

**From:** [Sandve, Chris MEM:EX](#)  
**To:** [Nikolejsin, Dave MEM:EX](#); [Morel, David P MEM:EX](#); [Haslam, David GCPE:EX](#)  
**Subject:** Briefing with MBB today - 3:30 PM  
**Date:** Monday, August 11, 2014 1:05:58 PM

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s.15

**Chris Sandve**

Chief of Staff to the Hon. Bill Bennett

Minister of Energy and Mines and Minister Responsible for Core Review

Office: 250-356-9944 | Cell: 250-818-4306 | E-mail: [chris.sandve@gov.bc.ca](mailto:chris.sandve@gov.bc.ca)

**From:** [Sandve, Chris MEM:EX](#)  
**To:** [Nikolejsin, Dave MEM:EX](#); [Morel, David P MEM:EX](#)  
**Subject:** FW: MARR call  
**Date:** Monday, August 11, 2014 1:17:44 PM

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MBB is on this pre-brief now and call with FNs at 1:30 PM. It does not appear we have staff on the call. David can you connect with Lori Hall and Peter Walters re: who we should have on these calls.

**Chris Sandve**

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**From:** Hancock, Tom ENV:EX  
**Sent:** Monday, August 11, 2014 12:14 PM  
**To:** Sandve, Chris MEM:EX  
**Subject:** MARR call

The Ministries of Environment, Energy and Mines, Aboriginal Relations and Reconciliation, and Emergency Management BC, are setting up regular conference calls to provide you with Mt. Polley mine information.

The first conference call will be held at 1:30 p.m. today, August 8, 2014. Subsequent calls will be held at 1:30 p.m. each Monday, Wednesday and Friday, until further notice.

Time-sensitive information will be shared by email before the next conference call.

Call-in information: s.15

Would MBB like a briefing prior to the call.

Tom Hancock

Ministerial Assistant to the Honourable Mary Polak

Minister of Environment

Office of the Minister

Province of British Columbia

T. 250-387-1187

F. 250-387-1356

Email [tom.hancock@gov.bc.ca](mailto:tom.hancock@gov.bc.ca)

**From:** [Sandve, Chris MEM:EX](#)  
**To:** [Nikolejsin, Dave MEM:EX](#); [Morel, David P MEM:EX](#)  
**Subject:** Call today at 3:30  
**Date:** Monday, August 11, 2014 1:28:19 PM

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MBB asked that MJR join the call at the start to discuss a couple FN issues. Then we can talk about our stuff.

**Chris Sandve**

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**From:** [Sandve, Chris MEM:EX](#)  
**To:** [Nikolejsin, Dave MEM:EX](#); [Morel, David P MEM:EX](#)  
**Subject:** just flagging...  
**Date:** Monday, August 11, 2014 2:04:03 PM

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From the call with FNs it sounds like MBB envisions the third party (whether it be panel, or ubc or whatever) having some involvement in reviewing the independent inspection reports that come back as part of the overall tailings ponds review

**Chris Sandve**

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**From:** [Sandve, Chris MEM:EX](#)  
**To:** [Morel, David P MEM:EX](#); [Nikolejsin, Dave MEM:EX](#)  
**Subject:** RE: just flagging...  
**Date:** Monday, August 11, 2014 2:09:06 PM

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Ok thanks – can you make a point of reviewing that with MBB on call today? Just want to make sure he is clear. Thanks!

**Chris Sandve**

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**From:** Morel, David P MEM:EX  
**Sent:** Monday, August 11, 2014 2:09 PM  
**To:** Sandve, Chris MEM:EX; Nikolejsin, Dave MEM:EX  
**Subject:** RE: just flagging...

What we have in mind is using a different group of consultants to help us review the materials that from other mines and keep the eminent expert group focused on Mt Polley.

David

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**From:** Sandve, Chris MEM:EX  
**Sent:** Monday, August 11, 2014 2:04 PM  
**To:** Nikolejsin, Dave MEM:EX; Morel, David P MEM:EX  
**Subject:** just flagging...

From the call with FNs it sounds like MBB envisions the third party (whether it be panel, or ubc or whatever) having some involvement in reviewing the independent inspection reports that come back as part of the overall tailings ponds review

**Chris Sandve**

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**From:** [Sandve, Chris MEM:EX](#)  
**To:** [Morel, David P MEM:EX](#)  
**Subject:** Angela - MABC  
**Date:** Monday, August 11, 2014 3:27:56 PM

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Can you connect with her after our call with the Minister – gave her heads up re: review of all tailings ponds. She has questions, re: how we are deciding what tailings ponds to review (i.e. how did we determine the 97)

1-778-828-2607

**Chris Sandve**

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**From:** [Nikolejsin, Dave MEM:EX](#)  
**To:** [Morel, David P MEM:EX](#)  
**Subject:** Ubc  
**Date:** Monday, August 11, 2014 4:48:58 PM

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Let me know if you need me to talk to the dean of the mining school at ubc. We need to sort that one out.  
Send me a name and number and I'm happy to help if you need it.

Dave Nikolejsin  
Deputy Minister  
Energy and Mines

**From:** [Sandve, Chris MEM:EX](#)  
**To:** [XT:Bennett, B LP:IN](#)  
**Cc:** [Nikolejsin, Dave MEM:EX](#); [Morel, David P MEM:EX](#)  
**Subject:** FN call  
**Date:** Monday, August 11, 2014 5:09:29 PM

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For the 10 am update call tomorrow, they plan to include the following Chiefs  
Dave / David – given MBB not on this call , can one of you participate – pre brief at 9:50 AM

s.15

Ann Louie, at Williams Lake Band  
Bev Sellars, at Soda Creek Band  
Mike Archie, at Canim Lake Band  
Patrick Harry, at Canoe Creek Band

Thanks

Chris

**Chris Sandve**

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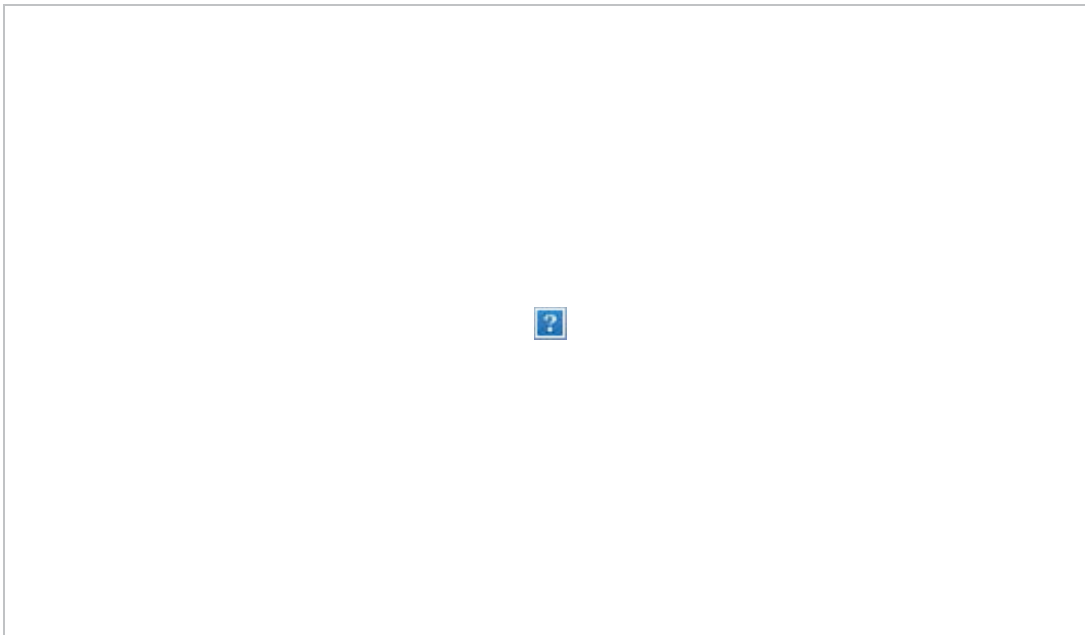
**From:** [Amann-Blake, Nathaniel MEM:EX](#)  
**To:** [Morel, David P MEM:EX](#)  
**Subject:** info request: changes since 2001  
**Date:** Monday, August 11, 2014 5:35:31 PM  
**Attachments:** [MMRD Budget History from 2001 to 2017 - August 11.xlsx](#)  
[image001.png](#)

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Hi David,

1. Attached are the FTE and budgets for the division dating back to 2001. This was prepared by Ranbir's group – I have deleted the forecasts and added the current 2014 FTEs.
2. You also asked about inspections/mine site visits. The chart below is from the latest CIM annual report. FYI, the number of mine visits in 2013 was 1201 (to be published in 2013 CIM report due this fall). The reports are available here:

<http://www.empr.gov.bc.ca/Mining/HealthandSafety/CI/Pages/default.aspx>



3. We are still compiling the list of legislative amendments and Code revisions since 2001. I will provide an update on that tomorrow.

**Nathaniel Amann-Blake**

Executive Director | Policy, Legislation and Issues Resolution

Mines and Mineral Resources Division

BC Ministry of Energy and Mines

Mines and Mineral Resources Budget History 2000/01 through to 2016/17

DRAFT ONLY																		
	(5000s)	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
(NOTES ARE VERY IMPORTANT FOR CONTEXT)																		
Mines and Mineral Resources Estimates		Note 1	Note 2	Note 3	Note 4	Note 5						NOTE 6						
Approved NRS Contingency Funding (MMRD only)		18 639	16 239	12 990	4 526	7 868	13 282	14 807	14 082	14 037	12 544	10 744	10 084	10 013	11 056	11 056		
MMRD Allocation of Structural Deficit													2 310	4 600	3 700	4 850		
Total MMRD Funding		18,639	16,239	12,990	4,526	7,868	13,282	14,807	14,082	14,037	12,544	10,744	12,394	14,613	15,798	15,906		
# of Positions (FTEs) from PAWS/PSA CHIPs Data (Green reflects manual adjustments)		189	198	133	30	69	94	91	132	119	108	92	99	124	138	143 (current)		
MMRD Salaries and Benefits per Estimates		12 557	13 138	9 396	3 013	5 573	8 854	8 989	10 514	10 850	9 505	8 568	7 859	7 786	9 011	9 011		

**Note 1:** Per Estimates for "Energy and Minerals" core business. The budget included \$1.1M in external recoveries.  
**Note 2:** Per Estimates (July 30th 2001)for "Energy and Minerals" core business - Between 2000/01 and 2001/02 - there was a program transfer of 18 ftes and \$1.182M plus \$180K for Mineral Titles to the Ministry of Sustainable Resource Mangement. Also, the budget included \$2M in external recoveries which reduced the net budget by \$900K. The total identifiable change is a reduction of \$2.3M over fiscal 2000/01.  
**Note 3:** Per Estimates for "Energy and Minerals" core business. Per Estimates supplement: Of the total \$3.2M year over year reduction, \$2.7M is in salary costs.  
**Note 4:** Per Estimates the Core Business Changed to "Mining" with a budget of \$4.526M. The comparable "restated" budget for fiscal 2002/03 per Estimates for "Mining" is \$6.123M - a reduction of \$1.6M.  
**Note 5:** Per Estimates the Core Business Changed to "Mining and Minerals" with a Core Business budget of \$7.868M. The comparable "restated" budget for fiscal 2003/04 for "Mining and Minerals" is \$10.510M.  
**Note 6:** Mining transferred to Ministry of Forests, Lands and Natural Resource Operations and back in this fiscal year

Note 7: FTE information is gathered from multiple sources: 1. The green highlighted information comes from manual historical data in printed and electronic form reflecting either actual/budget data; 2. All other data comes from CHIPs through PSA.

**From:** [Sandve, Chris MEM:EX](#)  
**To:** [Morel, David P MEM:EX](#)  
**Subject:** RE: FN call  
**Date:** Monday, August 11, 2014 5:38:30 PM

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I don't have any details – you may want to connect with Lori

**Chris Sandve**

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**From:** Morel, David P MEM:EX  
**Sent:** Monday, August 11, 2014 5:29 PM  
**To:** Sandve, Chris MEM:EX; XT:Bennett, B LP:IN  
**Cc:** Nikolejsin, Dave MEM:EX; Musgrove, Kate MEM:EX  
**Subject:** RE: FN call

Ok I can be on call. Please provide background info.

David

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**From:** Sandve, Chris MEM:EX  
**Sent:** Monday, August 11, 2014 5:09 PM  
**To:** XT:Bennett, B LP:IN  
**Cc:** Nikolejsin, Dave MEM:EX; Morel, David P MEM:EX  
**Subject:** FN call

For the 10 am update call tomorrow, they plan to include the following Chiefs

Dave / David – given MBB not on this call , can one of you participate – pre brief at 9:50 AM

s.15

Ann Louie, at Williams Lake Band

Bev Sellars, at Soda Creek Band

Mike Archie, at Canim Lake Band

Patrick Harry, at Canoe Creek Band

Thanks

Chris

**Chris Sandve**

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**From:** [Narynski, Heather M MEM:EX](#)  
**To:** [Bellefontaine, Kim MEM:EX](#); [Morel, David P MEM:EX](#); [Hoffman, Al MEM:EX](#)  
**Cc:** [Demchuk, Tania MEM:EX](#); [Warnock, George MEM:EX](#); [Howe, Diane J MEM:EX](#)  
**Subject:** CI Directive and Associated News Release  
**Date:** Monday, August 11, 2014 6:32:07 PM  
**Attachments:** [Chief Inspector's Directive TSF August 2014 DRAFT.docx](#)  
[NR Inspections of Tailings Facilities Aug11 123pm.docx](#)

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David,

I have attached the Chief Inspectors Directive and the associated News Release. The News Release has been reviewed for consistency with the CI directive.

Al has reviewed the CI Directive and has some concerns around the ability to meet the 90 day timeframe.

s.22

will be available to discuss tomorrow if this is not finalized tonight.

Heather



Pages 13 through 17 redacted for the following reasons:

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s.13

**From:** [Bellefontaine, Kim MEM:EX](#)  
**To:** [Dale Reimer \(dreimer@mountpolley.com\)](#); [bkynoch@imperialmetals.com](#); [Art Frye \(afrye@mountpolley.com\)](#); [Luke Moger \(LMoger@MountPolley.com\)](#); [Jack Love](#); [Don Parsons \(dparsons@imperialmetals.com\)](#)  
**Cc:** [Morel, David P MEM:EX](#); [Howe, Diane J MEM:EX](#); [Thorpe, Rolly MEM:EX](#); [Narynski, Heather M MEM:EX](#); [Rothman, Stephen MEM:EX](#); [Demchuk, Tania MEM:EX](#); [Warnock, George MEM:EX](#); [Art Frye \(afrye@mountpolley.com\)](#); [Bunce, Hubert ENV:EX](#); [Matscha, Gabriele ENV:EX](#); [McGuire, Jennifer ENV:EX](#)  
**Subject:** Chief Inspector Orders And Actions Related to Remedial Works and Conducting an Investigation  
**Date:** Monday, August 11, 2014 6:33:48 PM  
**Attachments:** [Letter to Dale Reimer Mine Manager Mount Polley - Chief Inspector Orders August 11, 2014.pdf](#)

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Dear Mr. Reimer,

Please find attached correspondence from the Chief Inspector of Mines containing orders and actions.

The original hard copy will be mailed tomorrow.

Regards,

***Kim Bellefontaine, M.Sc., P.Geo.***

Manager Environmental Geoscience & Permitting

B.C. Ministry of Energy and Mines

Phone: (250) 952-0489

E-mail: [Kim.Bellefontaine@gov.bc.ca](mailto:Kim.Bellefontaine@gov.bc.ca)



August 11, 2014

Mr. Dale Reimer  
Mine Manager  
Mount Polley Mining Corporation  
Box 12 Likely, BC V0L 1N0

Mine: 1101163  
ORCS: 19020-40

By mail and email: [dreimer@mountpolley.com](mailto:dreimer@mountpolley.com); [bkynoch@imperialmetals.com](mailto:bkynoch@imperialmetals.com);  
[afrye@mountpolley.com](mailto:afrye@mountpolley.com); [lmoger@mountpolley.com](mailto:lmoger@mountpolley.com); [ilove@imperialmetals.com](mailto:ilove@imperialmetals.com);  
[dparsons@imperialmetals.com](mailto:dparsons@imperialmetals.com)

Dear Mr. Reimer:

**Re: Chief Inspector Orders in follow-up to site inspections of August 4-8, 2014**

In follow-up to directions you may have received verbally and by email from mines inspectors attending the Mount Polley Mine site between the dates of August 4 to 8, 2014, I wish to follow-up with written orders and additional actions that are required to be undertaken by Mount Polley Mining Corporation.

In response to the dam failure of August 4, 2014, you are reminded of your responsibility to conduct a comprehensive investigation of the root cause(s) of the event.

- (a) Pursuant to Part 1.7.1(4) of the Health, Safety and Reclamation Code for Mines in British Columbia (Code), the Mine Manager shall ensure that the investigation is carried out by persons knowledgeable in the type of work involved as well as the co-chairpersons of the OHSC or their designates.
- (b) Pursuant to Part 1.7.2 of the Code, on completion of the investigation the Mine Manager shall prepare, for the Chief Inspector, a report that:
  - a. to the extent practicable identifies the causes of the accident,
  - b. identifies any unsafe conditions, acts, or procedures which contributed in any manner to the accident,
  - c. makes recommendations which may prevent similar accidents, and
  - d. is forwarded to the OHSC.
- (c) It is requested that the investigation report be submitted to the Chief Inspector no later than January 15, 2015.

Mount Polley Mining Corporation is also reminded that the Chief Inspector will be conducting a separate investigation of this incident. Pursuant to Section 15(7) of the *Mines Act*, and the Mine Regulation, you will be required to provide full access to all areas of the mine site and all relevant information.

.../2

Ministry of  
Energy and Mines

Health, Safety and  
Permitting Branch

Mailing Address:  
PO Box 9320  
Stn Prov Got  
Victoria, BC  
V8W 9N3

Phone: 250 952 0793  
Fax: 250 952 0491

Order 1

Pursuant to Section 15(4)(d) of the *Mines Act* the Mine Manager shall undertake to remediate the dam failure in a manner that ensures future stability of the tailings storage facility and prevents further release of tailings.

Order 2

The current condition of the tailings impoundment since the dam breach of August 4, 2014, represents a significant departure from the approved work system and reclamation plans for the Mount Polley Mine. Thus, pursuant to Section 10.1.11 of the Health, Safety and Reclamation Code, the Mine Manager shall submit a *Mines Act* Permit Amendment Application for the remediation of the dam failure. The application, including detailed designs, must be submitted by May 31, 2015 to the Chief Inspector for review and approval.

It is requested that a status update on the remedial plan and a schedule for implementation of the remedial works be provided to the Chief Inspector by January 15, 2015.

Sincerely,



Al Hoffman, P.Eng.  
Chief Inspector of Mines

Cc: Mr. David Morel, Assistant Deputy Minister, MEM  
Ms. Diane Howe, Deputy Chief Inspector of Mines, Permitting and Reclamation, MEM  
Mr. Rolly Thorpe, Deputy Chief Inspector of Mines, Health and Safety, MEM  
Ms. Heather Narynski, Senior Geotechnical Inspector, MEM  
Mr. Stephen Rothman, Senior Inspector of Mines, Kamloops, MEM  
Ms. Tania Demchuk, Senior Environmental Geoscientist, MEM  
Mr. George Warnock, Manager, Geotechnical Engineering, MEM  
Mr. Art Frye, Chief Operating Manager, Imperial Metals Corporation  
Mr. Jack Love, Environmental Superintendent, Imperial Metals Corporation  
Mr. Don Parsons, Chief Operating Officer, Imperial Metals Corporation  
Mr. Hubert Bunce, Environmental Protection, Mining Operations Director, MOE  
Ms. Gabi Matscha, Environmental Quality Section Head, MOE  
Ms. Jennifer McGuire, Executive Director, Environmental Protection Division, MOE

**From:** [Halls, Lori D ENV:EX](#)  
**To:** [Fraser, John Paul GCPE:EX](#); [Dyble, John C PREM:EX](#); [Shoemaker, Wes ENV:EX](#); [Sweeney, Neil PREM:EX](#); [Nikolejsin, Dave MEM:EX](#); [Morel, David P MEM:EX](#); [Quealey, Pat JAG:EX](#); [Wanamaker, Lori JAG:EX](#); [Brown, Stephen R HLTH:EX](#); [Mayhew, Neilane ABR:EX](#)  
**Subject:** MOE Update re: Mount Polley - Aug 12th  
**Date:** Monday, August 11, 2014 7:08:55 PM  
**Attachments:** [Results up to August 7 2014 water samples w DW GLs.xlsx](#)  
[Memo - Quesnel Water Quality Aug7 2014 AL.DOCX](#)  
[Memo - Quesnel Water Quality Aug7 2014 DW.DOCX](#)  
[Results up to August 7 2014 water samples w AL GLS.XLSX](#)

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John

**Sampling:**

We have received a partial set of data from Lab on MOE results for Polley Lake. We are expecting the rest later tonight. Full set (including metals) is needed before any determination can be made by IHA to make any further lifts to the water use ban. When we get full results we will share with IHA. We are coordinating with GCPE around possible an announcement by IHA tomorrow.

Day 4 (Aug 7<sup>th</sup>) results have been analyzed and are attached. This information has been shared with IHA and with Chief Louie and Chief Sellars. They will be released tomorrow.

The memos identify the following:

- most of the parameters were below both BC and Health Canada Drinking Water Guidelines at these sites.
- One site (Quesnel Lake between Hazeltine and Raft Creek ) two parameters exceeded DW guidelines:
  1. total phosphorus - slightly above the BC drinking water guidelines; and
  2. total aluminum which is slightly above the Health Canada DW guideline
  3. E coli which was slightly elevated at this site as compared to the River sites.

This sample was taken as a **worse case sample**. The sample was intentionally taken from an area of turbid/cloudy water. It does not represent the general lake water quality.

Interior Health has been clear in its instructions to the public regarding not consuming turbid or 'cloudy' water.

**Discharge from Polley Lake:**

Imperial has confirmed that the existing pumps used to discharge water from Polley Lake to reduce the risk of a breach are overheating. Pumping continues but at less than optimum levels.

Previously we thought it would take as much as 75 days to get Polley Lake levels to pre-Aug 4<sup>th</sup> levels. At this current rate it is expected to take 120 days. Imperial is working with MOE and MEM staff to look at other options. Rain is in the forecast for tomorrow. At this point in time folks have not determined exactly what the threshold (I assume somewhere between 2 metres or less) that lake needs to be reduced by before workers/FNs/public can safely have access to the impact zone.

Lori Halls

Assistant Deputy Minister

BC Parks and Conservation Officer Service

5<sup>th</sup> Floor, 2975 Jutland Road, Victoria

Phone (250)387-6177

Fax (250)953-3414

Email: [lori.d.halls@gov.bc.ca](mailto:lori.d.halls@gov.bc.ca)

# MoE Sampling Results Aug 04th, 2014, Quesnel Lake by site

Parameter	Units	Quesnel Lk North Shore East of Cedar Creek
pH	pH units	7.79
Conductivity	µS/cm	94.5
Turbidity	NTU	0.18
Total Suspended Solids	mg/L	<1.0
Total Dissolved Solids	mg/L	
Hardness - Total	mg/L	50.5
Hardness - Dissolved	mg/L	45.3
<b>Microbiology</b>		
E.coli	CFU/100mL	1
<b>General Inorganics</b>		
Alkalinity Total (CaCO <sub>3</sub> )	mg/L	44.1
<b>Anions</b>		
Bromide - Dissolved	mg/L	
Chloride -Dissolved	mg/L	
Sulphate	mg/L	
<b>Nutrients</b>		
Total Kjeldahl Nitrogen	mg/L	
Total Nitrogen	mg/L	
Total Organic Nitrogen	mg/L	
Ammonia Nitrogen	mg/L	
Nitrate+Nitrite	mg/L	
Nitrate Nitrogen	mg/L	
Nitrite Nitrogen	mg/L	
Total Phosphorus	mg/L	
<b>Total Metals</b>		
Aluminum	µg/L	20.7
Antimony	µg/L	<0.5
Arsenic	µg/L	<0.1
Barium	µg/L	5.5
Beryllium	µg/L	<0.1
Bismuth	µg/L	<1.0
Boron	µg/L	<50
Cadmium	µg/L	<0.010
Calcium	mg/L	16.9
Chromium	µg/L	<1.0
Cobalt	µg/L	<0.5
Copper	µg/L	<0.5
Iron	µg/L	24
Lead	µg/L	<0.20
Lithium	µg/L	N/A
Magnesium	mg/L	2
Manganese	µg/L	1.1
Mercury	µg/L	N/A
Molybdenum	µg/L	<1.0
Nickel	µg/L	<1.0
Phosphorus	µg/L	<10
Potassium	mg/L	0.509
Selenium	µg/L	0.17
Silicon	µg/L	1850
Silver	µg/L	<0.02
Sodium	mg/L	0.905
Strontium	µg/L	116
Sulfur	mg/L	<3.0
Tellurium	µg/L	
Thallium	µg/L	<0.05
Tin	µg/L	<5.0
Titanium	µg/L	<5.0
Uranium	µg/L	0.14
Vanadium	µg/L	<5.0
Zinc	µg/L	<5.0
Zirconium	µg/L	<0.5

Parameter	Units	Quesnel Lk North Shore East of Cedar Creek
<b>Dissolved Metals</b>		
Aluminum	µg/L	12.3
Antimony	µg/L	<0.5
Arsenic	µg/L	0.11
Barium	µg/L	5
Beryllium	µg/L	<0.1
Bismuth	µg/L	<1.0
Boron	µg/L	<50
Cadmium	µg/L	<0.01
Calcium	mg/L	15.1
Chromium	µg/L	<1.0
Cobalt	µg/L	<0.5
Copper	µg/L	0.79
Iron	µg/L	<5.0
Lead	µg/L	<0.2
Lithium	µg/L	<5.0
Magnesium	mg/L	1.85
Manganese	µg/L	<1.0
Mercury	µg/L	N/A
Molybdenum	µg/L	<1.0
Nickel	µg/L	<1.0
Phosphorus	µg/L	<10
Potassium	mg/L	0.471
Selenium	µg/L	0.17
Silicon	µg/L	1530
Silver	µg/L	<0.02
Sodium	mg/L	0.803
Strontium	µg/L	110
Sulfur	mg/L	3.8
Thallium	µg/L	<0.05
Tin	µg/L	<5.0
Titanium	µg/L	<5.0
Uranium	µg/L	0.12
Vanadium	µg/L	<5.0
Zinc	µg/L	<5.0
Zirconium	µg/L	N/A

Quesnel Ik, North Shore, West of 4 Cabins	Quesnel R @ Likely Townsite	Water Quality Guidelines (approved and working)			
		BC DW	Health Can DW	Aquatic Life	
				Chronic	Acute
7.81	7.82	<8.5	6.5-8.5		6.5-9.0
94.8	95.3				
0.18	0.19	Change of 1			Change of 5
<1.0	<1.0			Change of 5	Change of 25
		500	500		
46.4	45.8				
45.1	47				
<1	1				
43.5	43.8				
		250	250	150	600
		500	500	218	
				1	2.5
		10		1.07	7.82
		10	10	3	32.8
		1	1	0.02	0.06
		0.01			0.005 - 0.015
12.3	13.7		100		
<0.5	<0.5	14	6		20
0.11	0.14	25	10		5
5	5.3		1000	1000	5000
<0.1	<0.1	4		5.3	
<1.0	<1.0				
<50	<50	5000	5000		1200
<0.010	<0.010	5	5		0.002
15.6	15.4				
<1.0	<1.0	50	50		1
<0.5	<0.5			4	110
0.65	0.57	500	1000	2	7
<10	16		300		1000
<0.20	<0.20	50	10	21	4
<5.0	<5.0			14	870
1.81	1.78				
1	1.2		50	800	1100
<0.01	<0.01	1	1	0.02	0.1
<1.0	<1.0	250		1000	2000
<1.0	<1.0				25
<10	<10				
0.518	0.469				373
0.15	0.17	10	10	2	
1660	1670				
<0.02	<0.02			0.05	0.1
0.877	0.847		200		
108	113				
<3.0	<3.0				
<0.05	<0.05	2			0.3
<5.0	<5.0				
<5.0	<5.0				2000
0.14	0.13		20		300
<5.0	<5.0				6
<5.0	<5.0	5000	5000	0.033	0.75
N/A	N/A				



Quesnel Ik, North Shore, West of 4 Cabins	Quesnel R @ Likely Townsite	Water Quality Guidelines (approved and working)			
		BC DW	Health Can DW	Aquatic Life Chronic	Acute
10	11.1	200		50	100
<0.5	<0.5				
0.11	0.13				
4.8	5.2				
<0.1	<0.1				
<1.0	<1.0				
<50	<50				
<0.01	<0.01				
15.1	15.7				
<1.0	<1.0				
<0.5	<0.5				
0.71	0.5				
<5.0	<5.0				350
<0.2	<0.2				
<5.0	<5.0				
1.8	1.92				
<1.0	<1.0				
<0.010	<0.010				
<1.0	<1.0				
<1.0	<1.0				
<10	<10				
0.475	0.485				
0.11	0.14				
1600	1670				
<0.02	<0.02				
0 845	0.862				
104	113				
<3.0	<3.0				
<0.05	<0.05				
<5.0	<5.0				
<5.0	<5.0				
0.12	0.13				
<5.0	<5.0				
<5.0	<5.0				
N/A	N/A				

MoE Sampling Results Aug 05th, 2014, Quesnel Lake by site

Parameter	Units	QUESNEL R U/S ISLAND, NORTH SHORE	QUESNEL R U/S LIKELY BRIDGE, N. SIDE	QUESNEL R D/S NARROWS, SOUT H SHORE	QUESNEL R U/S NARROWS, NORTH SHORE	QUESNEL R D/S CEDAR PT PARK, N SHORE	Water Quality Guidelines (approved and working)			
							BC DW	Health Can DW	Aquatic Life	Acute
									Chronic	
pH	pH units	7.7	7.67	7.71	7.71	7.66	<8.5	6.5-8.5		6.5-9.0
Conductivity	µS/cm	96.8	94.4	96.7	96.7	96.9				
Turbidity	NTU	0.26	0.21	0.29	0.22	0.26	Change of 1			Change of 5
Total Suspended Solids	mg/L	<4.0	<4.0	<4.0	<4.0				Change of 5	Change of 25
Total Dissolved Solids	mg/L	46	48	46	46		500	500		
Hardness - Total	mg/L	45.8	46.6	44.6	46.2	46.3				
Hardness - Dissolved	mg/L	45.4	45.6	45	46.7					
<b>Microbiology</b>										
E.coli	CFU/100L	<1	<1	<1	#N/A					
<b>General Inorganics</b>										
Alkalinity Total (CaCO <sub>3</sub> )	mg/L	40.8	41.3	40	40.3	42.9				
<b>Anions</b>										
Bromide - Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.01				
Chloride - Dissolved	mg/L	<0.50	<0.50	<0.50	<0.50	<0.5	250	250	150	600
Sulphate	mg/L	5.85	5.58	5.92	6.31	5.8	500	500	218	
<b>Nutrients</b>										
Total Kjeldahl Nitrogen	mg/L	0.084	0.079	0.078	0.082	0.089				
Total Nitrogen	mg/L	0.133	0.131	0.128	0.133	0.139				
Total Organic Nitrogen	mg/L	0.073	0.068	0.07	0.071	0.082				
Ammonia Nitrogen	mg/L	0.011	0.011	0.0084	0.01	0.0075			1	2.5
Nitrate+Nitrite	mg/L	0.0493	0.052	0.0501	0.0511	0.0494	10		1.07	7.82
Nitrate Nitrogen	mg/L	0.0472	0.0496	0.0501	0.0511	0.0494	10	10	3	32.8
Nitrite Nitrogen	mg/L	0.0021	0.0024	<0.0020	<0.0020	<0.002	1	1	0.02	0.06
Total Phosphorus	mg/L	0.0021	0.0024	0.0023	0.002	<0.002	0.01			0.005 - 0.015
<b>Total Metals</b>										
Aluminum	µg/L	13.9	13.6	13.7	13.3	13		100		
Antimony	µg/L	<0.020	<0.020	0.02	<0.020	<0.020	14	6		20
Arsenic	µg/L	0.092	0.086	0.099	0.101	0.085	25	10		5
Barium	µg/L	5.25	5.3	5.48	5.18	5.17		1000	1000	5000
Beryllium	µg/L	<0.010	#N/A	<0.010	<0.010	<0.010	4		5.3	
Bismuth	µg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050				
Boron	µg/L	<20	<20	<20	<20	<20	5000	5000		1200
Cadmium	µg/L	<0.0050	<0.0050	0.006	0.011	0.005	5	5		#REF!
Calcium	mg/L	15.3	15.6	15	15.4	15.4				
Chromium	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	50	50		1
Cobalt	µg/L	0.011	0.012	0.009	0.01	0.013			4	110
Copper	µg/L	0.588	0.506	0.52	0.486	0.572	500	1000	2	7
Iron	µg/L	11.5	11.1	11.9	14.4	10.3		300		1000
Lead	µg/L	0.03	0.015	0.015	0.208	0.02	50	10	21	4
Lithium	µg/L	0.71	0.71	0.73	0.71	0.7			14	870
Magnesium	mg/L	1.86	1.86	1.73	1.87	1.91				
Manganese	µg/L	1.17	0.982	1.06	1.05	1.13		50	800	1100
Mercury	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	1	1	0.02	0.1
Molybdenum	µg/L	0.294	0.255	0.257	0.304	0.289	250		1000	2000
Nickel	µg/L	0.34	0.367	0.367	0.344	0.354				25
Phosphorus	µg/L	#N/A	#N/A	#N/A	#N/A	#N/A				
Potassium	mg/L	#N/A	#N/A	#N/A	#N/A	#N/A				373
Selenium	µg/L	0.088	0.085	0.107	0.096	0.121	10	10	2	
Silicon	µg/L	1600	1670	1630	1680	1620				
Silver	µg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			0.05	0.1
Sodium	mg/L	#N/A	#N/A	#N/A	#N/A	#N/A		200		
Strontium	µg/L	105	107	110	106	107				
Sulfur	mg/L	#N/A	#N/A	#N/A	#N/A	#N/A				
Tellurium	µg/L	#N/A	#N/A	#N/A	#N/A	#N/A				
Thallium	µg/L	<0.0020	<0.0020	0.002	<0.0020	<0.0020	2			0.3
Tin	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20				
Titanium	µg/L	<0.50	<0.50	<0.50	<0.50	#N/A				2000
Uranium	µg/L	0.123	0.124	0.128	0.128	0.127		20		300
Vanadium	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20				6
Zinc	µg/L	0.35	0.31	0.31	0.32	0.56	5000	5000	0.033	0.75
Zirconium	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10				
<b>Dissolved Metals</b>										
Aluminum	µg/L	10.4	10.6	10.6	10.5		200		50	100
Antimony	µg/L	0.023	0.02	0.023	<0.020					
Arsenic	µg/L	0.109	0.121 (1)	0.11	0.098					
Barium	µg/L	5.04	4.99	5.06	5.02					
Beryllium	µg/L	<0.010	<0.010	#N/A	<0.010					
Bismuth	µg/L	<0.0050	<0.0050	<0.0050	<0.0050					
Boron	µg/L	<20	<20	<20	<20					
Cadmium	µg/L	<0.0050	<0.0050	<0.0050	<0.0050					
Calcium	mg/L	15.2	15.2	14.9	15.7					
Chromium	µg/L	<0.10	<0.10	<0.10	<0.10					
Cobalt	µg/L	0.008	0.007	0.007	0.006					
Copper	µg/L	0.456	0.497	0.432	0.511					
Iron	µg/L	5.2	5.9	5.8	5.4					350
Lead	µg/L	<0.0050	0.009	0.005	0.006					
Lithium	µg/L	0.68	0.66	0.72	0.7					
Magnesium	mg/L	1.82	1.87	1.89	1.86					
Manganese	µg/L	0.518	0.247	0.252	0.261					
Mercury	µg/L	<0.010	<0.010	<0.010	<0.010	<0.01				
Molybdenum	µg/L	0.307	0.278	0.305	0.331					
Nickel	µg/L	0.341	0.374	0.326	0.391					
Phosphorus	µg/L	#N/A	#N/A	#N/A	#N/A					
Potassium	mg/L	#N/A	#N/A	#N/A	#N/A					
Selenium	µg/L	0.094	0.085	0.093	0.105					
Silicon	µg/L	1630	#N/A	1600	1660					
Silver	µg/L	<0.0050	0.007	0.018	<0.0050					
Sodium	mg/L	#N/A	#N/A	#N/A	#N/A					
Strontium	µg/L	107	104	104	108					
Sulfur	mg/L	#N/A	#N/A	#N/A	#N/A					
Thallium	µg/L	0.002	0.002	0.004	0.002					
Tin	µg/L	<0.20	<0.20	<0.20	<0.20					
Titanium	µg/L	<0.50	#N/A	<0.50	<0.50					
Uranium	µg/L	0.125	0.126	0.127	0.123					
Vanadium	µg/L	<0.20	<0.20	<0.20	<0.20					
Zinc	µg/L	0.19	2.70 (1)	0.46	0.14					
Zirconium	µg/L	<0.10	#N/A	<0.10	<0.10					

MoE Sampling Results Aug 06th, 2014, Quesnel Lake by site

Parameter	Units	QUESNEL LK OFF WINKLEY CK	QUESNEL LK OFF WINKLEY CK	QUESNEL LK AT S.E. CORNER OF MITCHELL BAY	QUESNEL LK AT S.E. CORNER OF MITCHELL BAY	QUESNEL LK AT S.E. CORNER OF MITCHELL BAY (blank)	Water Quality Guidelines (approved and working)			
sample Depth	m	0.5	15	0.5	15		BC DW	Health Can DW	Aquatic Life	
									Chronic	Acute
pH	pH units	7.89	7.84	7.89	7.75		<8.5	6.5-8.5		6.5-9.0
Conductivity	µS/cm	95.8	105	94.7	104					
Turbidity	NTU	0.29	0.2	0.3	0.17		Change of 1			Change of 5
Total Suspended Solids	mg/L	<12	<12	<12	<12				Change of 5	Change of 25
Total Dissolved Solids	mg/L	52	58	56	50		500	500		
Total Hardness (CaCO3)	mg/L	46.1	48.3	46.5	48.7					
Dissolved Hardness (CaCO3)	mg/L	46.5	52.4	47.8	50.4					
<b>Microbiology</b>										
E.coli	CFU/100	<1.0	<1.0	2	<1.0					
<b>General Inorganics</b>										
Alkalinity (Total as CaCO3)	mg/L	43.4	46.9	42.5	47.4					
<b>Anions</b>										
Bromide - Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010				
Dissolved Chloride (Cl)	mg/L	0.55	<0.50	<0.50	<0.50	<0.50	250	250	150	600
Dissolved Sulphate (SO4)	mg/L	5.75	6.3	5.75	6.67	<0.50	500	500	218	
<b>Nutrients</b>										
Total Total Kjeldahl Nitrogen	mg/L	0.119	0.088	0.109	0.089	0.047				
Total Nitrogen (N)	mg/L	0.165	0.214	0.151	0.212	0.047				
Total Organic Nitrogen (N)	mg/L	0.111	0.08	0.097	0.079	0.035				
Total Ammonia (N)	mg/L	0.0087	0.0077	0.012	0.01	0.012			1	2.5
Nitrate plus Nitrite (N)	mg/L	0.0458	0.126	0.0426	0.123	<0.002	10		1.07	7.82
Nitrate (N)	mg/L	0.0458	0.126	0.0426	0.123	<0.0020	10	10	3	32.8
Nitrite (N)	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	1	1	0.02	0.06
Total Phosphorus (P)	mg/L	0.0023	0.0027	0.0027	0.0028	<0.0020	0.01			0.005 - 0.015
<b>Total Metals</b>										
Aluminum	µg/L	13.1	7.25	15.7	8.87			100		
Antimony	µg/L	0.021	<0.020	<0.020	0.020		14	6		20
Arsenic	µg/L	0.105	0.084	0.094	0.092		25	10		5
Barium	µg/L	4.91	4.47	5.56	4.53			1000	1000	5000
Beryllium	µg/L	<0.010	<0.010	<0.010	<0.010		4		5.3	
Bismuth	µg/L	<0.0050	<0.0050	<0.0050	<0.0050					
Boron	µg/L	<20	<20	<20	<20		5000	5000		1200
Cadmium	µg/L	<0.0050	<0.0050	0.0110	0.0050		5	5		#REF!
Calcium	mg/L	15.3	16.2	15.4	16.3					
Chromium	µg/L	<0.10	<0.10	<0.10	<0.10		50	50		1
Cobalt	µg/L	0.011	0.009	0.0120	0.0090				4	110
Copper	µg/L	0.48	0.502	0.539	0.602		500	1000	2	7
Iron	µg/L	12.1	7.1	34.3	8.9			300		1000
Lead	µg/L	0.018	0.055	0.0210	0.300		50	10	21	4
Lithium	µg/L	0.76	0.96	0.78	0.79				14	870
Magnesium	mg/L	1.91	1.88	1.96	1.93					
Manganese	µg/L	1.01	0.721	1.16	0.618			50	800	1100
Mercury	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	1	1	0.02	0.1
Molybdenum	µg/L	0.273	0.236	0.287	0.234		250		1000	2000

Nickel	µg/L	0.344	0.318	0.398	0.366					25
Phosphorus	µg/L	#N/A	#N/A	#N/A	#N/A					
Potassium	mg/L	#N/A	#N/A	#N/A	#N/A					373
Selenium	µg/L	0.078	0.089	0.109	0.092	10	10	2		
Silicon	µg/L	#N/A	#N/A	#N/A	#N/A					
Silver	µg/L	<0.0050	<0.0050	<0.0050	<0.0050			0.05		0.1
Sodium	mg/L	#N/A	#N/A	#N/A	#N/A		200			
Strontium	µg/L	110	117	112	116					
Sulfur	mg/L	#N/A	#N/A	#N/A	#N/A					
Tellurium	µg/L	#N/A	#N/A	#N/A	#N/A					
Thallium	µg/L	<0.0020	<0.0020	<0.0020	<0.0020	2				0.3
Tin	µg/L	<0.20	<0.20	<0.20	<0.20					
Titanium	µg/L	#N/A	#N/A	#N/A	#N/A					2000
Uranium	µg/L	0.127	0.131	0.123	0.125		20			300
Vanadium	µg/L	<0.20	<0.20	<0.20	<0.20					6
Zinc	µg/L	0.28	0.57	2.00	2.22	5000	5000	7.5		3.3
Zirconium	µg/L	#N/A	#N/A	#N/A	#N/A					
<b>Dissolved Metals</b>										
Aluminum	µg/L	11.9	6.38	10.7	7.16	200		50		100
Antimony	µg/L	<0.020	<0.020	0.021	<0.020					
Arsenic	µg/L	0.094	0.067	0.105	0.082					
Barium	µg/L	5.01	4.78	4.97	4.87					
Beryllium	µg/L	<0.010	<0.010	<0.010	<0.010					
Bismuth	µg/L	<0.0050	<0.0050	<0.0050	<0.0050					
Boron	µg/L	<20	<20	<20	<20					
Cadmium	µg/L	<0.0050	<0.0050	0.0050	<0.0050					
Calcium	mg/L	15.4	17.6	16.1	16.8					
Chromium	µg/L	<0.10	<0.10	<0.10	<0.10					
Cobalt	µg/L	0.0080	0.0060	0.0080	0.0070					
Copper	µg/L	0.410	0.385	0.538	0.454					
Iron	µg/L	5.2	4.0	6.2	4.4					350
Lead	µg/L	0.0070	0.0090	0.0090	0.0870					
Lithium	µg/L	0.84	0.93	0.73	0.88					
Magnesium	mg/L	1.92	2.03	1.88	2.07					
Manganese	µg/L	0.395	0.220	0.508	0.144					
Mercury	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010				
Molybdenum	µg/L	0.298	0.247	0.290	0.275					
Nickel	µg/L	0.328	0.338	0.372	0.368					
Phosphorus	µg/L	#N/A	#N/A	#N/A	#N/A					
Potassium	mg/L	#N/A	#N/A	#N/A	#N/A					
Selenium	µg/L	0.093	0.075	0.089	0.074					
Silicon	µg/L	#N/A	#N/A	#N/A	#N/A					
Silver	µg/L	0.0080	0.0050	0.0090	0.0080					
Sodium	mg/L	#N/A	#N/A	#N/A	#N/A					
Strontium	µg/L	117	126	110	130					
Sulfur	mg/L	#N/A	#N/A	#N/A	#N/A					
Thallium	µg/L	<0.0020	<0.0020	0.0020	<0.0020					
Tin	µg/L	<0.20	<0.20	<0.20	<0.20					
Titanium	µg/L	#N/A	#N/A	#N/A	#N/A					
Uranium	µg/L	0.138	0.146	0.128	0.140					
Vanadium	µg/L	<0.20	<0.20	<0.20	<0.20					
Zinc	µg/L	0.16	0.52	0.96	1.13					
Zirconium	µg/L	#N/A	#N/A	#N/A	#N/A					

## MoE Sampling Results Aug 07th, 2014, Quesnel Lake by site

Parameter	Units	QUESNEL R D/S Cedar Park N shore	Quesnel R u/s Island N shore	QUESNEL L BTW Hazeltine and Raft Creek	Water Quality Guidelines (approved and working)	
Sample Depth	m	0.5	0.5	0.5	BC DW	Health Can DW
pH	pH units	7.74	7.58	7.76	<8.5	6.5-8.5
Conductivity	µS/cm	97.7	96.6	98.9		
Turbidity	NTU	0.33	0.36	3.99	Change of 1	
Total Suspended Solids	mg/L	<4.0	< 4.0	<4.0		
Total Dissolved Solids	mg/L	60	60	66	500	500
Hardness - Total	mg/L	45.3	48.1	45.4		
Hardness - Dissolved	mg/L	44.6	44.7	46.3		
<b>Microbiology</b>						
E.coli	CFU/100r	2	<1	42		
<b>General Inorganics</b>						
Alkalinity Total (CaCO <sub>3</sub> )	mg/L	41.1	39.7	43.7		
<b>Anions</b>						
Bromide - Dissolved	mg/L	<0.010	<0.010	<0.010		
Chloride -Dissolved	mg/L	<0.5	<0.5	<0.5	250	250
Sulphate	mg/L	5.45	5.49	5.52	500	500
<b>Nutrients</b>						
Total Kjeldahl Nitrogen	mg/L	0.09	0.059	0.097		
Total Nitrogen	mg/L	0.157	0.13	0.146		
Total Organic Nitrogen	mg/L	0.083	0.052	0.091		
Ammonia Nitrogen	mg/L	0.0076	0.0076	0.0054		
Nitrate+Nitrite	mg/L	0.0667	0.0707	0.0491	10	
Nitrate Nitrogen	mg/L	0.0667	0.0707	0.0466	10	10
Nitrite Nitrogen	mg/L	<0.0020	<0.0020	0.0025	1	1
Total Phosphorus	mg/L	0.0051	0.0049	0.0168	0.01	
<b>Total Metals</b>						
Aluminum	µg/L	16.6	15.4	172		100
Antimony	µg/L	<0.50	<0.50	<0.50	14	6
Arsenic	µg/L	0.13	0.12	0.19		10
Barium	µg/L	5.3	5.4	7.8		1000
Beryllium	µg/L	<0.10	<0.10	<0.10	4	
Bismuth	µg/L	<1.0	<1.0	<1.0		
Boron	µg/L	<50	<50	<50	5000	5000
Cadmium	µg/L	<0.010	<0.010	<0.010	5	5
Calcium	mg/L	15	16.2	14.9		
Chromium	µg/L	1.5	<1.0	<1.0	50	50
Cobalt	µg/L	<0.50	<0.50	<0.50		
Copper	µg/L	0.77	0.69	5.62	500	1000
Iron	µg/L	28	22	89		300
Lead	µg/L	<0.20	<0.20	<0.20	50	10
Lithium	µg/L	<5.0	<5.0	<5.0		
Magnesium	mg/L	1.91	1.85	1.96		
Manganese	µg/L	1.4	1.1	6.4		50
Mercury	µg/L	<0.01	<0.010	<0.010	1	1
Molybdenum	µg/L	<1.0	<1.0	<1.0	250	

Nickel	µg/L	1.2	<1.0	<1.0		
Phosphorus	µg/L	<10	<10	<10		
Potassium	mg/L	0.485	0.472	0.55		
Selenium	µg/L	<0.10	<0.10	<0.10	10	10
Silicon	µg/L	1620	1710	1860		
Silver	µg/L	<0.020	<0.020	<0.020		
Sodium	mg/L	0.846	0.885	0.904		200
Strontium	µg/L	109	110	110		
Sulfur	mg/L	<3.0	<3.0	<3.0		
Tellurium	µg/L					
Thallium	µg/L	<0.050	<0.050	<0.050	2	
Tin	µg/L	<5.0	<5.0	<5.0		
Titanium	µg/L	<5.0	<5.0	6.0		
Uranium	µg/L	0.13	0.13	0.13		20
Vanadium	µg/L	<5.0	<5.0	<5.0		
Zinc	µg/L	<5.0	<5.0	<5.0	5000	5000
Zirconium	µg/L					
<b>Dissolved Metals</b>						
Aluminum	µg/L	10.2	10.0	12.7	200	
Antimony	µg/L	<0.50	<0.50	<0.50		
Arsenic	µg/L	0.11	0.12	0.12		
Barium	µg/L	5.2	5.1	6.1		
Beryllium	µg/L	<0.10	<0.10	<0.10		
Bismuth	µg/L	<1.0	<1.0	<1.0		
Boron	µg/L	<50	<50	<50		
Cadmium	µg/L	<0.010	<0.010	<0.010		
Calcium	mg/L	14.9	14.9	15.5		
Chromium	µg/L	<1.0	<1.0	<1.0		
Cobalt	µg/L	<0.50	<0.50	<0.50		
Copper	µg/L	0.58	0.55	1.20		
Iron	µg/L	6.7	6.3	6.4		
Lead	µg/L	<0.20	<0.20	<0.20		
Lithium	µg/L	<5.0	<5.0	<5.0		
Magnesium	mg/L	1.82	1.82	1.85		
Manganese	µg/L	<1.0	<1.0	3.1		
Mercury	µg/L	<0.010	<0.010	<0.010		
Molybdenum	µg/L	<1.0	<1.0	<1.0		
Nickel	µg/L	<1.0	<1.0	<1.0		
Phosphorus	µg/L	<10	<10	<10		
Potassium	mg/L	0.48	0.468	0.507		
Selenium	µg/L	<0.10	<0.10	<0.10		
Silicon	µg/L	1580	1570	1590		
Silver	µg/L	<0.020	<0.020	<0.020		
Sodium	mg/L	0.874	0.846	0.91		
Strontium	µg/L	106	109	108		
Sulfur	mg/L	<3.0	<3.0	<3.0		
Thallium	µg/L	<0.050	<0.050	<0.050		
Tin	µg/L	<5.0	<5.0	<5.0		
Titanium	µg/L	<5.0	<5.0	<5.0		
Uranium	µg/L	0.12	0.13	0.13		
Vanadium	µg/L	<5.0	<5.0	<5.0		
Zinc	µg/L	<5.0	<5.0	<5.0		
Zirconium	µg/L					

**MOE Baseline data**

Parameter	Units	Quesnel R @ Likely Townsite August 4th	600034 Quesnel River at Likely 1972 to 1988	2006 Summer Average E256579 QUESNEL LAKE N- D1	Water Quality Guidelines (approved and working)			
					BC DW	Health Can	Aquatic Life	
							Chronic	Acute
pH	pH units	7.82	7.46		<8.5	6.5-8.5		6.5-9.0
Conductivity	µS/cm	95.3	116.4					
Turbidity	NTU	0.19	0.59		Change of 1			Change of 5
Total Suspended Solids	mg/L	<1.0	1.4				Change of 5	Change of 25
Total Dissolved Solids	mg/L		62.7		500	500		
Hardness - Total	mg/L	45.8						
Hardness - Dissolved	mg/L	47	49.8					
<b>Microbiology</b>								
E.coli	CFU/100ml	1						
<b>General Inorganics</b>								
Alkalinity Total (CaCO <sub>3</sub> )	mg/L	43.8	47.1					
<b>Anions</b>								
Bromide - Dissolved	mg/L							
Chloride -Dissolved	mg/L		0.517		250	250	150	600
Sulphate	mg/L		6.076		500	500	218	
<b>Nutrients</b>								
Total Kjeldahl Nitrogen	mg/L		0.083	0.093				
Total Nitrogen	mg/L		0.181	0.153				
Total Organic Nitrogen	mg/L		0.073	0.090				
Ammonia Nitrogen	mg/L		0.008	0.006			1	2.5
Nitrate+Nitrite	mg/L		0.098	0.059	10		1.07	7.82
Nitrate Nitrogen	mg/L		0.099	<0.057	10	10	3	32.8
Nitrite Nitrogen	mg/L		<0.005	<0.002	1	1	0.02	0.06
Total Phosphorus	mg/L		0.005	0.004	0.01			0.005 - 0.015
<b>Total Metals</b>								
Aluminum	µg/L	13.7	20			100		
Antimony	µg/L	<0.5			14	6		20
Arsenic	µg/L	0.14			25	10		5
Barium	µg/L	5.3				1000	1000	5000
Beryllium	µg/L	<0.1			4		5.3	
Bismuth	µg/L	<1.0						
Boron	µg/L	<50			5000	5000		1200
Cadmium	µg/L	<0.010			5	5		#REF!
Calcium	mg/L	15.4						
Chromium	µg/L	<1.0	0.5		50	50		1
Cobalt	µg/L	<0.5	0				4	110
Copper	µg/L	0.57	0.167		500	1000	2	7
Iron	µg/L	16	13.333			300		1000
Lead	µg/L	<0.20	1.656		50	10	21	4
Lithium	µg/L	<5.0	0.000				14	870
Magnesium	mg/L	1.78	180.625					
Manganese	µg/L	1.2	1.333			50	800	1100
Mercury	µg/L	<0.01			1	1	0.02	0.1
Molybdenum	µg/L	<1.0			250		1000	2000

Nickel	µg/L	<1.0						25
Phosphorus	µg/L	<10						
Potassium	mg/L	0.469						373
Selenium	µg/L	0.17			10	10	2	
Silicon	µg/L	1670						
Silver	µg/L	<0.02					0.05	0.1
Sodium	mg/L	0.847				200		
Strontium	µg/L	113						
Sulfur	mg/L	<3.0						
Tellurium	µg/L							
Thallium	µg/L	<0.05			2			0.3
Tin	µg/L	<5.0						
Titanium	µg/L	<5.0						2000
Uranium	µg/L	0.13				20		300
Vanadium	µg/L	<5.0						6
Zinc	µg/L	<5.0	0.008		5000	5000	7.5	33
Zirconium	µg/L	N/A						
<b>Dissolved Metals</b>								
Aluminum	µg/L	11.1			200		50	100
Antimony	µg/L	<0.5						
Arsenic	µg/L	0.13						
Barium	µg/L	5.2						
Beryllium	µg/L	<0.1						
Bismuth	µg/L	<1.0						
Boron	µg/L	<50						
Cadmium	µg/L	<0.01						
Calcium	mg/L	15.7	16.7875					
Chromium	µg/L	<1.0	0.7125					
Cobalt	µg/L	<0.5	0					
Copper	µg/L	0.5	0.484615385					
Iron	µg/L	<5.0	10					350
Lead	µg/L	<0.2	0.153846154					
Lithium	µg/L	<5.0	0					
Magnesium	mg/L	1.92	1.914615385					
Manganese	µg/L	<1.0	0.223076923					
Mercury	µg/L	<0.010						
Molybdenum	µg/L	<1.0						
Nickel	µg/L	<1.0						
Phosphorus	µg/L	<10						
Potassium	mg/L	0.485	0.5					
Selenium	µg/L	0.14						
Silicon	µg/L	1670						
Silver	µg/L	<0.02						
Sodium	mg/L	0.862	0.983333333					
Strontium	µg/L	113						
Sulfur	mg/L	<3.0						
Thallium	µg/L	<0.05						
Tin	µg/L	<5.0						
Titanium	µg/L	<5.0						
Uranium	µg/L	0.13						
Vanadium	µg/L	<5.0						
Zinc	µg/L	<5.0	0.853					
Zirconium	µg/L	N/A						



Polley Lake Water Quality Data

Parameter	Units	Mt Polley Mine POL-1	Mt Polley Mine POL-2	MOE Polley Lk North 1989-2014 AVG	MOE Polley Lk South 1991-2014 AVG	MOE Polley Lk North 2001-2014 AVG	MOE Polley Lk South 2001-2014 AVG	Water Quality Guidelines (approved and working)			
								BC DW	Health Can DW	Aquatic Life	Acute
										Chronic	
pH	pH units	9.01	9.06	7.80	8.01	7.79	8.09	<8.5	6.5-8.5		6.5-9.0
Conductivity	µS/cm	184.00	187.00	135.80	150.90	139.38	160.65				historical averages are specific conductivity
Turbidity	NTU	3.96	2.52	0.77	0.89	0.80	0.97	Change of 1			Change of 5
Total Suspended Solids	mg/L	<3.0	<3.0	2.07	2.40	2.10	2.62			Change of 5	Change of 25
Total Dissolved Solids	mg/L	126.00	127.00	87.79	104.93	88.10	109.67	500	500		
Hardness - Total	mg/L	95.20	97.10	81.38	85.18	81.38	85.18				
Hardness - Dissolved	mg/L			103.16	102.49	103.16	102.49				
<b>Microbiology</b>											
E.coli	CFU/100mL	>201	n/a								
<b>General Inorganics</b>											
Alkalinity Total (CaCO <sub>3</sub> )	mg/L	70.80	75.40	67.10	67.79	72.24	73.23				historical averages are at pH 4.5
<b>Anions</b>											
Bromide - Dissolved	mg/L										
Chloride -Dissolved	mg/L	<0.50	<0.50		0.50			250	250	150	600
Sulphate	mg/L	27.60	26.30	10.63	12.05	15.03	16.73	500	500	218	
<b>Nutrients</b>											
Total Kjeldahl Nitrogen	mg/L						0.20				
Total Nitrogen	mg/L			0.25	0.31	0.245156	0.311846				
Total Organic Nitrogen	mg/L			0.20		0.200000					
Ammonia Nitrogen	mg/L	<0.0050	<0.0050	0.01	0.01	0.007779	0.011486			1	2.5
Nitrate Nitrite	mg/L			0.02	0.03	0.015555	0.026914	10		1.07	7.82
Nitrate Nitrogen	mg/L	<0.0050	0.01	0.02	0.04	0.023148	0.039377	10	10	3	32.8
Nitrite Nitrogen	mg/L	<0.0010	<0.0010	0.00	0.00	0.002557	0.002314	1	1	0.02	0.06
Total Phosphorus	mg/L			0.01	0.02	0.021550	0.035833	0.01			0.005 - 0.013
<b>Total Metals</b>											
Aluminum	µg/L	139.00	53.70	10.79	12.80	8.836364	12.194118		100		
Antimony	µg/L	<0.00010	<0.00010	2.24	2.57	0.047550	0.085467	14	6		20
Arsenic	µg/L	0.63	0.57	4.45	5.49	0.392273	0.455294	25	10		5
Barium	µg/L	9.62	6.91	5.40	6.58	4.799545	6.443977		1000	1000	5000
Beryllium	µg/L	<0.00010	<0.00010	0.18	0.44	0.020000	0.020000	4		5.3	
Bismuth	µg/L	<0.00050	<0.00050	3.36	8.58	0.031333	0.020000				
Boron	µg/L	19.00	19.00	41.67	40.67			5000	5000		1200
Cadmium	µg/L	<0.000010	<0.000010	0.24	0.16	0.010000	0.016471	5	5		#REPT
Calcium	mg/L	29.90	30.90			26.877647	27.811765				
Chromium	µg/L	<0.00050	<0.00050	3.60	1.31	0.295455	0.323529	50	50		1
Cobalt	µg/L	0.10	<0.00010	36.19	25.60	0.030050	0.059111			4	110
Copper	µg/L	6.31	3.16	2.44	2.54	1.365909	1.998235	500	1000	2	7
Iron	µg/L	86.00	34.00	28.58	57.50	32.714286	54.384615		300		1000
Lead	µg/L	0.05	<0.000050	673.66	330.00	0.028182	0.054118	50	10	21	4
Lithium	µg/L	<0.00050	<0.00050	0.25	0.19	0.252667	0.190000			14	870
Magnesium	mg/L	4.76	4.71			3.471176	3.820588				
Manganese	µg/L	11.70	8.21	29.56	40.04	27.588091	48.175882		50	800	1100
Mercury	µg/L	<0.000050	<0.000050	0.08	0.11			1	1	0.02	0.1
Molybdenum	µg/L	2.51	2.17	3.49	1.57	1.012273	1.328824	250		1000	2000

exceeds AL acute guideline

Nickel	µg/L	<0.00050	<0.00050	17.91	9.61	0.194545	0.394118				25
Phosphorus	µg/L	17.30	13.80	20.78	29.52	0.000000	0.000000				
Potassium	mg/L	0.52	0.36			0.414500	0.355875				373
Selenium	µg/L	0.56	0.53	4.18	5.03	0.659545	0.624118	10	10	2	
Silicon	µg/L	2440.00	2400.00	3507.00	3491.25	3731.428571	3634.615385				
Silver	µg/L	<0.000010	<0.000010	0.00	0.12		0.013636			0.05	0.1
Sodium	mg/L	4.36	4.06			4.321429	4.171538		200		
Strontium	µg/L	205.00	203.00	114.45	139.37	119.011955	149.958824				
Sulfur	mg/L										
Tellurium	µg/L			20.00	20.00						
Thallium	µg/L	<0.000010	<0.000010	0.95	5.43	0.002333	0.002000	2			0.3
Tin	µg/L	<0.00010	<0.00010	3.37	8.58	0.044667	0.010000				
Titanium	µg/L	<0.010	<0.010	3.00	3.00						3000
Uranium	µg/L	0.11	0.10	0.03	0.00	0.029733	0.036500		20		300
Vanadium	µg/L	1.50	1.20	4.70	4.84	0.529333	1.065000				6
Zinc	µg/L	<0.0030	<0.0030	3.81	3.64	1.145455	2.488235	5000	5000	0.033	0.75 exceeds AL chronic guideline
Zirconium	µg/L			0.00	3.00						
Dissolved Metals				0.00	0.00						
Aluminum	µg/L	12.50	6.30	8.01	11.78			200		50	100
Antimony	µg/L	<0.000010	<0.000010	5.51	15.00	0.021200					
Arsenic	µg/L	0.61	0.55	8.47	13.90	0.301429	0.545000				
Barium	µg/L	7.72	6.36	7.49	7.09	3.805714	7.395000				
Beryllium	µg/L	<0.00010	<0.00010	0.39	1.00	0.020000					
Bismuth	µg/L	<0.00050	<0.00050	7.51	20.00	0.020000					
Boron	µg/L	20.00	19.00	10.05	9.71						
Cadmium	µg/L	<0.000010	<0.000010	0.37	0.39	0.010000	0.010000				
Calcium	mg/L	30.20	31.10			33.200000	34.300000				
Chromium	µg/L	<0.00050	<0.00050	5.31	3.00	0.285714	0.500000				
Cobalt	µg/L	<0.00010	<0.00010	58.79	58.43	0.005200	0.000000				
Copper	µg/L	2.77	1.67	1.63	2.08	1.065714	2.147500				
Iron	µg/L	<0.030	<0.030	12.14	15.11	30.000000	30.000000				350
Lead	µg/L	<0.000050	<0.000050	0.78	0.79	0.022857	0.050000				
Lithium	µg/L	<0.00050	<0.00050	0.15	0.00	0.148000	0.000000				
Magnesium	mg/L	4.78	4.72			4.870000	5.045000				
Manganese	µg/L	3.86	0.38	6.56	31.94	2.070143	120.745000				
Mercury	µg/L	<0.000050	<0.000050	0.00	0.00						
Molybdenum	µg/L		2.20	4.66	1.50	0.868571	1.056250				
Nickel	µg/L	<0.00050	<0.00050	0.00	25.00		0.500000				
Phosphorus	µg/L	5.00	4.40	0.00	0.00	12.673529	23.960000				
Potassium	mg/L	0.48	0.34			0.399500	0.420000				
Selenium	µg/L	0.55	0.56	9.50	18.30	0.712857	0.750000				
Silicon	µg/L	2260.00	2370.00	3544.00	3600.00	3825.000000	4095.000000				
Silver	µg/L	<0.000010	<0.000010	0.00	0.00						
Sodium	mg/L	4.44	4.24			4.080000	4.235000				
Strontium	µg/L	215.00	212.00	93.58	141.20	98.688429	228.500000				
Sulfur	mg/L										
Thallium	µg/L	<0.000010	<0.000010	2.38	6.00	0.002000					
Tin	µg/L	<0.00010	<0.00010	7.55	20.00	0.086000					
Titanium	µg/L	<0.010	<0.010	3.00	3.00						
Uranium	µg/L	0.10	0.10	0.02	0.04	0.023600					
Vanadium	µg/L	1.10	1.10	6.36	7.00	0.322000					
Zinc	µg/L	<0.0030	<0.0030	3.65	3.56	0.985714	3.000000				
Zirconium	µg/L			0.00	3.00						

# MoE Sampling Results Aug 04th, 2014, Quesnel Lake by site

Parameter	Units	Quesnel Lk North Shore East of Cedar Creek
pH	pH units	7.79
Conductivity	µS/cm	94.5
Turbidity	NTU	0.18
Total Suspended Solids	mg/L	<1.0
Total Dissolved Solids	mg/L	
Hardness - Total	mg/L	50.5
Hardness - Dissolved	mg/L	45.3
<b>Microbiology</b>		
E.coli	CFU/100mL	1
<b>General Inorganics</b>		
Alkalinity Total (CaCO <sub>3</sub> )	mg/L	44.1
<b>Anions</b>		
Bromide - Dissolved	mg/L	
Chloride -Dissolved	mg/L	
Sulphate	mg/L	
<b>Nutrients</b>		
Total Kjeldahl Nitrogen	mg/L	
Total Nitrogen	mg/L	
Total Organic Nitrogen	mg/L	
Ammonia Nitrogen	mg/L	
Nitrate+Nitrite	mg/L	
Nitrate Nitrogen	mg/L	
Nitrite Nitrogen	mg/L	
Total Phosphorus	mg/L	
<b>Total Metals</b>		
Aluminum	µg/L	20.7
Antimony	µg/L	<0.5
Arsenic	µg/L	<0.1
Barium	µg/L	5.5
Beryllium	µg/L	<0.1
Bismuth	µg/L	<1.0
Boron	µg/L	<50
Cadmium	µg/L	<0.010
Calcium	mg/L	16.9
Chromium	µg/L	<1.0
Cobalt	µg/L	<0.5
Copper	µg/L	<0.5
Iron	µg/L	24
Lead	µg/L	<0.20
Lithium	µg/L	N/A
Magnesium	mg/L	2
Manganese	µg/L	1.1
Mercury	µg/L	N/A
Molybdenum	µg/L	<1.0

Parameter	Units	Quesnel Lk North Shore East of Cedar Creek
Nickel	µg/L	<1.0
Phosphorus	µg/L	<10
Potassium	mg/L	0.509
Selenium	µg/L	0.17
Silicon	µg/L	1850
Silver	µg/L	<0.02
Sodium	mg/L	0.905
Strontium	µg/L	116
Sulfur	mg/L	<3.0
Tellurium	µg/L	
Thallium	µg/L	<0.05
Tin	µg/L	<5.0
Titanium	µg/L	<5.0
Uranium	µg/L	0.14
Vanadium	µg/L	<5.0
Zinc	µg/L	<5.0
Zirconium	µg/L	<0.5
<b>Dissolved Metals</b>		
Aluminum	µg/L	12.3
Antimony	µg/L	<0.5
Arsenic	µg/L	0.11
Barium	µg/L	5
Beryllium	µg/L	<0.1
Bismuth	µg/L	<1.0
Boron	µg/L	<50
Cadmium	µg/L	<0.01
Calcium	mg/L	15.1
Chromium	µg/L	<1.0
Cobalt	µg/L	<0.5
Copper	µg/L	0.79
Iron	µg/L	<5.0
Lead	µg/L	<0.2
Lithium	µg/L	<5.0
Magnesium	mg/L	1.85
Manganese	µg/L	<1.0
Mercury	µg/L	N/A
Molybdenum	µg/L	<1.0
Nickel	µg/L	<1.0
Phosphorus	µg/L	<10
Potassium	mg/L	0.471
Selenium	µg/L	0.17
Silicon	µg/L	1530
Silver	µg/L	<0.02
Sodium	mg/L	0.803
Strontium	µg/L	110
Sulfur	mg/L	3.8
Thallium	µg/L	<0.05
Tin	µg/L	<5.0
Titanium	µg/L	<5.0
Uranium	µg/L	0.12
Vanadium	µg/L	<5.0
Zinc	µg/L	<5.0
Zirconium	µg/L	N/A

Quesnel Ik, North Shore, West of 4 Cabins	Quesnel R @ Likely Townsite	Water Quality Guidelines (approved and working)			
		BC DW	Health Can DW	Aquatic Life	
				Chronic	Acute
7.81	7.82	<8.5	6.5-8.5		6.5-9.0
94.8	95.3				
0.18	0.19	Change of 1			Change of 5
<1.0	<1.0			Change of 5	Change of 25
		500	500		
46.4	45.8				
45.1	47				
<1	1				
43.5	43.8				
		250	250	150	600
		500	500	218	
				1	2.5
		10		1.07	7.82
		10	10	3	32.8
		1	1	0.02	0.06
		0.01			0.005 - 0.015
12.3	13.7		100		
<0.5	<0.5	14	6		20
0.11	0.14	25	10		5
5	5.3		1000	1000	5000
<0.1	<0.1	4		5.3	
<1.0	<1.0				
<50	<50	5000	5000		1200
<0.010	<0.010	5	5		0.002
15.6	15.4				
<1.0	<1.0	50	50		1
<0.5	<0.5			4	110
0.65	0.57	500	1000	2	7
<10	16		300		1000
<0.20	<0.20	50	10	21	4
<5.0	<5.0			14	870
1.81	1.78				
1	1.2		50	800	1100
<0.01	<0.01	1	1	0.02	0.1
<1.0	<1.0	250		1000	2000

Quesnel Ik, North Shore, West of 4 Cabins	Quesnel R @ Likely Townsite	Water Quality Guidelines (approved and working)			
		BC DW	Health Can DW	Aquatic Life	Acute
				Chronic	25
<1.0	<1.0				
<10	<10				
0.518	0.469				373
0.15	0.17	10	10	2	
1660	1670				
<0.02	<0.02			0.05	0.1
0.877	0.847		200		
108	113				
<3.0	<3.0				
<0.05	<0.05	2			0.3
<5.0	<5.0				
<5.0	<5.0				2000
0.14	0.13		20		300
<5.0	<5.0				6
<5.0	<5.0	5000	5000	0.033	0.75
N/A	N/A				
10	11.1	200		50	100
<0.5	<0.5				
0.11	0.13				
4.8	5.2				
<0.1	<0.1				
<1.0	<1.0				
<50	<50				
<0.01	<0.01				
15.1	15.7				
<1.0	<1.0				
<0.5	<0.5				
0.71	0.5				
<5.0	<5.0				350
<0.2	<0.2				
<5.0	<5.0				
1.8	1.92				
<1.0	<1.0				
<0.010	<0.010				
<1.0	<1.0				
<1.0	<1.0				
<10	<10				
0.475	0.485				
0.11	0.14				
1600	1670				
<0.02	<0.02				
0.845	0.862				
104	113				
<3.0	<3.0				
<0.05	<0.05				
<5.0	<5.0				
<5.0	<5.0				
0.12	0.13				
<5.0	<5.0				
<5.0	<5.0				
N/A	N/A				

MoE Sampling Results Aug 05th, 2014, Quesnel Lake by site

Parameter	Units	QUESNEL R U/S ISLAND, NORTH SHORE	QUESNEL R U/S LIKELY BRIDGE, N. SIDE	QUESNEL R D/S NARROWS,SOUT H SHORE	QUESNEL R. U/S NARROWS, NORTH SHORE	QUESNEL R D/S CEDAR PT PARK, N SHORE	Water Quality Guidelines (approved and working)			
							BC DW	Health Can DW	Aquatic Life	
									Chronic	Acute
pH	pH units	7.7	7.67	7.71	7.71	7.66	<8.5	6.5-8.5		6.5-9.0
Conductivity	µS/cm	96.8	94.4	96.7	96.7	96.9				
Turbidity	NTU	0.26	0.21	0.29	0.22	0.26	Change of 1			Change of 5
Total Suspended Solids	mg/L	<4.0	<4.0	<4.0	<4.0				Change of 5	Change of 25
Total Dissolved Solids	mg/L	46	48	46	46		500	500		
Hardness - Total	mg/L	45.8	46.6	44.6	46.2	46.3				
Hardness - Dissolved	mg/L	45.4	45.6	45	46.7					
<b>Microbiology</b>										
E.coli	CFU/100	<1	<1	<1	#N/A					
<b>General Inorganics</b>										
Alkalinity Total (CaCO <sub>3</sub> )	mg/L	40.8	41.3	40	40.3	42.9				
<b>Anions</b>										
Bromide - Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.01				
Chloride - Dissolved	mg/L	<0.50	<0.50	<0.50	<0.50	<0.5	250	250	150	600
Sulphate	mg/L	5.85	5.58	5.92	6.31	5.8	500	500	218	
<b>Nutrients</b>										
Total Kjeldahl Nitrogen	mg/L	0.084	0.079	0.078	0.082	0.089				
Total Nitrogen	mg/L	0.133	0.131	0.128	0.133	0.139				
Total Organic Nitrogen	mg/L	0.073	0.068	0.07	0.071	0.082				
Ammonia Nitrogen	mg/L	0.011	0.011	0.0084	0.01	0.0075			1	2.5
Nitrate+Nitrite	mg/L	0.0493	0.052	0.0501	0.0511	0.0494	10		1.07	7.82
Nitrate Nitrogen	mg/L	0.0472	0.0496	0.0501	0.0511	0.0494	10	10	3	32.8
Nitrite Nitrogen	mg/L	0.0021	0.0024	<0.0020	<0.0020	<0.002	1	1	0.02	0.06
Total Phosphorus	mg/L	0.0021	0.0024	0.0023	0.002	<0.002	0.01			0.005 - 0.015
<b>Total Metals</b>										
Aluminum	µg/L	13.9	13.6	13.7	13.3	13		100		
Antimony	µg/L	<0.020	<0.020	0.02	<0.020	<0.020	14	6		20
Arsenic	µg/L	0.092	0.086	0.099	0.101	0.085	25	10		5
Barium	µg/L	5.25	5.3	5.48	5.18	5.17		1000	1000	5000
Beryllium	µg/L	<0.010	#N/A	<0.010	<0.010	<0.010	4		5.3	
Bismuth	µg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050				
Boron	µg/L	<20	<20	<20	<20	<20	5000	5000		1200
Cadmium	µg/L	<0.0050	<0.0050	0.006	0.011	0.005	5	5		#REF!
Calcium	mg/L	15.3	15.6	15	15.4	15.4				
Chromium	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10	50	50		1
Cobalt	µg/L	0.011	0.012	0.009	0.01	0.013			4	110
Copper	µg/L	0.588	0.506	0.52	0.486	0.572	500	1000	2	7
Iron	µg/L	11.5	11.1	11.9	14.4	10.3		300		1000
Lead	µg/L	0.03	0.015	0.015	0.208	0.02	50	10	21	4
Lithium	µg/L	0.71	0.71	0.73	0.71	0.7			14	870
Magnesium	mg/L	1.86	1.86	1.73	1.87	1.91				
Manganese	µg/L	1.17	0.982	1.06	1.05	1.13		50	800	1100
Mercury	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	1	1	0.02	0.1
Molybdenum	µg/L	0.294	0.255	0.257	0.304	0.289	250		1000	2000
Nickel	µg/L	0.34	0.367	0.367	0.344	0.354				25
Phosphorus	µg/L	#N/A	#N/A	#N/A	#N/A	#N/A				
Potassium	mg/L	#N/A	#N/A	#N/A	#N/A	#N/A				373
Selenium	µg/L	0.088	0.085	0.107	0.096	0.121	10	10	2	
Silicon	µg/L	1600	1670	1630	1680	1620				
Silver	µg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			0.05	0.1
Sodium	mg/L	#N/A	#N/A	#N/A	#N/A	#N/A		200		
Strontium	µg/L	105	107	110	106	107				
Sulfur	mg/L	#N/A	#N/A	#N/A	#N/A	#N/A				
Tellurium	µg/L	#N/A	#N/A	#N/A	#N/A	#N/A				
Thallium	µg/L	<0.0020	<0.0020	0.002	<0.0020	<0.0020	2			0.3
Tin	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20				
Titanium	µg/L	<0.50	<0.50	<0.50	<0.50	#N/A				2000
Uranium	µg/L	0.123	0.124	0.128	0.128	0.127		20		300
Vanadium	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20				6
Zinc	µg/L	0.35	0.31	0.31	0.32	0.56	5000	5000	0.033	0.75
Zirconium	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10				
<b>Dissolved Metals</b>										
Aluminum	µg/L	10.4	10.6	10.6	10.5		200		50	100
Antimony	µg/L	0.023	0.02	0.023	<0.020					
Arsenic	µg/L	0.109	0.121 (1)	0.11	0.098					
Barium	µg/L	5.04	4.99	5.06	5.02					
Beryllium	µg/L	<0.010	<0.010	#N/A	<0.010					
Bismuth	µg/L	<0.0050	<0.0050	<0.0050	<0.0050					
Boron	µg/L	<20	<20	<20	<20					
Cadmium	µg/L	<0.0050	<0.0050	<0.0050	<0.0050					
Calcium	mg/L	15.2	15.2	14.9	15.7					
Chromium	µg/L	<0.10	<0.10	<0.10	<0.10					
Cobalt	µg/L	0.008	0.007	0.007	0.006					
Copper	µg/L	0.456	0.497	0.432	0.511					
Iron	µg/L	5.2	5.9	5.8	5.4					350
Lead	µg/L	<0.0050	0.009	0.005	0.006					
Lithium	µg/L	0.68	0.66	0.72	0.7					
Magnesium	mg/L	1.82	1.87	1.89	1.86					
Manganese	µg/L	0.518	0.247	0.252	0.261					
Mercury	µg/L	<0.010	<0.010	<0.010	<0.010	<0.01				
Molybdenum	µg/L	0.307	0.278	0.305	0.331					
Nickel	µg/L	0.341	0.374	0.326	0.391					
Phosphorus	µg/L	#N/A	#N/A	#N/A	#N/A					
Potassium	mg/L	#N/A	#N/A	#N/A	#N/A					
Selenium	µg/L	0.094	0.085	0.093	0.105					
Silicon	µg/L	1630	#N/A	1600	1660					
Silver	µg/L	<0.0050	0.007	0.018	<0.0050					
Sodium	mg/L	#N/A	#N/A	#N/A	#N/A					
Strontium	µg/L	107	104	104	108					
Sulfur	mg/L	#N/A	#N/A	#N/A	#N/A					
Thallium	µg/L	0.002	0.002	0.004	0.002					
Tin	µg/L	<0.20	<0.20	<0.20	<0.20					
Titanium	µg/L	<0.50	#N/A	<0.50	<0.50					
Uranium	µg/L	0.125	0.126	0.127	0.123					
Vanadium	µg/L	<0.20	<0.20	<0.20	<0.20					
Zinc	µg/L	0.19	2.70 (1)	0.46	0.14					
Zirconium	µg/L	<0.10	#N/A	<0.10	<0.10					

exceeds AL acute guideline

exceeds AL chronic guideline

MoE Sampling Results Aug 06th, 2014, Quesnel Lake by site

Parameter	Units	QUESNEL LK OFF WINKLEY CK	QUESNEL LK OFF WINKLEY CK	QUESNEL LK AT S.E. CORNER OF MITCHELL BAY	QUESNEL LK AT S.E. CORNER OF MITCHELL BAY	QUESNEL LK AT S.E. CORNER OF MITCHELL BAY (blank)	Water Quality Guidelines (approved and working)			
sample Depth	m	0.5	15	0.5	15		BC DW	Health Can DW	Aquatic Life	
									Chronic	Acute
pH	pH units	7.89	7.84	7.89	7.75		<8.5	6.5-8.5		6.5-9.0
Conductivity	µS/cm	95.8	105	94.7	104					
Turbidity	NTU	0.29	0.2	0.3	0.17		Change of 1			Change of 5
Total Suspended Solids	mg/L	<12	<12	<12	<12				Change of 5	Change of 25
Total Dissolved Solids	mg/L	52	58	56	50		500	500		
Total Hardness (CaCO3)	mg/L	46.1	48.3	46.5	48.7					
Dissolved Hardness (CaCO3)	mg/L	46.5	52.4	47.8	50.4					
<b>Microbiology</b>										
E.coli	CFU/100	<1.0	<1.0	2	<1.0					
<b>General Inorganics</b>										
Alkalinity (Total as CaCO3)	mg/L	43.4	46.9	42.5	47.4					
<b>Anions</b>										
Bromide - Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010				
Dissolved Chloride (Cl)	mg/L	0.55	<0.50	<0.50	<0.50	<0.50	250	250	150	600
Dissolved Sulphate (SO4)	mg/L	5.75	6.3	5.75	6.67	<0.50	500	500	218	
<b>Nutrients</b>										
Total Total Kjeldahl Nitrogen	mg/L	0.119	0.088	0.109	0.089	0.047				
Total Nitrogen (N)	mg/L	0.165	0.214	0.151	0.212	0.047				
Total Organic Nitrogen (N)	mg/L	0.111	0.08	0.097	0.079	0.035				
Total Ammonia (N)	mg/L	0.0087	0.0077	0.012	0.01	0.012			1	2.5
Nitrate plus Nitrite (N)	mg/L	0.0458	0.126	0.0426	0.123	<0.002	10		1.07	7.82
Nitrate (N)	mg/L	0.0458	0.126	0.0426	0.123	<0.0020	10	10	3	32.8
Nitrite (N)	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	1	1	0.02	0.06
Total Phosphorus (P)	mg/L	0.0023	0.0027	0.0027	0.0028	<0.0020	0.01			0.005 - 0.015
<b>Total Metals</b>										
Aluminum	µg/L	13.1	7.25	15.7	8.87			100		
Antimony	µg/L	0.021	<0.020	<0.020	0.020		14	6		20
Arsenic	µg/L	0.105	0.084	0.094	0.092		25	10		5
Barium	µg/L	4.91	4.47	5.56	4.53			1000	1000	5000
Beryllium	µg/L	<0.010	<0.010	<0.010	<0.010		4		5.3	
Bismuth	µg/L	<0.0050	<0.0050	<0.0050	<0.0050					
Boron	µg/L	<20	<20	<20	<20		5000	5000		1200
Cadmium	µg/L	<0.0050	<0.0050	0.0110	0.0050		5	5		#REF!
Calcium	mg/L	15.3	16.2	15.4	16.3					
Chromium	µg/L	<0.10	<0.10	<0.10	<0.10		50	50		1
Cobalt	µg/L	0.011	0.009	0.0120	0.0090				4	110
Copper	µg/L	0.48	0.502	0.539	0.602		500	1000	2	7
Iron	µg/L	12.1	7.1	34.3	8.9			300		1000
Lead	µg/L	0.018	0.055	0.0210	0.300		50	10	21	4
Lithium	µg/L	0.76	0.96	0.78	0.79				14	870
Magnesium	mg/L	1.91	1.88	1.96	1.93					
Manganese	µg/L	1.01	0.721	1.16	0.618			50	800	1100
Mercury	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010	1	1	0.02	0.1
Molybdenum	µg/L	0.273	0.236	0.287	0.234		250		1000	2000



Nickel	µg/L	0.344	0.318	0.398	0.366				25
Phosphorus	µg/L	#N/A	#N/A	#N/A	#N/A				
Potassium	mg/L	#N/A	#N/A	#N/A	#N/A				373
Selenium	µg/L	0.078	0.089	0.109	0.092	10	10	2	
Silicon	µg/L	#N/A	#N/A	#N/A	#N/A				
Silver	µg/L	<0.0050	<0.0050	<0.0050	<0.0050			0.05	0.1
Sodium	mg/L	#N/A	#N/A	#N/A	#N/A		200		
Strontium	µg/L	110	117	112	116				
Sulfur	mg/L	#N/A	#N/A	#N/A	#N/A				
Tellurium	µg/L	#N/A	#N/A	#N/A	#N/A				
Thallium	µg/L	<0.0020	<0.0020	<0.0020	<0.0020	2			0.3
Tin	µg/L	<0.20	<0.20	<0.20	<0.20				
Titanium	µg/L	#N/A	#N/A	#N/A	#N/A				2000
Uranium	µg/L	0.127	0.131	0.123	0.125		20		300
Vanadium	µg/L	<0.20	<0.20	<0.20	<0.20				6
Zinc	µg/L	0.28	0.57	2.00	2.22	5000	5000	7.5	3.3
Zirconium	µg/L	#N/A	#N/A	#N/A	#N/A				
<b>Dissolved Metals</b>									
Aluminum	µg/L	11.9	6.38	10.7	7.16	200		50	100
Antimony	µg/L	<0.020	<0.020	0.021	<0.020				
Arsenic	µg/L	0.094	0.067	0.105	0.082				
Barium	µg/L	5.01	4.78	4.97	4.87				
Beryllium	µg/L	<0.010	<0.010	<0.010	<0.010				
Bismuth	µg/L	<0.0050	<0.0050	<0.0050	<0.0050				
Boron	µg/L	<20	<20	<20	<20				
Cadmium	µg/L	<0.0050	<0.0050	0.0050	<0.0050				
Calcium	mg/L	15.4	17.6	16.1	16.8				
Chromium	µg/L	<0.10	<0.10	<0.10	<0.10				
Cobalt	µg/L	0.0080	0.0060	0.0080	0.0070				
Copper	µg/L	0.410	0.385	0.538	0.454				
Iron	µg/L	5.2	4.0	6.2	4.4				350
Lead	µg/L	0.0070	0.0090	0.0090	0.0870				
Lithium	µg/L	0.84	0.93	0.73	0.88				
Magnesium	mg/L	1.92	2.03	1.88	2.07				
Manganese	µg/L	0.395	0.220	0.508	0.144				
Mercury	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010			
Molybdenum	µg/L	0.298	0.247	0.290	0.275				
Nickel	µg/L	0.328	0.338	0.372	0.368				
Phosphorus	µg/L	#N/A	#N/A	#N/A	#N/A				
Potassium	mg/L	#N/A	#N/A	#N/A	#N/A				
Selenium	µg/L	0.093	0.075	0.089	0.074				
Silicon	µg/L	#N/A	#N/A	#N/A	#N/A				
Silver	µg/L	0.0080	0.0050	0.0090	0.0080				
Sodium	mg/L	#N/A	#N/A	#N/A	#N/A				
Strontium	µg/L	117	126	110	130				
Sulfur	mg/L	#N/A	#N/A	#N/A	#N/A				
Thallium	µg/L	<0.0020	<0.0020	0.0020	<0.0020				
Tin	µg/L	<0.20	<0.20	<0.20	<0.20				
Titanium	µg/L	#N/A	#N/A	#N/A	#N/A				
Uranium	µg/L	0.138	0.146	0.128	0.140				
Vanadium	µg/L	<0.20	<0.20	<0.20	<0.20				
Zinc	µg/L	0.16	0.52	0.96	1.13				
Zirconium	µg/L	#N/A	#N/A	#N/A	#N/A				

## MoE Sampling Results Aug 07th, 2014, Quesnel Lake by site

Parameter	Units	QUESNEL R D/S Cedar Park N shore	Quesnel R u/s Island N shore	QUESNEL L BTW Hazeltine and Raft Creek	Water Quality Guidelines (approved and working)	
Sample Depth	m	0.5	0.5	0.5	Aquatic Life	
					Chronic	Acute
pH	pH units	7.74	7.58	7.76		6.5-9.0
Conductivity	µS/cm	97.7	96.6	98.9		
Turbidity	NTU	0.33	0.36	3.99		Change of 5
Total Suspended Solids	mg/L	<4.0	< 4.0	<4.0	Change of 5	Change of 25
Total Dissolved Solids	mg/L	60	60	66		
Hardness - Total	mg/L	45.3	48.1	45.4		
Hardness - Dissolved	mg/L	44.6	44.7	46.3		
<b>Microbiology</b>						
E.coli	CFU/100r	2	<1	42		
<b>General Inorganics</b>						
Alkalinity Total (CaCO <sub>3</sub> )	mg/L	41.1	39.7	43.7		
<b>Anions</b>						
Bromide - Dissolved	mg/L	<0.010	<0.010	<0.010		
Chloride -Dissolved	mg/L	<0.5	<0.5	<0.5	150	600
Sulphate	mg/L	5.45	5.49	5.52	218	
<b>Nutrients</b>						
Total Kjeldahl Nitrogen	mg/L	0.09	0.059	0.097		
Total Nitrogen	mg/L	0.157	0.13	0.146		
Total Organic Nitrogen	mg/L	0.083	0.052	0.091		
Ammonia Nitrogen	mg/L	0.0076	0.0076	0.0054	1	2.5
Nitrate+Nitrite	mg/L	0.0667	0.0707	0.0491	1.07	7.82
Nitrate Nitrogen	mg/L	0.0667	0.0707	0.0466	3	32.8
Nitrite Nitrogen	mg/L	<0.0020	<0.0020	0.0025	0.02	0.06
Total Phosphorus	mg/L	0.0051	0.0049	0.0168		0.005 - 0.015
<b>Total Metals</b>						
Aluminum	µg/L	16.6	15.4	172	50	100
Antimony	µg/L	<0.50	<0.50	<0.50		20
Arsenic	µg/L	0.13	0.12	0.19		5
Barium	µg/L	5.3	5.4	7.8	1000	5000
Beryllium	µg/L	<0.10	<0.10	<0.10	5.3	
Bismuth	µg/L	<1.0	<1.0	<1.0		
Boron	µg/L	<50	<50	<50		1200
Cadmium	µg/L	<0.010	<0.010	<0.010		
Calcium	mg/L	15	16.2	14.9		
Chromium	µg/L	1.5	<1.0	<1.0		1
Cobalt	µg/L	<0.50	<0.50	<0.50	4	110
Copper	µg/L	0.77	0.69	5.62	2	7
Iron	µg/L	28	22	89		1000
Lead	µg/L	<0.20	<0.20	<0.20	21	4
Lithium	µg/L	<5.0	<5.0	<5.0	14	870
Magnesium	mg/L	1.91	1.85	1.96		
Manganese	µg/L	1.4	1.1	6.4	800	1100
Mercury	µg/L	<0.01	<0.010	<0.010	0.02	0.1
Molybdenum	µg/L	<1.0	<1.0	<1.0	1000	2000

Nickel	µg/L	1.2	<1.0	<1.0		25
Phosphorus	µg/L	<10	<10	<10		
Potassium	mg/L	0.485	0.472	0.55		373
Selenium	µg/L	<0.10	<0.10	<0.10	2	
Silicon	µg/L	1620	1710	1860		
Silver	µg/L	<0.020	<0.020	<0.020	0.05	0.1
Sodium	mg/L	0.846	0.885	0.904		
Strontium	µg/L	109	110	110		
Sulfur	mg/L	<3.0	<3.0	<3.0		
Tellurium	µg/L					
Thallium	µg/L	<0.050	<0.050	<0.050		0.3
Tin	µg/L	<5.0	<5.0	<5.0		
Titanium	µg/L	<5.0	<5.0	6.0		2000
Uranium	µg/L	0.13	0.13	0.13		300
Vanadium	µg/L	<5.0	<5.0	<5.0		6
Zinc	µg/L	<5.0	<5.0	<5.0	7.5	33
Zirconium	µg/L					
<b>Dissolved Metals</b>						
Aluminum	µg/L	10.2	10.0	12.7	50	100
Antimony	µg/L	<0.50	<0.50	<0.50		
Arsenic	µg/L	0.11	0.12	0.12		
Barium	µg/L	5.2	5.1	6.1		
Beryllium	µg/L	<0.10	<0.10	<0.10		
Bismuth	µg/L	<1.0	<1.0	<1.0		
Boron	µg/L	<50	<50	<50		
Cadmium	µg/L	<0.010	<0.010	<0.010		
Calcium	mg/L	14.9	14.9	15.5		
Chromium	µg/L	<1.0	<1.0	<1.0		
Cobalt	µg/L	<0.50	<0.50	<0.50		
Copper	µg/L	0.58	0.55	1.20		
Iron	µg/L	6.7	6.3	6.4		350
Lead	µg/L	<0.20	<0.20	<0.20		
Lithium	µg/L	<5.0	<5.0	<5.0		
Magnesium	mg/L	1.82	1.82	1.85		
Manganese	µg/L	<1.0	<1.0	3.1		
Mercury	µg/L	<0.010	<0.010	<0.010		
Molybdenum	µg/L	<1.0	<1.0	<1.0		
Nickel	µg/L	<1.0	<1.0	<1.0		
Phosphorus	µg/L	<10	<10	<10		
Potassium	mg/L	0.48	0.468	0.507		
Selenium	µg/L	<0.10	<0.10	<0.10		
Silicon	µg/L	1580	1570	1590		
Silver	µg/L	<0.020	<0.020	<0.020		
Sodium	mg/L	0.874	0.846	0.91		
Strontium	µg/L	106	109	108		
Sulfur	mg/L	<3.0	<3.0	<3.0		
Thallium	µg/L	<0.050	<0.050	<0.050		
Tin	µg/L	<5.0	<5.0	<5.0		
Titanium	µg/L	<5.0	<5.0	<5.0		
Uranium	µg/L	0.12	0.13	0.13		
Vanadium	µg/L	<5.0	<5.0	<5.0		
Zinc	µg/L	<5.0	<5.0	<5.0		
Zirconium	µg/L					

MOE Baseline data

Parameter	Units	Quesnel R @ Likely Townsite August 4th	600034 Quesnel River at Likely 1972 to 1988	2006 Summer Average E256579 QUESNEL LAKE N- D1	Water Quality Guidelines (approved and working)			
					BC DW	Health Can	Aquatic Life	
							Chronic	Acute
pH	pH units	7.82	7.46		<8.5	6.5-8.5		6.5-9.0
Conductivity	µS/cm	95.3	116.4					
Turbidity	NTU	0.19	0.59		Change of 1			Change of 5
Total Suspended Solids	mg/L	<1.0	1.4				Change of 5	Change of 25
Total Dissolved Solids	mg/L		62.7		500	500		
Hardness - Total	mg/L	45.8						
Hardness - Dissolved	mg/L	47	49.8					
<b>Microbiology</b>								
E.coli	CFU/100r	1						
<b>General Inorganics</b>								
Alkalinity Total (CaCO <sub>3</sub> )	mg/L	43.8	47.1					
<b>Anions</b>								
Bromide - Dissolved	mg/L							
Chloride -Dissolved	mg/L		0.517		250	250	150	600
Sulphate	mg/L		6.076		500	500	218	
<b>Nutrients</b>								
Total Kjeldahl Nitrogen	mg/L		0.083	0.093				
Total Nitrogen	mg/L		0.181	0.153				
Total Organic Nitrogen	mg/L		0.073	0.090				
Ammonia Nitrogen	mg/L		0.008	0.006			1	2.5
Nitrate+Nitrite	mg/L		0.098	0.059	10		1.07	7.82
Nitrate Nitrogen	mg/L		0.099	<0.057	10	10	3	32.8
Nitrite Nitrogen	mg/L		<0.005	<0.002	1	1	0.02	0.06
Total Phosphorus	mg/L		0.005	0.004	0.01			0.005 - 0.015
<b>Total Metals</b>								
Aluminum	µg/L	13.7	20			100		
Antimony	µg/L	<0.5			14	6		20
Arsenic	µg/L	0.14			25	10		5
Barium	µg/L	5.3				1000	1000	5000
Beryllium	µg/L	<0.1			4		5.3	
Bismuth	µg/L	<1.0						
Boron	µg/L	<50			5000	5000		1200
Cadmium	µg/L	<0.010			5	5		#REF!
Calcium	mg/L	15.4						
Chromium	µg/L	<1.0	0.5		50	50		1
Cobalt	µg/L	<0.5	0				4	110
Copper	µg/L	0.57	0.167		500	1000	2	7
Iron	µg/L	16	13.333			300		1000
Lead	µg/L	<0.20	1.656		50	10	21	4
Lithium	µg/L	<5.0	0.000				14	870
Magnesium	mg/L	1.78	180.625					
Manganese	µg/L	1.2	1.333			50	800	1100
Mercury	µg/L	<0.01			1	1	0.02	0.1
Molybdenum	µg/L	<1.0			250		1000	2000

Nickel	µg/L	<1.0						25
Phosphorus	µg/L	<10						
Potassium	mg/L	0.469						373
Selenium	µg/L	0.17			10	10	2	
Silicon	µg/L	1670						
Silver	µg/L	<0.02					0.05	0.1
Sodium	mg/L	0.847				200		
Strontium	µg/L	113						
Sulfur	mg/L	<3.0						
Tellurium	µg/L							
Thallium	µg/L	<0.05			2			0.3
Tin	µg/L	<5.0						
Titanium	µg/L	<5.0						2000
Uranium	µg/L	0.13				20		300
Vanadium	µg/L	<5.0						6
Zinc	µg/L	<5.0	0.008		5000	5000	7.5	33
Zirconium	µg/L	N/A						
<b>Dissolved Metals</b>								
Aluminum	µg/L	11.1			200		50	100
Antimony	µg/L	<0.5						
Arsenic	µg/L	0.13						
Barium	µg/L	5.2						
Beryllium	µg/L	<0.1						
Bismuth	µg/L	<1.0						
Boron	µg/L	<50						
Cadmium	µg/L	<0.01						
Calcium	mg/L	15.7	16.7875					
Chromium	µg/L	<1.0	0.7125					
Cobalt	µg/L	<0.5	0					
Copper	µg/L	0.5	0.484615385					
Iron	µg/L	<5.0	10					350
Lead	µg/L	<0.2	0.153846154					
Lithium	µg/L	<5.0	0					
Magnesium	mg/L	1.92	1.914615385					
Manganese	µg/L	<1.0	0.223076923					
Mercury	µg/L	<0.010						
Molybdenum	µg/L	<1.0						
Nickel	µg/L	<1.0						
Phosphorus	µg/L	<10						
Potassium	mg/L	0.485	0.5					
Selenium	µg/L	0.14						
Silicon	µg/L	1670						
Silver	µg/L	<0.02						
Sodium	mg/L	0.862	0.983333333					
Strontium	µg/L	113						
Sulfur	mg/L	<3.0						
Thallium	µg/L	<0.05						
Tin	µg/L	<5.0						
Titanium	µg/L	<5.0						
Uranium	µg/L	0.13						
Vanadium	µg/L	<5.0						
Zinc	µg/L	<5.0	0.853					
Zirconium	µg/L	N/A						

Polley Lake Water Quality Data

Parameter	Units	Mt Polley Mine POL-1	Mt Polley Mine POL-2	MOE Polley Lk North 1989-2014 AVG	MOE Polley Lk South 1991-2014 AVG
pH	pH units	9.01	9.06	7.80	8.01
Conductivity	µS/cm	184.00	187.00	135.80	150.90
Turbidity	NTU	3.96	2.52	0.77	0.89
Total Suspended Solids	mg/L	<3.0	<3.0	2.07	2.40
Total Dissolved Solids	mg/L	126.00	127.00	87.79	104.93
Hardness - Total	mg/L	95.20	97.10	81.38	85.18
Hardness - Dissolved	mg/L			103.16	102.49
<b>Microbiology</b>					
E.coli	CFU/100r	>201	n/a		
<b>General Inorganics</b>					
Alkalinity Total (CaCO <sub>3</sub> )	mg/L	70.80	75.40	67.10	67.79
<b>Anions</b>					
Bromide - Dissolved	mg/L				
Chloride - Dissolved	mg/L	<0.50	<0.50		0.50
Sulphate	mg/L	27.60	26.30	10.63	12.05
<b>Nutrients</b>					
Total Kjeldahl Nitrogen	mg/L				
Total Nitrogen	mg/L			0.25	0.31
Total Organic Nitrogen	mg/L			0.20	
Ammonia Nitrogen	mg/L	<0.0050	<0.0050	0.01	0.01
Nitrate+Nitrite	mg/L			0.02	0.03
Nitrate Nitrogen	mg/L	<0.0050	0.01	0.02	0.04
Nitrite Nitrogen	mg/L	<0.0010	<0.0010	0.00	0.00
Total Phosphorus	mg/L			0.01	0.02
<b>Total Metals</b>					
Aluminum	µg/L	139.00	53.70	10.79	12.80
Antimony	µg/L	<0.00010	<0.00010	2.24	2.57
Arsenic	µg/L	0.63	0.57	4.45	5.49
Barium	µg/L	9.62	6.91	5.40	6.58
Beryllium	µg/L	<0.00010	<0.00010	0.18	0.44
Bismuth	µg/L	<0.00050	<0.00050	3.36	8.58
Boron	µg/L	19.00	19.00	41.67	40.67
Cadmium	µg/L	<0.000010	<0.000010	0.24	0.16
Calcium	mg/L	29.90	30.90		
Chromium	µg/L	<0.00050	<0.00050	3.60	1.31
Cobalt	µg/L	0.10	<0.00010	36.19	25.60
Copper	µg/L	6.31	3.16	2.44	2.54
Iron	µg/L	86.00	34.00	28.58	57.50
Lead	µg/L	0.05	<0.000050	673.66	330.00
Lithium	µg/L	<0.00050	<0.00050	0.25	0.19
Magnesium	mg/L	4.76	4.71		
Manganese	µg/L	11.70	8.21	29.56	40.04
Mercury	µg/L	<0.000050	<0.000050	0.08	0.11
Molybdenum	µg/L	2.51	2.17	3.49	1.57

Nickel	µg/L	<0.00050	<0.00050	17.91	9.61
Phosphorus	µg/L	17.30	13.80	20.78	29.52
Potassium	mg/L	0.52	0.36		
Selenium	µg/L	0.56	0.53	4.18	5.03
Silicon	µg/L	2440.00	2400.00	3507.00	3491.25
Silver	µg/L	<0.000010	<0.000010	0.00	0.12
Sodium	mg/L	4.36	4.06		
Strontium	µg/L	205.00	203.00	114.45	139.37
Sulfur	mg/L				
Tellurium	µg/L			20.00	20.00
Thallium	µg/L	<0.000010	<0.000010	0.95	5.43
Tin	µg/L	<0.00010	<0.00010	3.37	8.58
Titanium	µg/L	<0.010	<0.010	3.00	3.00
Uranium	µg/L	0.11	0.10	0.03	0.00
Vanadium	µg/L	1.50	1.20	4.70	4.84
Zinc	µg/L	<0.0030	<0.0030	3.81	3.64
Zirconium	µg/L			0.00	3.00
<b>Dissolved Metals</b>				0.00	0.00
Aluminum	µg/L	12.50	6.30	8.01	11.78
Antimony	µg/L	<0.00010	<0.00010	5.51	15.00
Arsenic	µg/L	0.61	0.55	8.47	13.90
Barium	µg/L	7.72	6.36	7.49	7.09
Beryllium	µg/L	<0.00010	<0.00010	0.39	1.00
Bismuth	µg/L	<0.00050	<0.00050	7.51	20.00
Boron	µg/L	20.00	19.00	10.05	9.71
Cadmium	µg/L	<0.000010	<0.000010	0.37	0.39
Calcium	mg/L	30.20	31.10		
Chromium	µg/L	<0.00050	<0.00050	5.31	3.00
Cobalt	µg/L	<0.00010	<0.00010	58.79	58.43
Copper	µg/L	2.77	1.67	1.63	2.08
Iron	µg/L	<0.030	<0.030	12.14	15.11
Lead	µg/L	<0.000050	<0.000050	0.78	0.79
Lithium	µg/L	<0.00050	<0.00050	0.15	0.00
Magnesium	mg/L	4.78	4.72		
Manganese	µg/L	3.86	0.38	6.56	31.94
Mercury	µg/L	<0.000050	<0.000050	0.00	0.00
Molybdenum	µg/L	2.58	2.20	4.66	1.50
Nickel	µg/L	<0.00050	<0.00050	0.00	25.00
Phosphorus	µg/L	5.00	4.40	0.00	0.00
Potassium	mg/L	0.48	0.34		
Selenium	µg/L	0.55	0.56	9.50	18.30
Silicon	µg/L	2260.00	2370.00	3544.00	3600.00
Silver	µg/L	<0.000010	<0.000010	0.00	0.00
Sodium	mg/L	4.44	4.24		
Strontium	µg/L	215.00	212.00	93.58	141.20
Sulfur	mg/L				
Thallium	µg/L	<0.000010	<0.000010	2.38	6.00
Tin	µg/L	<0.00010	<0.00010	7.55	20.00
Titanium	µg/L	<0.010	<0.010	3.00	3.00
Uranium	µg/L	0.10	0.10	0.02	0.04
Vanadium	µg/L	1.10	1.10	6.36	7.00
Zinc	µg/L	<0.0030	<0.0030	3.65	3.56
Zirconium	µg/L			0.00	3.00

MOE Polley Lk North 2001-2014 AVG	MOE Polley Lk South 2001-2014 AVG	Water Quality Guidelines (approved and working)			
		BC DW	Health Can DW	Aquatic Life	
				Chronic	Acute
7.79	8.09	<8.5	6.5-8.5		6.5-9.0
139.38	160.65				
0.80	0.97	Change of 1			Change of 5
2.10	2.62			Change of 5	Change of 25
88.10	109.67	500	500		
81.38	85.18				
103.16	102.49				
72.24	73.23				
		250	250	150	600
15.03	16.73	500	500	218	
	0.20				
0.245156	0.311846				
0.200000					
0.007779	0.011486			1	2.5
0.015555	0.026914	10		1.07	7.82
0.023148	0.039377	10	10	3	32.8
0.002557	0.002314	1	1	0.02	0.06
0.021550	0.035833	0.01			0.005 - 0.015
8.836364	12.194118		100		
0.047550	0.085467	14	6		20
0.392273	0.455294	25	10		5
4.799545	6.443977		1000	1000	5000
0.020000	0.020000	4		5.3	
0.031333	0.020000				
		5000	5000		1200
0.010000	0.016471	5	5		#REF!
26.877647	27.811765				
0.295455	0.323529	50	50		1
0.030050	0.059111			4	110
1.365909	1.998235	500	1000	2	7
32.714286	54.384615		300		1000
0.028182	0.054118	50	10	21	4
0.252667	0.190000			14	870
3.471176	3.820588				
27.588091	48.175882		50	800	1100
		1	1	0.02	0.1
1.012273	1.328824	250		1000	2000

historical averages are specific conductivity

historical averages are at pH 4.5

exceeds AL acute guideline



0.194545	0 394118				25
0.000000	0 000000				
0.414500	0 355875				373
0.659545	0.624118	10	10	2	
3731.428571	3634.615385				
	0 013636			0.05	0 1
4.321429	4.171538		200		
119 011955	149.958824				
0.002333	0 002000	2			0 3
0.044667	0 010000				
					2000
0.029733	0 036500		20		300
0.529333	1 065000				6
1.145455	2.488235	5000	5000	0.033	0.75
		200		50	100
0.021200					
0.301429	0 545000				
3.805714	7 395000				
0.020000					
0.020000					
0.010000	0 010000				
33.200000	34 300000				
0.285714	0 500000				
0.005200	0 000000				
1.065714	2.147500				
30.000000	30 000000				350
0.022857	0 050000				
0.148000	0 000000				
4.870000	5 045000				
2.070143	120.745000				
0.868571	1 056250				
	0 500000				
12.673529	23 960000				
0.399500	0.420000				
0.712857	0.750000				
3825.000000	4095.000000				
4.080000	4 235000				
98.688429	228.500000				
0.002000					
0.086000					
0.023600					
0.322000					
0.985714	3 000000				

exceeds AL chronic guideline



## MEMORANDUM

**Date: August 11, 2014**

**File:**

**To: Jim Standen,  
Assistant Deputy Minister  
Environmental Protection Division**

### **Quesnel Lake Water Quality of August 7, 2014 compared to Aquatic Life Guidelines**

Ministry of Environment Staff has collected water quality samples at several locations in Quesnel Lake and/or Quesnel River on a daily basis since August 4, 2014, the day of the Mt. Polley Tailings Dam Breach to determine potential impacts on drinking water quality and aquatic life.

The Parameters analysed so far include pH, conductivity, turbidity, total suspended solids, total dissolved solids, hardness, alkalinity, nutrients, general ions, total and dissolved metals, and E.coli.

On August 7<sup>th</sup> water samples were collected from the following sites in Quesnel River:

- Quesnel River upstream Island on North Shore
- Quesnel River downstream Cedar Pt Park, N shore
- Quesnel River between Raft Creek and Hazeltine Creek

Review of these results indicate that the concentrations of most of the parameters were below the BC aquatic life guidelines at these sites. The exceptions were noted at the Quesnel Lake between Hazeltine and Raft Creek sample site, where a suspended sediment plume was sampled, for:

- total phosphorus which is slightly above the aquatic life guideline; and
- total aluminum which is above both the chronic and acute aquatic life guideline;
- total copper is above the chronic aquatic life guideline; and
- total chromium guideline for chromium VI was also slightly above the aquatic life guideline at the Quesnel River upstream Island on North Shore location. Earlier samples were below detection limits so this could be part of analytical variation. Since it is not clear which portion of the chromium measured is chromium VI, it is not clear whether the guideline was exceeded.

This is a worse case result, and does not represent the general lake water quality.

It should be noted that chronic guidelines are based on a minimum of five weekly samples collected over a 30 day period. Additional samples are being collected to further assess these parameters.

Sediment samples were also collected at the Quesnel River between Raft Creek and Hazeltine Creek location. This analysis has a longer processing time and results will be posted as they become available.

Gabriele Matscha, RPBio.,  
Impact Assessment Section Head - Mining  
Environmental Protection Division – Ministry of Environment



## MEMORANDUM

**Date: August 11, 2014**

**File:**

**To: Jim Standen,  
Assistant Deputy Minister  
Environmental Protection Division**

**Quesnel Lake Water Quality of August 7, 2014 compared to Drinking Water Guidelines**

Ministry of Environment Staff collected water quality samples at several locations in Quesnel Lake and/or Quesnel River on a daily basis since August 4, 2014, the day of the Mt. Polley Tailings Dam Breach to determine potential impacts on drinking water quality and aquatic life.

The Parameters analysed so far include pH, conductivity, turbidity, total suspended solids, total dissolved solids, hardness, alkalinity, nutrients, general ions, total and dissolved metals, and E.coli.

On August 7<sup>th</sup> water samples were collected from the following sites in Quesnel River:

- Quesnel River upstream Island on North Shore
- Quesnel River downstream Cedar Pt Park, N shore
- Quesnel River between Raft Creek and Hazeltine Creek

Review of these results indicate that the concentrations of most of the parameters were below both BC and Health Canada Drinking Water Guidelines at these sites. The exceptions were noted at the Quesnel Lake between Hazeltine and Raft Creek sample site where a suspended sediment plume was sampled for:

- total phosphorus which is slightly above the BC drinking water guidelines; and
- total aluminum which is slightly above the Health Canada DW guideline although according to Health Canada weight of evidence does not indicate adverse health effects at levels found above this value; and
- E coli which was slightly elevated at this site as compared to the River sites.

This is a worse case result, and does not represent the general lake water quality. Interior Health has been clear in it's instructions to the public regarding not consuming turbid or 'cloudy' water.

It should be noted that DW guidelines for E coli are based on type of treatment and the median or geometric mean of at least 5 samples collected in a 30-day period. Additional samples are being collected to further assess this parameter.

Fish tissue samples were collected August 8, 9 and 10, 2014. Generally bio-accumulation of contaminants in fish muscle tissue occurs over a longer exposure time (years) rather than a few days. Results will be posted as they are made available.

Gabriele Matscha, R.P. Bio.,  
Impact Assessment Section Head - Mining  
Environmental Protection Division – Ministry of Environment

**From:** [Bennett, Bill MEM:EX](#)  
**To:** [Morel, David P MEM:EX](#)  
**Cc:** [Sandve, Chris MEM:EX](#); [Nikolejsin, Dave MEM:EX](#)  
**Subject:** Re: Independent Panel or Commission  
**Date:** Monday, August 11, 2014 7:53:19 PM

---

"The panel would not have the ability independently to compel production of information. It would be limited to the information voluntarily provided to it by government, third parties, or information it could create itself."

This needs to be clarified. Does "third parties" include the company or engineer or record or employees of the company?

Sent from my iPad

On Aug 11, 2014, at 7:01 PM, "Morel, David P MEM:EX" <[David.Morel@gov.bc.ca](mailto:David.Morel@gov.bc.ca)> wrote:

Minister,

Attached for your review is the paper we discussed earlier for tomorrow's call. When you are Ok with it we will forward to John.

David Morel

Assistant Deputy Minister

Ministry of Energy and Mines

Mines and Mineral Resources Division

**From:** [Sandve, Chris MEM:EX](#)  
**To:** [Nikolejsin, Dave MEM:EX](#)  
**Cc:** [Morel, David P MEM:EX](#)  
**Subject:** Re: MABC and order on other Mines  
**Date:** Monday, August 11, 2014 8:03:37 PM

---

I spoke to Bryan Cox. He has concerns but also understands why we need to do this - concerns are

1. Perception (Admission we aren't doing enough)
2. Cost / capacity
3. Investor confidence - shows gov moving to regulate industry more , doesn't have confidence

I walked through each w him and pointed out

1. Perception - on contrary shows we are taking responsibility as the jurisdiction where this happened to do everything we can
- 2 - admitted I was unsure on cost to undertake inspection or review of inspection report (we should find this out) but that we were alive to capacity concerns and working on that
- 3 - investor confidence - said you could argue either way - people don't have confidence now - need process to provide confidence

Sent from my iPhone

On 2014-08-11, at 7:14 PM, "Nikolejsin, Dave MEM:EX" <[Dave.Nikolejsin@gov.bc.ca](mailto:Dave.Nikolejsin@gov.bc.ca)> wrote:

Just talked to scott. Had a long conversation about this and their concerns. I can review in detail when next we talk. Bottom line is he understands why we need to do this.

Dave Nikolejsin  
Deputy Minister  
Energy and Mines

On Aug 11, 2014, at 7:10 PM, "Sandve, Chris MEM:EX" <[Chris.Sandve@gov.bc.ca](mailto:Chris.Sandve@gov.bc.ca)> wrote:

Just spoke to Gavin - polar opposite reaction from Angela - he is fully supportive

Sent from my iPhone

On 2014-08-11, at 6:37 PM, "Nikolejsin, Dave MEM:EX" <[Dave.Nikolejsin@gov.bc.ca](mailto:Dave.Nikolejsin@gov.bc.ca)> wrote:

Not what I am hearing from the companies.

Dave Nikolejsin  
Deputy Minister  
Energy and Mines

On Aug 11, 2014, at 6:27 PM, "Morel, David P  
MEM:EX" <[David.Morel@gov.bc.ca](mailto:David.Morel@gov.bc.ca)> wrote:

Just a heads up you may here from Angela or  
Scott from MABC. Angel called me and told  
me they do not support our action to do any  
additional oversight on other tailings facilities  
until the investigation of Polley is completed .  
She argues it is unnecessary as our regulations  
are strong, it will cost firms money and will  
imply our current system is problematic. She  
also puts forward that there may not be  
enough experts to do all of the work.  
David

**From:** [Halls, Lori D ENV:EX](#)  
**To:** [Fraser, John Paul GCPE:EX](#); [Dyble, John C PREM:EX](#); [Shoemaker, Wes ENV:EX](#); [Sweeney, Neil PREM:EX](#); [Nikolejsin, Dave MEM:EX](#); [Morel, David P MEM:EX](#); [Quealey, Pat JAG:EX](#); [Wanamaker, Lori JAG:EX](#); [Brown, Stephen R HLTH:EX](#); [Mayhew, Neilane ABR:EX](#)  
**Subject:** RE: MOE Update re: Mount Polley - Aug 12th  
**Date:** Monday, August 11, 2014 8:09:00 PM

---

MOE's Polley Mine metal results have just arrived from the lab. Our biologists are pouring over them now. It will take a few hours. We've shared raw data with Dr. Corneill. Dissolved organic carbons will be coming tomorrow from lab. Dr. Corneill will review results and get back to us with his decision re: any further lifting of the water use ban.

---

**From:** Halls, Lori D ENV:EX  
**Sent:** Monday, August 11, 2014 7:09 PM  
**To:** Fraser, John Paul GCPE:EX; Dyble, John C PREM:EX; Shoemaker, Wes ENV:EX; Sweeney, Neil PREM:EX; Nikolejsin, Dave MEM:EX; Morel, David P MEM:EX; Quealey, Pat JAG:EX; Wanamaker, Lori JAG:EX; Brown, Stephen R HLTH:EX; Mayhew, Neilane ABR:EX  
**Subject:** MOE Update re: Mount Polley - Aug 12th  
John

**Sampling:**

We have received a partial set of data from Lab on MOE results for Polley Lake. We are expecting the rest later tonight. Full set (including metals) is needed before any determination can be made by IHA to make any further lifts to the water use ban. When we get full results we will share with IHA. We are coordinating with GCPE around possible an announcement by IHA tomorrow.

Day 4 (Aug 7<sup>th</sup>) results have been analyzed and are attached. This information has been shared with IHA and with Chief Louie and Chief Sellars. They will be released tomorrow.

The memos identify the following:

- most of the parameters were below both BC and Health Canada Drinking Water Guidelines at these sites.
- One site (Quesnel Lake between Hazeltine and Raft Creek ) two parameters exceeded DW guidelines:
  1. total phosphorus - slightly above the BC drinking water guidelines; and
  2. total aluminum which is slightly above the Health Canada DW guideline
  3. E coli which was slightly elevated at this site as compared to the River sites.

This sample was taken as a **worse case sample**. The sample was intentionally taken from an area of turbid/cloudy water. It does not represent the general lake water quality.

Interior Health has been clear in its instructions to the public regarding not consuming turbid or 'cloudy' water.

**Discharge from Polley Lake:**

Imperial has confirmed that the existing pumps used to discharge water from Polley Lake to reduce the risk of a breach are overheating. Pumping continues but at less than optimum levels.

Previously we thought it would take as much as 75 days to get Polley Lake levels to pre-Aug 4<sup>th</sup> levels. At this current rate it is expected to take 120 days. Imperial is working with MOE and MEM staff to look at other options. Rain is in the forecast for tomorrow. At this point in time folks have not determined exactly what the threshold (I assume somewhere between 2 metres or less) that lake needs to be reduced by before workers/FNs/public can safely have access to the impact zone.

Lori Halls

Assistant Deputy Minister

BC Parks and Conservation Officer Service

5<sup>th</sup> Floor, 2975 Jutland Road, Victoria

Phone (250)387-6177

Fax (250)953-3414

Email: [lori.d.halls@gov.bc.ca](mailto:lori.d.halls@gov.bc.ca)



**From:** [Bennett, Bill MEM:EX](#)  
**To:** [Morel, David P MEM:EX](#)  
**Cc:** [Sandve, Chris MEM:EX](#); [Nikolejsin, Dave MEM:EX](#)  
**Subject:** Re: Independent Panel or Commission  
**Date:** Monday, August 11, 2014 8:25:16 PM

---

so the panel cannot compel info from Imperial?

Sent from my iPad

On Aug 11, 2014, at 9:23 PM, "Morel, David P MEM:EX" <[David.Morel@gov.bc.ca](mailto:David.Morel@gov.bc.ca)> wrote:

With clarification about third parties.  
David

**From:** [Bennett, Bill MEM:EX](#)  
**To:** [Morel, David P MEM:EX](#)  
**Cc:** [Sandve, Chris MEM:EX](#); [Nikolejsin, Dave MEM:EX](#)  
**Subject:** Re: Independent Panel or Commission  
**Date:** Monday, August 11, 2014 8:28:54 PM

---

Go ahead and send to Dyble. I am getting on the airplane. I still don't understand what exactly you are trying to say.

"The panel would not have the ability independently to compel production of information. It would be limited to the information voluntarily provided to it by government, a d third partied (Imperial Metals, consulting or design engineer, workers etc.) z or information it could create itself.

It may be possible to share information compelled for the purposes of investigations under the Mines Act and Environmental Management Act. However, any such sharing would need to be consistent with the intent of the power and FOIPPA. Document production may be sharable while testimony may be more limited."

Sent from my iPad

On Aug 11, 2014, at 9:23 PM, "Morel, David P MEM:EX" <[David.Morel@gov.bc.ca](mailto:David.Morel@gov.bc.ca)> wrote:

With clarification about third parties.  
David

**From:** [Baldwin, Susan](#)  
**To:** [Morel, David P MEM:EX](#)  
**Subject:** Mt Polley mine remediation  
**Date:** Monday, August 11, 2014 8:29:57 AM

---

Dear David

Dirk van Zyl forwarded your email to me re clean-up of the spill at Mount Polley mine.

I have been working with Mount Polley since 2008 on design and testing of a pilot-scale natural biologically-based treatment pond for their tailings water. Since the spill occurred we have been considering how our mandate will change so that we can assist the mine in remediation of the spilt tailings. Our work showed that selenium and other metals can be sequestered within organic rich wetlands due to microbial activity.

I am in the process of putting together a group of university researchers at UBC and TRU to help evaluate the impacts of the spill to local wetlands and these can be ameliorated by enhancing microbial bioremediation. The exact direction of our research is still forming and it would be useful to talk with you to get the government's perspective on effective ways of moving forward with the clean-up.

Please let me know if you have time for a short conversation by phone this week.

Sincerely,

Sue Baldwin

**From:** [Nikolejsin, Dave MEM:EX](#)  
**To:** [Bennett, Bill MEM:EX](#)  
**Cc:** [Morel, David P MEM:EX](#); [Sandve, Chris MEM:EX](#)  
**Subject:** Re: Independent Panel or Commission  
**Date:** Monday, August 11, 2014 8:31:39 PM

---

Will tidy this up. What I understand is that the PANEL can't compel the info from the company, but the Chief inspector can. So we would use his powers to support the work of the panel.

We just need to make sure the way that sharing happens is air tight.

Dave Nikolejsin  
Deputy Minister  
Energy and Mines

On Aug 11, 2014, at 8:28 PM, "Bennett, Bill MEM:EX" <[Bill.Bennett@gov.bc.ca](mailto:Bill.Bennett@gov.bc.ca)> wrote:

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Sent from my iPad

On Aug 11, 2014, at 9:23 PM, "Morel, David P MEM:EX" <[David.Morel@gov.bc.ca](mailto:David.Morel@gov.bc.ca)> wrote:

With clarification about third parties.  
David

**From:** [Bennett, Bill MEM:EX](#)  
**To:** [Nikolejsin, Dave MEM:EX](#)  
**Cc:** [Morel, David P MEM:EX](#); [Sandve, Chris MEM:EX](#)  
**Subject:** Re: Independent Panel or Commission  
**Date:** Monday, August 11, 2014 8:42:19 PM

---

last thought before in the air...it would be useful for me to have a bullet point list of what can be compelled by the Chief Mines Inspector, what he can share with the panel, and what may not be sharable with the panel - that might allow us to make an educated decision tomorrow morning.

Sent from my iPad

On Aug 11, 2014, at 9:31 PM, "Nikolejsin, Dave MEM:EX" <[Dave.Nikolejsin@gov.bc.ca](mailto:Dave.Nikolejsin@gov.bc.ca)> wrote:

Will tidy this up. What I understand is that the PANEL can't compel the info from the company, but the Cheif inspector can. So we would use his powers to support the work of the panel.

We just need to make sure the way that sharing happens is air tight.

Dave Nikolejsin  
Deputy Minister  
Energy and Mines

On Aug 11, 2014, at 8:28 PM, "Bennett, Bill MEM:EX" <[Bill.Bennett@gov.bc.ca](mailto:Bill.Bennett@gov.bc.ca)> wrote:

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Sent from my iPad

On Aug 11, 2014, at 9:23 PM, "Morel, David P MEM:EX" <[David.Morel@gov.bc.ca](mailto:David.Morel@gov.bc.ca)> wrote:

With clarification about third parties.  
David

**From:** [Bennett, Bill MEM:EX](#)  
**To:** [Morel, David P MEM:EX](#)  
**Cc:** [Nikolejsin, Dave MEM:EX](#); [Sandve, Chris MEM:EX](#)  
**Subject:** Re: Independent Panel or Commission  
**Date:** Monday, August 11, 2014 8:42:47 PM

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good idea

Sent from my iPad

On Aug 11, 2014, at 9:32 PM, "Morel, David P MEM:EX" <[David.Morel@gov.bc.ca](mailto:David.Morel@gov.bc.ca)> wrote:

Not if they refuse to give it. We can compel them to give it to us if it is for the purpose of the Chief Inspectors investigation and provide it to the panel as long as it is consistent with FIAPP.

An approach I would suggest we take is to obtain a commitment from imperial as part of the announcement that they support the investigation and will cooperate fully.

David

Sent from my iPhone

On Aug 11, 2014, at 8:25 PM, "Bennett, Bill MEM:EX" <[Bill.Bennett@gov.bc.ca](mailto:Bill.Bennett@gov.bc.ca)> wrote:

so the panel cannot compel info from Imperial?

Sent from my iPad

On Aug 11, 2014, at 9:23 PM, "Morel, David P MEM:EX" <[David.Morel@gov.bc.ca](mailto:David.Morel@gov.bc.ca)> wrote:

With clarification about third parties.  
David

**From:** [Day, Alan MEM:EX](#)  
**To:** [Morel, David P MEM:EX](#)  
**Subject:** Out of Office: Geotechnial Expert Panel  
**Date:** Monday, August 11, 2014 9:13:18 PM

---

I am out of the office . s.22

I will be monitoring my emails and cell and will respond as when I can. For immediate assistance please contact Health and Safety Inspector, Laurie Meade with your concerns. Office# 250-565-4327 or cell# 250-614-9592.



**From:** [Musgrove, Kate MEM:EX](#)  
**To:** [Morel, David P MEM:EX](#)  
**Subject:** Scott from Alden Global NYC  
**Date:** Monday, August 11, 2014 9:38:00 AM

---

Hi David, Scott called from Alden Global NYC, who have interests in Imperial Metal. He would like some information regarding Red Chris if you could please call him: 1 646 205 1642

**Kate Musgrove**

Executive Assistant to  
David Morel, Assistant Deputy Minister  
Ministry of Energy and Mines  
Mines and Mineral Resources Division  
250.952.0470

**From:** [Narynski, Heather M MEM:EX](#)  
**To:** [Morel, David P MEM:EX](#)  
**Cc:** [Warnock, George MEM:EX](#); [Hoffman, Al MEM:EX](#); [Howe, Diane J MEM:EX](#); [Bellefontaine, Kim MEM:EX](#); [Demchuk, Tania MEM:EX](#)  
**Subject:** Geotechnial Expert Panel  
**Date:** Monday, August 11, 2014 10:38:33 AM  
**Attachments:** [Dirk Van Zyl Resume.pdf](#)  
[Steve Vick.pdf](#)  
[Norbert \(Nordie\) Morgenstern.pdf](#)

---

David,

Please find attached resumes for Norbert (Nordie) Morgenstern, Steve Vick and Dirk Van Zyl for your meeting this morning.

Heather

**Heather Narynski, P.Eng**

Sr. Geotechnical Inspector

Ministry of Energy and Mines

1810 Blanshard St., Victoria, BC V8W 9N3

Wk: 250-387-0883

Cell: 250-893-3396

**Dirk J. A. Van Zyl**

specialty: Mining Life Cycle Systems, Mined Earth Structures and Sustainability

Professor

s.22

Dirk has more than 30 years experience in research, teaching and consulting in tailings and mined earth structures. During that period he was a faculty member for 13 years at four Universities in the US and Canada. For the last 10 years much of his attention has been focused on mining and sustainable development. He has been involved internationally in many mining projects. These projects covered the whole mining life cycle, from exploration to closure and post-closure, in a large range of climatic and geographic environments. His present research is in the area of the contributions that mining makes to sustainable development as well as the application of life cycle assessment to mined earth structures.

#### **Research Interests**

s.22

Pages 68 through 75 redacted for the following reasons:

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s.22

**PERSONAL RESUME**

**September, 2012**

**NORBERT R. MORGENSTERN**

s.22

Pages 77 through 115 redacted for the following reasons:

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s.22

Steven G. Vick

Geotechnical Engineer

## Résumé

s.22

### **Expertise**

**Geotechnical Engineering and Technical Review**  
**Safety Evaluation of Embankment Dams**  
**Analysis and Design of Mine Tailings Dams**  
**Risk and Decision Analysis**  
**Diagnostic Assessment and Failure Analysis**

s.22

*Continued...*

Pages 117 through 130 redacted for the following reasons:

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**From:** [Demchuk, Tania MEM:EX](#)  
**To:** [Morel, David P MEM:EX](#)  
**Cc:** [Hoffman, AI MEM:EX](#)  
**Subject:** RE: Order  
**Date:** Monday, August 11, 2014 10:57:45 AM

---

David,  
Slightly modified:

The Chief Inspector will also be conducting a separate investigation. Pursuant to Section 15(7) of the *Mines Act*, and the Mine Regulation, you will be required to provide full access to all areas of the mine site and all relevant information.

---

**From:** Morel, David P MEM:EX  
**Sent:** Monday, August 11, 2014 9:31 AM  
**To:** Demchuk, Tania MEM:EX  
**Cc:** Hoffman, AI MEM:EX  
**Subject:** Order

Thanks for the sentence. It needs to be stronger along the lines of  
The Chief Inspector will also be conducting a separate investigation and pursuant to the mines act (Section?) you will be required to full access to all areas of the mine site and all relevant information.

David Morel  
Assistant Deputy Minister  
Ministry of Energy and Mines  
Mines and Mineral Resources Division

**From:** [Sandve, Chris MEM:EX](#)  
**To:** [Bennett, Bill MEM:EX](#)  
**Cc:** [Morel, David P MEM:EX](#); [Nikolejsin, Dave MEM:EX](#)  
**Subject:** Re: Independent Panel or Commission  
**Date:** Monday, August 11, 2014 10:59:42 PM

---

I am available -

s.15

Sent from my iPhone

On 2014-08-11, at 10:52 PM, "Bennett, Bill MEM:EX" <[Bill.Bennett@gov.bc.ca](mailto:Bill.Bennett@gov.bc.ca)> wrote:

Would it be possible to hold an MEM pre brief at 7:45? Not life or death, just think we should try to get on the same page.

Sent from my iPad

On Aug 11, 2014, at 9:05 PM, "Morel, David P MEM:EX" <[David.Morel@gov.bc.ca](mailto:David.Morel@gov.bc.ca)> wrote:

The powers to answer questions and order disclosure are very broad in the Mines Act (section 8)

s.14

s.14

David

---

**From:** Bennett, Bill MEM:EX  
**Sent:** Monday, August 11, 2014 8:42 PM  
**To:** Nikolejsin, Dave MEM:EX  
**Cc:** Morel, David P MEM:EX; Sandve, Chris MEM:EX  
**Subject:** Re: Independent Panel or Commission  
last thought before in the air...it would be useful for me to have a bullet point list of what can be compelled by the Chief Mines Inspector, what he can share with the panel, and what may not be sharable with the

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Energy and Mines

On Aug 11, 2014, at 8:28 PM, "Bennett, Bill MEM:EX"

<[Bill.Bennett@gov.bc.ca](mailto:Bill.Bennett@gov.bc.ca)> wrote:

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Sent from my iPad

On Aug 11, 2014, at 9:23 PM, "Morel, David P

MEM:EX" <[David.Morel@gov.bc.ca](mailto:David.Morel@gov.bc.ca)> wrote:

With clarification about third  
parties.  
David

**From:** [Sandve, Chris MEM:EX](#)  
**To:** [Morel, David P MEM:EX](#); [Hoffman, Al MEM:EX](#); [Thorpe, Rolly MEM:EX](#)  
**Subject:** FW: Reclamation Request for Tailings disaster  
**Date:** Monday, August 11, 2014 12:56:07 PM  
**Attachments:** [Request Letter and Maps.pdf](#)

---

FYI

**Chris Sandve**

Chief of Staff to the Hon. Bill Bennett

Minister of Energy and Mines and Minister Responsible for Core Review

Office: 250-356-9944 | Cell: 250-818-4306 | E-mail: [chris.sandve@gov.bc.ca](mailto:chris.sandve@gov.bc.ca)

**From:** s.22

**Sent:** Monday, August 11, 2014 12:54 PM

**To:** Sandve, Chris MEM:EX

**Subject:** Reclamation Request for Tailings disaster

Hi Chris

Thanks for your voice on the telephone. Many people of the Likely Community agreed with this request, I did not take the extra time to ask all I think it is very important to submit it early in the planning stages. I sincerely hope that this is the opportunity we were looking for to have the working relationship between mining, permitting, Government, tenures of all land based resources, and most of all home owners. By keeping it simple and cleaning all traces in a short timely manner.

One attachment with Letter and 2 Maps. Please contact me if you have more questions.

s.22

August 11, 2014

Imperial Metals Corporation  
Mount Polley Mining Corporation  
Box 12  
Likely BC V0L1N0

Dear Steve Robertson:

I write this letter following the Meeting held Aug 07, 2014. I spoke of these requests. I am hoping it will help with the reclamation plan submitted to the Minister Bill Bennett Chief Inspector Al Hoffman.

- To create single lane haul roads down and up Hazeltine Creek to truck or pipe contamination back up to Mt Polley to be \*reclaimed\* at the completion of this project. \*Reclaim\* as follows; Contour haul road then use area specific seedling trees and grasses to prevent weed infestation. Allow one 4 meter road for inspection access to creek analysis sites.
- To take Hazeltine Creek sides and bottom to bed rock, hauling all infected soils/debris up to Mt Polley, and, to replace with local soils to create a stable new creek bottom. This will include utilizing the natural contours of the entire creek bottom for catch retaining ponds to monitor and pump if needed throughout the mine life. Please start at the base of hill with a catch pond area to start the pumping, then move up to the mine.
- Divers to dredge all silvery grey pockets off the bottom of Quesnel Lake in the Hazeltine Creek mouth and pipe it back to Mt Polley utilizing the catch pond at the base of the hill.
- Remove all trees from the shores and lake to take to Mt Polley to process as they see fit to (minimize sorting yards on the lakeshore)
- To reclaim the ditch road to connect public and emergency access soon as possible. Bailey bridge?

Practical Papers - Part of the Likely Community trying to give a helping hand to set an example of a thorough way to clean up a big mistake, to give the mining industry world a regained confidence for multiuse tenures and residential land owners.

Yours Truly,

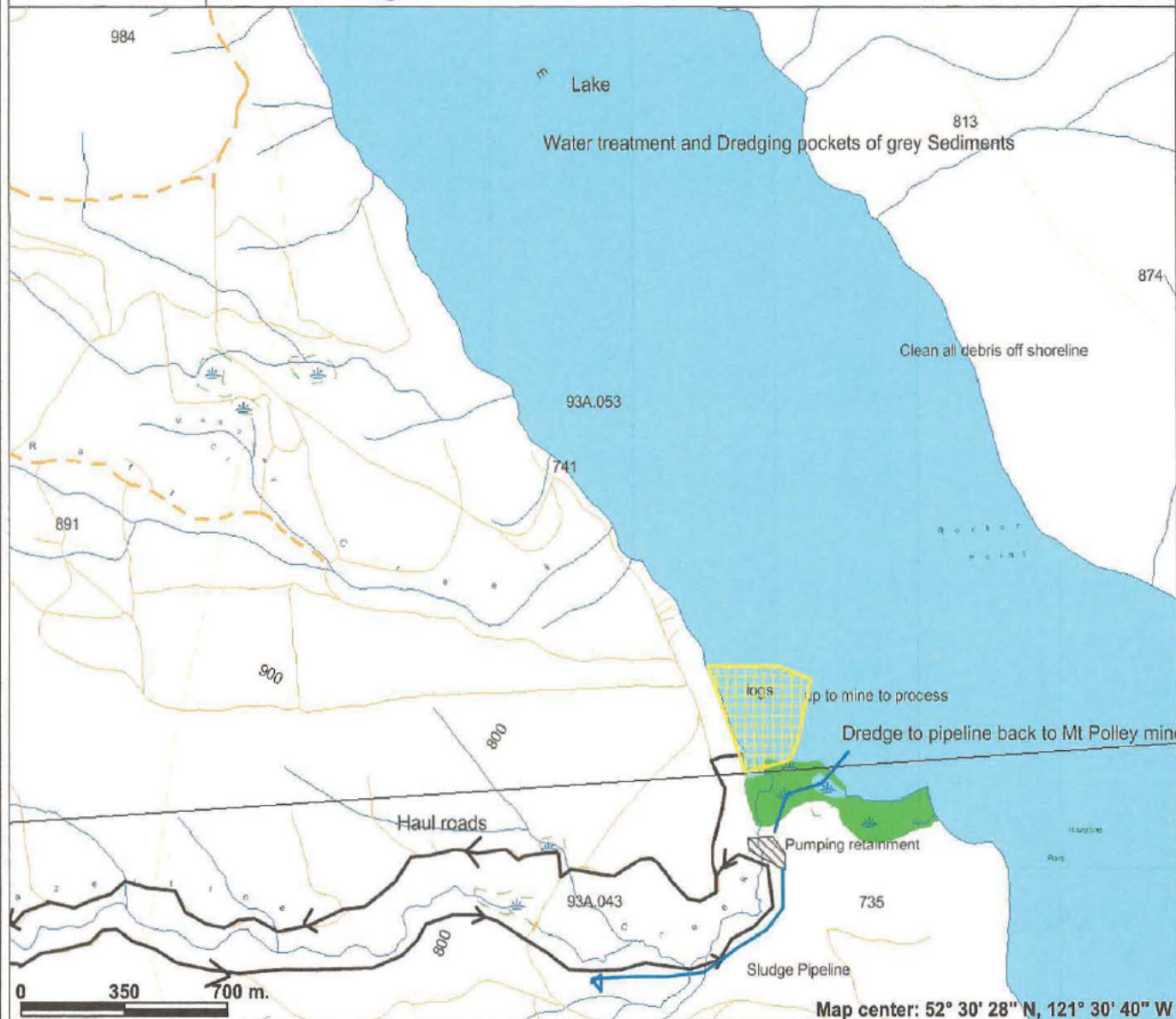
s.22





Mineral Titles  
Online BC

## plan for Mt Polley



### Legend

- ☐ Indian Reserves
- ☐ National Parks
- ☐ Conservancy Areas
- ☐ Parks
- ☐ Federal Transfer Lands
- ☐ First Nations Treaty Related Lands
- ☐ First Nations Treaty Lands
- ☐ Integrated Cadastral Fabric
- ☐ Survey Parcels
- ☐ BCGS Grid
- ☐ Contours (1:250K)
- ☒ Contour - Index
- ☒ Contour - Intermediate
- ☒ Area of Exclusion
- ☒ Area of Indefinite Contours
- ☒ Annotation (1:20K)
- ☒ Transportation - Points (TRIM)
- ☒ Helipad
- ☒ Transportation - Lines (TRIM)
- ☒ Airfield
- ☒ Airport
- ☒ Airstrip
- ☒ Airport Abandoned
- ☒ Ferry Route
- ☒ Road (Gravel Undivided) - 1 Lane
- ☒ Road (Gravel Undivided) - 2 Lanes
- ☒ Road (Gravel Undivided) - U/C - 1 Lane
- ☒ Road (Gravel Undivided) - U/C - 2 Lanes
- ☒ Road (Paved Divided) - Not Elevated - 1 Lane Each Way
- ☒ Road (Paved Divided) - Not Elevated -



Scale: 1:20,000

This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.





Mineral Titles  
OnlineBC

## Overall plan



### Legend

- ☐ Indian Reserves
- ☐ National Parks
- ☐ Conservancy Areas
- ☐ Parks
- ☐ Federal Transfer Lands
- ☐ First Nations Treaty Related Lands
- ☐ First Nations Treaty Lands
- ☐ Survey Parcels
- ☐ BCGS Grid
- Contours (1:250K)
- Contour - Index
- Contour - Intermediate
- Area of Exclusion
- Area of Indefinite Contours
- Transportation - Points (TRIM)
- ☐ Helipad
- Transportation - Lines (TRIM)
- Airfield
- Airport
- Airstrip
- Airport Abandoned
- Ferry Route
- Road (Gravel Undivided) - 1 Lane
- Road (Gravel Undivided) - 2 Lanes
- Road (Gravel Undivided) - U/C - 1 Lane
- Road (Gravel Undivided) - U/C - 2 Lanes
- Road (Paved Divided) - Not Elevated - 1 Lane Each Way
- Road (Paved Divided) - Not Elevated - 2 Lanes Each Way
- Road (Paved Divided) - U/C - Not Elevated - 2 Lanes Each Way



Scale: 1:60,601

This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.



**From:** [Hoffman, AI MEM:EX](#)  
**To:** [Sandve, Chris MEM:EX](#); [Morel, David P MEM:EX](#); [Thorpe, Rolly MEM:EX](#)  
**Subject:** RE: Reclamation Request for Tailings disaster  
**Date:** Monday, August 11, 2014 12:57:53 PM

---

Chris

Do you know what this is? Is it a recommendation?

---

**From:** Sandve, Chris MEM:EX  
**Sent:** Monday, August 11, 2014 12:56 PM  
**To:** Morel, David P MEM:EX; Hoffman, AI MEM:EX; Thorpe, Rolly MEM:EX  
**Subject:** FW: Reclamation Request for Tailings disaster  
FYI

**Chris Sandve**

Chief of Staff to the Hon. Bill Bennett

Minister of Energy and Mines and Minister Responsible for Core Review

Office: 250-356-9944 | Cell: 250-818-4306 | E-mail: [chris.sandve@gov.bc.ca](mailto:chris.sandve@gov.bc.ca)

**From:** s.22  
**Sent:** Monday, August 11, 2014 12:54 PM  
**To:** Sandve, Chris MEM:EX  
**Subject:** Reclamation Request for Tailings disaster

Hi Chris

Thanks for your voice on the telephone. Many people of the Likely Community agreed with this request, I did not take the extra time to ask all I think it is very important to submit it early in the planning stages. I sincerely hope that this is the opportunity we were looking for to have the working relationship between mining, permitting, Government, tenures of all land based resources, and most of all home owners. By keeping it simple and cleaning all traces in a short timely manner.

One attachment with Letter and 2 Maps. Please contact me if you have more questions.

s.22

**From:** [Sandve, Chris MEM:EX](#)  
**To:** [Hoffman, AI MEM:EX](#); [Morel, David P MEM:EX](#); [Thorpe, Rolly MEM:EX](#)  
**Subject:** RE: Reclamation Request for Tailings disaster  
**Date:** Monday, August 11, 2014 12:58:31 PM

---

Yes from my read it is a recommendation regarding reclamation work. I was unsure on how it should be handled so just forwarding to you for appropriate action.

**Chris Sandve**

Chief of Staff to the Hon. Bill Bennett

Minister of Energy and Mines and Minister Responsible for Core Review

Office: 250-356-9944 | Cell: 250-818-4306 | E-mail: [chris.sandve@gov.bc.ca](mailto:chris.sandve@gov.bc.ca)

---

**From:** Hoffman, AI MEM:EX  
**Sent:** Monday, August 11, 2014 12:58 PM  
**To:** Sandve, Chris MEM:EX; Morel, David P MEM:EX; Thorpe, Rolly MEM:EX  
**Subject:** RE: Reclamation Request for Tailings disaster  
Chris

Do you know what this is? Is it a recommendation?

---

**From:** Sandve, Chris MEM:EX  
**Sent:** Monday, August 11, 2014 12:56 PM  
**To:** Morel, David P MEM:EX; Hoffman, AI MEM:EX; Thorpe, Rolly MEM:EX  
**Subject:** FW: Reclamation Request for Tailings disaster  
FYI

**Chris Sandve**

Chief of Staff to the Hon. Bill Bennett

Minister of Energy and Mines and Minister Responsible for Core Review

Office: 250-356-9944 | Cell: 250-818-4306 | E-mail: [chris.sandve@gov.bc.ca](mailto:chris.sandve@gov.bc.ca)

---

**From:** s.22  
**Sent:** Monday, August 11, 2014 12:54 PM  
**To:** Sandve, Chris MEM:EX  
**Subject:** Reclamation Request for Tailings disaster  
Hi Chris

Thanks for your voice on the telephone. Many people of the Likely Community agreed with this request, I did not take the extra time to ask all I think it is very important to submit it early in the planning stages. I sincerely hope that this is the opportunity we were looking for to have the working relationship between mining, permitting, Government, tenures of all land based resources, and most of all home owners. By keeping it simple and cleaning all traces in a short timely manner.

One attachment with Letter and 2 Maps. Please contact me if you have more questions.

s.22

**From:** [Hupman, C Bruce MEM:EX](#)  
**To:** [Musgrove, Kate MEM:EX](#)  
**Subject:** MLA Barnett- 1000819 s.22  
**Date:** Wednesday, August 13, 2014 11:50:25 AM  
**Attachments:** [image003.jpg](#)

---

PC 397593, 397594

Operator: Samuel Vizi

Location: junction of the [Quesnel](#) and [Cariboo](#) Rivers and is 160 km southeast of [Quesnel](#) and only 11 km northwest of [Likely](#).

Background:

- proponent struggles with the need to have a permit, post reclamation security and conduct recognizable reclamation
- area outline does not include proponents working near the Cariboo River
- DFO has expressed concerns regarding the proponents activities and has been working with MEM to educate the proponent on the fisheries values
- permitting inspector increased the required reclamation bond from 7,500 to 10,000 dollars
- several inspectors have encountered written abuse from the proponent
- proponent has contacted the Chief Inspector, the Deputy Chief-Health and Safety as well as the Deputy Chief-Permitting
- considerable resources have been exhausted in getting the proponent to comply with regulations
- current Notice of Work application is out for consultation/referral comments



~~~~~  
*Bruce Hupman PAg  
Regional Director, South Region  
Office of the Chief Inspector  
Ministry of Energy and Mines*  
~~~~~

---

**From:** Musgrove, Kate MEM:EX  
**Sent:** Tuesday, August 12, 2014 4:03 PM  
**To:** Hupman, C Bruce MEM:EX  
**Cc:** Taje, Eddy MEM:EX; Bouffard, Maryann J MEM:EX; Hoffman, Al MEM:EX; Thorpe, Rolly MEM:EX  
**Subject:** RE: MLA Barnett  
Hi Bruce, could you please see Al's comments below and advise.

---

**From:** Hoffman, Al MEM:EX  
**Sent:** Tuesday, August 12, 2014 3:56 PM  
**To:** Musgrove, Kate MEM:EX; Thorpe, Rolly MEM:EX  
**Cc:** Taje, Eddy MEM:EX; Bouffard, Maryann J MEM:EX  
**Subject:** RE: MLA Barnett

Maryann

Please find out where this permit is and direct the question to that office.

Al

I

---

**From:** Musgrove, Kate MEM:EX  
**Sent:** Tuesday, August 12, 2014 3:38 PM  
**To:** Thorpe, Rolly MEM:EX  
**Cc:** Hoffman, Al MEM:EX  
**Subject:** FW: MLA Barnett

---

**From:** Sandve, Chris MEM:EX  
**Sent:** Tuesday, August 12, 2014 2:27 PM  
**To:** Musgrove, Kate MEM:EX  
**Subject:** MLA Barnett  
She is inquiring about this permit file – can you report back?  
file 14675-20/1000819

**Chris Sandve**

Chief of Staff to the Hon. Bill Bennett

Minister of Energy and Mines and Minister Responsible for Core Review

Office: 250-356-9944 | Cell: 250-818-4306 | E-mail: [chris.sandve@gov.bc.ca](mailto:chris.sandve@gov.bc.ca)

Copyright

**From:** [Amann-Blake, Nathaniel MEM:EX](#)  
**To:** [Musgrove, Kate MEM:EX](#)  
**Subject:** Mt Polley TOR  
**Date:** Monday, August 18, 2014 3:46:33 PM  
**Attachments:** [Mt Polley TOR.docx](#)

---

Looks good. Please proceed to get e-sig as per Chris' email. thanks.

## **Terms of Reference for Independent Expert Engineering Investigation and Review Panel**

### **Establishment of the Panel**

Pursuant to the Mount Polley Investigation and Inquiry Regulation, issued pursuant to section 8 (2) of the *Ministry of Energy and Mines Act*, I direct that an independent expert engineering investigation and review Panel (the Panel) be established, in accordance with these Terms of Reference, to investigate into and report on the breach of the tailings storage facility (TSF) at the Mount Polley mine on August 4, 2014.

For the purposes of conducting the investigation into the breach of the tailings storage facility at the Mount Polley mine on August 4, 2014, I confer upon the Panel members the powers and authorities as set out in section 8.2 and 8.4(1) of the *Ministry of Energy and Mines Act*.

I further confer upon the Panel members the protection set out in section 8.5 of the *Ministry of Energy and Mines Act*.

### **Purpose of the Panel**

The purpose of the Panel is to investigate into and report on the cause of the failure of the tailings storage facility that occurred on August 4, 2014 at the Mount Polley mine in BC.

The Panel will report on the cause of the failure of the tailings storage facility at the Mount Polley mine. In addition, the Panel may make recommendations to government on actions that could be taken to ensure that a similar failure does not occur at other mine sites in BC.

The Panel is authorized, as part of its investigation and report, to comment on what actions could have been taken to prevent this failure and to identify practices or successes in other jurisdictions that could be considered for implementation in BC.

### **Scope of Review**

In its report, it is expected the Panel will:

- a) identify any mechanism(s) of failure of the tailings storage facility;
- b) identify any technical, management, or other practices that may have enabled or contributed to the mechanism(s) of failure. This may include an independent review of the design, construction, operation, maintenance, surveillance and regulation of the facility;
- c) identify any changes that could be considered to reduce the potential for future such occurrences.

In conducting its investigation and in order to prepare its report into the cause of the failure of the tailings storage facility at the Mount Polley mine, the Panel may, at its discretion, and as it

deems necessary, examine some or all of the following in respect of the Mount Polley mine in BC:

- geotechnical designs of the dams and structures associated with the TSF, including both intact and breached embankments, and including both the original design and all lifts of the embankment structure;
- the adequacy of geotechnical investigations completed throughout design and operation of the facility;
- interpretation of results of geotechnical investigations and associated laboratory testing;
- patterns, trends, and relationships in instrumentation behaviour;
- interpretation of instrumentation and performance data in relation to dam behaviour;
- whether or not dam instrumentation and monitoring was consistent with standards of practice;
- appropriateness of methods and input parameters for geotechnical analyses;
- materials, methods, procedures, and quality assurance/quality control practices for dam construction and modification, and a determination with respect to whether or not construction was completed in general conformance with the design;
- water balance and water quality as they relate to the TSF breach;
- operational procedures and planning for tailings deposition and water management;
- inspection and surveillance procedures and implementation;
- the Engineer of Record's field reviews to ensure that construction was in conformance with design;
- regulatory oversight by the Ministry of Energy and Mines and the Ministry of Environment; and
- other matters the Panel deems appropriate to be examined.

### **Panel Members**

The Panel members are:

- Norbert Morgenstern
- Steven G. Vick
- Dirk Van Zyl

The Panel will be chaired by Norbert Morgenstern.

A liaison will be appointed in consultation with the Williams Lake Indian Band and the Soda Creek Indian Band.

### **Secretariat to the Panel**

Administrative, technical and procedural support required by the Panel shall be provided by a secretariat.

Kevin Richter will manage the secretariat in support and under the direction of the Panel.



**Information to be provided to the Panel**

The Panel will be supplied with all available information necessary for achieving its purpose and performing its functions.

**Timeline**

The Panel will submit a final report to the Minister of Energy and Mines and the Williams Lake Indian Band and the Soda Creek Indian Band on or before January 31, 2015.

**Limitations**

The Panel shall perform its duties without expressing any conclusions or recommendations regarding the potential civil or criminal liability of any person or organization. The Panel shall further ensure that the conduct of the inquiry does not in any way impede or conflict with any other ongoing investigation or proceeding related to these matters. Specifically, the Panel's review will not in any way impede investigations conducted by Mines Inspectors, Conservation Officers or other regulatory agencies and any related proceedings.

August 18, 2014

---

Honourable Bill Bennett  
Minister of Energy and Mines  
and Minister Responsible for Core Review

**From:** [Warnock, George MEM:EX](#)  
**To:** [Hall, Bob MEM:EX](#)  
**Cc:** [Morel, David P MEM:EX](#)  
**Subject:** FW: Invoice  
**Date:** Tuesday, November 4, 2014 5:06:21 PM

---

Hi Bob,

Did you ever receive further details with respect to the accommodation invoice that you received? We will need to make sure that it did not pertain to drillers as they are being paid a LOA by the mine (and should therefore be paying for their own accommodation. We will need to cover KCB accommodations for now.

George

---

**From:** Don Parsons [<mailto:dparsons@imperialmetals.com>]  
**Sent:** Tuesday, November 4, 2014 12:28 PM  
**To:** Dale Reimer ([dreimer@mountpolley.com](mailto:dreimer@mountpolley.com))  
**Cc:** Warnock, George MEM:EX  
**Subject:** FW: Invoice

Dale

FYI

See the email chain below re: geotech investigation costs.

George

Our contracts with ConeTec and Mud Bay have LOA built into their day rate.

Regards

Don

---

**From:** Warnock, George MEM:EX [<mailto:George.Warnock@gov.bc.ca>]  
**Sent:** Tuesday, November 04, 2014 9:52 AM  
**To:** Don Parsons; 'Plewes, Howard'  
**Cc:** 'Luke Moger'; Morel, David P MEM:EX; Brian Kynoch; Andre Deepwell; Hall, Bob MEM:EX; Hutchins, Julie MEM:EX; 'McLeod, Harvey'  
**Subject:** RE: Invoice

Thank you Don,

MEM will prepare a budget estimate/statement of costs for work that is being undertaken by MEM as a result of the breach, and will submit these costs to MPMC in due course. Costs for KCB engineer accommodation will be paid by MEM in the interim. Is it fair to assume that accommodations for drillers are being covered under the contracts that MPMC has with the drilling companies? As you know, the site investigation work that is being completed by KCB is being shared with MPMC and the Expert Panel (by way of the company). It was agreed early on that it made more sense to support the three investigations in this way rather than having each group (company, MEM, Expert Panel) complete all of this work independently. MEM believes that this will ultimately result in significant cost savings to MPMC, and trusts that the Board of Directors will approve these expenditures after due consideration.

Regards,

*George Warnock, P.Eng.*

*Manager, Geotechnical Engineering*

*Ministry of Energy and Mines*

*(250) 565-4457*

---

**From:** Don Parsons [<mailto:dparsons@imperialmetals.com>]  
**Sent:** Tuesday, November 4, 2014 9:38 AM  
**To:** Warnock, George MEM:EX; 'Plewes, Howard'

**Cc:** 'Luke Moger'; Morel, David P MEM:EX; Brian Kynoch; Andre Deepwell

**Subject:** RE: Invoice

George

The Company cannot approve this invoice for payment. Our Board of Directors approve all budgets and expenditure forecasts. We will require a budget from MEM to proceed.

Regards

Don

---

**From:** Warnock, George MEM:EX [<mailto:George.Warnock@gov.bc.ca>]

**Sent:** Friday, October 17, 2014 9:53 AM

**To:** 'Plewes, Howard'

**Cc:** 'Luke Moger'; Don Parsons; Morel, David P MEM:EX

**Subject:** RE: Invoice

Hi Howard,

The KCB work is a direct result of the breach, and is being undertaken on behalf of all parties. As such, it is MEM's view that these costs should be borne by the Company and MEM will be seeking to have all of KCB's costs recovered at a future date. In the meantime, any costs that can be covered directly by MPMC should be – including accommodation.

Regards,

George

---

**From:** Plewes, Howard [<mailto:HPlewes@klohn.com>]

**Sent:** Friday, October 17, 2014 9:49 AM

**To:** Warnock, George MEM:EX

**Cc:** McLeod, Harvey

**Subject:** FW: Invoice

George,

It was assumed in our proposal that the accommodation would be paid for by MPMC. I spoke to Luke Moger when I was last on site and he was of the view that this was a cost associated with the KCB work. However, he was amenable to paying directly, but was looking for direction. I am not sure of the arrangements you have with MPMC. Can you advise if we should pay or have MPMC pay.

Thanks,

**Howard Plewes, M.Sc., P.Eng.**

*Vice President, Mining Environmental Group, Principal*

**Klohn Crippen Berger** 500-2955 Virtual Way, Vancouver BC V5M 4X6, CANADA

T 604.251.8457 | [HPlewes@klohn.com](mailto:HPlewes@klohn.com) | [www.klohn.com](http://www.klohn.com)

**ISO 9001 • ISO 14001 • OHSAS 18001**

If you have received this email in error, please delete the original message.

**From:** Jeff Cleveland [<mailto:atlasdrilling@gmail.com>]

**Sent:** Tuesday, October 07, 2014 7:34 AM

**To:** Plewes, Howard

**Subject:** Invoice

Morning Howard,

Here is the accommodation invoice for your company that Luke from Mt Polley asked me to send to you

Thanks

Jeff

**From:** [Steve Robertson](#)  
**To:** [Bennett.MLA, Bill LASS:EX](#)  
**Cc:** [Petrie, Cynthia MEM:EX](#); [Morel, David P MEM:EX](#); [Nikolejsin, Dave MEM:EX](#)  
**Subject:** Reductions at Mount Polley  
**Date:** Tuesday, November 11, 2014 8:54:29 AM  
**Attachments:** [image001.jpg](#)  
[Mount Polley Manpower Reduction Nov 11 2014.pdf](#)

---

Hi Bill. Please see the attached notes on Manpower Reduction at Mount Polley. This is not a new release, but simply intended to work as a background document for your reference. Reductions in the workforce will total 36, resulting in 294 remaining full time positions at the mine (an 11% reduction). Crews were notified this morning and others will be notified by phone throughout the day.

Please call my cellular (604-740-6604) if you have any questions. I'll be available today.



Cynthia, we have provided a lot of information to our employees regarding assistance at this time, but please send along the information for the program you were talking about. Reviewing the materials, I don't think we have included information on that particular program

Steve



- Steve Robertson ● Vice President, Corporate Affairs ● **Imperial Metals Corporation**
  - 200-580 Hornby Street, Vancouver, British Columbia V6C 3B6
  - 604.488.2669 ● [srobertson@imperialmetals.com](mailto:srobertson@imperialmetals.com) ● [www.imperialmetals.com](http://www.imperialmetals.com)
- discover ● develop ● operate**



Please consider the environment before printing this email  

## **MOUNT POLLEY MINE WORKFORCE REDUCTION**

**Williams Lake, November 10, 2014** – Mount Polley Mine Corporation (MPMC) today announced a manpower reduction of thirty six (36) employees in the Mine Operations department. Post reduction, the workforce at the mine will stand at 294 persons.

“The decision to eliminate jobs is a very difficult one,” said Dale Reimer, General Manager, Mount Polley mine. “We believe our employees are very talented and dedicated individuals and we thank them for their service, and look forward to getting them back to work as quickly as we can.”

Since the breach of the tailings storage facility on August 4, 2014, operations at the Mount Polley mine has been suspended indefinitely and the MPMC has redeployed most of its workforce to the recovery and remediation efforts. As the recovery phase is nearing completion, MPMC is adjusting staffing levels to match the volume of work available.

“It is not possible to predict how long it will take to completely restore operations, however it is our sincerest hope that with the approval of a restoration plan and with help from our dedicated employees and partners in the surrounding communities, the mine could resume production in near term ” stated Reimer.

Imperial Contact Information

Steve Robertson | Vice President Corporate Affairs | 604.488.2669

**From:** [Halls, Lori D ENV:EX](#)  
**To:** [Demchuk, Tania MEM:EX](#); [Hoffman, Al MEM:EX](#); [Morel, David P MEM:EX](#)  
**Subject:** Fwd: Mount Polley Dam Breach community Meetings in Likely  
**Date:** Sunday, November 23, 2014 8:21:15 AM  
**Attachments:** [Mount Polley Dam Breach Community Meetings in Likely.pdf](#)  
[ATT00001.htm](#)

---

Sorry if you've gotten this through other channels.

Lori Halls  
Assistant Deputy Minister  
Environment Protection Division

Begin forwarded message:

**From:** "Dhanowa, Damon ENV:EX" <[Damon.Dhanowa@gov.bc.ca](mailto:Damon.Dhanowa@gov.bc.ca)>  
**To:** "Halls, Lori D ENV:EX" <[Lori.D.Halls@gov.bc.ca](mailto:Lori.D.Halls@gov.bc.ca)>  
**Cc:** "Mitschke, Matt ENV:EX" <[Matt.Mitschke@gov.bc.ca](mailto:Matt.Mitschke@gov.bc.ca)>, "Shoemaker, Wes ENV:EX" <[Wes.Shoemaker@gov.bc.ca](mailto:Wes.Shoemaker@gov.bc.ca)>  
**Subject:** Fw: Mount Polley Dam Breach community Meetings in Likely

Fyi

Thanks,

:D

250.884.7656

Sent from my BlackBerry 10 smartphone

---

**From:** Barnett, Donna <[D.Barnett@leg.bc.ca](mailto:D.Barnett@leg.bc.ca)>  
**Sent:** Saturday, November 22, 2014 9:05 PM  
**To:** Dhanowa, Damon ENV:EX  
**Subject:** Fw: Mount Polley Dam Breach community Meetings in Likely

---

Just received this

---

**From:** Barnett.MLA, Donna  
**Sent:** Saturday, November 22, 2014 06:48 PM Pacific Standard Time  
**To:** Barnett, Donna  
**Subject:** FW: Mount Polley Dam Breach community Meetings in Likely

Sent with Good ([www.good.com](http://www.good.com))

-----Original Message-----

**From:** Lisa Ann Kraus [[likelycommunitycoordinator@gmail.com](mailto:likelycommunitycoordinator@gmail.com)]

**Sent:** Saturday, November 22, 2014 06:19 PM Pacific Standard Time

**To:** [dreimer@mountpolley.com](mailto:dreimer@mountpolley.com)

**Cc:** [premier@gov.bc.ca](mailto:premier@gov.bc.ca); Bennett.MLA, Bill; Polak.MLA, Mary;  
[jsorley@cariboord.bc.ca](mailto:jsorley@cariboord.bc.ca); [arichmond@cariboord.bc.ca](mailto:arichmond@cariboord.bc.ca); Oakes.MLA, Coralee;  
Barnett.MLA, Donna; [b.sellars@xatsull.com](mailto:b.sellars@xatsull.com); [ann.louie@williamslakeband.ca](mailto:ann.louie@williamslakeband.ca);  
[dwatt@telus.net](mailto:dwatt@telus.net); [dparsons@imperialmetals.com](mailto:dparsons@imperialmetals.com);  
[srobertson@imperialmetals.com](mailto:srobertson@imperialmetals.com); [langlin@imperialmetals.com](mailto:langlin@imperialmetals.com); Bond.MLA,  
Shirley; robin hood

**Subject:** Mount Polley Dam Breach community Meetings in Likely

Dear Mr. Reimer

The Likely and District Chamber of Commerce is concerned about the lack of communication and meetings with the Likely community. Please find attached our letter in regards to our concerns. we look forward to your reply.

A hard copy of the letter has been mailed to you and all of those cc on this email.

Regards

Lisa Kraus

Likely Community Coordinator



**LIKELY & DISTRICT CHAMBER OF COMMERCE**

**P.O. BOX 29 LIKELY, B.C. V0L 1N0**

November 22, 2014

Mr. Dale Reimer, Mine Manager  
Mount Polley Mine  
PO Box 12  
Likely, BC V0L 1N0

Re: Mount Polley Dam Breach Community Meetings in Likely

Dear Mr. Reimer,

The Likely and District Chamber of Commerce is concerned about the recent lack of communications and meetings with the Likely community. The last community meeting occurred on October 9, 2014, and though the site tour that occurred on October 25, 2014 was much appreciated by those that participated, the next planned community meeting on November 23, sponsored by the Ministry of Environment not Mount Polley, leaves too long a gap (7 weeks) for participation by the general community.

In addition, at the last meeting, there were a number of questions regarding the remediation and reconstruction work at the dam breach and Hazeltine Creek that could not be answered by the MPMC representatives present, Lyn Anglin and Lee Nikl. In the future, can you please ensure that appropriate other technical representatives are available to answer enquiries on all aspects of the Mount Polley remediation efforts, as well as the proposed plans for restarting the Mount Polley mine and mill operation.

If you require any further information or assistance, please contact the undersigned, or contact Doug Watt, Likely Chamber Liaison, at [dwatt@telus.net](mailto:dwatt@telus.net) or phone 250-790-2446.

Regards,

Robin Hood  
President  
Likely and District Chamber of Commerce

s.22

CC Premier Christy Clark  
Bill Bennett, Minister of Energy and Mines  
Mary Polak, Minister of Environment  
Joan Sorley, Area F Director, Cariboo Regional District  
Al Richmond, Board Chairman, Cariboo Regional District



Coralee Oakes, MLA, Minister of Community, Sport and Cultural Development  
Donna Barnett, MLA, Cariboo-Chilcotin/Parliamentary Secretary for Regional Economic  
Development to the Minister of Jobs, Tourism and Innovation  
Chief Bev Sellars, Soda Creek Indian Band  
Chief Ann Louie, Williams Lake Indian Band  
Doug Watt, Likely Chamber Liaison  
Dale Reimer, Mine Manager, Mount Polley Mining Corporation  
Don Parsons, Chief Operating Officer, Imperial Metals Corporation  
Steve Robertson, VP Corporate Affairs, Imperial Metals Corporation  
Lyn Anglin, Chief of Scientific Officer, Imperial Metals Corporation  
Shirley Bond, Minister of Jobs, Tourism and Skills Training and Minister Responsible for  
Labour.

**From:** [Halls, Lori D ENV:EX](#)  
**To:** [Morel, David P MEM:EX](#); [Hoffman, Al MEM:EX](#); [Demchuk, Tania MEM:EX](#)  
**Subject:** Fwd: Mount Polley Mine Start up - Likely & District Chamber of Commerce  
**Date:** Sunday, November 23, 2014 8:22:21 AM  
**Attachments:** [Mount Polley Mine Start up- Likley & District Chamber of Commerce.pdf](#)  
[ATT00001.htm](#)

---

FYI

Lori Halls  
Assistant Deputy Minister  
Environment Protection Division

Begin forwarded message:

**From:** "Dhanowa, Damon ENV:EX" <[Damon.Dhanowa@gov.bc.ca](mailto:Damon.Dhanowa@gov.bc.ca)>  
**To:** "Halls, Lori D ENV:EX" <[Lori.D.Halls@gov.bc.ca](mailto:Lori.D.Halls@gov.bc.ca)>  
**Cc:** "Hancock, Tom ENV:EX" <[Tom.Hancock@gov.bc.ca](mailto:Tom.Hancock@gov.bc.ca)>, "Mitschke, Matt ENV:EX" <[Matt.Mitschke@gov.bc.ca](mailto:Matt.Mitschke@gov.bc.ca)>, "Shoemaker, Wes ENV:EX" <[Wes.Shoemaker@gov.bc.ca](mailto:Wes.Shoemaker@gov.bc.ca)>, "Crebo, David GCPE:EX" <[David.Crebo@gov.bc.ca](mailto:David.Crebo@gov.bc.ca)>  
**Subject:** Fw: Mount Polley Mine Start up - Likely & District Chamber of Commerce

Fyi

Thanks,

:D

250.884.7656

Sent from my BlackBerry 10 smartphone

---

**From:** Dhanowa, Damon ENV:EX <[Damon.Dhanowa@gov.bc.ca](mailto:Damon.Dhanowa@gov.bc.ca)>  
**Sent:** Saturday, November 22, 2014 9:09 PM  
**To:** Polak, Mary  
**Cc:** Hancock, Tom ENV:EX; Mitschke, Matt ENV:EX  
**Subject:** Fw: Mount Polley Mine Start up - Likely & District Chamber of Commerce

---

Fyi

Thanks,

:D

250.884.7656

Sent from my BlackBerry 10 smartphone

---

**From:** Barnett, Donna <[D.Barnett@leg.bc.ca](mailto:D.Barnett@leg.bc.ca)>  
**Sent:** Saturday, November 22, 2014 9:06 PM  
**To:** Dhanowa, Damon ENV:EX  
**Subject:** Fw: Mount Polley Mine Start up - Likely & District Chamber of Commerce

---

And this

---

**From:** Barnett.MLA, Donna  
**Sent:** Saturday, November 22, 2014 06:48 PM Pacific Standard Time  
**To:** Barnett, Donna  
**Subject:** FW: Mount Polley Mine Start up - Likely & District Chamber of Commerce

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-----Original Message-----

**From:** Lisa Ann Kraus [[likelycommunitycoordinator@gmail.com](mailto:likelycommunitycoordinator@gmail.com)]  
**Sent:** Saturday, November 22, 2014 06:13 PM Pacific Standard Time  
**To:** [premier@gov.bc.ca](mailto:premier@gov.bc.ca)  
**Cc:** Bond.MLA, Shirley; [ann.louie@williamslakeband.ca](mailto:ann.louie@williamslakeband.ca); [b.sellars@xatsull.com](mailto:b.sellars@xatsull.com); Polak.MLA, Mary; [arichmond@cariboord.bc.ca](mailto:arichmond@cariboord.bc.ca); [dreimer@mountpolley.com](mailto:dreimer@mountpolley.com); [dparsons@imperialmetals.com](mailto:dparsons@imperialmetals.com); [srobertson@imperialmetals.com](mailto:srobertson@imperialmetals.com); [langlin@imperialmetals.com](mailto:langlin@imperialmetals.com); [dwatt@telus.net](mailto:dwatt@telus.net); robin hood; Bennett.MLA, Bill; Oakes.MLA, Coralee; Barnett.MLA, Donna; [jsorley@cariboord.bc.ca](mailto:jsorley@cariboord.bc.ca)  
**Subject:** Mount Polley Mine Start up - Likely & District Chamber of Commerce

Premier Christy Clark

Please find attached a letter from the Likely & District Chamber of Commerce in regards to Mount Polley Mine Start up. The Likely & District Chamber of Commerce looks forward to your reply.

A hard copy had been mailed to you as well as all those cc on this email.

Regards

Lisa Kraus

Likely Community Coordinator



November 22, 2014

Premier Christy Clark  
PO Box 9041, STN PROV GOVT  
Victoria, BC V8W 9E1

Sent by email to [premier@gov.bc.ca](mailto:premier@gov.bc.ca)

**Re: Mount Polley Mine Startup (temporary) – Likely & District Chamber of Commerce support**

Dear Premier Clark

Mount Polley Mining Corporation (MPMC) and Imperial Metals Corporation (IMC) are proposing a plan to expedite the restart of operations at Mount Polley Mine in the near future. This temporary plan will reportedly allow mine and mill operations at about 50% of capacity for at least 1 year. As the proposed plan will not use the existing tailings pond where the dam breach occurred, there will be no effect on the investigations currently underway, and ongoing breach remediation efforts can continue unimpeded.

As you are aware, residents and businesses in Likely and surrounding areas, including all around Quesnel Lake, were impacted quite severely both personally and economically. The Likely and District Chamber of Commerce (LDCC) supports MPMC and IMC in the effort to partially restart operations, returning employment levels to near normal levels, as it will assist in alleviating some of the negative economic effects on the community. In addition, restarting the operation will allow MPMC to streamline operations to more effectively support the longer-term mitigation plan, as well as generating operating funds to assist the remediation efforts.

The LDCC requests that the Government of BC and appropriate Ministries assist in any way possible in processing the application to expedite the temporary restart of operations at Mount Polley, while of course ensuring the continued safety of people and the environment. The community of Likely wishes to continue to be included in an open and transparent dialogue on all aspects of the Mount Polley Mine operation and remediation, and look forward to working with the BC Government Ministries, First Nations and Imperial Metals to ensure the continued successful operation of the Mount Polley Mine.

If you require any further information or assistance, please contact the undersigned, or contact Doug Watt, Likely Chamber Liaison, at [dwatt@telus.net](mailto:dwatt@telus.net) or phone 250-790-2446.

Regards,



Robin Hood  
President  
Likely and District Chamber of Commerce

s.22

CC Bill Bennett, Minister of Energy and Mines  
Mary Polak, Minister of Environment  
Joan Sorley, Area F Director, Cariboo Regional District  
Al Richmond, Board Chairman, Cariboo Regional District  
Coralee Oakes, MLA, Minister of Community, Sport and Cultural Development  
Donna Barnett, MLA, Cariboo-Chilcotin/Parliamentary Secretary for Regional Economic Development to the Minister of Jobs, Tourism and Innovation  
Chief Bev Sellars, Soda Creek Indian Band  
Chief Ann Louie, Williams Lake Indian Band  
Doug Watt, Likely Chamber Liaison  
Dale Reimer, Mine Manager, Mount Polley Mining Corporation  
Don Parsons, Chief Operating Officer, Imperial Metals Corporation  
Steve Robertson, VP Corporate Affairs, Imperial Metals Corporation  
Lyn Anglin, Chief of Scientific Officer, Imperial Metals Corporation  
Shirley Bond, Minister of Jobs, Tourism and Skills Training and Minister Responsible for Labour.