Appendix E

CONTENTS OF RECLAMATION PERMITS AND PLANS

Two documents govern Westmin Resources Ltd.'s reclamation activities; both are reviewed and approved by the Ministry of Energy, Mines, and Petroleum Resources (EMPR). The primary document is Reclamation Permit M-26 which outlines the principles and goals for reclamation. The second document is the reclamation plan, sometimes called the decommissioning plan which outlines a more specific program of reclamation and defines how the principles and goals will be achieved.

Following are general summaries of these documents.

A. Reclamation Permit M-26

This summary is based on the latest, 27 May 1991, version of the permit. The permit is reviewed and renewed at five year intervals. The permit consists of two sections and 19 special conditions. This summary is general and should not be used to judge compliance. The intent ifs to provide a sense of the permit and the reader is urged to read the permit.

Preamble

This permit defines reclamation requirements of the Ministry of Energy, Mines and Petroleum Resources and the relationship to other agencies. Wherever possible it is compatible with requirements of other agencies. The authority of other agencies is not Ltd. by this permit.

Decisions will be made in consultation with other Ministries.

Amendments

Reclamation is subject to these conditions:

1. Reclamation Security

Additional security will be required. The amount will be determined by the Minister based on discussions between the Permittee and EMPR staff.

2. Annual Reclamation Report

By March 31 of each year a report including an estimate of the cost of outstanding

reclamation obligations including closure of the mine and long term costs of treatment of acid mine drainage. An updated five year plan is part of the report.

3. Land Use

   The surface of the land shall be reclaimed to the following use:
   (a) reintegration of disturbed lands into the surrounding landscape and park,

   (b) re-establishment of native forest,

   (c) reduction of erosion through development of maintenance-free indigenous vegetation covers, and the development of self-sustaining, erosion-free water courses.

4. Productivity

   Productivity shall not be less than existed prior to mining.

5. Long-term Stability

   Land and watercourses shall be left in a stable condition.

6. Revegetation

   Native indigenous species shall be used and cover established to a self sustaining state. Inventory and assessment programs shall be included in the annual report.

7. Use of Suitable Growth Media

   Growth medium shall satisfy land use, productivity and water quality objectives.

8. Treatment of Structures and Equipment

   All to be removed or covered.

9. Waste Dumps

   Waste dumps shall be reclaimed. Monitoring of measures are required.

10. Watercourses

Water courses to be reclaimed to ensure water quality and drainage is returned to original or new water courses that maintain themselves. Acid generation to be minimized at source.

11. Pits

    Pit walls in over burden to be reclaimed. Pit walls greater than 2:1 slope do not have to be reclaimed. Where free of water vegetation will be established. Where water impounded a body of water that meets productivity objectives to be established.

12. Roads

    All roads except those required for permanent access shall be reclaimed.

13. Metal Uptake in Vegetation

    Vegetation shall be monitored for heavy metal uptake.

14. Disposal of Fuels and Toxic Chemicals

    All regulations shall be complied with

15. Acid Generation Material

    Methods to reduce or eliminate acid rock drainage will be evaluated. Amount of acid generated shall be monitored. Treatment will continue until effluent meets Ministry of Environment, Lands and Parks standards.

16. Monitoring

    Permittee shall undertake monitoring to ensure all objectives are being met.

17. Temporary Shutdown

    If shutdown longer than one year Permittee shall carry out conditions of permit or request an amendment .

18. Safety Provisions

    All safety provisions to be complied with.

19. Closure Plan

    A closure plan shall be submitted. A complete and updated plan is required by December 31, 1995. The permit may be amended.

B. Reclamation Plan

The following executive summary outlines the reclamation or decommissioning plan.

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WESTMIN RESOURCES LIMITED

MYRA FALLS OPERATIONS

DECOMMISSIONING PLAN

EXECUTIVE SUMMARY

JANUARY 1992

DRAFT

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1.0 INTRODUCTION

A decommissioning program has been developed for Westmin Resources Limited, Myra Falls Operations which is based on the current knowledge of acid generation control and land use objectives. It should be recognized that the decommissioning plan is a dynamic one and will be revised and re-submitted every five years. The mine is believed to have a life of at least 10 to 20 years and it is expected that changes in control technologies will occur which may modify activities outlined in this plan. For example, the potential for controlled leaching of waste rock and recovery of leached metals resulting in a depletion of the acid generating potential of these waste materials is presently being considered. The expenditures proposed in this decommissioning plan are adequate to meet expected costs; future technological developments should reduce these costs.

The closure options selected for the acid generating portions of the mine site are based on detailed hydrogeological investigations of each major component. Monitoring of these systems will continue for some years to ensure that the hydrogeologic conditions observed during the study period are representative.

The land use plan is based upon the current objective of the B.C. Ministry of Energy, Mines and Petroleum Resources, to return the land to a natural condition. It is recognized that this objective could change during the period of time prior to the closure of the mine and that the land use plan could be modified, excect where a proposed use could have a negative impact on the acid generation controls. Acid generation control is viewed as the primary goal of the decommissioning plan.

Westmin Resources Limited has undertaken to implement and monitor the effectiveness of many of the acid generation controls over the next five to seven years. Portions of the decommissioning program cannot begin until closure of the mine operations, however those activities which can proceed during the life of the mine will be completed earlier. Additional research activities to field test the shotcreted cementitious cover mixtures, and to define the hydrogeological conditions of the Myra Creek floodplain and the Myra/Price/H-W mining complex are continuing.

2.0 MINING PROGRAM

Westmin Resources Limited, Myra Falls Operations is a 3,650 tonnes per day copper-zinc gold-silver mine located near Butle Lake, 85 km from Campbell River on Vancouver Island. Mining began in 1966 with the development of the Lynx Open Pit, producing about 900 tons per day of copper-lead-zinc ore with gold and silver values as well. This pit operated until 1973, since then all mining has been underground. A second underground mine, the Myra Mine, was developed in 1970 and produced until 1985.

An extensive zone of copper-zinc mineralization was discovered in 1980 which resulted in the opening of the H-W Mine in 1985. This development required the establishment of new facilities including a 2,700 tonnes per day mill, which has since been expanded to 4,000 tonnes per day, and a 1.4 km conveyor to transport ore from the H-W shaft to the mill. The new mining complex also required an enhanced hydro-electric power development, an improved water control and treatment system, a new backfill plant and a new tailings disposal facility. Prior to 1984, tailings had been deposited subaqueously in Buttle Lake.

A small exploration development in the lower Thelwood Creek drainage, the Price Mine, includes 4 adits, one of which connects with the underground development in the Myra Valley. This operation has not been active since the early 1980's.

The present reserves of ore indicate at least a 10 year mine life for the Myra Falls Operations, however, as only 40 percent of the claims haveen explored and the Company has been quite successful in discovering more ore, it is anticipated that mining will continue for at least 20 years.

2.1 Milling Process

The mill, which has a 4,000 tpd capacity, employs tertiary crushing and two-stage grinding and produces copper and zinc concentrates through differential flotation. Tailings from the milling process are cycloned and the coarse fraction, approximately 50 percent by volume, is used as backfill underground.

2.2 Tailings Deposit

Prior to 1984, tailings materials were discharged to the south basin of Buttle Lake. The floculated fine tailings were discharged below the thermocline via a submerged outfall.

Studies indicate that the tailings on the lake floor were not releasing dissolved metals into the overlying water column during the time when this tailings deposition was occurring. Studies carried out in 1989, indicate that the tailings on the lake bottom are now being covered with a veneer of organic-rich sediments at a rate of approximately 4 mm/yr, and that the tailings deposits are anoxic below depths of 2 or 3 cm and are having a negligible impact on water quality in the lake.

Beginning in July 1984, tailings were deposited on land into the tailings storage facility.

Using a sub-aerial technique, the fine portion of the cycloned tailings material is deposited

through spray bars along the outer tailings embankment and allowed to drain. As increased storage capacity is required, additional confining berms are constructed above the elevation of the starter embankments. They are placed directly in successive lifts on the previous embankment with an overlap on the tailings adjacent to the embankment to form an engineered structure.

A sloping sand filter was constructed against the waste rock dump and valley side along the north side of the tailings disposal facility. The primary purpose of the filter is to decant supernatant run-off from the surface of the tailings and to intercept contaminated seepage from the waste rock dump, and carry the flows to the under-drains for treatment.

Piezometers installed into the tailings indicate that all structural zones of the tailings mass are fully drained and consolidated. If excess pore pressures were indicated by the piezometers, vertical drains could be installed along the confining embankments to dissipate excess pore pressures in the tailings and increase the factor of safety against liquefaction failure. To date vertical drains have not been required.

2.3 Waste Dumps

The majority of waste rock and overburden at the mine site was generated between 1966 and 1975 during the development and mining of the Lynx open pit. This waste has been stockpiled adjacent to and within the open pit. Much smaller volumes of waste rock are generated by underground mining and most of the H-W waste is used underground as backfill. The waste rock is a mixture of variable basic volcanic rocks and felsic sericite schists – some of which have a high sulphide content and high acid-generating potential. Non-acid generating waste rock is used in the construction of tailings pond berms.

2.4 Stockpiling of Soil and Overburden

The construction of the tailings deposition area involved the removal of approximately 200,000 m^3 of fluvial soil materials. These materials were stockpiled to the east of the tailings area for use in the reclamation of the mine site.

2.5 Drainage Control

To minimize the amount of water entering the mine area from the slopes to the north of the mine site, an interceptor ditch was constructed up slope of the former Lynx surface

operations to convey surface flows away from the area of disturbance and into Myra Creek downstream of the tailings facility. In addition, two interceptor under-drains have been placed under the tailings area to prevent contaminated ground water from reaching Myra Creek. Water is pumped from these under-drains to the water treatment system.

2.6 Water Treatment Systems

The water treatment system employed at the mine site consists of two components: a primary treatment and settling pond, the Lynx Pond, and six polishing ponds, the Myra Ponds.

The Lynx Pond is supplied by mix tanks, which combines high pH discharges from the milling process with low pH mine water and ground water. Lime and/or CO_2 can be added to the mix tanks for pH control. Accumulated precipitates are removed from the Lynx Pond and Myra Ponds by a floating, automatically controlled pump which discharges sludges to the tailings area. Effluent is decanted sequentially through the six polishing ponds and then is discharged into a common channel. A pumphouse recycles clean water from this channel back to the mill with the excess discharged to Myra Creek.

3.0 OBJECTIVES FOR DECOMMISSIONING PROGRAM

The intent of this plan is to provide environmentally secure decommissioning of the site, and to minimize long term acid drainage and on-going water treatment. The plan is based on on-going research and monitoring programs.

The design objectives for the decommissioning program at Myra Falls Operations are:

- to provide long term maintenance free water management measures to ensure acceptable water quality in the area.

- to integrate the disturbed lands into the surrounding landscape; and

- to return the land to native vegetation.

4.0 LAND USE

The location of the mine within Strathcona Provincial Park determines the potential uses of the land after mining. The objective of the B.C. Ministry of Energy, Mines and Petroleum Resources, is for the land to be returned to a natural condition including the establishment of

plant species which will initiate the natural successional patterns of local ecosystems.

The acid generating wastes will be sealed and covered with soil and natural vegetation. The vegetation will protect the integrity of the seal which is necessary to ensure the control of acid generation. The development of early successional vegetation communities will provide wildlife habitat, particularly for deer, elk and bear. The control of acid generation at the mine site will ensure that the water quality of the groundwater and Myra Creek will support a healthy downstream aquatic environment.

Mine related structures will be removed and the sites reclaimed to meet these land use requirements. The only exceptions will be the main road into the mine site which will be left open for park access, and the road and dams at Jim Mitchell and Thelwood Lakes which will be retained to support the current new alpine fishery and to supply power for long term water treatment and monitoring facilities.

5.0 ACID DRAINAGE CONTROL

5.1 Introduction

In order to understand, and to develop closure options for the acid-generating components, detailed hydrogeological investigations were conducted on each major source of acid generation at the Myra Falls Operations.

The primary acid-generating components at Myra Falls are

- Lynx Pit, containing Waste-Rock Dumps #2, #3 and #4
- Lynx Underground
- Waste-Rock Dump #1

Other potentially acid-generating mine components include the Myra mine, the H-W mine and the tailings. These areas will be assessed in a proposed hydrogeologic study to be initiated in 1992.

The specific objectives of the hydrogeologic study for each component were:

- to delineate variations in water movement and water quality in and around the Lynx Pit and Lynx Underground,
- to define the water balance and the evolution of water chemistry of inflow waters in and

around Waste-Rock Dump #1, and

- to assess the hydrogeological impacts of the Myra Falls Tailings Impoundment.

Each component was found to have unique physical and geochemical characteristics, which were used to select the most appropriate closure option to minimize acid drainage.

The objectives of the closure options are to:

- reduce all water inputs into the components that can be reasonably controlled,
- capture and treat most flowpaths of acidic water leaving the components,
- remediate contaiminated water quality in the remaining flowpaths, and
- redirect good quality waters from the Lynx Underground into Myra Creek, and reduce volumes of mine water going to the treatment plant.

5.1.a Lynx Pit

The Lynx Pit was excavated laterally into the northwest wall of Myra Valley. It is open on the south end and not entirely surrounded by rock walls. Precipitation into the Lynx Pit area was found to be a primary source of water to the Lynx Underground and is suspected to be a source of water to the Myra Creek floodplain beneath the tailings.

The closure option for the Lynx Pit must address the following specific criteria:

- minimize water reaching pit walls,
- remove good quality water from the surface of the pit before it can enter acid generating areas, and
- minimize water flow through the fill.

5.1.b The Lynx Underground

The closure option for the Lynx Underground must address the following criteria:

- isolate primary zones of acid-generating rock,
- reduce oxygen flow on deeper levels to minimize oxidation,
- prevent seasonal flushing of oxidation products in acid generating areas, and
- minimize stagnant water on upper levels where flooding may not be feasible due to the extent of fracturing within the pit area.

The selected option to meet these criteria involves:

- sealing walls, stopes, raises, etc. with cementitious sealant and/or cemented backfill, and divert water away from acid generating areas to other levels where necessary,
- submerge deeper levels with water and reduce oxygen inflows, and
- divert water from the upper Diversion Ditch as necessary to flood underground workings where possible and minimize stagnant water on upper levels which cannot be easily flooded.

5.1.2 Waste-Rock Dump #1

The primary waste-rock dump at the minesite, Dump #1, was constructed against the northern valley wall and rises up to 42 metres above the original land surface. It contains more than 10 million tonnes of mine rock from all of the mine workings and consists of an upper lift, a partial middle lift, and a lower lift directly adjacent to the tailings impoundment. This dump is still active, currently receiving rock from the H-W Underground.

Because most of the waste rock is capable of generating net acidity, significant amounts of acid water are flushed downward through the dump during heavy rainfalls and snowmelt. This water then mixes with, and overwhelms, the pH-neutral groundwater at the water table producing a greater volume of acidic water.

The specific criteria to be met by the closure options are:

- minimize water inflows into and through the dump, and
- if ongoing monitoring indicates it is necessary, minimize water-table fluctuations within the dump.

The selected closure option to accomplish this involves:

- covering the dump with a cementitious or other sealant, and
- if necessary, control of water-table fluctuations could be achieved, for example, by excavating free-draining drifts behind the valley wall for drainage and water-table control.

Further engineering studies, testing and monitoring are required to refine the cover design.

5.1.3 Tailings Impoundment

A detailed hydrogeologic investigation of the surficial tailings conducted by Environment Canada in 1990 indicated that significant portions of the surficial tailings were capable of generating net acidity.

The criterion to be met by the closure option is:

- To minimize acid generation and migration of any acidic water through or from the tailings.

Based on the environmental liabilities and risks involved for all options, a cementitious cover has been selected as the closure option. Establishment of stable soil and vegetation on the cover would enhance the ability of the cover to limit the flow of water and oxygen. A drainage system will be established on the surface of the tailings prior to the application of the sealant. The water from the tailings area surface will drain into a collection system which will release the water into the main diversion ditch and ultimately into Myra Creek.

The emergency Lynx tailings impoundment, adjacent to the Lynx settling ponds, will be removed and the tailings placed in the main tailings impoundment. Since this emergency facility is no longer necessary for the operation of the mine, the decommissioning and revegetation of this facility is proposed to be undertaken during operations and prior to mine closure.

5.2 Sealant Technology

A variety of materials have been proposed for use as covers or seals for reactive waste rock and tailings; including soils, synthetic membranes, compacted clay and till, asphalt and concrete.

Design objectives for a dry cover capping system for control of acid rock drainage would require that the material:

- is easily applied
- is durable
- has good ductility
- has reasonable compressive strength
- is chemically resistant
- has low permeability to air and water
- is economical
- is compatible with revegetation programs.

Cementitious sealants have the potential to meet these criteria.

Westmin Resources Limited has been researching, developing and testing a cementitious cover which incorporates mine waste materials, specifically; mine tailings and sludge from the water treatment system.

The research program has led to the design of a shotcrete mix which can be applied to vertical or sloped rock and dump faces. A large scale test of this shotcrete technique is proposed for the 1992 field season. This study will evaluate the effectiveness of the cementitious cover to restrict acid generation and to evaluate material properties such as durability, weatherability and permeability.

6.0 WATERCOURSES

All watercourses, natural and constructed, will be left in a sustainable, maintenance-free, condition. The water quality of these watercourses will be ensured through control of acid

generating materials. Some watercourses will be returned to original drainages, while others will remain diverted in secure channels.

7.0 STABILITY OF ENGINEERED STRUCTURES

The engineered structures which will remain after decommissioning of the mine site are the tailings impoundment and the rockfill in the Lynx pit.

The tailings embankment was designed for long-term safety against seismic activity, specifically to resist deformation in a magnitude 7.5 earthquake. Subsequent testing of the tailings concluded that the tailings as deposited meet or exceed all design assumptions.

An engineering design study will be undertaken on the proposed rockfill of the Lynx Open Pit with waste rock. This study will design the underdrains, and appropriate slopes for the surface sealed rock.

8.0 ROADS

Two access roads will be left after decommissioning the mine; the main access road to Myra Creek and the access road to Jim Mitchell Lake. The British Columbia Ministry of Environment Lands and Parks will assume responsibility for these roads. All other small access roads will be reclaimed to meet the land use objective of the land unit in which they occur.

9.0 MINE STRUCTURES AND EQUIPMENT

All of the equipment will be removed from the site and the buildings dismantled. Any acid generating material comprising fill in the buildings or yards areas will be excavated and transported to the Lynx Open Pit or #1 Waste Dump where it will be sealed with the other materials in those sites.

The surface openings of all mines will be permanently sealed for public safety as well as part of the acid generation control.

10.0 SCHEDULE OF DECOMMISSIONING

The proposed schedule for the decommissioning of the mine site is currently undefined because the date of closure of the mine is unknown and other details are not all resolved. It

is the intent of Westmin Resources Limited to carry out all decommissioning activities in a timely fashion upon closure of the mine and to decommission all areas which can be decommissioned prior to mine closure. The control of the acid generation in these areas will reduce the amount of water which requires chemical treatment. This will reduce the amount of water treatment required and will also allow the evaluation of the performance on the acid generation control methods prior to the closure of the mine.

11.0 DECOMMISSIONING COSTS

Costs have been estimated for the various components of the mine closure based on the techniques believed to be the best options at this time. However, the approach proposed is considered to be an expensive solution and new technological developments should reduce these costs. Details of the costs are presented in the following table.

TOTAL ESTIMATED CLOSURE COSTS	
Lynx Pit	$ 4,608,000
Lynx Underground	6,450,000
Waste Dump #1	1,514,500
Tailings (surface & berm)	4,535,600
Myra Creek Floodplain	1,000,000
Mill and Mine Site	1,602,000
Roads	153,000
Water Treatment Ponds	611,500
Price Mine	366,800
Tennent Lake & Penstock	327,900
TOTAL COST	$21,169,300

12.0 MONITORING REQUIREMENTS

Surface water quality monitoring will continue throughout the life of the mine; at the time of mine closure an appropriate sampling program will be determined in conjunction with the Ministry of Environment, Lands and Parks. Quarterly water quality sampling will continue in Waste Dump #1 and the Lynx Underground to confirm the results obtained in the hydrogeology studies to date.

Revegetation success on all reclaimed sites will be monitored to determine species survival and productivity.