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SINOSTEEL MIDWEST MANAGEMENT PTY LTD

Weld Range Iron Ore Pre-Feasibility Study

Desktop Study for Future Deslime Plant

13923-RP-1150-ME-0001

1-Sep-08

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SINOSTEEL MIDWEST MANAGEMENT PTY LTD
WELD RANGE IRON ORE PRE-FEASIBILITY STUDY
DESKTOP STUDY FOR FUTURE DESLIME PLANT

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PROJECT 13923-RP-1150-ME-0001 - WELD RANGE IRON ORE PRE-FEASIBILITY STUDY

REV	DESCRIPTION	ORIG	REVIEW	WORLEY-PARSONS APPROVAL	DATE	CLIENT APPROVAL	DATE
A	Issued for internal review	R. Moncrieff / B. Purcell	P Hairsine		15-July-08		
B	Issued for Client Review	R. Moncrieff / B. Purcell	P Hairsine	P Hairsine	16-July-08		N/A
C	Issued for use	R. Moncrieff / B. Purcell	M Esvelt	P Hairsine	1-Sep-08		N/A 23/12/08

CONTENTS

Appendix List

1. BACKGROUND

The SinoSteel Midwest Joint Venture seeks to construct and operate a new iron ore mining operation at Weld Range in the mid-west region of Western Australia. The mine intends to operate at 15 Mtpa of iron ore at a single grade for a period of 15 years (assuming sufficient reserve). The geology of the deposits and details of the mining strategy are still being further investigated. One of the two major deposits, Beebyn, has been determined to have high alumina levels in some of the fines, which may require beneficiation to produce a marketable product grade. There is no such problem reported in the lump ore, nor any of the ore from the Madoonga deposit.

SMM have indicated that with appropriate mine planning and good in-pit grade control, it is anticipated that alumina in Beebyn fines could be managed without beneficiation for at least the first two years of operation. However, the main plant flow sheet has been developed with provision for separating the high alumina fines, so that they can be discarded or stockpiled for future treatment. This stockpile will provide the ore feed to the Deslime Plant. The Deslime Plant is intended to improve the fines product grade by removing the minus 65 micron material as a reject that is sent to the tailings disposal area. The Deslime Plant product will be combined with the main screenhouse plant fines to make up a total fines product for railing to the port.

This report is focused on proposing an appropriate type of deslime facility to be used at Weld Range. The process entails sizing the -1mm fines material via a wet plant, using standard mineral processing technology and equipment. There are similar process plants operating in the Pilbara region of Western Australia.

A desktop study has been deemed appropriate at this stage of the project development, however it is noted that future development stages will need to validate the assumptions in this study, particularly by obtaining appropriate metallurgical test data to support the design basis.

2. BASIS OF DESIGN PARAMETERS

The following table of design criteria lists parameters are based on the current Basis of Design, as well as proposed and assumed criteria for the wet plant design. Some of the assumed criteria will require confirmation by testwork (see Section 6).

2.1 Deslime Plant Feed Characteristics

In the absence of specific data for the high alumina fines Weld Range ore, the following typical fines characteristics have been assumed for this desktop study:

Parameter	Value	Source
Annual wet plant head feed, Mtpa (based on maximum RoM feed rate to Beebyn processing circuit)	0.75	BOD, Section 5.3
Wet plant annual operating hours	6,000	Proposed
Wet plant feed size range, mm	-6.3	Given
Wet plant head feed rate, t/h	125	Derived
Feed Surge bin capacity, tonnes	75	Proposed
Sizing screen cut size, mm	1	Proposed
-1 mm in fines feed, wt %	52.4	BOD, Table 5.1.4
-63 micron in fines feed, wt %	21.7	BOD, Table 5.1.4
Fines solids density, t/m^3	3.6	Assumed
Size fraction to be removed, micron	-65	Given
Hydrocyclone underflow solids density, % solids by weight	65	Assumed
-1 mm + 65 micron Dewatering screen product moisture %	20	Assumed
Thickener solids capacity, t/m^2/h	0.6 (1)	Assumed
Thickener underflow density, % solids	55 (1)	Assumed
Flocculant addition, g/t solids	40	Assumed

(1) Based on a high-rate thickener

2.2 Deslime Plant Feed Size Distribution

The plant feed size distribution used for this desktop study, summarised in the table below, has been taken from SMM process data for metallurgical test work (refer to sinter fines test sample – wet screening, provided in Appendix E). It should be noted that the metallurgical data is based on a composite sample of Beebyn and Madoonga fines, which may not be representative of the stockpiled Beebyn high alumina fines. The actual deslime plant feed distribution will be dependent on a number of factors, including the mining process (mining dilution). The feed size distribution should be further investigated if the development of the deslime plant progresses further.

Size (mm)	Wt % Retained
+6.3	3.24
-6.3 to +4	14.01
-4 to +2	18.29
-2 to +1	12.04
-1 to +0.5	8.94
-0.5 to +0.25	7.76
-0.25 to +0.15	5.90
-0.15 to +0.063	8.12
-0.063	21.7

3. DESLIME PLANT OPERATION AND PROCESS

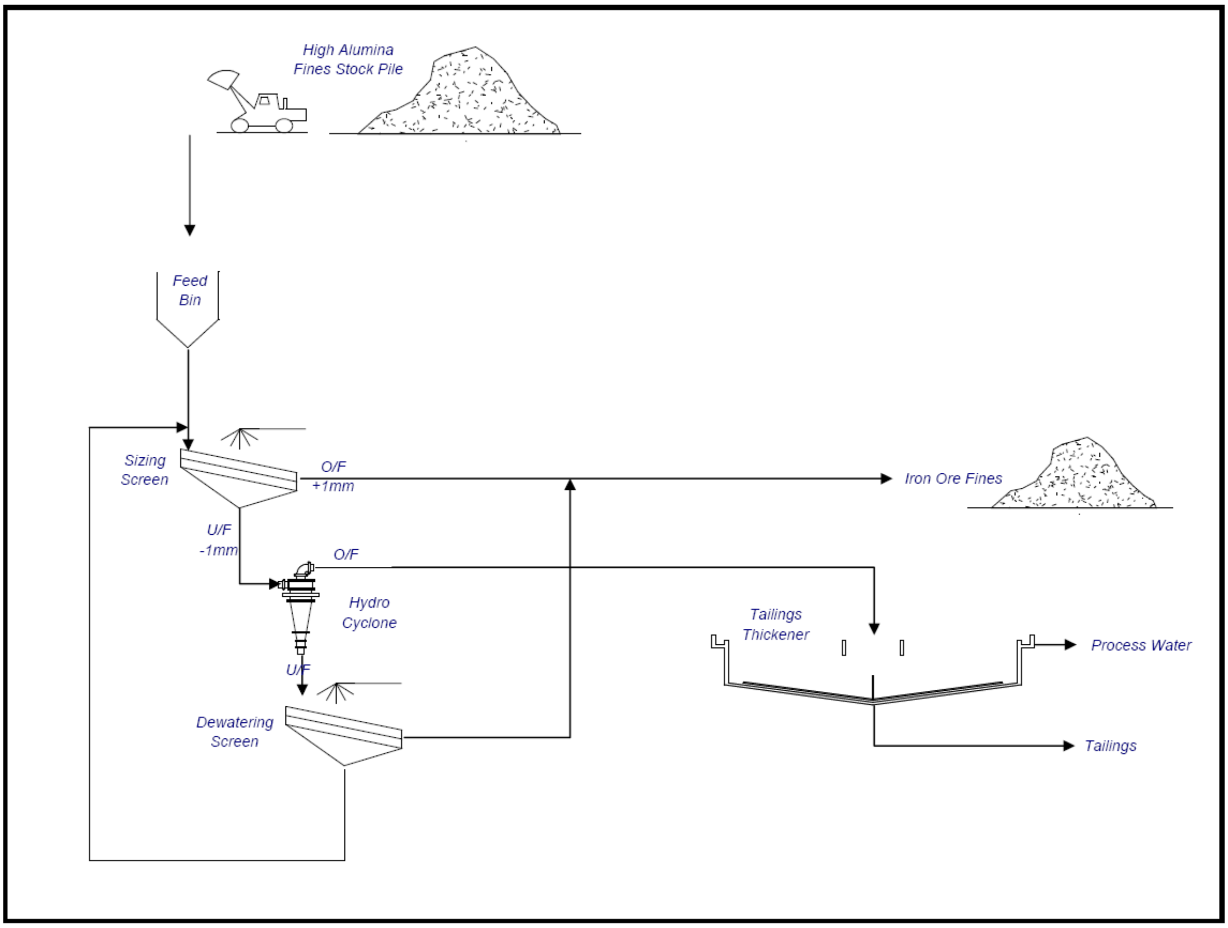
The Deslime Plant will be operated on a continuous basis to treat high alumina Beebyn ore that has been stored in a reject fines stockpile adjacent to the plant. Preliminary test work has indicated that the majority of the alumina is contained in the minus 65 micron fraction. It is therefore proposed that the reduction of the alumina in the Beebyn fines is to be achieved by sizing the fines product (comprising natural fines and fines produced by crushing) in order to remove the -65 micron material. This is achieved in a wet plant based on classification of a -1 mm fraction using standard mineral processing technology and equipment. The Deslime Plant product will then be combined with the main screenhouse plant fines to make up a total fines product for railing to the port.

The facility will be automated for ease of operation, and will require minimum operator supervision.

The process comprises the following stages and items:

- Wet screening at nominally 1 mm;
- Classification of the -1 mm product to separate out the -65 micron material;
- Dewatering of the -1 mm + 65 micron product;
- Tailings handling system for the -65 micron reject material;
- Ancillary equipment.

A block diagram of the main process elements is given below:



3.1 Functions of Main Equipment

The process is detailed on Drawing Number 13923-SK-0100-PR-0004 Rev B Deslime Plant Process Flow Diagram, which is included in Appendix A. The flow diagram includes mass and water balance data for all the major streams. Potential sample points are also indicated, however the sampling points and sampling methods are to be confirmed and will be determined by Client preference and metallurgical accounting requirements.

The following comments are based on the assumption that the wet plant head feed is 125 t/h based on annual operating hours of 6,000. This gives the wet plant more time for scheduled maintenance than the main crushing and screening plant, which is justified on the basis of complexity, and the fact that there is only one wet plant module.

3.1.1 Wet Plant Feed System

The wet plant is fed from the accumulated high alumina fines stockpile by means of a front-end loader discharging into a hopper located over a belt feeder, which loads the wet plant feed conveyor. The feed conveyor is equipped with a belt weigher to record the tonnes treated. The conveyor discharges into the 75 t capacity screen feed bin that provides approximately a half-hour surge capacity. This will allow for a non-continuous front-end loader operation (note-the feed bin capacity can be varied if required).

A belt feeder or vibrating feeder withdraws material from the bin at a pre-determined rate based on the feeder speed via a variable speed drive. The feeder type will be determined by the bin design and Client preference. For the purposes of this study, we have selected a belt feeder.

Provision has been made for automatic sampling the wet plant feed material.

3.1.2 Wet Screening

The screen feed is slurried with large quantities of water in a pulping box ahead of the screen. The pulping box is designed to obtain well-mixed slurry required for efficient screening at 1 mm on the sizing screen. A single deck banana screen is preferred for this duty, as it is more efficient in terms of sizing than a horizontal screen.

The screen apertures are selected to provide a nominal cut size of 1 mm. This size is selected as it is easier to pump smaller particles (lower pipe velocities, less wear, less pump power required), the quantity of solids pumped to the classification stage is less, and wear on the cyclone is lower than if a larger cut size was selected.

Sprays on the sizing screen assist the screening process. The sizing screen oversize (-6.3 + 1 mm) discharges to the product conveyor for transporting to the fines product stockpile feed system. It is recommended that provision be made for sampling screen oversize in order to analyse the efficiency of alumina removal in conjunction with the wet plant feed sample.

The screen undersize (-1 mm) reports to the sizing screen sump from where it is pumped to the hydrocyclone for classification. Level control is provided on the sump, via water make-up, to ensure continuous cyclone feed pump conditions are maintained.

3.1.3 Classification

Classification of the -1 mm solids in the screen undersize is achieved in a hydrocyclone. It is anticipated that a single 500 mm diameter hydrocyclone will be required, with the appropriate vortex finder and spigot sizes. The optimum hydrocyclone size and geometry for the application will be confirmed by the vendor based on a hydrocyclone model.

The hydrocyclone overflow product containing the -65 micron material reports to the reject handling section. The cyclone underflow product (nominally -1 mm+65 microns) reports to a dewatering screen.

3.1.4 Product Handling

The hydrocyclone underflow reports to a dewatering screen where most of the free water is removed before the product is discharged to the wet plant product conveyor. A belt weigher on the product conveyor will provide information for metallurgical accounting purposes.

The water recovered from the dewatering screen is recirculated to the pulping box ahead of the sizing screen.

Provision has been made for automatically sampling the blended wet plant product at the product discharge conveyor head chute.

3.1.5 Reject Handling

The hydrocyclone overflow reports to the reject handling section, comprising a thickener and a thickener underflow pump that is also the first stage tailings disposal pump. A high-rate type thickener is recommended.

The thickener feed will require flocculant to assist settling of fine solids in the thickener. Flocculant vendors commonly provide skid mounted package plants which can be either leased or purchased; a purchased plant has been assumed for this study. A density gauge on the thickener underflow pump discharge is included for controlling the underflow density. A two stage pumping system has been assumed, based on a pumping distance of 2 km to the tailings dam.

Thickener overflow reports to the process water tank where raw water is added as make-up for the process water system.

3.1.6 Tailings Disposal Dam

The tailings disposal system will be a bunded dam, with raised earth walls and a HDPE membrane lining. Tailings are to be spread around the dam via distribution pipe-work with valve operated off-take points spread around the perimeter of dam. Following an initial fill period, decant water will be returned to the process (refer also to Section 5.4 Potential for Capex Reduction). Initially one tailings dam would be constructed, with provision made for a future duplication if required.

- Indicative dimensions: 280m x 280m x 5m
- Volume of tailings to dam: 210,000 m^3/a
- Total solids deposited: 162,000 t/a
- Assumed settled density: 2.0 – 2.5 t/m^3
- Volume of settled slimes: 64,800 – 81,000 m^3/a
- Dam capacity: 392,000m^3
- Life: Approximately 5 – 6 years (at design head feed rate)

A sprinkler system will also be installed for dust control.

3.1.7 Ancillary Equipment & Services

Ancillary equipment required for the wet plant consists of the following:

- Process water supply system (tank and variable speed pumps).
- Gland water supply system (tank and pumps).
- Flocculant plant.

Services such as power and raw water will be drawn from the existing facilities. The main plant workshop and stores will cover the requirements of the wet plant. A storage shed near the plant for flocculant storage is recommended if dry flocculant is chosen.

4. EQUIPMENT AND LAYOUT

The main process equipment is detailed below.

The preliminary plant layout is given on Drawing Number 13923-SK-0100-ME-0013 Rev B Deslime Plant Plans & Elevations. The plant is laid out around the ore feed and the product return conveyors with the ore receival bin, feeder and sizing screen on one side and the hydrocyclone and de-watering screen on the other side. Peripheral equipment includes the thickener, flocculant plant, process water tank & pumps, as well as the electrical substations/switchrooms. The thickener is placed adjacent to hydrocyclone to effectively collect the return water stream.

Equipment	Qty	Size/Capacity 125t/h Feed	Recommended Supplier
Feed bin	1	75t	(Fabrication)
Belt or vibrating feeder (VSD)	1	75-150t/h	RCR or Schenck, Jost
Sizing screen (banana)	1	1.2 x 3.6	Schenck, Jost
Cyclone feed pump	1	6/4, 37kW	Weir/Warman, Krebs
Hydrocyclone	1	500mm diameter	Krebs, Multotec
Dewatering screen	1	0.9m wide	Schenck
Dewatering screen pump	1	1.5/1	Weir/Warman, Krebs
Thickener	1	8m diameter	Envirotech, Outotec
Thickener u/flow pump (VSD)	2	3/2	Weir/Warman, Krebs
Flocculant plant	1	8t/annum	Ciba
Process water tank	1	250m^3/h	(Fabrication)
Process water pump (VSD)	1+1	150-300	Weir/Warman, Krebs, KSB
Gland water tank	1	10m^3	(Fabricate)
Gland water pump (VSD)	1+1	4-8m^3/h	Grundfos
Floor drain pump	2	20m^3/h	Weir/Warman
Decant water return pump	1		Weir/Warman, Krebs, KSB
Air compressor	1		CAPS
Note: 1+1 indicates duty and standby units.			

5. CAPITAL & OPERATING COST ESTIMATES

5.1 Capital Cost Estimate

The capital costs estimation for the Weld Range Deslime Plant corresponds to a Class 1 estimate classification, with an accuracy of < +/- 50%.

A work breakdown structure has been developed based on the Process Flow Diagram, main equipment list and ancillary items typically required for this type of processing plant. Unit rates have been derived through indicative pricing from suppliers, engineers' estimates from comparison with other projects, and allowances. While contingency factors have not been applied to the quantities developed in this study, a contingency of 25% has been applied to the total CAPEX in line with a WorleyParsons' Class 1 level estimate.

The detailed cost breakdown is provided in Appendix C, with a summary provided below.

Direct Costs	$18,839,000
Contingency (25%)	$4,709,750
TOTAL PLANT	**$23,548,750**

5.2 Operating Cost Estimate

The operating costs estimate for the Weld Range Deslime Plant have been developed from first principles, with power costs derived for the major equipment items, quantities of consumables estimated from SMM process data and FIFO and accommodation costs for operators.

While contingency factors have not been applied to the quantities developed in this study, a contingency of 25% has been applied to the total OPEX in line with a WorleyParsons' Class 1 level estimate.

The detailed cost breakdown is provided in Appendix D, with a summary provided below.

Power Consumption	$672,341
Consumables	$426,492
Operator Labour	$477,000
Maintenance contractor costs	$530,872
FIFO & Accommodation costs	$59,875
Sub-Total	**$2,166,579**
Contingency (25%)	$541,645
TOTAL PLANT OPEX	**$2,708,224**

5.3 Assumptions & Qualifications

The Capital and Operating Cost Estimates are based on following qualifications and assumptions:

- Estimate base date is June 2008.
- Diesel fuel price of $1.31 / litre has been used throughout the estimate is based on the Geraldton Terminal gate price (TGP) at 27 June 2008, excluding GST and after application of fuel rebate.
- Power generation cost of $0.351 / kWh, based on the abovementioned diesel fuel pricing.
- Estimate reflects material take off's and allowances derived by WorleyParsons Engineering teams.
- All site labour shall be engaged on a fly in / fly out (FI/FO) basis from Perth as applicable.
- Work cycle for operator labour is based on an 8 days on and 6 days off rotation.
- This cost estimate has been prepared assuming environmental, statutory and regulatory approvals are in place.

The following items were excluded from the Capital and Operating Cost Estimates:

- Escalation from the estimate base date.
- Costs for EPCM Services.
- Owner's costs.
- Foreign Exchange rate variations.
- Duties and taxes on imported goods and services.
- No allowances have been made for deferred capital costs.
- Market forces, including:
  - The effect of related concurrent projects on the availability of construction labour and materials.
  - The net affect of the world demand on steel, pipe and copper.

- The availability of suitable milling and fabrication shops.

5.4 Potential for CAPEX Reduction

The CAPEX estimate assumes the construction of a lined tailings dam to enable re-use of process water. The potential for reducing the CAPEX is two-fold:

- Initial indications are that significant dewatering will be required for the mining operations, which will require disposal or use as process water. If the quality of the water proves adequate for process use, and environmental approval can be attained, the potential exists to construct an unlined tailings dam (i.e. without a HDPE membrane or geotextile fabric) which would reduce the CAPEX estimate by approximately $3.1M (from the base case).

- Given that the deslime plant is being considered for operation 2 years after mining operations have commenced, the potential for a disused section of the pit to be incorporated for tailings storage could be investigated. If viable, a CAPEX reduction of approximately $8.9M could be realised (from the base case).

6. PROPOSED FUTURE TESTWORK

The process design work undertaken for this desktop study is preliminary only, with the equipment selection not necessarily being optimised for the Beebyn ore. It is recommended that before further work is considered to advance the design of this plant, a test work program be conducted to provide the necessary design data.

The intent of the testwork is two-fold, namely:

1. To determine the optimum separation size for the removal of alumina, and
2. To determine equipment sizing.

6.1 Determination of Optimal Classification Size

It is recommended that this testwork is used to determine the removal of alumina from natural as well as crushed fines separately. This can be achieved by conducting wet sieving at a range of sieve sizes on the natural fines and the fines generated by crushing. The results will indicate if it is necessary to treat only one material source or both.

> **Note:**
> While natural fines are defined as those produced by the mining process, they can functionally be considered as the fines present where the ore stream is first presented for screening, commonly at scalping screens post primary crushing. It should be noted that the current processing flowsheet does not incorporate scalping screens; instead the combined primary crushed and secondary crushed ore being presented to the product screens. However, as the ore properties are further defined the flowsheet has significant potential for change, therefore this testwork would be considered prudent.

A typical testwork scheme is described for the natural fines below:

- Remove -6.3mm natural fines from a representative head feed sample(s).
- Wet sieve the sample at a range of fine sieve samples, say from approximately 35 micron to 120 micron, using a total of say 5 sizes.
- Dry and weigh the products, analyse for alumina.
- Construct a graph of cumulative weight loss versus alumina content in the product for the sieve fractions (this will be the equivalent of a grade/recovery curve).

The graph should show a distinct initial slope, with a flattening out as the separation size increases, and the product alumina content tends to the overall alumina content. The optimum separation size can be determined from inspection of the graph.

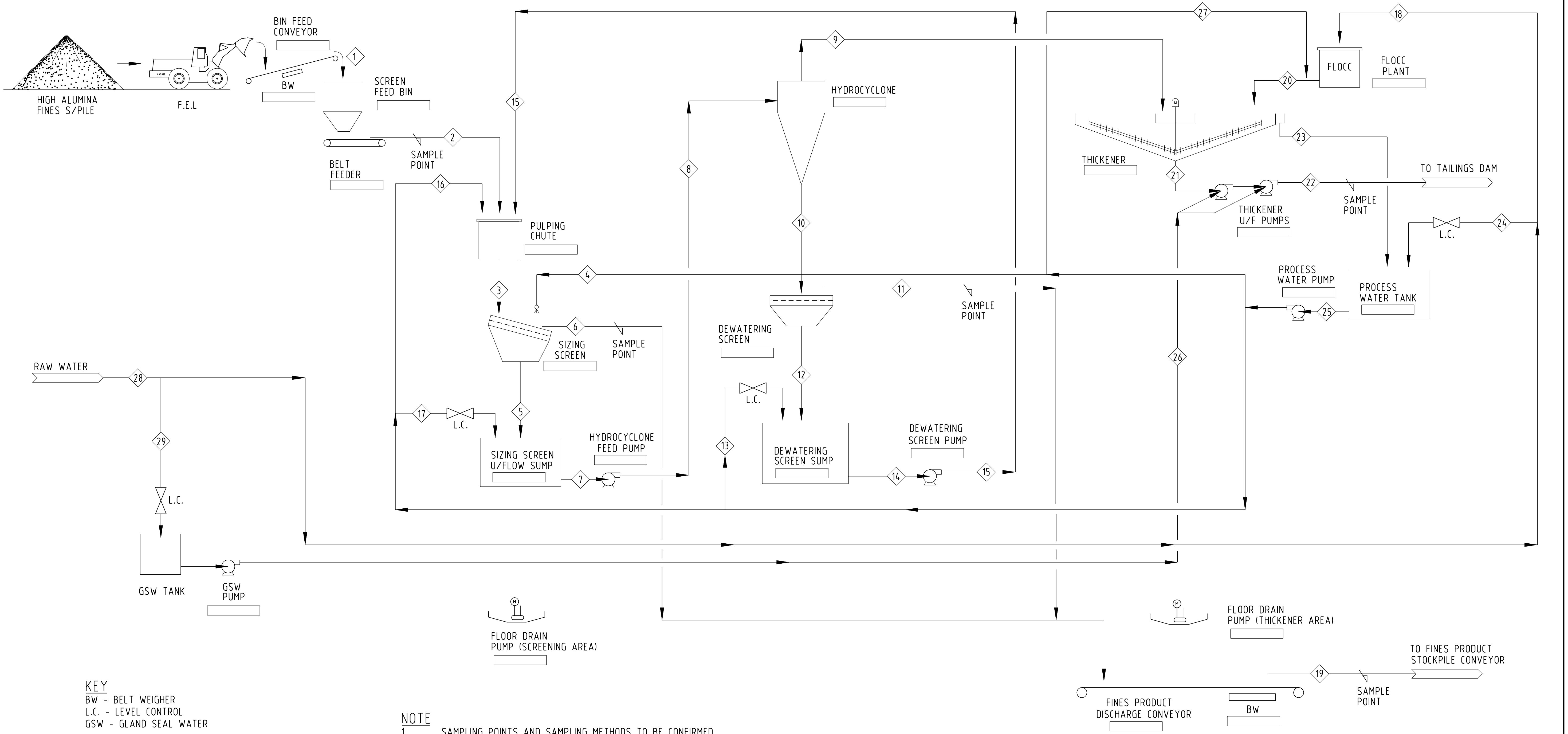
Repeat the above steps for the crushed fines to determine the alumina removal. The effect of treating the combined fines (natural and crushed) can be determined mathematically.

6.2 Equipment Performance Testwork

The main equipment item that will require testwork is the thickener, in order to procure the optimum size. The thickener will be the most expensive item of bought equipment, and therefore it is important not to oversize the unit. The testwork will also characterise the rheology of the thickener underflow for pumping.

The thickener testwork should be done on a freshly prepared sample generated by wet screening at the optimum size determined by the testwork described in Section 5.1 above. Both Envirotech and Outotec have laboratories that can perform the required testwork.

Appendix A



KEY

BW - BELT WEIGHER
L.C. - LEVEL CONTROL
GSW - GLAND SEAL WATER

NOTE

1. SAMPLING POINTS AND SAMPLING METHODS TO BE CONFIRMED

STREAM		1	2	3	4	5	6	7	8	9	10	11	12	13	14
STREAM DETAILS	UNIT	DESLIME MODULE FEED	FEED BIN DISCHARGE	SIZING SCREEN FEED	SIZING SCREEN SPRAY WATER	SIZING SCREEN U/SIZE	SIZING SCREEN O/SIZE	CYCLONE PUMP FEED	CYCLONE FEED	CYCLONE O/FLOW	CYCLONE U/FLOW	DEWATERING SCREEN O/FLOW	DEWATERING SCREEN U/FLOW	DEWATERING SCREEN SUMP LC	DEWATERING SCREEN PUMP FEED
SOLIDS	t/h	125	125	125	-	66	60	66	66	27	38	38	-	-	-
WATER	m3/h	4	4	188	30	207	11	227	227	207	21	10	11	4	15
SLURRY	m3/h	39	39	223	30	226	27	246	246	214	31	20	11	4	15
SLURRY DENSITY	t/m3	3.34	3.34	1.41	1	1.21	2.59	1.19	1.2	1.09	1.88	2.37	1	1	1
MOISTURE	% w/w	3	3	60	100	76	15	77.6	77.6	88.4	35	20	100	100	100
SOLIDS CONTENT	% w/w	97	97	40	-	24	85	22.4	22.4	11.6	65	80	-	-	-

STREAM		15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
STREAM DETAILS	UNIT	DEWATERING SCREEN PUMP DISCHARGE	PR WATER TO PULPING CHUTE	SIZING SCREEN SUMP LC	FLOCC DILUTION WATER	COMBINED DESLIME PLANT PRODUCT	FLOCC TO THICKENER	THICKENER U/FLOW	TAILINGS DAM FEED	THICKENER O/FLOW	PROCESS WATER TANK MAKE-UP	PROCESS WATER DEMAND	THICKENER U/F PUMP GSW	FLOCC MAKE-UP RAW WATER	TOTAL RAW WATER	RAW SEAL WATER TO GSW TANK
SOLIDS	t/h	-	-	-	-	98	-	27	27	-	-	-	-	-	-	-
WATER	m3/h	15	169	20	5	20	6	22	27	190	37	228	5	1	43.4	5
SLURRY	m3/h	15	169	20	5	47	6	30	35	190	37	228	5	1	43.4	5
SLURRY DENSITY	t/m3	1	1	1	1	2.5	1	1.66	1.56	1	1	1	1	1	1	1
MOISTURE	% w/w	100	100	100	100	17	100	45	50.1	100	100	100	100	100	100	100
SOLIDS CONTENT	% w/w	-	-	-	-	83	-	55	49.9	-	-	-	-	-	-	-

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B	16-JUL-08	ISSUED FOR CUSTOMER REVIEW	ADP	TG	RM			
A	04-JUL-08	ISSUED FOR INTERNAL REVIEW	ADP	TG	RM			

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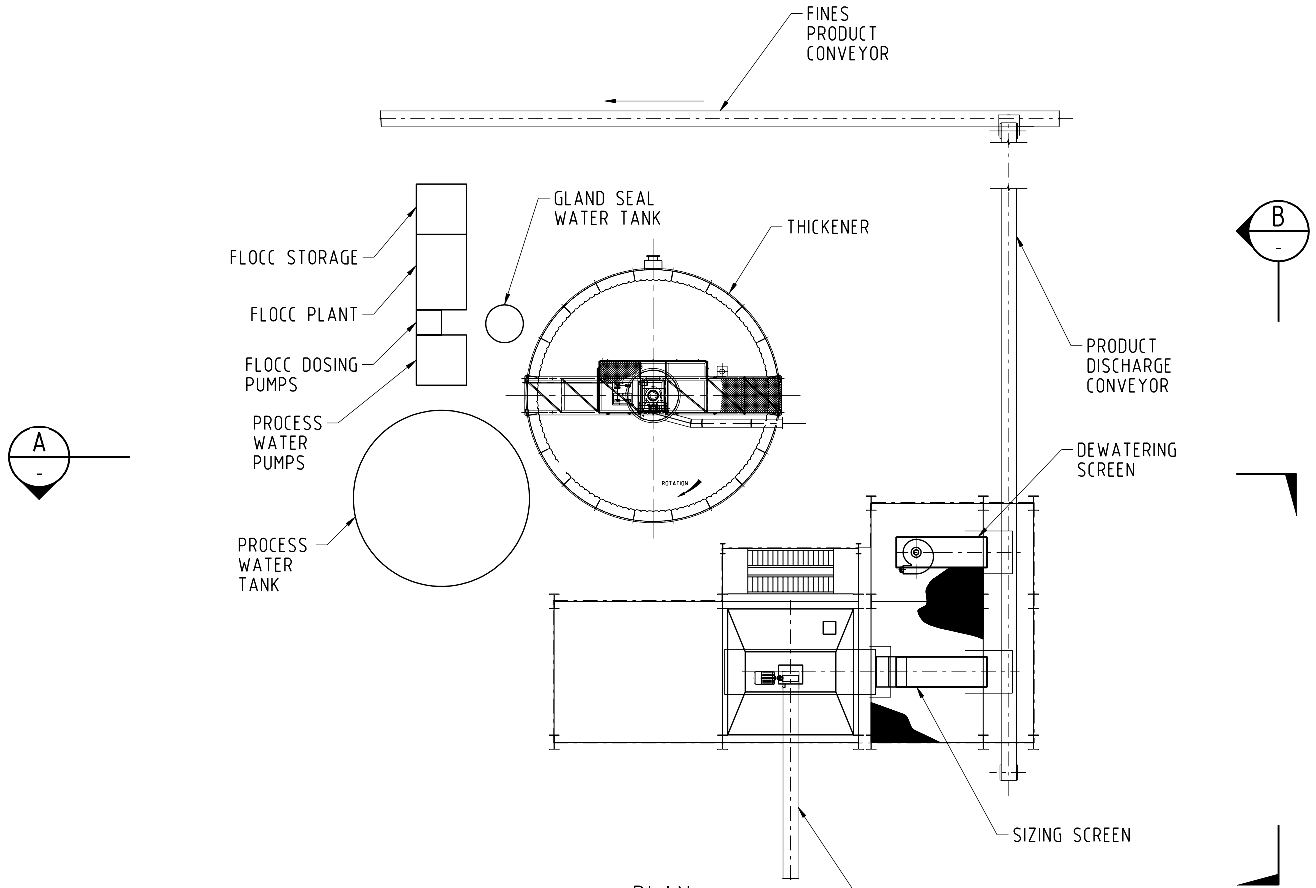
WELD RANGE IRON ORE PROJECT
PRE FEASIBILITY STUDY
PROCESS FLOW DIAGRAM
DESLIME PLANT

DRG No 13923-SK-0100-PR-0004 REV B

LOCATION: $FILE$ USER NAME: $USERNAME$ DATE & TIME: $DATE$ $TIME$

Appendix B



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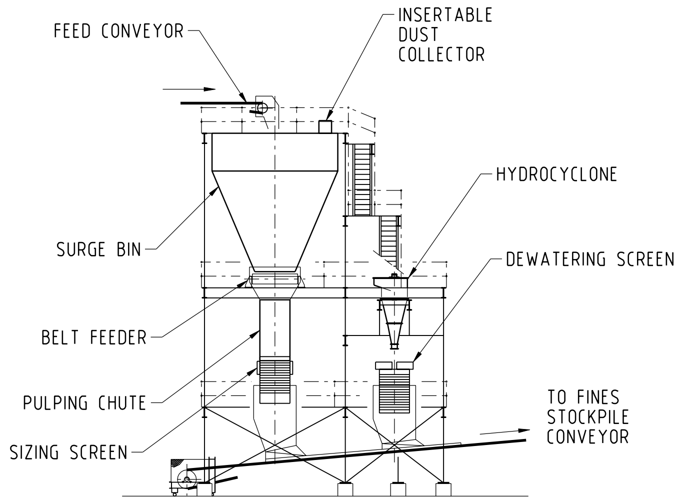

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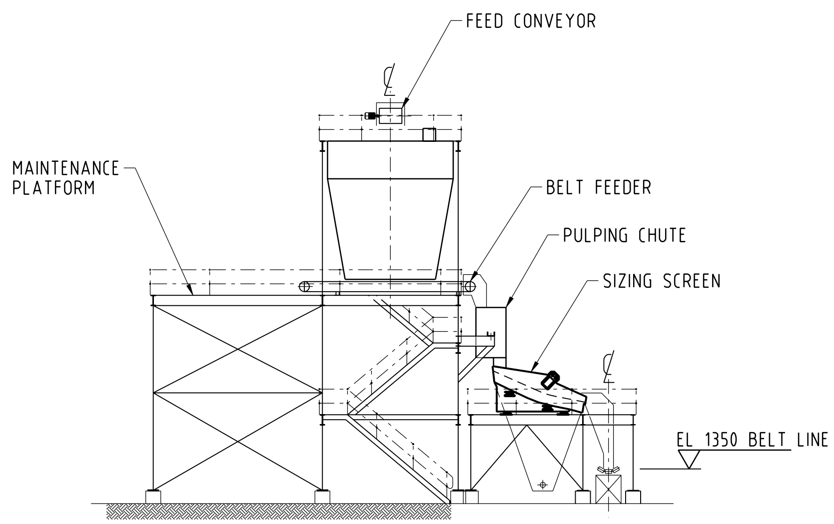

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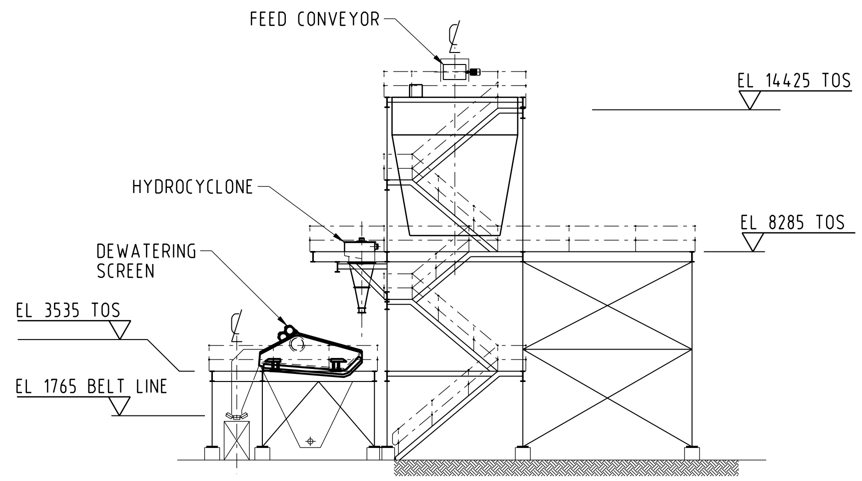

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DESLIME PLANT
PLANS & ELEVATIONS

DRG No 13923-SK-0100-ME-0013 REV B

LOCATION: $FILE$ USER NAME: $USERNAME$ $TIME$ DATE & TIME: $DATE$

Appendix C

WELD RANGE DESLIME PROJECT - CAPITAL COST ESTIMATE

Rev C
Date 14-Aug-08

WORK BREAKDOWN STRUCTURE	Unit	Qty	Unit Rate	Labour+ Distrib *	Cost
WELD RANGE DESLIME PROJECT					
FEED BIN					
Head bin					
Feed bin	t	12.0	16,270		195,000
Feed bin liners	t	18.0	12,910		232,000
Head feeder					
Belt Feeder	lot	1.0	150,000		150,000
Pulping chute					
Pulping chute	t	1.8	11,788		21,000
Pulping chute liners	t	2.5	13,110		33,000
Sizing screen					
Screen desand (Schenck budget quotation)	ea	1.0	70,000	16,058	86,000
Underflow sump - desand screen	t	4.7	14,629		68,000
Stiffeners	t	1.7	12,818		22,000
Underflow sump - rubber lining	m2	50.0	646		32,000
Discharge chute - Product discharge conveyor	t	1.0	11,788		11,000
Discharge chute liners	t	1.9	13,110		25,000
Dewatering Screen					
Screen dewatering (Schenck budget quotation)	ea	1.0	75,000	16,058	91,000
Underflow sump - dewatering screen	t	4.7	14,629		68,000
Stiffeners	t	1.7	12,818		22,000
Underflow sump - rubber lining	m2	50.0	646		32,000
Discharge chute - Product discharge conveyor	t	1.0	11,788		11,000
Discharge chute liners	t	1.9	13,110		25,000
HYDROCYCLONE					
Hydrocyclone (deslime)					
Hydrocyclone (Krebs budget quotation)	ea	1.0	17,500	3,211	21,000
FINAL PRODUCT STORAGE AND TAILING THICKNER					
Slimes thickener					
Foundations (incl. excav.+backfill+concrete)	lot	1	111,764		112,000
Concrete slab	m3	35	1,990		70,000
Thickener (Outotec budget quotation)	lot	1	390,000		390,000
Thickener installation+distributables	hrs	1,000	171		171,000
Tailings dam feed					
HDPE line to tailings dam	m	2,000	183		366,000
HDPE distribution	m	1,200	178		214,000
Valves	ea	24	1,752		42,000
Fittings	ea	48	250		12,000
Conveying systems					
Feed Conveyor	lot	1	2,160,000		2,160,000
Fines Stockpile Conveyor	lot	1	600,000		600,000
Feed Hopper					
FEL ramp-earthworks	m3	1,000	50		50,000
FEL ramp-walls	m3	60	2,939		176,000
Foundations (incl. excav.+backfill+concrete)	lot	1	49,900		50,000
Steelwork	lot	1	65,255		65,000
Feed Hopper	t	9	20,807		181,000
Feed Hopper Liners	t	13	12,910		170,000
Belt Feeder to Feed Conveyor	lot	1	200,000		200,000
BUILDING					
including Flocc plant & process water tank slabs					
Foundations (incl. excav.+backfill+concrete)	lot	1	104,980		105,000
Concrete slab	m3	56	1,659		93,000
Steel, grating,	m2	92	559		51,000
Structural steel	lot	1	555,106		555,000
Handrail,	m	130	388		50,000
Stair treads	ea	80	187		15,000
Stairway stringers	t	2	15,171		30,000
Tanks (incl. process water & gland seal water)	lot	1	122,006		122,000
Dust collectors	lot	1	37,500		38,000
Air compressor, dryer & receiver	lot	1	50,000	18,768	69,000
Flocculant plant (CIBA budget quotation)	lot	1	54,000	5,000	59,000
Pump - Flocculant dosing (CIBA budget quotation)	lot	1	22,000	3,210	25,000
Pump - sump	ea	2	19,200	6,420	45,000
Pump set - Cyclone feed	ea	1	75,000	3,210	78,000
Pump set - Dewatering screen u/f	ea	1	20,000	3,210	23,000
Pump set - process water	ea	2	50,000	6,420	106,000
Pump set - gland water	ea	2	10,000	6,420	26,000
Pump set - thickener underflow	ea	1	80,000	3,210	83,000
Pump spares	lot	1	30,000		30,000
Sampling	lot	1	150,000		150,000
Process Piping, fittings and valves-allowance (incl. dust suppression)	lot	1	600,000		600,000
OTHER MISCELLANEOUS ITEMS					
Electrical & Instrumentation					
Electrical equipment	lot	1	700,000	250,000	950,000
Instrumentation	lot	1	400,000		400,000
Air Services(piping and fittings)	m	200	176		35,000
TAILINGS DAM					
Earthworks	HA	15	390,452		5,724,000
Base course	m3	2,200	38		84,000
HDPE membrane	m2	106,345	20		2,127,000
Geotextile	m2	106,345	9		957,000
Monitoring bores	ea	7	5,000		35,000
SUB-TOTAL					**$18,839,000**
CONTINGENCY	**Lot**	**25%**			**$4,709,750**
TOTAL					**$23,548,750**

* Labour and distributables costs included in unit rates where not shown

Appendix D

Weld Range Deslime Plant - OPEX

Plant power consumption:-

	Estimated Power Demand(kW)	No. Off	Utilisation Factor	Hrs/ann.	Annual Cons. kWh	Comments
Cyclone feed pump	30	1	1	6000	180000	
Dewatering screen pump	10	1	1	6000	60000	
Thickener U/flow pump & tailings	80	1	1	6000	480000	
Process water pump	35	1	1	6000	210000	
Gland water pump	3	1	1	6000	18000	
Flocculant dosing pump	2	1	1	6000	12000	
Flocc. Plant Equipment	3	1	1	6000	18000	
Belt feeder - Plant Feed Conveyor	30	1	1	6000	180000	
Plant feed conveyor	50	1	1	6000	300000	
Disch to fines stockpiles conveyor	20	1	1	6000	120000	
Belt feeder - Pulping Chute	15	1	1	6000	90000	
Sizing screen	20	1	1	6000	120000	
Dewatering screen	15	1	1	6000	90000	
Thickener drive	5	1	1	6000	30000	
Compressor	5	1	0.25	6000	7500	
				Sub-total	**1915500**	**kWh**
				Power Cost =	**$672,341**	

Power cost = 0.351 $/kWh

Consumables:	**$/a**	**Comments**
Feed bin wear liners	$17,297.70	Considers replacement cost based on annual replacement of 10% of total wear liner costs.
Pulping chute wear liners	$11,330.00	Considers replacement cost based on annual replacement of 100% of total wear liner costs.
Plant feed conveyor	$118,800.00	Assume 10% of mech. capital cost per annum
Disch to fines stockpiles conveyor	$39,600.00	Assume 10% of mech. capital cost per annum
Vibratory feeder	$18,910.80	Based on data from Schenck Process (1 vibe feeder)
Sizing screen	$17,534.00	Assume 6 month life and pro rata cost of screen set to 2ndry crusher screen based on 5.76m2 area vs 26.28m2 = .219 x $32000 +25% = $8767/set
Dewatering screen	$15,220.00	Assume 6 month life and pro rata cost of screen set to 2ndry crusher screen based on 5m2 area vs 26.28m2 = .19 x $32000 +25% = $7610/set
Thickener drive	$40,000.00	Assume 10% of capital cost per annum
Hydrocyclone	$10,000.00	Assume 50% of capital cost per annum
Flocculant	$40,000.00	Based on data from Ciba Specialty Chemicals.
Slurry Pumps	$41,000.00	Assume 20% of capital cost per annum
Electrical and Instrumentation	$56,799.48	Assume 2% of combined capital cost per annum
Consumables cost =	**$426,492**	

Operator Labour:

Based on 1 person per 12 hour day shift dedicated to the beneficiation plant. (assume $150K base salary plus pkg costs & other on-costs = $238,500 p.a.)	**$477,000.00**	Based on 1 person on site with another operator on leave. Night shift coverage assumed available from part allocation of main processing plant operators.

Maintenance Contractor Costs

	Shuts	Duration (hrs)	Manning	Labour Cost	Mob & Demob of Plant & Workforce	Meals & Accom.	Totals
Minor Shutdowns (monthly)	10	12	2	$42,240	$212,500	$3,000	$257,740
Major shutdowns (bi-annually)	2	48	6	$38,016	$87,500	$1,200	$126,716
Breakdowns	2	24	6	$38,016	$107,500	$900	$146,416
						Total	$530,872

Miscellaneous Items

Messing / Accommodation	**No of Plant Operators**	**Accomm Cost ($/man/day)**	**Total Accomm Cost ($/a)**	**Comments**
Dedicated to Beneficiation Plant	1	$75.00	**$27,375**	Accommodation cost ($/man/day) - WP estimate Based on 1 operator on site with another on leave.

Flights	**No of Plant Operators**	**Flights (per yr per man)**	**Flight Cost ($/ea)**	**Total Flight Costs ($/a)**	**Comments**
Dedicated to Beneficiation Plant	2	26	$625.00	**$32,500**	Flight cost ($/ea) - WP estimate Includes 1 operator on site with another on leave.

Sub-Total	**$2,166,579**	**per annum**
Contingency (@25%)	**$541,645**	
Total Operating Cost	**$2,708,224**	
	588,000	t dry product fines fines p.a.
	$4.61	**per t product**

Appendix E

6. Metallurgy

A composite fines sample representing a blend of Madoonga and Beebyn for sinter testing in China was shipped in September. The composite intervals were selected on the basis of iron content (>53% Fe_{total} in fines portion), alumina and titania with the calculated composite assay shown below:

Table 1 Beebyn/Madoonga Sinter Fines Predicted Composition

SINTER FINES TEST SAMPLE (PQ Core)	%Fe	%SiO_2	%Al_2O_3	%TiO_2	%P	%S	%LOI (1000)	%Fe_{cal}
Beebyn/Madoonga	59.99	3.99	2.38	0.16	0.088	0.050	6.94	64.46

The corresponding lump composite based on the sinter fines composite plan is shown below:

Table 2 Beebyn/Madoonga Lump Predicted Composition

LUMP SAMPLE (PQ Core based on Sinter Plan)	%Fe	%SiO_2	%Al_2O_3	%TiO_2	%P	%S	%LOI (1000)	%Fe_{cal}
Beebyn/Madoonga	61.73	2.66	1.41	0.09	0.084	0.043	7.02	66.39

The sinter fines sample and corresponding lump samples were characterised for bulk density (loose & compacted – conveyor, bin, stockpile, railcar hopper design), chemical composition, size distribution and size by size chemical composition.

Table 3 Beebyn/Madoonga Sinter Fines Physical Properties

Sinter Fines Testwork	Value	Unit
Uncompacted Bulk Density	2.25	t/m^3
Compacted Bulk Density	2.52	t/m^3
Wet Sizing		
P80	3.70	mm
% -150um	29.82	%
Dry Sizing P_{80}		
P80	3.64	mm
% -150um	23.28	%

The bulk density of the fines is comparable to products sourced from the Pilbara region.

Table 4 Fines Bulk Density & Port Hedland Port Authority Stowage Factors

PRODUCT DESCRIPTION	Stowage Factor* t/m^3	Bulk Density (Uncompacted) t/m^3	Bulk Density (Compacted) t/m^3
Newman Fine Ore	2.72	--	--
Yandi Fines	1.96	--	--
Goldsworthy Fine	2.72	--	--
MAC Fines	1.90	--	--
Beebyn/Madoonga Sinter Fines	--	2.25	2.52

The fines size distribution indicates a concentration of deleterious elements and compounds in the minus 150µm fraction and in particular the minus 63µm fraction. The minus 63µm fraction contains 21.7% of the mass, 44.6% of the

Al_2O_3, 33.3% of the SiO2, 49.9% of the TiO2, 24.2% of the P and 17.7% of the S present in the sample.

Table 5 Beebyn/Madoonga Sinter Fines Size Distribution & Chemical Composition

Sinter Fines Test Sample - Size by Assay	Mass % Retained (from wet screening)	ASSAYS						
		Fe	SiO_2	Al_2O_3	TiO_2	P	S	LOI 1000
Sinter Fines Head		59.88	3.99	2.40	0.18	0.09	0.05	6.89
Calc Head	100.00	59.97	3.98	2.34	0.16	0.09	0.06	6.96
+6.3mm	3.24	61.15	3.47	1.48	0.08	0.11	0.04	7.21
+4.0mm	14.01	61.62	2.66	1.54	0.09	0.09	0.14	7.02
+2.0mm	18.29	61.59	2.64	1.59	0.09	0.09	0.04	6.75
+1.0mm	12.04	60.91	3.42	1.73	0.10	0.09	0.05	7.11
+500um	8.94	59.84	4.31	1.76	0.10	0.09	0.06	7.28
+250um	7.76	60.19	4.48	1.71	0.10	0.08	0.06	6.84
+150µm	5.90	60.88	4.06	1.69	0.10	0.07	0.05	6.18
+63um	8.12	61.33	3.73	1.79	0.15	0.07	0.05	5.97
-63um	21.70	56.07	6.12	4.82	0.36	0.10	0.05	7.46

Table 6 Beebyn/Madoonga Sinter Fines Size Distribution & Chemical Distribution

Sinter Fines Test Sample - Size by Assay	Mass % Retained (from wet screening)	DISTRIBUTION %						
		Fe	SiO_2	Al_2O_3	TiO_2	P	S	LOI 1000
Sinter Fines Head		59.88	3.99	2.40	0.18	0.09	0.05	6.89
Calc Head	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
+6.3mm	3.2%	3.3%	2.8%	2.0%	1.7%	4.0%	1.8%	3.4%
+4.0mm	14.0%	14.4%	9.4%	9.2%	8.0%	13.9%	31.7%	14.1%
+2.0mm	18.3%	18.8%	12.1%	12.4%	10.5%	18.1%	12.6%	17.7%
+1.0mm	12.0%	12.2%	10.3%	8.9%	7.7%	12.2%	9.5%	12.3%
+500um	8.9%	8.9%	9.7%	6.7%	5.7%	8.8%	7.9%	9.4%
+250um	7.8%	7.8%	8.7%	5.7%	5.0%	7.1%	7.0%	7.6%
+150µm	5.9%	6.0%	6.0%	4.3%	3.8%	5.0%	4.9%	5.2%
+63um	8.1%	8.3%	7.6%	6.2%	7.8%	6.7%	6.9%	7.0%
-63um	21.7%	20.3%	33.3%	44.6%	49.9%	24.2%	17.7%	23.3%

If a perfect wet separation based on particle size could be achieved at 63µm then the fines could be upgraded to 61% Fe and 1.66% Al2O3 with the loss of 20.3% of the original contained iron (refer Table 7 & Table 8). Perfect separation will not be achieved in practice and the respective product quality and elemental distribution should be determined from testwork on composite samples and individual samples for variability testing if beneficiation is deemed necessary.

Table 7 Truncated Fines Composition with Perfect Separation at 63µm

Composition	Mass %	Fe	SiO_2	Al_2O_3	TiO_2	P	S	LOI 1000
Original Fines	100.00	59.97	3.98	2.34	0.16	0.09	0.06	6.96
+63µm Truncated Fines	78.30	61.05	3.39	1.66	0.10	0.09	0.07	6.82
-63µm Reject Slimes	21.70	56.07	6.12	4.82	0.36	0.10	0.05	7.46

Table 8 Truncated Fines Distribution with Perfect Separation at 63µm

Distribution	Mass %	Fe	SiO_2	Al_2O_3	TiO_2	P	S	LOI 1000
+63µm Truncated Fines	78.3%	79.7%	66.7%	55.4%	50.1%	75.8%	82.3%	76.7%
-63µm Reject Slimes	21.7%	20.3%	33.3%	44.6%	49.9%	24.2%	17.7%	23.3%

Table 9 Beebyn/Madoonga Combined Lump Physical Properties

Combined Lump Testwork	Value	Unit
Uncompacted Bulk Density	1.82	t/m^3
Compacted Bulk Density	2.12	t/m^3
Dry Sizing		
P80	24.83	mm
% -8mm	9.89	%

The bulk density of the combined lump is comparable to products sourced from the Pilbara region.

Table 10 Lump Bulk Density & Port Hedland Port Authority Stowage Factors

PRODUCT DESCRIPTION	Stowage Factor* t/m^3	Bulk Density (Uncompacted) t/m^3	Bulk Density (Compacted) t/m^3
Newman Lump Ore	2.35	--	--
Yandi Lump	1.75	--	--
Goldsworthy Lump	2.35	--	--
MAC Lump	1.80	--	--
Beebyn/Madoonga Combined Lump	--	1.82	2.12

* Port Hedland Port Authority

Table 11 Beebyn/Madoonga Combined Lump Size Distribution & Chemical Composition

Combined Lump Composite Size by Assay	Mass % (from wet screening)	Assay (%)						
		Fe	SiO2	Al2O3	TiO2	P XRF	S XRF	LOI 1000
Lump Head Calc Head	100.00	61.75	2.67	1.38	0.10	0.08	0.04	7.13
+31.5mm	0.00							
+25mm	19.51	62.11	2.30	1.28	0.07	0.08	0.05	7.18
+20mm	14.45	62.03	2.88	0.93	0.04	0.07	0.03	7.16
+15mm	17.39	61.19	3.09	1.43	0.12	0.08	0.04	7.37
+10mm	28.12	61.69	2.62	1.54	0.11	0.09	0.05	7.14
+8mm	10.64	61.99	2.41	1.35	0.11	0.09	0.04	6.84
+6.3mm	7.92	61.99	2.45	1.47	0.11	0.08	0.05	6.77
-6.3mm	1.97	59.60	4.30	2.68	0.19	0.08	0.05	6.94

Table 12 Beebyn/Madoonga Combined Lump Size Distribution & Chemical Distribution

Combined Lump Composite Size by Assay	Mass % (from wet screening)	DISTRIBUTION (%)						
		Fe	SiO2	Al2O3	TiO2	P XRF	S XRF	LOI 1000
Lump Head Calc Head	100.00	100%	100%	100%	100%	100%	100%	100%
+31.5mm	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
+25mm	19.5%	19.6%	16.8%	18.1%	14.3%	18.9%	19.8%	19.7%
+20mm	14.4%	14.5%	15.6%	9.7%	6.1%	13.1%	10.8%	14.5%
+15mm	17.4%	17.2%	20.1%	18.0%	21.9%	17.1%	15.7%	18.0%
+10mm	28.1%	28.1%	27.5%	31.4%	32.4%	29.7%	33.6%	28.2%
+8mm	10.6%	10.7%	9.6%	10.4%	12.3%	11.4%	9.6%	10.2%
+6.3mm	7.9%	8.0%	7.3%	8.4%	9.1%	7.9%	8.2%	7.5%
-6.3mm	2.0%	1.9%	3.2%	3.8%	3.9%	2.0%	2.3%	1.9%

The combined lump size distribution indicates that most of the elements follow closely the mass distribution.

PQ drilling at Madoonga was underway in mid-August and core samples are expected to arrive at the laboratory in mid to late September.

Data analysis for sample selection for mining area composites (MAC) has commenced.

A series of algorithms have been generated from the PQ data relating head grade to product grade. These algorithms will be used to investigate the product quality based on resource head grade, ore block model and preliminary pit outlines and to identify areas of mineralisation which provide off specification material.

Analysis of the PQ data indicates some areas for further scrutiny in relation to alumina, titania, phosphorus and sulphur levels.

Beebyn (based on all PQ DHC composites) exhibits moderate iron (60.5%Fe), elevated phosphorus (0.105%P), moderate titania (0.12%TiO_2), low sulphur (0.012%S), high alumina (2.52%Al_2O_3), moderate silica (4.17%SiO_2) and moderate LOI_{1000} (6.01%) resulting in calcined iron of 64.3%Fe.

Madoonga (based on all PQ DHC composites) exhibits low iron (58.6%Fe), moderate phosphorus (0.069%P), high titania (0.27%TiO_2), moderate sulphur (0.078%S), high alumina (2.13%Al_2O_3), moderate silica (4.95%SiO_2) and high LOI_{1000} (8.17%) resulting in calcined iron of 63.8%Fe.

Beebyn W11 represented by PQ holes WRRD0273, WRRD0350 & WRRD0354 is predominantly haematite exhibited by low LOI_{1000} of 1.40 with correspondingly high iron at 65.3%Fe, low silica (2.31%SiO_2), high alumina (2.24%Al_2O_3), low phosphorus (0.055%P) and low sulphur (0.004%S). The balance of the Beebyn lenses (W7, W9, W10, W10A) are goethitic or mixtures of goethite and haematite.

Madoonga W14 and W26 are goethitic with low iron (58.7 & 57.8%Fe). W26 exhibits a high LOI_{1000} of 9.59%.

Figure 1 PQ Sample Testwork Progress

WELD RANGE METALLURGICAL EVALUATION OF DSO - DRILL PROGRESS

		Beebyn		Madoonga		HHJV		Sub-Total		UGMW		UGHH		Sub-Total		Total		
		Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Budget	Actual	Comp.
Stage 1	Holes (Deep)	19	6	12	14	7	0	38	20	14	0	3	0	17	0	55	20	36.4%
PQ Drilling	Drill metres	2,280	675	1,440	1,980	840	0	4,560	2,655	1,680	0	360	0	2,040	0	6,600	2,655	40.2%
	PQ metres	1,710	371	1,080	1,400	630	0	3,420	1,771	1,260	0	270	0	1,530	0	4,950	1,771	35.8%
Stage 2	Holes (Shallow)	19	8	12	9	7	0	38	17	14	0	3	0	17	0	55	17	30.9%
PQ Drilling	Drill metres	2,280	666	1,440	622	840	0	4,560	1,288	1,680	0	360	0	2,040	0	6,600	1,288	19.5%
	PQ metres	1,710	506	1,080	551	630	0	3,420	1,057	1,260	0	270	0	1,530	0	4,950	1,057	21.4%
Stage 3	Holes (Allow)	6	0	4	0	4	0	14	0	4	0	4	0	8	0	22	0	0.0%
PQ Drilling	Drill metres	720	0	480	0	480	0	1,680	0	480	0	480	0	960	0	2,640	0	0.0%
	PQ metres	540	0	360	0	360	0	1,260	0	360	0	360	0	720	0	1,980	0	0.0%
Stage 3 W14 Adit	Bulk Samples			25	0			25	0							25	0	0.0%
Stage 3 W11 Adit	Bulk Samples	11	0					11	0							11	0	0.0%

Data current up to 30 Sep 2007

WELD RANGE METALLURGICAL EVALUATION OF DSO - TEST PROGRESS

		Beebyn	Madoonga	HHJV	Sub-Total	UGMW	UGHH	Sub-Total	**Total**
Core	UCS	14	17	0	31	0	0	0	31
Physicals	CWi	14	13	0	27	0	0	0	27
	Bond Ai	14	13	0	27	0	0	0	27
	Bulk Density (BD)	859	902	0	1,761	0	0	0	1,761
	BD Check (Wax)	165	155	0	320	0	0	0	320
DHC	Selected	84	98	0	182	0	0	0	182
	Prepared	84	98	0	182	0	0	0	182
	Dropped	84	98	0	182	0	0	0	182
	Conditioned	84	98	0	182	0	0	0	182
	L:F Split	84	98	0	182	0	0	0	182

Note:

Data current up to 30 Sep 2007