

Introduction

Gladstone Pacific Nickel Ltd (ACN 104 261 887) (GPNL) is proposing to build and operate a nickel/cobalt refinery. The project, known as the Gladstone Nickel Project (GNP) consists of a high pressure acid leach (HPAL) plant and metals plant (collectively called the refinery) with supporting facilities to be located at Gladstone, Queensland (refer Figure ES.1).

The refinery site will be approximately 8 km west of the Gladstone central business district, and will be located at the intersection of Hanson and Reid Roads in the Yarwun Precinct of the Queensland Government Gladstone State Development Area (GSDA).

The refinery will process ores from a nickel laterite mine near Marlborough, approximately 180 km north-west of Gladstone, together with nickel laterite ores imported from the south-west Pacific region. The ores from Marlborough will be beneficiated at a plant adjacent to the mine site at Coorumburra and then pumped as a slurry through a pipeline to the refinery. Residue from the refinery will be pumped to a residue storage facility (RSF) located in the Aldoga Precinct of the GSDA and approximately 15 km south-west of the refinery site.

The locations of the key project components are shown on Figure ES.2.

The HPAL process selected for the refinery has lower greenhouse gas emissions per unit of product compared to other process alternatives. The lower emissions are achieved because the bulk of the power and steam requirements for the refinery's operation are raised from the exothermic reaction of burning sulphur to manufacture sulphuric acid (the leaching reagent).

The use of seawater as process water in the HPAL plant reduces the project's fresh water requirements and simultaneously increases the productivity of the project.

The refinery will add value to Australian and imported ores by producing nickel and cobalt metal which will be exported to the growing world market, primarily to meet the increasing demand for stainless steel. This Environmental Impact Statement (EIS) has been prepared to identify the environmental effects of the GNP.

Project Proponent

GPNL was formed in 2003 as Pearce Matheson Group Pty Ltd (PMG), an Australian private limited company, to pursue the development of the GNP. PMG acquired Marlborough Nickel Pty Ltd (MNPL) from Preston Resources Limited in December 2003. MNPL owns 12 mining leases with associated environmental approvals (MIM 800078102). MNPL is a wholly owned subsidiary of GPNL. GPNL was listed on the London Stock Exchange's Alternative Investment Market (AIM) in March 2005.

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EIS Scope

The refinery will initially be developed in two stages – 1 and 2. It is anticipated that Stage 1 will produce up to 60,000 t/y of nickel metal and 4,800 t/y of cobalt metal. Stage 2 will produce up to 126,000 t/y of nickel metal and 10,400 t/y of cobalt metal. This EIS addresses both stages, but not an anticipated further stage (Stage 3), which would essentially double the output of Stage 2.



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Client Gladstone Pacific Nickel Ltd	Project GLADSTONE NICKEL PROJECT ENVIRONMENTAL IMPACT STATEMENT	Title REGIONAL LOCALITY			
	Drawn: VH	Approved: CMP	Date: 24-01-07	Figure: ES.1	Rev: B
	Job No: 4262 5791	File No: 42625791-g-017.wor			



Client
**Gladstone
Pacific Nickel Ltd**

Client

Drawn: VH
Job No.: **4262 5791**
Approved: CMP
File No.: 42625791-g-118.wor
Date: 24-01-07

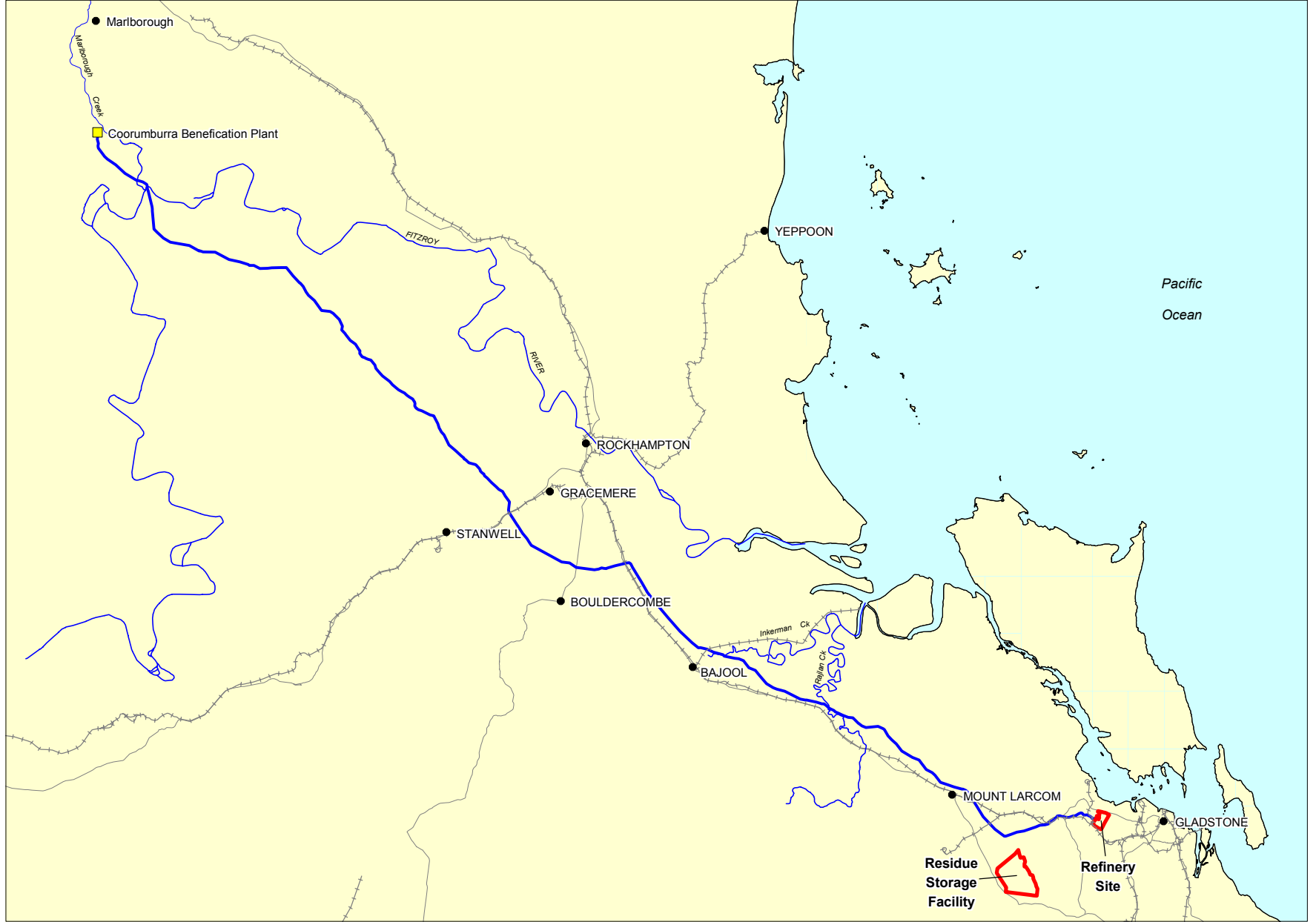
Project

**GLADSTONE NICKEL PROJECT
ENVIRONMENTAL IMPACT STATEMENT**

Title



Figure: **ES.2**

SLURRY PIPELINE ROUTE



0 12.5 25km

Scale 1:750,000 (A4)
MGA Z56, GDA94

-  Proposed Development Footprint (Refinery and RSF)
-  Slurry Pipeline

Rev: B
A4

The project components covered in the EIS comprise:

- The refinery.
- The RSF.
- Slurry and seawater pipelines between the Marlborough mine and the refinery.
- Residue and return liquor pipelines between the refinery and the RSF.
- Material handling facilities at the Gladstone port.
- Associated infrastructure.

Project components located in the Marlborough mine project area have already received a separate environmental approval (MIM 800078102) and do not form part of the scope of this EIS.

EIS Process

An Initial Advice Statement (IAS) for the project was lodged with the Queensland Government's Coordinator-General (CG) on 21 October 2005. On 10 November 2005, the CG determined that the GNP is a "Significant Project" in accordance with the requirements of Section 26 of the *State Development and Public Works Organisation Act 1971* (SDPWO Act).

A draft Terms of Reference (ToR) for the EIS was prepared and advertised for public comment on 14 January 2006 and issued for a period of four weeks. All relevant commonwealth, state and local government agencies and authorities were also invited to participate in the process as advisory agencies. The final ToR was released by the CG in March 2006.

The impact assessment process under the SDPWO Act is the subject of a bilateral agreement between the Queensland and Commonwealth Governments in relation to environmental assessment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). GPNL referred the project to the Commonwealth Minister for the Environment and Heritage (Department of the Environment and Heritage – DEH) in accordance with the provisions of the EPBC Act. The DEH declared that the project was a "controlled action" pursuant to Section 75 of the EPBC Act on 18 November 2005. The bilateral agreement recognises that the Queensland EIS process under the SDPWO Act fulfils the EIS requirements for "controlled actions" under the EPBC Act.

This EIS has been prepared under the provisions of the SDPWO Act and in accordance with the final ToR for the project.

A public notice has been placed in relevant local and state newspapers advising where copies of the EIS are available for inspection or purchase; that submissions may be made to the CG about the EIS; and the timeframe for the submission period. All submissions should be typed on A4 paper and not require colour for interpretation. Submissions should be sent to:

The Coordinator-General
Attention: EIS Project Manager
Gladstone Nickel Project
Major Projects
Department of Infrastructure
PO Box 15009
CITY EAST Qld 4002
Tel: (07) 3405 6205 Fax: (07) 3225 8282

Any submissions received by the close of the public review period will be addressed in an EIS Supplement, which will be prepared by GPNL and submitted to the CG. Upon receipt of the EIS Supplement and following any further discussions of unresolved issues, the CG will prepare an assessment report on the project.

Following this, the Commonwealth Minister for the Environment and Heritage will also make a decision on the project in accordance with the requirements of the EPBC Act.

Proposed Project

GPNL's vision is to build a major long-life nickel/cobalt refinery at Gladstone within the GSDA. The refinery will produce metal products for export to the global nickel market, which is expanding primarily due to growth in demand for stainless steel. Stainless steel has a number of properties, including corrosion resistance, high-temperature stability, strength, ductility and recyclability that support its sustainable use and generally result in high service life and reduced life cycle impacts compared to other alternative materials. The GNP is aimed at assisting in filling the widening gap between existing global nickel metal production and worldwide demand.

The refinery will treat high grade nickel laterite ores from around the south-west Pacific, underpinned by beneficiated ores from its own Marlborough deposits, and will produce valuable nickel and cobalt metal products, resulting in a positive effect on Australia's balance of trade. At the completion of Stages 1 and 2, the refinery will have the capacity to produce 8-10% of global nickel demand. Refer to Table ES.1 for details of the Stage 2 operating parameters.

The project will comprise a modern nickel/cobalt laterite mine at Marlborough, with beneficiated ore being pumped as a slurry through a 180 km pipeline to a fourth generation HPAL refinery sited in the Yarwun Precinct of the GSDA. The refinery incorporates a leach plant to produce an intermediate product, a metals plant for the production of pure nickel and cobalt metal products, and associated infrastructure and services. In addition to slurried ore from Marlborough, nickel ore (and sulphur) will be imported through the Wiggins Island Wharfs (WIW) to be developed at Wiggins Island, Gladstone by the Central Queensland Ports Authority (CQPA) as part of its proposed Wiggins Island Coal Terminal (WICT) project. If the WIW does not proceed or is delayed, nickel ore and sulphur can be imported through the existing port facilities at Fisherman's Landing.

The refinery will utilise the HPAL process, which treats nickel laterite ores by contact with sulphuric acid at high temperatures and pressures, resulting in the leaching of nickel and cobalt into solution. This process is successful in extracting high levels of nickel and cobalt whilst minimising the extraction of iron and aluminium (contaminants of metal products). The HPAL process has low greenhouse gas emissions per unit of product compared to other process alternatives because of the non-carbon derived energy that is produced and harnessed from the manufacture of sulphuric acid. The nickel/cobalt leach liquor is recovered and processed to produce high purity nickel and cobalt metal.

The refinery's products, refined nickel and cobalt metal, will be containerised and transported by rail to a container shipping terminal in Brisbane and then exported.

Ammonium sulphate, produced as a by-product, will be exported through the port facilities at Fisherman's Landing.

Residue from the refinery will be piped to the RSF to be constructed in the Aldoga Precinct of the GSDA.

Seawater extracted from Port Curtis will be used as cooling water in the process instead of fresh water. It will be returned to Port Curtis via diffusers near the Clinton Wharf at the RG Tanna Coal Terminal. Barren liquor from the process will be mixed with the return seawater and also discharged via the diffusers.

It is proposed to start construction of Stage 1 in early 2008. Construction is expected to take approximately 2.5 years with the commissioning of Stage 1 operations beginning in mid-2010. Depending on market demand, Stage 2 construction could begin in 2013 with Stage 2 operations starting in 2015.

Table ES.1 Stage 2 Operating Parameters

Process Input/Output	Stage 2
Products	
Nickel product (t/y)	126,000
Cobalt product (t/y)	10,400
Ammonium sulphate by-product (t/y)	343,000
Process Inputs	

Table ES.1 Stage 2 Operating Parameters

Process Input/Output	Stage 2
Imported Ore (Mdt/y)	8 -10
Marlborough Ore (Mdt/y)	1 - 4
Sulphur (Mt/y)	1.1
Limestone (Mt/y)	1.43
Raw water (GL/y)	10.5
Seawater (GL/y)	240
Natural gas (PJ/y)	4
Wastes	
Residue (Mdt/y)	10.8
Waste process water (GL/y)	27

Alternatives

Sites

Gladstone has been selected as the preferred site for the refinery because of the availability of suitable port and infrastructure facilities, ready access to utilities (power, gas, seawater), the availability of adequate land for residue storage, and the local skilled workforce. Several sites were investigated within the Gladstone region. Yarwun was preferred primarily due to its proximity to suitable wharf facilities for importing ore and sulphur.

A number of alternative sites within the GSDA were assessed for the location of the RSF. Environmental differences between the alternative sites were marginal, but vegetation clearing requirements will be relatively low for the selected site compared to other alternatives.

Ore Delivery

GPNL has considered the alternatives of slurry pipeline and rail for transporting ore from Marlborough to the refinery at Yarwun. The pipeline alternative is currently preferred due to the:

- Reduced potential for noise and visual impacts during operations.
- Lower energy requirements.
- Possibility that the pipeline may be installed over parts of the route in a State government multi-user pipeline corridor, reducing the disturbance footprint outside of the multi-user pipeline corridor.

However, a slurry pipeline requires additional water supply and plant infrastructure and has less flexibility in ore feed rates to the refinery (compared with rail transport). Hence, additional evaluation will be undertaken during the detailed design phase of the GNP to confirm the suitability of using a pipeline rather than rail. Adequate space has been provided in the refinery layout for a rail siding and dump station to keep the rail option open, should that be the preferred initial option for Stage 1.

A number of alternatives were considered for the pipeline route between the Marlborough mine and the refinery. The route identified as best meeting the route selection criteria (environmental, land use, land tenure, and engineering) was selected. The Queensland Government is currently considering the development of a multi-user pipeline corridor between the GSDA and the Stanwell Energy Park (SEP) west of Rockhampton. To minimise environmental disturbance and impacts to landholders along the pipelines route, GPNL would prefer to use this multi-user corridor if it proceeds, where suitable, and provided its timing does not constrain the GNP schedule.

GPNL has considered three CQPA alternative locations in Gladstone for importing ore and sulphur; Fisherman's Landing, RG Tanna Coal Terminal, and the proposed WIW. WIW is the preferred option due to the ability to use conveyors to transport ore and sulphur from the port to the refinery thus minimising disturbance created by possible haul roads and associated road traffic impacts, which may be the case for the other alternatives.

Process

The HPAL process selected for the refinery requires less energy per tonne of metal produced than alternative process routes, and hence emission of greenhouse gases per tonne of metal product is also lower than other alternative processes.

Barren liquor is process liquor originating from seawater that is unable to be reused in the refinery process (also referred to in the EIS as "return liquor" as it is returned to the refinery from the RSF). A number of alternatives for managing barren liquor have been investigated including disposal to Port Curtis, evaporation, additional neutralisation with lime or alumina refinery residues, and further treatment. The preferred method is treatment to ensure that barren liquor discharged will meet environmental objectives for disposal to Port Curtis.

Several types of residue storage facilities were considered with the preferred option selected providing the following favourable features:

- Pre-thickening of residue slurry prior to discharge into the impoundment, reducing the volume of residue to be stored and the potential impacts from any seepage.
- Placement of residue in discrete areas in shallow layers (beaching) to assist in draining retained liquid to a low elevation point for recovery.
- "Mud farming" to accelerate the residue dewatering process and evaporation, and increase residue consolidation.
- Use of residue material for internal RSF wall construction for upstream raising, reducing the disturbance to other areas for provision of construction materials.

Both upstream embankment raising and downstream embankment raisings have been considered for increasing the storage capacity of the RSF. The preferred method is upstream embankment raising because it provides greater storage efficiency, uses fewer resources and does not increase the footprint of the RSF.

Water

The existing environmental approval for development at the Marlborough mining leases includes the use of water from the Fitzroy River for process use. However, GPNL realises that fresh water in the region is becoming an increasingly valued commodity by the community and other industry users, and so it has trialled the use of saline water for the most water intensive part of the process. It found that process efficiencies in the HPAL process improved when using saline water, which resulted in a significant reduction in the demand for fresh water resources in the region. Seawater from Port Curtis is currently the preferred option for the supply of saline water. However, GPNL will undertake further investigations at the detailed design stage to confirm the optimum water supply source.

Construction

GPNL is considering the off-site construction of major plant components into pre-assembled modules (PAMs). This would shorten the construction schedule of the refinery and simultaneously reduce construction housing requirements. However, a port facility for importing large plant modules is not currently available in Gladstone. GPNL is consulting with government and industry in regard to a common-user port facility for large modules. Should such a facility be available in time for the GNP development, GPNL will apply this approach for plant construction.

Public Consultation

Consultation with advisory agencies, members of the public, and other stakeholders has formed an integral part of the EIS process and will continue to be an integral part of project development. The community consultation process continues to ensure clear, transparent, two-way communication between GPNL and the interested and affected stakeholders through listening, recording and responding to issues relating to the project as these arise. The process

provides an opportunity for GPNL to impart information to the stakeholders regarding the project, to obtain valuable local knowledge from these groups and to respond to concerns through appropriate action. It provides stakeholders with an opportunity to express their views and concerns, provide feedback, and be involved in the EIS process.

A comprehensive consultation program was successfully conducted throughout the EIS process and will continue during project implementation. A variety of communication tools and activities were used to inform and receive feedback including meetings, newsletters, presentations, a freecall number and website. The issues identified in, and outcomes of, the consultation programs have been recorded and fed back into the EIS process.

Project Potential Impacts

Solid Wastes

Process residue will be the main solid waste generated from the refining process. It will comprise the solids remaining after the nickel and cobalt have been extracted from the nickel laterite ore and the process liquors have been neutralised. Approximately 5.4 Mt/y of residue will be generated from the Stage 1 refinery and double this amount in Stage 2.

The residue will be stored in an engineered RSF designed specifically for the long-term storage of refinery residue. Residue will be deposited in the RSF as a high density slurry. Some of the liquor discharged in the slurry will separate from the solid phase. The surface liquor will be pumped back to the refinery and the solids will further settle and consolidate. At the end of its operating life, the RSF will be rehabilitated to form a self-sustaining land surface.

The residue will be non-acid forming and will comply with Environmental Protection Agency (EPA) assessment criteria for solids for dams containing hazardous waste (EPA, 2006). Initial testwork on a liquor sample taken during the laboratory test program evaluating Marlborough ores indicates that the concentration of soluble metals in the supernatant liquor will be within applied guideline criteria except for nickel, sulphate and chlorine. However, a detailed mass balance indicates that the concentration of metals in the RSF liquor, in practice, will be significantly lower than the sample on which the EIS geochemical results were based. Testing of a more representative sample of residue material will be undertaken in the near future to confirm the expected lower metals concentrations. The liquor will be returned to the refinery for reuse with excess being mixed with the cooling water discharge to Port Curtis.

The other solid wastes generated by the refinery will be relatively minor. These will include scale and grit (to be disposed of at the RSF) and sulphur filter rejects and spent catalyst, which will be disposed of by a licensed contractor, with options for reuse being considered. General solid wastes that are not recycled will be disposed of at a suitable local licensed landfill. GPNL is considering potential waste synergies with other industrial operations in the area to reduce potential impacts from wastes.

Liquid Wastes

Where practicable, liquid wastes will be recovered and reused within the refinery. This will be achieved through the provision of bunded areas surrounding refinery processing areas. Sumps and permanently mounted sump pumps and discharge piping will be utilised to re-circulate liquid wastes into the process and enable maximum recovery of metals and reagents and minimisation of liquid wastes for disposal.

The major liquid waste streams generated by the GNP during operations, which are not reusable due to process constraints, are return liquor from the RSF in excess of refinery needs, seawater used for cooling purposes, cooling water and boiler blowdowns and sewage. The cooling water and return liquor will be combined and discharged to Port Curtis via a diffuser system near the Clinton Wharf at the RG Tanna Coal Terminal. The remaining waste streams including blowdowns and reject water from the water treatment plant are minor in comparison and will be discharged to the RSF with process residue. Sewage will be sent to the Calliope Shire sewage treatment plant.

Transport

Construction loads to the project sites will generally be delivered by truck. Construction and operational workers will travel to work by either car or bus. Minor consumables will be delivered to the refinery by truck. However, the

major inputs of ore and sulphur will be delivered by pipeline and/or conveyor (from port) and the product (nickel and cobalt metal) will be transported by rail. Ammonium sulphate produced as a by-product will be transported to the port by truck.

Vehicular access to the site will be via Reid Road. Separate light vehicle and heavy vehicle access points will be provided.

A traffic analysis was undertaken to assess the impact of the project traffic on the local road network. This analysis determined the following:

- Hanson Road will require the addition of overtaking lanes in the section between Reid Road and Blain Drive by 2009.
- Three intersections will require upgrading earlier than otherwise would be the case to accommodate the additional refinery traffic. The intersection of Hanson Road and Reid Road requires upgrading to a roundabout (required by 2009), the intersection of Dawson Highway/Blain Drive/Herbertson Street will require upgrading to signals (required by 2014), and the intersection of Hanson Road/Blain Drive/Alf O'Rourke Drive will require a two-lane roundabout (required by 2009).
- The project's effect on timing of pavement rehabilitation works is less than a one-year bring forward and is not significant.
- The project's effect on routine maintenance of the state-controlled road network has been calculated as varying from 0.7% to 3.8 % per year based on the increase in equivalent standard axles for each of the various road segments assessed.
- The traffic attributed to pipelines construction will have no significant impact (< 5%) on road pavements.

GPNL will enter into an infrastructure agreement with the Department of Main Roads (DMR) and relevant councils to allocate responsibilities for works within the road network.

Terrain and Soils

The assessment of terrain and soils at the project sites found that:

- Erosion of soils due to rainfall and runoff may occur as a result of the clearing of existing vegetation and the removal of topsoil. Adherence to the drainage and erosion control measures outlined in the environmental management plan will reduce the risk of off-site erosion effects.
- Acid sulphate soils (ASS) are not expected at the RSF or the majority of the refinery site, as these areas are above RL 5 mAHD. Any potential disturbance to ASS in the lower-lying sections of the refinery site will be low as most of the construction will be in areas of fill placed above the in-situ soils. If, during detailed design, it is identified that construction activities are likely to intersect potential acid sulphate soil environments, a comprehensive ASS management program will be implemented. Some of the pipelines' creek-crossing locations are also potential areas for ASS. In these areas which are below RL 5 mAHD, ASS surveys will be undertaken and, where necessary, a comprehensive ASS management program will be implemented.
- Given the land uses identified by the site history review and subsequent site inspections, it is unlikely that activities with significant contamination potential have occurred on the project sites. Nevertheless, a soil contamination management plan has been developed and will be implemented to reduce the risk of land contamination.
- There will be a shortfall between the amount of topsoil available on site and the amount required for final rehabilitation of the RSF. The additional volume of topsoil required will be imported when the RSF is closed.

Surface Water Management

Implementation of the mitigation strategies outlined in the construction phase surface water management plan will ensure that potential impacts to surface water systems during the construction phase through alterations to surface water flows, erosion and possible spills of fuels etc., are managed.

Operational phase impacts on surface water will occur primarily through changes to drainage patterns/catchment boundaries, changes to catchment surfaces, potential contaminants in stormwater runoff and possible overflows

from runoff ponds in prolonged wet weather. To address these impacts, the refinery's stormwater management system will divide the site into the following areas:

- Maintenance, process and general chemical storage areas.
- Oily water drainage areas.
- Stockpile areas.
- General refinery areas.
- Undisturbed ('clean') areas.

Each of these catchments has a different potential to generate contaminated runoff. Catchment-specific management strategies will be implemented to ensure that contaminated runoff is not discharged to the natural drainage system.

The GNP pipelines are not expected to have any significant surface water impacts although special care will be taken to minimise temporary construction impacts. The highest risk areas will be at creek/river crossings which will be crossed by trenching, boring, or horizontal directional drilling methods. The preferred method will be determined during the detailed design phase and based on relevant site conditions. It is expected that most crossings will be constructed by trenching. However, horizontal directional drilling techniques have been identified as likely at a number of significant watercourses including the Fitzroy River, Neerkol Creek, Raglan Creek and Inkerman Creek. Once the crossing method has been selected, detailed crossing plans and procedures will be developed. During this phase, GPNL will liaise with the relevant regulatory agencies with respect to the design of the crossing and obtaining the relevant permits and approvals.

Marine Environment

The hydrodynamic and flushing characteristics of Port Curtis have been modelled to enable the effects of the refinery discharge to be determined. Two models were developed – one to look at near-field effects in the vicinity of Clinton Wharf (the proposed discharge location) and the other to look at the far-field effects throughout the whole of Port Curtis.

Discharge via diffusers near Clinton Wharf was selected over WIW for several reasons including:

- Far-field modelling indicated that contaminants disperse more effectively from Clinton Wharf due to fast running tidal currents. Main channel flows assist in the removal of the discharge from Port Curtis.
- Near-field areas at Clinton Wharf are disturbed by dredging, wharf and marina operations and rock walls which extend from the eastern side of the Calliope River mouth to Auckland Inlet. Clinton Wharf is further away from sea grass areas adjacent to Wiggins Island.

The modelling showed that there would be no significant environmental impacts from the refinery's discharge to Port Curtis and that all relevant water quality objectives will be met.

GPNL will continue to participate in the Port Curtis Integrated Monitoring Program (PCIMP) to assess the ecosystem health of Port Curtis.

The refinery land is adjacent to the proposed WICT rail facilities which abut the Calliope River Anabranh. Therefore, the GNP is unlikely to hinder fishing access to the Calliope River or to any of the recreational, indigenous or commercial fishing grounds located outside of restricted port areas along the river or in Port Curtis.

Imported nickel ore will be unloaded from ships into wharf-mounted hoppers using a purpose-built wharf crane with specialised grabs and spill capture screens to meet strict Australian Quarantine and Inspection Service (AQIS) importation requirements. Ore will be transported from the hoppers to the refinery by covered conveyor. The sulphur, which will be in the form of prills or pastilles (small, compacted tablets), will be handled in the same manner. The ammonium sulphate will be loaded directly into ships via a covered conveyor from an enclosed storage shed. These handling procedures will minimise the risk of spills for all of the project's bulk materials.

Groundwater

There is no significant groundwater usage in the vicinity of the refinery site, with only one registered groundwater bore within a 3 km radius. The refinery process plant will be built on bunded concrete slabs, which will prevent the direct migration of any low quality water into the groundwater beneath the site. Stormwater and washdown water will be contained within the bunds. Stockpile areas and stormwater containment and settlement ponds will be provided with low permeability surfaces to minimise the risk of seepage.

There is no significant groundwater use at the RSF site, with only three registered groundwater bores within a 3 km radius. The RSF design incorporates mitigation measures to limit seepage through the embankment to the underlying aquifers, including a seepage collection system. Seepage from the RSF will be controlled through a combination of measures including a low-permeability clay core and cut-off key in the RSF embankment, and a seepage collection system. Modelling has shown that any seepage not directly intercepted by the seepage collection system will not move more than 65 m down gradient of the RSF over a 50 year period. Any movement will be detected by the monitoring bores and, if necessary, recovery bores will be installed to recover impacted groundwater to the RSF.

The GNP pipelines will be designed in accordance with *AS 2885 Pipelines – gas and liquid petroleum*. This will ensure pipeline integrity equivalent to a natural gas pipeline. Extensive construction safeguards and testing procedures will be implemented as well as an operations monitoring program.

Terrestrial Flora

Approximately 164 ha of vegetation communities on the approximately 261 ha refinery site at Yarwun will be cleared for Stages 1 and 2 of the refinery and for the Stage 3 construction pad (if required for placement of excess fill). This includes the clearing of less than 2% of the area of each of four “of concern” regional ecosystems in the sub-region. None of the species identified in the refinery area are listed as “threatened” under the Queensland *Nature Conservation (Wildlife) Regulation, 1994* (NC Regulation) or the EPBC Act.

Most of the intertidal and supratidal communities on the refinery site will be filled by the CQPA during the construction of the proposed WICT project. However, there may be a small area (3.7 ha) of these communities that might be filled as part of the GNP. An application to clear these marine plants will be submitted in accordance with the requirements of Section 123 of the *Fisheries Act 1994*.

An area of approximately 1,316 ha will be cleared as a result of the construction of the RSF. Vegetation at the RSF site is composed predominantly of remnant vegetation, modified pastoral grasslands and non-remnant shrubby regrowth. Only one “of concern” regional ecosystem will be cleared (124 ha), which is 0.8% of its extent in the sub-region. None of the species identified in the RSF area is listed as “threatened” under the NC Regulation or the EPBC Act.

The proposed pipelines route does not transect any regional ecosystems listed as “endangered” under the *Vegetation Management Act 1999*, although five are listed as “of concern” and constitute 22 ha of the 95 ha of vegetation that will be cleared.

Two significant flora species are located along the pipelines route. These are the black ironbox (*eucalyptus raveretiana*) which is listed as “vulnerable” under the NC Regulation and the EPBC Act, and the zamia palm (*macrozamia serpentina*) which is listed as “endangered” under the NC Regulation. While the route has been realigned to avoid the zamia palms, such a realignment to completely avoid the black ironbox is not possible. It is estimated that up to 15 mature black ironbox and up to 40 juveniles will need to be cleared at five creek crossings. For each of these creek crossing points, black ironbox is the dominant canopy tree along the creek banks and more than 100 trees occur immediately upstream and downstream. Given its efficient regeneration capacity, but it is expected that, over the longer term, the potential impacts on this species will be reversible through natural regeneration. As such, the impact of clearing on this species is considered to be low.

Terrestrial Fauna

No “endangered” or “critically endangered” fauna species as listed in the NC Regulation is known or expected to occur at the refinery site. One species classified as “vulnerable” under the NC Regulation (powerful owl (*ninox strenua*)) was recorded within the refinery site. No fauna species listed in the EPBC Act were recorded. As the

potential foraging habitat for powerful owls at the refinery site is a small component of a wider foraging area, which would include the adjacent Mount Stowe State Forest and Calliope Conservation Park, local populations are not likely to be significantly affected.

The removal of potential open forest or woodland habitat for three threatened fauna species; the squatter pigeon (*geophaps scripta*) (“vulnerable” under the NC Regulation and the EPBC Act); the powerful owl (“vulnerable” under the NC Regulation); and the black-chinned honeyeater (*melithreptus gularis*) (“rare” under the NC Regulation) through clearing of the RSF area, is unlikely to significantly affect local populations as discussed below:

- Squatter pigeons are relatively common within the RSF area and are not considered to be an ‘important population’ in the context of the EPBC Act guidelines. Clearing the RSF site will remove an area of habitat for this species but the level of impact will depend on the ability of squatter pigeons within the RSF impact area to relocate and survive in adjacent habitats that may be currently occupied by other squatter pigeon populations. However, the population of squatter pigeons in the region is strongly established and any impacts incurred from the loss of habitat associated with the RSF are not considered critical to the survival of the species.
- The powerful owl is known to occur broadly across the region. The loss of potential foraging habitat may impact powerful owls that currently forage in the vicinity of the RSF. However, this area is relatively small in the regional context and represents only a small component of the powerful owl’s wider foraging area.
- The black-chinned honeyeater is generally sedentary but groups forage over a large home range giving the impression of it being locally nomadic. Large areas of suitable habitat occur in the local area.

There are 18 threatened fauna species identified as having the potential to be impacted due to effects on the preferred habitat occurring within the pipelines corridor. To minimise potential impacts, the GNP pipeline alignment has been modified such that the route avoids all high and medium priority habitat areas. Some low priority habitats areas will be disturbed. A special area plan has been developed to ensure that any potential impacts on the capricorn yellow chat (*epthianura crocea macgregori*) (“critically endangered” under the EPBC Act and “endangered” under the NC Regulation) from GNP pipelines construction will be minimal. .

Air Quality

Air dispersion modelling has shown that no adverse impacts on human health are anticipated at any nearby residential locations as a result of air emissions from operation of either Stage 1 or Stage 2 of the refinery. Emissions modelled include sulphur dioxide, nitrogen dioxide, hydrogen sulphide, sulphuric acid, trace metals and particulate matter.

Occupational health and safety impacts from the refinery’s emissions at nearby industrial locations were also assessed. This showed that all ground-level concentrations were well below the relevant occupational health guidelines.

The refinery generates about 50% less greenhouse gas (GHG) per unit of metal produced compared to other nickel processing alternatives. This is partly due to the refinery generating a significant amount of its own electricity demand (78% in Stage 1 and 61% in Stage 2) through the efficient use of heat released from process chemical reactions and through on-site gas-fired electricity generation.

Noise

Noise and vibration from the project’s construction stage are not expected to have any significant impacts.

The refinery’s major operational noise sources will include conveyors, grinding mills, pumps, motors and compressors. Noise control measures will be implemented including enclosing conveyors and grinding mills.

Noise modelling has been undertaken to assess the impacts at surrounding residential areas against a number of relevant noise criteria. The results of the modelling, when compared against relevant noise criteria, are as follows:

- EPA Background Creep Criteria: Predicted refinery noise is acceptable at all surrounding residential locations.

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- World Health Organisation (WHO) Sleep Disturbance Criteria: Predicted refinery noise is acceptable at all surrounding residential locations except for one (S2) during temperature inversion. S2 is an isolated residence in a heavy industrial area.
 - EPA Low Frequency Criteria: Predicted refinery noise is acceptable at all surrounding residential locations.
 - EPA Background Plus Criteria: Predicted refinery noise is acceptable at all surrounding residential locations except for two (S2 and S4). As discussed above, S2 is an isolated residence in a heavy industrial area. It is understood that location S4 is likely to be resumed as part of the WICT project and hence, its continued use as a residential property will cease.

On this basis, no significant noise impacts are expected from the refinery operations. Nevertheless, a noise monitoring program is proposed once the refinery begins operations to confirm the noise modelling predictions.

Social Effects

The impact on community services and facilities from the project's imported workforce and its associated population will depend on the accommodation strategy adopted for the construction phase and the proportion of married and single workers who relocate to either the local area or the region. The main impacts on social services arising from the project will be short term and related primarily to the construction phase.

The existing social services and community facilities within the region are considered to be capable of absorbing the short-term increase in population associated with the project's construction. The long-term operational phase population increase is relatively small and will not increase demand on existing services significantly.

GPNL will develop a housing strategy to ensure that adequate accommodation is available for the construction phase workforce. A number of accommodation options are currently being investigated to determine which combination of options is the most viable for the project as well as having minimal impact on the existing community. The options include:

- Stimulating construction of new dwellings including houses, townhouses, units and / or permanent villages for short-term accommodation.
- Coordinated leasing of existing rental properties.
- Promotion of utilising accommodation options and associated transport services in the greater regional area e.g. Fitzroy Shire.
- Development of a temporary construction workers' village.
- Off-site modular construction, thereby reducing the number of on-site construction workers required.

The pipelines construction workforce will be accommodated in relatively small short-term workers' villages that will be strategically located along the pipelines route.

Economic Effects

The key economic benefits of the project include the following:

- An investment (Stages 1 and 2) of approximately US\$3 billion which will create a significant input into the local, state and national economies.
- The refinery will produce valuable nickel and cobalt metal, bound for the world's stainless steel and special alloy markets, from both local and imported nickel laterite ores. Exporting of metals will result in a positive effect on Australia's balance of trade.
- A construction workforce peaking at 2,600 persons during a 2.5 year construction period for Stage 1 and at 1,750 for Stage 2 construction.
- An operational workforce of approximately 385 persons for Stage 1 with an additional 40 – 50 persons for Stage 2.
- The refinery will generate an increase in government revenue which will include increased income taxes, company taxes, export income, rates and fees.

- During construction, the increase in Queensland's gross state product will be approximately \$513 million for Stage 1 and \$268 million for Stage 2. The state's annual household income will increase by \$183 million during the Stage 1 construction and by \$155 million during Stage 2.
- During Stage 1 operations, the annual increase in Queensland's gross state product and household income will be approximately \$638 million and \$39 million respectively. During Stage 2 operations, the respective increases will be \$1,364 million and \$78 million.

Land Use

The refinery site is vacant land with no current land use. It was previously used as a source of fill for the CQPA. The predominant land use surrounding the refinery is industrial.

The refinery is located close to the Gladstone airport and one of the airport's flight paths crosses the site. In accordance with Civil Aviation Safety Authority (CASA) requirements, stack discharge plumes have been evaluated through modelling to determine if any of the plumes are classified as obstacles as per the Obstacle Limitation Surface (OLS). Modelling has indicated that the refinery stacks and plumes are not obstacles. GPNL will ensure that the plant is designed to meet OLS constraints for stack locations and heights.

Grazing activities will be displaced by the construction and operation of the RSF. This is not anticipated to be a significant issue as there is extensive availability of suitable grazing land in the region.

The route for the project pipelines generally traverses pastoral and agricultural properties, with the majority of the pipelines route being dominated by cattle grazing and some areas of intensive cattle pasture. Other land uses include industrial areas, infrastructure corridors and mining and petroleum leases. The pipelines route has been selected to avoid or minimise adverse impacts to land uses and infrastructure. Land use can generally recommence following construction with landholders retaining full access to and use of the surface area above the pipelines. GPNL will maintain on-going communications with landholders and infrastructure holders during the project and implement measures in the environmental management plan to minimise impacts to existing land use.

Cultural Heritage

GPNL has developed a good working relationship with the Darumbal and Barada, Barna, Kabalbarra and Yetimarla (BBKY) Peoples in association with the development of the Marlborough mining leases, as evidenced by the progress with Coorumburra Enterprises. GPNL is committed to the maintenance of a long term relationship with the relevant Aboriginal parties in association with the implementation of this project.

As the GNP encompasses a large area, a staged approach has been adopted to assess and manage cultural heritage issues. This staged approach includes:

- Contact with native title applicants.
- Examination of relevant cultural heritage registers and documentation.
- Desktop assessment of the proposed project area by an archaeologist to review the nature and form of known cultural heritage places and values in the area of the GNP.
- Negotiation with native title claimant organisations along the proposed pipelines route and at the refinery and RSF sites in relation to the development of an agreed Cultural Heritage Management Plan (CHMP) in accordance with the *Aboriginal Cultural Heritage Act 2003 (ACHA)*.
- Consultation with local historical experts and organisations.
- Conduct of the cultural heritage survey and development of agreed management strategies.

To date, progress has resulted in:

- An agreed CHMP with both the BBYK and Darumbal People for the Marlborough Mining Leases (per the 1999 Project Agreement).
- An agreed CHMP (in the Marlborough project area) with the Darumbal People.
- An agreed CHMP with the Darumbal over the portion of the pipelines route from the Marlborough project area to Raglan Creek

- An agreed CHMP with the Port Curtis Coral Coast (PCCC) native title applicants, over the portion of the pipelines route from Raglan Creek through to the refinery residue storage facility and other infrastructure sites within the GSDA..

There is the potential for previously unknown cultural heritage material to be present within the project areas and this material may be exposed during construction. GPNL is committed to protecting cultural heritage sites and the sensitive handling of any accidental discovery of sites. GPNL will:

- Complete cultural heritage surveys and develop and implement agreed measures for the management of cultural heritage in accordance with the principles and procedures detailed in the approved CHMPs.
- Implement mitigation measures as detailed in the CHMPs.

Visual Effects

The construction of the refinery will result in a fundamental change to the character of the existing landscape due to the removal of existing woodland vegetation and excavation of the existing hill to create a series of flat platforms. The cumulative visual impact of the visible portions of the refinery, which will generally be seen in the context of other industrial development in the vicinity, is assessed as low to medium. Potential views of the site from the adjoining sections of Reid Road and Hanson Road will result in localised medium visual impact.

The overall visual impact associated with the RSF is assessed as being generally low. The RSF has the potential to be visible for very short periods of time by motorists on the Bruce Highway. The majority of the views from the Bruce Highway to the RSF site are screened by roadside vegetation combined with a series of intervening ridges and hills.

As the pipelines will be buried, long-term visual impact will be restricted to route markers.

Risk and Safety

The risks associated with the GNP are generally low. All process and materials storage areas within the refinery were assessed as having a “low” risk with the exception of the solvent extraction, nickel reduction/cobalt reduction, and ammonia areas. These areas were assessed as having a “medium” risk. The results of the risk assessment show that impacts of most major hazardous events do not extend offsite. Only the release of ammonia is considered to have potential to extend offsite and to be of “medium” risk (others that have the potential to extend offsite have been assessed as being of “low” risk). The surrounding land uses are heavy industry. Consequently, the risk to the surrounding land uses is “low”.

Based on risk controls proposed in the pipelines design and construction, identified risks for the project pipelines were rated as “low” or “medium”. “Medium” risks comprise damage caused by third party interference, pipeline liner failure and damage from natural events that could expose the pipelines. A further detailed risk assessment in accordance with the requirements of AS 2885 will be undertaken during the detailed design phase.

GPNL is committed to ensuring that all relevant aspects of the *Workplace Health and Safety Act 1995* (WHS Act) are observed during both the construction and operation of the refinery. GPNL is committed to ensuring that the refinery provides a safe and healthy workplace for all employees and contractors. This will be achieved through the development and implementation of a project-specific health, safety and environment management system.

Environmental Management Plans

Strategic-level environmental management plans have been developed for all significant aspects of the refinery, RSF and pipelines which have the potential to affect environmental or social aspects. These plans outline the strategies to be implemented to minimise the potential impacts, the monitoring and reporting programs, and the corrective actions that will be taken if necessary.

Conclusion

Through implementation of the mitigation measures discussed in this EIS during the detailed design, construction and operations phases of the project, it is concluded that potential environmental and social impacts identified during the environmental impact assessment process can be managed to ensure that there are no significant impacts resulting from Stage 1 and Stage 2. Mitigation measures are outlined in the environmental management plans.

The GNP offers significant economic benefits for Gladstone, the wider region and Australia and produces nickel and cobalt metal products for the growing global market, which may otherwise be provided by projects that are not necessarily designed in keeping with the principles of ecologically sustainable development (ESD).