

MINERAL PROCESSING:

The Lornex mill was designed to process 38,000 tons of ore per day with an onstream efficiency of 90%. Operating experience has proven that a full capacity throughput rate of 48,000 tons per day with an operating factor of 93% is a realistic level.

The 4,000 tons per hour crushing section of the processing plant is presented diagrammatically by Figure 3 - "Concentrator Department - General Plant Area - Pictorial Flowsheet".

The material flow through the grinding and flotation sections is schematically outlined by Figure 3. A general description of the process is as follows:

1. Run-of-mine ore is delivered to the crushing plant by 100-ton and 200-ton capacity end-dump trucks. The ore is reduced to 8-inch material in a single pass through an Allis-Chalmers 60-inch x 89-inch gyratory crusher. Crushed ore discharges to a 300-ton surge pocket under the crusher. From the ore pocket, material is transported by dual speed 96-inch apron feeder to a 72-inch collection belt conveyor and thence to a 60-inch belt conveyor which discharges to a coarse ore surge pile. The nominal capacity of the coarse ore surge pile is 450,000 dry short tons and design live capacity is 150,000 dry short tons.
2. Crushed ore from the coarse stockpile is reclaimed by two parallel lines of four variable speed 48-inch x 13-foot apron feeders. This coarse ore is fed directly to two parallel grinding circuits.

Primary grinding is achieved by two 32-foot diameter by 15-foot 6-inch D.E.W. semi-autogenous mills. The mills are equipped with a grate discharge. The mill discharge is pumped to a splitter then to two 8-foot x 20-foot screens. The screen oversize is laundered to the feed-end of the autogenous mill. The screen undersize reports to the ball mill discharge sumps.

The semi-autogenous mills are driven by two 180-revolution per minute, 4,000-horsepower, quadratorque motors. The mills rotate at 10.0 revolutions per minute or 73.2% of critical speed.

The secondary circuit is comprised of two 16½-foot diameter by 23-foot ball mills for each autogenous mill. Each of the four secondary mills operate in a closed circuit with a cyclone cluster containing fifteen D20B Krebs cyclones. The respective screen undersize, ball mill discharge, and scavenger flotation product is classified in the cyclone cluster with the underflow reporting to the ball mill. The overflow nominally at 38% solids (with 70% passing 100-mesh screen) reports by gravity to four parallel rougher-scavenger flotation banks.

The secondary grinding mills are driven by synchronous, 180-revolution per minute, 4,000-horsepower motors through a Fawick air clutch. The mills rotate at 14.14 revolutions per minute or 74.2% of critical speed.

3. Sodium Isopropyl Xanthate, Potassium Amyl Xanthate, and Norpine are used in the Lornex primary flotation process to produce a bulk concentrate containing both copper and molybdenum values. The bulk flotation circuit consists of a rougher-scavenger section followed by two stages of cleaning. Each bank of rougher-scavengers contains eighteen Denver 600-H-DR flotation machines, eight of which are roughers and ten of which are scavengers.

The scavenger concentrate is returned to the grinding circuit and the rougher product is cleaned and recleaned in two parallel circuits of ten and four Denver 30-DR units, respectively.

The cleaner tailings combine with the scavenger product and the recleaner tailings are fed into the cleaner circuit. Final bulk recleaner concentrate is dewatered in an 85-foot thickener prior to copper-molybdenum separation.

Tailings from the four rougher-scavenger banks are collected in a common sump and flow by gravity to the tailings pond.

4. Dewatered bulk concentrate, at 40-60% solids, is fed to two conditioners which precede the molybdenum-copper separation plant. The copper concentrate is depressed with sodium hydrosulphide and sodium cyanide, and molybdenite floated with fuel oil in four Denver Sub-A, No. 24, rougher cells and six Sub-A, No. 24, scavenger cells. Rougher concentrate is reground in a 5-foot diameter by 10-foot Denver Ball Mill, cycloned and cleaned in six No. 18 Denver Specials. The first cleaner tailings are recirculated to plant feed and the first cleaner concentrate is reground in a 5-foot diameter by 6-foot Denver ball mill, cycloned and cleaned in four No. 18 Denver Specials. Six additional cleaning stages (No. 15) complete the circuit and pulp flow is counter-current with the tailings returning to the previous cleaning stage and the concentrate going to the successive cleaning stage.

The process flow is outlined schematically in Figure No. 4 - "Moly Plant Flowsheet".

Final molybdenite concentrate from the eighth cleaning stage is transferred to a holding stock tank. The slurried concentrate is pumped to the concentrate filtration plant where a single disc filter (6-foot) is utilized to dewater the concentrate prior to drying in a Skinner multiple-hearth dryer.

The tailings product from the molybdenite flotation plant is the final copper concentrate. This material flows by gravity to a 100-foot diameter thickener for dewatering prior to filtration.

5. Underflow from the final copper thickener is pumped to two 8 $\frac{1}{2}$ -foot diameter by 7-disc Dorr-Oliver-Long filters. The filtered product, normally at 12 - 14% moisture, is conveyed to an 8-foot diameter by 48-foot, natural gas-fired, parallel-flow rotary dryer. Dryer discharge, at 8% moisture, is conveyed to a 1,400-ton storage bin from whence it is trucked to Ashcroft for rail transportation to Vancouver to await marine transportation to off-shore smelters.

Concentrator operations are monitored and, where practical, controlled from a central room. Tonnage recorders, water addition controllers, electric power draw detectors, mill hydrostatic pressure recorders, mill bearing remote temperature detectors, sump level controllers, process alarm annunciators, density gauges, and equipment motor status lights are incorporated throughout the operation to provide maximum efficiency.

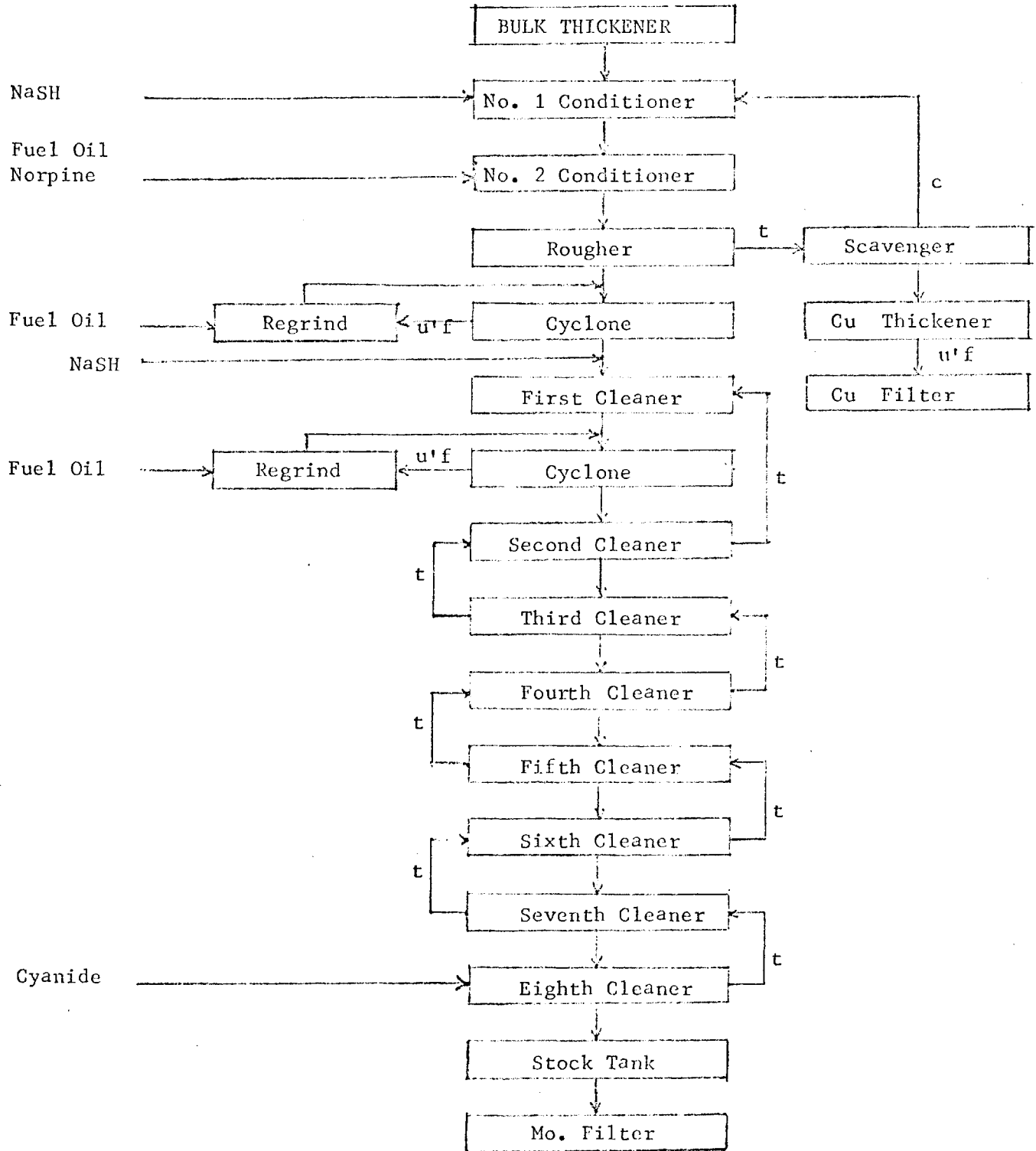
Tailings from the copper scavenger flotation flow by gravity through a short section of 36-inch plastic pipe to a diversion box. This box is equipped with pneumatically operated knife gates to divert all or part of the flow to an emergency storage area in the event of operating difficulties with the tailings disposal system. From the diversion box, the tailings flow by gravity, via a 36-inch diameter polyethylene pipe (tradename "Sclairpipe") to the impoundment area. The line has a total length of 23,800 feet, the first 1000 feet at a 9% slope; the remainder of the line is at a gradient of .2 percent.

The compacted zoned earthfill starter dams will be raised to maintain a minimum flood storage capacity of 16,000 acre feet.

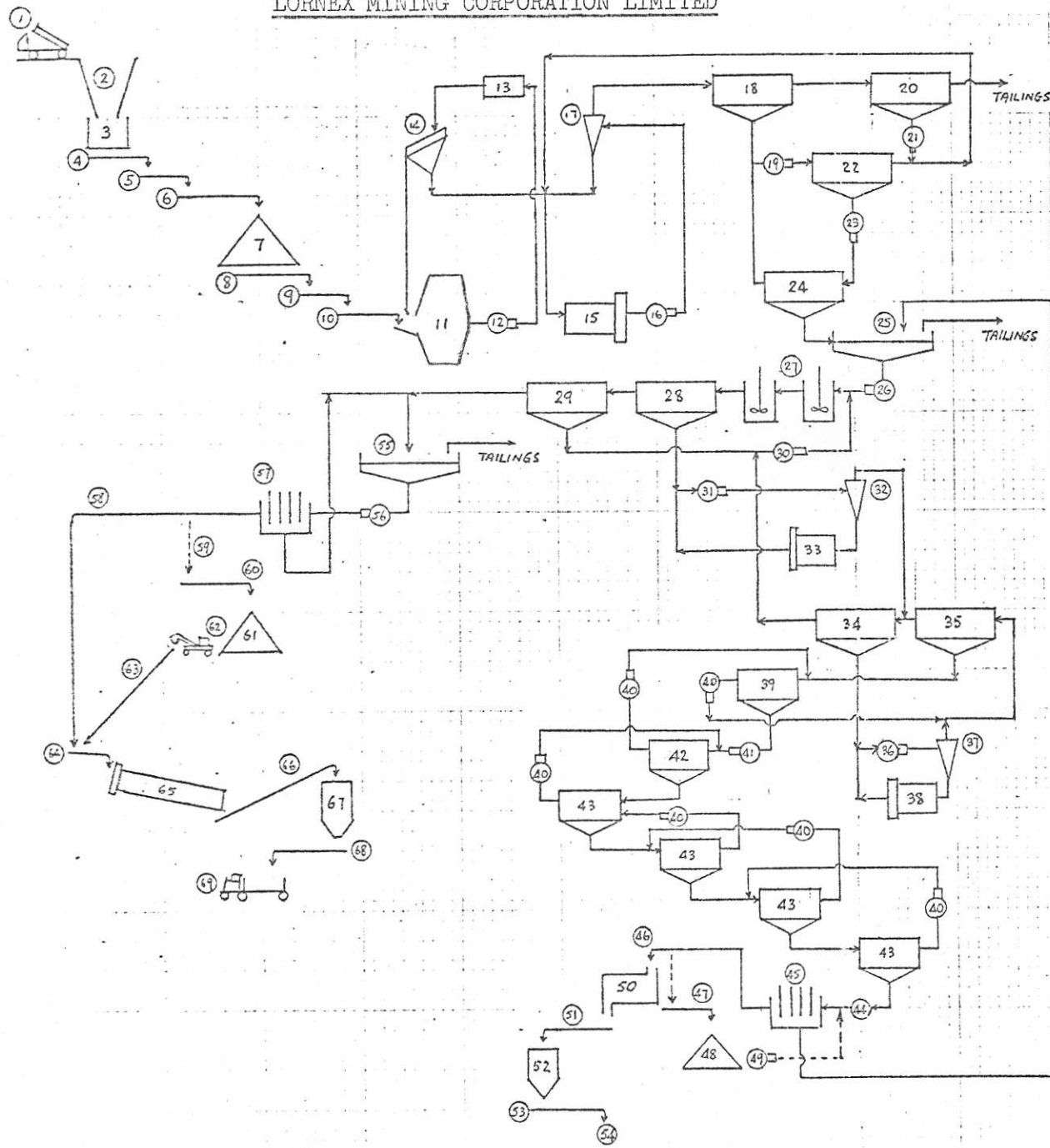
Four floating barge-mounted pumps deliver tailings pond supernatant to four booster pumps which feed reclaim water to the reservoir. The reclaimed water is mixed with fresh water pumped from the Thompson River in the reservoir and flows into three 1,000,000-gallon mill water head tanks which supply all the water required in the process.

LORNE MINING CORPORATION LIMITED
CONCENTRATOR DEPARTMENT

FIG. 4 MOLY PLANT FLOWSHEET



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- 1) 100 & 200-ton Wabco Trucks.
- 2) One 60x89 A-C Gyrotory Crusher.
- 3) One Ore Pocket, 300-Ton Cap.
- 4) One 96" Link-Belt Apron Fdr.
- 5) One 72" Belt Conveyor & One Metal Detector.
- 6) One 60" Belt Conveyor.
- 7) One Ore Surgepile, 150,000-ton Live Capacity.
- 8) Eight 48" Forano Aaron Fdrs.
- 9) Two 42" Belt Conveyors.
- 10) Two Belt Scales and Two 48" Belt Conveyors Nos. 4A, 4B.
- 11) Two 32' ϕ x 15 $\frac{1}{2}$ ' long, Semi-autogenous Mills, D.E.W.
- 12) Four GIW 16x16 SRT-44 Pumps.
- 13) Two Splitter Boxes.
- 14) Four 8'x20' Tyler Screens.
- 15) Four 16 $\frac{1}{2}$ ' ϕ x 23' long, Ball Mills, Dominion Engineering Works.
- 16) Four GIW 16x16 LGA-39 Pumps.
- 17) Sixty Krebs Cyclones, D20B, arranged in four Clusters of sixteen each.
- 18) 32 Denver 600-H Rougher Flotation Cells, arranged in 4 banks of 8 cells each.
- 19) Three Denver SRL, 6x6 Rougher Concentrate Pumps.
- 20) Twenty Denver 30 DR Bulk Flotation Cells, arranged in two rows of 10 cells each.
- 21) Six Denver SRL 10x3 Pumps.
- 22) Twenty Denver 30 DR Bulk Flotation cells, arranged in two rows of 10 cells each.
- 23) Three Denver SRL 5x5 Pumps.
- 24) Eight Denver 30 DR Bulk Flotation Cells, arranged in two rows of 4 cells each.
- 25) One 85' ϕ Bulk Concentrate Thickener.
- 26) Two Dorr-Oliver Diaphragm Pumps, Model 6W, and two Denver SRL 4x3 Pumps.
- 27) Two 5' ϕ x 6' Moly Conditioning Tanks.
- 28) Four Denver 24 DT Flotation Cells.
- 29) Six Denver 24 DR Moly Scavenger Flotation Cells.
- 30) One Denver SRL 5x5 Pump.
- 31) One Denver SRL 3x3 Moly Pump.
- 32) Two Krebs Cyclones, Model D6B.
- 33) One Denver 5x10 Regrind Ball Mill.
- 34) Six Denver Sub-A No. 18 SR Flotation Cells, First Moly Cleaner Flotation Banks.
- 35) Four Denver Sub-A No. 18 SR Flotation Cells, Second Moly Cleaner Flotation Banks.
- 36) One Denver SRL 2 $\frac{1}{2}$ x 2" Feed Pump.
- 37) One Krebs Cyclone, Model D6B.
- 38) One Denver 5x6 Regrind Mill.
- 39) Eight Denver Sub-A, No. 15, Flotation Cells.
- 40) Six Denver SRL 1 $\frac{1}{2}$ x 1 $\frac{1}{2}$ Pumps.
- 41) One SRL 1 $\frac{1}{2}$ x 1 $\frac{1}{2}$ Pump.
- 42) Six Denver Sub-A, No. 15, Flotation Cells.
- 43) Sixteen Denver Sub-A, No. 15, Flotation Cells (Four for each Cleaner Bank).
- 44) One 5,000-Gal. Moly Concentrate Surge Tank.
- 45) One Dorr-Oliver 6' ϕ x 6-disc Filter.
- 46) One Moly Cake Ribbon Feed Screw.
- 47) One Moly Cake Ribbon Feed Screw.
- 48) Moly Concentrate Emergency Floor Storage.
- 49) One Moly Filter Cake Sump Pump.
- 50) One 4' ϕ x 4' Hearth Spinner Moly Concentrate Dryer.
- 51) One Moly Concentrate Ribbon Feed Screw.
- 52) Three Concentrate Storage Bins, 15-ton each.
- 53) One Moly Concentrate Ribbon Feed Screw.
- 54) One Moly Packer; One Roller Conveyor; and Two Scales.
- 55) One 100' ϕ Copper Concentrate Thickener.
- 56) Two Diaphragm Pumps, and two Denver SRL 4x3 Pumps.
- 57) Two 8 $\frac{1}{2}$ ' ϕ x 7'-Disc Filter.
- 58) One 30" Belt Conveyor.
- 59) One Dryer By-pass Ribbon Feed Screw.
- 60) One 24" Belt Conveyor.
- 61) Emergency Copper Concentrate Storage.
- 62) Front-End Loader.
- 63) One 24" Belt Conveyor.
- 64) One Copper Dryer Ribbon Feed Screw.
- 65) One 8' ϕ x 48' long standard Copper Concentrate Rotary Dryer.
- 66) One 24" Belt Conveyor, and one Belt Scale.
- 67) One Copper Concentrate Storage Bin, 1,400-ton capacity.
- 68) One 60" Feed Conveyor, No. 9, and one Belt Scale.
- 69) Copper Concentrate Haulage Trucks.

FIG. No. 3 "CONCENTRATOR DEPARTMENT - GENERAL PLANT AREA - PICTORIAL FLOWSHEET"