

MINERALS AND METALS

Bateman Engineering Pty Ltd

ABN 67 009 001 558 ACN 009 001 558

DORIS NORTH TRIAL OPERATION SCOPING STUDY

MIRAMAR MINING CORPORATION

Table 7.1 PROJECT CAPITAL COST SUMMARY

DESCRIPTION	TOTAL COST
<u>Direct Field Costs</u>	
Civils	270
Mechanical Equipment including conveyors & tanks	3,374
Platwork & Liners included in 002	
Structural Steelwork	456
Piping & Valves excl tailings & overland pipes	469
buildings, container office - allowance	104
Electrical including PLC, MCC	640
Instrumentation	587
Tails Lines and Water Supply	873
Desom Ventilation	403
Mech Eqt, Plw, elec, struct, & Instrum. Erect mobilise	17
First fill - allowance	96
Electrical mobilise	16
Instrumentation mobilise	4
Trial assemble, Strip plant and load into containers	83
Transportation - CIF to Hope Bay - 15% of FOB value	1,007
Commissioning Spares - allowance 1% of mech, elect, 67% inst.	40
Commissioning labour	44
Vendor assist during Constr & Comm-Allow 1%	36
12 month's Op Spares - allow 4% of mech & elect, 67% inst.	161
DIRECT FIELD COSTS	8,687
Sprung Steel Dome	1,914
Transportation to Hope Bay	44
TOTAL DIRECT FIELD COSTS	10,645
<u>Home Office & Indirect Field Costs</u>	
Home Office Resources	
Site Resources	
Commissioning Resources	
Home Office Sundries	
Site Sundries	
Commissioning Sundries -	
External consultants/testwork - allowance	163
Site Establishment including air fares etc	407
Sprung Steel Dome	44

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DESCRIPTION	TOTAL COST
	2,233
TOTAL NET COST	12,878
Other Costs	
Interest & Surety Bond	0
Escalation	0
Fee - 10% of Total DFC	1,064
Fee - "Technical know-how" 15% of Tot HO costs	335
Insurance - CAR & marine - allowance	133
Contingency @ 12% of TNC	1,545
TOTAL OTHER COSTS	3,078
OVERALL PROJECT COST	15,957
TOTAL EXCLUDING GST	15,957
GRAND TOTAL PROJECT COST	15,957

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8 OPERATING COST ESTIMATE

The operating cost estimate has been derived from test work data, information supplied by the client and from Bateman's in-house database of similar duties. The methodology adopted is very similar to that used for the previous Hope Bay scoping study. The estimate uses quoted prices current for 4Q 2001. All costs are presented in Canadian dollars.

8.1 SUMMARY OF OPERATING COSTS

Table 8.1 presents a summary of operating costs derived for the selected process plant option to treat Doris North ore at a rate of 600 tonnes per day.

Table 8.1 SUMMARY OF OPERATING COSTS

Item	\$/annum
Reagents	1,334,422
Power	1,370,855
Liners	150,000
Labour	3,248,623
Hired Services	216,000
Mobile Equipment	301,632
Maintenance	500,000
Laboratory	100,000
Building Heating	128,100
Total	7,349,632
Cost per tonne	
Cost per oz produced	

Note that the cost per ounce is calculated based on 125,217 tr oz per year production, and cost per tonne is based upon a production rate of 219,000 tpa.

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DORIS NORTH TRIAL OPERATION SCOPING STUDY**MIRAMAR MINING CORPORATION****8.2 ESTIMATE METHODOLOGY****8.2.1 LABOUR**

The annual labour cost of personnel includes flat annualised salaries and includes an allowance for superannuation and statutory overheads (workers' compensation, insurance and training). Labour rates exclude company overheads such as recruiting, travel, housing and service charges from head office. No provisions are included in labour costs for lost time due to industrial disputes and redundancy considerations.

Drawing on the client's experience from other projects in the region, the allowance for staff personnel on costs is a base of 36% plus FIFO costs on a 2weeks on/2 weeks off basis, and daily living allowance. For award based personnel, the daily allowance and FIFO cost is built into hourly rates, based on a 12 hours operating shift. A working year of 183 days has been applied for all employees.

Manning levels were established to meet the production levels of the operation, in consultation with HBJV. HBJV provided rates for all operating and maintenance personnel. The shift arrangements for operating personnel are based on a regime of 4-crews working 12-hours shifts. A summary of labour requirements is detailed in Table 8.2.

Table 8.2 LABOUR COST SUMMARY

Staff	Number	Salary Base (\$pa)	Salary Inc. Oncosts (\$pa)	Sub-Total (\$pa)
Operating + Support				
Mill Superintendent	1	80,000	119,924	119,924
General Foreman	2	70,000	106,324	212,648
Plant Metallurgist	1	70,000	106,324	106,324
Chemist	2	55,000	85,924	171,848
Loader Drivers	4	42,734	69,230	276,921
Crusher Operators	4	36,498	60,512	242,048
Milling/Gravity Operators	4	39,462	64,026	256,103
Scav. Float/Leach/Filtration Operators	4	51,145	82,209	328,834
Gold Room Operators	2	48,861	77,751	155,501
Met Technician	1	45,589	74,786	74,786
Assayers	2	40,275	66,288	132,575
General Labourers	4	36,498	60,512	242,048
Sub-Total	31			2,319,560
Maintenance				
Maintenance Superintendent	2	80,000	119,924	239,848
Fitters	2	53,626	81,660	163,319
B/maker-Welder	2	53,626	81,660	163,319

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Staff	Number	Salary Base (\$pa)	Salary Inc. Oncosts (\$pa)	Sub-Total (\$pa)
Electrician/Instrument Technician	2	53,626	81,660	163,319
Labourer	2	36,498	58,799	117,598
Planner	1	53,626	81,660	81,660
Sub-Total	11			929,063
Total Labour	42			3,248,623

8.2.2 CRUSHER AND MILL LINERS

Schedules for crusher and mill liners were derived from Bateman's database for similar applications. Assumptions are as follows:

Jaw crusher liners – 1.5 sets per year at \$20,000 per set

Cone crusher liners – 2 sets per year at \$15,000 per set

Mill rubber liners – 1 set per year at \$40,000 per set

Mill rubber lifters – 2 sets per year at \$25,000 per set

8.2.3 MAINTENANCE CONSUMABLES

Maintenance expenses comprise those costs associated with the consumption of equipment spares and other supplies utilised in carrying out the maintenance functions for the project but exclude staff labour.

The amounts for maintenance consumables were estimated as 5% of total direct costs, which is reasonable for a new plant of this type. The total maintenance consumables cost as calculated at \$500,000 or \$2.28/t milled. A total maintenance cost of \$4.70/t was determined including labour.

8.2.4 POWER

- The total connected load for the project was determined from the equipment list and used in conjunction with appropriate factors for average and peak demand and the costs of generation to provide the power operating costs.
- Some power consumption data such as in the mill area was derived from first principles (Bond work indices and design criteria).
- Power consumption in other areas was determined by factoring installed power from the equipment list.
- The rate for power consumption was provided by HBJV of \$0.16/kWh. This rate was then used to determine totals.

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A summary is presented in Table 8.3.

Table 8.3 Power Cost Summary

	Installed Power (kW)	Drawn Power (kW)	Avail. (hr)	Consumption (MWH/yr)	Cost (\$/yr)
ROM Ore Crushing	274	219	5,585	1,223	195,698
Milling, Gravity and Classification	645	500	8,234	4,117	658,720
Scavenger Flotation	60	48	8,234	395	63,237
Regrind, Leaching and Filtration	109	83	8,234	683	109,348
Goldroom	65	51	8,234	420	67,189
Tailings and Detox	181	72	8,234	593	94,856
Reagents	9	7	8,234	58	9,222
Services	283	131	8,234	1,079	172,585
Total	1,626	1,111		8,940	1,370,855

8.2.5 HIRED SERVICES

Allowance has been made for bringing in external assistance for items such as weightometer calibration, environmental and water issues, metallurgical consultants, metallurgical testing, external assay checks and instrument calibration. A breakdown of these costs is provided as Table 8.4.

Table 8.4 Hired Services Summary

Category	Cost (\$/annum)
Instrument Calibration	20,000
Met Consultants	25,000
Met Testing	40,000
Conveyor Belt Repairs	12,000
Water Consultants	25,000
Water Assays	6,000
Tailings Management	30,000
Tailings Rehabilitation	50,000
External Assay Checks	8,000
Total	216,000

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DORIS NORTH TRIAL OPERATION SCOPING STUDY**MIRAMAR MINING CORPORATION****8.2.6 PLANT VEHICLES RUNNING COSTS**

A flat running cost estimate has been made for operating the mill feed FEL and bobcat on an annual hours basis, and the mill vehicles on a flat rate:

FEL – 8234 hrs/annum at \$30 per hour

Bobcat – 730 hrs/annum at \$20 per hour

Light vehicles (2) – \$20,000 each per annum

8.2.7 REAGENTS & CONSUMABLES

- Reagents and consumables were determined based on the design criteria.
- Mill balls were calculated using Bond method based on an assumed abrasion index for quartz reef ore in greenstone host rock.
- A complete schedule of metallurgical plant reagent costs based on a typical operating year was developed and priced.
- Costs for reagents and consumables were based on supplier quotations ex-major cities, then transported by road and rail to Hay River, followed by transport to Hope Bay by barge via the McKenzie River-sea route. A number of reagent costs were supplied by HBJV, using current supply costs for Yellowknife operations plus additional transport costs to Hope Bay.
- Import duties and provincial taxes have been excluded from the cost estimate.

Table 8.5 below summarises these items and their costs.

Table 8.5 Reagent & Consumable Cost Summary

Reagent	Unit	Consumption		Landed Cost (\$/unit)	Cost (CAN\$)	
		(per tonne)	(annual)		(\$/t ore)	(annual)
Cyanide	kg	1.10	240,900	2.49	2.739	599,841
Caustic	kg	0.22	48,180	1.68	0.370	80,942
Copper Sulphate	kg	0.12	25,842	2.20	0.260	56,852
Frother	kg	0.05	21,024	3.45	0.331	72,533
Promoter - 3418A	kg	0.02	3,942	5.53	0.099	21,789
Collector - PAX	kg	0.10	21,024	4.17	0.400	87,670
Hydrogen Peroxide	kg	0.12	26,280	1.49	0.178	39,026
Sulphuric Acid	kg	0.21	45,990	0.94	0.196	43,001
Grinding Balls	kg	1.20	262,800	1.16	1.392	304,848
Diesel	litre	0.07	15,600	0.94	0.067	14,586
Smelting Fluxes	kg	0.03	6,423	1.37	0.040	8,810
Steel Wool Cathodes	kg	0.004	824	5.49	0.021	4,523
TOTAL					6.09	1,334,422

8.2.8 LABORATORY

Laboratory costs were estimated and a total cost of \$100,000 was assumed.

8.2.9 WATER

Water requirements have been included in the operating cost schedule, and assume a pumping distance of 2.5 km from the lake supply to the plant. An estimate of approximately 72 m3/h has been calculated for raw water makeup purposes, determined from the mass balance.

8.3 QUALIFICATIONS & CLARIFICATIONS

Costs were estimated for a treatment rate of 219,000tpa of ore delivered to the ROM bin. Exclusions from the operating estimate are:

- Costs for areas outside of the battery limits including power supply, tailings dams, roads, communications, infrastructure;
- mining costs including mine maintenance;
- ore handling to the ROM pad;
- geology;
- site overheads and administration;
- head office costs;
- gold dore transportation and refining costs;

Appendix A
DESIGN CRITERIA

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DORIS NORTH TRIAL OPERATION SCOPING STUDY**MIRAMAR MINING CORPORATION**

CLIENT: Hope Bay Joint Venture
PROJECT: Hope Bay Engineering Study
JOB NUMBER: MAP102
CASE: Final Option for Study - Gravity/Flotation/Leach Plant, 600 tpd
DATE: January 9, 2002
REVISION: A

SOURCE OF DATA

Bateman estimate, assumption or recommendation	1
Bateman database	2
I.M.E. report, Doris Gold Project (for BHP)	3
Public domain	4
Calculated	5
Vendor advice	6
Centre for Minerals Technology report, Feb 1997, Boston Gold Project	7
Lakefield Progress Report No. 1, July 1998, Boston Gold Project	8
Client advice	9
PRA Test Report	10

1.0 SITE DATA	Unit	Value	Source
General			
Location		Hope Bay Area, Nunavut Territory, Canada	9
Site Elevation	m	50	1
Site Barometric Pressure	mBar	10.49	5
Temperatures			
Minimum	degrees C	-55	9
Maximum	degrees C	20	9
Rainfall			
Minimum	mm	tba	9
Maximum	mm	tba	9
Annual	mm	tba	9
Evaporation Rates			
Minimum	mm	tba	9
Maximum	mm	tba	9
Annual	mm	tba	9

2.0 FEED CHARACTERISTICS**Value**

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DORIS NORTH TRIAL OPERATION SCOPING STUDY**MIRAMAR MINING CORPORATION****Typical Head Analysis (average)**

Au	ppm	19.0	9
Ag	ppm	3	10
Total S	%	0.4	3
Cu	%	none	

Physical Properties

Description		Quartz reef	
Abrasion Index		0.45	2
Bond Ball Mill Work Index Determination			
P80 Size	um	108	10
Work Index	kWh/t	17.5	10
Specific Gravity			
ROM Feed		2.70	2
Rougher Gravity Cons		3.60	2
Cleaner Gravity Concentrate		4.00	2
Flotation Concentrate		3.60	2
ROM Ore Bulk Density	t/m3	1.60	2
ROM Size Distribution			
Maximum	mm	600	1
Nominal P80	mm	250	1
Nominal P50	mm	100	1

Water Analysis

not available

3.0 PRODUCTION CRITERIA

Plant Throughput	t/a	219,000	9
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Crushing

Days per Annum		365	2
Days per Week		7	2
Operating Hours	/day	18.0	2
Available Hours	/day	15.3	5
Design Availability	%	85	2
Operating Hours	hrs/a	5585	5
Throughput	t/h	39.2	5

Other Areas

Days per Annum		365	2
Days per Week		7	2
Operating Hours	/day	24	2
Available Hours	/day	22.6	5
Design Availability	%	94.0	2
Operating Hours	hrs/a	8234	5
Throughput	t/h	26.6	5

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DORIS NORTH TRIAL OPERATION SCOPING STUDY**MIRAMAR MINING CORPORATION****Gold Recoveries**

Gold to rougher gravity cons	%	60.0	10
Gold to rougher flotation cons	%	22.2	10
Gold to scavenger flotation cons	%	14.8	10
Gold to leaching	%	97.0	10
Leach recovery	%	98.0	10
Overall recovery	%	95.1	5

4.0 CRUSHING

Annual Throughput, t/a		219,000	9
Production Rate, t/h		39.2	5

ROM Bin

Live Capacity	mins	2	1
Live Volume	m3	0.8	5
Dead Volume	%	15	1
Total Volume	m3	0.9	5

Primary Crushing

Ore Delivery		FEL	1
Feed Rate	t/h	39.2	5
Feed Moisture, average	% w/w	5.0	1
Crusher Type		Jaw	6
Feeder Type		vibrating feeder	6
Crusher CSS	mm	110	6
Crusher Product, 80% Passing Size	mm	100	6

Product Screening

Feed Top Size	mm	200	6
Circulating Load	% of new feed	150	6
Feed Rate	tph	98.0	5
Screen Type		two deck, inclined, vibrating	6
Screen Aperture			
- upper	mm	38.0	6
- lower	mm	13.0	6
Panel Type		rubber	6
Product Size, 80% passing	mm	10.0	6
Product Rate	tph	39.2	5

Secondary Crushing

Feed Rate	t/h	58.8	5
Solids Content	% w/w	98.0	6
Crusher Type		Cone	6
Crusher CSS	mm	15	6
Crusher Product, 80% Passing Size	mm	13	6

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Conveyor Duties

Jaw Crusher d/c	tph	39.2	5
Screen Feed	tph	98.0	5
Fine Ore Transfer	tph	39.2	5
Cone Crusher Feed	tph	58.8	5
Fine Ore Stacking	tph	39.2	5
Mill Feed	tph	26.6	5

Particle Top Size

Jaw Crusher d/c	mm	200	6
Screen Feed	mm	200	6
Fine Ore Transfer	mm	13	6
Cone Crusher Feed	mm	200	6
Fine Ore Stacking	mm	13	6
Mill Feed	mm	13	6

5.0 GRINDING, CLASSIFICATION & ROUGHER GOLD RECOVERY

Ball Mill

Type		overflow ball	
Feedrate	t/h	26.60	5
Mill Feed Size, 100% passing	mm	13.0	6
Mill Feed Size, 80% passing	mm	10.0	6
Mill Product Size, 80% passing	P80 um	150	10
Milling Density	%w/w	70	1
Ball Mill Work Index	kWh/t	17.5	10
Rod Mill Work Index	kWh/t	19.3	1
EF Factors		1.19	5
Specific Milling Power at Pinion	kWh/t	15.12	5
Grinding Media			
Media Type		balls	1
Makeup Top Size	mm	90	5
Media Load			
Nominal	%	30	1
Design	%	40	1
Consumption Rate, estimate	kg/t	1.20	1

Mill Data

Liner Type		rubber	1
Mill Size		2.8m D x 4.6m EGL	6
Mill Motor	kW Installed	500	6
Nominal	kW at Motor Input	432	5
Design	kW at Motor Input	500	6
Design	kW at pinion	402	5
Media Addition Method		to mill feed chute	1
Storage		drums/kibble	1

Dilution Water

Mill Feed	m3/h	0.8	5
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Mill Discharge	m3/h	10.8	5
Rougher Gravity Separation			
Gravity Separator Type		In-Line Pressure Jig	1
Number of Units		IPJ2400	6
Feed Source		mill discharge	1
Proportion of Stream Treated	% of total	100	1
Feed Solids Rate	tph	98.1	5
Water in Feed	m3/h	52.8	5
Feed Dilution	m3/h	10.8	5
Feed Pulp Density	% w/w	65.0	5
Fluidisation Water	t water per t solids	0.2	6
	m3/h	19.6	5
	% split to cons	70	6
Mass Pull to Concentrate	% of new feed	5.0	6
Concentrate Solids Rate	tph	1.33	5
Tails Solids Rate	tph	96.8	5
Gold Recovery to Concentrate	% of new feed	60.0	3
Concentrate Grade	g/t Au	228.0	5
Tails Solids Content	% w/w	60.7	5
Concentrate Solids Content	% w/w	12.0	5
Concentrate Water	m3/h	9.8	5
Tails Water	m3/h	62.7	5
Concentrate P80 Size, estimate	um	250	2
Cyclone Classification Circuit			
<i>Cyclone Feed</i>			
Feed Solids	t/h	96.8	5
Water Flowrate	m3/h	62.7	5
Feed Density	%w/w	60.7	5
Slurry Flowrate	m3/h	98.6	5
Circulating Load	%	300	1
<i>Cyclone Overflow</i>			
Overflow Solids	t/h	24.2	5
Water Flowrate	m3/h	34.5	5
Overflow Density	%w/w	41.2	1
Slurry Flowrate	m3/h	43.4	5
<i>Cyclone Underflow</i>			
Underflow Solids	t/h	72.6	5
Water Flowrate	m3/h	28.2	5
Underflow Density	%w/w	72.0	1
Slurry Flowrate	m3/h	55.1	5
Cyclone Diameter	mm	380	1
Number of Clusters		1	1
Number Operating/Cluster		1	5
Number Installed /Cluster		2	5
Operating Pressure	kPa	70	1

Rougher Flotation

Flotation Device Type		"Flash Flotation" Unit Cell	1
Number Installed		1	6
Feed Source		Cyclone Underflow	1
Feed Solids Rate	tph	72.6	5
Water in Feed	m3/h	35.8	5
Dilution Required	m3/h	7.5	5
Feed Pulp Density	% w/w	67.0	6
Spray Water	t water per t solids	0.1	6
	tph	7.3	5
Mass Pull to Concentrate	% of new feed	4.0	6
Concentrate Solids Rate	tph	1.06	5
Tails Solids Rate	tph	71.54	5
Gold Recovery to Concentrate	% of new feed	22.2	10
Concentrate Grade - calculated	g/t Au	105	5
Concentrate Solids Content	% w/w	25.0	6
Concentrate Water	m3/h	3.19	5
Tails Solids Content	% w/w	64.2	5
Tails Water	m3/h	39.8	5
Air Requirement	Nm3/h	300	6
Reagents			
Collector - PAX	g/t treated	25	10
Frother - MIBC	g/t treated	30	10
Activator - CuSO4	g/t treated	33	3
Promoter - 3418A	g/t treated	5	3

6.0 SCAVENGER FLOTATION

Scavenger Flotation Feed Conditioning

Volumetric Flow Rate	m3/h	43.4	5
Feed Source		cyclone overflow	1
Conditioning Time	mins	5	3
Conditioning Tank - freeboard	mm	300	1
Conditioning Tank Volume - live	m3	3.62	5
D/C Pulp Density	% solids w/w	35	1
Feed Dilution	m3/h	10.5	5

Scavenger Flotation

Flotation Cell Type		Tank Cell	1
Number Installed		4	6
Available Volume in Cells	%	80	6
Size of Cells - minimum active volume	m3	8	5
Feed Source		conditioned cyclone overflow	1
Residence Time			
Laboratory	mins	15	10
Plant	mins	30	2
Feed Solids Rate	tph	24.2	5

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Volumetric Flow Rate	m3/h	53.9	5
Feed Grade	g/t Au	3.7	5
Water in Feed	tph	34.5	5
Feed Pulp Density	% w/w	35.0	1
Launder Water	t water per t cons	1.0	1
	tph	0.5	5
Mass Pull to Concentrate	% of new feed	2.0	1
Concentrate Solids Rate	tph	0.53	5
Tails Solids Rate	tph	23.67	5
Gold Recovery to Concentrate	% of new feed	14.8	5
Concentrate Grade	g/t Au	141	5
Tails Grade	g/t Au	0.64	5
Tails Solids Content	% w/w	34.8	5
Concentrate Solids Content	% w/w	25.0	1
Concentrate Water	m3/h	1.60	5
Tails Water	m3/h	44.4	5
Concentrate P80 Size, estimate	um	100	2
Minimum Cell Size	m3	8.4	5
Blower Air - total	Nm3/h	1848	6
Reagents			
Collector - PAX	g/t treated	30	10
Frother - MIBC	g/t treated	15	10
Activator - CuSO4	g/t treated	30	3
Promoter - 3418A	g/t treated	5	3

7.0 CONCENTRATE REGRINDING

Cyclone Classification Circuit

Cyclone Feed

Feed Solids	t/h	6.4	5
Water Flowrate	m3/h	8.0	5
Feed Density	%w/w	44.4	5
Slurry Flowrate	m3/h	10.3	5
Circulating Load	%	300	1

Cyclone Overflow

Overflow Solids	t/h	1.60	5
Water Flowrate	m3/h	6.1	5
Overflow Density	%w/w	20.7	5
Slurry Flowrate	m3/h	6.7	5

Cyclone Underflow

Underflow Solids	t/h	4.8	5
Water Flowrate	m3/h	1.9	5
Underflow Density	%w/w	72.0	1
Slurry Flowrate	m3/h	3.6	5
Cyclone Diameter	mm	150	1
Number of Clusters		1	1
Number Operating/Cluster		1	5
Number Installed /Cluster		2	5

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DORIS NORTH TRIAL OPERATION SCOPING STUDY

MIRAMAR MINING CORPORATION

Operating Pressure	kPa	70	1
Concentrate Regrind			
Feed Rate,t/h	t/h	1.60	5
Concentrate P80 Size, estimate	P80, microns	192	2
Product size	P80, microns	45	10
Work Index	kWh/t	17.0	2
Specific Power at Pinion	kWh/t	18.3	5
Mill Density	%w/w	60.0	6
Media Type		steel shot	6
Media Load	%	100	6
Media Makeup Size	mm	6	6
Media Consumption Rate	kg/t milled	0.94	6
Mill Charge - estimate	tonnes	tba	6
Liner Type		rubber	6
Mill Motor	kW Installed	37	6
	kW Drawn	30	5

8.0 INTENSE CYANIDE LEACHING

Leach Feed Dewatering

Feed Source		gravity + flotation concentrates	1
Feed Solids Rate	tph	2.93	5
Feed Water	m3/h	15.9	5
Feed Density	% w/w	15.6	5
Dewatering Unit		Static Cone	6
Underflow Density	% w/w	75	6
Decant Water	m3/h	14.9	5

Intense Cyanide Leaching

Leaching Type		In-line Leach Reactor (ILR)	1
Leach Feed			
Solids Rate	tph	2.93	5
Solution Rate	m3/h	0.98	5
Volumetric Rate	m3/h	2.06	5
Head Grade	g/t Au	167.5	5
Dilution Source		spent electrolyte	1
Dilution Rate	m3/h	3.41	5
Dilution Tenor	ppm Au	1.62	5
Leach Density	% w/w	40.0	6
Cyanide Consumption	kg/t feed	10.0	6
	kg/h	29.3	5
Cyanide Strength	% w/w	20	1
Cyanide Solution Addition Rate	kg/h	134.6	5
Sodium Hydroxide Consumption	kg/t feed	2.00	6
Sodium Hydroxide Strength	% w/w	20	5
Caustic Solution Addition Rate	kg/h	29.26	5
Reactor Residence Time	hrs	8.0	6

MINERALS AND METALS**Bateman Engineering Pty Ltd**

ABN 67 009 001 558 ACN 009 001 558

DORIS NORTH TRIAL OPERATION SCOPING STUDY**MIRAMAR MINING CORPORATION**

Reactor Live Volume Req'd	m3	43.8	5
Voidage	%	40	6
Total Reactor Volume	m3	73.0	5
Gold Recovery	%	98.0	3
Solution Tenor	ppm Au	114.1	5
Solids Assay	g/t Au	3.4	5

Leach Residue Dewatering

Discharge Solids Rate	tph	2.93	5
Discharge Pulp Density	% w/w	40.0	6
Discharge Volumetric Rate	m3/h	5.47	5
Discharge Solution Rate	m3/h	4.39	5
Dewatering Unit		Static Cone	6
Underflow Density	% w/w	60	6
Overflow Solution Rate	m3/h	2.44	5
Underflow Solution Rate	m3/h	1.95	5
Underflow Volumetric Flow	m3/h	3.03	5

Leach Residue Filtration

Type of Filter		vacuum belt	1
Filter Operation		continuous	1
Feed Pulp Density	% w/w solids	60	6
Solution in Feed	tph	1.95	5
Specific Filtration Rate	t/m2.h	0.50	1
Required Filtration Area	m2	5.9	5
Number of Wash Stages		3	5
Wash Ratio	t water to t solution	1.0	1
Wash Efficiency	%	>99	1
Cake Solids	% w/w solids	85	1
Wash Water Requirement	tph	1.95	5
Filtrate Tenor	ppm Au	57.1	5
Solution Content in Filter Cake	m3/h	0.52	5
Filtrate Solution Flowrate	m3/h	3.38	5

Rich Electrolyte

Filtrate Solution Flowrate	m3/h	5.82	5
Solution Tenor	ppm Au	81.0	5

9.0 ELECTROWINNING**Rich Electrolyte Tank**

Tank Residence Time	hrs	2.0	1
Live Volume	m3	11.6	5
Freeboard	mm	300	1
Height:Diameter Ratio		1.2	1
Required pH		12.5	1

Electrowinning

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DORIS NORTH TRIAL OPERATION SCOPING STUDY**MIRAMAR MINING CORPORATION**

Feed Rate	m3/h	5.82	2
Pass Efficiency per Cell	%	98	2
Gold Deposition Rate	g/h	462.0	5
	g/day	11087	5
	g/week	77611	5
Gold:Cathode Loading Ratio		3.0	2
Number of Cells in Parallel		1	2
Number of Cells in Series		1	2
Cathodes per Cell		9	2
Anodes per Cell		10	2

Spent Electrolyte Tank

Tank Residence Time	hrs	2.0	1
Live Volume	m3	11.6	5
Freeboard	mm	300	1
Height:Diameter Ratio		1.2	1
Spent Electrolyte Tenor	ppm Au	1.62	5
Solution Recycle to ILR	%	58.6	5
	m3/h	3.41	5
Solution Bleed to Cyanide Detox	%	41.4	5
	m3/h	2.41	5

10.0 DORE SMELTING**Cathode Calcining**

Wool:Recovered Metal Ratio		0.17	2
Steel Wool Consumption	kg/week	16	5
Weight Increase Factor After Calcining		1.43	5

Cathode Mass

Gold Content (assumes 24 hrs availability)	kg/day	11.53	5
Gold Purity - assumed	%	80	2
Gross Cathode Mass - includes calcined wool	kg/week	124	5
Flux:Cathode Ratio		1.0	2
Flux Requirement	kg/week	124	5

Smelting

Furnace Type		Tilting diesel fired	1
Smelting Temperature - max	deg C	1150	2
Smelting Time - including warmup	h	6	2
Smelts per Week		2	2
Ingot Size	ozs	500	2
Crucible Capacity	L	A200	2
Heater Source		Diesel	2

Dore Production

Fine Gold Content	kg/week	76.1	5
Assumed Impurities	%	20	1

MINERALS AND METALS

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DORIS NORTH TRIAL OPERATION SCOPING STUDY

MIRAMAR MINING CORPORATION

Dore Production	kg/week	95.1	5
Ingots Per Week Produced		6	5

11.0 CYANIDE DETOXIFICATION

Feed Source		repulped leach residue	1
Feed Solution Flow Rate	m3/h	2.93	5
Solids in Feed	tph	2.93	2
Volumetric Flow Rate	m3/h	4.01	2
Free and WAD Cyanide in Feed			
Average	ppm	350	1
Design	ppm	500	1
Free Cyanide in Tails			
Average	ppm	0.5	2
Design	ppm	1.0	2
Cyanide Flowrate			
Average	kg/h	1.022	5
Design	kg/h	1.46	5
Caro's Acid			
Stoichiometric Dose Rate	kg/kg CN ⁻	4.38	2
Stoichiometric Factor		1.10	2
Average	kg/h	4.9	5
Design	kg/h	6.4	5
Reaction Time	mins	2	2
Peroxide			
Concentration	%w/w	60.0	4
Average @ concentration noted	kg/h	2.4	5
Design @ concentration noted	kg/h	3.2	5
Sulphuric Acid			
Stoichiometric Factor		1.20	2
Average	kg/h	5.1	5
Max	kg/h	5.5	5

12.0 TAILINGS DISPOSAL

Feed Source		Flotation tails + detox d/c	
Solids Rate	t/h	26.6	5
Feed Density	%w/w	36.0	5
Volumetric Flow Rate	m3/h	57.1	5
Sump Residence Time	mins	1	9
Sump Minimum Live Volume	m3	1.0	2
Tailings Disposal Method		pump to storage dam	9

13.0 WATER BALANCE

Water In			
Mill Feed	m3/h	1.4	5

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DORIS NORTH TRIAL OPERATION SCOPING STUDY

MIRAMAR MINING CORPORATION

Reagents Allowance	m3/h	0.2	5
Total	m3/h	1.6	5
Water Out			
Final Tails	m3/h	47.3	5
Net Water Consumption	m3/h	45.7	5
Process Water Pumping			
Mill Feed	m3/h	0.8	5
Mill d/c	m3/h	10.8	5
Gravity Concentration	m3/h	19.6	5
Rougher Flotation: feed dilution + spray water	m3/h	14.8	5
Scavenger Flotation: feed dilution + launder water	m3/h	11.5	5
Regrind Mill	m3/h	1.3	5
Cleanup - peak demand	m3/h	10.0	5
Concentrate Belt Filter	m3/h	2.0	5
Reagents - peak demand	m3/h	2.8	5
Total	m3/h	73.6	5

14.0 REAGENTS + CONSUMABLES

Grinding Media - Ball Mill

Media Type		steel balls	1
Consumption			
unit	kg/t new feed	1.20	2
daily (24 hr operation)	t/day	0.77	5
annual (inc. availability)	t/a	262.8	5
Media Size	mm	90	5
On Site Storage	d	365	1

Grinding Media - Regrind Mill

Media Type		steel shot	1
Consumption			
unit	kg/t new feed	0.06	2
daily (24 hr operation)	t/day	0.04	5
annual (inc. availability)	t/a	12.4	5
Media Size	mm	6	5
On Site Storage	d	365	1

Sulphuric Acid

Liquid SG		1.834	4
pH		<1	4
Concentration	%w/w	98	4
Consumption			
unit	kg/t	0.21	5

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DORIS NORTH TRIAL OPERATION SCOPING STUDY**MIRAMAR MINING CORPORATION**

daily (24 hr operation)	t/day	0.13	5
annual (inc. availability)	t/a	45.3	5
Transport Form		Liquid	4
Transport Packaging		Bulka boxes	4
Delivery to Process Plant		drum pump	1
On Site Storage	d	365	1
Sodium Cyanide			
pH		alkaline	4
Net Consumption			
unit	kg/t new feed	1.10	5
daily (24 hr operation)	t/day	0.70	5
annual (inc. availability)	t/a	240.9	5
Mixed Concentration	%w/w	20	1
Addition Rate	l/h	117	5
Mixed Consumption (24 hr operation)	m3/day	2.81	5
Liquid SG		1.15	4
Mixing Tank Capacity	m3	2.8	5
Storage Tank Capacity	m3	3.7	5
Transport Form		pellets	4
Transport Packaging		bulka boxes, 1 tonne	4
Delivery to Process Plant		distribution pumps	1
Boxes per mix		1	1
On Site Storage	d	365	1
Hydrogen Peroxide			
Liquid SG		1.19	4
pH		mildly acidic	4
Concentration	%w/w	60.0	4
Consumption			
unit	kg/t	0.12	5
daily (24 hr operation)	t/day	0.08	5
annual (inc. availability)	t/a	26.2	5
Transport Form		Liquid	4
Transport Packaging		Bulka boxes	4
Delivery to Process Plant		metering pump	4
On Site Storage	d	365	1
Sodium Hydroxide			
pH		alkaline	4
Net Consumption			
unit	kg/t new feed	0.22	5
daily (24 hr operation)	t/day	0.14	5
annual (inc. availability)	t/a	48.2	5
Mixed Concentration	%w/w	20	1
Liquid SG		1.2	4
Addition Rate	l/h	23	5
Mixed Consumption (24 hr operation)	m3/day	0.56	5

Mixing Tank Capacity	m3	0.56	5
Storage Tank Capacity	m3	0.73	5
Transport Form		pellets	4
Transport Packaging		25 kg bags	4
Delivery to Process Plant		distribution pumps	1
Bags per mix		3	1
On Site Storage	d	365	1

Diesel (Cathode Smelting)

Consumption			
unit	l/h	25	2
hours per campaign	h	6	2
campaigns per week		2	2
annual	m3/a	15.6	5
Liquid SG		0.9	4
Transport Form		Liquid	4
Receival Method		metered from day tank	4
Storage Capacity	days	14	2
Storage Tank Volume	m3	0.6	5

Smelting Fluxes

Requirement per week	kg/week	124	5
Flux Makeup (typical)			
Anhydrous Borax	%	20	2
Silica	%	42	2
Sodium Nitrate	%	30	2
Soda Ash	%	8	2
Total	%	100	2
Annual Requirement (including availability)			
Anhydrous Borax	t/a	1.28	5
Silica	t/a	2.70	5
Sodium Nitrate	t/a	1.93	5
Soda Ash	t/a	0.51	5
Total	t/a	6.423	5
Storage Capacity	days	365	2

Steel Wool Cathodes

Type		Grade 1 ribbon	2
Requirement	kg/week	15.8	5
Annual Requirement	kg/a	824.1	5
Storage Capacity	days	365	2

Flotation Collector

Type		Potassium Amyl Xanthate	3
pH		Alkaline	4
Net Consumption			
unit	g/t new feed	96	5
daily (24 hr operation)	kg/d	61.0	5

MINERALS AND METALS

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MIRAMAR MINING CORPORATION

annual (inc. availability)	t/a	20.9	5
Mixed Concentration	%w/w	10.0	2
Addition Rate	l/h	22.9	5
Mixed Consumption (24 hr operation)	m3/day	0.55	5
Mixing Tank Capacity	m3	0.5	5
Storage Tank Capacity	m3	0.7	5
Deliver to Process Plant		distribution pumps	2
Transport Form		Powder	4
Transport Packaging		Drum, 220 kg	4
Drums/mix		2.0	5
On Site Storage	d	365	1

Frother

Type		MIBC	3
Bulk Density	t/m3	0.80	4
Consumption	g/t new feed	96	5
unit	l/day	76.2	5
annual	m3/a	26.2	5
Delivery to Process Plant		metering pump	2
Drum Capacity	L	300	4
	days	3.9	5
Transport Form		Liquid	4
Transport Packaging		Drum	4
On Site Storage	d	365	1

Flotation Promoter

Type		A3418A	3
pH		Alkaline	4
Form		liquid	4
SG		1.1	4
Net Consumption			
unit	g/t new feed	18	5
daily (24 hr operation)	kg/d	11.6	5
	l/d	10.6	5
annual (inc. availability)	t/a	4.0	5
Delivery to Process Plant		metering pump	2
Transport Packaging		200 litre drums	4
On Site Storage	d	365	1

Flotation Activator

Type		Copper Sulphate	3
pH		Alkaline	4
Net Consumption			
unit	g/t new feed	118	5
daily (24 hr operation)	kg/d	76	5
annual (inc. availability)	t/a	25.9	5
Mixed Concentration	%w/w	10.0	2
Addition Rate	l/h	28.3	5

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DORIS NORTH TRIAL OPERATION SCOPING STUDY**MIRAMAR MINING CORPORATION**

Mixed Consumption (24 hr operation)	m3/day	0.68	5
Mixing Tank Capacity	m3	0.7	5
Storage Tank Capacity	m3	0.9	5
Delivery to Process Plant		distribution pumps	2
Transport Form		Powder	4
Transport Packaging		25 kg bags	4
Bags/mix		3	5
On Site Storage	d	365	1

15.0 SERVICES + UTILITIES**Compressed Air**

HP Plant Air			
Flowrate	Nm3/h	400	2
Operating Pressure	kPa	700	2
No Units		2	2
No Operating		1	2
LP Plant Air			
Flowrate	Nm3/h	300	2
Operating Pressure	kPa	70	2
No Units		Takeoff from HP Circuit	2
Flotation Air			
Blower Type		centrifugal with letdown	2
Flowrate	m3/h	2,685	5
Operating Pressure	kPa	50	2
No Units		2	2
No Operating		1	2
Instrument Air		with dryer	2
Flowrate	Nm3/h	10	2
Operating Pressure	kPa	600	2
No Units		2	2

Raw Water

Source		lake supply	9
Supply method		submersible pump in decant	1
Plant Requirements			
- continuous	m3/h	46	2
- peak demand	m3/h	90	1

LP Process Water

Source		raw water	9
Storage Type		Tank	2
Live Storage Volume	m3	72	5
Surge Residence Time	h	1.0	2
Plant Requirements	m3/h	72	5

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DORIS NORTH TRIAL OPERATION SCOPING STUDY**MIRAMAR MINING CORPORATION****HP Process Water**

Source		raw water	2
Storage Type		Tank	2
Live Storage Volume	m3	10	2
Surge Residence Time	h	1.0	2
Plant Requirements	m3/h	10	2

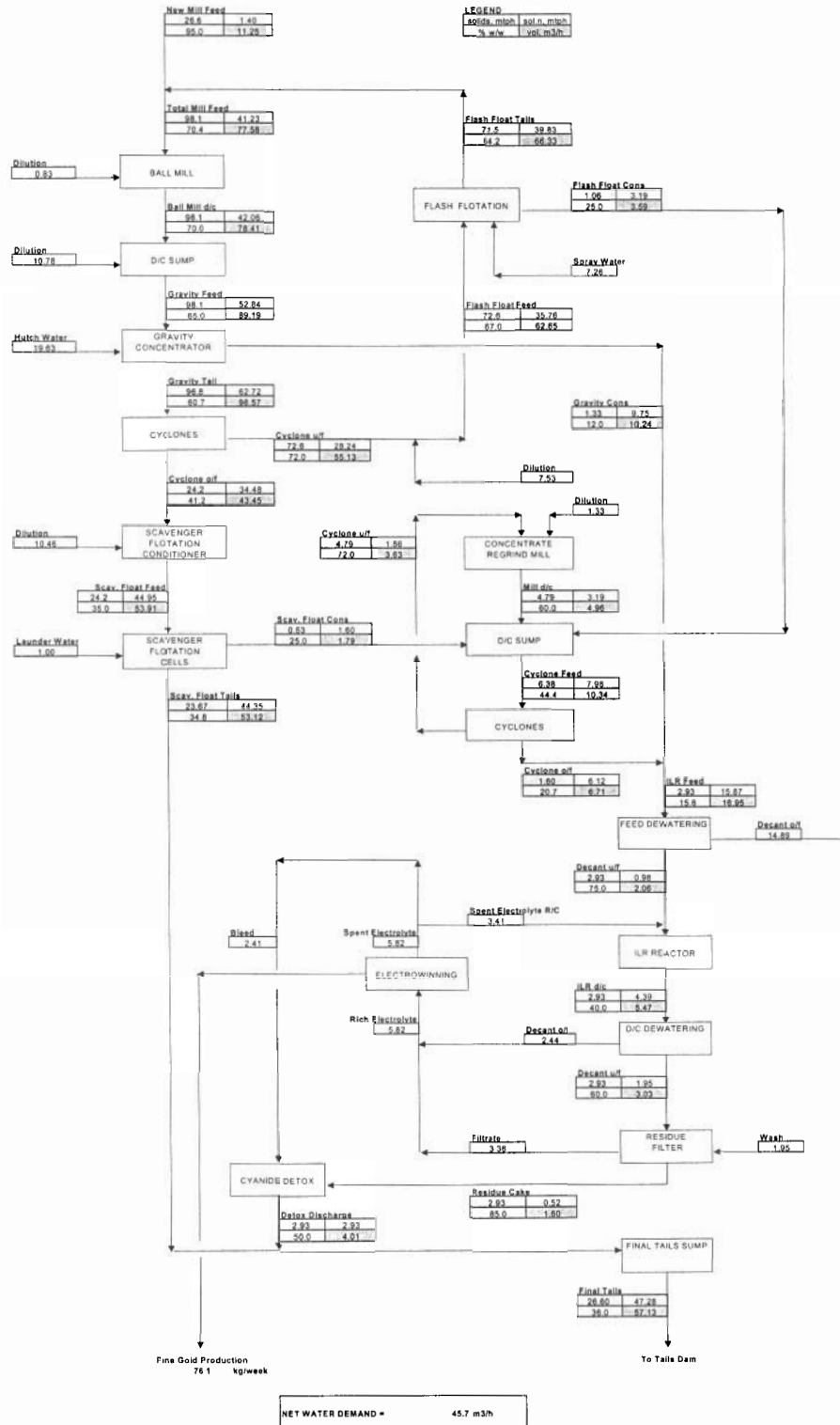
Potable Water

Source		tba	
Treatment		UV	2
Storage Volume	m3	5	2
Consumption	m3/h	2	2

*Appendix B***BLOCK FLOWSHEET AND MASS BALANCE**

MODULAR PLANT BLOCK MASS BALANCE

CLIENT: Hope Bay Joint Venture
 PROJECT: Hope Bay Engineering Study
 JOB NUMBER: MAP102
 CASE: Final Option for Study - Gravity/Flotation/Leach Plant, 600 tpd
 DATE: January 31, 2002
 REVISION: A



Appendix C
EQUIPMENT LIST

MINERALS AND METALS

Bateman Engineering Pty Ltd

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DORIS NORTH TRIAL OPERATION SCOPING STUDY
MIRAMAR MINING CORPORATION

MECHANICAL EQUIPMENT LIST

CLIENT : Hope Bay Joint Venture PROJECT : M3918

PROJECT : Hope Bay Scoping Study

PLANT : Modular Gravity / Flotation Plant, 600 tpd - no tails dewatering,

TYPE : water supplied included

REVISION : A

DATE : 31-Jan-02

IDENTIFICATION									
AREA	ITEM	Tag No.	DESCRIPTION	CAPACITY	Size	UNIT QTY.	POWER		Drawn kW
							Each kW	Installed kW	Factor
			Area 110: ROM Ore Crushing						
110	CP	01	Modular Crushing Plant	60 tph		1	250.0	250.0	0.80
110	CV	01	Secondary Crusher Feed Conveyor		18m x 600mm wide	1	5.5	5.5	0.80
110	CV	02	Cone Crusher Recycle Conveyor # 1		20m x 600mm wide	1	5.5	5.5	0.80
110	CV	03	Cone Crusher Recycle Conveyor # 2		20m x 600mm wide	1	5.5	5.5	0.80
110	CV	04	Stacking Conveyor		30m x 600mm wide	1	7.5	7.5	0.80
110	MD	01	Metal Detector			1			
110	MH	01	Manual Hoist	2 ton		1			
Totals						7		274	219

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DORIS NORTH TRIAL OPERATION SCOPING STUDY
MIRAMAR MINING CORPORATION

IDENTIFICATION									
AREA	ITEM	Tag No.	DESCRIPTION	CAPACITY	Size	UNIT QTY.	Each KW	Installed kW	POWER Draw Factor Drawn kW
			Area 120: Milling, Classification, Gravity Separation + Rougher Flotation						
120	BM	05	Ball Mill with Hydraulic Drive	44.3 ton		1	500.0	500.0	0.86 432.0
120	BN	01	Reclaim Feed Bin	2.5m3		1			
120	BN	02	Ball Charging Kibble	1 ton		1			
120	CV	01	Mill Feed Conveyor	32tph	25m 600mm wide	1	3.3	3.3	0.80 2.6
120	CY	01	Cyclones	120m3/h	380mm dia.	2			
120	DB	01	Underflow Distribution Box	1m3		1			
120	FC	01	Flash Flotation Cell	80tph	SK 80	1	11.0	11.0	0.80 8.8
120	GC	01	Rougher Gravity Concentrator	100tph	IPJ2400	1	2.2	2.2	0.80 1.8
120	MH	01	Hoist - manual	2 ton		1			
120	PP	01	Ball Mill D/C Sump Pumps	107m3/h	4/3-AH	2	60.0	120.0	0.80 48.0
120	PP	02	Mill Area Spillage Pump	30m3/h	65 QV SP	1	7.5	7.5	0.80 6.0
120	SM	01	Ball Mill D/C Sump	2m3		1			
120	SS	01	Milling Area Safety Shower			1			
120	VB	01	Vibrating Feeder	32tph		1	1.1	1.1	0.80 0.8
120	WT	01	Weightometer	32tph		1			
Totals						17		645	500

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DORIS NORTH TRIAL OPERATION SCOPING STUDY
MIRAMAR MINING CORPORATION

IDENTIFICATION									
AREA	ITEM	Tag No.	DESCRIPTION	CAPACITY	Size	UNIT QTY.	Each kW	Installed kW	POWER Draw Factor Drawn kW
			Area 125: Scavenger Flotation						
125	TK	01	Scavenging Conditioning Tank	4 m3	1.7 dia x 2.05 high	1			
125	AG	01	Scavenging Conditioning Tank Agitator		Mixer Model 1080	1	1.5	1.5	0.80 1.2
125	TK	03	Frother Head Tank + Lid	20 litre		1			
125	TK	04	Activator Head Tank + Lid	100 litre		1			
125	TK	05	Collector Head Tank + Lid	100 litre		1			
125	TK	06	Promotor Head Tank + Lid	20 litre		1			
125	FC	01	Scavenger Flotation Tank Cells	9m3		4	11.0	44.0	0.80 35.2
125	PP	01	Flotation Area Spillage Sump Pump	30m3/h	65 QV SP	1	7.5	7.5	0.80 6.0
125	PP	02	Scavenger Flotation Concentrate Pump	2.2m3/h	3/4" froth	1	5.5	5.5	0.80 4.4
125	SS	01	Flotation Area Safety Shower			1			
125	SM	01	Samplers			3	0.4	1.1	0.80 0.9
Totals						16		60	48

IDENTIFICATION

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DORIS NORTH TRIAL OPERATION SCOPING STUDY
MIRAMAR MINING CORPORATION

AREA	ITEM	Tag No.	DESCRIPTION	CAPACITY	Size	UNIT QTY.	Each kW	Installed kW	Draw Factor	Drawn kW
			Area 130: Concentrate Regrind, Leaching + Filtration							
130	RM	01	Concentrate Regrind Mill	3.5 tph	VTM 40 WB	1	37.0	37.0	0.81	30.0
130	CC	01	Regrind Circuit Cyclone	12.4 m3/h	100mm dia	1				
130	PP	01	Regrind Cyclone Feed Pump	12.4 m3/h	3/4" froth pump	2	5.5	11.0	0.80	4.4
130	SM	01	Regrind Mill d/c Sump	2.0m3		1				
130	BN	01	Media Charging Kibble	100 kg		1				
130	LR	01	In-Line Leach Reactor	5.0 tph	ILR5000	1	40.0	40.0	0.80	32.0
130	BF	01	Vacuum Belt Filter	3.5 tph	9m3 effective area	1	15.0	15.0	0.80	12.0
130	DL	01	Filter Discharge Launder		inc with Belt Filter	1				
130	PP	02	Filtration Area Spillage Pump	20m3	40 PV SP	1	5.5	5.5	0.80	4.4
Totals						10		109		83

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DORIS NORTH TRIAL OPERATION SCOPING STUDY
MIRAMAR MINING CORPORATION

AREA	ITEM	Tag No.	DESCRIPTION	CAPACITY	Size	UNIT QTY.	Each kW	Installed kW	Draw Factor	Drawn kW
			Area 140: Goldroom							
140	PC	01	Primary Electrowinning Cell		900mm x 900mm	1	18.0	18.0	0.80	14.4
140	SC	01	Scavenger Electrowinning Cell		900mm x 900mm	1	18.0	18.0	0.80	14.4
140	TK	01	Rich Electrolyte Tank with Lid	11.6 .m3	2.4 dia x 2.9 high	1				
140	TK	02	Spent Electrolyte Tank with Lid	11.6 .m3	2.4 dia x 2.9 high	1				
140	TK	03	Electrowinning Feed Box	0.1 m3	0.4 dia x 0.6 high	1				
140	CO	01	Calcining Oven		200 litre	1	14.0	15.0	0.80	11.2
140	PP	01	Goldroom Area Spillage Pump	20 m3/h	40 PV SP	1	5.5	5.5	0.80	4.4
140	WU	01	Cathode Washdown Unit			1				
140	WH	01	Cathode Wash Hopper		1m3	1				
140	CF	01	Cathode Sludge Filter			1				
140	PT	01	Cathode Preparation Table			1				
140	WS	01	Weighing Scales	0 - 40 kg	Model HL206-61	1				
140	SM	01	Smelting Furnace		A200 crucible size	1				
140	MB	01	Flux Mixing Barrel	1 m3		1				
140	SF	01	Safe			1				
140	DM	01	Dore Moulds		1000 oz	1				
140	EH	01	Smelting Exhaust Hood and Fan			1	3.3	3.3	0.80	2.6
140	EH	02	E/W Exhaust Hood and Fan			1	3.3	3.3	0.80	2.6
140	SS	01	Goldroom Safety Shower			1				
140	PP	02	E/W Feed Pump	4.1 m3/h	Helical Rotor - C61M	1	1.1	1.1	0.80	0.9

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140	PP	03	Spent Electrolyte Pump	4.1 m3/h	Helical Rotor - C61M	1	1.1	1.1	0.80	0.9
140	MH	01	Hoist	250 kg		1				
140	VD	01	Vault Door			1				
Totals						23	65			51

IDENTIFICATION										
AREA	ITEM	Tag No.	DESCRIPTION	CAPACITY	Size	UNIT QTY.	Each kW	Installed KW	Draw Factor	Drawn kW
			Area 150: Cyanide Detox + Tailings							
150	PP	03	Final Tails Pumps - 1st stage	69 m3/h	3/2-AH-CC	2	45.0	90.0	0.8	36.0
150	PP	04	Final Tails Pumps - 2nd stage	69 m3/h	3/2-AH-CC	2	45.0	90.0	0.8	36.0
150	DR	01	Cyanide Detox Reactor with Lid	1m3	1.1 dia x 1.3 high	1				
150	AG	01	Cyanide Detox Reactor Agitator		Mixer Model 1030	1	0.55	0.55	0.8	0.44
150	AR	01	Caro's Acid Reactor	15 l/h		1				
150	SU	01	Final Tails Sump	2m3		1				
Totals						8		181		72
IDENTIFICATION										
						UNIT			POWER	

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AREA	ITEM	Tag No.	DESCRIPTION	CAPACITY	Size	QTY.	Each kW	Installed kW	Draw Factor	Drawn KW
			Area 180: Reagents							
180	AG	01	Collector Mixing Tank Agitator		Mixer Model 1040	1	0.37	0.37	0.80	0.30
180	AG	02	Copper Sulphate Mixing Tank Agitator		Mixer Model 1040	1	0.37	0.37	0.80	0.30
180	AG	03	Caustic Mixing Tank Agitator		Mixer Model 1040	1	0.37	0.37	0.80	0.30
180	AG	04	Sodium Cyanide Mixing Tank Agitator		Mixer Model 1040	1	0.37	0.37	0.80	0.30
180	TK	01	Collector Mixing Tank	0.8m3		1				
180	TK	02	Copper Sulphate Mixing Tank	0.8m3		1				
180	TK	03	Caustic Mixing Tank	0.6m3		1				
180	TK	04	Sodium Cyanide Mixing Tank	2.8m3		1				
180	TK	05	Collector Circulation Tank	1.0m3		1				
180	TK	06	Copper Sulphate Circulation Tank	1.0m3		1				
180	TK	07	Caustic Circulation Tank	0.8m3		1				
180	TK	08	Sodium Cyanide Circulation Tank	3.7m3		1				
180	PP	01	Collector Dosing Pump	120 l/h	SP10	1	0.18	0.18	0.80	0.14
180	PP	02	Copper Sulphate Dosing Pump	120 l/h	SP10	1	0.18	0.18	0.80	0.14
180	PP	03	Caustic Dosing Pumps	50 l/h	SP10	2	0.15	0.30	0.80	0.12
180	PP	04	Sodium Cyanide Dosing Pumps	250 l/h	SP10	2	0.18	0.36	0.80	0.14
180	PP	05	Peroxide Drum Delivery Pump	12 l/h	SP10	1	0.15	0.15	0.80	0.12
180	PP	06	Sulphuric Acid Drum Delivery Pump	20 l/h	SP10	1	0.15	0.15	0.80	0.12
180	PP	07	Promoter Drum Delivery Pump	20 l/h	SP10	1	0.18	0.18	0.80	0.14
180	PP	08	Frother Drum Delivery Pump	20 l/h	SP10	1	0.18	0.18	0.80	0.14

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MIRAMAR MINING CORPORATION

180	PP	09	LPG Delivery Pump	50 l/h	SP10	1	0.18	0.18	0.80	0.14
180	PP	10	Alkaline Reagents Area Spillage Pump	20 m3/h	40 PV SP	1	5.50	5.50	0.80	4.40
180	MH	01	Reagents Hoist	2 ton		1				
180	DT	01	Collector Drum Tipper		200 litre drums	1				
Totals						26	8.8			6.8

IDENTIFICATION										UNIT	POWER

BATEMAN

REPORT DOCUMENT

MINERALS AND METALS

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DORIS NORTH TRIAL OPERATION SCOPING STUDY
MIRAMAR MINING CORPORATION

AREA	ITEM	Tag No.	DESCRIPTION	CAPACITY	Size	QTY.	Each kW	Installed kW	Draw Factor	Drawn kW
190	TK	01	Process Water Tank	72 m3	4.5 dia x 4.9 high	1				
190	TK	02	High Pressure Water Tank	20 m3	2.3 dia x 2.7 high	1				
190	TK	03	Potable Water Tank	5 m3	1.8 dia x 2.3 high	1				
190	XM	01	Raw Water Decant Tower		2 m dia x 10m high	1				
190	PP	01	LP Pressure Water Pumps	86m3/h	3/2-AH	2	15.0	30.0	0.8	12.0
190	PP	02	HP Pressure Water Pumps	12m3/h	1.5/1-AH	2	5.5	11.0	0.8	4.4
190	PP	03	Gland Seal Water Pumps	12m3/h	1.5/1-AH	2	5.5	11.0	0.8	4.4
190	PP	04	Potable Water Pumps	12m3/h	1.5/1-AH	2	5.5	11.0	0.8	4.4
190	PP	05	Raw Water Supply Pump	90m3/h	100 mm dia, multi-stage	1	45.0	45.0	0.8	36.0
190	FB	01	Flotation Blowers	50 kPa	URAI 33	2	5.5	11.0	0.8	4.4
190	CM	01	Plant Air Compressors	600 kPa	SSR XF60	2	45.0	90.0	0.8	36.0
190	CM	02	Instrument Air Compressors	600 kPa	SSR XFE-50	2	37.0	74.0	0.8	29.6
190	AR	01	Plant Air Receiver		R-4 1000L	1				
190	AR	02	Instrument Air Receiver		R-5 1350L	1				
190	AD	01	Instrument Air Dryer		TS-110	1				
Totals						22		283		131
Grand Totals						129		1,625		1,112

*Appendix D***PROCESS FLOW DIAGRAMS**

*Appendix E***CAPITAL COST ESTIMATE**