PITEAU ASSOCIATES
GEOTECHNICAL AND
HYDROGEOLOGICAL CONSULTANTS

SUITE 300 - 788 COPPING STREET
NORTH VANCOUVER, B.C.
CANADA - V7M 3G6
TEL: (604) 986-8551 / FAX: (604) 985-7286
www.piteau.com

Our file: 1071 (1071-14-L001)

Date: October 30, 2014

First Quantum Minerals Ltd.
Samatosum Minesite
P.O. Box 1499
Barriere, BC V0N 1E0

Attention: Mr. Brent Hamblin – Manager, First Quantum Minerals Ltd., Samatosum Minesite

Dear Sirs:

Re: 2014 Tailings Dam and Impoundment Dam Safety Inspection, Samatosum Mine, Barriere, BC

Submitted in fulfillment of:

- Chief Inspector's Orders – Tailings Dams – Independent Review of Dam Safety and Consequence Classification, August 18, 2014;
- As per – Canadian Dam Association (CDA) Checklist – Completed September-November 2014; and
- Health, Safety and Reclamation Code for Mines in British Columbia (Code) Section 10.5.3.

Section 1. Executive Summary

a) The Samatosum Tailings Dam Classification in terms of Consequence of Failure in accordance with Table 2.1 of the CDA Dam Safety Guidelines (2007) is 'low'.

First Quantum Minerals (FQM) has contracted a Dam Safety Review (DSR) for completion and submittal as part of the 2014 Annual Report due by March 31, 2015.

b) There were no significant changes in instrumentation monitoring records during 2013 and the portion of 2014 from January to October. Data collected in 2013 to October 2014 was similar to 2009 to 2012 data. Data from 2009 through 2013 is scheduled for review as part of the Piteau Associates 2014 Samatosum Geotechnical Site Inspection and will be reported in the 2014 Annual Report due by March 31, 2015.

c) There were no apparent changes to dam stability and/or surface water control during 2013 and the portion of 2014 up to the end of October. This is based on visual inspections conducted by site staff quarterly (as a minimum) and a site geotechnical inspection done by Piteau Associates Engineering Ltd. in September 2014.

d) As per Part 10.5.2 of the Health, Safety and Reclamation Code for Mines in BC, and Mining Association of Canada (MAC) Guidelines the Samatosum Tailings Dam has an

Operation, Maintenance and Surveillance (OMS) manual. The last revision of this manual was December 2013. (Electronic copy submitted to MEM Victoria in December 2013.)

e) As per section 4.0 (Emergency Preparedness) of the CDA Dam Safety Guidelines, an Emergency Preparedness Plan (EPP) is not required if a Tailings Dam Consequence Category is established as very low or low. The BC Dam Safety Regulations Section 3.(2)A(a) also do not require an EPP with a 'low' classification. The Samatosum Tailings Dam BC Dam Safety classification rating is 'low' (SNC, 2004) and therefore does not require an EPP.

   As a good management practice, Samatosum implemented and table top tested an Emergency Preparedness and Response Plan (EPRP) in 2005 and continues to improve and test the EPRP annually. The 2014 test is scheduled for the first half of November.

f) As per section 2.0 (Dam Safety Review) of the CDA Dam Safety Guidelines and Schedule 2 (Dam Safety Review Requirements) of the BC Dam Safety Regulations, Samatosum will periodically review conditions downstream of the tailings dam and notify a dam safety officer if the downstream consequence classification level increases. Samatosum will continue to conduct biennial geotechnical inspections by an engineer. The most recent geotechnical inspection was conducted in September 2014 and is detailed in Section 4.

Section 2. **Construction Summary**: There was no construction conducted during 2013 and the portion of 2014 up to the end of October and none is planned for the remainder of 2014.

Section 3. **Plans and representative cross sections**. Previously submitted in the "2005 Samatosum Geotechnical report" and also attached here in Appendix B. See Figures 2, 3, 4, 5, 6A, 6B, 6C, 7, and 9.

Section 4. **Details relating to the recommendations and comments relating to the 2014 Piteau Associates DSI start on page 4.** Site photographs taken during the DSI are included and show no significant changes of the tailings dam and associated structures.

Section 5. **Climatic review.** – Precipitation Data. Total precipitation at the weather station onsite for January through September 2014, was 413.7mm.

Section 6. **Water Balance. –** A quantitative water balance was not required during the 2014 reporting period because there was no discharge of tailings or supernatant into the impoundment.

Section 7. **Freeboard and storage availability** (based on 200-year flood or the permitted design flow, whichever is more severe). Freeboard usually remains constant as incoming water flows discharge naturally over spillway as designed.

Section 8. **Water discharge system, volumes and quality**.

a) Water flows were measured quarterly (as a minimum). Water flow for the period of January 1 to October 31, 2014 is estimated at 650,000 m^3.

b) Water quality is listed in Appendix C. The spillway (tailings pond impoundment discharge) sample point is listed as MOE Site 2.

Section 9. **Seepage occurrence and water quality**.

a) Tailings Dam seepage reports downstream to the water quality pond. The discharge of the water quality pond is sample point Site 1. Site 1 Water Quality data from 2013 and January to October 2014 is attached in Appendix C.

Section 10. **Surface water control and surface erosion**. Site inspections and the most recent Piteau Associates Engineering Ltd. inspection showed no concerns for 2014.

Section 11. **Instrumentation review including:**

a) Phreatic surfaces and Piezometric data – see attached Piezometric data are within normal ranges.

b) Settlement – most recent survey conducted in 1998. (See Figure 9, 1997/1998 Annual Geotechnical Inspection Report, attached in Appendix B.)

c) Lateral movement – most recent survey conducted in 1998. (See Figure 9, 1997/1998 Annual Geotechnical Inspection Report, attached in Appendix B.)

Section 12. **Water Quality**

a) Site 1 and Site 2 Water Quality data from 2013-2014 is attached in Appendix C.

INTRODUCTION

Between May 1989 and September 1992, Minnova Inc. (Minnova) operated the Samatosum silver mine located on the Adams Plateau (see Fig. 1), east of the community of Barriere, BC. Mining operations ceased and the mill was permanently shut down on September 26, 1992. Subsequently, Inmet Mining Corporation (Inmet) acquired certain assets of Minnova, including

the Samatosum Mine. In turn, First Quantum Minerals Ltd. (First Quantum) acquired Inmet in 2013. Since the shutdown, the Samatosum Minesite (Samatosum) of Inmet and most recently of First Quantum, has been implementing a phased decommissioning of the mine, mill and associated facilities in accordance with a closure, reclamation and abandonment plan. The general layout of the Samatosum site is illustrated on Fig. 2.

In accordance with the original operating permit and relevant provisions of the *B.C. Mines Act*, Samatosum is required to submit annual reports to the B.C. Ministry of Energy and Mines (MEM), and the B.C. Ministry of Environment (MOE) regarding the condition of the tailings disposal facility. From 1991 to 2000, Samatosum retained Piteau Associates Engineering Ltd. (Piteau) to conduct the geotechnical aspects of the annual review. Piteau has since been retained to conduct biennial geotechnical site inspections. The inspection for 2012-2014 is reported herein. Our last inspection was conducted in September 2012 (Piteau, 2012)[1].

The latest inspection of Samatosum was conducted by Mr. James D. Hogarth, P.Eng., of Piteau during a site visit on September 23, 2014. Representative site photographs taken during the inspection are included as Appendix A. Most of the photographs in Appendix A were taken from viewpoints utilized during previous inspections, to allow a visual comparison to be made of changes to the works over time. Photo 1 provides an overview of the Samatosum Mine from the Johnson Lake Road, which accesses the site. Weather conditions during the inspection consisted of partly clear skies, with temperatures ranging from about 10 to 15°C. Ground surfaces in the vicinity of the tailings impoundment facility, waste dump and open pit were clearly visible.

TAILINGS IMPOUNDMENT AND DIVERSION

Details regarding the location, general arrangement, design, construction, operation, decommissioning and monitoring of the tailings impoundment facility have been reported previously by Piteau.

Rediversion

Photos 2, 3 and 4 show various views of the rediversion works. Based on our observations, it appears that the rediversion structure continues to function as designed. As noted in previous inspection reports, erosion of the stilling basin at the rediversion has occurred where a small ephemeral stream enters. As can be seen in Photo 2, dense morainal soil exposed in this area continues to erode slowly. No remedial action or maintenance of the rediversion works is considered necessary at this time.

[1] Piteau, 2012. Letter report to Inmet Mining Corporation, Attention Mr. Brent Hamblin – Manager, Inmet Mining, Samatosum Division. Re: Samatosum Mine, Barriere, B.C. – Tailings Dam Inspection. November 30.

Below the rediversion, the armoured portion of the rediverted channel is in good condition and shows no signs of erosion or excessive accumulation of vegetation (see Photos 5 and 6).

As noted during previous inspections, an area of minor channel bank erosion is located on the rediverted channel approximately 25m upstream of the point where it discharges into a small embayment in the tailings impoundment (see Photo 7). At this location the left channel bank is approximately 0.8m high and appears to be stabilizing, as evidenced by vegetation growth on the exposed mineral soil.

As can be seen in Photo 8 and as noted during previous inspections, a gravel deposit has developed on the bottom of the impoundment where eroded gravel from the diversion channel banks has been deposited. No channel meandering or scouring of the shoreline or submerged tailings has occurred during the current reporting period. No significant changes were noted relative to our September 2012 inspection. No remedial action or maintenance is considered necessary at this time.

Cattle tracks were also noted in the area of the rediversion at the time of the inspection. As has been noted during previous inspections, cattle occasionally gain access to the Samatosum site, typically by knocking down portions of the perimeter fence. We understand that Samatosum continues to repair damaged portions of the perimeter fence and remove cattle from the site when discovered.

Main Embankment

As in previous inspections, the main embankment appears to be stable and no significant problems or unusual occurrences were observed or reported during the period covered by this review. The water level in the impoundment is controlled by the abandonment spillway weir, and generally remains approximately 1.3m below the crest of the embankment. Photos 9 through 15 show various views of the impoundment and main embankment.

Visible on the right in Photo 9, is an area of exposed glacial till on the northwest shore of the impoundment that corresponds to an old road cut. No evidence of significant slumping or major erosional scars is visible, but minor erosional rills are evident. No remedial work is considered warranted in this area.

As can be seen in Photo 10, vegetation, primarily grasses, is well established on the upstream face of the embankment. Vegetation, primarily grasses and clover, also appears to be well established on the crest and downstream face of the embankment, and continues to be effective in preventing surface erosion (see Photos 11 and 12). Small shrubs up to about 0.7m high are also becoming established on the downstream face of the embankment, and also aid in stabilizing the surficial soils and preventing erosion. However, trees growing on the embankment are not desirable due to the potential for windfall and subsequent erosion when the trees mature. Trees growing on the embankment

should be removed when noted. No work is considered warranted in this area at this time.

As noted during previous inspections, sections of the upstream face of the tailings dam have been undercut at the waterline by wave erosion. In these areas, as much as 40 cm of undercutting was measured at the time of the inspection. While the rushes and sedges previously planted along the upstream face at the waterline (see Photo 10) significantly reduce the potential for wave erosion, it is recommended that the amount of undercutting be monitored to confirm that the problem is not worsening. To this end, we understand that Samatosum has established two monitoring points along the upstream face where undercutting is monitored. However, it is recommended that three or four more monitoring points be added to the two existing ones and these should be marked in the field where reliable measurements of the amount of undercutting can be made on a periodic basis, such that any increase in the rate of erosion over time can be identified.

Several gopher holes were evident in the downstream face at the time of the inspection. Based on the number of active gopher burrows, the gopher population appears to be somewhat lower than noted during previous inspections. The burrows at the downstream toe of the dam are concentrated in the drainage blanket, and are presumably above the zone of saturation. Based on an inspection of several of the burrows conducted by Samatosum in April 2004 and June 2006, we understand that burrow run lengths are up to about 3.5m and extend only as deep as 0.7m below the surface of the embankment face. The effect of the burrows on the stability of the dam is presently considered to be negligible. However, continued burrowing near the waterline on the upstream face could increase the risk of local piping and erosion. As per the action plan noted in the 2006 Geotechnical Site Inspection report, the installation of a galvanized mesh on the upstream and downstream faces has been completed to help restrict gopher activity in these areas (see Photo 13).

As in past years, soft/wet conditions were noted in the vicinity of rutting on the right abutment (Photo 14). Similarly, greener vegetation is evident on the left abutment and in the low area below the downstream toe of the main embankment (see Photo 15). Minor surface seepage and ponding of water in this area was noted during the inspection. The quantity of water discharging from the toe drain is very minor and within the range of design predictions. No indicators of potential instability, such as seepage above the toe or tension cracks, were noted on the downstream face of the embankment.

Samatosum is currently compiling piezometer monitoring data for the tailings storage facility. A review of this data will be carried out and the results reported separately. This review will provide more detail on ongoing consolidation settlement of the embankment and long-term groundwater levels in the foundation.

Abandonment Spillway Structure

The approach channel, saddle dyke and spillway, which comprise the outlet spillway, are illustrated in Photos 16, 17 and 18. No erosion has been observed along the saddle dyke, and vegetation on the face of the dyke is well established. The log boom anchored across the entrance to the approach channel to prevent floating debris from blocking the spillway remains in place (see Photo 16) and appears to be in good condition. A minor amount of water was discharging over the spillway weir at the time of the inspection (see Photo 18).

Diversion Channel

The portion of the original tailings impoundment diversion channel between the rediversion structure and the abandonment spillway (i.e., Segments II to VI) is cut off by the rediversion structure and now contributes only a very small proportion of the total flow in the diversion channel. Alder, willow, aspen and cottonwood trees have colonized sections of this portion of the diversion channel. These trees help stabilize the channel banks and do not require clearing where they are outside the active channel.

The portion of the diversion downstream of the abandonment spillway (i.e., Segments VII to X) functions as a permanent (abandonment) channel. Discharge from the impoundment, via the abandonment spillway, contributes the bulk of flow to this lower section of the diversion channel.

Photos 19 to 24 illustrate the current condition of the diversion channel downstream from the abandonment spillway. No significant changes to the diversion channel were apparent since our September 2012 inspection. As part of the ongoing maintenance program, Samatosum continues to remove saplings and significant accumulations of vegetation from channel side slopes (see Photos 19 and 20) to maintain flow capacity. Minor erosion, noted during the 2012 inspection, immediately downstream of the wooden weir located just upstream of the downstream end of Segment X (see Photo 24) does not appear to have changed significantly. The eroded portion of channel shown in Photo 24 should be armoured to help prevent future erosion.

Previously repaired areas of erosion in the riprap armoured sections of the lower portion of Segment X show no evidence of further erosion (see Photo 23).

The stilling basin/turning pond structure at the junction of Segments IX and X (Photo 21) and the stilling basin/culvert at the downstream end of Segment X (Photo 25) were both in relatively good condition at the time of the inspection. However, as can be seen in Photo 25, alder saplings are beginning to become established in the stilling basing at the inlet to the culvert under Johnson Lake Road and should be removed to help prevent debris buildup that could restrict flow into the culvert inlet.

As can be seen in Photo 26, the pulled pack (i.e., resloped) area of previously reported instability above the middle section of Segment X continues to perform well. No evidence of further instability or erosion of this area was noted at the time of the inspection and no remedial action or additional slope stabilization appears warranted at this time.

Plant Site Sedimentation Pond

As illustrated in Photo 27, there appeared to be up to about 1m of water in the plant site sedimentation pond at the time of the inspection. The dyke that forms the pond appears stable and is covered with vegetation, including grasses, alder and cottonwood saplings. Interior slopes of the pond are covered with typical wetland vegetation. We understand that small flows discharge through the rockfill spillway during the freshet. No erosion or undermining of the spillway armouring was noted at the time of our inspection. Saplings should be removed from the crest of the dyke to facilitate visual inspections.

Seepage Collection System

The seepage collection system for the tailings impoundment facility consists of two shallow trenches excavated along the downstream toe of the main embankment. The collection system is designed to pick up seepage issuing from the drainage blanket installed under the downstream portion of the main embankment, and to intercept some of the shallow groundwater that flows through the natural morainal soils and bedrock in the dam foundation.

As directed by MEM, the collection ditches below the dam were regraded near their confluence in October 2000, to prevent ponding of water in a low lying area. At the time of the inspection, minor ponding was noted in the remaining portion of the seepage collection ditch (see Photo 28). No remedial work or maintenance is required at this time.

Water Quality Pond

The water quality pond is located immediately downstream of the main embankment. The pond consists of an inlet channel, an excavated and dyked pond with baffle system, a spillway, and an outlet channel. Photos 29 and 30 show the pond and some associated structures at the time of the inspection. The original culvert spillway was removed and replaced with a riprap-lined spillway in 1994.

No significant changes in the pond or associated structures since our September 2012 inspection were apparent. No erosion or sloughing of channel side slopes or down-cutting of channel inverts was noted. Riprap armouring of the spillway and outlet channel appeared to be functioning as designed. Cut slopes forming three sides of the pond appeared stable, as did the small dyke forming the fourth side of the pond. Vegetation has become well established on all surfaces, with rushes along the shoreline, and grasses and cottonwood, alder and aspen saplings on the interior

slopes. As can be seen in Photo 30, a few cottonwood trees have become established on the upstream face of the dyke near the waterline. While these trees will likely need to be removed in the future, they do not appear to represent a significant hazard at the present time. No remedial work or maintenance is required at this time.

Consistent with previous inspections, the baffle in the centre of the pond is submerged under about 0.5m of water (see Photo 29), but the freeboard on the dyke is approximately 1m, which is considered to be adequate. Given the limited inflows and the lack of suspended sediment in the inflow, the submerged baffle is not considered to be a significant concern.

SUMMARY AND RECOMMENDATIONS

Tailings Impoundment and Diversion

The embankment for the tailings impoundment was in generally good condition. Previously noted erosion of the upstream face along the waterline does not appear to have been exacerbated since the previous inspection; however, monitoring of the rate of erosion at a few locations appears warranted. Planting of wetland vegetation (i.e., cattails) along the waterline to reduce the likelihood of wave erosion has been completed. Galvanized wire mesh installed on the uppermost portions of the upstream and downstream faces appears to be helping control gopher burrowing. Notwithstanding this, the ongoing population control program should be continued.

The low quantity of seepage issuing from the drainage blanket at the dam toe is consistent with design predictions, and the seepage collection system appears to be functioning as designed. No maintenance concerns were identified with respect to the seepage collection system, water quality pond or related works during the field inspection.

The diversion channel downstream from the abandonment spillway continues to function effectively as a permanent abandonment channel.

The diversion channel upstream of the impoundment was in generally good condition. Two areas of minor erosion noted during previous inspections do not need to be addressed at this time.

CLOSURE

This report has been prepared to document visual observations from our September 23, 2014 site visit, and presents conclusions made on the basis of these observations. Piezometer monitoring data for the site was not available at the time of writing, and have not been considered in our assessments.

Yours truly,

PITEAU ASSOCIATES ENGINEERING LTD.

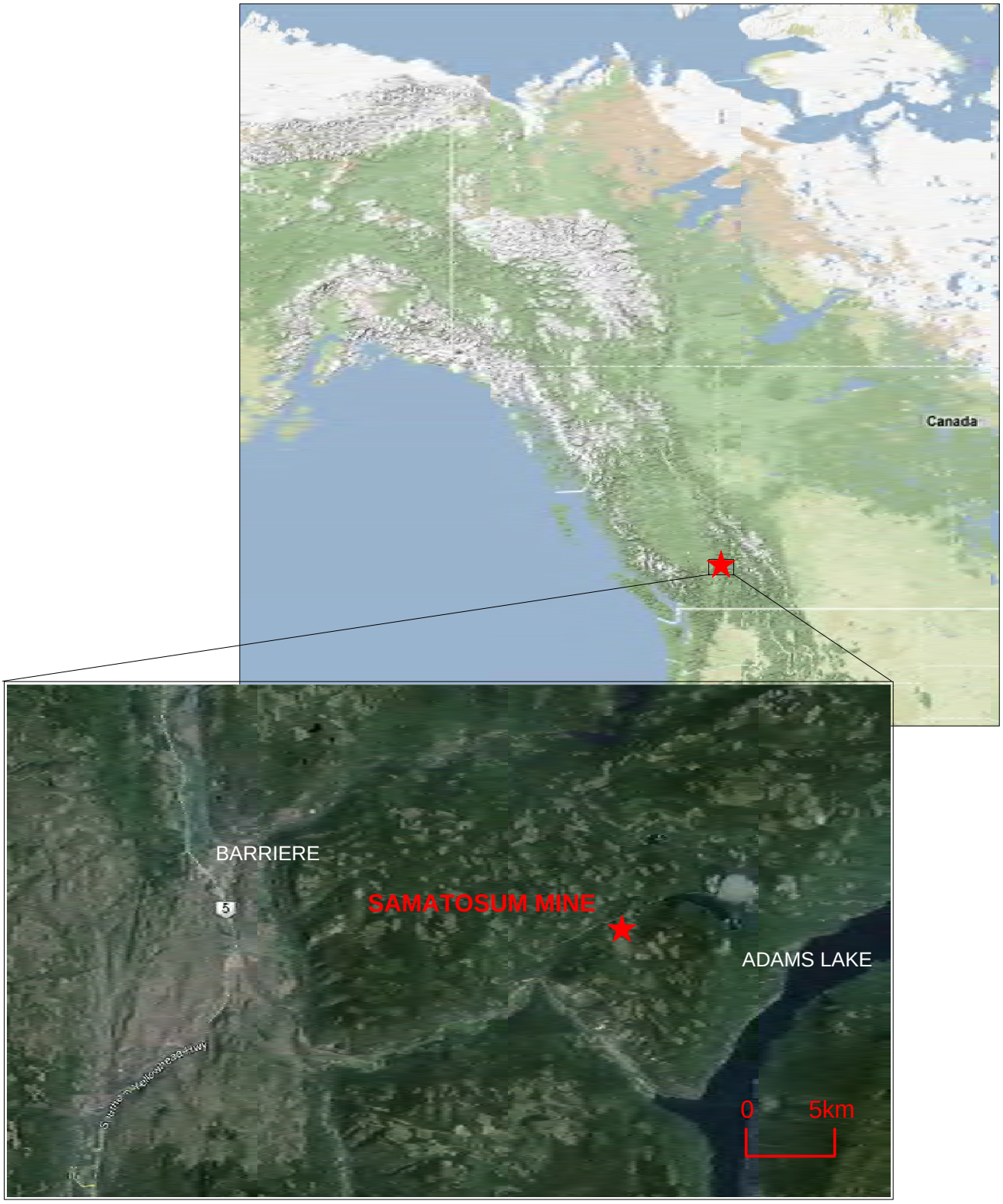
James D. Hogarth, P.Eng.

JDH/slc

Att.

FIGURES

H:\Project\1071\2014\Fig1_Project_Location.grf



Adapted from earth.google.com website.

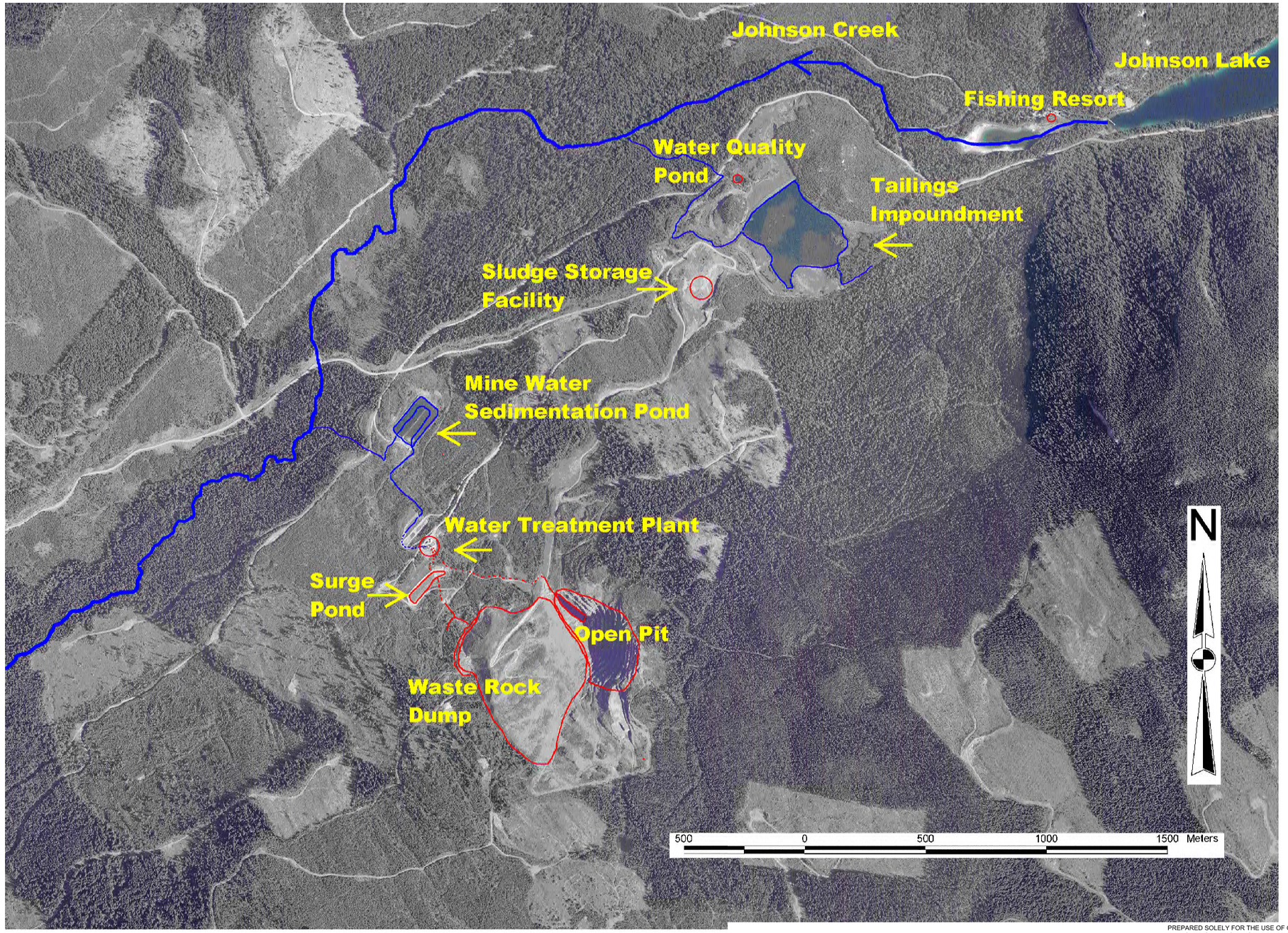
FIRST QUANTUM MINERALS LTD.
SAMATOSUM MINESITE
2014 DAM SAFETY INSPECTION

PITEAU ASSOCIATES
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS

PROJECT LOCATION MAP

BY:	DATE:
JDH	OCT 14
APPROVED:	FIG:
	1

DWG. NUMBER: K:\1071\CADD\1071-079.dwg (Fig 2)



FIRST QUANTUM MINERALS LTD.
SAMATOSUM MINESITE
2014 DAM SAFETY INSPECTION

PITEAU ASSOCIATES
GEOTECHNICAL AND HYDROGEOLOGICAL CONSULTANTS

SAMATOSUM MINESITE

BY:	DATE:
JDH/sl	OCT 14
APPROVED:	FIG: 2

APPENDIX A

SITE INSPECTION PHOTOGRAPHS

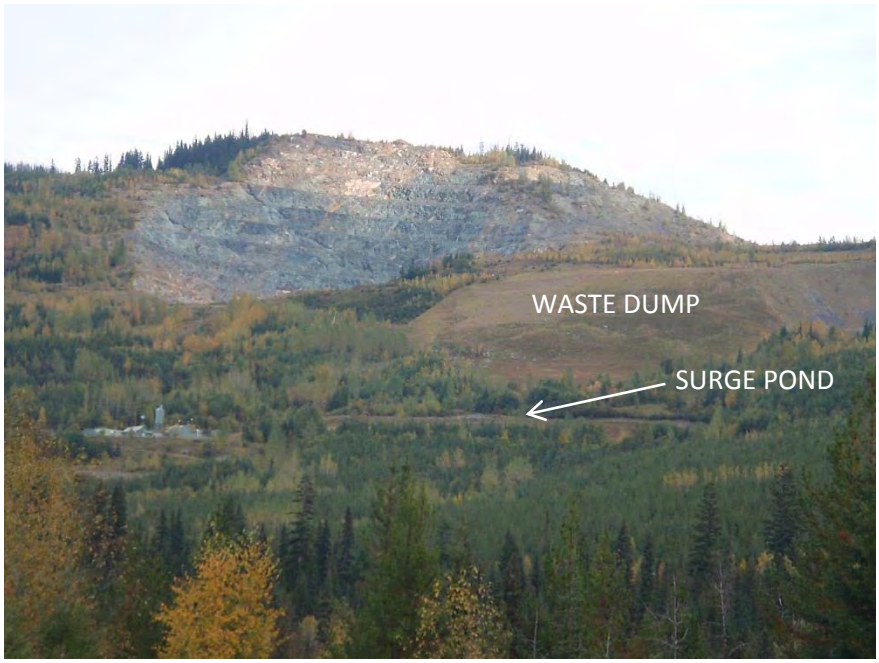


Photo 1. View of the Samatosum site, including the ARD treatment plant, surge pond, waste dump, and open pit.

Photo 2. View of minor erosion on left side of stilling basin at rediversion where ephemeral stream enters. No work warranted at this time.

Photo 3. View of Diversion Segment I and main creek looking upstream from rediversion. Note alder saplings starting to encroach on channel. We understand that channels are periodically cleared of saplings as part of the routine maintenance program at Samatosum. While clearing of these saplings does not appear warranted at this time, their growth should be monitored and they should be removed before they pose a concern for development of debris jams.

Photo 4. View looking downstream toward junction of diversion and rediversion. Again saplings are noted in this area, but removal of them does not appear warranted at this time.

Photo 5. View looking down rediversion from just above first weir below junction of diversion and rediversion.

Photo 6. View looking upstream at armoured portion of rediverted channel.

Photo 7. View of minor erosion on bank of rediverted channel upstream of point where it discharges into impoundment.

Photo 8. View of point where rediverted channel discharges into impoundment. Note gravel deposited in impoundment, likely from erosion of the channel banks upstream. No significant change since previous inspection.

Photo 9. View of tailings storage facility from the point where rediversion discharges into impoundment. Note exposed glacial till on the northwest shore on the right side of the photo. No evidence of instability or significant erosion. No work warranted at this time.

Photo 10. View of upstream face of tailings dam. Eroded and undercut portion at waterline shows no significant change since the last inspection. Note cattails planted along the waterline to help reduce wave action erosion of the upstream face.

Photo 11. View looking along downstream crest and downstream face from the left abutment towards the right abutment. Note the Buffalo Berry bushes on the face. As noted during past inspections, these shrubs pose a limited risk and do not impede the ability to conduct a visual inspection of the dam. No work warranted.

Photo 12. View looking along downstream face of tailings dam from the right abutment.

Photo 13. View of a portion of the galvanized mesh placed on upstream and downstream crest to help prevent gophers from burrowing into dam.

Photo 14. View of area of historic seepage and rutting on right abutment. No work warranted.

Photo 15. View of historic seepage zone at toe of tailings dam in vicinity of drainage blanket. Spongy ground and minor ponded water was noted at surface in this area. No work warranted.

Photo 16. View of log boom at entrance to approach channel.

Photo 17. View of approach channel from just downstream of inlet and log boom. Note well vegetated upstream face of Saddle Dyke.

Photo 18. View of spillway weir. Note the water flowing over the crest of the weir.

Photo 19. View looking up Segment VII about 100m below the spillway. Note the cleared channel.

Photo 20. View looking up the lower portion of Segment IX just above the turning pond.

Photo 21. View of the turning pond at the junction of Segments IX and X.

Photo 22. View looking up Segment X immediately upstream of the section of eroded slope that was previously pulled back. Note the open channel, which has been recently cleared of saplings.

Photo 23. View of hand placed armour on right bank of Segment X. No erosion evident at any of the three locations of hand-placed armour.

Photo 24. View of area of minor channel erosion in lower Segment X, immediately below the concrete and wooden weir located just upstream of the inlet of the culvert under Johnson Lake Road. Eroded channel banks should be armoured to help prevent future erosion. Water currently flows under weir. Weir should be relocated or repaired, as required.

Photo 25. View of the inlet to the culvert under Johnson Lake Road at the bottom of Segment X. Alder saplings are becoming established and should be removed to prevent a buildup of debris.

Photo 26. View of portion of resloped area of slope instability noted during previous inspections. Pulled back slope is performing well.

Photo 27. View of plant site sedimentation pond. No significant change since last inspection, except vegetation on dyke has been removed.

Photo 28. View of ponded water in seepage collection ditch below toe of tailings dam.

Photo 29. View of the water quality pond. Baffles are submerged.

Photo 30. View of the water quality pond dyke. Note large saplings near waterline on upstream face of dyke that pose limited hazard to dyke stability and do not impede visual inspection. Removal of saplings not warranted at this time.

APPENDIX B

TAILINGS FACILITY DRAWINGS

APPENDIX C

WATER QUALITY