



NORTH COAL LIMITED
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Date Received: 16-OCT-20
Report Date: 28-OCT-20 12:29 (MT)
Version: FINAL

Client Phone: 250-423-8854

Certificate of Analysis

Lab Work Order #: L2517514
Project P.O. #: NOT SUBMITTED
Job Reference: 18CANA02
C of C Numbers:
Legal Site Desc:

Patryk Wojciak, B.Sc., P.Chem.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

28-OCT-20 12:29 (MT)

Version: FINAL

Sample ID Description Sampled Date Sampled Time Client ID		L2517514-1 Water 15-OCT-20 09:15 AND1	L2517514-2 Water 15-OCT-20 10:10 MICH-33.8	L2517514-3 Water 15-OCT-20 10:50 MICH-13.0	L2517514-4 Water 15-OCT-20 11:00 DUPLICATE	L2517514-5 Water 15-OCT-20 08:00 BLANK
Grouping	Analyte					
WATER						
Physical Tests	Colour, True (CU)	<5.0	<5.0	<5.0	<5.0	<5.0
	Hardness (as CaCO ₃) (mg/L)	129	346	234	231	<0.50
	Total Suspended Solids (mg/L)	<3.0	<3.0	<3.0	<3.0	<3.0
	Total Dissolved Solids (mg/L)	139 ^{DLHC}	458 ^{DLHC}	290 ^{DLHC}	272 ^{DLHC}	<10
	Turbidity (NTU)	0.25	0.36	0.41	0.41	<0.10
Anions and Nutrients	Alkalinity, Total (as CaCO ₃) (mg/L)	120	181	149	161	<2.0
	Ammonia as N (mg/L)	0.126	0.0192	0.0404	0.0328	0.0084 ^{RRV}
	Bicarbonate (HCO ₃) (mg/L)	146	220	182	197	<5.0
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Carbonate (CO ₃) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Chloride (Cl) (mg/L)	<0.50	1.36	1.13	1.13	<0.50
	Conductivity (EC) (uS/cm)	241	656	439	443	<2.0
	Fluoride (F) (mg/L)	0.272	0.153	0.099	0.098	<0.020
	Hydroxide (OH) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Nitrate (as N) (mg/L)	0.189	1.20	0.325	0.328	<0.0050
	Nitrite (as N) (mg/L)	<0.0010	0.0022	<0.0010	0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	0.140	0.509	0.783	0.180	<0.050
	pH (pH)	8.15	8.30	8.27	8.26	5.37
	Orthophosphate-Dissolved (as P) (mg/L)	0.0018	0.0017	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total (mg/L)	<0.0020	0.0022	<0.0020	0.0023	<0.0020
	Sulfate (SO ₄) (mg/L)	19.5	202	95.7	95.9	<0.30
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	<0.50	0.51	1.01	1.04	<0.50
	Total Organic Carbon (mg/L)	<0.50	0.52	1.04	0.95	<0.50
Total Metals	Aluminum (Al)-Total (mg/L)	0.0061	0.0093	0.0070	0.0075	<0.0030
	Antimony (Sb)-Total (mg/L)	<0.00010	0.00016	0.00010	0.00010	<0.00010
	Arsenic (As)-Total (mg/L)	0.00050	0.00026	0.00021	0.00020	<0.00010
	Barium (Ba)-Total (mg/L)	0.0187	0.0756	0.144	0.143	<0.00010
	Beryllium (Be)-Total (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Total (mg/L)	<0.010	0.024	0.012	0.012	<0.010
	Cadmium (Cd)-Total (mg/L)	0.0000120	0.0000182	0.0000289	0.0000229	<0.0000050
	Calcium (Ca)-Total (mg/L)	39.6	86.6	61.3	62.0	<0.050
	Chromium (Cr)-Total (mg/L)	0.00030	0.00025	0.00011	0.00011	<0.00010
	Cobalt (Co)-Total (mg/L)	<0.00010	0.00022	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010	0.020	<0.010	<0.010	<0.010

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L2517514-1 Water 15-OCT-20 09:15 AND1	L2517514-2 Water 15-OCT-20 10:10 MICH-33.8	L2517514-3 Water 15-OCT-20 10:50 MICH-13.0	L2517514-4 Water 15-OCT-20 11:00 DUPLICATE	L2517514-5 Water 15-OCT-20 08:00 BLANK
Grouping	Analyte						
WATER							
Total Metals	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
	Lithium (Li)-Total (mg/L)	0.0020	0.0146	0.0076	0.0077	<0.0010	
	Magnesium (Mg)-Total (mg/L)	8.34	34.1	19.9	20.2	<0.0050	
	Manganese (Mn)-Total (mg/L)	0.00012	0.00220	0.00115	0.00099	<0.00010	
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Total (mg/L)	0.000827	0.000965	0.000735	0.000787	<0.000050	
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00579	0.00090	0.00087	<0.00050	
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	
	Potassium (K)-Total (mg/L)	0.21	1.10	0.80	0.80	<0.10	
	Selenium (Se)-Total (mg/L)	0.00191	0.00455	0.00206	0.00199	<0.000050	
	Silicon (Si)-Total (mg/L)	1.21	1.85	1.91	1.87	<0.050	
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Total (mg/L)	0.589	14.8	6.75	6.66	<0.050	
	Strontium (Sr)-Total (mg/L)	0.131	0.311	0.196	0.195	<0.00020	
	Sulfur (S)-Total (mg/L)	6.23	64.1	30.3	30.3	<0.50	
	Thallium (Tl)-Total (mg/L)	0.000052	0.000017	<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
	Uranium (U)-Total (mg/L)	0.000895	0.00189	0.000906	0.000895	<0.000010	
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD	
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0016	<0.0010	<0.0010	<0.0010	<0.0010	
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	0.00014	0.00010	0.00010	<0.00010	
	Arsenic (As)-Dissolved (mg/L)	0.00049	0.00023	0.00018	0.00017	<0.00010	
	Barium (Ba)-Dissolved (mg/L)	0.0172	0.0715	0.139	0.132	<0.00010	
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)	<0.010	0.024	0.012	0.012	<0.010	
	Cadmium (Cd)-Dissolved (mg/L)	0.0000094	0.0000175	0.0000228	0.0000206	<0.0000050	
	Calcium (Ca)-Dissolved (mg/L)	38.3	83.7	61.1	60.3	<0.050	
	Chromium (Cr)-Dissolved (mg/L)	0.00025	0.00016	0.00011	<0.00010	<0.00010	
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	0.00017	<0.00010	<0.00010	<0.00010	
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	

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Sample ID Description Sampled Date Sampled Time Client ID		L2517514-1 Water 15-OCT-20 09:15 AND1	L2517514-2 Water 15-OCT-20 10:10 MICH-33.8	L2517514-3 Water 15-OCT-20 10:50 MICH-13.0	L2517514-4 Water 15-OCT-20 11:00 DUPLICATE	L2517514-5 Water 15-OCT-20 08:00 BLANK
Grouping	Analyte					
WATER						
Dissolved Metals	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0011	0.0137	0.0069	0.0069	<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	8.10	33.2	19.9	19.6	<0.0050
	Manganese (Mn)-Dissolved (mg/L)	<0.00010	0.00153	0.00068	0.00063	<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.000839	0.000946	0.000776	0.000786	<0.000050
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	0.00542	0.00082	0.00080	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	0.19	1.01	0.76	0.75	<0.10
	Selenium (Se)-Dissolved (mg/L)	0.00224	0.00534	0.00226	0.00227	<0.000050
	Silicon (Si)-Dissolved (mg/L)	1.15	1.85	1.87	1.88	<0.050
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	0.532	14.3	6.67	6.62	<0.050
	Strontium (Sr)-Dissolved (mg/L)	0.125	0.303	0.197	0.189	<0.00020
	Sulfur (S)-Dissolved (mg/L)	6.54	69.8	31.9	32.3	<0.50
	Thallium (Tl)-Dissolved (mg/L)	0.000049	0.000017	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.000838	0.00180	0.000854	0.000841	<0.000010
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0022	0.0011	<0.0010	<0.0010	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Aggregate Organics	Chemical Oxygen Demand (mg/L)	<10	<10	<10	<10	<10
Volatile Organic Compounds	Acetone (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Acrolein (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Acrylonitrile (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	Benzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bromobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Bromochloromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Bromodichloromethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bromoform (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bromomethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	2-Butanone (MEK) (mg/L)	<0.020	<0.020	<0.020	<0.020	<0.020
	n-Butylbenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	sec-Butylbenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	tert-Butylbenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

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28-OCT-20 12:29 (MT)

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Sample ID Description Sampled Date Sampled Time Client ID		L2517514-1 Water 15-OCT-20 09:15 AND1	L2517514-2 Water 15-OCT-20 10:10 MICH-33.8	L2517514-3 Water 15-OCT-20 10:50 MICH-13.0	L2517514-4 Water 15-OCT-20 11:00 DUPLICATE	L2517514-5 Water 15-OCT-20 08:00 BLANK
Grouping	Analyte					
WATER						
Volatile Organic Compounds	Carbon disulfide (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Carbon tetrachloride (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Chlorobenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Dibromochloromethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Chloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Chloroform (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Chloromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	2-Chlorotoluene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	4-Chlorotoluene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	1,2-Dibromo-3-chloropropane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Ethylene dibromide (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Dibromomethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	cis-1,4-Dichloro-2-butene (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	trans-1,4-Dichloro-2-butene (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	1,2-Dichlorobenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	1,3-Dichlorobenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	1,4-Dichlorobenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Dichlorodifluoromethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	1,1-Dichloroethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	1,2-Dichloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	1,1-Dichloroethene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	cis-1,2-Dichloroethene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	trans-1,2-Dichloroethene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Methylene chloride (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	1,2-Dichloropropane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	1,3-Dichloropropane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	2,2-Dichloropropane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	1,1-Dichloropropene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	cis-1,3-Dichloropropene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	trans-1,3-Dichloropropene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Ethanol (mg/L)	<0.20	<0.20	<0.20	<0.20	<0.20
	Ethyl methacrylate (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Ethylbenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Hexachlorobutadiene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	2-Hexanone (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Iodomethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Isopropylbenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010

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		Sample ID	L2517514-1	L2517514-2	L2517514-3	L2517514-4	L2517514-5
		Description	Water	Water	Water	Water	Water
		Sampled Date	15-OCT-20	15-OCT-20	15-OCT-20	15-OCT-20	15-OCT-20
		Sampled Time	09:15	10:10	10:50	11:00	08:00
		Client ID	AND1	MICH-33.8	MICH-13.0	DUPLICATE	BLANK
Grouping	Analyte						
WATER							
Volatile Organic Compounds	p-Isopropyltoluene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	4-Methyl-2-pentanone (MIBK) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	
	Methyl-t-butyl ether (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	n-Propylbenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Styrene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	1,1,1,2-Tetrachloroethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	1,1,2,2-Tetrachloroethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Tetrachloroethylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Toluene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00106 ^{RRV}	
	1,2,3-Trichlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	1,2,4-Trichlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	1,3,5-Trichlorobenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	1,1,1-Trichloroethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	1,1,2-Trichloroethane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Trichloroethene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Trichlorofluoromethane (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	1,2,3-Trichloropropane (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	1,2,4-Trimethylbenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	1,3,5-Trimethylbenzene (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Vinyl chloride (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	o-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	m+p-Xylenes (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Xylenes (mg/L)	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071	
	Surrogate: 4-Bromofluorobenzene (%)	88.6	94.2	90.7	89.0	85.0	
	Surrogate: 3,4-Dichlorotoluene (%)	103.6	104.8	76.5	106.3	90.6	
	Surrogate: 1,4-Difluorobenzene (%)	101.8	102.5	102.5	100.0	100.6	
Hydrocarbons	EPH10-19 (ug/L)	<100	<100	<100	<100	<100	
	EPH19-32 (ug/L)	<100	<100	<100	<100	<100	
	Surrogate: 2-Bromobenzotrifluoride (%)	75.9	72.6	71.1	71.9	72.8	

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

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2517514-1, -2, -3, -4, -5
Matrix Spike	Sodium (Na)-Total	MS-B	L2517514-1, -2, -3, -4, -5

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BE-D-L-CCMS-CL	Water	Diss. Be (low) 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.			
BE-T-L-CCMS-CL	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.			
TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.			
The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.			
TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.			
CL-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
COD-T-COL-CL	Water	Chemical Oxygen Demand (COD)	APHA 5220 D Colorimetry
Samples are analyzed using the closed reflux colourimetric method			
COLOUR-TRUE-CL	Water	Colour (True) by Spectrometer	APHA 2120 Color
True Colour is measured spectrophotometrically by comparison to platinum-cobalt standards using the single wavelength method (450 - 465 nm) after filtration of sample through a 0.45 um filter. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment. Concurrent measurement of sample pH is recommended.			
EPH-L-ME-FID-CL	Water	EPH (C10-C19) & EPH (C19-C32)	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.			
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HARDNESS-CALC-CL Water Hardness APHA 2340 B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO₃ equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-CL Water Dissolved Mercury in Water by CVAAS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 µm), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

HG-T-CVAA-CL Water Total Mercury in Water by CVAAS EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

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

Water samples are filtered (0.45 µm), 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-T-CCMS-CL Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

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

MTBE-ADD-CL Water MTBE - additional to BTEX EPA 8260C/5021A

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

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH/EC/ALK-CL Water pH, Conductivity and Total Alkalinity APHA 4500H,2510,2320

All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode.

Alkalinity measurement is based on the sample's capacity to neutralize acid

Conductivity measurement is based on the sample's capacity to convey an electric current

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

SO4-IC-N-CL Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

Reference Information

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VOC-HS-MS-CL Water VOCs in Water EPA 8260C/5021A
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. VOC Target compound concentrations are measured using mass spectrometry detection.

XYLENES-CALC-CL 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
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, 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 ww - 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.

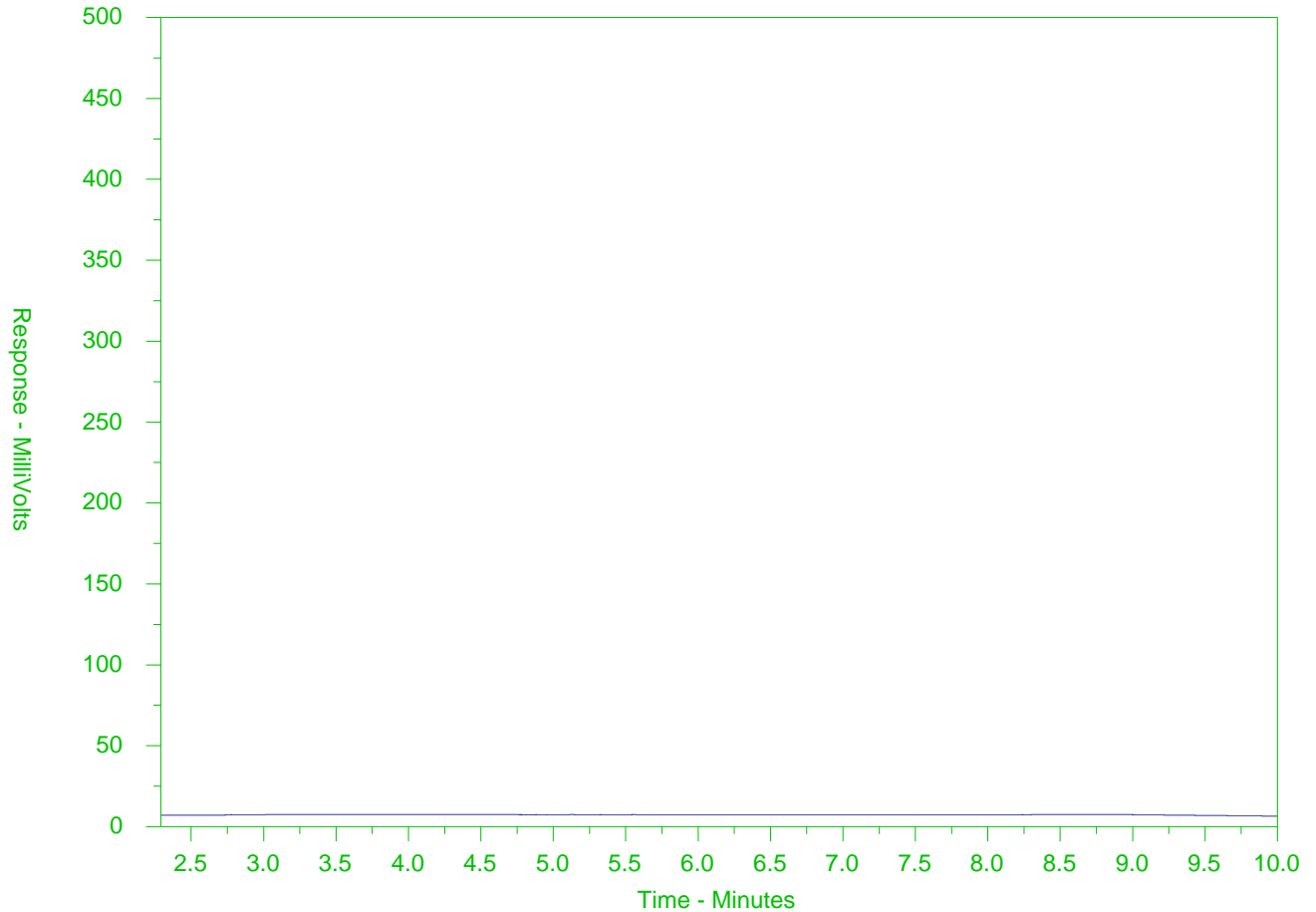
Test results reported relate only to the samples as received by the laboratory.

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: L2517514-1
 Client Sample ID: AND1



← 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.

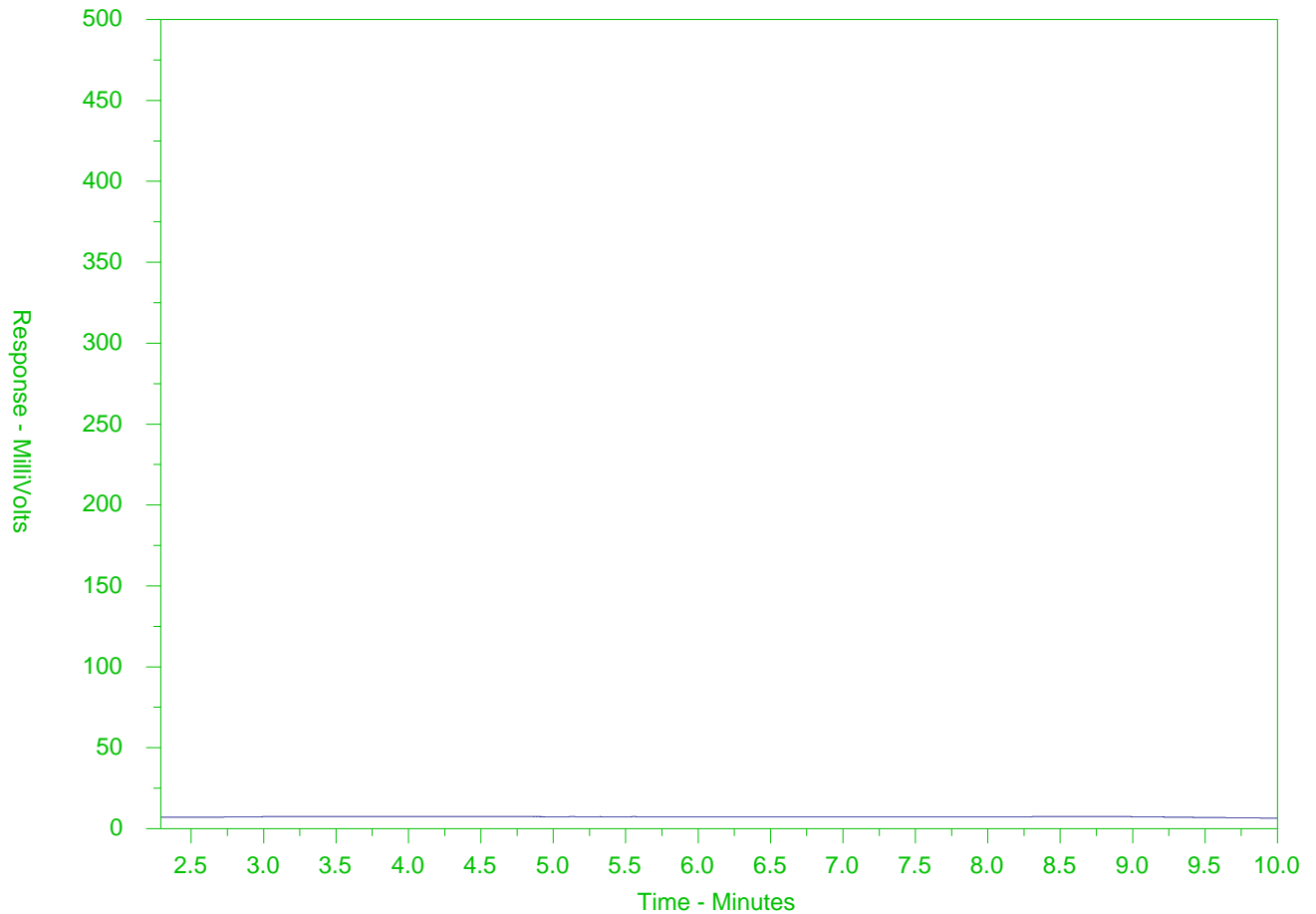
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

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: L2517514-2
 Client Sample ID: MICH-33.8



← 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.

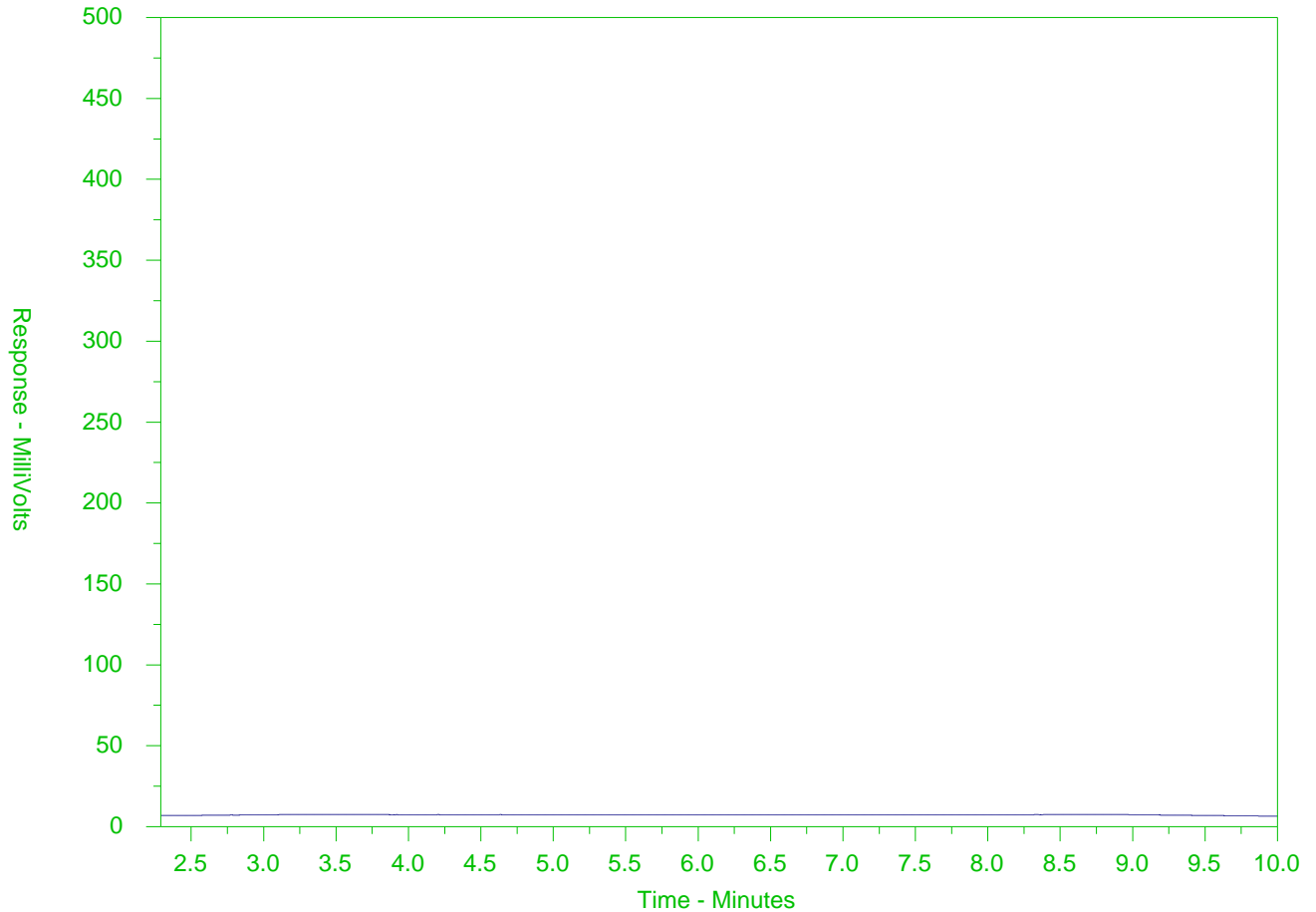
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

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: L2517514-3
 Client Sample ID: MICH-13.0



← 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.

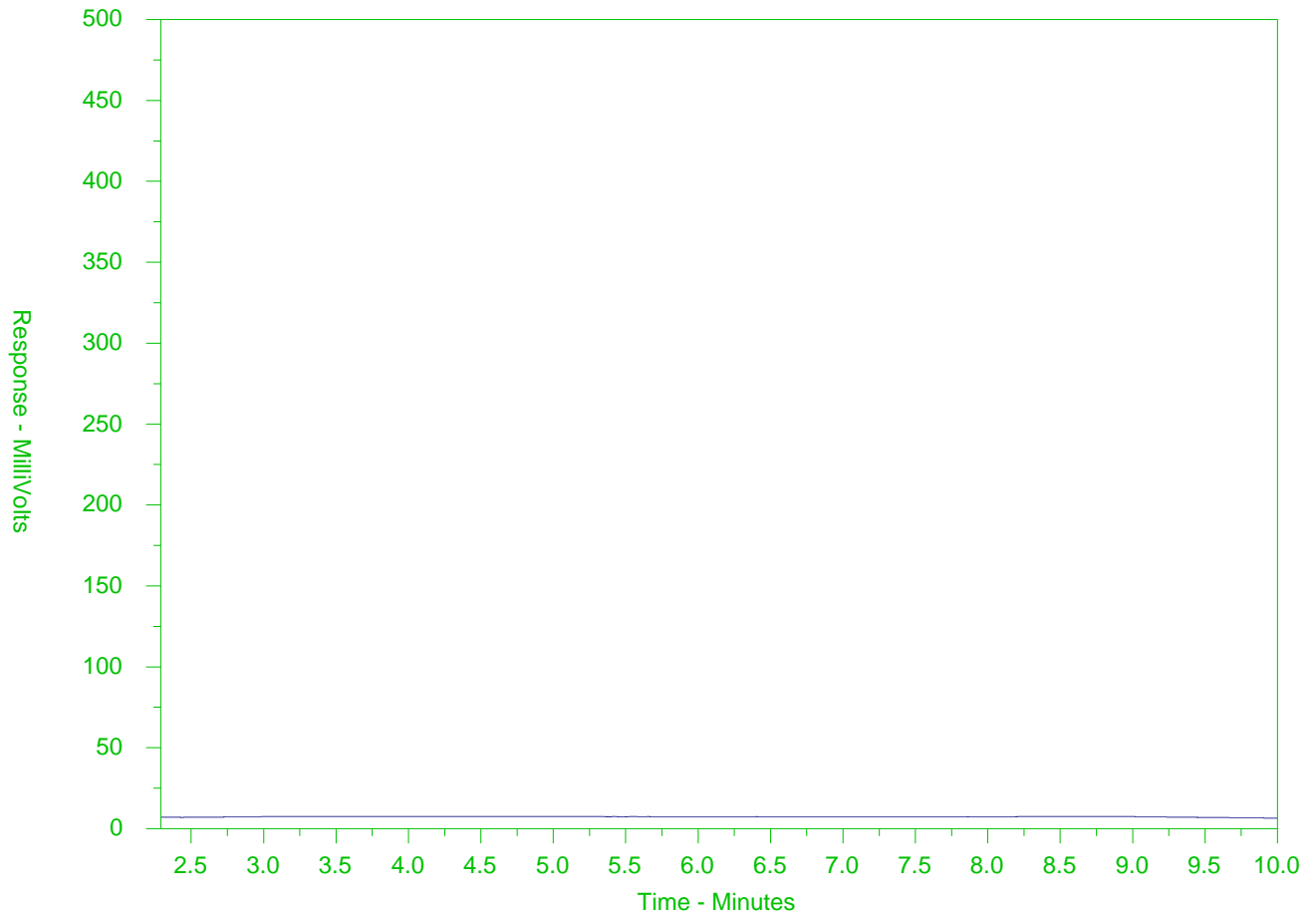
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

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: L2517514-4
 Client Sample ID: DUPLICATE



← 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.

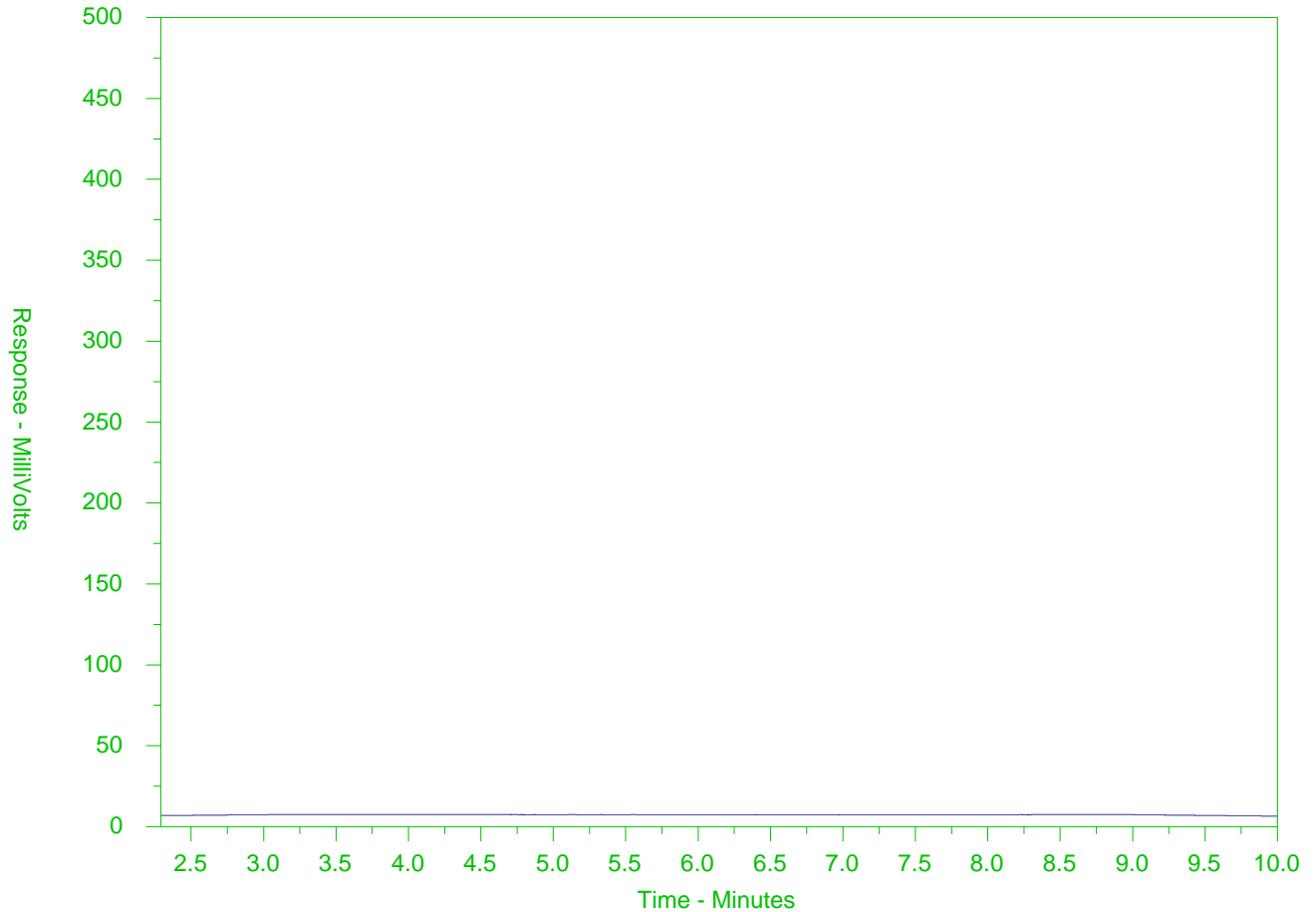
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

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: L2517514-5
 Client Sample ID: BLANK



← 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.

