Postal Code:	V5A 4R4
Invoice To	Same as Report To ☐ YES ☒ NO
	Copy of Invoice with Report ☐ YES ☒ NO
Company:	Parkland Refining (B.C.)
Contact:	Christopher Boys

Report Format / Distribution

Select Report Format: ☒ PDF ☒ EXCEL ☒ EDD (DIGITAL)
Quality Control (QC) Report with Report ☒ YES ☐ NO
☒ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☒ EMAIL | | MAIL ☐ FAX
Email 1 or Fax: Leslie.Southern@aecom.com
Email 2: Justin.Becker@aecom.com
Email 3:

Invoice Distribution

Select Invoice Distribution: ☒ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: Leslie_Southern@aecom.com
Email 2:

Project Information

ALS Account # / Quote #:
Job #: 60601814 / ARO-0005
PO / AFE:
LSD: Burnaby Refinery

Oil and Gas Required Fields (client use)

AFE/Cost Center: | PO#:
Major/Minor Code: | Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only):
ALS Contact: Dean Watt
Sampler: JuB + C+W + AAR

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐
EMERGENCY: 1 Business day [E - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	P BTEX/VPH	P LEPH/HEPH	P Benzo(a)pyrene	P Naphthalene	F/P HRMS Dissolved Copper	F/P HRMS Dissolved Zinc	Nitrates/Sulfates/Alkalinity	Methane (Dissolved)	Silty Sample	Brackish Water (≥4000 µS/cm)	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	PW17-1_20191210	11-Dec-19	21:01	Parameter	5	X	X	X	X	X	X				X		
	PW17-2_20191210		20:35												X		
	PW17-3_20191210		21:59												X		
	PW17-4_20191210		21:52												X		
	PW17-5_20191210		22:04												X		
	PW17-6_20191210		22:20												X		
	PW17-7_20191210		21:36												X		
	PW17-8_20191210		22:34												X		
	PW17-9_20191210		20:20												X		
	PW17-10_20191210		21:25												X		
	R-Blank-2_20191210		N/A	Other	5	X	X			X	X						
	T-Blank-3		N/A	Other	1	X											

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☒ NO
Are samples for human consumption/ use? | | YES ☒ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

BC CSR
Only analyze for copper and zinc for metals
1, 2, 3, 4, 5 → T-Blank-3

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☐
Ice Packs ☐ Ice Cubes ☐ | Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
6.4	7.2	6.6	6.8				

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
Justin Becker	Dec. 12, 2019	00:25

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
AC	12:30 AM	

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
	12 Dec 19	

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2018 FRONT

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2395640-COFC

COC Number: 17 - 784765

Report To	Contact and company name below will appear on the final report
Company:	AECOM Canada Ltd.
Contact:	Leslie Southern
Phone:	604-444-6608
	Company address below will appear on the final report
Street:	3292 Production Way
City/Province:	Burnaby, BC
Postal Code:	V5A 4R4

Report Format / Distribution	
Select Report Format:	[X] PDF [X] EXCEL [X] EDD (DIGITAL)
Quality Control (QC) Report with Report	[X] YES [ ] NO
[X] Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	[X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	Leslie.Southern@aecom.com
Email 2	Justin.Becker@aecom.com
Email 3	

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] [X] Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] [ ]; 3 day [P3-25%] [ ]; 2 day [P2-50%] [ ]

EMERGENCY: 1 Business day [E - 100%] [ ]; Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] [ ]

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Invoice To		
	Same as Report To	[ ] YES [X] NO
	Copy of Invoice with Report	[ ] YES [X] NO
Company:	Parkland Refining (B.C.)	
Contact:	Christopher Boys	

Invoice Distribution	
Select Invoice Distribution:	[X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	Leslie_Southern@aecom.com
Email 2	

Project Information	
ALS Account # / Quote #:	
Job #:	60601814 / ARO-0005
PO / AFE:	
LSD:	Burnaby Refinery
ALS Lab Work Order # (lab use only):	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#:
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	
ALS Contact: Dean Watt	Sampler: JUB+CXW+AAR

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	BTEX/VPH (P)	LEPH/HEPH (P)	Benzo(a)pyrene (P)	Naphthalene (P)	HRMS Dissolved Copper (F/P)	HRMS Dissolved Zinc (F/P)	Nitrates/Sulfates/Alkalinity	Methane (Dissolved)	Silty Sample	Brackish Water (≥4000 µS/cm)	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	T-Blank-4	11-Dec-19	N/A	Porewater	1	X											

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? [ ] YES [X] NO	BC CSR
Are samples for human consumption/ use? [ ] YES [X] NO	only analyze for copper and zinc for metals

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen [ ] SIF Observations Yes [ ] No [ ]

Ice Packs [ ] Ice Cubes [ ] Custody seal intact Yes [ ] No [ ]

Cooling Initiated [ ]

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Justin Becker	Date: Dec. 12, 2019	Time: 00:25	Received by:	Date:	Time:	Received by: AC	Date: 12 Dec 19	Time: 12:30 PM

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2018 FRONT

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

AECOM CANADA LTD.
ATTN: Leslie Southern
3292 Production Way
Suite 330
Burnaby BC V5A 4R4

Date Received: 13-DEC-19
Report Date: 19-DEC-19 18:19 (MT)
Version: FINAL

Client Phone: 604-444-6608

Certificate of Analysis

Lab Work Order #: L2396150

Project P.O. #:	0015243589
Job Reference:	60601814/ARO-0005
C of C Numbers:	17-784765
Legal Site Desc:	Burnaby Refinery

Dean Watt, B.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2396150-3	L2396150-5	L2396150-6	L2396150-8	L2396150-9
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	12-DEC-19	12-DEC-19	12-DEC-19	12-DEC-19	12-DEC-19
	Sampled Time	21:40	21:36	21:56	22:08	22:22
	Client ID	PW17-18_20191210|REG|GW	PW17-22_20191210|REG|GW	PW17-23_20191210|REG|GW	PW17-27_20191210|REG|GW	PW17-28_20191210|REG|GW
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Copper (Cu)-Dissolved (ug/L)	<0.20	0.53	0.33	0.31	<0.20
	Zinc (Zn)-Dissolved (ug/L)	4.8	1.2	1.4	1.2	1.4

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2396150-10	L2396150-11			
	Description	Porewater	Porewater			
	Sampled Date	12-DEC-19	12-DEC-19			
	Sampled Time	12:00	12:00			
	Client ID	DUP-1_20191210|FD|GW	DUP-2_20191210|FD|GW			
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD			
	Copper (Cu)-Dissolved (ug/L)	0.49	0.32			
	Zinc (Zn)-Dissolved (ug/L)	<1.0	2.4			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2396150-1 Porewater 12-DEC-19 22:10 PW17-16_20191210|REG|GW	L2396150-2 Porewater 12-DEC-19 21:55 PW17-17_20191210|REG|GW	L2396150-3 Porewater 12-DEC-19 21:40 PW17-18_20191210|REG|GW	L2396150-4 Porewater 12-DEC-19 21:20 PW17-21_20191210|REG|GW	L2396150-5 Porewater 12-DEC-19 21:36 PW17-22_20191210|REG|GW
WATER						
Dissolved Metals	Dissolved Metals Filtration Location	FIELD	FIELD		FIELD	
	Copper (Cu)-Dissolved (ug/L)	<1.0 DLA	<0.20		<1.0 DLA	
	Zinc (Zn)-Dissolved (ug/L)	<5.0 DLA	1.4		<5.0 DLA	
Volatile Organic Compounds	Benzene (ug/L)	4.63	10.6	<0.50	0.70	<0.50
	Ethylbenzene (ug/L)	8.14	<0.50	<0.50	<0.50	<0.50
	Styrene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Toluene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	ortho-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	meta- & para-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Xylenes (ug/L)	<0.75	<0.75	<0.75	<0.75	<0.75
Hydrocarbons	EPH10-19 (ug/L)	350	<250	<250	<250	<250
	EPH19-32 (ug/L)	<250	<250	<250	<250	<250
	LEPH (ug/L)	350	<250	<250	<250	<250
	HEPH (ug/L)	<250	<250	<250	<250	<250
	Volatile Hydrocarbons (VH6-10) (ug/L)	520	290	<100	<100	<100
	VPH (C6-C10) (ug/L)	510	280	<100	<100	<100
	Surrogate: 2-Bromobenzotrifluoride (%)	101.9	100.2	98.7	102.8	91.2
Polycyclic Aromatic Hydrocarbons	Acenaphthene (ug/L)	0.124	<0.010	<0.010	<0.010	<0.010
	Acenaphthylene (ug/L)	<0.020 DLCI	<0.010	<0.010	<0.010	<0.010
	Acridine (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benz(a)anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(a)pyrene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Benzo(b&j)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(b+j+k)fluoranthene (ug/L)	<0.015	<0.015	<0.015	<0.015	<0.015
	Benzo(g,h,i)perylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(k)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Chrysene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Dibenz(a,h)anthracene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Fluorene (ug/L)	0.109	<0.010	<0.010	<0.010	<0.010
	Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	1-Methylnaphthalene (ug/L)	1.69	<0.050	<0.050	<0.050	<0.050
	2-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Naphthalene (ug/L)	<0.60 DLQ	<0.10 DLQ	<0.050	<0.090 DLQ	<0.050
	Phenanthrene (ug/L)	0.027	<0.020	<0.020	<0.020	<0.020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2396150-6 Porewater 12-DEC-19 21:56 PW17-23_20191210|REG|GW	L2396150-7 Porewater 12-DEC-19 22:27 PW17-26_20191210|REG|GW	L2396150-8 Porewater 12-DEC-19 22:08 PW17-27_20191210|REG|GW	L2396150-9 Porewater 12-DEC-19 22:22 PW17-28_20191210|REG|GW	L2396150-10 Porewater 12-DEC-19 12:00 DUP-1_20191210|FD|GW
WATER						
Dissolved Metals	Dissolved Metals Filtration Location		FIELD			
	Copper (Cu)-Dissolved (ug/L)		0.30			
	Zinc (Zn)-Dissolved (ug/L)		2.1			
Volatile Organic Compounds	Benzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Ethylbenzene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Styrene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Toluene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	ortho-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	meta- & para-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	<0.50
	Xylenes (ug/L)	<0.75	<0.75	<0.75	<0.75	<0.75
Hydrocarbons	EPH10-19 (ug/L)	<250	<250	<250	<250	<250
	EPH19-32 (ug/L)	<250	<250	<250	<250	<250
	LEPH (ug/L)	<250	<250	<250	<250	<250
	HEPH (ug/L)	<250	<250	<250	<250	<250
	Volatile Hydrocarbons (VH6-10) (ug/L)	<100	<100	<100	<100	<100
	VPH (C6-C10) (ug/L)	<100	<100	<100	<100	<100
	Surrogate: 2-Bromobenzotrifluoride (%)	98.7	93.3	97.3	97.3	98.0
Polycyclic Aromatic Hydrocarbons	Acenaphthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acenaphthylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Acridine (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benz(a)anthracene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(a)pyrene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Benzo(b&j)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(b+j+k)fluoranthene (ug/L)	<0.015	<0.015	<0.015	<0.015	<0.015
	Benzo(g,h,i)perylene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Benzo(k)fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Chrysene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Dibenz(a,h)anthracene (ug/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Fluoranthene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Fluorene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	1-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	2-Methylnaphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Naphthalene (ug/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Phenanthrene (ug/L)	<0.020	<0.020	<0.020	<0.020	<0.020

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2396150-11	L2396150-12	L2396150-13	L2396150-14	
	Description	Porewater	Porewater	Porewater	Porewater	
	Sampled Date	12-DEC-19	12-DEC-19	12-DEC-19	12-DEC-19	
	Sampled Time	12:00	12:00			
	Client ID	DUP-2_20191210|FD|GW	DUP-3_20191210|FD|GW	TRAVEL BLANK-5	TRAVEL BLANK-6	
Grouping	**Analyte**					
WATER						
Dissolved Metals	Dissolved Metals Filtration Location		FIELD			
	Copper (Cu)-Dissolved (ug/L)		0.22			
	Zinc (Zn)-Dissolved (ug/L)		1.6			
Volatile Organic Compounds	Benzene (ug/L)	<0.50	<0.50	<0.50	<0.50	
	Ethylbenzene (ug/L)	<0.50	<0.50	<0.50	<0.50	
	Styrene (ug/L)	<0.50	<0.50	<0.50	<0.50	
	Toluene (ug/L)	<0.50	<0.50	<0.50	<0.50	
	ortho-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	
	meta- & para-Xylene (ug/L)	<0.50	<0.50	<0.50	<0.50	
	Xylenes (ug/L)	<0.75	<0.75	<0.75	<0.75	
Hydrocarbons	EPH10-19 (ug/L)	<250	<250			
	EPH19-32 (ug/L)	<250	<250			
	LEPH (ug/L)	<250	<250			
	HEPH (ug/L)	<250	<250			
	Volatile Hydrocarbons (VH6-10) (ug/L)	<100	<100	<100	<100	
	VPH (C6-C10) (ug/L)	<100	<100	<100	<100	
	Surrogate: 2-Bromobenzotrifluoride (%)	99.2	98.1			
Polycyclic Aromatic Hydrocarbons	Acenaphthene (ug/L)	<0.010	<0.010			
	Acenaphthylene (ug/L)	<0.010	<0.010			
	Acridine (ug/L)	<0.010	<0.010			
	Anthracene (ug/L)	<0.010	<0.010			
	Benz(a)anthracene (ug/L)	<0.010	<0.010			
	Benzo(a)pyrene (ug/L)	<0.0050	<0.0050			
	Benzo(b&j)fluoranthene (ug/L)	<0.010	<0.010			
	Benzo(b+j+k)fluoranthene (ug/L)	<0.015	<0.015			
	Benzo(g,h,i)perylene (ug/L)	<0.010	<0.010			
	Benzo(k)fluoranthene (ug/L)	<0.010	<0.010			
	Chrysene (ug/L)	<0.010	<0.010			
	Dibenz(a,h)anthracene (ug/L)	<0.0050	<0.0050			
	Fluoranthene (ug/L)	<0.010	<0.010			
	Fluorene (ug/L)	<0.010	<0.010			
	Indeno(1,2,3-c,d)pyrene (ug/L)	<0.010	<0.010			
	1-Methylnaphthalene (ug/L)	<0.050	<0.050			
	2-Methylnaphthalene (ug/L)	<0.050	<0.050			
	Naphthalene (ug/L)	<0.050	<0.050			
	Phenanthrene (ug/L)	<0.020	<0.020			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2396150-1	L2396150-2	L2396150-3	L2396150-4	L2396150-5
	Description	Porewater	Porewater	Porewater	Porewater	Porewater
	Sampled Date	12-DEC-19	12-DEC-19	12-DEC-19	12-DEC-19	12-DEC-19
	Sampled Time	22:10	21:55	21:40	21:20	21:36
	Client ID	PW17-16_20191210|REG|GW	PW17-17_20191210|REG|GW	PW17-18_20191210|REG|GW	PW17-21_20191210|REG|GW	PW17-22_20191210|REG|GW
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Quinoline (ug/L)	<0.80 DLCI	<0.070 DLCI	<0.050	<0.080 DLCI	<0.050
	Surrogate: Acridine d9 (%)	93.3	102.2	90.0	104.5	97.0
	Surrogate: Chrysene d12 (%)	107.0	101.3	101.2	104.9	100.5
	Surrogate: Naphthalene d8 (%)	110.1	100.4	107.6	117.6	108.8
	Surrogate: Phenanthrene d10 (%)	105.2	112.4	107.1	118.1	110.5
	Total PAHs (ug/L)	1.9	<0.15	<0.11	<0.15	<0.11

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2396150-6 Porewater 12-DEC-19 21:56 PW17-23_20191210|REG|GW	L2396150-7 Porewater 12-DEC-19 22:27 PW17-26_20191210|REG|GW	L2396150-8 Porewater 12-DEC-19 22:08 PW17-27_20191210|REG|GW	L2396150-9 Porewater 12-DEC-19 22:22 PW17-28_20191210|REG|GW	L2396150-10 Porewater 12-DEC-19 12:00 DUP-1_20191210|FD|GW
WATER						
Polycyclic Aromatic Hydrocarbons	Pyrene (ug/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Quinoline (ug/L)	<0.050	<0.070 DLCI	<0.050	<0.050	<0.050
	Surrogate: Acridine d9 (%)	88.1	91.4	108.1	87.6	79.9
	Surrogate: Chrysene d12 (%)	113.2	105.0	110.6	102.0	102.5
	Surrogate: Naphthalene d8 (%)	111.7	99.2	116.5	104.5	111.4
	Surrogate: Phenanthrene d10 (%)	118.2	105.5	116.2	105.1	105.5
	Total PAHs (ug/L)	<0.11	<0.12	<0.11	<0.11	<0.11

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2396150-11	L2396150-12	L2396150-13	L2396150-14	
	Description	Porewater	Porewater	Porewater	Porewater	
	Sampled Date	12-DEC-19	12-DEC-19	12-DEC-19	12-DEC-19	
	Sampled Time	12:00	12:00			
	Client ID	DUP-2_20191210|FD|GW	DUP-3_20191210|FD|GW	TRAVEL BLANK-5	TRAVEL BLANK-6	
Grouping	**Analyte**					
WATER						
Polycyclic Aromatic Hydrocarbons	Pyrene (ug/L)	<0.010	<0.010			
	Quinoline (ug/L)	<0.050	<0.070 DLCI			
	Surrogate: Acridine d9 (%)	91.7	90.2			
	Surrogate: Chrysene d12 (%)	105.3	114.4			
	Surrogate: Naphthalene d8 (%)	120.0	117.4			
	Surrogate: Phenanthrene d10 (%)	114.1	118.4			
	Total PAHs (ug/L)	<0.11	<0.12			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLCI	Detection Limit Raised: Chromatographic Interference due to co-elution.
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
EPH-ME-FID-VA	Water	EPH in Water	BC Lab Manual
EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.			
LEPH/HEPH-CALC-VA	Water	LEPHs and HEPHs	BC MOE LEPH/HEPH
LEPHw and HEPHw are measures of Light and Heavy Extractable Petroleum Hydrocarbons in water. Results are calculated by subtraction of applicable PAH concentrations from EPH10-19 and EPH19-32, as per the BC Lab Manual LEPH/HEPH calculation procedure. LEPHw = EPH10-19 minus Acenaphthene, Acridine, Anthracene, Fluorene, Naphthalene and Phenanthrene. HEPHw = EPH19-32 minus Benz(a)anthracene, Benzo(a)pyrene, Fluoranthene, and Pyrene.			
MET-D-F-HMI-CCMS-VA	Seawater	Diss. Metals in Seawater by CRC ICPMS	APHA 3030B/EPA 6020B (mod)
Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS (HMI Mode).			
MET-D-XXX-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020B (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
PAH-ME-MS-VA	Water	PAHs in Water	EPA 3511/8270D (mod)
PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS. Because the two isomers cannot be readily separated chromatographically, benzo(j)fluoranthene is reported as part of the benzo(b)fluoranthene parameter.			
PAH-SUM-CALC-VA	Water	TOTAL PAH's	CALCULATION
Total PAH represents the sum of all PAH analytes reported for a given sample. Note that regulatory agencies and criteria differ in their definitions of Total PAH in terms of the individual PAH analytes to be included.			
VH-HSFID-VA	Water	VH in Water by Headspace GCFID	BC Env. Lab Manual (VH in Water)
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.			
VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.			
VPH-CALC-VA	Water	VPH is VH minus select aromatics	BC MOE VPH
VPHw measures Volatile Petroleum Hydrocarbons in water. Results are calculated by subtraction of specific Monocyclic Aromatic Hydrocarbons from VH6-10, as per the BC Lab Manual VPH calculation procedure. VPHw = VH6-10 minus Benzene, Toluene, Ethylbenzene, Xylenes, and Styrene			
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION
Calculation of Total Xylenes Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

17-784765

Reference Information

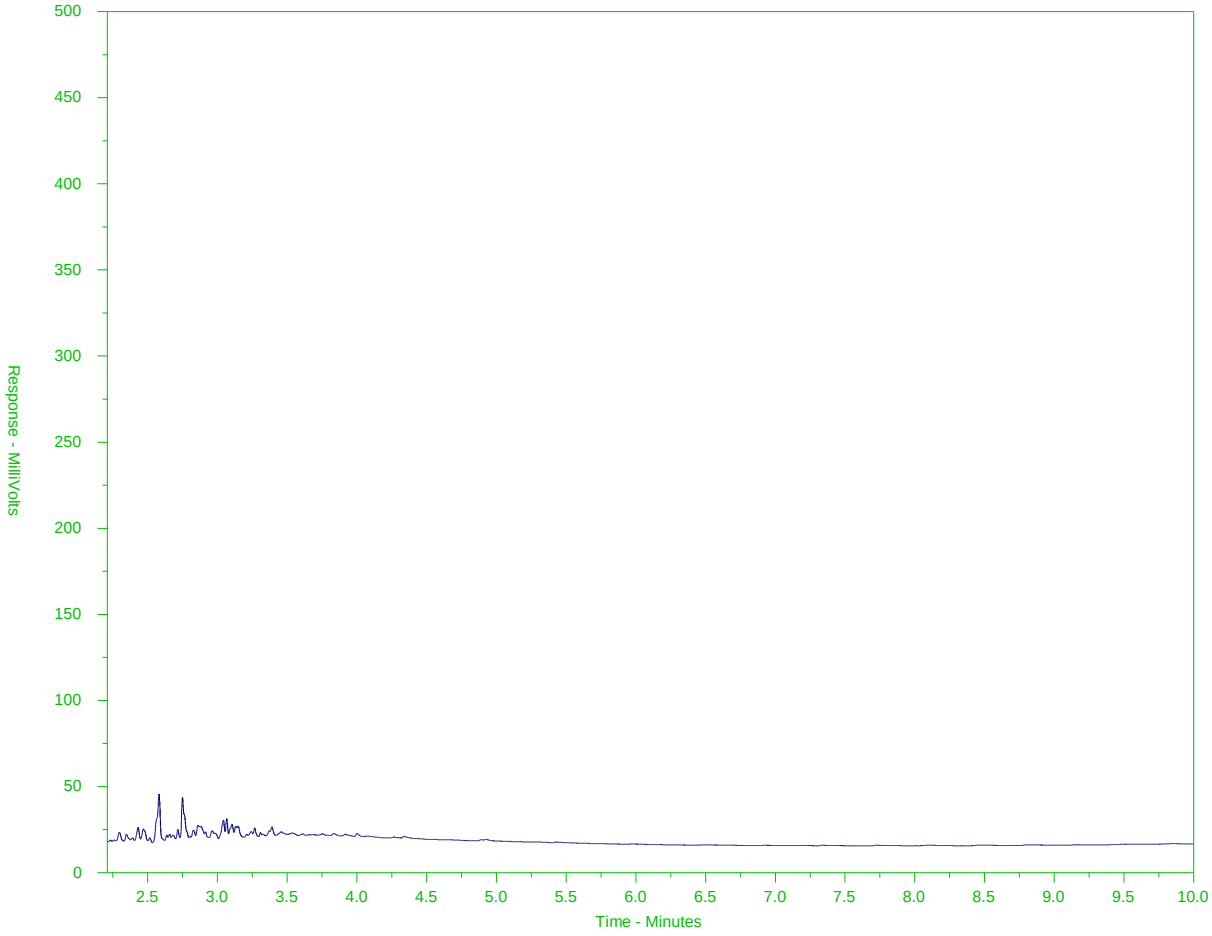
GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2396150-1
Client Sample ID: PW17-16_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

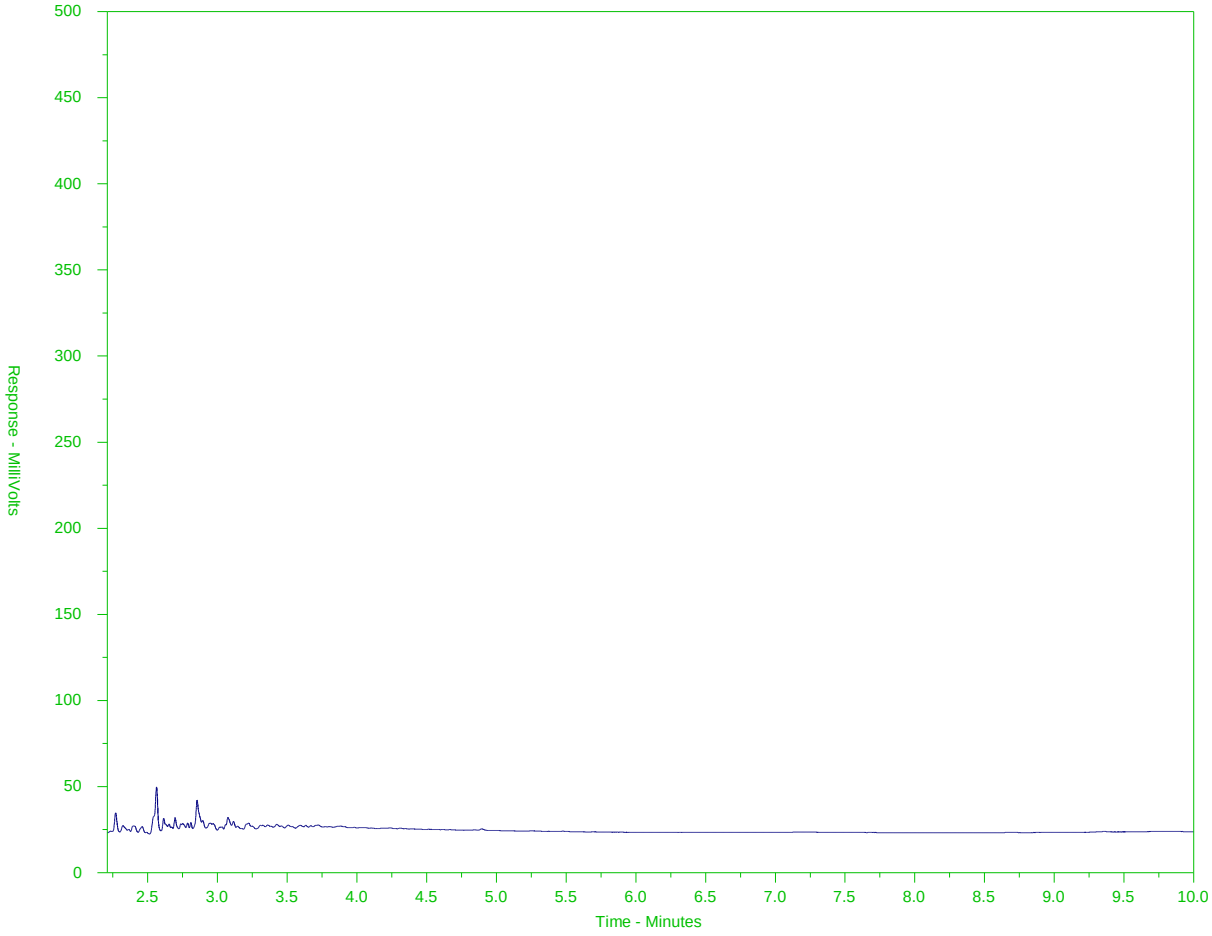
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2396150-2
Client Sample ID: PW17-17_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

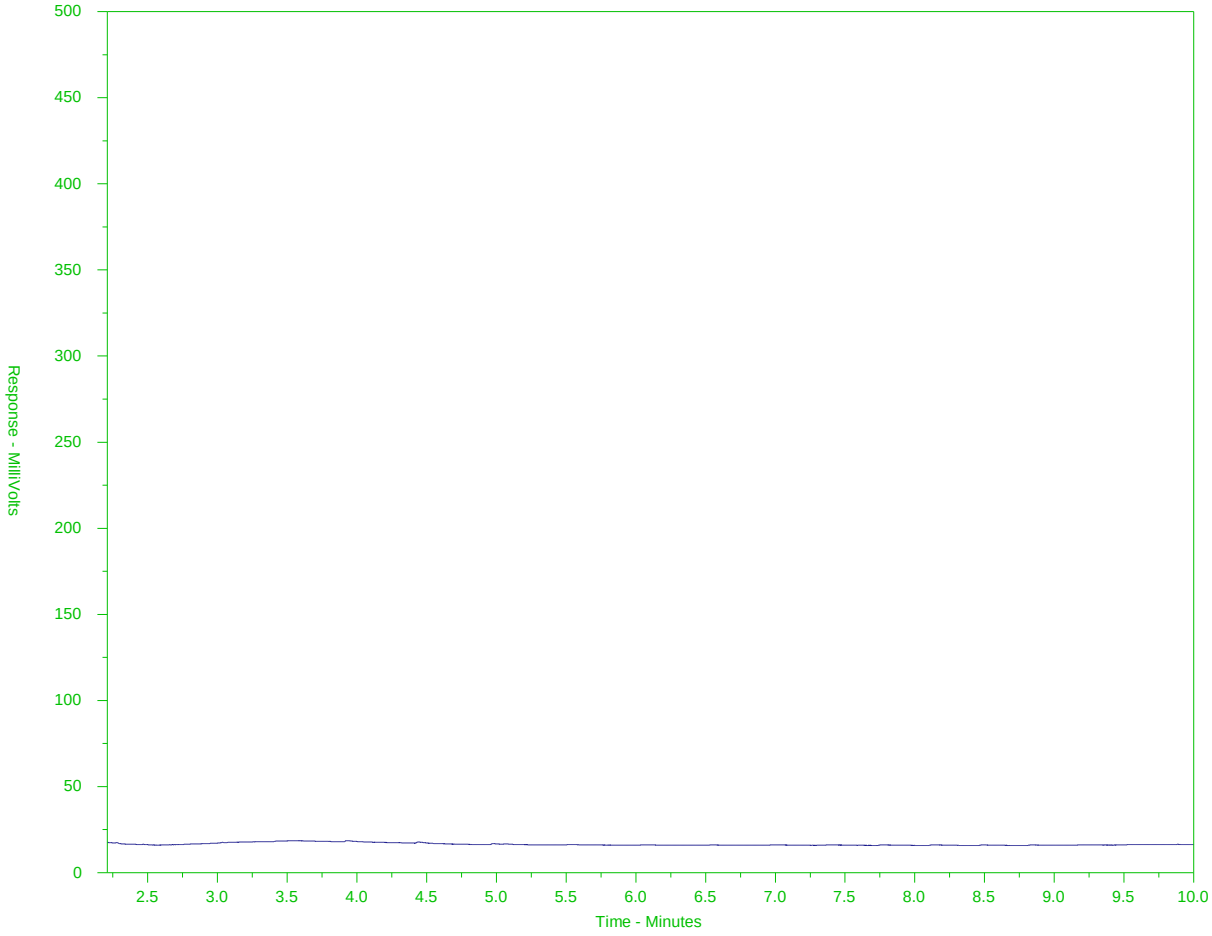
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2396150-3
Client Sample ID: PW17-18_20191210|REG|GW



← EPH10-19 →	← EPH19-32 →	
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

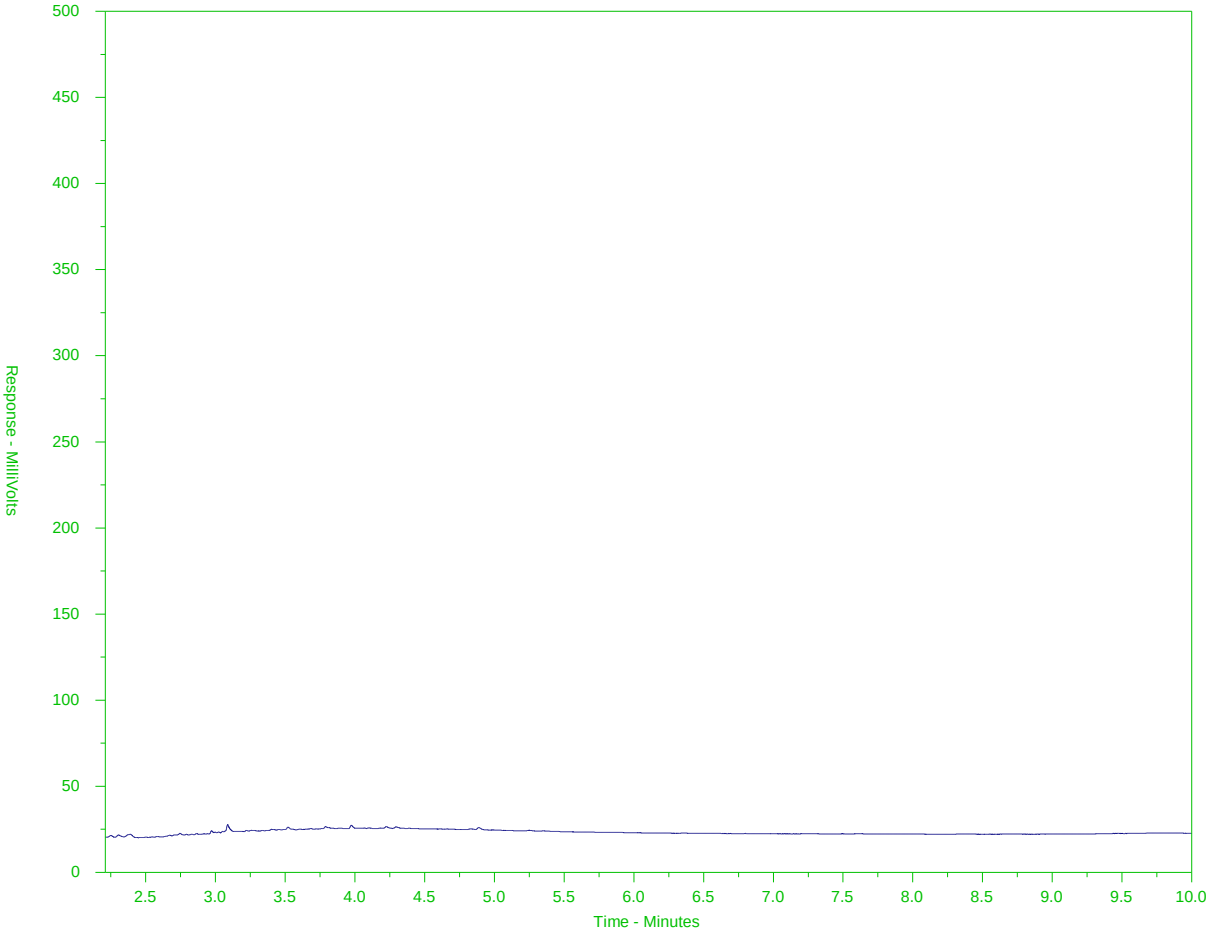
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2396150-4
Client Sample ID: PW17-21_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

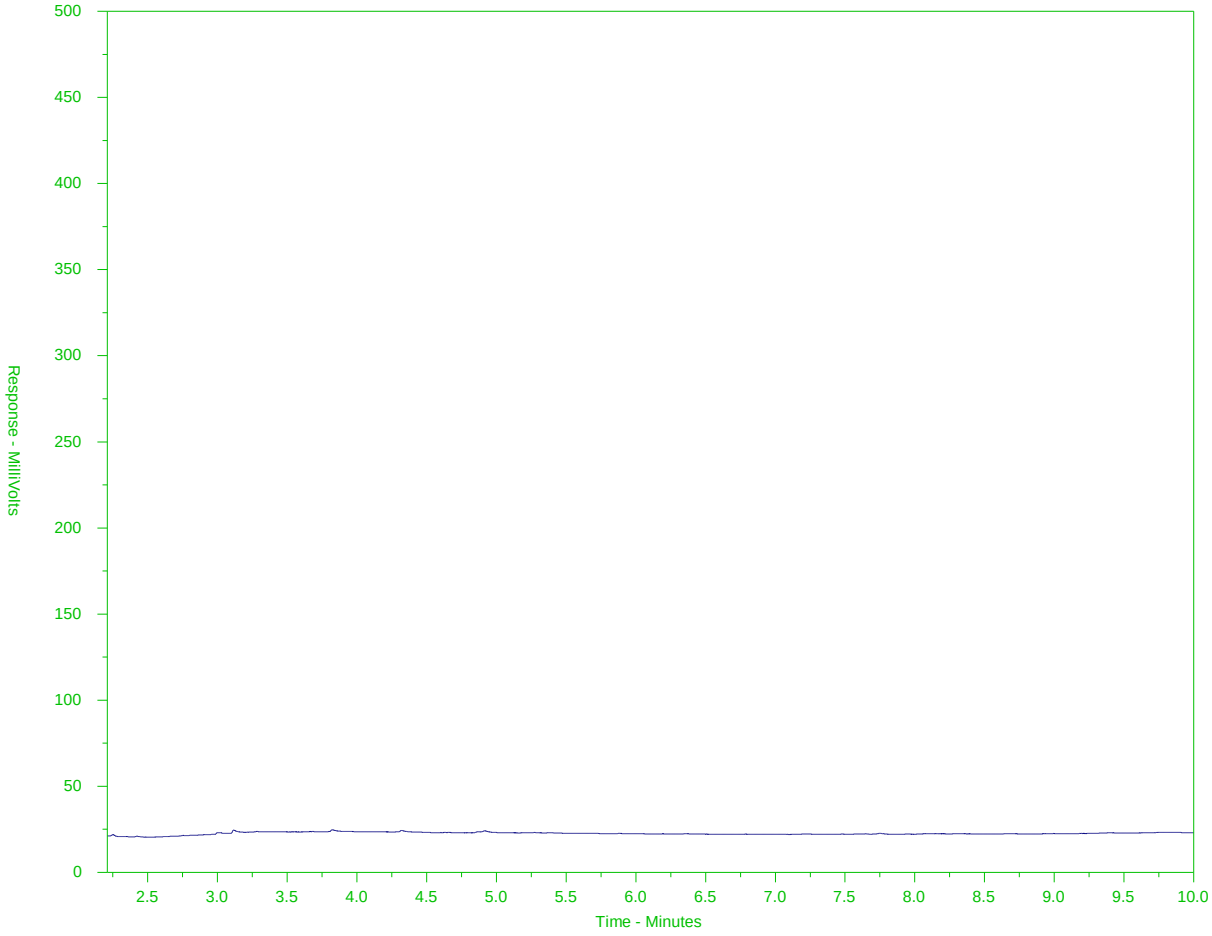
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2396150-5
Client Sample ID: PW17-22_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

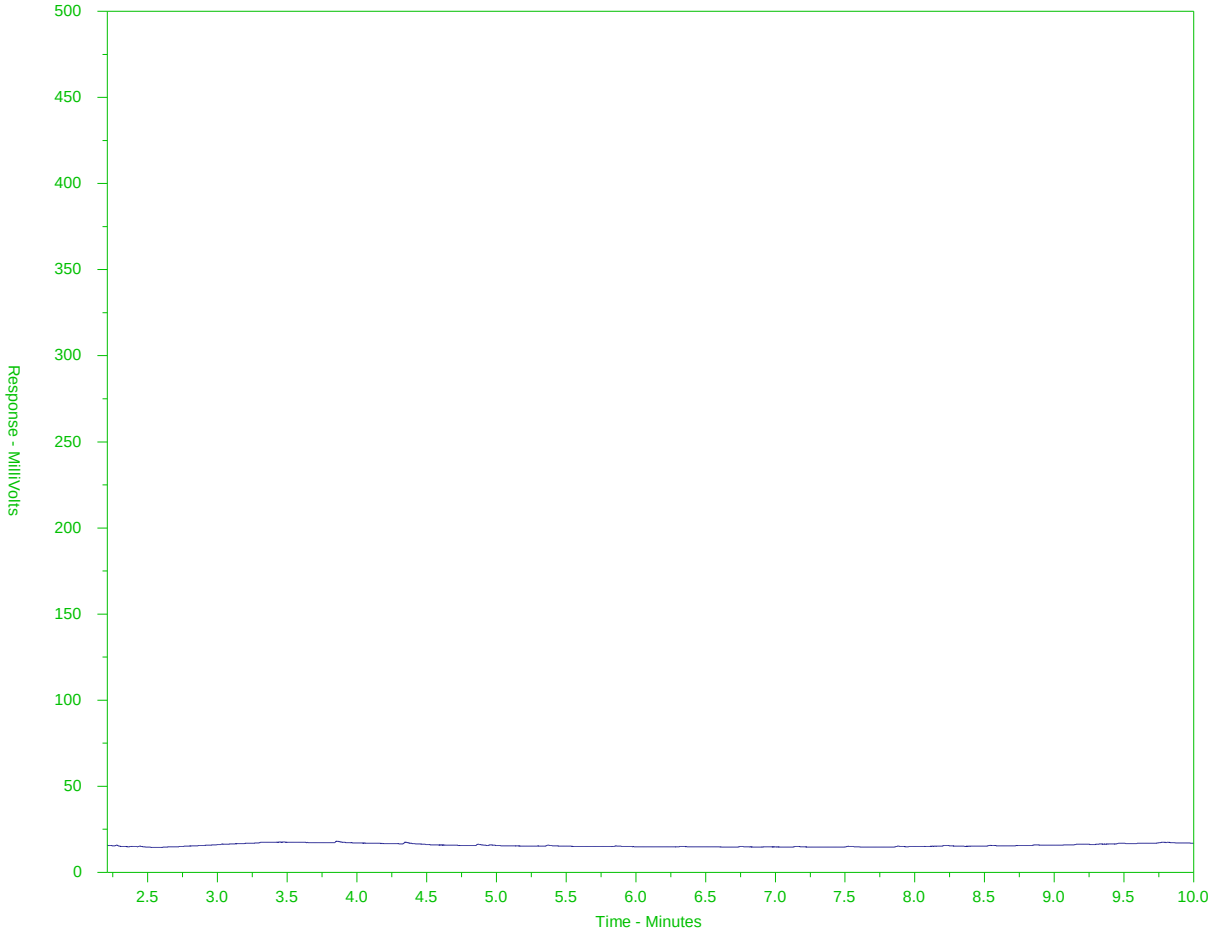
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2396150-6
Client Sample ID: PW17-23_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

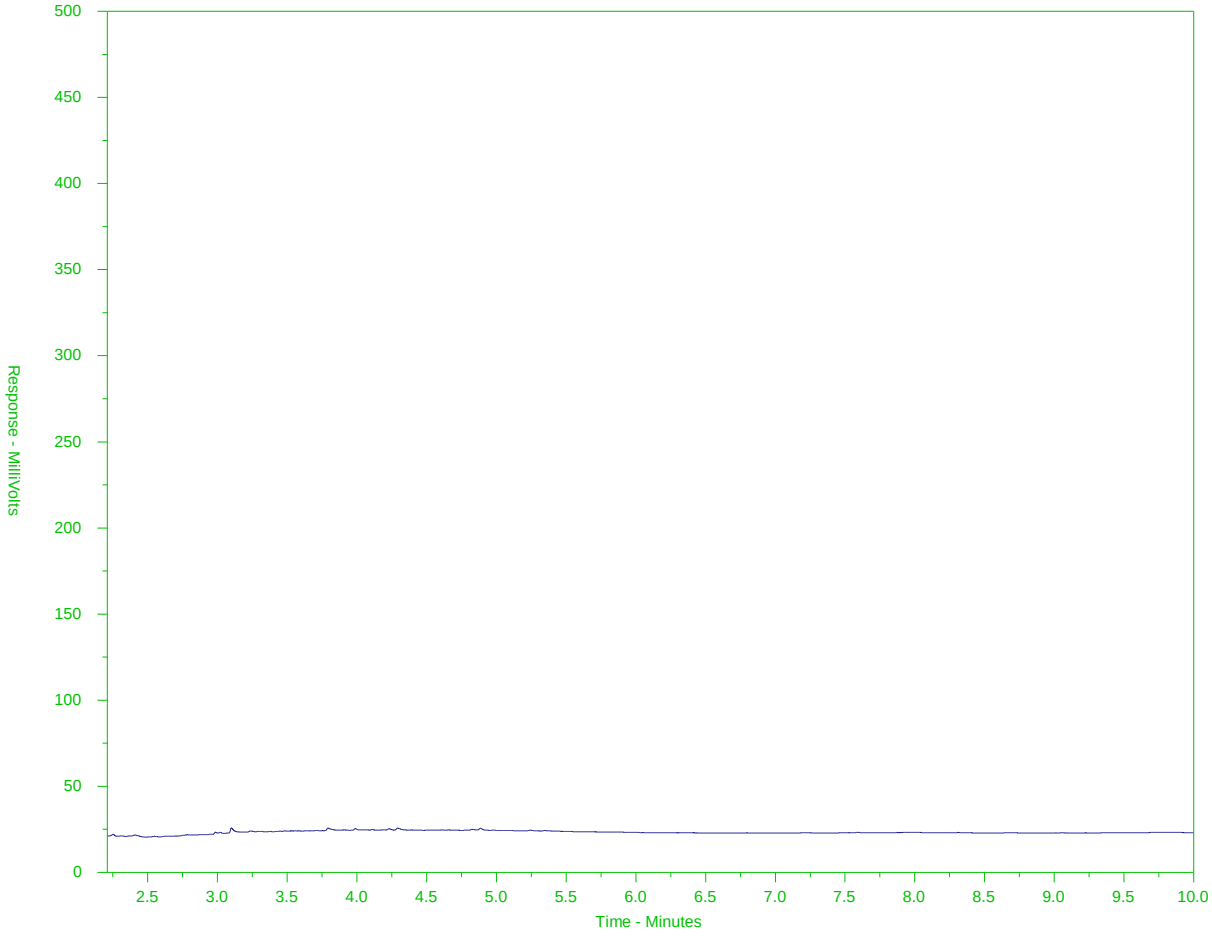
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2396150-7
Client Sample ID: PW17-26_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

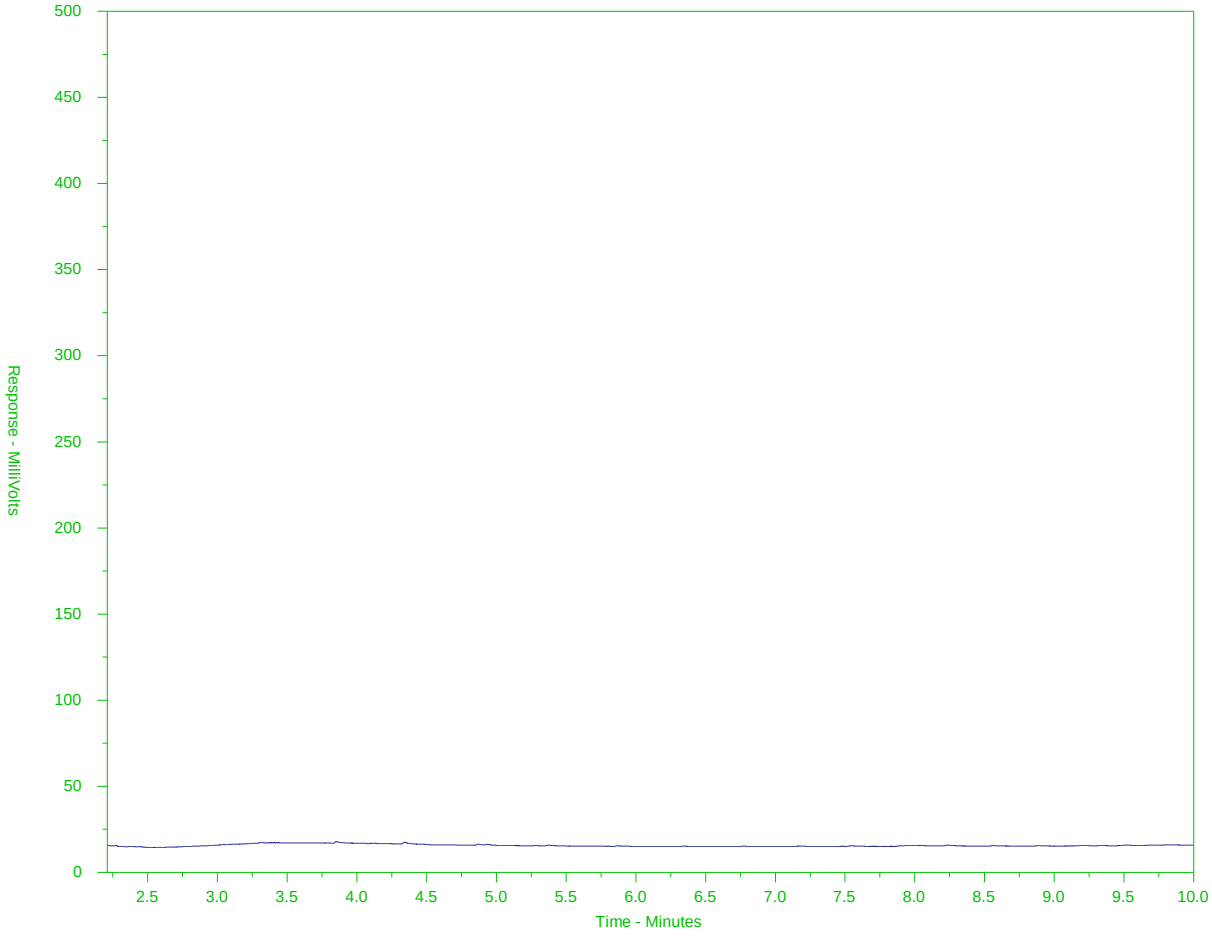
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2396150-8
Client Sample ID: PW17-27_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

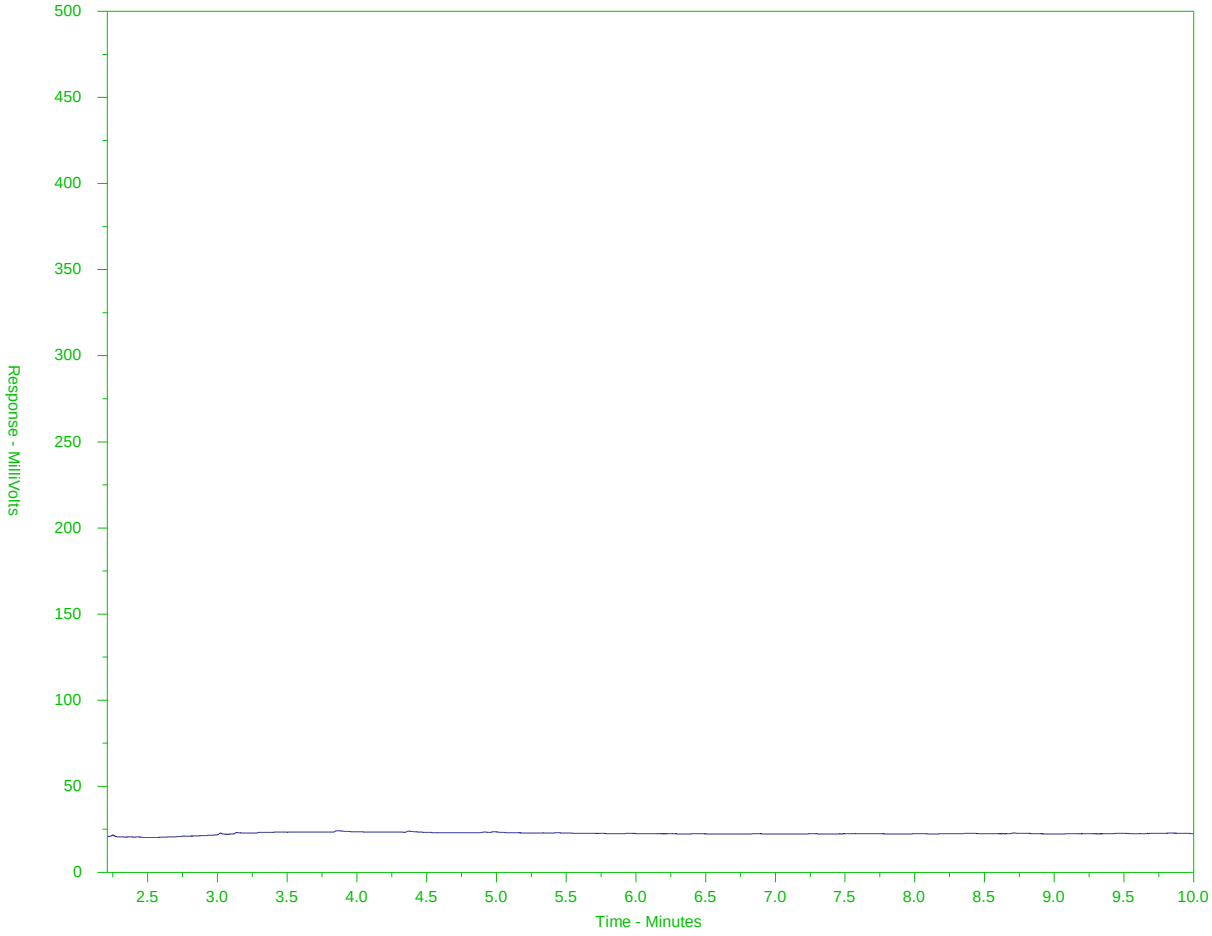
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2396150-9
Client Sample ID: PW17-28_20191210|REG|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

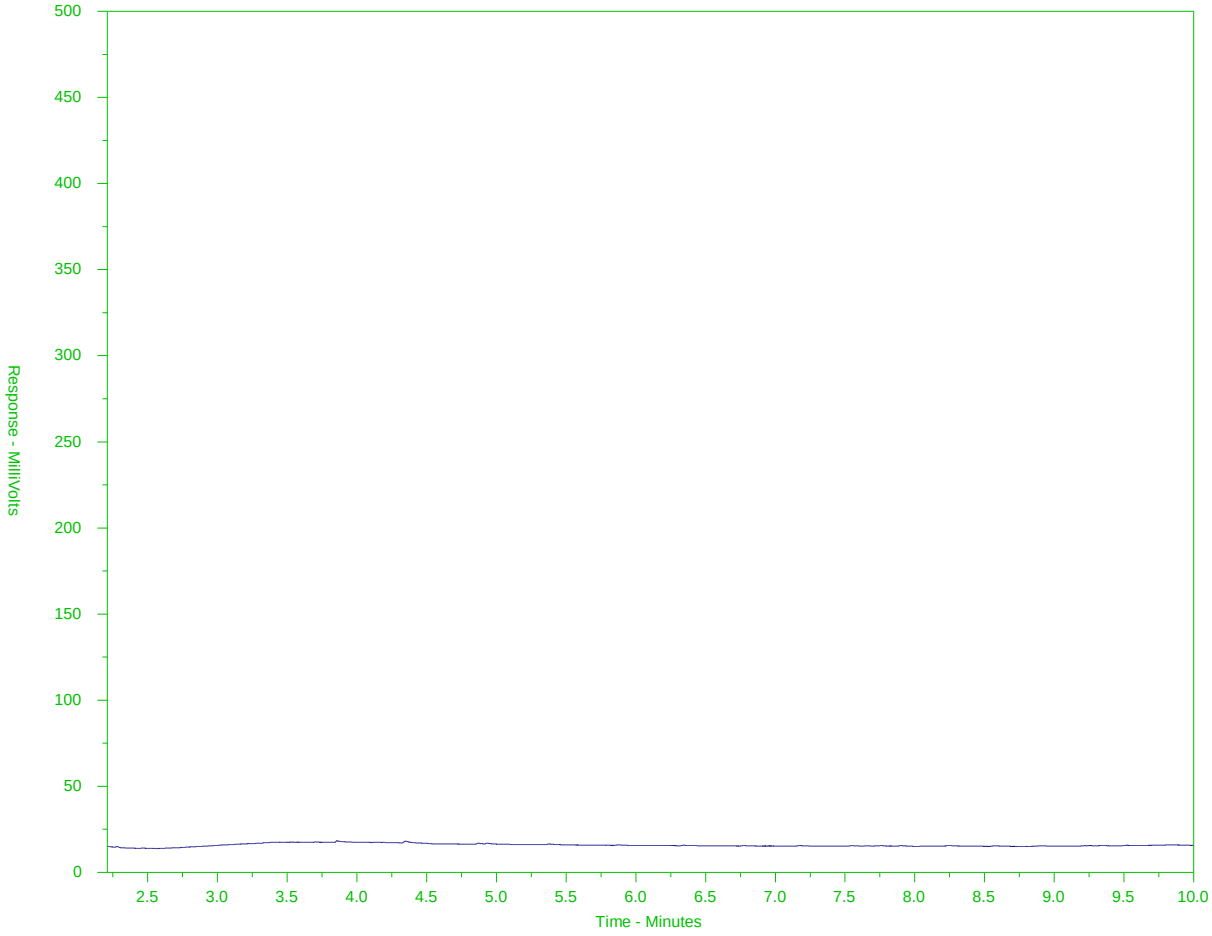
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2396150-10
Client Sample ID: DUP-1_20191210|FD|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

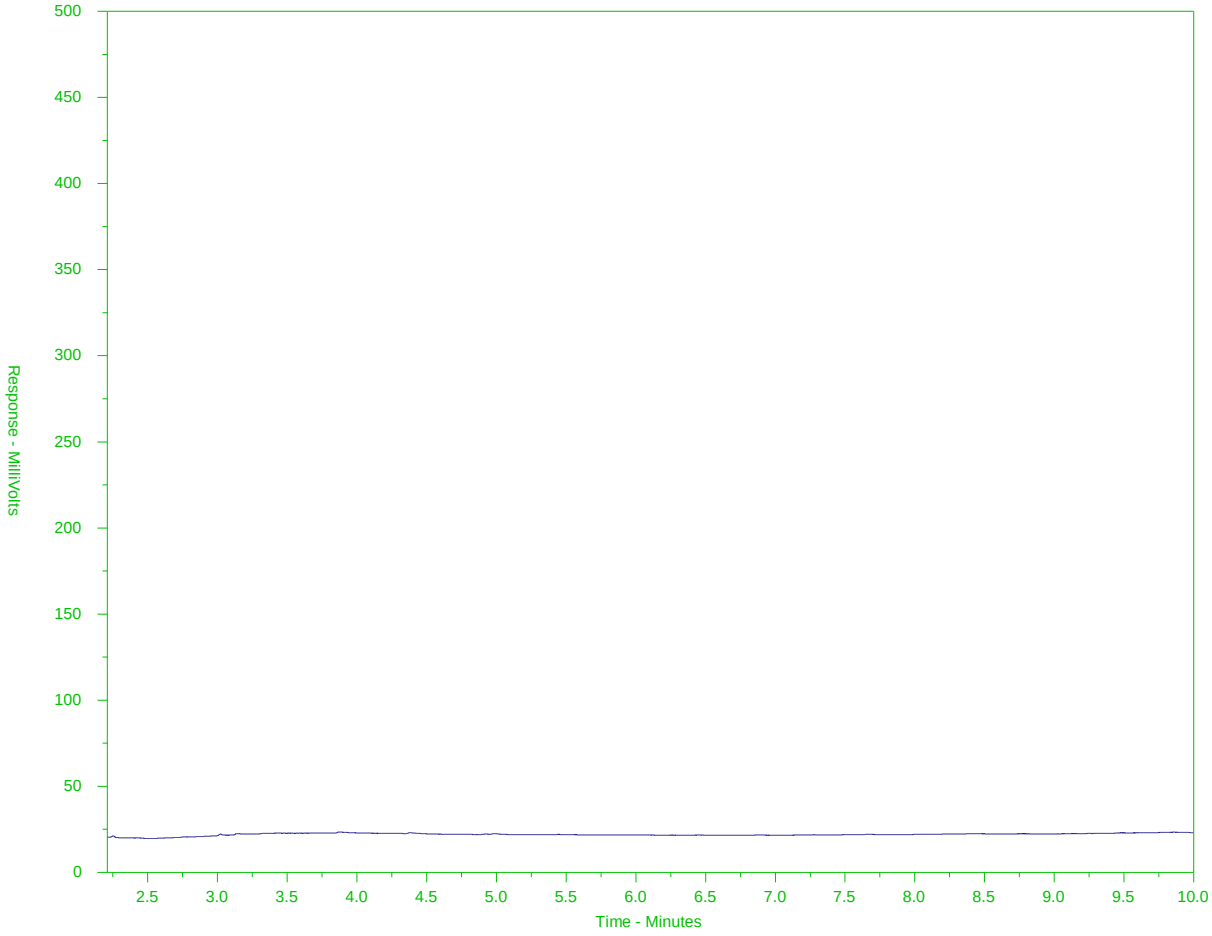
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2396150-11
Client Sample ID: DUP-2_20191210|FD|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

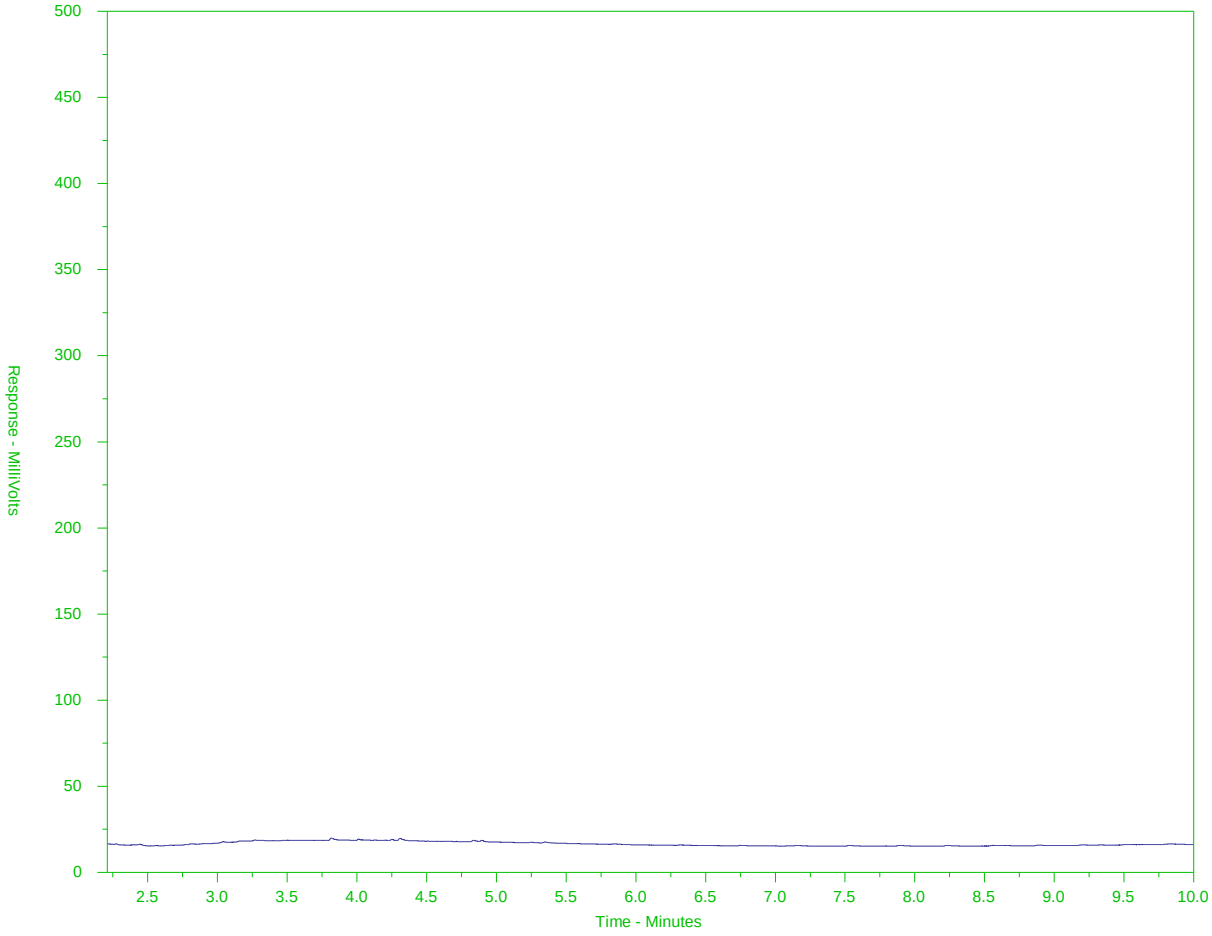
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

BC EPH HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2396150-12
Client Sample ID: DUP-3_20191210|FD|GW



← EPH10-19 →		← EPH19-32 →
nC10	nC19	nC32
174°C	330°C	467°C
346°F	626°F	873°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →	
← Diesel/ Jet Fuels →		

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2396150-COFC

COC Number: 17 - 784765

Page 1 of 2

Report To	Contact and company name below will appear on the final report
Company:	AECOM Canada Ltd.
Contact:	Leslie Southern
Phone:	604-444-6608
	Company address below will appear on the final report
Street:	3292 Production Way
City/Province:	Burnaby, BC
Postal Code:	V5A 4R4

Report Format / Distribution	
Select Report Format:	[X] PDF [X] EXCEL [X] EDD (DIGITAL)
Quality Control (QC) Report with Report	[X] YES [ ] NO
[X] Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	[X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	Leslie.Southern@aecom.com
Email 2	Justin.Becker@aecom.com
Email 3	

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)	
Regular [R]	[X] Standard TAT if received by 3 pm - business days - no surcharges apply
PRIORITY (Business Days) 4 day [P4-20%]	[ ]
PRIORITY (Business Days) 3 day [P3-25%]	[ ]
PRIORITY (Business Days) 2 day [P2-50%]	[ ]
EMERGENCY 1 Business day [E - 100%]	[ ]
EMERGENCY Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)]	[ ]
Date and Time Required for all E&P TATs:	dd-mmm-yy hh:mm
For tests that can not be performed according to the service level selected, you will be contacted.	

Invoice To			
	Same as Report To	[ ] YES	[X] NO
	Copy of Invoice with Report	[ ] YES	[X] NO
Company:	Parkland Refining (B.C.)		
Contact:	Christopher Boys		

Invoice Distribution	
Select Invoice Distribution:	[X] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	Leslie_Southern@aecom.com
Email 2	

Project Information	
ALS Account # / Quote #:	
Job #:	60601814 / ARO-0005
PO / AFE:	
LSD:	Burnaby Refinery
ALS Lab Work Order # (lab use only):	

Oil and Gas Required Fields (client use)		
AFE/Cost Center:		PO#
Major/Minor Code:		Routing Code:
Requisitioner:		
Location:		
ALS Contact:	Dean Watt	Sampler: JUB + AR

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	BTEX / VPH (P)	LEPH / HEPH (P)	Benzo(a)pyrene (P)	Naphthalene (P)	HRMS Dissolved Copper (F/P)	HRMS Dissolved Zinc (F/P)	Nitrates/Sulfates/Alkalinity (P)	Methane (Dissolved) (P)	Silty Sample (P)	Brackish Water (>40000 µS/cm) (P)	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	PW17-16_20191210	12-Dec-19	22:10	Porewater	5	X	X	X	X	X	X						
	PW17-17_20191210		21:55														
	PW17-18_20191210		21:40												X		
	PW17-21_20191210		21:20														
	PW17-22_20191210		21:36												X		
	PW17-23_20191210		21:56												X		
	PW17-26_20191210		22:27														
	PW17-27_20191210		22:08												X		
	PW17-28_20191210		22:22												X		
	DUP-1_20191210		PM												X		
	DUP-2_20191210		PM												X		
	DUP-3_20191210		PM														

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? [ ] YES [X] NO	BC CSR
Are samples for human consumption/ use? [ ] YES [X] NO	Only analyze for copper and zinc for metals
	17, 23, 26, 27, 28, DUP-3 → T-Blank-5

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	[ ]	SIF Observations	Yes [ ]	No	[ ]
Ice Packs	[X]	Ice Cubes [ ]	Custody seal intact	Yes [ ]	No [ ]
Cooling Initiated	[X]				

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				8 (Run #2)			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
Justin Becker	Dec. 13, 2019	00:05				TC	Dec 13	12:05 pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2018 FRONT

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2396150-COFC

COC Number: 17 - 784765

Report To	Contact and company name below will appear on the final report
Company:	AECOM Canada Ltd.
Contact:	Leslie Southern
Phone:	604-444-6608
	Company address below will appear on the final report
Street:	3292 Production Way
City/Province:	Burnaby, BC
Postal Code:	V5A 4R4
Invoice To	Same as Report To ☐ YES ☒ NO
	Copy of Invoice with Report ☐ YES ☒ NO
Company:	Parkland Refining (B.C.)
Contact:	Christopher Boys

Project Information

ALS Account # / Quote #:	
Job #:	60601814 / ARO-0005
PO / AFE:	
LSD:	Burnaby Refinery
ALS Lab Work Order # (lab use only):	

Report Format / Distribution

Select Report Format: ☒ PDF ☒ EXCEL ☒ EDD (DIGITAL)

Quality Control (QC) Report with Report ☒ YES ☐ NO

☒ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☒ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: Leslie.Southern@aecom.com

Email 2: Justin.Becker@aecom.com

Email 3:

Invoice Distribution

Select Invoice Distribution: ☒ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: Leslie_Southern@aecom.com

Email 2:

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Contact: Dean Watt

Sampler: JVB + AAR

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☒ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	BTEX/VPH (P)	LEPH/HEPH (P)	Benzo(a)pyrene (P)	Naphthalene (P)	HRMS Dissolved Copper (F/P)	HRMS Dissolved Zinc (F/P)	Nitrates/Sulfates/Alkalinity (P)	Methane (Dissolved) (P)	Silty Sample Brackish Water (>4000 µS/cm) (P)	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	T-Blank-5	12-Dec-19	N/A	Other	1	X										
	T-Blank-6	↓	N/A	↓	1	X										

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☒ NO

Are samples for human consumption/ use? ☐ YES ☒ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

BC CSR

Only analyze for copper and zinc for metals

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☐

Ice Packs ☒ Ice Cubes ☐ | Custody seal intact Yes ☐ No ☐

Cooling Initiated ☒

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			8°	(dw CF)	

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
Justin Becker	Dec. 13, 2019	0905

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
	Dec 13	12:05

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JUNE 2018 FRONT

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

Appendix D

Quality Assurance and Quality Control Protocols

DATA QA/QC

In order to assure the integrity and defensibility of the data collected, rigorous QA/QC protocols were observed. These protocols ensured that all samples were properly collected, identified, stored, shipped, and documented. Standard operating procedures (SOPs) for sample collection and storage, equipment decontamination, and sample chain of custody protocols were followed. Porewater samples were collected using sampling techniques discussed above. The use of these methods ensured the quality, soundness, and defensibility of the data obtained. The laboratory analytical data, once generated, was also proofed for inconsistencies and anomalies. Field duplicates, trip blanks, and rinsate blanks were collected for QA/QC purposes.

Field Duplicate Samples

Field duplicate samples are two identical samples that are submitted to the laboratory with no indication that they are the same. The analysis of field duplicate samples provides an indication of the total precision of the sampling and analysis process. Field duplicate samples were collected and analyzed at a rate of approximately 10% of samples for a given analytical suite.

Trip Blanks

Trip blanks are samples of clean deionized, distilled (Reagent Grade Type II) water that are prepared in the laboratory, taken to the field, retained on site throughout sample collection, returned to the laboratory, and analyzed with the environmental samples. The QA/QC review identifies trip blanks with detections of target analytes and evaluates the effect of the detections on associated sample results for possible cross-contamination during transport. One trip blank was included for analysis in every cooler submitted to the laboratory.

Rinsate Blanks

Rinsate blanks are samples of deionized and distilled analyte free (Reagent Grade Type II) water that are prepared in the field by pouring water over or through decontaminated field sampling equipment[7], prior to the collection of the environmental samples. The QA/QC review identifies rinsate blank detections of target analytes and evaluates the effect of the detections on associated sample results for possible cross-contamination during sample collection. Rinsate blank samples were collected and analyzed at a rate of approximately 5% of samples for petroleum hydrocarbon parameters (BTEX, VPH_w, and $LEPH_w$).

[7] Throughout the 2019 sampling program, the decontaminated equipment used for the collection of the rinsate blanks included the oil/water interface meter.

QUALITY ASSURANCE/QUALITY CONTROL

Precision

Precision measures the reproducibility of repetitive measurements and is usually expressed in terms of imprecision. It is strictly defined as the degree of mutual agreement among multiple independent measurements as the result of repeated application of the same process under similar conditions.

Analytical precision is a measurement of the variability associated with the duplicate (*i.e.,* two) or replicate (*i.e.,* more than two) analyses of the same sample in the laboratory, and is determined by the analysis of matrix spike duplicate or laboratory duplicate samples.

Total precision is a measurement of the variability associated with the entire sampling and analysis process. It is determined by the analysis of duplicate or replicate field samples and incorporates any variability introduced by the analytical procedure, sample collection and handling procedures, and matrix factors. Precision data must be interpreted by taking into consideration these possible sources of variability.

Duplicate field samples were collected, and duplicate spiked or unspiked samples were analyzed to assess analytical precision. The results were assessed using the relative percent difference (RPD) between duplicate measurements. The equation used to calculate RPD for duplicate samples is:

$$RPD = \frac{(A - B)}{((A + B)/2)} \times 100$$

where:

A	=	analytical result
B	=	duplicate result.

Note that for RPDs the result can be a positive or a negative value. RPDs are often presented as *absolute* RPDs, in which case the absolute value of the RPD is reported, always resulting in a positive number. Reporting the absolute RPD results in a reduction in information, since, for instance, if a duplicate sample consistently returned higher results than the original sample, all RPD values would be negative and it may be an indication of a precision problem. In this case, if absolute RPD was reported, no indication would be forthcoming.

Total precision was determined by collecting field duplicate samples. These samples were collected and analyzed at a rate of approximately 10% of total samples for each analytical suite.

Analytical precision will be determined in the laboratory by running matrix spike/matrix spike duplicate (MS/MSD) pairs, or by running laboratory duplicate analyses. These samples will be analyzed at a rate of approximately 5% for each analytical suite.

Accuracy

Accuracy is a statistical measurement of correctness and includes components of random error (*e.g.,* variability due to imprecision) and systematic error (*e.g.,* bias). Therefore, accuracy reflects the total error associated with a measurement. A measurement is accurate when the value reported does not differ beyond acceptable limits from the true value or known concentration of the spike or standard. Acceptance criteria are indicated in the individual standardized analytical methods.

Analytical accuracy is typically measured by determining the percent recovery of known target analytes that are spiked into a field sample (*i.e.,* a surrogate or matrix spike), or reagent water (*i.e.,* laboratory control sample [LCS] or blank spike) before extraction at known concentrations. Percent recovery is calculated as:

$$\%REC = \frac{A}{B} \times 100$$

where:

A = obtained value
B = true value.

Analytical accuracy was determined in the laboratory by the running of MS samples or laboratory control samples. These samples were analyzed at a minimum rate of 5% for each analytical suite.

Completeness

Completeness for this investigation was defined as the percentage of valid analytical results. Results made uncertain due to missed hold times, improper calibration, blank contamination, or poor calibration verification results would be deemed invalid. Results that may be flagged due to matrix effects are not considered invalid. Completeness for projects should exceed 90%. Completeness is calculated by:

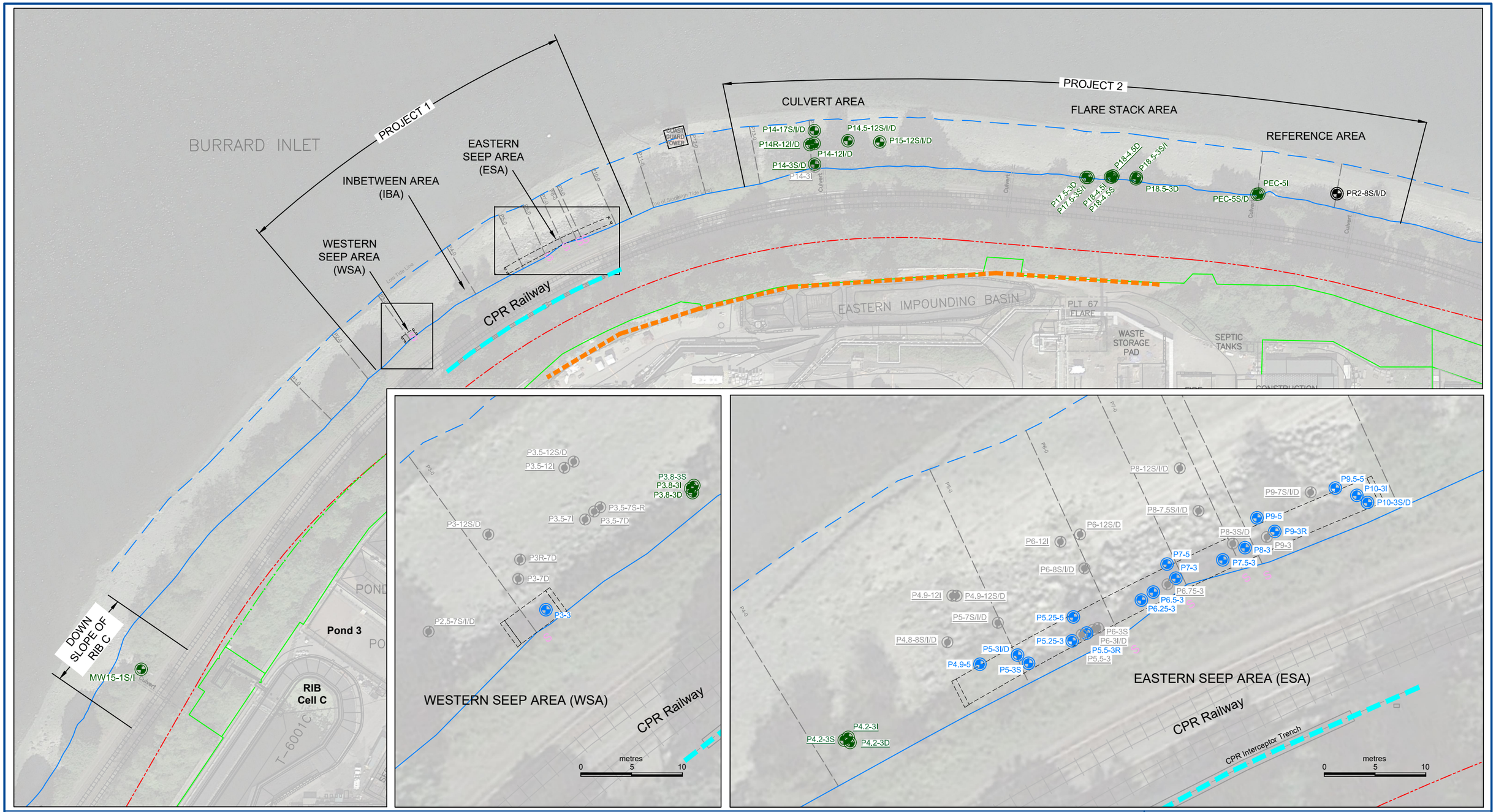
$$completene\,ss = \frac{A}{B} \times 100$$

where:

A = number of valid analytical results
B = total number of analytical results.

Appendix E

2019 Historical Monitoring Well Decommissioning



LEGEND:

- Property Line
- Fence Line
- Foreshore Monitoring Well
- Foreshore Sampling Transect
- NAPL Seep Observed in 2010
- Excavation in 2017
- CPR Interceptor Trench
- Refinery Extraction System
- Monitoring Well Decommissioned During Construction of the FPTS
- Monitoring Well Not Found/ Destroyed
- Monitoring Well Decommissioned in July 2019
- Monitoring Well Remains in Place

ABBREVIATIONS:

S	Shallow Well
I	Intermediate Well
D	Deep Well
NAPL	Non-Aqueous Phase Liquid
FPTS	Foreshore Passive Treatment System

NOTE:

Monitoring wells installed during the construction of the Foreshore Passive Treatment System in 2017 are not shown.

GRID NORTH

N W E S

metres 0 20 40

AECOM

SITE PLAN - FORESHORE WELL DECOMMISSIONING

Foreshore 2019 Annual Monitoring Report
Foreshore Below Area 2 - Parkland Refinery, Burnaby, BC

PARKLAND REFINING (B.C.) LTD.

DATE:	PROJECT NO.:	DRAWN BY:	REVISION NO.:	DRAWING NO.:
February 2020	60601814	NT	0	FIGURE E1

FILE NAME: H:\URS-PROPOSALS\2019\2019-1686-007 - 2019 Foreshore Well Decom\Figures\2019-08-08 F01 SITE PLAN - PRE CONSTRUCTION.dwg

TABLE E1
FORESHORE HISTORICAL MONITORING WELLS
FORESHORE WELL DECOMMISSIONING PROJECT
FORESHORE DOWN SLOPE OF AREA 2, PARKLAND BURNABY REFINERY, BURNABY, BC
15-Aug-19
Project number: 60601814

Well	Screened Interval (m bgs)	Depth of Install (m bgs)	Present / Not found / Decommissioned during construction of FPTS / Decommissioned	Decommissioning Method [1,2]
Project 1 - West Seep Area				
P2.5-7S	0.2-0.4	0.4	Not found	N/A
P2.5-7I	0.7-0.9	0.9	Not found	N/A
P2.5-7D	1.5-1.7	1.7	Not found	N/A
P3-7D	1.5-1.7	1.7	Not found	N/A
P3-12S	0.2-0.4	0.4	Not found	N/A
P3-12D	1.1-1.3	1.3	Not found	N/A
P3R-7D	4.6-5.0	5.0	Not found	N/A
P3.5-7SR	0.2-0.4	0.4	Not found	N/A
P3.5-7S	0.2-0.4	0.4	Not found	N/A
P3.5-7I	1.5-1.7	1.7	Not found	N/A
P3.5-7D	2.1-2.3	2.3	Not found	N/A
P3.5-12S	0.6-1.0	1.0	Not found	N/A
P3.5-12I	2.6-3.0	3.0	Not found	N/A
P3.5-12D	4.6-5.0	5.0	Not found	N/A
P3.8-3S	0.6-1.0	1.0	Decommissioned	A
P3.8-3I	2.6-3.0	3.0	Decommissioned	A
P3.8-3D	4.6-5.0	5.0	Decommissioned	B
Project 1 - West Seep IRA well				
P3-3	0.2-0.8	0.8	Decommissioned during construction of FPTS	N/A
Project 1 - East Seep IRA wells				
P4.9-5	0.4-0.8	0.8	Decommissioned during construction of FPTS	N/A
P5.25-3	0.4-0.8	0.8	Decommissioned during construction of FPTS	N/A
P5.25-5	0.4-0.8	0.8	Decommissioned during construction of FPTS	N/A
P5.5-3R	0.4-0.8	0.8	Decommissioned during construction of FPTS	N/A
P6.25-3	0.5-0.9	0.9	Decommissioned during construction of FPTS	N/A
P6.5-3	0.4-0.8	0.8	Decommissioned during construction of FPTS	N/A
P7-3	0.2-0.8	0.8	Decommissioned during construction of FPTS	N/A
P7-5	0.4-0.8	0.8	Decommissioned during construction of FPTS	N/A
P7.5-3	0.4-0.8	0.8	Decommissioned during construction of FPTS	N/A
P8-3	0.3-0.7	0.7	Decommissioned during construction of FPTS	N/A
P9-3R	0.4-0.8	0.8	Decommissioned during construction of FPTS	N/A
P9-5	0.4-0.8	0.8	Decommissioned during construction of FPTS	N/A
P9.5-5	0.4-0.8	0.8	Decommissioned during construction of FPTS	N/A
Project 1 - East Seep Area				
P4.2-3S	0.6-1.0	1.0	Decommissioned	A
P4.2-3I	2.6-3.0	3.0	Decommissioned	B
P4.2-3D	4.6-5.0	5.0	Decommissioned	B
P4.8-8S	0.2-0.4	0.4	Not found	N/A
P4.8-8I	0.6-0.8	0.8	Not found	N/A
P4.8-8D	1.3-1.5	1.5	Not found	N/A
P4.9-12S	0.6-1.0	1.0	Not found	N/A
P4.9-12I	2.6-3.0	3.0	Not found	N/A
P4.9-12D	4.6-5.0	5.0	Not found	N/A
P5-7S	0.2-0.4	0.4	Not found	N/A
P5-7I	0.6-0.8	0.8	Not found	N/A
P5-7D	1.3-1.5	1.5	Not found	N/A
P6-8S	0.8-1.0	1.0	Not found	N/A
P6-8I	2.0-2.4	2.4	Not found	N/A
P6-8D	4.0-4.4	4.4	Not found	N/A
P6-12S	0.2-0.4	0.4	Not found	N/A
P6-12I	0.6-0.8	0.8	Not found	N/A
P6-12D	1.1-1.3	1.3	Not found	N/A
P8-7.5S	0.8-1.0	1.0	Not found	N/A
P8-7.5I	2.0-2.4	2.4	Not found	N/A
P8-7.5D	3.6-4.0	4.0	Not found	N/A
P8-12S	0.2-0.4	0.4	Not found	N/A
P8-12I	0.7-0.9	0.9	Not found	N/A
P8-12D	1.2-1.4	1.4	Not found	N/A
P9-7S	0.8-1.0	1.0	Not found	N/A
P9-7I	2.0-2.4	2.4	Not found	N/A
P9-7D	4.4-4.8	4.8	Not found	N/A
Project 1 - Up Slope of Anchor Trench of Eastern IRA				
P5-3S	0.2-0.4	0.4	Decommissioned during construction of FPTS	N/A
P5-3I	0.6-0.8	0.8	Decommissioned during construction of FPTS	N/A
P5-3D	1.3-1.5	1.5	Decommissioned during construction of FPTS	N/A
P10-3S	0.2-0.4	0.4	Decommissioned during construction of FPTS	N/A
P10-3I	0.6-0.8	0.8	Decommissioned during construction of FPTS	N/A
P10-3D	1.1-1.3	1.3	Decommissioned during construction of FPTS	N/A
Project 2 - Flare Stack Area				
P17.5-3S	0.6-1.0	1.0	Decommissioned	A
P17.5-3I	2.6-3.0	3.0	Decommissioned	B
P17.5-3D	4.6-5.0	5.0	Decommissioned	B
P18-4.5S	0.6-1.0	1.0	Decommissioned	A
P18-4.5I	2.2-2.6	2.6	Decommissioned	B
P18-4.5D	4.6-5.0	5.0	Decommissioned	B
P18.5-3S	0.6-1.0	1.0	Decommissioned	A

TABLE E1
FORESHORE HISTORICAL MONITORING WELLS
FORESHORE WELL DECOMMISSIONING PROJECT
FORESHORE DOWN SLOPE OF AREA 2, PARKLAND BURNABY REFINERY, BURNABY, BC
15-Aug-19
Project number: 60601814

Well	Screened Interval (m bgs)	Depth of Install (m bgs)	Present / Not found / Decommissioned during construction of FPTS / Decommissioned	Decommissioning Method [1,2]
P18.5-3I	2.6-3.0	3.0	Decommissioned	B
P18.5-3D	4.6-5.0	5.0	Decommissioned	B
Project 2 - Culvert Area				
P14-3S	0.3-0.5	0.5	Decommissioned	A
P14-3I	0.4-0.7	0.7	Not found	N/A
P14-3D	0.9-1.1	1.1	Decommissioned	A
P14-12I	1.2-1.4	1.4	Decommissioned	B
P14-12D	1.5-1.7	1.7	Decommissioned	B
P14-17S	0.8-1.0	1.0	Decommissioned	A
P14-17I	2.6-3.0	3.0	Decommissioned	B
P14-17D	4.6-5.0	5.0	Decommissioned	B
P14R-12I	2.6-3.0	3.0	Decommissioned	B
P14R-12D	4.6-5.0	5.0	Decommissioned	B
P14.5-12S	0.8-1.0	1.0	Decommissioned	A
P14.5-12I	3.0-3.4	3.4	Decommissioned	B
P14.5-12D	4.6-5.0	5.0	Decommissioned	B
P15-12S	0.8-1.0	1.0	Decommissioned	A
P15-12I	2.6-3.0	3.0	Decommissioned	B
P15-12D	4.6-5.0	5.0	Decommissioned	B
Project 2 - Reference Area				
PEC-5S	0.8-1.0	1.0	Decommissioned	A
PEC-5I	2.1-2.5	2.5	Decommissioned	B
PEC-5D	4.6-5.0	5.0	Decommissioned	B
PR2-8S	0.8-1.0	1.0	Present	Well remains in place
PR2-8I	2.7-3.1	3.1	Present	Well remains in place
PR2-8D	4.6-5.0	5.0	Present	Well remains in place
Down slope of RIB Cell C (Pond 3)				
MW15-1S	0.6-1.0	1.0	Decommissioned	A
MW15-1I	1.6-2.0	2.0	Decommissioned	B

Notes and Abbreviations:

1. Decommissioning method Option A - well was manually removed by hand.
2. Decommissioning method Option B - well was removed with the use of a manual jack.

Construction of the Foreshore Passive Treatment System (FPTS) was completed between July 10 and October 30, 2017
Survey of wells completed on August 30, 2017 and March 25, 2019
Survey of wells categorized as not found completed on July 29, 2019
Well Decommissioning completed July 29 - 31, 2019
IRA = Interim Remedial Action
N/A = not applicable
m bgs = metres below ground surface
NA = not applicable
RIB = Remote Impounding Basin

Appendix F

Photographic Log of FPTS Inspections

APPENDIX F: PHOTOGRAPHIC LOG

Client Name:	**Site Location:**	**Project Number:**
Parkland Refining (B.C.) Ltd.	Foreshore – Downgradient Area 2, Parkland Refinery, Burnaby, BC	60601814

Photo No.	**Date:**
1	March 25, 2019

Direction Photo Taken:

Looking down at exposed OBB associated with the Western FPTS

Description:

Small portion of exposed filter fabric and oleophilic biobarrier (OBB) before repair.

Photo No.	**Date:**
2	March 25, 2019

Direction Photo Taken:

Looking down at exposed OBB associated with the Western FPTS

Description:

Small portion of exposed /filter fabric and oleophilic biobarrier (OBB) during repair.

APPENDIX F: PHOTOGRAPHIC LOG

Client Name:	**Site Location:**	**Project Number:**
Parkland Refining (B.C.) Ltd.	Foreshore – Downgradient Area 2, Parkland Refinery, Burnaby, BC	60601814

Photo No.	**Date:**
3	March 25, 2019

Direction Photo Taken:

Looking down at area with formerly exposed OBB associated with the Western FPTS

Description:

Ground surface after repair.

Photo No.	**Date:**
4	March 25, 2019

Direction Photo Taken:

Looking down at exposed geogrid

Description:

Example of exposed geogrid at contact point between the rip rap and cobble interface in the Eastern FPTS, approximately half way between PW17-19 and PW17-24.

APPENDIX F: PHOTOGRAPHIC LOG

Client Name: Parkland Refining (B.C.) Ltd.	**Site Location:** Foreshore – Downgradient Area 2, Parkland Refinery, Burnaby, BC	**Project Number:** 60601814

Photo No. 5	**Date:** March 25, 2019

Direction Photo Taken:

Looking down / east at exposed geogrid

Description:

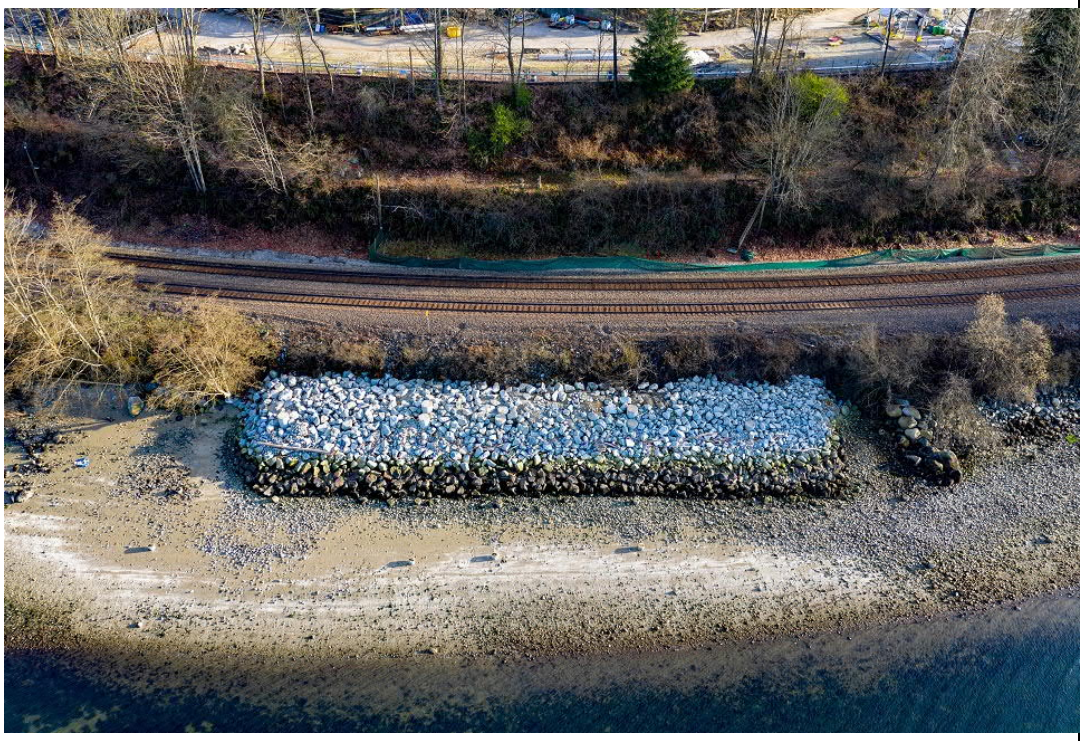
Example of exposed geogrid at contact point between the rip rap and cobble interface in the Eastern FPTS, located approximately 3 m west of PW17-19.

Photo No. 6	**Date:** March 27, 2019

Direction Photo Taken:
Looking south

Description:

Aerial view of Eastern FPTS.



APPENDIX F: PHOTOGRAPHIC LOG

Client Name:	**Site Location:**	**Project Number:**
Parkland Refining (B.C.) Ltd.	Foreshore – Downgradient Area 2, Parkland Refinery, Burnaby, BC	60601814

Photo No.	**Date:**
7	March 27, 2019

Direction Photo Taken:
Looking south

Description:

Aerial view of Western FPTS.

Photo No.	**Date:**
7	June 6, 2019

Direction Photo Taken:
Looking South

Description:

Example of exposed geogrid at contact point between the rip rap and cobble interface in the Eastern FPTS, located approximately 1 m west of PW17-24.