



19 November 2014

TE143006

VIA COURIER

Glencore Canada Corporation
P.O. Box 405
100 King Street West, Suite 7200
Toronto, ON M5X 1E3

**Attention: Mr. John Stroiazzo
Reclamation Manager**

Dear John;

**Reference: Granisle Mine Site
2014 Dam Safety Inspection**

Please find enclosed two CDs and three copies of the 2014 Dam Safety Inspection of the Granisle Mine site near the Village of Granisle, British Columbia.

Please contact the undersigned should you have any questions or wish to discuss any aspects of the report.

**AMEC Environment & Infrastructure,
a Division of AMEC Americas Limited**

**Original hard copies signed by
Andy Small, M.Sc., P.Eng.**

C.A. (Andy) Small, P.Eng. (BC)
Senior Associate Geotechnical Engineer



GRANISLE MINE SITE
2014 DAM SAFETY INSPECTION
FINAL REPORT

Submitted to:

Glencore Canada Corporation
Toronto, ON

Submitted by:

AMEC Environment & Infrastructure,
a division of AMEC Americas Limited
495 Prospect Street, Suite 1
Fredericton, NB
E3B 9M4

November 2014

AMEC File: TE143006

EXECUTIVE SUMMARY

AMEC Environment & Infrastructure, a division of AMEC Americas Limited (AMEC), was retained by Glencore Canada Corporation (Glencore), to conduct a Dam Safety Inspection (DSI) on the Granisle Mine Site near the Village of Granisle, British Columbia (BC). The DSI was completed by a senior dam safety engineer who is also a registered Professional Engineer in the Province of BC. The DSI was carried out following the Canadian Dam Association (CDA) 2007 Dam Safety Guidelines, the *BC Water Act* Dam Safety Regulations (Reg. 163/2011), and other best practices and procedures in the industry. This report has been prepared in accordance with the requirements of the BC Ministry of Energy and Mines (MEM), including MEM's updated guidelines for Annual DSI's, revised August 2013.

Overall, the No. 1 Tailings Impoundment and No. 2 Tailings Impoundment Dams appeared to be in satisfactory condition. The following presents the findings of the DSI in accordance with MEM's guidelines for annual DSIs.

a) Classification of the Dam(s) in Terms of Consequence of Failure (ref. Canadian Dam Association, 2007 Dam Safety Guidelines)

In 2009, a dam safety review was conducted by AMEC for the Granisle Mine dams. At that time, the dams at the Granisle Bell Mine were all classified as low. In the 2013 DSI, the classification for Granisle Tailings Dams 1, 2 and 3 was modified to significant. This was as a result of a risk assessment process that was undertaken by Glencore (formerly Xstrata) in 2011 that concluded that the classification should possibly be increased for these dams. In 2014, as part of this DSI, Glencore further assessed the dam classifications and determined that this increase in classification was not warranted. As a result, the dams remain classified as low (per the 2009 DSR).

The classifications will be considered again during the next dam safety review, which is scheduled for 2019.

b) Significant Changes in Instrumentation Monitoring Records

A review of the instrumentation readings was not conducted for Granisle Mine site as there is no instrumentation currently installed in the No. 1 and No. 2 Tailings Impoundments

c) Significant Changes to Dam Stability and/or Surface Water Control

No significant changes to dam stability or surface water controls were observed at the time of the 2014 DSI at Granisle Mine. There were no concerns noted during the DSI with respect to dam stability and surface water control.

d) For major tailings impoundments, as described in Part 10.5.2 of the Health, Safety and Reclamation Code for Mines in British Columbia, all operating dams shall have

a current Operations, Maintenance and Surveillance (OMS) Manual. The annual report shall indicate the latest revision date of the OMS Manual

The Operation, Maintenance and Surveillance (OMS) Manual for the Granisle Mine is combined with that of the Bell Mine and was first issued in April 1999. The most recent revision is Version 3 dated December 2008.

Based on the review conducted as part of the 2014 DSI, the OMS Manual is generally complete and covers the important elements, including management roles and responsibilities, for safe operations.

e) For tailings dams classified as High or Very High Consequence, an EPP is required. The annual report shall indicate the latest revision date of the EPP document

The Emergency Preparedness Plan (EPP) for the Granisle Mine site was incorporated in the 2008 revision of the OMS Manual. A separate Emergency Preparedness and Response Plan for the combined Bell and Granisle Mines was issued February 2013.

f) Scheduled date for formal DSR (ref. Canadian Dam Association, 2007 Dam Safety Guidelines)

The recommended schedule for carrying out a DSR for the Tailings Dams 1, 2 and 3 is 2019. No DSRs are required for Tailings Dams 4 and 5, which are low consequence structures.

g) Summary of Past Year's Construction

No construction at the Granisle Mine Tailings Dams or their appurtenances has been carried out since the time of the 2013 DSI.

h) Tailings and Flood Storage/Freeboard

Ample freeboard was observed at the time of the 2014 DSI. A very minor water pond of limited extent was observed at the No. 1 Tailings Impoundment and the No. 2 Tailings Impoundment's freeboard was in excess of 15 m.



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IMPORTANT NOTICE

This report was prepared exclusively for Glencore Canada Corporation by AMEC Environment & Infrastructure, a wholly owned subsidiary of AMEC Americas Limited. The quality of information, conclusions and estimates contained herein is consistent with the level-of-effort involved in AMEC services and based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions and qualifications set forth in this report. This report is intended to be used by Glencore Canada Corporation only, subject to the terms and conditions of its contract with AMEC. Any other use of, or reliance on, this report by any third party is at that party's sole risk.

1.0 INTRODUCTION

AMEC Environmental & Infrastructure, a division of AMEC Americas Limited (AMEC), was retained by Glencore Canada Corporation (Glencore), to conduct a Dam Safety Inspection (DSI) at the Granisle Mine Site near the Village of Granisle, British Columbia (BC). This report presents the findings of the DSI.

The previous DSI was conducted by MBS GeoConsulting (MBS) in May 2013. The results of that inspection are described in the report titled “*2013 DSI Report, Bell and Granisle Mine Sites, Granisle, BC*”, which was issued in July 2013 (MBS, 2013).

This DSI was carried out following the Canadian Dam Association (CDA) 2007 Dam Safety Guidelines, as well as guidelines for Dam Safety Inspections provided by the British Columbia (BC) Ministry of Energy and Mines (MEM) under the *Mines Act* and Health, Safety and Reclamation Code for Mines in BC, and other best practices and procedures in the industry.

This report provides the following:

- Section 2.0 - Site description;
- Section 3.0 – Scope of the 2014 annual inspection
- Section 4.0 – Activities since 2013 annual inspection;
- Section 5.0 - Climate and water balance;
- Section 6.0 – Instrumentation monitoring;
- Section 7.0 - Results of dam safety inspection;
- Section 8.0 - Status of previous recommendations; and
- Section 9.0 – 2014 DSI recommendations.

2.0 SITE DESCRIPTION

The former Granisle Mine Site is located approximately 5 km northeast of the Village of Granisle, BC on the Islands of McDonald, Sterrett and Snowshoe within Babine Lake (south of the Newman Peninsula) as illustrated in Figure 1.1. Figure 1.2 presents an aerial view of the Granisle Mine Site.

The Granisle Mine was an open pit copper producer that operated between 1966 and 1982. The mine transitioned to a care and maintenance basis through the 1980's, and was permanently closed with mine facilities removed in 1990. Approximately 34,000,000 m³ of tailings were generated and stored in two impoundments: No. 1 Tailings Impoundment and No. 2 Tailings Impoundment. Both tailings impoundments have stability berms, where required, and the pond levels have been relatively constant over the last decade after steadily decreasing for several years as the facilities became dryer. From a closure perspective, vegetation has already been established on the tailings surfaces within the impoundments.

The No. 1 Tailings Impoundment is formed by one dam, Dam 1, Dam 1 was initially constructed as a rockfill embankment by dumping rockfill directly into Babine Lake, in water up to a depth of 24 m. The dam was subsequently raised by the upstream construction method, via spigoting of tailings, until reaching a maximum height of 15 m to 20 m above the lake level and a length of approximately 300 m. The downstream slope of the dam was buttressed by construction of a rockfill access road causeway at the toe. The impoundment has an emergency spillway located at Dam 1. The No. 1 Tailings Impoundment operated until 1970, when it was replaced by the No. 2 Tailings Impoundment. It is noted that no documentation of the design or as-built information is available for Dam 1. In 2011, the dam was classified in the significant consequence category in a dam safety workshop organized by Xstrata Canada Corporation in May 2011 (MBS, 2013). However, a dam safety review was done in 2009 by AMEC that concluded that the classification should be low. The classification was revisited in September 2014 and established as low.

The No. 2 Tailings Impoundment comprises four dams. Dams 2 and 3 were the first to be constructed, by building their submerged bases in Babine Lake and connecting the McDonald and Sterrett islands. Subsequently, Dams 4 and 5 were constructed to the north, adjacent to the open pit, and in a saddle at the southwest corner of the tailings impoundment, respectively. The dams comprising this impoundment consist of rockfill embankments with two upstream filters above the lake level. The first filter was composed of select fine rockfill with the upstream most filter consisting of cycloned sand. Dams 2 to 5 were raised in stages by the downstream construction method and, in their final configuration, reached an approximate total length of 2,120 m with a maximum height of 75 m (from lake bottom). A significant dam raise had just been completed when the mine closed prematurely. At the time of closure, there was a minimum freeboard of 12.7 m between the water pond level and the lowest dam crest level. The freeboard has increased since that time as the pond level has dropped significantly following mine closure, as shown in Figure 5.5. Two waste rock safety berms were constructed downstream of Dams 2 and 3 to buttress the structures and enhance long-term stability (Altura 2008). The available dam design sections are attached in Appendix A. There is no spillway in the No. 2 Tailings Impoundment.

In 2011, Dams 2 and 3 were classified in the significant consequence category and dams 4 and 5 in the low category in the May 2011 dam safety workshop discussed above. The 2009 DSR had concluded that the classification for all of these dams should be low. The classification was revisited in September 2014 and established as low for all of these dams.

Most of the direct precipitation over the McDonald and Sterrett islands tends to quickly infiltrate due to the lack of natural catchment area and the highly pervious man-made structures of the mine site, thus minimizing surface runoff. Both subsurface groundwater and surface runoff from the islands flow to Babine Lake.

At Granisle, a gravity drainage collection system directs seepage from the north waste rock dump, through a diversion ditch and a pipeline, into the Granisle pit, which serves as a groundwater sink and contaminated water storage facility. Filling of Granisle pit to the level at which treatment of pit water would be required, is estimated to take 85 to 100 years.

Figure 2.1 Overview Location Map Granisle Mine Site (source: EcoMetrix)

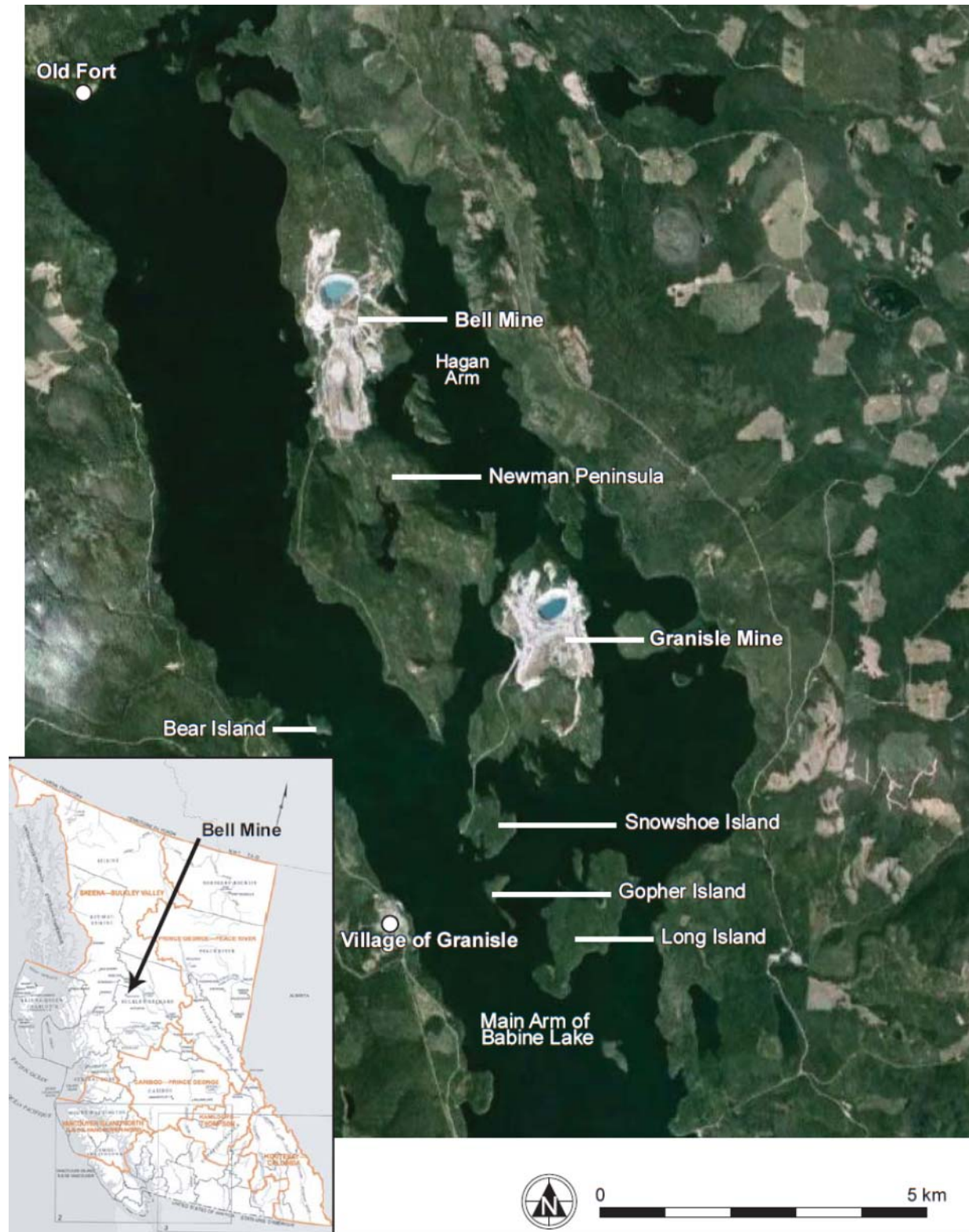


Figure 2.2 General Site Plan Granisle Mine Site (source: EcoMetrix)



3.0 SCOPE OF THE 2014 ANNUAL INSPECTION

The scope of the 2014 DSI comprised:

- Review of the available information on the design and construction of the tailings and water/sludge retention dams prior to the site visit;
- Visual inspection of the tailings impoundment dams;
- Discussions with the site personnel responsible for dam surveillance who conduct quarterly dam inspections;
- Review of activities since the 2013 DSI;
- Review of the monitoring data relevant to dam safety;
- Review of climate and water balance information; and
- Preparation of this DSI report.

The dams inspected included:

- The No. 1 Tailings Impoundment Dam (Dam 1)
- The No. 2 Tailings Impoundment Dam (Dam 2, 3, 4 and 5)

In general, the visual inspections of the dams involved making observations at dam crests, toes and slopes regarding structural integrity of the dams, spillways and associated facilities, including adjacent tailings beaches (where applicable).

This DSI report is intended to meet the requirements of the British Columbia Ministry of Energy, Mines and Natural Gas' Guidelines for Annual DSI reports, dated October 2012. The last DSI was carried out by MBS GeoConsulting Limited in 2013 as documented in the 2013 DSI report. The last dam safety review for the site was carried out in 2009 (AMEC 2010).

4.0 ACTIVITIES SINCE THE 2013 ANNUAL INSPECTION

No construction at the Granisle Mine site dams or their appurtenances was carried out since the 2013 DSI (July 2013).

5.0 CLIMATE AND WATER BALANCE

5.1 Climate

The climate at the Granisle Mine site is characterized by long and cold winters, with an average annual precipitation of approximately 550 mm, 60% of it as rainfall. Figures 5.1 to 5.4 show temperature and precipitation records, along with normal distribution of temperature and precipitation for the site throughout the year, based on data obtained from the Topley Landing (station ID: 1078209) and Smithers Airport (station ID: 1077499) weather stations sponsored by Environment Canada. Of these two stations, Topley Landing is the closest to the Granisle Mine site, approximately 14 km to the south of the site.

Based on data collected at the Topley Landing Climate Station between 1971 and 2000 (Environment Canada), January is the coldest month with an average mean daily temperature of -8.5°C . July is the warmest month with an average mean daily temperature of $+14.6^{\circ}\text{C}$. Lake evaporation for the site has been estimated at different stages through the life of the mine, and ranges between 380 mm/year and 560 mm/year (Altura, 2008).

Temperature and precipitation data from Topley Landing was collected only sporadically in 2013 (e.g. compiled data from Environment Canada websites covers only the months of January and between April and October), and no data was collected in 2014. Therefore, temperature and precipitation data from the Smithers Airport weather station, located approximately 67 km to the south-west of the mine site, was also used to assess the climate at the mine site over the period of January 2013 to June 2014. Based on a comparison of historical average annual data, the Topley Landing and Smithers Airport weather stations have similar temperature and precipitation distributions throughout the year, with Smithers Airport being slightly warmer (1°C higher average daily temperature over a year) and dryer (6% less annual precipitation) than Topley Landing.

The total precipitation recorded at the Smithers Airport station for 2013 (calendar year) was 370 mm, which was lower than the average annual precipitation estimated at 508 mm based on site precipitation records from 1981 to 2010. Although the total precipitation for 2013 was lower than the average precipitation, the months of May, August and December showed increased precipitation above the average by between 26 to 164%. Similarly, 2014 precipitation data (between January and June) was lower than the average annual precipitation. Overall results of comparing 2013 and 2014 weather records with average year data suggest that temperature and precipitation has been similar to previous years from a dam safety perspective.

Figure 5.1 Average Monthly and Normal Distribution of Temperature for Topley Landing Station (January to December 2013)

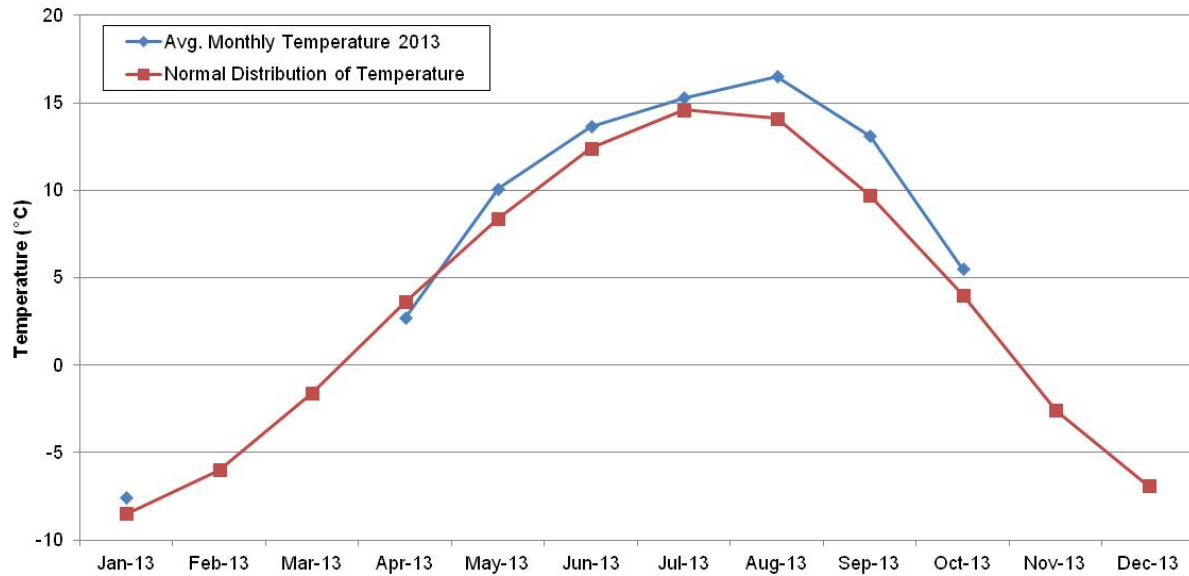


Figure 5.2 Average Monthly and Normal Distribution of Precipitation for Topley Landing Station (January to December 2013)

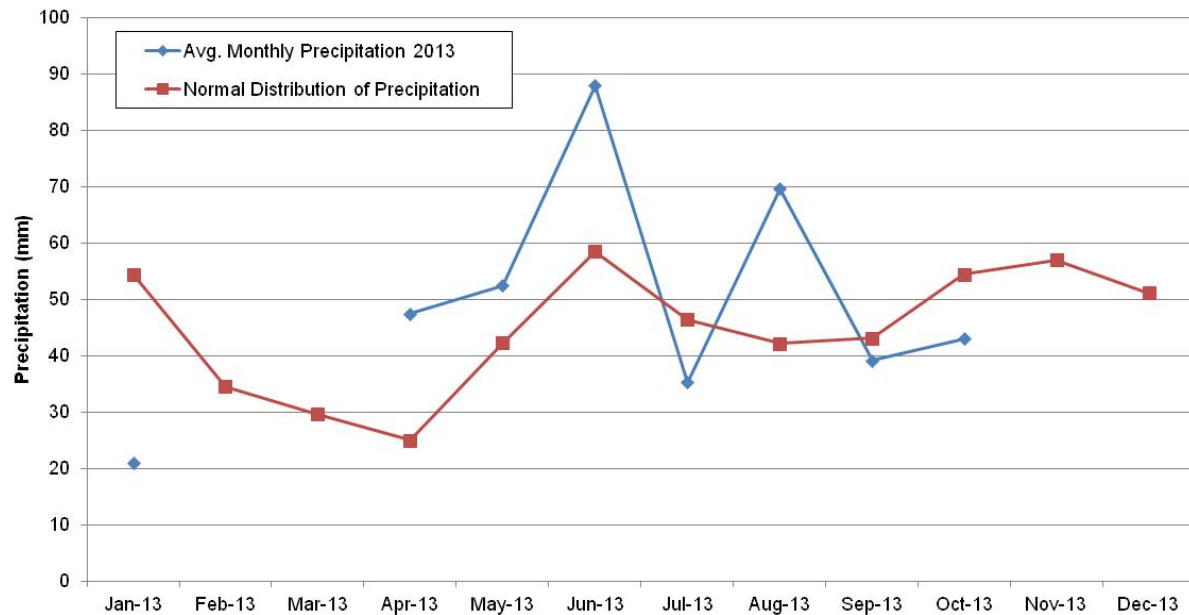


Figure 5.3 Average Monthly and Normal Distribution of Temperature for Smithers Airport Station (January 2013 to June 2014)

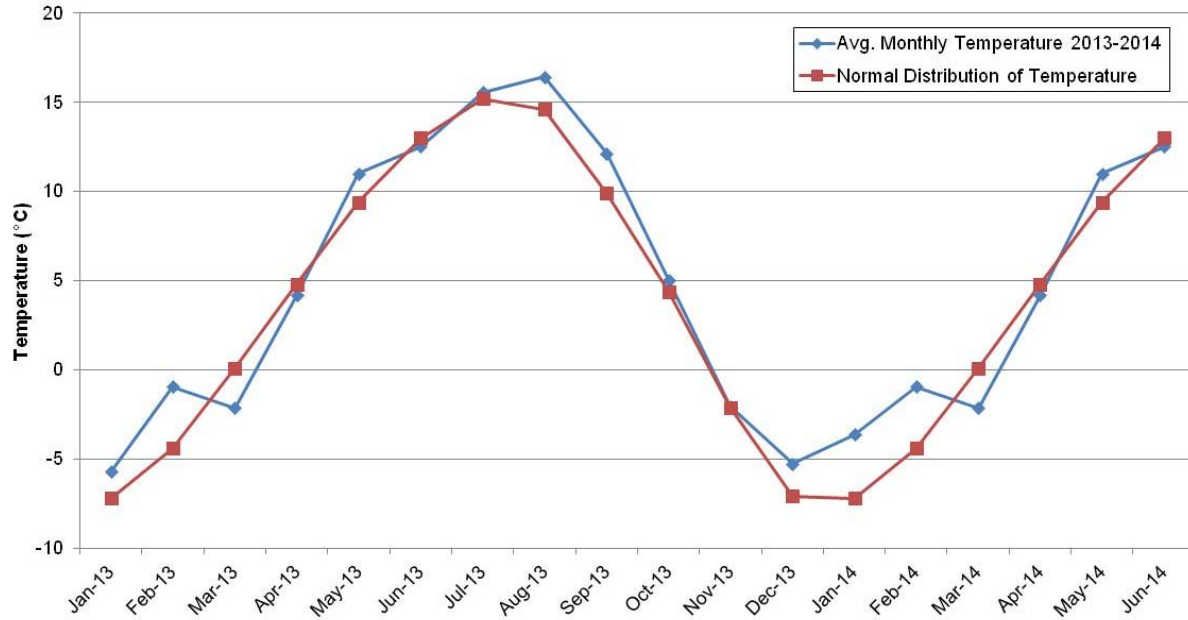
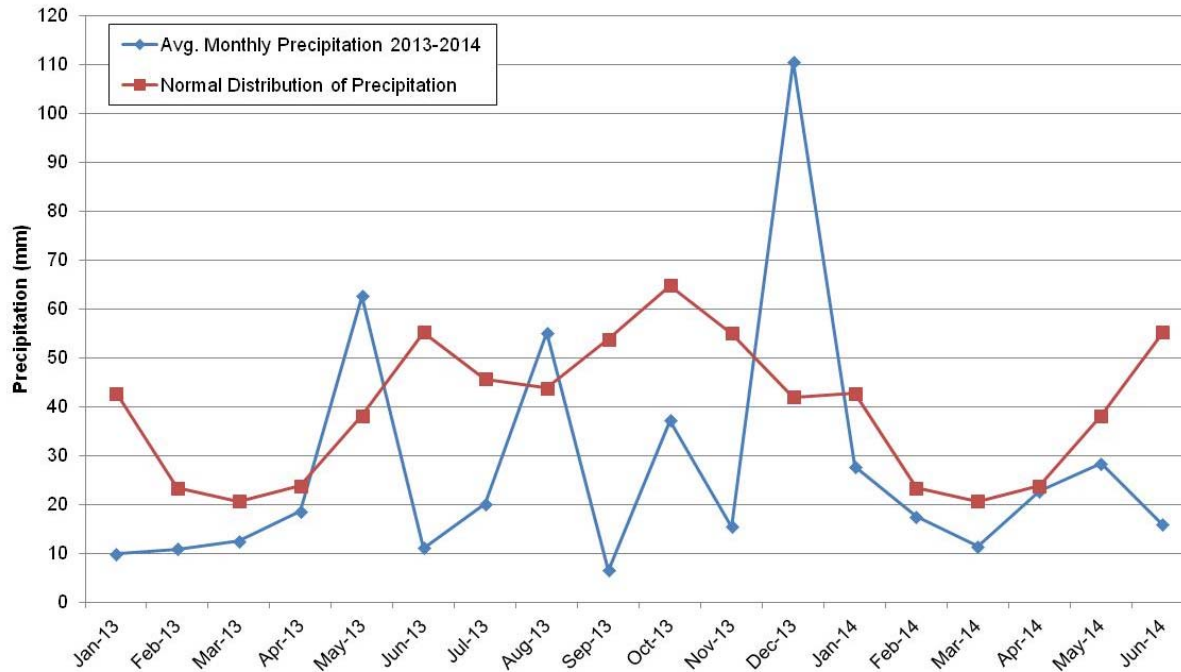


Figure 5.4 Average Monthly and Normal Distribution of Precipitation for Smithers Airport Station (January 2013 to June 2014)



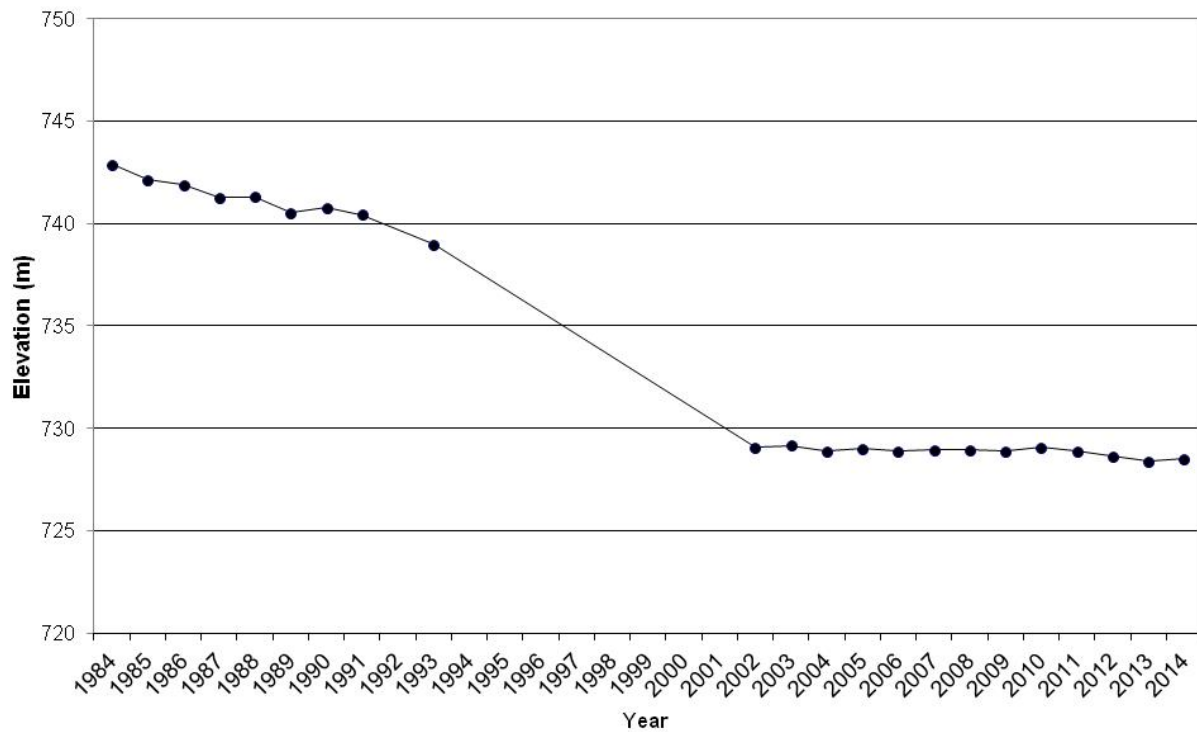
5.2 Water Balance

Figure 5.5 presents the historic tailings pond water levels for the No. 2 Tailings Impoundment pond. During the DSI, the pond was observed to be of limited extent. Monitoring of the tailings pond water level in the No. 2 Tailings Impoundment indicates a long-term trend toward a lower pond level, with water levels currently at approximately EI. 728.5 m and a freeboard in excess of 15 m. The beach length and freeboard are more than adequate.

No pond level data is available for the No. 1 Tailings Impoundment but observations made during the DSI indicated ample freeboard.

Overall, the water management at the Granisle Mine site is consistent with OMS Manual. Water balance is not a concern at the Granisle Mine site given the current state of the No. 1 and No. 2 Tailings Impoundments. As reported in previous DSI Reports, the width of these beaches has not significantly changed over the last 15 years.

Figure 5.5 Historic Tailings Pond Water Levels for the Main Tailings Pond



6.0 INSTRUMENTATION MONITORING

There is no instrumentation currently installed in the No. 1 and No. 2 Tailings Impoundments. The OMS Manual refers to instrumentation that was installed within the dam slopes, but an examination of a site plan showing the location of these instruments indicates that they would not provide information related to the geotechnical performance of the dams.



7.0 RESULTS OF DAM SAFETY INSPECTION (DSI)

The site inspection/condition assessment was conducted for the Granisle Dam site on 11 June 2014, for the No. 1 and No. 2 Tailings Impoundments dams. The inspections were carried out by Andy Small, P.Eng., from AMEC and Messrs. William Tell and Sean O'Connell, from Glencore.

The visual inspection included, but was not limited to, observing the condition of the dams, deficiencies, and potential or immediate concerns. In general, the visual inspections involved making observations at dam crests, toes and slopes with regard to the structural integrity of the dams, vegetation establishment, spillways (when applicable) and associated facilities, including adjacent tailings beaches. No subsurface investigations, to examine the soil conditions for the dam, were conducted at the time of the site inspections. Photographs of the Granisle Mine site and the No. 1 and No. 2 Tailings Impoundments dams are presented in Appendices C and D.

Overall the No. 1 and No. 2 Tailings Impoundments dams appeared to be in satisfactory condition. A summary of the observations that were anomalous are presented in Table 7.1. Also indicated are whether the observations are new and if there is a concern with these observations. Checklists that were completed as part of the DSI are included in Appendices C and D.

Table 7.1 Summary of Anomalous 2014 DSI Observations

| No. | 2014 DSI Observations | Change from 2013 | Concern? |
|---|--|------------------|----------|
| No. 1 Tailings Impoundment (Dam 1) | | | |
| 1 | A cast iron pipe was noted buried in the toe of the downstream slope, near the left abutment. This was the discharge of a former decant pipe that was decommissioned. Pipe condition within the dam is unknown. | No | No |
| 2 | There are two structures that can act as spillways for the dam. One is located near the left abutment and was the original spillway. It is heavily over grown with vegetation. The other is mid-way along Dam 1 and is a low area that had some rockfill placed for erosion protection. The erosion protection sparse with vegetation ingrowths. | No | Possible |
| No. 2 Tailings Impoundment (Dams 2 to 5) | | | |
| 3 | No anomalous conditions were observed during the 2014 DSI. | No | No |



8.0 STATUS OF PREVIOUS RECOMMENDATIONS

Recommendations that were provided in the 2013 DSI for Granisle Mine site are presented in Table 8.1. The table also indicates if action has been taken on the recommendations thus far and for those that have not been actioned, whether the recommendation is still appropriate or not applicable. Note that the 2009 DSR (AMEC 2010) did not provide any recommendations specific to the Granisle Mine Site.

Table 8.1 Summary of Previous Recommendations

| PREVIOUS RECOMMENDATIONS | REFERENCE REPORT | 2014 STATUS | |
|--|------------------|---------------|-------------|
| | | Actions Taken | Validity |
| The inspections of the dams by the site personnel on a quarterly basis should continue. Taking photographs from the same locations is recommended. | 2013 DSI | Ongoing | Appropriate |

9.0 2014 DSI CONCLUSIONS AND RECOMMENDATIONS

The dams forming the No. 1 and No. 2 Tailings Impoundments are considered to be in satisfactory condition. Recommendations for the No. 1 and No. 2 Tailings Impoundments Dams are provided in Table 9.1.

In addition to continuing to implement the surveillance program as per the OMS Manual, the following additional recommendations are made for the continued safe operation of the dams forming the No. 1 and No. 2 Tailings Impoundments.

Table 9.1 Summary of Recommendations for 2014 DSI – No. 1 and No. 2 Tailings Impoundment

| No. | 2014 DSI Recommendations |
|-----|---|
| 1 | Develop a tree and vegetation removal plan (prioritization of tree removal to be addressed in the plan). |
| 2 | Establish a proper spillway for Dam 1. |
| 3 | AMEC understands that the Granisle Mine site OMS Manual is being revised this year. This 2014 revision should update the OMS Manual to reflect the current Dam class for the dams forming the No. 1 and No. 2 Tailings Impoundments (based on CDA's 2007 five level classification system). |

10.0 LIMITATIONS AND CLOSING REMARKS

Recommendations presented herein are based on a geotechnical evaluation of the findings of the Site inspection, and the reports reviewed pertaining to the noted facilities. This report was prepared by Andy Small, P.Eng. and Pablo Urrutia, P.Eng.

This report is for the exclusive use of Glencore Canada Corporation, for specific application to the area within this report. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. AMEC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. It has been prepared in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made.

Sincerely,

**AMEC Environment & Infrastructure,
a division of AMEC Americas Limited**

Prepared by:

**Original hard copies signed by
Andy Small, M.Sc., P.Eng.**

C.A. (Andy) Small, P.Eng. (BC)
Senior Associate Geotechnical Engineer
Direct Tel.: (506) 444-9585
Email: andy.small@amec.com

REFERENCES

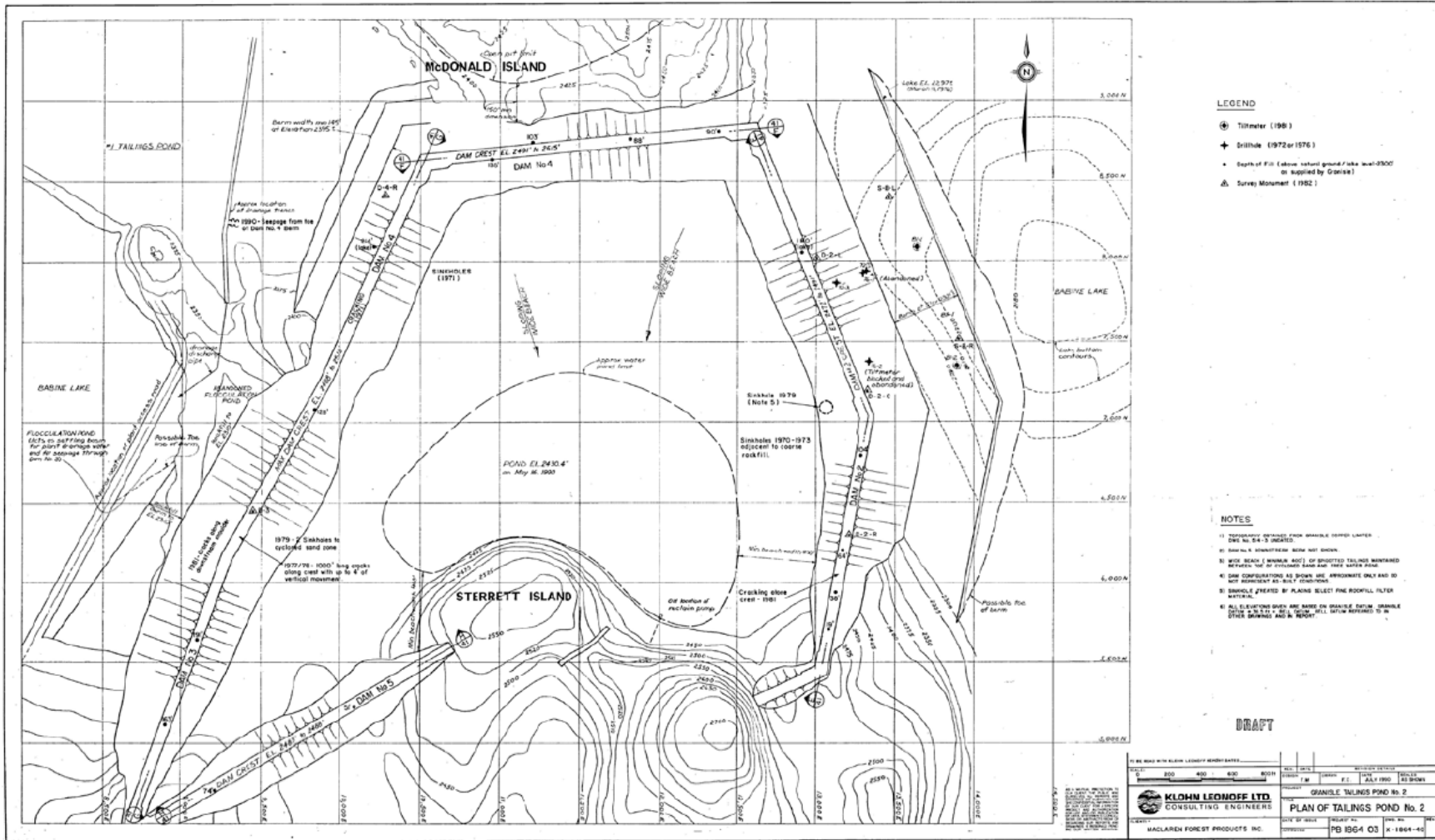
- Altura Environmental Consulting (Altura). 2008. Xstrata Copper Canada – Bell and Granisle Mines – Operation, Maintenance, and Surveillance (OMS) Manual – Rev 3, dated December 2008.
- AMEC Earth & Environmental Limited (AMEC). 2010. 2009 Dam Safety Review – Bell and Granisle Mine Sites, AMEC project File TC93915-2000, dated February 26, 2010.
- British Columbia Ministry of Energy and Mines (MEM). 2013. Annual Dam Safety Reports, dated August 2013.
- British Columbia Water Act* (2011). Dam Safety Regulations – Reg. 163/2011
- Canadian Dam Association (CDA). 2007. Dam Safety Guidelines.
- Glencore Canada Corporation. 2014. Dam Inspection Reports for Dams 1 to 5, dated June 2014.
- MBS GeoConsulting. (MBS) 2013. 2013 DSI Report – Bell and Granisle Mine Sites, Granisle, B.C., MBS GeoConsulting project No GC019, dated July 2013.

APPENDIX A

CROSS-SECTIONS OF DAMS AT GRANISLE MINE SITE

NOTES

1. Dam 2 through Dam 5 drawings attached in this appendix have been extracted from the report titled 'Granisle Tailings Pond No. 2 - Dam Stability Review' (Klohn Leonoff 1990).
2. The attached drawings show the 1982 (final) configuration of the tailings deposit. The confining tailings dams are significantly higher than shown on those drawings. According to Klohn Leonoff (1990), the dam crests in 1990 ranged in elevation from a minimum of 2,508.5 ft. at Dam No. 2 to a maximum of 2,551.5 ft. at Dam Nos. 3 and 4. The dams were not further raised after 1990.
3. Dam 1 drawings are not available. It is known that the No 1 Tailings Impoundment was operated between 1966 and 1970 with the confining tailings dam constructed of rockfill to just above the lake level and further raised by the upstream method of tailings dam construction.

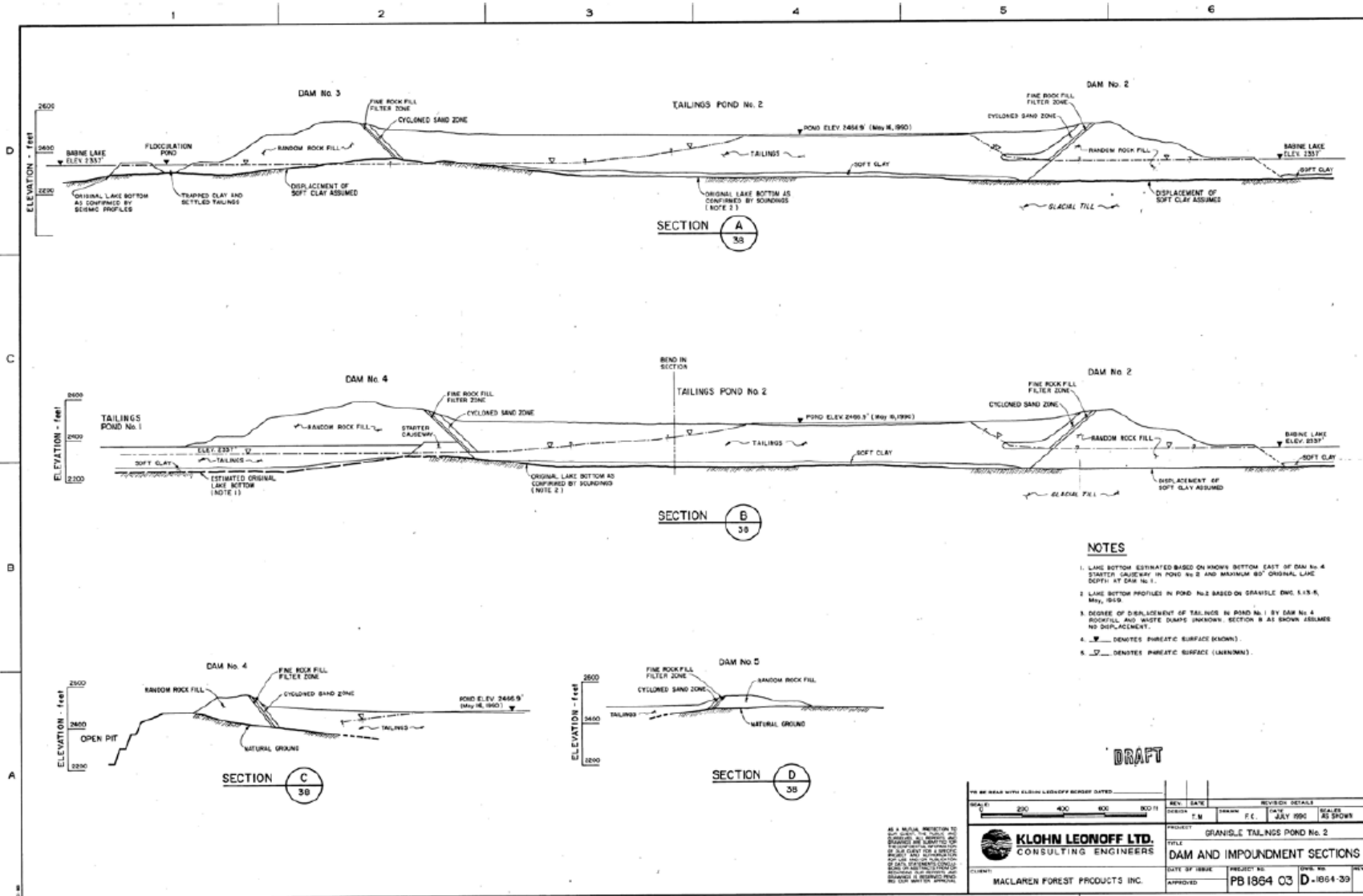


- LEGEND**
- ⊕ Tiltmeter (198)
 - ⊕ Stiltmeter (1972 or 1976)
 - Depth of Fill (above natural ground) take level 2500 (as supplied by Geotech)
 - Δ Survey Monument (1982)

- NOTES**
- 1) INFORMATION DERIVED FROM GRANISLE CONSULTING ENGINEERS DRAWING No. 84-3 UNDATED
 - 2) DRAWING IS UNREVISED. SOME NOT SHOWN.
 - 3) THIS DRAWING IS A SUMMARY OF THE GRANISLE CONSULTING ENGINEERS REPORT OF THE GRANISLE BASIN AND TAILINGS POND.
 - 4) USE CONSIDERATIONS AS SHOWN ARE APPROXIMATE ONLY AND DO NOT REPRESENT AS-BUILT CONDITIONS.
 - 5) SANDPILE CREATED BY PLAINS SELECT FINE ROCKWELL FILTER MATHIAS.
 - 6) ALL ELEVATIONS GIVEN ARE BASED ON GRANISLE DATUM. GRANISLE DATUM = 10.211' BELOW C.T.S. HILL. SETUP APPLICABLE TO ALL OTHER DRAWINGS AND REPORTS.

DRAFT

| | | | | | | | |
|-------------------------------|-----|-------------|-----|-------------|------|-----------|--|
| SCALE | | DATE | | BY | | CHECKED | |
| 0 | 200 | 400 | 600 | 800 | 1000 | | |
| PROJECT | | DATE | | BY | | CHECKED | |
| GRANISLE TAILINGS POND No. 2 | | AUG 1980 | | J.L. | | J.L. | |
| DRAWN BY | | DATE | | BY | | CHECKED | |
| PLAN OF TAILINGS POND No. 2 | | AUG 1980 | | J.L. | | J.L. | |
| CLIENT | | PROJECT NO. | | DRAWING NO. | | SHEET NO. | |
| MACLAREN FOREST PRODUCTS INC. | | PB 1564 03 | | K-1564-03 | | 1 | |



- NOTES**
1. LAKE BOTTOM ESTIMATED BASED ON KNOWN BOTTOM EAST OF DAM No. 4 STARTER CAUSEWAY IN POND No. 2 AND MAXIMUM 80' ORIGINAL LAKE DEPTH AT DAM No. 1.
 2. LAKE BOTTOM PROFILES IN POND No. 2 BASED ON GRANVILLE DMC 5.15-K, May, 1959.
 3. DEGREE OF DISPLACEMENT OF TAILINGS IN POND No. 1 BY DAM No. 4 ROCKFILL AND WASTE DUMPS UNKNOWN. SECTION B AS SHOWN ASSUMES NO DISPLACEMENT.
 4. ▾ DENOTES PHREATIC SURFACE (KNOWN).
 5. ▽ DENOTES PHREATIC SURFACE (UNKNOWN).

DRAFT

| | | |
|---|--|--|
| AS A MAJOR PRELIMINARY TO THE DESIGN OF THIS PROJECT, THE ENGINEER HAS CONDUCTED VISUAL AND AERIAL PHOTOGRAPHIC SURVEYS AND HAS OBTAINED THE NECESSARY PERMITS AND RIGHTS OF WAY FROM THE APPROPRIATE AGENCIES AND INDIVIDUALS. THE ENGINEER HAS ALSO CONDUCTED FIELD SURVEYS AND HAS OBTAINED THE NECESSARY PERMITS AND RIGHTS OF WAY FROM THE APPROPRIATE AGENCIES AND INDIVIDUALS. THE ENGINEER HAS ALSO CONDUCTED FIELD SURVEYS AND HAS OBTAINED THE NECESSARY PERMITS AND RIGHTS OF WAY FROM THE APPROPRIATE AGENCIES AND INDIVIDUALS. | | PROJECT: GRANVILLE TAILINGS POND No. 2 TITLE: DAM AND IMPONDMENT SECTIONS DATE OF ISSUE: [blank] APPROVED: [blank] |
| SCALE: 200 400 600 800 FT PROJECT: GRANVILLE TAILINGS POND No. 2 TITLE: DAM AND IMPONDMENT SECTIONS DATE OF ISSUE: [blank] APPROVED: [blank] | REV. DATE: [blank] DESIGNED BY: T.M. DRAWN BY: F.C. CHECKED BY: [blank] DATE: JULY 1990 SCALE: AS SHOWN | CLIENT: MACLAREN FOREST PRODUCTS INC. PROJECT: GRANVILLE TAILINGS POND No. 2 TITLE: DAM AND IMPONDMENT SECTIONS DATE OF ISSUE: [blank] APPROVED: [blank] |

APPENDIX B

2014 PRECIPITATION AND TEMPERATURE DATA

TOPLEY LANDING MONTHLY PRECIPITATION DATA

SOURCE: Environment Canada webpage (<https://weather.gc.ca/>)
Station Name TOPLEY LANDING
Province BRITISH COLUMBIA
Latitude 54.82
Longitude -126.16
Elevation 722
Climate Identifier 1078209
WMO Identifier
TC Identifier

| | Monthly Precip (mm) | Precip Normals (mm) |
|----------------|--------------------------------|--------------------------------|
| January 2013 | 21.0 | 54.4 |
| February 2013 | 0.0 | 34.5 |
| March 2013 | 0.0 | 29.6 |
| April 2013 | 47.4 | 25.0 |
| May 2013 | 52.4 | 42.2 |
| June 2013 | 87.9 | 58.5 |
| July 2013 | 35.3 | 46.4 |
| August 2013 | 69.6 | 42.1 |
| September 2013 | 39.1 | 43.1 |
| October 2013 | 43.0 | 54.4 |
| November 2013 | 0.0 | 57.0 |
| December 2013 | 0.0 | 51.1 |

SMITHERS AIRPORT MONTHLY PRECIPITATION DATA

SOURCE: Environment Canada webpage (<https://weather.gc.ca/>)
Station Name SMITHERS
Province BRITISH COLUMBIA
Latitude 54.83
Longitude -127.18
Elevation 523
Climate Identifier 1077499
WMO Identifier 71950
TC Identifier YYD

| | Monthly Precip (mm) | Precip Normals (mm) |
|----------------|--------------------------------|--------------------------------|
| January 2013 | 9.9 | 42.7 |
| February 2013 | 10.8 | 23.4 |
| March 2013 | 12.5 | 20.6 |
| April 2013 | 18.6 | 23.8 |
| May 2013 | 62.6 | 38.1 |
| June 2013 | 11.1 | 55.2 |
| July 2013 | 20.1 | 45.6 |
| August 2013 | 55.1 | 43.8 |
| September 2013 | 6.5 | 53.8 |
| October 2013 | 37.2 | 64.8 |
| November 2013 | 15.4 | 55.0 |
| December 2013 | 110.6 | 41.9 |
| January 2014 | 27.7 | 42.7 |
| February 2014 | 17.5 | 23.4 |
| March 2014 | 11.4 | 20.6 |
| April 2014 | 22.7 | 23.8 |
| May 2014 | 28.4 | 38.1 |
| June 2014 | 15.8 | 55.2 |

APPENDIX C

**DAM 1 –
DAM SAFETY INSPECTION, BACKGROUND, CHECKLISTS AND PHOTOGRAPHS**

Table C1
Background Information – Dam 1
Granisle Mine

| | |
|-----------------------------------|---|
| Purpose of dam: | tailings retention |
| Date of last DSR: | October 2009 (AMEC) |
| Initial dam construction date: | 1966; by mine forces |
| Original dam engineered: | - |
| Type of dam: | upstream (spigotted) tailings dam with rockfill starter dam |
| Relation to tailings basin: | separates tailings impoundment 1 from Babine Lake |
| Associated tailings dams | None |
| Tailings basin watershed: | ±12 ha |
| Typical dam section: | rockfill and spigotted tailings |
| Approx. dam length / max height | 300 m / 12 m (above lake level) |
| Tailings pond adjacent to dam: | no |
| Freeboard at time of DSI: | there was no tailings pond of substance |
| Minimum past freeboard: | unknown |
| Discharge/decant structure(s): | Yes, cast iron pipe |
| Emergency discharge structure: | open channel spillway |
| Date of last raise of dam: | 1970 |
| Future dam raise planned: | no |
| Dam instrumentation: | none |
| Design/as-built data available: | no |
| Dam classification (CDA 2007): | low hazard |
| Preliminary dam classification: | n/a |
| Volume and type of solids stored: | ± 4,000,000 m ³ of tailings |
| Tailings disposal method: | spigotted |
| Tailings production rate: | 4,500 tpd between 1970 and 1972 |
| Special 'as-built' features: | rockfill 'starter dam' extends 80 ft. into the lake |
| Surveillance program available: | yes |
| SCF/other facility inspected: | n/a |
| Next DSR recommended: | in 2019 |

GLENCORE

Dam Surveillance Record

| | | |
|------------------------------|---|-----------------------------------|
| Dam Site: | Granisle Mine Site | |
| Dam Structure: | Dam 1 | |
| Inspection Carried Out By: | Andy Small | |
| Date: | 11 June 2014 | |
| Inspection Type: | Walk-over <input checked="" type="checkbox"/> | Fly-over <input type="checkbox"/> |
| Weather Conditions: | Sunny 15 degrees | |
| Date of Last DSI: | June 19, 2013 | |
| Freeboard at Time of DSI: | Not measured, but more than adequate | |
| New Developments d/s of Dam: | None | |
| Dam Failed Since Last DSI: | None | |
| Reviewed By: | Andy Small | |

| Observed Features | Yes | No | Photo # | Comment / Note # |
|---|-----|----|---------|--|
| 1.0 Upstream Dam Slope | | | | |
| 1.1 Concern with Water Level or with previous high water levels since the last inspection | | | | N/A as covered by tailings, small pond located well away from the crest of the dam |
| 1.2 Evidence of Wave or Other Erosion | | | | N/A as covered by tailings |
| 1.3 Unusual Accumulation of Debris/Logs | | | | N/A as covered by tailings |
| 1.4 Evidence of Sloughing/Sliding | | | | N/A as covered by tailings |
| 1.5 Evidence of Cracks | | | | N/A as covered by tailings |
| 1.6 Any Other Deformation | | | | N/A as covered by tailings |
| 1.7 Excessive Vegetation | | | | N/A as covered by tailings |
| 1.8 Other Unusual Conditions | | | | N/A as covered by tailings |
| 2.0 Dam Crest | | | | |
| 2.1 Evidence of Shoulder Erosion | | X | | |
| 2.2 Evidence of Cracking | | X | | |
| 2.3 Other Deformation/Settlement | | X | | |
| 2.4 Concerns with Low Areas on the Crest | | X | | |
| 2.5 Animal Burrows | | X | | |
| 2.6 Other Unusual Conditions | | X | | |
| 3.0 Downstream Dam Slope | | | | |
| 3.1 Evidence of Erosion | X | | | Evidence of erosion is minor. |
| 3.2 Evidence of Sloughing/Sliding | | X | | |
| 3.3 Evidence of Cracking | | X | | |
| 3.4 Any Other Deformation | | X | | |
| 3.5 Signs of Phreatic Surface/Seepage | | X | | |
| 3.6 Seepages Observed | | X | | |

| Observed Features | Yes | No | Photo # | Comment / Note # |
|--|-----|----|---------------|---|
| 3.7 Is Seepage Turbid | | | | N/A |
| 3.8 Non-Uniform Slope | | X | | |
| 3.9 Excessive Vegetation | | X | | |
| 3.10 Animal Burrows | | X | | |
| 3.11 Other Unusual Conditions | | X | | |
| 4.0 Dam Abutments | | | | |
| 4.1 Seepages Observed | | X | | |
| 4.2 Is Seepage (if any) Turbid | | | | N/A |
| 4.3 Evidence of Erosion | | X | | |
| 4.4 Evidence of Cracks | | X | | |
| 4.5 Other Deformation/Settlement | | X | | |
| 4.6 Evidence of Repairs | | X | | |
| 4.7 Other Unusual Conditions | | X | | |
| 5.0 Downstream Toe | | | | |
| 5.1 Seepages Observed | | X | | |
| 5.2 Is Seepage (if any) Turbid | | | | N/A |
| 5.3 Evidence of Soft Toe Condition | | X | | |
| 5.4 Evidence of Boils | | X | | |
| 5.5 Evidence of Contamination | | X | | |
| 5.6 Excessive Vegetation | | X | | |
| 5.7 Evidence of vegetation kill | | X | | |
| 5.8 Soft toe condition | | X | | |
| 5.9 Evidence of boils | | X | | |
| 5.10 Other Unusual Conditions | X | | C-8 | Buried steel pipe from former decant structure daylight at the downstream toe near the abutment |
| 5.11 Evidence of repairs | X | | | |
| 6.0 Spillway | | | | |
| 6.1 Emergency Spillway Showing Signs of Erosion or Obstructions. | X | | C-4, C-5, C-6 | Channel overgrown with trees/grasses. The original spillway is located on the left abutment and covered with trees. An alternate spillway appears to have been established in the middle of the dam, but it is not clear if this is actually a planned spillway or a rock lined low spot. |
| 6.2 Unusual Intensity of Flow in Spillway. | | X | | No flow in spillway |
| 6.3 Water Samples Collected. Physical Measurements Made. | | X | | |
| 7.0 General | | | | |
| 7.1 Pipelines at the dam | | X | | |
| 7.2 Evidence of ARD | | X | | |
| 7.3 Crest accessible by truck | X | | | |

| Observed Features | Yes | No | Photo # | Comment / Note # |
|-----------------------------------|-----|----|---------|--------------------------|
| 7.4 Public access to dam | X | | | Use of boat is necessary |
| 8.0 Other | | | | |
| 8.1 Other Unusual Site Conditions | | X | | |



Photo C-1: View of the tailings beach. Looking north-east from the crest at the left end of Dam 1 (the segment that is oriented NW-SE). Note that tailings beach is well vegetated. (11 June 2014)



Photo C-2: View of the tailings beach and pond, looking east from the crest, near the north-west end of the segment that is oriented NW-SE. Note that tailings beach is well vegetated and pond is well away from the crest. (11 June 2014)



Photo C-3: View of the upstream beach for the segment of the dam that is oriented NW-SE. Looking north-west from about one third along the dam segment. The dam crest is on the left. The downstream slope of the dam is located on the west side of the photo but is heavily vegetated and difficult to see. (11 June 2014)



Photo C-4: View of the crest of Dam 1, looking north-west along the segment of the dam that is oriented NW-SE. In the background is a depression that will act as a spillway. See the next photo. (11 June 2014)



Photo C-5: View of the depression in central portion of Dam 1 that will act as a spillway. Looking north-west. According to Glencore, this feature was not intended to be a spillway, but it could act as such. (11 June 2014)



Photo C-6: View of the downstream discharge channel of the depression that could act as a spillway, looking north-west from the crest of Dam 1. (11 June 2014)



Photo C-7: View of the downstream slope at left abutment, looking north-east from beyond the toe of Dam 1. Note that the downstream slope of the dam is heavily vegetated, but it is not a concern. The actual spillway for the dam is located on the right side of the photo, note the depression, but it is covered in vegetation. (11 June 2014)



Photo C-8: View of a cast iron pipe located at the toe of the downstream slope of Dam 1, near the left abutment. This was a former decant pipe from the pond that had been decommissioned. There was no evidence of seepage around the pipe. Looking north-east from the toe of Dam 1. (11 June 2014)



Photo C-9: View of the downstream slope of Dam 1, looking southeast along the NW-SE segment of the dam. (11 June 2014)

APPENDIX D

**DAMS 2 TO 5 –
DAM SAFETY INSPECTION, BACKGROUND, CHECKLISTS AND PHOTOGRAPHS**

Table D1
Background Information – Dam 2
Granisle Mine

| | |
|-----------------------------------|---|
| Purpose of dam: | tailings retention |
| Date of last DSR: | October 2009 (AMEC) |
| Initial dam construction date: | 1970; by mine forces |
| Dam engineered: | yes (Klohn Leonoff Consultants Ltd.) |
| Type of dam: | highly pervious rockfill dam |
| Relation to tailings basin: | confines tailings pond 2 on Hagan Arm side |
| Associated tailings dams | Dams 3 to 5 |
| Tailings basin watershed: | ± 105 ha |
| Typical dam section: | rockfill with u/s filter and cycloned sand above lake level |
| Approx. dam length / max. height: | 1,100 m / 75 m (founded on lake bottom) |
| Tailings pond adjacent to dam: | no |
| Freeboard at time of DSI: | in excess of 15 m |
| Minimum past freeboard: | unknown |
| Discharge/decant structure(s): | none |
| Emergency discharge structure: | none |
| Date of last raise of dam: | 1978 |
| Future dam raise planned: | no |
| Dam instrumentation: | none |
| Design/as-built data available: | design reports available at the site |
| Dam classification (CDA 2007): | low hazard |
| Preliminary dam classification: | n/a |
| Volume and type of solids stored: | ± 30,000,000 m ³ of tailings |
| Tailings disposal method: | cycloned/spigotted |
| Tailings production rate: | ± 12,000 tpd, discontinued in 1982 |
| Special 'as-built' features: | displaced soft clays under dam foundation, stability berm |
| Surveillance program available: | yes |
| SCF/other facility inspected: | n/a |
| Next DSR recommended: | in 2019 |

Table D2
Background Information – Dam 3
Granisle Mine

| | |
|-----------------------------------|---|
| Purpose of dam: | tailings retention |
| Date of last DSR: | October 2009 (AMEC) |
| Initial dam construction date: | 1970; by mine forces |
| Dam engineered: | yes (Klohn Leonoff Consultants Ltd.) |
| Type of dam: | highly pervious rockfill dam |
| Relation to tailings basin: | confines tailings pond 2 on west side |
| Associated tailings dams | Dams 2, 4, and 5 |
| Tailings basin watershed: | ±105 ha |
| Typical dam section: | rockfill with u/s filter and cycloned sand above lake level |
| Approx. dam length / max. height: | ± 600 m / 60 m (founded on lake bottom) |
| Tailings pond adjacent to dam: | no |
| Freeboard at time of DSI: | in excess of 15 m |
| Minimum past freeboard: | unknown |
| Discharge/decant structure(s): | none |
| Emergency discharge structure: | none |
| Date of last raise of dam: | 1978 |
| Future dam raise planned: | no |
| Dam instrumentation: | none |
| Design/as-built data available: | design reports available at the site |
| Dam classification (CDA 2007): | low hazard |
| Preliminary dam classification: | n/a |
| Volume and type of solids stored: | ± 30,000,000 m ³ of tailings |
| Tailings disposal method: | cycloned/spigotted |
| Tailings production rate: | ± 12,000 tpd, discontinued in 1982 |
| Special 'as-built' features: | displaced soft clays under dam foundation, stability berm |
| Surveillance program available: | yes |
| SCF/other facility inspected: | n/a |
| Next DSR recommended: | in 2019 |

Table D3
Background Information – Dam 4
Granisle Mine

| | |
|-----------------------------------|--|
| Purpose of dam: | tailings retention |
| Date of last DSR: | October 2009 (AMEC) |
| Initial dam construction date: | 1970; by mine forces |
| Dam engineered: | yes (Klohn Leonoff Consultants Ltd.) |
| Type of dam: | highly pervious rockfill dam |
| Relation to tailings basin: | separates tailings pond 2 from open pit |
| Associated tailings dams | Dams 2, 3, and 5 |
| Tailings basin watershed: | ± 105 ha |
| Typical dam section: | rockfill with u/s filter and cycloned sand |
| Approx. dam length / max. height: | 1050 m / 75 m (founded on lake bottom) |
| Tailings pond adjacent to dam: | no |
| Freeboard at time of DSI: | in excess of 15 m |
| Minimum past freeboard: | unknown |
| Discharge/decant structure(s): | none |
| Emergency discharge structure: | none |
| Date of last raise of dam: | 1978 |
| Future dam raise planned: | no |
| Dam instrumentation: | none |
| Design/as-built data available: | design reports available at the site |
| Dam classification (CDA 2007): | low hazard |
| Preliminary dam classification: | n/a |
| Volume and type of solids stored: | ± 30,000,000 m ³ of tailings |
| Tailings disposal method: | cycloned/spigotted |
| Tailings production rate: | ± 12,000 tpd, discontinued in 1982 |
| Special 'as-built' features: | founded on soft clays and tailings |
| Surveillance program available: | yes |
| SCF/other facility inspected: | n/a |
| Next DSR recommended: | none required (review potential consequences of failure in DSIs) |

Table D4
Background Information – Dam 5
Granisle Mine

| | |
|-----------------------------------|--|
| Purpose of dam: | tailings retention |
| Date of last DSR: | October 2009 (AMEC) |
| Initial dam construction date: | 1970; by mine forces |
| Dam engineered: | yes (Klohn Leonoff Consultants Ltd.) |
| Type of dam: | highly pervious rockfill dam |
| Relation to tailings basin: | confines tailings pond 2 on southwest side |
| Associated tailings dams | Dams 2 to 4 |
| Tailings basin watershed: | ± 105 ha |
| Typical dam section: | rockfill with u/s filter and cycloned sand |
| Approx. dam length & max. height: | 370 m / 21 m |
| Tailings pond adjacent to dam: | n |
| Freeboard at time of DSI: | in excess of 15 m |
| Minimum past freeboard: | unknown |
| Discharge/decant structure(s): | none |
| Emergency discharge structure: | none |
| Date of last raise of dam: | 1978 |
| Future dam raise planned: | no |
| Dam instrumentation: | none |
| Design/as-built data available: | design reports available at the site |
| Dam classification (CDA 2007): | low hazard |
| Preliminary dam classification: | N/a |
| Volume and type of solids stored: | ± 30,000,000 m ³ of tailings |
| Tailings disposal method: | cycloned/spigotted |
| Tailings production rate: | ± 12,000 tpd, discontinued in 1982 |
| Special 'as-built' features: | none |
| Surveillance program available: | yes |
| SCF/other facility inspected: | n/a |
| Next DSR recommended: | none required (review potential consequences of failure in DSIs) |

GLENCORE

Dam Surveillance Record

| | | |
|------------------------------|---|-----------------------------------|
| Dam Site: | Granisle Mine Site | |
| Dam Structure: | Dam 2 | |
| Inspection Carried Out By: | Andy Small | |
| Date: | 11 June 2014 | |
| Inspection Type: | Walk-over <input checked="" type="checkbox"/> | Fly-over <input type="checkbox"/> |
| Weather Conditions: | Sunny 15 degrees | |
| Date of Last DSI: | June 19, 2013 | |
| Freeboard at Time of DSI: | Not measured, but more than adequate | |
| New Developments d/s of Dam: | None | |
| Dam Failed Since Last DSI: | None | |
| Reviewed By: | Andy Small | |

| Observed Features | Yes | No | Photo # | Comment / Note # |
|---|-----|----|---------|------------------|
| 1.0 Upstream Dam Slope | | | | |
| 1.1 Concern with Water Level or with previous high water levels since the last inspection | | X | | |
| 1.2 Evidence of Wave or Other Erosion | | X | | |
| 1.3 Unusual Accumulation of Debris/Logs | | X | | |
| 1.4 Evidence of Sloughing/Sliding | | X | | |
| 1.5 Evidence of Cracks | | X | | |
| 1.6 Any Other Deformation | | X | | |
| 1.7 Excessive Vegetation | | X | | |
| 1.8 Other Unusual Conditions | | X | | |
| 2.0 Dam Crest | | | | |
| 2.1 Evidence of Shoulder Erosion | | X | | |
| 2.2 Evidence of Cracking | | X | | |
| 2.3 Other Deformation/Settlement | | X | | |
| 2.4 Concerns with Low Areas on the Crest | | X | | |
| 2.5 Animal Burrows | | X | | |
| 2.6 Other Unusual Conditions | | X | | |
| 3.0 Downstream Dam Slope | | | | |
| 3.1 Evidence of Erosion | | X | | |
| 3.2 Evidence of Sloughing/Sliding | | X | | |
| 3.3 Evidence of Cracking | | X | | |
| 3.4 Any Other Deformation | | X | | |
| 3.5 Signs of Phreatic Surface/Seepage | | X | | |
| 3.6 Seepages Observed | | X | | |

| Observed Features | Yes | No | Photo # | Comment / Note # |
|------------------------------------|------------|-----------|----------------|--------------------------------|
| 3.7 Is Seepage Turbid | | | | N/A |
| 3.8 Non-Uniform Slope | | X | | |
| 3.9 Excessive Vegetation | | X | | |
| 3.10 Animal Burrows | | X | | |
| 3.11 Other Unusual Conditions | | X | | |
| 4.0 Dam Abutments | | | | |
| 4.1 Seepages Observed | | X | | |
| 4.2 Is Seepage (if any) Turbid | | | | N/A |
| 4.3 Evidence of Erosion | | X | | |
| 4.4 Evidence of Cracks | | X | | |
| 4.5 Other Deformation/Settlement | | X | | |
| 4.6 Evidence of Repairs | | X | | |
| 4.7 Other Unusual Conditions | | X | | |
| 5.0 Downstream Toe | | | | |
| 5.1 Seepages Observed | | | | N/A. Downstream toe submerged. |
| 5.2 Is Seepage (if any) Turbid | | | | N/A. Downstream toe submerged. |
| 5.3 Evidence of Soft Toe Condition | | | | N/A. Downstream toe submerged. |
| 5.4 Evidence of Boils | | | | N/A. Downstream toe submerged. |
| 5.5 Evidence of Contamination | | | | N/A. Downstream toe submerged. |
| 5.6 Excessive Vegetation | | | | N/A. Downstream toe submerged. |
| 5.7 Evidence of vegetation kill | | | | N/A. Downstream toe submerged. |
| 5.8 Soft toe condition | | | | N/A. Downstream toe submerged. |
| 5.9 Evidence of boils | | | | N/A. Downstream toe submerged. |
| 5.10 Other Unusual Conditions | | | | N/A. Downstream toe submerged. |
| 5.11 Evidence of repairs | | | | N/A. Downstream toe submerged. |
| 6.0 General | | | | |
| 6.1 Spillway at/next to this dam | | X | | |
| 6.2 Pipelines at the dam | | X | | |
| 6.3 Evidence of ARD | | X | | |
| 6.4 Crest accessible by truck | X | | | |
| 6.5 Public access to dam | X | | | Use of boat is necessary |
| 8.0 Other | | | | |
| 8.1 Other Unusual Site Conditions | | X | | |

GLENCORE

Dam Surveillance Record

| | | |
|------------------------------|---|-----------------------------------|
| Dam Site: | Granisle Mine Site | |
| Dam Structure: | Dam 3 | |
| Inspection Carried Out By: | Andy Small | |
| Date: | 11 June 2014 | |
| Inspection Type: | Walk-over <input checked="" type="checkbox"/> | Fly-over <input type="checkbox"/> |
| Weather Conditions: | Sunny 15 degrees | |
| Date of Last DSI: | June 19, 2013 | |
| Freeboard at Time of DSI: | Not measured, but more than adequate | |
| New Developments d/s of Dam: | None | |
| Dam Failed Since Last DSI: | None | |
| Reviewed By: | Andy Small | |

| Observed Features | Yes | No | Photo # | Comment / Note # |
|---|-----|----|---------|------------------|
| 1.0 Upstream Dam Slope | | | | |
| 1.1 Concern with Water Level or with previous high water levels since the last inspection | | X | | |
| 1.2 Evidence of Wave or Other Erosion | | X | | |
| 1.3 Unusual Accumulation of Debris/Logs | | X | | |
| 1.4 Evidence of Sloughing/Sliding | | X | | |
| 1.5 Evidence of Cracks | | X | | |
| 1.6 Any Other Deformation | | X | | |
| 1.7 Excessive Vegetation | | X | | |
| 1.8 Other Unusual Conditions | | X | | |
| 2.0 Dam Crest | | | | |
| 2.1 Evidence of Shoulder Erosion | | X | | |
| 2.2 Evidence of Cracking | | X | | |
| 2.3 Other Deformation/Settlement | | X | | |
| 2.4 Concerns with Low Areas on the Crest | | X | | |
| 2.5 Animal Burrows | | X | | |
| 2.6 Other Unusual Conditions | | X | | |
| 3.0 Downstream Dam Slope | | | | |
| 3.1 Evidence of Erosion | | X | | |
| 3.2 Evidence of Sloughing/Sliding | | X | | |
| 3.3 Evidence of Cracking | | X | | |
| 3.4 Any Other Deformation | | X | | |
| 3.5 Signs of Phreatic Surface/Seepage | | X | | |
| 3.6 Seepages Observed | | X | | |

| Observed Features | Yes | No | Photo # | Comment / Note # |
|------------------------------------|------------|-----------|----------------|--------------------------------|
| 3.7 Is Seepage Turbid | | | | N/A |
| 3.8 Non-Uniform Slope | | X | | |
| 3.9 Excessive Vegetation | | X | | |
| 3.10 Animal Burrows | | X | | |
| 3.11 Other Unusual Conditions | | X | | |
| 4.0 Dam Abutments | | | | |
| 4.1 Seepages Observed | | X | | |
| 4.2 Is Seepage (if any) Turbid | | | | N/A |
| 4.3 Evidence of Erosion | | X | | |
| 4.4 Evidence of Cracks | | X | | |
| 4.5 Other Deformation/Settlement | | X | | |
| 4.6 Evidence of Repairs | | X | | |
| 4.7 Other Unusual Conditions | | X | | |
| 5.0 Downstream Toe | | | | |
| 5.1 Seepages Observed | | | | N/A. Downstream toe submerged. |
| 5.2 Is Seepage (if any) Turbid | | | | N/A. Downstream toe submerged. |
| 5.3 Evidence of Soft Toe Condition | | | | N/A. Downstream toe submerged. |
| 5.4 Evidence of Boils | | | | N/A. Downstream toe submerged. |
| 5.5 Evidence of Contamination | | | | N/A. Downstream toe submerged. |
| 5.6 Excessive Vegetation | | | | N/A. Downstream toe submerged. |
| 5.7 Evidence of vegetation kill | | | | N/A. Downstream toe submerged. |
| 5.8 Soft toe condition | | | | N/A. Downstream toe submerged. |
| 5.9 Evidence of boils | | | | N/A. Downstream toe submerged. |
| 5.10 Other Unusual Conditions | | | | N/A. Downstream toe submerged. |
| 5.11 Evidence of repairs | | | | N/A. Downstream toe submerged. |
| 6.0 General | | | | |
| 6.1 Spillway at/next to this dam | | X | | |
| 6.2 Pipelines at the dam | | X | | |
| 6.3 Evidence of ARD | | X | | |
| 6.4 Crest accessible by truck | X | | | |
| 6.5 Public access to dam | X | | | Use of boat is necessary |
| 8.0 Other | | | | |
| 8.1 Other Unusual Site Conditions | | X | | |

Dam Surveillance Record

| | | |
|------------------------------|---|-----------------------------------|
| Dam Site: | Granisle Mine Site | |
| Dam Structure: | Dam 4 | |
| Inspection Carried Out By: | Andy Small | |
| Date: | 11 June 2014 | |
| Inspection Type: | Walk-over <input checked="" type="checkbox"/> | Fly-over <input type="checkbox"/> |
| Weather Conditions: | Sunny 15 degrees | |
| Date of Last DSI: | June 19, 2013 | |
| Freeboard at Time of DSI: | Not measured, but more than adequate | |
| New Developments d/s of Dam: | None | |
| Dam Failed Since Last DSI: | None | |
| Reviewed By: | Andy Small | |

| Observed Features | Yes | No | Photo # | Comment / Note # |
|---|-----|----|---------|------------------|
| 1.0 Upstream Dam Slope | | | | |
| 1.1 Concern with Water Level or with previous high water levels since the last inspection | | X | | |
| 1.2 Evidence of Wave or Other Erosion | | X | | |
| 1.3 Unusual Accumulation of Debris/Logs | | X | | |
| 1.4 Evidence of Sloughing/Sliding | | X | | |
| 1.5 Evidence of Cracks | | X | | |
| 1.6 Any Other Deformation | | X | | |
| 1.7 Excessive Vegetation | | X | | |
| 1.8 Other Unusual Conditions | | X | | |
| 2.0 Dam Crest | | | | |
| 2.1 Evidence of Shoulder Erosion | | X | | |
| 2.2 Evidence of Cracking | | X | | |
| 2.3 Other Deformation/Settlement | | X | | |
| 2.4 Concerns with Low Areas on the Crest | | X | | |
| 2.5 Animal Burrows | | X | | |
| 2.6 Other Unusual Conditions | | X | | |
| 3.0 Downstream Dam Slope | | | | |
| 3.1 Evidence of Erosion | | X | | |
| 3.2 Evidence of Sloughing/Sliding | | X | | |
| 3.3 Evidence of Cracking | | X | | |
| 3.4 Any Other Deformation | | X | | |
| 3.5 Signs of Phreatic Surface/Seepage | | X | | |
| 3.6 Seepages Observed | | X | | |

| Observed Features | Yes | No | Photo # | Comment / Note # |
|------------------------------------|------------|-----------|----------------|--------------------------|
| 3.7 Is Seepage Turbid | | | | N/A |
| 3.8 Non-Uniform Slope | | X | | |
| 3.9 Excessive Vegetation | | X | | |
| 3.10 Animal Burrows | | X | | |
| 3.11 Other Unusual Conditions | | X | | |
| 4.0 Dam Abutments | | | | |
| 4.1 Seepages Observed | | X | | |
| 4.2 Is Seepage (if any) Turbid | | | | N/A |
| 4.3 Evidence of Erosion | | X | | |
| 4.4 Evidence of Cracks | | X | | |
| 4.5 Other Deformation/Settlement | | X | | |
| 4.6 Evidence of Repairs | | X | | |
| 4.7 Other Unusual Conditions | | X | | |
| 5.0 Downstream Toe | | | | |
| 5.1 Seepages Observed | | X | | |
| 5.2 Is Seepage (if any) Turbid | | | | N/A |
| 5.3 Evidence of Soft Toe Condition | | X | | |
| 5.4 Evidence of Boils | | X | | |
| 5.5 Evidence of Contamination | | X | | |
| 5.6 Excessive Vegetation | | X | | |
| 5.7 Evidence of vegetation kill | | X | | |
| 5.8 Soft toe condition | | X | | |
| 5.9 Evidence of boils | | X | | |
| 5.10 Other Unusual Conditions | | X | | |
| 5.11 Evidence of repairs | | X | | |
| 6.0 General | | | | |
| 6.1 Spillway at/next to this dam | | X | | |
| 6.2 Pipelines at the dam | | X | | |
| 6.3 Evidence of ARD | | X | | |
| 6.4 Crest accessible by truck | X | | | |
| 6.5 Public access to dam | X | | | Use of boat is necessary |
| 8.0 Other | | | | |
| 8.1 Other Unusual Site Conditions | | X | | |

GLENCORE

Dam Surveillance Record

| | | |
|------------------------------|---|-----------------------------------|
| Dam Site: | Granisle Mine Site | |
| Dam Structure: | Dam 5 | |
| Inspection Carried Out By: | Andy Small | |
| Date: | 11 June 2014 | |
| Inspection Type: | Walk-over <input checked="" type="checkbox"/> | Fly-over <input type="checkbox"/> |
| Weather Conditions: | Sunny 15 degrees | |
| Date of Last DSI: | June 19, 2013 | |
| Freeboard at Time of DSI: | Not measured, but more than adequate | |
| New Developments d/s of Dam: | None | |
| Dam Failed Since Last DSI: | None | |
| Reviewed By: | Andy Small | |

| Observed Features | Yes | No | Photo # | Comment / Note # |
|---|-----|----|---------|------------------------|
| 1.0 Upstream Dam Slope | | | | |
| 1.1 Concern with Water Level or with previous high water levels since the last inspection | | X | | |
| 1.2 Evidence of Wave or Other Erosion | | X | | |
| 1.3 Unusual Accumulation of Debris/Logs | | X | | |
| 1.4 Evidence of Sloughing/Sliding | | X | | |
| 1.5 Evidence of Cracks | | X | | |
| 1.6 Any Other Deformation | | X | | |
| 1.7 Excessive Vegetation | | X | | |
| 1.8 Other Unusual Conditions | | X | | |
| 2.0 Dam Crest | | | | |
| 2.1 Evidence of Shoulder Erosion | | X | | |
| 2.2 Evidence of Cracking | | X | | |
| 2.3 Other Deformation/Settlement | | X | | |
| 2.4 Concerns with Low Areas on the Crest | | X | | |
| 2.5 Animal Burrows | | X | | |
| 2.6 Other Unusual Conditions | | X | | |
| 3.0 Downstream Dam Slope | | | | |
| 3.1 Evidence of Erosion | X | | | Minor erosion gullies. |
| 3.2 Evidence of Sloughing/Sliding | | X | | |
| 3.3 Evidence of Cracking | | X | | |
| 3.4 Any Other Deformation | | X | | |
| 3.5 Signs of Phreatic Surface/Seepage | | X | | |
| 3.6 Seepages Observed | | X | | |

| Observed Features | Yes | No | Photo # | Comment / Note # |
|------------------------------------|------------|-----------|----------------|--------------------------|
| 3.7 Is Seepage Turbid | | | | N/A |
| 3.8 Non-Uniform Slope | | X | | |
| 3.9 Excessive Vegetation | | X | | |
| 3.10 Animal Burrows | | X | | |
| 3.11 Other Unusual Conditions | | X | | |
| 4.0 Dam Abutments | | | | |
| 4.1 Seepages Observed | | X | | |
| 4.2 Is Seepage (if any) Turbid | | | | N/A |
| 4.3 Evidence of Erosion | | X | | |
| 4.4 Evidence of Cracks | | X | | |
| 4.5 Other Deformation/Settlement | | X | | |
| 4.6 Evidence of Repairs | | X | | |
| 4.7 Other Unusual Conditions | | X | | |
| 5.0 Downstream Toe | | | | |
| 5.1 Seepages Observed | | X | | |
| 5.2 Is Seepage (if any) Turbid | | | | N/A |
| 5.3 Evidence of Soft Toe Condition | | X | | |
| 5.4 Evidence of Boils | | X | | |
| 5.5 Evidence of Contamination | | X | | |
| 5.6 Excessive Vegetation | | X | | |
| 5.7 Evidence of vegetation kill | | X | | |
| 5.8 Soft toe condition | | X | | |
| 5.9 Evidence of boils | | X | | |
| 5.10 Other Unusual Conditions | | X | | |
| 5.11 Evidence of repairs | | X | | |
| 6.0 General | | | | |
| 6.1 Spillway at/next to this dam | | X | | |
| 6.2 Pipelines at the dam | | X | | |
| 6.3 Evidence of ARD | | X | | |
| 6.4 Crest accessible by truck | X | | | |
| 6.5 Public access to dam | X | | | Use of boat is necessary |
| 8.0 Other | | | | |
| 8.1 Other Unusual Site Conditions | | X | | |



Photo D-1: View of Dam 2 crest and upstream tailings beach, looking south (toward right abutment) from the crest at the left end of Dam 2. (11 June 2014)



Photo D-2: View of upstream tailings beach and pond, looking south from the junction of Dams 2 and 4. Note that the dams were built to accommodate future tailings storage that did not happen. (11 June 2014)



Photo D-3: View of the crest of Dams 4 and 2, near the junction with Dams 4 and 2. Looking east along the crest of Dam 4. (11 June 2014)



Photo D-4: View of the upstream beach from the junction of Dams 3 and 5. Looking east. (11 June 2014)



Photo D-5: View of the crest of Dam 5 looking west. (11 June 2014)



Photo D-6: View of the downstream slope of Dam 2, looking south-east from the junction of Dam 2 and 4. (11 June 2014)



Photo D-7: View of the downstream slope of Dam 2, looking south-east along toe area of Dam 2. (11 June 2014)



Photo D-8: View of the downstream slope of Dam 4, looking west from beyond the toe of the dam. (11 June 2014)



Photo D-9: View of the downstream slope of Dam 3, looking south-west. (11 June 2014)



Photo D-10: View of the downstream slope of Dam 3, looking north-east. (11 June 2014)



Photo D-11: View of the downstream slope of Dam 5, looking west. (11 June 2014)



Photo D-12: View of the downstream toe of Dam 5, looking south. Some seepage evident, not a concern. (11 June 2014)



Photo D-13: View of the downstream slope of Dam 2, looking south-east along toe area of Dam 2. (11 June 2014)