



December 1, 2015

BC Ministry of Environment  
Regional Operations Branch  
Mining Operations  
c/o PO Box 9334 Stn Prov Govt  
Victoria, BC, V8W 9N3

Via email: [Doug.Hill@gov.bc.ca](mailto:Doug.Hill@gov.bc.ca)

**Attention: Mr. Douglas J. Hill, Regional Director, Mining Operations (Williams Lake)**

Dear Mr. Hill,

**Re: Report of Discharge Exceedance, October 8, 2015, PE-107835, Brucejack Mine**

Further to the notification message provided October 28<sup>th</sup> 2015, this letter provides a report of the discharge exceedance that occurred at site 'weir at 3.10' (BJ 3.10; lake outlet) on October 8<sup>th</sup>, 2015. An incident report is also attached (Appendix A). As described in the notification message, the exceedance was of TSS along with several mainly particulate associated metals. Per the attached results (Appendix B), TSS was recorded at 125 mg/L on October 8<sup>th</sup> at site 'weir at 3.10' (BJ 3.10) (discharge limit is 30 mg/L). Related exceedances are Dissolved Aluminum (0.0543 mg/L recorded; discharge limit is 0.05 mg/L), Total Arsenic (7.68 µg/L recorded; discharge limit is 5 µg/L), Total Copper (3.43 µg/L recorded; discharge limit is 2 µg/L), Total Iron (2.89 mg/L recorded; discharge limit is 1 mg/L), Total Lead (5.17 µg/L recorded; discharge limit is 4.6 µg/L), and Total Zinc (12.4 µg/L recorded; discharge limit is 7.5 µg/L).

A very heavy rainfall event was experienced at the Brucejack Mine October 8<sup>th</sup> and 9<sup>th</sup>, with ~170 mm of rain received in slightly over 48 h. Site observations and assessment at the time sourced the sediment primarily to 2 locations along Brucejack Creek where water was bypassing or overtopping sediment collection sumps that are in place as part of the construction water management system. At the primary source location, water was passing under the sump and through the base of Lakefront Road. At the secondary location, water over-topped the sump for a short period until the pump at that location could be replaced with a higher capacity unit. Water exiting the lake was clear; the elevated sediment inputs were between the creek sediment curtains and not sourced from the lake (i.e. the source was not lake discharge). The location of BJ 3.10 is such that it was picking up these creek-side sources.

Remedial water management measures to address the sediment discharge issue were promptly implemented, and are expected to prevent any recurrence. At the more easterly sump (primary source location), work was completed to better key the liner into the ground. A new interception/collection ditch was constructed up-gradient of this sump to direct water to the

Pretium Resources Inc.

1242 Main Street, Smithers, BC V0J 2N0 | T: 250-847-2526 | [www.pretivm.com](http://www.pretivm.com) | TSX/NYSE: PVG

Contact Water Pond sump and prevent it from flowing directly to the lower sump along Lakefront Road. As above, the pump at the secondary source location was replaced with a higher capacity unit.

The Brucejack Mine has been in winter conditions since late October, with temperatures mainly below freezing. Construction of the full Contact Water Pond (CWP) is continuing, and the presence of the bedrock portion of the CWP prior to freshet 2016 will further intercept and collect flows up-gradient of the more easterly sump. A water management plan specific to 2016 freshet will be prepared over the 2015/16 winter. Additional water management measures specific to that plan will be implemented prior to 2016 freshet, including changes to water management for the secondary source location referred to above (lower Mill Pad sump).

Please contact me at [SVanZalingen@pretivm.com](mailto:SVanZalingen@pretivm.com) or by phone at 250.847.2526 (Ext. 502) if you require any additional information.

Sincerely,



Environmental Manager

Cc via email:

M. Love, R. Martinka, MOE  
D. Howe, D. Flynn, MEM  
Chief D. Simpson, Tsetsaut/Skii km Lax Ha First Nation  
C. Azak, Nisga'a Lisims Government  
N. MacLean, for Tahltan Nation, as represented by Tahltan Central Council  
K. Moselle, DNR, State of Alaska  
E. O'Bryan, Independent Environmental Monitor  
K. Torpy, W. Osborne, S. Smith, M. Holtby, R. McCall, T. Sandhals, C. Creaney, Pretium

# **Appendix A**

## **Incident Report**

**BRUCEJACK MINE  
ENVIRONMENTAL INCIDENT  
REPORT FORM**

1	DATE OF INCIDENT: October 8 <sup>th</sup> , 2015	TIME OF INCIDENT: Sampling conducted 14:40
2	LOCATION OF INCIDENT (PROVIDE GPS COORDINATES IF NECESSARY):  Brucejack Lake Outlet site (BJ 3.10)	SITE CONDITIONS (TEMPERATURE, WIND, GROUND PERMEABILITY ETC.):  Heavy Rain ~170mm over 52 hours, 4 C.
3	SAFETY HAZARDS (FIRE, FUMES, EXPLOSIVE SUBSTANCE, ETC.):  None.	
4	TYPE OF PRODUCT SPILLED: OIL <input type="checkbox"/> GASOLINE <input type="checkbox"/> DIESEL <input type="checkbox"/> <u>High Total Suspended Solids (TSS) in Runoff</u> OTHER <input checked="" type="checkbox"/>	
5	CAUSE OF THE INCIDENT:  During an elevated rainfall event (~170 mm over a ~52 hour period), water with elevated sediment concentrations bypassed and over-topped (respectively) two sediment collection sumps that were in place as part of the construction water management system; the water discharged to Brucejack Creek. Water with elevated sediment concentrations bypassed the westerly sump down-gradient of the Contact Water Pond (CWP) sump by draining to ground above the sump and passing through the base of Lakefront Road. The runoff then contacted additional sediment en route to Brucejack Creek (Photo 1). At the secondary source location (lower Mill Pad Sump), water was overflowing the sump due to insufficient pumping capacity, crossing Lakefront Road and draining to Brucejack Creek (Photo 2). Water exiting Brucejack Lake was clear (Photo 1). The location of BJ 3.10 is such that it was picking up these creek-side sources.	
6	REMEDIAL ACTIONS TAKEN TO DATE TO PREVENT RECURRENCE:  Remedial water management measures to address the sediment discharge issue were promptly implemented, and are expected to prevent any recurrence.  At the more westerly sump below the CWP sump, work was completed to better key the liner into the ground. A new interception/collection ditch was constructed up-gradient of this sump to direct water to the CWP sump and prevent it from flowing directly to the lower sump along the road. This served to intercept most of the drainage toward the lower sump. There were no further issues with this sump for the remainder of the 2015 open water season.  Pretivm crew replaced pump at the lower Mill Pad sump with a higher capacity unit and pumped the sump to a manageable level so that the overflow could be stopped and the sump berm could be repaired. There were no further issues with this sump for the remainder of the 2015 open water season.	
7	ENVIRONMENTAL RISK (DESCRIBE DISTANCE TO NEAREST WATER BODY, SENSITIVE HABITAT, NEAREST PUBLIC FACILITY): LOW <input checked="" type="checkbox"/> MEDIUM <input type="checkbox"/> HIGH <input type="checkbox"/>  It is not expected that the resulting TSS load from this flash rain event resulted in a significant negative impact on the creek habitat or biota.	
8	SAMPLES TAKEN: BJ 3.10 Exceedance – S1 – Sample collected on Oct 8 <sup>th</sup> from Brucejack Lake Outlet (Site BJ 3.10).	
9	MONITORING ACTIONS AND FREQUENCY:  Monitoring of site BJ 3.10 continued as required under permit PE-107835 (weekly and daily as per the permit).	

<b>10</b>	<b>RECOMMENDATIONS FOR IMPROVEMENTS/PREVENTATIVE MEASURES:</b> The Brucejack Mine has been in winter conditions since late October, with temperatures mainly below freezing. Construction of the full Contact Water Pond (CWP) is continuing, and the presence of the bedrock portion of the CWP prior to freshet 2016 will further intercept and collect flows up-gradient of sumps located down-gradient of the CWP. A water management plan specific to the 2016 freshet will be prepared over the winter. Any additional measures determined to be necessary will be implemented pre-freshet, including specific measures to manage water collected in all of the lower sumps along Lakefront Road.																							
<b>11</b>	<b>COMPANY/CONTRACTOR INVOLVED:</b> Pretivm & BPC	<b>FRONT LINE SUPERVISOR :</b> Jeff Stewart & Chris Homister																						
<b>12</b>	<b>NAME OF PRETIVM ONSITE SUPERVISOR(S) AT THE TIME OF INCIDENT:</b> Jeff Stewart	<b>13 IS THE INCIDENT REPORTABLE AS PER TABLE 2.1-1 IN SPILL RESPONSE PLAN?</b> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> IF YES, FILL OUT BOX 15. IF NO, STOP AFTER BOX 14.																						
<b>14</b>	<b>INTERNAL REPORTING SEQUENCE:</b> <b>FIRST OBSERVER:</b> <table style="width:100%; border:none;"> <tr> <td style="width:50%; border:none;">Torence Sandhals</td> <td style="width:50%; border:none;">Allnorth</td> </tr> <tr> <td style="border:none; text-align:center;">NAME</td> <td style="border:none; text-align:center;">COMPANY</td> </tr> </table> <b>REPORTED TO:</b> <table style="width:100%; border:none;"> <tr> <td style="width:33%; border:none;">Chris Homister</td> <td style="width:33%; border:none;">Belvedere Place Contracting (BPC)</td> <td style="width:34%; border:none;">October 8<sup>th</sup>, 14:40</td> </tr> <tr> <td style="border:none; text-align:center;">NAME</td> <td style="border:none; text-align:center;">COMPANY</td> <td style="border:none; text-align:center;">Date Time</td> </tr> </table> <b>REPORTED TO ENVIRONMENTAL DEPARTMENT:</b> <table style="width:100%; border:none;"> <tr> <td style="width:33%; border:none;">Dave Korobanik</td> <td style="width:33%; border:none;">Torence Sandhals</td> <td style="width:34%; border:none;">October 8<sup>th</sup>, 14:45</td> </tr> <tr> <td style="border:none; text-align:center;">TO WHO</td> <td style="border:none; text-align:center;">BY WHOM</td> <td style="border:none; text-align:center;">Date Time</td> </tr> </table> <b>REPORTED TO PRETIVM MANAGEMENT (MGM OR ALTERNATE):</b> <table style="width:100%; border:none;"> <tr> <td style="width:33%; border:none;">Sylvia Van Zalingen</td> <td style="width:33%; border:none;">Dave Korobanik</td> <td style="width:34%; border:none;">October 8<sup>th</sup>, 15:00</td> </tr> <tr> <td style="border:none; text-align:center;">TO WHO</td> <td style="border:none; text-align:center;">BY WHOM</td> <td style="border:none; text-align:center;">Date Time</td> </tr> </table>		Torence Sandhals	Allnorth	NAME	COMPANY	Chris Homister	Belvedere Place Contracting (BPC)	October 8 <sup>th</sup> , 14:40	NAME	COMPANY	Date Time	Dave Korobanik	Torence Sandhals	October 8 <sup>th</sup> , 14:45	TO WHO	BY WHOM	Date Time	Sylvia Van Zalingen	Dave Korobanik	October 8 <sup>th</sup> , 15:00	TO WHO	BY WHOM	Date Time
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TO WHO	BY WHOM	Date Time																						
<b>15</b>	<b>EXTERNAL REPORTING SEQUENCE:</b> <b>REPORTED TO BC GOVERNMENT, MINISTRY OF ENVIRONMENT (MOE):</b> <table style="width:100%; border:none;"> <tr> <td style="width:33%; border:none;">Sylvia Van Zalingen</td> <td style="width:33%; border:none;">Douglas Hill</td> <td style="width:34%; border:none;">October 28<sup>th</sup>, 2015</td> </tr> <tr> <td style="border:none; text-align:center;">BY WHOM</td> <td style="border:none; text-align:center;">TO WHO</td> <td style="border:none; text-align:center;">DATE/TIME</td> </tr> </table> <b>DETAILED WRITTEN REPORT TO MOE, ENVIRONMENT CANADA AND FIRST NATIONS:</b> <table style="width:100%; border:none;"> <tr> <td style="width:60%; border:none;">December 1, 2015</td> <td style="width:40%; border:none;">Sylvia Van Zalingen</td> </tr> <tr> <td style="border:none; text-align:center;">DATE SUBMITTED</td> <td style="border:none; text-align:center;">BY WHOM</td> </tr> </table>		Sylvia Van Zalingen	Douglas Hill	October 28 <sup>th</sup> , 2015	BY WHOM	TO WHO	DATE/TIME	December 1, 2015	Sylvia Van Zalingen	DATE SUBMITTED	BY WHOM												
Sylvia Van Zalingen	Douglas Hill	October 28 <sup>th</sup> , 2015																						
BY WHOM	TO WHO	DATE/TIME																						
December 1, 2015	Sylvia Van Zalingen																							
DATE SUBMITTED	BY WHOM																							



Photo 1: (2015-10-08)

Water bypassed western lower collection sump below the Contact Water Pond sump during very heavy rainfall event, passing through the road base and eroding additional sediment en route to Brucejack Creek. Water exiting Brucejack Lake was clear. Water management measures were implemented to prevent recurrence.



Photo 2: (2015-10-08)

The temporary pumping system for the lower collection sump below the Mill Pad was unable to keep up with the heavy rainfall, resulting in overflow of the sump. The pump at this location was replaced with a higher capacity unit. Further water management changes will be implemented prior to 2016 freshet to prevent recurrence.

# **Appendix B**

## **Analytical Results**

**Table 1: Results of water quality samples taken Oct. 8<sup>th</sup> 2015 at BJ 3. 10.****Results Summary L1686409**

<b>Job Reference</b>	BRUCEJACK BJ 3.10 WEEKLY
<b>Report To</b>	Max Holtby, PRETIUM EXPLORATIONS INC.
<b>Date Received</b>	10-Oct-2015 23:00
<b>Report Date</b>	22-Oct-2015 17:59
<b>Report Version</b>	1

Client Sample ID	BJ 3.10	FIELD BLANK	Discharge Limit
Date Sampled	8-Oct-2015	8-Oct-2015	
Time Sampled	14:40	14:45	
ALS Sample ID	L1686409- 1	L1686409-2	
Parameter	Lowest Detection Limit	Units	Water

**Physical Tests (Water)**

Conductivity	2.0	uS/cm	79.6	<2.0	
Hardness (as CaCO <sub>3</sub> )	0.50	mg/L	35	<0.50	
pH	0.10	pH	7.56	5.55	6.5-8.5
Total Suspended Solids	3.0	mg/L	<b>125</b>	<3.0	<b>30 (max)</b>
Total Dissolved Solids	10	mg/L	88	<10	
Turbidity	0.10	NTU	87.3	<0.10	

**Anions and Nutrients (Water)**

Alkalinity, Total (as CaCO <sub>3</sub> )	1.0	mg/L	25.5	1.0	
Ammonia, Total (as N)	0.0050	mg/L	0.0061	<0.0050	1.0 mg/L
Bromide (Br)	0.050	mg/L	<0.050	<0.050	
Chloride (Cl)	0.50	mg/L	<0.50	<0.50	
Fluoride (F)	0.020	mg/L	<0.020	<0.020	
Nitrate (as N)	0.0050	mg/L	0.310	<0.0050	3 mg/L
Nitrite (as N)	0.0010	mg/L	0.0037	<0.0010	0.075 mg/L
Total Kjeldahl Nitrogen	0.050	mg/L	0.06	<0.050	
Total Nitrogen	0.030	mg/L	0.374	<0.030	
Orthophosphate-Dissolved (as P)	0.0010	mg/L	<0.0010	<0.0010	
Phosphorus (P)-Total	0.0020	mg/L	0.115	<0.0020	
Sulfate (SO <sub>4</sub> )	0.30	mg/L	13.9	<0.30	128 mg/L

**Organic / Inorganic Carbon (Water)**

Total Organic Carbon	0.50	mg/L	1.13	<0.50	
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**Total Metals (Water)**

Aluminum (Al)-Total	0.0030	mg/L	4.34	<0.0030	
Antimony (Sb)-Total	0.00010	mg/L	0.00138	<0.00010	
Arsenic (As)-Total	0.00010	mg/L	<b>0.00768</b>	<0.00010	<b>0.005 mg/L</b>
Barium (Ba)-Total	0.000050	mg/L	0.183	<0.000050	
Beryllium (Be)-Total	0.00010	mg/L	0.00013	<0.00010	0.001 mg/L
Bismuth (Bi)-Total	0.000050	mg/L	<0.000050	<0.000050	
Boron (B)-Total	0.010	mg/L	<0.010	<0.010	
Cadmium (Cd)-Total	0.0000050	mg/L	0.0000755	<0.0000050	
Calcium (Ca)-Total	0.050	mg/L	13.4	<0.050	
Chromium (Cr)-Total	0.00010	mg/L	0.00089	<0.00010	0.009 mg/L
Cobalt (Co)-Total	0.00010	mg/L	0.00094	<0.00010	
Copper (Cu)-Total	0.00050	mg/L	<b>0.00343</b>	<0.00050	<b>0.002 mg/L</b>
Iron (Fe)-Total	0.010	mg/L	<b>2.89</b>	<0.010	<b>1 mg/L</b>
Lead (Pb)-Total	0.000050	mg/L	<b>0.00517</b>	<0.000050	<b>0.0046 mg/L</b>
Lithium (Li)-Total	0.0010	mg/L	0.0031	<0.0010	0.09 mg/L
Magnesium (Mg)-Total	0.10	mg/L	1.09	<0.10	
Manganese (Mn)-Total	0.00010	mg/L	0.164	<0.00010	0.8 mg/L
Molybdenum (Mo)-Total	0.000050	mg/L	0.000658	<0.000050	
Nickel (Ni)-Total	0.00050	mg/L	0.00071	<0.00050	
Phosphorus (P)-Total	0.30	mg/L	<0.30	<0.30	
Potassium (K)-Total	0.050	mg/L	2.33	<0.050	
Selenium (Se)-Total	0.000050	mg/L	0.000184	<0.000050	0.002 mg/L
Silicon (Si)-Total	0.050	mg/L	7.92	<0.050	
Silver (Ag)-Total	0.000010	mg/L	0.000309	<0.000010	0.01 mg/L
Sodium (Na)-Total	0.050	mg/L	1.44	<0.050	
Strontium (Sr)-Total	0.00020	mg/L	0.104	<0.00020	
Thallium (Tl)-Total	0.000010	mg/L	0.000168	<0.000010	
Tin (Sn)-Total	0.00010	mg/L	<0.00010	<0.00010	
Titanium (Ti)-Total	0.010	mg/L	0.070	<0.010	
Uranium (U)-Total	0.000010	mg/L	0.000261	<0.000010	
Vanadium (V)-Total	0.00050	mg/L	0.00556	<0.00050	
Zinc (Zn)-Total	0.0030	mg/L	<b>0.0124</b>	<0.0030	<b>0.007 mg/L</b>

**Dissolved Metals (Water)**Dissolved Metals Filtration  
Location

- LAB

Dissolved Metals Filtration  
Location

- LAB

Aluminum (Al)-Dissolved

0.0010

mg/L

0.0543

Antimony (Sb)-Dissolved

0.00010

mg/L

0.00088

Arsenic (As)-Dissolved

0.00010

mg/L

0.00058

Barium (Ba)-Dissolved

0.000050

mg/L

0.0447

Beryllium (Be)-Dissolved

0.00010

mg/L

&lt;0.00010

Bismuth (Bi)-Dissolved

0.000050

mg/L

&lt;0.000050

Boron (B)-Dissolved	0.010	mg/L	<0.010	
Cadmium (Cd)-Dissolved	0.0000050	mg/L	<0.0000050	
Calcium (Ca)-Dissolved	0.050	mg/L	13.3	
Chromium (Cr)-Dissolved	0.00010	mg/L	<0.00010	
Cobalt (Co)-Dissolved	0.00010	mg/L	<0.00010	
Copper (Cu)-Dissolved	0.00020	mg/L	<0.00020	
Iron (Fe)-Dissolved	0.010	mg/L	<0.010	
Lead (Pb)-Dissolved	0.000050	mg/L	<0.000050	
Lithium (Li)-Dissolved	0.0010	mg/L	0.0010	
Magnesium (Mg)-Dissolved	0.10	mg/L	0.43	
Manganese (Mn)-Dissolved	0.00010	mg/L	0.0378	
Molybdenum (Mo)-Dissolved	0.000050	mg/L	0.000427	
Nickel (Ni)-Dissolved	0.00050	mg/L	<0.00050	
Phosphorus (P)-Dissolved	0.30	mg/L	<0.30	
Potassium (K)-Dissolved	0.050	mg/L	0.392	
Selenium (Se)-Dissolved	0.000050	mg/L	0.000117	
Silicon (Si)-Dissolved	0.050	mg/L	0.657	
Silver (Ag)-Dissolved	0.000010	mg/L	<0.000010	
Sodium (Na)-Dissolved	0.050	mg/L	1.17	
Strontium (Sr)-Dissolved	0.00020	mg/L	0.0963	
Thallium (Tl)-Dissolved	0.000010	mg/L	<0.000010	
Tin (Sn)-Dissolved	0.00010	mg/L	<0.00010	
Titanium (Ti)-Dissolved	0.010	mg/L	<0.010	
Uranium (U)-Dissolved	0.000010	mg/L	0.000063	
Vanadium (V)-Dissolved	0.00050	mg/L	<0.00050	
Zinc (Zn)-Dissolved	0.0010	mg/L	<0.0010	
<b>Aggregate Organics (Water)</b>				
COD	20	mg/L	<20	<20



PRETIUM EXPLORATIONS INC.  
ATTN: Max Holtby  
Suite 2300, Four Bentall Centre  
1055 Dunsmuir Street  
Vancouver BC V7X1L4

Date Received: 10-OCT-15  
Report Date: 22-OCT-15 17:59 (MT)  
Version: FINAL

Client Phone: 604-558-1784

## Certificate of Analysis

Lab Work Order #: L1686409  
Project P.O. #: NOT SUBMITTED  
Job Reference: BRUCEJACK BJ 3.10 WEEKLY  
C of C Numbers:  
Legal Site Desc:

Dean Watt, B.Sc.  
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700  
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1686409-1 Water 08-OCT-15 14:40 BJ 3.10	L1686409-2 Water 08-OCT-15 14:45 FIELD BLANK		
Grouping	Analyte				
<b>WATER</b>					
<b>Physical Tests</b>	Conductivity (uS/cm)	79.6	<2.0		
	Hardness (as CaCO3) (mg/L)	35.0	<0.50		
	pH (pH)	7.56	5.55		
	Total Suspended Solids (mg/L)	125	<3.0		
	Total Dissolved Solids (mg/L)	88	<10		
	Turbidity (NTU)	87.3	<0.10		
<b>Anions and Nutrients</b>	Alkalinity, Total (as CaCO3) (mg/L)	25.5	1.0		
	Ammonia, Total (as N) (mg/L)	0.0061	<0.0050		
	Bromide (Br) (mg/L)	<0.050	<0.050		
	Chloride (Cl) (mg/L)	<0.50	<0.50		
	Fluoride (F) (mg/L)	<0.020	<0.020		
	Nitrate (as N) (mg/L)	0.310	<0.0050		
	Nitrite (as N) (mg/L)	0.0037	<0.0010		
	Total Kjeldahl Nitrogen (mg/L)	0.060	<0.050		
	Total Nitrogen (mg/L)	0.374	<0.030		
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010		
	Phosphorus (P)-Total (mg/L)	0.115	<0.0020		
	Sulfate (SO4) (mg/L)	13.9	<0.30		
<b>Organic / Inorganic Carbon</b>	Total Organic Carbon (mg/L)	1.13	<0.50		
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	4.34	<0.0030		
	Antimony (Sb)-Total (mg/L)	0.00138	<0.00010		
	Arsenic (As)-Total (mg/L)	0.00768	<0.00010		
	Barium (Ba)-Total (mg/L)	0.183	<0.000050		
	Beryllium (Be)-Total (mg/L)	0.00013	<0.00010		
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050		
	Boron (B)-Total (mg/L)	<0.010	<0.010		
	Cadmium (Cd)-Total (mg/L)	0.0000755	<0.0000050		
	Calcium (Ca)-Total (mg/L)	13.4	<0.050		
	Chromium (Cr)-Total (mg/L)	0.00089	<0.00010		
	Cobalt (Co)-Total (mg/L)	0.00094	<0.00010		
	Copper (Cu)-Total (mg/L)	0.00343	<0.00050		
	Iron (Fe)-Total (mg/L)	2.89	<0.010		
	Lead (Pb)-Total (mg/L)	0.00517	<0.000050		
	Lithium (Li)-Total (mg/L)	0.0031	<0.0010		
	Magnesium (Mg)-Total (mg/L)	1.09	<0.10		
	Manganese (Mn)-Total (mg/L)	0.164	<0.00010		

\* 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	L1686409-1 Water 08-OCT-15 14:40 BJ 3.10	L1686409-2 Water 08-OCT-15 14:45 FIELD BLANK		
Grouping	Analyte				
<b>WATER</b>					
<b>Total Metals</b>	Molybdenum (Mo)-Total (mg/L)	0.000658	<0.000050		
	Nickel (Ni)-Total (mg/L)	0.00071	<0.00050		
	Phosphorus (P)-Total (mg/L)	<0.30	<0.30		
	Potassium (K)-Total (mg/L)	2.33	<0.050		
	Selenium (Se)-Total (mg/L)	0.000184	<0.000050		
	Silicon (Si)-Total (mg/L)	7.92	<0.050		
	Silver (Ag)-Total (mg/L)	0.000309	<0.000010		
	Sodium (Na)-Total (mg/L)	1.44	<0.050		
	Strontium (Sr)-Total (mg/L)	0.104	<0.00020		
	Thallium (Tl)-Total (mg/L)	0.000168	<0.000010		
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010		
	Titanium (Ti)-Total (mg/L)	0.070	<0.010		
	Uranium (U)-Total (mg/L)	0.000261	<0.000010		
	Vanadium (V)-Total (mg/L)	0.00556	<0.00050		
	Zinc (Zn)-Total (mg/L)	0.0124	<0.0030		
<b>Dissolved Metals</b>	Dissolved Metals Filtration Location	LAB			
	Aluminum (Al)-Dissolved (mg/L)	0.0543			
	Antimony (Sb)-Dissolved (mg/L)	0.00088			
	Arsenic (As)-Dissolved (mg/L)	0.00058			
	Barium (Ba)-Dissolved (mg/L)	0.0447			
	Beryllium (Be)-Dissolved (mg/L)	<0.00010			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050			
	Boron (B)-Dissolved (mg/L)	<0.010			
	Cadmium (Cd)-Dissolved (mg/L)	<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)	13.3			
	Chromium (Cr)-Dissolved (mg/L)	<0.00010			
	Cobalt (Co)-Dissolved (mg/L)	<0.00010			
	Copper (Cu)-Dissolved (mg/L)	<0.00020			
	Iron (Fe)-Dissolved (mg/L)	<0.010			
	Lead (Pb)-Dissolved (mg/L)	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	0.0010			
	Magnesium (Mg)-Dissolved (mg/L)	0.43			
	Manganese (Mn)-Dissolved (mg/L)	0.0378			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000427			
	Nickel (Ni)-Dissolved (mg/L)	<0.00050			
	Phosphorus (P)-Dissolved (mg/L)	<0.30			
	Potassium (K)-Dissolved (mg/L)	0.392			

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>	L1686409-1 Water 08-OCT-15 14:40 BJ 3.10	L1686409-2 Water 08-OCT-15 14:45 FIELD BLANK		
Grouping	Analyte				
<b>WATER</b>					
<b>Dissolved Metals</b>	Selenium (Se)-Dissolved (mg/L)	0.000117			
	Silicon (Si)-Dissolved (mg/L)	0.657			
	Silver (Ag)-Dissolved (mg/L)	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	1.17			
	Strontium (Sr)-Dissolved (mg/L)	0.0963			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.010			
	Uranium (U)-Dissolved (mg/L)	0.000063			
	Vanadium (V)-Dissolved (mg/L)	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	<0.0010			
<b>Aggregate Organics</b>	COD (mg/L)	<20	<20		

\* 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)
Method Blank	Alkalinity, Total (as CaCO3)	B	L1686409-1
Duplicate	Bromide (Br)	DLDS	L1686409-1, -2
Duplicate	Nitrite (as N)	DLDS	L1686409-1, -2
Duplicate	Fluoride (F)	DLDS	L1686409-1, -2
Duplicate	Nitrite (as N)	DLDS	L1686409-1, -2
Duplicate	Nitrate (as N)	DLDS	L1686409-1, -2
Duplicate	Bromide (Br)	DLDS	L1686409-1, -2
Duplicate	Chloride (Cl)	DLDS	L1686409-1, -2
Matrix Spike	Sulfate (SO4)	MS-B	L1686409-1, -2
Matrix Spike	Nitrate (as N)	MS-B	L1686409-1, -2
Matrix Spike	Sulfate (SO4)	MS-B	L1686409-1, -2
Matrix Spike	Titanium (Ti)-Total	MS-B	L1686409-1, -2
Matrix Spike	Total Nitrogen	MS-B	L1686409-1, -2
Matrix Spike	Total Nitrogen	MS-B	L1686409-1, -2
Matrix Spike	Total Nitrogen	MS-B	L1686409-1, -2
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L1686409-1
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L1686409-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L1686409-1
Matrix Spike	Aluminum (Al)-Total	MS-B	L1686409-1, -2
Matrix Spike	Cobalt (Co)-Total	MS-B	L1686409-1, -2
Matrix Spike	Iron (Fe)-Total	MS-B	L1686409-1, -2
Matrix Spike	Manganese (Mn)-Total	MS-B	L1686409-1, -2
Matrix Spike	Nickel (Ni)-Total	MS-B	L1686409-1, -2
Matrix Spike	Vanadium (V)-Total	MS-B	L1686409-1, -2
Matrix Spike	Total Organic Carbon	MS-B	L1686409-1, -2

### Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. All associated sample results are at least 5 times greater than blank levels and are considered reliable.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<b>ALK-TITR-VA</b>	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
<b>BR-L-IC-N-VA</b>	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.			
<b>CARBONS-TOC-VA</b>	Water	Total organic carbon by combustion	APHA 5310B TOTAL ORGANIC CARBON (TOC)
This analysis is carried out using procedures adapted from APHA Method 5310 "Total Organic Carbon (TOC)".			
<b>CL-IC-N-VA</b>	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>COD-COL-VA</b>	Water	Chemical Oxygen Demand by Colorimetric	APHA 5220 D. CHEMICAL OXYGEN DEMAND
This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.			
<b>EC-PCT-VA</b>	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
<b>F-IC-N-VA</b>	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-VA** Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO<sub>3</sub> equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

**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-DIS-ICP-VA** Water Dissolved Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

**MET-T-CCMS-VA** 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.

**MET-TOT-ICP-VA** Water Total Metals in Water by ICPOES EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using either hotblock or microwave oven (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

**N-T-COL-VA** Water Total Nitrogen in water by Colour APHA Method 4500-P (J) / NEMI 5735

This analysis is carried out using procedures adapted from APHA Method 4500-P (J) "Persulphate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus" and National Environmental Methods Index - Nemi method 5735.

**NH3-F-VA** Water Ammonia in Water by Fluorescence APHA 4500 NH<sub>3</sub>-NITROGEN (AMMONIA)

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.

**NH3-F-VA** Water Ammonia in Water by Fluorescence 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-VA** 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-VA** 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-PRES-COL-VA** Water Total P in Water by Colour 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-PCT-VA** Water pH by Meter (Automated) APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

**PH-PCT-VA** Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

**PO4-DO-COL-VA** Water Diss. Orthophosphate in Water by Colour 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.

## Reference Information

<b>SO4-IC-N-VA</b>	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>TDS-VA</b>	Water	Total Dissolved Solids by Gravimetric	APHA 2540 C - GRAVIMETRIC
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.			
<b>TKN-CALC-VA</b>	Water	TKN in Water (Calculation)	BC MOE LABORATORY MANUAL (2005)
Total Kjeldahl Nitrogen is a calculated parameter. Total Kjeldahl Nitrogen (calc) = Total Nitrogen - [Nitrite (as N) + Nitrate (as N)].			
<b>TSS-VA</b>	Water	Total Suspended Solids by Gravimetric	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, TSS is determined by drying the filter at 104 degrees celsius.			
<b>TURBIDITY-VA</b>	Water	Turbidity by Meter	APHA 2130 "Turbidity"
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			
<b>TURBIDITY-VA</b>	Water	Turbidity by Meter	APHA 2130 Turbidity
This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.			

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\*\* 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:*

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

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### 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.*

