

# **COST GENERATION ASPECTS OF THE GIBRALTAR CLOSURE PLAN**

R. J. Patterson – Mine Superintendent  
T. Wambolt, P. Eng. - Senior Environmental Engineer

Gibraltar Mines Ltd.  
P.O. Box 130  
McLeese Lake, B.C. V0L 1P0

## **ABSTRACT**

One of the prime considerations of closure planning is to provide for the long term environmental security of the site. Ideally it is the mandate of any operator to strive towards a program that will require minimal maintenance, control and monitoring of the site leading to the ultimate relinquishment of long term liability. In more recent years, especially for mines with water quality issues, this relinquishment of long term responsibility seems less likely to occur and as a result large bonds are being requested from operators of mines. These bonds insure an on-going sustainable fund to maintain the site. If operators must maintain a presence at these operations, then there is an incentive to make use of the existing infrastructure to create alternate businesses. Gibraltar has embarked on an aggressive program to look for alternative business ventures which generate revenue to offset long term bonding arrangements. Projects being considered or in the works are a solid waste landfill to be located on top of a waste rock dump, a power generation project, metallurgical test work, maintenance work in existing shops, ranching and should the mine start at a later date the development of a hydrometallurgical refinery plant that will operate long after reserves at the Gibraltar site are depleted.

## **INTRODUCTION**

Present operations at the Gibraltar Mine are in a state of temporary suspension due to depressed copper prices. Since mine operations were suspended in December 1998, work programs are being maintained to insure that environmental security with respect to waste rock dumps, the tailing impoundment, pits and other mine components is being met. Although Gibraltar has sufficient funds in place to cover the long term liability at the mine site once final closure is determined, it has become the mandate of mine personnel to develop sustainable businesses that will generate revenues to offset this long term liability. As operating personnel will be present at the mine for an indefinite period, it only makes good economic sense to have them carry out alternate business in conjunction with regular work duties to offset security bonding.

The discount rate used to set security bonding can vary depending on the specific project and can range from 3.0 % to 4.0 %. The standard 100 year period was used in the assessment. At a discount rate of

3.0%, long term liability discounted 100 years out calls for fixed funding of \$3.16 million for every \$100,000 of liability.

Gibraltar recently completed a closure report on the assumption that operations would not resume and that the site would be reclaimed within 5 years. Along with the detailed assessment of reclamation cost, a hydrology model was constructed for the 100 year period and accounted for all water movement including pumping and treatment costs. Essentially the liability is broken down into a present day cost to reclaim the site and a long term cost to manage water quality / treatment costs calculated over a 100 year period. All costs were allocated to their respective time frames and future costs worked out into present day dollars to arrive at the bonding requirement.

The following general discussion highlights several of the sustainable businesses that Gibraltar are presently pursuing.

### **Cariboo Regional Landfill**

The Cariboo Regional District (CRD) had been looking for a new landfill site since 1991. Eight different sites were being investigated with approximately 40 public meetings held over this time frame. Gibraltar realizing there was a fit for the landfill at the mine site, approached the CRD with the concept of building such a facility on one of the waste rock dumps. The concept was discussed then taken to a public meeting for discussion. After numerous open houses, public meetings and tours of the site, there was a general consensus that the Gibraltar site was a better fit over prior sites selected.

Gibraltar entered into a private public partnership with the CRD. Partnering and operations agreements were drawn up and signed off by both parties. Under the agreement, Gibraltar would remain responsible for the waste rock and drainage below the landfill and the CRD would be responsible for the air space above the waste rock. Separating the waste dump and future landfill would be a 1 meter thick layer of compacted glacial till and sealed 60 mil liner. A statutory right of way agreement was drawn up between the two parties to provide for legal ownership of the two horizons. This statutory right of way agreement was the first of its kind to be developed in the province.

Aside from profits of operation, the landfill operation guarantees a fixed income, most of which is labour cost. At a 3% real rate of return (NPV), this fixed income offsets \$2,610,000 of bonding requirement.

Profits will further offset liability however are not factored in at this time. In addition to the revenue flow, the cost to reclaim the landfill site is borne by the landfill capital budget.

### **Hydroelectricity Generation**

With the shut down of the mine, the fresh water pumping system and pipeline from wells beside the Fraser River were shut down as part of the standby procedure. The tentative plans are to use this 500 mm. buried pipeline to release tailing pond water to the Fraser River. Tailing water presently accrues in the pond and needs discharge to one of the completed pits to maintain a constant freeboard in the pond. The pipeline has sufficient head to generate power by using the pipeline as a penstock. Turbines will be installed in all 3 pump houses along the pipeline. Gibraltar has sufficient treated water resources on the property that could be channelled down the pipeline at an annual release rate of 5 million M3 which has the potential to generate about 1 mega watt of power annually. A proposal has been made to BC Hydro and has been accepted pending obtaining an approval to discharge water to the Fraser River. BC Hydro will cover a portion of the cost under the Power Smart program. Consultants are presently carrying water chemistry and plume modelling for the release of water into the Fraser River. Once completed application will be made to discharge water via the pipeline to the Fraser River.

The potential revenue generated by the hydroelectric project could offset long term liability by as much as \$2,440,000 at a 3% real rate of return (NPV).

### **Metallurgical Laboratory**

The metallurgical and analytical laboratory at Gibraltar is being set up to carry out “first pass” metallurgical and analytical test work. Due to the lower overhead and staffing present to carry out other functions at the mine, Gibraltar can offer lower cost services. The focus is perform screening tests to determine the most appropriate course for future metallurgical work if deemed appropriate. Once the customer has a basic concept of the process requirements from the initial metallurgical work then a refined program can be designed and carried out at the Gibraltar site or elevated to an accredited facility.

While the program is in its infant stage, it does has the potential to generate revenue to offset long term maintenance costs at the mine.

### **Maintenance Complex**

Once the mine is decommissioned then the maintenance complex could be contracted to local businesses such as equipment dealers or logging contractors for maintenance of heavy equipment. The complex contains warehousing, electrical, mechanical, welding and machine shops. This facility could be used for other industrial activities yet to be determined.

### **Ranching**

Over the long term there is potential to use reclaimed lands for ranching. Lands around the minesite are presently used as open range for cattle. Since the mine was closed in 1998, the tailing pond has been home to a herd of cattle grazing on fall rye and grasses planted for soil stabilization. There is the issue of metal uptake in vegetation however has not been a problem during the period of grazing. As reclamation continues on the waste dumps there will also be the opportunity for controlled grazing through proper management of access to the sites. It is difficult to evaluate the economic impact of this activity at this time, however there is a strong possibility of capitalizing on reclamation measures in the future.

### **Hydrometallurgical Plant**

Feasibility work has been carried out on the construction of a hydrometallurgical plant for the Gibraltar site. Hydrometallurgical plants are extremely capital intensive and would require a relatively strong copper market over a 5 year period to realize a timely payback on capital. The hydromet process eliminates the shipping of concentrates to off shore smelters by processing the concentrates at the mine site. The copper sulphide in the concentrate is oxidized to an aqueous copper sulphate solution in autoclaves in an extreme oxidizing environment. The copper sulphate solutions are then upgraded and placed in electrolytic cells to produce cathode copper. A hydromet plant offers an ideal sustainable business venture as it provides for a cost effective short term benefit to operations and a long term business as a custom facility well after mine reserves are depleted at the site.

### **Recreation**

Rainbow trout have been routinely stocked both in the tailing and seepage return ponds for the past 15 years. Sport angling is allowed on a catch and release basis. Anglers record weight and fork length and report information back to the environmental department. Stocking exercises have been successful over

the years and is not unusual to produce fish in the 5 to 7 pound range. Although there may not be a significant economic benefit of the fishery resource, it will add to the overall attractiveness of the property to the community both as a business and recreational site.

### **General Statement**

Not all mine sites can enter into post mine closure businesses due to their locale. Gibraltar has the distinct advantage of being located adjacent to a major transportation corridor and is in close proximity to several industry based communities. Although the presentation of these initiatives has been in simplistic terms, the studies, permitting, public and First Nations consultation that went along with the process have been intensive and time consuming. All will be worth while in keeping with sustainable business ventures.