

IMPACT OF CONTAMINATED SITES LEGISLATION ON CLOSURE OF AN ACID GENERATING MINE SITE IN BRITISH COLUMBIA

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ABSTRACT

In the past few years, numerous mine closure and reclamation projects have been subjected to the provincial Contaminated Sites Regulation (CSR) in British Columbia. A mine decommissioning and closure plan should contain among other things a Detailed Site Investigation report, a Remedial Action Plan and the necessary financial security to ensure funds are available to carry out the remediation work. The intent of the CSR has been to facilitate the complete sign off of long-term environmental liability to a company by government from a particular site through requiring a company to meet all the requirements defined in the regulation. This sign off can be in the form of a Certificate of Compliance, Conditional Certificate of Compliance or Letter of Comfort.

Contaminated Sites Regulations have been developed predominantly for industrial or commercial sites usually in an urban environment with clearly defined contaminants associated with the particular industry. Problems associated with acid rock drainage and acid generating sulphide waste contamination are not clearly defined in these regulations. Complications arise when applying the CSR to the mining sector. In particular, the interpretation of a regulation which defines "contaminated site" based on concentrations of naturally occurring inorganic substances (metals) in soil and groundwater

In addition, the CSR bureaucratic process has not been generally structured to blend with more traditional mine closure plans required under the Mines Act even though the regulations are somewhat linked. While the intent of government has been to link and harmonize the CSR with the mine closure regulations, in BC, the harmonization of the regulations and various ministries has yet to be tested fully and it is anticipated will require modification to the regulations.

This paper will give an overview of the environmental regulatory context in British Columbia with particular reference to CSR requirements at acid generating mine sites. In addition, technical and administrative requirements will be given together with a discussion of the impacts of these regulations on the mining industry and ways to plan and manage associated liabilities.

INTRODUCTION

Historically in the Province of British Columbia the operation and closure of mines were regulated by the Resources Ministry of Energy and Mines formerly the Ministry of Energy, Mines and Petroleum and closure and reclamation of mines was administered by the Ministry of Energy and Mines. While other Regulations and Acts applied to the operation and closure of a mine site, only one Ministry actually administered the closure and reclamation process. Recent changes in provincial legislation have caused

some degree of difficulty when dealing with mine closure planning, namely the addition of the requirement for review under the Waste Management Act (Contaminated Sites Regulation). Traditionally, the Waste Management Act was triggered in BC during the operation of a mine for the issuance of an effluent permit and / or air discharge permit. However, with the introduction of the Contaminated Sites Regulation under the Waste Management Act and the linkage of the Waste Management Act Contaminated Sites Regulation with the Mines Act on April 1, 1997, additional requirements must be considered during the closure of a mine. These additional requirements include the submission of a Site Profile under the Contaminated Sites Regulation to an approving officer if the mine owner applies for a permit or for revisions to conditions of an existing permit under section 10 of the Mines Act or if the owner gives notice of intention to stop work in or near a mine before abandonment in accordance with the Health, Safety and Reclamation Code for Mines in British Columbia.

To date, the contaminated site legislation process has not been well integrated with the mine closure process pursuant to the Mines Act. The process varies widely from region to region. Harmonization has been achieved in certain regions, but in others MELP is enforcing a separate assessment from the mine closure process. This means that MELP is requiring separate documentation from the closure plans filed as part of the mine closure process by imposing remediation requirements separate from the mine reclamation requirements and may pursue a separate public consultation process. This duplication significantly increases the costs of the mine closure process.

If a mine site, or part of, is deemed to be "contaminated" pursuant to the Contaminated Sites Regulation a whole range of additional requirements will need to be met during the remedial (closure) process. Not only does the requirement to involve the British Columbia Ministry of Environment, Lands and Parks (MELP) and the Ministry of Energy and Mines (MEM) in the closure plans involve a series of additional steps in the process, it introduces a different ministry with a differing set of objectives and goals. To date, there exists limited coordinated effort between the two ministries. In contrast, the Province of Ontario coordinates mine closure through the Rehabilitation Compliance and Inspection Office of the Ontario Ministry of Northern Development and Mines (MNDM) and hence, mine closures are led by one department. The MNDM's objective is to serve as the "single window" to other government ministries in Ontario. Involvement in a recent mine closure in the Province of British Columbia suggests that the system followed in Ontario is less cumbersome and likely more efficient in terms of completing mine closure projects.

CONTAMINATED SITES REGULATION - WASTE MANAGEMENT ACT

While it was never the intent of the Waste Management Act Contaminated Sites Regulation to put undue restraints or restrictions on the mining industry, it is likely that further work will be required on behalf of the government to work towards a more succinct process that melds the objectives of the Ministry of

Energy and Mines with the concerns of British Columbia Ministry of Environment, Lands and Parks. Given that the CSR has been promulgated and is in place, the mining industry must be prepared to operate under the current regulatory regime.

The Contaminated Sites Regulation was developed using the "polluter pays principle", where the clean-up costs are paid by those causing the contamination. The liability under the Regulation is considered absolute, retroactive and joint and several. Responsible persons can be current or previous owners or operators, producers of a substance or the transporter of a substance.

The Contaminated Sites Regulation provides for the issuance of Certificates of Compliance to site owners once a site has been cleaned-up or remediated and provides site owners with assurances that the site meets the intent of the Contaminated Sites Regulation and is therefore "clean". The effective "sign-off" by the Province should facilitate the transfer of a subject property on to another owner or, in the case of a mine site closure, back to the provincial crown with the minimization of future liability. The issuance of a Certificate of Compliance may ultimately reduce the value of financial assurance (e.g. bonding) requirements for future monitoring of a mine closure.

The Contaminated Sites Regulation defines the following:

1. **Staged identification assessment and clean-up:** The Contaminated Sites Regulation provides a defined approach to the assessment of industrial and commercial properties as well as the remediation of impacted properties. The process ensures that the entire site has been characterized and all areas of potential environmental concern have been identified. The various stages of the process include the filing of a site profile, completion of a Preliminary and Detailed Site Investigation (PSI / DSI) and the development of a Remedial Action Plan.
2. **Tools for public access to site information:** The Contaminated Sites Regulation provides the public with a means to gain access to information pertaining to potentially contaminated sites. The site registry is used to track the progress of sites through the Contaminated Sites Regulation process.
3. **Cost recovery fees for government to off-set costs:** The BC government charges a fee for service under the regulation for the review of reports and plans, accessing information on the site registry, reviewing Remedial Action Plans and Risk Assessments, issuing Approvals in Principle (AIPs) for remediation and issuing Certificates of Compliance (CCOC) and Conditional Certificates of Compliance (CCOC) once remediation and or Risk Assessment has been completed.

4. **Flexible scientifically based standards:** The success of a site remediation and / or a site is deemed as "clean" through the use of scientifically based standards for common inorganic and organic contaminants of concern. These soil and groundwater standards include generic standards based on a specified land use, matrix standards for sixteen of the more common contaminants of concern that facilitate a broader interpretation of the potential risks at the subject sites, or the use of site specific risk based standards developed by the property owner using the MELP protocol.
5. **Extensive rules on liability:** The Contaminated Sites Regulation defines who is liable for potential impacts to a subject property and is based on the polluter pays principle.
6. **Guidance on independent and voluntary clean-ups:** The Contaminated Sites Regulation provides for a defined approach to either follow through with a voluntary remediation process in which MELP is involved at each step of the process and / or defines an independent approach in which MELP is not involved with the site remediation until such time as a Certificate of Compliance or Conditional Certificate of Compliance is requested.

The introduction of the legislation and regulation was anticipated to:

- Improve the protection of human health, environment and infrastructure;
- Enhance business certainty;
- Increase fairness in determining liability;
- Implement the polluter and user pays principles;
- Easy public access to information;
- Minimize legal costs using alternate dispute resolution;
- Minimize government involvement in site clean-ups;
- Formal certification of clean-ups;
- Defensible scientifically based standards; and
- Involve Public Health officials to develop alternate health protection standards.

The main provisions of the legislation and regulations consist of the following:

1. **Site screening:** Completion of a Site Profile and a Preliminary Site Investigation.
2. **Site investigations:** Completion of a Preliminary and Detailed Site Investigation (PSI / DSI).
3. **Standards comparison:** Comparison of analytical data collected during the completion of the PSI / DSI to the most appropriate generic, matrix or site specific standards.

4. **Site remediation:** Based on the comparison to soil and groundwater standards, complete the remediation of the site soil and groundwater to the prescribed soil and groundwater standards (based ultimately on future land and water usage).
5. **Site monitoring:** Site monitoring may be required once remediation has been completed to verify the results of remediation and / or verify the results of a Risk Assessment.
6. **Soil relocation:** Removal of contaminated soil from a subject property to a certified soil disposal location within British Columbia requires the permission of MELP through the issuance of a Soil Relocation Agreement.
7. **Site information:** Site information including reference to all technical documents produced on a site is compiled on the Site Registry and is made available to the general public.
8. **Liability provisions:** Based on polluter pays principles.
9. **Fees for services under the Contaminated Sites Regulation:** The Contaminated Sites Regulation and legislation defines fees for services charged by MELP to the property owner.

While the intent of the Contaminated Sites Regulation was to provide a means by which a contaminated site could be determined, the responsibility for a contaminated site could be allocated and also the liability for contaminated site could be determined, the Regulations have not been developed with the mining sector in mind. The Regulations were developed for industrial operations in more urban type settings and not necessarily mining wastes, waste rock or tailings. Problems associated with acid rock drainage and acid generating sulphide waste contamination are not clearly defined in these regulations. Generally, in the past acid drainage (ARD) related impacts have been addressed indirectly through soil, hydrologic, hydrogeological and metals-loading evaluations, mass balance and contaminant migration pathways assessments.

A contaminated site as defined under the Contaminated Sites Regulation contains either Special Waste or a substance that exceeds standards prescribed in the Regulation. The standards are comprised of either numerical standards defining acceptable levels of substances (organic and inorganic constituents) in soil and groundwater and risk-based standards defining acceptable risk levels from exposure to substances at sites. A site is defined as contaminated if the statistically valid investigation results suggest that the soil and groundwater data exceed the generic, matrix or site specific standards.

Risk assessment and risk tools for the management of a contaminated site refers to the systematic process of identifying and evaluating substances, persons affected, and exposures to the substances in order to estimate cancer risk or *hazard* indices in accordance with a protocol approved by the director under section 53 of the Contaminated Sites Regulation is used. The protocols that must be approved by a director

include (but are not limited to) the completion of statistical designs, analyses and evaluation of data, completing risk assessments, modelling of physical, chemical and biological processes, development of soil and groundwater standards and the classification of site risks. Risk-management tools that can be utilized subsequent to the remediation and / or Risk Assessment of a property. These tools involve actions, including monitoring, that are designed to mitigate human health or environmental impacts of any contamination at the site.

DISCUSSION

The Contaminated Sites Regulation can be applied to many of the industrial activities on a mine property such as the fuel storage and potential impacts created by this storage, waste dumps, and impacts generated by the day to day activities of a mining operation. However, the division between the Contaminated Sites Regulation regulated activities and activities regulated by the Mines Act is unclear.

To date experience suggests that the roles played by the MEM and MELP are somewhat undefined and unclear. Caution should be exercised in the application of the Contaminated Sites Regulation to the mining industry, especially as it applies to waste rock, tailings and naturally occurring substances. In planning the future operation and closure of a mine, operations should be designed such that all aspects of the BC Waste Management Act Contaminated Sites Regulation are addressed. Provided planning in the closure process for a mine allocates time and budget for addressing the Contaminated Sites Regulation, the sign-off by the Province will give the owners the added protection of a Certificate of Compliance. However, complications of dealing with two different ministries will likely arise and could cause undue delays in the divestiture of a property.

Although the intent of the Contaminated Sites Regulation was to provide a defined process for the determination of liability and governmental sign-off, it is debatable if the process will be to the detriment of the mining sector in British Columbia. Other jurisdictions such as in Ontario where only one ministry provides the lead in the Reclamation process may have a more business friendly approach to the closure of mine sites.

A closure plan in British Columbia should identify clearly the areas of the mining operation that are captured under the Contaminated Sites Regulation prior to implementing the plan. Two separate assessment processes should be followed if the closure is to proceed in an unfettered manner. If possible, the assessment of contaminated sites issues should be completed by groups familiar with the Contaminated Sites Regulation and all other mining related assessment activities should be completed by a separate group. Although there may be overlapping issues such as the quality of groundwater and soil on the site, keeping the spheres of influence for the two different ministries separate will likely result in an expeditious

divestiture of the property. However, given the ability to review the entire closure plan and data collected during the mine closure the BC Ministry of Environment, Lands and Parks could complicate rather than assist in the process. Although there are definite benefits to former mine owners under the Contaminated Sites Regulation in the form of long term sign off by the provincial government, until the roles of the two BC ministries are more clearly defined in the closure of mines, caution should be exercised prior to entering into the process and the closure plan should be carefully thought through.

Based on experience to-date, the closure of a mine under the CSR is difficult and often an impossible task to complete. The interpretation of the regulations in terms of naturally occurring substances as it relates to groundwater, tailings impoundment's, concentrates and ores as well as ARD often leads to insurmountable differences between the MEM or MELP and the mining company. Based on difficulties encountered to-date in the application of the CSR to the mining sector, and recognizing the difficulties of applying the regulation to this industry, the Provincial government has created a mining task force to provide advice and guidelines on how to overcome some of the inherent difficulties. It is hoped that the recommendations of this task force will modify the regulation and / or the process by which mine closures are captured under the CSR.

Information Sources

The aforementioned discussion is only a brief overview of the Waste Management Act Contaminated Sites Regulation. A mine owner or potential future owner of commercial and or industrial property in BC should understand the implications of the Act and associated regulations. In addition to the Waste Management Act and Contaminated Sites Regulation available through the Queen's Printer, the Government of British Columbia Ministry of Environment, Lands and Parks has information including guidance documents posted on their Web page found at <http://www.gov.bc.ca/envparkst.html>. In addition, a guidance document entitled Resource Contaminated Sites Regulation Binder - A Guide to the Contaminated Sites Regulation is available through the offices of MELP and through BC Online at <http://www.bconline.gov.bc.ca>.

Planning a Future Mine. Mine Operation and Mine Closure in British Columbia

Whether planning a new mine or preparing a closure plan the following areas should be considered in light of the Contaminated Sites Regulation and the implications of the regulations.

- As part of a mine start-up, all areas in a future mining operation with the potential to impact the environment should be identified. This could include, but not be limited to: fuel storage and distribution; fuel delivery; ore processing; ore load-out and transportation; waste rock and waste rock storage; tailings ponds and the potential for leachate generation; groundwater quality; municipal waste handling (landfills, incineration, shipment off-site etc); and sanitary disposal.

Any areas where potential impacts could be generated in the mine operation should be identified during the design stages so that mitigative measures or mine processes can be designed to accommodate these potential impacts. By planning ahead, the final closure of a mine site under the Contaminated Sites Regulation will be much easier.

- Prior to construction of a mine site, a mine owner should consider as part of the Environmental Assessment, the collection of baseline samples for both soil and groundwater. These samples may be used to demonstrate the natural occurrence of inorganic constituents at the site and demonstrate that the site was "clean" prior to the mine opening.
- Given that the Waste Management Act and Contaminated Sites Regulation apply to the operation of a mine site in BC and, that prior to closure, the site soil and groundwater must meet the standards defined in the Contaminated Sites Regulation or site specific objectives defined using the protocols established in the Contaminated Sites Regulation, environmental due diligence must be practiced as part of the daily site operation. Due diligence could include the inclusion of annual audits of the mine site operations in terms of the items potentially captured under the Contaminated Sites Regulation.
- If consideration is being given to the closure of a mine site, the mine owners should identify as part of the planning stages all areas of the environment that could have been impacted by both current and past operations. These areas are similar to the items listed in the first bullet. However, given that the site is currently in operation, the site owners may want to consider the assessment of each of these areas. This would include the sampling of groundwater and soil. Modifications to the mining operations could be made in advance of the shut down in order to prevent further environmental impacts and remediation could be initiated well before the closure process. By planning in this manner, it may be possible to enter the closure review under the Contaminated Sites Regulation with a non-contaminated property or a risk managed approach already defined. This could facilitate a much faster review of the closure documents and closure plan by MELP under the Contaminated Sites Regulation.
- A review of mine site operations suggests that one of the major uncertainties associated with site operations is associated with the impact to groundwater whether it is from tailings disposal or fuel handling. In the cases where large-scale impacts to groundwater have developed due to tailings disposal, it is likely that the final solution to remediation will be a risk-based solution that will include long-term monitoring. If long-term monitoring is required at the subject site it is likely that MELP will require financial assurance from the mining company. These financial assurances could be in the form of letters of credit or bonds.

- The existing regulatory system used by MEM and MELP to regulate mines require to be reviewed to ensure environmental protection.
- Roles and responsibilities should be identified and clarified to minimize related costs, time and protect the environment.
- Government and industry should work together to identify areas of administrative and regulatory overlap and duplication.
- Administrative and regulatory responsibilities and accountability between MEM and MELP for development of mines, operating mines, closed and abandoned mines should be clearly define.
- Identify which components of a mine closure fall under MELP and MEM responsibilities.

CONCLUSION

The aforementioned sections provide the reader with a brief overview of the Contaminated Sites Regulation. However, it is by no means an exhaustive discussion. It is hoped that by raising some of the issues contained in this paper that mine operators and operational personnel within British Columbia can carry forward with the implementation of procedures designed to address the Contaminated Sites Regulation. In addition, an understanding of the timing of the various elements of the Contaminated Sites Regulation and the technical details behind satisfying the regulation will assist in the development of thorough Closure Plans.

REFERENCES

BC Environment, Lands and Parks. 1997. Waste Management Act Contaminated Sites Regulation B.C. Reg. 375/96. Deposited December 16, 1996 effective April 1, 1997.