

Draft roundtable discussion paper on the mining Sector
Roundtable Meeting, October 16th, 2009
Victoria Room, Delta Hotel and Suites, Ottawa

1. Introduction

The National Round Table on the Environment and the Economy (NRTEE) is undertaking a major new research program on Water Sustainability and the Future of Canada's Natural Resource Sectors.

The NRTEE will examine the relationship between water and the forestry, mining, agriculture, and energy sectors. The Program seeks to evaluate what policies, approaches and mechanisms can be used by governments, industry and water management authorities so that water can be best managed to foster both ecosystem health and the natural resource sectors' economic sustainability. The focus for the initiative is water availability.

2. Sector roundtables

Recognizing that each sector has different water needs and experiences, the NRTEE is undertaking a series of expert sectoral roundtables in the fall 2009. The purpose of these meetings is to gain information and facilitate a dialogue amongst practitioners and researchers about the water use in each of the sectors. The meetings will inform the NRTEE's work to identify water-related risks for sectors and ecosystems, opportunities to improve efficient water use, barriers to innovation, as well as views on integrated watershed management (IWM). The mining water sector roundtable will be held in Ottawa on October 16th.

More specifically, the objectives of the meeting are to:

1. *Identify the key current and emerging freshwater use and availability issues within the mining sector.*
2. *Identify data sources and characterize the state of freshwater use information in the mining sector.*

3. Water use information

Why is water use data important?

Just as monitoring debits, credits, and savings are crucial to financial success, water accounting is critical in informing the effective and efficient allocation of water and for its sustainability. An understanding of how much water is accessible and when; where water is located; who uses it; and what services water provides are basic necessities. Without consistent, comprehensive, and reliable water use data, appropriate decisions on water use management cannot be made.

Ideally, Canada would have a comprehensive account of all water use data obtained by direct measurements. In reality, this kind of monitoring is very costly. And while certain provinces are making efforts to improve their monitoring, implementation and allocation schemes, these processes are impinged by a general lack of real information on the impacts of concurrent water uses to inform water allocation policies. In water rich regions there is little political incentive to monitor and regulate water use. However, international experience shows us that, unless carefully managed, the legacy of prior licensing decisions can result in over-allocation problems that significantly impair the health of aquatic ecosystems, and ultimately the economic health of the industry.

Looking to the future sustainability of Canada's natural resources, water demands are expected to change regionally because of changes in climate, urban growth patterns, and growth of industry. These factors will have implications for allocation, trade, investments and infrastructure. The NRTEE seeks to understand what information is needed and how it can be better managed to improve the management of water to sustain aquifers and baseflow in streams while supporting the economy.

How is water use data collected in Canada?

The NRTEE conducted preliminary research on water use data that demonstrates that no single data source provides a comprehensive picture of water use for any of Canada's jurisdictions. However, the following sources of information can provide some insights to water use in Canada:

- Well Logs (proxy source);
- Effluent Monitoring Regulations Reporting Requirements (proxy source);
- Individual companies' sustainability reports (primary, proxy and/ or, other);
- Provincial Water Allocation Databases, Licenses and Permits Online (proxy source);
- Statistics Canada's Industrial Water Use Surveys (analyzed source);
- Provincial State of the Environment Reports (analyzed source);
- Other Analyzed Sources; and
- Environmental Assessments (modelled source).

The research shows that certain mining companies track their water use, but readily available data is largely absent.

Most Canadian information that attempts to characterize water use by the natural resource sectors draws upon estimates from Statistics Canada's "Industrial Water Use Survey". Data on manufacturing and mining industries from the Survey were obtained using a stratified, simple random sample design. Reporting upon request is mandatory. Statistics Canada cannot comment on the quality of the data provided by survey respondents. Discharge volume data may also be captured under provincial effluent quality monitoring regulations.

Environment Canada houses data on effluent volumes for mining companies developed as reporting requirements of the Metal Mining Effluent Regulations under the *Fisheries Act*. This data may be useful in providing proxy data on water use by the sector. The regulation applies to mines discharging a total of more than 50 m³ per day of effluent containing one or more deleterious substances exceeding set concentrations. These quarterly and annual reports include, among other items, the total monthly volume of effluent recorded at each discharge point, accurate to within 15% of measured flow rate or volume. However, the relationship between effluent volumes and intake volumes would require further research.

Mining sector projects that require environmental assessments also require estimates of water use. In terms of accessibility, all Canadian Environmental Assessment Act Environmental Assessment reports are public; however not all are available online.

Regional watershed associations and conservation authorities have no legislative water use reporting requirements. However, some collect water use data on a voluntary basis to develop watershed-scale water budgets.

A number of Canadian mining companies – many whom are MAC members—voluntarily track and report on water use as part of the Global Reporting Initiative (GRI) protocol for sustainability reports. The GRI provides companies with indicators on a variety of metrics, including water. Water metrics recommended by the GRI include total water withdrawal by source and percent and total volume of water recycled and reused. But it is unknown what percentage of companies participate in such practices and whether a uniform standard of data collection is widely employed.

4. Water use in the Mining Sector

According to Statistics Canada, approximately 459 million cubic metres of freshwater were used by mining industries in 2005. Of this, metal mining operations accounted for nearly 76%. Self-supplied

surface freshwater consisted of most of this water (76%) although 19% is attributed to groundwater sources. Mining accounted for only 1% of all national water in-take in 2005, compared to 9% in agriculture operations for example. The low volume of intake is largely attributable to the degree to which the sector is already practicing water recycling in their operations. 2005 measurements of water intake in manufacturing, shows that 21% is attributable to primary metals industries as compared to 32% for paper and 18% for food.

Most minerals sector operations require at least a nominal quantity of water with which to perform critical operations such as drilling, dust control, and mineral ore processing (see Figure 1). For minerals, metal and non-metal mines, mine dewatering using pumping wells and diversion techniques are the most significant water use. While this does not relate to a direct intake of water (as a service) for the sector, there may be repercussions for water management of diverting watercourses and groundwater flows. For extraction processes, water is often re-circulated many times, which reduces water use but increases concentrations of contaminants which are often later discharged into freshwater bodies. Water is also used in dust suppression activities and for mineral processing.

Opportunities for further water conservation in the mining sector may be modest. However an examination of common practices in water-diversion and impoundment activities in relation to integrated water management objectives may be warranted in certain regions.

5. Water availability and climate change

Climate change is one of many threats that are expected to change the way in which we must manage water resources. Although water availability is not a problem in most regions of Canada at this time, large-scale changes to water regimes are occurring. In future, climate change is expected to have multiple and varying effects on water in Canada with implications for water management and policies. The current and anticipated effects of climate change on water resources vary greatly because the impacts are dependent of geographic features such as vegetation, topography, soil, etc. These impacts will be increasingly important for water managers when determining long-range water strategies.

For the mining sector, the frequency of extreme weather events is likely the greatest challenge posed by climate change and water impacts. For the purpose of managing tailings and constructing infrastructure to manage discharge, predictability in precipitation and water flows is critical. In some areas of the country where water is scarce, such as the semi-arid Arctic, mining operations may be limited in their capacity to dilute effluents or provide water for basic operations.

6. Risks for the sector

NRTEE research to date suggests that water availability has not been identified by the sector as a significant risk or challenge for mining operations overall. However, some Canadian literature states that water scarcity can impact production rates, dust suppression activities, mine drainage composition, and the covering of tailing ponds. Given the nature of mining, water related risks to mining operations are location-specific. An NRTEE literature review has identified two principal locations: the Arctic and certain regions in Quebec, where these issues have been raised. That is not to say that other mining operations in particular watersheds where scarcity issues have arisen during drought periods do not exist. In a recent report documenting the Climate Change Impacts and Adaptations in the Canadian Mining Sector, a survey was conducted to determine climate hazards most commonly identified as affecting operations. Of those surveyed, 25% noted flooding as a risk, 8% noted water scarcity, and 4% noted water levels as a concern about the impacts of climate change. To minimize use, the mining industry has demonstrated significant effort to increase the percentage of water that is recycled where applicable. In the context of integrated watershed management and accountability of water users, growing competition may force mining operations in

those areas to ensure they can characterize their water use and demonstrate efficiency in those practices.

7. Risk for ecosystems and other water users

Historically, water has been managed using a supply-side perspective. Now that science has improved our understanding of ecosystem health, it is apparent that the complex interactions of flow regimes, ground and surface water levels, temperature and chemistry of aquatic systems must be considered if water resources are to be sustainably managed. A balance of objectives for both human needs and the health of ecosystems is required to ensure the economic viability of sectors into the future. By definition, ecosystems are a biological community of interacting organisms in connection with their physical environment. All ecosystems are water-dependent and rely on the circulation of water through cycles. Every ecosystem has site-specific biological components essential for its functioning, species and services it provides.

The mining sector requires water for various mineral extraction processes. And 78% of this water is discharged back into freshwater bodies in a compromised state. Therefore by virtue, mining operations impact ecosystems in a number of ways. Mining activities have the potential to increase the runoff of sediments/ increased suspended sediment load to surface water; disturb wildlife and local communities, increased demand for local water resources, and to contribute to chemical contamination of surface and ground waters. However, these impacts can be minimized through risk analysis, improved construction standards, the type of operation developed, and methods of waste disposal. Science and innovation may also contribute to the sustainable coexistence of mining and natural organisms.

8. Opportunities

Although responsibility for regulating resource development rests with governments, Canada's mining industry has a substantial history of demonstrating corporate sustainability in social and environmental responsibility in order to achieve and protect their development and financial objectives. There is a broad consensus about the link between corporate social responsibility and business success. At the same time, governments must ensure that they provide the tools for industry to innovate and achieve excellence in their operations. Such practices for water management include:

- Development of more efficient work practices;
- Substitution of lower quality recycled water where practicable; and,
- Modification of metallurgical processes to reduce water consumption or increase water recovery.

In addition, various processes have been modified to reduce water use in flotation and separation of the minerals from the ore. These processes include:

- use of high density thickeners to reduce water passing to the tailings system;
- recycling the acidic liquids from mine tailings that historically had been evaporated;
- using highly saline water which seeps from the mine for drilling and dust control; and,

Research to develop innovations in mining and water use (most abundantly utilized in water scarce areas) has demonstrated the mining industry's ability to find innovative means to improve water use efficiency. The degree to which such technological innovations are suitable for Canadian operations is worthy of discussion.

9. Integrated Water Management

Integrated Water Management is a term that refers to the development of a strategy for water management that incorporates management of land, water, and living resources and promotes conservation of water resources as well as use of water in a sustainable way. This form of

management typically takes place at the watershed, water basin or sub-basin scale and involves the collaboration of participants that represent the range of water uses that are present in the area in question.

As a starting point, most strategies require participants to define the values and services that they wish to obtain, maintain or preserve. The subsequent actions required are then defined based on both shared and self interest.

Also part of the current thinking about Integrated Water Management, is the acceptance that water resources are in constant change, as are the needs of water users. Therefore, solutions must be grounded in adaptive processes, with monitored and enforced commitments, as well as benchmarks for success.

Across Canada, numerous examples of integrated water management case studies exist, and representatives from the mining industry are frequently present in such processes to ensure that the needs of the mining industry are accounted for.

This paper was produced to assist the NRTEE and sector roundtable participants to identify the key current and emerging freshwater use and availability issues within the mining sector, and to identify data sources and characterize the state of freshwater use information in the mining sector. However, the information as it is presented may contain gaps or highlight themes that are more or less relevant to the broader discussion of water issues in Canada.

Comments on the paper are welcome in writing to the NRTEE and may be sent to Katherine Balpataky at balpatakyk@nrtee-trnee.ca

The NRTEE is conducting a series of sector roundtables to further advance its work on water and resource sectors in Canada. Specifically, the mining sector meeting will address the following questions:

10. Questions

1. What are the key/priority water use issues facing the sector (now/future; and real versus perceived)?
2. What are the key water use risks in the sector (now/future)?
3. What opportunities exist to improve the sector's water use, and perhaps its competitiveness through innovation (or other means) in water use?
4. What are the key issues that NRTEE should focus on?
5. What are the key information needs that NRTEE should study further?
6. What are some initial ideas on potential solutions to these priority issues that the NRTEE could investigate (policy options for example)?
7. What are some initial ideas on examples of particularly effective governance processes?

Figure 1: Schematic of water use by the mining sector
(Developed by Marbek Resource Consulting Ltd. for the NRTEE)

