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THE SALVAGE, RECLAMATION AND ABANDONMENT OF THE GRANDUC MINE

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INTRODUCTION

The Granduc copper mine is located 30 miles northwest of Stewart, in the Portland Canal District of northwestern British Columbia.

The Granduc Mine was operated by Canada Wide Mines Ltd. a wholly owned subsidiary of Esso Resources Canada Limited. The mine was acquired by Esso in June 1979 and commenced production in October 1980 after completing an extensive rehabilitation program.

The mine became uneconomical to operate due to continuing low copper prices and once again was forced to close in 1984.

This paper will describe the salvage, reclamation and abandonment activities for the permanent closure of the Granduc Mine.

PLANNING AND SCHEDULING

It was impractical to prolong the closure of the mine property into the following year from the viewpoint of safety, manpower, equipment and high winter maintenance costs.

Therefore it was necessary to prepare an extremely ambitious schedule to ensure that the mine abandonment was completed before the onset of another winter season.

Closure Decision

It was decided in the fall of 1983, to permanently close the Granduc Mine due to low copper prices and plans were immediately formulated in preparation for the closure.

The final production date of April 6, 1984 was eventually determined by considering the rate of production and drilled reserves.

Scheduling Activities

It was decided that all work would have to be completed before the end of October 1984 because historically weather conditions would not permit work to continue beyond this date.

It was also recognized that the schedule was extremely tight and there was no allowance for error or delay. A considerable amount of work would have to be accomplished in a short span of time (6 months).

There were many other factors to be considered, such *as:*

(a) bid documents and specification
(b) selection of contractors
(c) manpower requirements
(d) equipment
(e) power and water
(f) dry and office facilities
(g) transportation
(h) sale of assets
(i) storage
(j) safety
(k) budget preparation
(l) potential - union problems.

Manpower

The manpower lay-off plan was first completed in November 1983 and it was necessary to make several revisions before the April closure date. Continual adjustments were necessary to accomplish a smooth and relatively trouble-free lay-off of mine personnel.

Manpower levels decreased from a total of 377 employees in January 1984 down to a level of 18 supervisory staff in June. The majority of the employees were laid off in April *(70%).*

It was important that a sufficient number of skilled and experienced supervisors and tradesmen remain to perform the salvage and reclamation work, safely and efficiently.

The salvage and reclamation program was performed by local contractors under the direction of company supervision. The demolition contract was awarded to Wearmouth of Calgary.

The contractor's manpower varied from a high of 77 in June 1984 to 45 employees for completion of the program in October 1984.

The contractor's labour force consisted almost in its entirety of ex-mine employees.

To ensure an orderly closure there had to be a total commitment, dedication and cooperative relationship between management, labour and government.

The lay-off procedure at Granduc included the following activities:

(a) communications with all personnel
(b) general information meetings
(c) establish a lay-off committee - union/management
(d) severance and relocation policies
(e) media attention

(f) Manpower Adjustment Committee - company, union, government
(g) manpower coordinator appointed
(h) establish a coordination centre
(i) Job Bulletin - circular
(j) newspapers
(k) National Job Bank
(l) trades up-grading
(m) group and individual counselling
(n) recruiting trips
(o) mobility grants
(p) resume writing
(q) financial planning
(r) skills inventory
(s) Unemployment Insurance Benefits.

SALVAGE, RECLAMATION AND ABANDONMENT

The Granduc Mine abandonment plan was prepared in compliance with egislation guidelines. The plan was presented to the Ministry and reviewed in detail at a series of meetings held with the various government agencies.

The following section describes the abandonment plans and activities in each area.

Land Use Status

The spirit of these guidelines is to ensure that the surface of the land and water courses are returned to a land use compatible with provincial land use objectives.

It was ascertained and concluded that due to the remote location and mountainous terrain, the only major land use in the vicinity of Granduc is industrial activity (mining and exploration).

Mine

The abandonment of the underground mining area included the clean-up of mining materials and barricading the existing portals for safety reasons and to preclude entry.

Some clean up was required on surface at the Leduc portals and diamond drill sites on Leduc Mountain. The debris was either removed, buried or burned.

A summary of the mining statistics and a compilation of drawings of the underground workings was prepared and submitted to the Ministry.

Where economical, all mobile and fixed equipment was salvaged and removed from the underground workings.

Ore Processing Facilities

All economically salvageable equipment was removed from the concentrator complex and the building demolished. The remaining debris and rubble was compacted, covered with local fill material and contoured.

Concrete foundations for the milling and crushing equipment was removed by drilling and blasting. Some concrete floors, retaining walls and tunnel entrance snow shed remained exposed, however the site was left in a free draining safe condition. The tunnel entrance was securely barricaded and "NO ENTRY" signs posted.

On Site Facilities

The support structures and surface buildings were managed in the following manner:

Fuel and Water Storage Tanks:	Fuel was removed, the tanks crushed, compacted and buried on site.
Power Generating Plant:	Generating equipment was salvaged. The boilers and building was demolished, compacted and buried.
Wooden Storage Sheds:	Burned, debris buried, graded.
Mobile Homes - Kitchen Complex:	Removed. Area filled and graded.
Permanent Bunkhouses:	Burned, debris buried, filled and graded.
Sewage Plant:	Salvaged and removed from site.
Pump House:	Salvaged and removed.
Field Wells:	Salvaged, filled and leveled.
Power Poles - Ski Hill:	Salvaged and removed.
Surface Refuse Dumps:	Filled and contoured.
Waste Dumps:	Clean up and bury debris, contoured.
Surface Drainage:	Removed culverts, diverted streams to provide natural drainage.
Mine Heat Plant - Leduc:	Remove fuel, drain lines, seal all openings. Building and boilers left intact.
Leduc Tank Farm:	Removed fuel and left in place.

Access Roads and Air Strip

The existing access roads from Stewart to the mine site and on site access roads will remain for use by other mining companies. Scottie Gold Mines assumed responsibility for the main access road and Trojan tunnel.

The access roads servicing the concentrator complex were contoured to conform to the surrounding terrain.

The air strip at Tide Flats will remain as an unmaintained emergency landing strip.

Off Site Facilities

The ship loading facilities in Stewart which includes two Bunker "C" storage tanks, concentrator storage building and dock will be retained by Esso Minerals for future use.

The Stewart housing and accommodations was sold to local businessmen.

The communications systems and repeater stations on Mount Dolley and Mount Bayard were turned over to Scottie Gold Mines.

The old Premier Building and wharf in Stewart, which was considered a safety hazard, was demolished and removed.

Hazardous Material

The overall objective of the hazardous material handling program was to use al the materials possible within the limits of the operation. Disposal of the remaining quantities of hazardous material were handled in the following manner.

(a) Laboratory Reagents

Materials from the laboratory were present in small quantities and were either neutralized using acceptable procedures or disposed of in accordance with Laboratory Waste Disposal methods. The majority of the laboratory reagents were donated to the local high school.

(b) Power Plant Reagents

All reagents were depleted prior to the mine shut down with the exception of these used for analytical purposes. These were either returned to the manufacturer or donated to the local high school.

(c) Process Chemicals

These chemicals were either neutralized and disposed of in a safe and proper manner or returned to the manufacturer.

(d) Waste Oil

Waste oil from underground and surface was mixed with the Bunker "C" and burned in the power plant boilers or mixed with the rescue remaining in the tanks and burned prior to démoli

(e) Radiation Sources

All radioactive sources were removed by the Radiation Protection Servie in accordance with the guidelines established by the Atomic Energy Control Board. The permits were also cancel

(f) Polychlorinated Biphenyls

All P.C.B. contaminated transformers, equipment and materials were removed and transported from the mine site by the Kenetic Ecological Resource Group, a government recognized agent.

(g) Explosives

Explosives and blasting agents were removed from the site, returned to the manufacturer or destroyed.

(h) Avalanche Duds

A search for undetonated avalanche control artillery was carried out along the length of the access road. A total of 23 avalaunchers and 22 - 75 mm projectiles were found and destroyed.

Water Quality Report

A detailed water quality report was submitted to the Waste Management Branch of the Ministry. This report contained supportive environmental data which led to the conclusion that Granduc used an environmentally sound means for tailings disposal with minimal effect on the receiving environment.

Permits

All permits were cancelled for underground diesel equipment, waste management and reclamation.

Employee Register

Records were compiled for each employee working at the Granduc Mine since the start of production by Canada Wide Mines and forwarded to the Ministry.

TRANSPORTATION AND STORAGE

The equipment salvaged from the operation was transported 30 miles by tractor trailer to Stewart. The underground equipment was hauled from the mine by rail and out the 10 mile tunnel for furtherance to Stewart.

Cranes, loaders and fork lifts were used to handle the equipment and material. The concentrator haul trucks were converted to tractor trailers to facilitate the transportation of some 450 loads of freight from the mine site to Stewart.

Several alternative storage locations were investigated including Smithers, Terrace, Kamloops and Vancouver. However, transportation and cost for storage in these areas was too high.

It was decided to establish storage facilities in Stewart. The concentrator

storage building was utilized for inside storage and additional land was prepared for outside storage.

INVENTORY CONTROLS

An inventory control system was implemented to keep track of the high volume of material being removed and transported to Stewart. All salvageable equipment, materials and supplies were identified, numbered, catalogued and tagged prior to removal.

As the equipment was loaded a travelling manifest was prepared and copies distributed to personnel responsible for warehousing, transportation, security and accounting. Finally, when the trucks were unloaded in the Stewart storage areas the location was recorded.

COSTS

The cost of salvage, demolition, reclamation, transportation and storage for all work performed underground and on surface at Granduc totalled $2,393,673.00.

DESCRIPTION	$	%
Underground	63,610	3
Mill	100,182	4
Auxiliary Power and Heat	44,318	2
Power Plant	52,289	2
*Road and Transport	861,819	36
Demolition and Reclamation	678,278	28
Equipment Rental	213,376	9
Equipment Storage	26,105	1
Administration	353,696	15
TOTAL	2,393,673	100

*Road and Transport also includes truck drivers, bus drivers, equipment operators, road and equipment maintenance and fuel.

SUMMARY

The Granduc Mine ceased production in April 1984. Salvage, reclamation and abandonment activities commenced immediately in preparation for a permanent closure of the mine property.

In spite of the work volume and the extremely tight schedule, the abandonment program was completed by the end of October 1984.

Lay off of some 377 mine employees was well executed as a result of hard work and combined efforts on behalf of management, labour and government.

The history of the Granduc Mine is a legend in British Columbia and the North American mining scene but unfortunately has become one of the many mining operations to succumb to depressed metal prices.

GRANDUC CLOSURE - SCHEDULE CRITERIA - 1984

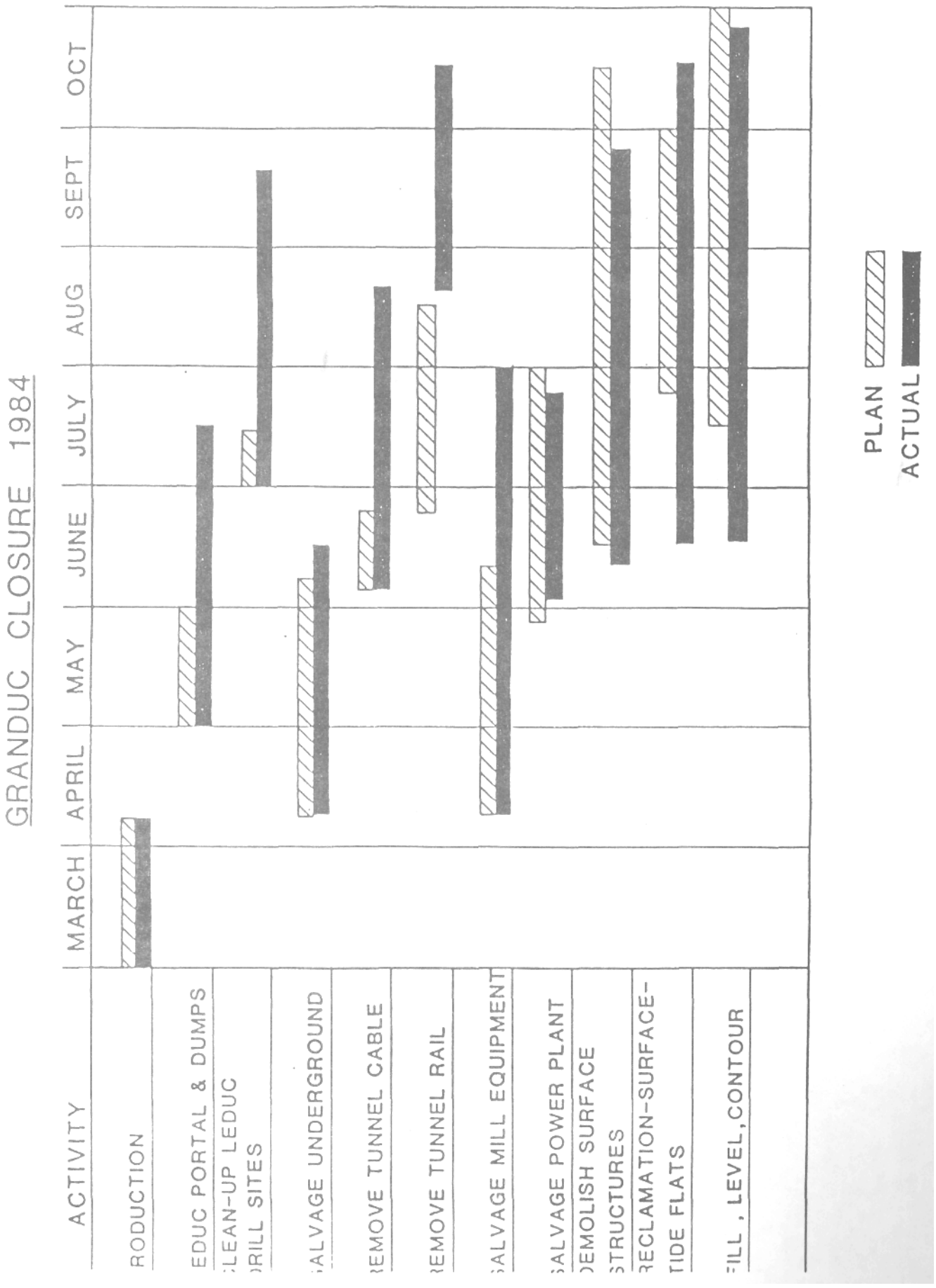
	PLAN		ACTUAL	
Leduc Portals & Dumps	May 1	June 1	May 1	July 15
Leduc D/Drill Sites	July 1	July 15	July 1	Sept. 20
Underground Salvage	April 10	June 4	April 10	June 15
Remove Tunnel Cables	June 4	June 20	June 4	Aug. 20
Remove Tunnel Rail	June 20	Aug. 15	Aug. 20	Oct. 15
Salvage Mill Equipment	April 10	June 9	April 10	July 10
Salvage Power Plant	May 28	July 30	June 4	July 27
Demolition Surface Structures	June 18	Oct. 15	July 11	Sept. 27
Reclamation - Surface Tide Lake	July 23	Oct. 1	June 15	Oct. 15
Fill Level Contour	July 1	Oct. 30	June 15	Oct. 25

MANPOWER LEVELS - 1984

	COMPANY	CONTRACTOR
January	377	0
February	330	0
March	310	0
April	277 to 39 Supervisory	0
May	24 Supervisory	55
June	18 Supervisory	69 (77 High)
July	14 Supervisory	48
August	12 Supervisory	46
September	10 Supervisory	50
October	7 Supervisory	39
November	5 Supervisory	10
December	3 Supervisory	6

TRUCKING - 1984

MONTHS	LOADS
May	91
June	116
July	94
August	48
September	22
October	81
TOTAL	452


GRANDUC CLOSURE 1984
ACTIVITY
MARCH
APRIL
MAY
JUNE
JULY
AUG
SEPT
OCT
RODUCTION
EDUC PORTAL & DUMPS
:LEAN-UP LEDUC
)RILL SITES
:ALVAGE UNDERGROUND
:EMOVE TUNNEL CABLE
:EMOVE TUNNEL RAIL
:ALVAGE MILL EQUIPMENT
:ALVAGE POWER PLANT
)EMOLISH SURFACE
STRUCTURES
:ECLAMATION-SURFACE-
TIDE FLATS
:ILL , LEVEL, CONTOUR
PLAN
ACTUAL