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MOUNT POLLEY MINE
Tailings Storage Facility Stage 9
2013 As-Built and Annual Review Report

Submitted to:

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IMPORTANT NOTICE

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SUMMARY

This report presents the annual review of the operation and performance of the Mount Polley Mining Corporation (MPMC) tailings storage facility (TSF) for 2013, together with the as-built report documenting the 2013 construction of the embankments. This report has been prepared in accordance with the requirements of the British Columbia Ministry of Energy and Mines (MEM). The following gives a general summary of the 2013 TSF activities and the key developments.

1) Classification of the dam(s) in terms of Consequence of Failure (ref. Canadian Dam Association, Dam Safety Guidelines [2007])

A formal dam safety review was conducted in 2006 (AMEC 2006). This review assigned a "LOW" hazard classification based on 1999 Canadian Dam Association (CDA 1999) guidelines. CDA updated their Dam Safety Guidelines rating in 2007 (CDA 2007), and under the new classification the TSF is classified under "Significant" category (see Classification System Table 1.1).

2) 2013 Construction Season Summary

The Stage 9 TSF raise includes design to El. 970.0 m via a centerline design as presented in AMEC's 2013 Construction Monitoring Manual (AMEC 2013). Construction of the Stage 9 raise began with the placement of Zone S (till core) in late April 2013. Zone S placement was suspended on October 30, 2013. At the end of construction, the Zone S was completed to a minimum elevation of 967.0 m with Zone F (filter) and Zone T (transition) completed to a minimum elevation of 966.1 m.

The 2013 embankment raise consisted of:

- Placement of zone materials:
  - Zone U – comprised of predominantly tailings sand cells, supplemented by non-acid-generating (NAG) rockfill occasionally along the Perimeter Embankment and South Embankment and along the majority of the Main Embankment;
  - Zone S – comprised of compacted glacial till;
  - Zone F – comprised of filter zone NAG rockfill;
  - Zone T – comprised of transition zone NAG rockfill; and
  - Zone C – comprised of run of mine NAG rockfill.

- Foundation preparation of abutment tie-ins, completely on the South Embankment and partially along the Perimeter Embankment.

- Foundation preparation and Zone C material placement to construct a buttress below the Perimeter Embankment.

Table 1.1: CDA (2007) Consequence Classification Scheme

Dam Class	Population at Risk [note 1]	Incremental Losses		
		Loss of Life [Note 2]	Environmental and Cultural Values	Infrastructure and Economics
Low	None	0	Minimal short-term loss No long-term loss	Low economic losses; area contains limited infrastructure or services
Significant	Temporary only	Unspecified	No significant loss or deterioration of fish or wildlife habitat Loss of marginal habitat only Restoration or compensation in kind highly possible	Losses to recreational facilities, seasonal workplaces, and infrequently used transportation routes
High	Permanent	10 or fewer	Significant loss or deterioration of *important* fish or wildlife habitat Restoration or compensation in kind highly possible	High economic losses affecting infrastructure, public transportation, and commercial facilities
Very High	Permanent	100 or fewer	Significant loss or deterioration of *critical* fish or wildlife habitat Restoration or compensation in kind possible but impractical	Very high economic losses affecting important infrastructure or services (e.g. highway, industrial facility, storage facilities for dangerous substances)
Extreme	Permanent	More than 100	Major loss of *critical* fish or wildlife habitat Restoration or compensation in kind impossible	Extreme losses affecting critical infrastructure or services (e.g. hospital, major industrial complex, major storage facilities for dangerous substances)

Note 1. Definitions for population at risk:

None – There is no identifiable population at risk, so there is no possibility of loss of life other than through unforeseeable misadventure.

Temporary – People are only temporarily in the dam-breach inundation zone (e.g. seasonal cottage use, passing through on transportation routes, participating in recreational activities).

Permanent – The population at risk is ordinarily located in the dam-breach inundation zone (e.g. as permanent residents); three consequence classes (high, very high, extreme) are proposed to allow for more detailed estimates of potential loss of life (to assist in decision-making if the appropriate analysis is carried out).

Note 2. Implications for loss of life:

Unspecified – The appropriate level of safety required at a dam where people are temporarily at risk depends on the number of people, the exposure time, the nature of their activity, and other conditions. A higher class could be appropriate, depending on the requirements. However, the design flood requirement, for example, might not be higher if the temporary population is not likely to be present during the flood season.

An AMEC representative was on site to observe the start of the construction and to provide training for the MPMC personnel responsible for the construction monitoring. AMEC provided periodic visits throughout the construction season up to the end of August to verify that the materials and construction methodology satisfied the specifications. From the end of August to the completion of construction activities, an AMEC representative provided full daytime coverage for construction monitoring, reporting, material sampling and testing, and instrumentation reading.

MPMC performed all related earthwork construction for Zone U (upstream fill), Zone T and Zone C. Material placement and related earthwork construction for Zone S and Zone F were completed by Peterson Contracting Ltd (Peterson). AMEC reviewed daily reports, performed laboratory test on the provided samples, reviewed provided instrumentation data, and conducted site visits during critical stages of construction and at minimum on a monthly basis.

3) Instrumentation Summary

In 2013, a number of previously unknown vibrating wire piezometers (VWP) were located and some previously functioning VWPs were destroyed or failed. Table 1.1 summarizes the locations and changes of the various VWPs:

Table 1.2: Changes in VWP Status

Embankment	Functional at End of 2012	Located During 2013	Destroyed During 2013	Functional at the End of 2013
Main	55	3	2	**56**
Perimeter	13	0	1	**12**
South	11	0	1	**10**
Total	**79**	**3**	**4**	**78**

The following general trends were seen in the VWPs:

- Pore pressures in foundation soils around the TSF embankment were generally noted as stable with minor fluctuations.
- Pore pressures in the till core were generally found to be stable, with a slightly increasing trend in response to the rising pond level.
- Pore pressures in all filter and drain VWPs (except D3) remained unchanged throughout the year. VWP readings from D3 indicated a slight increase in pore pressure.
- Pore pressures in the tailings and upstream fill generally experienced an upwards trend in response to the rising pond level. In addition, VWPs that were installed at a lower elevation experienced lower response relative to the VWPs near the pond elevation.

A total of nine (9) slope inclinometers (SIs) are installed within the TSF, two (2) of which were installed during 2012. During the 2013 construction season, five (5) of the SIs located below the Main Embankment were extended to allow for construction of the Main Embankment buttress.

In general, surveys of SIs in and below the downstream shell of the Perimeter Embankment indicate that movements are minor and thus pose no immediate stability concerns.

Surveys of SIs in and below the downstream shell of the Main Embankment indicate that movements are generally minor; however, due to the concerns with the SI probe accuracy, readings should be monitoring closely in the coming year to ensure there are no further concerns with equipment and there remains no significant signs of movement.

1.0 INTRODUCTION

1.1 General

The Mount Polley Mine (MPM) is a copper gold mine, operated by the Mount Polley Mining Corporation (MPMC). The MPM is located in central British Columbia, approximately 60 km northeast of Williams Lake. The mine commenced production in 1997 and operated until October 2001 when operations were suspended for economic reasons. In March 2005, the mine restarted production and has been in continuous operation since. Ore is crushed and processed by selective flotation to produce a copper-gold concentrate. The mill throughput rate is approximately 21,800 tonnes per day (approximately 8.0 million tonnes per year). Mill tailings are discharged as slurry into the Tailings Storage Facility (TSF) located on the south area of the mine property. Figure 1.1 shows an aerial view of the site from 2013.

The starter dam for the TSF embankment was constructed in 1996 to a crest elevation of 927.0m. The starter dam was constructed out of a homogeneous compacted till fill. Beyond the starter dam, the TSF embankment comprised compacted till as well as rockfill zones. The embankment was raised in subsequent years as follows:

- To elevation 934.0 m in 1997.
- To elevation 936.0 m in 1998.
- To elevation 937.0 m in 1999.
- To elevation 941.0 m in 2000.
- To elevation 942.5 m in 2001.
- To elevation 944.0 m in 2004.
- To elevation 946.0 m in 2005.
- To elevation 949.0 m in 2006.
- To elevation 950.9 m in 2007.
- To elevation 951.9 m in 2008.
- To elevation 953.9 m in 2009.
- To elevation 958.0 m in 2010.
- To elevation 960.1 m in 2011.
- To elevation 963.5 m in 2012.

Construction of the Stage 9 dam raise of approximately 3.5 m, from an approximate starting El. 963.5 m to final El. 967.0 m, was started at the end of April 2013 and was suspended in November 2013. The raise, with a minimum crest (Zone S) of El. 967.0 m is projected to provide storage and freeboard through to summer 2014. The next dam raise is scheduled to commence in the spring 2014.

Figure 1.1: Aerial View of Mount Polley Mine Site: October 2013

1.2 Documentation Requirements

This report includes the relevant as-built information for the Stage 9 (2013) raise and also represents the 2013 annual review of the MPM TSF. The scope of this report includes the following:

- Description of the operation of the TSF;

- Description of the Stage 9 raise design, and design modifications that were implemented during construction;
- Description of the monitoring program for the TSF;
- An overview of the 2013 Stage 9 construction, including: description of conditions encountered during construction; inspection reports, field and laboratory test results including:
    - sample locations and test standards and/or methodologies;
    - description of the quality assurance (QA) and quality control (QC) procedures and results;
    - selected photographs documenting construction progress and final conditions;
    - as-built drawings; and
    - confirmation that the Stage 9 TSF construction was carried out in accordance with the design intent;
- Summary of instrumentation installed within the TSF;
- Description of water management and impoundment raising schedule on site;
- Works to be completed from the 2013 Stage 9 construction; and,
- Conclusions and recommendations based on 2013 Stage 9 construction.

2.0 OPERATION OF THE TAILINGS STORAGE FACILITY

2.1 General

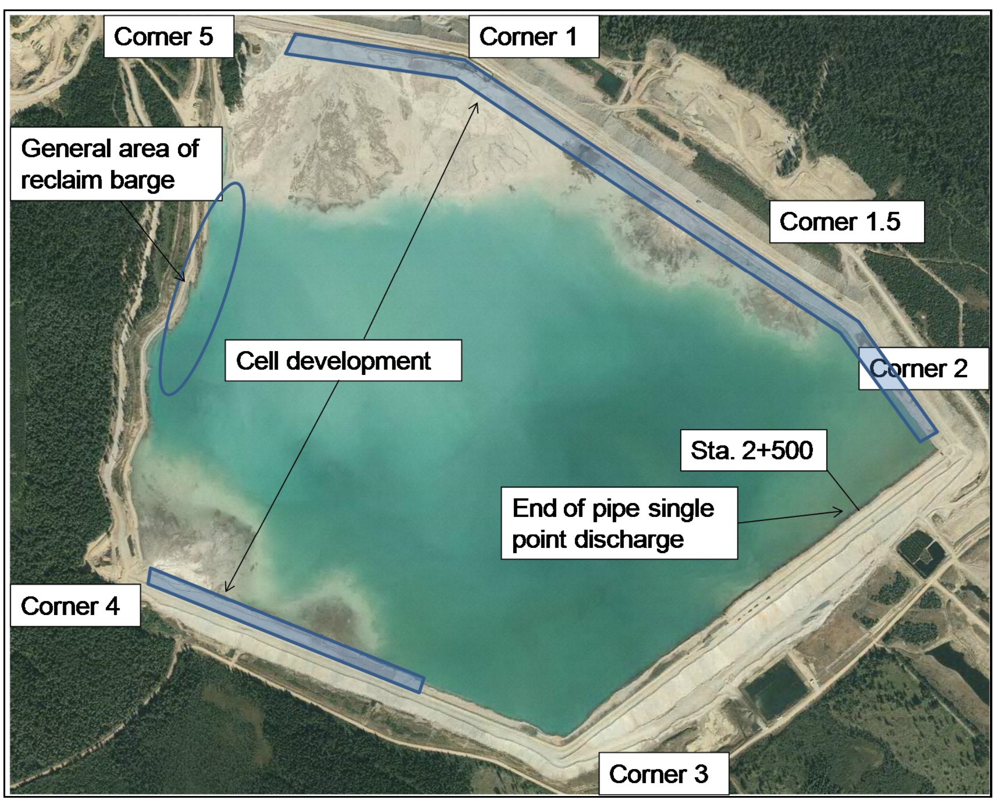
The MPM TSF is comprised of one overall embankment that is approximately 5.2 km in length. The embankment is subdivided into three sections; referred to as the Main Embankment, Perimeter Embankment and South Embankment. Heights vary along the embankment and are approximately 55 m, 37 m, and 29 m for the Main Embankment, Perimeter Embankment and South Embankment respectively.

2.2 Tailings Discharge and Beach Management

Tailings are transported from the mill to the impoundment via an approximately 7 km long HDPE pipeline. The pipeline design flow is 22,000 tpd at about 35% solids by dry weight.

Cell construction was carried out from Corner 5 advancing along the Perimeter Embankment to the Main Embankment to about Station 2+500. Near the end of the 2013 construction season, the pipeline route was re-graded near Corner 5 to provide room for embankment expansion at the abutment. Insufficient tailings line pressure prevented cell construction along the central portion of the Main Embankment and single point discharge was employed (approximately Sta. 2+500) to facilitate the beach development in this area. Discharge from Station 2+500 was maintained for about two weeks, after which discharge was relocated to Corner 4. Cellular development began along the South Embankment towards the end of 2013. Figure 2.1 illustrates the cell development locations during 2013.

Figure 2.1: 2013 Cell Development



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2.3 Process Water Reclaim

The tailings pond supernatant is recycled to the mill for use as process water. It is transported via the reclaim pumping system, which consists of a barge, pipeline and booster pump station.

2.4 Operations, Maintenance and Surveillance Manual

The Operations, Maintenance and Surveillance (OMS) Manual was updated in 2013 in keeping with its implementation as a live document.

2.5 Freeboard Requirements

The freeboard requirements for the TSF are outlined in the OMS manual. Under normal operating levels, freeboard requirements include a water level 1.3 m below the embankment crest to allow for the 72-hour PMP event, plus an allowance for wave run-up. MPMC holds the option of transferring excess pond water into the Perimeter Borrow Pit or Cariboo Pit, if required, to satisfy freeboard requirements.

2.6 Seepage Collection Ponds

Seepage collection ponds are located downstream of each of the three (3) embankments that create the TSF. The seepage collection ponds collect seepage from the embankments, embankment drain discharge as well as direct runoff from the embankment and reporting catchments. Records indicate that the ponds were excavated into low conductivity glacial till.

During AMEC's annual site visit, it was noted that a culvert running into the main seepage pond appeared to be plugged, creating a large area of ponded water (Photo 20). With the exception of the ponded water, all the ponds were observed to be in good condition. MPMC reported that this plugged culvert was remedied in August 2013.

2.7 Drain Flow Data

Flows from the upstream toe drain and foundation drains of the Main Embankment were historically measured at the sump located at the Main Embankment seepage collection pond, but they are now measured at a manifold located at a water transfer station near the Main Embankment seepage collection pond (constructed as part of the discharge system installation completed in 2013). Upstream toe drains from the Perimeter Embankment and South Embankment discharge into ditches which carry the flow to their respective seepage collection ponds. Flow for the Perimeter Embankment and South Embankment are measured across the ditch profile as close to the end of the pipe as possible. Water from the upstream toe and foundation drains is recycled to the TSF, evaporated or discharged in accordance with permitted activities, the combination of which is dictated by the site water management strategy.

Drain flows from the Main Embankment, Perimeter Embankment and South Embankment are read monthly as weather permits. These flows are typically influenced by the upstream sand cell placement. South Embankment and Perimeter Embankment drain flows measured since 2005 are illustrated below in

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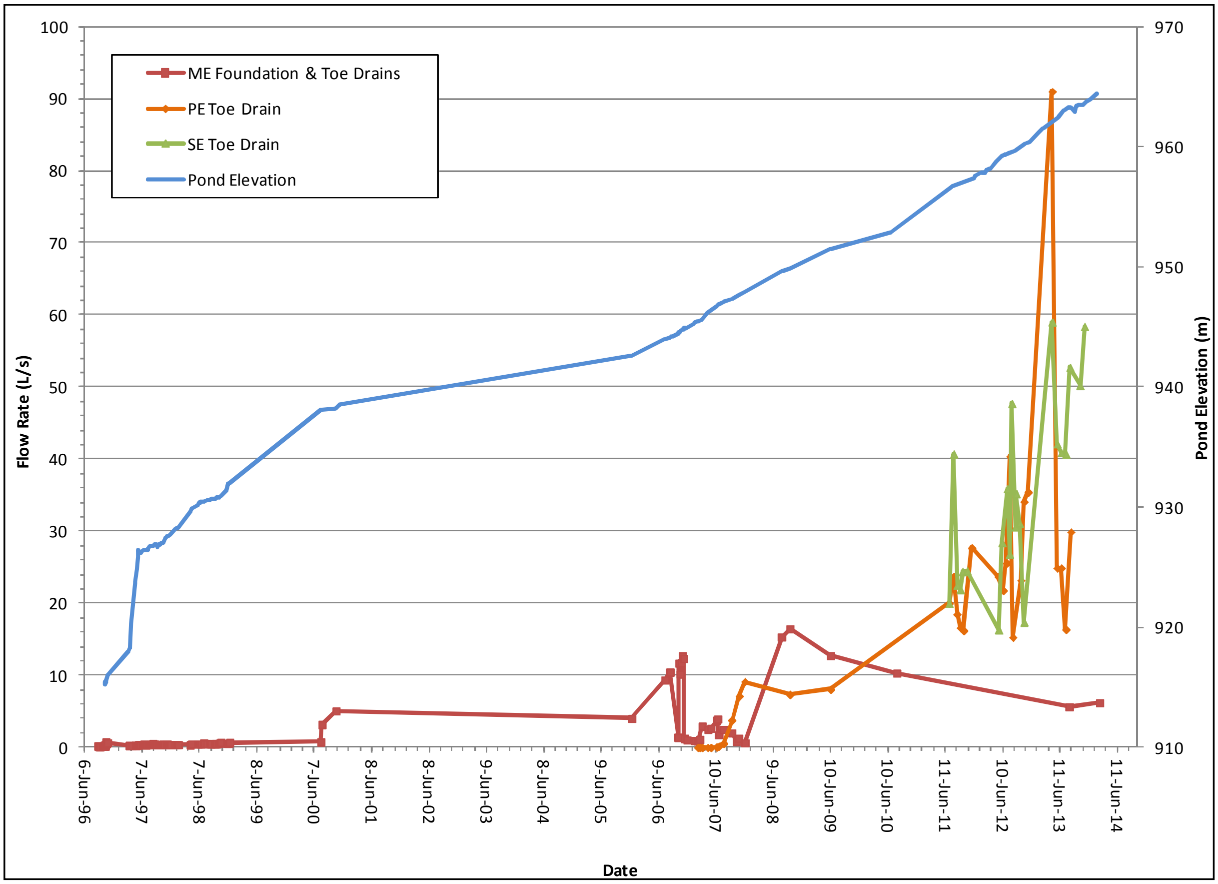
Figure 2.2.

Figure 2.2: Main Embankment, Perimeter Embankment and South Embankment Drain Flow Readings



3.0 2013 DAM DESIGN

The 2013 construction schedule was planned to comprise the Stage 9 TSF embankment raise targeting an elevation of 970.0 m. AMEC prepared a design package presenting the stability analyses and issued-for-construction drawings for the raise to El. 970.0 m which was submitted by MPMC to the MEM for approval.

The design of the Stage 9 raise has not changed from the previously approved and constructed Stage 8a raise design cross sections, consisting of a downstream shell of NAG rockfill, a central, low permeability till core, a filter sequence downstream of the core and an upstream support for the embankments consisting of a mix of tailings and NAG rockfill. These design materials are progressively raised in a centreline configuration to El.970.0 m, and the details of the Stage 9 design are presented on Drawings 2013AB.03 – 2013AB.05.

The Stage 9 raise maintains a downstream slope of 1.3H:1V, which is temporary given that the final dam downstream slope is currently planned to be flattened to 2H:1V. The final design for the downstream slope may be revised after the current target elevation of 970 m is reached. Zone C in the dam shell was placed and compacted by dozer and haul truck traffic. Zone T was obtained by selectively sorting run-of-mine waste rock placed and compacted by excavator, dozer and haul truck traffic. Zone F was processed by on site crushing of run-of-mine waste rock, placed by haul trucks and a grader, and compacted by a combination of vibratory compactors and equipment traffic. Zone S was obtained from a locally borrowed, low permeability glacial till, placed by haul trucks and dozers, and compacted by a combination of equipment traffic and vibratory compactors. The total tailings portion of Zone U was deposited into the impoundment and compacted by a dozer and the rock portion was obtained from run-of-mine waste rock and placed and compacted by dozer and haul truck traffic.

4.0 CONSTRUCTION MONITORING PROGRAM

4.1 Responsibilities for Construction Monitoring

Construction monitoring during the period of May to the end of August was mainly carried out by a MPMC field inspector. AMEC's support engineer reviewed daily construction records and performed regular site visits to monitor the quality of construction and assess MPMC's monitoring of the construction. From August 26th onwards, AMEC provided on-site field staff to monitor daytime construction on a general schedule of Monday through Friday, while MPMC continued the task of survey control.

4.2 AMEC's Support Engineer

While on site, the responsibilities of AMEC's support engineer were as follows:

- Monitor, train, and assist MPMC personnel with the requirements of construction monitoring;
- Monitor, sample, and requisition tests of the borrow areas, as required;
- Monitor and perform QA testing of compacted till core soils, as required;
- Review and approve proposed borrow soils;
- Review and approve transition and filter material, processing methodology and monitoring practices;
- Monitor and approve filter trench excavation and preparation;
- Monitor and approve abutment preparation;

- Address any concerns or out-of-compliance situations observed and recorded during construction;
- Carry out the QC field and laboratory testing; and
- Meet as required with MPMC to review the construction program.

AMEC's support engineer provided on-site supervision during the following periods:

- *April Site Visit:* April 23-26
- *May Site Visits*: May 1-3, 7-9 and 13
- *June Site Visits*: June 4-6, 17-19, 26-28
- *July Site Visit*: July 3-5
- *August Site Visits*: August 2, 12-14

While off-site, the responsibilities of AMEC's support engineer were as follows:

- Review daily construction reports submitted by MPMC personnel;
- Review compaction results submitted by MPMC personnel;
- Plot and review instrumentation readings submitted by MPMC personnel;
- Address any concerns or out-of-compliance situations observed by MPMC personnel;
- Coordinate with MPMC personnel and AMEC's Project Manager/Principal Engineer; and
- Prepare the site As-built/Annual Review Report.

4.3 AMEC's Field Staff

While on site, the responsibilities of AMEC's field staff were as follows:

- Monitor and maintain a photographic record of ongoing construction activities;
- Perform QC compaction testing of placed Zone S material (as per material placement specifications);
- Monitor and approve the filter trench excavation and preparation;
- Monitor and approve abutment preparation;
- Collect material samples for QA/QC laboratory testing;
- Monitor, sample, and requisition tests of the borrow areas, as required;
- Review and approve proposed borrow soils;
- Collect and submit instrumentation data;
- Direct MPMC personnel to address the survey requirements, results, etc.;
- Prepare and submit daily construction reports;
- Address any concerns or out-of-compliance situations observed and recorded during construction; and
- Coordinate with MPMC personnel and AMEC's Project Manager.

AMEC's field staff provided on-site supervision from August 26th through October, generally on a schedule of Monday through Friday, with intermittent site supervision at the request of MPMC throughout November and December.

4.4 AMEC's Project Manager

AMEC's Project Manager's responsibilities included reviewing daily construction reports, and liaising with the AMEC Principal Engineer, AMEC Support Engineer, AMEC Field Staff and MPMC Project Manager to address any problems.

AMEC's Project Manager performed a site visit from August 12 to 14. In general, the purpose of the site visit was to view the construction activities, liaise with MPMC project personnel and discuss any issues as pertaining to the TSF.

4.5 MPMC Field Inspector

The responsibilities of MPMC's field inspector were as follows:

- Monitor and maintain a photographic record of ongoing construction activities;
- Review borrow pit material to verify material consistency;
- Delineate construction control lines with stakes (every 25 to 50 m) and marking paint (as required);
- Perform QC compaction testing of placed Zone S material (as per material placement specifications);
- Collect material samples of various construction materials for QC laboratory testing;
- Conduct as-built surveys of various zones;
- Prepare and submit daily construction reports;
- Collect and submit instrumentation data; and
- Report out-of-compliance situations to AMEC's Support Engineer.

Examples of daily construction reports prepared during the construction season are presented in Appendix D.

4.6 QA/QC Testing

A summary of the testing requirements is given in Table 4.1**Error! Reference source not found.**.

Table 4.1: Embankment Material Types and QA/QC Testing Requirements

MATERIAL TYPE	ON-SITE TESTING	OFF-SITE TESTING	SAMPLE COLLECTION SCHEDULE
Zone S Till Core	Source Classification: Visual inspection of borrow material. In-Place Testing: Visual inspection of zone dimension, and material. ND Density Testing (D6938-10) Moisture Content (D2216-10)	Source Classification and In-Place Testing : Proctor (D698-07 / D4718-07) Atterberg (D421-07 / D4318-10) Hydrometer Gradation (D421-07 and D422-07) Sieve Gradation (D6913-09)	Source Classification : One (1) per biweekly per source or One (1) per 10,000 m^3 per source In-Place Testing: One (1) per offset biweekly per source or one (1) per 6,500 linear meters per source Moisture Content: One (1) per 1000 linear meters per lift per day
Zone F Filter	During Production/Transportation: Wash Sieve Gradation (C117-04 and C136-06) During Placement: Frequent supervision and visual inspection to check that material gradation meets specification and that handling procedures do not result in excessive segregation. Wash Sieve Gradation (C117-04 and C136-06)	During Production/Transportation: Wash Sieve Gradation (C117-04 and C136-06) In-Place Testing: Wash Sieve Gradation (C117-04 and C136-06)	During Production/Transportation: One (1) per 5,000 m^3 per stockpile A duplicate sample for off-site testing one (1) per stockpile In-Place Testing: One (1) per placement event or one (1) per 2,500 linear meters A duplicate sample for off-site testing one (1) per 4,500 linear meters
Zone T Transition	In-Place Testing: Wash Sieve Gradation (C117-04 and C136-06) Confirmation of waste rock inertness, as required. Visual inspection of material size, compaction, preparation, and zone dimension.	In-Place Testing: Wash Sieve Gradation (C117-04 and C136-06)	In-Place Testing: One (1) per 5,000 m^3 material placed. A duplicate sample for off-site testing one (1) per 10,000 m^3
Zone C Rockfill	Confirmation of waste rock inertness, as required. Visual in-place inspection of material size, preparation, and placement.	Not Applicable	Not Applicable

4.7 Instrumentation Monitoring

MPMC personnel are responsible for monitoring both VWPs and SIs located within the TSF. During the 2013 construction period, the instrumentation was generally read once every two (2) weeks, with SI readings offset a week from VWP readings. During more critical construction activities (i.e. Main Embankment buttress construction), the VWPs were usually read every day or every other day.

For the period prior to and after the 2013 construction period through the end of 2013, instrumentation monitoring was reduced to readings once a month.

5.0 TSF EMBANKMENT - STAGE 9 CONSTRUCTION OVERVIEW

5.1 General

Construction of the Stage 9 raise during 2013 entailed a raise of approximately 3.5 m from approximate El. 963.5 m to a minimum crest El. 970.0 m. Zone S placement took place between April 30, 2013 and October 30, 2013. The following subsections provide a brief summary of the 2013 construction activities for the TSF.

Drawing 2013AB.01 provides a general mine layout. Drawing 2013AB.02 shows the as-built embankment in plan view and the location of the borrow sources used in the Stage 9 construction. Drawings 2013AB.03 through 2013AB.05 show the as-built sections of the embankment in relation to the design.

Throughout the report, references to specific photographs are listed to better illustrate given details about the embankment construction process. In each case, the photograph will be noted by a number; the photographs are presented in Appendix A.

5.2 Foundation Preparation

Preparation of the Perimeter abutment was started in late November but was postponed due to poor weather conditions. Foundation preparation at the South abutment was completed up to an elevation of 967.5 m on October 20th. Foundation preparation for the abutments was carried out in accordance with the guidelines outlined in AMEC's 2013 Construction Monitoring Manual (AMEC 2013) as follows:

- **Removal of overburden**
    - At the South abutment, all areas within the dam footprint and 3 m beyond were stripped of organic material, loose or soft soils and deleterious material (including previously placed waste rockfill). The foundation was prepared and approved by the AMEC Field Staff up to an approximate elevation of 967.5 m.
    - At the Perimeter abutment, the foundation within the till core limits was prepared and approved by the AMEC Field Staff up to an approximate elevation of 967.5 m. Subsequent to this, one lift of Zone S material was placed and compacted at the Corner 5 tie-in up to an elevation of 964.8 m. (Photo 1)

  Foundation preparation was also conducted downstream of the Perimeter Embankment within the final dam footprint. The area was stripped of all organics and soft and over wet soils to expose the dense inorganic native soils. The area was then approved by the AMEC Field Staff and waste material hauled outside the proposed dam's footprint. The area was located roughly below Corner 1.5 and was approximately 1,700 m in length, extending from Station 2+700 to 4+400 (Photo 23). Inspection of the prepared foundation between Station 4+100 and 4+300 was attempted late in the season but was covered with snow. It should be noted that this section will require approval prior to any backfilling activities.

- **Test pitting** – Prior to cutoff trench construction, excavation of two test pits was performed (one at each of the South and Perimeter abutments) to confirm that a minimum of 2 m depth of native till was present beneath the embankment core limits. The test pits were completed downstream of the core limits such that the existing soils under the till core contact were not compromised (Photo 2). Bedrock was encountered within 2 m below ground surface, above El. 967.5 m in the test pit located at the South abutment (Photo 3).

- **Drainage blanket construction -** Prior to placement of the drainage blanket at the South abutment, proof-rolling of the exposed native abutment material was completed using a 10 ton vibratory smooth drum compactor (Photo 4). A drainage blanket consisting of a minimum 0.6 m thick lift of Zone F material was then placed to the full extents of the embankment downstream shell limits.

- **Drainage ditch construction** – Construction of a drainage ditch was completed by excavating a ditch approximately 0.6 to 1.0 m in depth and with a 2.0 m minimum base width along the South Embankment, downstream of the abutment core extensions. The ditch was constructed in order to accommodate drainage trench detail implemented in past raises, aligned along the toe of the dam. On the South Embankment, the corrugated drainage pipe was extended and placed at the base of the trench. The trench was then backfilled with Zone F material.

5.3 Fill Placement

5.3.1 Zone U – Upstream Shell

Upstream support for the raising of the TSF embankment is provided by NAG tailings. The majority of the upstream shell was constructed using end-of-pipe spigotted tailings, placed in cells and reworked with a dozer to achieve proper distribution, provide compaction and expedite excess water drainage (Photo 5). Further shaping of Zone U confining berms was done with the aid of an excavator. The majority of this work was carried out without AMEC supervision. Where the tailings could not be used for shell construction due to gravity feed limitations in the tailings pipe or material placement timing constrains, NAG waste rock was brought to the TSF by haul truck and placed/shaped by excavators and dozers (Photo 6). Specifically, NAG waste rock was substituted for use as Zone U along the central portion of the Main Embankment between Corner 2 and Corner 3. Prior to Zone S placement downstream of Zone U, AMEC's Support Engineer inspected the NAG waste rock that had been used as Zone U to ensure that large boulders (diameter > 1 m) did not exist near the Zone U/Zone S interface.

5.3.2 Zone S – Till Core

The till fill core material used in the construction of the TSF embankment was obtained from two different sources. One of the borrow pits, the Perimeter Till Borrow, is located downstream of the Perimeter Embankment between Corner 1 and Corner 2, while the other borrow pit, the Corner 2 Till Borrow is located below the Main Embankment at Corner 2 (Photos 7-9).

Prior to starting the Zone S raising, repairs were made to the existing Zone S. Due to insufficient support on the upstream side of the Zone S over the winter months, a section had slumped, and the total required design width of 5 m had to be re-established. This was accomplished by trenching out Zone U (0.5 m width by 0.3 m depth) at the upstream limits of the Zone S and Zone U interface. The trench was then backfilled and compacted with Zone S fill along sections of the Perimeter and Main Embankments (Photos 21-22).

The placement of Zone S material was performed by Peterson and generally followed the methodology outlined below:

- Prior to placement of the first lift during 2013, the existing Zone S (and native till on the abutments) was prepared by proof-rolling with a 10-ton vibratory smooth drum roller. Areas that were noted to be soft or affected by the frost were removed and replaced with approved Zone S material.
- The top 0.1 m of the prepared surface was scarified with the aid of a dozer/grader, to promote bonding between successive lifts (Photo 10).
- The surface was moisture conditioned as required to further promote proper bonding of successive lifts (Photo 19).
- Zone S was end dumped by haul trucks and spread in 0.3 m thick lifts with a dozer (Photo 11).
- Compaction was primarily achieved using the combination of a 10-ton sheep's foot drum vibrating compactor and a 10-ton smooth drum vibrating compactor.
- On average, for every three (3) lifts placed, the downstream face of the Zone S was trimmed and shaped by an excavator to maintain design lines during the excavation of the Zone F trench.

5.3.3 Zone F – NAG Filter Rock

The material utilized for Zone F sand and gravel was crushed on site at the primary crusher. Haul trucks were used to transport and stockpile the material around the TSF embankment for use in construction. Drawing 2013AB.02 illustrates the stockpile locations used during the 2013 construction.

Prior to the placement of Zone F material, a 1.5 m wide trench was excavated in previously placed rockfill material on the downstream side of the Zone S (Photo 12). This trench was excavated along the downstream design line along the Zone S to expose the previously placed Zone F at a depth of approximately 0.9 m (equivalent to three (3) 0.3 m Zone S lifts). Zone F material was then end dumped by a haul truck into the trench and smoothed off at surface with a grader (Photos 13-14).

5.3.4 Zone T – NAG Transition Rock

The material utilized for Zone T was selectively sorted and transported to the TSF as required. Prior to the back filling of the Zone F trench with Zone F material, the downstream sidewall of the trench was inspected for any unsuitable Zone T material. Any material that was found to be oversize (greater than 150 mm) or had greater than 20% fines was removed with an excavator after backfilling of the Zone F trench was completed (Photo 15). The removed material was replaced by suitable Zone T material hauled and placed by MPMC with the aid of a loader and grader.

5.3.5 Zone C – Downstream Shell NAG Rock

The Zone C downstream rockfill shell (placed by MPMC) was constructed with NAG rockfill obtained from waste rock produced in the mining operation. Prior to placement, the surface was scarified with the aid of a grader/dozer in areas where non-free-draining surfaces had developed. Scarification was performed to avoid continuous, low hydraulic conductivity zones within the rockfill shell, thus promoting downward drainage through the rockfill. The NAG rockfill was transported from active mining areas to the embankment via haul truck and placed and spread by dozers in approximate 1 m thick lifts (Photo 16).

Zone C placement on the Main Embankment downstream buttress began in June near Corner 3. Placement generally continued to the end of June, then from mid-July through to August 10. Rockfill was placed in maximum lift thicknesses of 3 m to an approximate elevation of 925 m.

Zone C placement at the Perimeter Embankment downstream toe began in October. After approval of the prepared foundation, Zone C material was placed from about Station 3+500 to 4+400 in a 1.5 m lift, with subsequent lifts placed in maximum thicknesses of 3 m (Photo 24).

5.4 Survey Control

Survey control requirements for the 2013 construction of the TSF included the following:

- Establishing and maintaining upstream and downstream limits of the Zone S (construction stakes were generally placed every 25 to 50 m along the entire length of the embankment, and as requested by Peterson);
- Maintaining the downstream crest chainage during construction;
- Verifying that a 5 m till core width was maintained during construction;
- Establishing and verifying the Zone F transition line for placement of Zone T material;
- Locating (and later marking out) the location of any unsuitable material identified in the Zone T material;
- Surveying the location and elevation of in-situ density tests;
- Collecting and storing data as required for the as-built record; and
- Providing location and elevation data as required by the AMEC Support Engineer.

MPMC personnel performed the survey control described above for the 2013 construction season.

5.5 Quality Control and Quality Assurance Testing

QA/QC testing of the materials used in the construction of the embankment involved on-site and off-site tests. On-site testing included in-situ nuclear densometer tests (ASTM D6938-10) to confirm adequate compaction of the till fills placed. Sieve analyses of the Zone F filter material to assess particle size gradation (ASTM D-422-63) were also performed on-site (prior to the end of August) and off-site to confirm adequate compliance to specifications.

Off-site tests of the fills included Standard Proctor Density (SPD) tests (ASTM D-698) that provided reference values used in the field to assess whether the compacted fill had achieved the 95% SPD in the design specifications. Tests of the fill material particle size gradation (ASTM D-422-63) were performed to assess whether the fill material satisfied the allowable gradation envelope according to the design specifications. Test of the core materials Atterberg limits (ASTM D-4318-98) were also performed. The results of these tests are presented in Appendix B.

During the 2013 construction season, the testing frequencies as outlined in Section 4.6 were generally maintained. A summary of the quantities of each different material type and the number and types of tests performed on the fills is provided in Table 5.1.

Table 5.1: TSF Summary of Material Quantities and Laboratory testing

Material Type	Source Of Material	Volume Placed (m^3)	QA/QC Tests Performed
Zone C – Downstream Shell NAG Rock	Springer Pit (ROM)*	1,186,609	Visual
Zone T – Transition NAG Rock	Springer Pit (Road Crush product)		3 Gradations (MPMC) 1 Gradations (AMEC)
Zone F – NAG Filter Rock	Springer Pit (Filter Crush)	28,556	26 Gradations (MPMC) 13 Gradations (AMEC)
Zone S - Till Core	Perimeter Till Borrow Corner 2 Till Borrow	95,410	18 Proctor (AMEC) 18 Gradation (AMEC) 18 Atterberg limits (AMEC) 253 ND field density (AMEC) 540 ND field density (MPMC) 34 Laboratory Moisture tests
	Total Fill Volume Placed**	**1,310,575**	

*Run of mine material (no processing required)
**Zone U volumes are not included

5.5.1 Zone S – Till Core

Zone S material found in the borrow pits was generally consistent and within the design specifications. The material was generally classified as a low plasticity Sandy Silt, some clay with trace to some gravel.

A glaciolacustrine unit was encountered interbedded within the till in some areas of the borrow pit. The glaciolacustrine material typically meets the core material specification, however, due to its poor workability, this material was wasted or whenever possible intermixed with till in a ratio of one (1) part glaciolacustrine and two (2) parts till.

The in-situ density and moisture content of the compacted Zone S was determined by a nuclear densometer (ASTM D6938-10). (Photo 17) Where field test results indicated that the specified 95% Standard Proctor Maximum Dry Density (SPMDD) was not achieved, the area was recompacted until satisfactory test results were achieved. Samples of Zone S material were also collected and periodically sent to AMEC's Prince George lab facility for geotechnical index testing.

In addition to the 18 samples that were collected and tested as part of the Zone S material, two (2) samples were collected from an area northwest of Corner 5 in order to determine if the material being stripped from that location would meet the requirements of the Zone S material (Photo 18). The two (2) samples (TS13-15 and TS13-16) were subjected to sieve analysis, Atterberg limits, and proctor testing. Results indicated that the material was unacceptable for use as Zone S material due to the low compaction results and high moisture content.

The SPMDD value used in the field was selected from the first SPMDD (1,953 kg/m^3) lab result for the 2013 construction season and adjusted as necessary based on field observations and lab testing results. The average of the SPMDD lab results taken from the 18 samples for the 2013 construction season was 2,068 kg/m^3.

Test results for the in-situ density and moisture content of the till were recorded and entered into a spreadsheet. Plots of the test results were prepared and are presented in Appendix B.

5.5.2 Zone F – NAG Filter Rock

Zone F was produced by running run-of-mine NAG waste rock through the mill crusher. The majority of the material brought to and placed on the embankment was fairly consistent, plotting within the accepted Zone F design gradation envelope. Approximately half of the on-site tested samples plotted slightly to the coarse side of the specified envelope for the finer range of sizes (D_{15} to D_{30}), as indicated on the grain size analyses curves shown in Appendix B. This slight deviation from the gradation specification could be due to segregation of the material during transportation and placement. Generally, based on the visual assessments as well as the laboratory testing results, the Zone F material was judged an acceptable filter for the Zone S material.

5.5.3 Zone T – NAG Transition Rock

Zone T consisted of selectively sorted NAG rockfill obtained from the Springer Pit and/or from rockfill produced by running run-of-mine NAG waste rock through the mill crusher. Visual inspections of the Zones F and T interface indicated acceptable filter compatibility. Routine visual assessments were carried out during construction to qualitatively determine the conformance of Zone T transition to the gradation specifications and its acceptability as a filter for Zone F filter rock. Based on the visual assessments, the Zone T was judged an acceptable filter for the Zone F. Sieve analyses were also conducted on samples of the Zone T and results are presented in Appendix B.

5.5.4 Zone C – NAG Downstream Shell Rock

Zone C downstream rockfill shell was constructed with NAG rockfill obtained from the Springer Pit. The Zone C gradation specifications call for a broad range of sizes smaller than 1 m (maximum diameter). Routine visual assessments were carried out during construction to determine qualitatively the conformance of Zone C transition to the gradation specifications and its acceptability as a filter for Zone T filter rock. Based on the visual assessments, the Zone C was judged an acceptable filter for the Zone T.

5.6 Conformance of 2013 Construction with Design Intent

In general, the 2013 Stage 9 raise of the embankment is judged to have been carried out in conformance with design intent. This conclusion is based on AMEC's periodic observations of the construction, review of reports prepared by MPMC when AMEC was not on site, and the review of QA/QC records.

There are two items of note in keeping with original design intent that do not pose any immediate concerns to embankment stability or overall function. The items listed below are to be corrected during the 2014 TSF construction season as necessitated by the 2013 Construction Monitoring Manual (AMEC 2013) and MPMC OMS:

- **Zone F & Zone T Elevation**: Zones F and T are at elevations lower than the Zone S elevation in the Main and Perimeter embankments. As-built elevations immediately recorded after the suspension of construction in 2013 were provided to AMEC by MPMC. The elevations indicated that the difference between the Zone S and Zone T/F lifts was approximately 0.6 m and 1.0 m in the Main and South embankments, respectively. Maintenance of the Zones F and T above the tailings/pond level is part of the TSF design requirements. MPMC is aware that the elevation of the tailings was to be closely monitored following the 2013 construction and raising the level of the filter and transition materials as necessary.

- **Perimeter Embankment Tie-in:** The elevation of Zone S at the location of the Perimeter tie-in at Corner 5 is lower than the remaining Zone S along the Perimeter Embankment. The elevations indicate that the tie-in remains up to 2.0 m lower than adjacent Zone S elevation of 967.5 m. This location is to be closely monitored during the TSF pond elevation increase and completed as necessitated during the 2014 construction season.

6.0 INSTRUMENTATION MONITORING

6.1 General

Functioning instrumentation in the TSF currently consists of nine (9) Slope Indicators (SIs) and seventy seven (77) Vibrating Wire Piezometers (VWPs). During the course of 2013, VWPs B7, D5, E4, and F1 failed or were destroyed and are no longer read. No new instrumentation was installed during the 2013 construction season; however, some existing instruments were extended and reinitialized. Details regarding the extended instrumentation are summarized in Section 6.2.

The as-built locations of the SIs and VWPs (organised by plane) is shown in plan view on Drawing 2013AB.07.

6.2 Instrumentation Extensions

Piezometers

The following VWPs located along the Main Embankment downstream toe were extended in 2013: AX1, AX5, AX6, BX1, BX2, BX4, CX1, CX2, CX4, EX1, EX4, and KX2. VWPs were extended by means of splicing on an additional length of cable to the existing cable that was located above ground surface. The new cables were extended to ensure that they were above the buttress construction (El. 925.0 m). During the extension, a number of previously separated stations were combined for ease of field data collection. Previous stations AX1, AX5 and AX6, and BX1, BX2 and BX4 were extended downstream and combined into single stations labelled AX1 and BX1, respectively. The remaining VWPs that required extending were each extended vertically to accommodate the Stage 9 raise. Table 6.1: Summary of Extended VWP stationsTable 6.1 below gives a summary of VWPs that were extended and their current stationing.

Table 6.1: Summary of Extended VWP stations

Old VWP station	VWP ID	Current VWP station
AX1	A1-6	AX1
AX5	A16-18	AX1
AX6	A19-21	AX1
BX1	B1-2	BX1
BX2	B3-8	BX1
BX4	B11-13	BX1
CX1	C1-3	CX1
CX2	C4-8	CX2
CX4	C11-12	CX4
EX1	E1	EX1
EX4	E6-7	EX4
KX2	K1-2	KX2

Slope Inclinometers

Five (5) of the six (6) SIs located below the Main Embankment were extended upward to accommodate the construction of the toe buttress. After the extension in mid-June, the SIs were re-initialized. Table 6.2 below shows the SIs that were extended, how much they were extended, and the new total maximum depth.

Table 6.2: Summary of Extended Slope Inclinometers

Instrument Name	Extension (m)	Previous Surveyed Depth (m)	New Surveyed Depth (m)
SI01-02	2.9	37.5	40.5
SI06-01	9.0	43.0	48.5[1]
SI06-02	9.1	32.0	41.0
SI06-03	7.2	41.0	48.0
SI11-01	3.0	48.0	49.0[1]

Note : 1) In the case of SI06-01 and SI11-01 the new survey depth was restricted to less than the new total depth by the length of the cable used to survey the holes (50 m). The bottom few meters of these holes were deemed at low risk for movement based on historical readings.

6.3 Piezometers

VWPs have been installed in each of the embankments in the following locations: foundation, tailings, upstream fills, Zone F, Zone S and in various embankment drains. The piezometric data has been organized by planes. Drawings 2013AB.07 through 2013AB.15 show the relative placement of the VWPs within the embankment and the foundation in section view. The planes are located in the embankments as follows:

- Perimeter Embankment: G, D, J
- Main Embankment: K, B, A, C, E
- South Embankment: I, F

At the end of August, a VWP station was re-discovered downstream of the Main Embankment along plane B. The station is now labelled BX5 and includes VWPs located within the tailings, upstream fill and till core. These have been given the labels B14 (B0-PE2-02), B15 (B0-PE1-01) and B16 (B2-PE1-02), respectively.

The recommended Stage 9 threshold levels for VWPs in the Main Embankment foundation are shown in Table 6.3. The table is based off a stability analysis done on plane A and during 2013 all VWPs in plane a remained in the green threshold. A number of VWP in planes B, C, and E have remained stable at the lower edge of the yellow threshold since the stability analysis was completed. Plane K remains in the red threshold were it has been since it was installed in 2011.

Table 6.3: Piezometer Threshold Levels

Condition	Main Embankment Foundation Piezometer	
	Elevation (m)	Above Original Ground (m)
RED	> 933 m	>21 m
YELLOW	916 m to 933 m	4 m to 21 m
GREEN	< 916 m	< 4 m

In 2013, the VWPs indicated the following general trends for the TSF:

- Foundation:
  - Pore pressures in the foundation soils around the TSF embankment were generally noted to be stable with minor fluctuations throughout the year with a few exceptions:

    A slight increase in pore pressure (+0.5 m – 1.0 m) was noted near the end of July in a number of VWPs within the Main Embankment foundation. This increase corresponds to the rockfill placement to raise the buttress downstream of the Main Embankment.

    VWP J1, located downstream of the Perimeter Embankment, indicated a slight increase in pore pressure during April – June and then a significant decrease (-2.6 m) between then the beginning of August. The decrease in pore pressure corresponds to the dewatering activities of the Perimeter Till Borrow Pit in June and July. The borrow pit is located immediately northeast of VWP J1.

    The location of I2 (I2-PE2-03) as a foundation VWP was identified to be incorrect based on inconsistent readings and comparison to other plane I VWPs. It is thought that confusion or mislabelling may have occurred during the transferring of engineer of record in 2011. I2 now corresponds to the label of **I2-PE2-01**, located within the upstream till. The location and status of I2-PE2-03 is currently unknown.

- Zone S:
  - Pore pressures in the Zone S core are generally found to be stable, with a slight increasing trend in response to the rising pond level. Readings from VWP A2 and VWP A14 indicated a steady increase in pore pressure (1.0 m - 2.0 m) throughout 2013, but have appeared to have stabilized towards the end of the year. This is likely due to the lack of an established fine grain tailings beach near Plane I of the South Embankment as well as raising of the crest during construction season.

- Zone F and drain:
  - Pore pressures in all Zone F and drain VWPs, except VWP D3, remained unchanged throughout the year. VWP D3 readings indicate a slight but steady increase in pore pressure. The increase may indicate a restriction in the

drainage of the Zone F material at this location and should continue to be monitored closely.

- Zone U and tailings:
  - Pore pressures in the Zone U and tailings generally experienced an upwards trend in response to the rising pond level. In addition, VWPs that were installed at a lower elevation experienced lower response relative to the VWPs near the pond elevation.

VWP data organized by plane are summarized in Appendix C.

6.4 Slope Inclinometers

A total of nine (9) SIs are installed in the TSF and are currently functional. Three (3) are located within the downstream toe of the Perimeter Embankment while six (6) are located within the Main Embankment's downstream shell. All of the SIs are located within the embankment foundation soils. Drawings 2013AB.09 through 2013AB.13, and Drawing 2013AB.15 show the locations of the SIs in section view.

The recommended threshold levels for SIs are shown in Table 6.4. Bi-Weekly monitoring during the construction and more frequent monitoring during buttress raises indicated that the movement rate was within the green threshold.Table 6.4: Inclinometer Threshold Levels

Condition	Inclinometer Movement Rate	
	(mm/day)	(Bi-Weekly)
RED	> 1 mm/day	>14mm
YELLOW	0.5 mm/day to 1.0 mm/day	7 mm to 14 mm
GREEN	< 0.5 mm/day	7 mm

A number of factors may have affected the accuracy of the displacement readings in 2013.

- A number of the SIs' readings show a jump in displacement in the order of 2-5 mm over a two (2) week period. This appears to correspond to construction of the Main Embankment buttress which took place during June, July and August.

- Towards the end of the 2013 construction season, a number of the SI readings appeared to be steadily increasing in inconsistency. It was noted by MPMC staff that the SI probe had not received up to date calibration in 2013 so it was sent for calibration at the end of December in order to help rectify this issue. Inconsistencies were generally restricted to the less critical B-axis though some surveys were completely ignored due to excessive errors in the readings.

The following general trends in the SIs were noted during 2013:

<u>SI11-01 (Station 1+850) - ME</u>

SI11-01 was re-initialized June 29, 2013. Prior to the extension, essentially no displacement was observed. After the extension through the rest of 2013, displacement was noted to be about 3 mm.

SI01-02 (Station 1+930) - ME

SI01-02 was re-initialized June 29, 2013. Prior to the extension, displacement was noted to be about 5 mm over 6 months. After the extension through the rest of 2013, displacement was noted to be about 4 mm.

SI06-01 (Station 1+980) - ME

SI06-01 was re-initialized June 27, 2013. Prior to the extension, essentially no displacement was observed. After the extension through the rest of 2013, displacement was noted to be about 4 mm.

SI06-02 (Station 2+090) - ME

SI06-02 was re-initialized June 27, 2013. Prior to the extension, essentially no displacement was observed. After the extension through the rest of 2013, displacement was noted to be about 9 mm.

SI06-03 (Station 2+190) – ME

SI06-03 was re-initialized June 18, 2013. Prior to the extension, displacement was noted to be about 3 mm over 6 months. After the extension through the rest of 2013, displacement was noted to be about 2 mm.

SI11-02 (Station 2+460) – ME

Minimal displacement (1-2 mm) was observed in SI11-02 during 2013.

SI12-02 (Station 3+270) – PE

SI12-02 was installed in 2012. Essentially no displacement has been observed in SI12-02 since its installation.

SI11-04 (Station 3+900) – PE

SI11-04 is noted to have a compression displacement pattern at a depth of 5-10 mbgs but no other substantial movements have been observed. Compression displacement is thought to occur as a result of the installation process. Since early 2012 this instrument has shown to decompress slightly over the winter months and then recompress again in early spring. SI12-01 was installed as replacement in 2012.

SI12-01 (Station 3+900) - PE

SI12-01 was installed in 2012 to replace SI11-04. Essentially no displacement has been observed since its installation.

Plots of the SI displacements are provided in Appendix C. For the SIs requiring extending, plots of both before and after re-initialization are shown. It should be noted that the first reading after the re-initialization uses the last reading prior to the extension as the initial reference point.

7.0 WATER MANAGEMENT AND IMPOUNDMENT RAISING SCHEDULE

7.1 General

MPMC maintains the water balance for the TSF and it has not been reviewed by AMEC. Integral component of any mine is the short and long term solid waste and water management. AMEC understands that currently the total inflow from precipitation and surface runoff exceeds losses from evaporation. Thus, MPMC mine site is operating under a water surplus condition, with the surplus being stored in the TSF and the Cariboo Pit with the Perimeter Embankment Till Borrow providing additional storage capacity if required. MPMC transfers water as needed between these locations, and, combined with evaporation and permitted discharge, follows an onsite water management strategy.

7.2 Mass Balance

Survey and pond soundings of the impoundment area are conducted annually by MPMC. The survey data is used to create a revised storage elevation curve for the tailings impoundment, and incorporated into the mass balance model. The updated mass balance model is then used to predict average tailings and pond level/volume within the TSF. In turn, that level plus the PMF event determines the required dam crest elevations and the dam raising schedule.

The mass balance model is updated on a regular basis with actual tonnages (milled/mined) and surveyed pond water elevations to calibrate the model and increase the accuracy of pond level projections.

7.3 Dam Raising Schedule

MPMC is managing the site water balance, and only the corresponding projected pond elevations and respective dam filling schedule have been reviewed by the design engineer. The following section was provided by MPMC:

> *The water balance projects that the current minimum dam crest elevation of 967.0 m is sufficient until August 2014. MPMC holds the option of transferring excess pond water into the mined out Cariboo Pit if required to satisfy freeboard requirements.*

The 2014 embankment raise to crest El. 967.5 m is targeted for completion by the end of June 2014.

7.4 Mine Planning

The 2016 Mine Plan remains unchanged and forms the basis for future dam raises.

8.0 WORKS TO BE COMPLETED

There are a number of outstanding tasks pertaining to the ongoing development of the TSF. These tasks are important to the proper completion of the development of the tailings embankment and AMEC is to be updated on their progress. These tasks include, but are not limited to:

- *Foundation preparation of the Perimeter Abutment*: Foundation preparation and approval needs to be completed up to elevation 967.5 m at the Perimeter abutment.
- *Completion of the till core, downstream filter and transition materials (Zones S, F and T)*: Placement of Zones S, F and T up to a minimum crest elevation of 967.5 m need to be completed on the Perimeter, Main and South embankments prior to the pond elevation reaching 966.2 m;
- *Foundation approval of the Perimeter Embankment:* Inspection and approval of the prepared foundation downstream of the Perimeter Embankment between Station 4+100 and 4+300 is required prior to any further backfilling activities;
- *Instrumentation monitoring:* Monitoring of all TSF instrumentation needs to continue at the recommended intervals outlined in the 2013 Construction Monitoring Manual (AMEC 2013). Extension of the SIs located below the Perimeter Embankment will also need to be completed prior to widening of the downstream toe.

9.0 CONCLUSIONS AND RECOMMENDATIONS

Conclusions drawn on the basis of this annual review and as-built report are as follows:

1. The TSF embankment was raised to a minimum crest elevation (till core) of 967.0 m in 2013.
2. The 2013 raise construction of the TSF embankment was carried out in conformance with design intent.
3. Monitoring of the TSF embankment via instrumentation and visual inspections indicated the following:
    a. Surveys of SIs in and below the downstream shell of the Perimeter Embankment indicate that movements are minor and thus pose no immediate stability concerns.
    b. Surveys of SIs in and below the downstream shell of the Main Embankment indicate that movements are generally minor; however, due to the concerns with the SI probe accuracy, readings should be monitoring closely in the coming year to ensure there are no further concerns with equipment and there remains no significant sign of movement.
    c. Foundation pore pressures have been stable.

d. Pore pressures in the till fill of the dam have increased slightly due to the pore pressure increase of the tailings but not beyond what would be expected.

e. The TSF embankment is performing in accordance with its design intent.

10.0REPORT CLOSURE

This report has been prepared for the exclusive use of MPMC 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 and tailings dam engineering practices. No other warranty, expressed or implied, is made.

Respectfully submitted,

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DRAWINGS

APPENDIX A

2013 CONSTRUCTION SEASON PHOTOGRAPHS

APPENDIX B

MATERIAL TESTING RESULTS

APPENDIX C

INSTRUMENTATION PLOTS

APPENDIX D

SAMPLE REPORTS