Hello David,

Please find the attached letter, sent on behalf of Shelagh Montgomery, Executive Director of the Mackenzie Valley Land and Water Board and Jonathan Tsetso, Superintendent – Nahanni National Park Reserve, regarding CZN’s applications for land use permits and water licences related to their All-Season Road Project.

Please let me know if you have any questions.

Julian Morse
Regulatory Specialist
Mackenzie Valley Land and Water Board
7th Floor, 4922 48th St. | PO Box 2130 | Yellowknife, NT | Canada | X1A 2P6
ph 867.766.7453 | mobile 867.446.0276 | fax 867.873.6610
jmorse@mvlwb.com | www.mvlwb.com

Please note: All correspondence to the Board, including emails, letters, faxes, and attachments are public documents and may be posted to the Public Registry.
Mr. David Harpley  
Canadian Zinc Corporation  
SUITE 1710-650 West Georgia Street  
P.O. Box 11644  
Vancouver BC V6B 4N9  
Email: david@canadianzinc.com

Dear Mr. Harpley:

**Submission Requirements for All-Season Road Applications – Water Licence MV/PC2014L8-0006 and Land Use Permit MV/PC2014F0013 – Prairie Creek Mine, Prairie Creek, NT**

The Mackenzie Valley Environmental Impact Review Board (MVEIRB) released its Report of Environmental Assessment (REA) EA1415-01 for the *Prairie Creek All Season Road* (Project) on September 12, 2017. The Minister of Crown-Indigenous Relations, as the federal Minister for this project, with concurrence from all responsible ministers, provided her approval of the EA (Environmental Assessment), on October 9, 2018.

In order to recommence the water licensing and land use permitting process, the Mackenzie Valley Land and Water Board (the Board) and Parks Canada jointly require Canadian Zinc Corporation (CZN) to submit a Post-EA Information Package. This information is being requested to fulfill section 72.1 of the *Mackenzie Valley Resource Management Act (MVRMA)*, subsection
19(2) of the *Mackenzie Valley Land Use Regulations*, and section 41.1 of the *Canada National Parks Act* within Nahanni National Park Reserve. Parks Canada will make best efforts to follow the Board’s timeline and process, however Parks Canada does not have a legislated timeline.

**Post-EA Information Package Minimum Requirements**
The Post-EA Information Package shall include at a minimum the requirements outlined in Schedules 1-3 (attached). To make the review process more efficient, please submit information organized separately by Schedule.

The requirements listed in the attached Schedules are the minimum requirements of the Board and Parks Canada. CZN may choose to submit additional information as part of the Post-EA Information Package. The submission of complete information will increase the efficiency of the process.

Please note that all information submitted must comply with the Board’s [Document Submission Standards](#) and [Standards for Geographical Information Systems (GIS) Submissions](#).

All draft management and monitoring plans must be prepared according to:
- the guidelines referenced in the Schedule;
- REA measures and/or suggestions as referenced;
- Appendix B of the REA;
- the Board’s [Standard Outline for Management Plans](#); and
- Measure 15-1 for all monitoring.

**Conformity Table**
A conformity table must be included to indicate how all the requirements of the Post-EA Information Package have been satisfied. Should CZN be unable to include any of the information requested, please provide rationale.

**Generic Work Plan and Timelines**
Once the Post-EA Information Package is received and determined to completely satisfy the Board and Parks Canada’s requirements, CZN can expect the timeline as outlined in the generic work plan in Schedule 4 (attached). Please note that the timeline is approximate, and is subject to change due to the Board, Parks Canada, proponent and reviewer schedules, and the need for further information or additional public reviews.

**Split-Interest Project – Board Jurisdiction**
The Government of the Northwest Territories and Federal Government have recently clarified that separate water licences are required where a project crosses Federal and Territorial lands. For this reason, the portion of the undertaking on Indian Affairs Branch (IAB) lands near Nahanni Butte will require a separate licence. Information requirements such as RECLAIM estimates will therefore need to be separated based on whether the activities will take place on IAB or Territorial lands.

**Request to Meet and Notification Prior to Submittal**
The Board and Parks Canada recommend that a meeting be held between CZN, the Board and Parks Canada staff to discuss the requirements of this information request and any concerns or comments you may have. Please contact us at your earliest convenience to set up this meeting.
CZN is requested to provide notification to the Board and Parks Canada a minimum of ten days in advance of when they intend to submit the information required by this request, to allow staff to prepare to receive the submission. CZN is encouraged to remain in close contact with Board and Parks Canada staff as they prepare their submission.

Finally, the Board considers the nine-month timeline for the processing of a water licence, subsection 72.18(1) of the MVRMA, to be paused in accordance with subsection 72.22(1) of the MVRMA until the Board and Parks Canada receive the information requested in this letter and deem the responses satisfactory.

Please note that requirements from other regulators (i.e., DFO) may be different or expanded over the level of information requested in this letter and attached schedules.

If you have any questions or concerns regarding this letter, please contact Shelagh Montgomery at (867) 766-7457 or smontgomery@mvlwb.com or Jonathan Tsetso at (867) 695-7753 or Jon.Tsetso@pc.gc.ca.

Sincerely,

Shelagh Montgomery
Executive Director MVLWB

&

Jonathan Tsetso
Superintendent, Nahanni National Park Reserve

Copied to: Distribution List

Attached: Schedule 1: Post-EA Information Package — Minimum Requirements to be sent to the Board and Parks Canada
Schedule 2: Post-EA Information Package — Board-specific requirements
Schedule 3: Post-EA Information Package — Parks Canada-specific requirements
Schedule 4: Type B Water Licence Generic Work Plan
RECLAIM template
RECLAIM User Manual
Schedule 1: Post-EA Information Package – Minimum Requirements to be sent to the Board and Parks Canada

The Post-EA Information Package is to include at minimum the information outlined below, however the Proponent may choose to format this information in a different manner, for instance where similar information is required by multiple plans. The Post-EA Information Package should incorporate changes made to the Project design during the EA process, as well as changes made to address relevant measures, suggestions and commitments.

Joint management and monitoring plans are required, as listed below. Within joint plans, information should be organized to clearly identify to which jurisdiction(s) it pertains.

Information Requested from the Proponent

I. Updated Project Description (UPD)

The UPD is meant to be a stand-alone document that provides an overview of the entire proposed Project. It should give enough detail to allow the Board, Parks Canada and reviewers to understand key aspects of the Project setting as well as how each phase of the Project will occur. Where details have been provided in other submissions being made with the Post-EA Information Package (e.g., draft management plans for specific Project components, etc.), the Proponent should summarize the information in the UPD and then refer to the more detailed submission.

The UPD shall include the following information:

a) Project history:
   i. Regulatory history – e.g., previous permits/licences, currently held claims, environmental assessment/impact review, etc.

b) Project schedule:
   i. Summary of how the Project will be sequenced, including pre-construction and all Project phases; and
   ii. Term of Licence and Permit being applied for.

c) Geology and geochemical characterization:
   i. Geological setting;
   ii. Geochemical characterization of rock;
   iii. Rock face/soil slope geohazard and global stability assessments:
      a. Hazard ratings for major fill and cut slopes (e.g. km 28-29, 31-39); and
      b. Proposed mitigations at above locations.

d) Detailed description of Project components – describe Project components; provide drawings, maps or supporting documentation as necessary, including:
   i. Draft plans and profile drawings (50% stage) along the entire alignment, including standard cross-sections; and
   ii. Bridges, crossings and culverts, including updated general arrangement plans for major crossings.
iii. Quarries and borrow sources, including:
   a. Proposed total footprints (including access roads where required); and
   b. Estimated volumes (soils, overburden, and gravels).
iv. Rock storage areas
v. Waste management infrastructure, including wastewater treatment and discharge (if applicable)
vi. Fuel use and storage
vii. Camp related infrastructure and staging areas:
   a. Intended uses at each site;
   b. Proposed clearing and development footprints; and
   c. Proposed surface treatments (gravel, drainage).
viii. Fresh water withdrawal facilities
ix. Estimated water use volumes associated with the Project, and the locations of all fresh water withdrawal areas for the whole project including winter and summer construction and operations. Daily and total annual water use volumes must be presented separately for each jurisdiction the project will cross (Parks Canada, Government of the Northwest Territories, and the Federal Government).
x. Maps of the Project area of sufficient various scales to provide detailed information on the road corridor, camps, and quarries, and showing the entirety of the road corridor in the context of its geographical surroundings. This should include:
   a. at least one map, approximately 2x3 ft (poster-sized), which illustrates the following: the Project and main facilities, water crossings, water withdrawal locations, potential water monitoring locations, and the direction of water flow paths; and
   b. Environmental alignment sheets for the entire alignment at a scale of approximately 3 km/page, including key engineering and environmental features.
xii. A list of studies undertaken to date. This essentially means a list of all information/reports/investigations which support the information given in the Post-EA Information Package, as necessary. Complete references using public registry ID number should be included (in addition, hyperlink to document on registry is preferred), and these reports must be available upon request. Please note that raw data (e.g., data in Excel spreadsheets) may also be requested by the Board or Parks Canada.

II. Provide an updated table of Developer’s commitments that includes all commitments from Appendix C of the REA as well as any additional commitments, including all those referred to in commitment #60 of Appendix C. Please use the column headings below to provide this information while maintaining the same numbering system (ID) as Appendix C.

<table>
<thead>
<tr>
<th>Column headings</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>From REA Appendix C for existing commitments</td>
</tr>
<tr>
<td>Subtopic</td>
<td>From REA Appendix C for existing commitments</td>
</tr>
<tr>
<td><strong>EA Phase</strong></td>
<td>From REA Appendix C for existing commitments</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td><strong>Commitment</strong></td>
<td>From REA Appendix C for existing commitments</td>
</tr>
<tr>
<td><strong>Reference</strong></td>
<td>From REA Appendix C for existing commitments</td>
</tr>
<tr>
<td><strong>REA Measure or Suggestion</strong></td>
<td>If the commitment is associated with an REA Measure or Suggestion, identify it here</td>
</tr>
<tr>
<td><strong>Management or Monitoring Plan</strong></td>
<td>If the commitment will be contained with an Management or Monitoring Plan, identify it here</td>
</tr>
<tr>
<td><strong>Action and timeline</strong></td>
<td>Describe how and when CZN proposes fulfilling the commitment, or identify if the action has been completed</td>
</tr>
<tr>
<td><strong>Jurisdiction: MVLWB</strong></td>
<td>Mark with “x” if commitment is within MVLWB jurisdiction</td>
</tr>
<tr>
<td><strong>Jurisdiction: Parks Canada</strong></td>
<td>Mark with “x” if commitment is within Parks Canada jurisdiction</td>
</tr>
</tbody>
</table>

III. Provide a Draft Terms of Reference for the Independent Technical Review Panel in accordance with EA Measure 5-1. In addition, it is recommended that CZN provide a list of panel nominees and several alternates, as doing so will expedite the panel selection process.

IV. Provide a Draft Traffic Control Mitigation and Management Plan developed in accordance with REA Measure 5-2.

V. Measures 6-1, 6-2, 6-3: Wildlife baseline information collection, monitoring, mitigation and adaptive management, including reducing the risk of vehicle collisions with wildlife:
   a. Measure 6-1, Part 2 - Provide plans for collecting baseline data; and
   b. Provide a single, updated and consolidated Draft Wildlife Management and Monitoring Plan (WMMP) for the entire alignment developed in accordance with Measure 6-1 part 3, 6-2 part 3 and Measure 6-3, and ENR’s WMMP Guidelines:
      - WMMP overview of the guidelines public presentation
      - WMMP Guidelines 1: Process Requirements
      - WMMP Guidelines 2: Content Requirements
      - WMMP Guidelines: Acronyms and Definitions

Note that Parks Canada and GNWT ENR intend to use the MVLWB process to conduct a public review of the draft WMMP, as required under 6-2 Part 1 (b) and 6-2 Part 2 (b).

VI. Measure 8-1: Water baseline data, mitigation, monitoring, and adaptive management:
   a. Measure 8-1, Part 2 – Provide plans for collecting baseline data in accordance with Measure 8-1, Part 2;
   b. Measure 8-1, Part 3 – Discuss how CZN intends to use baseline data collected in accordance with Measure 8-1, Part 2, to determine appropriate mitigation of potential impacts;
   c. Measure 8-1, Part 4 – Provide a draft of CZN’s water monitoring strategy; and
d. Measure 8-1, Part 5 – Provide a draft of CZN’s adaptive management framework for water, developed in accordance with Measure 8-1, Part 5 and Appendix B of the REA.

VII. Provide an Updated Engagement Plan and Engagement Record, in accordance with REA Measure 10-1, and the Board’s Engagement Guidelines for Applicants and Holders of Water licences and Land Use Permits.

VIII. Measure 10-2: Archaeological Impact Assessment – Provide plans for conducting an AIA in accordance with Measure 10-2.

IX. Measure 11-2: Invasive species management:
   a. Measure 11-2, Part 2 – Provide plans for completing a survey of the right-of-way for the presence of invasive species;
   b. Measure 11-2, Part 3 – Discuss how CZN intends to mitigate the potential spread of invasive species in accordance with Measure 11-2, Part 3; and

X. Measure 12-1-Permafrost Management:
   a. Measure 12-1, Part 2 – Provide plans for collecting baseline permafrost data, providing data to Independent Review Panel, and using results to inform detailed/final design in accordance with Measure 12-1, Part 2;
   b. Measure 12-1, Part 3 – Provide CZN’s plans to ensure the design and construction of the Project is in accordance with Measure 12-1, Part 3; and
   c. Measure 12-1, Part 4 – Provide a Draft Permafrost Management Plan, including CZN’s proposed monitoring and adaptive management framework, in accordance with REA Measure 12-1, Part 4 and Appendix B.

XI. Provide a Conceptual Closure and Reclamation Plan for areas inside and outside Nahanni National Park Reserve. Areas outside the park will be developed in accordance with REA Suggestion 14-1 and the MVLWB/AANDC Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories. Due to the fact that separate security deposits will be required for Territorial IAB lands, closure activities should be separately described for the two jurisdictions. Areas inside Nahanni National Park Reserve will be developed in accordance with REA Suggestion 14-1 and the Principles and Guidelines for Ecological Restoration in Canada’s Natural Protected Areas.

XII. Provide a Draft Waste Management Plan, developed in accordance with the Board’s Guidelines for Developing a Waste Management Plan. Note that as per the Guidelines, separate plans for specific waste streams may be required. Any wastewater discharges to the receiving environment will be reviewed and authorized according to the Board’s Water and Effluent Quality Management Policy. Should the Project require any wastewater discharges to the environment, please provide any evidence and/or recommendations to support the establishment of Effluent Quality Criteria (EQC) for the discharges as per the Policy. Parks Canada may rely on additional guidelines with regards to sewage and grey water.

XIII. Provide a Draft Geochemical Verification Program, which addresses potential acid rock drainage and metal leaching issues associated with road construction and operation. The Draft Program must outline how CZN plans to characterize, monitor, and manage rock with acid rock drainage and/or metal leaching potential to prevent impacts associated with quarrying and road construction, in accordance with EA Suggestion 8-2.
XIV. Provide a Draft Sediment and Erosion Control Plan which details CZN’s plans for implementing erosion and sediment control measures for road construction, operation and decommissioning, including a general in-stream workplan.

XV. Provide a Draft Operations & Maintenance Plan for the road, which incorporates contaminant loading and dust management. Within the Plan, discuss how CZN intends to mitigate impacts to vegetation from contamination along the road corridor, including the collection of baseline data on vegetation contaminant levels prior to construction (Suggestion 11-3).

XVI. Provide a Draft Explosives Management Plan which discusses mitigation approaches to be deployed in handling, use, and storage of explosives, and how CZN proposes to minimize nitrogen species loading to the environment.

XVII. Provide a Draft Spill Contingency Plan, developed in accordance with Indian and Northern Affairs Canada’s Guidelines for Spill Contingency Planning (2007).

XVIII. Paragraph 26(5)(d) of the Waters Act and paragraph 72.03(5)(d) of the Mackenzie Valley Resource Management Act require the Board and Parks Canada to consider an applicant’s financial ability to complete the undertaking, any mitigation measures which may be necessary, and maintenance and restoration in the event of closing or abandonment. Discuss how CZN will satisfy these requirements.

XIX. Provide any other reports, including data that support the predictions and assumptions listed in the preceding documents.
Schedule 2: Required information to be sent to the Board

XX. Provide a Security Estimate in RECLAIM (template attached) for the portion of the Project not within Nahanni National Park Reserve for Territorial lands - if staging of security is proposed by CZN, please provide proposed staging for review.

XXI. Provide a Security Estimate in RECLAIM (template attached) for the portion of the Project not within Nahanni National Park Reserve for IAB lands – if staging of security is proposed by CZN, please provide proposed staging for review.

XXII. Suggestion 5-1 of the REA contains recommendations for CZN to prevent significant impacts from avalanches, including preparation of an Avalanche Hazard Management Plan. Provide details on how CZN intends to fulfill these recommendations.

XXIII. Suggestion 11-2 of the EA suggests the Board require a Rare Plant Management Plan. Please provide details as to how CZN intends to address this recommendation, and submit a draft Plan if necessary.
Schedule 3: Required information to be sent to Parks Canada

XXIV. Provide a draft Avalanche Hazard Management Plan developed in accordance with Suggestion 5-1.

XXV. Describe how CZN will support and cooperate with wildlife management authorities and potentially-affected Aboriginal communities to implement a harvest monitoring program (Suggestions 7-1 and 7-2).

XXVI. Measure 9-1: effects mitigation, baseline data, monitoring, and adaptive management of the Sundog Creek diversion:
   a. Measure 9-1, Part 1 – Provide a Draft Sundog Creek Diversion Plan in accordance with Measure 9-1, Part 1 which is protective of fish and fish habitat and ensures the ecological and hydraulic effectiveness of this diversion;
   b. Measure 9-1, Part 2 – Provide plans for collecting baseline data in accordance with Measure 9-1, Part 2;
   c. Measure 9-1, Part 3 – Discuss how CZN intends to use best management practices and baseline data collected in accordance with Measure 9-1, Part 2, to design the diversion channel and determine appropriate mitigation of potential impacts;
   d. Measure 9-1, Part 4 – Provide CZN’s draft monitoring plan to detect Project-related effects on fish and fish habitat from the Sundog Creek Diversion in accordance with Measure 9-1, Part 4; and
   e. Measure 9-1, Part 5 – Provide CZN’s proposed adaptive management framework, developed in accordance with Measure 9-1, Part 5 and Appendix B of the REA.

XXVII. Within the draft of the Sundog Creek Diversion Plan:
   a. Provide the detailed design elements of the diversion channel, including engineering drawings, designed in accordance with Measure 9-1;
   b. Describe (using maps and narrative) the proposed alignment of the diversion;
   c. Outline the proposed construction approach objectives;
   d. Characterize the existing fish habitat, geomorphology and hydrology of the existing Sundog Creek and compare these factors with the same factors in the proposed diversion; and
   e. Characterize the proposed offsetting plan for the fish habitat and fish productivity losses associated with the diversion of Sundog Creek.

XXVIII. Measure 11-1: rare plant and rare plant assemblage baseline surveys and management in NNPR
   a. Measure 11-1, Part 1 – Provide plans for completing vegetation field surveys and using them to inform mitigation, monitoring, adaptive management, closure and reclamation in accordance with Measure 11-1, Part 1; and
   b. Measure 11-1, Part 2 – Provide a Draft Rare Plant Management Plan in accordance with Measure 11-1, Part 2.

XXIX. Provide a Security Estimate in RECLAIM (template attached) for the portion of the Project within Nahanni National Park Reserve. If staging of security is proposed by CZN, please provide proposed staging for review.
**Schedule 4: Generic Work Plan**

The table below outlines a generic work plan for a type B water licence application. Note that land use permits are typically processed on the same time schedule as water licences when a water licence is also required.

<table>
<thead>
<tr>
<th>Task</th>
<th>Responsible Party</th>
<th>Timeline (Calendar Days)</th>
</tr>
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<tbody>
<tr>
<td>Submission of Post-EA Information Package</td>
<td>Proponent</td>
<td>Day 1</td>
</tr>
<tr>
<td>Board staff completeness decision on Post-EA Information Package</td>
<td>Board/Parks Canada</td>
<td>Day 21</td>
</tr>
<tr>
<td>If deemed complete, circulation of Post-EA Information Package</td>
<td>Board/Parks Canada</td>
<td>Day 22</td>
</tr>
<tr>
<td>Distribution of technical workshop agenda</td>
<td>Board/Parks Canada</td>
<td>Day 52</td>
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<tr>
<td>Technical Workshop</td>
<td>All parties</td>
<td>Day 55-57</td>
</tr>
<tr>
<td>Potential Public Hearing (to be decided by the Board and Parks Canada)</td>
<td>All parties</td>
<td>TBD</td>
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<tr>
<td>Comments due from reviewers on the Post-EA Information Package (comment on the UPD package)</td>
<td>Reviewers</td>
<td>Day 71</td>
</tr>
<tr>
<td>Proponent responses to reviewer comments due</td>
<td>Proponent</td>
<td>Day 92</td>
</tr>
<tr>
<td>Distribute draft Water Licence and Land Use Permit for review</td>
<td>Board/Parks Canada</td>
<td>Day 122</td>
</tr>
<tr>
<td>Comments due from reviewers on draft Water Licence and Land Use Permit</td>
<td>Reviewers</td>
<td>Day 152</td>
</tr>
<tr>
<td>Proponent responses to reviewer comments on drafts due</td>
<td>Proponent</td>
<td>Day 166</td>
</tr>
<tr>
<td>Board decision/Parks Canada decision</td>
<td>Board/Parks Canada</td>
<td>Approximately 6 weeks for edits to licence and permit, Board/Parks Canada approval and writing RFD</td>
</tr>
</tbody>
</table>
This manual supports the RECLAIM 7.0 Model for Closure and Reclamation Cost Estimates.
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1 Introduction

RECLAIM has been developed by Brodie Consulting Ltd. (BCL) on behalf of the Government of the Northwest Territories (GNWT) to assist the GNWT, the Land and/or Water Boards, and other stakeholders (typically proponents) to estimate closure and reclamation costs (the "closure cost estimate") at mines and advanced mineral explorations projects in the Northwest Territories (NWT). The model format is specifically designed to help these parties to better comprehend the multiple components of mine site closure cost estimates. These estimates are intended to cover government liabilities associated with authorized development projects in the NWT.

Until such time as the GNWT issues its own Policy for Closure and Reclamation Cost Estimates, GNWT adheres to Indigenous and Northern Affairs Canada's (INAC) Mine Site Reclamation Policy for the Northwest Territories, 2002.

Presently, the authority for setting security in the NWT rests with the Gwich’in, Sahtu, Wek’èezhìi, and Mackenzie Valley Land and Water Boards (in the Mackenzie Valley) and the Inuvialuit Water Board (in the Inuvialuit Settlement Region). The Minister determines the form of security.1 The Land and/or Water Boards are also guided by INAC’s Mine Site Reclamation Policy for the Northwest Territories, which states that: “The recognized methodology for calculating reclamation costs for the purposes of financial security, should be the RECLAIM or some other appropriate model.” The Land and Water Boards rely on the GNWT to develop and maintain the RECLAIM Model and User Manual.

This User Manual includes descriptions of:

- Considerations for closure cost estimates in northern settings (Section 2);
- How different parties may approach the cost estimate for a given site (Section 3). An understanding of the perspectives may help resolve differences in the estimates prepared;
- The RECLAIM Model and guidance on how to use it (Section 4 and 5), which includes:
  - RECLAIM Model Worksheets (Section 4.1 to Section 4.5);
  - Data entry into spreadsheets (Section 4.6-4.8); and
  - Menu descriptions (Section 5).

2 Considerations for Northern Settings

It cannot be over-emphasized that in order to derive an accurate closure cost estimate it is imperative that the company have a Closure and Reclamation Plan that demonstrates a comprehensive understanding of the closure and reclamation requirements and objectives and scope of work to achieve those objectives. The first step to using the

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1 Waters Act, s 35(1); MVRMA s 60(1.1)
RECLAIM Model effectively is to prepare a comprehensive Closure and Reclamation Plan with sufficient detail to list and quantify the activities required.

Factors that should be recognized when developing a Closure and Reclamation Plan and closure cost estimate for a site in northern Canada are discussed below:

- Low Unit Costs typically apply to work that is conducted in large volumes using appropriate equipment. However, in northern Canada efforts to reduce mobilization costs to remote sites may result in some work being conducted with non-optimal equipment.
- Some activities are best conducted in summer, such as placement and compaction of soils, while others may require winter (i.e. frozen) conditions for trafficability reasons. As such, reclamation activities may need to be extended over several seasons at some northern sites.
- Productivity of people and equipment is reduced in winter conditions.
- Fuel costs can be high due to the cost of mobilizing fuel to site.

3 Proponent Operating Costs vs. Security Estimate

There are important differences in the types of cost estimates that may be prepared by a proponent or a regulator. These are described as follows:

3.1 Company Operating Costs – Internal Use

A proponent’s estimate for internal use presents the costs the company expects to incur as part of the development project and is typically based on operating costs. The estimates may be derived to assess the viability of the mine or for corporate cash flow accounting. Typical factors which may affect this type of estimate are:

- Low Unit Costs are generally utilized as it is assumed that the work will be conducted under the direction of the mine manager utilizing existing staff and equipment.
- Equipment Unit Cost may exclude capital cost of the equipment as it may have been discounted to zero during operations.
- Equipment productivity may be assumed to be relatively high due to familiarity with working conditions on the site.
- Salvage and sale of equipment is typically included in a company's internal estimate to off-set costs.
- A low contingency may be applied based upon the assumption that the mine development and closure activities will proceed as planned without upsets or deviations.
3.2 Security Estimate

A security estimate is assumed to cover the government’s costs for closure and reclamation should the company become insolvent and abandon the site. Costs are therefore inherently higher than a proponent’s operating cost estimate described above.

Typical factors which may affect this type of estimate are:

- Unit Costs are based on third-party contractors conducting all of the work.
- Mobilization costs are included for every piece of equipment or machine required for the work (i.e. does not assume that existing mine equipment is available and in good working condition, see Section 4.3.2).
- There is no allowance for salvage or sale of equipment.
- The closure costs are not reduced for progressive reclamation work until after the work has been completed and it is demonstrated that it meets the approved closure objectives.
- A provision is included for interim site care and maintenance to address the period of time between the ceasing of operations and the commencement of closure work. Based on recent mine closure for which the company has become insolvent, this period of interim care and maintenance would be a minimum of 2-3 years. Additional time could be required if a final Closure and Reclamation Plan has not been approved and/or there are complex issues that still need to be addressed.
- A contingency is applied that reflects the degree of uncertainty in the Closure and Reclamation Plan (i.e. address key areas of uncertainty in closure options until such time as the preferred option is demonstrated or verified during the life of the project).

3.2.1 Salvage Considerations

GNWT does not recognize salvage value because of the problems associated with creditor’s rights, sale of equipment, and uncertainty as to the actual value at the time of insolvency.

3.2.2 Progressive Reclamation Considerations

Mine reclamation cost estimates are prepared assuming that progressive reclamation is not conducted. Until this work is completed it is still an outstanding closure cost (i.e. government liability) just like any reclamation which is put off until final closure of the mine. Therefore, financial security should cover the costs to complete this work as proposed. If the company carries out progressive reclamation during operations as proposed, such as revegetation of disturbed areas during operations, then the closure cost estimate could be reduced by the associated costs for that component when the company demonstrates that the closure activity has been successfully completed and closure objectives and criteria have been met.
4 RECLAIM v.7.0

4.1 General Description

RECLAIM is a model developed in Microsoft Excel to aid in the calculation of costs associated with each activity required to meet the objectives of the Closure and Reclamation Plan. It provides line items for each reclamation activity which might be required at a given site. For each, the model presents the “quantity” of work multiplied by the appropriate “Unit Cost”.

For example, a reclamation activity may involve using a dozer to contour overburden in a disturbed area. If the quantity of soil to be dozed is 500 m$^3$ and the Unit Cost is $1.05/m^3$, then the cost for that reclamation activity would be $525. RECLAIM is designed to both assist the user in identifying each of the activities required by including a list of typical activities, as well as providing a range of Unit Costs.

RECLAIM lists many typical reclamation activities for each component. These default lists will likely cover the majority of reclamation activities required for decommissioning a given mine. The default lists do not attempt to include all possible reclamation activities as the spreadsheet would be too cumbersome. If a desired activity is missing from the default list the user may modify text within this area of the spreadsheet or insert rows within Excel. If rows are inserted, it should be checked that these rows have been included in the total for the worksheet.

There are eleven reclamation costing worksheets used to compute the overall closure cost estimate. These include direct costs associated with the following mine components:

- Open pit
- Underground mine
- Tailings impoundment
- Rock pile
- Buildings and equipment
- Chemicals, hazardous materials and contaminated soils
- Water treatment
- Water management
- Interim care and maintenance

As well as worksheets for each of the following indirect costs:

- Post-closure monitoring and maintenance
- Mobilization and demobilization

Additional cost factors such as contingency, engineering, project management and bonding are calculated in the Summary Worksheet.

4.2 Direct Costs

Closure costs for each of the typical mine components are estimated in worksheets of the same name. A percentage of direct costs may be applied to either "land costs" upon
which the land security is held, or "water costs" upon which the water licence security is held. Additional information regarding segregation of costs into either land or water is included in Section 4.5.

Most of the worksheets are self-explanatory based on the list of activities. However, the following worksheets warrant further description.

4.2.1 Chemicals, Hazardous Materials and Contaminated Soil
This worksheet is intended to itemize the costs for three aspects of this component of mine closure and reclamation:

- Inventory, collect, and contain chemicals, hazardous materials and contaminated soil for treatment or transport.
- Physically gather materials from various locations around the mine site and secure for on-site treatment or for transport off-site.
- Off-site disposal fees at a certified facility.

It is the GNWT's experience that even the best managed mines will have minor problems with hydrocarbon contamination associated with fuel handling and storage of waste oil, lubricants, coolants, and hydraulic fluid. In addition, many base-metal mines have soil contamination in the ore concentrate areas, especially if these are not protected from wind. It is common at older mines to encounter problems with asbestos and/or PCB’s.

Management of any of these materials must be addressed on an individual basis. This typically involves off-site site disposal, though some hydrocarbon contaminated soil can be remediated on-site. Some mines produce a significant volume of hazardous waste, which may require a hazardous waste landfill to be developed on-site. This requires sophisticated design to ensure that the wastes remain encapsulated in the long term.

4.2.2 Buildings and Equipment
This worksheet outlines the demolition costs for buildings typically found at a mine site. It is assumed that inert debris (steel, concrete, wood, glass, plastic) will be disposed of on-site in an approved location such as a waste rock pile, landfill or other approved area specifically designated to accept these types of waste materials.

The area of each building is typically scaled by the ratio of the total height over an average 3m height. For example, the total area of a 6m high building would be the area of the footprint of the building multiplied by two (or 6m/3m). Unit Costs are then applied per m². The provision of demolition costs on a cost per area is such that the completion of demolition can be readily quantified and the security for this component refunded. This is opposed to providing the costs in terms of person days, which is more difficult to quantify for security refunds. Effort for disposal and burial of demolition waste needs to be included in this worksheet.
Users should be aware that the demolition Unit Costs included in RECLAIM are established at a point in time based on historically available information and as such may not represent all current costs. This is due to a number of factors that have increased demolition costs in recent years, as follows:

- Increased requirement for decontamination in advance of demolition to provide environmental protection. Where demolitions costs are expected to form a significant component of the closure cost estimate, users are encouraged to retain qualified persons to estimate costs.
- Increased health and safety workplace culture.
- Increased expectation for recycling, which then requires more careful demolition.

Proponents are encouraged to discuss demolition activities and requirements with the GNWT prior to finalizing the demolition costs, especially if decontamination is required for remediation purposes.

### 4.2.3 Water Treatment

Water treatment is generally considered for a site to be either short-term (≤20 years), or long-term. Examples of short-term water treatment could include: water treatment required to draw down the supernatant in a tailings storage facility pond; treatment of a sediment pond with flocculent prior to release of water; or treatment of water expected to reach acceptable quality for direct discharge within 20 years.

Long-term water treatment may be required for post-closure treatment of acid mine drainage or metal leaching. A more comprehensive list of what might be considered short-term versus long-term water treatment (i.e. post-closure) is described in Table 1. It is recognized that this definition of short-term versus long-term is somewhat arbitrary and the user is encouraged to use the worksheet as it best represents the expected situation and costs.

Given that water treatment may be considered short-term or long-term, the results of this worksheet do not appear directly within the summary sheet. Rather, the “Water Treatment” worksheet is used to calculate a cost that then feeds into either the “Water Management” worksheet when costs are for short-term water treatment or the “Post-closure Monitoring and Maintenance” worksheet when costs are for long-term water treatment. In the “Post-closure Monitoring and Maintenance” worksheet, there is a provision for the future costs to be calculated as a discounted Net Present Value.²

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² Net Present Value discount rates need to be discussed with the GNWT. The provision of Net Present Value results in certain requirements for the form of this security.
Table 1. Examples of What Would Typically be Considered Short-Term Versus Long-Term Water Management and Treatment

<table>
<thead>
<tr>
<th>Open Pit</th>
<th>Short-term (≤ 20 years)</th>
<th>Long-term (&gt; 20 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>flood pit - install/operate pumping system</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>construct diversion ditches</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>treat 1st filling</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>install pump/decant system</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>passive/biological treatment</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>overflow treatment</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Rock Pile/Heap Leach Facility</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>construct diversion ditches</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>install groundwater collection system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>install toe seepage collection system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>collect and treat groundwater</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>collect and treat seepage (ARD/ML)</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>install passive treatment system</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>operate and maintain passive treatment system</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>detoxify heap leach pile (cyanide destruction)</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Tailings Storage Facility</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>construct diversion ditches</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>pump supernatant (to pit, underground)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>treat supernatant</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>install toe seepage collection system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>collect and treat seepage (ARD/ML)</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>install passive treatment system</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>operate and maintain passive treatment system</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Underground Mine</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>accelerate flooding</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>install seepage collection system</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>install dewatering/pumping system</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>operate seepage/dewatering system (ARD/ML)</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Water Management</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>refill lakes</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>redirect creeks/streams</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>stabilize water management ponds</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>stabilize/close sediment ponds</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>fresh water supply - breach embankment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>fresh water supply - remove piping system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>construct water treatment plant</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>construct sludge pond</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>water control in reclamation quarry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>operate/maintain water treatment plant</td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>
4.2.4 Water Management (and Short-Term Water Treatment)

This worksheet provides a list of activities associated with water management; in essence the closure activities needed to collect, control, or restore surface or groundwater flows. Capital costs of water treatment systems are calculated within this worksheet, both for conventional active water treatment systems and passive water treatment systems.

As described above, there is a line included within this worksheet for short-term, or defined duration, water treatment calculated from the worksheet “Water Treatment”.

Alternatively, short-term water treatment costs may be included within a component worksheet. For example, pit flooding activities such as batch treatment are listed within the worksheet “Open Pit”; costs of detoxifying a heap leach facility are listed within the “Rock Pile” worksheet; and treatment of tailings supernatant where reagents such as cyanide or ammonia are expected to decay to non-toxic levels in a specified period of time are included in the worksheet “Tailings”.

4.2.5 Interim Care and Maintenance

Very few mines commence closure work soon after operations cease. Based on experience at abandoned sites in the NWT, it is assumed that a minimum period of time of 2-3 years is required to transfer ownership of the site to the GNWT, finalize a Closure and Reclamation Plan, retain a water licence for closure, mobilize equipment to the site, and conduct procurement activities to retain reclamation contractors. Care and maintenance costs should include personnel, camp, fuel, equipment and supplies. Water licence and land use permit requirements for environmental and geotechnical monitoring will have to be met during this period, and have been shown to be a significant driver in overall interim care and maintenance costs.

4.3 Indirect Costs

Worksheets for the indirect costs of Post-Closure Monitoring and Maintenance and Mobilization/Demobilization are described in more detail in the following sections.

4.3.1 Post-Closure Monitoring and Maintenance

Post-closure monitoring and maintenance costs are estimated in the "Post-Closure" Worksheet. These should reflect the monitoring and maintenance identified in the Closure and Reclamation Plan. Common monitoring programs are the Surveillance Network Program (SNP), Aquatic Effects Monitoring Program (AEMP), groundwater, geotechnical, vegetation, and seepage. Other monitoring programs may be included to reflect the approved closure objectives for a particular project. Commonly, monitoring is conducted on a declining frequency at progressively fewer sampling points after closure.

Post-closure maintenance is typically required for all mine sites with waste rock piles, tailings storage areas, etc. For example, spillways and diversions may require occasional
clearing of debris and ice, rip rap may need to be repaired, covers over mine waste may require management of vegetation or repair of erosion.

When post-closure costs extend into the long term (for example more than 20 years), a discount rate may be applied when calculating the Net Present Value of the future series of annual monitoring and maintenance cost. This is appropriate provided that the future costs are estimated on the basis of current (or end of mine life) as opposed to nominal (inflated) costs. Proponents must discuss discount rates and their use with the GNWT.

Note that determination of future costs must include all parameters, including: site access, monitoring, labour, fuel, power and all reagents and supplies. The calculation of the Net Present Value of a future series of costs may be complicated as costs, and the frequency in which these costs are incurred, may change in future years (e.g. a reduced monitoring program with a declining frequency). In these cases, supporting worksheets and/or calculations may be required.

4.3.2 Mobilization/Demobilization

Costs are estimated based on the assumption that a site has been abandoned after the owner becomes insolvent. Further, the assumption is made that the equipment and infrastructure has deteriorated to an advanced state of disrepair and has no material value (as has been the case for many abandoned sites in the north). Any equipment of value or that is salvageable is likely to be removed or sold to other local operators.

Mobilization/Demobilization of Equipment and Supplies

It is assumed that a contractor would have to mobilize all equipment and infrastructure to the site in order to carry out the closure and reclamation work. Mobilization of fuel (including the costs of the fuel and its transport) is assumed to be necessary for every site.

Personnel Movement and Accommodation

In the case of remote sites, mobilization of workers at the beginning/end of each work rotation is included. Modifications to an existing camp or mobilization of a workers camp may be required to allow for use by smaller numbers of support staff during closure and reclamation, or post-closure activities.

4.4 Indirect Costs as a Percentage of Direct Costs

In addition to the indirect costs of Monitoring and Maintenance, and Mobilization/Demobilization, there are a number of indirect costs that are calculated as a percentage of the direct costs in the RECLAIM Model.

4.4.1 Project Management

Project management covers general project coordination, accounting and project control, quality assurance/quality control and oversight, change orders and as-built reports. Project management is assumed to be at least 5% of direct project costs.
4.4.2 Engineering

In preparing a closure cost estimate, it is typical to assume that there is an existing, approved Closure and Reclamation Plan that can be converted to contract ready documents for closure activities (i.e. engineering is not required to develop a closure plan) and that there are no dramatic departures from the approved Closure and Reclamation Plan.

In the RECLAIM Model, the engineering provision is for advancing the Closure and Reclamation Plan into a scope of work that can be provided to a contractor. Engineering includes preparation of Issued For Construction (IFC) drawings and specifications for the closure and reclamation work. Additional engineering may be required while the work is being carried out to address any unexpected issues.

Engineering is normally assumed to be at least 5% of direct project costs.

4.4.3 Health and Safety and Bonding/Insurance

The inclusion of costs for workers health and safety as well as insurance for work related injury are common in government contracting processes and as such are relevant to reclamation of mine sites. A provision of 1% of direct costs provides for preparation and administration of safety protocols, and relevant worker training.

4.4.4 Contingency

A contingency is added to cover both the uncertainty in the costing estimate (i.e. variability in quantity of work, Unit Costs and required scope of activities) and the possibility that some aspects of the closure and reclamation activities may be more difficult to perform. The determination of the contingency percentage is a subjective and project-specific task that relies on the judgement of the estimator. There is commonly considerable debate between proponents and regulators about the most appropriate contingency percentage. Table 2 provides some guidance.

<table>
<thead>
<tr>
<th>Estimate Type</th>
<th>Description</th>
<th>Contingency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed or Project Control</td>
<td>Based upon detailed engineering &quot;take-offs&quot; and written quotes</td>
<td>5%</td>
</tr>
<tr>
<td>Definitive or construction drawing phase</td>
<td>Engineering mostly complete, some written quotes</td>
<td>10%</td>
</tr>
<tr>
<td>Preliminary or budget level</td>
<td>Little detailed engineering and costs based upon verbal quotes</td>
<td>15%</td>
</tr>
<tr>
<td>Feasibility or advanced conceptual</td>
<td>Engineering may be 10% complete and costs based upon typical Unit Costs</td>
<td>20%</td>
</tr>
<tr>
<td>Pre-feasibility, conceptual or trade-off study</td>
<td>Very basic engineering only and costs based upon typical Unit Costs</td>
<td>25%</td>
</tr>
</tbody>
</table>

Table 2. Guidelines for Contingency Percentage

For mining, most Closure and Reclamation Plans and associated closure cost estimates are at the "feasibility or advanced conceptual" level until nearing the end of operations.
This is due to lack of detailed engineering and uncertainty in the quantities of work. During the life of the mine, reclamation research, operational experience (possibly from other mines), data from environmental monitoring programs, and engagement with affected parties may reduce uncertainty.

A low contingency would be indicative of a comprehensive database of site specific parameters, detailed engineering, and proven closure and reclamation measures. Proven measures are those that have been shown to be effective in conditions similar to those at the mine, and the effort and cost associated with that work is well understood.

To the extent possible, if there are major areas of uncertainty in a Closure and Reclamation Plan, these should be addressed in the appropriate mine component spreadsheet (e.g. thicker cover, different slope, liner, quarry, etc.). In some cases, it may be appropriate to consider a different level of contingency for different components of the closure cost estimate.

In RECLAIM v.7.0, contingencies are only applied to direct costs. However, for some liability estimates where there is a similar level of uncertainty, it may be appropriate to apply contingency costs to indirect costs as well.

**4.4.5 Market Price Factor Adjustment**

To account for times when economic activity is very high the RECLAIM Model includes a Market Price Factor Adjustment. It is recommended that companies contact the GNWT to determine if the Market Price Factor Adjustment would apply for their cost estimate.

**4.5 Segregation of Costs into Land or Water Related Costs**

For each activity, the user can assign a percentage of each cost to either be included as a land related cost or as a water related cost. Examples of each are as follows:

- An activity such as a building demolition would be 100% land liability.
- Treating supernatant prior to discharge would be 100% water liability.
- Placing a soil cover over a rock pile could be, for example, 50% land liability in promoting revegetation, and 50% water liability in reducing seepage loading. This could vary based on site-specific factors.

**4.6 Unit Cost Table**

After having developed a comprehensive Closure and Reclamation Plan from which the reclamation activities have been scoped and quantified, the selection of Unit Costs to apply to each of these activities is required to derive a security estimate.

The Unit Cost table contains a list of many of the common reclamation activities that may be carried out at a particular mine site and the associated Unit Costs for each activity. To the extent achievable, the Unit Costs in the table are independent third party costs that have been obtained from a review of northern reclamation projects.
conducted by third party contractors. Unless specifically noted, all Unit Costs are inclusive of equipment, labour, maintenance, fuel, consumables, and contractor profit.

For each activity in the Unit Cost table, there is a brief description of the activity and a one to four-character acronym, called the cost code, for that activity. Additional activities, with user-defined cost codes and Unit Costs, may be added to the Unit Cost table.

Acronyms have been developed to reflect the activity it is intended to apply to. For example, if a reclamation activity such as covering a waste rock pile for re-vegetation involves the excavation of soil which is readily excavated, hauled a short distance and dumped, then the cost code SB1L would be appropriate. This acronym translates roughly as Soil, Bulk, 1 (for short haul), low. If the excavation involved careful or controlled work, such as in ditch or spillway construction, then the SC1L cost code for Soil, Controlled, 1 (for short haul), low may be more appropriate.

For each Unit Cost, a range is provided from low (L) to high (H), which is intended to capture the variability in level of effort that may be required. For the example provided above, SB1L, the suffix L in the acronym indicates that the cost for this particular activity is believed to be at the lower end of the range for soil movement. Factors such as an uphill haul, difficult excavation due to density, frozen zones or excessive boulders would require the use of the high cost suffix, H. In this way the selection of the cost code allows others to understand the assumptions of the estimator for the scope of work and intended effort. Users are encouraged to document the assumptions used to select the appropriate Unit Cost.

4.6.1 Inflation

Unit Costs are based on the Canadian dollar at the time of the RECLAIM Model update. Unit Costs in RECLAIM v.7.0 were updated March 2014, more than 3 years ago. Adjustments for inflation should occur using a function in the RECLAIM Model described in Section 7. Inflation rates can be obtained from Statistics Canada (http://www.statcan.gc.ca/daily-quotidien/170224/dq170224a-eng.htm) or Bank of Canada (http://www.bankofcanada.ca/rates/related/inflation-calculator/).

Proponents are encouraged to discuss whether to consider inflation with the GNWT prior to completing their security estimate. For example, inflation can be considered for reclamation estimates when there is a time lapse between the estimate date and the calendar year in which the RECLAIM was last updated.

4.7 Specified Costs and Estimator

In some cases, rather than selecting a Unit Cost from the Unit Cost Table provided in RECLAIM, it may be appropriate to derive a project specific Unit Cost. If a proponent is proposing a specified Unit Cost, it should provide sufficient detail and rationale to allow others to review and assess the adequacy of these specified costs. All supporting calculations and documentation should be provided.
When using a specified cost, the Unit Cost can be inserted in the Unit Cost Table. Where these specified costs are to be used in calculations, the suffix "S" would be used instead of "L" or "H". For example, SBTS = $15.50/m³ is specific to hauling and placing wet tailings as infill. Alternatively, the specified cost can be simply inserted directly into the applicable worksheet in the Unit Cost Column.

Specified costs are typically derived from one of the following three methods, which are further described below:

- Quotes from qualified 3rd party contractors,
- Information provided by equipment suppliers, or
- First principle cost estimating.

**Quotes from Contractors**
It is important to be very clear in obtaining costs from qualified contractors. The contractor's cost should include capital cost, fuel (consumption and mobilization unless mobilization is included elsewhere), tires, maintenance, support equipment, and an operator's hourly rate. Ideally, the contractor should have knowledge of local conditions and how they may vary with seasons. The more information the contractor has regarding the scope of work and conditions, the more reliable the cost estimate to carry out the work will be.

**Equipment Suppliers**
Unit Cost data can be obtained from equipment suppliers. However, caution is warranted as a supplier is likely to provide only peak or optimal performance data. In all cases, adjustments will be required to reflect local cost factors such as labour rate and availability, or specific job site factors which affect productivity (cycle-times) such as weather and daylight hours.

**First Principle Cost Estimating**
First principle cost estimating means evaluating equipment productivity in terms of hourly production divided by hourly cost of operation. Productivity evaluation is a series of adjustments or corrections to the peak or optimal productivity rate for a given piece of equipment. For example, adjustment factors for an excavator would involve difficulty in digging (type and hardness of material), job geometry (side-hill or full bench), finish condition (ditch versus quarry operation), operator skill (fair, good, excellent), working time per hour and other appropriate site factors. The "Estimator" worksheet provides examples for productivity adjustments based on the Caterpillar Performance Handbook Edition 42. Another source of Unit Cost data is the RS Means Heavy Construction Costs.

**4.8 Summary Sheet**
The summary sheet presents the subtotals of capital and indirect costs to derive the total closure cost estimate.
It is within the summary sheet that the percentage of indirect costs that are to be assigned to “land liability” and “water liability” are calculated for determining the appropriate security. These percentages correspond directly to the direct costs that make up the total direct cost subtotal. The RECLAIM Model then applies these direct cost percentages to indirect costs. For example, if direct costs are calculated as being 20% land and 80% water, then the same percentages are applied to each indirect cost.

5 Using RECLAIM v.7.0

Upon opening RECLAIM v.7.0, depending on the user’s computer security settings, the user may receive a SECURITY WARNING “macros have been disabled”. Select the “Enable this content” within the options menu. A pop-up box will request the Project Name. Typically this is the mine name, which will be inserted at the top right of each worksheet. The program will then initialize, which should only take a few seconds.

The program should open to the instructions sheet, which is an overview description of the program and details of program limitations. There are some requirements that must be met for the program to work. The following instructions should be reviewed prior to modifying the worksheets:

- The names of the worksheets must not be changed.
- Certain cells have defined names, which must not be changed. Where the cell is named, the name will appear in the name box.
- The first line of data for any component worksheet starts on line 4. Do not change the first line of a component worksheet.
- Cell A1 of the component sheet must always contain the “count” of that component for the duplicate function to work.
- The user can add lines to component activities in each worksheet and the Unit Cost table. However, the user should check that the new Unit Cost does not fall outside the named ranges. You can check the size of the named range by selecting the name from the drop-down box at the top left of the sheet. For example, in RECLAIM v.7.0 the Unit Costs range is to line 172 of the Unit Cost worksheet.
- A component will only be printed if its sub-total is greater than zero. In addition, a component and the summary sheet cannot be printed if there is an error. Printing has been set to print 1 page per worksheet.

5.1 Start-up Error Message

A common error which arises when starting RECLAIM v.7.0 is to see the dialogue box shown below.
This message occurs when the RECLAIM Model is opened with another Microsoft Excel file already open on the computer. In this situation, the RECLAIM Model macros have not been enabled. However, all other functions of the RECLAIM Model are unaffected, and the calculation functions are not affected in any way.

If the user wants the macros to function, the RECLAIM Model must be the first Excel file to be opened.

5.2 Completing Worksheets

Complete each of the individual worksheets by selecting the type of activity required, estimating the quantity (i.e. volume, area, length etc.) in column E and assigning an appropriate Unit Cost code in column F.

Activity items can be added to component worksheets, either by changing the activity/material description in column B, adding the activity where the line item is purposely left as “other” or inserting a line and copying the content from an adjacent line.

As described in Section 4.5, activities are typically assigned a percentage as "land liability" which can be used to set land security and the remaining percentage as "water liability" which can be used to set water security.

5.3 Menu Descriptions

Functions specific to the RECLAIM Model are displayed in the tab “Add Ins” on the Excel menu bar. If this menu tab is not displayed, the functions are also found within the sheet titled “Tools”. A summary of the functions is provided in the Instructions worksheet and are described below:

Clear
This function deletes all input data, deletes any duplicated elements and blanks out the project name.
Another function within this menu is to hide or display segregation columns within the worksheets that ascribe the costs to either ‘water’ or ‘land’ liability.

Note the Clear function does not affect the Unit Cost table.

**Duplicate**
This function duplicates components of the project. For example, if there is more than one Open Pit, complete the activities and quantities for one Open Pit then use duplicate to add a second Open Pit. Quantities for the new Open Pit are erased, but the Activities and Cost Codes are carried over from the original Open Pit. The new Open Pit subtotal is added to the Summary page. The duplicate function can be applied for the following worksheets: open pit, underground mine, tailings impoundment, rock piles, buildings and infrastructure, and estimator.

**Unit Costs**
By selecting the show/hide function within Unit Costs a window of Unit Costs is displayed to the right of the open worksheet to allow the user to view the table of Unit Costs for ease of reference. The Unit Cost table has a filter in the 'UNITS' column. You can select to only see a particular unit (e.g. km) or multiple units (km and m³) or all units.

By selecting the inflate function, Unit Costs can be increased by a percentage to account for inflation from the date the Unit Costs were last updated (RECLAIM v.7.0 was updated in March 2014).

**Print All**
This option prints the Summary Worksheet, Unit Cost Worksheet, and individual component worksheets having non-zero balances. Individual worksheets can be printed directly using standard printing methods.