

ASSESSMENT OF MINE CLOSURE BONDS AS TOOLS FOR PROTECTION OF WATER QUALITY AND FIRST NATIONS RIGHTS

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ABSTRACT

Mine closure bonds have been assessed as tools for the goal of protecting water quality, aquatic habitat and First Nations Rights. While some mining companies have taken a strong stewardship approach at their sites, other mining companies fall short of protecting long-term water quality and interests of First Nations. Consideration is given to successes and challenges with a number of operating and closed mines, mainly in British Columbia.

Lessons learned show it is essential that closure bonds reflect the on-the-ground liabilities on an annual basis and that the bonds be fully updated when mines are profiting. Once conditions change and mines are not profiting, it is very difficult to remedy a situation where liabilities greatly exceed the closure bond held by the Province. To reach long-term closure and full remediation of a mines site, a delay in action of decades is common before water quality impacts are remediated. Improved regulatory tools to protect long-term water quality and First Nations rights are considered such as Environmental Performance Bonds.

This paper draws attention to a gap in stewardship that often exists during prolonged periods of Care and Maintenance and economically challenging periods of mine Operations. During periods of economic hardship, remediation of water quality impacts is not typically achieved. A strengthened regulatory approach is recommended to address water quality concerns associated with companies with long-standing track records of non-compliance. To increase trust in the mining industry, an improved regulatory system is proposed with reduced reliance on positive corporate culture and fortunate economic conditions.

KEY WORDS

Mine closure, water quality, First Nations, regulatory tools, environmental performance bonds

INTRODUCTION

A common goal for mining is to maintain appropriate levels of environmental protection, particularly in waters receiving mine effluent and seepage. Mining companies have varying levels of success in protecting aquatic life. In the case where mine water impacts are monitored and shown to be causing environmental harm to aquatic life, it can be difficult and prolonged for First Nations, regulators, and mining companies to achieve acceptable solutions for mitigation and remediation of a site. The goal of this paper is to review the typical pathway for completing remediation efforts to reach final long-term closure and to explore potential improvements to regulatory approaches.

In a mine's life, there are multiple phases leading to Final Long-term Closure that are discussed herein. Once approved and permitted, mining projects typically go through the following phases:

- Construction,
- Operations,
- Care and Maintenance,
- Additional Operating periods / Care and Maintenance periods,
- Remediation (or Active Closure), and
- Final Long-term Closure

This paper draws on work for both mining companies and First Nations at projects that have advanced beyond the proposal stage. Table 1 summarizes the mining project by status and includes some key challenges. The information used in this paper was taken from publicly available information sources. The current status of the project (i.e. Operations, Care and Maintenance, Final Closure) is listed along with a brief summary of the key challenges for water quality and mitigation planning and mine closure.

In Table 1, common key challenges include addressing acid rock drainage and neutral metal leaching. Key challenges impacting waterways and aquatic life are often driven by waste rock left exposed to air and water; the natural condition of the rock is typically under-water. By bringing certain rock to the surface, mine water pollution problems often arise. Once mine pollution problems exist, water treatment is typically the mitigation plan used to protect the aquatic environment.

Table 1. Status of Mining Project Examples and Key Challenges for Final Mine Closure

Mine Examples	Status of Mine	Key Challenges Past and/or Present for Mine Closure
Baker and Shasta Mines	Operations to essentially abandoned	Tailings ponds (geotechnical); Water quality (ARD Adit discharge); MEM/FNs taking control of the site
Endako Mine	Expansion under approval process, Operations to Care and Maintenance	ARD water discharge long-term; current neutral drainage (sulphate, molybdenum)
Detour Lake Mine	Operations	Water quality modeling required for long term PAG rock; need for mitigation planning
Myra Falls	Expansion approved; Operations to Care and Maintenance	Uncaptured ARD groundwater from reactive PAG waste rock to water courses, closure plan mitigation measures
Kemess	Care and Maintenance to near Final Closure	Well managed site; all PAG rock underwater; neutral selenium drainage captured; mitigation planning underway
Gibraltar	Expansion approved; Operations	Accumulation of mine contact water; contested discharge to Fraser River
Elk Valley (5 coals mines)	Expansions approved; Operations	Selenium and sulfate loading from sulfide oxidation in waste rock; nitrates from blasting; filling in of stream and creeks
Dome Mountain Mine	Care and Maintenance; proposed expansion	Improvements to water treatment underway; small site with little-to-no impacts
Kitsault	Final Closure; proposed expansion	N/A
Tulsequah	Care and Maintenance	Challenge with operating water treatment for ARD adit discharge
Mount Polley	Operations	Mitigation planning for tailings breach
Cantung	Care and Maintenance	Mitigation for historic ARD tailings deposit into

Mine		natural creek
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For many mines, the length of time between Operations and Final Long-term Closure extends for many decades. The Pinchi Mercury Mine in north-central BC illustrates the timeline of a mine reaching the Final Long-term Closure Phase. This mine is located within Tl'azt'en First Nation and Nak'azdli First Nation territory.

The Pinchi Mine operated in two different phases between 1940 and 1975, and the mine was placed in Care and Maintenance between 1975 and 2010. In 2010, decommissioning and reclamation of the site was initiated, a three-year, \$22 million reclamation project. Reclamation was completed in August 2012. In the case of the Pinchi Mine, the Care and Maintenance Phase spanned over 35+ years. At times there may be good reasons for delays in action, however often there is documented evidence of aquatic harm and a lack of motivation from the mining company to resolve the issue.

In order to explore improved regulatory approaches, a review is provided of the current regulatory tools typically employed to reach the goal of protection of aquatic life and the Final Long-term Closure Phase. The Closure bond or security is a well-known tool that is required in BC. This paper looks at the effectiveness and limitations of the Closure Bond and other regulatory tools for preventing prolonged periods of demonstrated environmental aquatic harm.

Once a mine is identified as causing aquatic harm (e.g. chronic toxicity), it should be possible to resolve mine pollution issues within an appropriate timeframe such as the span of one decade. In the case of the Pinchi Mine and many other mining projects, a closure bond is often not utilized; it is kept in trust in case of bankruptcy/ abandonment. Even though a mine may not be abandoned, a delay-in-action spanning many decades is common for mining projects prior to completion of remediation works.

There is a distinction between reaching final long-term closure and finding a “walk-a-way” solution that allows for no further monitoring or engagement at a site; this paper does not specifically focus on finding passive or walk-away solutions. The focus of this paper is to explore new regulatory approaches for addressing mining projects causing harm to aquatic. The longevity of the timeframes for longer-term Care and Maintenance is important to consider when contemplating improvements to the mining regulatory system in BC. In addition, a number of mine pollution challenges are continually growing in size due to approval of expansion applications.

LIMITATIONS OF THE CURRENT REGULATORY APPROACH

The current regulatory system in BC needs to be improved to better protect aquatic life and ensure companies remediate a site in a timely manner. At many mining sites, fluctuating metals prices are a key challenge and can result in a lack of motivation to remediate environmental problems. Examples of mining projects are provided to help motivate development of new regulatory tools.

Example: Mine A

A mining client once explained the evolution at a particularly challenging mine. After years of experience working at Mine A as an Environmental Superintendent, he observed that all the “thinker” types and qualified professionals were let go over the years during times of economic hardship. All that was left were the minimum staff, which included only operators. There were time spans in the past when Mine A employed Qualified Environmental Professionals (QEPs). At the time, there were no QEPs on staff and it was very difficult to implement mitigation strategies to reduce harm to aquatic life. At this time Mine A was experiencing favorable economic times, making hundreds of millions of dollars in annual profit. Mine A was within a “window of opportunity” where it was possible to improve mitigation systems and environmental compliance as funds were readily available. However, there were no qualified staff employed and regulatory oversight was minimal; as a result, little improvement was achieved for pressing issues causing aquatic harm. Unfortunately, the “window of opportunity” ended and Mine A may or may not re-open.

Proponent Motivation Levels for Taking Action and the Window of Opportunity

The example of Mine A shows that two components are required for action to be taken at a site:

- The mining company needs motivation to “do the right thing”, i.e. protect aquatic life; and
- A window of opportunity needs to exist such that economic times are favorable and remediation efforts are not an economic hardship.

The first factor, motivation to “do the right thing”, can come about for two reasons:

- Regulatory requirements are strong and clearly communicated; or
- The mining company has QEPs on staff and positive corporate culture.

Unfortunately, the current regulatory approach does little to motivate remediation efforts. Environmental compliance permits are often written to the level of existing pollution to avoid putting a company out of compliance. Companies that start off with positive corporate culture and high motivation to do the right thing can change when economic times deteriorate. Motivation may wane over the years. Regulatory requirements for mining needs to be strengthened in BC.

A summary of phases that may be experienced by mining companies is provided in Table 2:

Table 2. Summary of Mining Phases

Mining Phase	Considerations for Regulatory tools
Operations – Good Economic Conditions	“Window of opportunity exists” for securing funds and commitments for environmental protection.
Operations – Poor Economic Conditions	Achieving environmental protection through mitigation measures is difficult to achieve.
Care and Maintenance	Similar difficulties are faced with achieving environmental protection through mitigation measures.

The regulatory system in BC does not formally consider the “window of opportunity” that exists when the costs of appropriate mitigation plans are relatively negligible compared with a company’s annual profits. Unfortunately, if this window of opportunity is missed, there may be little chance of success in securing funds for appropriate mitigation plans in subsequent mining phases. Therefore, it is critical to secure funding and commitments for environmental remediation efforts when the window of opportunity is open.

The current approach allows for long delays in action spanning many decades, costing tax payer’s funds while sites are monitored and discussed for decades. It would be wise for the Province and First Nations to limit response time to a 5 to 10 year period. In order to do that, preventative action needs to be taken during the “window of opportunity”, with funds set aside for remediation rather than defaulting to no action for decades.

Further Limitations of the Current Approach

In 2016, information was released publicly documenting a total of \$1.2 Billion owed to the Province by mining companies in unfunded closure bonds (Hoekstra, 2016). The cost of the closure bond can be relatively negligible when a company is experiencing good economic conditions (i.e. high metal prices and high profits). It is important that companies be pressured to resolve outstanding closure bond liabilities during the “window of opportunity”.

One existing regulatory tool that can theoretically be used is the power to shut down a mine. This tool is not used in practice because of the political fallout resulting from the loss of jobs. The political risk of shutting a mine down is far too great for the Province to take this strategy. In fact, the motivation for this potential tool can work in the opposite direction. Mining companies have been known to threaten to shut down a mine and publicly blame the Province for insisting on costly environmental protection measures.

During times of economic hardship there are no clear solutions. During poor economic times, it is difficult to ensure companies comply with permit conditions and implement adaptive management strategies and remediation efforts. Currently there is no effective regulatory tool for securing environmental commitments during Operations or Care and Maintenance similar to the closure bond used in the case of mine abandonment. In practice, the closure bond is the main regulatory tool used to pressure companies to be good stewards of environmental protection. As the closure bond does not ensure environmental protection for the Operations or Care and Maintenance Phases, improved regulatory tools are needed to ensure the non-compliant companies are held to commitments.

Case Study, “Mine B”, Improved Regulatory Tools for Expansion Projects

This paper addresses the need for better mitigation planning and improved regulatory tools for approving proposed expansion projects and reducing long Care and Maintenance Phases common to mining projects. An example has been selected to demonstrate the need for a different regulatory approach when approving expansion proposals.

In 2012, Mine B was granted an approval for expansion of mining and modernization of a new mill. This relatively recent regulatory approval was short-sighted in a number of ways. At the time of the approval, the “window of opportunity” was open as the company was making hundreds of millions of dollars in annual profits. However, motivation for considering harm to aquatic life was lacking along with regulatory pressure.

At the time of the approval, it was known that a pyrite zone and extensive quantities of subaerial (exposed to air and water) potentially Acid generating (PAG) waste rock could cause long-term concerns for the downstream receiving environment, including salmon habitat. However, the Province allowed the company to go ahead without requiring appropriate environmental studies be completed by qualified professionals. Instead, the Province required that the appropriate studies be completed by September 2014. In addition to acid rock drainage problems in the long-term, the current site has neutral metal leaching that is of concern.

A cursory look at the relatively high permit limits for mine discharge water (sulphate and molybdenum) and the lack of dilution in the receiving environment prompted review of the aquatic effects monitoring. Unfortunately, the aquatic effects monitoring studies showed mine effluent was chronically toxic on an ongoing basis and causing environmental harm. Initially upon discovering the aquatic harm, BC MOE issued a letter to the company requiring that swift action be taken within a 2-month timeframe. Following this letter, the company complained and was granted a much longer 2-year time-frame. Following extensive interactions with the company and the Province’s regulatory staff, it became clear the company was aiming to delay further studies and taking any action. The regulatory staff attempted to sort out the problems and work on defining mitigation measures, but this was near impossible under the current regulatory system. First Nations involved in the project became very frustrated with all the time and resources spent trying to resolve the issue. To date, there has been no resolution of the neutral metal leaching issue and there are no funds remaining for First Nations to engage in the process.

In addition to the neutral metal leaching issue, the ARD issue is a concern. Under pressure and duress, the company instructed its consultants to estimate the cost to mitigate the long-term acid rock drainage issue from one of many mine site discharges (over 5 discharges are present at this mine site). The cost to mitigate the site considering discharge from the open pit once it spills was estimated to be on the order of \$45 million. The current closure bond held by the Province is about \$15 million and the gap is about \$30 million. This funding gap is also posted publicly (Hoekstra, 2016) and makes up a small fraction of the total unfunded closure bonds owed to the Province. First Nations have worked with the Province to attempt to resolve the funding gap and it is a very difficult exercise.

Over 4 years later, no action has been taken and progress is virtually stalled by the company's position to delay. Some companies "do the right thing" while others do not take that approach. Mine B took the approach of delay as much as possible and the BC regulatory system was somewhat supportive of this approach. Once the company was put into Care and Maintenance (2015), it became clear the window of opportunity was missed by the Province.

The estimate for \$45 million was completed in 2015 and does not include all the environmental liabilities. A full closure plan and associated closure bond estimate is currently outstanding. The delay in sorting out mitigation plans is partially attributed to uncertain requirements for receiving environment guidelines. MOE and FNs are working together to sort out the receiving environment requirements, however the FNs have no IBA with the company and limited funds to engage in this process.

It is interesting to note that FNs have never had a revenue stream from Mine B, which is situated within the heart of their traditional territory. The local towns of non-indigenous townspeople have benefited from a revenue stream to the municipal tax base. This situation is difficult for FNs as they are essentially funding efforts to protect the environment without having the benefit of revenue from the project.

Case Study, "Mine C"

Mine C is currently being fast-tracked for approval of an expansion application. There are clear monitoring results showing damage to aquatic life and regulators are attempting to improve this situation. Even though old issues have not been adequately addressed, mine approval is proceeding and the expansion is expected to cause even greater environmental harm. The proposal is to double the amount of waste rock generating mine pollution, specifically selenium and sulfate levels pose a concern.

In this case, regulators did not insist on adequate work to characterize water quality entering into new water treatment systems. Mine C is complex and regulators have a belief in the mining company's good corporate culture. However, the lack of regulatory oversight did not serve the mining company's interest. Water treatment was not initially successful and resulted in documented fish kills and prolonged periods of the mine being out-of-compliance. It was not until the mining company did the proper work to predict water quality entering water treatment plants that they were able to succeed in designing proper mitigation measures. This example shows that even mining companies with perceived good corporate culture need to be held to a higher regulatory standard.

IMPROVED REGULATORY TOOLS AND STRENGTHENED AUTHORITY

Potential solutions to improve the current regulatory system for BC mining are explored. These solutions consider the need for mining companies to be motivated by stronger regulations and to formally consider the “Window of Opportunity”.

Simplify Mandate of Ministries Regulating Mining

In 2016 the Auditor General of BC identified a regulatory challenge, the difficulty in promoting and regulating an industry (BC Auditor General, 2016); in the case of conflicting mandates, which mandate takes precedence. The recommendation by the Auditor General is to separate promotion and regulation of the mining industry to allow for stronger regulatory oversight. This recommendation deserves support as it will strengthen environmental protection and compliance.

The Ontario mining regulatory system has separated promotion and environmental protection for review of tailings dams. In Ontario all tailings dams and water retaining dams are reviewed by the same regulator, the Ministry of Natural Resources and Forestry (MNRF) under the Lakes and Rivers Protection Act. In Ontario, each dam raise is approved in stages, typically on an annual basis. In addition, overall dam designs are submitted and approved. In BC, tailings dams are regulated by the Ministry of Energy and Mines (MEM), which has a dual mandate to promote and regulate mining. On the surface, it would appear that the Ontario approach for tailing dams allows for simpler and stronger regulation of tailings dams. However, in terms of regulation of Acid Rock Drainage, the BC regulatory approach is considered superior in Canada to other provinces approaches. The BC regulatory approach includes the provision of a Mines Act Permit with conditions requiring mitigation measures. In other provinces such as Ontario there is no such regulatory tool as the BC Mines Act Permit and the regulatory requirements for acid rock drainage management are substantially weaker than in BC.

Improved Review of Mining Expansion Applications

In general, the BC regulatory system needs to have equally stringent requirements for new mines and older mines applying for expansion. It is essential that BC ministries not issue temporary permits for expansion without sound professional science/engineering work being completed. Regulators and the ministry supporting them must insist environmental issues be addressed as early as possible so that the “window of opportunity” is not missed. This involves taking short-term politics out of the regulatory permitting system.

There are positive examples of mining companies doing the right thing. The Kemess Mine in northern BC deserves praise for the Kemess South closure success. In this example, the mining company is well poised to apply for an expansion as environmental issues are resolved at the site. The expansion application is essentially being held to the standards of a new mining application. This should be the case for all proposed expansion plans by mining companies.

Qualified Environmental Professionals

Currently, there is a lot of attention and Qualified Environmental Professional (QEP) time at the Environmental Application (EA) stage and permitting. Unfortunately, there is often very little QEP involvement during Operational and Care and Maintenance stages. Regulators need to require the use of qualified environmental professionals in decision-making roles at operating mines sites and subsequent phases. Qualified professionals have ethical obligations under the professional organization's code of ethics.

PROPOSED SOLUTIONS

Environmental Performance Bonds

Performance bonds are used in many jurisdictions and various industries to motivate companies to meet minimum acceptable levels of environmental performance (Paddock and Wentz, 2014). Specifically, the goal in question is to motivate attainment of water quality targets for the protection of aquatic life. The bond is returned to the mining company if minimum water quality targets are maintained and forfeited if minimum water quality targets are not attained.

To avoid lengthy delays in determining minimum acceptable water quality targets and to motivate companies to complete work to define alternative or more flexible water quality targets, performance bonds should be initially costed to meet simple water quality guidelines for protection of aquatic life or natural background conditions as appropriate. In some cases, such as pipeline discharges to very large and ecologically / culturally significant water bodies, more stringent water quality targets may be appropriate such as allowing a maximum 10% change from natural background conditions (Nadleh, 2016). The water quality targets required should be determined at the time of the Environmental Assessment Certificate, or EAC.

Once the Environmental Performance Bond (EPB) is costed and held in trust by the Province, mining companies can apply for more flexible water quality targets and less costly mitigation measures. This approach motivates the company to complete the environmental studies required. It is important that the onus shift to the companies to prove that site specific conditions allow for more flexible (less stringent) water quality targets. The EPB as a regulatory tool motivates companies to do the work to reduce the costs of mitigation. Under the current system in BC, companies often delay work on defining minimum water quality targets such as SBEBs (BCMOE, 2016) and discussing design of mitigation measures.

The EPB is similar to a closure bond but can be used for remediation works during mine operations rather than only at mine abandonment. The EPB is an incentive for good environmental stewardship by mining companies. Once Long-term Final Closure is reached, the EPB is returned to the company. However, in the case that aquatic harm is demonstrated and no action is taken within a specified timeframe, the EPB can be used to remediate a site or bring a site into environmental compliance.

The EPB reverts to the current BC closure bond in the case of company bankruptcy. In effect, the EPB would not add a financial burden to companies but would allow for remediation efforts to occur sooner. The EPB is designed to both motivate companies to act in good faith and to strengthen regulatory power of the Province to ensure environmental compliance and complete remediation measures such as building water treatment plants.

The size of the bond should be determined by the expected costs of implementing mitigation measures. For example, if a water treatment plant is estimated to cost 50 million, the performance bond would be set at that amount and would only be returned once the water quality target was reached. In the case where a project is approved at the EA stage and no clear mitigation measures are defined, the EPB could be set at a minimum value such as 2% of the capital costs of the mining operation. Provision should be made for unforeseen events contributing to environmental impacts, particularly aquatic harm. Once the mine starts operating and generating waste materials, further data will help better define the requirements of the EPB.

In the case where the company is unable or unwilling to plan mitigation measures and provide cost estimates for remediation plans, a team of independent experts should be assigned to the site. In this scenario, the company could apply to have some of the funds returned if they show that a less costly approach with reaching more flexible water quality targets could be acceptable for protection of aquatic life. This process would be overseen by the Province and the affected First Nations with the regulators retaining control of the remediation planning.

Province Wide Mine Rehabilitation Fund

If there are insufficient funds from mining companies for developing remediation plans and cost estimates, funds for assessing aquatic harm and remediation efforts could be provided by a Province-Wide Mine Rehabilitation Fund. These funds should be set aside as a backup for assessment of all mining projects, regardless of a project's economic success. This concept has been employed in other jurisdictions (Department of Mines and Petroleum, West Australia, 2012) as a method of collecting funds to remediate abandoned mines. Such a Mining Fund in BC could be used for completing remediation efforts for mining projects at various project phases.

CONCLUSION

To increase trust in the mining industry and regulatory system, an approach is proposed to improve regulatory tools and reduce reliance on positive corporate culture and fortunate economic conditions. We can avoid delays in implementing remediation activities by strengthening environmental regulations and applying rules consistently across the mining industry.

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