PARSONS

ESTIMATE WORKSHEET

M.T.O. BY | PRICED BY | DATE 11/88 | SHEET ___ OF ___

JOB NO.: 6905-1 | CLIENT: MECA | TYPE OF ESTIMATE PRE FEASIBILITY. | CHECKED BY RMN

UNIT/AREA 60 AUXILIARY FACILITIES

DESCRIPTION CHILEAN SULPHUR STUDY

CAPACITY

ACCNT	DESCRIPTION	QUANTITY	UNIT	COST OR M/HRS PER UNIT: MATL	M/H	LAB $	MATERIAL EXPENSE	SUBCONTRACT: M/HRS	SUBCONTRACT: DOLLARS	LABOR: M/HRS	LABOR: DOLLARS	TOT'L DOLLARS
6300	SITE PREP											
	WAREHOUSE CAMP ROADS, ETC }	105100	ft²		4				$420,000			
6300	TOTAL AREA 60	105100	ft²						$420,000			$420,000
											25%	[illegible]
												[illegible]

CEB-2000 0 (4/81)

PARSONS
ESTIMATE WORKSHEET

M.T.O. BY: VM PRICED BY: VM DATE: 10/26/88 SHEET ___ OF ___

JOB NO.: 6905-1 CLIENT: CHILE TYPE OF ESTIMATE: CHECKED BY: [illegible]

UNIT/AREA: AREA 60 AUXIL. FACILITIES

DESCRIPTION:

CAPACITY:

ACCNT	DESCRIPTION	QUANTITY	UNIT	COST OR M/HRS PER UNIT: MATL	M/H	LAB $	MATERIAL EXPENSE	SUBCONTRACT M/HRS	SUBCONTRACT DOLLARS	LABOR M/HRS	LABOR DOLLARS	TOTAL DOLLARS
	ELECTRICAL											
	150KVA XFMER 6.6KV/400V PAD MTD OUT DOOR TYPE	3	EA	5000	80		15000			240		
	500KVA - SAME	1	EA				13000			100		
	75KVA - SAME	1	EA				5000			80		
	TOTAL					$5	33000			420	2100	35,100
											[illegible]	14,900
												50,000

CES-2000-0 (4/81)

PARSONS

ESTIMATE WORKSHEET

M.T.O. BY
PRICED BY AB
DATE 11/88
SHEET ___ OF ___
JOB NO.: 6905-1
CLIENT: MECA
TYPE OF ESTIMATE PRE FEASIBILITY.
CHECKED BY [illegible]
UNIT/AREA 70 PORT
DESCRIPTION CHILEAN SULPHUR STUDY
CAPACITY

ACCNT		QUANTITY	UNIT	COST OR M/HRS PER UNIT: MATL	M/H	LAB $	MATERIAL EXPENSE	SUBCONTRACT: M/HRS	SUBCONTRACT: DOLLARS	LABOR: M/HRS	LABOR: DOLLARS	TOTAL DOLLARS
	SUMMARY											
2000	MATERIALS HANDLING						322,000					
	FREIGHT						26,000					
	TOTAL MAJOR EQUIPMENT						348,000					
	FACTORED TOTAL -									3.0		1,050,000
	ROADS, PARK, ETC.								400,000			
	BUILDINGS								10,000			
	OTHER CIVIL (YARD CLEANUP)								10,000			
												420,000
	TOTAL CONSTR COST AREA 70											1,470,000

MAJOR EQUIP 348K
BULK MTL [illegible] 491K
LABOR 211K
ROADS/RR 400K
BLDGS 10K
OTHER CIVIL 10K

TOTAL 1,470K

PARSONS

ESTIMATE WORKSHEET

M.T.O. BY
PRICED BY
DATE 11/88
JOB NO.: 6905-1
CLIENT: MEGA
TYPE OF ESTIMATE PRE FEASIBILITY.
SHEET ___ OF ___
UNIT/AREA 70 PORT
CHECKED BY [illegible]
DESCRIPTION CHILEAN SULPHUR STUDY.
CAPACITY

ACCNT		QUANTITY	UNIT	COST OR M/HRS PER UNIT: MATL	M/H	LAB $	MATERIAL EXPENSE	SUBCONTRACT: M/HRS	DOLLARS	LABOR: M/HRS	DOLLARS	TOTAL DOLLARS
4800	ROADS. PAVING. RAILROADS.											
	AT PORT											
	EXCAV & FINE GRADE	21600	SY		2.50				54,000			
	8" BASE	21600	SY		6.00				130,000			
	4" A/C PAVING	21600	SY		6.00				130,000			
	PRIME/SEAL .03 GAL/SY	43200	SY		.05				2,000			
4800	TOTAL AREA 70	21600	SY		(14.63)				316,000			316,000
											25%	79[illegible]
												[illegible]

CEB 2000 0 (4/81)

P. SONS

ESTIMATE WORKSHEET

M.T.O. BY

PRICED BY

JOB NO.: 6905-1 CLIENT: MEGA

DATE 11/88

UNIT/AREA 70 PORT

TYPE OF ESTIMATE PRE FEASIBILITY.

SHEET ___ OF ___

CHECKED BY [illegible]

DESCRIPTION CHILEAN SULPHUR STUDY.

CAPACITY

ACCNT		QUANTITY	UNIT	COST OR M/HRS PER UNIT: MATL	M/H	LAB $	MATERIAL EXPENSE	SUBCONTRACT: M/HRS	DOLLARS	LABOR: M/HRS	DOLLARS	TOTAL DOLLARS
4900	BUILDINGS-											
	TUNNEL EXHAUST VENT BLDG 8X8X8	2	EA		2000				4000			
	600 CFM EXHAUST FANS - 1 HP MOTOR	2	EA		1000				2000			
									6000			6000
											25%	4
												10000

CES 2000 0 (4/81)

PARSONS

ESTIMATE WORKSHEET

M.T.O. BY　　PRICED BY　　DATE 11/88　　SHEET ___ OF ___

JOB NO.: 6905-1　　CLIENT: MEGA　　TYPE OF ESTIMATE PRE FEASIBILITY.　　CHECKED BY DML

UNIT/AREA 70 PORT

DESCRIPTION CHILEAN SULPHUR STUDY.

CAPACITY

ACCNT		QUANTITY	UNIT	COST OR M/HRS PER UNIT: MATL	M/H	LAB $	MATERIAL EXPENSE	SUBCONTRACT: M/HRS	SUBCONTRACT: DOLLARS	LABOR: M/HRS	LABOR: DOLLARS	TOTAL DOLLARS
5300	OTHER CIVIL WORK											
	STORAGE YARD CLEANUP	10000	TN		1				10000			
5300	TOTAL AREA 70	10000	TN						10000			10000

CES-2000 0 (4/81)

SECTION 10

OPERATING COSTS

This section covers the operating costs for the mine, the process plant, the port and the administration and other general costs of the plant. Selling and ocean freight costs are excluded.

The salaries were based on data from the El Hueso Project, which was prepared in the first quarter of 1988. The work schedule was assumed to be 8 hours per day and 40 hours per week for 270 calendar days per year.

No attempt has been made to determine what effect the shutdown during the winter months (95 days) would have on the labor force. No cost allowance has been made to keep any of the personnel on the payroll during that period except a small security unit. This could result in serious operating problems if the experienced personnel do not return after the shutdown.

10.1 SUMMARY OF OPERATING COSTS

Department	U.S. $ Per Year	Per tonne of Ore Milled	Per tonne of sulfur Produced
Mine	1,821,000	0.8203	3.6420
Process	10,379,000	4.6754	20.7580
Port	292,000	0.1315	0.5840
Administrative	3,675,000	1.6554	7.3500
Total	16,167,000	7.2826	32.3340

The above figures are based on (360 x 24 x 270 x 0.9516) - 2,219,892.48 tonnes of ore milled per year for a production of 500,000 tonnes of sulfur.

10.2 MINE OPERATING COSTS

These costs include labor, supplies and maintenance as shown below:

10.2.1 LABOR

A. Operations Staff Manpower and Cost

Job Description	No. Req'd	Monthly Salary	Total Cost/Month
Mine Superintendant	1	3,890	3,890
Mining Engineer	1	2,865	2,865
Surveyor	1	1,085	1,085
Draftsman	1	915	915
Rodman	1	615	615
Clerk	4	615	2,460
Subtotal			$11,830

B. Maintenance Staff Manpower and Cost

Foreman	4	2,090	8,360
Subtotal			$8,360

C. Daily Paid Operations Personnel and Cost

Dozer Operators	8	840	6,720
FEL Operators	4	840	3,360
Grader Operators	1	840	840
Truck Drivers	20	735	14,700
Small Vehicle Drivers	4	615	2,460
Subtotal			$28,080

D. Daily Paid Maintenance Personnel and Cost

Mechanics	12	840	10,080
Mechanics Helper	16	735	11,760
Subtotal			$21,840

E. Total Mine Labor Costs

Per month - $70,110

Per year @ 270 days worked

$\frac{270}{365} \times 12 \times 70,110$ - $622,000

10.2.2 OPERATING SUPPLIES

A. Fuel

Assume 7.5 hours/shift per vehicle -
(7.5 x 3 x 270) - 6075 hours/year.

	No. Vehicles	Liters Per Hr.	Liters Per Year	Cost $/Liter	$/Year
Ripping	1	70	425,250	0.20	85,100
Loading	1	104	631,800	0.20	126,400
Hauling	5	47	1,427,625	0.20	285,500
Misc.	1/3	40	243,000	0.20	16,200
		Subtotal			513,200
		Other Misc @ 10%			51,300
		Total (Approx)			565,000

B. Tires

	Cost/Tonne	Tonnes Handled/Year	
Loading	$0.004		
Hauling	0.080	Ore	2,214,000
Miscellaneous	0.006	Overburden	361,000
Total	$0.09	Total	2,575,000

Total Annual Tire Cost-2,575,000 x 0.09 or $232,000 (approx.)

10.2.3 MAINTENANCE SUPPLIES

Assume that maintenance supply costs are 1.5 times the maintenance labor costs.

Labor - 8,360 + 21,840 - $30,200/month
or 30,200 x 8.87 - 268,000/year

Maintenance supplies cost

268,000 x 1.5 - $402,000

10.2.4 SUMMARY OF ANNUAL MINE OPERATING COSTS

Labor	622,000
Operating Supplies	
Fuel	565,000
Tires	232,000
Maintenance Supplies	402,000
Total Annual Cost	$1,821,000

10.3 PROCESS OPERATING COST

These costs include labor, supplies, power and maintenance, as shown below.

10.3.1 LABOR

A. Operations Staff Manpower and Cost

Job Description	Number	Monthly Pay/Man	Total Monthly Pay
Mill Superintendent	1	3,890	3,890
Asst. Mill Supt., Comminution	1	2,865	2,865
Asst. Mill Supt., Beneficiation	1	2,865	2,865
Metallurgist/Chemist	1	2,865	2,865
Laboratory Assistants	5	895	4,475
Foreman, Comminution	1	2,120	2,120
Foreman, Flotation	1	2,120	2,120
Foreman, Refining	1	2,120	2,120
Shift Foreman, Comminution	4	1,230	4,920
Shift Foreman, Beneficiation	4	1,230	4,920
Sub-Total			33,160
B. Maintenance Staff Manpower and Cost			
Maint. Foreman, Comminution	1	2,090	2,090
Maint. Foreman, Beneficiation	1	2,090	2,090
Electrical Maint. Foreman	1	2,090	2,090
Instrument Maint. Foreman	1	1,640	1,640
Sub-Total			7,910
Total Staff	24		41,070
C. Daily-Paid Operations Personnel			
Crushing Operators	4	840	3,360
Grinding Operators	4	840	3,360
Pipeline Operators	2	840	1,680
Flotation Operators	4	840	3,360
Concentrate Handling Operators	4	780	3,120
Refining Operators	4	840	3,360
Helpers	6	735	4,410
Samplers	6	735	4,410
Laborers	8	615	4,920
Sub-Total			31,980

D. Daily-Paid Maintenance Personnel

Fitters/Welders	8	840	6,720
Assistant Mechanics	8	735	5,880
Electrical Technicians	3	735	2,205
Instrument Technicians	2	735	1,470
Electrical Helpers	2	615	1,230
Sub-Total			17,505
Total Daily-Paid Personnel			49,485

E. Total Process Plant Labor Costs

Per month - $ 90,555

Per year @ 270 days worked

$\frac{270}{365} \times 12 \times 90,555$ - $ 804,000

10.3.2 OPERATING SUPPLIES

A. Bunker C Fuel Oil

The estimated quantities of Bunker C used for drying the sulfur concentrate and generating steam for melting the sulfur are

(325 + 244) - 569 gph

The number of liters per year is

(24 x 270 x 569 x 3.785) - 13,955,749

The estimated cost is 50 pesos per liter. At an exchange rate of 250 pesos to the dollar, the annual cost for Bunker C is $ 2,791,150, say $ 2,791,000.

B. Reagents

The following tabulation provides an approximation of the anticipated reagent consumption. The collector is kerosene. Lime is used in the melter as described in Section 7. Sodium Cyanide is used to depress the iron. The flocculant is used in all the thickeners.

	Kg./Tonne	Kg/Year	$/Kg	$/Year
Pine Oil	0.018	41,990	2.172	91,202
MIBC	0.007	16,330	2.48	40,498
Kerosene	0.07	163,296	0.267	43,600
Lime (60%)	2.5	5,832,000	0.132	769,824
Flocculant	0.015	34,992	3.45	120,722
NaCN	0.007	16,330	2.4	39,192
Total				1,105,038

For reagents, use $1,105,000 per year.

C. Steel

Parsons has assumed that the steel consumption for a sulfur ore will be half of that for a typical porphyry copper ore.

	Kg./Tonne	Kg/Year	$/Kg	$/Year
Liners				
All Crushers	0.016	37,325	1.4	52,255
Ball Mill	0.043	100,310	1.7	170,527
Grinding Media				
Balls	0.347	809,482	0.65	526,163
Total Steel				801,200

Assume $ 801,000 per year for steel.

10.3.3 POWER COST

The equipment lists presented in Tables 5-3 and 7-1 show a total operating horsepower of 14,921.7 kWh. This is equivalent to (14,921.7 x 0.824 x 0.7457 x 24 x 270) = 59,413,435 kWh per year. At a cost of 0.07/kWh the annual power cost is $4,158,941, say $4,159.000 per year.

10.3.4 MAINTENANCE SUPPLIES

The cost of the major equipment, excluding pipes, bins and tanks, is $ 17,982,572. Assuming an annual expenditure for upkeep of 4% of the major equipment cost, the cost per year is ($ 17,982,572 x 0.04) = $ 719,303, say $ 719,000.

10.3.5 SUMMARY OF ANNUAL PROCESS PLANT OPERATING COSTS

Labor	$ 804,000
Operating Supplies	
Fuel	2,791,000
Reagents	1,105,000
Steel	801,000
Power	4,159,000
Maintenance Supplies	719,000
Total Annual Cost	$10,379,000

10.4 PORT OPERATING EXPENSES

This section covers the costs for receipt, stockpiling and loading of sulfur slates into ocean going vessels.

10.4.1 MANPOWER AND COSTS

A. Staff

Job Description	Number	Monthly Pay/Man	Total Monthly Pay
Port Superintendent	1	3,890	3,890
Shift Foreman	4	2,120	8,480
Maintenance Foreman	1	2,090	2,090
Sub-Total	6		14,460
B. Daily-Paid Personnel			
Mechanics	2	840	1,680
Electrical Technician	1	735	735
Helpers	4	735	2,940
Laborers	6	615	3,690
Sub-Total	13		9,045
C. Total Manpower/Cost			
Total/Month	19		23,505

Cost/Year (23,505 x 8.87) - $ 208,000

10.4.2 MAINTENANCE AND SUPPLY COST

Assuming that the total capital cost of the equipment which requires routine maintenance is $900,000, the maintenance cost will be 4% of that figure - (0.04 x 900,000) - $ 36,000. Cost of other supplies - gasoline, diesel, tires and office supplies is assumed to be $ 6,000 or an overall cost of $ 42,000 per year.

10.4.3 POWER COST

Assume total power is 150 HP, then the overall power cost is (150 x 24 x 270 x 0.824 x 0.7457 x 0.07) - $ 42,000 per year at a power cost of $ 0.07/kWh and a load factor of 82.4%.

10.4.4 SUMMARY OF ANNUAL PORT OPERATING COSTS

	$/Year
Manpower	$ 208,000
Maintenance/Supplies	42,000
Power	42,000
Total	$ 292,000

10.5 ADMINISTRATIVE AND GENERAL OPERATING COSTS

This section covers managerial, security, camp, pipe patrol, road maintenance, warehousing, machine shop and overall upkeep costs not included in the previous sections.

10.5.1 LABOR

A. Staff

Job Description	Number	Monthly Pay/Man	Total Monthly Pay
Manager	1	4,480	4,480
Yard Superintendent	1	2,865	2,865
Power House Superintendent	1	3,890	3,890
Warehouseman/Purchasing Agent	1	2,865	2,865
Chief Clerk	1	2,865	2,865
Paramedic	2	2,865	5,730
Chief of Security/Safety Engineer	1	2,865	2,865
Watchmen	4	1,085	4,340
Cooks	3	1,085	3,255
Executive Secretary	1	915	915
Accounting Clerks/Secretaries	8	615	4,920
Chief Engineer	1	2,865	2,865
Elec./Mechanical Superintendent	1	3,890	3,890
Shop Foreman	1	840	840
Sub-Total	27		46,585

B. Daily Paid Personnel

Surveyors	3	1,085	3,255
Shop Mechanics (Montandon)	6	840	5,040
Power Plant Personnel	6	840	5,040
Helpers	10	735	7,350
Laborers	20	615	12,300
Draftsmen	3	915	2,745
Sub-Total	47		35.730

C. Total Administrative and General Labor Costs

Per month	82,315
Per year (82,315 x 8.87) -	730,000

10.5.2 OPERATING SUPPLIES

The major costs involved are for fuel, tires, office supplies, food and special clothing.

A. Fuel

For gasoline, assume 200 liters/day at $ 0.32/liter = (200 x 0.32 x 270) = $ 17,280 per year.

For diesel, assume 1000 liters per day for vehicles and space heating at $ 0.20/liter = (1000 x 0.2 x 270) = $ 54,000 per year.

Total fuel cost: $ 713,000.

B. Tires

Assume a cost of $ 0.09 per tonne hauled and that 200 tonnes of various commodities are hauled per day. Then the annual tire cost is (0.09 x 200 x 270) = $ 4,860.

C. Office Supplies

Assume an annual cost of $ 2,500.

D. Food, Clothing and Miscellaneous Supplies

Assume that, an equivalent of 90 personnel need to be fed each day at a cost of $ 5.00 each. Also assume that special clothing needs (around the melters, for example) and other miscellaneous supplies, amounts to $ 1 per day. Then the annual cost is (90 x 6 x 270) = $ 145,800.

E. Total cost of operating supplies

The total annual cost is (17,280 + 4,860 + 2,500 + 145,800) = $170,440. Say $ 170,000.

10.5.3 MAINTENANCE SUPPLIES

Assume that the annual cost is 2.5% of the applicable capital cost for items that will wear out such as the pipeline(s) between the upper and lower plants and mobile equipment. Parsons estimates that this capital cost investment is eight million dollars. The maintenance cost is then (0.025 x 8,000,000) = $200,000.

10.5.4 CONTRACT SERVICES

There are two major contracts, viz, haulage of personnel and delivery of the sulfur to the port facility.

A. Haulage of Personnel

Assume that all personnel reside in Diego de Almagro. Personnel working in the refinery area will commute daily while those working at the mine site will be relieved at ten day intervals. In order to accomplish the transportation assignments it will be necessary to make three round trips per day to the lower site and one round trip every ten days to the mine area. For this purpose thirty-passenger buses will be used. A reasonable return on the investment and profit can be made by the operator if he charges $ 60 per round trip to the lower area and $ 100 per round trip to the upper area. The costs will then be [(3 x 60 x 270) + (100 x 270/10)] = $ 51,300 per year.

B. <u>Sulfur Haulage</u>

The annual production of sulfur is 500,000 tonnes. Assume a freight charge of $ 5 per tonne from the refinery to the port. The annual cost is then (500,000 x 5) = $ 2,500,000.

C. <u>Total Annual Cost for Contracts</u>

Total cost per year = (51,300 + 2,500,000) = $ 2,551,300.

10.5.5 COST FOR THE PLANT DURING SHUT DOWN PERIOD.

The facilities will be shut down for some 95 days per year. During that time there will be a need for watchmen and heating of some of the facilities together with some transportation expenses. Assume that four watchman with one supervisor takes care of the manpower needs at an average monthly cost of $ 1,305 per man then the labor cost would be approximately $ 6,525 per month to which must be added $ 790 for food. The cost for fuel and transportation, in company vehicles, is estimated to be another $ 750. So the total cost for "looking after" the plants during the off season is 3(6,525 + 790 + 750) = 24,000. This is assuming no maintenance or other activities take place.

10.5.6 SUMMARY OF ANNUAL ADMINISTRATIVE AND GENERAL COSTS

	Cost $/Year
Manpower	730,000
Supplies	170,000
Maintenance	200,000
Contracts	2,551,000
Off Season Expenses	24,000
Total	3,675,000

SECTION 11

FINANCIAL ANALYSIS

The economics of the project have been analyzed using a simplified discounted cash flow technique. Under "Base Case" conditions the project is projected to have an internal rate of return (IRR) of slightly in excess of 19%. The economics are highly sensitive to sulfur selling price changes but only slightly sensitive to changes in operating cost. A ten percent change in capital cost results in a four to five percent change in the IRR.

The purchasing power of the Chilean peso is rapidly eroding. So called "price level" accounting procedures are employed in Chile to compensate for changing monetary values and special indices have been developed. To avoid this complication, the entire economic analysis has been made in U S currency.

Much of the project equity would be in Chilean peso currency. These funds can be acquired at a very considerable discount (as much as 40%) using hard currency for a "debt for equity swap." Such an approach would make this project much more attractive. This analysis however takes no account of such benefits. The entire analysis is presented in hard currency numbers, as already stated.

This section of the report defines the basis for the cash flow summaries and tabulations presented in Tables 11-1 through 11-14. The basis of the capital cost estimate is described, financing assumptions are described and justified and Chilean taxation is discussed. Some comments are furnished on hard currency cost and sulfur price escalation. All parameters used in the cash flow analyses are defined in Section 11.5. The results of sensitivity analyses are presented in Section 11.6.

11.1 CAPITAL COST BASIS

The capital cost estimate for the mine, process plant and infrastructure is presented in Section 9 of this report.

In addition to the above, capital provision must be made for the capitalization construction loan (see 11.2.3 below), which amounts to $3.9 million. Furthermore working capital will be required for the project to provide for such items as spare parts and the cost of operations until receipt of revenue. Working capital is difficult to estimate at this early stage. This analysis contains a working capital provision for spare parts (calculated at ten percent of the equipment costs) and the cost of three months of operation. Total working capital is thus estimated at $6.6 million.

This analysis excludes owners' costs for the sensitivity studies, head office charges and the like.

The base case capital cost estimate and the economic analysis is composed as follows:

Cost of the Mine, Process Plant and Infrastructure	$107,600,000
Cost of Engineering and Procurement Services	$ 10,000,000
Contingency at 15%	$ 17,600,000
Capital Cost Construction Loan Interest	$ 3,900,000
Working Capital	$ 6,600,000
TOTAL	$145,700,000

11.2 FINANCIAL ASSUMPTIONS

The financing structure assumed for the purpose of economic evaluation of the MECA Sulfur Project has been structured to conform with the known project requirements and with the normal financing practice for a project of this kind. Debt financing has been assumed in order to optimize economic performance, but excessive leverage, which could not be financed, has been avoided.

Four sources of capital funding have been assumed:

- Equity
- A construction loan to meet in-country construction costs until the inception of operations
- Export credit financing for all off-shore equipment and material acquisitions
- Preferred equity (non voting shares drawing pre-determined interest)

11.2.1 EQUITY

This evaluation assumes that construction costs and costs for Chilean bulk materials would be met by a combination of Chilean loans and equity. It has been assumed that the total equity contribution to the capital cost will amount to 30% of total project cost. Part of this equity would be employed for foreign equipment procurement and the remainder would be utilized in Chile for construction and materials. For simplicity, the evaluation assumes that the entire equity contribution is made two years before the project start-up. It is expected that equity contributions in Chilean pesos might benefit from a "debt swap" approach whereby local currency is acquired at a very substantial discount. This economic analysis, as stated above, takes no account of such benefits.

11.2.2 EXPORT CREDIT FINANCING

Of the three sources of debt financing, an export credit based loan offers the most favorable interest and repayment terms. For a project of this nature in Chile, most of the equipment would have to be imported. Although bulk materials are available in Chile, quantities are limited and, in some instances, insufficient to support a project such as this. This evaluation is based on Parsons best estimate of the capital required for equipment and material procured off-shore. It was assumed that all such imports would be subject to export credit for financing. Financing terms were as follows:

o Loan amount	85% of cost FOB country of origin
o Interest rate	9.65%
o Grace period	1 year
o Loan period	10 years
o Principal amortization	9 years

For simplicity, this model assumes that the center of gravity of export credit expenditure occurs one year before mine start-up.

It is assumed that the balance of the foreign source capital cost (15% payable in hard currency) would be part of the equity contribution by the shareholders.

11.2.3 PREFERRED EQUITY AND CONSTRUCTION LOAN

This evaluation assumes that Chilean capital costs, not covered by equity, would be financed by the issuance of preference shares. Such shares would be non voting and would bear real interest at the London Interbank Offered Rate (LIBOR) plus a premium of, say, two percent. The term of the loan would be for ten years, with principal repayment amortized over the period.

Such a loan may not be available until construction is complete. A construction loan may be required during the construction period, secured by the contractor or by others. This analysis assumes that a construction loan for the amount of the preferred equity is required. A one year loan period has been assumed with interest at LIBOR plus two percent. The construction loan is assumed to be paid off once the preferred shares are issued. Interest for the construction loan is assumed to be capitalized.

11.3 TAXATION

This study has not included an analysis of how best to incorporate for the Chilean sulfur venture. Such a study would be premature at present. Two alternate approaches to the project have been foreseen:

- o Incorporate off-shore with an operating branch in Chile

- o Incorporate as a Chilean company

All corporations in Chile pay a ten percent "First Category Tax" on income.

Foreign corporations with Chilean branches pay "Additional Tax" at a rate of 40% upon remittance of funds however ten percent of the amount subject to the Additional Taxation is deducted from the Additional Tax payable. Thus net taxation for foreign corporations with Chilean branches is 37%.

Dividends from Chilean companies are subject to surtax. This is a progressive personal tax ranging from five to 50%. This tax is in addition to the First Category Tax.

For the purpose of this analysis, incorporation as a foreign company with a Chilean branch is assumed.

Transactions in Chile are subject to value added tax (IVA). Capital goods, forming part of capital contribution and imported into Chile, are generally exempt from IVA. The tax is payable on in-country transactions but may be recovered as a credit or reimbursed when incurred to produce exports. This position needs a proper investigation and analysis but it is known that at least one recent major project has not been burdened with IVA. For the purpose of this economic analysis, it has been assumed that no IVA will be payable.

Corporate tax is levied on income, less deductions for business expenses. Depreciation on fixed assets, except land, is deductible and a tabulation of US Internal Revenue Service (IRS) guidelines for mining projects is given below:

	Number of Years	
	Normal	Accelerated
Heavy machinery	10	3
Installations	5	1
Permanent buildings	25	8
Provisional buildings	10	3
Trucks	7	2
Heavy tools	10	3
Light tools	5	1

A corporation may opt for either normal or accelerated depreciation. Losses are deductible and there is no limit on carry-forward of losses. It is not permissible to group profitable and unprofitable affiliates for tax purposes.

This analysis assumes that accelerated depreciation is adopted.

11.4 COST AND SULFUR PRICE ESCALATION

No prediction of sulfur price trends for sulfur is included in the economic, analysis. Escalation has been set at zero. Although it is recognized that cost escalation will take place, no recognition of this is made in this analysis. The underlying assumption is that escalation will be matched by the sulfur price escalation.

The effects of sulfur cost and operating cost escalation, in isolation, can be inferred from the sensitivity analysis which demonstrates the effect of variations in various economic factors.

11.5 PARAMETERS FOR ECONOMIC ANALYSIS - BASE CASE

The following economic parameters constitute the base case economics model:

Capital cost	$145,700,000
Ore reserve life	11.5 years
Daily production rate of product	1850 tonnes
Operating days per year	270
Sulfur price, FOB Chanaral	$95/tonne
Operating Cost per tonne of product	$32.33
Export credit interest rate	9.65%
Preferred shares dividend	10.5%
Effective tax rate	37%
Discounting rate for NPV calculation	10%

11.6 SENSITIVITY ANALYSIS

This prefeasibility study does not warrant a full scale risk analysis and extensive economic evaluation. Insufficient data are available to justify such extensive study. Sensitivity to capital cost, sulfur price and operating cost has been tested by testing each of these "macro variables" at plus and minus ten percent variation from the base case conditions.

The project is most sensitive to sulfur price variation and least sensitive to operating cost of the variables tested. The project results are summarized below:

Condition	Internal Rate of Return Percent	Net Present Value of Return on Investment $000
Base Case	19.2	24,783
10% Escalation of capital cost	15.2	15,110
10% Reduction of capital cost	23.9	34,233
10% Escalation of operating cost	17.0	18,563
10% Reduction in operating cost	21.5	31,002
10% Escalation in sulfur price	29.0	53,058
10% Reduction in sulfur price	12.0	5,237

Table 11-1 - Economic Evaluation Summary - Base Case

NEDA SULFUR PROJECT, CHILE

ECONOMIC EVALUATION SUMMARY BASE CASE

Total project capital cost:	$145.700
Production	1,650 tonnes/operating day
Operating Days/Year	270
Sale Price	$95.00 /ton
Operating Costs	$32.33 /ton

Financing Assumptions:

Equity	30.0%	$43.710

Debt	Preferred (Debt 1)	Export Credits (Debt 2)	
	27.5%	42.5%	
amount	$40.068	$61.923	
debt rate	10.50%	9.65%	
debt term	10 years	10 years	
repayat.term	10 year	9 year	principal amortization)
payment	6.662 per year	10.603 per year, starting in year	3

Interest only for years prior to production, interest and principal (level payment amortization) for years 3 through 12.

Inflation Rate	0.0%	
Effective tax rate	37.0%	
Investment Performance:		
NPV at	10.0%	24.783
IRR		19.2%

DEPRECIATION SCHEDULE (ACCELERATED FOR MINING PROJECTS)

Property Class	% of project capital cost	Depreciation Amount							
Year of operation		1	2	3	4	5	6	7	8
Heavy Mach.	26.0%	12,627	12,627	12,627					
Installations	55.1%	80,281							
Buildings	5.1%	929	929	929	929	929	929	929	929
Trucks	3.8%	2,768	2,768						
Heavy Tools	0.0%	0	0	0					
Light Tools	0.0%	0							
Organizational Exp.	10.0%	2,428	2,428	2,428	2,428	2,428	2,428		
		99,034	18,753	15,985	3,357	3,357	3,357	929	929

Table 11-2 - Cash Flow - Base Case

CASH FLOW IN THOUSANDS OF DOLLARS BASE CASE

Years From Inception Operating Year	1	2	3 1	4 2	5 3	6 4	7 5	8 6	9 7	10 8	11 9	12 10	13 11	14 12
Gross Revenue			47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	23,726
Operating Expenses			16,149	16,149	16,149	16,149	16,149	16,149	16,149	16,149	16,149	16,149	16,149	8,074
Management Fee (Excluded)														
Operating Income			31,304	31,304	31,304	31,304	31,304	31,304	31,304	31,304	31,304	31,304	31,304	15,652
Interest Exp.--Debt 1			(4,207)	(3,949)	(3,665)	(3,350)	(3,003)	(2,618)	(2,193)	(1,724)	(1,206)	(633)	(0)	(0)
Interest Exp.--Debt 2		(5,976)	(5,976)	(5,529)	(5,039)	(4,502)	(3,914)	(3,268)	(2,560)	(1,784)	(933)	(0)	(0)	(0)
Depreciation--see schedule			(93,034)	(18,753)	(15,985)	(3,357)	(3,357)	(3,357)	(929)	(929)	0	0	0	0
Losses brt fwd		0	(5,976)	(83,888)	(80,815)	(74,200)	(54,106)	(33,075)	(11,015)	0	0	0	0	0
Income less deductions		(5,976)	(83,888)	(80,815)	(74,200)	(54,106)	(31,075)	(11,015)	14,606	26,866	29,165	30,671	31,304	15,652
Losses crd fwd		(5,976)	(83,888)	(80,815)	(74,200)	(54,106)	(31,075)	(11,015)	0	0	0	0	0	0
Taxable Income		0	0	0	0	0	0	0	14,606	26,866	29,165	30,671	31,304	15,652
Tax 37%		0	0	0	0	0	0	0	(5,404)	(9,941)	(10,791)	(11,348)	(11,582)	(5,791)
Principal--Debt 1			(2,454)	(2,712)	(2,997)	(3,312)	(3,659)	(4,044)	(4,468)	(4,937)	(5,456)	(6,029)	0	0
Principal--Debt 2			(4,628)	(5,074)	(5,564)	(6,101)	(6,689)	(7,335)	(8,043)	(8,819)	(9,670)	0	0	0
Equity	(43,710)													
Add Back Depreciation			93,034	18,753	15,985	3,357	3,357	3,357	929	929	0	0	0	0
Add back losses b.fwd			5,976	83,888	80,815	74,200	54,106	33,075	11,015	0	0	0	0	0
CASH FLOW AVAIL. FOR DISTN.	(43,710)	(5,976)	14,039	14,039	14,039	14,039	14,039	14,039	8,635	4,098	3,248	13,294	19,721	9,861

Table 11-3 - Economic Evaluation Summary - Sensitivity to High Capital

MEDA SULFUR PROJECT, CHILE

ECONOMIC EVALUATION SUMMARY SENSITIVITY TO HIGH CAPITAL

Total project capital cost:	$160.270	
Production	1,850	tonnes/operating day
Operating Days/Year	270	
Sale Price	$95.00	/ton
Operating Costs	$32.33	/ton

Financing Assumptions:

Equity	30.0%	$48.081

Debt	Preferred (Debt 1)	Export Credits (Debt 2)	
	27.5%	42.5%	
amount	$44.074	$68.115	
debt rate	10.50%	9.65%	
debt term	10 years	10 years	
repaymt. term	10 year	9 year	principal amortization)
payment	7,328 per year	11,663 per year, starting in year	3

Interest only for years prior to production, interest and principal (level payment amortization) for years 3 through 12.

Inflation Rate	0.0%	
Effective tax rate	37.0%	
Investment Performance:		
NPV at	10.0%	15.110
IRR		15.2%

DEPRECIATION SCHEDULE (ACCELERATED FOR MINING PROJECTS)

Property Class	% of project capital cost	Depreciation Amount							
Year of operation		1	2	3	4	5	6	7	8
Heavy Mach.	26.0%	13.890	13.890	13.890					
Installations	55.1%	88,309							
Buildings	5.1%	1,022	1.022	1,022	1.022	1,022	1.022	1.022	1.022
Trucks	3.8%	3,045	3,045						
Heavy Tools	0.0%	0	0	0					
Light Tools	0.0%	0							
Organizational Exp.	10.0%	2,671	2,671	2.671	2.671	2.671	2.671		
		106,937	20.628	17.583	3.693	3.693	3.693	1.022	1.022

CASH FLOW IN THOUSANDS OF DOLLARS HIGH CAPITAL CASE

Years from Inception	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Operating Year			1	2	3	4	5	6	7	8	9	10	11	12
Gross Revenue			47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	23,726
Operating Expenses			16,149	16,149	16,149	16,149	16,149	16,149	16,149	16,149	16,149	16,149	16,149	8,074
Management Fee (Excluded)														
Operating Income			31,304	31,304	31,304	31,304	31,304	31,304	31,304	31,304	31,304	31,304	31,304	15,652
Interest Exp.--Debt 1			(4,620)	(4,344)	(4,031)	(3,685)	(3,302)	(2,800)	(2,413)	(1,897)	(1,326)	(696)	0	0
Interest Exp.--Debt 2		(6,573)	(6,573)	(6,082)	(5,543)	(4,953)	(4,305)	(3,595)	(2,816)	(1,963)	(1,026)	0	0	0
Depreciation--see schedule			(108,937)	(20,628)	(17,583)	(3,693)	(3,693)	(3,693)	(1,022)	(1,022)	0	0	0	0
Losses brt fwd		0	(6,573)	(95,407)	(95,158)	(91,011)	(72,038)	(52,035)	(30,899)	(5,846)	0	0	0	0
Income less deductions		(6,573)	(95,407)	(95,158)	(91,011)	(72,038)	(52,035)	(30,899)	(5,046)	20,577	28,951	30,607	31,304	15,652
Losses crd fwd		(6,573)	(95,407)	(95,158)	(91,011)	(72,038)	(52,035)	(30,899)	(5,846)	0	0	0	0	0
Taxable Income		0	0	0	0	0	0	0	0	20,577	28,951	30,607	31,304	15,652
Tax 37%		0	0	0	0	0	0	0	0	(7,613)	(10,712)	(11,325)	(11,582)	(5,791)
Principal--Debt 1			(2,700)	(2,903)	(3,297)	(3,643)	(4,025)	(4,440)	(4,915)	(5,431)	(6,001)	(6,631)	0	0
Principal--Debt 2			(5,090)	(5,502)	(6,120)	(6,711)	(7,358)	(8,060)	(8,847)	(9,701)	(10,637)	0	0	0
Equity	(48,081)													
Add Back Depreciation			108,937	20,628	17,583	3,693	3,693	3,693	1,022	1,022	0	0	0	0
Add back losses b.fwd			6,573	95,407	95,158	91,011	72,038	52,035	30,899	5,846	0	0	0	0
CASH FLOW AVAIL. FOR DISTN.	(48,081)	(6,573)	12,313	12,313	12,313	12,313	12,313	12,313	12,313	4,699	1,601	12,661	19,721	9,861

Table 11-5 - Economic Evaluation Summary - Sensitivity to Low Capital

MECA SULFUR PROJECT, CHILE

ECONOMIC EVALUATION SUMMARY SENSITIVITY TO LOW CAPITAL

Total project capital cost:	$131,130
Production	1,650 tonnes/operating day
Operating Days/Year	270
Sale Price	$35.00 /ton
Operating Costs	$32.33 /ton

Financing Assumptions:

Equity	30.0%	$39,339

Debt	Preferred (Debt 1)	Export Credits (Debt 2)	
	27.5%	42.5%	
amount	$36,061	$55,730	
debt rate	10.50%	9.65%	
debt term	10 years	10 years	
repaymt. term	10 year	9 year	principal amortization/
payment	5,995 per year	9,543 per year, starting in year	3

Interest only for years prior to production, interest and principal (level payment amortization) for years 3 through 12.

Inflation Rate	0.0%	
Effective tax rate	37.0%	
Investment Performance:		
NPV at	10.0%	34,233
IRR		23.9%

DEPRECIATION SCHEDULE (ACCELERATED FOR MINING PROJECTS)

Property Class	% of project capital cost	Depreciation Amount							
Year of operation		1	2	3	4	5	6	7	8
Heavy Mach.	26.0%	11,365	11,365	11,365					
Installations	55.1%	72,253							
Buildings	5.1%	836	836	836	836	836	836	836	836
Trucks	3.8%	2,491	2,491						
Heavy Tools	0.0%	0	0	0					
Light Tools	0.0%	0							
Organizational Exp.	10.0%	2,186	2,186	2,186	2,186	2,186	2,186		
		89,130	16,878	14,386	3,021	3,021	3,021	836	836

Table 11-6 - Cash Flow - Low Capital Case

CASH FLOW IN THOUSANDS OF DOLLARS LOW CAPITAL CASE

Years from Inception Operating Year	1	2	3 1	4 2	5 3	6 4	7 5	8 6	9 7	10 8	11 9	12 10	13 11	14 12
Gross Revenue			47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	23,726
Operating Expenses			16,149	16,149	16,149	16,149	16,149	16,149	16,149	16,149	16,149	16,149	16,149	8,074
Management Fee (Excluded)														
Operating Income			31,304	31,304	31,304	31,304	31,304	31,304	31,304	31,304	31,304	31,304	31,304	15,652
Interest Exp.--Debt 1			(3,786)	(3,554)	(3,298)	(3,015)	(2,702)	(2,356)	(1,974)	(1,552)	(1,085)	(570)	0	0
Interest Exp.--Debt 2		(5,378)	(5,378)	(4,976)	(4,535)	(4,052)	(3,522)	(2,941)	(2,304)	(1,606)	(840)	0	0	0
Depreciation--see schedule			(89,130)	(16,878)	(14,386)	(3,021)	(3,021)	(3,021)	(836)	(836)	0	0	0	0
Losses brt fwd		0	(5,378)	(72,369)	(66,473)	(57,389)	(36,174)	(14,116)	0	0	0	0	0	0
Income less deductions		(5,378)	(72,369)	(66,473)	(57,389)	(36,174)	(14,116)	8,869	26,189	27,310	29,379	30,734	31,304	15,652
Losses crd fwd		(5,378)	(72,369)	(66,473)	(57,389)	(36,174)	(14,116)	0	0	0	0	0	0	0
Taxable Income		0	0	0	0	0	0	8,869	26,189	27,310	29,379	30,734	31,304	15,652
Tax 37%		0	0	0	0	0	0	(3,281)	(9,690)	(10,105)	(10,870)	(11,372)	(11,582)	(5,791)
Principal--Debt 1			(2,209)	(2,441)	(2,697)	(2,980)	(3,293)	(3,639)	(4,021)	(4,444)	(4,910)	(5,426)	0	0
Principal--Debt 2			(4,165)	(4,567)	(5,007)	(5,491)	(6,021)	(6,601)	(7,239)	(7,937)	(8,703)	0	0	0
Equity	(39,339)													
Add Back Depreciation			89,130	16,878	14,386	3,021	3,021	3,021	836	836	0	0	0	0
Add back losses b.fwd			5,378	72,369	66,473	57,389	36,174	14,116	0	0	0	0	0	0
CASH FLOW AVAIL. FOR DISTN.	(39,339)	(5,378)	15,765	15,765	15,765	15,765	15,765	12,484	6,075	5,661	4,895	13,937	19,721	9,861

Table 11-7 - Economic Evaluation Summary - Sensitivity to High Operating Cost

MECA SULFUR PROJECT, CHILE

ECONOMIC EVALUATION SUMMARY SENSITIVITY TO HIGH OPERATING COST

Total project capital cost:	$145,700	
Production	1,850	tonnes/operating day
Operating Days/Year	270	
Sale Price	$95.00	/ton
Operating Costs	$35.56	/ton

Financing Assumptions:

Equity	30.0%	$43,710

Debt:	Preferred (Debt 1)	Export Credits (Debt 2)	
	27.5%	42.5%	
amount	$40,068	$61,923	
debt rate	10.50%	9.65%	
debt term	10 years	10 years	
repaymt.term	10 year	9 year	principal amortization)
payment	6,662 per year	10,603 per year, starting in year	3

Interest only for years prior to production, interest and principal (level payment amortization) for years 3 through 12.

Inflation Rate	0.0%	
Effective tax rate	37.0%	
Investment Performance:		
NPV at	10.0%	18,563
IRR		17.0%

DEPRECIATION SCHEDULE (ACCELERATED FOR MINING PROJECTS)

Property Class	% of project capital cost	Depreciation Amount							
Year of operation		1	2	3	4	5	6	7	8
Heavy Mach.	26.0%	12,627	12,627	12,627					
Installations	55.1%	60,281							
Buildings	5.1%	929	929	929	929	929	929	929	929
Trucks	3.8%	2,768	2,768						
Heavy Tools	0.0%	0	0	0					
Light Tools	0.0%	0							
Organizational Exp.	10.0%	2,428	2,428	2,428	2,428	2,428	2,428		
		99,034	18,753	15,985	3,357	3,357	3,357	929	929

Table 11-8 - Cash Flow - High Operating Cost Case

CASH FLOW IN THOUSANDS OF DOLLARS HIGH OPERATING COST CASE

Years from Inception Operating Year	1	2	3 1	4 2	5 3	6 4	7 5	8 6	9 7	10 8	11 9	12 10	13 11	14 12
Gross Revenue			47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	23,726
Operating Expenses			17,762	17,762	17,762	17,762	17,762	17,762	17,762	17,762	17,762	17,762	17,762	8,881
Management Fee (Excluded)														
Operating Income			29,690	29,690	29,690	29,690	29,690	29,690	29,690	29,690	29,690	29,690	29,690	14,845
Interest Exp.--Debt 1			(4,207)	(3,949)	(3,665)	(3,350)	(3,002)	(2,618)	(2,193)	(1,724)	(1,206)	(633)	(0)	(0)
Interest Exp.--Debt 2		(5,976)	(5,976)	(5,529)	(5,039)	(4,502)	(3,914)	(3,268)	(2,560)	(1,784)	(933)	(0)	(0)	(0)
Depreciation--see schedule			(99,034)	(18,759)	(15,985)	(3,357)	(3,357)	(3,357)	(929)	(929)	0	0	0	0
Losses brt fwd		0	(5,976)	(85,501)	(84,042)	(79,040)	(60,560)	(41,142)	(20,695)	0	0	0	0	0
Income less deductions		(5,976)	(85,501)	(84,042)	(79,040)	(60,560)	(41,142)	(20,695)	3,312	25,253	27,551	29,057	29,690	14,845
Losses crd fwd		(5,976)	(85,501)	(84,042)	(79,040)	(60,560)	(41,142)	(20,695)	0	0	0	0	0	0
Taxable Income		0	0	0	0	0	0	0	3,312	25,253	27,651	29,057	29,690	14,845
Tax 37%		0	0	0	0	0	0	0	(1,226)	(9,344)	(10,194)	(10,751)	(10,985)	(5,493)
Principal--Debt 1			(2,454)	(2,712)	(2,997)	(3,312)	(3,659)	(4,044)	(4,468)	(4,937)	(5,456)	(6,029)	0	0
Principal--Debt 2			(4,628)	(5,074)	(5,564)	(6,101)	(6,689)	(7,335)	(8,043)	(8,819)	(9,670)	0	0	0
Equity	(43,710)													
Add Back Depreciation			99,034	18,759	15,985	3,357	3,357	3,357	929	929	0	0	0	0
Add back losses b.fwd			5,976	85,501	84,042	79,040	60,560	41,142	20,695	0	0	0	0	0
CASH FLOW AVAIL. FOR DISTN.	(43,710)	(5,976)	12,426	12,426	12,426	12,426	12,426	12,426	11,200	3,082	2,232	12,278	18,706	9,352

.9 - Economic Evaluation Summary - Sensitivity to Low Operating Cost

PROJECT, CHILE

ALUATION SUMMARY SENSITIVITY TO LOW OPERATING COST

tal project capital cost: $145,700
oduction 1,850 tonnes/operating day
perating Days/Year 270
le Price $95.00 /ton
erating Costs $29.10 /ton

inancing Assumptions:
Equity 30.0% $43,710

Debt	Preferred (Debt 1)	Export Credits (Debt 2)	
	27.5%	42.5%	
amount	$40,068	$61,923	
debt rate	10.50%	9.65%	
debt term	10 years	10 years	
repaymt.term	10. year	9 year	principal amortization)
payment	6,662 per year	10,603 per year, starting in year	3

Interest only for years prior to production. interest and principal
(level payment amortization) for years 3 through 12.

nflation Rate 0.0%
ffective tax rate 37.0%
vestment Performance:
NPV at 10.0% 31,002
IRR 21.5%

ON SCHEDULE (ACCELERATED FOR MINING PROJECTS)

ass	% of project capital cost	Depreciation Amount							
eration		1	2	3	4	5	6	7	8
	26.0%	12,627	12,627	12,627					
ons	55.1%	60,281							
	5.1%	929	929	929	929	929	929	929	929
	3.8%	2,768	2,768						
	0.0%	0	0	0					
s	0.0%	0							
onal Exp.	10.0%	2,428	2,428	2,428	2,428	2,428	2,428		
		99,034	18,753	15,985	3,357	3,357	3,357	929	929

Table 11-10 - Cash Flow - Low Operating Cost Case

CASH FLOW IN THOUSANDS OF DOLLARS LOW OPERATING COST CASE

Years from Inception Operating Year	1	2	3 1	4 2	5 3	6 4	7 5	8 6	9 7	10 8	11 9	12 10	13 11	14 12
Gross Revenue			47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	47,453	23,726
Operating Expenses			14,535	14,536	14,535	14,535	14,535	14,535	14,535	14,535	14,535	14,535	14,535	7,268
Management Fee (Excluded)														
Operating Income			32,917	32,917	32,917	32,917	32,917	32,917	32,917	32,917	32,917	32,917	32,917	16,459
Interest Exp.--Debt 1			(4,207)	(3,949)	(3,665)	(3,350)	(3,002)	(2,610)	(2,193)	(1,724)	(1,206)	(639)	(0)	(0)
Interest Exp.--Debt 2		(5,976)	(5,976)	(5,529)	(5,039)	(4,502)	(3,914)	(3,260)	(2,560)	(1,784)	(933)	(0)	(0)	(0)
Depreciation--see schedule			(93,034)	(18,753)	(15,985)	(3,357)	(3,357)	(3,357)	(929)	(929)	0	0	0	0
Losses brt fwd		0	(5,976)	(82,275)	(77,509)	(69,360)	(47,652)	(25,000)	(1,335)	0	0	0	0	0
Income less deductions		(5,976)	(82,275)	(77,509)	(69,360)	(47,652)	(25,008)	(1,315)	25,900	28,480	30,778	32,204	32,917	16,459
Losses crd fwd		(5,976)	(82,275)	(77,509)	(69,360)	(47,652)	(25,008)	(1,315)	0	0	0	0	0	0
Taxable Income		0	0	0	0	0	0	0	25,900	28,480	30,778	32,204	32,917	16,459
Tax 37%		0	0	0	0	0	0	0	(9,583)	(10,538)	(11,388)	(11,945)	(12,179)	(6,090)
Principal--Debt 1			(2,454)	(2,712)	(2,997)	(3,312)	(3,659)	(4,044)	(4,468)	(4,937)	(5,456)	(6,029)	0	0
Principal--Debt 2			(4,628)	(5,074)	(5,564)	(6,101)	(6,689)	(7,336)	(8,043)	(8,819)	(9,670)	0	0	0
Equity	(43,710)													
Add Back Depreciation			93,034	18,753	15,985	3,357	3,357	3,357	929	929	0	0	0	0
Add back losses b.fwd			5,976	82,275	77,509	69,360	47,652	25,000	1,335	0	0	0	0	0
CASH FLOW AVAIL. FOR DISTN.	(43,710)	(5,976)	15,652	15,652	15,652	15,652	15,652	15,652	6,069	5,115	4,265	14,310	20,738	10,369

Table 11-11 - Economic Evaluation Summary - Sensitivity to High Sulfur Price

MECA SULFUR PROJECT, CHILE

ECONOMIC EVALUATION SUMMARY SENSITIVITY TO HIGH SULFUR PRICE

Total project capital cost:	$145.700
Production	1,850 tonnes/operating day
Operating Days/Year	270
Sale Price	$110.00 /ton
Operating Costs	$32.33 /ton

Financing Assumptions:

Equity	30.0%	$43.710

Debt	Preferred (Debt 1)	Export Credits (Debt 2)
	27.5%	42.5%
amount	$40.068	$61.923
debt rate	10.50%	9.65%
debt term	10 years	10 years
repaymt.term	10 year	9 year principal amortization:
payment	6.662 per year	10.603 per year, starting in year 3

Interest only for years prior to production. Interest and principal (level payment amortization) for years 3 through 12.

Inflation Rate	0.0%	
Effective tax rate	37.0%	
Investment Performance:		
NPV at	10.0%	53.058
IRR		29.0%

DEPRECIATION SCHEDULE (ACCELERATED FOR MINING PROJECTS)

Property Class	% of project capital cost	Depreciation Amount							
Year of operation		1	2	3	4	5	6	7	8
Heavy Mach.	26.0%	12.627	12.627	12.627					
Installations	55.1%	80.281							
Buildings	5.1%	929	929	929	929	929	929	929	929
Trucks	3.8%	2.768	2.768						
Heavy Tools	0.0%	0	0	0					
Light Tools	0.0%	0							
Organizational Exp.	10.0%	2.428	2.428	2.428	2.428	2.428	2.428		
		99,034	18.753	15.985	3.357	3.357	3.357	929	929

Table 11-12 - Cash Flow - High Sulfur Price Case

CASH FLOW IN THOUSANDS OF DOLLARS HIGH SULFUR PRICE CASE

Years from Inception Operating Year	1	2	3 1	4 2	5 3	6 4	7 5	8 6	9 7	10 8	11 9	12 10	13 11	14 12
Gross Revenue			54,945	54,945	54,945	54,945	54,945	54,945	54,945	54,945	54,945	54,945	54,945	27,473
Operating Expenses			16,149	16,149	16,149	16,149	16,149	16,149	16,149	16,149	16,149	16,149	16,149	8,074
Management Fee (Excluded)														
Operating Income			38,796	38,796	38,796	38,796	38,796	38,796	38,796	38,796	38,796	38,796	38,796	19,398
Interest Exp.--Debt 1			(4,207)	(3,949)	(3,665)	(3,350)	(3,002)	(2,610)	(2,193)	(1,724)	(1,206)	(633)	(0)	(0)
Interest Exp.--Debt 2		(5,976)	(5,976)	(5,529)	(5,039)	(4,502)	(3,914)	(3,268)	(2,560)	(1,784)	(933)	(0)	(0)	(0)
Depreciation--see schedule			(99,034)	(18,753)	(15,985)	(3,357)	(3,357)	(3,357)	(929)	(929)	0	0	0	0
Losses brt fwd		0	(5,976)	(76,395)	(65,030)	(51,723)	(24,136)	0	0	0	0	0	0	0
Income less deductions		(8,976)	(76,395)	(65,830)	(51,723)	(24,136)	4,387	29,553	33,114	34,359	36,657	38,163	38,796	19,398
Losses crd fwd		(5,976)	(76,395)	(65,830)	(51,723)	(24,136)	0	0	0	0	0	0	0	0
Taxable Income		0	0	0	0	0	4,387	29,553	33,114	34,359	36,657	38,163	38,796	19,398
Tax 37%		0	0	0	0	0	(1,623)	(10,935)	(12,252)	(12,713)	(13,563)	(14,120)	(14,355)	(7,177)
Principal--Debt 1			(2,454)	(2,712)	(2,997)	(3,312)	(3,659)	(4,044)	(4,468)	(4,937)	(5,456)	(6,029)	0	0
Principal--Debt 2			(4,628)	(5,074)	(5,564)	(6,101)	(6,689)	(7,315)	(8,043)	(8,819)	(9,670)	0	0	0
Equity	(43,710)													
Add Back Depreciation			99,034	18,753	15,985	3,357	3,357	3,357	929	929	0	0	0	0
Add back losses b.fwd			5,976	76,395	65,030	51,723	24,136	0	0	0	0	0	0	0
CASH FLOW AVAIL. FOR DISTN.	(43,710)	(5,976)	21,532	21,532	21,532	21,532	19,908	10,597	9,279	8,819	7,968	18,014	24,442	12,221

11-13 - Economic Evaluation Summary - Sensitivity to Low Sulfur Price

UR PROJECT, CHILE

EVALUATION SUMMARY SENSITIVITY TO LOW SULFUR PRICE

Total project capital cost:	$145,700
Production	1,850 tonnes/operating day
Operating Days/Year	270
Sale Price	$85.00 /ton
Operating Costs	$32.33 /ton

Financing Assumptions:

Equity	30.0%	$43,710

Debt	Preferred (Debt 1)	Export Credits (Debt 2)
	27.5%	42.5%
amount	$40,068	$61,923
debt rate	10.50%	9.65%
debt term	10 years	10 years
repaymt.term	10 year	9 year (principal amortization)
payment	6,662 per year	10,603 per year, starting in year 3

Interest only for years prior to production, interest and principal (level payment amortization) for years 3 through 12.

Inflation Rate	0.0%	
Effective tax rate	37.0%	
Investment Performance:		
NPV at	10.0%	5,237
IRR		12.0%

TION SCHEDULE (ACCELERATED FOR MINING PROJECTS)

Class	% of project capital cost	Depreciation Amount							
operation		1	2	3	4	5	6	7	8
ch.	26.0%	12,627	12,627	12,627					
tions	55.1%	80,281							
s	5.1%	929	929	929	929	929	929	929	929
	3.8%	2,768	2,768						
ols	0.0%	0	0	0					
ols	0.0%	0							
tional Exp.	10.0%	2,428	2,428	2,428	2,428	2,428	2,428		
		99,034	18,753	15,985	3,357	3,357	3,357	929	929

SECTION 12

RECOMMENDATIONS FOR FUTURE WORK

The entire study is based on certain assumptions, the validity of which must be determined prior to embarking on a full feasibility study. This section will attempt to define those areas of work which require special attention. The reader must be cautioned that this section can, in no way, be considered complete, so it will be necessary to review these suggestions together with those recommendations which may be forthcoming from other sources.

12.1 GEOLOGICAL AND MINERALOGICAL WORK

The Piedra Amarilla property has excellent showings of caliche sulfur mineralization. The detailed exploration work necessary for a detailed understanding of the deposit's tonnage and grade remains to be done. Based on Ulricksen's work and reports from MECA's field work, the highly altered and caliche sulfur mineralized areas on claim group PA 221-250 should be given first priority for future field work. Additional detailed field work is also recommended in the areas where preliminary work has been done (PA 131-160 and PA 161-190).

Some of the more important elements of the coming phase of field work are briefly noted below.

12.1.1 GROUND SURVEY CONTROL

Horizontal and vertical control monuments need to be established on the ground at Piedra Amarilla as soon as field work begins. A local coordinate system with 0.00N; 0.00E point of origin should be located about 1.5 km south of Colina Negro. Survey control should coincide with that on the Lagunas Bravas quadrangle map so that topographic data from that source may be utilized. This base map should be at a scale of 1:10,000.

12.1.2 GEOLOGIC MAPPING

Ulricksen's photo geologic interpretation data should be carried to the field and refined with ground-truth detail. Bulldozer cuts, drill hole locations, and like work should be plotted on the geology map, which will use the 1:10,000 map as a base.

12.1.3 TRENCHING AND DRILLING

The caliche sulfur deposits are at this point, assumed to have the following characteristics:

- o Possess a large areal extent in comparison to the thickness.
- o Have an attitude that conforms to the present land-form slope.
- o Lie near the surface with no great amount of overburden or cover.

In view of the above, a bulldozer will be an extremely valuable exploration tool since it can rapidly prospect for caliche sulfur in the hydrothermally altered areas. Additionally, the bulldozer will be essential for gaining access to difficult areas and for preparing drill sites.

It is not anticipated that exploration drill notes will need to be deeper than 50 meters. In most cases, holes will be collared in caliche or hydrothermally altered volcanics. This material will not be difficult to drill, but with conventional diamond core drilling, recovery of core and/or loss of drill fluid could prove to be a problem (it is assumed that the brackish water from the nearby laguna will serve as drill fluid).

An alternative to consider in place of diamond drilling is reverse circulation drilling using a drag or plug bit and with cuttings flushed up the hole in an air current. This is a very rapid method and works well in friable rocks provided water is not present in the formation -which will not be a problem at Piedra Amarilla. Using this drilling method, cuttings are collected for a pre-determined drilling interval (say, every 1.5 meters) or for abrupt changes in formation indicated by the appearance of the cuttings. Cuttings for each interval are poured through a splitter at the drill and a sample retained for geological logging and for assay.

Drill hole spacing will in large part be determined by the geologist as the project progresses. A good hole in a newly prospected area (one cutting a meter or more of caliche sulfur) should be offset drilled at each of the four grid directions, where possible, in order to check for continuity, and thus extend the drilling to outline the areal extent and thickness of the caliche sulfur body. The spacing of holes on the grid will probably be somewhere between 50 m as a minimum and 10 m as a maximum in order to consider the particular block "drilled out" (in terms of readiness for a final feasibility study).

12.2 MINING WORK

The mining study assumes that the caliche sulfur ore bodies can be stripped and mined without drilling and blasting. Blast hole drill cuttings usually provide the final definitive grade of an ore block. If the exploration work indicates that the sulfur grade and thickness varies considerably, this must be taken into account in choosing the drill grid or provisions made for fine tuning the ore grade control by additional drilling/sampling before mining.

The trenching and drilling work done during the exploration campaign will provide the data necessary to determine if:

- Stripping and mining can, in reality, be done by ripping (as assumed in this study) or;

- A combination of ripping and secondary breaking of oversize is required or;

- A combination of ripping with some drilling and blasting will be necessary.

The method required could have a large effect on equipment required as well as operating costs.

12.3 METALLURGICAL WORK

All of the metallurgical work required can be summed up in the need to do test work. Parsons cautions that sulfur ore deposits in general, and South American deposits south of the Equator in particular, are highly variable and deposits that are relatively close to one another (say within a kilometer or two) may respond quite distinctly even though their mineralogical characteristics are similar. For this reason we feel that it would be advisable to embark on a test program which would eventually include full-scale pilot plant work prior to building any type of beneficiation facility. Parsons is in a position to formulate a test program for MECA and to monitor it and evaluate the results; in fact, we recently completed such an exercise for a client in New South Wales.

In the following paragraphs an indication will be given of the specific areas of most concern to us at this time.

12.3.1 CRUSHING AND GRINDING

A glance at the flowsheet will show that a traditional approach has been taken to attacking the problem of comminution. We need to know the actual crushing and grinding characteristics of the ore before the equipment can be properly selected and sized. Among the items requiring attention are the screening, crushing and the determination of the Bond Work Index. Parsons has used steel grinding media for the present study. Pebble milling might be more appropriate in rubber lined mills. If this is true, then it will be advisable to ascertain if a suitable media can be mined within a reasonable distance from the grinding site. A crushing and screening test needs to be done. Such a test is more satisfactorily undertaken in the facility of a manufacturer of crushing equipment - Nordberg for example.

12.3.2 PIPELINE

When the characteristics of the final ground product have been determined, the most appropriate means for piping this product to the flotation section has to be evaluated. This work will include, but not be limited to, studying the rheology of the pulp.

12.4 POSSIBLE TEST PROGRAM

In order to determine if a representative sample of the ore can be upgraded by flotation and that a saleable sulfur product can be produced by concentrate melting and hot sulfur filtration, bench scale test work must be conducted to fix flotation parameters including fineness of grind, desliming and reagents. Hot melting and filtration tests have to be conducted on the concentrate samples and the tests have to be evaluated on product yield and purity. A minimum of twenty (20) kilos of ore are required and the work can be completed in a six to eight week period. On the basis of $49.50 per man hour the following is an estimate for doing this work in Canada.

		U.S.Dollars
Sample Preparation, Head Analysis, Mineralogy		1,500
Six Flotation Tests	@ $450 each	2,700
Three Melting and Hot Filtration Tests	@ $750 each	2,250
Additional Concentrate Analysis		1,000
Overall Supervision and Report		2,500
Total Cost of Program		9,950

Should MECA desire that Parsons supervise the laboratory work there would be an additional cost.

12.5 INTEC TEST WORK

The following discussion is presented with reference to Intec-Chile's final report dated October 1988 entitled "Flotabilidad de Caliches de Azufre."

All of the work presented up to this point has been based on test work and other data supplied to Parsons prior to September 1, 1988. One of the key points of that work was that flotation should be conducted on a pulp ground to a size of eighty percent passing ninety microns. The latest work by Intec indicates that a substantially coarser grind is not only acceptable, it is, in fact apparently desirable. The main result of that revelation is to suggest that the crushing and grinding circuits can be simplified and hence, made more cost effective.

There are, however, problems in accepting this information immediately. The sample submitted to Intec was apparently contaminated with some unknown organic material and the sample was of much higher grade than we believe can actually be consistently mined. For these reasons it is suggested that the conclusions reached be rechecked on a clean sample of a more realistic grade.

Intec has suggested that pre-concentration* be used to upgrade the virgin ore prior to embarking on conventional flotation and we agree with this idea. However, one of the suggested approaches, that of differential grinding, drying and air classification, requires quite a bit of sophistication and we do not believe that it will be found viable in the particular location where MECA's deposits are to be found. The use of autogenous crushing should be investigated by MECA and autogenous grinding may also be worth some study. If MECA wishes to "push ahead" and save time, however, it may be quite satisfactory to investigate an open circuit crushing plant followed by rod and/or ball or pebble milling. It would appear logical to conduct rougher flotation at a very coarse grind and employ a regrind stage prior to cleaning. Unit or flash flotation is not easily done in the laboratory or even the pilot plant but its inclusion in a finished flowsheet is, in the light of the latest work, probably more than justified.

It was gratifying to see, in the report, that our prognostication of rougher, cleaner recoveries was born out by the latest test work but we do believe that it is necessary to obtain a flotation concentrate of a grade at least into the eighties in order to assure that the melting process will work properly.

Parsons has used local North American melting, molten sulfur filtration and forming practice. The use of the CORFO-Chile process would, in Chile, be worth investigating. We suggest that MECA may wish to test both methodologies and select the one which is more appropriate.

In Section 7, the reader will observe that we have cast some doubts as to the possibility of grinding and refloating the hard refinery wastes. A dotted line shows them being returned to the flotation circuit with appropriate comminution. It is understood that in South America some operators are grinding the hard refinery wastes and refloating them. The loss is quite significant if something is not done to recover the sulfur contained in the refinery wastes and some work needs to be done to determine exactly how to go ahead with retreatment. If the flotation and melting steps are separated by distance (see Section 13.1) then the hard refinery wastes would have to be retreated without the benefit of mixing them with the ore or other conventional flotation products. Such separate treatment might be in a small local flotation plant in the melting area. It is estimated that the additional flotation capacity needed would be approximately 6 cells of 180 cubic feet each. Provisions will have to be made for thickening and disposing of the additional flotation tailing. There will be an increase in the circulating load in the refinery section but the amount of this and the effect of same has not been determined. There are economics to be considered meaning that the additional recovery of sulfur may or may not justify the investment. For the purpose of this present investigation, Parsons has assumed that the investment is not justified.

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*One method of culling out low grade material, which may be satisfactory for inclusion in future work, is the E.L. Bateman/RTZ Ore Sorter color sorting equipment.

Intec suggests several flotation cells for investigation. We have recently installed a complete lead-zinc circuit with Maxwell cells and column flotation. For Chile's sulfur operations we suggest that MECA may want to consider conventional mechanical cells (OK for example) and column flotation.

The above discussion is presented as an addendum to our main report. The information from Intec was received too late for inclusion in the main report. We congratulate Intec on an excellent presentation.

SECTION 13

ALTERNATE CASE

This section discusses the ramifications of moving the flotation plant to the comminution site at the mine and only melting and forming at the lower site.

13.1 ALTERNATE FLOWSHEET

As a means of reducing expenditure, MECA requested that Parsons investigate the possibility of conducting the flotation operations adjacent to the grinding circuit. The resultant final sulfur flotation concentrate would then be piped to the refinery located down the hill at the same location as in the base case.

In order to conform with the request a new set of flowsheets and a new material balance were prepared and these are submitted as follows:

Figure 13-1	Flowsheet: Comminution, Flotation and Pipeline Transportation of the Concentrate.
Figure 13-2	Flowsheet: Refining
Figure 13-3	Flowsheet: Water Balance
Table 13-1	Sulfur Grinding, Flotation, Concentrate Pipeline Transportation and Refinery Material Balance. [Note that the crushing plant material balance (Table 5-1) remains unchanged].

Basically the differences between the two sets of flowsheets can be summarized as follows:

A. There is a need for a conditioner ahead of the flotation.

B. Since the pipeline handles sulfur concentrate rather than flotation feed, the pipeline feed thickener, pipeline feed conditioner and the pipeline discharge conditioner have all been resized.

C. The pipeline itself has been resized as well as the pipeline feed pumps.

D. The water line from the upper site to the lower site has been eliminated in favor of obtaining the small amount of water needed at the refinery from local wells or from another, as yet undetermined, source.

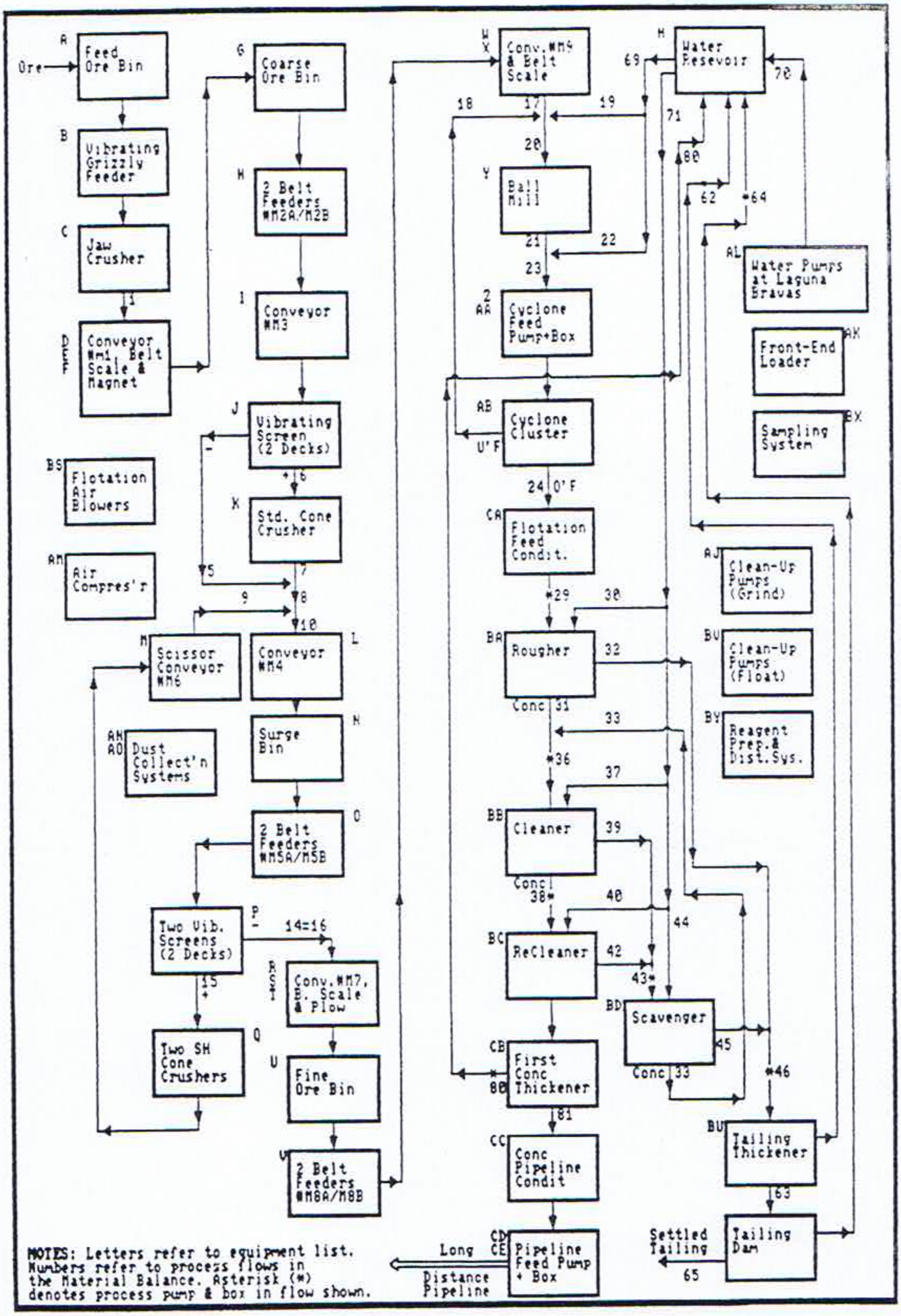

Figure 13-1 - Flowsheet: Comminution, Flotation, and Pipeline Transportation of the Concentrate (Alternate Case)

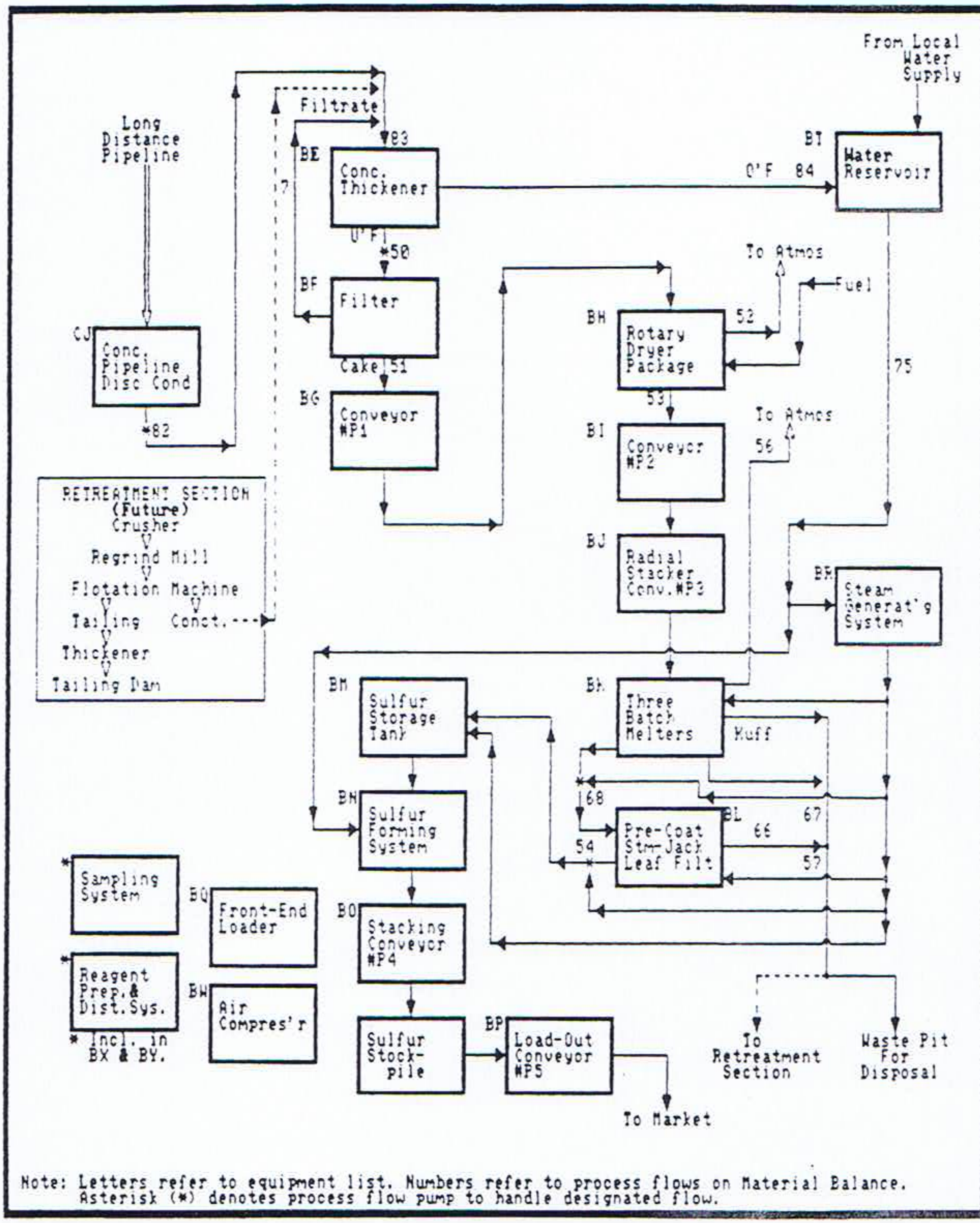

Figure 13-2 - Flowsheet: Refining (Alternate Case)

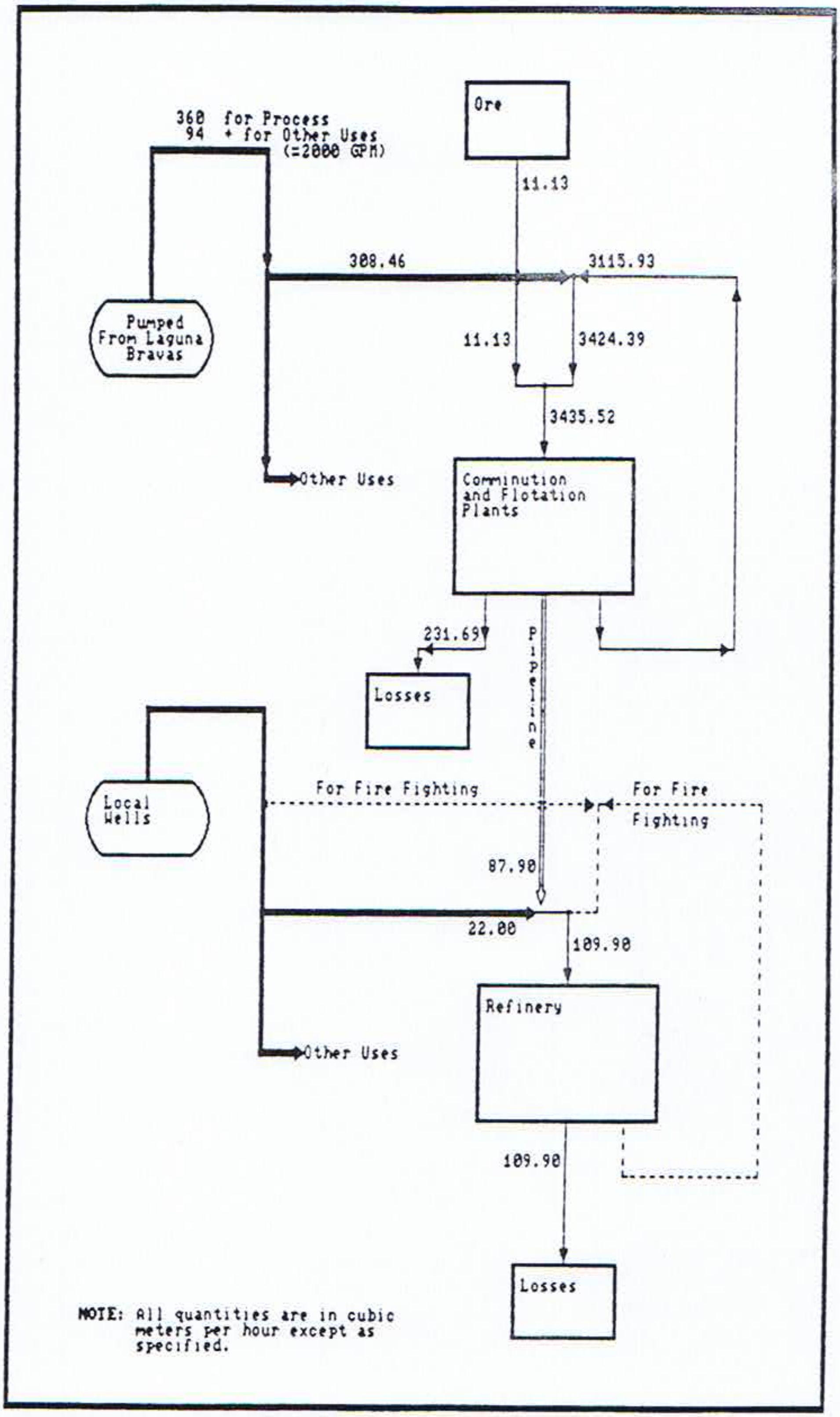

Figure 13-3 - Water Balance (Alternate Case)

Table 13-1 - Material Balance - Sulfur Grinding, Flotation, Pipeline Transportation of Concentrate, and Refining (Alternate Case)

Pulp USgpm	W E Solids	W E Pulp	cu m/hr Water In	Cu m/hr Out	USgpm Water In	USgpm Out
770	163.64	174.77	11.13		49	
2666	245.45	605.45				
500		113.48	113.48		500	
3935	409.09	893.71				
3935	409.09	893.71				
6672		1515.38	1515.38		6672	
10607	409.09	2409.09				
7941	163.64	1803.64				
7941	163.64	1803.64				
2419		549.42	549.42		2419	
3997	87.80	907.80				
6363	75.83	1445.25				
123	2.65	28.01				
4120	90.46	935.82				
2494		566.41	566.41		2494	
3305	74.23	750.52				
3310	16.23	751.71				
1995		453.13	453.13		1995	
2491	58.60	565.82				
2808	15.63	637.83				
2808	15.63	637.83				
6118	31.86	1389.54				
998		226.56	226.56		998	
6992	29.20	1588.09				
13356	105.04	3033.34				
1846		419.32		419.32		1846
645	58.60	146.50		87.90		387
11675		2651.59		2651.59		11675
1681	105.04	381.75				
198		45.02		45.02		198
1483	105.04	336.73		231.69		1020
			3435.52	3435.52	15127	15127
645	58.60	146.50	87.90		387	
911	58.60	206.97				
326		74.14		74.14		326
266		60.47				
585	58.60	132.83				
319	58.60	72.36				
40		9.12		9.12		40
278	58.60	63.24				
198	45.04	45.04		0.00		
80	13.56	18.20				
20		4.64		4.64		20
60	13.56	13.56		0.00		
			87.90	87.90	387.02	387.02
2	0.45	0.45				
58	13.11	13.11				
200	45.49	45.49				
97		22.00	22.00	22.00	97	97
			11.13		49	
			1628.87		7172	
			1795.52		7906	
			3115.93		13719	
			231.69		1020	
			87.90		387	
					0	
			87.90		387	
			87.90		387	
			22.00		97	
			22.00		97	
			341.59		1504	
			330.46		1455	
			360.00		1585	

From a manpower point of view there will be a need for a few more laborers since those located in the flotation area will not be available to help in the refinery, or vice versa.

Tables 13-2 and 13-3 show the equipment at the two sites and can be compared with Tables 5-3 and 7-1 respectively.

13.2 CAPITAL COST

By changing from the Basic Case to that in which the flotation circuit is alongside the comminution circuit (The Alternate Case) quite substantial savings in capital cost can be realized. The principal sources of savings are as follows:

A. The pipeline feed thickener and conditioner and the pipeline discharge conditioner are smaller

B. The tailing can be discharged by gravity without the need for pumping

C. The concentrate pipeline is smaller than the slurry line.

D. The water line to Montandon has been eliminated.

Even though the pipeline feed pumps require more horsepower because of the increase in head loss from the smaller pipeline size, the net effect is a saving of about ten million dollars per year as evidenced in Table 13-4 which shows a Comparison of Capital Costs between the Base Case and the Alternate Case.

13.3 OPERATING COST

Table 13-5 presents a comparison of operating costs between the Base and Alternate Cases as previously defined.

The overall operating cost for the Base Case is 16.2 million dollars per annum (See Section 10). When the flotation section is moved "up-the-hill" alongside the comminution plant the cost is reduced by slightly more than half-a-million dollars. The principal reasons for this reduction are enumerated as follows:

A. About six million kWh per year are saved in power consumption, principally because the tailing no longer has to be pumped to the dam, but will flow there by gravity

B. Savings are effected in capital cost and these savings are directly reflected in operating cost for maintenance supplies since these costs are obtained by factoring the capital cost of equipment subject to wear. The capital cost savings are in the operating plant and in the long distance pipeline.

Table 13-2 - Equipment List - Comminution and Flotation (Alternate Case)

Key	Description	Size	Connected H P Each	Total Connected H P	Operating H P
A	Feed Ore Bin	250 cu m	0	0	0
B	Vibrating Grizzly Feeder	62" x 18' w/2 x 5' of grizzly	60	60	60
C	Jaw Crusher	48" x 60" - OSS 165 mm	200	200	200
D	Conveyor Belt #M1	30" x 465, 460 fpm	60	60	60
E	Belt Scale, included	30"	0	0	0
F	Tramp Iron Magnet icl. 5 kW Rectifier, incl.	30"	0.2	0.2	0.2
G	Coarse Ore Bin	4000 cu m	0	0	0
H	Two Belt Feeders, #M2A & #M2B	42" x 25', 100 fpm	20	40	40
I	Conveyor Belt #M3	30" x 270', 460 fpm	40	40	40
J	Double Deck Vibrating Screen	8' x 16' w/127 & 76 mm slots	30	30	30
K	Standard Cone Crusher	5-1/2' - CSS 32 mm	400	400	400
L	Conveyor Belt #M4	42" x 440', 485 fpm	150	150	150
M	Scissor Conveyor Belt #M6	30" x 490', 540 fpm	60	60	60
N	Surge Bin	550 cu m	0	0	0
O	Two Belt Feeders, #M5A & M5B	60" x 35', 75fpm	40	80	80
P	Two Double Deck Vibrating Screens	8' x 16' w/38 & 12 mm slots	30	60	60
Q	Two Short Head Cone Crushers	7' - CSS 11 mm	400	800	800
R	Conveyor Belt #M7	30" x 465', 460 fpm	60	60	60
S	Belt Scale, included	30"	0	0	0
T	Plow, included	30"	0	0	0
U	Fine Ore Bin	10000 cu m	0	0	0
V	Two Belt Feeders, #M8A & #M8B	42" x 36', 84 fpm	30	60	60
W	Conveyor Belt #M9	30" x 125', 460 fpm	5	5	5
X	Belt Scale, included	24"	0	0	0
Y	Ball Mill	16' x 21'3"	3500	3500	3500
Z	Cyclone Feed Pump Box	20 cu m	0	0	0
AA	2 Cyclone Feed Pumps	16" x 18"	400	800	400
AB	Cyclone Cluster	6 x 26"	0	0	0
AH	Water Reservoir	1500000 gallons	0	0	0
AJ	Two Clean-Up Vertical Pumps	3" x 60"	20	40	20
AK	Articulated Front-End Loader	4.5 Cubic Yard Bucket	0	0	0
AL	3 Water Sup. Pumps/2000 gpm @1150' (2 op 1 sp)	13" Imp. 5 St. Vert. Turbine	450	1350	900
AM	Air Compressor & 400 Gallon Receiver	637 ACFM 125 psi	150	150	150
AN	Dust Collection at Jaw Crusher	Allowance	5	5	5
AO	Dust Collection at Fine Crushing Area	Allowance	15	15	15
BA	Rougher Flotation Machine	1 x 10 x 500 cu ft	400	400	400
BB	Cleaner Flotation Machine	1 x 8 x 300 cu ft	240	240	240
BC	Re Cleaner Flotation Machine	1 x 5 x 300 cu ft	150	150	150
BD	Scavenger Flotation Machine	1 x 7 x 500 cu ft	280	280	280
BV	Four Clean-Up Vertical Pumps	3" x 60"	20	80	20
BX	Sampling System	Allowance	3	3	3
BY	Reagent Preparation & Distribution System	Allowance	20	20	20
CA	Flotation Feed Conditioner	20' dia x 24'	20	20	20
CB	First Concentrate Thickener	125' x 10' SWD	7.5	7.5	7.5
CC	Concentrate Pipeline Conditioner	36' dia x 42'	50	50	50
CD	Pipeline Feed Pump Box	2.5 cu m	0	0	0
CE	3 Pipeline Feed Pos. Displ. Pumps (2 op 1 sp)	4-3/4" x 9" w/3 plungers	1000	3000	2000
29	2 Flotation Feed Slurry Pumps	18" x 16"	150	300	150
36	2 Cleaner Feed Slurry Pumps	14" x 12"	100	200	100
38	2 ReCleaner Feed Slurry Pumps	14" x 12"	75	150	75
41	2 ReCleaner Concentrate Slurry Pumps	10" x 10"	50	100	50
43	2 Cleaner Scavenger Feed Slurry Pumps	16" x 14"	125	250	125
46	2 Total Tailing Slurry Pumps	22" x 20"	250	500	250
62	3 Tail. Thick. O'F Water Pumps (2 op 1 sp)	10" x 12" x 14" Hor. (60' TDH)	125	375	250
64*	2 Tailing Dam Reclaim Water Pumps On Barge	12 Stage 6"Bowl	60	120	60
80	First Concentrate Thickener Overflow Pump	8" S/D 12"Imp Horiz Water Pump	30	60	30
81	First Concentrate Thickener Underflow Pump	4" x 6" x 16"	25	50	25

* Same Flow Number as Table 7.1 But Different Flow and Pump Characteristics

Key	Description	Size	Connected H P Each	Total Connected H P	Operating H P
29	Pump Box	10 cu m			
36	Pump Box	5.2 cu m			
38	Pump Box	4.2 cu m			
41	Pump Box	3.1 cu m			
43	Pump Box	7.7 cu m			
46	Pump Box	16.9 cu m			
62	Pump Box	14.7 cu m			
64	Pump Box	1.0 cu m			
80	Pump Box	4.2 cu m			
81	Pump Box	4.2 cu m			
	Sub-Total Mine Area			14320.7	11400.7

Table 13-3 - Equipment List - Refining (Alternate Case)

Key	Description	Size	Connected H P Each	Total Connected H P	Operating H P
BE	Concentrate Thickener	125' x 10' SWD	7.5	7.5	7.5
BF	Concentrate Filter w/vac. pump, two filtrate pumps, two 7x84" vacuum receivers.	15 x 12' 6" disks	840	840	840
BG	Dryer Feed Conveyor Belt #P1	24" x 60', 300 fpm	3	3	3
BH	Concentrate Rotary Dryer w/auxilliaries.	12' x 85' (325 GPH Bunker C Fuel)	350	350	350
BI	Dryer Discharge Conveyor Belt #P2	24" x 20', 300 fpm	3	3	3
BJ	Radial Stacker Conveyor Belt #P3	245" x 125', 300 fpm	5	5	5
BK	Three Atmospheric Batch Sulfur Melters	25'w x 100'l x 10'd	0	0	0
	(each with 4 Mixers - 10' Shafts)		50	600	200
BL	Two Pre-Coated Steam-Jacketed Leaf Filters	44 Leaves 66" x 61"	0	0	0
BM	Sulfur Storage Tank	22' x 30'	0	0	0
BN	Sulfur Forming System Incl. 1 sulfur pit, 2 sulfur pumps, steam-jacketed piping w/flow control & shut-off valves, 3 steel belt slaters 1.5 m x 80 m, exhaust fan, water cooling system, piping, instr. & eng.		150	150	150
BO	Sulfur Stacking Conveyor Belt #P4	30" x 920', 125 fpm	25	25	25
BP	Sulfur Load-Out Conveyor Belt #P5	42" x 65', 100 fpm	25	25	25
BQ	Articulated Front-End Loader	4.5 Cubic Yard Bucket	0	0	0
BR	Steam Generating System	30000#/Hr Boiler @ 55-60 psig (244 GPH Bunker C Fuel)			
BS	Four Flotation Multistage Air Blower	1755 icfm @ 42 oz @ Sea Level	40	40	40
BT	Water Reservoir	2500000 gallons			
BU	Tailing Thickener	190' x 10' SWD	7.5	7.5	7.5
BW	Air Compressor & 400 Gallon Receiver	637 ACFM 125 psi	150	150	150
CJ	Concentrate Pipeline Discharge Conditioner	36' dia x 42'	50	50	50
54	6 Vertical Dirty Molten Sulfur Pumps	4" x J-120"	15	90	30
68	6 Vertical Dirty Molten Sulfur Pumps	4" x J-120"	15	90	30
50	2 Concentrate Thickener Underflow Slurry Pumps	5" x 4"	15	30	15
82	2 Conc. Pipeline Disch. Cond. Pumps	4" x 6" x 16"	25	50	25
50	Pump Box	2.1 cu m			
82	Pump Box	4.2 cu m			
	Sub-Total Process Area			2516	1956
	Sub-Total Mine and Process Areas			16836.7	13356.7

Table 13-4 Comparison Of Capital Costs For Base and Alternate Cases
($ 000)

Area	Description	Base Case	Add	Subtract	Alt. Case	Note No.
5	Mine	5550			5550	
10	Crushing	16150			16150	
15	Grinding	5920		- 2160	3760	a
20	Slurry Pipe	15938	+ 9244	-11259	13923	b
30	Flotation	4704	+ 1669		6373	c
	Filtration	6011	+ 48		6059	
35	Refinery	20880			20880	
40	Water	11490		- 7953	3537	d
45	Tailing	4680	+ 39	- 1526	3193	e
50	Power	10680			10680	
60	Camps, Etc.	4080	+ 1563		5643	f
70	Port	1470			1470	
	Total	107553	+12563	-22898	97218	

Notes.

a. Elimination of flotation feed thickeners & conditioners.
b. Change in Pump/Pipe sizes for Concentrate.
c. New Concentrate thickeners and Conditioners
d. Elimination of Water pip[eline between plants
e. Smaller diameter tailing pipeline. No tailing pumps. Saving on reclaim water pumps.
f. More personnel needed at mine site.

Partially offsetting the above operating cost savings is an increase in the labor force of seven individuals as described above.

The reader should bear in mind that the differences in operating costs are within the limits of accuracy of the estimate.

Parsons is of the belief that there may exist extenuating circumstances which would warrant "staying with" the Base Case, which, in our opinion, is easier to manage. The present study considers the comminution, flotation and refinery beneficiation steps to be under the same management sub heading in both the Base and Alternate Cases. It might be worth considering placing the refinery under its own department head if it is separated from the flotation section. A slight increase in manpower would be required but more effective control might be accomplished

Another item which might be worth consideration by MECA prior to starting the feasibility study would be to set up a sell/purchase arrangement between departments. This arrangement, can result in conflicts but it has the advantage of having each department take its own operations more seriously and hence produce a greater profit for the company.

Table 13-5 Comparison of Operating Costs

	$000/Year		$/Tonne of Ore		$/Tonne S Prod.	
	Basic	Alter.	Basic	Alter.	Basic	Alter.
Mine	1821	1821	0.8203	0.8203	3.6420	3.6420
Process						
Labor	804	845				
Fuel	2791	2791				
Reagents	1105	1105				
Steel	801	801				
Power	4159	3723				
Maint. Sup.	719	704				
Sub Total	10379	9969	4.6754	4.4908	20.7580	19.9380
Administrative						
General	3475	3475				
Maint. Sup.	200	120				
Sub Total	3675	3595	1.6554	1.6194	7.3500	7.1900
Port	292	292	0.1315	0.1315	0.5840	0.5840
TOTAL	16167	15677	7.2826	7.0620	32.3340	31.3540