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AMEC Project Number VM00448

**Via EMAIL**

Imperial Metals Corporation  
200 – 580 Hornby Street  
Vancouver, B.C. V6C 3B6

Attention: Mr. Ron Martel  
Environmental Superintendent

**Reference: Mt. Polley Mine Tailings Facility  
Optimization Potential – Follow Up from Dam Safety Review**

## 1.0 INTRODUCTION

As per your request, we have undertaken a review of some possible optimization measures for the Mt. Polley Tailings Storage Facility (TSF). This work followed a recently completed dam safety review (DSR) of the facility. Todd Martin, Peter Lighthall and Michael Davies, three Principals with AMEC Earth & Environmental (AMEC), participated in the review. The format for the review was an interactive workshop completed on 19 February 2007. This letter report presents the results of that workshop.

Several potential optimization areas were evaluated and are discussed in this letter in separate sections/subsections. The areas evaluated were:

- Till Management:
  - Minimization
  - Substitution
  - Virtual Elimination
- Buttress Need:
  - Justification
  - Material(s)
- Pond Management:
  - Freeboard Assignment
  - Beach Development
- Stewardship
- Closure Objectives

A PowerPoint outline was used to guide the workshop. That presentation is appended to this letter report.

## 2.0 OPTIMIZATION ISSUES

### 2.1 Till Management

From our review we consider that there is a real opportunity to reduce the width of the core zone being stipulated for the raises moving forward. It is common dam engineering practice to narrow the core with height in the dam though there is a minimum thickness for the core (typically a practical construction consideration – the cost for core can actually increase if placement area narrows sufficiently to impede contractor productivity). The current core width of 8 m is certainly robust. Given the remaining projected height of dam construction to final elevation (assuming that the currently stipulated final elevation is not significantly exceeded), a decrease in core width should be considered for the 2007 raise and each raise thereafter. An acceptable rule of thumb is to have the core width be a minimum of 30% of the maximum head on the core at that particular elevation; for example 20 metres of head corresponds to a 6 metre minimum requirement. For the specific example of the Mt. Polley TSF, the current crest elevation is 950 m and the closure crest will be 965 m. Assuming a closure freeboard of, say, 1 metre, then there would be a maximum additional head of 14 metres of water pressure on the present core resulting in a minimum core width requirement of just over 5 metres ( $0.3 \times 14$ ). The core could be further narrowed as the dam is raised in future, down to a practical minimum width of 3 m to 4 m.

There may be other opportunities to reduce till requirements in the future as the dams reach their ultimate crest elevations. These future opportunities would not affect dam construction costs in the near term but could represent significant future optimizations. The measures that should be considered include:

- Elimination of the top 1 metre of core, above the maximum pond storage level. An impervious core is not required in this upper part of the crest that essentially only provides freeboard. This would be consistent with the design for the final dam crests at Huckleberry and Kemess.
- Core alternatives such as a bituminous liner could be considered for the final few raises of the embankment section as the head will be low and confinement of such a liner is relatively straightforward to achieve. Bituminous liners are increasingly being accepted in long-term applications such as a closed tailings dam.

### 2.2 Buttness Need

Per the 2006 DSR report, it remains unclear to us why a buttressing berm has been specified for the closure geometry of the TSF. Provided that the foundation parameters are consistent with the glacial till reported in the documents to date, there should not be a foundation concern with the existing Main Embankment Dam geometry. The foundation strength parameters indicated in design documentation for the TSF to date and the current planned geometry without a berm would result in adequate stability conditions for operations and the closure condition.

The only uncertainty is the nature of the foundation soils regarding potential presheared planes of weakness. This issue was raised during the DSR but had not been noted in previous design

documentation. If there is no such concern, as above, then there would appear to be no real need for the proposed berm.

Finally, if there is a valid reason for the berm identified the berm material need not necessarily be waste rock from the mine. All that would be required is an equivalent mass and, depending upon placement and geochemical considerations, even tailings may be an acceptable berm construction material.

### **2.3 Pond Management**

The mine maintains a comprehensive water balance for the TSF. This balance appears to be fine-tuned to an accuracy that is in the range of centimetres in terms of pond elevation. The currently stated freeboard requirement of 1.0 metres for wave runup from wind activity is excessive and could be reduced to a value readily calculable but not likely to be more than 0.3 metres. This amount of wave freeboard would then be added to the Inflow Design Flood (IDF) for the chosen return period. It is likely that the operating freeboard could be reduced from about 1.4 m to, say, about 0.7 to 1.0 m. It should be noted however that, as the TSF is operated without a spillway, longer duration IDF events would result in larger inflows which may argue against any additional reduction in freeboard beyond the wave runup reduction. What likely is required is an overall assessment of the inflows, design floods and resulting freeboard implications. It is likely such a review would result in a reduction in the minimum freeboard requirements.

In terms of beach development, as long as there is not water depth to the point where the dyke raise portion that is built out in the pondward direction has instability issues, there is no rush to develop a beach on the impoundment from the Main Embankment. During operations, the TSF is provided frequent inspection and piezometric monitoring of installed instruments. Subject to continued regular visual observations by mine personnel and favourable piezometric conditions through the dam and foundation as confirmed by piezometers, minimal if any above-water beach required. In other words, there is no real need, subject to continued good piezometric conditions, for a formal subaerial beach during operations. If piezometers in one portion of the dam indicate unfavourable trends, then beaching could be concentrated in that area. As discussed below in Section 2.5, development of a beach consistent with closure expectations will eventually be required, though simply keeping the water depth to a bare minimum (not more than about one metre) should be sufficient until the last one or two lifts of the facility. This should allow some capital planning for the eventual expense of having to create a closure geometry consistent with a TSF pond spillway adjacent to the natural ground/embankment interface on either the Perimeter or South Embankments (we understand the former location is the currently preferred option). Finally, from a pragmatic perspective, given the geometry of the impoundment and the positive water balance, it is difficult to envision operating conditions that could maintain an above-water beach all the way along the dam at all times during operations. The tailings disposal operation need not and should not be constrained unnecessarily in that regard.

## 2.4 Facility Stewardship

We understand there is a challenge as to the degree of designer involvement in construction inspection of the facility as well as in the consistency of personnel for that role. While we recognize the opportunity in maintaining a consistent staff from year to year, the level of interchange of personnel indicated for this site has been in excess of normal practice. It is also possible that some of the more routine aspects of the construction could have reduced, or eliminated, third party inspection given the track record and site record keeping practices. Finally, in this regard of site inspection, training by personnel familiar with the site from the previous years' construction activity is essential.

The incremental designs are of a consistent quality and fully meet all current engineering standards. The one aspect of the designs perhaps missing in more recent raise designs has been some degree of optimization as the current design section appears pretty much identical to the original section. Some degree of optimization to benefit from the observed performance would typically be expected.

## 2.5 Closure Considerations

The current closure concept for the TSF is currently at odds with the way in which the pond is operating. As noted in 2.3, this is not something that requires immediate attention provided water depths at the embankments is kept to a minimum.

Finally, the conceptual layout in Figure 1 of the provided "Preliminary Design of the Tailings Storage Facility to its Ultimate Elevation" cannot be practically achieved. The nature of the manner in which tailings beaches develops is at odds with the schematic concept in Figure 1. A more realistic tailings planning exercise will be required prior to adopting a final closure plan for the TSF.

### 3.0 SUMMARY COMMENTS

There are some immediate optimization opportunities for the mine to consider in 2007 with its TSF. These include:

- narrowing the till core;
- getting a clear response on whether a buttressing berm is actually required (and if so, very specifically why is it required?); and
- reducing the operating freeboard (and thus reducing the amount of embankment raise).

There are some other potential optimizations that may be realized in future.

Recommendations presented herein are based on an evaluation of the available information from a recent DSR and the collective experience of the undersigned. If conditions other than those reported are noted during subsequent phases of the project, AMEC should be notified and be given the opportunity to review and revise the current recommendations, if necessary.

This report has been prepared for the exclusive use of Imperial Metals for specific application to the area within this report. It is not intended in any way to be a review of another engineer's work. 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 soil and foundation engineering practices. No other warranty, expressed or implied, is made.

Respectfully submitted,

#### AMEC Earth & Environmental

Todd E. Martin, P.Eng., P.Geo.  
Principal Geotechnical Engineer

Michael P. Davies, P.Eng, P.Geo.  
Vice-President  
Principal Geotechnical Engineer

Peter C. Lighthall, P.Eng.  
Vice-President  
Principal Geotechnical Engineer