

# New life for Brenda Mines

By Glenda Malcolm\*

## After exhaustion of the orebody, Brenda Mines Ltd lives on as a centre of expertise in reclamation and process technology.

**B**renda Mines Ltd operated in the mountains above Peachland in the Okanagan Valley of British Columbia, Canada, for 20 years until the mine closed in June 1990 due to the depletion of the orebody. During that time it produced copper and molybdenum concentrate with small amounts of gold and silver recovered from the copper concentrate. While in production the mine employed approximately 410 people at any given time.

The orebody was discovered in the 1930s by the Sandberg family of Kelowna, who were searching for gold. The Sandbergs stopped working their claims in the late 1940s and no further activity took place until 1954 when Bob Bechtel, a Penticton prospector, came across the mineral showing and staked claims. Bechtel contacted Bern Brynelsen, then manager of the Noranda Exploration Company office in Vancouver, and further claims were staked. However, it was well into the 1960s before Noranda made a decision to proceed with development of the property and in 1968 assumed manage-

ment control, putting the mine into production in early 1970. The cost for development and construction was approximately \$C62 million.

Brenda operated with the uncommonly low grades of 0.161% copper and 0.034% of molybdenum. This led to the operation becoming one of the earliest and most highly automated concentrators in North America and ultimately to the formation of Brenda Process Technology. Although it began production at 21,000 t/d, capacity was gradually increased to 33,000 t/d.

During its life Brenda processed 182 Mt of ore and placed 109 Mt of non-ore rock around the pit in waste heaps. The

result was a pit 914 m in diameter and 310 m deep. The total metal recovered amounted to 271,938 t of copper, 65,469 t of molybdenum, 3.63 Moz silver and 57,140 oz gold.

Reclamation is part of the mining cycle and the objectives for Brenda Mines Ltd are to reclaim the mine area in an environmentally acceptable manner, with regard to long-term future land use and impacts down stream.

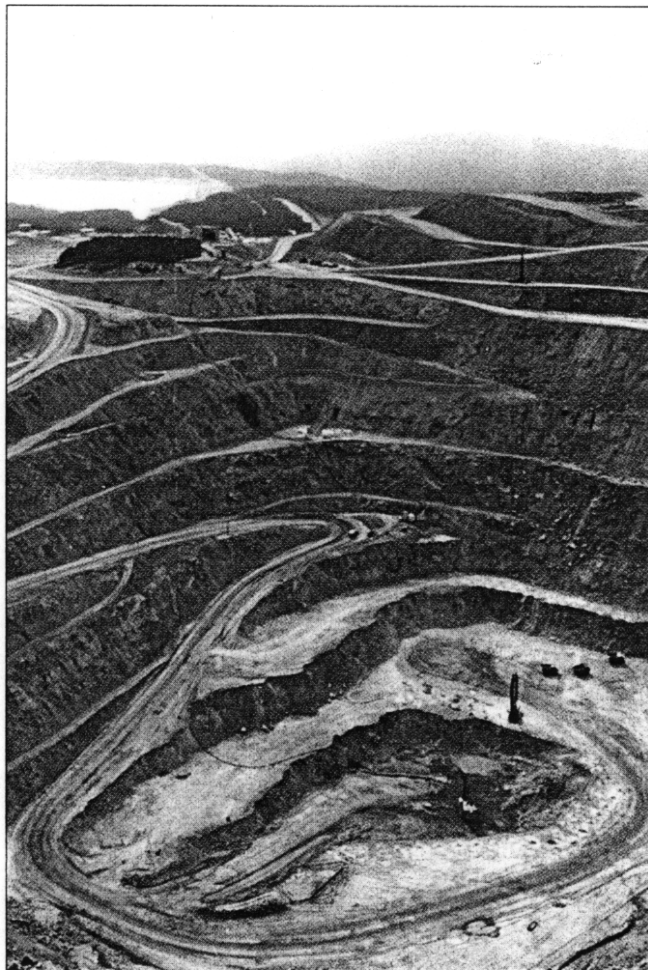
### The minesite today

Towards the end of the mine life, and since that time, considerable reclamation work has been done to restore the land to a natural state. For safety reasons a large rock barricade has been built around a portion of the pit. Many buildings that were part of the milling process have been removed and the land has been recontoured. Over 220,000 trees and shrubs have been planted and reinforcement grass seeding and fertilisation continue. All chemicals used in the metallurgical process, as well as all polychlorinated biphenyls (PCBs - formerly used as transformer oils), have been removed from the minesite: in 1994, some 6,800 litres of PCBs and 25 transformer carcasses were shipped to a storage/disposal facility at Swan Hills, Alberta, at a cost of \$C209,000.

Brenda Mines is at present working in close co-operation with ranchers in the area and several different government ministries, to determine the long-term effects of molybdenum intake on range cattle.

The site is now quiet and park-like and provides a haven for deer, moose,

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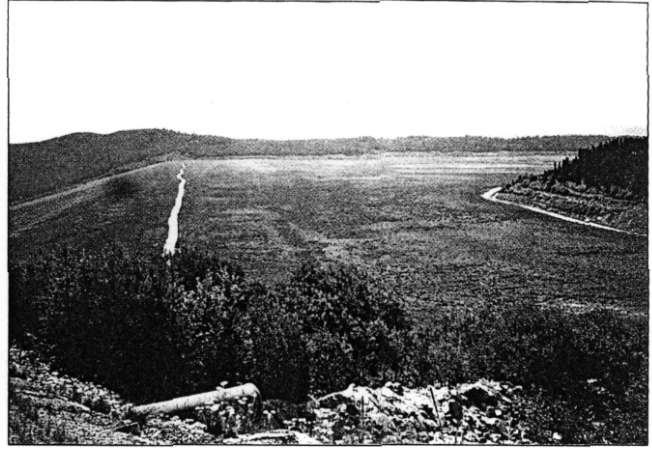
East wall of Brenda Mines pit in 1984.

(Below): Brenda Pit lake - 1994.





The tailings dam as it was in 1984 - 1,800 m across.



The tailings dam in 1994 - now open to cattle grazing.

bear, coyote, marmot, birds and other wild life. Tours of the minesite are very popular with students and the public, viewing the reclamation and experimental work taking place.

### Water management

During its years as an operating mine Brenda built and maintained the Peachland Lake Dam, increasing the size of Peachland Lake in order to provide enough water for the mine and the community of Peachland. This facility will soon be turned over to the Peachland Municipality.

When the mine closed in 1990 the surface area of the tailings pond was approximately 400 ha. About 80% of the water in the tailings pond was pumped into the worked-out mine for storage. In 1992, following three years of experimental work with aquatic plants and sulphate-reducing bacteria, 800 plant sandwiches were placed in the remaining tailings pond. This activity resulted in what is today a wetland with a complete ecosystem and which is frequented by a large number of animals and water fowl.

At the minesite the reclamation of the land and safety concerns are well in hand. Water management has become the focus of the company's decommissioning efforts. The rockpiles are the only significant source of molybdenum contamination on the site and runoff water from these is collected and stored in the mine pit. The mine water stored in the pit, now referred to as Pit Lake, is at present 135 m deep and is expected to overflow in around eleven years' time, depending on winter conditions and spring runoff. The water would find its way down the mountains to the 132 km-long Lake Okanagan.

Three options for the handling of this water have been developed:

- Discharge runoff without treatment, and provide an alternative supply of water to water users along the creek affected;

- Discharge water directly to Lake Okanagan in a pipeline (this would preserve existing creek water quality but would impact the lake);

- Minesite treatment of rockpile runoff to reduce molybdenum content, with storage and seasonal discharge to nearby creeks. The mine water would be treated to reduce molybdenum to the drinking water, aiming for less than 0.25 ppm. The water would then be released to either of the existing creeks at a proposed 5:1 dilution ratio.

Consultation, research and experimental work will continue but soon an assessment of the relative merits of the three options should be completed so that the company can draft applications for the proper discharge permits.

### Brenda Process Technology

Since the cessation of mining operations, Brenda Process Technology (BPT) now provides the management for a vibrant new business entity. At the minesite the focus is not only on land reclamation but also on mine equipment reconditioning. During the life of the mine the development of new mine process and metallurgical technologies propelled BPT into world-wide sales of equipment and technology.

Today, with offices in Kelowna, B.C., BPT has three principal business initiatives and has gone from 27 employees after the mine closure to employing approximately 100 full-time and contract employees.

These initiatives include the Instrumentation and Control Services, a team of experts which provides a wide range of customised instrumentation and process control services to an international clientele in the minerals and other processing industries. One of the current projects is the development of a commercial computer-based multimedia educational/training programme for concentrator operators. Recognising that mill operators' educational back-

grounds can range from the very modest to university degrees, the programme will be self-paced, non-intimidating, and in modules which reflect the concentrator process.

The Mechanical Services section, formed from the core of the Brenda Mines maintenance department, provides comprehensive mechanical design, construction and maintenance services which are available to the minerals industry.

Specialising in small to medium-sized projects, Mechanical Services can complete all aspects of the design work from general equipment layouts through to fabrication and construction drawings using a sophisticated multi-station CAD system. Because the design team is also responsible for supervising construction, it can provide a complete package, ensuring exceptionally high quality control throughout. The team can provide an objective inspection and evaluation of the quality of used equipment up for sale, as well as being able to carry out the disassembly, refurbishment, transportation and installation of the equipment at the client's location world-wide.

The Metallurgical and Environmental Laboratory Services group offers a broad spectrum of laboratory services to the mining and mineral industry to support metallurgical process development and optimisation programmes, such as:

- Preliminary metallurgical programmes for pre-feasibility and feasibility studies;
- Detailed metallurgical research for process development;
- Process test work for plant and unit operation optimisation;
- Environmental testing for regulatory requirements and permitting.

The group's integrated laboratory facility at Kelowna includes separate areas for metallurgical and environmental research and a full-service analytical section. □