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NVI MINING LTD.

MYRA FALLS OPERATIONS

MYRA FALLS CONCENTRATOR

INTRODUCTION

NVI Mining Limited operates a 3600 mtpd mine and mill complex at the south end of Buttle Lake in Strathcona Provincial Park on Vancouver Island, B. C. Access to the mine site is provided by a 90 km paved highway from Campbell River. The mine and facilities are nestled in the narrow Myra Valley between Mt. Phillips and Mt. Myra. These steep, rugged mountains rise from the valley floor, at the 300 meter elevation to summits of almost 1800 meters. The steep slopes are heavily wooded with fir, hemlock, and cedar up to 1200 meters where a transition to alpine meadows occurs. The summits are craggy rock faces, some capped with glacial ice.

Myra Creek winds its way through the valley dropping several hundred feet into Buttle Lake. Precipitation is high at over 250 centimeters per year, which may include up to 5 meters of snow in winter. The temperature ranges from 32 C in summer to -18 C in winter.

HISTORY

The claims covering the Lynx and Price Mines were originally staked in 1918 by James Cross and Associates of Victoria. The claims covering the Myra Mine were held by the Paramount Mining co. of Toronto. Some development work was done between 1919 and 1925 with inconclusive results. Interest in the claim group was rekindled in 1959 when the Lynx, Myra and Price claim groups were acquired and Consolidated by the Reynolds Syndicate. In 1961 the claims were sold to Western Mines Ltd. Exploration by diamond drilling established underground ore deposits at the present Lynx Mine. An 1100 foot shaft was sunk with horizontal levels at 150 foot intervals to facilitate further exploration. The decision to bring the property into production was made in 1965 when the proven and probable ore reserves reached one million tons. Construction of the concentrator and surface facilities were completed in 1966. Operations commenced at 950 stpd producing copper and zinc concentrates. Access to the property was by boat, float plane and barge on Buttle Lake until 1968 when a road, built by Western Mines, was completed along the east side of the lake. This 25 mile road linked up with the Gold River road and was paved in 1970. This road not only provided access to the mine, but improved public access into Strathcona Park. ?, 1966

Development of the Myra Mine followed Lynx in 1970 when a 2200 foot, 8.5 degree decline was completed. Ore-bearing zones were accessed from levels at 150 foot intervals.

In 1972, to maximize gold and silver recovery from the high-grade Myra ore, production of a lead concentrate began in a separate circuit called the Myra circuit. Later, Myra circuit tails were combined with the Lynx circuit to recover copper and zinc values from the Myra circuit. Production of a Lynx lead concentrate soon followed.

Lynx and Myra ore reserves started a slow but steady decline in the Late 1970's. Until then, annual exploration within the Lynx and Myra mines had been successful in maintaining reserves. An aggressive exploration program was launched which soon resulted in the discovery of the Price and HW ore bodies in 1979 and the Lynx West G zone in 1982.

Definition drilling of the HW ore-body proved sufficient reserves to justify an increase in production to 3000 stpd. Flowsheet development for a new concentrator was started in 1981. Laboratory bench testing and operation of an on-site pilot plant provided the data for equipment selection and design. Construction of the concentrator was completed in May 1985. Shutdown of the original concentrator coincided with the start-up of the new concentrator on May 7, 1985. Production from the original concentrator facility totaled 6,476,910 tons.

In early 1987 Westmin decided to increase its throughput from 2700 mtpd to 4000 mtpd. Modifications to the concentrator were primarily in the flotation area. A new flowsheet was developed based on laboratory test results, materials handling capacity was increased and all of the concentrate thickeners were retrofitted with high capacity feed systems. The grinding circuit was fitted with expanded cyclone capacity and the speed and motor size of the rod mills was increased. Two additional Larox PF32 filters were added to increase dewatering capacity and ensure sufficient availability for filter maintenance. In July 1988, the expansion of the concentrator to 4000 tpd was completed. A Foxboro I/A DCS was installed in November 1989, and computer control of flotation circuit air flow was installed April 1990. In 1991 the flowsheet was simplified by eliminating the regrind thickeners and going to two stage cleaning in both circuits. Seven foot diameter flotation columns were added for final cleaning.

GEOLOGY

The Myra Falls ore bodies occur in the Myra formation of the Sicker Group. The Sicker group is the oldest stratigraphic unit recognized on Vancouver Island.

The Myra formation is composed of variable sequences of differentiated and bedded volcanics, and sediments are volcanic greywacke with inter-bedded argillite and chert.

In the Lynx-Myra-Price system, sedimentary massive sulfide lenses occur within or on the top contact of the host rhyolite beds. The HW system is also a sedimentary massive sulfide lens but is substantially larger than the Lynx-Myra-Price system and is located at the base of a rhyolite bed some 800 to 1000 feet stratigraphically lower than the Lynx-Myra-Price system.

The Battle - Gap ore-body contains over 4 millions tonnes of high Zn/low Fe ore and started production in 1997. It is similar to the HW, but contains significantly more sphalerite, and tennantite/bornite. Pyrite content is very variable.

The composition of the massive sulfide lenses vary substantially both within and among each ore lens. The most graphic example of the differences between lenses is that the HW ore body averages about 70% by weight pyrite while the Lynx-Myra-Price system averages about 15% by weight pyrite. Higher grade zinc ore is located on the perimeter and higher grade copper ore is near the center of the HW orebody. Minor amounts of tennantite and bornite are also present. The gangue minerals are primarily pyrite with some barite, quartz and pyrrhotite.
The principal gold carrier mineral is electrum with 22 to 30 wt% silver. Grain sizes of up to 50 micron and as small as 2 micron have been identified.. Electrum appears to associate with bornite rich ores where it is found in myrmekitie intergrowths of galena with chalcocite. Finer grained electrum, which is enclosed in tetrahedrite and tennantite, associates with sphalerite and pyrite. Gold is also in solid solution with other sulphides which are uniformly distributed throughout the ore body. The unprejudiced association of gold and silver with all of the sulfides has resulted in lower gold and silver recoveries from HW ore than was historically experienced from Lynx ore. It is felt lower recoveries are due to pyrite rejection to tails.
The HW ore grain size is also extremely variable. Pyrite grains have been found from several millimeters to smaller than 10 microns in size. Polished sections show ore mineral grain size variation from a sphalerite matrix with 50 to plus 100 micron pyrite and chalcopyrite grains to a gangue matrix with less than 10 microns chalcopyrite grains and sphalerite grains between 50 and 200 microns.

CONCENTRATOR

FIGURE 2 shows the current mill flowsheet.

Crushing

Ore is fed from the 100 tonne surge bin in the head-frame onto a 1.4 km long conveyor using a 48" x 12' hydrastroke feeder. This belt discharges into a 3600 live tonne coarse ore bin. A 48" x 16' Hydrastroke feeder and a weightometer on the coarse ore bin discharge controls the feed rate to the crushing plant.

The crushing plant feed is first passed over a 5' x 12' double deck screen with 3/4" x 2" slotted openings on the bottom deck. Screen oversize feeds a 5.5' Symons standard cone crusher. Ore passing the bottom deck reports to the fine ore bins. Product from the secondary crusher reports to the tertiary screen, which is a 8' x 16' single deck with 16mm x 28mm openings. The tertiary crusher, a 5.5' Symons short head cone crusher, is in closed circuit with the tertiary screen. Tertiary screen undersize reports to two 3500 live tonne fine ore bins. In an effort to blend ore, a reversing conveyor alternates the HW crushing plant product between the two fine ore bins at regular intervals. The HW crushing plant has a nominal capacity of 270 tonnes per hour.

Grinding

The concentrator is designed with two parallel grinding and rougher circuits, each capable of treating 2000 tonnes per day. Both grinding lines are identical and independent. Rod mill feed is drawn from a fine ore bin using two hydraulically driven 60" slot feeders which discharge onto the rod mill feed belt. Mill feed tonnage is measured and feed rate is controlled with the hydraulic slot/belt feeders while rod mill water is ratioed to feed tonnage. Rod mill discharge density is controlled between 78% and 80% by operator checks and ratio adjustments. Rod mill discharge combines with ball mill discharge in a common pumpbox and is pumped with a fixed speed pump to a pair of Krebs D20LB cyclones. Cyclone feed density is measured and controlled by cascading a pumpbox water flow set-point from the cyclone feed density controller. Cyclone underflow is ball mill feed which is 80% to 85% solids. Cyclone overflow is measured and is nominally 42% solids. Product size from the grinding circuit is 75% to 80% -200 mesh and the mean operating Work index is 13.4 kwhr/tonne. In 1992 a 30" Knelson gold concentrator was installed on each grinding circuit treating 30 tph of cyclone underflow to recover recirculating free gold.

The copper and zinc rougher scavenger concentrates are reground in essentially identical circuits.

Both regrind mills are 7' x 12' Dominion rubber lined mills charged with 1" balls and driven by 250 Hp motors. The mills are in closed circuit with six 9" Linatex cyclones.

Cyclone underflow ranges between 65% and 75% solids and cyclone overflow is 20 - 35% solids. The copper and zinc regrinds feed their respective first cleaners. Grinding statistics are shown below in Table 2.

TABLE 2: Grinding Statistics

	Rod Mill	Ball Mill	Cu Regrind	Zn Regrind
Manufacturer	Dominion	Dominion	Dominion	Dominion
Size feet	8 x 12	11.5 x 15	7 x 12	7 x 12
Horsepower	400 Induction	1100 Synchronous	250 Induction	250 Induction
Critical Speed, %	76	75	73	73
Grinding media	3.5" x 11.5'	1.5" 30% 2.0" 70%	1"	1"
Consumption, Kg/tonne	0.235	1.04	combined .234	
Liners	Noranda Wave 4" lift Ni-Hard	Rubber 5" lift	Rubber 4" lift	Rubber 4" lift
Product size(P80)	425 microns	190 microns	38 microns	38 microns

FLOTATION

Flotation feed grades are variable. Copper ranges from 1.0 to 3.0%, zinc ranges from 3.0% to 10 %, lead ranges from 0.1% to 0.5 %, and iron ranges from 15% to 30%. A great deal of effort goes into blending ores underground, however, rapid grade fluctuations do occur regularly. A Courier 300 on stream X-ray analyzer assays 16 streams for Cu, Pb, Zn, Fe, As, and %solids. Assays are reported every 5 minutes with each stream being reassayed every 15 minutes. Sixty- three Outokumpu OK8 (300 cu ft.) Flotation machines and two 7' flotation columns are used in the flotation circuit. Air and level control for each bank of cells is managed by the Foxboro Computer. The primary sensor for air control is an Annubar and the final control element is an air actuated butterfly valve. The primary sensor for level control is an Outokumpu float and angle transmitter and the final control element is an air actuated dart valve. The originally supplied Outokumpu field controllers are maintained for backup, startup and shutdown. Nearly all flotation reagents flows are measured by magnetic flow meters and metered into the circuit using small ball valves, which are regulated by The Foxboro computer. In some cases, one flow loop serves two addition points by splitting the flow with small in-house design pinch valves. MIBC and lime are the only reagent flows not measured. MIBC is metered with Pulsa feeder pumps and lime is pulsed into the circuit using air actuated red jacket valves. Lime is added to a pH set-point. All reagent set-point changes are made by operators.

Copper

There are two independent identical copper rougher circuits, one for each grinding line. Each cyclone overflow is gravity fed to its own 400 cu ft conditioner at the head of each copper rougher circuit's ten OK8 cells. The last 6 cells of each bank is the rougher scavenger. The pH in the roughers is controlled between 8.5 and 11.2, depending on lead, zinc and iron heads. The primary sensor is a pH probe in the rougher conditioner; a red jacket valve pulses lime into the rod mill feed chute. A 73/27 mixture by weight of Potassium Amyl Xanthate (PAX) and Aerofloat 208 are stage added. The collector blend is added at the ball mill feed chute when Cu heads are high. The blend is also added at the copper conditioner and the copper rougher scavenger transition box. Zinc sulfate is added to the Rod mill and Cu regrind for sphalerite depression. MIBC is also added to each copper rougher and cleaner circuit.

Copper rougher concentrates from both circuits are combined and pumped to the copper regrind pumpbox where zinc sulfate is added to depress zinc collector blend is added to reactivate copper, and lime is added should the pH drop below 10.6 which helps aid lead depression. The Cleaner scavenger bank has three OK8 cells while the first Cleaner bank has four OK8 cells. Copper regrind cyclone overflow reports to the copper first cleaner. Copper first cleaner tail feeds the copper cleaner scavenger whose tail reports to the zinc conditioner tank and whose concentrate reports to the copper regrind feed pumpbox. The copper final concentrate from the column reports to the 32' copper concentrate thickener while the column tail reports to the Cu regrind circuit.

Zinc

Copper rougher scavenger tail and copper cleaner scavenger tail are conditioned in a 1000 cu. ft. tank and split to two 400 cu. ft. conditioners which feed identical zinc rougher circuits. Each zinc rougher has a total of ten OK8 cells. The first four cells make up the rougher bank and the last six make up the rougher scavenger bank. Copper sulfate is added to the zinc conditioner tank and each zinc rougher scavenger drop box. Lime is pulsed into the zinc conditioner tank where the pH is controlled between 11.8 and 12.2, using a red jacket valve. The alkaline pH is required to depress iron. Collector blend is also split between each zinc rougher conditioner and each zinc rougher scavenger drop box. MIBC is also added to each zinc rougher conditioner.

Zinc rougher concentrate from both circuits are combined and pumped to the zinc regrind pumpbox where copper sulfate and collector blend are added to reactivate zinc, and lime is added to raise the pH to 12.3 which helps aid iron depression. Zinc regrind cyclone overflow reports to the zinc first cleaner which is composed of three OK8 cells. Zinc first cleaner tail feeds the zinc cleaner scavenger whose concentrate reports to the zinc regrind feed pumpbox. The zinc cleaner scavenger bank is three OK8 cells. The zinc final column concentrate reports to the 32' zinc concentrate thickener while the column tail reports to the Zn regrind circuit. The Zn 1st cleaner cell #1 has the option of being diverted to the final concentrate (high Zn heads) or the column feed (low Zn heads).

TABLE 3: Metallurgical Performance 2003

	ASSAYS					RECOVERY				
	Au g/t	Ag g/t	Cu	Pb	Zn	Au	Ag	Cu	Pb	Zn
Head	1.53	44.12	1.35	0.42	6.50					
Cu Conc	9.98	521.0	24.88	5.61	7.07	27.07	49.01	76.66	55.34	4.52
Zn Conc	3.11	106.0	1.68	1.05	53.17	21.20	25.04	13.00	25.99	85.32
Knelson Conc	9909	2474				8.43	0.05			

TABLE 4: Reagent Consumption 2003

REAGENT	CONSUMPTION Kg/tonne	
Aeroflot 208	0.031	
Potassium Amyl Xanthate	0.079	
Copper Sulfate	0.542	
Sodium MetabiSulfite	0.458	
Zinc Sulfate	0.334	
Lime	1.671	Includes Surface Water Treatment
MIBC	0.028	
Percol E-10 flocculant	0.002	

Filtration

Copper and zinc concentrates are thickened to 70% solids and stored in 3000 cu ft stock tanks prior to filtration. Both concentrates are filtered using one of five Larox PF32 pressure filters. Three filters are assigned to zinc concentrate. One of the four filters can be used for either concentrate should the need arise. Each filter discharges to its respective concentrate storage bin below.

Concentrate thickener underflow is pumped from the stock tank into the pressure filter using a 3" x 4" Worthington pump. When the filter starts its fill cycle the pump motor switches on. A feed pressure of 80 psi is required for the fill cycle. Each filter is monitored and controlled by a PLC. Operators change fill times, which are nominally 60 seconds, according to cake thickness. After the fill cycle is complete, the cake is pressed further with clean water for 60 seconds. The cake is then air dried with compressed air at 70 to 80 psi. Operators adjust air blow time, which is nominally 180 seconds, according to cake moistures. A 950 cu ft air receiver is pressurized by two 1250 cfm and one 600 cfm compressors. The filters produce moistures as low as 5%; however, dusting problems require that moistures be kept above 7%.

Surface Water Treatment and Tailings Disposal System

Mill tail is gravity fed to a backfill cyclone plant. Single stage classification, in four 15" cyclones, is used to produce backfill sand. The cyclone solids split is 50:50. Cyclone underflow is 80% plus 37 micron. Backfill is either pumped directly to the mine backfill tanks for placement or is pumped to a storage facility for reclaim when required. Cyclone overflow is pumped to the Paste plant, thickened in an OK high capacity thickener, then disc filtered. The filter cake is density adjusted, before being pumped as a 'paste' some 1.5 km to one of three tailing storage areas. The sub-aerial storage method is employed. Water decanted and collected from ground water is pumped to the head of the surface water treatment system.

The surface water treatment system comprises several settling ponds, a central collection tank and pH control.

All the surface water including mine drainage, mill thickener overflows, and tailings area decant water is pumped to the Super pond. Here a pH probe measures pH which is controlled using lime to 10.5. Depending on runoff conditions and the mill operation, the combination of all effluents may be above or below pH 10.5, which is the pH at which zinc, copper, and lead solubility is lowest. Control of this system is done with the Foxboro Computer from the mill. The Super pond discharges into the Myra pond system. There are 6 smaller finishing ponds which overflow to a common discharge where it is pumped back to the mill Reclaim water head tanks. Reclaim water consumption is typically 230 M^3/HR.

Excess water, which represents anywhere from 1 to 5 times the water used by the concentrator is discharged into the Myra Creek. Discharge pH is measured and a weir is used to measure the total flow discharged to the creek. Fresh water is pumped from the Tennent hydro tailrace to the fresh water tank. The fire water tank which services the mill buildings and power house is fed from Arnica Creek in the wet months and supplemented by the fresh water tank during the dryer months. The fire water tank can overflow into the fresh water tank which in turn can overflow into the reclaim water tank. Fresh water consumption is typically 350 M^3/HR.

Personnel

TABLE 5

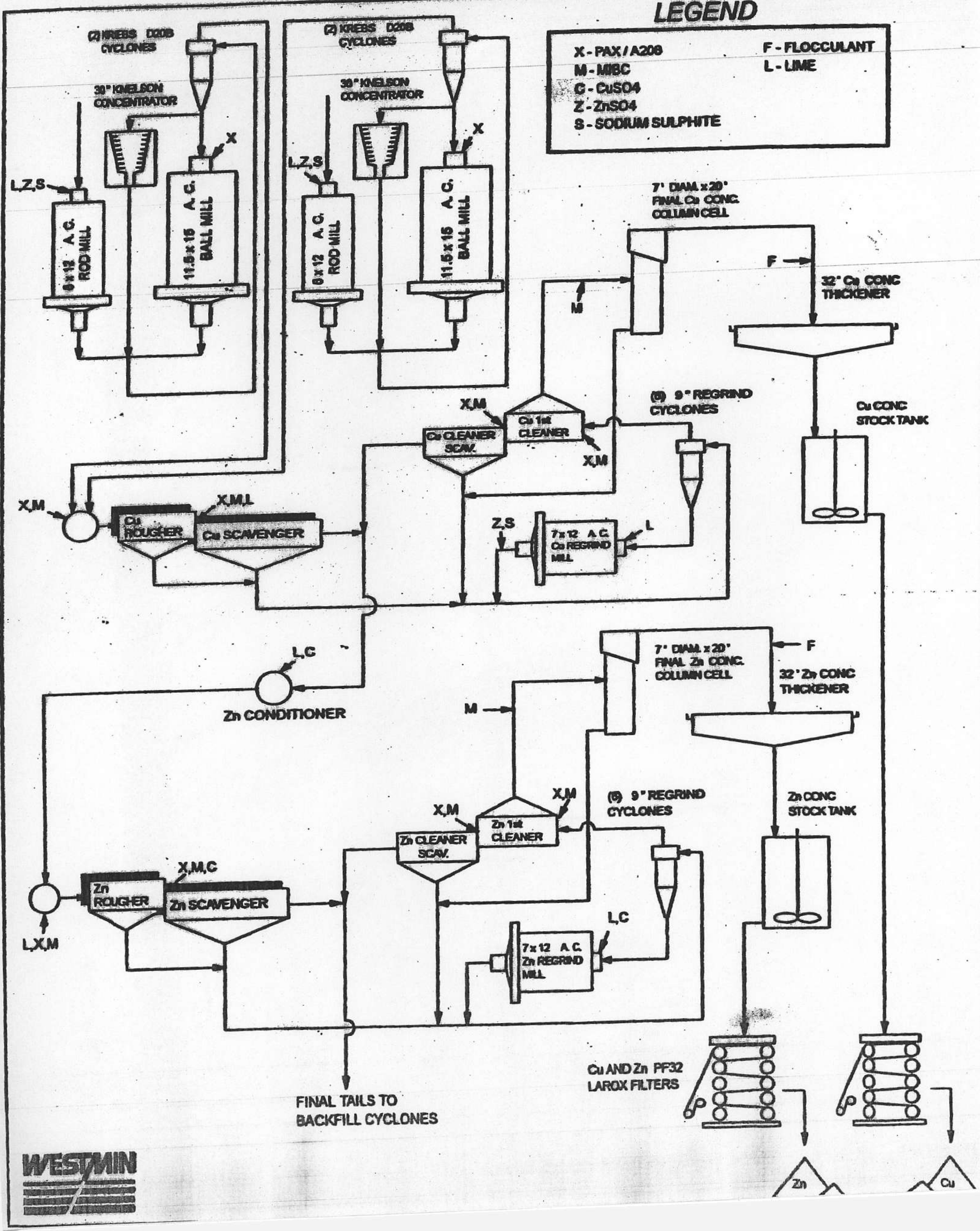
Mill Superintendent	1
Metallurgist	1
Technician	1
Shift Supervisors	2
Control Room Operator	4
Flotation Operator	4
Filter/Tailings Operator	4
Spare Operator	4
Labourer	2
Assayers	2
Mechanical Foreman/Planning	2
Mechanics	8

Power Generation

The Myra Falls Operation's use between 15MW of power during the winter, and 12 MW of power during the summer. One unique feature is the power generation facilities as all power is generated on site. There are two lakes above the mine site, called the Jim Mitchell and Tennent lakes. The Jim Mitchell feeds the Thelwood power Station. The 8.2 MW Thelwood generator is driven by a Gilkes Impulse pelton wheel. At maximum capacity the pelton wheel uses two jets of water, supplied at 580 psi. Maximum water consumption is 39,200 USGPM. A Woodward UG8 governor controls the Pelton wheel's output and by using only one jet the generator can be operated down to 1 MW. Tennent Lake feeds the Tennent power Station. The 3.0 MW Tennent generator is driven by a Gilkes Impulse pelton wheel, similar to the Thelwood unit; however, the Tennent pelton wheel is smaller and only has a single jet. It is also controlled by a Woodward UG8 governor. The Tennent, whose water is supplied at 2000 psi, can operate as low as 0.5 MW.

In addition to the hydro plants, a 12 MW diesel generating plant is maintained. During the wet months both hydro plants operate at maximum capacity and diesel generators provide the remaining 4 MW of power. Depending on lake levels as little as 0.5 MW of hydro electric Power is available during the dry season.

WESTMIN RESOURCES
MYRA FALLS OPERATION - REAGENT ADDITION POINTS



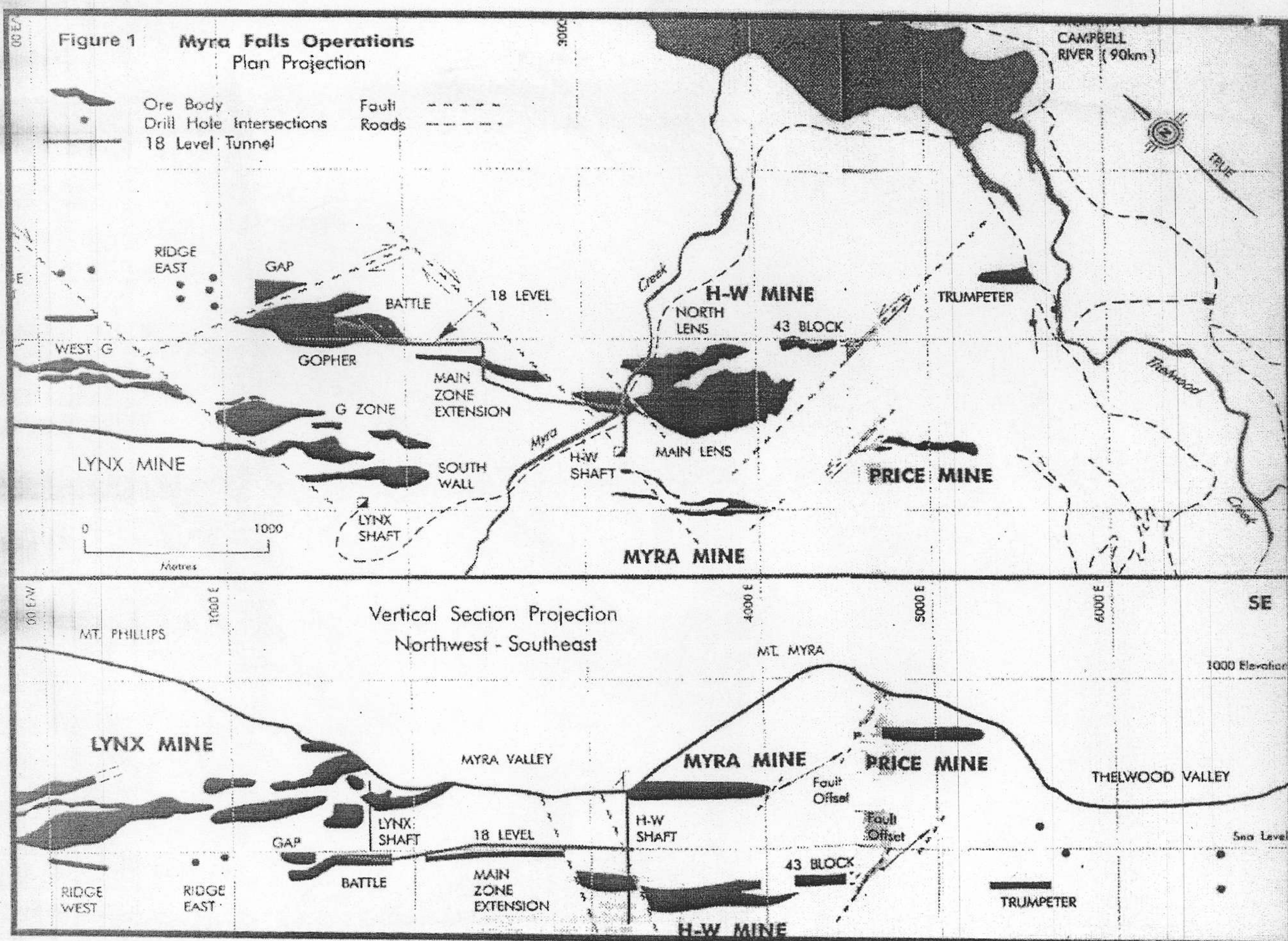


Figure 1
Myra Falls Operations
Plan Projection
Ore Body
Drill Hole Intersections
18 Level Tunnel
Fault
Roads
CAMPBELL RIVER (90km)
TRUE
RIDGE EAST
GAP
BATTLE
18 LEVEL
H-W MINE
NORTH LENS
43 BLOCK
TRUMPETER
WEST G
GOPHER
MAIN ZONE EXTENSION
G ZONE
Creek
Myra
Thelwood
Creek
LYNX MINE
SOUTH WALL
H-W SHAFT
MAIN LENS
PRICE MINE
LYNX SHAFT
0
1000
Metres
MYRA MINE
Vertical Section Projection
Northwest - Southeast
MT. PHILLIPS
1000 E
4000 E
5000 E
6000 E
SE
MT. MYRA
1000 Elevation
LYNX MINE
MYRA VALLEY
MYRA MINE
PRICE MINE
THELWOOD VALLEY
Fault Offset
Fault Offset
LYNX SHAFT
18 LEVEL
H-W SHAFT
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Sea Level
43 BLOCK
RIDGE WEST
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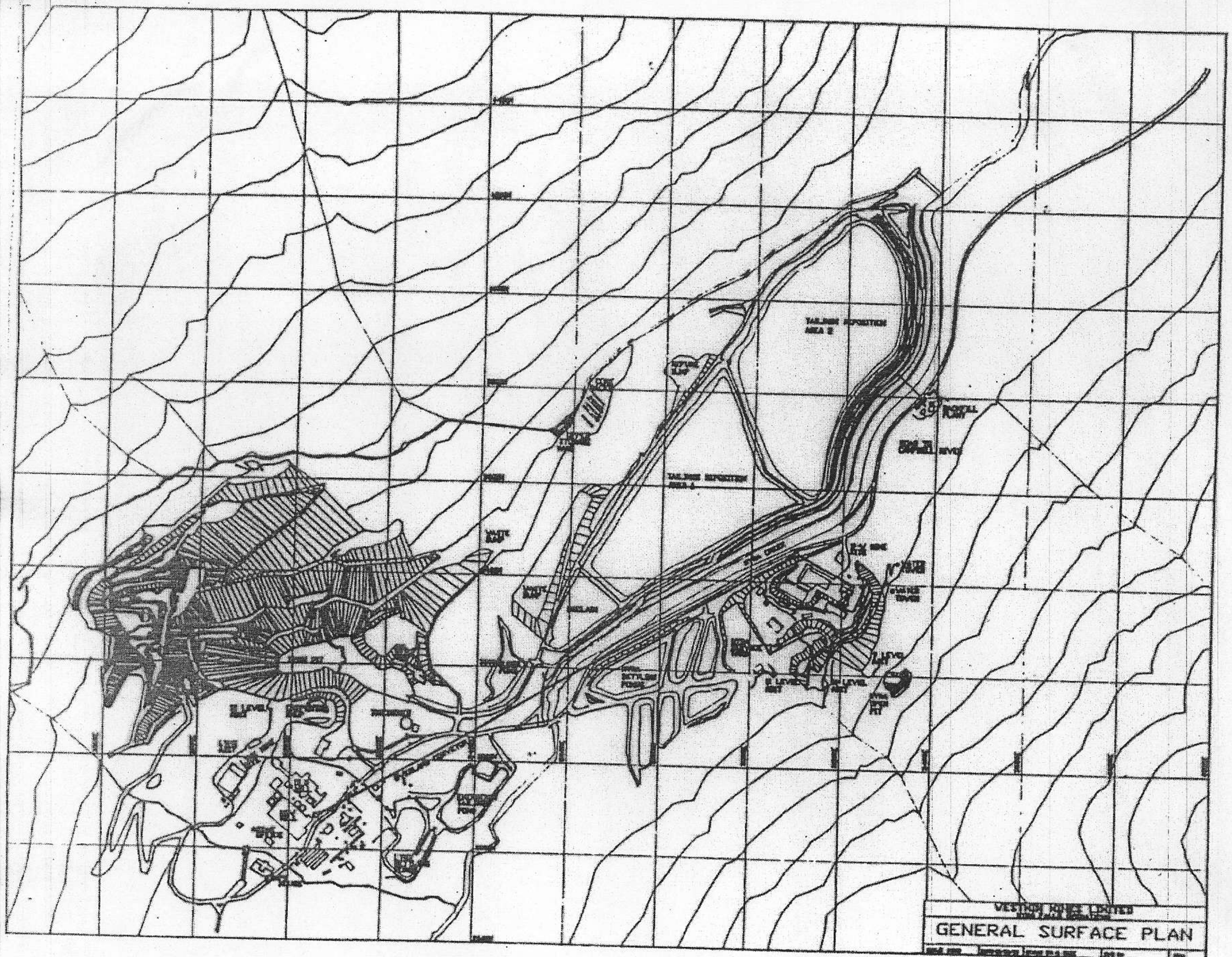
BATTLE
MAIN ZONE EXTENSION
TRUMPETER
H-W MINE



FIGURE

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