

The Norbec mill performed to expectation. All modifications were completed on schedule and milling efficiencies were on plan. As part of the Division's reclamation program, two dams of the number one tailings pond were repaired and revegetated. Efforts to reduce our environmental impact will continue during 1990.

The Division succeeded in reducing its lost-time accident frequency 50% from 1988, a very creditable achievement of which all of its employees can be proud.

Lac Shortt Mine and Mill

Gold production at this Division was adversely affected by excessive dilution as the last ore above the 500 level was extracted. Further, a rockburst in late November adjacent to the loading pocket area of the shaft curtailed

production for approximately three weeks. Thereafter, skipping was resumed at a reduced rate and full production was achieved by the end of January 1990.

Early in the year, it was realized that dilution would remain a problem above the 500 level in spite of revisions to the stoping sequence. Efforts were directed to reducing operating costs and planning a new mining method for production between the 500 and 800 levels. Detailed rock mechanics computer modelling, done by the Noranda Technology Centre in conjunction with the Lac Shortt mine staff, has indicated a safer and more efficient mining method for this deeper ore. During the year, the deepening of the shaft, excavation of the crusher station and the access ramp to the 800 level were completed. Production from this block is scheduled during the second quarter of 1990.

A cyanide destruction unit to treat mill tailings effluent was commissioned in October. This system will produce effluent at levels well within environmental limits, thereby permitting an improved use of the tailings system for waste solid deposition.

After two years of excellent safety performance, the lost-time accident frequency of the Division rose sharply, reflecting for the most part the difficult ground conditions the mine is facing. The challenge for 1990 will be to return to the former safety levels.

Opemiska—Springer, Perry and Cooke Mines, and Mill

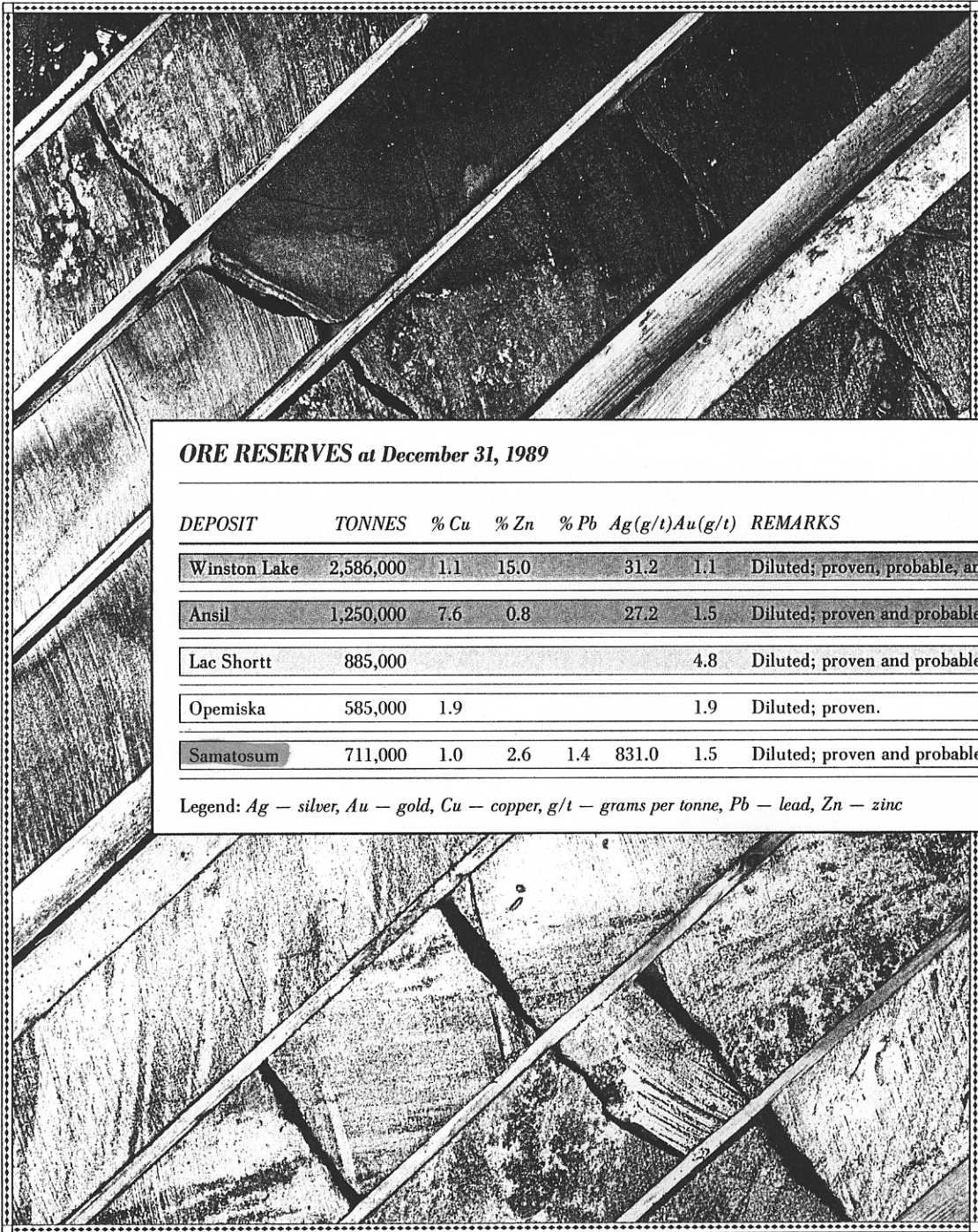
The 1988 program to develop and exploit higher-grade copper reserves continued in 1989. However, decreasing prices for copper and gold combined with a strengthening Canadian dollar,

Production Review

	Winston Lake		Lac Dufault		Lac Shortt		Opemiska		Samatosum	
	1989	1988 ¹	1989 ²	1988	1989	1988	1989	1988	1989 ²	1988
Tonnes milled (000s)	303	220	163		350	371	382	349	79	
Grade:										
copper, %	0.92	0.85	7.22				1.29	1.42	0.94	
zinc, %	15.76	16.62							4.10	
lead, %									2.23	
gold, grams per tonne			1.88		3.87	4.66	2.23	2.64	1.40	
silver, grams per tonne			25.31				11.65	11.76	739.00	
Recovery:										
copper, %	78.4	73.6	96.4				96.2	96.8	89.8	
zinc, %	94.4	91.4							88.0	
lead, %									81.4	
gold, %			83.8		92.2	93.4	88.7	90.0	84.5	
silver, %			77.6				84.5	84.4	89.8	
Production:										
copper, pounds (000s)	4,802	3,051	25,022				10,411	10,545	1,018	
zinc, pounds (000s)	99,287	73,755							4,844	
lead, pounds (000s)									2,801	
gold, ounces	3,835	2,428	8,245		40,083	52,029	24,093	26,551	2,925	
silver, ounces	113,841	68,275	103,014		1,659	1,668	120,767	111,379	1,741,000	
Operating cost: \$ per tonne milled	81.18	66.27	67.14		43.51	53.52	54.99	56.74	137.86	
\$ per ounce produced					380	382				
Number of employees, December 31	152	145	215	195	158	171	284	286	53	9
Lost-time accident frequency per 200,000 hours worked	4.5	7.4	2.5	5.0	5.9	1.2	3.8	4.8	5.7	0.0

¹Based on nine months' production.

²Based on six months' production.



ORE RESERVES at December 31, 1989

DEPOSIT	TONNES	% Cu	% Zn	% Pb	Ag(g/t)	Au(g/t)	REMARKS
Winston Lake	2,586,000	1.1	15.0		31.2	1.1	Diluted; proven, probable, and possible.
Ansil	1,250,000	7.6	0.8		27.2	1.5	Diluted; proven and probable.
Lac Shortt	885,000					4.8	Diluted; proven and probable.
Opemiska	585,000	1.9				1.9	Diluted; proven.
Samatosum	711,000	1.0	2.6	1.4	831.0	1.5	Diluted; proven and probable.

Legend: Ag — silver, Au — gold, Cu — copper, g/t — grams per tonne, Pb — lead, Zn — zinc

Thunder Bay

Exploration from the Thunder Bay office is directed towards massive sulphide mineralization in the Winston Lake mine area and on massive sulphide and gold projects in parts of northwestern Ontario and Manitoba. *Winston Lake*—Drilling that intersected anomalous mineralization and alteration, combined with further mapping and geochemistry, resulted in some new structural interpretation. Good exploration potential also continues to be indicated on both the Winston Lake mine horizon and the stratigraphically deeper Pick Lake horizon.

Sturgeon Lake (JV)—Drilling in 1989 intersected a zone of pyrrhotite-chalcopyrite stringer mineralization in intensely chloritized volcanic rocks of the Mattabi mine package, just west of the mine. The presence of a strong conductor, proximity to a major geological structure, and similarities to other deposits in the area make this an attractive target. Further drilling began in January 1990.

Big Island (JV)—This property is located ten kilometers east of Flin Flon, Manitoba. A small lens of massive sulphide is situated in volcanic rocks and is estimated by Minnova to contain 130,000 tonnes grading 17% zinc, 1% copper, 72 grams of silver per tonne, and 3.8 grams of gold per tonne. The

lens is strongly zoned and fault bounded, suggesting that the main part of the deposit has not yet been found. Geological mapping has resolved the stratigraphy and fault problems and points to some excellent geochemical and geophysical targets that will be drill tested in early 1990.

Vancouver, British Columbia

Exploration in Western Canada focussed primarily on massive sulphide targets near the Samatosum mine in the Adams-Barriere region on Vancouver Island, and in the Britannia mine area near Squamish. Gold targets and properties in south-central British Columbia were also actively explored.

Samatosum—A sub-economic, massive sulphide lens with good grades in zinc, lead and silver, but with narrow widths and flat dips was discovered about 500 meters north of the Samatosum pit. The zone is being used to test exploration techniques for non-conductive, overburden-covered targets in the area.

Chu Chua (JV)—Additional drilling increased the open-pittable portion of the mineral inventory to 1,000,000 tonnes grading 3% copper (versus 700,000 tonnes grading 3.1% copper in 1988). Metallurgical testing indicated that the ore minerals are finely intergrown with gangue, and more work will be required to improve recoveries. Further exploration of the property will be conducted to test other targets.

Laramide/Mount Sicker—In spite of a major drill campaign, the mineral inventory figure reported for the Lara deposit in 1988 failed to change from 529,000 tonnes grading 1% copper,

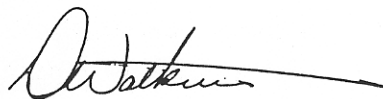
5.9% zinc, 1.2% lead, 99 grams of silver per tonne, 4.8 grams of gold per tonne. However, the additional geological information, combined with a number of intersections having anomalous metal values and hydrothermal alteration, indicate continued potential in the area. More work will be done in 1990.

Reno, Nevada

Exploration in the southwestern United States is primarily for open-pittable, heap-leachable epithermal gold deposits.

Most of our work is in Nevada with some projects in California, Oregon and Washington. Expenditures by Minnova (U.S.) Inc. are leveraged through joint ventures with a number of junior exploration companies and major metal producers.

Mud Springs (JV)—This large property is situated in the Battle Mountain trend in Nevada. Targets developed by mapping, geophysics and geochemistry in an area with a number of gold occurrences were drilled in late 1989. One hole discovered a new zone of mineralization with a 75 foot intersection averaging 0.05 ounces of gold per ton in oxidized, near-surface material. Follow-up drilling is planned in 1990.



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