Dear Mr. Fequet:

Response to Information Requests - DDMI Closure Cost Estimate for Rock Cover

On November 23, 2016 GNWT – ENR provided comments to the Wek’eezhii Land and Water Board (WLWB) regarding Diavik Diamond Mines (2012) Inc.’s (DDMI) Closure Cost Estimate for Type III Rock in the CLR Basin. In those comments, GNWT – ENR provided recommendations regarding adopting unit costs developed for the Ekati mine as well as updated unit costs from the most recent version of RECLAIM. On January 12, 2017 the WLWB issued an IR to GNWT – ENR seeking greater clarity around these costs. Specifically, the WLWB requested answers to the following two questions:

1. Use of DDEC Site-Specific Unit Costs
   a. Provide a rationale for why DDEC’s site specific unit costs for covering Type III rock are more appropriate at the Diavik site than the default unit costs in RECLAIM Version 7.

   b. If the Board determines that DDEC’s unit costs for the cover are appropriate at the Diavik site, does the GNWT believe that future updates to one mine’s unit cost should automatically result in a corresponding change for the other mine?

2. Re-sloping cost
   The GNWT has proposed updating the re-sloping unit cost labelled “DSL” (doze overburden/soil piles, low) from $0.95/m³ to $1.05/m³ and DDMI has objected.

   Please explain the basis for the GNWT’s proposed increase. Please note that RECLAIM Version 7 provides a range of $0.95/m³ to $3.80/m³, with a comment that the high end of the range is for pushing materials up to 300 meters.

3. Unit Costs for the Cover
   The unit costs in DDMI’s approved RECLAIM estimate for constructing the cover are described in the table below.
The GNWT has proposed using site-specific unit costs calculated for the Ekati site. If the Board does not wish to adopt the Ekati unit costs, it will consider the unit costs in RECLAIM Version 7, and the unit costs in DDMI’s approved estimate. It is not clear that the unit costs currently used in DDMI’s approved RECLAIM estimate appropriately reflect the unit costs and guidance provided in RECLAIM Version 7.

Please provide the most appropriate unit costs for till and Type I rock placement based on the RECLAIM Version 7 unit costs with rationale.

4. Other Areas of the Site
During the review of the RECLAIM estimate submitted with DDMI’s Version 1.1 of the 2015 Annual Closure and Reclamation Progress Report, the GNWT recommended that DDMI provide an updated security estimate for the WRSA and the PKC facility using the same method to calculate DDEC’s rock cover unit costs. Please provide an opinion on whether the Board should adjust the closure cost estimate to reflect these changes now or with the RECLAIM update for ICRP Version 4.

GNWT – ENR provides this letter in response to these questions and has retained Brodie Consulting Ltd. (BCL) to provide additional clarification on the points raised by the WLWB, and BCL’s memo is attached with this letter.
1. **Use of DDEC Specific Unit Costs:**

**Response 1a:**

As described more fully in the attached BCL memo, RECLAIM unit costs are based upon unit costs which have been reported for third party work at northern mines, to the extent that such information is available. The unit costs provided in the RECLAIM model represent a range of costs that are considered appropriate for a given activity based upon the knowledge of such costs at the time the unit cost was generated. In this case, RECLAIM 7 was created in March 2014. As new information becomes available and it is scrutinized and evaluated, it is appropriate to use the updated unit costs to calculate security for similar activities and project components.

As described in the attached memo from BCL:

> "Given the similarity in the expected activities and level of effort for construction of covers over WRSA's at Diavik and Ekati, consistency in unit costs would also be expected. It is not to say that the RECLAIM default unit costs are not appropriate, as the DDEC unit costs of $7.09 to $9.65 fall within the range of $5.10 - $17.80 provided in RECLAIM. At this time, and in the absence of rationale as to why DDEC's unit costs should be different than DDMI's, BCL recommends that the site specific unit costs derived by DDEC be applied to DDMI's costs for cover of the WRSA."

In GNWT – ENR's opinion, since the type of work to be completed at DDMI's site is very similar to the work that has been recently costed at the DDEC site, it is appropriate to apply the updated DDEC unit costs to the corresponding activity at DDMI's site.

**Response 1b:**

GNWT - ENR believes that the most recent unit cost should always be used for calculating the reclamation liability for a mine site. ENR recognizes that significant effort that is required to generate a RECLAIM estimate through the WLWB review process. For major diamond mine projects, under the oversight of the WLWB, the review of security typically occurs on an annual basis. This may be an appropriate schedule where unit cost updates could be assessed.

In the existing case for DDMI, the security estimate was being reviewed and ENR was in possession of updated unit costs developed for a very similar type of work, for an operation occurring in a similar environment. Thus, GNWT – ENR believed it was reasonable to use the most up to date unit cost.
2. **Sloping Cost:**

GNWT - ENR has recommended updating the re-sloping unit cost from DSL at $0.95/m³ to DRL at $1.05/m³. We note that DSL unit cost (doze overburden/soil piles, low) is intended to be used for dozing soil material whereas the unit cost DRL is for dozing rock piles. GNWT - ENR believes that the DRL unit cost is more appropriate for the activity being proposed by DDMI, which is for working on waste rock surfaces. For these activities, the DRL unit cost is $1.05/m³ in RECLAIM 7.

Similar to the response provided for 1b above, GNWT – ENR is of the opinion that the most recent unit costs should be used, and this review provided the opportunity to both update the unit cost type as well as incorporate the most up to date unit cost amount.

3. **Unit Costs for the Cover**

The attached memo from BCL provides the following recommendation for estimating the unit cost for the cover. GNWT – ENR notes that these rates are estimated using SB3L, which is the lowest rate for the scope of work associated with this activity. The additional costs to rip or drill/blast of frozen rock or till is added to the unit cost SB3L of $5.10/m³.

"Excavate soil/load/short haul/place and compact (SB3L $5.10) + Rip or Drill/blast the stockpiled waste rock.

*There are not specific unit costs for either ripping or drill/blast in RECLAIM. Given recent review and approval of the unit costs for these activities of $1.05/m³ and $3.30/m³ respectively, the unit costs for till and Type I rock placement would therefore be between $6.15/m³ - $8.40/m³."

4. **Other areas of the Site**

As noted in the previous response to IR 1b, the GNWT - ENR believes that the most recent unit cost should be used in security estimates. The most appropriate time to reflect this updated unit cost(s) in other estimates is at the discretion of the WLWB but recently security reviews have happened annually.

ENR does not oppose the inclusion of these revisions immediately. Alternatively, an update to the DDMI costs could follow the approval of the Final North Country Rock Pile (NCRP) Closure Plan, which is anticipated in the coming months.
If you have any questions regarding the responses, please contact Nathen Richea at Nathen.Richea@gov.nt.ca or 767-9234 ext.53110.

Sincerely,

[Signature]

Robert Jenkins
Director
Water Resources Division

Attachment:

BCL Memo – DDMI – Closure Cost Estimate for Type III Rock in the CLR – WLWB IR to GNWT
MEMORANDUM

DATE: February 14, 2017

TO: Paul Green; GNWT - ENR Water Resources Division


SUBJECT: DDMI - Closure Cost Estimate for Type III Rock in the CLR - WLWB IR to GNWT

1 BACKGROUND

GNWT-ENR submitted comments to the Wek'eезhii Land and Water Board (WLWB, 2016a) regarding Diavik Diamond Mines (2012) Inc. (DDMI) cost estimate for covering Type III waste rock (potentially acid generating) in the CLR basin of the Waste Rock Storage Area (WRSA) submitted by DDMI October 13, 2016 (DDMI 2016a). DDMI responded to GNWT’s comments on November 30, 2016 (DDMI, 2016b).

To assist the Board in setting security for the closure and reclamation of the Type III waste rock in the CLR basin, the Board has requested GNWT-ENR submit further information regarding the cost estimate. This memo provides comments and recommendations to assist GNWT-ENR in providing the requested information.

2 IRS

2.1 IR1. Use of DDEC Site-Specific Unit Costs

IR1a. Provide a rationale for why DDEC’s site specific unit costs for covering Type III rock are more appropriate at the Diavik site than the default unit costs in RECLAIM Version 7.

IR1a. Response:

The selection of appropriate unit costs for cover is not unique to the Type III rock in the CLR basin. Appropriate unit costs for cover has been a topic of considerable attention during reviews of security estimates for Ekati, Diavik and other mines for many years.

DDEC Site Specific Unit Costs:

The following provides a summary of the evolution of DDEC's site specific unit costs for what is referred to in DDEC's security estimate table of unit costs as “granite rock capping”.

In 2013, BHP Billiton Canada Inc. (BBCI) presented unit costs that were significantly higher than those provided by AANDC for waste rock capping in the 2011 Diavik RECLAIM estimate (BBCI, 2013). These included 4 activities:
- Drill Blast Granite Rock
- Rip Granite Rock
- Load/Short Haul/Spread Compact
- Load/Long Haul/Spread Compact

In DDEC's 2014 Annual CRP Progress Report, a fifth unit cost was added: Drill Blast Granite Rock (Remined Rock) of $2.13/m³ with the original Drill Blast Granite Rock being for Intact Rock. This was specific to re-mining of granite waste rock from existing waste rock storage areas (WRSAs) for use as capping materials. The unit cost for drilling and blasting of stockpiled waste rock reflected a lower level of effort than conventional open pit drilling and blasting (DDEC, 2014). This unit cost was further revised to $2.43/m³ in DDEC's 2015 Annual CRP Progress Report (DDEC, 2015). DDEC subsequently added comment that a third party contractor cost for construction of the Sable Haul Road included the drill and blasting of ~ 1Mm³ of granite from the Panda/Koala WRSA at a unit cost of $3.00/m³ (WLWB, 2016a). The WLWB determined "the site specific unit cost for drilling/blasting of previously mined waste rock at Ekati to be $3.30/m³" (WLWB, 2016b). For cover construction, the cost of load/haul/spread compact would be in addition to the $3.30/m³.

To be clear, and as has been noted by DDMI (DDMI, 2016b), DDEC has not proposed revisions to the other unit costs associated with construction of granite caps, such as load/haul/spread and compact. The unit costs for those activities remain the same as has previously been approved for DDEC's security estimate, which are only slightly higher than the 2013 BBCI unit costs.

RECLAIM v 7.0 Unit Costs:
Since inception in 1992, RECLAIM has been based upon unit costs which have been reported for third-party contractor work at northern mines, to the extent that such information is available. Data for a variety of common reclamation tasks have been obtained and the model has been periodically updated. The most recent version of RECLAIM, v 7.0, was updated in 2014. Review of cover design, construction constraints, and sources of material continues to inform unit costs. The unit costs used for calculation of Security Estimates by DDEC are considered relevant given the similarities in the types and source of cover materials, scale of project, cover design, and construction constraints. As are more recent unit costs at other sites, either based on estimates put forward by the company or actual work completed.

In this regard, the unit costs in RECLAIM 7.0 are appropriate but the selection of the unit cost within the range provided must represent the level of effort expected. For the activities associated with construction of covers, the unit costs of excavate soil (bulk) or excavate rock (bulk) are higher for intact rock requiring drilling and blasting than an unfrozen overburden stockpile. Construction of covers with the source of material being a waste rock pile compacted by the passage of loaded haul trucks and with frozen zones could be considered to require a level of effort somewhere between the lowest unit cost for this activity (SB3L = $5.10/m³) to the highest (RB3H = $17.80/m³). The site specific unit costs included in DDEC's Security Estimate fall within this range and thus are considered appropriate and consistent with RECLAIM v 7.0 unit costs.
Comparison of Unit Costs:
For comparison, Table 1 provides the range of unit costs for covers at mines where WRSA's are proposed to be covered with overburden or waste rock. As shown, the unit costs approved in DDMI's Security Estimate are low in comparison with Board approved costs at other mines and are at or below the lowest provided in RECLAIM 7.0.

<table>
<thead>
<tr>
<th>Mine and Year of Most Recent Review</th>
<th>Unit Costs for WRSA Covers (or similar) ($/m³)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diavik (2016):</td>
<td>$4.20 - waste rock $5.10 - till</td>
<td>Average for a variety of cover applications (i.e. material sources are stockpiled waste rock and overburden and covers include tailings storage facilities and hazardous waste disposal site).</td>
</tr>
<tr>
<td>Con (2015):</td>
<td>$12.88</td>
<td></td>
</tr>
<tr>
<td>Gahcho Kue (2016)</td>
<td>$5.50 overburden cover to provide vegetation substrate $6.00 - Waste rock cover over coarse PK.</td>
<td></td>
</tr>
<tr>
<td>RECLAIM 7.0 (2014)</td>
<td>$5.10 - $8.90 - soil $12.05-$17.80 - rock (includes drill/blast intact rock)</td>
<td>Costs for bulk unit costs (as opposed to controlled) are considered appropriate to large quantities and little variability in design.</td>
</tr>
<tr>
<td>Completed Contracts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faro (2010)</td>
<td>$6.00</td>
<td>Contractor rates for relocating waste rock. ~1 Mm³ moved less than 300 m, mostly downhill movement. Approximately 50% moved by dozer, and 50% moved by load/haul/dump. Unfrozen, soft rock.</td>
</tr>
</tbody>
</table>

Selection of Unit Cost for DDMI:
Given the similarity in the expected activities and level of effort for construction of covers over WRSA's at Diavik and Ekati, consistency in unit costs would also be expected. It is not to say that the RECLAIM default unit costs are not appropriate, as the DDEC unit costs of $7.09 to $9.65 fall within the range of $5.10 - $17.80 provided in RECLAIM. At this time, and in the absence of rationale as to why DDEC's unit costs should be different than DDMI's, BCL recommends that the site specific unit costs derived by DDEC be applied to DDMI's costs for cover of the WRSA.
IR1b. If the Board determines that DDEC's unit costs for the cover are appropriate at the Diavik site, does the GNWT believe that future updates to one mine's unit cost should automatically result in a corresponding change for the other mine?

IR1b. Response
The GNWT would be better suited to respond to this Information Request. However, from a security estimation purpose, it is BCL's opinion that should there be new information that causes a material change in unit costs that are not attributable to site specific conditions then a review of security for other mines may be warranted. Consideration should be given as to when a review should occur, whether as part of an update to the CRP which would allow for a more comprehensive review, or during another time deemed appropriate to relieve regulatory burden (upcoming licence renewal or project amendment/expansion).

DDMI's letter (2016b) states "It is DDMI's opinion that consistency of unit rates within an operation is more important than consistency between operations. Site-specific unit costs derived for one operation may not be directly applicable to another..." It is BCL's opinion that consistency within an operation as well as between operations is appropriate, particularly when the activities proposed are very similar.

It should also be noted that DDMI adopted the unit costs approved for DDEC in the 2015 Annual Closure and Reclamation Report Security Estimate, though they appeared to have misinterpreted that the DDEC unit cost was in two parts: drill/blast and load/haul/spread and compact.

2.2 IR2. Re-sloping Cost
The GNWT has proposed updating the re-sloping unit cost labelled "DSL" (doze overburden/soil piles, low) from $0.95/m³ to $1.05/m³ and DDMI has objected. Please explain the basis for the GNWT's proposed increase. Please note that RECLAIM v7 provides a range of $0.95/m³ to $3.80/m³, with a comment that the high end of the range is for pushing materials up to 300m.

IR2. Response
The re-sloping cost proposed by GNWT-ENR of $1.05/m³ is consistent with the unit cost in RECLAIM of DRL - doze rock pile. The unit cost maintained by DDMI of $0.95/m³ is the lowest cost in RECLAIM for dozing soil/overburden piles (DSL). It is BCL’s opinion that the level of effort to doze waste rock surfaces would be higher than unfrozen soil and overburden surfaces.

Further to this point, BCL is concerned that the unit costs of DRL or DSL (at even $1.05/m³) are too low for what is required to prepare a uniform sloped surface prior to placement of till. This is based on professional judgment as opposed to comparable experience or references to validate.

2.3 IR3. Unit Costs for the Cover
Please provide the most appropriate unit costs for till and Type I rock placement based on the RECLAIM v7 unit costs with rationale.

IR3 Response
As indicated in response to IR1a., the unit costs approved for DDEC are within the range provided in RECLAIM. That is, they are between the low cost for excavate soil/load/haul/spread
and compact (SB3L) and excavate rock/load/haul/spread and compact (RB3L). If the Board is looking for input on how RECLAIM unit costs could be used for DDMI, the following is offered:

- Excavate soil/load/short haul/place and compact (SB3L $5.10) + Rip or Drill/blast the stockpiled waste rock.

There are not specific unit costs for either ripping or drill/blast in RECLAIM. Given recent review and approval of the unit costs for these activities of $1.05/m³ and $3.30/m³ respectively, the unit costs for till and Type I rock placement would therefore be between $6.15/m³ - $8.40/m³. Given that the till will be frozen and could potentially require the same level of effort as excavating waste rock, and may require thawing to spread, previous assumptions that the unit cost for till should be lower than for stockpiled waste rock may not be correct.

While the unit cost derived above is based on the default unit cost of SB3L of $5.10/m³, BCL notes that this is the lowest cost for this activity.

Future revisions to RECLAIM will include unit costs for covers based on DDEC's unit costs and others as this information continues to be amassed and refined.

2.4 IR4. Other Areas of the Site

During the review of the RECLAIM estimate submitted with DDMI's Version 1.1 of the 2015 Annual Closure and Reclamation Progress Report, the GNWT recommended that DDMI provide an updated security estimate for the WRSA and the PKC facility using the same method to calculate DDEC's rock cover unit costs. Please provide an opinion on whether the Board should adjust the closure cost estimate to reflect these changes now or within the RECLAIM update for ICRP v 4.

IR4 Response

The GNWT would be better suited to respond to this Information Request. However, from a security estimation purpose, it is BCL’s opinion that it may be most efficient to adjust the closure cost estimate as part of the RECLAIM update for ICRP v 4. This would allow for a comprehensive review of the security estimate for the WRSA, PKC facility, and other components where rock or till covers will be placed. However, given that the exact submission or approval date of ICRP v 4 is not known at this time, adjusting DDMI's closure cost estimate now to reflect changes to rock capping unit costs would avoid what may be significant delays that could put GNWT at risk of being under secured for an extended period.
3 CLOSURE

We trust that the above provides sufficient information to assist GNWT-ENR in preparation of the responses to the WLWB Information Requests. Please do not hesitate to contact us for questions or clarification.

Yours truly,
Brodie Consulting Ltd.

Lara Fletcher, P.Eng.

References:


