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***Gladstone Nickel Project
Initial Advice Statement***

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Appendix A

Draft Terms of Reference

1. Introduction

This Initial Advice Statement (IAS) was prepared on behalf of Gladstone Pacific Nickel Limited (GPNL) identifying the potential environmental impacts associated with the construction and operation of a high-pressure acid leach (HPAL) plant in Gladstone to produce nickel and cobalt metal.

1.1 Background

Gladstone Pacific Nickel Limited is focussed on establishing the feasibility of a HPAL plant in Central Queensland, Australia, in order to partially fill a widening gap between the current global nickel metal production and world demand. The initial Stage 1 plant will be built in two phases and will produce approximately 64,400 tonnes per annum of nickel and nearly 5,300 tonnes per annum of cobalt from Marlborough and imported ore. Stage 1a will be based on ore from the Marlborough ore deposits. The proposed construction of Wiggins Island Terminal – announced by the Premier of Queensland on 4 October 2005 – provides a facility which is capable of handling Capesize vessels. This enables Stage 1b to use imported ore and be completed in conjunction with Stage 1a.

It is proposed that the HPAL plant for the Project be sited at the industrial deepwater port of Gladstone, with access to the world class infrastructure of this region including the proposed port of Wiggins Island. The processing plant will source 2.5 to 3.2 Mdt/a of ore directly from a proposed nickel and cobalt laterite mine at Marlborough, approximately 175km north-west of Gladstone, via a dedicated ore slurry pipeline. Additional higher quality nickel laterite ore will be sourced from the South West Pacific, a region reported to have approximately two thirds of currently quoted global nickel laterite reserves.

Figure 1 outlines the location of the mine and proposed plant.

1.2 Purpose of the Initial Advice Statement

The preparation of an IAS is the first step in the process of an environmental impact assessment and assists in the initial consultation, scoping and definition of the proposal as well as enabling the Queensland Coordinator-General (CoG) to declare the project a “Significant Project”. The purpose of an IAS is to provide information on the nature and extent of potential environmental impacts arising from the construction and operation of the nickel plant and related activities that take place concurrently to contribute to the decision making process. The IAS provides:

- Background information and historical details regarding the proposal;
- The need and justification for the project;
- A brief description of the proposed works; and
- An outline of the potential environmental effects associated with the construction, operation and decommissioning phases of the development.

1.3 The Proponent

The project proponent is Gladstone Pacific Nickel Limited, a public company formed in 2003 as the Pearce Matheson Group Pty Ltd (PMG), and which has acquired the entire issued share capital of Marlborough Nickel Pty Limited (MNPL) from Preston Nickel Holdings Pty Ltd, a subsidiary of Preston Resources Limited, a company listed on the Australian Stock Exchange. The business address for the proponent is:

Gladstone Pacific Nickel Limited
Suite 309
320 Adelaide Street
BRISBANE QLD 4000

GPNL has raised funds through a prospectus and listing on the London Stock Exchange's Alternative Investment Market (AIM) to carry out a Definitive Feasibility Study (DFS). This includes infill and extensional drilling of the Marlborough Deposits, and design and costing of the beneficiation plant, the slurry pipeline and the HPAL plant, for Stage 1 of the Project. The company also proposes to use such funds to complete a Preliminary Feasibility Study (PFS) for the second stage of the Project.

If the DFS and PFS prove the viability of the Project, the Company proposes to invite one or more major resource or associated industry companies to either purchase the Project outright or to enter into a joint venture, taking a majority interest in and control of the Project. The Company would, except in the case of an outright sale, retain a minority interest in the Project.

1.4 Outline of the Proposal

Initially, the Project is focussed on developing a mine and beneficiation plant at Marlborough, a slurry pipeline, ore importing facilities at Wiggins Island and a HPAL plant and refinery at Gladstone. In the first stage, ore supplies will be sourced from the nickel laterite deposits at Marlborough owned by MNPL, a wholly owned subsidiary of GPNL. This will be supplemented with higher quality nickel laterite ore from the South West Pacific utilising Capesize bulk ore carriers that can be accommodated at both Gladstone and the proposed offshore loading points.

Although the final form of the Project will be determined during the DFS and the PFS, it is currently proposed that the Project will be developed in two stages:

- **Stage 1a** – This stage will involve the establishment of a conventional truck and shovel open cut mine operation and an ore beneficiation plant at Marlborough, a pipeline to transport beneficiated ore slurry from Marlborough to Gladstone and an HPAL processing plant and refinery at Gladstone, designed to produce up to approximately 36,000 tonnes of nickel and 1,650 tonnes of cobalt metal per year.
- **Stage 1b** – Stage 1b will involve ongoing expansion of the proposed HPAL processing plant, refinery and associated infrastructure to produce approximately 64,400 tonnes of nickel and 5,300 tonnes of cobalt metal per year. Ore feed from the Marlborough mine will be supplemented by higher grade ore imported from the South West Pacific.
- **Stage 2** – Currently proposed to commence following the successful commissioning and operation of the Stage 1 project, the second stage will involve a further expansion of the proposed HPAL processing plant and refinery at Gladstone. Total production at Stage 2 is estimated to be approximately 135,100 tonnes of nickel and 11,200 tonnes of cobalt metal per year. It is expected that most of the ore would be imported for Stage 2.

The focus of this proposal and IAS, and subsequent EIS is as follows:

- A greenfield Stage 1 HPAL plant and refinery at Gladstone incorporating Stages 1a and 1b;
- The slurry pipeline exiting the Marlborough Nickel Mining Lease (Environmental Authority No: MIM800078102) to the Stage 1 HPAL plant; and
- An unloading facility at Wiggins Island and conveyor for imported ore to a storage facility at the refinery
- An unloading and storage facility at Fisherman's Landing for the importation of sulphur.

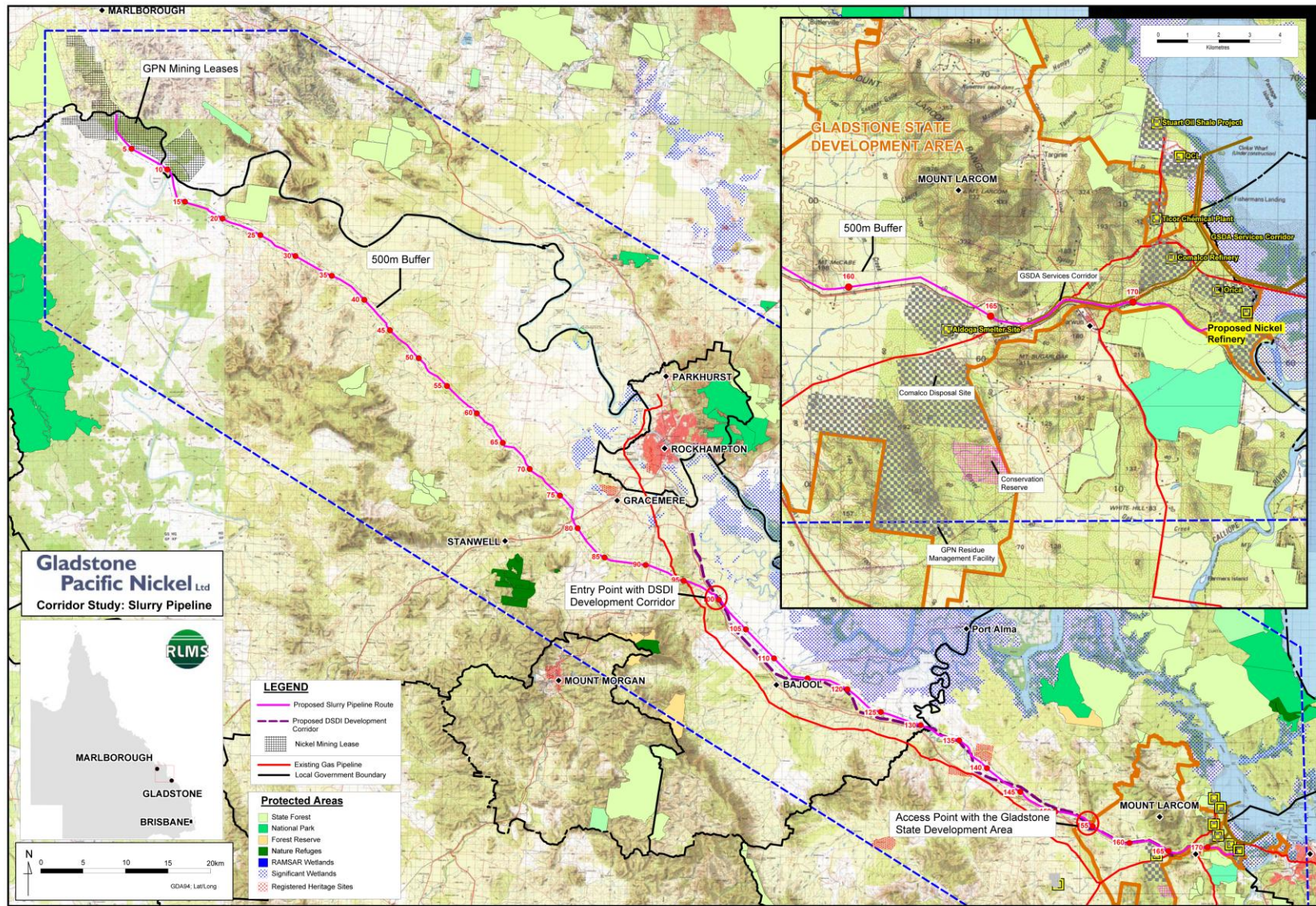
As the Marlborough Mine already has a current Environmental Authority, it will not be included in the scope of the IAS and EIS.

1.5 Site Location

The plant site is in the Yarwun Precinct of the Gladstone State Development Area (GSDA). The site is located to the south of Hanson Road, and is bounded by Calliope River to the east and Reid Road to the west. The site marginally extends beyond the GSDA boundary to the east, into wetlands/saltflats.

A general area has been identified in the GSDA for the location of the Residue Storage Facility (RSF). Further studies and investigations are required prior to selecting the exact location of the RSF.

Figure 2 identifies the location of the refinery site and the general area for the location of the RSF.



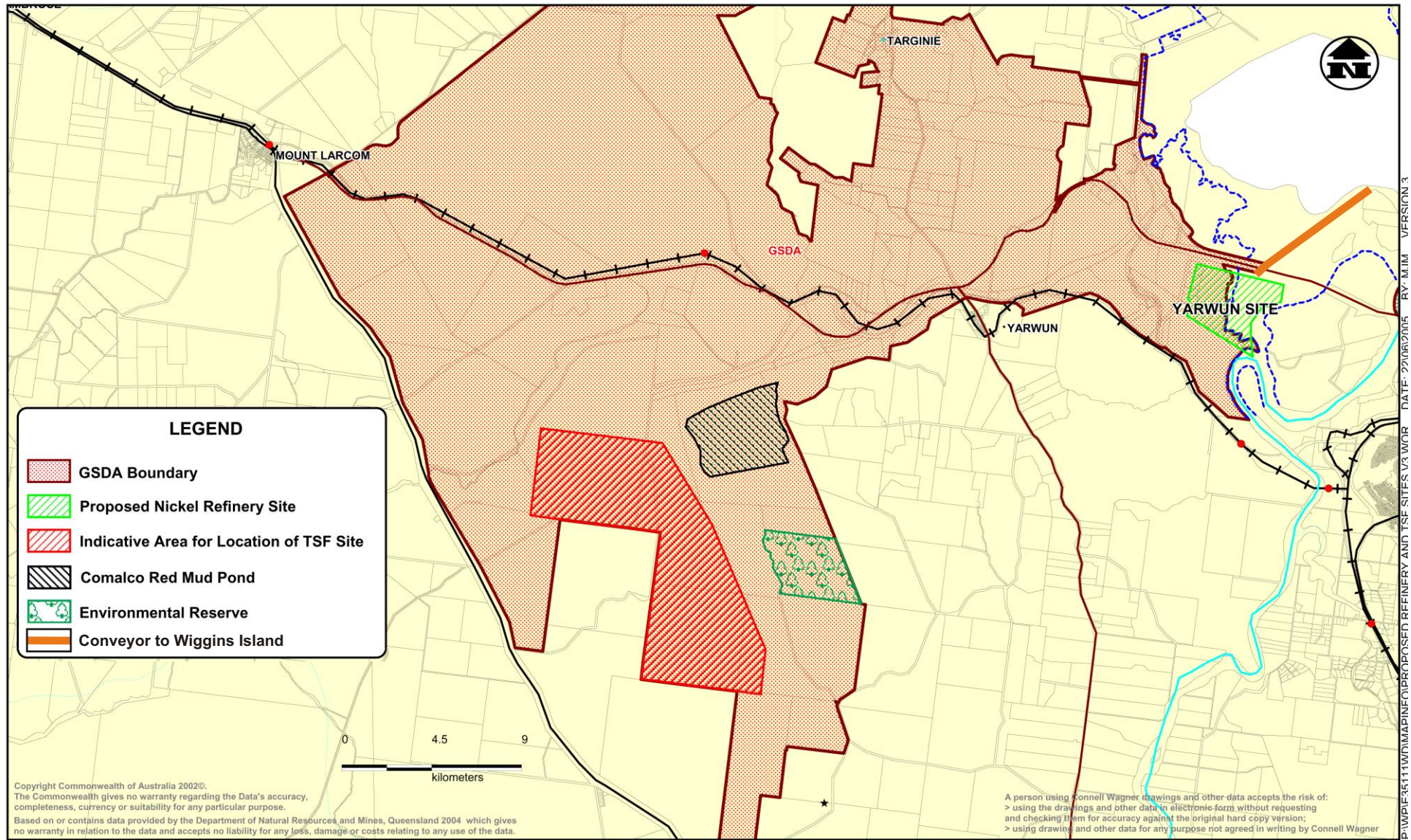


Figure 2
 Gladstone Pacific Nickel
 Proposed Refinery and TSF Sites

2. Need for the Project

2.1 Overview

The world has a growing need for nickel, primarily due to the increasing demand for stainless steel. The majority of nickel metal is currently derived from sulphide ore deposits and very few have been discovered in recent years. Therefore, the increase in global nickel supplies required to meet expected future world demand will have to come primarily from the development of new nickel laterite projects.

AME Consulting Pty Ltd was commissioned by Gladstone Pacific Nickel Limited (GPNL) to provide an independent report on the outlook for the global nickel markets.

Nickel and cobalt are two of the world's premier growth metals. In the ten years to 2003, global consumption of primary nickel grew at an average 4.7% per year, mainly driven by strongly rising demand for its principal end-use, stainless steel products. This compares with compound annual growth rates over the same period of 3.5% for copper and 4.1% for zinc. Propelled by robust demand from the aerospace and rechargeable battery sectors, cobalt showed an even more impressive growth rate of 7.6% per year. Both nickel and cobalt set new consumption records in 2004, and AME forecasts that global nickel demand growth will continue to outstrip the other major base metals over the next twenty five years.

AME's refined metal production projections are in three categories:

- Existing sources, planned minor (low-cost) brownfield expansions, and small new projects that will feed existing smelters and refineries;
- Committed major greenfields projects; and
- Possible other greenfields developments to be justified by demand.

2.2 Proposed Projects

Only three major projects can be classified as "committed". Inco's 50,000 tonnes per year Voisey's Bay operation in Labrador, Canada, is due to produce its first metal in early 2006. Starting in 2007 are Inco's 57,000 tonnes per year Goro HPAL laterite project in New Caledonia and BHP Billiton's 50,000 tonnes per year Ravensthorpe laterite mine and HPAL processing facility in Western Australia, which will boost finished nickel production from the company's expanded Yabulu refinery in Queensland.

The first two categories above leave a supply gap that will need to be met from possible but as yet uncommitted mine and downstream projects. Stage 1 of the Gladstone Nickel Project is planned to produce 64,400 tonnes per year of nickel and 5,300 tonnes per year of cobalt. Other possible sources include:

- 15,000 tonnes per year of potential refined nickel based on Turkey's Caldag mining project;
- 20,000 tonnes per year expansion of the Kwinana refinery to accommodate WMC Resources' proposed doubling of concentrator capacity at Mount Keith (which may also process material from Yakabindie);
- 60,000 tonnes per year Koniambo ferronickel project in New Caledonia;
- 33,000 tonnes per year Ramu project in Papua New Guinea; and
- Three projects planned for Brazil including:
 - 30,000 tonnes per year at Onca-Puma;
 - 45,000 tonnes per year at Niquel do Vermelho; and
 - 40,000 tonnes per year at Barro Alto.

Supply will expand to meet demand growth, however over the next six years, global nickel consumption is forecast to grow by an average annual increment of over 60,000 tonnes. To this end, the equivalent of a new Goro or Voisey's Bay is required every year.

2.3 Gladstone Nickel Proposal

The Gladstone Nickel Project is designed to meet some of the likely shortfall of nickel supply from 2010 through to 2050 and beyond by potentially producing up to 135,100 tonnes of metal per year from orebodies having in excess of 40 years of suitable ore.

At the completion of Stage 1 concept, ore sourced from the Australian lateritic resource at Marlborough, near Rockhampton, Central Queensland, will be selectively mined and beneficiated and blended with imported ore to provide high grade plant feed. After year 5, the plant can be expanded to double its Stage 1 production capacity supplemented by the importation of high grade ore from the south-west Pacific.

GNP has the capacity to produce as much as 10% of the world's new nickel demand. Furthermore, it can be a significant supplier of cobalt to world markets.

3. Project Description

3.1 Introduction

Scoping studies have been conducted for this project and these studies have been the source for the information in this section that describes the process plant and associated facilities proposed for Stage 1 of the Gladstone Nickel Project.

Marlborough ore provides the major feedstock to be processed in Stage 1a of the Project, comprised of 2.0 to 2.6 Mdt/a of upgraded Low Magnesium Saprolite (LMS ore) and 0.5 to 0.65 Mdt/a of upgraded High Magnesium Saprolite (HMS ore). It is proposed that two HPAL units are to be used in Stage 1a and a further two HPAL units in Stage 1b to process imported ore. Stage 1b will consume 1 to 2.6 Mdt/a of upgraded Low Magnesium Saprolite (LMS ore) and 0.65 to 0.9 Mdt/a of upgraded High Magnesium Saprolite (HMS ore) from Marlborough and 4.6 to 5 Mdt/a of imported low magnesium limonitic ore.

The design basis is outlined together with a process description of each plant area, an outline of the major equipment within each area and associated facilities such as utilities and reagents.

Domestic ore supply will be sourced from Marlborough in central Queensland. The environmental authority for the mining lease has already been obtained (MIM800078102). Imported ore will be sourced from several regions including New Caledonia and Indonesia.

The selected processing route will consist of a high pressure acid leach circuit followed by unit operations to neutralise, precipitate impurities, and precipitate metal values with hydrogen sulphide to produce an intermediate product of mixed nickel and cobalt sulphides. Metal refining will be achieved by re-leaching the mixed sulphides, followed by impurity removal, solvent extraction to separate nickel and cobalt, and recovery of metal by hydrogen reduction to produce metal briquettes.

3.2 Project Summary

A summary of the key operating parameters for the proposal is presented in Table 3.1 below.

Table 3.1 Operating Parameters Summary

Process Input/Output	Stage 1a Quantity	Stage 1a + 1b	Units	Transportation Method	Source/ Disposal Location
Process Inputs					
Marlborough Ore mined comprising:	8.3 - 10	5.3 - 10	Mdt/a	Road	Marlborough Mine
Low Magnesium Saprolite (LMS ore)	6.7 - 8	3.3 - 8	Mdt/a		Marlborough Mine
High Magnesium Saprolite (HMS ore)	1.7 - 2	2 - 3	Mdt/a		Marlborough Mine
Imported ore (LMS)		4 - 5	Mdt/a		Indonesia and new Caledonia
HPAL Feed:					
Upgraded LMS Ore Feed from Marlborough	2 - 2.6	1 - 2.6	Mdt/a	Slurry pipeline	Marlborough Mine
Imported LMS Ore Feed		4 - 5	Mdt/a	Conveyor from Wiggins Is	Indonesia and new Caledonia
Nickel	1.4 - 1.2	1.56	(%)		
Cobalt	0.07	0.07	(%)		
Saprolite Neutralisation Feed:					
Upgraded HMS Ore Feed from Marlborough	0.5 - 0.65	0.65 - 0.9	Mdt/a	Slurry Pipeline	Marlborough Mine
Imported HMS Ore Feed					
Nickel	1.35 - 1.2	1.35 - 1.2	(%)		
Cobalt	0.04	0.04	(%)		
Annual Major Consumables:					
Marlborough Raw Water	4.6 (35% slurry) - 8.45 (25% slurry)	3.5 (35% slurry) - 8.45 (25% slurry)	GL/a	Slurry Pipeline	Fitzroy River/Seawater
Gladstone Raw Water	2.2 (25% solids) - 5.1 (35% solids)	6.4 (25% solids) - 8.6 (35% solids)	GL/a	Pipeline	GAWB/Seawater
Sea Water for cooling	26 - 34	52 - 68	GL/a	Pipeline	Port Curtis
Sulphur	380,000 - 494,000	760,000 - 888,000	t/a	Shipments	North America
Natural Gas	0.83 - 1.08	1.66 - 2.16	PJ/a	Pipeline	Regional
Ammonia	21,000 - 27,300	42,000 - 54,600	t/a	Road/Pipeline	Brisbane/ Gladstone
Limestone	610,000 - 793,000	1,220,000 - 1,586,000	t/a	Rail/Road	Regional
Lime	7,300 - 9,490	14,600 - 18,980	t/a	Road	Regional

Process Input/Output	Stage 1a Quantity	Stage 1a + 1b	Units	Transportation Method	Source/ Disposal Location
Process Outputs					
Metal Products:					
Form	Briquettes				
Nickel in Products	30,280 - 36,000	60,000 - 64,500	t/a	Containerised Shipments	Export
Cobalt in Products	1,360 - 1,632	4,500 - 5,400	t/a	Containerised Shipments	Export
By-Products:					
Ammonium Sulphate	81,500 - 105,950	163,000 - 211,900	t/a	Bulk Shipment	Domestic
Process Effluents:					
Barren Solution of which	6.1 - 7.9	12.2 - 14.9	GL/a	Pipeline	Port Curtis
Leach Residue	3.5 - 4.6	7 - 9	Mdt/a	Slurry Pipeline	Tailings Storage Facility

3.3 Process Overview

Significant upgrade potential has been demonstrated for Marlborough laterite ore, and beneficiation will be performed at the Marlborough site. The upgraded ore slurry will be pumped to Gladstone via a 175km long, 350mm to 400mm diameter slurry pipeline.

The process design for the leach plant will be based on the hydrometallurgical route proven at Moa Bay in Cuba for more than 40 years. More recently the chosen processing route has been employed by Minara Nickel at its Murrin Murrin plant and the Cawse Plant, both in Western Australia.

An innovation in the proposed processing route will be the inclusion of saprolite neutralisation. This will involve pre-neutralisation of the residual free acid in the leach discharge with high magnesium saprolite ore. This process, performed at atmospheric pressure, will consume much of the free acid while recovering additional nickel and cobalt values from the saprolite ore. Neutralisation of the remaining acid will be achieved using limestone and lime.

The metals refinery process has been employed successfully for many years by Corefco (Sherritt) at Fort Saskatchewan, WMC's Kwinana Nickel Refinery in Western Australia, the Base Metals Refinery at Impala Platinum in South Africa, Outokumpu's Harjavalta refinery in Finland and the Murrin Murrin plant in Western Australia.

The primary products to be produced are nickel and cobalt metal in the form of pillow shaped briquettes which are either drummed or bagged (1 t bulka bags) for containerisation and export out of the Port of Gladstone or the Port of Brisbane. The containers are transferred to the Port of Gladstone by truck and, if to the Port of Brisbane, by rail or truck. By-product ammonium sulphate is despatched from site in covered trucks using sealed bulka bags.

3.4 Process Unit Operations

The processing plant will consist of the following operations:

- Ore Beneficiation;
- Slurry Pumping and Pipeline;
- Slurry Receival;
- High Pressure Acid Leach;
- Neutralisation;
- Counter Current Decantation and Thickening;

- Solution Neutralisation;
- Sulphide Precipitation;
- Barren Liquor Treatment;
- Residue Neutralisation;
- Residue Disposal;
- Sulphide Leach;
- Impurity Removal;
- Solvent Extraction;
- Nickel Reduction;
- Nickel Metal Handling;
- Cobalt Reduction;
- Cobalt Metal Handling,
- End Solution Stripping;
- Zinc Removal;
- Ammonium Sulphate Plant;
- Sulphuric Acid Plant;
- Hydrogen Plant;
- Hydrogen Sulphide Plant;
- Air Separation Plant;
- Limestone Plant;
- Lime Plant;
- Process Effluent Management;
- Reagent Preparation; and
- Utilities.

Figure 3 is a flow diagram of the nickel and cobalt extraction process.

3.5 General Infrastructure

The key infrastructure required for the Stage 1 plant will be:

- Unloading facilities for imported ore at Wiggins Island terminal and 4 km conveyor to site;
- An unloading wharf facility provided by the Central Queensland Port Authority (CQPA) to unload sulphur at Fisherman's Landing Wharf. Sulphur will be stockpiled west of the wharf and trucked to the plant site; and
- A power plant which will utilise excess steam from the acid plant to generate power for use in the process plant.

CQPA has approval for two Environmentally Relevant Activities (ERAs) which relate to this project:

- ERA 71 – Operating a Port; and
- ERA 74 – Stockpiling, Loading, Unloading Goods in Bulk.

GNL proposes to operate under CQPA's environmental authorities for these ERAs for its sulphur and ore unloading activities and product export.

Either fresh water from the Eden Bann Barrage, recycled effluent from Rockhampton City Council Sewerage treatment plants or seawater, either from Gladstone using the slurry pipeline corridor or a new corridor from Broom Head, will provide water for ore preparation and slurring at Marlborough. Seawater for other process plant requirements will be provided from Port Curtis for use as "once through" cooling water around the Gladstone plant. Seawater will be used at Gladstone for ore preparation and slurring. Fresh water will be required for utilities and site amenities.

The plant will include all the required buildings to house operations and administration staff, and all warehouses and workshops.

Construction and operations personnel will be accommodated in the township of Gladstone and the adjacent Calliope Shire, which have the capacity to provide short term housing for large numbers of personnel.

Requirements for schooling, medical services, shopping and recreational facilities are readily available in the Gladstone region.

3.6 Mining and Beneficiation

Lateritic nickel deposits are formed from igneous ultra basic rocks, peridotite, harzburgite and dunite by a process of weathering. Most of the world's deposits are located in the tropics. The resource in New Caledonia accounts for 20 to 40% of the world's known nickel resources and Indonesian lateritic nickel ore resources are ranked behind New Caledonia and the Caribbean. Ores in both countries have been mined for many years for export and local processing.

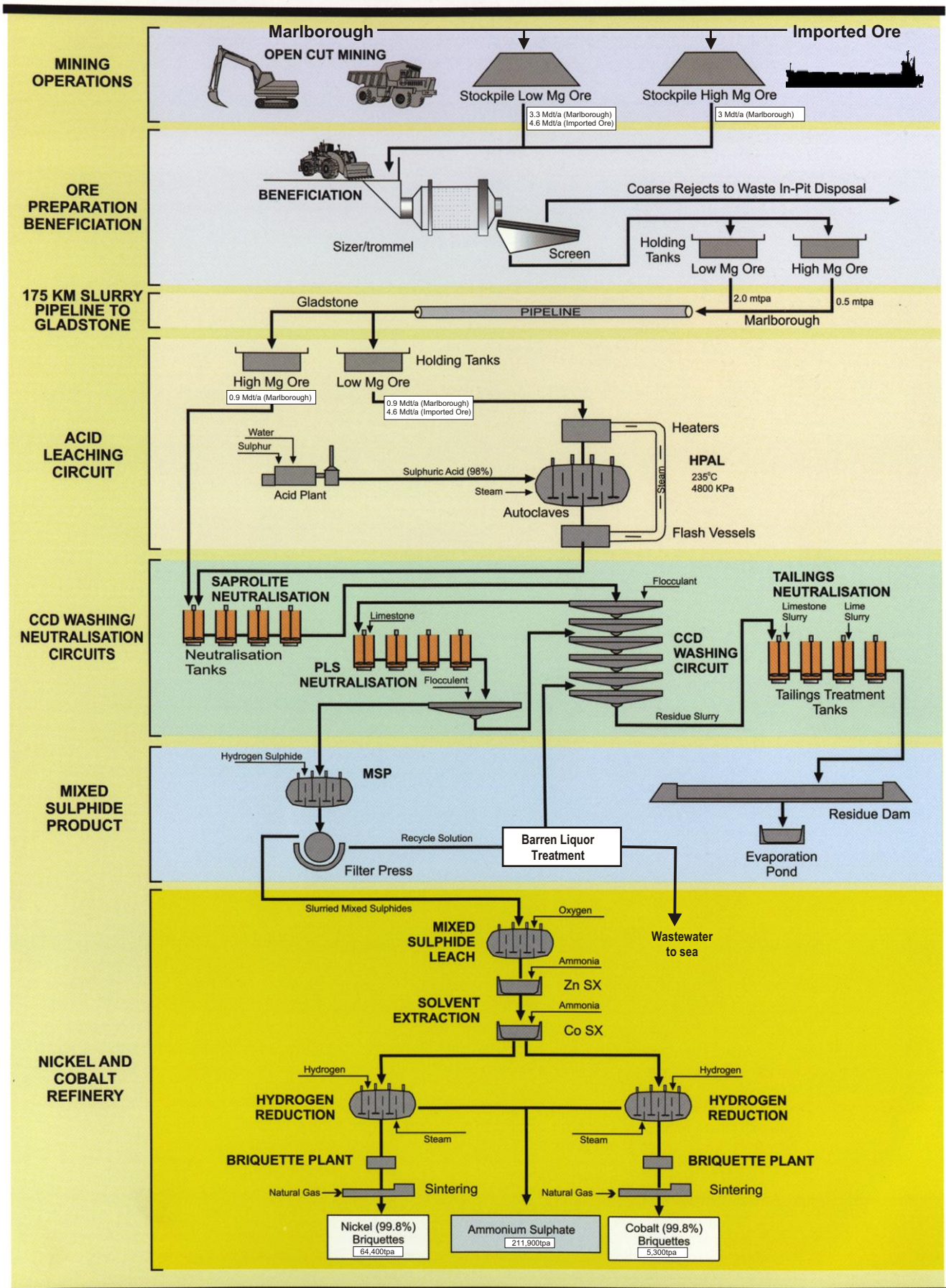
3.6.1 Marlborough

Run Of Mine (ROM) ore will be delivered to LMS and HMS ore stockpiles at the Marlborough plant site and will be reclaimed by front-end loader. The ore beneficiation circuit will consist of parallel trains incorporating scrubbing and screening followed by magnetic and gravity separation, one train for LMS ore and the other for HMS ore.

The ores will be upgraded by separating the coarse siliceous fraction which contains little nickel and cobalt. The ore fines may be further treated by magnetic and gravity separation circuits to remove spinels and high chromate material. Product slurry will report to LMS and HMS ore thickeners for settling to approximately 35% solids.

3.6.2 Imported Ore

A beneficiation plant will be constructed similar to Marlborough including crushing and grinding facilities.



Gladstone Nickel Project

NB. Extracted from Gladstone Pacific Nickel Ltd Prospectus March 2005

3.7 Ore Transportation

Ore transportation will be a vital component of the project.

3.7.1 Marlborough

Beneficiated ore will be transported from Marlborough to Gladstone via a 175km slurry pipeline. The buried pipeline will be constructed from 350mm – 400mm High Density Polypropylene lined carbon steel. Long distance slurry pipelines of this nature are a well established and proven technology.

Underflow slurry will be pumped from the LMS ore and HMS ore slurry thickeners into slurry storage tanks located at the slurry pumping station. Positive displacement pumps will pump LMS ore and HMS ore slurry down the slurry pipeline in batches, which will be delivered into a series of large agitated storage tanks at the Gladstone plant site.

3.7.2 Imported Ore

Low magnesium ore will be sourced from ore-bodies adjacent to deep water ports to enable Capesize vessels to be used. Unloading will take place at a new berth capable of handling Capesize ships at Wiggins Island. Ore will be conveyed 4 km to site and stored in stockpiles.

Ore will be slurried using seawater and beneficiated prior to thickening and storage.

3.8 Nickel Refinery (Leach)

This section includes a description of the processing plant and the major equipment items for each process area of the mixed sulphides plant.

3.8.1 High Pressure Acid Leach (HPAL)

The high pressure acid leach circuit will obtain high nickel and cobalt extractions from the ore while minimising the net extraction of iron and aluminium. This will be achieved by performing the acid leach at a temperature 255°C to 265°C.

In stage 1 up to four parallel autoclave leach circuits will be required to obtain the desired leaching conditions. LMS ore slurry from the leach feed slurry storage tanks will be heated in three stages by direct contact splash vessels condensing flashed steam from the three stages of autoclave discharge slurry pressure letdown flash vessels. The slurry will then be pumped into the HPAL autoclaves by positive displacement pumps. The autoclave feed pumps will be sized to be operated in parallel at all times.

In the HPAL autoclaves, concentrated sulphuric acid (98%wt) and high pressure steam will be injected to achieve the desired leaching conditions under which almost all of the nickel and cobalt will be leached from the ore. The slurry will be maintained as a homogeneous “fluid” by the autoclave agitators.

The hot leached slurry will be discharged from each autoclave and depressurised through three flash vessels to atmospheric pressure by flashing off steam, which will be recycled to heat the autoclave feed slurry. The Low Pressure flash vessel will empty into the flash seal tank to ensure that the slurry is at atmospheric pressure.

3.8.2 HMS Ore Neutralisation

The HMS ore Neutralisation circuit will consume most of the residual sulphuric acid from the leach circuit whilst simultaneously extracting a significant fraction of the nickel and cobalt contained in the saprolite ore.

The depressurised HPAL discharge slurry will be fed to HMS Ore Neutralisation, where it will be blended with HMS ore slurry to neutralise some of the free sulphuric acid. In addition to consuming much of the free acid, approximately 70% of the nickel and cobalt in the HMS ore will be recovered.

The discharge from the HMS neutralisation tanks will be pumped to the Counter Current Decantation (CCD) circuit.

3.8.3 CCD Thickening

The CCD circuit will recover the nickel and cobalt rich solutions from the barren leached solids. A six stage CCD washing circuit will be required to achieve the desired recovery of nickel and cobalt. Flocculant will be mixed with the feed to improve the slurry settling characteristics.

3.8.4 Solution Neutralisation

The solution neutralisation circuit will neutralise the residual free sulphuric acid contained in the CCD overflow and will precipitate impurities such as iron, aluminium and silica by reaction with limestone slurry, whilst leaving the nickel and cobalt in solution for subsequent recovery. Flocculant will be mixed with the feed to improve the slurry settling characteristics.

3.8.5 Sulphide Precipitation

The sulphide precipitation circuit will recover nickel and cobalt as mixed sulphide solids. Overflow from the neutralisation thickener will be blended with recycled seed solids and contacted with vent gas from the sulphide precipitation autoclaves where it will be cycloned and the fines thickened and recycled as seed material. The barren solution will be filtered and stripped of hydrogen sulphide prior to final neutralisation.

The coarse cyclone underflow will be counter currently washed with process water prior to dewatering by vacuum belt filters. The filter cake will be repulped for further refining to metal products.

3.8.6 Barren Liquor Treatment

The barren liquor treatment circuit will provide CCD wash liquor and neutralise and clarify excess barren liquor for disposal to sea.

Barren liquor will be delivered to the CCD wash liquor neutralisation tanks where it will be mixed with limestone slurry to neutralise the majority of the residual free acid. The CCD wash liquor, with a pH of 2.5, will be pumped to the CCD circuit where it will be used to wash the leached solids from the HPAL circuit.

The balance of the barren liquor slurry will be mixed with milk of lime slurry to neutralise the remaining free acid and precipitate heavy metals. The treated barren liquor slurry will be clarified in the barren liquor neutralisation thickener. Flocculant will be mixed with the thickener feed to improve the slurry's settling characteristics. The thickener overflow will gravitate to the barren liquor surge tank.

Some of the thickener underflow will be recycled to the barren liquor neutralisation tanks as seed material and the balance will be transferred to the residue treatment tanks.

3.8.7 Residue Neutralisation

The Residue Treatment Circuit neutralises the final CCD thickener underflow, precipitating all of the metals from the entrained solution and some of the manganese. Limestone Slurry is added as reactant to the first two stages, raising the pH of the slurry to 4.5. Milk of lime slurry is added as reactant to the last two stages, raising the pH of the final slurry to 8.0.

The neutralised slurry is pumped to the residue surge tank for disposal.

3.9 Nickel Refinery (Metals)

This section includes a description of the processing plant and the major equipment items for each process area of the metals refinery.

3.9.1 Sulphide Leach

The sulphide leach circuit will redissolve the mixed sulphide solids to produce an impure nickel/cobalt sulphate solution with low acidity and impurity content. This will be achieved by reacting the mixed sulphide slurry with oxygen in an agitated autoclave at elevated pressure and temperature.

3.9.2 Impurity Removal

The impurity removal circuit will precipitate iron and aluminium from the sulphide leach solution by neutralising the acid with aqua ammonia, and precipitate copper by contact with zinc sulphide. This will be performed in a series of tanks, followed by filtration to remove the precipitated solids.

The clear filtrate will advance to the Solvent Extraction Area. The solids collected in the filters will be repulped and disposed of with the residue slurry.

3.9.3 Solvent Extraction

The solvent extraction (SX) circuit will remove zinc and separate the cobalt from the nickel. This will be accomplished by sequentially extracting the zinc and cobalt into an organic solution utilising a phosphinic acid based extractant as the active agent. Each element will then be stripped from the respective metal loaded organic streams with sulphuric acid solution.

3.9.4 Nickel Reduction

The nickel reduction circuit will recover nickel from solution as metallic powder. The processing steps will involve chemical adjustment of the nickel sulphate solution, reduction of nickel from the adjusted solution using hydrogen, and decantation of spent solution.

Nickel reduction will be carried out in cycles, with each reduction cycle consisting of nucleation, densifications, total discharge and continuous rinse, followed by a nickel plate leach, as well as the purging steps required between the leaching and reduction operations.

3.9.5 Nickel Metal Handling

The nickel metal handling area will produce nickel powder and briquette products from nickel powder slurry. This will involve classification, filtering, washing, drying, cooling, and drumming of nickel powder, as well as briquetting of nickel powder, and sintering and drumming of the product briquettes.

3.9.6 Cobalt Reduction

The cobalt reduction circuit will treat cobalt sulphate solution to recover cobalt as cobalt powder. The processing steps will involve chemical adjustment of the cobalt sulphate solution; reduction of cobalt from the adjusted solution using hydrogen; and decantation of spent solution.

Cobalt reduction will be carried out in cycles, with each reduction cycle consisting of nucleation, densifications, total discharge and continuous rinse, followed by a cobalt plate leach, as well as the purging steps required between the leaching and reduction operations.

3.9.7 Cobalt Metal Handling

The cobalt metal handling area will produce a cobalt briquette product from a cobalt powder slurry. This will involve filtering, washing, drying, cooling, and briquetting of cobalt powder, as well as sintering of the product briquettes.

3.9.8 End Solution Stripping

The sulphide strip circuit will remove metals from the reduction end solutions to produce a mixed sulphide slurry that can be recycled to the sulphide leach area.

The reduction end solutions from the nickel and cobalt reduction areas will be contacted with hydrogen sulphide to precipitate any remaining metals. The product slurry will be fed to a thickener where the solids will be flocculated and settled. A portion of the thickener underflow will be recycled to the sulphide strip tank as seed material while the remainder will be pumped to the sulphide leach circuit.

3.9.9 Zinc Removal

The zinc removal circuit will precipitate zinc sulphide from the zinc sulphate solution received from the solvent extraction area, using hydrogen sulphide gas.

3.9.10 Ammonium Sulphate Plant

The Ammonium Sulphate Plant will produce ammonium sulphate for recycle to the nickel and cobalt reduction areas. In addition to this, ammonium sulphate will also be produced for sale as a by-product and process condensate will be recycled to the process plant as dilution water.

3.10 Process Services

3.10.1 Sulphuric Acid Plant

The Sulphuric Acid Plant will provide the following services to the metallurgical processing plant:

- Sulphuric acid for the pressure leach and minor plant users;
- High pressure (5,950 kPa) superheated steam for use in the turbine generators and, after de-superheating, in the pressure leach plant; and
- Molten sulphur for the hydrogen sulphide plant.

The principal steps in the process will consist of burning sulphur in air to form sulphur dioxide, combining the sulphur dioxide with oxygen to form sulphur trioxide, and combining the sulphur trioxide with water to form a solution containing sulphuric acid at a concentration of about 98.5%.

The oxidation and absorption steps in the manufacture of sulphuric acid from sulphur are all highly exothermic. The excess heat generated at each step of the process will be recovered in economisers, a waste heat boiler and superheater. The heat will be recovered in the form of high pressure superheated steam which will be exported to meet process requirements. Any excess of steam will be used for power generation. The process will be designed to give a conversion of sulphur dioxide to sulphuric acid of more than 99.5%.

The plant will also produce demineralised water for seal systems and make-up boiler feed water for steam.

3.10.2 Process Gases

Hydrogen Plant

The Hydrogen Plant will provide hydrogen gas to the processing plant. Low pressure (LP) hydrogen will be used as a feedstock for the hydrogen sulphide plant, and as a desulphurising agent in the briquette sintering furnaces. High Pressure (HP) hydrogen will be used as a reductant for nickel and cobalt metal precipitation.

Hydrogen Sulphide Plant

The Hydrogen Sulphide Plant will provide hydrogen sulphide gas for mixed sulphide precipitation, to precipitate zinc in the zinc removal area, and to precipitate nickel and cobalt from end solution in the sulphide strip area.

Air Separation Plant

The Air Separation Plant will provide the following services to the processing plant:

- High pressure oxygen gas;
- Plant air;
- Instrument air;
- LP nitrogen; and
- HP nitrogen.

Oxygen will be used for leaching nickel and cobalt from the mixed sulphides slurry in the sulphide leach autoclave, and for plate leaching in the nickel and cobalt reduction autoclaves.

LP nitrogen will be used as an inert purge gas, a sintering furnace atmosphere gas, and to strip hydrogen sulphide from the sulphide strip thickener overflow solution. HP nitrogen will be used for rinsing and purging reduction autoclaves and to provide an overpressure in the nickel reduction feed vessel.

Process air will be used for air blowing process filters, bag house/dust collector operation, nickel and cobalt powder pan filters, and for utility stations. Instrument air will be used for driving actuated and control valves and for other control functions.

The Air Separation Plant will consist of an air separation unit with a front end purification process. The process scheme is based on the principle of Internal Compression Cycle for oxygen allowing the oxygen to be produced directly at the required pressure without the need for oxygen compressors.

3.10.3 Limestone Plant

The Limestone Plant will provide a neutralisation medium to the process in the form of 45% solids by weight of ground limestone slurry. The slurry will be supplied on demand through a ring main system.

Crushed limestone will be railed to the plant site limestone stockpiles. The limestone slurry section will receive and store crushed limestone transferred from the limestone storage site. This will be ground to the size required by the process and stored as a slurry before distribution.

3.10.4 Lime Plant

The Lime Plant will provide an alkaline neutralisation medium to the process in the form of milk of lime slurry. The slurry will be supplied on demand through a ring main system.

Slaked lime slurry will be required at the main site for final residue neutralisation and barren liquor treatment. The lime slaking plant will convert the quicklime into a slaked lime slurry which will be stored before distribution to the process. Minor amounts of dry lime will be required to treat the sulphur stockpile for the neutralisation of molten sulphur.

3.10.5 Process Effluent Management

The effluent disposal will remove the liquid and solid process effluents from the Gladstone plant.

This section of the report describes the disposal of liquid effluent, which is to be neutralised and pumped to Port Curtis Bay via pipeline, and the wet disposal of solid effluent, which is to be pumped via pipeline to a residue disposal area.

Liquid Effluent

Treated barren liquor from the barren liquor clarifier will be pumped into a surge tank. A portion of the treated barren liquor will be drawn off by the alkaline reagents area and will be used as slurring liquor for the limestone, and lime slurries produced by this area. A controlled amount of liquor will also be drawn off the main pipe and introduced to the residue slurry surge tank to dilute the residue.

The surplus treated barren liquor will be sent down the barren liquor pipeline, through the seawater eductor and into Port Curtis Bay. The eductor will reduce the temperature of liquor being disposed by diluting the treated barren liquor with seawater.

Table 3.2 outlines the expected effluent water quality based on comparable plants.

Table 3.2 Predicted Wastewater Discharge – Stage 1 (in mg/L)

Parameter	Units	(Symbol)	Before Seawater Eductor	Discharge Stream
Flow Rate	(m ³ /hr)	-	1,560 - 2,030	4,020 - 5,220
Aluminium	mg/L	(Al)	<1	<1
Calcium	mg/L	(Ca)	460 - 700	420 – 500
Chloride	mg/L	(Cl)	<10 – 10,400	10,100 – 14,550
Total Chromium	mg/L	(Cr)	<5	<1
Cobalt	mg/L	(Co)	<5	<1
Manganese	mg/L	(Mn)	370	144
Magnesium	mg/L	(Mg)	12,900 – 13,650	5,000 – 5,350
Nickel	mg/L	(Ni)	<5	<1
Silicon	mg/L	(Si)	<5	<1
Sodium	mg/L	(Na)	2 - 50	6,600 – 6,700
Sulphate	mg/L	(SO ₄)	52,900 – 54,400	17,630 – 19,730
Iron	mg/L	(Fe)	<1	<1
Zinc	mg/L	(Zn)	<1	<1

Solid Effluent

The residue disposal method for the plant will be wet disposal to a Residue Storage Facility (RSF). The residue will be slurried with barren liquor at the plant and pumped via a pipeline to the RSF. At the RSF, the residue will be hydraulically deposited in the impoundments behind the RSF walls.

The slurry from the final residue neutralisation tank will be mixed in the residue surge tank with treated barren liquor to dilute the slurry to 40 wt% solids. The slurry will be pumped to the RSF via the residue pipeline.

The residue disposal pumps will be sized for one pump to handle the typical flow of residue to the dam, with the second pump on standby. For peak flow situations, such as thickener shutdowns, both pumps will be required to handle the increase flow. Flushing of the residue line will be carried out with either treated barren liquor or process water.

All residue will then be disposed to the RSF which is described in Section 3.10.7.

3.10.6 Reagent Preparation

The purpose of this area is to provide the specific reagent storage and make-up requirements for the main processing plant.

Flocculants

The process will require three locations for flocculant make-up:

- In the beneficiation slurry thickeners and the barren liquor clarifier;
- In the solution neutralisation clarified and the mixed sulphides thickener; and
- In the CCD thickeners and the atmospheric leach thickener.

Separate systems will be required for the preparation, storage and distribution of each of these flocculants.

Filter Aid

Filter aid will be delivered in palletised bags to separate storage areas serving the various polishing filters around the plant. Facilities to prepare filter aid slurry will be located at each location.

Ammonia and Aqua Ammonia

Anhydrous and aqua ammonia will be used for pH adjustment and to establish the optimum ammonia to metal ratio in solution for the hydrogen reduction process. Ammonia will ultimately report as a fertiliser grade ammonium sulphate product.

Road tankers or pipeline will deliver liquid anhydrous ammonia to the anhydrous ammonia unloading and storage facility. Liquid ammonia from the storage bullet will be reticulated around the plant site as required.

Polyacrylic Acid

Polyacrylic acid will be used in nickel and cobalt briquetting to lubricate the powder particles during compaction and to assist the release of the formed briquettes from the briquetting rolls. It will also be used as an additive in hydrogen reduction where it will activate the surface of the seed nickel and cobalt powder particles, promoting uniform particle growth and accelerating the reduction reaction.

Ammoniated polyacrylic acid will be delivered into the polyacrylic acid storage tank farm via bulk tankers. It will be transferred on demand to make-up tanks located in the briquetting and hydrogen reduction areas.

3.10.7 Residue Storage Facility (RSF)

A general area has been identified in the Gladstone State Development Area (GSDA) for the location of the RSF. Further studies and investigations are required prior to selecting the exact location of the RSF. For Stage 1 there is adequate storage in the identified area of the GSDA and the focus for this IAS, and subsequent EIS, is residue storage for Stage 1 only. For Stage 2 additional waste disposal areas have been identified, however this will be subject to the Stage 2 environmental approvals.

Residue generation rates and assumed characteristics for the first stage, as provided by Aker Kvaerner Australia Pty Ltd, are detailed in Table 3.3. The values stated in Table 3.3 are conservative estimates and may be altered during the detailed design phase.

Table 3.3 Residue Design Parameters*

Design Parameter	Stage 1 (Years 1 to 5)	Units
Generation Rate	7 - 9	Mdt/a
Residue slurry density	40	%w/w
Insitu Dry Density	1.15	t/m ³

* Source: Connell Wagner (May 2005).

It should be noted that the insitu density figure above is an assumed value based on experience with similar operations and laboratory test work. These assumptions will be confirmed with the completion of a pilot trial to determine the characteristics of the Residue produced from ore sourced from the Marlborough ore body.

3.11 Utilities

3.11.1 Water Supply

Seawater

Seawater will be pumped from Port Curtis, at 52 to 68 GL per annum, for use as "once through" cooling water around the plant.

Raw Water Supply

Raw water for the beneficiation plant at Marlborough and for pipeline ore transportation will be sourced from either the Fitzroy River, seawater or grey water from Rockhampton City Council.

Water transported from Marlborough with the beneficiated ore slurry meets approximately 30% to 57% of the Gladstone plant site requirements. Additional raw water for the process plant will be sourced from Seawater and the Gladstone Area Water Board municipal water supply main at 6.4 to 8.6 GL per annum.

Process Plant Fire Water

Raw water will be fed into a fire water tank. This tank will be the supply reservoir for a fire water pump set serving the plant site fire water ring main and supplying fire and hosing water to the conveyor from the wharf to the plant site. The fire water pump will consist of an electric and a diesel pump each rated at 100%, and an electric jockey pump.

Demineralised Water

The demineralised water package will be designed to supply demineralised water for use within the process plant, the main use being boiler feed water for the boiler feedwater package. Following demineralisation, the purified water will be distributed as follows to:

- Boiler feed water, acid plant dilution water and hydrogen plant boiler feed water; and
- HPAL, sulphide precipitation, sulphide re-leach and metal reduction autoclave barrier seal water make up.

3.11.2 Steam Supply and Reticulation

Steam will be produced from two sources, namely the acid plant and the standby boiler. The major sources of high pressure steam will be from the acid plant, a result of the exothermic reaction in the production of sulphuric acid. The high pressure (HP) steam production (5,950 kPa) will be an integral part of the acid plant and will be fed into a high pressure header at the power station.

The secondary source of HP steam will be from the standby boiler that produces supplementary steam into the same HP header for steam distribution system.

From the HP header a quantity of the HP steam will be bled off to the pressure acid leach and metal reduction sections of the process plant, with the remainder distributed to the turbo alternators in the power station.

Standby Boiler

The purpose of the steam boiler will be to provide supplementary process steam to enable the process plant to continue to operate at reduced capacity during periods of downtime at the sulphuric acid plant and statutory boiler inspections. This period will be dictated by the sulphuric acid surge capacity. A standby natural gas fired package boiler will be available to provide high and low pressure steam when required. The package boiler can also operate in tandem with the sulphuric acid plant to supplement power generation should the need arise.

3.11.3 Power Generation

Excess superheated HP steam from the sulphuric acid plant will be directed to a turbine generator set. Sufficient power will be generated to meet the normal operating requirements of the Gladstone Plant. Potential exists to export surplus power to the state electricity grid.

3.12 General Infrastructure and Services

This section includes a description of the infrastructure located in the vicinity of the Gladstone process plant, and major components of the facilities.

3.12.1 Gladstone Port Facilities

A new unloading berth is to be constructed by the Central Queensland Port Authority at Fisherman's Landing, adjacent to the Cement Australia wharf. GPNL proposes to use the unloading berth to unload sulphur from 70,000 DWT Panamax vessels.

A new terminal is under development at Wiggins Island by the Central Queensland Port Authority. This facility is capable of handling Capesize vessels and will enable stage 1b of the project to be established. Appropriately configured conveyors from a nominated berth will be installed to transport ore to site where it will be stockpiled. Access along the conveyor route will enable regular inspection to be made.

3.12.2 Services

Power

The process plant facilities include a turbine generator capable of generating approximately 60MW of power using excess HP superheated steam from the sulphuric acid plant waste heat boilers. The Gladstone Nickel Project site will normally be self-sufficient for electrical power.

The plant will also be connected to the existing grid via a switchyard adjacent to the plant. It is assumed the power authority will provide the switchyard.

Water

Water transported from Marlborough with the beneficiated ore slurry meets 29% to 57% of the plant water requirements. The volume of raw water used at Marlborough will be 2.2 to 8.5 GL per annum.

The balance of the raw water requirement (6.4 to 8.6 GL per annum) will enter the site from the Gladstone Area Water Board main and will be distributed to various users within the plant. Raw water will be reticulated around the plant site for general process use and also supplied to a fire water pump set providing fire water around the site.

Seawater (52 to 68 GL per annum) from Port Curtis will be used as "once through" cooling water around the plant and possibly, for saline water to Marlborough. It will be supplied from submersible pumps located at the wharf and transferred to the process plant by pipeline.

Buildings

The number of personnel located in or requiring access to processing areas will be kept to a minimum. Maintenance services and stores personnel will be located on the edge of the processing facility enabling easy access when required. The remainder of the personnel will be located in and around the administration building.

Buildings to be provided may include:

- Administration – single storey brick veneer air conditioned;
- Control room / Production Office / Laboratory – two storey cavity brick air conditioned;
- First Aid and Training Room – single storey brick veneer air conditioned;
- Amenities – toilet and showers;
- Workshop and Store Building – steel framed industrial building with overhead crane;
- Warehouse Building – steel framed industrial building with overhead crane;
- Gatehouse Building – single storey brick veneer air conditioned; and
- Process Office and Crib areas – in plant areas adjoining MCC buildings.

Container Storage Area

Product from the plant, as metal briquettes, will be packaged and loaded into shipping containers at the plant. An area adjacent the plant will be provided to store containers.

Communications

An allowance has been made for a communications system. The plant data network/communication system will have a fibre optic backbone between the administration area and the Central Control Room, with all communications hardware and software at these two locations.

Sewerage

The site will use the existing reticulation of the Calliope Shire sewerage system.

Natural Gas

Natural gas, at line pressure from the main available at the fence, will pass through a skid-mounted natural gas let down and metering station where it will be reduced in pressure to 2,310 kPa gauge and reticulated as required around the plant site. The volume of natural gas required for the plant during Stage 1a and Stage 1b is estimated to be 1.6-2.0 PJ per annum.

4. Existing Environment

4.1 General

The proposed site within the Yarwun Precinct of the GSDA is located to the south of Hanson Road, and is bounded by Calliope River to the east and Reid Road to the west. The site extends marginally beyond the GSDA to the east into tidal wetlands.

The prevailing land uses within the broader project area are industry and agriculture. Several industries are located in close proximity to the site, including the ORICA chemical plant, Cement Australia and the Comalco Alumina Refinery. A railway line is located to the south-west of the site.

High voltage powerlines cross the site and form a 'T' junction onsite towards the south.

4.2 Climate

The region has a sub-tropical climate and experiences average annual rainfall of approximately 1,000mm. The majority of rainfall occurs during the summer months. Climate data for the region is outlined in Table 4.1 and Table 4.2.

Table 4.1 Gladstone Post Office – Meteorological Records (1872-1958)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Mean Daily Max Temp (°C)	29.9	29.7	29.1	27.8	25.1	22.8	22.2	23.1	24.8	26.7	28.3	29.6	26.6
Mean Daily Min Temp (°C)	22.2	22.1	21.0	18.2	15.0	12.6	11.4	12.2	15.0	17.9	20.1	21.6	17.4
Mean Rainfall (mm)	181.6	191.1	129.6	61.0	46.1	63.1	47.3	23.7	30.9	15.9	75.1	118.7	1,020.1
Highest Daily Rainfall (mm)	371.3	478.3	215.6	109.5	156.0	221.5	203.2	57.4	52.3	136.9	110.5	260.4	478.3

Table 4.2 Gladstone Radar – Meteorological Records (1957-2004)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Mean Daily Max Temp (°C)	31.1	30.8	30.0	28.2	24.5	23.0	22.5	23.9	26.3	28.2	29.8	30.9	27.6
Highest Max Temp (°C)	38.3	40.1	37.0	34.1	31.3	29.3	28.7	30.4	33.8	40.0	40.1	39.8	40.1
Mean Daily Min Temp (°C)	22.4	22.3	21.4	19.6	16.9	14.1	13.2	14.1	16.3	18.6	20.5	21.8	18.5
Lowest Min Temp (°C)	12.8	18.0	16.2	13.0	8.5	6.1	4.4	7.6	9.6	10.9	15.1	12.4	4.4
Mean Rainfall (mm)	154.5	143.2	96.8	51.0	69.6	34.4	39.8	30.9	24.4	60.3	78.1	135.5	918.4
Highest Daily Rainfall (mm)	196.8	229.4	112.3	93.4	178.0	62.5	92.7	78.2	75.0	149.4	84.2	196.0	229.4
Mean Daily Evaporation (mm)	6.4	5.9	5.4	4.5	3.4	3.0	3.1	3.5	4.3	5.4	6.0	6.3	4.8

4.3 Soils and Geology

The geology of the site consists of Palaeozoic, Curtis Island Group, Doonside Formation, red green and white chert, mudstone, acid tuff, limestone, and tuffaceous arenite. Holocene, alluvial deposits of gravel, sand, silt and clay are also present on the eastern section of the site, adjacent to Calliope River, and are underlain by the Paleozoic Doonside Formation. The site is also bisected by a fault from the north-west corner to the south-east corner of the site.

The major soils are red, structured gradational clay loams and uniform clays; shallow, bleached sandy and loamy surface, and red duplex soil.

At this stage it is not known whether acid sulphate soils are present onsite. Prior to plant construction, an investigation will need to be undertaken to determine the presence of acid sulphate soils within the site, particularly in the north-eastern portion of the site where reclamation works are proposed.

Sediments towards the lower areas of the site, adjacent to the Calliope River and wetlands, are potentially unconsolidated, and will require additional stabilisation works to be undertaken prior to plant construction.

4.4 Water Quality

The project site is located within the estuarine reaches of the Calliope River catchment which discharges into Port Curtis Bay which extends into the Great Barrier Reef Marine Park World Heritage Area (GBRWHA).

Current water quality conditions within the Calliope River catchment are influenced by a number of anthropogenic activities including grazing, agriculture, industry and urban-based activities. The catchment is highly disturbed in some areas, particularly in the lower reaches where a number of industries exist and urbanisation has occurred. Given the land uses within the catchment and the associated level of disturbance, it is likely that the lower reaches of the River exhibit elevated levels of hydrocarbons, nutrients and sediment. Further investigations will need to be undertaken during the planning phase of the project to determine the River's existing water quality conditions.

Previous water quality investigations undertaken in Port Curtis Bay indicate that the Bay experiences relatively high levels of nutrients, turbidity and bacterial levels (Connell Wagner 2002). Again, further investigations, including a review of contemporary water quality studies pertaining to Port Curtis Bay, will be required during the planning phase of the project.

Two gullies run through the site, one draining into the northern area into Port Curtis, the other draining the southern area into an anabranch of the Calliope River. An onsite area is also available for site runoff collection and detention. The water quality characteristics of the two gullies and the onsite detention area are not known at this stage but will be investigated during the planning phase of the project.

Groundwater is expected to flow towards Calliope River in the east and north, with saltwater intrusion expected towards the river and the tidal flats located to the north. Groundwater quality data will also need to be analysed and reported upon during the project's planning phase.

4.5 Air Quality

The site is located within the Gladstone airshed. Major industry including NRG Gladstone Power Station, Comalco Alumina Refinery, Orica, Cement Australia Fisherman's Landing Plant and other local industries all release process gases into the local airshed.

4.6 Noise

Major industry in the immediate area, including Comalco Alumina Refinery, Orica, Cement Australia Fisherman's Landing Plant and other local industries all contribute to the local noise emissions. Port Curtis Way is a highly utilised road, with high volumes of industrial traffic, with particularly high volumes during industry shift changes. No sensitive receptors have been identified in the immediate area.

4.7 Flora and Fauna

The site is predominantly vegetated, with minor cleared areas present for access roads, the disused quarry and powerline easements.

The typical remnant vegetation for the land system that this site is located on is eucalypt woodland (pink bloodwood, bluegum, swamp mahogany, poplar gum) with mixed shrub understorey.

The north-eastern portion of the site is located on tidal lands which harbours mangroves and other marine plants. The ecological health of this portion of the site is not known at this stage but tidal flow to the area has been impeded by bunds which may have diminished the habitat value and health of the mangrove forests.

Discussions with the proponent have indicated that the mangrove stands within and/or adjacent to the north-eastern portion of the site have been earmarked for removal by the Central Queensland Port Authority (CQPA), which has a permit under the *Harbours Act 1955* (QLD) to undertake land reclamation works in the area.

Further investigations will be required to identify the dominant flora and fauna species that exist within the site. An assessment of the mangrove stands within the tidal area and their overall ecological and connectivity value in the broader area will also be required.

4.8 Visual Amenity

From the Gladstone Industrial Land Study (Connell Wagner 1992) the visual quality of the area was found to lie in the:

- Naturalness of the area;
- The contrasts in the landform and vegetation;
- Presence of views of landmark hills and ranges such as Mt Larcom; and
- The cultural landscape of open, undulating grasslands by woodlands.

Mt Larcom with its slopes and undulating forested foothills plays a dominant role in forming the landscape character of the GSDA and the high scenic quality of the landscape.

Areas that make a significant contribution to the locality are:

- Mt Larcom and the slopes and foothills of its range; and
- The landscape in outlooks to Mt Larcom and Mt Sugarloaf from the Mt Larcom Road.

The project site is visible from Hanson Road, however mature vegetation in the northern section of the site acts as a partial screen. The adjacent land is currently utilised by ORICA for industrial operations, with associated plants present. The Australian Magnesium Corporation pilot plant is also located adjacent to the site, however, this plant is no longer operational and is being decommissioned.

4.9 Traffic and Transport

Connell Wagner undertook a study of the infrastructure for the GSDA in 1999. The study found that Queensland Rail currently provides access to the GSDA via the main North Coast Rail with branch lines to both Fisherman's Landing and East End.

Existing industry near and within the GSDA is serviced by the Central Queensland Port Authority's facility at Fisherman's Landing.

Vehicular access to the GSDA can be readily obtained via the existing Port Curtis Way and Mt Larcom – Gladstone Road. Both these roads are dedicated main roads and are controlled by the Department of Main Roads.

The project site is bounded by Port Curtis Way to the north, Reid Road to the west and the North Coast Railway to the south. A highway turnoff and overtaking facility exists to provide access from Port Curtis Way to Reid Road.

4.10 Cultural Heritage

There is an existing agreement between the Traditional Owner Claimants and the Minister for State Development for Cultural Heritage Management of the GSDA. As the Yarwun site will extend beyond the GSDA border, further Cultural Heritage Studies and liaison with the Traditional Owners will be required.

4.11 Socio-Economic

In the Gladstone Region Overview, January 2005, the estimated population in the Gladstone region was reported as 62,666.

The demographics of the region indicate that the median age in Gladstone City is 32 and in Calliope Shire is 35. Over the next 20 years the demographics of the region are forecast to change so that the median age in Gladstone City is 35 and in Calliope Shire is 38.

Table 4.3 outlines the employment by occupation in the Gladstone Region.

Table 4.3 Employment by Occupation

Occupation	Number	%
Managers and Administration	2,617	9.8%
Professionals	3,099	11.6%
Associate Professionals	2,836	10.7%
Tradepersons	4,527	17%
Clerks/sales/service workers	4,042	15.2%
Labourers and related workers	8,983	33.8%
Not stated / inadequately stated	509	1.9%
Total	26,613	100.0%

In terms of facilities the Gladstone Region provides:

- Health – the Gladstone General Hospital offers a choice of general practitioner and specialist doctors, dentists and medical services, and has 98 beds. A private hospital wing operated by the Mater hospital is also available;
- Education – there are a variety of pre-schools, primary schools, special schools, high schools and tertiary education facilities. The spectrum of tertiary education facilities in the area includes a TAFE and a branch of the Central Queensland University. Around 9,000 state and private school pupils are enrolled in the Gladstone education system; and
- Airport – Gladstone has a modern airport that offers regular services to Brisbane, Mackay, Rockhampton, Townsville and Cairns. Services are operated by Qantas Link, offering nine daily services to Brisbane.

The population growth in the Gladstone/Rockhampton Region in recent times has occurred as a result of the establishment of major industry. Australian Bureau of Census data shows manufacturing is the most important employer in Calliope Shire and manufacturing and wholesale/retail industries are the major employers in Gladstone.

5. Potential Environmental Impacts

5.1 Land Use and Tenure

The existing land use will change from rural/farmland to industrial. As the site for the Gladstone Nickel Project is mainly within the GSDA, there is expected to be minimal impact.

5.2 Soils, Geology and Topography

The site is located adjacent to Calliope River and Port Curtis Bay. If suitable control measures are not implemented during construction and operations, there is a risk of increasing sediment and other pollutant transportation to sensitive environmental areas, such as the GBRWHA. Sediments towards the lower areas of the site, adjacent to the Calliope River and wetlands/saltflats, are also potentially unconsolidated, and will require additional stabilisation works to be undertaken. It is anticipated that potential impacts will be managed through the implementation of an appropriate Construction Environmental Management Plan.

If acid sulphate soils are present onsite, then there is the potential for exposing acid sulphate soils to the atmosphere during earthworks which may in turn produce sulphuric acid runoff and contaminate downstream waterways. An investigation will be undertaken to establish whether acid sulphate soils exist within the site and any predicted impacts will be addressed in terms of mitigation measures as necessary.

Inactive geological faults cross the site, and detailed geological investigations will be required prior to earthworks and construction commencing onsite.

5.3 Water Quality

Disposal of process water from the site will occur through an ocean outfall discharge to Port Curtis. An assessment will need to be undertaken of the pollutant concentration of the discharge dispersal conditions and implications for marine ecology and the GBRWHA.

Construction and operational activities may have the potential to generate a range of pollutants which, if not managed appropriately, will have the potential to affect water quality conditions within the Calliope River and Port Curtis Bay. However, management measures, including treatment of wastewater prior to discharge, will be put in place to minimise the impact of the plant on the aquatic ecological health of the River, Bay and adjoining Marine Park.

5.4 Air Quality

The proposed HPAL Plant has the potential to impact air quality in the Gladstone airshed.

During construction, considerable earthworks will be necessary to prepare the site for construction, along with increased vehicular movement, increasing the potential for dust generation and air quality impacts. Dust generation will be addressed in the Construction Environmental Management Plan, and minimised during construction and operational phases using appropriate dust suppression and control techniques.

During the operational phase, the HPAL Plant will potentially release the following process gases to the atmosphere:

- Sulphur oxide species (SO_x);
- Nitrogen oxide species (NO_x);
- Carbon monoxide (CO);
- Carbon dioxide (CO₂);
- Hydrogen sulphide (H₂S);

- Ammonia species; and
- Steam.

The most significant pollutant source to the atmosphere will be the emission of SO_x gas from the stack of the sulphuric acid plant. Based on emissions data from a typical sulphuric acid plant, it is estimated that around 400ppm of SO₂ gas will be released during operations.

Appropriate capture and control measures for the process gases will be implemented in the detailed design phase for the plant. It is anticipated that potential impacts will be addressed in the Environmental Impact Statement and managed through the implementation of an appropriate Operation Environmental Management Plan.

5.5 Noise and Vibration

The proposed HPAL Plant may contribute to increased noise levels during both construction and operation.

During construction there will be an increase in vehicle movements to and from the site. The noise generated from the increased vehicle movements has the potential to generate noise that will be audible on occasions from nearby properties and industry. Other construction specific activities, such as excavation, filling and potentially blasting, also have the potential to increase ambient noise levels.

The potential increase in noise levels, both during construction and operation, are expected to be limited in intensity and duration, and mitigated through a combination of environmental management strategies, appropriate infrastructure design criteria and separation distances to sensitive receptors. Landscaping and vegetative buffers will also be utilised to minimise potential noise impacts on sensitive receptors.

Furthermore, the potential for vibration impacts during both construction and operation are expected to be minimal, with no vibration impacts occurring as part of the operational phase. Possible vibration impacts during construction from limited blasting (if required) would be managed through appropriate design of blasting patterns and selection of blasting techniques.

5.6 Flora and Fauna

The extent of the vegetation and habitat impacts of the entire GSDA is likely to be of local significance only. Approximately 65 percent of the GSDAs native vegetation has already been cleared and the areas of highest biological value (the closed forests around Mt Larcom and vine thickets of Mt Larcom and Gravel Creek) will remain undisturbed by this development.

The construction of the HPAL Plant on the site will result in the removal of the majority of vegetation. However, given that the vegetation present onsite is widespread and common to the region, it is unlikely that the clearing activities will have a significant impact on the area's overall biological and habitat value.

Depending on the extent of works undertaken by CQPA, the reclamation works proposed for the north-eastern portion of the site may also result in the removal of mangroves and other marine plants.

It is likely however that the removal of mangroves in this area may fall completely under the auspices of CQPA. Should this project result in the removal of marine plants, then an application for the removal of marine plants under the *Fisheries Act 1994* will be required which will need to outline the impact of marine plant removal on the ecology of the area. Given that the mangroves adjacent to and possibly within the site are earmarked for removal by CQPA, it is considered that any additional disturbance to mangroves resulting from this project will not significantly contribute towards the already diminishing conditions of the mangrove stands.

5.7 Visual Amenity

The location of the plant on the project site will diminish to a degree the visual quality views from the road to this area (Connell Wagner 1992). The site is visible from Port Curtis Way and is the first major visible landform when travelling west from Gladstone, increasing the potential to reduce the visual amenity of the area.

Mature vegetation exists onsite and has the potential, if retained in strategic locations, to act as partial screen and buffer for visually sensitive receptors.

Surrounding land use for the site is industrial, with the adjacent land currently utilised by ORICA and the Comalco Alumina Refinery located further along Port Curtis Way. The AMC pilot plant is also located adjacent to the site, however, this plant is no longer operational.

5.8 Waste Management

The location for a purpose built RSF is currently being assessed by Connell Wagner. This conceptual investigation focuses on identifying a suitable RSF site for Stage 1 for a minimum 20 year period, but also considers the commissioning of Stage 2.

A general area has been identified in the GSDA for the location of the RSF. Further studies and investigations are required prior to selecting the exact location of the RSF. For Stage 1 there is adequate storage in the identified area of the GSDA and the focus for this IAS, and subsequent EIS, is residue storage for Stage 1 only. For Stage 2, additional waste disposal areas have been identified, however this will be subject to the future environmental approvals.

Current project planning is based on refining lateritic ore sourced locally from the Marlborough mine (Stage 1a) and imported ore subject to the development of Wiggins Island terminal (Stage 1b). Stage 1 is expected to generate approximately 8 million dry tonnes of Residue per annum (Mdt/a).

Residue generation rates and assumed characteristics for the first stage, as provided by Aker Kvaerner Australia Pty Ltd, are detailed in Table 5.1 below.

Table 5.1 Residue Design Parameters

Design Parameter	Stage 1 (Years 1 to 5)
Generation Rate (Mdt/ a)	7 - 9
Residue slurry density (% w/w)	40
Insitu Dry Density (t/m ³)	1.15

It should be noted that the insitu density figure above is an assumed value based on experience with similar operations and laboratory test work. These assumptions will be confirmed with the completion of a pilot trial to determine the characteristics of the residue produced from ore sourced from Marlborough and overseas.

A final site for the RSF will be selected prior to the EIS commencing and a detailed investigation of environmental impacts of the preferred site will be undertaken as part of the EIS process.

Earthworks associated with the construction of the RSF and residue pipeline have the potential to cause erosion and sediment transportation into waterways.

5.9 Traffic and Transport

The development will generate an increase in traffic to and from the site, during both construction and operational phases of the project. Port Curtis Way would therefore be more heavily trafficked than at present. The impact of this on the road has not yet been determined. A traffic study will be undertaken as part of the EIS process.

5.10 Cultural Heritage

Review of the Gladstone Industrial Land Study to date indicate that the likelihood of encountering items of Aboriginal cultural heritage is low. No items of European cultural heritage values are likely to be present on the site. A Cultural Heritage Investigation as part of the EIS, will be undertaken to confirm these findings.

As the site extends beyond the GSDA boundary, Cultural Heritage Studies and liaison with Traditional Owners will need to be undertaken to address cultural heritage issues that pertain to the portion of the site that lies outside the GSDA.

Procedures will be developed as part of the Cultural Heritage Management Plan to address cultural heritage onsite, and will establish protocols to be followed in the event that cultural sites or artefacts are discovered.

5.11 Socio-Economic

Approximately 70% of the world's nickel supply goes into stainless steel which is a "quality of life" material widely used in environmental and other applications (eg hospitals, food processing) requiring "cleanliness". GPNL has the potential to supply up to 10% of the world's new nickel demand from both (a) initially locally identified ore bodies at Marlborough, and (b) imported ores. The latter is the kind of "value adding" that is so important to the growth and maturing of the Australian and Queensland economies.

The socio-economic benefits of the project at the Local, State and National levels are significant with substantial economic opportunities at the local, regional and state levels both directly from the project and indirectly from the flow-on effects.

Benefits to Central Queensland and Australia

Stage 1a and 1b Construction Phase 2007 – 2009 at a cost of over USD1,565M (August 2003 est).

Direct Employment – Stage 1 Construction

- Gladstone Refinery approximately 1,000 jobs at height of construction phase.
- Marlborough Mine approximately 100 jobs at height of construction phase.
- Pipeline construction approximately 100 jobs.
- Additional related jobs of approximately 1,200 jobs.

Operational Phase

- Gladstone Refinery approximately 350 jobs
- Marlborough Mine approximately 50 jobs
- Additional related jobs of approximately 900 jobs

Export Value

- AUD550 million per year (Stage 1a) to AUD1,100 million per year (Stage 1b).

Scoping studies for the proponent are currently based on processing 6.8 Mdt/a of ore with annual production of approximately 64,400t nickel and 5,300t of cobalt. A further doubling of capacity is proposed for Stage 2.

Cash operating costs have been estimated in the scoping studies at approximately US\$1.90/lb Ni for the first full year of nickel production (before cobalt credits).

GNL direct expenditure and the expenditure of its employees and contractors during construction and operational phases will provide increased trade to local service, hospitality and other industries.

The export of nickel through the Port of Gladstone will provide export revenue for Australia, increased State revenue, additional employment opportunities, and will facilitate continued investment in the Central Queensland area.

The proposed HPAL Plant will generate additional employment in the Gladstone region, and also has the potential to generate demand for additional social infrastructure. Employment opportunities may also be generated in upstream and downstream manufacturing sectors in Central Queensland.

There are a number of industrial projects committed or planned for the Gladstone Region. Although the timing of some major projects is dependent upon feasibility assessments and planning approvals they have the potential to generate competition for labour and accommodation.

For district landholders and other activities, there are likely to be various impacts, both positive and negative. District landholders would likely benefit from certain infrastructure improvements related to the development, for example water supply, improved roads and improved telephone network.

There may be impacts for the village of Yarwun, as road and rail traffic past the village would increase. Generally these impacts have been considered as part of the establishment of the GSDA. With the planning for the GSDA in the last decade, there are also a limited number of residential properties in the vicinity of the GSDA that would be affected by the proposal.

5.12 Pipeline Route Impacts

Initially (Stage 1a) the processing plant will source ore supplies directly from a proposed nickel and cobalt laterite mine at Marlborough, approximately 175km north of Gladstone, via a dedicated ore slurry pipeline and, possibly, a seawater pipeline to supply water to Marlborough. An alternative pipeline route supplying seawater from Broom Head to Marlborough is to be investigated.

Engineering studies and a route selection investigation is currently being undertaken for the slurry pipeline from Marlborough to Gladstone. The final route will be decided prior to the EIS commencing, and the pipeline will be included in the EIS investigations.

However, from experience from other linear infrastructure development projects, the specific environmental issues that will need to be addressed with respect to the slurry pipeline from Marlborough to Gladstone include:

- **Vegetation Clearing** – An easement would be necessary for the entire length of the slurry pipeline. In addition, it is typically necessary to establish access tracks for both construction and maintenance during operation. Aside from loss of remnant species and habitat associated with the removal of the vegetation, issues such as vegetation edge effects, weed infestation and regrowth management all need to be considered as part of the planning for the pipeline.
- **Land Use Conflicts and Access** – The creation of a pipeline easement can lead to land use conflicts or access issues. Land use conflicts can be created by positioning an easement across land that has resource development potential or has been identified in a planning scheme as future urban development.
- **Weed Management** – Weed infestation can result in cleared areas or adjoining lands by weeds resulting from clearing and construction activities. Weed infestation is largely managed by avoiding environmental disturbance, limiting access to the easement or revegetating the easement with ground cover vegetation.

- **Cultural Heritage** – It is necessary to consult with and engage Traditional Owners to ensure that the development of a pipeline corridor occurs in a manner which does not impact on cultural heritage values.

Other environmental issues associated with the construction and operation of the slurry pipeline include:

- Water quality and hydrologic impacts;
- Noise during construction; and
- Air quality (dust and diesel emissions) during construction.

6. Environmental and Risk Management

6.1 Introduction

The Gladstone Nickel Project must ensure that all environmental safeguards are met. This will be achieved by the preparation of an Environmental Management Plan (EMP) as part of the EIS. This will be implemented as part of the construction contract and operational Environmental Management System (EMS).

Figure 4 provides a flow diagram of the environmental management process for the Gladstone Nickel Project. It outlines the order in which environmental documents are prepared through the planning, design, construction and operational stages of the project. Parties responsible for the creation and implementation of the various environmental documents are also provided in the attached figure.

6.2 Aim of the EMP

The potential exists during the construction and operation phases of this project for the degradation of the natural values of the site and surrounds. Planning is therefore necessary to ensure all reasonable measures are taken to protect the environmental values which may be impacted upon by the construction and operation activities and related infrastructure.

The purpose of an EMP is to detail the actions and procedures to be carried out during the implementation phase of the project in order to mitigate adverse, and enhance beneficial, environmental and social impacts. The EIS will identify the potential construction and operation effects of proceeding with the plant and recommend a range of impact mitigation measures to be implemented during the design, construction and operation stages of the project.

The EMP will address proposed environmental safeguards and control measures and establish the framework to ensure they are implemented. In effect, the EMP will become the key reference document in that it converts the undertakings and recommendations in the EIS into a set of actions and commitments to be followed by designers, constructors and operators.

The EMP will serve as the framework for measuring the effectiveness of environmental protection and management. This is achieved by specifying the monitoring, reporting and auditing requirements, including responsibilities, timing and format in order to meet the necessary performance criteria. The EMP also makes provision, as appropriate, for unforeseen events by outlining corrective actions which may be implemented in these situations. The EMP will be written as a stand alone document, so that it may be extracted from the main body of the EIS.

6.3 Construction Environmental Management Plan

An important requirement for projects of this nature is to prepare a Construction Environmental Management Plan (CEMP) to ensure the environmental safeguards proposed as a result of the planning and environmental assessments associated with the project are enacted in an appropriate and timely fashion.

Design and construction measures/strategies will ensure that all reasonable measures are taken to protect the environmental values which may otherwise be impacted during construction activities associated with the proposed expansion.

The CEMP details the performance objectives, actions and procedures to be carried out during the construction phase of the project to minimise potential environmental impacts. The CEMP defines the environmental issues of the proposed development by addressing the following:

- The environmental policies of Gladstone Pacific Nickel Limited and the Construction Contractor;
- Environmental responsibilities;
- Environmental site induction;

- Environmental monitoring;
- Environmental reporting;
- Environmental incidents/complaints;
- Environmental audits; and
- A management plan for each environmental element.

With the effective implementation of the developed CEMP during the construction phase and the EMP during operation, it is expected that environmental risks can be managed to meet all legislative requirements and stakeholder's expectations.

6.4 Hazard, Risk and Health and Safety Issues

There will be a number of hazards and associated risks with both the construction and operation of the refinery and associated plant. A hazard is a source, or a situation with a potential for harm in terms of:

- Human injury or ill health;
- Damage to property;
- Damage to the environment; or
- A combination of these.

A risk is the likelihood and consequence of an injury or harm occurring as a result of a hazard. Risk management is the systematic application of management policies, procedures and practices to the tasks of establishing the context, identifying, analysing, assessing, controlling and monitoring risk.

To enable effective risk management, some form of formal risk assessment is required to identify the risks associated with the construction and operation of the plant. The formal risk assessment process follows the methodology outlined in *AS4360: Risk Assessment*. This process is based on:

- Establishing the context;
- Identifying the risks;
- Analysis of the risks;
- Evaluating the risks; and
- Treating the risks.

At various stages of the project, formal risk assessments will be conducted to ensure that effective risk management of all risks (including health and safety risks) occurs during both the construction and operation phases of the project.

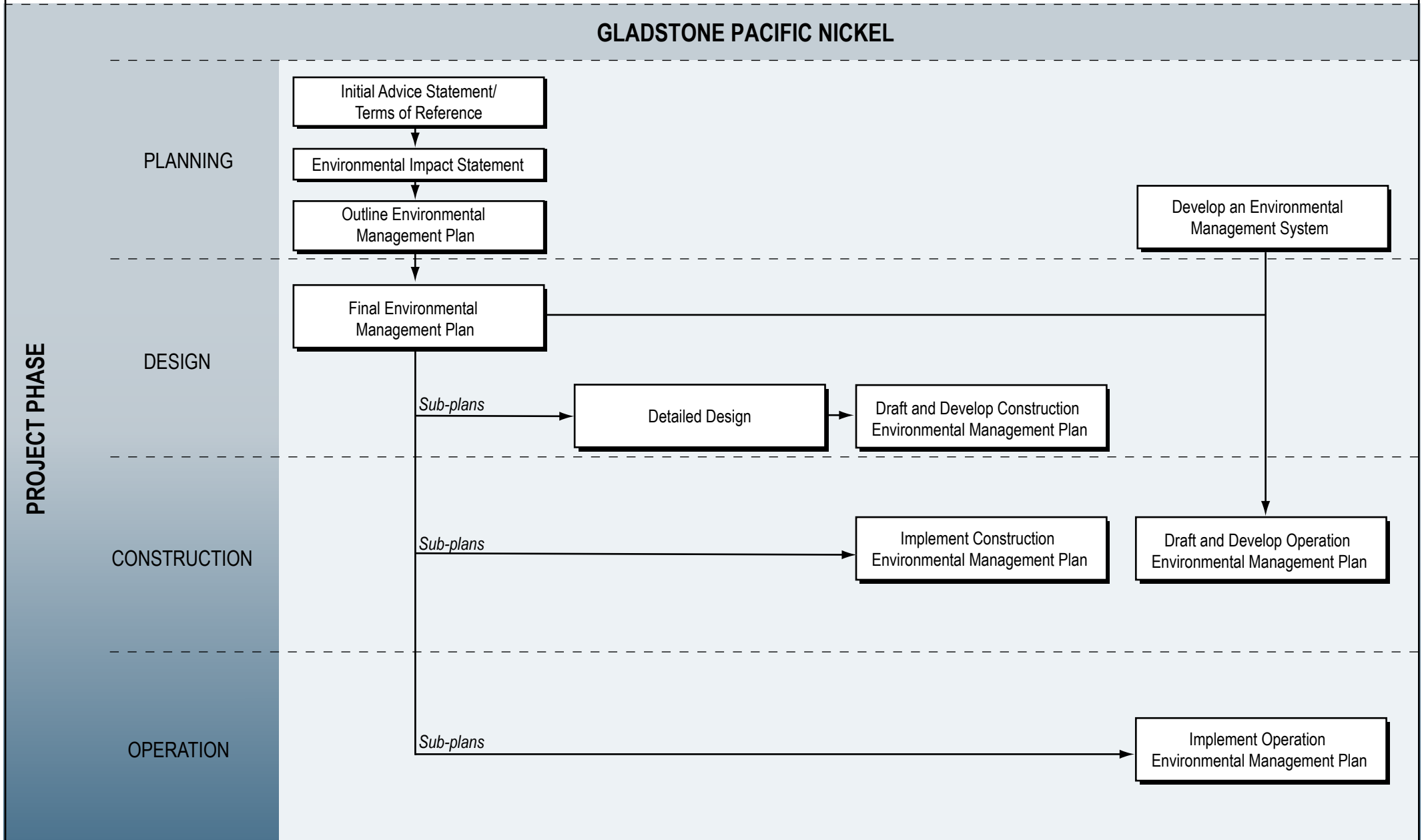
6.5 Decommissioning

It is not expected that this project site will require decommissioning prior to the end of Stage 2, and a decommissioning strategy and closure plan will be developed as part of the plant operation management system when appropriate.

However, if the site required earlier decommissioning, the site would be rehabilitated and returned to a similar environment that existed prior to the construction of the plant, unless another industrial land use can be found for the site.

Figure 4

Environmental Management of Gladstone Nickel Refinery



7. Environmental and Planning Approval Process

7.1 Overview

This section describes the project approval framework and the relevant legislation to be addressed by the proposed plant, and considers the project within a broader project development process.

Given the nature, scale and location of the proposed plant, and the potential impact on Port Curtis, which is adjacent to the Great Barrier Reef Marine Park, there will be a need for various approvals from Commonwealth, State and Local government.

In addition, a referral to the Department of Environment and Heritage (DEH) has been made under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for a determination on the Controlled Action status of the project. The outcome of the referral decision by DEH was that the proposed action is a Controlled Action.

Further details regarding the approvals required for the project are provided below.

7.2 Commonwealth Approvals

Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides the primary environmental assessment and approval legislative framework for the Commonwealth Government. The EPBC Act establishes the requirement for the approval by the Commonwealth for actions which have, will have or are likely to have a significant impact on matters of national significance.

The current list of matters of national environmental significance are:

- The world heritage values of a declared World Heritage property;
- The ecological character of a declared Ramsar wetland;
- Listed threatened species and ecological communities;
- Listed migratory species;
- Nuclear actions; and
- Commonwealth marine areas.

The site lies within the Calliope River catchment, which drains into Port Curtis Bay and adjoining GBRWHA. It is also expected that the plant will discharge barren liquor to Port Curtis, which is within the Marine Park boundary.

The project has been determined as a Controlled Action and the controlling provisions are as follows:

- Sections 12 and 15A (World Heritage);
- Sections 18 and 18A (Listed threatened species and communities); and
- Sections 20 and 20A (Listed migratory species).

Quarantine Act 1908

For shipments of imported ore, approval will be required under the Commonwealth *Quarantine Act 1908*.

7.3 State Approvals

A number of State approvals will be required to facilitate the construction and operation of the proposed plant. The key legislative approvals include:

- *State Development and Public Works Organisation Act 1971*;
- *Integrated Planning Act 1997*; and
- *Environmental Protection Act 1994*.

These legislative requirements are summarised below.

State Development and Public Works Organisation Act 1971

Gladstone Pacific Nickel Limited is seeking declaration of the proposed plant as a "Significant Project" under the *State Development and Public Works Organisation Act 1971* (SDPWO Act). A Memorandum of Understanding has been signed between the Department of State Development and Innovation and Gladstone Pacific Nickel Limited, to facilitate Government assessment and support for the Gladstone Nickel Project and ancillary developments.

The SDPWO Act establishes the framework for environmental assessment of major projects in Queensland, identifying the EIS process and its relationship with the *Integrated Planning Act 1997* (IPA).

As required by the SDPWO Act, a Development Scheme has been prepared to manage the development of the GSDA. The Development Scheme applies to the land use approval being for a Material Change of Use (MCU) of premises as usually required under IPA. The application for MCU will be accompanied by the EIS

The Development Scheme provides for a transparent and streamlined approval process with stated objectives and guidelines for land use. Under this framework there are:

- Requirements for public notification of applications and referral to government agencies;
- Processes to avoid duplication in handling applications;
- Procedures to ensure that referrals proceed within acceptable timeframes; and
- Requirements for liaison with local governments.

Matters to be addressed in an EIS prepared pursuant to the SDPWO Act are detailed in Schedule 1 of the *State Development and Public Works Organisation Regulation 1999*.

The EIS process includes provision for:

- Public notification and development of the EIS Terms of Reference (ToR);
- Public notification of the EIS which must address the matters detailed in the ToR;
- Consideration and review of public submissions on the EIS; and
- The evaluation of the EIS and public submissions, and the preparation of an Evaluation Report by the Coordinator-General (CoG).

The EIS process under the SDPWO Act replaces the Information and Referral Stage, and the Notification Stage under IPA (refer below).

Integrated Planning Act 1997

IPA is Queensland's principal planning legislation. It establishes a framework assessing new developments through a development approval system known as the Integrated Development Assessment System (IDAS).

As discussed above, the SDPWO Act EIS process replaces the Information and Referral Stage, and the Notification Stage of the IDAS process under IPA. At the completion of the EIS process, the CoG

Report will be taken as being a Concurrence Agency response under IPA and will be provided to the Assessment Manager to issue a Decision Notice.

Environmental Protection Act 1994

The *Environmental Protection Act 1994* (EP Act) provides a licensing and approval regime for a range of Environmentally Relevant Activities (ERAs). A range of ERAs will be carried out during the construction and operation of the proposed plant.

Approval for these ERAs will take the form of Development Approvals granted under IPA and Registration Certificates granted under the EP Act.

7.4 Other State Approvals

It will be necessary to secure a range of other State approvals in order to progress the project to construction and ultimately operation. These approvals will be fully identified and confirmed as part of the EIS process, however, it is likely those provided in Table 7.1 may be required

Table 7.1 State Approvals

Legislation	Department	Trigger	Permit/Licence
<i>Aboriginal Cultural Heritage Act 2003</i>	Department of Natural Resources and Mines (DNRM)	Duty of care to take all reasonable and practicable measures not to harm Aboriginal cultural heritage (Section 23)	Cultural Heritage Management Plan required.
<i>Coastal Protection and Management Act 1995</i>	Environmental Protection Agency (EPA)	Various triggers including Operational Works in tidal waters	Development Permit for Operational Works required.
<i>Explosives Act 1999</i>	DNRM	Possession, storage and use of explosives	
<i>Fisheries Act 1994</i>	Department of Primary Industry and Fisheries	Removal of marine plants	Fisheries Development Approval required.
<i>Water Act 2000</i>	DNRM/EPA	Vegetation removal, excavation and/or filling in a "watercourse", Residue Storage Facility Construction and stream diversion.	Riverine Protection Permit, Referable Dam and Stream Diversion Permit.

8. Community Consultation

8.1 Preliminary Consultation

Gladstone Pacific Nickel Limited has ensured that key government agencies have been involved in initial discussions and briefing sessions with respect to the proposed plant. To date, the following key agencies have been consulted:

- Queensland Department of State Development and Innovation;
- Queensland Environmental Protection Agency;
- Central Queensland Ports Authority;
- Queensland Department of Main Roads;
- Queensland Department of Natural Resources and Mines;
- Queensland Rail;
- Rockhampton City Council;
- Livingstone Shire Council;
- Fitzroy Shire Council;
- Gladstone City Council;
- Calliope Shire Council;
- Gladstone Area Water Board;
- Fitzroy Water Board;
- Sunwater; and
- Gladstone Economic and Industry Development Board.

Consultation with a range of government agencies will continue throughout the EIS process so as to ensure that all the issues are addressed as required.

Also a comprehensive communication strategy will be developed which will be aimed at ensuring that the public and stakeholders are kept abreast of the project's development.

9. Glossary

AIM	London Stock Exchange's "Alternative Investment Market"
AKA	Aker Kvaerner Australia
ASS	Acid Sulphate Soils
CCD	Counter Current Decantation
CEMP	Construction Environment Management Plan
CoG	Coordinator-General
CQPA	Central Queensland Port Authority
dt/a	Dry tonnes per annum
DEH	Department of Environment and Heritage
DFS	Definitive Feasibility Study
DMR	Queensland Department of Main Roads
DNR&M	Queensland Department of Natural Resources and Mines
DSDI	Queensland Department of State Development and Innovation
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Environmental Management System
EPAct	<i>Environment Protection Act 1994</i> (QLD)
EPBC	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cth)
ERA	Environmentally Relevant Activity
GBRWHA	Great Barrier Reef World Heritage Area
GL/a	Gigalitres per annum
GNP	Gladstone Nickel Project
GPNL	Gladstone Pacific Nickel Ltd
GSDA	Gladstone State Development Area
HMS	High Magnesium Saprolite ore
HP	High Pressure
HPAL	High Pressure Acid Leach
IDAS	Integrated Development Assessment System
IPA	<i>Integrated Planning Act 1997</i> (Qld)
LMS	Low Magnesium Saprolite ore
LP	Low Pressure
Mdt/a	Mega dry tonnes per annum
MCC	Motor Control Centre
PJ/a	Petajoules per annum
PMG	Pearce Matheson Group
PFS	Preliminary Feasibility Study
ROM	Run of Mine
SDPWO	<i>State Development and Public Works Organisation Act 1971</i> (QLD)
SX	Solvent Extraction
t/a	tonnes per annum
TOR	Terms of Reference
RSF	Residue Storage Facility

10. References

Aker Kvaerner, August 2004, *Gladstone Nickel Project – New Stage 1 Scoping Study Report*.

AME Consulting, March 2005, *AME Report – The Outlook for Nickel and Cobalt*.

Brown & Root, 2000, *Gladstone State Development Area – Waste Management Study*, for Department of State Development.

Connell Wagner, May 2005, *Gladstone Pacific Nickel Limited, Residue Storage Facility Conceptual Site Selection Assessment Report*, Gladstone Pacific Nickel Project.

Connell Wagner, October 2002, *Aldoga Aluminium Smelter, Environmental Impact Statement*, Aldoga Aluminium Smelter Project.

Connell Wagner, 1992, *Gladstone Industrial Land Study Consortium – Consolidated Data Analysis Report*, for Office of the Coordinator General – Queensland Government.

Connell Wagner, 1994, *Gladstone Industrial Land Study – Final Report Stage 4*, for Office for Coordinator General – Queensland Government.

Dames & Moore Pty Ltd, May 1998, *Comalco Alumina Project Gladstone – Impact Assessment Study Environmental Impact Assessment*, Comalco Alumina Project.

Department of Economic and Industry Development Board (GEIDB), 2000, *GSDA 21 – The Strategy for the Development and Management of the Gladstone State Development Area 2000-2003*.

Gladstone Pacific Nickel Ltd, Placing and Admission to AIM.

Gladstone Area Promotion and Development Limited, January 2005, *The Gladstone Region Overview*.