GR ENGINEERING SERVICES
ENGINEERING CONSULTANTS AND CONTRACTORS

PEKO BULL PTY LTD

Peko Tailings Project

Costing Study

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1. EXECUTIVE SUMMARY

1.1 Introduction

Peko Bull Pty Ltd (Peko Bull) commissioned GR Engineering Services Limited (GRES) to undertake a preliminary capital cost estimate and operating cost estimate study for the Peko Tailings Project (Project).

The Project will encompass the redevelopment of ore processing facilities and infrastructure at the historic Peko Mine near Tennant Creek in the Northern Territory. An existing processing plant for the production of magnetite concentrate will be modified and recommissioned to enable the processing of the Peko tailings to recover copper, cobalt, gold and magnetite. To keep capital costs as low as possible, the existing magnetite plant feed equipment will be retained and upgraded to its maximum capacity and this will set the overall plant nameplate at 750,000 tonnes of tailings feed per year. The tailings will be reclaimed by a conventional truck and shovel mining method. The Project infrastructure largely exists having been established for the magnetite operation. The power requirement for the multi-product plant is greater than the current installed transformer capacity and this will be upgraded as part of the Project.

The stated resource for the Project is 3.75 Mt at 1.14 g/t gold, 0.25% copper, 0.11% cobalt and magnetite which is of coal washery grade and sizing. The Project site is a brownfields mining area with an existing access road, grid power facilities and administration, workshop and work force amenities. Ground water for processing is available locally and a bore field exists as part of the Project.

1.2 Flowsheet Description

The process flowsheet developed includes:

- Tailings reclamation and screening;
- Flotation;
- Ultra-fine grinding and acid leaching of the flotation concentrate either by Low Pressure Oxidation (LoPOX) or Atmospheric Leach (AL);
- Copper and cobalt recovery by resin-in-pulp following by dedicated copper and cobalt crystallisation to sulphate products;
- Magnetic separation of the flotation tails;
- Cyanidation of the magnetic product followed by filtration;
- Cyanidation of the non-magnetic stream, and;
- Gold recovery.

A detailed description of the process plant facilities is in Section 4.

1.3 Capital and Operating Costs

GRES developed capital and operating costs for the process plant. A summary of these costs have been presented in Table 1.1.

The capital costs include the costs for the treatment plant (only) and does not include upstream and downstream plant and infrastructure costs, pre-production costs such as flowsheet development costs (i.e. test work), pre-production labour, corporate costs, feasibility study costs, sustaining capital, etc. The capital costs have been developed from first principles and based primarily on the available test work and the mechanical equipment lists as described in Section 8.

The operating costs have been developed from first principles based on the available test work, capital costs, mechanical equipment lists and an assessment of the operational requirements. Details on the development of the operating costs have been provided in Section 9.

Description	Units	LoPOX Cost Summary (AUD)	Atmospheric Leach Cost Summary (AUD)
Capital Cost	$M	68.0	42.0
Operating Cost			
Mining	$'000	5,117	5,117
Labour	$'000	4,847	4,847
Power	$'000	9,063	4,608
Reagents	$'000	14,391	15,794
Maintenance and Wear Materials	$'000	3,279	1,979
Other	$'000	2,159	2,109
Unit Processing Cost	$/t	51.81	45.94

Table 1.1 Capital and Operating Cost Summary

The Project engineering and construction schedule is expected to range between 12 to 18 months, and dependent on the acid leach option selected which governs the major equipment long lead items.

GRES has not performed a financial analysis for the Project nor verified any market valuations for the products.

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2. INTRODUCTION

Peko Bull Pty Ltd (Peko Bull) commissioned GR Engineering Services Limited (GRES) to undertake preliminary capital cost estimate and operating cost estimate for a tailings retreatment process plant to be developed using an existing magnetite production facility located at the old Peko Mine in the Northern Territory. The Peko Mine is located approximately 12 km from the town of Tennant Creek in the Northern Territory.

Figure 2.1 Plant Location

The Peko Tailings Project (Project) will utilise an existing processing plant for the production of magnetite concentrate to enable the processing of the Peko tailings to recover copper, cobalt, gold and magnetite.

GRES was commissioned to examine the existing magnetite plant for suitability to be expanded to include acid leaching (either AL or LoPOX) and unit processes for the recovery of copper, cobalt and gold. Existing process plant feed equipment will be retained and upgraded to its maximum capacity and this will set the overall plant nameplate at 750,000 tonnes of tailings feed per year.

The costing study examines the potential capital and operating costs, at concept level, for the Project.

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3. PROCESS METALLURGY

3.1 Introduction

A proposed mining and processing schedule was not developed for the Costing Study (Study).

GRES was presented with a very limited amount of background information on the tailings resource and preliminary test work results to support the metal recoveries and Project viability.

3.2 Historical Information

The Peko Mine has a substantial history of gold and copper mining and more recently has been exploited for magnetite production. Gold was first mined at Tennant Creek in the 1930's and copper from the 1950's. Ore was mined from several resources and some of the Peko and Warego tailings has been previously retreated which mobilised materials from their original place of deposition into other tailings facilities.

The stated resource for the current Project is 3.75 Mt at 1.14 g/t gold, 0.25% copper, 0.11% cobalt and magnetite.

3.3 Ore Characterisation

The cyanide soluble copper content of the tailings is relatively high in proportion to the total copper content making the material not economically amenable to direct cyanidation at current gold prices. The copper is mostly present in sulphide mineralisation which can be recovered by flotation. Cobalt mostly follows the same metallurgy as the copper.

Gold is associated with sulphide minerals, magnetite and siliceous minerals meaning that some form of gold leaching will be required on each aspect of the flowsheet products.

The magnetite content of the tailings is high, with approximately 51% by mass of the process plant feed reporting to a magnetite concentrate. The magnetite can be broadly classified into two size fractions and has been shown to be suitable as heavy media for coal washing applications.

3.4 Process Flowsheet

The process flowsheet designed for the Project will target four products; copper, cobalt (via low pressure oxidation, acid leaching and resin in pulp), magnetite and gold, which will be recovered from leaching the magnetite concentrate (with filtration and washing to recover a pregnant leachate containing gold) and the non-magnetic fraction by carbon in pulp (CIP). The pregnant leachate from the magnetite concentrate will be added into the CIP process to achieve a common gold recovery circuit.

The process design concept lends itself to specific and careful control of circuit conditions and reagent addition that should enable high metallurgical recoveries to be achieved and managed cost.

The flowsheet design is similar in concept to the multi-product flowsheet design being developed for the Mount Morgan Copper Gold Project in Queensland.

3.4.1 Testwork

Testwork has focused on establishing the metal recovery values that can be expected from bulk sulphide flotation, low pressure oxidation and acid leaching of the bulk sulphide concentrate followed by resin-in-pulp (RIP) recovery of the soluble copper and cobalt, magnetic separation of the flotation tails and subsequent sodium cyanide leaching for the recovery of gold.

The copper and cobalt recovery process is an established and utilised technology. Peko Bull Pty Ltd provided their expertise on the evaluation and development of this process aspect within the design.

The magnetite recovery has been established from the process facility which has operated previously at the Project. The gold recovery from magnetite and non-magnetics fractions has been tested via laboratory scale leach tests.

3.4.2 Re-Grinding Testwork

The process flowsheet intended for the Project has been tested with additional grinding of the whole tailings feed. The results indicated very limited benefit in metals recovery from the additional grinding.

Grinding of the flotation concentrate, however, is very beneficial to high copper and cobalt extraction and is applied within the process design.

3.4.3 Flotation Testwork

Bench scale flotation tests have been completed on a composite (Composite 123) made up by combining sub samples from three dam composites. The flotation tests indicate copper, cobalt and gold recovery to the sulphide concentrate of 68%, 72% and 58% respectively. Approximately 21% of the magnetite also reports to the sulphide concentrate.

3.4.4 Magnetite Separation

Magnetic separation test work completed by ALS on flotation tail samples showed mass recovery to the magnetic concentrate ranging between 65.9 to 66.5% with an iron recovery of 86.2%. Sulphur and copper recovery to the magnetic concentrate were high at 28.7% and 38.7% respectively, resulting in sulphur and copper grades in the magnetic concentrate of 0.52% and 340 ppm. These are considered high and further optimisation work is recommended.

3.4.5 *Acid Leaching*

An acidic RIP test was performed on the Composite 123 flotation concentrate at a target size of 80% passing 10 microns using Lewatit TP207XL resin to recovery the copper and cobalt.

The test showed copper will load quickly onto the resin, however, cobalt did not load. Acid leaching appeared to be unsuccessful in solubilising the copper and cobalt, with extractions reaching 5.8% and 1.02% for copper and cobalt respectively after 8 hours.

3.4.6 *Low Pressure Oxidation*

A single test that subjected a flotation concentrate sample to oxidative pre-treatment via low pressure oxidation (LoPOX) has been completed. The concentrate sample was ground to a target size of 80% passing 10 microns prior to the test.

Under the LoPOX test conditions, 64.5% of the sulphide minerals oxidised with copper, cobalt and iron extractions being 61.5%, 80.7% and 23% respectively. No gold was extracted with all the gold reporting to the leach residue.

3.4.7 *Cyanidation Leach Testwork*

Sodium cyanide leach tests have been completed on LoPOX residue, magnetic separation concentrate and magnetic separation tail samples.

The table below summarises the test outcomes applied to this Study.

Description	Unit	LoPOX Residue	Magnetic Conc	Non Magnetic Tails	Basis
Residence Time	hr	48	4	48	ALS, A17394, A17129
NaCN Addition	kg/t	7.31	4.01	7.59	ALS, A17394, A17129
Lime Addition	kg/t	13.17	3.11	9.02	ALS, A17394, A17129
Metal Extraction					
- Gold	%	87.48	54.97	77.30	ALS, A17394, A17129
- Copper	%	3.14	42.04	74.40	ALS, A17394, A17129
- Cobalt	%	19.96	0.67	0.85	ALS, A17394, A17129

Table 3.1 Cyanidation Test Work Summary

The testwork confirms maximising the recovery of copper to the bulk sulphide concentrate will be a critical design aspect of the flowsheet to minimise the quantity of cyanide soluble copper from entering the carbon-in-leach (CIL) circuit and to reduce the consumption of sodium cyanide.

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4. PROCESS PLANT DESIGN AND PROCESS DESCRIPTION

4.1 Flowsheet Development

Peko Bull has developed the proposed flowsheet in accordance with the diagram in Figure 4.1 below.

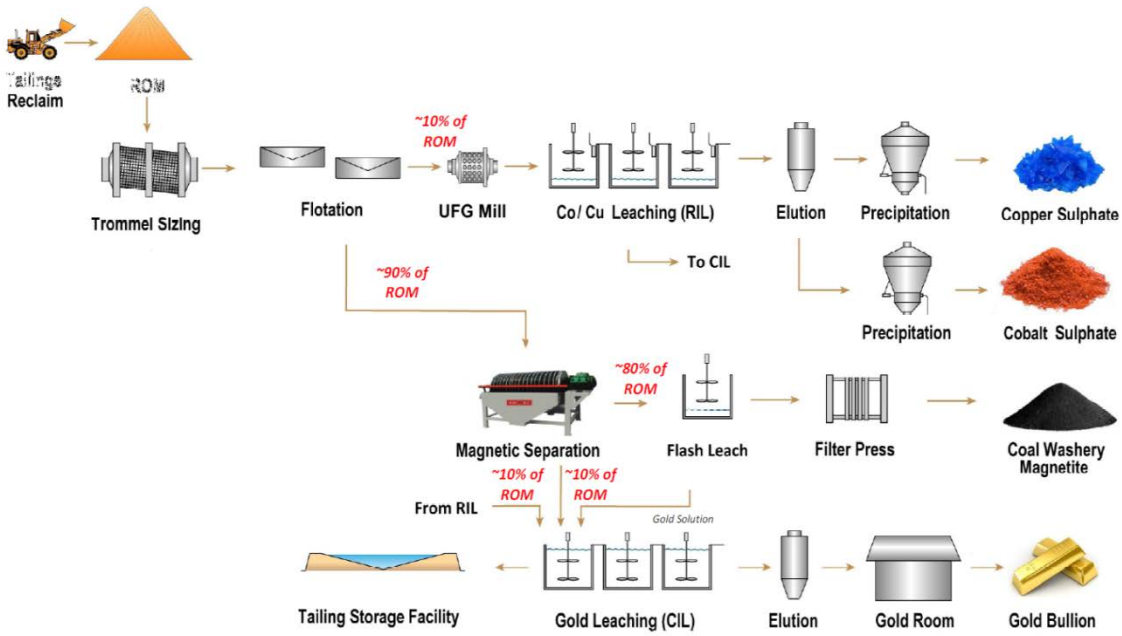

Figure 4.1 Proposed Flowsheet

4.1.1 Feed Handling

The feed handling system will utilise, where possible, existing equipment from the magnetite production plant in order to keep capital costs as low as possible. Reclaimed tailings will be contact with process water and repulped through a trommel screen. Undersize material will be directed to the flotation circuit.

4.1.2 Flotation and Ultra-Fine Grinding (UFG)

Slurry from the feed handling area will undergo flotation to produce a bulk sulphide concentrate containing the majority of the copper and cobalt. The concentrate mass pull will be approximately 22%. Preliminary test work has indicated gold, copper and cobalt recoveries to the bulk sulphide concentrate of 58%, 68% and 72% respectively.

The bulk sulphide concentrate will be subjected to ultra-fine grinding (UFG) to a target grind size P_{80} of 8 microns (µm). The ground sulphide concentrate will be subjected either to low pressure oxidation (LoPOX) or acid leaching followed by the recovery of cobalt and copper with resin.

4.1.3 *Acid Leaching, Copper and Cobalt Resin in Leach (RIL)*

For this flowsheet option, acid leaching of the sulphide concentrate will be completed in a RIL circuit.

The copper and cobalt will be leached with sulphuric acid in a RIL circuit that will incorporate a series of acid resistant contactors in the presence of resin. The resin will be moved counter-current to the flowrate of slurry.

Resin will be removed periodically from the first RIP contactor as 'loaded' resin. The loaded resin will be transferred to a single desorption vessel to elute the resin and recover copper and cobalt in separate low volume, concentrated eluates.

Copper and cobalt will be recovered from their respective pregnant eluates as crystallised sulphate salts.

The residue from the RIL circuit will be neutralised and directed to the gold extraction circuit.

4.1.4 *Low Pressure Oxidation (LoPOX), Copper and Cobalt Resin in Pulp (RIP)*

For the LoPOX option, oxidation will be carried out in a horizontal, six compartment acid resistant brick lined autoclave operating at 100°C and 1,000 kPa with a total residence time of 3 hours. The autoclave is not shown on the Peko flowsheet in Figure 4.1. The ground bulk sulphide concentrate material will be pumped from the autoclave feed tank to the low pressure autoclave by a pair of centrifugal pumps operating in series. Concentrated sulphuric acid will also be added to the autoclave to leach the contained copper and cobalt.

Oxygen will be injected into each autoclave compartment. An oxygen analyser will monitor the oxygen level in the autoclave off-gas stream. The oxygen addition rate to each compartment will be controlled by the off-gas oxygen content.

The oxidised slurry will discharge from the final autoclave compartment via a ceramic choke into a flash vessel. The flashed steam from the flash vessel will be directed to a gas scrubber. The off-gas from the autoclave will also be directed to the gas scrubber.

All spillage from the area will be contained within a concrete bund. The bund floor will be sloped to direct slurry into a single sump located within the bunded area.

A low pressure packaged boiler (5 t/h capacity) will be provided to assist with plant start-up.

Following oxidation of the sulphide concentrate, the slurry will be pumped to the copper and cobalt resin-in-pulp (RIP) circuit. The RIP in functionality will be identical to the RIL description Section 4.1.3.

The residue from the RIP circuit will be neutralised and directed to the gold extraction circuit.

4.1.5 *Magnetic Separation and Coal Washery Magnetite Recovery*

The tails stream from the flotation circuit will be directed to a magnetic separation circuit. The magnetic separation circuit will use conventional wet low intensity magnetic separators (LIMS). The existing magnetite plant has been fitted with two units capable of processing 74 dry tonnes per hour.

The magnetic product will be subjected to an intensive cyanidation leach to dissolve readily recoverable gold from the magnetite. The leached magnetite will then be filtered and thoroughly washed to remove and recover all the gold bearing solution and any residual cyanide from the product to the filter filtrate. The magnetite filter cake, with a moisture content of approximately 15% may either be solar dried before packaging or packaged directly based on the transport and market requirements.

The filter filtrate, containing soluble gold and residual sodium cyanide, will be pumped to the non-magnetics leach and CIP circuit.

Approximately 51% by mass, of the process plant feed will be recovered to the magnetic concentrate stream, leading to about 384,000 tonnes of magnetite product to be transported in bags or containers per year.

4.1.6 *Non-Magnetics Leach and Gold Recovery*

Gold will be extracted from the flotation tails and the copper and cobalt tails streams by conventional sodium cyanide leaching followed by carbon in pulp (CIP). Filter filtrate from the magnetite intensive cyanidation leach circuit containing soluble gold and residual sodium cyanide will also be added. There is no evidence of preg-robbing minerals in the Peko tailings and the selection of CIP allows the adsorption vessel size to be minimised which will reduce the elution capacity required for the Project (significantly reducing capital cost compared with CIL).

4.1.7 *Elution and Electrowinning*

The elution process is anticipated to be a 2 tonne per day Pressure ZADRA unit which will offer a single column design in SAF 2205 handling both the acid wash and elution functions. Cyanide soluble copper may also be adsorbed by the carbon in the CIL circuit. A cold cyanide wash step has not been included in the elution process. This will be investigated in more detail as project development progresses.

4.1.8 *Carbon Regeneration*

A carbon regeneration kiln has not been included in the flowsheet. It is anticipated, carbon regeneration will be performed off site with a minor increase to the operating cost.

This will require further investigation during the next phase of project development.

4.1.9 *Oxygen Supply*

For the LoPOX flowsheet option, oxygen will be supplied to the autoclave by a VPSA plant, equipped with a booster compressor to increase the oxygen delivery pressure. The daily oxygen consumption will be about 52 tonnes.

4.1.10 *Infrastructure*

Existing infrastructure at the Project site will be used to support the operation. The incoming power supply will require additional or upgraded transformers to enable the full power requirements for the Project to be drawn from the grid. For the Study, the 22 kV overhead power line will be suitable to support the Projects power needs.

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5. INFRASTRUCTURE

Site infrastructure facilities required as part of the Project are:

- Site access road – existing;
- Administration complex – existing;
- Power corridor and power line - existing (need upgraded transformers);
- Process water supply and pipe line - partly existing;
- Residue storage facilities – existing;
- Buildings and support equipment not directly associated with the processing plant - partly existing.

5.1 Accommodation

Project accommodation will be in the town of Tennant Creek.

5.2 Site Access Road

The access road to the Project site is in good condition.

5.3 Administration Complex

The existing administration complex will service the operation.

5.4 Power Corridor and Power Line

The power corridor and overhead power line are established and can currently supply 0.8 MW of drawn power.

For the LoPOX leaching option, an installed total power requirement of 6.2 MW with a steady state power draw of about 4.5 MW will be required. For the AL option, the installed power requirement will be about 3.5 MW, with a steady state power draw of 2.2 MW.

Upgrades to the existing switch yard and transformers have been allowed within the capital cost estimates.

5.5 Process Water Supply and Pipe Line

The process water supply has been established but additional water sources and quantity will be required for the Project.

5.6 Residue Storage Facilities

It is expected that the plant tailings will be able to be deposited into the voids left by reclamation of the feed tailings for treatment particularly given that a significant portion of the process plant feed will be transported off site as coal washery magnetite. This will be confirmed during the next Project development phase.

5.7 Buildings and Support Equipment

Buildings and support equipment required for the Project include; plant workshop, warehouse and office, plant offices and hard stand areas with fencing.

Buildings and support equipment included in the Project capital estimate for the process facilities are for items which do not exist at the Project site.

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6. ADMINISTRATION

Administration associated with the processing plant and GRES design scope is limited to the coordination functions for the processing plant and security. As part of the operating cost estimate for the processing plant some costs have been annexed into an administration function.

The main administrative functions are:

- Tailings reclamation (mining);
- Plant management;
- Clerical functions;
- Bullion transport and refining;
- Security;
- Communications.

6.1 Bullion Transport and Refining

Bullion transport and refining charges are usually contracted based on the number of ounces moved, secured, insured and refined. An allowance in the costs for bullion transport and refining has been made assuming single weekly shipments to a refiner located in Australia. The dore composition is assumed to be 95% precious metals and no allowance has been made for refiner penalties or retention. An allowance of $1.50 per ounce has been allowed for in the operating cost estimate.

6.2 Security

In the experience of GRES, security functions and the level of risk mitigation adopted by a company is driven internally. GRES was not provided with information regarding the level of security to be adopted for the Project. As such, nominal allowance has been made in the capital cost estimate for security hardware (electronic security and surveillance system) for the gold room. No allowance has been made in the operating cost estimate for dedicated security personnel at the operation.

6.3 Communications

GRES has assumed that communications exist at the current site that will cover future operational requirements.

6.4 Warehousing and Supply

The operation of warehousing and supply has not been included in the process plant function and costs. However, all consumable rates have been costed on an FIS basis and the construction of a warehouse facility is included in the plant capital estimate. It is assumed that warehousing and supply logistics will form part of the site commercial functions and will be picked up in other parts of the project study.

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7. PROJECT IMPLEMENTATION PLAN AND SCHEDULE

7.1 High Level Development Schedule

An MS Project or Primavera P6 schedule has not been established for this level of study.

Following a brief analysis of the long lead equipment items and the man-hours necessary to deliver the Project, GRES believe the engineering and construction schedule will be approximately 12 to 18 months, pending on the acid leach flowsheet adopted.

The Project schedule will be governed by the ordering and delivery of the autoclave, autoclave agitators and oxygen plant.

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8. CAPITAL COST ESTIMATE

8.1 General

Capital costs for the mechanical and platework items for the various plant areas have been developed from first principles based on the information from the preliminary metallurgical test work. The remaining capital costs for concrete, structural steel, piping, electrical and instrumentation, construction and engineering have been factored in line with other projects.

The capital cost estimates are in Australian Dollars and based on using an EPC contracting methodology for project delivery.

The capital cost estimates have been developed to an order of magnitude level of accuracy.

8.2 Capital Cost Estimates

Summaries of the capital cost estimates for each leach option has been presented in Table 8.1. The detailed capital cost estimates have been provided in Appendix A.

Project Area	LoPOX Estimate ($'000)	Atmospheric Leach Estimate ($'000)
Detail Earthworks & Civil	106	106
Ore Feed and Screening	256	256
Flotation	2,230	2,230
Regrind Circuit	4,333	4,333
Low Pressure Oxidation (LoPOx)	14,112	-
Atmospheric Leach	-	2,958
Co/Cu Recovery - RIP	2,492	2,492
Magnetic Separation & Flash Leach	1,157	1,157
Au Leaching/Adsorption - CIP	4,571	4,571
Elution & Gold Recovery	880	880
Reagents	1,972	1,972
Power & Reticulation	7,564	4,064
Water Services & Reticulation	302	302
Tails Thickener & Disposal	153	153
Air & Oxygen	9,040	1,296
Piping	4,786	4,151
Engineering	5,624	4,828
Commissioning	567	495
Initial Fills	1,291	1,291
Spares	291	129

Project Area	LoPOX Estimate ($'000)	Atmospheric Leach Estimate ($'000)
Contractor Preliminary & General	141	105
Construction	2,651	1,992
Construction Equipment	3,348	2,142
Construction General	127	127
Project Capital Cost Total	**67,994**	**42,031**

Table 8.1 Capital Estimate

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9. OPERATING COST ESTIMATE

9.1 Introduction

The operating costs for the Project have been developed in accordance the GRES Standard for Scoping Studies and reflect the preliminary test work completed by Peko Bull Pty Ltd.

All costs should be considered to have a level of accuracy of ±35%. Full details of the operating cost estimate are included in Appendix B.

9.2 Project Operating Cost Summary

The operating cost estimates, broken down by cost categories have been presented in Table 9.1. The cost summary for the Project is presented below.

Cost Category	LoPOX Unit Cost ($/t)	AL Unit Cost ($/t)
Mining		
Mining	6.82	6.82
Process Plant		
Labour	6.46	6.46
Power	12.08	6.14
Reagents	19.19	21.06
Maintenance and Wear Items	4.37	2.64
Other	2.88	2.81
TOTAL	51.81	45.94

Table 9.1 Operating Cost Estimate Summary

9.3 Structure of Operating Cost Estimate

The operating cost estimate for mineral processing is broken down into the following categories:

- Mining;
- Process Plant;
  - Labour;
  - Power;
  - Reagents;
  - Maintenance;
  - Other Processing Costs.

The inclusions and exclusions for each of these categories have been detailed below. The detailed operating cost models have been included in Appendix A.

The operating cost estimate excludes costs associated with product transport and logistics, royalties, administrative personnel.

General and administration costs have been included in the Other Processing Cost category at a fixed rate of $1.50 per tonne of material processed.

9.4 Mining

The material will be reclaimed by conventional truck and shovel mining techniques. The mining unit cost has been determined from first principles and referencing Chapter 7 of the Cost Estimating Handbook 2013. The basis of the estimate has been detailed below.

The annual operating hours for the shovel is low as a larger shovel size than required has been applied and the operating hours adjusted to meet the processing rate. This is deemed adequate for the accuracy level.

Items	#	Operating Hours h/y	Unit Rate $/h or $/y	Annual Cost $
Fleet				
Excavator/Shovel	1	2,000	520	1,040,000
Trucks	2	6,200	150	1,860,000
Grader	1	100	75	7,500
Water Truck	1	2,190	60	131,400
Loader	1	7,000	78	546,000
Labour (inclusive of 35% on cost)				
Mining Engineer	1		263,250	263,250
Supervisors	1		189,000	189,000
Operators	6		108,000	648,000
Maintenance	4		108,000	432,000
Sub Total				5,117,150
Unit Cost ($/t)				6.82

Table 9.2 Mining Cost Estimate

9.5 Process Plant

9.5.1 Labour

The production manpower schedule assumes two shifts per day of 12 hours duration. Management, technical, maintenance and administrative roles are day work positions. Maintenance shutdown work would be scheduled with additional labour provided by contract arrangement. The contract maintenance costs have been allocated under the maintenance cost centre. The work roster has been framed around 2 weeks on and 1 week cycles that fit into a fortnightly rotation. It has been assumed that all roles are live in Tennant Creek.

There is sufficient manpower on each shift to operate the tailings reclaim, flotation, low pressure oxidation of the flotation concentrate, copper and cobalt recovery plants, magnetic separation and gold recovery plant areas. The gold room will be staffed on day shift only. The loader driver has been included in the mining movement costs. The laboratory services have been assumed to be provided by an external contract service.

The calculation for on-costs includes accommodation, meals, recruitment and training costs, and travel allowance (where applicable). No allowance has been made for annual bonuses, medical allowances or special provisions to attract quality staff. The salary on-cost percentage as a function of the base salary costs is approximately 35% and is inclusive of 9.5% superannuation, annual leave, sick leave and special leave provisions, payroll tax, workers compensation insurance, training and recruitment costs. No allowance has been made for casual staff coverage.

Operating, consumables and labour costs have not been indexed for inflation.

Direct labour costs for general and administration personnel (security, commercial, human resources, environmental and finance) have been excluded.

The number of plant personnel to manage, operate and maintain the Plant has been estimated at 40 people at an annual cost of $4.8 million for both the LoPOX and AL flowsheets.

9.5.2 Power

Power for the Project is to be provided via an overland power line from the Tennant Creek Power Station.

An electrical supply tarriff for the Project of A$290 per MWh has been applied. For the LoPOX flowsheet the annual power cost has been estimated at $9.1 million or $12.08 per tonne of material processed. For the AL flowsheet, the annual power cost has been estimated at $4.6 million or $6.14 per tonne of material processed.

Power for the bore field will be provided from small diesel generator sets. Generator hire and diesel fuel costs for the bore field have been included separately in the estimate.

9.5.3 Reagents and Consumables

Reagents and consumables generally include the following cost elements:

- All reagents used in the process;
- Fuel for mobile equipment assigned to the processing or maintenance groups;
- Lubricants, operating tools and equipment, general and operator supplies.

For the LoPOX flowsheet, the average annual reagent and consumable cost (excluding mining) has been estimated at $14.4 million or $19.19 per tonne of material processed and, $15.8 million or $21.06 per tonne of material for the AL flowsheet.

Table 9.3 details the consumption and cost basis for the various plant reagents. The costs tabulated are exclusive of GST.

Consumable	Consumption Rate (units as stated)	Unit Cost ($/unit)
Sodium Cyanide	4.92 kg/t	$2,750/t
Quicklime	6.93 kg/t	$215/t
Regrind Mill Media	10 g/kWh	$6.00/kg
Caustic Soda	0.09 kg/t	$760/t
Sulphuric Acid	7.5 kg/t to 16.2 kg/t	$210/t
Hydrochloric Acid	0.16 kg/t	$640/t
Resin	34 m^3/y	$20/L
Activated Carbon	30 g/t	$3,000/t
Flocculant	100 g/t	$4,990/t
Antiscalant	8 g/t	$3.00/kg
LPG	484 L/day	$0.66/L

Table 9.3 Reagent Consumption and Unit Costs Data

9.5.4 Maintenance

The maintenance costs have been determined as a percentage of the plant area capital cost and estimated at $3.3 million per year of $4.37 per tonne of material processed for the LoPOX flowsheet and, $2 million per year of $2.64 per tonne of material processed for the AL flowsheet.

In addition, costs have been allocated for the following:

- Shutdown maintenance personnel estimated at $142,800 per year;
- Main access road and internal plant road maintenance - $200,000 per year; and
- Borefield track maintenance - $100,000 per year.

9.5.5 Other Processing Costs

Other processing costs for both the LoPOX and AL flowsheets have been estimated at $2.2 million or $2.88 per tonne of material processed. Other processing costs include the following items:

- Miscellaneous mobile equipment hire costs;
- Mobile vehicle fuel cost;
- Lubricants and general supplies;
- Laboratory assaying and consumables;

- Training;
- Miscellaneous travel;
- General office expenses;
- Dore refining costs; and
- Consultants.

The costs considered have been outlined below.

Cost Area	Basis
General and Administration	$1.50 per tonne of ore processed
Mobile Vehicles	Allowance of $352,000 per year
Fuel for Mobile Equipment (non-mining)	322 L/day @ $1.00 per litre
Lubricants	$0.04 per tonne of ore processed
Laboratory Consumables	$13.50 per assay
Consultants	Allowance of $150,000 per year

Table 9.4 Other Processing Costs

9.5.6 Tailing Storage Facility Construction and Embankment Raising

The tailing storage facility (TSF) is outside the battery limits for the GRES scope of study. GRES has assumed that void left by the reclamation of tailings since a significant portion of the material reclaimed and processed will be exported from site as a product, allowing scope for the re-deposition of the process plant tailings at very low cost and without the need to further raise embankments.

This will require further investigation during the next phase of project development.

9.6 Qualifications, Assumptions and Exclusions

9.6.1 Qualifications

The following qualifications are made in respect to the operating cost estimates:

- Consumables have been derived either from the test work or first principles;
- Labours rates reflect current market conditions and plant location;
- A power unit cost of $290/MWh.

The date of the estimate is Q3 2017.

9.6.2 Exclusions

The following have been excluded from the operating cost estimates:

- Escalation;
- Contingency;

- Sustaining capital;
- Costs associated with third party carbon regeneration;
- Commissioning and ramp up costs;
- Product transport and unloading;
- Corporate costs;
- Product marketing costs;
- Foreign exchange variations;
- Licences, permitting and levies;
- Royalties;
- Deferred capital;
- Closure and rehabilitation;
- Depreciation and amortisation;
- Residual value.

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10. PROJECT RISK ANALYSIS

The scope of work for GRES encompasses only the design of the processing plant and associated infrastructure. A detailed project risk analysis was not conducted at the time of preparation of this report, but, is recommended for the future development of the Project.

The key risk areas in relation to the GRES scope items are:

- Production profile and cost;
- Technical;
- Security;
- Safety;
- Environmental.

10.1 Production Profile and Cost

The proposed mining and processing schedule was not developed for the Study.

The production profile for the Project will be reliant on the plant throughput, plant utilisation, average feed grade, process recovery and operating costs being maintained within the parameters established for the design criteria and cost estimates for the project.

To minimise the project capital costs, no standby equipment (i.e. pumps) have been included as major equipment items. The removal of standby equipment will generally result in a reduction to the plant operating time. A detailed mean time to failure (MTTF) and mean time to repair (MTTR) assessment is to be completed during the next phase of project development to assess this impact.

Mining, sodium cyanide consumption and power have been identified as key cost drivers.

A conventional truck and shovel mining method has been adopted for this Study, however, hydraulic mining should be considered providing the mobility of soluble metals can be contained.

10.2 Technical

The test work completed to date can be considered to be preliminary. As a minimum, the following additional test work is recommended;

- Confirm the extent of water solubility and mobility of metals;
- Mineralogy;
- Rheology;
- Flotation (sample variability tests, maximise copper recovery, product settling tests);
- Levin tests on the flotation concentrate products;
- Low pressure oxidation and atmospheric leach tests;

- Copper and cobalt recovery tests (resin selection, RIP, equilibrium isotherms, kinetic loading, elution isotherm and profiles, locked cycle tests, etc.);
- Magnetic separation (sample variability test, impurity deportment, investigate the effect of regrind, cleaning, flotation, product filtration, etc.);
- Cyanidation (leaching, carbon loading test including copper, etc.);
- Tailing detoxification.

10.3 Security

Security risk can be categorised into two areas:

1. Product security.
2. Asset security.

10.3.1 Product Security

The design of the process plant gold recovery equipment has been undertaken to include proven industry practices for security enclosures and devices and the gold room facility will have an electronic security and surveillance system. The above mentioned mitigation strategies result in the risk from theft of gold doré as low to moderate.

10.3.2 Asset Security

Site security has not formed part of the GRES scope, however, a small allowance has been included in the capital estimate for a gatehouse control point for the Project site. Controlling site access will improve asset security.

10.4 Safety

The process facility will be designed to Australian Standards and will be constructed in accordance with GRES technical specifications and quality control. GRES will utilise a system of hazard identification, hazard and operability studies (HAZID, HAZOP) and adherence to the standards to manage safety risk for project development and construction.

The neutralisation of acid bearing slurries prior to cyanidation will be a key aspect of the HAZID and HAZOP studies.

10.5 Environmental

Preliminary metallurgical test work has identified a significant portion of the copper and cobalt in the tailings to be water soluble and it for this reason a conventional truck and shovel mining method has been adopted for this Study. Consideration for the lining of storm water drains and ponds to minimise soluble metal loss will be undertaken at the next phase of project development.

Containment of process plant spillage will be within dedicated bunded areas.

The CIL tails will not be detoxified prior to disposal. The storage and management of the CIL tails will be reviewed in more detail during the next phase of project development.

APPENDIX A CAPITAL COSTS

Peko Bull
Peko Tailings Scoping Study
LoPOX - Area Cost Summary

AREA LEVEL 2	Supply Cost $	Install Cost $	Install Manhours	Freight Cost $	Subtotal Cost $	Contingency Cost $	Project Total Cost $
250 - Detail Earthworks & Civil	21,000	70,978	214	4,655	96,633	9,663	106,296
310 - Ore Feed and Screening	161,169	67,768	697	6,530	235,467	20,899	256,366
322 - Co / Cu Recovery - RIP	744,397	148,662	1,581	245,077	1,138,136	113,814	1,251,950
323 - Co / Cu Sulphate Crystalliser	958,332	68,251	706	100,667	1,127,250	112,725	1,239,975
330 - Co / Cu Low Pressure Oxidation (LoPOx)	10,856,268	1,495,347	15,994	495,234	12,846,849	1,264,975	14,111,824
336 - Flotation	1,656,088	276,849	2,924	94,565	2,027,502	202,251	2,229,753
337 - Co / Cu Leaching (RIP)	-	-	-	-	-	-	-
338 - Regrind Circuit	3,525,545	366,347	3,956	47,327	3,939,218	393,922	4,333,140
340 - Leaching / Adsorption - CIP	2,587,815	1,227,328	12,753	339,950	4,155,093	415,509	4,570,602
340 - Magnetic Separation	-	-	-	-	-	-	-
342 - Magnetic Concentrate Flash Leaching	653,730	350,334	3,636	67,556	1,071,620	85,713	1,157,333
350 - Elution & Gold Recovery	560,785	214,381	2,277	25,030	800,196	80,020	880,216
360 - Reagents	1,415,340	312,517	3,252	64,550	1,792,407	179,241	1,971,647
370 - Power & Reticulation	4,814,538	1,870,364	19,238	191,892	6,876,794	687,679	7,564,473
390 - Water Services & Reticulation	209,708	61,758	662	3,021	274,486	27,449	301,935
400 - Tails Thickener	-	-	-	-	-	-	-
401 - Tailings Disposal	123,584	11,517	119	3,599	138,700	13,870	152,570
420 - Compressed Air	7,705,100	405,373	4,157	107,635	8,218,107	821,811	9,039,918
499 - Piping	1,954,003	2,172,126	21,553	225,148	4,351,277	435,128	4,786,405
500 - Engineering	538,167	4,574,935	29,573		5,113,102	510,847	5,623,949
510 - Commissioning	63,000	452,390	2,948		515,390	51,539	566,929
550 - Initial Fills	1,116,425	-	-	57,598	1,174,023	117,402	1,291,426
560 - Spares	248,114	-	-	16,541	264,655	26,465	291,120
620 - Contractor Preliminary & General	-	128,951	-		128,951	11,645	140,596
800 - Construction	318,889	2,092,014	12,813		2,410,903	240,049	2,650,951
804 - Construction Equipment	1,757,287	1,231,525	12,920	54,667	3,043,478	304,348	3,347,826
820 - Construction General	102,778	7,292	75	5,506	115,576	11,558	127,134
Grand Total	**42,092,060**	**17,607,006**	**152,047**	**2,156,749**	**61,855,814**	**6,138,521**	**67,994,335**

Peko Bull
Peko Tailings Scoping Study
Atmospheric Leach - Area Cost Summary (2)

AREA LEVEL 2	Supply Cost $	Install Cost $	Install Manhours	Freight Cost $	Subtotal Cost $	Contingency Cost $	Project Total Cost $
250 - Detail Earthworks & Civil	21,000	70,978	214	4,655	96,633	9,663	106,296
310 - Ore Feed and Screening	161,169	67,768	697	6,530	235,467	20,899	256,366
322 - Co / Cu Recovery - RIP	744,397	148,662	1,581	245,077	1,138,136	113,814	1,251,950
323 - Co / Cu Sulphate Crystalliser	958,332	68,251	706	100,667	1,127,250	112,725	1,239,975
330 - Co / Cu Low Pressure Oxidation (LoPOx)	-	-	-	-	-	-	-
336 - Flotation	1,656,088	276,849	2,924	94,565	2,027,502	202,251	2,229,753
337 - Co / Cu Leaching (RIP)	2,297,866	289,178	3,054	102,232	2,689,276	268,928	2,958,204
338 - Regrind Circuit	3,525,545	366,347	3,956	47,327	3,939,218	393,922	4,333,140
340 - Leaching / Adsorption - CIP	2,587,815	1,227,328	12,753	339,950	4,155,093	415,509	4,570,602
340 - Magnetic Separation	-	-	-	-	-	-	-
342 - Magnetic Concentrate Flash Leaching	653,730	350,334	3,636	67,556	1,071,620	85,713	1,157,333
350 - Elution & Gold Recovery	560,785	214,381	2,277	25,030	800,196	80,020	880,216
360 - Reagents	1,415,340	312,517	3,252	64,550	1,792,407	179,241	1,971,647
370 - Power & Reticulation	2,586,499	1,005,649	10,366	102,771	3,694,919	369,492	4,064,411
390 - Water Services & Reticulation	209,708	61,758	662	3,021	274,486	27,449	301,935
400 - Tails Thickener	-	-	-	-	-	-	-
401 - Tailings Disposal	123,584	11,517	119	3,599	138,700	13,870	152,570
420 - Compressed Air	704,246	366,479	3,757	107,635	1,178,361	117,836	1,296,197
499 - Piping	1,709,199	1,892,146	18,781	171,917	3,773,262	377,326	4,150,589
500 - Engineering	536,778	3,852,285	24,965		4,389,063	438,443	4,827,506
510 - Commissioning	54,444	395,686	2,600		450,130	45,013	495,143
550 - Initial Fills	1,116,425	-	-	57,598	1,174,023	117,402	1,291,426
560 - Spares	109,680	-	-	7,312	116,992	11,699	128,692
620 - Contractor Preliminary & General	-	96,937	-		96,937	8,444	105,380
800 - Construction	242,667	1,569,444	9,750		1,812,111	180,169	1,992,281
804 - Construction Equipment	1,186,044	721,048	7,544	40,222	1,947,314	194,731	2,142,045
820 - Construction General	102,778	7,292	75	5,506	115,576	11,558	127,134
Grand Total	**20,632,004**	**11,070,645**	**95,400**	**1,536,045**	**33,238,694**	**3,296,562**	**42,030,791**

APPENDIX B OPERATING COST MODEL

Project **Peko Tailings**
Option **LoPOX**

ITEM	Units	Value
Total RIP Feed Tonnes	Mtpa	0.75
Plant Availability	%	90
Effective Operating Hours	h	7884
Throughput	dry t/h	95.1
Feed Grade	Au g/t	1.44
CIL Recovered Gold	grams	820,800
	oz	26,390
Design Carbon Loading	Au g/t	1050
Number of Elutions Required	#/yr	391

Table 2 **Summary of Operating Costs**

ITEM	$,000's	$/tonne
Mining Costs	5,117	6.82
Labour	4,847	6.46
Maintenance Materials	2,763	3.68
Wear Materials	516	0.69
Reagents	14,391	19.19
Power	9,063	12.08
Other	2,159	2.88
Total	**38,856**	**51.81**

Note
The calculated operating cost is sustainable with the following exclusions.

- No equipment lease costs
- No provision for tailings dam upgrade as existing
- No provision for any licencing
- No provision for any royalties
- No provision for head office overheads.
- No provision for Loader
- No provision for site Administration Costs
- No provision for site to market transport costs

LABOUR COSTS

Administration Positions	Salary $	Number	Total Including Oncost $
Manager Metallurgy	180,000	1	243,000
Metallurgy Clerk	60,000	1	81,000
HSE			
Human Resources			
Subtotal		2	324,000

Plant Operations Positions	Salary $	Number	Total Including Oncost $
Production Superintendent	140,000	1	189,000
Gold Room Supervisor	100,000	1	135,000
Training Coordinator	0	0	0
Production Coordinator	0	0	0
Shift Coordinators	100,000	3	405,000
Shift Operators	80,000	12	1,296,000
Day Crew	70,000	2	189,000
Gold Room Operators	70,000	1	94,500
Subtotal		20	2,308,500

Maintenance Positions	Salary $	Number	Total Including Oncost $
Maintenance Superintendent	140,000	1	189,000
Electrical Supervisor	120,000	1	162,000
Mechanical Engineer	120,000	1	162,000
Mechanical Supervisor	120,000	1	162,000
Maintenance Planners	100,000	1	135,000
Maintenance Clerk	0	0	0
Instrument Technician	80,000	0	0
Electricians	80,000	2	216,000
Boiler Makers	80,000	2	216,000
Fitters	80,000	6	648,000
Vehicle Mechanic	60,000	0	0
Trades Assistants	50,000	0	0
Subtotal		15	1,890,000

Support Services Positions	Salary $	Number	Total Including Oncost $
Chemist	100,000	0	0
Lab Technician	60,000	0	0
Plant Metallurgist	120,000	2	324,000
Graduate Metallurgist	85,000	0	0
Metallurgical Technicians	70,000	0	0
Stores	70,000	1	94,500
Subtotal		3	324,000
Total		**40**	**4,846,500**

Grinding Media	Consumption g/kWh	kW	Usage Tonnes	Unit Cost $/tonne	Cost ($,000)
Regrind Mill Balls	10	880	69	6000	416.3
				Subtotal	416.3
Liners (0.8 Mtpa)	**Sets per Year**		**$ Cost Each Set**	**Cost ($,000)**	**$/t**
Regrind Mill Liners	1		100000	100	0.125
			Subtotal	100	0.125
	Total Cost			**516**	**0.65**

Equipment Number			Equipment No.	Item Description	Make / Model / Type	Duty & Detailed Specification	Motor Size (Duty) kW	Motor Size (Standby) kW	Motor Size Draw kW	kWh/y
AREA 310				**SCREENING AREA**						
310	CV	01	310-CV-01	Belt Feeder Conveyor	Dodge TA6307H	100 tph, ph 2.5. Frame, HBE paint, HDPE rollers and pulle	15.0		11.3	88,695
310	CV	02	310-CV-02	Grizzley Oversize Conveyor	Dodge TA4207H	8 tph, ph 2.5. Frame, HBE paint, HDPE rollers and pulleys	7.5		5.6	44,348
310	CV	03	310-CV-03	Trommel Feed Conveyor	Dodge TA6307H	92tph, ph 2.5. Frame, HBE paint, HDPE rollers and pulley	15.0		11.3	88,695
310	CV	04	310-CV-04	Trommel & Secondary Screen O/S Conveyor	Dodge TA4207H	8 tph, ph 2.5. Frame, HBE paint, HDPE rollers and pulleys	5.5		4.1	32,522
310	GZ	02	310-GZ-02	Vibrating Grizzly	Minspec Min-VG-12/24-60	Capacity: 100 tph, Nom Size: 1.2 x 3.0, PH 2.5, Fraction t	32.0		24.0	189,216
310	PP	01	310-PP-01	Slurry Transfer Pump No 1	Warman 8/6 EAH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 260 m3/hr, SG; 1.29. TDH; 12m.	22.0		16.5	130,086
310	PP	03	310-PP-03	Screening Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		0.0	0
310	SN	01	310-SN-01	Trommel Screen	RCR/ 1,800 x 2,900	Steel Fabricated drum type trommel screen, rubber tyre dri	132.0		66.0	520,344
310	SN	02	310-SN-02	Secondary Screen	HS 1800/3600	Horizontal Vibrating Screen, Feed Rate 90 tph, 1.8m x 3.6i	11.0		5.5	43,362
AREA 320				**FLOTATION**						
320	AG	01	320-AG-01	Flotation Conditioning Tank Agitator		Type: Single Impeller Canitevered ShaftConstruction: Mild	2.2		1.7	13,009
320	FL	01	320-FL-01	Rougher Flotation Cell No 1	e20		22.0		16.5	130,086
320	FL	02	320-FL-02	Rougher Flotation Cell No 2	e20		22.0		16.5	130,086
320	FL	03	320-FL-03	Rougher Flotation Cell No 3	e20		22.0		16.5	130,086
320	FL	04	320-FL-04	Rougher Flotation Cell No 4	e20		22.0		16.5	130,086
320	FL	05	320-FL-05	Rougher Flotation Cell No 5	e20		22.0		16.5	130,086
320	FL	06	320-FL-06	Rougher Flotation Cell No 6	e20		22.0		16.5	130,086
320	PP	01	320-PP-01	Flotation Feed Pump No 1	Warman 8/6 EAH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 260 m3/hr, SG; 1.29. TDH; 12m.	22.0		16.5	130,086
320	PP	03	320-PP-03	Rougher Concentrates Pump No.1	Warman 6 AHF, HD, R/L Froth Pump	Flowrate; 100 m3/hr, SG; 1.15. TDH; 17m.	11.0		8.3	65,043
320	PP	04	320-PP-04	Flotation Tails Pump No 1	Warman 6/4DAH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 210m3/hr, SG; 1.27. TDH; 16m.	30.0		22.5	177,390
320	PP	06	320-PP-06	Flotation Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		0.0	0
AREA 325				**REGRIND CIRCUIT**						
325	ML	01	325-ML-01	Ultra Fine Regrind Mill (IsaMill or HIG Mill)	HIG 1100 or M5000Including all ancillaries	Design motor power draw; 1000 kW; Feed 22 tph, F80; 15	1,000.0		800.0	6,307,200
325	PP	01	325-PP-01	Regrind Cyclone Feed Pump No 1	Warman 3/2C-AH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 57 m3/hr, SG; 1.28. TDH; 32m.	15.0		11.3	88,695
325	PP	03	325-PP-03	Regrind Mill Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		0.0	0
AREA 330				**Co / Cu LOW PRESSURE OXIDATION (LoPOX)**						
330	AG	01	320-AG-01	Autoclave agitator 1		4 x blades, rushton turbine, titanium impeller & shaft	75.0		56.3	443,475
330	AG	02	320-AG-02	Autoclave agitator 2		4 x blades, rushton turbine, titanium impeller & shaft	75.0		56.3	443,475
330	AG	03	320-AG-03	Autoclave agitator 3		4 x blades, rushton turbine, titanium impeller & shaft	75.0		56.3	443,475
330	AG	04	320-AG-04	Autoclave agitator 4		4 x blades, rushton turbine, titanium impeller & shaft	75.0		56.3	443,475
330	AG	04	320-AG-05	Autoclave agitator 5		4 x blades, rushton turbine, titanium impeller & shaft	75.0		56.3	443,475
330	AG	04	320-AG-06	Autoclave agitator 6		4 x blades, rushton turbine, titanium impeller & shaft	75.0		56.3	443,475
330	AG	05	320-AG-07	Autoclave Feed Tank Agitator	Dual impeller	3 x blades, carbon steel rubber lined impeller & shaft	45.0		33.8	266,085
330	PP	01A	320-PP-01A	Autoclave feed pump 1A	4/3 R-HH	Flowrate; 100 m3/hr, SG; 1.15. TDH; 60m.	45.0		33.8	266,085
330	PP	01B	320-PP-01B	Autoclave feed pump 1B	4/3 R-HH	Flowrate; 100 m3/hr, SG; 1.15. TDH; 60m.	45.0		33.8	266,085
330	PP	02	320-PP-02	Autoclave quench water feed pump 1		10m³/h @ 124m TDH.	11.0		8.3	65,043
330	PP	03	320-PP-03	Autoclave quench water feed pump 2		10m³/h @ 124m TDH.		11.0		
330	PP	04	320-PP-04	Autoclave Discharge Pump 1	4/3 C-AH	Flowrate; 100 m3/hr, SG; 1.15. TDH; 15m.	11.0		8.3	65,043
330	PP	06	320-PP-06	Cooling Coil Water Supply Pump 1	40 NC WBH	14m³/h @ 14m TDH.	2.2		1.7	13,009
330	PP	08	320-PP-08	Area Sump Pump 1	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		0.0	0
AREA 334				**Co / Cu RECOVERY**						
334	PP	01	334-PP-01	RIP Contactor Feed Pump	Warman 6/4DAH, HD, R/L Slurry Pump	Flowrate; 194m3/hr, SG; 1.42. TDH; 10m.	15.0		11.3	88,695
334	PP	02	334-PP-02	RIP Discharge Pump 1	Warman 6/4DAH, HD, R/L Slurry Pump	Flowrate; 194m3/hr, SG; 1.42. TDH; 10m.	15.0		11.3	88,695
334	PP	03	334-PP-03	RIP Discharge Pump 2	Warman 6/4DAH, HD, R/L Slurry Pump	Flowrate; 194m3/hr, SG; 1.42. TDH; 10m.		15.0		
AREA 336				**COPPER SULPHATE CRYSTALLISER**						
336	CX	01	336-CX-01	Crystalliser Vessel 1			75.0		56.3	443,475
AREA 338				**COBALT SULPHATE CRYSTALLISER**						
338	CX	01	338-CX-01	Crystalliser Vessel 1			75.0		56.3	443,475
AREA 340				**MAGNETIC SEPARATION**						
340	MS	01	340-MS-01	Rougher Magnetic Separator 1	1.2m dia x 3.0m L, single drum, 1150 Gauss		7.5		5.6	44,348
340	MS	02	340-MS-02	Rougher Magnetic Separator 2	1.2m dia x 3.0m L, single drum, 1150 Gauss		7.5		5.6	44,348
340	MS	03	340-MS-03	Cleaner Magnetic Separator 1	1.2m dia x 2.4m L, triple drum, 850/1000 Gauss		7.5		5.6	44,348
340	MS	04	340-MS-04	Cleaner Magnetic Separator 2	1.2m dia x 2.4m L, triple drum, 850/1000 Gauss		7.5		5.6	44,348
340	PP	01	340-PP-01	Clnr Magnetic Concentrate Transfer Pump 1	Warman 3/2 CAH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 60m3/hr, SG; 1.7. TDH; 16m.	11.0		8.3	65,043
340	PP	01	340-PP-01	Magnetic Tails Transfer Pump 1	Warman 4/3CAH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 140m3/hr, SG; 1.13. TDH; 17m.	15.0		11.3	88,695
AREA 342				**MAGNETITE CONCENTRATE FLASH LEACHING**						
342	AG	01	342-AG-01	Flash Leach Tank 1 Agitator			32.0		24.0	189,216
342	AG	02	342-AG-02	Flash Leach Tank 1 Agitator			32.0		24.0	189,216
342	PP	01	342-PP-01	Flash Leach Transfer Pump 1	Warman 4/3CAH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 70m3/hr, SG; 1.7. TDH; Xm.	11.0		8.3	65,043
342	PP	02	342-PP-02	Flash Leach Transfer Pump 2	Warman 4/3CAH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 70m3/hr, SG; 1.7. TDH; Xm.		11.0		
AREA 344				**MAGNETITE CONCENTRATE FILTRATION**						
344	AG	01	344-AG-01	Filter Feed Tank Agitator			75.0		56.3	443,475
344	FR	01	344-FR-01	Concentrate Filter	64 m2 plate & frame filter	70 t/h @ 1,000 kg/m2/h	32.0		17.6	69,379
344	PP	01	344-PP-01	Filter Feed Pump 1	Warman 6/4E-AH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 340 m3/hr, SG; 1.63. TDH; 39m.	132.0		72.6	286,189
344	PP	02	344-PP-02	Filter Feed Pump 2	Warman 6/4E-AH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 340 m3/hr, SG; 1.63. TDH; 39m.		132.0		
344	PP	03	344-PP-03	Filtrate Pump	Warman 4/3C-AH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 100 m3/hr, SG; 1.01. TDH; 15m.	9.0		6.8	26,609
344	PP	06	344-PP-06	Filter Feed Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		0.0	0
AREA 350				**GOLD LEACHING AND ADSORPTION**						
350	AG	01	350-AG-01	CIL Leach Tank 1 Agitator			32.0		24.0	189,216
350	AG	02	350-AG-02	CIL Leach Tank 2 Agitator			32.0		24.0	189,216
350	AG	03	350-AG-03	CIL Adsorption Tank 1 Agitator			15.0		11.3	88,695
350	AG	04	350-AG-04	CIL Adsorption Tank 2 Agitator			15.0		11.3	88,695
350	AG	05	350-AG-05	CIL Adsorption Tank 3 Agitator			15.0		11.3	88,695
350	AG	06	350-AG-06	CIL Adsorption Tank 4 Agitator			15.0		11.3	88,695
350	AG	07	350-AG-07	CIL Adsorption Tank 5 Agitator			15.0		11.3	88,695
350	AG	08	350-AG-08	CIL Adsorption Tank 6 Agitator			15.0		11.3	88,695
350	PP	01	350-PP-01	CIL Feed Thickener u/f Pump 1	Warman 3/2 C-AH, HD, R/L Slurry Pump, c/w steel fabricat	Flowrate; 70 m3/hr, SG; 1.51. TDH; 19m.	11.0		8.3	65,043
350	PP	02	350-PP-02	CIL Feed Thickener u/f Pump 2	Warman 3/2 C-AH, HD, R/L Slurry Pump, c/w steel fabricat	Flowrate; 70 m3/hr, SG; 1.51. TDH; 19m.		11.0		
350	PP	03	350-PP-03	Carbon Transfer Pump # 1	Warman 2/2 QVTC D = 1.8m Vertical Cyclo Pump.	Flowrate; 20m3/hr, SG; 1.37. TDH; 5m.	2.2		1.7	4,818
350	PP	04	350-PP-04	Carbon Transfer Pump # 2	Warman 2/2 QVTC D = 1.8m Vertical Cyclo Pump.	Flowrate; 20m3/hr, SG; 1.37. TDH; 5m.	2.2		1.7	4,818
350	PP	05	350-PP-05	Carbon Transfer Pump # 3	Warman 2/2 QVTC D = 1.8m Vertical Cyclo Pump.	Flowrate; 20m3/hr, SG; 1.37. TDH; 5m.	2.2		1.7	4,818
350	PP	06	350-PP-06	Carbon Transfer Pump # 4	Warman 2/2 QVTC D = 1.8m Vertical Cyclo Pump.	Flowrate; 20m3/hr, SG; 1.37. TDH; 5m.	2.2		1.7	4,818
350	PP	07	350-PP-07	Carbon Transfer Pump # 5	Warman 2/2 QVTC D = 1.8m Vertical Cyclo Pump.	Flowrate; 20m3/hr, SG; 1.37. TDH; 5m.	2.2		1.7	4,818
350	PP	08	350-PP-08	Loaded Carbon Pump	Warman 2/2 QVTC D = 1.8m Vertical Cyclo Pump.	Flowrate; 20m3/hr, SG; 1.37. TDH; 5m.	3.0		2.3	6,570
350	PP	11	350-PP-11	Leach Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		0.0	0
350	PP	12	350-PP-12	Adsorption Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		0.0	0
350	SN	01	350-SN-01	Fines CIL Intertank Screen # 1	Cylindrical Wedgewire, powered external wiper arm.	Screen area 3 m2, Apperture; 0.8mm.	2.2		1.7	13,009
350	SN	02	350-SN-02	Fines CIL Intertank Screen # 2	Cylindrical Wedgewire, powered external wiper arm.	Screen area 3 m2, Apperture; 0.8mm.	2.2		1.7	13,009
350	SN	03	350-SN-03	Fines CIL Intertank Screen # 3	Cylindrical Wedgewire, powered external wiper arm.	Screen area 3 m2, Apperture; 0.8mm.	2.2		1.7	13,009
350	SN	04	350-SN-04	Fines CIL Intertank Screen # 4	Cylindrical Wedgewire, powered external wiper arm.	Screen area 3 m2, Apperture; 0.8mm.	2.2		1.7	13,009
350	SN	05	350-SN-05	Fines CIL Intertank Screen # 5	Cylindrical Wedgewire, powered external wiper arm.	Screen area 3 m2, Apperture; 0.8mm.	2.2		1.7	13,009
350	SN	06	350-SN-06	Fines CIL Intertank Screen # 6	Cylindrical Wedgewire, powered external wiper arm.	Screen area 3 m2, Apperture; 0.8mm.	2.2		1.7	13,009
350	SN	07	350-SN-07	Loaded Carbon Screen	Horizontal Vibrating Screen, poly screen panels; size 0.8m x	Screen area 0.8m2, Apperture; 0.8mm.;	3.0		2.3	6,570
350	SN	08	350-SN-08	Carbon Safety Screen	Horizontal Vibrating Screen, poly screen panels; size 1.0m x	Screen area 1.8m2, Apperture; 0.8mm.;	3.0		2.3	17,739
350	TH	01	350-TH-01	CILFeed Thickener	Hi Rate, Diameter 10 m	Underflow density 60%	7.5		5.6	44,348

AREA 360				**GOLD RECOVERY AND ELUTION**						
360	FA	01	360-FA-01	Electrowinning Fume Extraction Fan	Axial Inline Fan		0.8		0.0	0
360	FA	02	360-FA-02	Smelting Furnace Extraction Fan	Axial Inline Fan		0.8		0.0	0
360	FA	03	360-FA-03	Gold Room Extraction Fan 1	Axial Inline Fan		0.8		0.0	0
360	FA	04	360-FA-04	Gold Room Extraction Fan 2	Axial Inline Fan		0.8		0.0	0
360	FU	02	360-FU-02	Smelting Furnace	Tilting Furnace	Crucible Size: A100Smelting Time: 12 hFuel Type: LPG	0.6		0.0	0
360	HT	13	360-HT-13	Gold Room Cathode Hoist		SWL 2t	5.0		0.0	0
360	PP	47	360-PP-47	Thermal Oil Circulation Pump	Vendor Supply; SIHI ISO Back Pull out pump, mechanical s	Flowrate; 18m3/hr, SG; 0.77. TDH; 12m.	1.1		0.0	0
360	PP	48	360-PP-48	Elution Pump	Netzsch NM045BYL06B	Flowrate; 8m3/hr, SG; 1.20. TDH; 30m.	1.5		0.0	0
360	PP	49	360-PP-49	Elution Column Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		0.0	0
360	PP	50	360-PP-50	Elution Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		0.0	0
360	PP	51	360-PP-51	Electro-winning Feed Pump	ISO Pro 50x32-160	Flowrate; 10m3/hr, SG; 1.05. TDH; 8m.	0.6		0.0	0
360	PP	52	360-PP-52	Gold Room Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.10. TDH; 12m.	5.5		0.0	0
AREA 370				**REAGENTS**						
370	AB	01	370-AB-01	Flocculant Blower	GreencoAVT		3.0		2.3	1,643
370	AG	01	370-AG-01	Flocculant Mixing Tank Agitator	Mixtec 1037	Stainless Steel shaft and impellers	0.8		0.6	616
370	AG	04	370-AG-04	PAX Mix Tank Agitator	Mixtec 1037	Stainless Steel shaft and impellers	0.8		0.6	616
370	DC	01	370-DC-01	Lime Silo Dust Collector			0.8		0.6	616
370	FE	02	370-FE-02	Lime Slaker Feeder			0.8		0.6	616
370	HP	01	370-HP-01	Flocculant Feed Hopper	Skid mounted Flocculant preparation and mixing unit, 76.8m	76.8 m3/day, 75 min batch time, 4m3 mix tank.	7.5		5.6	6,159
370	ML	01	370-ML-01	Lime Slaker Mill		Capacity; 48 tonnes per day.	45.0		33.8	36,956
370	PP	03	370-PP-03	Frother Transfer Pump	Grundfos DDA 7.5 Electric Pulse Diaphagm or similar	Flowrate; 1.2m3/hr, SG; 1.10. TDH; 12m.	0.2		0.2	164
370	PP	04	370-PP-04	HCL Acid Wash Pump	Graco 1.5" Polypropylene	Flowrate; 0.7m3/hr, SG; 1.10. TDH; 12m.	0.2		0.2	164
370	PP	05	370-PP-05	HCL Acid Drum Pump	Graco 1.5" Polypropylene	Flowrate; 0.7m3/hr, SG; 1.10. TDH; 12m.		0.2		
370	PP	06	370-PP-06	Acid Area Sump Pump	Warman 40PVSPR, D = 1.2m	Flowrate; 18m3/hr, SG; 1.10. TDH; 12m.	5.5		0.0	0
370	PP	07	370-PP-07	Cyanide Transfer Pump	ISO Pro 50x32-200	Flowrate; 10m3/hr, SG; 1.05. TDH; 40m.	3.0		2.3	2,464
370	PP	08	370-PP-08	Cyanide Recirculation Pump 1	ISO Pro 50x32-200	Flowrate; 10m3/hr, SG; 1.05. TDH; 40m.	3.0		2.3	17,739
370	PP	09	370-PP-09	Cyanide Recirculation Pump 2	ISO Pro 50x32-200	Flowrate; 10m3/hr, SG; 1.05. TDH; 40m.		3.0		
370	PP	10	370-PP-10	Cyanide Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.10. TDH; 12m.	5.5		0.0	0
370	PP	11	370-PP-11	Caustic Dosing Pump 1 (elution only)	Grundfos CMB 5-74 (fixed)	Flowrate; 1.0m3/hr, SG; 1.0. TDH; 40m.	1.5		1.1	1,232
370	PP	13	370-PP-13	Flocculant Transfer Pump	Netzsch NM045BYL06B	Flowrate: 10 m3/h, TDH 25m, SG; 1.1	2.2		1.7	1,807
370	PP	14	370-PP-14	CIL Feed Thickener Flocculant Pump 1	Netzsch NM038BYL06B	Flowrate: 3 m3/h, TDH 15m, SG; 1.1	0.8		0.6	4,435
370	PP	16	370-PP-16	Thickener Flocculant Pump Spare	Netzsch NM038BYL06B	Flowrate: 3 m3/h, TDH 15m, SG; 1.1	0.8		0.6	4,435
370	PP	17	370-PP-17	Wash Thickener Flocculant Pump Spare	Netzsch NM038BYL06B	Flowrate: 3 m3/h, TDH 15m, SG; 1.1	0.8		0.0	0
370	PP	22	370-PP-22	Lime Slaking Mill Discharge Pump	Warman 2/1.5 BAH HD Metal Lined Slurry Pump, c/w Direc	Flowrate; 5.0m3/hr, SG; 1.30. TDH; 10m.	5.5		4.1	32,522
370	PP	23	370-PP-23	Lime Ringmain Pump 1	Warman 2/1.5 BAH HD Metal Lined Slurry Pump, c/w Direc	Flowrate; 18m3/hr, SG; 1.30. TDH; 40m.	11.0		8.3	65,043
370	PP	24	370-PP-24	Lime Ringmain Pump 2	Warman 2/1.5 BAH HD Metal Lined Slurry Pump, c/w Direc	Flowrate; 18m3/hr, SG; 1.30. TDH; 40m.		11.0		
370	PP	25	370-PP-25	PAX Transfer Pump	Netzsch NM038BYL06B	Flowrate; 10.0m3/hr, SG; 1.10. TDH; 25m.	2.2		1.7	13,009
370	PP	28	370-PP-28	PAX Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.10. TDH; 12m.	5.5		0.0	0
AREA 390				**WATER STORAGE AND RETICULATION**						
390	PD	01	390-PD-01	Process Water Pond 1	Earth construction, plastic lined	Effective Volume: 3000m3				
390	PP	01	390-PP-01	RIP Water Pump 1	ISP Pro 80x50-200	Flowrate; 42m3/hr, SG; 1.0. TDH; 55m.	11.0		8.3	65,043
390	PP	02	390-PP-02	RIP Water Pump 2	ISP Pro 80x50-200	Flowrate; 42m3/hr, SG; 1.0. TDH; 55m.		11.0		
390	PP	03	390-PP-03	Process Water Pump 1	ISO Pro 200 x 150 -400	Flowrate; 230 m3/hr, SG; 1.0. TDH; 55m.	75.0		56.3	443,475
390	PP	04	390-PP-04	Process Water Pump 2	ISO Pro 200 x 150 -400	Flowrate; 230 m3/hr, SG; 1.0. TDH; 55m.		75.0		
390	PP	05	390-PP-05	Raw Water Pump 1	ISP Pro 80x50-200	Flowrate; 42m3/hr, SG; 1.0. TDH; 55m.	11.0		8.3	65,043
390	PP	06	390-PP-06	Raw Water Pump 2	ISP Pro 80x50-200	Flowrate; 42m3/hr, SG; 1.0. TDH; 55m.		11.0		
390	PP	07	390-PP-07	Main Fire Water Pump	ISO Pro 125x80-250	Flowrate; 144m3/hr, SG; 1.0. TDH; 75m.	45.0		33.8	266,085
390	PP	08	390-PP-08	Diesel Fire Water Pump	ISO Pro 125x80-250	Flowrate; 144m3/hr, SG; 1.0. TDH; 75m.		45.0		
390	PP	09	390-PP-09	Jockey Fire Water Pump	Grundfos CRI 1s-19	Included as part of Diesel fire water pump	5.5		4.1	32,522
390	PP	10	390-PP-10	Potable Water Pump 1	Grundfos CMB 5-74 (fixed)	Flowrate; 1.0m3/hr, SG; 1.0. TDH; 40m.	1.5		1.1	8,870
390	PP	11	390-PP-11	Potable Water Pump 2	Grundfos CMB 5-74 (fixed)	Flowrate; 1.0m3/hr, SG; 1.0. TDH; 40m.		1.5		
390	PP	12	390-PP-12	Fresh Water Pump 1	Grundfos CRI 10-4	Flowrate; 10m3/hr, SG; 1.0. TDH; 30m.	1.5		1.1	8,870
390	PP	13	390-PP-13	Fresh Water Pump 2	Grundfos CRI 10-4	Flowrate; 10m3/hr, SG; 1.0. TDH; 30m.		1.5		
390	PP	14	390-PP-14	Gland Water Pump 1	Grundfos CDI 20-8	Flowrate; 18m3/hr, SG; 1.0. TDH; 100m.	11.0		8.3	65,043
390	PP	15	390-PP-15	Gland Water Pump 2	Grundfos CDI 20-8	Flowrate; 18m3/hr, SG; 1.0. TDH; 100m.		11.0		
AREA 391				**RAW WATER SUPPLY**						
391	PP	01	391-PP-01	Bore Pump 1	Grundfor SP 60-7	Flowrate; 50 m3/hr, SG; 1.0. TDH; 60m.	15.0		11.3	88,695
391	PP	02	391-PP-02	Bore Pump 2	Grundfor SP 60-7	Flowrate; 50 m3/hr, SG; 1.0. TDH; 60m.	15.0		11.3	88,695
391	PP	03	391-PP-03	Bore Pump 3	Grundfor SP 60-7	Flowrate; 50 m3/hr, SG; 1.0. TDH; 60m.		15.0		
AREA 401				**TAILINGS DISPOSAL**						
401	HP	01	401-HP-01	Tailings Hopper	6mm Steel Plate Rubber lined	6 m3 Fabricated Carbon Steel, sloped bottomRubber Lined Tank Hopper.				
401	PP	01	401-PP-01	Final Tailings Pump 1	Warman 4/3 E-HH, HD, R/L Slurry Pump, c/w steel fabricat	Flowrate; 90 m3/hr, SG; 1.37. TDH; 75m.	55.0		41.3	325,215
401	PP	02	401-PP-02	Final Tailings Pump 2	Warman 4/3 E-HH, HD, R/L Slurry Pump, c/w steel fabricat	Flowrate; 90 m3/hr, SG; 1.37. TDH; 75m.		55.0		
401	PP	03	401-PP-03	Tails Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		0.0	0
AREA 402				**TAILINGS STORAGE FACILITY**						
402	PP	01	402-PP-01	Seepage Pump	By others		30.0		22.5	24,638
402	PP	02	402-PP-02	Underdrain Pump	By Others		30.0		22.5	24,638
AREA 403				**DECANT RETURN**						
403	PP	88	403-PP-88	Decant Return Water Pump	Grundfos DWK E.10.100.220	Flow Rate; 100m3/h, TDH; 45m	22.0		0.0	0
AREA 420				**AIR SERVICES**						
420	AC	01	420-AC-01	Air Compressor 1	GA90+FF-8.5	1014 m3/h @ 800kPa	90.0		67.5	532,170
420	AC	03	420-AC-03	Oxygen Compressor 1	52 TPD (@ 100% O2)	1,100 kPa discharge pressure (2000 Nm3/h)	250.0		187.5	1,478,250
420	AC	04	420-AC-04	Oxygen Compressor 2	52 TPD (@ 100% O2)	1,100 kPa discharge pressure (2000 Nm3/h)		250.0		
420	OX	01	420-OX-01	VPSA Oxygen Plant	52 TPD (@ 100% O2)	>95% oxygen purity (2,000 Nm3/h)	1,843.0		1,382.3	10,897,659
AREA 430				**PLANT BUILDINGS**						
430	BD	01	430-BD-01	Administration & Mining Office			25.0		18.8	73,913
430	BD	02	430-BD-02	Admin. Male Ablutions			5.0		3.8	14,783
430	BD	03	430-BD-03	Admin. Female Ablutions			5.0		3.8	14,783
430	BD	04	430-BD-04	Plant Crib Room			10.0		7.5	29,565
430	BD	05	430-BD-05	Plant Workshop Office			10.0		7.5	29,565
430	BD	06	430-BD-06	Plant Ablutions			10.0		7.5	29,565
430	BD	07	430-BD-07	Warehouse			10.0		7.5	29,565
430	BD	08	430-BD-08	Main Plant Control Room			7.0		5.3	20,696
AREA 440				**WORKSHOP / STORES**						
440	BD	09	440-BD-09	Reagent Stores			2.0		1.5	5,913
440	BD	10	440-BD-10	Plant Maintenance Workshop			20.0		15.0	59,130
440	HT	11	440-HT-11	Light Vehicle Workshop 4 Post Hoist						
AREA 460				**PROCESS CONTROL LABORATORY**						
460	BD	12	460-BD-12	Process Laboratory			75.0		56.3	221,738
						Total	**5,695**	**670**	**4,169**	**31,253**
								Power Unit Cost	**$/MW**	**290**
								Power Cost	**$/y**	**9,063,477**

Reagent Costs

Acid Wash and Elution Reagent Requirements

	Av kg/Strip	kg/annum	kg/t
Sodium Cyanide	324	126638	0.17
Sodium Hydroxide	172	67227	0.09
Hydrochloric Acid	300	117257	0.16
Elution LPG (Litres)	484	189175	0.25
Regeneration LPG (Litres)	0	0	0.00

Leach and Adsorption Reagent Consumptions

	Kg/t	tpa	
Sodium Cyanide		3564	
Quicklime		5196	
Oxygen	0.3	225	
Carbon	0.03	11	CIL feed only
Flocculant	0.1	75	

Total Reagents Consumption and Costs Float Feed tonnes 750000

Reagent	kg/t	tpa or unit	Unit Cost $/tonne	Total Cost $	Total Cost $/t
Sodium Cyanide	4.92	3,691	2,750	10,150,587	13.53
Quicklime	6.93	5,196	215	1,117,093	1.49
Oxygen	0.00	0	0	0	
Sodium Hydroxide	0.09	67	760	51,093	0.07
Hydrochloric Acid	0.16	117	636	74,576	0.10
LPG (m3)	0.25	189	660	124,855	0.17
Sulphuric Acid (kg/h)	7.51	5,630	210	1,182,276	1.58
Resin (m3)		34	20,000	685,000	0.91
Carbon	0.01	11	3,000	33,075	0.04
PAX	0.14	105	2,385	250,425	0.33
Frother	0.02	15	3,700	55,500	0.07
Flocculant	0.10	75	4,990	374,250	0.50
Antiscalant (m3)	0.01	6	3,000	18,000	0.02
Bulka Bags (1.5 t/bag)		5,902	21	120,991	0.16
Filter Cloths		6	22,199	133,193	0.18
Other Reagents				20,000	0.03
Total				**14,390,913**	**19.19**

AREA	DESCRIPTION	INSTALLED COST	REFERENCE CODE	% FACTOR APPLIED	ANNUAL MAINTENANCE MATERIALS COST
	Mining	0			
M	**SUBTOTAL MINING**	**0**			
	Ore Feed and Screening	256,366	p-high	7.0%	17,946
	Flotation	2,229,753	p-low	3.0%	66,893
	Regrind Circuit	4,333,140	p-low	3.0%	129,994
	Low Pressure Oxidation (LoPOx)	14,111,824	p-high	7.0%	987,828
	Co / Cu Recovery - RIP	2,491,925	p-low	3.0%	74,758
	Magnetic Separation & Flash Leach	1,157,333	p-low	3.0%	34,720
	Au Leaching / Adsorption - CIP	4,570,602	p-low	3.0%	137,118
	Elution & Gold Recovery	880,216	p-medium	4.0%	35,209
	Reagents	1,971,647	p-low	3.0%	59,149
	Tails Thickener & Disposal	152,570	p-high	7.0%	10,680
	Piping	5,175,875	p-low	3.0%	155,276
P	**SUBTOTAL PROCESS PLANT**	**37,331,252**		4.6%	**1,709,570**
	Power & Reticulation	8,250,751	e-low	4.0%	330,030
	Water Services & Reticulation	301,935	services	3.0%	9,058
	Air & Oxygen	9,039,918	services	3.0%	271,198
P	**SUBTOTAL PROCESS PLANT SERVICES & UTILITIES**	**17,592,604**		3.5%	**610,286**
	TOTAL PROJECT SUMMARY	**54,923,856**		**4.2%**	**2,319,856**

OTHER COSTS

Maintenance Contractors					
Area	**Description**				**$/annum**
Crushing Circuit					0
Access road maintenance					200,000
Borefield track maintenance					100,000
General	$85/h, 12 h/day, 20 people, 7 day/yr				142,800
			Subtotal		**442,800**
Equipment Hire					
Loader					0
Bobcat					25,000
Large Lift Crane					10,000
All Terrain Forklift					40,000
Service Truck					40,000
Trader					40,000
Warehouse Fork Lift					20,000
Franna 25					132,000
Light vehicle lease	4 vehicles				45,000
Oxygen Plant					0
Multimixer					0
			Subtotal		**352,000**
Consultants					
Tailings	Reporting				30,000
Vibration Monitoring					0
Water	Reporting				20,000
LoPOX					50,000
Metallurgical					50,000
			Subtotal		**150,000**
Fresh Water Supply					
Plant		0	m3	2.25	0
Potable		49,056	m3	2.25	110,376
WTP maintenance		$3,550	per month		42,600
			Subtotal		**110,376**
Raw Water Supply				**0**	**0**
Minting and Security Cost	at $1.50/oz		**Subtotal**		**39,585**
Fuel Cost					
Light Vehicles	4 x 20 litres/vehicle/day at $1.00				29,200
Crane	20 litres/day at $1.00				7,300
Bob Cat	40 litres/day at $1.00				14,600
Forklift	20 litres/day at $1.00				7,300
Borefield	3.5 L/h per bore				55,188
			Subtotal		**113,588**
Laboratory Costs					
Metallurgical Testwork	External				20,000
Consumable Costs	20 samples/day at $13.50				98,550
			Subtotal		**118,550**
Other					
Training					50,000
Conferences					0
Travel					20,000
Expenses					10,000
General Office					40,000
Lubricants	$0.04 per tonne of ore processed				30,000
G & A	$1.50 per tonne of ore processed				1,125,000
			Subtotal		**1,275,000**
			Total		**2,159,099**

Project **Peko Tailings**
Option **Atmpsheric Leach**

ITEM	Units	Value
Total RIP Feed Tonnes	Mtpa	0.75
Plant Availability	%	90
Effective Operating Hours	h	7884
Throughput	dry t/h	95.1
Feed Grade	Au g/t	1.44
CIL Recovered Gold	grams	820,800
	oz	26,390
Design Carbon Loading	Au g/t	1050
Number of Elutions Required	#/yr	391

Table 2 **Summary of Operating Costs**

ITEM	$,000's	$/tonne
Mining Costs	5,117	6.82
Labour	4,847	6.46
Maintenance Materials	1,463	1.95
Wear Materials	516	0.69
Reagents	15,794	21.06
Power	4,608	6.14
Other	2,109	2.81
Total	**34,453**	**45.94**

Note
The calculated operating cost is sustainable with the following exclusions.

- No equipment lease costs
- No provision for tailings dam upgrade as existing
- No provision for any licencing
- No provision for any royalties
- No provision for head office overheads.
- No provision for Loader
- No provision for site Administration Costs
- No provision for site to market transport costs

LABOUR COSTS

Administration Positions	Salary $	Number	Total Including Oncost $
Manager Metallurgy	180,000	1	243,000
Metallurgy Clerk	60,000	1	81,000
HSE			
Human Resources			
Subtotal		2	324,000

Plant Operations Positions	Salary $	Number	Total Including Oncost $
Production Superintendent	140,000	1	189,000
Gold Room Supervisor	100,000	1	135,000
Training Coordinator	0	0	0
Production Coordinator	0	0	0
Shift Coordinators	100,000	3	405,000
Shift Operators	80,000	12	1,296,000
Day Crew	70,000	2	189,000
Gold Room Operators	70,000	1	94,500
Subtotal		20	2,308,500

Maintenance Positions	Salary $	Number	Total Including Oncost $
Maintenance Superintendent	140,000	1	189,000
Electrical Supervisor	120,000	1	162,000
Mechanical Engineer	120,000	1	162,000
Mechanical Supervisor	120,000	1	162,000
Maintenance Planners	100,000	1	135,000
Maintenance Clerk	0	0	0
Instrument Technician	80,000	0	0
Electricians	80,000	2	216,000
Boiler Makers	80,000	2	216,000
Fitters	80,000	6	648,000
Vehicle Mechanic	60,000	0	0
Trades Assistants	50,000	0	0
Subtotal		15	1,890,000

Support Services Positions	Salary $	Number	Total Including Oncost $
Chemist	100,000	0	0
Lab Technician	60,000	0	0
Plant Metallurgist	120,000	2	324,000
Graduate Metallurgist	85,000	0	0
Metallurgical Technicians	70,000	0	0
Stores	70,000	1	94,500
Subtotal		3	324,000
Total		**40**	**4,846,500**

Grinding Media	Consumption g/kWh	kW	Usage Tonnes	Unit Cost $/tonne	Cost ($,000)
Regrind Mill Balls	10	880	69	6000	416.3
				Subtotal	416.3
Liners (0.8 Mtpa)	**Sets per Year**		**$ Cost Each Set**	**Cost ($,000)**	**$/t**
Regrind Mill Liners	1		100000	100	0.125
			Subtotal	100	0.125
	Total Cost			**516**	**0.65**

Equipment Number			Equipment No.	Item Description	Make / Model / Type	Duty & Detailed Specification	Motor Size (Duty) kW	Motor Size (Standby) kW	Motor Size Draw kW	kWh/y
AREA 310				**SCREENING AREA**						
310	CV	01	310-CV-01	Belt Feeder Conveyor	Dodge TA6307H	100 tph, ph 2.5. Frame, HBE paint, HDPE rollers and pulle	15.0		11.3	88,695
310	CV	02	310-CV-02	Grizzley Oversize Conveyor	Dodge TA4207H	8 tph, ph 2.5. Frame, HBE paint, HDPE rollers and pulleys	7.5		5.6	44,348
310	CV	03	310-CV-03	Trommel Feed Conveyor	Dodge TA6307H	92tph, ph 2.5. Frame, HBE paint, HDPE rollers and pulleys	15.0		11.3	88,695
310	CV	04	310-CV-04	Trommel & Secondary Screen O/S Conveyor	Dodge TA4207H	8 tph, ph 2.5. Frame, HBE paint, HDPE rollers and pulleys	5.5		4.1	32,522
310	GZ	02	310-GZ-02	Vibrating Grizzly	Minspec Min-VG-12/24-60	Capacity: 100 tph, Nom Size: 1.2 x 3.0, PH 2.5, Fraction t	32.0		24.0	189,216
310	PP	01	310-PP-01	Slurry Transfer Pump No 1	Warman 8/6 EAH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 260 m3/hr, SG; 1.29. TDH; 12m.	22.0		16.5	130,086
310	PP	03	310-PP-03	Screening Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		0.0	0
310	SN	01	310-SN-01	Trommel Screen	RCR/ 1,800 x 2,900	Steel Fabricated drum type trommel screen, rubber tyre dri	132.0		66.0	520,344
310	SN	02	310-SN-02	Secondary Screen	HS 1800/3600	Horizontal Vibrating Screen, Feed Rate 90 tph, 1.8m x 3.6i	11.0		5.5	43,362
AREA 320				**FLOTATION**						
320	AG	01	320-AG-01	Flotation Conditioning Tank Agitator		Type: Single Impeller Canitevered ShaftConstruction: Mild	2.2		1.7	13,009
320	FL	01	320-FL-01	Rougher Flotation Cell No 1	e20		22.0		16.5	130,086
320	FL	02	320-FL-02	Rougher Flotation Cell No 2	e20		22.0		16.5	130,086
320	FL	03	320-FL-03	Rougher Flotation Cell No 3	e20		22.0		16.5	130,086
320	FL	04	320-FL-04	Rougher Flotation Cell No 4	e20		22.0		16.5	130,086
320	FL	05	320-FL-05	Rougher Flotation Cell No 5	e20		22.0		16.5	130,086
320	FL	06	320-FL-06	Rougher Flotation Cell No 6	e20		22.0		16.5	130,086
320	PP	01	320-PP-01	Flotation Feed Pump No 1	Warman 8/6 EAH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 260 m3/hr, SG; 1.29. TDH; 12m.	22.0		16.5	130,086
320	PP	03	320-PP-03	Rougher Concentrates Pump No.1	Warman 6 AHF, HD, R/L Froth Pump	Flowrate; 100 m3/hr, SG; 1.15. TDH; 17m.	11.0		8.3	65,043
320	PP	04	320-PP-04	Flotation Tails Pump No 1	Warman 6/4DAH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 210m3/hr, SG; 1.27. TDH; 16m.	30.0		22.5	177,390
320	PP	06	320-PP-06	Flotation Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		0.0	0
AREA 325				**REGRIND CIRCUIT**						
325	ML	01	325-ML-01	Ultra Fine Regrind Mill (IsaMill or HIG Mill)	HIG 1100 or M5000Including all ancillaries	Design motor power draw; 1000 kW; Feed 22 tph, F80; 15	1,000.0		800.0	6,307,200
325	PP	01	325-PP-01	Regrind Cyclone Feed Pump No 1	Warman 3/2C-AH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 57 m3/hr, SG; 1.28. TDH; 32m.	15.0		11.3	88,695
325	PP	03	325-PP-03	Regrind Mill Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		0.0	0
AREA 330				**Co / Cu Leach**						
332	AG	01	332-AG-01	Concentrate Leach Tank 1 Agitator		CS/Butyl rubber - shaft/impeller, suspension, 250 m3 live t	15.0		11.3	88,695
332	AG	02	332-AG-02	Concentrate Leach Tank 2 Agitator		CS/Butyl rubber - shaft/impeller, suspension, 250 m3 live t	15.0		11.3	88,695
332	AG	03	332-AG-03	Concentrate Leach Tank 3 Agitator		CS/Butyl rubber - shaft/impeller, suspension, 250 m3 live t	15.0		11.3	88,695
332	AG	04	332-AG-04	Concentrate Leach Tank 4 Agitator		CS/Butyl rubber - shaft/impeller, suspension, 250 m3 live t	15.0		11.3	88,695
332	PP	01	332-PP-01	Slurry transfer pump 1	4 AHF	Flowrate; 110m3/hr, SG; 1.15. TDH; 10m.	11.0		8.3	65,043
332	PP	03	332-PP-03	AL feed thickener underflow pump 1	3/2 C-AH	Flowrate; 40m3/hr, SG; 1.36. TDH; 11m.	5.5		4.1	32,522
332	PP	05	332-PP-05	AL feed thickener overflow pump 2	4/3 C-AH or equivalent	Flowrate; 70m3/hr, SG; 1.00. TDH; 11m.	11.0		8.3	65,043
332	PP	07	332-PP-07	AL discharge pump 1	3/2 C-AH	Flowrate; 40m3/hr, SG; 1.36. TDH; 11m.	5.5		4.1	32,522
332	PP	09	332-PP-09	Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		4.1	3,011
332	PP	10	332-PP-10	Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		4.1	3,011
332	TH	01	332-TH-01	Concentrate Thickener	Hi Rate, Diameter 6 m	Underflow density 40%	3.0		2.3	17,739
332	XM	01	332-XM-01	Off Gas Scrubber			4.0		3.0	23,652
AREA 334				**Co / Cu RECOVERY**						
334	PP	01	334-PP-01	RIP Contactor Feed Pump	Warman 6/4DAH, HD, R/L Slurry Pump	Flowrate; 194m3/hr, SG; 1.42. TDH; 10m.	15.0		11.3	88,695
334	PP	02	334-PP-02	RIP Discharge Pump 1	Warman 6/4DAH, HD, R/L Slurry Pump	Flowrate; 194m3/hr, SG; 1.42. TDH; 10m.	15.0		11.3	88,695
334	PP	03	334-PP-03	RIP Discharge Pump 2	Warman 6/4DAH, HD, R/L Slurry Pump	Flowrate; 194m3/hr, SG; 1.42. TDH; 10m.		15.0		
AREA 336				**COPPER SULPHATE CRYSTALLISER**						
336	CX	01	336-CX-01	Crystalliser Vessel 1			75.0		56.3	443,475
AREA 338				**COBALT SULPHATE CRYSTALLISER**						
338	CX	01	338-CX-01	Crystalliser Vessel 1			75.0		56.3	443,475
AREA 340				**MAGNETIC SEPARATION**						
340	MS	01	340-MS-01	Rougher Magnetic Separator 1	1.2m dia x 3.0m L, single drum, 1150 Gauss		7.5		5.6	44,348
340	MS	02	340-MS-02	Rougher Magnetic Separator 2	1.2m dia x 3.0m L, single drum, 1150 Gauss		7.5		5.6	44,348
340	MS	03	340-MS-03	Cleaner Magnetic Separator 1	1.2m dia x 2.4m L, triple drum, 850/1000 Gauss		7.5		5.6	44,348
340	MS	04	340-MS-04	Cleaner Magnetic Separator 2	1.2m dia x 2.4m L, triple drum, 850/1000 Gauss		7.5		5.6	44,348
340	PP	01	340-PP-01	Clnr Magnetic Concentrate Transfer Pump 1	Warman 3/2 CAH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 60m3/hr, SG; 1.7. TDH; 16m.	11.0		8.3	65,043
340	PP	01	340-PP-01	Magnetic Tails Transfer Pump 1	Warman 4/3CAH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 140m3/hr, SG; 1.13. TDH; 17m.	15.0		11.3	88,695
AREA 342				**MAGNETITE CONCENTRATE FLASH LEACHING**						
342	AG	01	342-AG-01	Flash Leach Tank 1 Agitator			32.0		24.0	189,216
342	AG	02	342-AG-02	Flash Leach Tank 1 Agitator			32.0		24.0	189,216
342	PP	01	342-PP-01	Flash Leach Transfer Pump 1	Warman 4/3CAH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 70m3/hr, SG; 1.7. TDH; Xm.	11.0		8.3	65,043
342	PP	02	342-PP-02	Flash Leach Transfer Pump 2	Warman 4/3CAH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 70m3/hr, SG; 1.7. TDH; Xm.		11.0		
AREA 344				**MAGNETITE CONCENTRATE FILTRATION**						
344	AG	01	344-AG-01	Filter Feed Tank Agitator			75.0		56.3	443,475
344	FR	01	344-FR-01	Concentrate Filter	64 m2 plate & frame filter	70 t/h @ 1,000 kg/m2/h	32.0		17.6	69,379
344	PP	01	344-PP-01	Filter Feed Pump 1	Warman 6/4E-AH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 340 m3/hr, SG; 1.63. TDH; 39m.	132.0		72.6	286,189
344	PP	02	344-PP-02	Filter Feed Pump 2	Warman 6/4E-AH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 340 m3/hr, SG; 1.63. TDH; 39m.		132.0		
344	PP	03	344-PP-03	Filtrate Pump	Warman 4/3C-AH, HD, R/L Slurry Pump, c/w steel fabricate	Flowrate; 100 m3/hr, SG; 1.01. TDH; 15m.	9.0		6.8	26,609
344	PP	06	344-PP-06	Filter Feed Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		0.0	0
AREA 350				**GOLD LEACHING AND ADSORPTION**						
350	AG	01	350-AG-01	CIL Leach Tank 1 Agitator			32.0		24.0	189,216
350	AG	02	350-AG-02	CIL Leach Tank 2 Agitator			32.0		24.0	189,216
350	AG	03	350-AG-03	CIL Adsorption Tank 1 Agitator			15.0		11.3	88,695
350	AG	04	350-AG-04	CIL Adsorption Tank 2 Agitator			15.0		11.3	88,695
350	AG	05	350-AG-05	CIL Adsorption Tank 3 Agitator			15.0		11.3	88,695
350	AG	06	350-AG-06	CIL Adsorption Tank 4 Agitator			15.0		11.3	88,695
350	AG	07	350-AG-07	CIL Adsorption Tank 5 Agitator			15.0		11.3	88,695
350	AG	08	350-AG-08	CIL Adsorption Tank 6 Agitator			15.0		11.3	88,695
350	PP	01	350-PP-01	CIL Feed Thickener u/f Pump 1	Warman 3/2 C-AH, HD, R/L Slurry Pump, c/w steel fabricat	Flowrate; 70 m3/hr, SG; 1.51. TDH; 19m.	11.0		8.3	65,043
350	PP	02	350-PP-02	CIL Feed Thickener u/f Pump 2	Warman 3/2 C-AH, HD, R/L Slurry Pump, c/w steel fabricat	Flowrate; 70 m3/hr, SG; 1.51. TDH; 19m.		11.0		
350	PP	03	350-PP-03	Carbon Transfer Pump # 1	Warman 2/2 QVTC D = 1.8m Vertical Cyclo Pump.	Flowrate; 20m3/hr, SG; 1.37. TDH; 5m.	2.2		1.7	4,818
350	PP	04	350-PP-04	Carbon Transfer Pump # 2	Warman 2/2 QVTC D = 1.8m Vertical Cyclo Pump.	Flowrate; 20m3/hr, SG; 1.37. TDH; 5m.	2.2		1.7	4,818
350	PP	05	350-PP-05	Carbon Transfer Pump # 3	Warman 2/2 QVTC D = 1.8m Vertical Cyclo Pump.	Flowrate; 20m3/hr, SG; 1.37. TDH; 5m.	2.2		1.7	4,818
350	PP	06	350-PP-06	Carbon Transfer Pump # 4	Warman 2/2 QVTC D = 1.8m Vertical Cyclo Pump.	Flowrate; 20m3/hr, SG; 1.37. TDH; 5m.	2.2		1.7	4,818
350	PP	07	350-PP-07	Carbon Transfer Pump # 5	Warman 2/2 QVTC D = 1.8m Vertical Cyclo Pump.	Flowrate; 20m3/hr, SG; 1.37. TDH; 5m.	2.2		1.7	4,818
350	PP	08	350-PP-08	Loaded Carbon Pump	Warman 2/2 QVTC D = 1.8m Vertical Cyclo Pump.	Flowrate; 20m3/hr, SG; 1.37. TDH; 5m.	3.0		2.3	6,570
350	PP	11	350-PP-11	Leach Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		0.0	0
350	PP	12	350-PP-12	Adsorption Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		0.0	0
350	SN	01	350-SN-01	Fines CIL Intertank Screen # 1	Cylindrical Wedgewire, powered external wiper arm.	Screen area 3 m2, Apperture; 0.8mm.	2.2		1.7	13,009
350	SN	02	350-SN-02	Fines CIL Intertank Screen # 2	Cylindrical Wedgewire, powered external wiper arm.	Screen area 3 m2, Apperture; 0.8mm.	2.2		1.7	13,009
350	SN	03	350-SN-03	Fines CIL Intertank Screen # 3	Cylindrical Wedgewire, powered external wiper arm.	Screen area 3 m2, Apperture; 0.8mm.	2.2		1.7	13,009
350	SN	04	350-SN-04	Fines CIL Intertank Screen # 4	Cylindrical Wedgewire, powered external wiper arm.	Screen area 3 m2, Apperture; 0.8mm.	2.2		1.7	13,009
350	SN	05	350-SN-05	Fines CIL Intertank Screen # 5	Cylindrical Wedgewire, powered external wiper arm.	Screen area 3 m2, Apperture; 0.8mm.	2.2		1.7	13,009
350	SN	06	350-SN-06	Fines CIL Intertank Screen # 6	Cylindrical Wedgewire, powered external wiper arm.	Screen area 3 m2, Apperture; 0.8mm.	2.2		1.7	13,009
350	SN	07	350-SN-07	Loaded Carbon Screen	Horizontal Vibrating Screen, poly screen panels; size 0.8m x	Screen area 0.8m2, Apperture; 0.8mm.;	3.0		2.3	6,570
350	SN	08	350-SN-08	Carbon Safety Screen	Horizontal Vibrating Screen, poly screen panels; size 1.0m x	Screen area 1.8m2, Apperture; 0.8mm.;	3.0		2.3	17,739
350	TH	01	350-TH-01	CILFeed Thickener	Hi Rate, Diameter 10 m	Underflow density 60%	7.5		5.6	44,348

AREA 360				**GOLD RECOVERY AND ELUTION**						
360	FA	01	360-FA-01	Electrowinning Fume Extraction Fan	Axial Inline Fan		0.8		0.6	411
360	FA	02	360-FA-02	Smelting Furnace Extraction Fan	Axial Inline Fan		0.8		0.6	411
360	FA	03	360-FA-03	Gold Room Extraction Fan 1	Axial Inline Fan		0.8		0.6	411
360	FA	04	360-FA-04	Gold Room Extraction Fan 2	Axial Inline Fan		0.8		0.6	411
360	FU	02	360-FU-02	Smelting Furnace	Tilting Furnace	Crucible Size: A100Smelting Time: 12 hFuel Type: LPG	0.6		0.4	301
360	HT	13	360-HT-13	Gold Room Cathode Hoist		SWL 2t	5.0		3.8	2,738
360	PP	47	360-PP-47	Thermal Oil Circulation Pump	Vendor Supply; SIHI ISO Back Pull out pump, mechanical s	Flowrate; 18m3/hr, SG; 0.77. TDH; 12m.	1.1		0.8	602
360	PP	48	360-PP-48	Elution Pump	Netzsch NM045BYL06B	Flowrate; 8m3/hr, SG; 1.20. TDH; 30m.	1.5		1.1	821
360	PP	49	360-PP-49	Elution Column Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		4.1	3,011
360	PP	50	360-PP-50	Elution Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		4.1	3,011
360	PP	51	360-PP-51	Electro-winning Feed Pump	ISO Pro 50x32-160	Flowrate; 10m3/hr, SG; 1.05. TDH; 8m.	0.6		0.4	301
360	PP	52	360-PP-52	Gold Room Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.10. TDH; 12m.	5.5		4.1	3,011
AREA 370				**REAGENTS**						
370	AB	01	370-AB-01	Flocculant Blower	GreencoAVT		3.0		2.3	1,643
370	AG	01	370-AG-01	Flocculant Mixing Tank Agitator	Mixtec 1037	Stainless Steel shaft and impellers	0.8		0.6	616
370	AG	04	370-AG-04	PAX Mix Tank Agitator	Mixtec 1037	Stainless Steel shaft and impellers	0.8		0.6	616
370	DC	01	370-DC-01	Lime Silo Dust Collector			0.8		0.6	616
370	FE	02	370-FE-02	Lime Slaker Feeder			0.8		0.6	616
370	HP	01	370-HP-01	Flocculant Feed Hopper	Skid mounted Flocculant preparation and mixing unit, 76.8m	76.8 m3/day, 75 min batch time, 4m3 mix tank.	7.5		5.6	6,159
370	ML	01	370-ML-01	Lime Slaker Mill		Capacity; 48 tonnes per day.	45.0		33.8	36,956
370	PP	03	370-PP-03	Frother Transfer Pump	Grundfos DDA 7.5 Electric Pulse Diaphagm or similar	Flowrate; 1.2m3/hr, SG; 1.10. TDH; 12m.	0.2		0.2	164
370	PP	04	370-PP-04	HCL Acid Wash Pump	Graco 1.5" Polypropylene	Flowrate; 0.7m3/hr, SG; 1.10. TDH; 12m.	0.2		0.2	164
370	PP	05	370-PP-05	HCL Acid Drum Pump	Graco 1.5" Polypropylene	Flowrate; 0.7m3/hr, SG; 1.10. TDH; 12m.		0.2		
370	PP	06	370-PP-06	Acid Area Sump Pump	Warman 40PVSPR, D = 1.2m	Flowrate; 18m3/hr, SG; 1.10. TDH; 12m.	5.5		0.0	0
370	PP	07	370-PP-07	Cyanide Transfer Pump	ISO Pro 50x32-200	Flowrate; 10m3/hr, SG; 1.05. TDH; 40m.	3.0		2.3	2,464
370	PP	08	370-PP-08	Cyanide Recirculation Pump 1	ISO Pro 50x32-200	Flowrate; 10m3/hr, SG; 1.05. TDH; 40m.	3.0		2.3	17,739
370	PP	09	370-PP-09	Cyanide Recirculation Pump 2	ISO Pro 50x32-200	Flowrate; 10m3/hr, SG; 1.05. TDH; 40m.		3.0		
370	PP	10	370-PP-10	Cyanide Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.10. TDH; 12m.	5.5		0.0	0
370	PP	11	370-PP-11	Caustic Dosing Pump 1 (elution only)	Grundfos CMB 5-74 (fixed)	Flowrate; 1.0m3/hr, SG; 1.0. TDH; 40m.	1.5		1.1	1,232
370	PP	13	370-PP-13	Flocculant Transfer Pump	Netzsch NM045BYL06B	Flowrate: 10 m3/h, TDH 25m, SG; 1.1	2.2		1.7	1,807
370	PP	14	370-PP-14	CIL Feed Thickener Flocculant Pump 1	Netzsch NM038BYL06B	Flowrate: 3 m3/h, TDH 15m, SG; 1.1	0.8		0.6	4,435
370	PP	16	370-PP-16	Thickener Flocculant Pump Spare	Netzsch NM038BYL06B	Flowrate: 3 m3/h, TDH 15m, SG; 1.1	0.8		0.6	4,435
370	PP	17	370-PP-17	Wash Thickener Flocculant Pump Spare	Netzsch NM038BYL06B	Flowrate: 3 m3/h, TDH 15m, SG; 1.1	0.8		0.0	0
370	PP	22	370-PP-22	Lime Slaking Mill Discharge Pump	Warman 2/1.5 BAH HD Metal Lined Slurry Pump, c/w Direc	Flowrate; 5.0m3/hr, SG; 1.30. TDH; 10m.	5.5		4.1	32,522
370	PP	23	370-PP-23	Lime Ringmain Pump 1	Warman 2/1.5 BAH HD Metal Lined Slurry Pump, c/w Direc	Flowrate; 18m3/hr, SG; 1.30. TDH; 40m.	11.0		8.3	65,043
370	PP	24	370-PP-24	Lime Ringmain Pump 2	Warman 2/1.5 BAH HD Metal Lined Slurry Pump, c/w Direc	Flowrate; 18m3/hr, SG; 1.30. TDH; 40m.		11.0		
370	PP	25	370-PP-25	PAX Transfer Pump	Netzsch NM038BYL06B	Flowrate; 10.0m3/hr, SG; 1.10. TDH; 25m.	2.2		1.7	13,009
370	PP	28	370-PP-28	PAX Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.10. TDH; 12m.	5.5		0.0	0
AREA 390				**WATER STORAGE AND RETICULATION**						
390	PD	01	390-PD-01	Process Water Pond 1	Earth construction, plastic lined	Effective Volume: 3000m3				
390	PP	01	390-PP-01	RIP Water Pump 1	ISP Pro 80x50-200	Flowrate; 42m3/hr, SG; 1.0. TDH; 55m.	11.0		8.3	65,043
390	PP	02	390-PP-02	RIP Water Pump 2	ISP Pro 80x50-200	Flowrate; 42m3/hr, SG; 1.0. TDH; 55m.		11.0		
390	PP	03	390-PP-03	Process Water Pump 1	ISO Pro 200 x 150 -400	Flowrate; 230 m3/hr, SG; 1.0. TDH; 55m.	75.0		56.3	443,475
390	PP	04	390-PP-04	Process Water Pump 2	ISO Pro 200 x 150 -400	Flowrate; 230 m3/hr, SG; 1.0. TDH; 55m.		75.0		
390	PP	05	390-PP-05	Raw Water Pump 1	ISP Pro 80x50-200	Flowrate; 42m3/hr, SG; 1.0. TDH; 55m.	11.0		8.3	65,043
390	PP	06	390-PP-06	Raw Water Pump 2	ISP Pro 80x50-200	Flowrate; 42m3/hr, SG; 1.0. TDH; 55m.		11.0		
390	PP	07	390-PP-07	Main Fire Water Pump	ISO Pro 125x80-250	Flowrate; 144m3/hr, SG; 1.0. TDH; 75m.	45.0		33.8	266,085
390	PP	08	390-PP-08	Diesel Fire Water Pump	ISO Pro 125x80-250	Flowrate; 144m3/hr, SG; 1.0. TDH; 75m.		45.0		
390	PP	09	390-PP-09	Jockey Fire Water Pump	Grundfos CRI 1s-19	Included as part of Diesel fire water pump	5.5		4.1	32,522
390	PP	10	390-PP-10	Potable Water Pump 1	Grundfos CMB 5-74 (fixed)	Flowrate; 1.0m3/hr, SG; 1.0. TDH; 40m.	1.5		1.1	8,870
390	PP	11	390-PP-11	Potable Water Pump 2	Grundfos CMB 5-74 (fixed)	Flowrate; 1.0m3/hr, SG; 1.0. TDH; 40m.		1.5		
390	PP	12	390-PP-12	Fresh Water Pump 1	Grundfos CRI 10-4	Flowrate; 10m3/hr, SG; 1.0. TDH; 30m.	1.5		1.1	8,870
390	PP	13	390-PP-13	Fresh Water Pump 2	Grundfos CRI 10-4	Flowrate; 10m3/hr, SG; 1.0. TDH; 30m.		1.5		
390	PP	14	390-PP-14	Gland Water Pump 1	Grundfos CDI 20-8	Flowrate; 18m3/hr, SG; 1.0. TDH; 100m.	11.0		8.3	65,043
390	PP	15	390-PP-15	Gland Water Pump 2	Grundfos CDI 20-8	Flowrate; 18m3/hr, SG; 1.0. TDH; 100m.		11.0		
AREA 391				**RAW WATER SUPPLY**						
391	PP	01	391-PP-01	Bore Pump 1	Grundfor SP 60-7	Flowrate; 50 m3/hr, SG; 1.0. TDH; 60m.	15.0		11.3	88,695
391	PP	02	391-PP-02	Bore Pump 2	Grundfor SP 60-7	Flowrate; 50 m3/hr, SG; 1.0. TDH; 60m.	15.0		11.3	88,695
391	PP	03	391-PP-03	Bore Pump 3	Grundfor SP 60-7	Flowrate; 50 m3/hr, SG; 1.0. TDH; 60m.		15.0		
AREA 401				**TAILINGS DISPOSAL**						
401	HP	01	401-HP-01	Tailings Hopper	6mm Steel Plate Rubber lined	6 m3 Fabricated Carbon Steel, sloped bottomRubber Lined Tank Hopper.				
401	PP	01	401-PP-01	Final Tailings Pump 1	Warman 4/3 E-HH, HD, R/L Slurry Pump, c/w steel fabricat	Flowrate; 90 m3/hr, SG; 1.37. TDH; 75m.	55.0		41.3	325,215
401	PP	02	401-PP-02	Final Tailings Pump 2	Warman 4/3 E-HH, HD, R/L Slurry Pump, c/w steel fabricat	Flowrate; 90 m3/hr, SG; 1.37. TDH; 75m.		55.0		
401	PP	03	401-PP-03	Tails Area Sump Pump	Warman 40PVSP, D = 1.2m	Flowrate; 18m3/hr, SG; 1.24. TDH; 12m.	5.5		0.0	0
AREA 402				**TAILINGS STORAGE FACILITY**						
402	PP	01	402-PP-01	Seepage Pump	By others		30.0		22.5	24,638
402	PP	02	402-PP-02	Underdrain Pump	By Others		30.0		22.5	24,638
AREA 403				**DECANT RETURN**						
403	PP	88	403-PP-88	Decant Return Water Pump	Grundfos DWK E.10.100.220	Flow Rate; 100m3/h, TDH; 45m	22.0		0.0	0
AREA 420				**AIR SERVICES**						
420	AC	01	420-AC-01	Air Compressor 1	GA90+FF-8.5	1014 m3/h @ 800kPa	90.0		67.5	532,170
AREA 430				**PLANT BUILDINGS**						
430	BD	01	430-BD-01	Administration & Mining Office			25.0		18.8	73,913
430	BD	02	430-BD-02	Admin. Male Ablutions			5.0		3.8	14,783
430	BD	03	430-BD-03	Admin. Female Ablutions			5.0		3.8	14,783
430	BD	04	430-BD-04	Plant Crib Room			10.0		7.5	29,565
430	BD	05	430-BD-05	Plant Workshop Office			10.0		7.5	29,565
430	BD	06	430-BD-06	Plant Ablutions			10.0		7.5	29,565
430	BD	07	430-BD-07	Warehouse			10.0		7.5	29,565
430	BD	08	430-BD-08	Main Plant Control Room			7.0		5.3	20,696
AREA 440				**WORKSHOP / STORES**						
440	BD	09	440-BD-09	Reagent Stores			2.0		1.5	5,913
440	BD	10	440-BD-10	Plant Maintenance Workshop			20.0		15.0	59,130
440	HT	11	440-HT-11	Light Vehicle Workshop 4 Post Hoist						
AREA 460				**PROCESS CONTROL LABORATORY**						
460	BD	12	460-BD-12	Process Laboratory			75.0		56.3	221,738
						Total	**3,098**	**409**	**2,247**	**15,888**

Power Unit Cost	**$/MW**	**290**
Power Cost	**$/y**	**4,607,527**

Reagent Costs

Acid Wash and Elution Reagent Requirements

	Av kg/Strip	kg/annum	kg/t
Sodium Cyanide	324	126638	0.17
Sodium Hydroxide	172	67227	0.09
Hydrochloric Acid	300	117257	0.16
Elution LPG (Litres)	484	189175	0.25
Regeneration LPG (Litres)	0	0	0.00

Leach and Adsorption Reagent Consumptions

	Kg/t	tpa	
Sodium Cyanide		3564	
Quicklime		5196	
Oxygen	0.3	225	
Carbon	0.03	11	CIL feed only
Flocculant	0.11	83	

Total Reagents Consumption and Costs Float Feed tonnes 750000

Reagent	kg/t	tpa or unit	Unit Cost $/tonne	Total Cost $	Total Cost $/t
Sodium Cyanide	4.92	3,691	2,750	10,150,587	13.53
Quicklime	6.93	5,196	215	1,117,093	1.49
Oxygen					
Sodium Hydroxide	0.09	67	760	51,093	0.07
Hydrochloric Acid	0.16	117	636	74,576	0.10
LPG (m3)	0.25	189	660	124,855	0.17
Sulphuric Acid (kg/h)	16.18	12,131	210	2,547,612	3.40
Resin (m3)		34	20,000	685,000	0.91
Carbon	0.01	11	3,000	33,075	0.04
PAX	0.14	105	2,385	250,425	0.33
Frother	0.02	15	3,700	55,500	0.07
Flocculant	0.11	83	4,990	411,675	0.55
Antiscalant (m3)	0.01	6	3,000	18,000	0.02
Bulka Bags (1.5 t/bag)		5,902	21	120,991	0.16
Filter Cloths		6	22,199	133,193	0.18
Other Reagents				20,000	0.03
Total				**15,793,674**	**21.06**

AREA	DESCRIPTION	INSTALLED COST	REFERENCE CODE	% FACTOR APPLIED	ANNUAL MAINTENANCE MATERIALS COST
	Mining	0			
M	**SUBTOTAL MINING**	**0**			
	Ore Feed and Screening	256,366	p-high	7.0%	17,946
	Flotation	2,229,753	p-low	3.0%	66,893
	Regrind Circuit	4,333,140	p-low	3.0%	129,994
	Co/Cu Leach	2,958,204	p-medium	4.0%	118,328
	Co / Cu Recovery - RIP	2,491,925	p-low	3.0%	74,758
	Magnetic Separation & Flash Leach	1,157,333	p-low	3.0%	34,720
	Au Leaching / Adsorption - CIP	4,570,602	p-low	3.0%	137,118
	Elution & Gold Recovery	880,216	p-medium	4.0%	35,209
	Reagents	1,971,647	p-low	3.0%	59,149
	Tails Thickener & Disposal	152,570	p-high	7.0%	10,680
	Piping	4,150,589	p-low	3.0%	124,518
P	**SUBTOTAL PROCESS PLANT**	**25,152,345**		3.2%	**809,312**
	Power & Reticulation	4,064,411	e-low	4.0%	162,576
	Water Services & Reticulation	301,935	services	3.0%	9,058
	Air Systems	1,296,197	services	3.0%	38,886
P	**SUBTOTAL PROCESS PLANT SERVICES & UTILITIES**	**5,662,543**		3.7%	**210,520**
	TOTAL PROJECT SUMMARY	**30,814,888**		**3.3%**	**1,019,832**

OTHER COSTS

Maintenance Contractors					
Area	**Description**				**$/annum**
Crushing Circuit					0
Access road maintenance					200,000
Borefield track maintenance					100,000
General	$85/h, 12 h/day, 20 people, 7 day/yr				142,800
			Subtotal		**442,800**
Equipment Hire					
Loader					0
Bobcat					25,000
Large Lift Crane					10,000
All Terrain Forklift					40,000
Service Truck					40,000
Trader					40,000
Warehouse Fork Lift					20,000
Franna 25					132,000
Light vehicle lease	4 vehicles				45,000
Oxygen Plant					0
Multimixer					0
			Subtotal		**352,000**
Consultants					
Tailings	Reporting				30,000
Vibration Monitoring					0
Water	Reporting				20,000
LoPOX					0
Metallurgical					50,000
			Subtotal		**100,000**
Fresh Water Supply					
Plant		0	m3	2.25	0
Potable		49,056	m3	2.25	110,376
WTP maintenance		$3,550	per month		42,600
			Subtotal		**110,376**
Raw Water Supply				**0**	**0**
Minting and Security Cost	at $1.50/oz		**Subtotal**		**39,585**
Fuel Cost					
Light Vehicles	4 x 20 litres/vehicle/day at $1.00				29,200
Crane	20 litres/day at $1.00				7,300
Bob Cat	40 litres/day at $1.00				14,600
Forklift	20 litres/day at $1.00				7,300
Borefield	3.5 L/h per bore				55,188
			Subtotal		**113,588**
Laboratory Costs					
Metallurgical Testwork	External				20,000
Consumable Costs	20 samples/day at $13.50				98,550
			Subtotal		**118,550**
Other					
Training					50,000
Conferences					0
Travel					20,000
Expenses					10,000
General Office					40,000
Lubricants	$0.04 per tonne of ore processed				30,000
G & A	$1.50 per tonne of ore processed				1,125,000
			Subtotal		**1,275,000**
			Total		**2,109,099**