MOUNT NANSEN GOLD PROJECT
FEASIBILITY STUDY
MILL AND SURFACE FACILITIES

MEL PROJECT NO. 164

JANUARY 6, 1988

prepared for

Archer Cathro (Chevron Minerals Ltd.) Associates (1981) Ltd.

(BYG Natural Resources Inc.)

Vancouver, B.C.

by

MELIS ENGINEERING LTD.

519 - 45TH STREET WEST

SASKATOON, SASKATCHEWAN

S7L 5Z9

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January 6, 1989

Archer Cathro & Associates (1981) Ltd.
510 W Hastings Street, Suite 1016
Vancouver, B.C.
V6B 1L8

Attention: Mr. A. Archer, P. Eng. **MEL Project No. 164**

Dear Mr. Archer:

re: Mount Nansen Project Feasibility Study
Mill and Surface Facilities

Melis Engineering Ltd. is pleased to submit twelve (12) copies of our final report entitled "Mount Nansen Gold Project Feasibility Study-Mill and Surface Facilities". This report describes the selected milling circuit for the Brown McDade orebody and provides detailed capital and operating cost estimates for the mill and surface facilities of a retrofitted Mount Nansen operation.

We hope the information included in this report meets your requirements and we remain available to answer questions or discuss any aspect of the report at your convenience. We look forward to working with Archer Cathro & Associates as the project proceeds to construction and operation.

Respectfully submitted,
MELIS ENGINEERING LTD.

L.A. Melis, P. Eng.
President

LAM:yhm

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MOUNT NANSEN GOLD PROJECT

FEASIBILITY STUDY

MILL AND SURFACE FACILITIES

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MOUNT NANSEN GOLD PROJECT
MILL AND SURFACE FACILITIES
FEASIBILITY STUDY

1.0 SUMMARY

The re-activation of the Mount Nansen gold mine property, located approximately 65 km west of Carmacks, Yukon Territory, is a joint venture between Chevron Minerals Ltd. and BYG Natural Resources Inc. As part of the Mount Nansen gold project feasibility study being prepared by Archer Cathro & Associates (1981) Ltd., Melis Engineering Ltd. has completed metallurgical evaluations on ore samples from the Brown McDade orebody and has established the process design, mill flowsheets and general arrangement drawings for a retrofitted Mount Nansen gold mill. This information was used to complete detailed capital and operating cost estimates for the mill and surface facilities.

The milling process found suitable for the Brown McDade surface ore includes crushing, grinding, cyanidation, carbon-in-pulp and zinc precipitation gold recovery. The present concept is to treat mill tailings for cyanide destruction prior to discharging to the tailings containment area approximately 1600 ft NW of the mill site on the 4,265 foot contour. Once sufficient levels are built up in the tailings pond, reclaim water will be recycled to the mill and any excess discharged to the environment. Further treatment of reclaim water may be required prior to discharge. From a cost point-of-view a better alternative would be to discharge cyanide-bearing tailings to the tailings pond and only treat excess reclaim water not re-used in the mill. This alternative can be assessed further once environmental permitting procedures are at a more advanced stage.

Metallurgical work has indicated that gold recoveries of 86% can be anticipated based on a mill feed grade of 0.29 oz/ton gold. The corresponding silver recovery will be approximately 35% based on a silver head grade of 2.55 oz/ton. The design milling rate of 296.4 tons/day (11.2 metric tonnes per hour) will achieve a throughput of 97,333 tons per year based on a 90% plant availability. At this production rate the expected annual gold production would be approximately 24,275 troy ounces with an estimated 86,870 troy ounces of silver recovered in conjunction with the gold.

The capital cost estimate summarized in Table 1-1 provides the estimated cost of the mill and surface facilities required for re-activation and operation of a retrofitted Mount Nansen gold mill. Existing buildings would be upgraded to a usable condition to house the process plant, laboratory and power generators. ATCO-type trailers will be used to provide a 24-man camp for construction and operation.

The total capital cost for the mill and surface facilities is estimated at $4,581,895 which includes a $250,000 contingency. This estimate includes all direct and indirect costs to complete the work described in this report. It does not include mining or tailings construction costs, working capital, pre-production interest, owner's costs, or any allowance for increased costs due to acceleration of project schedules.

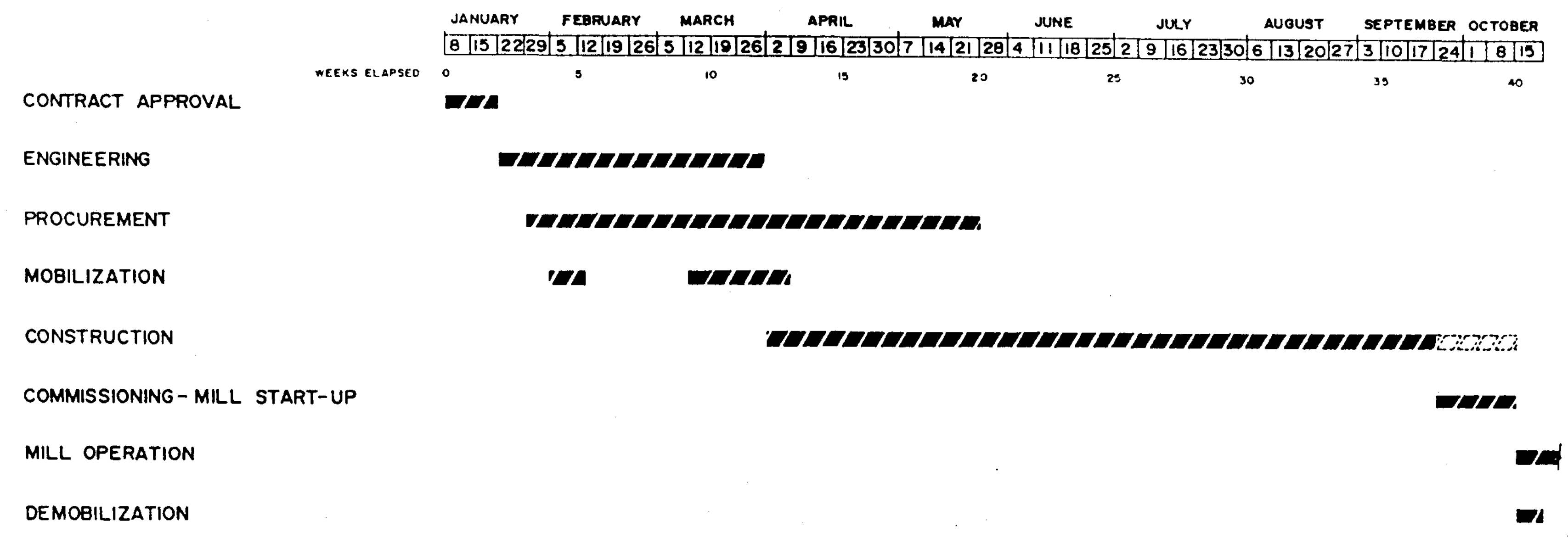
A project schedule is given in Figure 1-1. With project initiation in mid-January 1989 the mill start-up would be targeted for mid-September 1989 with full production achieved sometime in October 1989.

The annual mill operating costs are summarized in Table 1-2. The total estimated annual operating cost of $4,210,704 includes a 5% contingency factor to allow for unknowns associated with environmental requirements for the project. The annual operating cost is equivalent to $43.26/short ton of ore processed or $173.46 per troy ounce of gold recovered at the proposed production rate. The operating costs include the labour and materials to operate and maintain the mill and surface facilities and to provide basic analytical requirements for the mill operation.

TABLE 1-1

MOUNT NANSEN GOLD PROJECT
MILL AND SURFACE FACILITIES
CAPITAL COST ESTIMATE SUMMARY

	Area	$
Direct costs		
	Crushing	190,280
	Grinding	355,350
	Cyanidation	233,500
	Carbon-in-pulp	208,860
	Acid Wash	94,990
	Stripping and Precipitation	188,750
	Refining	59,855
	Carbon Handling	57,800
	Tails Treatment	167,435
	Reagents	93,700
	Process Water	35,285
	Primary Water Supply	337,300
	Air Supply	51,395
	Power Generation	502,640
	Buildings	316,775
	Heating and Ventilation	68,075
	Laboratory	151,425
	Camp	179,950
	Shop and Mobile Equipment	188,530
Total Direct Costs		**3,481,895**
Indirect Costs		
	Engineering and Procurement	135,000
	Construction Supervision	120,000
	Camp Costs	125,000
	Turnaround	80,000
	Mobilization and Demobilization	40,000
	Construction Equipment and Small Tools	100,000
	Contractor Overhead	125,000
	Start-up Costs	125,000
Total Indirect Costs		**850,000**
Total Direct and Indirect Costs		**4,331,895**
	Contingency	**250,000**
Total Estimated Capital Costs		**4,581,895**



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MOUNT NANSEN GOLD PROJECT

CARMACKS, YUKON

PROJECT SCHEDULE

FIGURE 1-1

TABLE 1-2

MOUNT NANSEN GOLD PROJECT
MILL AND SURFACE OPERATING COSTS SUMMARY

Item	$/year	$/tonne	$/ton
Manpower	1,939,634	21.97	19.93
Reagents and Consumables	1,279,745	14.49	13.15
Power and Fuel	630,815	7.14	6.48
Road and Camp Maintenance	110,000	1.24	1.13
Communication	50,000	0.57	0.51
Sub-Total	4,010,194	45.41	41.20
Contingency (5%)	200,510	2.27	2.06
Total Estimated Operating Costs	4,210,704	47.68	43.26

NOTES:
1. Costs do not include mining costs or costs associated with tailings dam.
2. Annual costs based on a 365 days per year operation at a milling rate of 11.2 metric tonnes per hour (12.35 short tons per hour) with a 90% plant availability to give an annual tonnage of 88,300 metric tonnes (97,333 short tons).

2.0 PROCESS SELECTION

2.1 GENERAL

Previous work on Mount Nansen area ores (Hazen Research, 1986; Lakefield Research, 1985, 1987; Chevron Research, 1988) had shown that both oxide ore and sulfide ore were present on the Mount Nansen claims and that gold extraction efficiencies appeared to be related to the sulfide content in the ore. Consequently, the metallurgical assessment for the enclosed feasibility study was initiated by determining baseline cyanidation extraction efficiencies on bulk samples taken from different areas of the Brown McDade ore deposit as well as identifying the heap leaching potential of Brown McDade ore.

This work was followed up by cyanidation tests on drill core composites made up to represent ore types of the Brown McDade orebody along strike and at different depths. The results of these tests were then used in arriving at the make-up of an oxide ore composite and a sulfide ore composite for use in determining the optimum process for the Brown McDade ore and for identifying the process design criteria for a retrofit of the existing Mount Nansen mill.

2.2 METALLURGY RESULTS

2.2.1 Bulk Samples

The bulk samples of ore selected for the initial bottle and column leach tests (June 17, 1988 letter, Melis to Archer Cathro) are described in Table 2-1. Drum quantities of surface trench material representing clay-bearing ore, siliceous ore and fractured low-grade ore, along with clay-bearing and siliceous underground ore, were sent to Coastech Research in Vancouver, B.C. for testing. The test results from this work are summarized in Table 2-2.

The basic findings of this first phase of work on Brown McDade ore (September 29, 1988 letter, Melis to Archer Cathro) were that an agitated cyanide leach with a fine grind could give close to 90% gold extraction on the surface trench ore accompanied with a 60%

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TABLE 2-1
BROWN McDADE BULK ORE SAMPLES

Barrel No	Trench	Description	Au (g/t)	Ag(g/t)
1	BM 85-2	clay-bearing ore	4.66	20.57
2	BM 85-2	siliceous ore	14.64	80.49
3	BM 85-2	fractured, low grade ore	1.09	3.23
4	BM 85-10	mixture	4.04	48.52
5	Underground	clay-bearing ore (Sampling Point No 5 to 7)	7.60	70.04
6	Underground	siliceous ore (Sampling Point No 2 to 5)	7.03	48.65

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TABLE 2-2

BROWN McDADE BULK SAMPLES

TEST CONDITIONS AND RESULTS

ITEM	1	2	2	3	4	5	6	6
Sample	Clay	Siliceous	Siliceous	Fractured	Mix	Clay	Siliceous	Siliceous
Trench	BM 85-2	BM 85-2	BM 85-2	BM 85-2	BM 85-10	U/G	U/G	U/G
BOTTLE ROLL- FINE								
Calc. Head - Au, g/t	5.14	14.56		1.30	4.10	8.56	7.09	
- Ag, g/t	22.08	83.19		2.76	49.49	76.92	44.67	
Au/Ag Ratio	0.23/1	0.18/1		0.47/1	0.08/1	0.11/1	0.16/1	
Grind, % -75 um	96.2	63.3		84.7	76.5	87.4	77.7	
% Extraction - Au	87.9	94.8		89.2	90.0	89.6	80.7	
- Ag	59.2	59.7		63.8	34.3	35.0	21.6	
Residue Au, g/t	0.62	0.75		0.14	0.41	0.89	1.37	
Leach Time, hours	48	48		48	48	48	48	
NaCN Consumption, kg/t	0.5	0.3		0.6	0.4	1.3	1.4	
CaO Consumption, kg/t	8.1	3.0		11.3	5.2	13.7	16.0	
BOTTLE ROLL - COARSE								
Calc. Head - Au, g/t	4.17	14.72		0.88	3.97	6.63	6.96	
- Ag, g/t	19.05	77.79		3.70	47.54	63.15	52.62	
Au/Ag, Ratio	0.22/1	0.19/1		0.24/1	0.08/1	0.10/1	0.13/1	
Grind, % - 3.35 mm	95.3	90.8		87.5	90	89.6	93.8	
% Extraction - Au	85.1	94.4		84.0	89.7	78.3	58.6	
- Ag	29.1	37.6		32.3	24.3	28.7	9.7	
Residue - Au, g/t	0.62	0.82		0.14	0.41	1.44	2.88	
Leach Time, hours	72	72		72	72	72	72	
NaCN Consumption, kg/t	0.6	0.4		0.7	0.5	1.2	0.9	
CaO Consumption, kg/t	9.5	4.8		7.4	5.0	8.4	14.2	
COLUMN LEACH								
Head Assay - Au, g/t	4.29	13.20	13.20	0.89	4.79	6.88	6.26	6.26
Ore Size, mm	12.7	25.4	12.7	12.7	12.7	12.7	25.4	12.7
% Extraction, Au	8.6 (1)	78.6	81.6	79.5	50.3	-(2)	-(2)	-(2)
Leach Time, days	6	32	32	32	32	42	42	42
NaCN Consumption, kg/t	0.22	1.13	1.17	1.51	1.08	-	-	-
CaO Consumption, kg/t	0.075	1.03	0.99	0.98	0.99	2.23	2.89	2.85
Average pH	10.3	9.6	9.6	9.4	9.4	7.1	5.1	5.0

1) Column No. 1 test terminated after 6 days due to plugged column (clay Material)
2) Leach not initiated since alkali still being consumed after 42 days.

silver extraction. The underground ore samples resulted in an 80% gold extraction and a corresponding 20% silver extraction. Although reasonable gold extractions (80%) could be obtained by heap leaching of siliceous and fractured surface ore, the clay-bearing surface ore and the underground ore were not amenable to heap leaching. Reagent consumptions indicated for an agitated cyanide leach were 0.5 kg NaCN/tonne and 5-10 kg CaO/tonne for surface ore and 1.3 kg NaCN/tonne and 15 kg CaO/tonne for underground ore.

2.2.2 Drill Core Samples

The second phase of testwork consisted of a series of bottle leach tests on various drill core composite samples of the Brown McDade orebody as selected by Archer Cathro from the 1988 summer drilling program. These tests were aimed at determining the ultimate cyanide gold extraction potential (baseline test using a fine grind) of different areas of the orebody and to differentiate oxide (leachable) ore from the more refractory sulfide ore (November 10, 1988 letter, Melis to Archer Cathro). The test results are summarized in Table 2-3.

The average calculated head grade of the 47 composites tested was 7.02 g Au/tonne (0.205 oz/ton) and 58.1 g Ag/tonne (1.695 oz/ton). The average leach residue grade obtained for the 47 tests was 1.14 g Au/tonne (0.033 oz/ton) and 32.62 g Ag/tonne (0.951 oz/ton). The sulfide content in the composites varied from zero to as high as 17.1% with the average content being 2.88%. Gold extractions varied from 19.1% to 96.3% with the average extraction being 78.9%. Silver extractions varied from 7.3% to 89.2% with the average extraction being 38.9%. Reagent consumptions averaged 1.55 kg NaCN/tonne and 9.75 kg CaO/tonne.

Gold extractions were generally related to sulfide content with lower gold extractions being obtained with increasing sulfide content. The same relationship held true with residue gold grades, the lowest residue grades were obtained on the drill core

MT. NANSEN PROJECT, YUKON
BOTTLE LEACH TESTS ON BROWN McDADE DRILL CORE

Composite No.	Head Grade Au(g/t) Calc.	Head Grade Au(g/t) Assay	Head Grade Ag(g/t) Calc.	Head Grade Ag(g/t) Assay	%S2-	% Extraction Au	% Extraction Ag	Consumption (kg/t) NaCN	Consumption (kg/t) CaO	Residue (g/t) Au	Residue (g/t) Ag
54-A	7.95	8.09	91.39	82.00	1.42	75.0	69.9	1.69	6.81	1.99	27.5
54-B	10.94	16.60	171.78	164.00	0.29	89.7	47.6	1.32	5.13	1.13	90.0
55-A	2.72	5.31	143.12	189.00	13.68	28.3	23.1	6.08	70.9	1.95	110.0
55-D	11.35	15.90	245.94	238.00	4.77	66.8	37.4	2.73	4.87	3.77	154.0
56-A	6.88	4.66	37.76	35.80	0.03	91.0	23.5	1.67	13.62	0.62	28.9
56-B	22.46	24.62	69.13	70.70	0.25	94.8	35.2	1.19	10.95	1.17	44.8
57-A	1.41	1.03	13.39	12.00	0.32	70.8	26.0	1.83	26.12	0.41	9.9
57-C	4.58	4.52	41.24	42.80	0.68	89.5	56.4	1.12	21.70	0.48	18.0
58-A	4.56	4.59	133.24	142.00	5.02	61.0	69.6	3.70	8.19	1.78	40.5
58-B	24.46	25.10	60.09	49.50	6.85	91.9	66.2	2.34	5.74	1.99	20.3
59-A	1.78	2.98	16.89	18.00	0.61	86.5	44.9	1.69	9.59	0.24	9.3
59-C	10.16	9.33	48.55	39.80	1.95	85.5	54.7	2.54	5.80	1.47	22.0
60-A	6.77	6.34	152.17	134.00	1.25	86.9	44.8	1.85	6.48	0.89	84.0
62-A	2.49	2.95	58.18	30.50	3.86	65.5	74.6	2.40	10.10	0.86	14.8
63-C	6.02	5.28	23.13	23.80	0.60	92.0	27.4	0.72	5.39	0.48	16.8
65-A	4.93	5.04	154.51	134.00	1.43	88.9	80.6	0.66	4.71	0.55	30.0
65-B	7.69	8.91	46.96	34.80	0.10	94.1	28.7	0.36	7.04	0.45	33.5
66-A	11.71	10.90	67.34	64.50	0.09	85.4	45.1	1.37	4.00	1.71	37.0
68-A	9.60	11.80	93.60	90.00	1.89	87.2	33.2	2.83	25.78	1.23	62.5
69-A	12.56	12.70	58.79	56.50	8.63	63.9	42.3	2.77	12.91	4.53	33.9
70-A	16.23	20.10	30.96	33.00	8.80	90.3	34.1	0.45	2.79	1.58	20.4
70-B	2.01	1.85	8.85	8.50	3.41	69.1	51.4	1.06	6.36	0.62	4.3
71-A	2.45	1.99	29.29	27.50	0.45	89.0	28.3	1.14	9.55	0.27	21.0
72-A	2.96	3.36	19.43	20.60	3.89	93.2	48.0	1.80	12.61	0.20	10.1
73-A	6.39*	6.31*	41.22	40.00	16.72	81.9*	0	2.59*	5.9*	1.17*	41.2
74-A	2.09	1.85	16.98	16.00	0.75	64.1	15.8	1.87	16.05	0.75	14.3
75-A	4.57*	4.11*	41.51	41.50	17.09	19.1*	0.5	3.98*	19.0*	3.70*	41.3
75-B	1.53	1.65	28.19	29.50	0.40	86.3	23.0	2.46	23.43	0.21	21.7
76-A	2.32	2.26	19.85	22.40	0.12	82.3	40.6	0.52	7.32	0.41	11.8
77-A	26.29	26.19	43.13	43.10	8.18	96.3	65.7	1.76	8.59	0.96	14.8
78-B	4.73	4.90	35.83	40.70	0.04	91.3	7.3	0.66	7.74	0.41	33.2
79-A	5.55	6.03	68.33	70.00	4.49	61.6	47.6	1.40	5.86	2.13	35.8
80-A	3.35	2.67	14.18	11.70	0.04	94.0	33.7	0.43	6.75	0.20	9.4
81-A	6.66	5.89	48.22	40.70	0.07	83.5	14.1	0.67	7.14	1.10	41.4
82-A	1.14	1.03	19.80	18.50	0.32	91.2	84.8	1.71	5.27	0.10	3.0
83-A	7.97	7.89	99.92	103.20	0.19	85.3	29.1	0.28	4.01	1.17	70.8
85-A	2.67	2.26	31.06	27.90	0.05	79.4	17.9	0.86	4.64	0.55	25.5
92-A	6.85	2.13	20.86	22.60	0.00	94.0	21.9	0.26	1.74	0.41	16.3
93-A	1.72	1.99	20.77	20.00	0.23	87.8	28.3	0.97	4.52	0.21	14.9
95-A	2.89	2.88	15.30	13.00	0.02	71.6	25.5	1.44	2.92	0.82	11.4
97-A	15.31	13.20	101.17	94.3	0.04	89.7	26.8	0.39	3.61	1.58	74.1
100-A	2.20	1.71	32.34	33.90	0.08	81.3	20.8	1.83	4.39	0.41	25.6
103-A	4.17	4.18	12.56	11.60	7.86	16.0	24.3	0.99	2.24	3.50	9.5
104-A	3.30	3.84	8.23	7.30	2.63	93.6	51.4	0.72	3.52	0.21	4.0
104-B	16.64	20.80	155.25	142.00	3.32	95.1	89.2	0.36	6.84	0.82	16.8
106-A	3.83	3.36	32.80	29.60	0.04	87.5	15.9	0.70	3.75	0.48	27.6
109-A	3.08	3.15	7.68	7.50	2.20	36.7	50.5	0.65	5.69	1.95	3.8
AVERAGE	**7.02**	**7.32**	**58.1**	**55.92**	**2.88**	**78.9**	**38.9**	**1.55**	**9.75**	**1.14**	**32.62**

* results from second composite samples submitted for testing

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composites with the lower sulfide content. Silver extractions did not appear to be related to sulfide content since low silver extractions were obtained on both low and high sulfide material. Sodium cyanide consumptions were highest for the higher sulfide samples. The good agreement between head assays and calculated head grades, for both gold and silver, suggests that a gravity recovery step would not be required in the milling circuit.

2.2.3 Ore Composites

Contour representations of the drill core leach results on orebody cross-sections were used to select two oxide composites and three sulfide composites of the Brown McDade orebody to establish the optimum process for the Brown McDade ore (November 10, 1988 letter, and December 19, 1988 letter, Melis to Archer Cathro).

The make-up of the two oxide composites is presented in Table 2-4. Composite A represents the northern section of the Brown McDade surface ore (the north pit) and Composite B represents the southern section of the surface orebody (the south pit). These two composites were used in testwork at Coastech Research to develop the process design criteria for the Mount Nansen mill retrofit. The baseline cyanidation tests on these two composites resulted in an average residue gold grade of 1.00 g Au/tonne and an average gold extraction of 86.2% from a head grade of 7.14 g Au/tonne.

The make-up of the three sulfide ore composites is presented in Table 2-5. These three composites were submitted for testing at Lakefield Research in Lakefield, Ontario to identify primary sulfide ore metallurgy. The baseline cyanidation tests on these three composites, completed by Coastech, gave residue gold grades of 1.07 to 3.06 g Au/tonne with gold extractions of 44.8%, 78.3%, and 95.2% being obtained from head grades of 4.35, 14.1 and 22.5 g Au/tonne respectively. Additional testing of these composites is currently on-going at Lakefield Research.

TABLE 2-4

BROWN McDADE ORE

OXIDE COMPOSITE MAKE-UP*

Item	Composite A	Composite B
Samples	54-A, 54-B, 55-D, 63-C, 65-A, 65-B, 66-A	92-A, 97-A
Area	North Pit	South Pit
Head Assay - Au (g/t)	8.07	6.21
- Ag (g/t)(estimated)	114.4	61.0
- % S^{2-}	0.58	<0.01
Residue Grade - Au (g/t)	1.17	0.82
- Ag (g/t)(estimated	55.5	45.2
NaCN Consumption (kg/t)	1.16	0.07
CaO Consumption (kg/t)	8.6	4.4
Baseline Gold Extraction (%)	85.5	86.8
Estimated Silver Extraction (%)	48	24

* data from bottle-roll tests

TABLE 2-5

BROWN McDADE ORE

SULFIDE COMPOSITE MAKE-UP*

Item	Composite		
	C	D	E
Samples	55-A, 69-A, 79-A 103-A, 109-A	58-B, 70-A, 77-A	127-A 132-A
Head Assay - Au (g/t)	4.35	22.5	14.1
- Ag (g/t)	30.0	150.0	180.0
- % S^{2-}	8.2	8.0	9.9
Residue Grade - Au (g/t)	2.40	1.07	3.06
NaCN Consumption (kg/t)	0.89	1.81	2.64
CaO Consumption (kg/t)	6.5	8.0	5.2
Baseline Gold Extraction (%)	44.8	95.2	78.3

* data from bottle-roll tests

2.2.4 Design Testwork

Basic metallurgical testwork was completed at Coastech Research on the two oxide composites (A and B) to derive the design criteria for the Mount Nansen mill retrofit (November 10, 1988 letter, Melis to Archer Cathro). These results were used to establish the process design criteria described in Section 5.0 of this report.

A grind of 70% minus 74 microns (80% passing 100 microns) would give a cyanidation residue grade of 1.1 g Au/tonne (0.032 oz/ton) or better which infers a gold extraction efficiency of 88.9% for a head grade of 9.87 g Au/tonne (the weighted average head grade of the drill core used to make up Composite A and Composite B). The bond work index obtained for Composite A and Composite B was 14.5 and 16.4 respectively.

Grinding-in-cyanide, pre-aeration, and addition of lead nitrate did not lead to any significant improvement in gold extractions. A low cyanide solution concentration (0.3 g NaCN/L) gave acceptable gold extractions while minimizing cyanide consumptions. A 24-hour leach retention time would be sufficient to give the required gold extraction.

Filtration of cyanide leach slurry gave poor filtration unit rates which precludes the use of filtration ahead of zinc precipitation for the Mount Nansen mill. The alternative carbon-in-pulp process will be acceptable for the Mount Nansen mill, in spite of the relatively high silver content of the ore, but zinc precipitation for final gold recovery is recommended instead of electrowinning to accommodate the high silver content of the leach solution.

The presence of heavy metals in the barren leach solution indicates that treatment of mill tailings (and possibly tailings reclaim water) will be required to meet environmental regulations. A typical barren solution analysis is presented in Table 2-6.

TABLE 2-6

TYPICAL BARREN SOLUTION ANALYSIS FOR OXIDE ORE

Analyte (mg/L)	Composite A	Composite B
Ca	610	80
Cd	0.14	0.09
Co	0.04	<0.02
Cu	69.0	3.5
Fe	2	1
Mg	1.10	0.05
Mo	0.11	0.08
Na	290	155
Ni	0.06	0.02
Sb	0.45	0.15
Sr	0.64	0.06
Zn	59.0	1.8
CN_T	157	148

3.0 MILL FEED COMPOSITION

The Brown McDade ore is made up of different ore types. The orebody near surface can be made up of clay-bearing ore, siliceous ore or low-grade fractured ore. Underground ore can either be clay-bearing or siliceous.

The anticipated mill feed composition from an open pit mining operation of the Brown McDade surface ore would be generally as indicated for Composite A and B in Table 3-1. The typical sulfide ore analysis (Composite C, D and E) is also presented in this table.

The gold and silver content of Composite A and B are average values expected for these composites obtained from analysis of individual drill core composites presented in Table 2-3. The relatively high levels of arsenic, copper, antimony and zinc in the ore infers that waste treatment will be required within the Mount Nansen mill.

TABLE 3-1

OXIDE AND SULFIDE ORE COMPOSITES

HEAD ANALYSIS

Elements(ppm)	Oxide		Sulfide		
	A	B	C	D	E
Au	8.66	11.08	4.35	22.45	14.13
Ag	114	61	30.0	150.0	180.0
S^{2-}	0.58	<0.01	8.15	8.02	9.86
As	4990	9830	2590	8580	7600
Ba	100	530	80	110	180
Be	<0.5	<0.5	<0.5	<0.5	<0.5
Bi	30	38	20	<20	120
Cd	37.5	4.5	52	70.0	90.0
Co	4	2	10	21	11
Cr	19	27	20	<10	<10
Cu	540	150	612	881	1220
Ga	<10	<10	<10	<10	<10
Hg	<1	<1	<1	<1	<1
La	20	<10	<10	<10	<10
Mn	2320	156	4620	6910	2530
Mo	1	1	3	3	6
Ni	9	3	4	9	2
P	400	470	310	740	310
Pb	4160	2200	1740	2710	7630
Sb	345	330	295	1095	820
Se	2	2	2	9	8
Sr	61	77	47	53	40
Tl	<10	10	<10	<10	<10
U	<10	<10	<10	<10	<10
V	13	14	6	10	7
W	<5	<5	<5	<5	35
Zn	2780	408	4400	4960	6090
Element (%)					
Al	0.38	0.28	0.35	0.52	0.46
Ca	0.67	0.09	4.35	5.48	3.22
Fe	5.36	7.08	9.85	9.75	12.75
K	0.33	0.72	0.24	0.34	0.33
Mg	0.12	0.02	0.66	0.91	0.46
Na	0.01	0.01	0.01	0.01	0.01
Ti	<0.01	<0.01	<0.01	<0.01	<0.01
SiO_2	N/A	N/A	54.04	54.68	58.03
LOI	N/A	N/A	13.10	11.80	12.20

4.0 PROCESS DESCRIPTION

4.1 General

The selected Mount Nansen gold mill flowsheet for processing Brown McDade surface ore is depicted on Drawings No. 164-F-001 and 164-F-002 presented in Appendix A.

The process consists of reclaiming run-of-mine ore from an open pit stockpile. The ore will be crushed, wet ground, classified, and thickened prior to being processed through a cyanidation/carbon-in-pulp gold recovery circuit. Zinc precipitation will be used for final gold recovery.

The CIP tailings will be treated for cyanide destruction prior to discharging to the tailings containment area. Reclaim water from the tailings pond will be returned to the mill by gravity for recycle in the mill circuit.

4.2 ORE PREPARATION

Ore will be reclaimed from the run-of-mine ore stockpile with a front-end loader and dumped through a grizzly into a dump hopper. A feeder belt will transfer the ore from the dump hopper to the 450-ton coarse ore storage bin. Ore will discharge from the bottom of the ore storage bin via a vibrating feeder to a conveyor belt feeding the jaw crusher. The jaw crusher discharges to a conveyor belt which also receives the cone crusher discharge.

The combined jaw and cone crusher products are transferred to another belt that feeds a vibrating screen. Minus 10 mm (3/8") material passing the screen is transferred to the fine ore storage bins via another belt conveyor. The screen oversize (+3/8") material returns directly by gravity to the cone crusher.

A reversing conveyor on top of the fine ore storage bins permits the discharge of crushed ore to either bin. Each fine ore storage bin has a 250-ton live load capacity. The crushing and storage capacity is adequate for one 12-hour shift per day crushing cycle with approximately 2 hours per shift available for clean-up and maintenance.

4.3 GRINDING

Fine ore from each bin will be fed to individual grinding circuits via a slot feeder and variable-speed conveyor belt. The ore will be ground in single stage ball mills in close-circuit with hydrocyclones to give a 70% minus 74 micron (200 mesh) grind. Cyclone underflow is recycled to the ball mill for further grinding and cyclone overflow from each grinding circuit is discharged to a 40 ft. diameter thickener equipped with a high-rate feedwell for thickening to 50% solids prior to cyanidation. Lime will be added in the grinding circuit for pH adjustment.

4.4 CYANIDATION

The thickened slurry will be leached in a series of three cyanidation tanks to give in excess of 24 hours overall leach retention time. Additional lime will be added to result in a pH of 10.5 to 11 for cyanidation, and sodium cyanide will be added to give a solution cyanide concentration of 0.3 g NaCN/L. Low pressure air will be added in each tank to give the required oxygen content in the leach pulp.

4.5 GOLD RECOVERY

The cyanidation slurry will flow by gravity to a five stage carbon-in-pulp (CIP) circuit to recover the dissolved gold. Total retention time in the CIP circuit is approximately 5 hours.

Carbon will be retained in each tank by utilizing equalized-pressure launder screens. Carbon transfer between tanks (counterflow to slurry flow) is accomplished with air-lifts. Transfer of gold-loaded carbon to the loaded carbon screen is accomplished with a recessed impeller pump.

Loaded carbon discharges from the screen to an acid wash tank and after washing is transferred via an eductor to the atmospheric carbon strip tanks. Gold is stripped from the carbon with a hot caustic/cyanide solution. The resulting pregnant solution is precipitated with zinc dust and the gold-bearing zinc is collected in a filter press. The resulting sludge is then fluxed and smelted to produce dore bullion.

Anticipated gold and silver production will require the movement of 1.65 tons of carbon per day. Every third batch of stripped carbon will be acid washed to maximize carbon loading efficiencies. Stripped carbon will be screened on a sizing screen to remove any carbon fines prior to re-using in the CIP circuit. Fresh, pre-soaked carbon will be added as required.

In order to minimize front-end capital costs, the present design does not include a carbon reactivation kiln. The installation of a kiln may become necessary for reactivating stripped carbon if the requirement for fresh carbon replacement becomes excessive.

4.6 TAILINGS TREATMENT

The present design assumes treatment of CIP tailings slurry using the SO_2/air process to reduce cyanide levels prior to discharging to the tailings containment area. Treatment will be accomplished by mixing the tailings slurry in the presence of copper sulfate and sodium metabisulfite and air using lime for pH control.

The treated tailings slurry will be pumped from the mill to the tailings containment area. The proposed tailings dam crest is about 50 meters (160 feet) higher than the plant site, hence three SRL pumps in series will be required to develop the discharge head required for slurry pumping.

Reclaim water from the tailings disposal area will be returned to the mill by gravity once several months of operation sufficiently raises the tailings pond water level. The present design assumes half the reclaim water is returned to the process and the remainder discharged to the environment. If further treatment of reclaim water is required then the treatment circuit will include SO_2/air treatment and the addition of ferric sulfate with collection of waste precipitates in a reactor-clarifier.

The cost estimates in this study only include treatment of mill tailings slurry, no allowance has been made for reclaim water treatment. The most economical approach would be the containment of cyanide-bearing tailings in the tailings pond and subsequent treatment of the portion of reclaim water to be discharged to the environment. This approach should be investigated more closely once environmental permitting procedures are at a more advanced stage.

4.7 REAGENT HANDLING

Lime will be received in bags and stored on pallets. Lime slurry will be mixed to 20% solids and stored in a holding tank and fed to the grinding, cyanidation and tailings treatment circuits as required.

Sodium cyanide will be received in drums and made up as a 15% NaCN solution for addition to the cyanidation and carbon stripping circuit.

Flocculant will be made up with an aspirator and metered to the thickener as required.

Copper sulfate will be made up in a mix tank and stored as a 10% solution in a holding tank. Due to the acidic nature of this solution this reagent make-up will be contained within the curbed carbon acid wash section of the mill.

Sodium metabisulfite will be made up in a mix tank and stored as a 10% solution in a holding tank for metering to the tails treatment tank.

Sodium hydroxide, received in bags or drums, will be added directly to the caustic make-up tank as required.

Hydrochloric acid will be added to the acid tank manually and diluted with water to the required strength. The acid tank and acid wash vessel will be curbed separately in the mill to avoid mixing acid solution with cyanide-bearing solution.

Zinc dust and lead nitrate will be added directly to the zinc feeder as required.

Fresh carbon will be pre-soaked, attritioned and screened before addition to the CIP circuit.

Flux reagents will be stored in the furnace area and used as necessary.

5.0 PROCESS DESIGN CRITERIA

5.1 ORE COMPOSITION

Typical analyses of the oxide ore, the anticipated mill feed, along with the sulfide ore, have been previously presented in Table 3-1. These analyses are representative of the ore samples received for test purposes and as such form the basis of the process and waste treatment design, as well as the capital and operating cost estimates, described in this report.

5.2 ORE CHARACTERISTICS

Run-of-mine ore size, % passing 12 inches	100
Run-of-mine ore moisture, %	3
Specific gravity	2.7*
Bulk density, lbs/ft^3	100 *

*assumed, measured SG value of Composite A was 2.64

5.3 PRODUCTION CRITERIA

Design throughput capacity - tons/hour	12.35
- tons/day	296.4
Average production rate - tons/day	266.8
- tons/year	97,333
Operating days per year	365
Operating hours per year	7,884
Net % plant availability	90
Typical ore feed grade - Au oz/ton	0.29
- Ag oz/ton	2.55
Average gold recovery	
(based on 0.29 oz/ton Au head), %	86
Annual gold production - oz	24,275
Average silver recovery	
(based on 2.55 oz/ton Ag head), %	35
Annual silver production, oz	86,870

5.4 ORE STORAGE

Open pit stockpile capacity, tons	70,000

5.5 GRINDING

Ore feed rate tons/hour - No.1 Mill	5.63
- No.2 Mill	6.72
- total	12.35
Ore feed size, -% passing 12.7 mm	80
Product size- % passing 100 micron	80
- % passing 74 micron	70
Bond work index	16.4
Ball consumption, lbs/ton	1
Liner consumption, lbs/ton	0.5
Fine ore capacity, tons/bin	250
Thickener unit area (with hi-capacity feedwell), ft^2/TPD	4.2
Thickener underflow density, % solids	50
Flocculant addition, lbs/tons	0.04

5.6 CYANIDATION

pH	10.5-11
Lime (95% CaO) consumption, lbs/ton	4.0
Cyanide concentration, g NaCN/L	0.3
Sodium Cyanide addition, lbs/ton	2.1
Retention time, hours	24
Number of stages	3
Anticipated residue grade - Au, oz ton	0.032
- Ag, oz/ton	1.46
Gold extraction, % (based on 0.29 oz/ton Au head)	88.9
Silver extraction, % (based on 2.55 oz/ton Ag head)	42.9

5.7 CARBON ADSORPTION

Number of stages	5
Retention time per stage, hours	1
Average carbon pulp loading, g/L	25
Average carbon loading - Au, oz/ton	41
- Ag, oz/ton	177

Carbon fines loss, lbs/ton	0.1-0.2
Carbon size, mesh	6 x 16
Carbon safety screen size, mesh	35
Carbon launder screen size, mesh	20
Gold adsorption efficiency, %	98
Silver adsorption efficiency, %	85
Unnaccountable losses, % - Au	1
- Ag	1

5.8 CARBON DESORPTION AND ZINC PRECIPITATION

Operation - hours/day	24
- days/week	7
Carbon transfer rate, tons/day	1.65
Batch size, tons	6.6
Stripping temperature, ^{o}F	206
Barren strip solution design flow, USGPM	55
Total strip volume, bed volumes	72
Barren strip bleed, %	50
Strip solution, - g NaCN/L	2
- g NaOH/L	10
Carbon loading - initial loading - Au, oz/ton	40
- Ag, oz/ton	180
- final loading - Au, oz/ton	1-3
- Ag, oz/ton	5-10
Carbon bulk density - lbs/ft^3 dry	30
- lbs/ft^3 wet	55
- lbs/ft^3 flooded	80
Caustic soda consumption, lbs/ton	0.5
Zinc dust consumption, lbs/ton	0.2
Lead nitrate consumption, lbs/ton	0.02

5.9 BULLION PRODUCTION

Refinery operation, days/week	3
Charges/week	3
Gold/charge (average), oz	156
Silver/charge (average), oz	557

Flux mixture, % - Niter	40-50
- Silica	30-25
- Borax	30-25

5.10 CARBON HANDLING

Acid wash frequency	every third batch
Acid concentration, % HCl	5
Acid consumption, lbs/ton	0.4
Caustic rinse, bed volumes	2
Caustic concentration, %	5
Acid and caustic flowrate, USGPM	28
Acid and caustic bleed, %	50
Sizing screen, mesh	16

5.12 TAILINGS TREATMENT

Cyanide concentration in untreated tailings, g CN_T/L	0.3
SO_2/CN_T ratio	4/1
Air flow, CFM	300
Retention time, hours	1
pH	8.5
Lime consumption, lbs/ton	5
Copper sulfate addition, mg Cu^{2+}/L	50
Sodium metabisulfite addition, g $Na_2S_2O_5$/L	2
Total tailings solids, - tons/hour	12.35
- tons/year	97,333
Tailings discharge density, % solids	40

5.13 REAGENTS

Cyanide

Consumption - lbs/ton	2.2
- lbs/day, average	587
Solution concentration, %	15

Lime

Type	quick lime
Bulk density, lbs/ft^3	35
% CaO	95
Lime slurry density, % solids	20
Consumption, lbs/ton	10.3
lbs/day, average	2,750

Flocculant

Type	Percol 351 or equivalent
Consumption, lbs/ton	0.04
Solution concentration, %	0.05

Sodium Hydroxide

Consumption, lbs/ton	0.4
Caustic wash strength, %	5
Addition method	direct

Hydrochloric Acid

Strength, % HCl	31.5
Acid wash strength, % HCl	5
Consumption, lbs/ton	0.4

Copper Sulfate

Strength, % Cu	25
Solution strength, % $CuSO_4$	10
Addition rate, mg Cu/L	50
Consumption, $CuSO_4.H_2O$, lbs/ton	0.6

Sodium Metabisulfite

Equivalent SO_2,%	66.6
Solution strength, % $Na_2S_2O_5$	10
Consumption $Na_2S_2O_5$, lbs/ton	6.0

Carbon

Mesh size	6 x 16
Type	medium activity
Consumption, lbs/ton	0.1 - 0.2

Zinc Dust

Consumption, lbs/day	50 - 60

Lead Nitrate

Consumption, lbs/day	5

Fluxes

Mixture, % - Niter	40 - 50
- Silica	30 - 25
- Borax	30 - 25
Consumption, lbs/day (average) - Niter	30
- Silica	15
- Borax	15

6.0 SURFACE FACILITIES

6.1 General

The plant layout for the Mount Nansen mill retrofit is shown on Drawings No. 164-G-001, 164-G-002, and 164-G-003 in Appendix A enclosed in this document.

The existing building structures at the Mount Nansen mine site are essentially in sound condition and can be used without major modifications. Insulation will be replaced where missing and existing doors and windows will be returned to usable condition. Areas to be partitioned off will be done basically with lumber and plywood construction.

The coarse ore storage bin, crushing section, conveyors, fine ore storage bins, conveyor belts and ball mills are essentially intact and will be returned to service by installing new motors, drives, liners, etc. as required. The existing flotation cells are not required, hence they will be removed to make room for other process equipment. The existing structural steel at floor level will be utilized as is.

A new dump hopper, grizzly and feeder belt are recommended for loading the coarse ore storage bin to avoid surcharging the bin unevenly, to maintain the existing live storage capacity and to avoid surcharging the bridge retaining wall with heavy wheel loads adjacent to the bin.

No allowance has been made for re-activating the dump hopper, apron feeder and conveyor feeding the coarse ore storage bin from the original underground mining operation.

The building originally installed for a cyanidation circuit will be used to house the thickener, leach tanks, CIP tanks, and tails treatment circuit.

The diesel generators, refinery area and laboratory facilities will be housed in the existing warehouse building adjacent to the mill building.

6.2 POWER GENERATION

Power for the Mount Nansen gold mill will be provided by two new diesel powered 910 kW (prime rating) generators. One generator on line will provide the power requirements for the mill, camp and general surface facilities. The second generator will serve as a standby unit. Synchronizing gear is not necessary and hence has not been included. A crossover switch has been included to insure that only one generator is on line at any one time.

The engines will be located in the present warehouse-dry area to minimize the piping required for heat recovery and to simplify supervision and operation by the mill operating personnel. Heat recovery from the engine jacket cooling system is adequate to meet mill heating requirements when the mill is operating at capacity. In the unlikely event that engine reject heat is not sufficient, (such as during a mill shutdown period), construction-type propane heaters will be utilized as back-up.

The remote-mounted engine fans and radiators will be piped, valved and ducted to permit discharging pre-heated ventilation air to the mill building during winter operation and cool air during summer operation. Large amounts of fresh make-up air to the mill building are desireable to maintain a healthy working environment. Adequate fresh air make-up will help confine any dust generated in the crushing and ore storage areas to those respective areas.

6.3 HEATING AND VENTILATION

Heating for the mill building and adjacent buildings will be provided by hot water unit heaters operating directly off a glycol system connected to the diesel engines. A circulating pump will be utilized to circulate the hot glycol through the plant heater piping loop. Ventilation within the mill building will be provided by wall-mounted exhaust fans and louvres. Heating for the camp trailer units will either be propane or oil-fired heaters.

6.4 WATER SUPPLY SYSTEM

Water for the process plant and surface facilities will be supplied from the existing well system, some 12,000 feet from the mill building.

Approximately 20% of the existing 4-inch steel water supply line is missing as well as the water storage tank. It is therefore proposed to locate the new water storage tank about 3,000 feet closer to the well pumphouse and install a new 6-inch Sclairpipe from the storage tank to the mill. The larger size of this line will improve the fire water supply capabilities at the mill. All of the existing 4-inch steel line requires new heat tracing and insulation. The 6-inch Sclairpipe can be factory insulated and heat traced.

It has been assumed that the existing wells are serviceable and will adequately supply the water requirements. A pump test should be done however prior to proceeding with the project to ensure an adequate water supply is available from this source.

A diesel generator (approximately 80 HP) will be utilized to power a multi-stage submersible well pump and a portion of the 4-inch pipeline heat tracing at the pumphouse. Since the heat tracing is required only during very cold weather (about -40°F and colder) it is proposed to provide 4 portable diesel-generating sets (about 10 HP per unit) along the pipeline to power the heat tracing when required. If the insulation remains intact and the water supply line is not shut down, it is unlikely that the heat tracing will be required, however it has been included as a precautionary measure.

The well pumphouse building is basically intact but requires extensive insulation and sheeting as well as new doors and windows.

6.5 CAMP

Camp facilities for the construction and operating phase will consist of portable ATCO-style units. A 24-man camp complete with kitchen facilities has been included in the estimate. This will meet the accommodation requirements for both construction and operations.

6.6 LABORATORY BUILDING

The laboratory will be housed within the existing warehouse building. It will include sample preparation facilities as well as a fire assay and atomic absorption unit to meet the basic analytical requirements of the mill operation. Any special analytical requirements will be contracted out to a commercial laboratory.

7.0 CAPITAL COST ESTIMATE

7.1 SUMMARY

The capital cost summary in Table 7-1 provides the estimated costs of the mill and surface facilities for the Mount Nansen gold project including mill and process equipment, powerhouse, water supply, laboratory, and camp. The total estimated cost of $4,581,895, in fourth quarter 1988 Canadian dollars, includes a $250,000 contingency. The detailed capital cost estimate is listed in Appendix B.

7.2 BASIS OF ESTIMATE

The battery limits for the cost estimate of the Mount Nansen gold mill and surface facilities described in this report are receipt of Brown McDade surface ore at the stockpile area and discharge of treated tailings to the tailings containment area including the return of tailings reclaim water to the mill.

The capital cost estimate is based on the following:

- flowsheets and general arrangement drawings as prepared by Melis Engineering Ltd. and attached to this report
- test data generated from the Brown McDade ore samples
- design criteria as listed in this report
- budget quotations for the majority of the equipment
- re-use of existing equipment and buildings where applicable
- sources of good used equipment as identified in the cost estimate details
- file pricing data for low-cost items
- estimation of mechanical installation man hours for individual pieces of equipment
- estimation of piping, electrical and instrumentation installation from historical data for individual areas of the process plant
- labour estimates for building repairs.

The mill circuit included in the cost estimate, as specified in the process design criteria, is for processing Brown McDade surface (oxide) ore. The metallurgical efficiency of the mill circuit for processing other Nansen ores has not as yet been identified.

TABLE 7-1

MOUNT NANSEN GOLD PROJECT, YUKON

CAPITAL COST ESTIMATE - MILL AND SURFACE FACILITIES

	Area	$
Direct costs		
	Crushing	190,280
	Grinding	355,350
	Cyanidation	233,500
	Carbon-in-pulp	208,860
	Acid Wash	94,990
	Stripping and Precipitation	188,750
	Refining	59,855
	Carbon Handling	57,800
	Tails Treatment	167,435
	Reagents	93,700
	Process Water	35,285
	Primary Water Supply	337,300
	Air Supply	51,395
	Power Generation	502,640
	Buildings	316,775
	Heating and Ventilation	68,075
	Laboratory	151,425
	Camp	179,950
	Shop and Mobile Equipment	188,530
Total Direct Costs		**3,481,895**
Indirect Costs		
	Engineering and Procurement	135,000
	Construction Supervision	120,000
	Camp Costs	125,000
	Turnaround	80,000
	Mobilization and Demobilization	40,000
	Construction Equipment and Small Tools	100,000
	Contractor Overhead	125,000
	Start-up Costs	125,000
Total Indirect Costs		**850,000**
Total Direct and Indirect Costs		**4,331,895**
	Contingency	**250,000**
Total Estimated Capital Costs		**4,581,895**

The following have been included in the capital cost estimate:
- process equipment
- mechanical installation
- field materials
- process piping
- electrical
- basic instrumentation where needed for process control
- building repairs and modifications
- concrete
- miscellaneous steelwork
- laboratory
- tailings lines
- reclaim water line
- water supply line and pumphouse
- power generation
- camp
- loader, forklift truck and vehicles
- freight
- construction indirects
- engineering and procurement
- construction management
- start-up costs
- contingency.

The capital cost estimate excludes:
- tailings pond construction as well as the decant structure for reclaim water
- installation of a carbon reactivation kiln
- treatment of reclaim water
- any costs associated with mining
- working capital
- pre-production construction interest
- owner's costs such as owner representative
- allowances for increased cost caused by acceleration of the project schedule.

7.3 METHODOLOGY

Equipment prices were obtained on an individual basis as budget quotations, both for new equipment and used equipment. Mechanical installation manhours were estimated for each piece of equipment based on experience and historical data. The indicated construction man-hour rate used in the capital cost estimate details includes contractor overhead and profit.

Field materials were factored from the equipment costs for each major area of the process plant. In-plant piping, electrical and instrumentation costs were factored from the total installed mechanical costs for each individual area and the man hours given for each discipline were assessed for each separate area of the process plant.

The cost of buildings was assessed by estimating the labour and materials required for repairs and modifications to existing buildings.

Engineering and procurement costs and construction supervision are lump sum estimates to meet the requirements of the project. Camp costs and employee turnaround have been estimated for the total construction manhours using a 4-weeks-on, 1-week-off construction schedule.

A lump sum estimate was used for mobilization and demobilization. An allowance for start-up costs was included for start-up assistance.

The contingency allowance provides for additions and unidentified items within the stated scope of work but it is not intended to cover major changes in scope.

8.0 OPERATING COST ESTIMATE

8.1 SUMMARY

The annual operating costs for the mill and surface facilities are summarized in Table 8-1. The total annual operating costs of $4,210,704, in fourth quarter 1988 Canadian dollars, equivalent to a unit operating cost of $43.26/ton of ore, at a throughput rate of 97,333 tons per year, are based on the design criteria listed in this report. The costs include the labour to operate and maintain the process plant and to provide analytical services for the site. They also include reagents, supplies, fuel and power costs directly related to the mill operation and surface facilities. Details of the operating costs are presented in Tables 8-2, 8-3, 8-4, and 8-5.

A 5% contingency has been included in the operating cost estimate to allow for unknowns such as final environmental requirements for the project.

8.2 MANPOWER

The manpower costs are listed in Table 8-2. The annual costs of $1,939,634 are based on site personnel working a 2-weeks-in, 2 weeks-out schedule. The metallurgist will be in charge of the operation in the absence of the mill superintendent. An overtime allowance has been included to provide some supervision overlap.

There will be a total of three mill operators on each shift with the lead hand operator being responsible for the shift operation. It is anticipated that a 12 hours per day crushing operation will be sufficient, hence a loader operator and crusher operator will work on nightshift to feed ore from the stockpile to the coarse ore bin and to run the crushing circuit. This will allow crusher maintenance to be done on dayshift as well as allowing periodic operation of the crushing plant by dayshift personnel when necessary. A dayshift operator has been included to run the refining operation and complete other mill tasks as necessary. Once steady-state operating conditions are achieved in the mill it may be possible to reduce the shift crew by one

TABLE 8-1
MOUNT NANSEN GOLD PROJECT, YUKON
MILL AND SURFACE OPERATING COSTS

Item	$/year	$/tonne	$/ton
Manpower	1,939,634	21.97	19.93
Reagents and Consumables	1,279,745	14.49	13.15
Power and Fuel	630,815	7.14	6.48
Road and Camp Maintenance	110,000	1.24	1.13
Communication	50,000	0.57	0.51
Sub-Total	4,010,194	45.41	41.20
Contingency (5%)	200,510	2.27	2.06
Total Estimated Operating Costs	4,210,704	47.68	43.26

NOTES:
1. Costs do not include mining costs or costs associated with tailings dam.
2. Annual costs based on a 365 days per year operation at a milling rate of 11.2 metric tonnes per hour (12.35 short tons per hour) with a 90% plant availability to give an annual tonnage of 88,300 metric tonnes (97,333 short tons).

TABLE 8-2

MOUNT NANSEN GOLD PROJECT, YUKON
MILL AND SURFACE MANPOWER OPERATING COSTS

Employee	Total	On Site	Hours/4 weeks Per Employee	Total	Rate	$/4 wks	$/year
Mill Superintendent	1	1	168	168	$65,000/year	5,000	65,000
Metallurgist	1	1	168	168	$50,000/year	3,846	50,000
Lead Hand Operator	4	2	168	672	$19.00/hour	12,768	165,984
Mill Operator	8	4	168	1344	$17.50/hour	23,520	305,760
Crusher Operator	2	1	168	336	$15.00/hour	5,040	65,520
Dayshift Operator	2	1	168	336	$16.00/hour	5,376	69,888
Millwright/Electrician	6	3	168	1008	$19.00/hour	19,152	248,976
Loader Operator	2	1	168	336	$15.00/hour	5,040	65,520
Expeditor	2	1	168	336	$16.00/hour	5,376	69,888
Office/Payroll Clerk	2	1	168	336	$12.50/hour	4,200	54,600
Assayer	1	1	168	168	$22.50/hour	3,780	49,140
Lab Technician	2	1	168	336	$18.00/hour	6,048	78,624
Sub Total	**33**	**18**				99,146	1,288,900
Payroll Burden (21%)							270,669
Camp Costs ($30/man/day x 365 days/year x 20 men)							219,000
Turnaround Costs							32,175
Overtime Allowance (10% of salary costs)							128,890
Total Estimated Labour Costs							**1,939,634**

NOTES:

1. Work schedule is 2 weeks-in, 2 weeks-out, 12 hours per shift, 7 shifts per week.
2. Camp costs based on contract operation, 10% allowance included for visitors.
3. Turnaround costs based on Whitehorse, Yukon point-of-hire.
4. Overtime allowance included to cover overtime pay of 8 hours/4 week cycle/employee plus miscellaneous overtime typical of 24-hour mill operations.
5. It may be possible to reduce the mill operating crew by 1 man per shift after start-up, once steady-state operating conditions are achieved in the mill.

TABLE 8-3
MOUNT NANSEN GOLD PROJECT, YUKON
REAGENTS AND CONSUMABLES OPERATING COSTS

Item	kg/tonne	kg/year	$/kg	$/year	$/tonne
Crusher and Mill Liners	0.25	22,075	1.85	40,839	0.46
Steel Balls	0.5	44,150	0.85	37,528	0.43
Lime (95% CaO)	4.7	415,010	0.25	103,753	1.17
Sodium Cyanide (98% NaCN)	1.1	97,130	3.00	291,390	3.30
Hydrochloric Acid (31.5%)	0.2	17,660	0.60	10,596	0.12
Sodium Hydroxide	0.2	17,660	1.00	17,660	0.20
Zinc Dust	0.1	8,830	2.90	25,607	0.29
Lead Nitrate	0.01	883	2.60	2,296	0.03
Flocculant	0.02	1,766	4.00	7,064	0.08
Copper Sulfate (25% Cu)	0.3	26,490	1.20	31,788	0.35
S. Metabisulfite (66.6% SO_2)	3.0	264,900	0.90	238,410	2.70
Carbon	0.05	4,415	4.40	19,426	0.22
Refinery Flux	0.1	8,830	1.25	11,038	0.13
Furnace Refractory				45,000	0.51
Maintenance Supplies				264,900	3.00
Operating Supplies				66,225	0.75
Laboratory Supplies				66,225	0.75
Total Estimated Reagents and Consumables Costs				**1,279,745**	**14.49**

NOTES:

1. Annual consumption based on a 365-day operation with a 11.2 tonne/hour milling rate and a 90% plant availability to give an annual tonnage of 88,300 metric tonnes.
2. Reagent costs include treatment of mill tailings for cyanide destruction. Additional costs will be incurred if treatment of tailings reclaim water becomes necessary.
3. Sodium cyanide cost is unit price expected in 4th quarter of 1989 (present spot price is quoted at $5.00/kg).
4. Carbon consumption based on attrition losses only, does not include cost of carbon replacement if reactivation kiln is not installed.
5. Refinery flux would include nitre, borax and silica; consumption could be reduced if acid dissolution of zinc precipitate is practiced.
6. Sodium metabisulfite cost includes Inco royalty payment of $0.068/kg of SO_2 used ($0.045/kg $Na_2S_2O_5$ used).

TABLE 8-4

MOUNT NANSEN GOLD PROJECT, YUKON

POWER AND FUEL OPERATING COSTS

Item	$/year	$/tonne
Power - Mill	513,315	5.81
Power - Water Pumphouse	50,000	0.57
Power - Heat Trace	10,000	0.11
Fuel - Mobile	30,000	0.34
Fuel - Refinery	7,500	0.08
Fuel - Camp Heating	20,000	0.23
Total Power and Fuel Costs	**630,815**	**7.14**

NOTES:

1. Mill power cost based on 768 kw for 16 hours per day and 641 kW for 8 hours per day at 80% loading for 365 days per year using a power generation cost of $0.10/kWh.
2. Pumphouse power cost is lump sum estimate based on 60 HP at 85% load, 24 hours per day, 365 days per year.
3. Heat trace power cost for water line is lump sum estimate based on 4, 10 HP diesel generators operating 1 month per year (to be used during periods of cold temperature extremes).
4. Mobile fuel is lump sum estimate for loader and 1/2-ton trucks.
5. Refinery fuel is lump sum estimate for operation of bullion furnace.
6. Camp heating fuel is lump sum estimate for propane fuel.

TABLE 8-5

MOUNT NANSEN GOLD PROJECT, YUKON
MISCELLANEOUS OPERATING COSTS

Item	$/year	$/tonne
Access Road Maintenance	100,000	1.13
Camp Maintenance	10,000	0.11
Communication	50,000	0.57
Total Miscellaneous Costs	**160,000**	**1.81**

NOTES:

1. Road maintenance is a lump sum estimate for a contract service for snow removal and grading.
2. Telephone cost is lump sum estimate for equipment and toll charges.

man but this will depend on the availability of experienced mill operators for the operation. Mill maintenance will be provided by two mechanics and one electrician working dayshift.

An expeditor and clerk has been included to cover site administration duties. One laboratory technician and one assayer will meet the site analytical requirements, with only the laboratory technician present on site in the absence of the assayer.

The scheduled hours of work will be 12 hours per day with one hour for lunch. Each employee will be entitled to one turnaround in every 4-week cycle. The turnaround costs are based on Whitehorse as the point-of-hire. Site accommodation costs are based on a contract caterer operation of the camp.

8.3 REAGENTS AND SUPPLIES

The annual costs of reagents and supplies are based on the consumption figures and delivered reagent prices listed in Table 8-3. These costs do not include treatment of reclaim water or the cost of replacing carbon if a kiln is not installed.

Lump sum estimates have been included for laboratory, maintenance and operating supplies.

8.4 HEATING

A $20,000 lump sum estimate has been included for camp heating. Radiant heat from the process equipment and waste heat from the power generators will be utilized to heat the mill building. Construction-type propane heaters will be used during emergencies.

8.5 POWER

The total on-line power for the mill, including process equipment, lighting, laboratory and camp, is estimated at 768 kW for 16 hours per day and 641 kW for 8 hours per day. The cost of power generation on site has been estimated at $0.10/kWh to give an annual power cost of

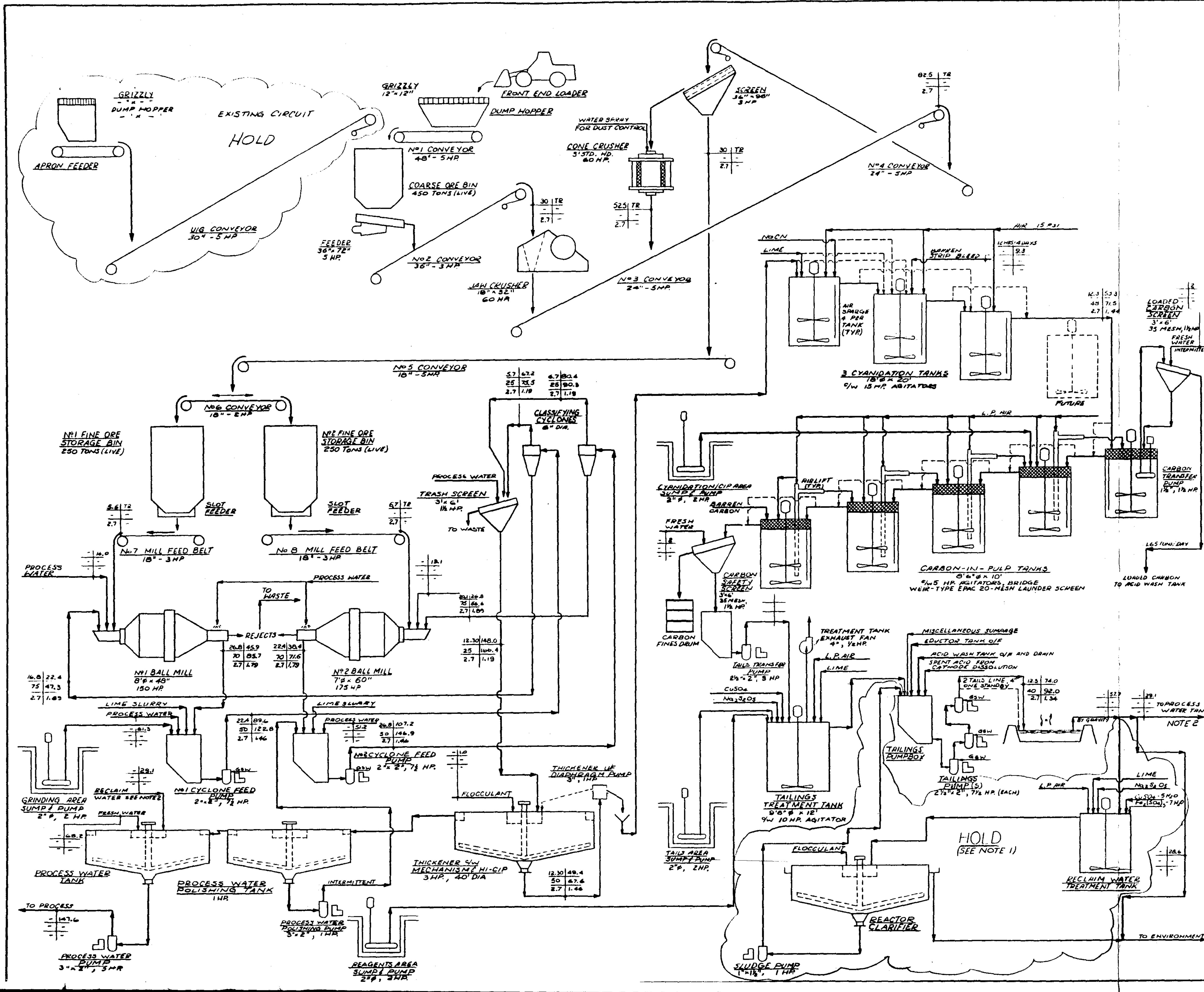
$513,315. An annual lump sum estimate of $60,000 has been included for the water pumphouse and heat tracing.

8.6 MISCELLANEOUS

Lump sum estimates have been included for mobile fuel, refinery furnace fuel, communication (telephone) and camp and road maintenance.

APPENDIX A

DRAWINGS



LEGEND

Tons/Hr	USGPM (liquid)
% SOLIDS	USGPM (slurry)
SG (solids)	SG (slurry)

NOTES:

1- PRESENT CASE ASSUMES TREATMENT OF MILL TAILINGS SLURRY PENDING ENVIRONMENTAL APPROVAL. MOST ECONOMIC OPTION IS TO DISCHARGE TAILINGS DIRECTLY TO POND AND TREAT RECLAIM WATER ONLY.

2- NO RECLAIM WATER RECYCLE FOR FIRST FEW MONTHS OF OPERATION.

NO	DATE	REVISION	BY	APP
1	JAN 1989	ADDED THICKENER	LAM EDH	LAM
0	DEC 1988	PRELIMINARY	LAM EDH	LAM

DETAIL SYMBOL
A DETAIL NUMBER
B DRAWING WHERE DETAIL SHOWN
C CROSS REFERENCE TO DRAWING WHERE DETAIL TAKEN OR SHOWN

CLIENT
ARCHER CATHRO ASSOCIATES(1981)LTD.
(CHEVRON MINERALS LTD.)
(BYG NATURAL RESOURCES INC.)
VANCOUVER, B.C.

PROJECT No. 164

MELIS ENGINEERING LTD

PROJECT
MOUNT NANSEN GOLD MILL
CARMACKS, YUKON

DRAWING
PROCESS FLOWSHEET
CRUSHING, GRINDING, THICKENING
CYANIDATION, CARBON-IN-PULP
TAILS TREATMENT

DESIGN	SCALE	DATE
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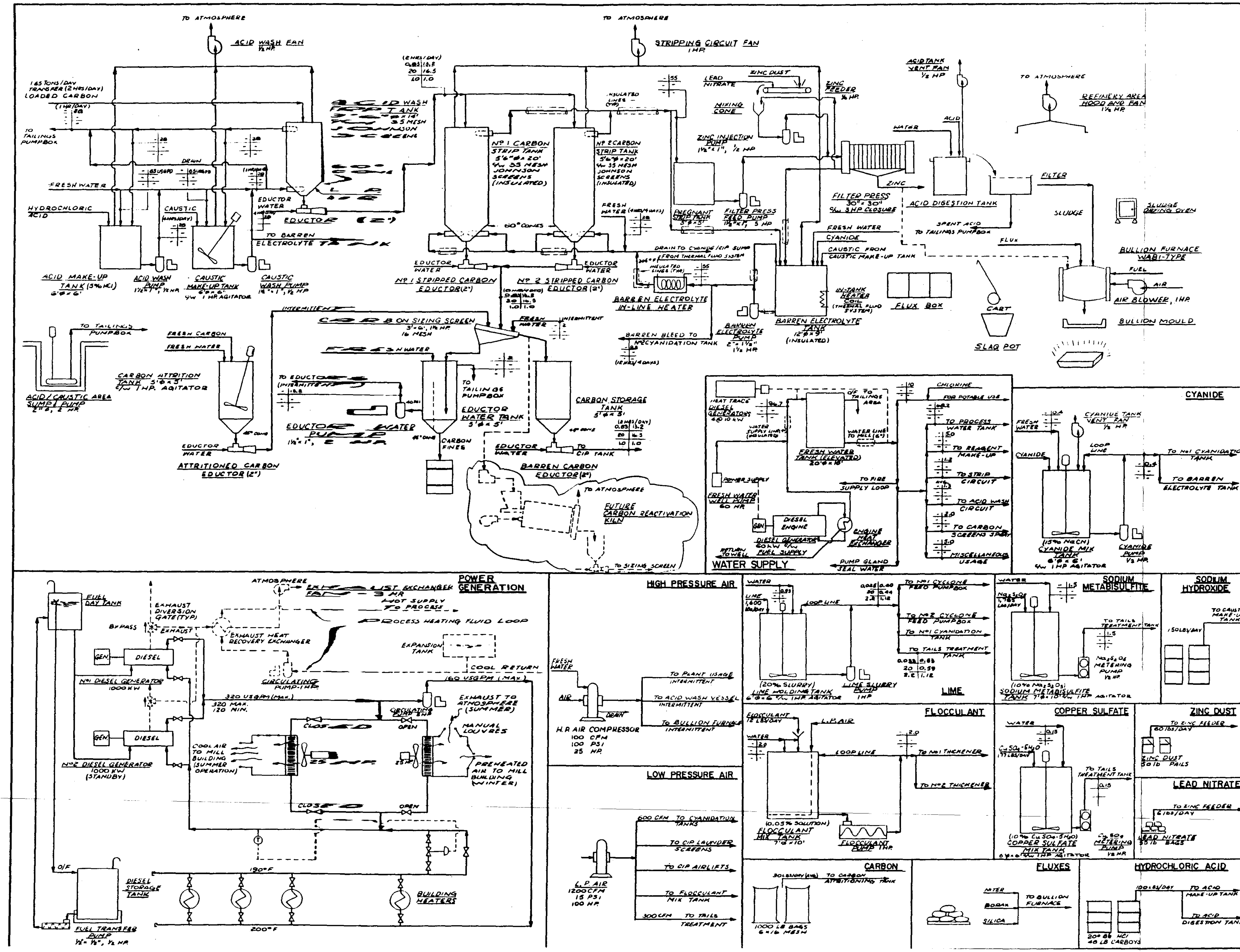
CHECKED EDH	DRAWING NO 164-F-001	REV 1
APPROVED LAM		



LEGEND

Tons/Hr (solids)	USGPM (liquid)
% SOLIDS	USGPM (slurry)
SG (solids)	SG (slurry)

NOTES.

1.- $Na_2S_2O_5$ CONSUMPTION WOULD BE LOWER IF CYANIDE TAILINGS DISCHARGED TO POND AND ONLY RECLAIM WATER TREATED.

2.- CARBON REACTIVATION KILN NOT INCLUDED IN INITIAL INSTALLATION.

NO	DATE	REVISION	BY	APP
0	DEC. 1988	PRELIMINARY	LAM & EDH	

DETAIL SYMBOL
A-B / C
A DETAIL NUMBER
B DRAWING WHERE DETAIL SHOWN
C CROSS REFERENCE TO DRAWING WHERE DETAIL TAKEN OR SHOWN

CLIENT
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(CHEVRON MINERALS LTD.)
(BYG NATURAL RESOURCES INC.)
VANCOUVER, B.C.

PROJECT No. 164

MELIS ENGINEERING LTD.

PROJECT
MOUNT NANSEN GOLD MILL CARMACKS, YUKON

DRAWING
PROCESS FLOWSHEET
STRIPPING AND ZINC PRECIPITATION
REFINING, CARBON HANDLING
REAGENTS AND SERVICES

DESIGN	SCALE	DATE
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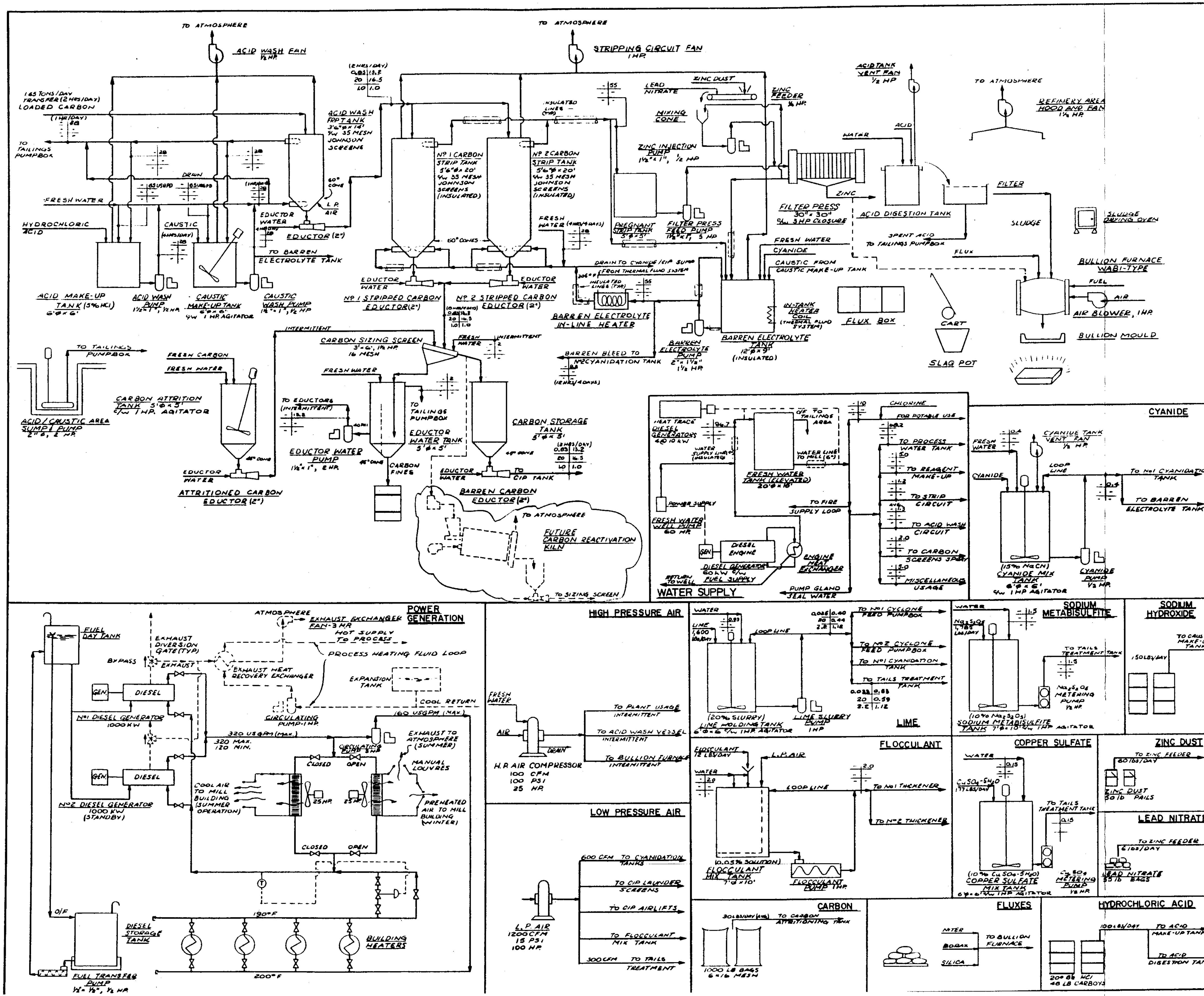
CHECKED: EDH	DRAWING NO: 164-F-002	REV: 0
APPROVED: LAM		



LEGEND

Tons/Hr (solids)	USGPM (liquid)
% SOLIDS	USGPM (slurry)
SG (solids)	SG (slurry)

NOTES.

1.- $Na_2S_2O_5$ CONSUMPTION WOULD BE LOWER IF CYANIDE TAILINGS DISCHARGED TO POND AND ONLY RECLAIM WATER TREATED.

2.- CARBON REACTIVATION KILN NOT INCLUDED IN INITIAL INSTALLATION.

NO	DATE	REVISION	BY	APP
0	DEC. 1988	PRELIMINARY	LAM & EDH	LAM

DETAIL SYMBOL
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PROJECT N. 164

MELIS ENGINEERING LTD.

PROJECT
MOUNT NANSEN GOLD MILL
CARMACKS, YUKON

DRAWING
PROCESS FLOWSHEET
STRIPPING AND ZINC PRECIPITATION
REFINING, CARBON HANDLING
REAGENTS AND SERVICES

DESIGN	SCALE	DATE
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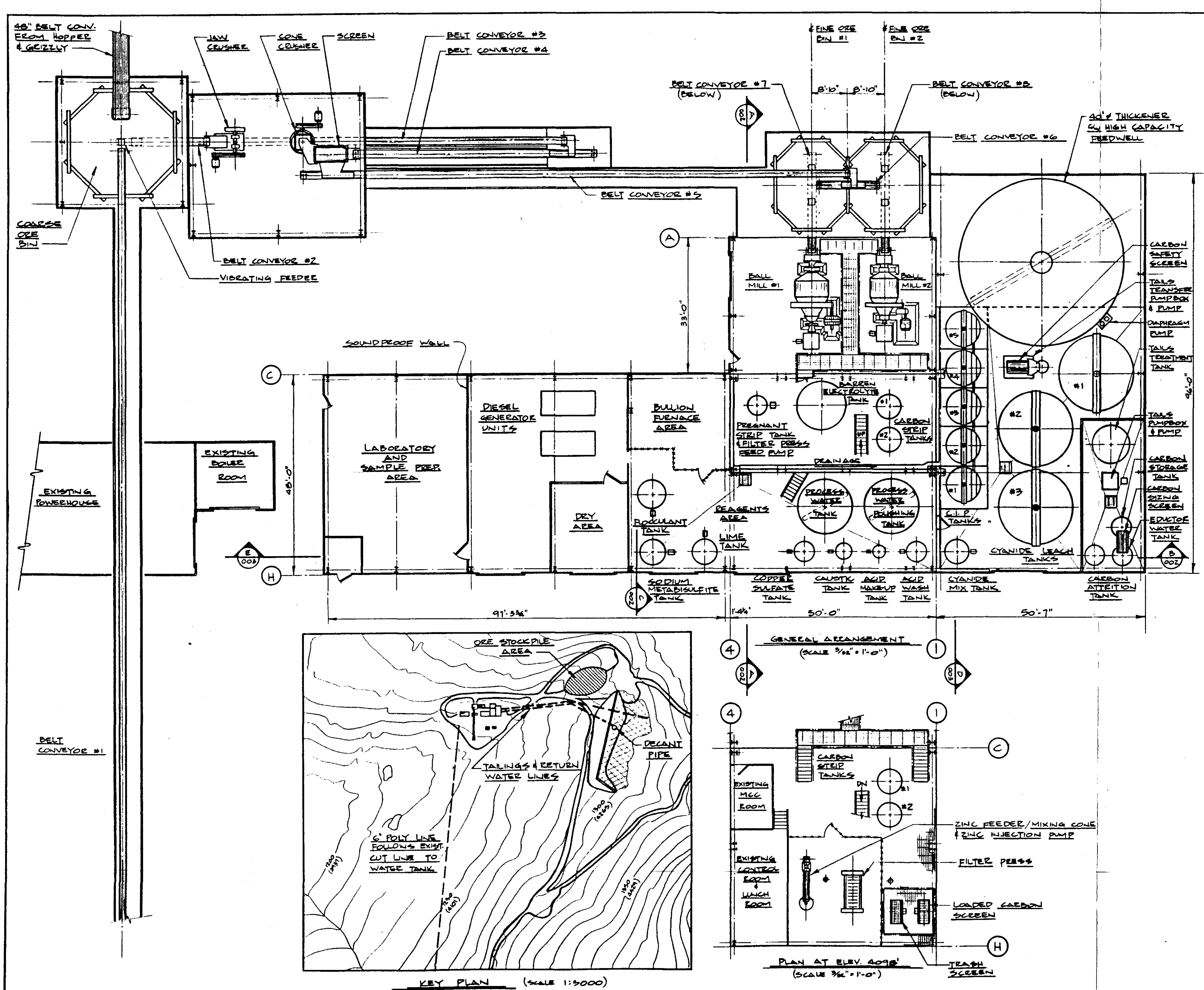
APPROVED LAM		



NO	DATE	REVISION	BY	APP
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0	DEC. 1988	PRELIMINARY	LAM & EDH	LAM

DETAIL SYMBOL
A-B / C
A DETAIL NUMBER
B DRAWING WHERE DETAIL SHOWN
C CROSS REFERENCE TO DRAWING WHERE DETAIL TAKEN OR SHOWN

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VANCOUVER, B.C.

PROJECT No. 164

MELIS ENGINEERING LTD

PROJECT
MOUNT NANSEN GOLD MILL
CARMACKS, YUKON

DRAWING
GENERAL ARRANGEMENT PLAN

DESIGN	SCALE	DATE
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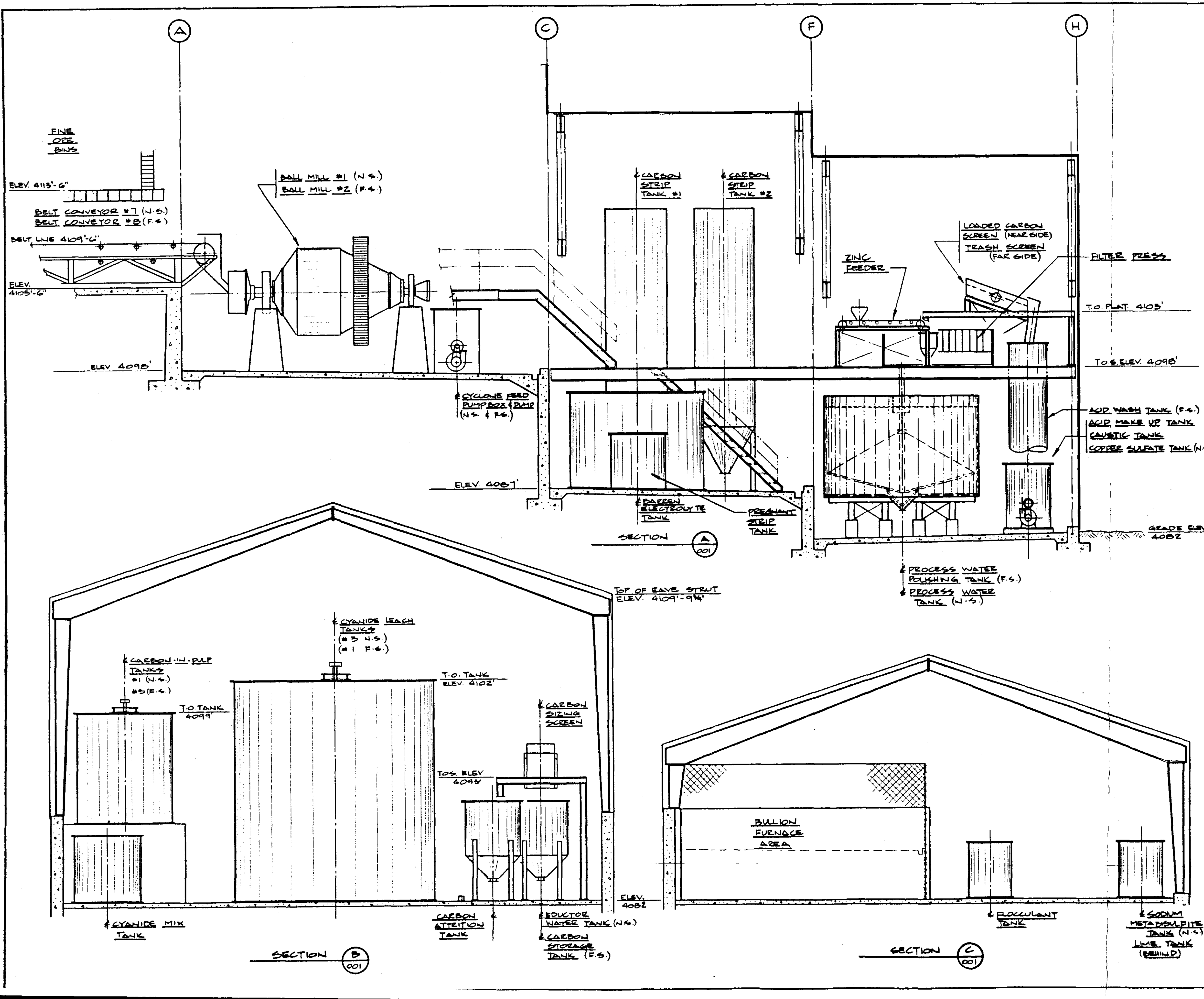
CHECKED EDH	DRAWING NO 164-G-001	REV 1
APPROVED LAM		



NO	DATE	REVISION	BY	APP
1	JAN 1989	ADDED THICKENER AND LAB.	LAM & EDH	LAM
0	DEC 1988	PRELIMINARY	LAM & EDH	LAM

DETAIL SYMBOL
A-B / C
A DETAIL NUMBER
B DRAWING WHERE DETAIL SHOWN
C CROSS REFERENCE TO DRAWING WHERE DETAIL TAKEN OR SHOWN

ARCHER CATHRO ASSOCIATES (1981) LTD.
(CHEVRON MINERALS LTD.)
(BYG NATURAL RESOURCES INC.)
VANCOUVER, B.C.

PROJECT No. 164

MELIS ENGINEERING LTD.

PROJECT
MOUNT NANSEN GOLD MILL
CARMACKS, YUKON

DRAWING
GENERAL ARRANGEMENT
SECTION A-A
SECTION B-B
SECTION C-C

DESIGN	SCALE	DATE
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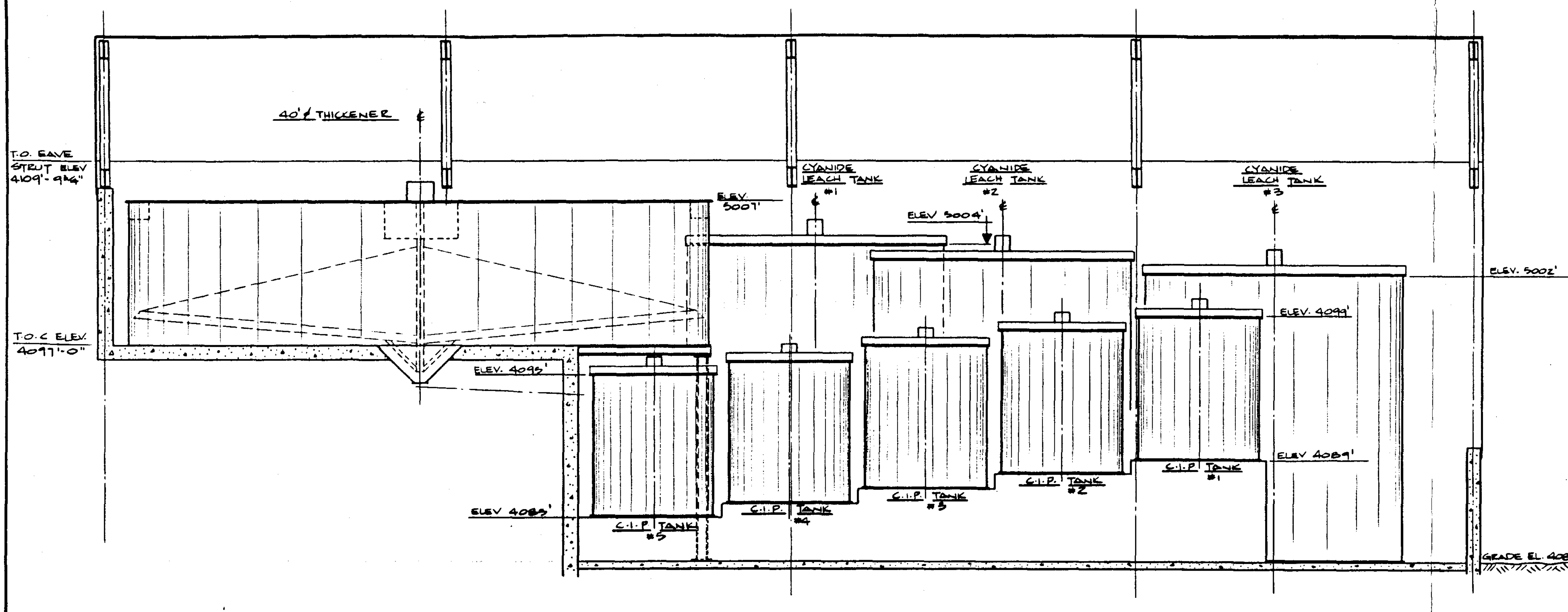
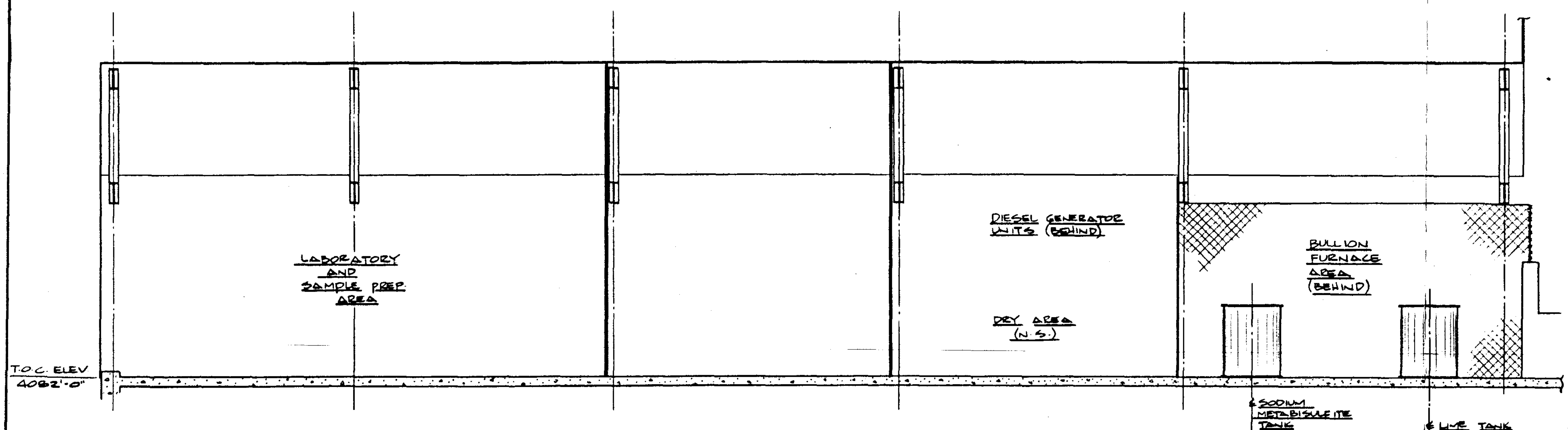
CHECKED EDH	DRAWING NO 164-G-002	REV 1
APPROVED LAM		



SECTION D/001



SECTION E/001

NO	DATE	REVISION	BY	APP
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0	DEC 1988	PRELIMINARY	LAM EDH	LAM

DETAIL SYMBOL
A-B / C
A DETAIL NUMBER
B DRAWING WHERE DETAIL SHOWN
C CROSS REFERENCE TO DRAWING WHERE DETAIL TAKEN OR SHOWN

ARCHER CATHRO ASSOCIATES (1981) LTD.
(CHEVRON MINERALS LTD.)
(BYG NATURAL RESOURCES INC.)
VANCOUVER, B.C.

PROJECT No 164

MELIS ENGINEERING LTD

PROJECT
MOUNT NANSEN GOLD MILL
CARMACKS, YUKON

DRAWING
GENERAL ARRANGEMENT
SECTION D-D
SECTION E-E

DESIGN	SCALE	DATE	
LAM/EDH	1/4" = 1'-0"	21-11-88	
DRAWN DJF			
CHECKED EDH	DRAWING NO		RT
APPROVED LAM	164 - G - 003		1

APPENDIX B

CAPITAL COST ESTIMATE DETAILS

MELIS ENGINEERING LTD.
PROJECT NO. 164

MOUNT NANSEN GOLD PROJECT, YUKON
MILL AND SURFACE FACILITIES
CAPITAL COST ESTIMATE SUMMARY

DATE: JANUARY 4, 1989
CURRENCY: CANADIAN
4th QUARTER 1988

	AREA	TOTAL MNHRS	TOTAL LABOUR	TOTAL MATERIAL	TOTAL COST
DIRECT COSTS					
	CRUSHING	1,580	71,100	119,180	190,280
	GRINDING	3,020	135,900	219,450	355,350
	CYANIDATION	1,830	82,350	151,150	233,500
	CARBON-IN-PULP	1,660	74,700	134,160	208,860
	ACID WASH	770	34,650	60,340	94,990
	STRIPPING AND PRECIPITATION	1,220	54,900	133,850	188,750
	REFINING	385	17,325	42,530	59,855
	CARBON HANDLING	460	20,700	37,100	57,800
	TAILS TREATMENT	1,185	53,325	114,110	167,435
	REAGENTS	580	26,100	67,600	93,700
	PROCESS WATER	225	10,125	25,160	35,285
	PRIMARY WATER SUPPLY	1,840	82,800	254,500	337,300
	AIR SUPPLY	215	9,675	41,720	51,395
	POWER GENERATION	700	31,500	471,140	502,640
	BUILDINGS	2,805	126,225	190,550	316,775
	HEATING AND VENTILATION	445	20,025	48,050	68,075
	LABORATORY	965	43,425	108,000	151,425
	CAMP	810	36,450	143,500	179,950
	SHOP AND MOBILE EQUIPMENT	340	15,300	173,230	188,530
TOTAL DIRECT COSTS		21,035	946,575	2,535,320	3,481,895
INDIRECT COSTS					
	ENGINEERING AND PROCUREMENT				135,000
	CONSTRUCTION SUPERVISION				120,000
	CAMP COSTS				125,000
	TURNAROUND				80,000
	MOBILIZATION AND DEMOBILIZATION				40,000
	CONSTRUCTION EQUIPMENT AND SMALL TOOLS				100,000
	CONTRACTOR OVERHEAD				125,000
	START-UP COSTS				125,000
TOTAL INDIRECT COSTS					850,000
TOTAL DIRECT AND INDIRECT COSTS					4,331,895
	CONTINGENCY				250,000
TOTAL ESTIMATED CAPITAL COSTS					4,581,895

MELIS ENGINEERING LTD.

PROJECT NO. MEL-164
MT. HANSEN PROJECT

CAPITAL COSTS ESTIMATE DETAILS

DATE: DECEMBER 21, 1988

AREA: CRUSHING

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	N.O. MATERIAL UNT. CST. $	N.O. MATERIAL FREIGHT $	N.O. MATERIAL TAX $	N.O. MATERIAL DUTY $	N.O. MATERIAL TOTAL $	FIELD MATERIAL UNT. CST. $	FIELD MATERIAL TOTAL $	TOTAL MATERIAL $	TOTAL COST $
1		GRIZZLY - SIZE 14" X 14"	NIL	1 EA		100	45	4,500	2,500	750	NIL	NIL	3,250			3,250	7,750
2		COARSE ORE HOPPER	NIL	1 EA		100	45	4,500	8,000	1,700	NIL	NIL	9,700			9,700	14,200
3		NO. 1 CONVEYOR - SIZE 48" X 50'	5	1 EA		250	45	11,250	25,000	3,500	NIL	NIL	28,500			28,500	39,750
4		U/G ORE CONVEYOR - SIZE 30" X 300' (NOT REQUIRED FOR OPEN PIT ORE)	5	N/A		NIL	45	NIL	NIL	NIL	NIL	NIL	NIL			NIL	NIL
5		COARSE ORE BIN, 450 TONS	NIL	1 EA		5	45	225	NIL	NIL	NIL	NIL	NIL			NIL	225
6		PAN FEEDER - SIZE 36" X 72" TO BE CLEANED, LUBRICATED REQUIRES VARI-SPEED CONTROL	5	1 EA		15	45	675	NIL	NIL	NIL	NIL	NIL			NIL	675
7		NO. 2 CONVEYOR - SIZE 36" X 19' CLEANED AND LUBRICATED	3	1 EA		25	45	1,125	200	NIL	NIL	NIL	200			200	1,325
8		JAW CRUSHER 18" X 32" CLEANED AND LUBRICATED V-BELT CHANGE	60	1 EA		40	45	1,800	4,500	NIL	NIL	NIL	4,500			4,500	6,300
9		NO. 3 CONVEYOR - SIZE 24" X 58' REQUIRES NEW GEAR RED. REQUIRES NEW SPROCKETS REQUIRES NEW LENGTH OF CHAIN $60	5	1 EA		30	45	1,350	4,500	350	NIL	NIL	4,850			4,850	6,200
10		NO. 4 CONVEYOR - SIZE 24" X 58' NEW SKIRT, NEW DRIVE	5	1 EA		30	45	1,350	4,500	350	NIL	NIL	4,850			4,850	6,200
11		SCREEN DILLION - SIZE 36" X 96"	3	1 EA		5	45	225	100	NIL	NIL	NIL	100			100	325
12		CONE CRUSHER - SIZE 36" STANDARD HAS TO BE STRIPPED DOWN FOR INSPECTION	60	1 EA		160	45	7,200	10,000	930	NIL	NIL	10,930			10,930	18,130
13		NO. 5 CONVEYOR - SIZE 18" X 135' REQUIRES NEW DRIVE	5	1 EA		40	45	1,800	4,500	350	NIL	NIL	4,850			4,850	6,650
14		NO. 6 CONVEYOR - SIZE 18" X 23' REQUIRES NEW MOTOR AND GEAR DRIVE	2	1 EA		40	45	1,800	4,500	350	NIL	NIL	4,850			4,850	6,650
SUB-TOTAL						840	630	37,800	68,300	8,200	0	0	76,500			76,500	114,300
		FIELD MATERIAL													7,600	7,600	7,600
SUB-TOTAL INSTALLED MECHANICAL																	121,900
		PROCESS PIPING				70	45	3,150					3,000			3,000	6,150
		ELECTRICAL				670	45	30,150					32,000			32,000	62,150
		INSTRUMENTATION				NIL	45	NIL					NIL			NIL	NIL
TOTAL DIRECT COSTS						1,580		71,100					111,500		7,600	119,100	190,200

MELIS ENGINEERING LTD.

CAPITAL COSTS ESTIMATE DETAILS

PAGE 2
DATE: DECEMBER 21, 1988

PROJECT NO. MEL-164
MT. HANSEN PROJECT

AREA: GRINDING

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	H.O. MATERIAL UNT. CST. $	FREIGHT $	TAX $	DUTY $	TOTAL $	FIELD MATERIAL UNT. CST. $	TOTAL $	TOTAL MATERIAL $	TOTAL COST $
1		NO. 1 FINE ORE BIN (250 TONS)	NIL	1 EA		5	45	225	NIL	NIL	NIL	NIL	NIL			NIL	225
2		NO. 2 FINE ORE BIN (250 TONS)	NIL	1 EA		5	45	225	NIL	NIL	NIL	NIL	NIL			NIL	225
3		NO. 1 SLOT FEEDER TO BE BUILT ON SITE	NIL	1 EA		170	45	7,650	3,600	500	NIL	NIL	4,100			4,100	11,750
4		NO. 2 SLOT FEEDER TO BE BUILT ON SITE	NIL	1 EA		170	45	7,650	3,600	500	NIL	NIL	4,100			4,100	11,750
5		NO. 7 MILL FEED BELT - SIZE 18" X 35' REQUIRES NEW DRIVE (SPROCKET DRIVE) AND CHAIN	3	1 EA		20	45	900	6,000	350	NIL	NIL	6,350			6,350	7,250
6		NO. 8 MILL FEED BELT - SIZE 18" X 35' NEW HEAD PULLEY 20" X 20" X 1.5" SHAFT NEW SPROCKET DRIVE NEW CHAIN	3	1 EA		40	45	1,800	6,000	350	NIL	NIL	6,350			6,350	8,150
7		NO. 1 BALL MILL - SIZE 8' DIAM. X 48" NEW LINERS INTERNAL CHECK FOR SHELL CRACKS LUB PUMP REQUIRED	150	1 EA		340	45	15,300	22,000	1,750	NIL	NIL	23,750			23,750	39,050
8		NO. 1 CYCLONE FEED PUMP BOX	NIL	1 EA		15	45	675	2,250	400	NIL	NIL	2,650			2,650	3,325
9		NO. 1 CYCLONE FEED PUMP, 2" X 2" REQUIRES COMPLETE UNIT	7.5	1 EA		5	45	225	4,000	350	NIL	NIL	4,350			4,350	4,575
10		NO. 1 CYCLONE - SIZE 6"	NIL	1 EA		10	45	450	3,000	200	NIL	NIL	3,200			3,200	3,650
11		NO. 2 BALL MILL - 7' DIAM. X 60" REQUIRES NEW LINERS REQUIRES BEARING AND CLEANING AND FURTHER INSPECTION, SHELL TO BE CHECKED FOR CRACKS	175	1 EA		360	45	16,200	21,000	1,750	NIL	NIL	22,750			22,750	38,950
12		NO. 2 CYCLONE FEED PUMP BOX	NIL	1 EA		15	45	675	2,250	500	NIL	NIL	2,750			2,750	3,425
13		NO. 2 CYCLONE FEED PUMP, 2" X 2" REQUIRES COMPLETE UNIT	7.5	1 EA		5	45	225	4,000	350	NIL	NIL	4,350			4,350	4,575

AREA: GRINDING (continued)

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	H.O. MATERIAL UNT. CST. $	FREIGHT $	TAX $	DUTY $	TOTAL $	FIELD MATERIAL UNT. CST. $	TOTAL $	TOTAL MATERIAL $	TOTAL COST $
14		NO. 2 CYCLONE - SIZE 6"	NIL	1 EA		10	45	450	3,000	200	NIL	NIL	3,200			3,200	3,650
15		TRASH SCREEN - SIZE 3' X 6'	1.5	1 EA		150	45	6,750	10,000	700	NIL	NIL	10,700			10,700	17,450
16		40' DIAMETER THICKENER - NEW TANK EXIST. BRIDGE AND DRIVE - NEW MOTOR	3	1 EA		900	45	40,500	28,000	12,000	NIL	NIL	40,000			40,000	80,500
17		HI-CAPACITY FEEDWELL	NIL	1 EA		40	45	1,800	7,000	500	NIL	NIL	7,500			7,500	9,300
18		THICKENER UNDER FLOW DIAPHRAGM PUMP EXISTING NEW MOTOR	1	1 EA		20	45	900	250	50	NIL	NIL	300			300	1,200
19		GRINDING AREA SUMP PUMP - SIZE 2" NEW REPLACEMENT	2	1 EA		10	45	450	2,500	550	NIL	NIL	3,050			3,050	3,500
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SUB-TOTAL						2,290	45	103,050	128,450	21,000	0	0	149,450			149,450	252,500
	FIELD MATERIAL														17,000	17,000	17,000
SUB-TOTAL INSTALLED MECHANICAL																	269,500
	PROCESS PIPING					300	45	13,500					13,500			13,500	27,000
	ELECTRICAL					390	45	17,550					37,000			37,000	54,550
	INSTRUMENTATION					40	45	1,800					2,500			2,500	4,300

TOTAL DIRECT COSTS						3,020		135,900					202,450		17,000	219,450	355,350

MELIS ENGINEERING LTD.

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PROJECT NO. MEL-164
MT. HANSEN PROJECT

CAPITAL COSTS ESTIMATE DETAILS

DATE: DECEMBER 21, 1988

AREA: CYANIDATION

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	H.O. MATERIAL UNT. CST. $	H.O. MATERIAL FREIGHT $	H.O. MATERIAL TAX $	H.O. MATERIAL DUTY $	H.O. MATERIAL TOTAL $	FIELD MATERIAL UNT. CST. $	FIELD MATERIAL TOTAL $	TOTAL MATERIAL $	TOTAL COST $
1		NO. 1 CYANIDATION TANK - 10' DIAM X 20' NEW	NIL	1 EA		520	45	23,400	15,000	6,000	NIL	NIL	21,000			21,000	44,400
2		NO. 1 CYANIDATION TANK BAFFLES NEW	NIL	INCL		INCL	45	INCL	INCL	INCL	NIL	NIL	INCL			INCL	INCL
3		NO. 1 CYANIDATION TANK AGITATOR COMPLETE WITH BRIDGE NEW	15	1 EA		INCL	45	INCL	15,600	2,800	NIL	NIL	18,400			18,400	18,400
4		NO. 2 CYANIDATION TANK - 18' DIAM. X 20' NEW	NIL	1 EA		520	45	23,400	15,000	6,000	NIL	NIL	21,000			21,000	44,400
5		NO. 2 CYANIDATION TANK BAFFLES NEW	NIL	INCL		INCL	45	INCL	INCL	INCL	NIL	NIL	INCL			INCL	INCL
6		NO. 2 CYANIDATION TANK AGITATOR COMPLETE WITH BRIDGE NEW	15	1 EA		INCL	45	INCL	15,600	2,800	NIL	NIL	18,400			18,400	18,400
7		NO. 3 CYANIDATION TANK - 18' DIAM. X 20' NEW	NIL	1 EA		520	45	23,400	15,000	6,000	NIL	NIL	21,000			21,000	44,400
8		NO. 3 CYANIDATION TANK BAFFLES NEW	NIL	INCL		INCL	45	INCL	INCL	INCL	NIL	NIL	INCL			INCL	INCL
9		NO. 3 CYANIDATION TANK AGITATOR COMPLETE WITH BRIDGE	15	1 EA		INCL	45	INCL	15,600	2,800	NIL	NIL	18,400			18,400	18,400
SUB-TOTAL						1,560	45	70,200	91,800	26,400	0	0	118,200			118,200	188,400
		FIELD MATERIAL													16,000	16,000	16,000
SUB-TOTAL		INSTALLED MECHANICAL															204,400
		PROCESS PIPING				130	45	5,850					6,200			6,200	12,050
		ELECTRICAL				100	45	4,500					5,750			5,750	10,250
		INSTRUMENTATION				40	45	1,800					5,000			5,000	6,800
TOTAL DIRECT COSTS						1,830		82,350					135,150		16,000	151,150	233,500

MELIS ENGINEERING LTD.

CAPITAL COSTS ESTIMATE DETAILS

DATE: DECEMBER 21, 1988

PROJECT NO. MEL-164
MT. HANSEN PROJECT

AREA: CARBON-IN-PULP

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	N.O. MATERIAL UNT. CST. $	FREIGHT $	TAX $	DUTY $	TOTAL $	FIELD MATERIAL UNT. CST. $	TOTAL $	TOTAL MATERIAL $	TOTAL COST $
1		NO. 1 CARBON-IN-PULP TANK SIZE 8'6" DIAMETER X 10' NEW	NIL	1 EA		200	45	9,000	6,500	1,450	NIL	NIL	7,950			7,950	16,950
2		NO. 1 CARBON-IN-PULP TANK BAFFLES NEW	NIL	INCL		INCL	45	INCL	INCL	INCL	NIL	NIL	INCL			INCL	INCL
3		NO. 1 CARBON-IN-PULP TANK LAUNDER SCREEN, NEW	NIL	1 EA		INCL	45	INCL	1,000	450	NIL	NIL	1,450			1,450	1,450
4		NO. 1 CARBON-IN-PULP TANK AGITATOR NEW	5	1 EA		INCL	45	INCL	5,500	1,700	NIL	NIL	7,200			7,200	7,200
5		NO. 2 CARBON-IN-PULP TANK SIZE 8'6" DIAMETER X 10' NEW	NIL	1 EA		200	45	9,000	6,500	1,450	NIL	NIL	7,950			7,950	16,950
6		NO. 2 CARBON-IN-PULP TANK BAFFLES NEW	NIL	INCL		INCL	45	INCL	INCL	INCL	NIL	NIL	INCL			INCL	INCL
7		NO. 2 CARBON-IN-PULP TANK LAUNDER SCREEN, NEW	NIL	1 EA		INCL	45	INCL	1,000	450	NIL	NIL	1,450			1,450	1,450
8		NO. 2 CARBON-IN-PULP TANK AGITATOR NEW	5	1 EA		INCL	45	INCL	5,500	1,700	NIL	NIL	7,200			7,200	7,200
9		NO. 3 CARBON-IN-PULP TANK SIZE 8'6" DIAMETER X 10' NEW	NIL	1 EA		200	45	9,000	6,500	1,450	NIL	NIL	7,950			7,350	16,950
10		NO. 3 CARBON-IN-PULP TANK BAFFLES NEW	NIL	INCL		INCL	45	INCL	INCL	INCL	NIL	NIL	INCL			INCL	INCL
11		NO. 3 CARBON-IN-PULP TANK LAUNDER SCREEN, NEW	NIL	1 EA		INCL	45	INCL	1,000	450	NIL	NIL	1,450			1,450	1,450
12		NO. 3 CARBON-IN-PULP TANK AGITATOR NEW	5	1 EA		INCL	45	INCL	5,500	1,700	NIL	NIL	7,200			7,200	7,200
13		NO. 4 CARBON-IN-PULP TANK SIZE 8'6" DIAMETER X 10' SCREEN, NEW	NIL	1 EA		200	45	9,000	6,500	1,450	NIL	NIL	7,950			7,950	16,950
14		NO. 4 CARBON-IN-PULP TANK BAFFLES NEW	NIL	INCL		INCL	45	INCL	INCL	INCL	NIL	NIL	INCL			INCL	INCL

MELIS ENGINEERING LTD.

PROJECT NO. MEL-164
MT. HANSEN PROJECT

CAPITAL COSTS ESTIMATE DETAILS

DATE: DECEMBER 21, 1988

AREA: CARBON-IN-PULP (continued)

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	B.O. MATERIAL UNT. CST. $	FREIGHT $	TAX $	DUTY $	TOTAL $	FIELD MATERIAL UNT. CST. $	FIELD MATERIAL TOTAL $	TOTAL MATERIAL $	TOTAL COST $
15		NO. 4 CARBON-IN-PULP TANK LAUNDER SCREEN, NEW	NIL	1 EA		INCL	45	INCL	1,000	450	NIL	NIL	1,450			1,450	1,450
16		NO. 4 CARBON-IN-PULP TANK AGITATOR NEW	5	1 EA		INCL	45	INCL	5,500	1,700	NIL	NIL	7,200			7,200	7,200
17		NO. 5 CARBON-IN-PULP TANK SIZE 8'6" DIAM. X 10' NEW	NIL	1 EA		200	45	9,000	6,500	1,450	NIL	NIL	7,950			7,950	16,950
18		NO. 5 CARBON-IN-PULP TANK BAFFLES NEW	NIL	INCL		INCL	45	INCL	INCL	INCL	NIL	NIL	INCL			INCL	INCL
19		NO. 5 CARBON-IN-PULP TANK LAUNDER SCREEN, NEW	NIL	1 EA		INCL	45	INCL	1,000	450	NIL	NIL	1,450			1,450	1,450
20		NO. 5 CARBON-IN-PULP TANK AGITATOR NEW	5	1 EA		INCL	45	INCL	5,500	1,700	NIL	NIL	7,200			7,200	7,200
21		CYANIDATION AND CIP AREA SUMP PUMP, 2"	2	1 EA		10	45	450	2,000	350	NIL	NIL	2,350			2,350	2,800
22		CARBON SAFETY SCREEN - SIZE 3' X 6' NEW	1.5	1 EA		40	45	1,800	10,000	700	NIL	NIL	10,700			10,700	12,500
SUB-TOTAL						1,050	45	47,250	77,000	19,050	0	0	96,050			96,050	143,300
		FIELD MATERIAL													9,600	9,600	9,600
SUB-TOTAL INSTALLED MECHANICAL																	152,900
		PROCESS PIPING				340	45	15,300					15,300			15,300	30,600
		ELECTRICAL				270	45	12,150					13,210			13,210	25,360
		INSTRUMENTATION				NIL	45	NIL					NIL			NIL	NIL
TOTAL DIRECT COSTS						1,660		74,700					124,560		9,600	134,160	208,860

MELIS ENGINEERING LTD.

CAPITAL COSTS ESTIMATE DETAILS

PROJECT NO. MEL-164
MT. HANSEN PROJECT

DATE: DECEMBER 21, 1988

AREA: ACID WASH

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	H.O. MATERIAL UNT. CST. $	FREIGHT $	TAX $	DUTY $	TOTAL $	FIELD MATERIAL UNT. CST. $	TOTAL $	TOTAL MATERIAL $	TOTAL COST $
1		CARBON TRANSFER PUMP - SIZE 1 1/2" NEW	1.5	1 EA		10	45	450	2,700	350	NIL	NIL	3,050			3,050	3,500
2		LOADED CARBON SCREEN - SIZE 3' X 6' NEW	1.5	1 EA		150	45	6,750	10,000	350	NIL	NIL	10,350			10,350	17,100
3		ACID WASH TANK F.R.P. (CLOSED TOP) SIZE 3'-6" DIAMETER X 14' NEW	NIL	1 EA		100	45	4,500	5,000	1,500	NIL	NIL	6,500			6,500	11,000
4		ACID WASH JOHNSON SCREEN - SIZE 35 MESH NEW	NIL	2 EA		10	45	450	1,000	150	NIL	150	1,300			1,300	1,750
5		ACID WASH EDUCTOR - SIZE 2" NEW	NIL	1 EA		5	45	225	500	50	NIL	NIL	550			550	775
6		ACID MAKE-UP TANK (CLOSED TOP) - FRP SIZE 6' DIAMETER X 6' NEW	NIL	1 EA		40	45	1,800	3,600	600	NIL	NIL	4,200			4,200	6,000
7		ACID WASH PUMP, 1 1/2" X 1" NEW	0.5	1 EA		5	45	225	900	250	NIL	NIL	1,150			1,150	1,375
8		CAUSTIC MAKE-UP TANK (CLOSED TOP) - SIZE 6'DIAMETER X 6' NEW	NIL	1 EA		40	45	1,800	3,200	1,400	NIL	NIL	4,600			4,600	6,400
9		CAUSTIC MAKE-UP TANK AGITATOR NEW	1	1 EA		20	45	900	2,000	350	NIL	NIL	2,350			2,350	3,250
10		CAUSTIC WASH PUMP, 1 1/2" X 1"	.5	1 EA		5	45	225	900	250	NIL	NIL	1,150			1,150	1,375
11		ACID AND CAUSTIC AREA SUMP PUMP, 2"	2	1 EA		5	45	225	2,500	350	NIL	NIL	2,850			2,850	3,075
12		ACID WASH FAN	0.5	1 EA		20	45	900	800	300	NIL	NIL	1,100			1,100	2,000
SUB-TOTAL						410	45	18,450	33,100	5,900	0	150	39,150			39,150	57,600
		FIELD MATERIAL													3,800	3,800	3,800
SUB-TOTAL INSTALLED MECHANICAL																	61,400
		PROCESS PIPING				130	45	5,850					5,900			5,900	11,750
		ELECTRICAL				230	45	10,350					11,490			11,490	21,840
		INSTRUMENTATION				NIL	45	NIL					NIL			NIL	NIL
TOTAL DIRECT COSTS						770		34,650					56,540		3,800	60,340	94,990

MELIS ENGINEERING LTD.

PROJECT NO. MEL-164
MT. NANSEN PROJECT

CAPITAL COSTS ESTIMATE DETAILS

DATE: DECEMBER 21, 1988

AREA: STRIPPING AND PRECIPITATION

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	H.O. MATERIAL UNT. CST. $	H.O. MATERIAL FREIGHT $	H.O. MATERIAL TAX $	H.O. MATERIAL DUTY $	H.O. MATERIAL TOTAL $	FIELD MATERIAL UNT. CST. $	FIELD MATERIAL TOTAL $	TOTAL MATERIAL $	TOTAL COST $
1		NO. 1 CARBON STRIP TANK (CLOSED TOP) - SIZE 5'6" DIAMETER X 20' NEW	NIL	1 EA		100	45	4,500	7,200	1,550	NIL	NIL	8,750			8,750	13,250
2		NO. 1 CARBON STRIP TANK JOHNSON UNDER FLOW SCREEN NEW	NIL	1 EA		5	45	225	500	75	NIL	75	650			650	875
3		NO. 1 CARBON STRIP TANK JOHNSON UNDER FLOW SCREEN NEW	NIL	1 EA		5	45	225	500	75	NIL	75	650			650	875
4		NO. 1 CARBON STRIP TANK JOHNSON OVER FLOW SCREEN NEW	NIL	1 EA		5	45	225	500	75	NIL	75	650			650	875
5		NO. 1 STRIPPED CARBON EDUCTOR, 2" NEW	NIL	1 EA		5	45	225	500	50	NIL	NIL	550			550	775
6		NO. 1 CARBON STRIP TANK INSULATION NEW	NIL	LS		60	45	2,700	2,000	800	NIL	NIL	2,800			2,800	5,500
7		NO. 2 CARBON STRIP TANK (CLOSED TOP) - SIZE 5'6" DIAMETER X 20' NEW	NIL	1 EA		100	45	4,500	7,200	1,550	NIL	NIL	8,750			8,750	13,250
8		NO. 2 CARBON STRIP TANK JOHNSON UNDER FLOW SCREEN NEW	NIL	1 EA		5	45	225	500	75	NIL	75	650			650	875
9		NO. 2 CARBON STRIP TANK JOHNSON UNDER FLOW SCREEN NEW	NIL	1 EA		5	45	225	500	75	NIL	75	650			650	875
10		NO. 2 CARBON STRIP TANK JOHNSON OVER FLOW SCREEN NEW	NIL	1 EA		5	45	225	500	75	NIL	75	650			650	875
11		NO. 2 STRIPPED CARBON EDUCTOR, 2" NEW	NIL	1 EA		5	45	225	500	50	NIL	NIL	550			550	775

MELIS ENGINEERING LTD.

PROJECT NO. MEL-164
MT. NANSEN PROJECT

CAPITAL COSTS ESTIMATE DETAILS

DATE: DECEMBER 21, 1988

MELIS ENGINEERING LTD

AREA: STRIPPING AND PRECIPITATION (continued)

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	H.O. MATERIAL UNT. CST. $	H.O. MATERIAL FREIGHT $	H.O. MATERIAL TAX $	H.O. MATERIAL DUTY $	H.O. MATERIAL TOTAL $	FIELD MATERIAL UNT. CST. $	FIELD MATERIAL TOTAL $	TOTAL MATERIAL $	TOTAL COST $
12		NO. 2 CARBON STRIP TANK INSULATION NEW	NIL	LS		60	45	2,700	2,000	800	NIL	NIL	2,800			2,800	5,500
13		BARREN ELECTROLYTE TANK SIZE 12' DIAMETER X 9' NEW	NIL	1 EA		60	45	2,700	9,200	2,000	NIL	NIL	11,200			11,200	13,900
14		BARREN ELECTROLYTE TANK INSULATION	NIL	1 EA		60	45	2,700	2,000	800	NIL	NIL	2,800			2,800	5,500
15		BARREN ELECTROLYTE HEAT COIL NEW	NIL	1 EA		20	45	900	1,000	300	NIL	NIL	1,300			1,300	2,200
16		BARREN ELECTROLYTE PUMP, 2" X 1 1/2" NEW	1.5	1 EA		15	45	675	1,200	300	NIL	NIL	1,500			1,500	2,175
17		BARREN ELECTROLYTE IN-LINE HEATER/ EXCHANGER INSULATION	NIL	1 EA		60	45	2,700	2,000	450	NIL	NIL	2,450			2,450	5,150
18		PREGNANT STRIP TANK, 6' DIAM. X 6'	NIL	1 EA		40	45	1,800	3,000	650	NIL	NIL	3,650			3,650	5,450
19		FILTER PRESS FEED PUMP, 1 1/2" X 1"	5	1 EA		15	45	675	1,500	300	NIL	NIL	1,800			1,800	2,475
20		FILTER PRESS, 30" X 30"	3	LS		40	45	1,800	42,500	2,500	NIL	NIL	45,000			45,000	46,800
21		ZINC FEEDER AND CONE	0.25	INCL		INCL	45	INCL	INCL	INCL	NIL	NIL	INCL			INCL	INCL
22		ZINC INJECTION PUMP	0.5	INCL		INCL	45	INCL	INCL	INCL	NIL	NIL	INCL			INCL	INCL
23		CARBON STRIPPING VENTILATION FAN NEW	1	1 EA		30	45	1,350	2,500	600	NIL	NIL	3,100			3,100	4,450
24		ACID DISSOLUTION TANK (FRP) NEW	NIL	LS		5	45	225	500	75	NIL	NIL	575			575	800
25		SLUDGE FILTER NEW	NIL	LS		20	45	900	50	75	NIL	NIL	125			125	1,025
26		SLUDGE DRYING OVEN NEW	5	1 EA		5	45	225	500	70	NIL	NIL	570			570	795
27		ACID TANK VENT FAN	0.5	1 EA		20	45	900	800	300	NIL	NIL	1,100			1,100	2,000
SUB-TOTAL						750	45	33,750	89,150	13,670	0	450	103,270			103,270	137,020
		FIELD MATERIAL													7,500	7,500	7,500
SUB-TOTAL INSTALLED MECHANICAL																	144,520
		PROCESS PIPING				220	45	9,900					9,600			9,600	19,500
		ELECTRICAL				190	45	8,550					9,480			9,480	18,030
		INSTRUMENTATION				60	45	2,700					4,000			4,000	6,700
TOTAL DIRECT COSTS						1,220		54,900					126,350		7,500	133,850	188,750

MELIS ENGINEERING LTD.

AREA: REFINING

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	F.O. MATERIAL UNT. CST. $	F.O. MATERIAL FREIGHT $	F.O. MATERIAL TAX $	F.O. MATERIAL DUTY $	F.O. MATERIAL TOTAL $	FIELD MATERIAL UNT. CST. $	FIELD MATERIAL TOTAL $	TOTAL MATERIAL $	TOTAL COST $
1		FLUX BOX NEW	NIL	LS		10	45	450	300	100	NIL	NIL	400			400	850
2		BULLION FURNACE C/W BLOWER NEW	1	LS		140	45	6,300	18,000	6,000	NIL	NIL	24,000			24,000	30,300
3		SLAG POT NEW	NIL	INCL		INCL	45	INCL	INCL	INCL	NIL	NIL	INCL			INCL	INCL
4		SLAG POT CART NEW	NIL	INCL		INCL	45	INCL	INCL	INCL	NIL	NIL	INCL			INCL	INCL
5		BULLION MOULD NEW	NIL	INCL		INCL	45	INCL	INCL	INCL	NIL	NIL	INCL			INCL	INCL
6		FURNACE VENT FAN AND HOOD NEW	1.5	1 EA		60	45	2,700	6,000	900	NIL	NIL	6,900			6,900	9,600
SUB-TOTAL						210	45	9,450	24,300	7,000	0	0	31,300			31,300	40,750
		FIELD MATERIAL													3,100	3,100	3,100
SUB-TOTAL INSTALLED MECHANICAL																	43,850
		PROCESS PIPING				100	45	4,500					4,400			4,400	8,900
		ELECTRICAL				75	45	3,375					3,730			3,730	7,105
		INSTRUMENTATION				NIL	45	NIL					NIL			NIL	NIL
TOTAL DIRECT COSTS						385		17,325					39,430		3,100	42,530	59,855

MELIS ENGINEERING LTD.

PROJECT NO. MEL-164
MT. HANSEN PROJECT

CAPITAL COSTS ESTIMATE DETAILS

DATE: DECEMBER 21, 1988

AREA: CARBON HANDLING

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	H.O. MATERIAL UNT. CST. $	H.O. MATERIAL FREIGHT $	H.O. MATERIAL TAX $	H.O. MATERIAL DUTY $	H.O. MATERIAL TOTAL $	FIELD MATERIAL UNT. CST. $	FIELD MATERIAL TOTAL $	TOTAL MATERIAL $	TOTAL COST $
1		CARBON ATTRITION TANK 5' DIAMETER X 5' CONE BOTTOM	NIL	1 EA		20	45	900	1,800	850	NIL	NIL	2,650			2,650	3,550
2		CARBON ATTRITION TANK AGITATOR	1	1 EA		20	45	900	1,500	900	NIL	NIL	2,400			2,400	3,300
3		ATTRITIONED CARBON EDUCTOR - SIZE 2" NEW	NIL	1 EA		5	45	225	500	50	NIL	NIL	550			550	775
4		CARBON SIZING SCREEN - SIZE 3' X 6' NEW	1.5	1 EA		150	45	6,750	10,000	850	NIL	NIL	10,850			10,850	17,600
5		CARBON STORAGE TANK - 5' DIAMETER X 5' CONE BOTTOM NEW	NIL	1 EA		20	45	900	2,000	850	NIL	NIL	2,850			2,850	3,750
6		BARREN CARBON EDUCTOR - SIZE 2" NEW	NIL	1 EA		5	45	225	500	50	NIL	NIL	550			550	775
7		EDUCTOR WATER TANK - 5' DIAMETER X 5' CONE BOTTOM NEW	NIL	1 EA		20	45	900	1,800	850	NIL	NIL	2,650			2,650	3,550
8		EDUCTOR WATER PUMP, 1 1/2" X 1" NEW	2	1 EA		5	45	225	1,500	350	NIL	NIL	1,850			1,850	2,075
SUB-TOTAL						245	45	11,025	19,600	4,750	0	0	24,350			24,350	35,375
		FIELD MATERIAL													3,000	3,000	3,000
SUB-TOTAL INSTALLED MECHANICAL																	38,375
		PROCESS PIPING				100	45	4,500					4,000			4,000	8,500
		ELECTRICAL				115	45	5,175					5,750			5,750	10,925
		INSTRUMENTATION				NIL	45	NIL					NIL			NIL	NIL
TOTAL DIRECT COSTS						460		20,700					34,100		3,000	37,100	57,800

MELIS ENGINEERING LTD

AREA: TAILS TREATMENT

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	H.O. MATERIAL UNT. CST. $	FREIGHT $	TAX $	DUTY $	TOTAL $	FIELD MATERIAL UNT. CST. $	FIELD MATERIAL TOTAL $	TOTAL MATERIAL $	TOTAL COST $
1		TAILS TRANSFER PUMP BOX NEW	NIL	1	EA	20	45	900	2,250	500	NIL	NIL	2,750			2,750	3,650
2		TAILS TRANSFER PUMP, 2 1/2" X 2" NEW	3	1	EA	20	45	900	4,500	350	NIL	NIL	4,850			4,850	5,750
3		TAILS TREATMENT TANK (CLOSED TOP) SIZE 9'6" DIAM. X 12' NEW	NIL	1	EA	200	45	9,000	8,000	1,750	NIL	NIL	9,750			9,750	18,750
4		TAILS TREATMENT TANK AGITATOR NEW	10	1	EA	INCL	45	0	5,500	700	NIL	NIL	6,200			6,200	6,200
5		TAILS TREATMENT EXHAUST FAN NEW	0.5	1	EA	40	45	1,800	1,500	500	NIL	NIL	2,000			2,000	3,800
6		TAILS AREA SUMP PUMP, 2" NEW	2	1	EA	10	45	450	2,000	350	NIL	NIL	2,350			2,350	2,800
7		TAILINGS PUMP BOX NEW	NIL	1	EA	15	45	675	2,250	500	NIL	NIL	2,750			2,750	3,425
8		NO. 1 TAILINGS PUMP, 2 1/2" X 2"	7.5	1	EA	20	45	900	4,500	350	NIL	NIL	4,850			4,850	5,750
9		NO. 2 TAILINGS PUMP, 2 1/2" X 2"	7.5	1	EA	20	45	900	4,500	350	NIL	NIL	4,850			4,850	5,750
10		NO. 3 TAILINGS PUMP, 2 1/2" X 2"	7.5	1	EA	20	45	900	4,500	350	NIL	NIL	4,850			4,850	5,750
11		NO. 1 TAILS LINE - SIZE 4" X 1600' SERIES 160	NIL	1	EA	100	45	4,500	4,800	2,800	NIL	NIL	7,600			7,600	12,100
12		NO. 2 TAILS LINE - SIZE 4" X 1600' SERIES 160 (SPARE)	NIL	1	EA	100	45	4,500	4,800	2,800	NIL	NIL	7,600			7,600	12,100
13		RECLAIM WATER LINE SIZE - 4' X 1400' INSULATED AND HEAT TRACED	NIL	1	EA	100	45	4,500	16,100	2,300	NIL	NIL	18,400			18,400	22,900
SUB-TOTAL						665	45	29,925	65,200	13,600	0	0	78,800			78,800	108,725
		FIELD MATERIAL													8,000	8,000	8,000
SUB-TOTAL INSTALLED		MECHANICAL															116,725
		PROCESS PIPING				200	45	9,000					9,100			9,100	18,100
		ELECTRICAL				280	45	12,600					13,210			13,210	25,810
		INSTRUMENTATION				40	45	1,800					5,000			5,000	6,800
TOTAL DIRECT COSTS						1,185		53,325					106,110		8,000	114,110	167,435

MT. HANSEN PROJECT

AREA: REAGENTS

ITEM EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	H.O. MATERIAL UNT. CST. $	H.O. MATERIAL FREIGHT $	H.O. MATERIAL TAX $	H.O. MATERIAL DUTY $	H.O. MATERIAL TOTAL $	FIELD MATERIAL UNT. CST. $	FIELD MATERIAL TOTAL $	TOTAL MATERIAL $	TOTAL COST $
1	CYANIDE MIX TANK (CLOSED TOP) SIZE 6'0 X 6'	NIL	1 EA		10	45	450	3,000	650	NIL	NIL	3,650			3,650	4,100
2	CYANIDE MIX TANK AGITATOR	1	1 EA		10	45	450	2,000	800	NIL	NIL	2,800			2,800	3,250
3	CYANIDE DISTRIBUTION PUMP	0.5	1 EA		10	45	450	800	250	NIL	NIL	1,050			1,050	1,500
4	CYANIDE TANK VENT FAN	0.5	1 EA		20	45	900	800	300	NIL	NIL	1,100			1,100	2,000
5	LIME SLURRY HOLDING TANK SIZE 6' DIAMETER X 6'	NIL	1 EA		10	45	450	2,900	650	NIL	NIL	3,550			3,550	4,000
6	LIME HOLDING TANK AGITATOR	1	1 EA		10	45	450	2,000	600	NIL	NIL	2,600			2,600	3,050
7	LIME SLURRY DISTRIBUTION PUMP	1	1 EA		20	45	900	2,500	350	NIL	NIL	2,850			2,850	3,750
8	SODIUM METABISULFITE MIXING TANK SIZE - 7' DIAMETER X 10'	NIL	1 EA		15	45	675	4,400	900	NIL	NIL	5,300			5,300	5,975
9	SODIUM METABISULFITE AGITATOR	1	1 EA		10	45	450	2,000	625	NIL	NIL	2,625			2,625	3,075
10	SODIUM METABISULFITE METERING PUMP	0.5	1 EA		10	45	450	1,000	250	NIL	NIL	1,250			1,250	1,700
11	FLOCCULANT MIX TANK SIZE 7' DIAMETER X 10'	NIL	1 EA		15	45	675	4,400	900	NIL	NIL	5,300			5,300	5,975
12	FLOCCULANT ASPIRATOR	NIL	1 EA		INCL	45	INCL	400	100	NIL	NIL	500			500	500
13	FLOCCULANT TANK AIR RING	NIL	LS		5	45	225	200	150	NIL	NIL	350			350	575
14	FLOCCULANT METERING PUMP	1	1 EA		10	45	450	800	250	NIL	NIL	1,050			1,050	1,500
15	COPPER SULFATE MIX TANK (FRP) SIZE 6' X 6'	NIL	1 EA		10	45	450	3,600	650	NIL	NIL	4,250			4,250	4,700
16	COPPER SULFATE MIX TANK AGITATOR	1	1 EA		10	45	450	2,000	625	NIL	NIL	2,625			2,625	3,075
17	COPPER SULFATE METERING PUMP	0.5	1 EA		10	45	450	1,000	350	NIL	NIL	1,350			1,350	1,800
18	REAGENTS AREA SUMP PUMP - SIZE 2" NEW REPLACEMENT	2	1 EA		10	45	450	2,500	550	NIL	NIL	3,050			3,050	3,500
SUB-TOTAL					195	45	8,775	36,300	8,950	0	0	45,250			45,250	54,025
	FIELD MATERIAL													4,000	4,000	4,000
SUB-TOTAL INSTALLED MECHANICAL																58,025
	PROCESS PIPING				120	45	5,400					5,150			5,150	10,550
	ELECTRICAL				265	45	11,925					13,200			13,200	25,125
	INSTRUMENTATION				NIL	45	NIL					NIL			NIL	NIL
TOTAL DIRECT COSTS					580		26,100					63,600		4,000	67,600	93,700

MT. HANSEN PROJECT

DATE: JANUARY [illegible]

AREA: PROCESS WATER

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE	TOTAL LABOUR	H.O. MATERIAL UNT. CST.	FREIGHT	TAX	DUTY	TOTAL	FIELD MATERIAL UNT. CST.	TOTAL	TOTAL MATERIAL	TOTAL COST
1		PROCESS WATER POLISHING TANK 14' DIAM. REQUIRES CLEANING AND INSPECTION OF RAKES AND DRIVE, NEW MOTOR (EXISTING THICKENER TANK)	1	1 EA		40	45	1,800	4,500	350	NIL	NIL	4,850			4,850	6,650
2		PROCESS WATER TANK SIZE - 14'DIAMETER (EXISTING THICKENER TANK)	1	1 EA		10	45	450	NIL	NIL	NIL	NIL	NIL			NIL	450
3		POLISHING TANK UNDER FLOW CENTRIFUGAL PUMP NEW REPLACEMENT, 3" X 2"	1	1 EA		10	45	450	3,000	350	NIL	NIL	3,350			3,350	3,800
4		PROCESS WATER PUMP, 3" X 2"	5	1 EA		5	45	225	6,000	350	NIL	NIL	6,350			6,350	6,575
SUB-TOTAL						65	45	2,925	13,500	1,050	NIL	NIL	14,550			14,550	17,475
		FIELD MATERIAL													3,000	3,000	3,000
SUB-TOTAL INSTALLED		MECHANICAL															20,475
		PROCESS PIPING				120	45	5,400					5,600			5,600	11,000
		ELECTRICAL				40	45	1,800					2,010			2,010	3,810
		INSTRUMENTATION				NIL	45	NIL					NIL			NIL	NIL
TOTAL DIRECT COSTS						225		10,125					22,160		3,000	25,160	35,285

MELIS ENGINEERING LTD.

PROJECT NO. MEL-164
MT. NANSEN PROJECT

CAPITAL COSTS ESTIMATE DETAILS

DATE: DECEMBER 21, 1988

AREA: PRIMARY WATER SUPPLY

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN. UN	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	H.O. MATERIAL UNT. CST. $	H.O. MATERIAL FREIGHT $	H.O. MATERIAL TAX $	H.O. MATERIAL DUTY $	H.O. MATERIAL TOTAL $	FIELD MATERIAL UNT. CST. $	FIELD MATERIAL TOTAL $	TOTAL MATERIAL $	TOTAL COST $
1		FRESH WATER PUMP	60	1 EA	30	45	1,350	10,000	2,500	NIL	NIL	12,500			12,500	13,850
2		DIESEL GENERATOR	80	1 EA	40	45	1,800	25,000	3,000	NIL	NIL	28,000			28,000	29,800
3		4 " WATER LINE (PUMP TO TANK)	NIL	NIL	160	45	7,200	NIL	NIL	NIL	NIL	NIL			NIL	7,200
4		4" WATER LINE INSULATION, 10,200'	NIL	LS	510	45	22,950	47,000	4,000	NIL	NIL	51,000			51,000	73,950
5		4" WATER LINE HEAT TRACE, 10,200'	NIL	LS	110	45	4,950	33,000	INCL	NIL	NIL	33,000			33,000	37,950
6		4" POLYKEN WRAP	NIL	LS	250	45	11,250	3,500	INCL	NIL	NIL	3,500			3,500	14,750
7		WATER STORAGE TANK - SIZE 16' DIAM X 16'	NIL	LS	360	45	16,200	9,400	4,000	NIL	NIL	13,400			13,400	29,600
8		DIESEL OIL STORAGE SUMP AND TANK	NIL	LS	10	45	450	1,000	500	NIL	NIL	1,500			1,500	1,950
9		6" WATER LINE (TANK TO MILL) 3,200' SERIES 160 SCLAIR PIPE C/W HEAT TRACE AND INSULATION	15	LS	200	45	9,000	55,000	5,000	NIL	NIL	60,000			60,000	69,000
10		4 DIESEL GENERATORS FOR HEAT TRACE	40	LS	10	45	450	35,000	4,000	NIL	NIL	39,000			39,000	39,450
SUB-TOTAL					1,680	45	75,600	218,900	23,000	0	0	241,900			241,900	317,500
		FIELD MATERIAL												5,000	5,000	5,000
SUB-TOTAL INSTALLED		MECHANICAL														322,500
		PROCESS PIPING			INCL	45	INCL					INCL			INCL	INCL
		ELECTRICAL			140	45	6,300					6,600			6,600	12,900
		INSTRUMENTATION			20	45	900					1,000			1,000	1,900
TOTAL DIRECT COSTS					1,840		82,800					249,500		5,000	254,500	337,300

MELIS ENGINEERING LTD.
PROJECT NO. MEL-164
MT. HANSEN PROJECT

CAPITAL COSTS ESTIMATE DETAILS

DATE: DECEMBER 21, 1988

AREA: AIR SUPPLY

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	H.O. MATERIAL UNT. CST. $	FREIGHT $	TAX $	DUTY $	TOTAL $	FIELD MATERIAL UNT. CST. $	TOTAL $	TOTAL MATERIAL $	TOTAL COST
1		HIGH PRESSURE AIR COMPRESSOR 100 CFM, 125 PSI	25	1 EA		30	45	1,350	12,500	2,000	NIL	NIL	14,500			14,500	15,850
2		LOW PRESSURE AIR BLOWER 1200 CFM, 15 PSI	100	1 EA		30	45	1,350	14,000	1,500	NIL	NIL	15,500			15,500	16,850
SUB-TOTAL						60	45	2,700	26,500	3,500	0	0	30,000			30,000	32,700
		FIELD MATERIAL													3,000	3,000	3,000
SUB-TOTAL INSTALLED		MECHANICAL															35,700
		PROCESS PIPING				80	45	3,600					3,600			3,600	7,200
		ELECTRICAL				75	45	3,375					5,120			5,120	8,495
		INSTRUMENTATION				NIL	45	NIL					NIL			NIL	NIL
TOTAL DIRECT COSTS						215		9,675					38,720		3,000	41,720	51,395

MELIS ENGINEERING LTD.

PROJECT NO. MEL-164
MT. HANSEN PROJECT

CAPITAL COSTS ESTIMATE DETAILS

DATE: DECEMBER 21, 1988

AREA: POWER GENERATION

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	H.O. MATERIAL UNT. CST. $	H.O. MATERIAL FREIGHT $	H.O. MATERIAL TAX $	H.O. MATERIAL DUTY $	H.O. MATERIAL TOTAL $	FIELD MATERIAL UNT. CST. $	FIELD MATERIAL TOTAL $	TOTAL MATERIAL $	TOTAL COST $
1		NO. 1 DIESEL GENERATOR	1350	1 EA		100	45	4,500	200,000	4,000	NIL	NIL	204,000			204,000	208,500
2		NO. 2 DIESEL GENERATOR	1350	1 EA		100	45	4,500	200,000	4,000	NIL	NIL	204,000			204,000	208,500
3		NO. 1 ENGINE REMOTE RAD	25	1 EA		INCL	45	INCL	INCL	INCL	NIL	NIL	INCL			INCL	INCL
4		NO. 2 ENGINE REMOTE RAD	25	1 EA		INCL	45	INCL	INCL	INCL	NIL	NIL	INCL			INCL	INCL
5		FUEL STORAGE	0.5	LS		60	45	2,700	5,000	500	NIL	NIL	5,500			5,500	8,200
6		FUEL TRANSFER PUMP	NIL	1 EA		20	45	900	1,000	200	NIL	NIL	1,200			1,200	2,100
7		FUEL DAY TANK	NIL	1 EA		20	45	900	500	100	NIL	NIL	600			600	1,500
SUB-TOTAL						300	45	13,500	406,500	8,800	0	0	415,300			415,300	428,800
		FIELD MATERIAL													5,000	5,000	5,000
SUB-TOTAL INSTALLED		MECHANICAL															433,800
		PROCESS PIPING				100	45	4,500					5,000			5,000	9,500
		ELECTRICAL				300	45	13,500					45,840			45,840	59,340
		INSTRUMENTATION				INCL	45	INCL					INCL			INCL	INCL
TOTAL DIRECT COSTS						700		31,500					466,140		5,000	471,140	502,640

PROJECT NO. MEL-164
MT. HANSEN PROJECT

AREA: BUILDINGS

MELIS ENGINEERING LTD

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	E.O. MATERIAL UNT. CST. $	FREIGHT $	TAX $	DUTY $	TOTAL $	FIELD MATERIAL UNT. CST. $	TOTAL $	TOTAL MATERIAL $	TOTAL COST $
1		REPAIRS TO EXISTING PRIMARY PUMP HOUSE	NIL		LS	80	45	3,600	2,000	500	NIL	NIL	2,000			2,000	5,600
2		OIL FIRED SPACE HEATER	NIL		LS	5	45	225	1,000	250	NIL	NIL	1,250			1,250	1,475
3		WATER STORAGE TANK REPAIRS WATER STORAGE TANK RELOCATION	NIL		LS	280	45	12,600	4,000	1,000	NIL	NIL	5,000			5,000	17,600
4		OIL FIRED SPACE HEATER	NIL		LS	5	45	225	1,000	250	NIL	NIL	1,250			1,250	1,475
5		COARSE ORE BUILDING DOORS	NIL		LS	80	45	3,600	2,000	300	NIL	NIL	2,300			2,300	5,900
6		COARSE ORE DUMP POCKET MODIFICATIONS	NIL		LS	80	45	3,600	5,000	800	NIL	NIL	5,800			5,800	9,400
7		CONCRETE CYANIDE BUILDING	NIL		LS	INCL	45	INCL	42,250	4,000	NIL	NIL	46,250			46,250	46,250
8		GRINDING BUILDING DOORS	NIL		LS	80	45	3,600	2,000	350	NIL	NIL	2,350			2,350	5,950
9		THICKENER BUILDING DOORS	NIL		LS	60	45	2,700	1,000	350	NIL	NIL	1,350			1,350	4,050
10		CYANIDE BUILDING INSULATION	NIL		LS	150	45	6,750	1,500	3,000	NIL	NIL	4,500			4,500	11,250
11		CYANIDE BUILDING WALL	NIL		LS	280	45	12,600	5,000	1,000	NIL	NIL	6,000			6,000	18,600
12		CYANIDE BUILDING ROOF REPAIRS	NIL		LS	80	45	3,600	1,000	300	NIL	NIL	1,300			1,300	4,900
13		CYANIDE BUILDING DOORS	NIL		LS	20	45	900	1,000	300	NIL	NIL	1,300			1,300	2,200
14		TEN TON CRUSHER CRANE	NIL		LS	30	45	1,350	24,000	1,200	NIL	NIL	25,200			25,200	26,550
15		BULLION FURNACE AREA WALLS	NIL		LS	60	45	2,700	2,500	500	NIL	NIL	3,000			3,000	5,700
16		BULLION FURNACE AREA DOORS	NIL		LS	15	45	675	1,000	200	NIL	NIL	1,200			1,200	1,875
17		DRY AREA WALLS	NIL		LS	200	45	9,000	20,000	3,000	NIL	NIL	23,000			23,000	32,000
18		TOILETS, SHOWERS, LOCKERS, ETC.	NIL		LS	INCL	45	INCL	INCL	INCL	NIL	NIL	INCL			INCL	INCL
19		INTERNAL STEEL	NIL		LS	320	45	14,400	20,000	3,000	NIL	NIL	23,000			23,000	37,400
20		GENERAL SITE CLEAN-UP	NIL		LS	250	45	11,250	1,000	NIL	NIL	NIL	1,000			1,000	12,250
21		ELECTRICAL (LIGHTING, PLUGS)	NIL		LS	230	45	10,350	32,000	1,500	NIL	NIL	33,500			33,500	43,850
22		ALLOWANCE FOR REMOVAL OF REDUNDANT EQUIPMENT	NIL		LS	500	45	22,500	NIL	NIL	NIL	NIL	NIL			NIL	22,500
SUB-TOTAL						2,805	45	126,225	169,250	21,300	0	0	190,550			190,550	316,775
		FIELD MATERIAL													INCL	INCL	INCL
SUB-TOTAL INSTALLED MECHANICAL																	316,775
		PROCESS PIPING				INCL	45	INCL					INCL				INCL
		ELECTRICAL				INCL	45	INCL					INCL				INCL
		INSTRUMENTATION				NIL	45	NIL					NIL				NIL
TOTAL DIRECT COSTS						2,805		126,225					190,550		INCL	190,550	316,775

AREA: HEATING AND VENTILATION

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	E.O. MATERIAL UNT. CST. $	E.O. MATERIAL FREIGHT $	E.O. MATERIAL TAX $	E.O. MATERIAL DUTY $	E.O. MATERIAL TOTAL $	FIELD MATERIAL UNT. CST. $	FIELD MATERIAL TOTAL $	TOTAL MATERIAL $	TOTAL COST $
1		GLYCOL HEATING SYSTEM	1	LS		360	45	16,200	25,000	4,000	NIL	NIL	29,000			29,000	45,200
2		EXHAUST HEAT EXCHANGER	1	1 EA		20	45	900	5,000	2,500	NIL	NIL	7,500			7,500	8,400
3		EXHAUST HEAT EXCHANGER FAN	3	1 EA		5	45	225	2,000	500	NIL	NIL	2,500			2,500	2,725
4		GLYCOL, 160 GAL.	NIL	LS		10	45	450	1,600	250	NIL	NIL	1,850			1,850	2,300
5		HEATING FLUID, 90 GAL.	NIL	LS		10	45	450	1,200	500	NIL	NIL	1,700			1,700	2,150
SUB-TOTAL						405	45	18,225	34,800	7,750	0	0	42,550			42,550	60,775
		FIELD MATERIAL													4,000	4,000	4,000
SUB-TOTAL INSTALLED MECHANICAL																	64,775
		PROCESS PIPING				INCL	45	INCL					INCL			INCL	INCL
		ELECTRICAL				40	45	1,800					1,500			1,500	3,300
		INSTRUMENTATION				NIL	45	NIL					NIL			NIL	NIL
TOTAL DIRECT COSTS						445		20,025					44,050		4,000	48,050	68,075

MELIS ENGINEERING LTD.

PROJECT NO. MEL-164
MT. HANSEN PROJECT

AREA: CAMP

ITEM EQUIP. NO. DES

ITEM	DESCRIPTION
1	24-MAN CAMP C/W KITCHEN DINER REC. UNIT WASHCAR 4-6 MAN SLEEP
2	INSTALLATION
3	FIRST AID ROOM
SUB-TOTAL	
	FIELD MATERIAL
SUB-TOTAL INSTALLED MECHANICAL	
	CIVIL
	ELECTRICAL
	INSTRUMENTATION
TOTAL DIRECT COSTS	

MELIS ENGINEERING LTD.

CAPITAL COSTS ESTIMATE DETAILS

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DATE: DECEMBER 21, 1988

PROJECT NO. MEL-164
MT. HANSEN PROJECT

AREA: LABORATORY

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	H.O. MATERIAL UNT. CST. $	FREIGHT $	TAX $	DUTY $	TOTAL $	FIELD MATERIAL UNT. CST. $	TOTAL $	TOTAL MATERIAL $	TOTAL COST $
1		LABORATORY EQUIPMENT	25	LS		800	45	36,000	80,000	5,000	NIL	NIL	85,000			85,000	121,000
2		LABORATORY BUILDING(REPAIR EXISTING)	NIL	LS		INCL	45	INCL	12,000	1,000	NIL	NIL	13,000			13,000	13,000
SUB-TOTAL						800	45	36,000	92,000	6,000	0	0	98,000			98,000	134,000
		FIELD MATERIAL													1,000	1,000	1,000
SUB-TOTAL INSTALLED MECHANICAL																	135,000
		PROCESS PIPING				INCL	45	INCL					NIL			NIL	INCL
		ELECTRICAL				165	45	7,425					9,000			9,000	16,425
		INSTRUMENTATION				NIL	45	NIL					NIL			NIL	NIL
TOTAL DIRECT COSTS						965		43,425					107,000		1,000	108,000	151,425

MELIS ENGINEERING LTD

PROJECT NO. MEL-164
MT. NANSEN PROJECT

CAPITAL COSTS ESTIMATE DETAILS

DATE: DECEMBER 21, 1988

AREA: SHOP AND MOBILE EQUIPMENT

ITEM	EQUIP. NO.	DESCRIPTION	H.P.	QUAN.	UN.	TOTAL MANHRS	MANHRS RATE ($/HOUR)	TOTAL LABOUR $	H.O. MATERIAL UNT. CST. $	H.O. MATERIAL FREIGHT $	H.O. MATERIAL TAX $	H.O. MATERIAL DUTY $	H.O. MATERIAL TOTAL $	FIELD MATERIAL UNT. CST. $	FIELD MATERIAL TOTAL $	TOTAL MATERIAL $	TOTAL COST $
1		SHOP BUILDING	NIL	LS		40	45	1,800	3,000	500	NIL	NIL	3,500			3,500	5,300
2		FRONT-END LOADER (USED)	NIL	LS		NIL	45	NIL	110,000	5,000	NIL	NIL	115,000			115,000	115,000
3		FORK LIFT TRUCK (USED)	NIL	LS		NIL	45	NIL	8,000	INCL	NIL	NIL	8,000			8,000	8,000
4		TRUCKS-1/2 TON, 2 (NEW)	NIL	LS		NIL	45	NIL	30,000	500	NIL	NIL	30,500			30,500	30,500
5		FIRST AID VEHICLE (USED)	NIL	LS		NIL	45	NIL	7,500	300	NIL	NIL	7,800			7,800	7,800
SUB-TOTAL						40	45	1,800	158,500	6,300	0	0	164,800			164,800	166,600
		FIELD MATERIAL													NIL	NIL	NIL
SUB-TOTAL INSTALLED MECHANICAL																	166,600
		PIPING				NIL	45	NIL					NIL			NIL	NIL
		ELECTRICAL				300	45	13,500					8,430			8,430	21,930
		INSTRUMENTATION				NIL	45	NIL					NIL			NIL	NIL
TOTAL DIRECT COSTS						340		15,300					173,230		NIL	173,230	188,530