2.0 PROJECT PLANNING AND MANAGEMENT

2.1 ABOUT SISSON MINES LTD.

Sisson Mines Ltd. (SML), the general partner of the Sisson Project Limited Partnership, is a mineral development company based in Vancouver, British Columbia, that is focused on developing the Sisson ore deposit. SML's commitment is to develop and operate the Sisson Project according to its "Principles of Responsible Mineral Development" (Section 1.3.2) for the benefit of shareholders, partners, communities and governments.

SML is associated with Hunter Dickinson Inc. (HDI), a mining company also based in Vancouver, British Columbia with more than 25 years of mineral development experience. HDI is a private company that provides management and technical services to a diverse portfolio of mineral companies and properties in order to advance them through exploration, development, permitting, and construction into stable and profitable mine operations.

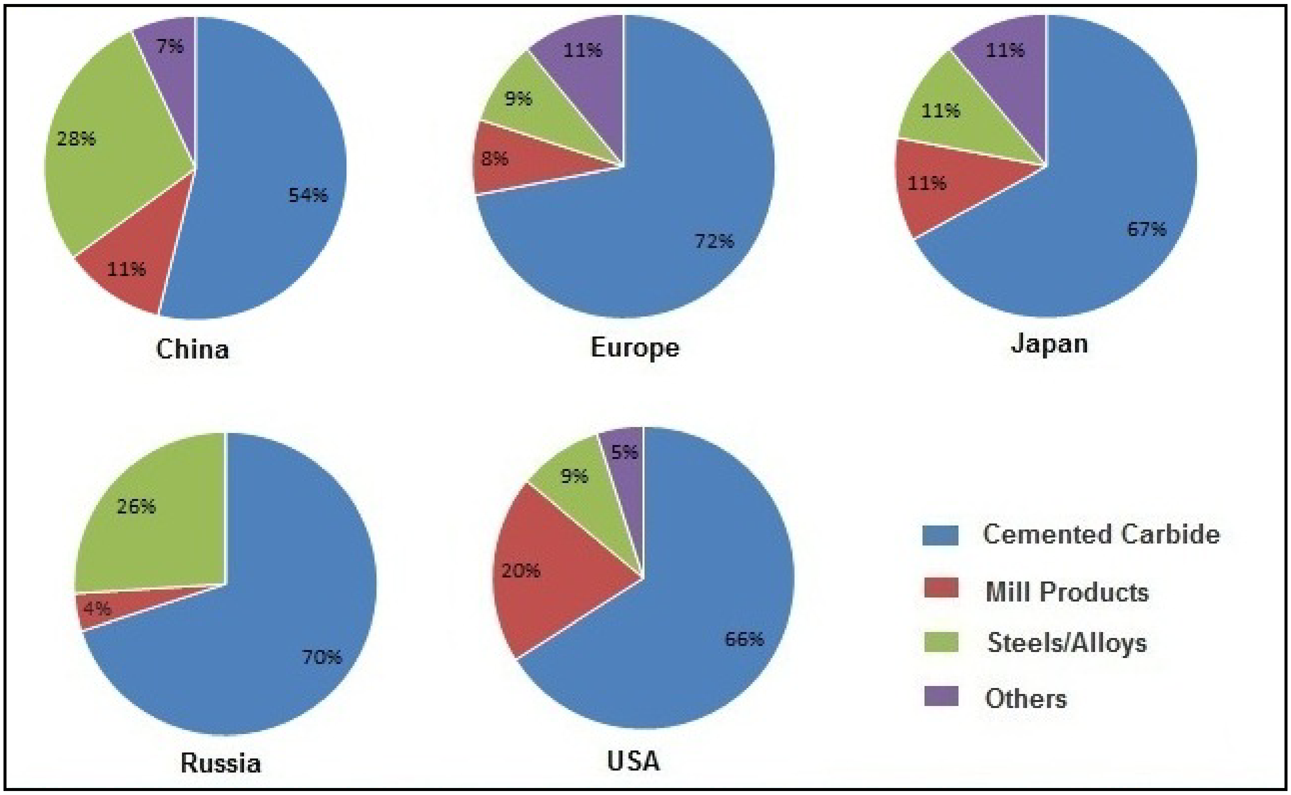
2.2 ABOUT TUNGSTEN AND MOLYBDENUM

2.2.1 Tungsten

Tungsten (chemical symbol W) is a steel-grey metal that is an important alloy in tool making and construction steel as it enhances hardness, cutting efficiency, and speed with a similar hardness to diamonds. Tungsten components are used in lighting technology, electronic industry, transportation, the chemical industries, glass melting industry, medical technology, power engineering, and in jewelry.

According to the International Tungsten Industry Association (ITIA), tungsten has the highest melting point of all metals (3,422 ± 15°C). At this temperature, most of the other engineering metals (*e.g.,* iron, aluminum, copper, titanium) are vapour. Also notable is tungsten's high density, comparable to gold. It is an important metal for thermo-emission applications, not only because of its high electron emissivity (which is caused by additions of foreign elements) but also because of its high thermal and chemical stability (ITIA n.d.).

Primary uses for tungsten are shown in Figure 2.2.1. Cemented carbides, also called "hardmetals", consume the largest portion of tungsten in recent years. Hardmetal tools are used for shaping metals, alloys, wood, composites, plastics and ceramics, and in the mining and construction industries. Tungsten remains important for tool steels, high speed steels, stellites and creep-resistant steels and alloys (ITIA n.d.).

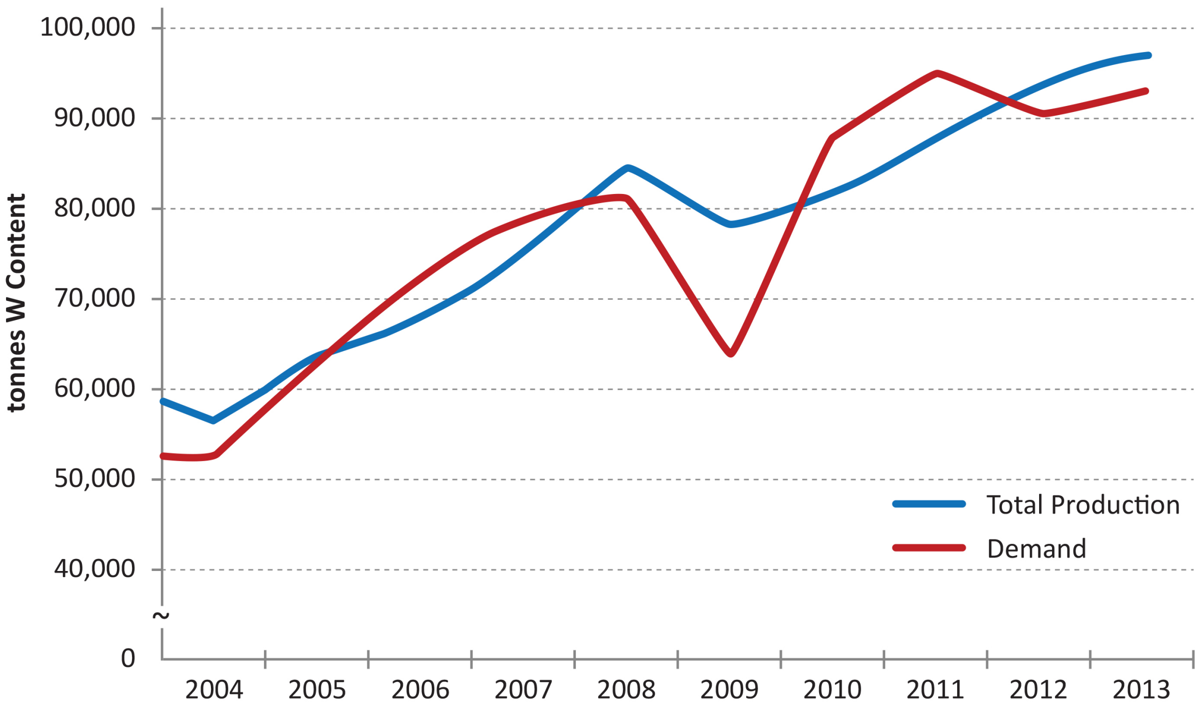


Source: ITIA n.d.

Figure 2.2.1 Primary Uses for Tungsten in Selected Industrialized Nations (2010)

Current global tungsten consumption is estimated to be 93,000 tonnes per year (Roskill 2014). In a base-case demand scenario (Samuel Engineering 2013), demand for tungsten is forecast to reach 112,750 tonnes per year by 2017 and 148,500 tonnes per year by 2025.

World production and demand for tungsten is shown in Figure 2.2.2, and estimated tungsten mine production in 2013 by major producing country is shown in Table 2.2.1. China is by far the major producer of tungsten, though Russia, Canada, Vietnam, Austria, Australia, Bolivia, and Portugal are also important producers. Some of the biggest tungsten deposits are in the areas where access is difficult, or have a low ore grade, making the long-term view of tungsten prices the governing factor in determining their economic viability (ITIA n.d.).



Source: Roskill (2014).

Figure 2.2.2 Worldwide Tungsten Production and Demand (2004 to 2013)

Table 2.2.1 Estimated Tungsten Mine Production by Major Producing Country (2013)

Country	Production in 2013 (tonnes W)
China	60,000
Russia	4,200
Canada	2,100
Vietnam	1,600
Austria	1,100
Bolivia	1,100
Australia	1,000
Portugal	1,000
Other Countries	3,500
World Total (rounded) [a]	**75,600**

Notes:
[a] United States tungsten mine production was not available and is not included in this total.

Source: Roskill (2014).

Worldwide tungsten supply is dominated by Chinese production and export. In 2013, Chinese production accounted for approximately 80% of the world total (Table 2.2.1). China has approximately 54% of the world's tungsten reserves. China was also the world's leading tungsten consumer in 2013 (Roskill 2014).

The Chinese government has managed the tungsten industry in several ways, including:

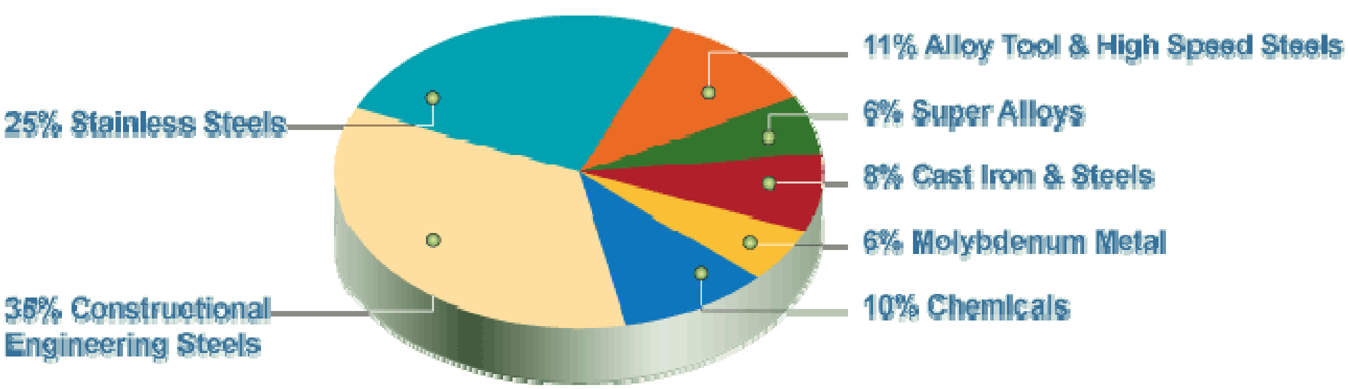
- limiting the number of exploration, mining and export licenses;
- limiting or forbidding foreign investment;
- imposing constraint on mining and processing;
- establishing quotas on production and export;
- adjusting export quotas to favour value-added downstream materials and products; and
- imposing export taxes on tungsten materials (US Geological Survey 2012a).

Thus, alternative supplies outside of China for meeting world demand are highly desirable.

2.2.2 Molybdenum

Molybdenum (chemical symbol Mo) is an important alloy in the manufacture of stainless steel and steel. It is also an important material for the chemical and lubricant industries. Molybdenum is used in automotive parts, construction equipment, gas transmission pipes, and turbine parts.

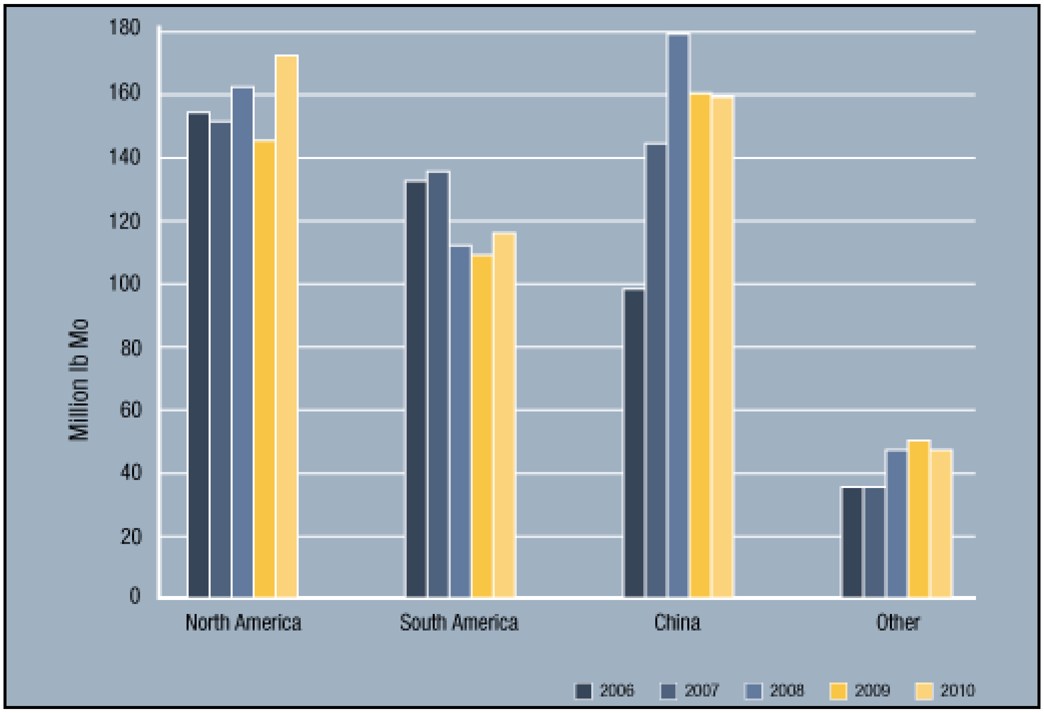
According to the International Molybdenum Association (IMOA), molybdenum has one of the highest melting temperatures of all the elements. When added to steel and cast irons, molybdenum enhances strength, hardenability, weldability, toughness, elevated temperature strength, and corrosion resistance. In nickel-base alloys, it improves resistance to both corrosion and high-temperature creep deformation (IMOA n.d.). The main molybdenum uses are shown in Figure 2.2.3.



Source: IMOA n.d.

Figure 2.2.3 Primary Molybdenum Uses (2012)

The principal producers of molybdenum are the Americas and China. Global molybdenum production is shown in Figure 2.2.4, and estimated molybdenum mine production in 2012 by major producing country is shown in Table 2.2.2. Demand for molybdenum remains strong, despite decreasing prices in recent years (US Geological Survey 2013b).



Source: IMOA n.d.

Figure 2.2.4 Major Molybdenum Producing Regions (2006-2010)

Table 2.2.2 Estimated Molybdenum Mine Production by Major Producing Country (2012)

Country	Production in 2012 (tonnes Mo)
China	105,000
United States	57,000
Chile	35,300
Peru	19,500
Mexico	10,900
Canada	9,400
Other Countries	12,900
World Total (rounded)	**250,000**

Source: US Geological Survey (2013b).

As reported in the Technical Report of the feasibility study for the Project (Samuel Engineering 2013), with the requirement for high grade steel alloys continuing to rise in a number of industries, demand for molybdenum appears set to increase steadily, particularly in the industrializing and emerging economies of Asia and South America. Growth is forecast at 5% per year, resulting in molybdenum demand almost doubling from 225,000 tonnes per year in 2011 to about 435,000 tonnes per year in 2025.

While China was a major exporter of molybdenum in the past, in 2004 the Chinese government reduced molybdenum supply to the rest of the world through production curtailments, export taxes, and export quotas (US Geological Survey 2013b). Thus, alternative supplies for molybdenum outside of China are needed to meet world demand.

2.3 RATIONALE AND NEED FOR THE PROJECT

As described above, demand exists worldwide for tungsten and molybdenum for a variety of products and uses, and those demands are expected to increase in the future. The Sisson Project will be an important source of tungsten and molybdenum, and will help to alleviate tungsten supply shortages caused by export restrictions by China.

Based on the Sisson Project feasibility study (Samuel Engineering 2013), the Project will produce an estimated annual average of 557,000 metric tonne units per year of tungsten trioxide (mtu WO_3/a) contained in ammonium paratungstate (APT). (Note: 1 mtu is equivalent to 10 kg of material). This equates to an annual average production of approximately 5,570 tonnes per year. Compared to tungsten mine production rates in 2012 for major tungsten-producing countries (Table 2.2.1; US Geological Survey 2013a), the Project will increase the worldwide total mine production of tungsten by approximately 7.6%. Furthermore, as approximately 85% of mined tungsten is produced in China, the Project will increase non-Chinese tungsten production by over 50% each year. Unlike tungsten from China that is subject to stringent government limitation, the tungsten produced by the Project will be available to the North American and other markets to meet market demand.

Also, the Project will produce an estimated annual average of 1,860 tonnes per year (4.1 million lb/a) of molybdenum contained in concentrates (Samuel Engineering 2013). Molybdenum demand remains strong worldwide (US Geological Survey 2013b). Compared to mine production for molybdenum in 2012 from major molybdenum-producing countries (Table 2.2.2; US Geological Survey 2013b), the Project will represent approximately 0.7% of the world's mine production, and approximately 1.3% of the world's mine production outside of China.

In addition to helping to meet worldwide market demand for tungsten and molybdenum, the Project will generate profit for the partners in the Project, and tax revenues for the Province of New Brunswick and the Government of Canada. The Project will also generate direct employment (*i.e.,* for mine Construction and Operation) and indirect employment (*e.g.,* services, materials and equipment supply, transportation) in New Brunswick and elsewhere, and will contribute substantially to New Brunswick's gross domestic product (GDP). It will also attract businesses and development to the local region, adding to the economic benefits, local development, and the standard of living. New Brunswick generally has been hard hit by relatively high unemployment and limited economic growth in recent years, and Central New Brunswick has also been greatly affected by mill closures and reduced economic activity in the region. As a major employer and economic driver over its 29 year lifetime (*i.e.,* 2 years of Construction and 27 years of Operation), the Project will bring much-needed employment to the Central New Brunswick communities that surround it, and contribute considerably to the overall well-being of the region. More detailed information on the economic benefits of the Project can be found in Section 8.10, Labour and Economy.

2.4 PROJECT PURPOSE

In light of the world supply and demand for tungsten and molybdenum, and the consequent rationale and need for the Project as described above, the purpose of the Project is to mine tungsten and molybdenum-containing ore from the Sisson deposit, process it to meet market demand for the mineral products, generate tax revenue for New Brunswick and Canada, and create return on investment for the partners in the Project.

2.5 PROJECT ALTERNATIVES

2.5.1 Alternatives to the Project

There are no alternatives to the Project that would meet the Project Purpose as defined in Section 2.4.

Section 3.3(a) of the Final Guidelines (NBENV 2009) requires that: "*The null or "do nothing" alternative (not constructing and operating the mine) must be discussed. The study must examine the implications of not proceeding with the project with reference to environmental (both biophysical and socio-economic) factors/effects*." In this regard, if the Project is not carried out, the biophysical environment would remain unchanged from its existing condition, and the socioeconomic benefits of the Project would not be realized.

2.5.2 Alternative Means of Carrying Out the Project

As part of the feasibility and EIA studies carried out for the Project, various alternative means of carrying out the Project were evaluated by SML and its consultants in the process of developing the feasibility level Project design described in Chapter 3 of this EIA Report. As required by Section 16(2)(b) of *CEAA*, the alternative means of carrying out the Project that are technically and economically feasible are considered and assessed in Section 3.3.

2.6 PROJECT PLANNING AND MANAGEMENT STRATEGIES

SML is committed to developing the Project in an environmentally responsible manner consistent with its "Principles of Responsible Mineral Development", retaining the rural, resource-based character of the region while affording benefits to the community, region and province. To this end, SML will implement Project planning and management strategies that avoid or minimize the adverse environmental effects of the Project, and enhance positive ones, in a manner that complies with all laws and regulations while ensuring that the Project presence is compatible with the way of life that the people of central New Brunswick know and enjoy. This will be done in a variety of ways, some of which include:

- developing a world-class tungsten and molybdenum mine that partially fulfills the demands of world markets for such commodities for use in manufacturing goods and services that society needs;

- implementing progressive environmental protection, mitigation, and management strategies and concepts that avoid or minimize adverse environmental effects, and enhance positive ones;

- adopting guiding principles for design and implementation of the Project, particularly those that protect surface water and groundwater resources, use geotechnically stable materials and concepts, implement technically and economically feasible components and technologies that are proven, limit the footprint and visual effects of the Project, and design the Project components with closure in mind;
- incorporating feedback received from the public, stakeholders, Aboriginal persons, and other parties so as to minimize environmental effects and address issues and concerns; and
- promoting responsible and sustainable development of the mineral resource.

2.6.1 Design Standards and Codes

The Project will be constructed to meet all applicable building, safety and industry codes and standards. The engineering design of the Project will consider and incorporate potential future changes in the forces of nature that could affect its operation or integrity (*e.g.,* climate change), and Project components and infrastructure will be designed and built to adapt to or withstand these effects. The Project components will be designed to meet the National Building Code of Canada, the Canadian Dam Association Guidelines, and other design codes and standards for wind, snowfall, extreme precipitation, seismicity, and other weather variables. These standards and codes provide factors of safety regarding environmental loading (*e.g.,* snow load, high winds, seismic events), and Project specific activities and events. Compliance with these standards and codes reduces the potential for adverse environmental effects as a result of an accident, malfunction or unplanned event.

2.6.2 Environmental Protection Measures

A variety of environmental protection and management measures have been adopted through the development of the Project to date in order to guide the planning, design, construction, operation, and ultimate decommissioning, reclamation and closure of the Project. These include, but are not limited to, the following measures.

- Siting facilities to avoid sensitive areas such as wetlands, watercourses and important habitat types, where possible, and to reduce the size and number of natural drainages that may be affected.
- Minimizing the “footprint” of Project facilities and activities to consequently reduce the amount of disturbed land, wetlands and water resources.
- Employing good planning, design and management practices to comply with:
  - regulated standards for air emissions, water releases, storage or disposal of solid wastes, and handling and disposal of hazardous materials; and
  - regulated and/or industry design and management standards to satisfactorily deal with environmental risks such as seismicity, unusual weather events, flooding, and erosion.

- Preparing and implementing an Environmental and Social Management System (ESMS) (Appendix D) for the Project to ensure the Sisson Project is implemented according to SML's "Principles of Responsible Mineral Development". SML's ESMS includes:
  - a corporate management system including responsibilities for senior and site management, employees and contractors;
  - an Environmental Management Plan incorporating operational policies and practices for monitoring and management of, for example, land and soil resources, air and water, noise and vibration, hazardous materials and waste, and community health and safety, and cultural heritage;
  - an Environmental Protection Plan (EPP) for Construction activities that will be included in, and enforced through, construction contracts;
  - an Emergency Preparedness and Response Plan (EPRP); and
  - a Public, Stakeholder and First Nations Engagement Plan to ensure that, wherever possible, concerns about the Project are accommodated in its design, construction, operation and closure, and employment, business and other benefits are optimized and realized locally.
- Planning the Project with closure in mind and having a Decommissioning, Reclamation and Closure Plan, and a bonding agreement in place with the Government of New Brunswick, from the startup of Construction.
- Planning and financing compensation measures for unavoidable adverse environmental effects to aquatic habitats and wetlands in order to sustain biodiversity in the vicinity of the Project.

With the exception of the open pit (for which the location is fixed by the location of the mineral resource), SML has emphasized Project design and siting so that the location and configuration of the Project facilities considers the above measures wherever possible so as to avoid or minimize the potential environmental effects of the Project. To the extent possible, Project facilities have been sited to avoid and reduce interactions with watercourses, wetlands, areas of elevated archaeological potential, and other sensitive environmental features. Where avoidance was not possible, mitigation or compensation measures have been developed as part of the EIA, and will be implemented in consultation with the applicable regulatory authorities.

2.6.3 Planning for Closure

The Project has a finite life, and as such, SML is proactively planning for closure during all stages of the Project. All elements of the design of the Project are being carried out with eventual closure in mind. This ranges from constructing Project components to facilitate their future closure, to stockpiling topsoil and overburden for future use, to carrying out progressive reclamation and stabilization of Project components throughout Operation as possible, to consulting with local communities and First Nations about their desired future land uses at the Project site. A conceptual Decommissioning, Reclamation and Closure Plan (EvEco 2013) has been developed to meet the requirements of the Terms of Reference (Stantec 2012a) and to provide the basis for developing the more detailed plan required by the New Brunswick *Mining Act.* The main activities planned for Decommissioning, Reclamation and Closure, based on the conceptual plan developed by EvEco (2013), are described at an overview level in Section 3.4.3 of this report. In response to information requests for additional information in the EIA Report regarding the decommissioning, reclamation and closure plan, a new Section 3.4.3.6 has been added to this document to provide further details on the planned approach to this phase, based on the more detailed application for a mining lease submitted to the New Brunswick Department of Energy and Mines in January 2014 (updated in October 2014).

SML is carrying out, and will continue to carry out, various public, stakeholder, and First Nations engagement initiatives to consider (among other issues) the potential post-closure land uses for the Project. Feasible ultimate land uses will be determined based on this engagement and discussions with the Province of New Brunswick, and the Decommissioning, Reclamation and Closure Plan will be updated accordingly as the Project proceeds and planned land uses change. Each update, and the final version, of the plan must be approved by the Province of New Brunswick.

A financial security is required by the Province to ensure acceptable decommissioning, reclamation, and closure of the Project. The amount of the required security will grow over the life of the Project to an estimated value of 50 million dollars (Samuel Engineering 2013). The estimated security amount covers staged decommissioning, reclamation and closure costs beginning one year before mine start-up, and grows progressively to the full estimated value at the final stage of mine development. Thus, at any point during the life of the Project, the amount of the security will be sufficient to accomplish decommissioning, reclamation and closure of the Project.

2.6.4 Follow-up and Monitoring Program

A follow-up and monitoring program will be developed as part of the Project. The objectives of the program are to:

- propose follow-up measures that are intended to verify the environmental effects predictions in this EIA Report and to assess the effectiveness of mitigation, as required by *CEAA*; and
- propose environmental monitoring measures aimed at monitoring the Project's environmental effects; to demonstrate compliance with environmental acts, regulations, and approvals/ permits/authorizations issued for the Project; and to provide a basis for long-term adaptation to changing environmental conditions occurring naturally or as a result of the Project.

The framework for, and proposed elements of, the follow-up and monitoring program for the Project as conceived at this planning stage of the Project are outlined in Chapter 9 of this EIA report. The program will be adjusted as required over the life of the Project in response to the results of follow-up or monitoring initiatives, changes in regulatory requirements, or other factors.

2.7 THE ROLE OF THE EIA REPORT

This EIA Report is a key instrument for implementing the above-noted approaches and measures. Preparation of the EIA Report has involved a substantial field data collection program, a variety of analyses of potential environmental effects, the development of measures for avoiding or mitigating potentially significant adverse environmental effects, the development of measures to compensate for adverse environmental effects that cannot be avoided or mitigated, and the preparation of this EIA Report for public review and government review and approval. This work is an integral part of the engineering design and corporate planning for the Project so that EIA is both a project planning tool and a government review and decision-making tool. As such, the EIA is a key tool for implementing sustainable development for major projects like the Sisson Project.

In carrying out the EIA, potential environmental effects of the Project have been considered for all phases of the Project, including those potentially arising from credible accidents, malfunctions and unplanned events. Potential interactions and overlapping environmental effects with other past, present, or reasonably foreseeable future projects or activities have also been considered. The public and stakeholder consultation, and Aboriginal engagement, program undertaken by SML, and the input received as part of these activities, has informed the EIA and the factors required to be considered as part of it.