Review of Mine Financial Security Estimates and RECLAIM

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Executive Summary

In accordance with the guiding principles of the Crown-Indigenous Relations and Northern Affairs Canada's (CIRNAC) Mine Site Reclamation Policy for Nunavut (Indian and Northern Affairs Canada, 2002), "*Adequate security should be provided to ensure the cost of reclamation, including shutdown, closure and post-closure, is born by the operator of the mine rather than the Crown*". However, it has been CIRNAC's experience with management of abandoned mines that the financial security held for these sites has fallen well short of actual expenditures.

This discussion paper evaluates a more comprehensive scope of government expenditures that may contribute to the overall costs of government management of closure and reclamation of a mine site. The scope considers the management costs from the time the site becomes the responsibility of the government, through the implementation of closure and reclamation, followed by post-closure monitoring and maintenance.

While some of the costs can be reasonably estimated, others are more difficult and based on an evaluation of risk. This introduces subjectivity and is potentially more onerous in that it may require a higher level of involvement from qualified professionals with a broad range of knowledge or expertise.

It is known that any additions to the categories of costs that are included in a financial security estimate will be met with resistance by mine owners and proponents who will argue that there must be a balance between protecting taxpayers from potential mine closure and reclamation costs and maximizing opportunities for resource development. Where that balance rests has long been a topic of debate.

This paper outlines the categories of costs that do typically get included in financial security estimates and how these costs are captured in the RECLAIM costing model. RECLAIM being a recognized model for calculating reclamation costs for the purposes of financial security in Northwest Territories and Nunavut. Discussion is then provided for the categories of costs that are known to have contributed to government expenditures for the management and remediation of mine sites that are not typically included or may have been underestimated. Recommendations are made for improvements to RECLAIM as well as recommendations for CIRNAC to consider in the further development of mine reclamation financial security scope and policy.

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1 INTRODUCTION

1.1 BACKGROUND

In accordance with the guiding principles of the Crown-Indigenous Relations and Northern Affairs Canada's (CIRNAC) Mine Site Reclamation Policy for Nunavut (Indian and Northern Affairs Canada, 2002), "*Adequate security should be provided to ensure the cost of reclamation, including shutdown, closure and post-closure, is born by the operator of the mine rather than the Crown*". However, it has been CIRNAC's experience with management of abandoned mines that the security held for these sites has fallen well short of actual expenditures.

CIRNAC has contracted Brodie Consulting Ltd. (BCL) to prepare this discussion paper which aims to identify the types and ranges of expenditures that have contributed to the management of mines under government care and then considers whether such costs are likely to be captured with the current methods of estimating financial liability. Though other appropriate models are sometimes accepted, the recognized methodology for calculating reclamation costs, for the purposes of financial security, is the RECLAIM costing model (Indian and Northern Affairs Canada, 2002; Mackenzie Valley Land and Water Board/Indigenous and Northern Affairs Canada/Government of Northwest Territories Guidelines, 2017).

The purpose of this discussion paper is to identify where gaps exist and allow for a more informed evaluation of discrepancies due to inaccuracy of the estimated costs that do get included in the financial security estimates using RECLAIM, as well as to what degree the scope of financial security estimates captures the full scope of government expenditures that have been incurred.

It was initially thought that this discussion paper would involve CIRNAC providing documented expenditures broken out into categories. Thereby not only assisting to identify gaps but also helping to quantify them. However, there are a number of obstacles to obtaining and making use of such information, such as contractor confidentiality, limited examples available to provide a sufficient range and average of costs (which can vary considerably depending on the size and scope), and the effort required to synthesize data. This paper is therefore more qualitative than quantitative though recommendations have been provided to pursue this effort further.

1.2 EXPERTISE OF AUTHORS RELEVANT TO EVALUATION

BCL has provided services to CIRNAC and the Government of the Northwest Territories since 1993. In 1993, John Brodie developed the original RECLAIM costing model, with the Mining Version updated by BCL in 2014 (Mining Version 7.0). BCL updated the RECLAIM Mining Version 7.0 User Manual in 2017.

BCL has utilized the RECLAIM model for closure and reclamation cost estimates for many northern mines, several of which have been assessed multiple times as mine development has proceeded. BCL has been involved in both the review and preparation of security estimates for mine owners and government.

In addition, RECLAIM has been used for mine sites in other parts of Canada, Peru and Chile with substitution of regionally appropriate unit costs.

1.3 ORGANIZATION OF DISCUSSION PAPER

CIRNAC is the intended audience for this discussion paper. Recognizing that various readers have different roles within CIRNAC, the discussion paper starts with a description of what is and is not typically included in financial security estimates and how these are calculated using RECLAIM.

The discussion paper is organized as follows:

- Categories of costs typically included in the development of security estimates and how these are captured in RECLAIM.
- Categories of costs not typically included but that are likely to contribute to government expenditures in the event of abandonment. Or those that are included but either inconsistently, or may be underestimated.
- Brief discussion of security held for various authorizations and jurisdictions.
- Other considerations in the review of financial security policy.
- Recommendations

1.4 QUESTIONNAIRE

As part of this discussion paper, a questionnaire was sent to individuals within CIRNAC and Government of the Northwest Territories who are involved in the review of securities and/or management of contaminated sites.

The questionnaire requested input on:

- The categories, and range of costs within that category, that the respondent expected would contribute to government expenditures
- Known deficiencies in using RECLAIM to estimate financial security
- Familiarity with other costing tools
- Division of financial security into various authorizations/jurisdictions

A blank questionnaire is included as Appendix A.

The following is a list of respondents:

<u>CIRNAC</u>

- Redacted
- Redacted
- Redacted
-

Government of Northwest Territories

- Redacted

Comments from review of the draft version of the discussion paper were received from:

- Redacted

Redacted

Redacted

Redacted

Redacted

2 CATEGORIES OF COSTS TYPICALLY INCLUDED IN FINANCIAL SECURITY ESTIMATES

This section of the discussion paper describes the categories of costs that are typically included in financial security estimates, and how they are captured in RECLAIM Version 7.0.

2.1 CLOSURE AND RECLAMATION ACTIVITIES DIRECT AND INDIRECT COSTS

At minimum, the costs included in the financial security estimate are expected to include those to carry out the actual, physical work of the activities described in the Closure and Reclamation Plan. In RECLAIM Version 7.0 these costs are divided into direct costs and indirect costs as follows:

Direct costs are for the activities associated with:

- Closure of open pit or underground mine workings
- Decommissioning and reclamation of tailing storage facilities
- Structure, equipment, and facilities decommissioning and removal
- Consolidation and removal of chemicals and hazardous waste
- Remediation of contaminated soil
- Water management and treatment
- Land reclamation and revegetation

In addition to the actual closure and reclamation activities, RECLAIM includes a worksheet for Interim Care and Maintenance as direct costs.

Costs considered indirect costs in RECLAIM Version 7.0 are for:

- Mobilization and demobilization of reclamation equipment, fuel, and costs of travel and housing of workers
- Environmental and geotechnical monitoring and inspections
- Post-closure maintenance
- Engineering
- Project management
- Health and safety
- Bonding/insurance

2.2 DIRECT COSTS

Within RECLAIM there are eight costing worksheets used to calculate the direct costs for completion of closure and reclamation activities. Direct cost calculations are based on an estimate of the amount of work to be done (quantity) and a unit cost reflective of the level of effort required. To the extent achievable, the unit costs in the table are based on independent third party costs and rates that have been obtained from a review of actual northern reclamation projects or reputable quotes and sources.

It is recommended that for those readers who are interested, the RECLAIM User Manual - Mining be read for more information on the general basis of costs and assumptions for each of the individual worksheets. The Closure and Reclamation Plan itself will also inform the basis of cost and assumptions of the security estimate.

Two of the eight worksheets are discussed in more detail below as the basis of costs and assumptions applied have a particular bearing on the costs for these categories. These are:

- Chemicals and hazardous waste removal and remediation
- Interim Care and Maintenance

2.2.1 Hazardous Waste Removal and Remediation

The worksheet "Chemicals" encompasses a number of line items associated with assessments, consolidation and removal of chemicals and hazardous waste, and remediation of contaminated soil. It is necessary to make assumptions as to the expected quantities for removal as well as the extent of contamination at the time of abandonment. This in turn drives everything from costs of assessment to remediation.

The extent of potential contamination is expected to be much lower for newer mines with newer environmental regulation. However, it has typically been assumed that even the best managed mines will have minor areas impacted by hydrocarbon contamination associated with fuel handling and storage of waste oil, lubricants, coolants, and hydraulic fluid. In addition, metal mines may have metal concentrations in soils that are elevated above acceptable levels. For the purposes of security, remediation is typically assumed to be limited to the ore concentrate areas or areas where spills may have occurred. Provisions to remove and dispose of hazardous waste may be more if a mine is of a sufficient age that materials may contain asbestos, lead based paints, or polychlorinated biphenyls (PCBs).

Provisions for assessments and remediation have typically been quite modest unless site specific conditions dictate otherwise. It is recognized that costs have often been much more for some sites, though BCL cannot speak to how often this is the case, nor why this scenario could not be avoided through modern regulation and inspections. The potential underestimation of this category of costs is discussed further in Section 3.1.3.

2.2.2 Interim Care and Maintenance

Interim Care and Maintenance is intended to capture the costs that would be incurred during the period of time between the site becoming the responsibility of the government and when closure and reclamation activities are initiated.

This is another category where the scenario and assumptions the security estimate is based upon has a large influence on associated costs.

For the security estimates BCL is familiar with, the scenario that typically forms the basis of Interim Care and Maintenance costs is as follows. It is assumed that operations have ceased with as much of the site facilities mothballed as possible. For example, the number of buildings that require usage and heat is reduced to the extent possible. It is also assumed that efforts have been made to minimize site presence with costs based on the minimum number of people on site thought to be necessary to maintain site security and environmental compliance. It is also

assumed that the open pit or underground mine has been allowed to flood thus reducing (though likely not eliminating) the quantity of water to manage or treat.

Importantly, the duration of Interim Care and Maintenance is typically limited to two to three years. It is known that government experience has been much different than this, both in scope and duration. This is an obvious category for which government could be under secured, and is discussed further in Section 3.1.4.

2.3 INDIRECT COSTS

In RECLAIM, there are three worksheets for indirect costs:

1. Mobilization and demobilization
2. Post-closure monitoring and maintenance
3. Summary worksheet for which project management, engineering, health and safety, bonding and insurance, and contingency are calculated as a percentage of the direct costs.

Most of these costs are the most difficult to quantify and may not currently be well defined in the RECLAIM User Manual.

2.3.1 Mobilization and Demobilization

Especially in remote locations, more careful consideration is given to the logistics and associated costs that are expected to contribute to high mobilization and demobilization costs. The assumption is made that any equipment of value or that is salvageable is likely to be removed or sold. I.e., all required equipment is assumed to require mobilization/demobilization.

Uncertainty in the estimate of costs for mob/demob may arise from the following:

- The equipment type and number of units required is typically provisional in a RECLAIM estimate. A detailed work plan must be developed in order to identify the fleet of equipment required. This can easily become a complex problem because of the linkage between duration/seasonality of work, trade off between smaller equipment for ease of mobilization versus larger equipment for improved efficiency of work, number of mobilization periods, need for leaving equipment on site (and in-active) for winter periods, etc.
- Further to the above, it may not be known where the equipment will come from.
- For access by ice road the scheduling of mobilization, completion of work, and demobilization may be challenging to align with the seasonal window.
- It has been noted by a representative of CIRNAC that the assumptions regarding whether fuel will be available or must be mobilized, or whether some fuel will have to be removed if no longer useable or in excess for reclamation activities is also a source of uncertainty. The RECLAIM manual suggests that mobilization of fuel (including the purchase and transport) is assumed to be necessary for every site.

2.3.2 Monitoring and Maintenance

This category of costs has seen an increased focus in the last five years or so. As such, recommendations are provided in Section 3.2.1 for improvements to this category of financial security.

2.3.2.1 Environmental Monitoring and Geotechnical Inspections

The following types of environmental monitoring and inspections are usually included:

- Wildlife effects and wildlife habitat protection
- Revegetation
- Air quality and emissions
- Water quality monitoring (surveillance network program, aquatic effects, seepage surveys)
- Geotechnical inspections of tailings storage facilities and other critical reclamation components (covers, caps on raises/shafts, portals).

The types, frequency and duration of monitoring and inspections will depend on a number of factors. For the security estimates BCL is familiar with, environmental monitoring and geotechnical inspections have typically been included for the phases of Interim Care and Maintenance, Active Closure, and Post-Closure (despite the worksheet in RECLAIM being labelled as Post-Closure). For the post-closure monitoring period it has been assumed that monitoring and inspections will be phased and declining in frequency over a period of time ranging from five to twenty years, unless it is reasonably certain that monitoring will be required beyond this time frame. This is not to suggest that monitoring will not be required for longer than five to twenty years, but that this duration has generally been accepted as a provision in the security estimate recognizing that the duration may be shorter or longer depending on what the results of the monitoring indicate.

More than one respondent from CIRNAC indicated that the default minimum should be twenty five years and that newer estimates now do. CIRNAC has been developing a Post-Remediation Cost Estimating Tool to support CIRNAC's Northern Contaminated Sites Branch in estimating long term (50 year) costs of management of sites post remediation (not publically available). Post-remediation monitoring and maintenance needs and associated costs were developed by a working group of experts based on experience to date and a review of industry best practices. As such, CIRNAC should have reliable ranges of costs for monitoring and inspections that could be used to update RECLAIM.

2.3.2.2 Compliance Reports and Other Regulatory Requirements

In addition to environmental monitoring and geotechnical inspections, there may be a number of other compliance reports with respect to regulatory instruments. These might include:

- Annual Water Licence Report
- Environmental Impact Report
- Annual Reclamation Progress Report
- Reclamation Completion Report
- Performance Assessment Report

This is a category that has been added to some financial security estimates, though not consistently.

2.3.2.3 Post-closure maintenance

Modern mine decommissioning and reclamation strategies are implemented with the intent to minimize post-closure maintenance. Despite this, for the majority of mines some level of post-closure maintenance will be required. Some aspects will be relatively straight forward to anticipate (example repair of minor erosion) and the period of time over which they will be required will be in the order of five to ten years while the site stabilizes. Others are more difficult to predict or quantify and may be required for longer. This has been acknowledged by mine owners and regulators to be a difficult provision to estimate.

For financial security estimates BCL is familiar with, the approach has been to estimate the costs for a work campaign of a few weeks every few years while the site stabilizes (approximately five to ten years). For very remote sites and for some estimates, it has been accepted that an allowance is included which is based on the purchase of a small fleet of equipment to be left on site to carry out limited maintenance. The provisions have been very subjective. In the case of the diamond mines in the NWT, an amount in the order of $500,000 to $750,000 has been considered as an addition to the security, and in the order of $4.4 million when proposed as a holdback (i.e. deducted from the return of security with completion of reclamation).

Further discussion regarding considerations for this category is provided in Section 3.2.2.1.

2.3.3 Project Management

Project management covers general project coordination, accounting, change orders, and project oversight. Project management is calculated as a percentage of direct costs in the RECLAIM summary sheet. The default in RECLAIM is 5% of total direct costs. Further discussion regarding whether this default percentage should be revised is provided in Section 3.2.3.

2.3.4 Engineering

The provision for engineering is intended to cover the costs for advancing the closure and reclamation plan into a scope of work and contract documents for tendering of reclamation contractors. The provision includes preparation of Issued For Construction (IFC) drawings and specifications for the closure and reclamation work as well as some additional engineering that may be required while the work is being carried out to address any unexpected issues. The default percentage in RECLAIM is 5%. Further discussion regarding whether this default percentage should be revised in provided in Section 3.2.3.

2.3.5 Health and Safety and Bonding/Insurance

Costs to prepare and maintain health and safety plans and programs, as well as secure performance and payment bonds and liability insurance are each calculated as 1% of direct costs in RECLAIM.

2.3.6 Contingency for Uncertainty in Costing Estimate

Contingency calculated as a percentage of direct costs is intended to cover 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. This is different than contingency to address other risk factors as described in Section 3.2.5.

The percent contingency in the RECLAIM User Manual is based on the phase and level of detail in the Closure and Reclamation Plan and cost estimate as provided in Table 1.

Table 1. Guidelines for Contingency Percentage

Estimate Type	Description	Contingency
Detailed or Project Control	Based upon detailed engineering "take-offs" and written quotes	5 %
Definitive or construction drawing phase	Engineering mostly complete, some written quotes	10 %
Preliminary or budget level	Little detailed engineering and costs based upon verbal quotes	15 %
Feasibility or advanced conceptual	Engineering may be 10 % complete and costs based upon typical unit costs	20 %
Pre-feasibility, conceptual or trade-off study	Very basic engineering only and costs based upon typical unit costs	25 %

Although not publicly available, CIRNAC has a Contaminated Sites Cost Estimating Guide (2013) that outlines appropriate contingency levels based on the cost estimate classification. Three types of contingency are considered: Design Contingency (Undefined Knowns); Project Risk Contingency (Known-Unknowns); and Management Risk Contingency (Unknown-Unknowns). Discussion of contingency for other risk factors is provided in Section 3.2.5.

2.4 NET PRESENT VALUE

In a paper prepared for the National Orphaned/Abandoned Mines Initiative (NOAMI) titled *Orphaned and Abandoned Mines: Risk Identification, Cost Estimation and Long-term Management*, Kingsmere Resources (2016) writes:

> *When estimating future costs, a type of Net Present Value (NPV) calculations are generally used as they are currently the accepted method. In order to ensure that no unnecessary burden is placed on future generations, conservative discount rates must be used in such calculations. Similarly, if the future funding of the monitoring and maintenance activities is based on investment and/or interest income, conservative values must be used when calculating the rate of return.*

Similarly, in Ernst and Young's (EY) review of the British Columbia Ministry of Energy, Mines and Petroleum Resources (EMPR), EY recommended that the Government of BC allow an appropriate discount rate to be applied to liability estimates in accordance with Generally Accepted Accounting Principles, or International Financial Reporting Standards (EY, 2017). A spectrum of discount rates was provided that could be appropriately adopted.

The current default discount rate in RECLAIM is 3% but other rates or phased rates are known to have been used. Based on direction from Government of the Northwest Territories, the RECLAIM User Manual suggests that only those costs after twenty years be discounted. However, again there has been a lack of consistency in both rate as well as what future costs should be discounted. When future post-closure costs will be required may not be well known. Therefore, the discount rate selected (or phased rates), as well as when funds may be required, leads to inherent risk in this aspect of cost estimating.

3 CATEGORIES OF COSTS NOT TYPICALLY INCLUDED IN FINANCIAL SECURITY ESTIMATES OR POTENTIALLY UNDERESTIMATED

This section outlines the costs that in our experience, and/or based on input from respondents, are either not captured at all, inconsistently, or are likely underestimated.

3.1 DIRECT COSTS

3.1.1 Building Decontamination and Demolition

BCL has always been candid in the limitations of RECLAIM for estimating building decontamination and demolition. The RECLAIM Manual states:

> *Users should be aware that the unit costs included in RECLAIM may be dated. This is due to a number of factors that have increased demolition costs in recent years, as follows:*
>
> - *Increased health and safety workplace culture.*
> - *Increased expectation for recycling, which then requires more careful demolition.*
> - *Increased requirement for decontamination in advance of demolition to provide environmental protection.*
>
> *Where demolitions costs are expected to form a significant component of the liability estimate, users are encouraged to retain qualified persons to estimate costs.*

It is recommended that RECLAIM be updated with guidance from a qualified demolition consultant/contractor.

3.1.2 Land Surface Reclamation

Although there are line items included in the worksheet "Buildings & Equipment" for some aspects of land surface reclamation, future updates to RECLAIM for this category should be enhanced based on current standards and best practices.

The financial security estimate line items should be sufficiently detailed to allow for the following aspects of land reclamation:

- Surface re-contouring
- Re-establishment of natural drainage systems (including removal of bridges and culverts)
- Surface decompaction, particularly roads, laydowns, and building areas
- Replacing salvaged subsoil, topsoil and organic material
- Addition of soil amendments such as fertilizer or mulches and/or importing reclamation materials to site.
- Planting and/or seeding

It is recommended that RECLAIM be updated to include a more comprehensive list of land reclamation activities and the unit cost table be updated to reflect a range for each activity.

3.1.3 Contaminated Site Assessment Process

Although a number of line items are included in RECLAIM for assessments, management of hazardous waste, and remediation of select types of contaminants, it is probable that the costs in security estimates prepared using the current version of RECLAIM underestimate the assessment and decision making process that would be taken in the event government assumes responsibility for the site.

In the event of federal responsibility sites would enter into the 10-step process of federal contaminated sites decision-making framework[1]:

- Step 1: Identify Suspect Site
- Step 2: Historical Review (also known as Phase I Environmental Site Assessment)
- Step 3: Initial Testing Program and development of a Conceptual Site Model (also known as Phase II Environmental Site Assessment)
- Step 4: Classify Site (optional)
- Step 5: Detailed Testing Program (developing and completing a Phase III Environmental Site Assessment, updating and finalising the Conceptual Site Model).
- Step 6: Re-Classify Site
- Step 7: Develop Remediation/Risk Management Strategy
- Step 8: Implement Remediation/Risk Management Strategy
- Step 9: Confirmatory Sampling and Final Reporting
- Step 10: Long-Term Monitoring (if required)

Costs to retain consultants and contractors to support the decision-making framework will vary greatly and also impact the duration of Interim Care and Maintenance.

Having said that, although it is known that a formal assessment process would be followed by CIRNAC, as discussed in Section 2.2.1 the degree to which it should be assumed that a full suite of assessments will be required will be site specific and contentious. The mine owner will argue that the mine will be managed responsibly and therefore minimal assessment and remediation will be required.

It is recommended that future updates to RECLAIM more explicitly include line items for what CIRNAC expects will be a minimum sequence of assessments, and update the range of expected costs in the unit cost table.

The following should be considered:

- Environmental Site Assessments (Phased I through III)
- Human Health and Ecological Risk Assessment (HHERA)
- Develop Remedial Action Plan (RAP)/Remedial Risk Management Plan (this may be one and the same as finalizing the Closure and Reclamation Plan described in Section 3.3)

[1] Federal Contaminated Sites Decision Making Framework

3.1.4 Interim Care and Maintenance

Interim Care and Maintenance is a category that mine owners may argue as not being a justifiable element in financial security, or for which there has been disagreement between mine owners and regulators as to the duration that should be included in the security estimate. However, as discussed in Section 2.2.2, it is also a category that is known could result in a significant gap between financial security held and actual government expenditures.

The RECLAIM User Manual is explicit in stating that it is assumed that there is an approved Closure and Reclamation Plan that can be converted to contract ready documents and that there are no dramatic departures from the approved reclamation and closure plan. As described in Section 2.2.2, it has also typically been assumed that the majority of the site has been shut down and site presence has been reduced to a minimum required for site safety and environmental compliance.

These are optimistic assumptions compared to government experience. It was the opinion of one of the respondents that:

> *RECLAIM assumes that a closure plan is ready to go by the regulator and is fully secured such that the government can step in essentially without delay or variance to implement the closure plan. Our experience is that nothing could be further from the truth.*
>
> *The reality is that the government needs to first get organized, then essentially start from scratch with an assessment program, development of a closure plan, Environmental Assessment/Water Licencing, etc which overall can take 5-10 years, at which time significant cost has already been realized and the cost to do the reclamation has become far greater due to inflation, additional impositions on a government actor, etc.*
>
> *Most every significant site the government has in its inventory has been subject to an insolvency process under the CCAA or BIA. These processes take between several months and several years in order to be completed. During this time someone needs to fund the insolvency itself, which usually involves care and maintenance at the site utilizing existing company staff. In order to secure a site, the department typically participates in the insolvency until it has run its course (e.g. Anvil Range Mining, Royal Oak, North American Tungsten, Shear Diamonds, etc). The cost of the insolvency itself isn't often that onerous and is usually paid by other creditors, but the care and maintenance cost and time usually falls to the government.*
>
> *The reality is that it is becoming more and more difficult to do 'minimum site monitoring and maintenance'. Community partners and regulators are holding government actors to as high or a higher standard than private sector actors.*

In the above quote, CCAA is an acronym for Companies' Creditors Arrangement Act, and BIA for Bankruptcy and Insolvency Act .

It is recommended that this be a category of cost more fully evaluated by CIRNAC as one of the categories most significantly contributing to discrepancy between estimated costs and actual expenditures. CIRNAC should also recommend a minimum number of years for Interim Care and Maintenance to be included in financial security estimates.

3.2 INDIRECT COSTS

3.2.1 Post-Closure Monitoring and Maintenance

For future updates to Post-Closure Monitoring and Maintenance in RECLAIM it may be advantageous to have separate worksheets for each. One for monitoring, and one for post-closure maintenance. This is for the following reasons:

- The expected level of detail for monitoring and maintenance has increased in recent years.
- Monitoring is often phased and shown for both active closure and post-closure as opposed to only post-closure.
- There is an evolving realization of post-closure maintenance requirements as well as ongoing discussion as to how best to address holdbacks and requests for security adjustments for completed reclamation. For example, Diavik Diamond Mines Inc. have proposed that holdbacks be tied to provisions for post-closure maintenance, i.e. maintenance and holdback has been proposed to be one and the same.
- It allows for a cross check of amounts that have been estimated for each category for other mines.

At the same time, duplication of mobilization costs should be avoided when activities can be conducted at the same time.

A representative from CIRNAC Nunavut Regional Office suggested that the effort be on providing clear guidelines as to how post-closure maintenance should be estimated. It was suggested that adding extra worksheets adds complexity and it may not be the best option to separate them.

It is recommended that the option to have separate individual worksheets for Monitoring and Post-closure Maintenance be further evaluated.

3.2.2 Monitoring and Inspections

There has been an increased focus in the estimation of monitoring requirements in recent years. However, without input from qualified professionals in those areas the amounts are often very provisional. In addition, as was noted by the responses received, there has not been consistency in the duration of post-closure monitoring that is included in the financial security.

As has already been done for some security estimates[2], it is recommended that a stand-alone worksheet be added to RECLAIM that provides a template for the types of monitoring expected, frequency, and duration.

Amounts should be considered for the following:

- Wildlife effects and wildlife habitat protection
- Revegetation
- Air quality and emissions

[2] Example: De Beers Canada Inc. Snap Lake Mine 2019 Financial Security Estimate

- Water quality monitoring (surveillance network program, aquatic effects, seepage surveys)
- Geotechnical inspections
- Annual Water Licence Report
- Environmental Impact Report
- Reclamation Completion Reports
- Performance Assessment Reports

Public meetings associated with dissemination of the content of the reports should be factored into costs where appropriate.

It is recommended that a template be developed for monitoring and inspections that includes types of monitoring, frequency, and duration.

3.2.2.1 Post-Closure Maintenance

As discussed in Section 0, the anticipated requirements for post-closure (or post-remediation) maintenance are difficult to quantify. It has been BCL's experience that there has been general agreement that the amount should be reflective of residual risk, but several challenges have been identified in the risk assessment process. Not the least of which is attempting to define how extensive the costs could potentially be, as well as the probability of occurrence.

One respondent to the questionnaire indicated that post-remediation maintenance is "*evolving to be far more intensive and longer than ever contemplated before*".

Another stated that:

> *Post-closure maintenance costs can be very high depending on the type of maintenance. Constructed facilities usually have a lifespan associated with them. Assuming a reasonable failure rate would make sense too. DND has seen significant costs associated with the maintenance of site landfills. CIRNAC is seeing deterioration of some facilities but not a lot have triggered maintenance to date.*

Consideration must also be given as to whether a provision for post-closure maintenance is added to a financial security estimate, or whether it becomes a hold back with completion of reclamation. Obviously the former is more protective of government in the event of company insolvency, whereas the latter will be seen by some as excessively financially punitive.

The Saskatchewan Institutional Control Program[3] maintains two funds for long term management costs of monitoring and maintenance. One is a monitoring and maintenance fund that is specific to the site. The other is a joint "unforeseen events fund" with contributions calculated as a percentage of the site specific long-term management costs. This is estimated at the end of a closure monitoring period, not as part of the financial security during operations, and therefore it is not as protective of government if the mine owner were to become insolvent prior to completion of the closure monitoring phase. It also appears to be woefully underfunded if an "unforeseen event" were actually to occur, though the intention is to build up this fund over time.

[3] Saskatchewan Institutional Control Program

The Post-Remediation Cost Estimating Tool being developed by CIRNAC could be adopted as a financial security estimating tool. Two maintenance "events" are considered. The first is an Adaptive Management Event that is expected to occur no matter what (probability of one). Costs are calculated as 10% percent of the remediation cost. Mobilization costs are calculated as 80% of the remediation mobilization. Another amount is estimated for a Year 35 event, which is intended to "capture a repair/refurbishment cost that extends the life of earthen long term infrastructure even further". A probability of occurrence is assigned to this event depending on the region and/or site type (size).

There are a lot of decisions to be made as to how to estimate post-closure maintenance costs both in terms of scope as well as risk thresholds, as well as at which phase of the mine life provisions should be included in the financial security estimate. This is a work in progress for many jurisdictions.

3.2.3 Net Present Value

As discussed in Section 2.4, there has been inconsistency in the calculation of Net Present Value of future costs. Comments received based on review of the draft version of this discussion paper included the recommendation to provide a rationale for the use of an Net Present Value calculation given that most security instruments are letters of credit, which do not increase in value with time.

It is recommended that guidance be provided by CIRNAC as to discount rates to be used where a component of the financial security is based on a calculation of the present value of future costs.

3.2.4 Project Management and Engineering

In BCL's experience, the percentages for project management and engineering do not vary much from the defaults in RECLAIM of 5%. This is on the low end of the 5% to 9%t range defined as 'contract administration' in a review of the indirect cost categories of the Alaska Mine Closure and Reclamation Cost Estimation Guidelines (DOWL, 2015). Similarly, according to a respondent from CIRNAC:

> *It has been CIRNAC's experience that if Public Services and Procurement Canada (PSPC) is involved in combination with CIRNAC, then administrative and project management costs usually range in the 18-20% of total project costs per year. The amount is more when consultation/engagement and regulatory activities are required.*

Another response indicated that according to Treasury Board policy, CIRNAC must add costs for Public Services and Procurement Canada project management above CIRNAC administration and project management. This suggests that between CIRNAC and Public Services and Procurement Canada project management, and the Alaska Cost Estimation Guidelines, the default amount in RECLAIM of 5% is too low to reflect CIRNAC responsibility for project management.

The engineering provision of 5% is in line with what DOWL defines as Engineering Re-Design in Alaska's Guidelines of 3% to 7% percent of total direct costs. However, the amount is intended to involve updating the mine's Reclamation and Closure Plan and that "*the engineering design*

work would typically be conducted by an independent engineer prior to engaging a Reclamation and Closure contractor." This is consistent with RECLAIM, which assumes that:

> *There is an existing, approved closure plan that can be converted to contract ready documents for closure activities (i.e. engineering is not required develop a closure plan) and that there are no dramatic departures from the approved reclamation and closure plan.*

BCL recommends that the default percentage for Project Management could be increased based on CIRNAC's experience. Whereas, the default percentage for Engineering should be maintained but with the RECLAIM User Manual revised to be even more explicit as to what is and is not assumed to be covered in this amount.

3.2.5 Contingency for Other Risk Factors

As described in Section 2.3.6, a contingency is applied as a percentage of direct costs in the summary worksheet of RECLAIM. This is intended to cover both the uncertainty in the costing estimate (i.e. variability in quantity of work and unit costs) and the possibility that some aspects of the closure and reclamation activities may be more difficult to perform.

These contingency amounts are not intended to address other risk factors such as:

- Deficiencies in the mine owner's mine plan or Closure and Reclamation Plan which have been identified by the regulator as likely to result in post-closure impacts unless additional or alternative measures are implemented.
- The potential for economic induced departures from the approved mine plan resulting in a need for additional mitigation/remediation measures beyond that which was anticipated in approval of the Closure and Reclamation Plan.
- Uncertainty that is inherent in most closure and reclamation design and predictions (i.e. residual risk).

In theory, if the regulator is of the opinion that there are deficiencies in the Closure and Reclamation Plan that could result in post-closure impacts then these should be resolved in the regulatory review of the Closure and Reclamation Plan. However, deficiencies in a Closure and Reclamation Plan have implications for the security estimate and it is not uncommon for the cost of additional or alternative measures to be estimated and added to the security estimate. For example, a mine owner may propose that a large percentage of potentially acid generating mine waste will be backfilled into underground workings during operations and therefore does not include these costs in the security estimate. If that is not considered reliable by the regulator, then instead the security estimate should include the costs of reclaiming that portion of the mine waste that may not be backfilled. It is also not uncommon to include contingency water treatment costs.

Adding the costs of additional measures is seen by BCL as a preferable and more transparent approach than simply increasing the contingency percentage. However, it is seen by some mine owners as a work around to the regulatory review and approval of the Closure and Reclamation Plan. Effectively it results in the financial security estimate reflecting something other than the Closure and Reclamation Plan which is not consistent with the Mackenzie Valley Land and Water Board/Indigenous and Northern Affairs Canada/Government of Northwest Territories *Guidelines for Closure and Reclamation Cost Estimates for Mines*.

To the best of BCL's knowledge, for existing security estimates for mines in Northwest Territories, Nunavut and other jurisdictions, costs have not been included for catastrophic failings.

Appropriate levels of contingency is tied to risk as discussed in Section 5.

3.3 FINAL CLOSURE AND RECLAMATION PLAN

It has been CIRNAC's experience that while the financial security estimate is based on the assumption that a site is fully secured and that closure and reclamation can be initiated without delay according to an approved Closure and Reclamation Plan, the reality is far from it. Instead, a response to the questionnaire included the following:

> *The government essentially starts from scratch with an assessment program, development of a closure plan, Environmental Assessment/Water Licencing, etc which overall can take 5-10 years, at which time significant cost has already been realized and the cost to do the reclamation has become far greater due to inflation, additional impositions on a government actor, etc.*

Another respondent from CIRNAC indicated that:

> *Consultant fees can range depending on the work being done. Usually, once we get responsibility for a site we are looking at doing an environmental site assessment, a geotechnical assessment, an archaeological assessment, possibly a Human Health and Ecological Risk Assessment and then we need to prepare a remedial action plan (which includes a community consultation) and prepare an Environmental Impact Assessment. Once this has been screened and accepted by the authorities having jurisdiction, we develop specifications to contract the work out. All of this comes to about $1M-$1.5M but this could increase with the size of the project.*

Mackenzie Valley Land and Water Board/Indigenous and Northern Affairs Canada/Government of Northwest Territories *Guidelines for Closure and Reclamation Cost Estimates for Mines* (2017) states that:

> *There may be costs which are not specifically identified in RECLAIM, but are required in order to implement the Closure and Reclamation Plan...There are three regulatory compliance costs not included in RECLAIM which will likely be incurred during closure and reclamation:*
>
> - *Engagement costs: the Boards' (2013) Engagement and Consultation Policy and their (2014) Engagement Guidelines for Applicants and Holders of Water Licences and Land Use Permits require all holders of water licences and land use permits to engage with affected parties. Therefore, engagement costs during the closure planning, active closure, and post-closure phases should be included in the estimate.*
> - *Regulatory compliance costs may include, but are not limited to: transfer or renewal of authorizations e.g. submission of application, participation in technical sessions and public hearings); preparing required submissions (e.g. annual reports required by the water licence, responses to information requests); reporting (e.g.*

monitoring reports, reclamation completion reports); and responding to reviewer comments during public reviews.

- *All costs for finalizing the Closure and Reclamation Plan prior to commencement of reclamation, which may include but not be limited to the completion of any outstanding reclamation research.*

While acknowledging that there will be opposition by mine owners (and other proponents of mining) to any additional categories of financial security, it is BCL's opinion that the more readily defensible categories of costs to consider further are those that the mine owner will already anticipate having to undertake themselves, and that will have little to do with an insolvency scenario. Adding those that have been written into the Mackenzie Valley Land and Water Board/Indigenous and Northern Affairs Canada/Government of Northwest Territories 2017 Guidelines seems prudent. Primarily these would be the costs to advance the Closure and Reclamation Plan to a final Plan and proceed through a regulatory process for authorization to proceed. I.e., the regulatory compliance costs described in Section 3.3.

The following components would likely be contracted to consultants when finalizing a Closure and Reclamation Plan and advancing through the regulatory process.

- Update management plans for Interim Care and Maintenance and then for closure
- Complete any incomplete Reclamation Research/Engineering Studies (this may be the same as assessments required as part of CIRNAC's 10 step decision making framework outlined in Section 3.1.3)
- Complete Traditional Knowledge Studies
- Consult with Indigenous and non-Indigenous Communities
- Draft the Final Closure and Reclamation Plan and all supporting appendices.
- Provide technical support to government during proceedings, which will require participation in workshops, technical sessions, and public hearings, as well as drafting responses to Information Request, Interventions, and Closing Arguments.

The security associated with Environmental Agreements for the Snap Lake, Ekati, and Diavik mines include provisions for some of these items. However, in general these costs are not included in financial security estimates.

Given that the recent federal guidelines identify the regulatory compliance costs which would likely be incurred during Closure and Reclamation, it seems prudent and defensible to explicitly include these costs in RECLAIM.

3.3.1 Completion of Reclamation Research/Engineering Studies

Inclusion or exclusion of the costs of reclamation research and engineering studies in financial security estimates needs to be considered carefully. On one hand, if the mine is abandoned prior to completion of the reclamation research and the costs have not been included in the security estimate, the government may be under-secured. Further, including costs that would be removed upon completion of the reclamation research provides an incentive for the mine owner to complete the research.

On the other hand, even if the mine owner wants to commit to reclamation research, there may be reluctance to do so with the knowledge that the costs of completing the reclamation research will

be added to the security estimate. An alternative incentive tool would be to allow a mine owner a time period in which to complete reclamation research at which point costs would be added if the commitment had not been fulfilled. This alternative is less punitive and does not tie up funds necessary to carry out the research. Another alternative is to select a higher contingency percentage for certain components of the Closure and Reclamation Plan that can be reduced when the research is completed.

3.4 INTERIM RECEIVER/MONITOR/LEGAL FEES

This category of cost has been added as BCL understood that the costs of an interim receiver or court appointed monitor during an insolvency process to be a substantial additional cost.

However, according to a respondent from CIRNAC:

> *Most every significant site the government has in its inventory has been subject to an insolvency process under the CCAA or BIA. These processes take between several months and several years in order to be completed. However, "the cost of insolvency itself isn't often that onerous and is usually paid by other creditors".*

The same respondent indicated that legal fees are typically not significant unless there is a complex insolvency. This would be different that legal advice required during a licencing process.

3.5 FUNDING TO SUPPORT ENVIRONMENTAL MONITORING AGENCIES

Environmental monitoring agencies have been established for several projects in the north to provide third party oversight. The Environmental Agreements for these projects include provisions for funding these agencies or boards. Environmental agencies for mining projects include the Independent Environmental Monitoring Agency for the Ekati Mine, Snap Lake Environmental Agency, and the Environmental Monitoring Advisory Board for the Diavik Diamond Mine. Monitoring agencies for public projects include the Giant Mine Oversight Board and the Kaska Faro Secretariat where the proponent and funder is the federal government.

Although dependent on the size, location, and potential hazards, it is expected that for most mines there would not be a monitoring or oversight board established.

3.6 OTHER FACTORS THAT HAVE CONTRIBUTED TO ESCALATED COSTS

Although no additional categories were identified in the responses to the questionnaires, based on BCL's experience with legacy sites under CIRNAC's care, the following additional factors have contributed to high costs to government at abandoned mines.

- Project scope escalation under government management
- Prolonged decision making of preferred closure option
- Very low government risk tolerance in both the Remedial Action Plan that is developed and the approach to contracting
- Increased scrutiny by community partners and stakeholders holding government to a high or higher standard than the private sector

4 REGULATORY AUTHORITY

As has been referenced at the beginning of this discussion paper, Crown-Indigenous Relations and Northern Affairs Canada's (CIRNAC) Mine Site Reclamation Policy for Nunavut states, "*Adequate security should be provided to ensure the cost of reclamation, including shutdown, closure and post-closure, is born by the operator of the mine rather than the Crown*".

It is recognized that "*the cost of reclamation, including shutdown, closure and post-closure*" is not particularly clear in definition or scope. There is also enabling acts and legislation specific to Security. These include the Territorial Lands Act (TLA) with Regulations made under this Act including the Territorial Land Use Regulations (TLUR) Section 36 *Security Deposit* and Territorial Lands Regulations (TLR) Section 12. The Nunavut Waters and Nunavut Surface Rights Tribunal Act (NWNSRT) includes Section 76 *Security*. The Qikiqtani Inuit Association Abandonment and Reclamation Policy for Inuit Owned Lands includes Section 4.0 *Financial Security Estimation*.

However, for all of these policies, acts, and legislation (as well as Guidelines), it is not particularly clear as to scope or limits to the amount held.

It has been BCL's experience that the split of costs in the financial security estimate between land and water has been somewhat arbitrary and sometimes subject to disagreement between proponents and regulators. Some sites are complicated by more than one landowner having jurisdiction over aspects of reclamation (see INAC, 2002 p.4 Section - *Application*).

Proponents express concern for double bonding when security is held under more than one authorization, as well as potential complications in adjustments to security. Similar opinions were shared by respondents to the questionnaire. However, another perspective was provided as:

> *This issue has lead to an assertion of double bonding which I generally reject. In Nunavut, Regional Inuit Associations often go in and do cleanup work while CIRNAC is still planning, leading to double costs, not double bonding...There should be clarity about liabilities and responsibilities and each land owner secured to their satisfaction.*

To paraphrase a CIRNAC representative, any future developments by CIRNAC for financial security *'need to ensure all of these frameworks (legislation, policy, RECLAIM) work together when requesting security and when needing to use security held'*.

5 FURTHER CONSIDERATIONS FOR FINANCIAL SECURITY POLICY

This section provides points of view that are often expressed on the topic of financial security policy, including those of the respondents to the questionnaire.

5.1 DUAL OBJECTIVES

Terms that are often used in describing financial security policy are "reasonable assurance", "balance" and "risk and benefits". What is being described are the dual objectives of managing risk to taxpayers while also supporting a competitive mining sector.

The following excerpt is from an Ernst and Young report completed for the British Columbia Ministry of Energy, Mines and Petroleum Resources to evaluate BC's mine reclamation financial security policy (EY, 2017).

> *A key tenet of a risk-based approach is that absolute assurance over future outcomes is impossible to obtain, and would be prohibitively costly to do so even it was. The Province has therefore adopted a working practice of requiring reasonable assurance that the taxpayer will not need to contribute to reclamation costs.*

The Alberta Energy Regulator (AER) describes the Mine Financial Security Program[4] as:

> *Used by the Government of Alberta and the AER to strike a responsible balance between protecting Albertans from oil sands and coal mine closure costs, and maximizing industry's opportunities for responsible and sustainable resource development.*

Furthermore, there is often the opinion that the province or territory should share the risks of mining. Royalties received, Impact and Benefit Agreements, and employment/business/training opportunities are seen by many to offset potential future liabilities.

5.2 RISK AND THRESHOLDS

A robust and rigorous process of review of Closure and Reclamation Plans exists within NWT and NU, which if not explicitly, then implicitly considers risk. Modern reclamation strategies are expected, and there is opportunity throughout the mine life for multi-stakeholder input to identify risks and to request that the mine owner demonstrate that risks have been or will be reduced to acceptable levels. Mine inspectors are on the ground to identify problems.

Although it cannot be substantiated quantitatively, it is expected that for most existing or planned mines a risk assessment based on a probability that there will be conditions resulting in the requirement for significant expenditures for remediation and that the government will have to assume those costs, would be within normally accepted levels of risk. This makes it difficult to defend that the mine owner should have to bond for that scenario regardless.

[4] Alberta Energy Regulator Mine Financial Security Program

This is echoed in the Asia-Pacific Economic Cooperation *Mine Closure - Checklist for Governments* (APEC, 2018):

> *On the regulator side, it will be important to realize that closure plans and all engineering works inherently carry some level of risk. As such, it is not reasonable to expect that properly implemented closure plans will be able to reduce risk to zero prior to the relinquishment of bond amounts. Rather, there should be a reasonable threshold of residual risk that is acceptable and that takes account the benefits the mining operations have provided over the life of the mine.*

Key findings of EY's review of BC's mine reclamation financial security policy were that the BC Ministry of Energy, Mines and Petroleum Resources has already established a carefully considered and systematic financial security approach for mine reclamation that includes elements of a risk-based approach and is tailored to the context of mining in BC. EY recommended that the BC Ministry formalize and enhance this approach to ensure that:

- Risk is reduced to an appropriate level that is consistent with the Ministry's risk assessment factors and tolerance.
- Companies are assessed on an equal playing field.

These findings are applicable to the financial security approach in Northwest Territories and Nunavut, although BCL is not aware of established risk tolerance thresholds.

5.3 THE COUNTER ARGUMENT

On the other hand, as stated above, closure plans and all engineering works inherently carry some level of risk. Performance often relies on the results of a considerable amount of predictive modelling of complex systems which will take monitoring and time to validate. In the event models are wrong, or conditions exist that were not accounted for, remediation will likely be very costly.

Added to that are the risks identified in Section 3.2.5, such as departures from the mine plan. As well as the very basis of this paper, which is that government costs are always much higher than expected.

In which case, having financial security in place for the full range of anticipated government expenditures in the event a mine owner defaults on the responsibility of closure and reclamation is a much more protective and risk adverse approach.

5.4 OTHER CONSIDERATIONS

Any discussion on the topic of risk and financial security policy typically identifies a number of other considerations (e.g. National Orphaned/Abandoned Mines Initiative, 2011; and McKenna et al. 2016), some of which add increased protection to government and taxpayers while others present obstacles or increase risk.

5.4.1 Considerations that Provide Increased Protection to Government and Taxpayers

The following bullets are considerations that add a level of protection to government and taxpayers against future costs of mine remediation and reclamation.

- The Polluter Pays Principle of the Canadian Environmental Protection Act enshrines the principle that users and producers of pollutants and wastes should bear the responsibility for their actions. Companies, or people that pollute, should pay the costs they impose on society. Recovery of costs and expenses is also outlined in the Nunavut and Northwest Territories Environmental Protection Acts. As such, even if all of the costs of remediation are not included in the financial security, provided the company has not become insolvent then the responsibility remains that of the company.
- Mine owners will strive to avoid long term liability. Furthermore, *Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories* (Mackenzie Valley Land and Water Board and Aboriginal Affairs and Northern Development Canada, 2013) specifically lists no long-term active care as one of four closure principles (i.e. mine owners are directed to avoid long-term costs).
- Current design criteria for primary components includes criteria for extreme events, which should result in a low risk of failure.
- The reality is that unless a company becomes insolvent, if it appears that conditions are not favourable, it is more likely that the company would retain the site rather than turn it over to the government to manage. In fact, this would be required under existing regulations.
- Although still a large cost to taxpayers, Federal Contaminated Sites Action Plan (FCSAP) projects report socio-economic benefits, especially in Indigenous communities and in northern or rural areas. FCSAP's 2016-2017 Annual Report[5] indicates that through joint ventures between custodians and local communities, work conducted on FCSAP sites offers opportunities for local residents and contractors to learn and develop skills, as well as build careers and businesses.

5.4.2 Considerations That May Result in Obstacles or Increased Risk

The following bullets are considerations that may result in obstacles to successful mine closure and reclamation or increase the risk to government and taxpayers for future costs of mine remediation and reclamation.

- As identified by the National Orphaned and Abandoned Mines Initiative - Mine Closure/Return of Mining Lands Task group[6], as well as Asia-Pacific Economic Cooperation (APEC) Checklist (2017), in the absence of clear policy for relinquishment, and if a mine owner fails to receive release of bond money/financial assurance, there is an increased risk of abandonment.
- If the financial assurance includes the costs of decommissioning and reclamation, monitoring and maintenance, as well as other substantial security provisions, the mine owner must be provided assurance that that the majority of the bond will be returned within a short period of time. Otherwise, there will be reduced incentive to carry out the work, progressively or at closure. Or, that the mine owner will leave these responsibilities

[5] Federal Contaminated Sites Program 2016-2017 Annual Report
[6] NOAMI Mine Closure/Return of Mining Lands Taskgroup

to the government, as the financial assurance was to have been adequate. In reality, it will likely be found that the financial assurance was not adequate for this scenario.

- The requirement of a company to provide financial assurance in an amount and form accepted by governments can have an impact on a company and its ability to manage its financial future.
- The proponent for mines with prohibitively high funding requirements for relinquishment may elect to retain the properties thus limiting future land uses.
- It may be a large administrative burden for industry and government to calculate site-based liabilities for a wide range of categories of costs. Each category requires a reasonably sound knowledge of expected costs. For some components or categories it may require specific expertise to derive an accurate estimate or propose additional costs.

6 RECOMMENDATIONS

Recommendations have been divided into the following:

- Recommendations for improvements to components of current guidelines and RECLAIM that are typically included in financial security estimates.
- Recommended other steps in considering additional categories of costs or other revisions to RECLAIM and financial security policy.

6.1 IMPROVEMENTS TO COMPONENTS OF EXISTING GUIDELINES AND RECLAIM

6.1.1 Align Costing Model with the MVLWB/INAC/GNWT Guidelines

The Mackenzie Valley Land and Water Board/Indigenous and Northern Affairs Canada/Government of Northwest Territories *Guidelines for Closure and Reclamation Cost Estimates for Mines* were released in 2017. The Guidelines note that:

> *There may be costs which are not specifically identified in RECLAIM, but are required in order to implement the Closure and Reclamation Plan...There are three regulatory compliance costs not included in RECLAIM which will likely be incurred during closure and reclamation:*
>
> - *Engagement costs: the Boards' (2013) Engagement and Consultation Policy and their (2014) Engagement Guidelines for Applicants and Holders of Water Licences and Land Use Permits require all holders of water licences and land use permits to engage with affected parties. Therefore, engagement costs during the closure planning, active closure, and post-closure phases should be included in the estimate.*
> - *Regulatory compliance costs may include, but are not limited to: transfer or renewal of authorizations e.g. submission of application, participation in technical sessions and public hearings); preparing required submissions (e.g. annual reports required by the water licence, responses to information requests); reporting (e.g. monitoring reports, reclamation completion reports); and responding to reviewer comments during public reviews.*
> - *All costs for finalizing the Closure and Reclamation Plan prior to commencement of reclamation, which may include but not be limited to the completion of any outstanding reclamation research.*

As discussed in Section 3.3, these costs are not typically or consistently included in financial security estimates and are not specific items in RECLAIM. It is recommended that CIRNAC provide a policy decision as to whether these categories of costs be included in financial security estimates, which should then be reflected in an update to RECLAIM (or whatever costing model is selected for use) and provides guidelines as to the expected range of costs.

It was also noted by a representative of CIRNAC Nunavut Regional Office that consideration should also be given to the mine reclamation policies of CIRNAC's partners with whom CIRNAC holds security. For example, the Qikiqtani Inuit Association (QIA) Abandonment and Reclamation Policy for Inuit Owned Lands (Version 2.0) - Section 4.0 *Financial Security Estimation* reads:

> *Commonly, Tenants have employed the RECLAIM model as a tool to develop a financial security estimate. It is QIA's position that the RECLAIM model does not offer a fully transparent assessment of security costs, nor does RECLAIM represent the best interest of Inuit as private landowners.*

Appendix B of the policy contains tables that QIA state may aid a Tenant in developing a methodical framework to present a financial security costing estimate. Although QIA acknowledges that the examples do not represent all required budget line items for such activities and that QIA requires a detailed line item breakdown of each cost to complete reclamation of each component.

6.1.2 Task a Working Group With Reviewing Unit Costs and Comprehensiveness of RECLAIM

The initial scope of work for this discussion paper included a review of actual government expenditures broken out into categories and detail. This was to evaluate whether there are components of closure and reclamation that would be underestimated using the current version of RECLAIM. However, as noted in the Introduction section of this discussion paper, there are a number of obstacles to obtaining and making use of such information, such as contract confidentiality, limited examples available to provide a sufficient range and average of costs (which can vary considerably depending on the size and scope), and the effort required to synthesize data. Contractor confidentiality has been a long standing obstacle in evaluating the accuracy of RECLAIM and in particular updating RECLAIM unit costs and is not unique to CIRNAC.

It appears however, that the CIRNAC Long Term Operations and Maintenance Estimate Working Group were successful in sourcing information from a relatively long list of CIRNAC project files. It is recommended that the same effort be applied to reviewing the unit costs in RECLAIM, as well as whether the list of most likely activities is sufficiently comprehensive. It is noted that reference was made in one of the responses to the questionnaire to a Security Working Group having recently been established so perhaps this recommendation is already underway.

The following components may be underestimated or inaccurate:

- Costs for building decontamination and demolition described in Section 3.1.1.
- The list of expected activities for land reclamation described in Section 3.1.2.
- Minimum assessments expected for Contaminated Site Assessments described in Section 3.1.3.
- As noted in Section 3.2.3, the default percentage for Project Management is possibly low. Again, it is recommended that the specifics of what this category is intended to be used for, and whether it is sufficient, should be reviewed.
- Interim Care and Maintenance, as described in Section 3.1.4.
- The full monitoring suite, phasing, and duration.

6.1.3 Create Mechanism to Update Unit Costs

Further to the above, create a mechanism to continually update Unit Costs with: information from Public Services and Procurement Services Canada; other government sources; and inflation. It is understood that bid prices need to be confidential but this has consistently been an obstacle to updating the RECLAIM Unit Cost table.

6.1.4 Improve Detail in RECLAIM User Manual and Unit Cost Table

BCL, the author of the current RECLAIM User Manual and the most recent update to the RECLAIM model, acknowledges that it would be beneficial to provide greater detail and transparency in the Manual and the unit cost table as to the basis of costs and assumptions. This has been identified by some mine owners as a frustration, and improvements could potentially reduce subjectivity as well as discrepancies between a mine owners estimate and regulators.

For some worksheets, this would have to be done with explicit direction from CIRNAC.

6.1.5 Direct Costs Versus Indirect Costs

Two of the worksheets that are included as indirect costs in RECLAIM are the Post-closure Monitoring and Maintenance and Mobilization/Demobilization. In part, this is a carry-over from revisions that have been made to RECLAIM over time. For example, mobilization/demobilization at one time was calculated as a percentage of direct costs.

It is recommended that further consideration is given to whether these categories be included as direct costs in RECLAIM, in which case those costs that are calculated as percentages in the RECLAIM summary sheet would increase.

6.2 ADDITIONAL STEPS

6.2.1 Advance Policy on Security Reduction and Relinquishment

Opposition to additional categories or scope of financial security is going to be even greater given the lack of advancement on the issue security reduction for completion of reclamation (whether progressive during operations, or final).

It is recommended that any consideration of adding to the scope of financial security estimates also provide improved clarity as to how and when those costs would be returned. It is understood that the CIRNAC Nunavut Regional office is developing a framework for reclamation of the Lupin mine and that this framework could be a useful reference for continuing to advance policy and guidelines on the return or reduction of security.

6.2.2 Comparison of Security Held and Total Government Expenditures

Another component of the initial scope of work was to summarize security held for mines or advanced exploration projects in NWT and NU as well as total expenditures at mines or advanced exploration project that have become the responsibility of those governments or CIRNAC. If this is a task requiring a lot of effort, or legacy sites that have been remediated by CIRNAC are not thought to accurately represent current and existing mines, then the value is questionable. However, what it may allow for is a more quantitative evaluation of how much current estimates differ from actual expenditures.

An assessment of financial costs to remediate Canada's contaminated sites having by undertaken by the Parliamentary Budget Officer in 2014. The Parliamentary Budget Officer utilized the costs

that are reported in the Federal Contaminated Sites Inventory. As such, it may not be a lot of effort to filter the sites to look only at total costs for mines and mineral exploration projects.

6.2.3 Potential Loss of Accuracy Versus Ease of Use

Although recommendations for some added detail and reclamation activities have been made, in general it is noted that there is going to be a trade off with any cost estimating tool between maintaining the tool as something relatively straightforward to use by a range of users versus improved accuracy. Improved accuracy requires a higher level of involvement from qualified professionals with a broad range of knowledge or expertise. Potentially a team is required to develop an estimate as well as a team to review it.

A trend has been observed in financial security estimates of increasing detail and "precision". For one, this may provide a false sense of protection and for another, it becomes quite burdensome (especially when trying to determine amounts to relinquish). There is not an easy answer, but it is raised as something to be considered in future updates. Particularly as several of the categories that may be considered for addition to the scope of financial security estimates are recognized as being more difficult to define and quantify and may therefore be better suited to lump sum or included as an annual average (with transparency as to how costs were derived).

6.2.4 Evaluate Other Costing Tools

No recommendations were provided in the responses to the questionnaires for other models or cost estimating tools. Cost estimates for CIRNAC remedial works are usually contracted as part of the assessments and development of the remediation plan. CIRNAC also has a Cost Estimation Guide for Contaminated Sites (INAC, 2013) that could provide additional guidance. A respondent from GNWT indicated that the Land Use Permit Security Template is in the process of being updated. Another respondent from CIRNAC suggested that policy and costing tools that have been developed by CIRNAC's partners such as Regional Inuit Associations (RIAs) and Nunavut Tunngavik Incorporated (NTI) be reviewed.

There are elements of the British Columbia Ministry of Energy, Mines and Petroleum Resources *Mine Reclamation Bond Calculator* (BC Ministry of Energy, Mines and Petroleum Resources, 2018) that could be useful for adoption to improve the land reclamation activities and costs included in RECLAIM.

The following reclamation cost estimating software is available, but BCL has not reviewed them in any detail.

- Info Mine Cost-Estimating Software for Reclamation Bonds https://costs.infomine.com/software/sherpa/reclamation-bonds/
- Standardized Reclamation Cost Estimator, software that was originally developed as a cooperative effort between the Nevada Division of Environmental Protection, Bureau of Mining Regulation and Reclamation, the U.S. Department of Interior, Bureau of Land Management and the Nevada Mining Association https://nvbond.org/

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Appendix A - Closure and Reclamation Costs Questionnaire

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Mariah Smith
Land and Water Management
Natural Resources and Environment Branch
Northern Affairs Organization
Crown-Indigenous Relations and Northern Affairs Canada

RE: **Review of Components of Security Estimates and RECLAIM Model**

Dear Ms. Smith,

In accordance with the guiding principles of the Crown-Indigenous Relations and Northern Affairs Canada's (CIRNAC) Mine Site Reclamation Policy, adequate security should be provided to ensure the cost of reclamation, including shutdown, closure and post-closure are born by the operator of the mine rather than the Crown. It has been CIRNAC's experience with the management of abandoned mines that security held for these costs falls well short of actual costs incurred.

Brodie Consulting Ltd. has been contracted by CIRNAC to assist in the review of mine closure and reclamation financial security. The review is intended to evaluate both whether costs that are typically captured in security estimates reflect actual costs that have been incurred, as well as whether there are other known costs that should be considered as components of security.

We are requesting your assistance in evaluating the expected types and range of costs associated with closure and reclamation. For regulators using the RECLAIM model for cost estimating, we are also requesting input regarding perceived deficiencies in the model. Please review and complete the attached questionnaire.

We request this information be submitted by January 10, 2019 to both Ms. Mariah Smith, Land and Water Management, Natural Resources and Environment Branch, mariah.smith@canada.ca, (873) 354-1183 and Ms. Lara Fletcher, Brodie Consulting Ltd, lara.f@telus.net, (250) 751-3755.

Thank you,

Brodie Consulting Ltd.

Lara Fletcher, P.Eng. (BC, NT/NU)

Brodie Consulting Ltd.
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604-790-1853 mjohnbrodie@gmail.com

Closure and Reclamation Costs Questionnaire

In accordance with the guiding principles of the Crown-Indigenous Relations and Northern Affairs Canada's Mine Site Reclamation Policy, adequate security should be provided to ensure the cost of reclamation, including shutdown, closure, and post-closure are born by the operator of the mine rather than the Crown. It has been CIRNAC's experience with the management of abandoned mines that security held for these costs falls well short of actual costs incurred.

This questionnaire seeks to evaluate the costs that contribute to management of abandoned mines and identify where gaps exist between projected or calculated security requirements and actual costs incurred by government when assuming responsibility for mine closure and reclamation.

The questionnaire consists of four sections:

- Section 1 - Identification of respondent
- Section 2 - Categories of costs that may contribute to overall costs of mine abandonment and management of reclamation.
- Section 3 - Identify deficiencies with RECLAIM
- Section 4 - General comments

Section 1. Identification of Respondent

Please provide your name, title, and department. Also, please provide the contact information of the people within your organization who are best able to assist with this review. Those individuals may be contacted for additional details or clarification.

Section 2. Components of Security Estimates

Security is intended to cover the costs of completing the activities described in a closure and reclamation plan. Typically these costs are based on the assumption that the work is carried out by 3rd party contractors and that mobilization costs are included for every piece of equipment required for the work (i.e. does not assume that existing mine equipment is available and in good working condition).

1) What other types of costs have been incurred, or do you expect would be incurred in the event that government must assume responsibility for closure and reclamation? Below is a list of possibilities. Some of the categories are presently included in some existing security estimates. However, each category has been listed for the respondent to provide:

   - A description of what the category is intended to encompass;
   - Factors that should be considered;
   - Duration of time, and at what phase of the mine life the cost should be included in the security estimate. For example, if post-closure monitoring and maintenance is to be included in security does that become of component of security at the start of mining, or is it evaluated and included toward the end of closure and reclamation?;
   - <u>It would be particularly helpful to provide an estimate of the range of expected costs</u>.

Categories:

a) Interim Care and Maintenance. Should costs reflect the assumption that the site will remain in a state that allows for evaluation as the government seeks to find a new owner (i.e. pits or underground not flooded)? Or the assumption that the site will be shut down and minimum site monitoring and maintenance be maintained?

b) Environmental monitoring and geotechnical inspections during interim care and maintenance, closure and post-closure. Obviously the number of years of post-closure monitoring will depend on a number of factors, but what do you consider a minimum number of years?

c) Provisions for post-closure maintenance. How should this be calculated? For sites that have been reclaimed, have maintenance requirements been more than expected?

d) Interim receiver

e) Legal fees

f) Government administrative and project management

g) Consultant fees: evaluate existing conditions, update management plans, prepare a final closure and reclamation plan, provide technical support during water licence transfer and/or renewal.

h) Completion of reclamation research/engineering studies (may be similar or overlap with item g)

i) Completion of Traditional Knowledge studies

j) Annual reporting that includes compliance reports with respect to regulatory instruments; results and findings of reclamation research and monitoring programs; and a summary of site activities. This could include Reclamation Completion Reports and Performance Assessment Reports. It may also include requirements to present annual report at public meeting. Consider whether these are likely to be completed internally (may overlap with item f), or contracted out.

k) Aboriginal Consultation and Engagement. Would include hosting community meetings and site visits.

l) Funding to support Environmental Monitoring Agencies (e.g. Independent Environmental Monitoring Agency for Ekati Mine).

m) Contingency that is different from the contingency typically included in RECLAIM which is intended 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. Is this contingency considered adequate to address other uncertainties? Or should additional contingency be required to address:

- Imminent risk to safety or the environment due to abandonment. For example, the government must engage a contractor on an emergency basis to mitigate the risk of over-topping of the tailings storage facility.
- The potential for economic induced departures from the approved mine plan resulting in increased risk and a need for additional mitigation/remediation measures.
- Uncertainty in completed closure and reclamation (i.e. residual risk) while transitional phase monitoring is completed to confirm objectives have been achieved. Also referred to as "holdbacks". How should this be calculated?

n) Others?

2) Which of the categories do you recommend be held with the Water Licence, Land Use Permit, or Environmental Agreement if one exists?

3) At some sites, more than one landowner may have jurisdiction. Should security requirements:

   a) Sum to the total potential liability of the site, or;

   b) Allow each landowner to establish an amount irrespective of others.

Section 3. RECLAIM Model

4) Is there a standard model other than RECLAIM that is used by your organization to prepare security estimates or that your organization advises companies to utilize? Please list acceptable models/methods.

5) Are you familiar with alternative models that you recommend governments consider utilizing? If so, please provide the name and internet link to those that are publicly accessible.

6) What do you see as deficiencies with RECLAIM? Please identify whether there are particular components that are known to be underestimated with respect to government incurred costs.

Section 4. General Comments

BCL is aware that there are many points of view on the topic of security. Please provide any additional input and opinions you wish to be considered.