GLADSTONE NICKEL PROJECT ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT

Waste Management 7

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4.0 Waste Management (17)

A respondent has raised the concern that marine and land areas are exposed to contamination due to the process plant operations.

Section 8.1.10 of the EIS describes the potential environmental contamination of the proposed refinery site based on past land uses.

Section 8.1.10.5 of the EIS describes mitigation measures proposed in the design and operation of the refinery to control contamination that may potentially arise from construction and operation of the refinery.

Section 2.9.1 of the EIS describes the activities that may potentially lead to contamination of land and the management actions proposed at the site decommissioning stage to identify and address any contamination impacts identified. Section 14.12.1 of the EIS includes details on the proposed decommissioning environmental management plan for the refinery site.

Information on storm water run-off from the refinery site is described in Sections 8.2.1.8 and 8.2.1.10 of the EIS. The proposed storm water impact mitigation measures are described in Sections 8.2.2 and 8.2.3.

Section 8.3 of this EIS Supplement (together with Appendix L) provides a description of the refinery effluent discharge to Port Curtis, the quality of water as a result of the discharge and the proposed impact mitigation measures.

4.5.3 Waste Generation (16)

CSC/GGG seek clarification regarding the volume of waste and specific waste streams that are likely to be passing through the GCC Waste Transfer Station. It is noted that Section 4 of the EIS states that a Waste Management Plan will be prepared for the construction and operation of the project. Councils requests that this plan is submitted to Councils for review and input prior to the commencement of construction.

The solid wastes to be generated by the construction of the refinery, including an indication of those likely to go to landfill, are listed in Table 4.5.1 of the EIS. The wastes from the operational phase are listed in Table 4.7.1.

GNPL will submit the Waste Management Plan to both CSC and GCC for review and comment prior to the commencement of construction.

4.6 Operational Liquid Wastes (16)

CSC/GCC has advised that Section 4.6 highlights a number of waste streams that will be discharged to Port Curtis as they are not suitable for reuse within the process. Given the presence of several large industrial sites within the Gladstone area with high water usage requirements, have the options of reusing this waste stream at other plants been explored? Calliope Shire Council/Gladstone City Council wish to see all possible reuse options investigated before discharge into Port Curtis. Has the risk of algal blooms as a result of the introduction to warmer water into the Harbour been assessed? Councils require an assessment of whether this is an increased risk, particularly during winter months.

Sections 5.11 and 5.12 of the EIS outline alternatives to the treatment and disposal of the waste liquor from the plant. In addition, studies have been carried out for additional opportunities for waste recycling and a number of options identified including the recycling of water between the Yarwun Alumina Refinery and the GNP. Further negotiations and discussions will take place however the level of development is insufficient for inclusion within the expected Stage 1 construction time frame. Nevertheless the opportunity will continue to be explored for later implementation.

The effect of discharge water temperature at Port Curtis is negligible. Elevated temperatures above ambient caused by the discharge will be limited to an area no greater than 20 m from the discharge point. Algal blooms require a mix of temperature and nutrients and there are no significant nutrients in the GNP discharge. Algal blooms are not expected to occur as a result of the discharge.

4.8 Operational Air Emissions (15)

QCPA has advised that no reference is made to dust emissions associated with the handling and storage of nickel ore.

Section 8.7.7.2 of the EIS describes the potential dust emissions associated with the handling and storage of nickel ore (Marlborough and imported). The imported ore will have a high moisture content of around 35% and hence dust generation from its handling will be low. Nevertheless the ore unloading and conveying system will be designed to further reduce any dust emission that may be generated. In periods of dry windy weather sprinklers will be used to assist with dust suppression.

Stage 1 of the project requires the importation of 40,000 tonnes of nickel ore or sulphur per day. To achieve the unloading of a large vessel and allow for high and low efficiency operation of unloading, a peak rate of 4,000 tonnes per hour (tph) has been assumed.

A long travelling, luffing type ship unloader has been selected as the preferred machine type for this operation. Its primary features are as noted below:

- A minimum of two ship unloaders shall be able to access each berth
- All ship unloaders shall run on the same rail lines
- Each ship unloader shall be designed for unloading at an average of 20,000 t/d
- Ship unloaders shall be suitable for unloading ships of Cape class up to LOA 290 metres, and up to 45 metre beam
- Each ship unloader shall have the capacity to lift a 30 t excavator into the ships hull
- Each unloader will deploy a catch plate to bridge the gap between berthed ship and the wharf deck. This will prevent spillage from the surface of the grab falling into the sea.
- Unloader grabs shall be designed for zero spillage
- The design of grabs shall require the mechanism to open to at least the vertical
- Grabs design shall consider internal coating or lining to minimise ore build up
- Storm tie down provision will be provided for each ship unloader
- Maximum operational wind speed for the ship unloaders shall be 20 metres per second

The unloader will transfer material to the wharf conveyor which will be set at a low level, close to the wharf deck. Provision on the wharf has been made for the storage and maintenance of grabs from the unloaders.

Examination of the handling properties and characteristics of imported nickel and sulphur has confirmed that the main parameters for design of the conveyor system should be based on the nickel ore. Larger belt sizes permit slower belt speeds which is beneficial for the handling of nickel ore. The design has assumed the following basic belt design criteria:

- Capacity - 4,000 t/h
- Belt width - 2,000 mm
- Belt speed - 3 m/s

The majority of conveyors will be at ground (or deck) level. Where the conveyors are required to rise into transfer towers, they will be supported on steel trusses. This also permits pedestrian and vehicle access under the conveyor routes at transfer locations.

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All conveyors and transfer structures will have flooring. This will be in the form of concrete bunds for ground level conveyors and steel plate floors for elevated sections. This will contain dust and residual carry back within the conveyor structure and minimise release of nickel and sulphur dust or spillage. Dry or wet cleaning can then be undertaken on a maintenance basis to remove any spilt material.

The conveyors will be shielded from wind and rain by either covers (ground conveyors) or extensive cladding (elevated conveyors). However adequate ventilation and dust suppression will be maintained to prevent possible sulphur dust build up and hence explosion risk.

Each transfer station will have chutes designed to prevent clogging, skirts sized to reduce dust generation, dust suppression equipment and a comprehensive belt washing system to prevent carry-back.

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5.4.1 Marlborough Ore (8, 9)

(8) *QR has noted that the proponent's proposal relies to a certain extent on part or whole of the Wiggins Island Coal Terminal being completed for its functioning. The proponent needs to provide details of adequate and appropriate contingency plans for operating the refinery should the WICT project get delayed or even suspended. General statements (i.e., Section 5.4.1 penultimate paragraph) would not suffice.*

The CQPA has advised that WIW can proceed independently of WICT. Hence any delay or suspension of WICT will not affect the development of the port facilities required to service the GNP.

The proposed jetty will be approximately 1,850 m long and will provide support for conveyors, services and access to the berthing and unloading wharf. It will consist of a series of raking, tubular steel piles with lateral connecting steel bents, spaced at approximately 24 m centres. Precast concrete deck units will span between bents to provide the access road, and other services span on their own supporting structural frames.

The arrangement of the jetty will ultimately be configured to suit:

- the development of stage 1 of the GPNL project (WIW);
- Stage 1 of WICT development; or
- Both WIW and WICT together.

If the GPNL project was to proceed independently of and without consideration of the proposed WICT project, a two-pile jetty bent, with ultimate capacity for Stages 1 and 2 of GPNL will be the most cost-effective design. This is the basis of the current design.

If initial development requires consideration of the proposed WICT project, the most cost-effective approach will be a three-piled jetty bent designed to support the Stage 1 of both projects, and expandable for future stages.

(9) *QT has noted that the several options for the slurry pipeline route involve crossing of more than five railway lines and more than three crossings of major main roads. GPNL is requested to consult with QR and DMR on the design parameters for pipeline rail and road and crossing under-boring, and methods to ensure safe and effective preservation of the integrity of rail and road infrastructure, and the arrangements to be put in place to effectively manage any potential traffic disruptions.*

A number of discussions have taken place with DMR with regard to the pipeline crossing the road. These discussions have occurred in Rockhampton and a further discussion with the office in Brisbane is anticipated. Additional discussions will continue. An application process through DMR has been identified. GPNL will adhere to this application process subsequent to completion of detailed design work. A similar arrangement will be developed with QR with respect to the crossing of railway lines.

GPNL is committed to reaching agreement with both QR and DMR on all issues relating to pipeline crossings including the safe and effective preservation of the integrity of rail and road infrastructure, and the arrangements to be put in place to effectively manage any potential traffic disruptions.

5.4.2 Imported Ore (15)

QCPA has advised that the construction of wharf facilities for the nickel and sulphur import at Wiggins Island is not conditional on the construction of the coal terminal.

Noted.

5.5.2 Route Refinement (16)

CSC/GCC has advised that the process used to define the route for the nickel ore slurry pipeline is supported. However a review of the proposed options is requested to allow local input to the assessment process. This review would encompass input from Local Government and community on the level to which each of the objectives set for the pipeline is met by the various options.

GPNL has contacted all landholders potentially impacted by the route of the proposed pipelines. This involved initial phone contact, provision of a project brochure and face-to-face meetings. The purpose of this contact was to:

- Introduce the project proponent and project.
- Provide a description of the proposed project and construction methods.
- Provide maps to illustrate the indicative pipeline route.
- Identify any landholder concerns or property constraints to locating the pipeline.
- Obtain the landholders consent to conduct field investigations on their properties.

There has also been subsequent ongoing contact with landholders potentially impacted by the pipeline route via phone and site visits on an as-needs basis. Issues raised and discussed by landholders and GPNL included location of the pipelines on their property, potential impacts to land use and values, potential for erosion, potential for the spread of weeds, security of access tracks, prior notification, and grazing issues.

Extensive discussions have also been held with the relevant local authorities.

The consultation methods that have already been used will continue to be used for any variations or options to the proposed pipeline route. These will be discussed with relevant landowners and local authorities including information on why the variations is required and the extent to which it meets the objectives set for the pipeline.

5.5.3 Multi-User Pipeline Corridor (9)

QT has requested GPNL to liaise with Mr Fergus Fitzgerald, EIS Project Manager – ZeroGen Clean Coal Power Demonstration Project, Department of Infrastructure, (3224 2911), to clarify whether there is any need to take account of relative co-location or separation of the slurry and possible CO_2 pipeline within the proposed multi-user pipeline corridor linking Stanwell and Gladstone.

GPNL will liaise with Fergus Fitzgerald with regard to the ZeroGen project. However, it is GPNL's understanding that ZeroGen's proposed CO_2 pipeline heads westwards away from the proposed multi-user pipeline corridor and would not be in the vicinity of the GNP slurry pipeline.

5.14 Modularisation (15)

CQPA noted that it appears from other Sections in the EIS, that the provision of Pre-Assembled Modules (PAM's) is a critical aspect of the Project. The EIS should therefore contain all details regarding the import of PAM's from size of vessels envisaged, draft of those vessels, wharf facilities required to handle the PAM's, dredging works associated with the handling of those vessels and the route proposed from those wharf facilities to Plant Site.

As discussed in Section 1.2.11 GPNL is considering the offsite fabrication of pre-assembled modules (PAMs) of major refinery components. This includes modularisation of key vendor packages such as the power plant and sulphuric acid plants. GPNL is working with the Co-ordinator General to develop a common-user long-term PAM facility in Gladstone

A port facility to accept the PAMs is planned in the north-east corner of the existing Fisherman's Landing Port Precinct, between the existing Wharf 5 – Bulk Liquids Facility and future Wharf 6 to be developed by

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the Central Queensland Ports Authority (CQPA) as part of the proposed Northern Development at Fisherman's Landing Port Facility.

The port facility will be able to service a wide range of sea transport vessels, inclusive of roll-on - roll-off, lift-on – lift-off, and ocean-going barges. The quay line for the wharf and barge ramp will be located at the existing reclamation line, requiring a dredged channel to be established between Wharf 5 and 6, and a dredged berth pocket adjacent to the existing reclamation line. The marine facility is to allow for the retention, if possible, of the existing barge ramp facility located in this area, both in the short term until Wharf 6 is established, and post Wharf 6 construction.

In order to release each barge as quickly as possible, it will be necessary to remove each PAM from the ship and place in a module staging area near the wharf. The size of this laydown area has been estimated as 20,000 m^2 to allow for the holding of one complete ship load while a second is being unloaded with sufficient clearance for access to the PAMs for removal of transport steelwork that may interfere during the journey to the work site. Sufficient provision will be made for cyclone tie-down.

The location of the marine facility is shown on Figure 2.7.

The land transport route proposed from the above marine facility to the GNP refinery site comprises:

- Northern bund of the existing reclamation, upgraded as required.
- Widening the existing access road from above, south to the Aldoga Materials Transport & Services Corridor (AMTSC).
- Widening the existing access road from above, south along the AMTSC to north of Boat Creek located on the western side of the AMTSC between Rio Tinto Aluminium Yarwun (RTAY) Services Licensed Area and Queensland Rail (QR) Fisherman's Landing Rail.
- Exiting west from the AMTSC generally on the alignment of the Fisherman's Road reserve for approximately 400 m, with an at-grade crossing of the Fisherman's Landing Rail.
- Turning south from the above to cross Boat Creek, then ramping up and turning east to cross the AMTSC and the RTAY Licensed Area via a grade separated overpass.
- Continuing east and ramping down to cross both the Fisherman's Landing Rail at grade and the southern half of the AMTSC.
- Turning south east towards Hanson Road, generally following and to the seaward side of the alignment of the AMTSC for a distance of approximately 2km.
- Turning south across Hanson Road, approximately 500 m east of the Reid Road intersection, to enter the GNP site.

The layout of the PAM route from Fisherman's Landing to the refinery site is shown on Figure 2.7.

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Transportation 9

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6.0 Transportation (16)

CSC/GCC advised that the EIS does not fully address the TOR in regard to the following issues:

1. *Transport of plant and materials at the decommissioning stage of the project;*
2. *Anticipated times at which each type of transport movements may occur;*
3. *The effect of rail freight demand on the Rockhampton to Gladstone line and rail infrastructure at the Port of Gladstone;*
4. *Haulage routes for oversize indivisible loads;*
5. *The need and extent of port facilities required for the project; and*
6. *The TOR requires 'The description shall also include brief information of other infrastructure and industrial projects in the vicinity of the projects that may impinge on or be impacted by the project on account of cumulative effects.' This section has not been considered and needs to be further considered as discussed above.*

1. The management of transport of plant and equipment at the decommissioning stage of the project is discussed in the draft EIS in Sections 2.9 14.12.1. The project lifespan is considerable and decommissioning of the refinery may involve relocation of plant and equipment from the site for appropriate alternative uses. Re-use opportunities may arise at the time of decommissioning that would affect the decommissioning objectives and activities. Prior to decommissioning, GPNL will prepare a road use management plan to address all relevant transportation issues associated with the refinery's decommissioning.

2. Predominantly construction and operational workforces and material deliveries will be between 7am and 7pm. On occasion, special deliveries of materials and out-of-hours working will have to occur (for example PAM movements, oversized loads etc.). During detailed design, a detailed traffic management plan will be developed which will identify the different types of material or personnel movements which might require out-of-hours timing. Liaison with Council, DMR and the community will be undertaken to the minimise traffic impacts.

3. The effect of rail freight demand on Rockhampton to Gladstone line has been studied by QR. QR have advised that capacity is available for the required 18 trains per week on the line. Port traffic is dictated by an existing port traffic management plan to access the port using a specially constructed haul road. The GNP will not require the use of any rail infrastructure at the Port of Gladstone.

4. Haulage routes for oversized indivisible loads will be determined on a case-by-case basis in accordance with approval permits sought prior to movement using appropriate roads and transportation periods.

5. The need and extent of port facilities required for the project is described in Section 2.2.4 of the EIS with the exception of the facilities required for ammonium sulphate. Contrary to what is stated in the EIS, ammonium sulphate will now be exported from Barney Point rather than Fisherman's Landing.

6. As discussed in the EIS, infrastructure that may be impacted by the project includes existing roads, power supply, water supply facilities, sewerage facilities, port facilities and housing and community facilities. Section 10.5.4 of the EIS includes a description of the cumulative impacts of other proposed projects on construction workforce numbers in the Gladstone /Calliope Region. The traffic impacts assessment described in Section 6 of the EIS includes the cumulative impacts of the predicted other (non-GNP) traffic on the region's roads. Section 8.7 of the EIS includes an assessment of the cumulative impacts of the GNP together with existing industries on the region's air quality. Section 8.8 includes an assessment of the cumulative noise impacts from the GNP together with existing noise sources in the region.

6.2 Road Transport (3, 16, 17)

(3) *The Queensland Police Service (QPS) has raised the issues of increased industrial and commercial traffic on the Dawson Highway, Hanson Road, Reid Road and Blain Drive in the Gladstone area. In particular there will be a need for upgrading the traffic control and conditions of the following intersections: Hanson Road/Reid Road; Dawson highway / Blain Drive / Herbertson Street; and Hanson Road / Blain Drive / Alf O'Rourke Drive.*

The necessary road upgrades required as a result of the project are discussed in Appendix F.

(16) *CSC/GCC has raised the issue as a general comment that many of the assumptions and recommendations from the EIS have been based on outdated statistical data, which Calliope Shire Council/Gladstone City Council considers do not fully represent the current situation for a number of matters. This is especially the case for traffic and transport analysis and also housing which are key elements of Council's response to the EIS. Council is of the view that it is imperative that up to date statistical data is sourced in order to fully comprehend the issues resulting from the proposed project.*

The revised traffic assessment provided in Appendix F is based on current statistical data.

Updated demographic and housing data are presented in Appendices D and E.

(17) *A respondent has raised concerns regarding increased heavy vehicle traffic flows.*

Analysis of the Bruce Highway/Calliope River Road intersection shows that it will operate with a high level of service with the addition of development traffic through to the 2030 design horizon. Buses will travel from the construction camp (situated on the southern end of Calliope River Road), along the entire length of Calliope River Road. The recent improvements at the Gladstone-Mt Larcom Road/Targinie Road/Calliope River Road intersection have increased both it's capacity and safety, particularly for turning vehicles. The effects of the increased heavy traffic generated by the GNPL are discussed in Appendix F.

The respondent is located in Yarwun and of particular interest would be the predicted effects on the traffic along Calliope River Road. The table below presents the predicted traffic volumes without the development and with the development at the different stages of the project. It incorporates a background increase in traffic unrelated to the Gladstone Nickel Project.

AM Peak

Year	Light Vehicles		Heavy Vehicles		Total Vehicles	
	Without Development	With Development	Without Development	With Development	Without Development	With Development
2006	61vph	N/A	18vph	N/A	79vph	N/A
2009	70vph	232vph	21vph	114vph	91vph	346vph
2011	76vph	126vph	23vph	23vph	99vph	149vph
2014	85vph	247vph	25vph	93vph	111vph	340vph
2016	91vph	155vph	27vph	27vph	119vph	182vph
2026	122vph	185vph	36vph	36vph	158vph	222vph

Daily

Year	Light Vehicles		Heavy Vehicles		Total Vehicles	
	Without Development	With Development	Without Development	With Development	Without Development	With Development
2006	519vpd	N/A	81vpd	N/A	600vpd	N/A
2009	597vpd	921vpd	93vpd	306vpd	690vpd	1,227vpd
2011	649vpd	749vpd	101vpd	101vpd	750vpd	850vpd
2014	727vpd	1,051vpd	113vpd	274vpd	840vpd	1,325vpd
2016	779vpd	906vpd	121vpd	121vpd	900vpd	1,027vpd
2026	1,039vpd	1,166vpd	161vpd	161vpd	1,200vpd	1,327vpd

In summary, the increase in the daily traffic along Calliope River Road during Stage 1 operations would be in the order of 15%. The Stage 1 construction increase in traffic would be approximately 80%. The majority of this increase would be light vehicles, however buses (considered as heavy vehicles) will also be part of the increase (approximately 100 vehicles per day) ad potentially sand delivery trucks. There is uncertainty on the precise location of the quarry for some of the material required for the construction of the residue storage facility. The sand and gravel materials may come from either a quarry in the Calliope area or Yarwun. The assumptions used for this EIS Supplement includes exploiting the quarry off Gladstone - Mt Larcom Road (north of Yarwun) with trucks moving in an anti-clockwise route along Gladstone – Mt. Larcom Road then south down the Bruce Highway into the RSF. The return of empty trucks to the quarry would take a left hand turn back onto the Bruce Highway and then turning left into Calliope River Road travelling north. Once a specific quarry has been identified for this material, discussions with the Council and local Yarwun community would take place to optimise route options and timing.

6.2.2 Existing Traffic (16)

CSC/GCC has advised that the EIS uses limited manual traffic counts undertaken in 2006. These traffic counts were updated based on traffic data from 2003 and 2004. This approach is not accepted as Gladstone traffic has grown significantly over the past years and consequently the adjusted traffic volumes are unlikely to represent the current traffic volumes on the road network. In addition the growth rates used in the analysis should consider the level of traffic increase between 2003/04 and 2007 and use this information to predict future traffic volumes. An additional analysis of traffic volumes should be undertaken to ensure the predictions are representative of current circumstances.

The traffic counts used to develop the background traffic volumes and patterns, their dates and sources are summarised in Table 5.3 of Appendix F. The majority of traffic counts used in the traffic impact assessment were undertaken in 2006. It is considered that these counts give a reasonable picture of existing background traffic.

6.2.3.1 Refinery Construction Traffic (16)

CSC/GCC has noted that additional assessment of impacts based on amended usage patterns is required to accurately test the impact on the network. This assessment should consider two additional scenarios as follows:

- *50% Bus, 50% passenger vehicles, Occupancy 1.8 persons per vehicle*
- *37% Bus, 63% passenger vehicles, Occupancy 1.5 persons per vehicle.*

This approach will test the sensitivity of the assessment and allow the potential impact on intersections to be considered in additional detail. Many of the intersections that are listed as performing adequately during the construction and operation of the project have degrees of saturation on individual intersection approaches that are nearing the maximum acceptable levels and small increases in traffic may result in the need for remedial works. Recent major construction projects in Gladstone have resulted in localised traffic problems due to the high number of staff leaving the site at the one time. The EIS should consider the staggering of start and finish times to minimise these types of traffic impacts.

The assumed bus occupancy for the GNP construction workforce travelling to site was based on the use of a construction camp by a majority (80%) of the construction workforce. Comparison with other major construction projects in Gladstone is not valid because their construction workforces were distributed throughout the Gladstone area in houses, flats and units.

The camp site will be located north of the Bruce Highway on Calliope River Road. Hence it will take traffic away from the main city routes as the workers will be bussed along Calliope River Road and Mt Larcom Road onto Hanson Road. The provision of a camp enables more control over staff transport to the refinery site and more certainty that buses will be used.

6.2.3.3 Pipeline Construction Traffic (16, 18)

(16) *CSC/GCC has advised that the EIS should be amended such that the proponent is required to prepare a RUMP that considers issues such as the standard of the road network, access conditions, hours of operation, dust control, safety etc. The proponent should also prepare a RIA for Local Government controlled roads to ensure that traffic generated by the proposed workers villages is investigated and the traffic impacts resulting from these villages mitigated to the satisfaction of the relevant Local Government. Both the RUMP and the RIA should conform to the current requirements of the DMR. » These plans should be approved by the relevant Local Government prior to any access or construction work on the pipeline.*

A revised road impact assessment is presented in Appendix F. This assessment includes the impact on roads from the traffic generated by the proposed construction workers village. The assessment has been undertaken in accordance with the requirements of the DMR.

During the detailed design stage, GPNL will prepare a RUMP to address issues such as the standard of the road network, access conditions, hours of operation, dust control, safety etc. GPNL will discuss the details of the RUMP with the relevant local government officials and DMR as required.

(18) *Fitzroy Shire Council (FSC) has advised that for shire roads the FSC required that all costs determined for these works are borne by GPN.*

GPNL will negotiate roads costs with FSC.

6.2.5 Traffic Predictions (17)

A respondent asked for further discussion on the increased traffic flow that will be generated by the project.

The effect of traffic flows on Calliope River Road are discussed in Section 6.2. A revised road impact assessment is presented in Appendix F.

6.2.5.3 Traffic Volumes (11, 16)

(11) *DMR has advised that their Roads Implementation Program 2006-07 to 2010-11 does not have a project listed for this section of Hanson Road to bring forward to 2009. The suggestion that overtaking lanes be constructed on this link is not acceptable in accordance with the design parameters of the RP&D manual. The distance between the noses of the Blain Drive and Red Rover Rd splitter islands at each intersection is only 0.4km. A distance of 1.2km is required to construct a passing lane with a minimum of 0.4km clearance between the end of the auxiliary lane and any downstream intersection. The link from Blain Drive to Red Rover Rd would require duplication to 4 lanes to achieve any passing opportunity. The proponent should reassess the suggested impact mitigation strategy for this section of Hanson Rd in accordance with the RP&D manual. To ensure road impacts of the project are mitigated, any upgrading works on the section of Hanson Rd from Blain Drive to Red Rover Rd will be the proponent's responsibility to complete, prior to the commencement of Stage 1 works.*

This issue has been discussed further with DMR and the result incorporated into the revised traffic report given in Appendix F.

(16) *CSC/GCC noted that daily two-way traffic volumes have been used to assess the capacity of the state controlled road network. In general this approach is acceptable however the high volumes of traffic expected during the peak hours may result in some capacity limitations during these times. The mid block capacity of the road network should therefore be tested to determine the level of performance in the peak hour and the impact of additional traffic (particularly the during the construction phase) on this performance.*

This issue has been discussed further with DMR and the result incorporated into the revised traffic report given in Appendix F.

6.2.5.4 Traffic Volumes – Council (16)

CSC/GCC noted that the traffic volumes provided on the Local Government controlled road network do not include the potential increases on Hanson/Glenlyon Road heading towards Philip Street. Possible increases in traffic utilising Phillip Street also needs to be considered and addressed if required. It is preferable that these impacts be assessed through a calibrated traffic model rather than a manual distribution of generated traffic. The DMRs 'FINS' model is suitable for this assessment.

This issue has been incorporated into the revised traffic report given in Appendix F. A consequence of the majority of construction workers being accommodated at the construction camp means that any increases in traffic on Philip Street as a result of the refinery would be negligible.

6.2.6.2 Hanson Road / Reid Road (11, 16)

***(11)** DMR has advised that the proponent should discuss with DMR how the design of the proposed roundabout will meet DMR safety and efficiency requirements and be integrated with the staged development of the Hanson Road/Reid Road intersection to accommodate project traffic on the link with projected future traffic growth.*

This issue has been discussed further with DMR and the result incorporated into the revised traffic report given in Appendix F.

***(16)** CSC/GCC advised that the construction of a roundabout at this intersection will result in a decrease in the travel speed for vehicles travelling along Hanson Road. Alternate intersection arrangements should be considered such that the existing speed environment is maintained.*

A number of discussions have been held with DMR where it has been agreed that a roundabout will be appropriate for the intersection of Hanson and Reid Road.

The Hanson Road and Reid Road intersection will need to be upgraded by 2009 with the addition of the GNP traffic. The provision of a bypass lane from the eastern leg of the roundabout would provide sufficient capacity to accommodate the additional GNP traffic. However, it is recognised that in consideration of other significant developments within the region and in consideration of the likely future form of Hanson Road, a dual circulating lan0e roundabout may be more appropriate. The intersection would fail by 2015 if the GNP did not proceed.

***(16)** CSC/GCC advised that the future access to Wiggins Island should be considered in conjunction with this intersection to assess the performance of the overall road segment. The layouts for the two intersections should be tested to ensure that the future design of the two intersections is capable of meeting traffic demands and conforms with design standards. In particular the separation between the two intersections and between any turning lanes or tapers should be investigated and compared to current design standards. Given the proximity of the two intersections it may be necessary to model the performance of traffic at the intersections to confirm the adequacy of the proposal.*

The approval by DMR for the design of the Reid Road/Hanson Road roundabout will take into consideration of the access requirements of both the proposed GNP and the Wiggins Island Coal Terminal development.

6.2.6.3 Dawson Hwy/Blain Drive / Herbertson Street (11)

DMR advised that the proponent should analyse the existing roundabout using demand driven peak hour traffic signals on one or two legs of the roundabout to improve capacity.

This issue has been discussed further with DMR and the result incorporated into the revised traffic report given in Appendix F. GNP traffic will trigger the requirement to upgrade the intersection by 2013. Though metering of only the western and northern legs would be required to cater for GNP traffic through to the design horizon of 2026, it is believed that signalisation works on all four legs are currently, or soon to be, undertaken as part of another development's approval process.

6.2.6.5 Hanson Road / Red Rover Road (11)

DMR noted that Table 6.12 on page 28 of Appendix B of the EIS indicates that the capacity of this intersection will be adequate beyond 2026. However based on current traffic data, the intersection capacity appears to be exceeded in 2019. Also, the conclusion does not appear to consider the proponent's recommendation for capacity improvements at the end of clause 6.2.5.3 of the EIS. The proponent should re-assess the capacity of this intersection based on current traffic data and liaise with DMR concerning the difference in the assessment. The section of Hanson Road from Blain Drive to Red Rover Road may need capacity mitigation works (duplication) prior to the commencement of Stage 1 works. These duplication works will impact on Hanson Road / Red Rover Road intersection.

This issue has been discussed further with DMR and the result incorporated into the revised traffic report given in Appendix F. The Hanson Road/Red Rover Road intersection will require upgrading by 2022 to accommodate the additional traffic demands of the GNP. Upgrading the intersection to a dual circulating lane roundabout will allow it to operate acceptably to the 2026 design horizon.

6.2.6.7 Transportation Gladstone (15, 16)

(15) *CQPA advised that given the basic detail of the Plant Operations, it could be conceivable that the Mt Larcom/Hanson Rd/Landing Rd intersection "operates well within prescribed limits". There are however a number of factors that have not been included in that assessment:*

1. *The transportation of Amsul from plant site to the proposed Fisherman's Landing No 3 Berth.*
2. *The effect of initial importation of both nickel ore and sulphur through the proposed FIL No 3 Berth to Plant Site.*
3. *The effect of the initial movement of sulphuric acid from a proposed terminal in the Fisherman's Landing Development Area to the refinery.*

The current project proposals with respect to the above issues are as follows:

1. Ammonium sulphate will now be transported from Barney Point instead of Fisherman's Landing No 3.

2. It is proposed to transfer nickel ore and sulphur via Wiggins Island Wharf not Fisherman's Landing.

3. Sulphuric acid will be moved from the terminal in Fisherman's Landing to the refinery by pipeline and consequently there will be not impact on traffic movement during normal operation.

On this basis the revised assessment of the Gladstone-Mt Larcom Road/Landing Road/Hanson Road intersection indicates that it will operate within desirable limits with the addition of the GNP traffic and no upgrading will be necessary.

(15) *CQPA noted that comment has been made throughout the EIS on the potential for an initial start up for nickel ore import through Fisherman's Landing. In the event that this option is pursued the impacts will need to be addressed? What is the method of transport from Fisherman's Landing to the plant site? If conveyor, what is the route? If truck, what are the impacts on the road system? (Mt Larcom/Hanson Road, RTA Roundabout).*

It is proposed to transfer nickel ore and sulphur via Wiggins Island Wharf. If Wiggins Island Wharf is not to proceed and if Fisherman's Landing Berth 3 became a necessary element of the project, this would be incorporated by way of additional approval process. The conveying and transport of materials from Fisherman's Landing to site would utilise the material transport services corridor or PAM route which runs to the northern side of Hanson Road.

(15) *CQPA advised that regarding the nickel ore rail receival, indications have been made that nickel ore may be transferred from Marlborough to Gladstone on rail. The method of handling at the receival point is for a tippler system to be deployed. The noise and dust implications of this receival facility should be evaluated.*

Assessments of the noise and dust implications of the rail unloading facility at the refinery are discussed in Section 8.8.5.5 and Appendix G respectively. A rotary dumper system will be employed rather than a "tippler" system.

(16) *CSC/GCC advised that although the EIS states that the Gladstone - Mt Larcom / Hanson Rd / Landing Rd intersection operates effectively for all scenarios, Calliope Shire Council suggests that capacity is not always a good measure for operating effectively. The design and layout of this intersection may not be ideal, and should the Department of Main Roads identify this intersection as an issue, Council would support further assessment of it.*

This issue has been discussed further with DMR and the result incorporated into the revised traffic report given in Appendix F. The revised assessment of the Gladstone-Mt Larcom Road/Landing Road/Hanson Road intersection indicates that it will operate within desirable limits with the addition of the GNP traffic and no upgrading will be necessary

6.2.6.11 Bruce Hwy/RSF Access Rd (11, 16)

(11) *DMR advised that the proponent should re-assess the intersection requirements based on Clause 13.4.4 of Chapter 13 of the Road Planning and Design Manual and demonstrate that any proposed mitigation measures ameliorates any adverse road safety impacts. The proponent should also re-consider alternative local road options for access to the residue storage facility once this analysis is carried out.*

GPNL has reconsidered the issue of access to the RSF and has determined that access for both construction and operations will now be from Bruce Highway through Koncina Road. A fully channelised intersection should be built to accommodate the longer deceleration requirements of trucks, in accordance with DMR's Road Planning and Design manual. This issue has been discussed further with DMR and the result incorporated into the revised traffic report given in Appendix F.

(16) *CSC/GCC advised that access to the RSF should be provided through the GSDA internal road network and not direct to the Bruce Highway. The EIS should be amended to include this alternate arrangement so that traffic safety impacts on the Bruce Highway are minimised.*

This issue has been discussed further with DMR and the result incorporated into the revised traffic report given in Appendix F.

6.2.6.12 Summary of Intersection (11, 16)

(11) *DMR advised that no funding is allocated in RIP for the Hanson / Reid Road intersection. The proponent should upgrade this intersection before commencement of construction of Stage 1 to manage the road impacts of the project construction.*

It is anticipated that construction of the Hanson Road/Reid Road roundabout will occur early in the project during the earthworks phase of site works.

(11) *DMR has advised that no funding is allocated in RIP for the Dawson Hwy / Blain Drive / Herberston St intersection. Due to the uncertainty of the future development of the Dawson Hwy corridor, a bring forward contribution to future works at this intersection may be accepted.*

Noted.

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***(11)** DMR advised that no funding is allocated in RIP for the Dawson Hwy / Blain Drive / Alf O'Rourke Drive intersection. Upgrading of this intersection should commence before Stage 1 construction.*

This issue has been discussed further with DMR and the result incorporated into the revised traffic report given in Appendix F.

***(11)** DMR advised that no funding is allocated in Main Roads' RIP for the Hanson Road intersection. The intersection analysis indicates that there are no capacity issues at the intersection. However, the mid-block capacity analysis of Hanson Road (Blain Drive – Red Rover Road) indicated capacity constraints. As the assessment indicates there are impacts on mid-block capacity performance, modification of this intersection to dual lane should be included as part of the project.*

This issue has been discussed further with DMR and the result incorporated into the revised traffic report given in Appendix F.

***(11)** DMR advised that the project requires access to the Bruce Hwy which will need to be in accordance with the Road Planning and Design Manual. The construction of the access will be the responsibility of the proponent.*

Any works undertaken at this intersection will be in accordance with the Road Planning and Design Manual.

***(16)** CSC/GCC advised that the summary of intersection effects should be revised once the amendments to traffic volumes suggested earlier are complete.*

Revised intersections effects are included in the revised traffic report given in Appendix F.

6.2.7 Pavement Impact Assessment (11)

DMR advised that the proponent should provide materials lists, movement routes and origin/destination tabulations for the construction materials for the refinery, slurry pipeline and seawater pipeline and construction of the materials conveyor/s for transportation of materials from the proposed WIW to the proposed Refinery site.

The traffic impact assessment has been revised from that included in the EIS to account for the revised construction and operation processes that will have the following changes have implications for the traffic impact assessment:

- The majority of the construction workforce will be based at a construction camp. This gives more certainty and control in the transport of staff to the construction sites.
- A consequence of the majority of construction staff being accommodated at the construction camp means that any increases in traffic on Philip Street as a result of the refinery would be negligible.
- Construction of the refinery using Pre-Assembled Modules has decreased the number of construction staff required at Yarwun, thus reducing the traffic impacts during construction.
- The recent changes to the Gladstone-Mt Larcom Road/Landing Road/Hanson Road intersection priority go some way in addressing Council's concerns about design and layout.
- The recent improvements at the Gladstone-Mt Larcom Road/Targinie Road/Calliope River Road intersection have increased both its capacity and safety, particularly for turning vehicles.
- A significant increase in development proposals within the Hanson Road corridor mean that traffic patterns will become increasingly dominated by local staff and heavy vehicle traffic. This shift from predominantly through traffic will correspond to a shift from a rural road environment to an urban operating environment.

Due to these changes the inputs to the traffic assessment have been changed. The initial and revised traffic generation inputs are summarised in Table 5.1 of Appendix F for construction traffic and Tables 5.2 of Appendix F for operational traffic.

6.2.7.2 Pipeline Impacts (11)

DMR advised that the proponent should supply supporting information to demonstrate how the heavy vehicle impacts of the pipeline construction have been apportioned / assessed over the impacted road segments and all impacts should be included.

Details associated with pipeline traffic will be discussed in the road management plan. This will follow from more detailed design, road surveys and land owner communications. In addition, negotiation with DMR will also be undertaken to support the road use management plan that will be prepared by GPNL prior to construction commencing. It should be noted that the pipeline construction traffic will halve from that described in the EIS as the seawater pipeline to Marlborough is no longer proposed.

6.2.8 Public Transport (16)

CSC/GCC advised that whilst it is agreed that the effect on public transport from the project is minimal; however, the project relies heavily on the use of charter buses and the use of these buses has previously impacted on local residents. The EIS should address the manner in which bus parking will be managed so that these vehicles are not parked in residential areas.

Sufficient bus parking will be made available at construction workers village and the construction sites. The parking of buses within the Gladstone City Council and Calliope Shire Council areas will rely on government regulations and the enforcement of those regulations. This issue will be addressed in the road use management plan. GPNL will undertake ongoing negotiation through construction phases of the project to with CSC/GCC to ensure that these issues are dealt with as they occur.

6.3.1 Wiggins Island (8, 9)

(8) *QR noted that the EIS states that the construction of Stage 1 of GPNL is likely to commence in early 2008. The construction for Wiggins Island Coal Terminal (WICT) rail works is not likely to commence at that time and property acquisition of required land parcels may be still in progress. The proponent will need to take this into consideration in their planning and address all possible impacts on the current residents in the vicinity of GPNL refinery.*

Construction of the refinery is not dependent on the construction of the WICT rail works. Any delays in WICT will not impact the GNP.

(9) *QT advised that the planning for WICT has incorporated the WIW facilities and has notionally earmarked the GNP for use of these wharf facilities. It should however be noted that to-date there has been no decision to proceed with the development of the WICT and associated WIW facilities.*

It is expected that a decision to proceed with the WIW facilities will not be made until the GNP is approved and committed.

6.3.2 Shipping Fisherman's Landing (14)

QH noted that it is stated that GPNL will be utilising the Wiggins Island terminal to import/ export products, however this terminal may not be functional when GNP begins operation. The EIS identifies Fisherman's Landing terminal as an interim shipping port for the project. Matters concerning this terminal have not been addressed in the EIS and will need to be considered.

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A significant amount of work is underway on Wiggins Island Wharves in conjunction with CQPA and Connell Hatch. GPNL will progress on the basis of availability of Wiggins Island Wharf being completed and available for operations in an appropriate timeframe to satisfy the project timetable.

6.4 Rail Transport (8, 9, 16)

(8) *QR noted that there are several instances in the EIS where reference is made to the use or potential use of rail to transport materials in and out of the GPNL refinery. However, neither the scope (loading / unloading stations, rail tracks, sidings, etc) nor the impacts of use of rail (both on existing rail corridor and at QR/GPNL interface sections) for these purposes have been dealt with in the EIS. These will need to be addressed in this EIS by the proponent after consultation with Queensland Rail (QR).*

Consultation has occurred with QR. Details of the proposed rail access to the refinery are given in Section 2.1.

(8) *QR noted that the proponent has also stated that adequate space has been provided in the refinery layout for a rail siding and dump stations. Is this still current? Connection points to the existing QR rail network need to be agreed with QR.*

QR has undertaken studies with regard to rail connections to the existing main line. Figure 2.1 shows the location of the rail siding within the refinery site.

(8) *QR advised that the impact on the rail network during construction has not been adequately addressed.*

QR has undertaken studies to determine the handling of ore from Marlborough to Gladstone. This is an internal QR matter. An associated commercial agreement is being negotiated with QR as a consequence. It is considered that impacts on the rail network during construction will be dealt with internally by QR. Assessments of the noise and dust implications of the rail unloading facility at the refinery are discussed in Section 8.8.5.5 and Appendix G respectively.

(8) *QR noted that in regard to ore delivery, the proponent has stated that the option of transporting ore from Marlborough to the refinery at Yarwun through rail, though not the preferred option, has not been discounted yet. QR notes that it is the proponent's responsibility to secure all necessary approvals (environmental, safety, etc) for the loading, transporting and unloading of ore through the rail corridor and on rail wagons. The proponent will also need to discuss and secure all necessary agreements with QR if this option is to be adopted.*

GPNL has worked with QR to determine the layout and points at which interaction occurs with the existing rail system. QR will also use their processes to identify impacts and obtain approvals. A major infrastructure agreement will also be negotiated with QR. Details of the proposed rail siding and connection to the QR system are given in Section 2.1.

(8) *QR advised that where electricity supply points and transmission/distribution routes could impact on rail operations, GPNL should coordinate locations, transmission/distribution routes and railway crossings with QR, the electricity infrastructure owner and other neighbouring stakeholders (e.g. CQPA).*

Co-ordination of locations, transmission and distribution routes and railway crossings will be notified and application procedures followed with respect to QR assets, electricity infrastructure owners and other stakeholders.

(8) *QR has requested GPNL to determine whether residues and effluents could have deleterious effects on QR overhead systems.*

Residue and effluents are not anticipated to have a deleterious effect on QR overhead systems.

Section 9 Transportation

(8) *QR has requested GPNL to determine the extent of corrosion effects due to proximity of pipelines to electrified rail and provide mitigation measures in consultation with QR.*

GPNL has completed a study to identify corrosion effects and induced current from proximity of pipelines to electrified rail. The QR system has been identified as a major contributor to induced current in pipelines consequently GPNL has taken measures to limit the impact of QR electrified rail including locating pipelines at least 500 m from rail in addition to installing insulation between pipeline lengths along with pipeline current measurement.

(8) *QR has requested GPNL to determine impacts of high frequency and low frequency interference between GPNL and QR communications, data and power systems in consultation with QR.*

GPNL has sought the identification of the appropriate personnel within QR to discuss this issue. It will be dealt with during detailed design through application for work associated with QR assets.

(8) *QR has requested GPNL to ensure that the type, location and intensity of site lighting does not interfere with visibility of railway signals.*

GPNL will provide detailed drawings during the design stage to demonstrate how the lighting will comply with QR's guidelines on lighting relative to railway signals.

(9) *QT has advised that for Stage 2, nickel and cobalt product could potentially be trucked to port of Gladstone rail-loading facilities. The palletised drums of metal product will be loaded into containers at the refinery and the containers will be trucked to the port of Gladstone or to the Mt Miller rail siding, railed to the port of Brisbane and loaded onto ships for export to the required destination. It needs to be clarified whether the trucking of containers to the port of Gladstone for rail loading is still being considered. It should be further clarified whether the rail siding at Mt Miller has the capacity to lift, store, lift and load 130 containers per week of the specified dimensions and weight product, for railing to Brisbane for shipment.*

The output of the refinery for Stage 1 will be approximately 60,000 tonnes of nickel briquettes per year and 1,600 tonnes of cobalt briquettes per year. The briquettes will be packed into steel drums and bulker bags and loaded onto pallets. The drums will be strapped and shrink wrapped to the pallet. The palletised drums and bulker bags will then be loaded into containers ready for export.

A number of options were studied to determine the most economic method of delivering the containers to market. Toll is a logical logistics partner for GPNL with its capability in Gladstone and ability to offer a fully integrated logistics service leveraging off other Toll Holdings Limited (Toll) business units.

The optimal solution is to containerise the nickel and cobalt at the refinery, transfer the containers to the Mt Miller rail siding, load them onto rail for shipment to Brisbane for loading onto ships. As well as delivering the lowest cost it is also the most secure, with the least handling of the nickel and cobalt.

Toll has exclusive access to the Mt Miller rail terminal. An overhead gantry crane (owned and operated by Toll) has sufficient capacity to handle the required volume of export containers onto Brisbane bound train services.

GPNL's view is that the transportation plan for Stage 1 will continue for Stage 2. Limited liner services through Gladstone Port make this option unattractive at this time.

(16) *CSC/GCC advised that the EIS should consider the impact of increased rail transport through Gladstone on the amenity of local residents. The EIS should include a statement that, should the slurry pipeline not be the preferred option for the haulage of ore, a fresh consultation process will be initiated with Local Government and the future rail system subject to a separate EIS. The EIS should also investigate and comment upon the impact of additional materials (not ore) to be hauled on the existing rail network. This investigation should discuss the capacity of the rail network to manage the additional loading in addition to any impacts on local residents / amenity.*

Section 9 Transportation

Should ore be transported by rail from Marlborough to Yarwun, it would travel on the existing North Coast Rail Line. This line is owned and operated by QR. Data were obtained from QR for the number of train movements at Mt Miller, between Gladstone and Yarwun. On the weekdays, the typical number of daily train movements is 80, whereas on weekends the daily train movements is halved to approximately 40. The trains use the railway line 24 hours/day, 7 days/week.

The additional train movements generated by the GNP will be 3 trains per day (6 movements). Given that the proposed trains will be similar to the existing trains, an increase of 6 train movements per day equates to an 8% increase on weekdays and 15% increase on weekends. These increases are small and it is not expected that residents near to the rail track would notice the difference.

The scheduling and operation of train movements is the responsibility of QR as are safety and amenity issues.

It should be noted that trains carrying GPN's ore will not pass through either Gladstone City nor Calliope township so residents in these areas will not be affected. Residents of smaller communities in proximity to the rail line are already experiencing the effects of train movements and the effects of the QR trains carrying the GNP ore will be no different.

GPNL is committed to undertaking further consultation with both CSC and GCC on the issue of rail transport of ore.

Assessments of the noise and dust implications of the rail unloading facility at the refinery are discussed in Section 8.8.5.5 and Appendix G respectively.

Under the access agreements that QR operate there is a process by which impacts on neighbouring residents is reviewed.

GLADSTONE NICKEL PROJECT ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT

Environmental Effects of Pipelines 10

URS

Gladstone Pacific Nickel LTD

Section 10 Environmental Effects of Pipelines

7.0 Environmental Effects of Pipelines (2)

DPIF advised they are unclear as to why the Midgee to Stanwell section of the pipeline deviates from the multipurpose corridor, given this is understood to be the optimal route. DPIF recommend the pipeline should be installed in the corridor. Development approvals will be required for any marine plant disturbance and temporary waterway barriers required for construction of the pipelines. DPIF will undertake detailed assessment of these applications to ensure that waterway crossing techniques are appropriate to individual sites.

Section 7 of the EIS provided information on the potential environmental effects of the pipeline including the basis for selecting the proposed route. At the time of the EIS, the multipurpose corridor had not been determined and it is still yet to be finalised. Utilisation of the corridor will occur once it is finally approved.

Development applications will be submitted to DPIF for any marine plant disturbance and temporary waterway barriers required for construction of the pipeline prior to construction.

7.2.4 Acid Sulfate Soils (13)

DNRW has advised that acid sulfate soil management procedures should also include verification testing of potential or actual Acid Sulfate Soils post liming and prior to re-burial.

The acid sulfate soil management plan will include verification testing of potential or actual acid sulfate soils post liming and prior to re-burial.

7.3.2 Effects – Surface Water (1)

EPA has advised that the EIS should provide an assessment of potential impacts on flow and quality of surface waters from the operation of the ore slurry pipeline and parallel seawater pipeline as required in the ToR. In addition the assessment should provide management strategies and monitoring programs in sufficient detail to demonstrate best practice management as required in the ToR.

The proposed slurry and residue pipelines will be buried for the entire route. The potential impacts to flow and quality of surface waters associated with operation of the pipelines are largely associated with:

- Erosion and scouring of the bed and banks of creek crossings post construction.
- Potential breach of pipeline integrity and loss of containment from the pipeline.

Erosion and Scouring

The greatest risk for soils and sediment movement at creek crossings will be the initial wet season post-construction. A significant wet season could lead to high or modified flow velocities within the steam, which could lead to failure of the stabilisation techniques employed during construction and cause increased sediment flow into the watercourse and/or exposure of the pipeline. Increased turbidity has the potential to impact on sensitive downstream environments and in-stream habitats.

The primary mitigation measure for watercourse crossings is to design the crossing to take into consideration the key constraints of the location. Mitigation measures to be adopted to minimise the potential for erosion and sediment runoff post-construction, which are consistent with the Australian Pipeline Industry (APIA) Code of Environmental Practice, include:

- Rapidly stabilise the disturbed areas following completion of construction.
- Restore the watercourse bed and banks to as near as practicable to their original profile and compact the banks to ensure stability.
- Respread topsoil over the area from which it was removed.

- Where required, use sandbag, gabion or other scour protection measures and ensure these are placed to conform to existing natural contours, as appropriate.
- Where practicable and agreed by the landholder, assist the post-construction recovery of watercourses with intact riparian areas by preventing access to the site (i.e. fencing or barriers).
- Where appropriate, use terracing and surface water diversion berms along the top and at intermediate points down the bank slope to encourage runoff to discharge to stable (e.g. vegetated) areas or via sediment settling basins and not directly to the watercourse.
- Install silt and sediment fences on slopes where appropriate to filter surface run-off water even if the watercourse is currently dry.
- Use stabilising materials such as, hydromulch, jute matting or other suitable geotextile where necessary.
- Undertake post construction monitoring of crossings to ensure the rehabilitation has been successful and that the stability of the watercourses is consistent with pre-construction conditions.

Pipeline Integrity

A preliminary risk assessment of the slurry pipeline was completed and identified that the primary threats to the integrity of the pipeline that may lead to a release of the contents of the pipeline. A summary of the identified risks rated as medium or higher are presented in the following table. A full list of risks assessed and control measures proposed provided in Appendix D of the EIS.

The hazards associated with the failure of the pipeline during operations have been revised. GPNL recognises that a loss of containment from the slurry pipeline has the potential to cause adverse impacts on the surrounding environment. As the slurry water will now be fresh water rather than seawater as was stated in the EIS, the key impacts of a potential release are associated with deposition of the slurry material, erosion of the receiving area, and smothering vegetation and material within the immediate vicinity of the leak.

Details of the likely specifications and features of the pipeline that would minimise the risk of failure or leakage during operations are presented in the following table. The control measures proposed will be confirmed as a result of the risk assessment to be competed during the project's detailed design phase.

Pipeline Hazards and Proposed Control Measures

Hazards	Proposed Control Measure (to be confirmed during detailed design phase)
Interference/potential contact with pipeline by third party Infrastructure crossings – contact during operation or maintenance	Detailed risk assessment to be completed during the detailed design phase to determine: • Probability and type of excavation along the pipeline route and likely equipment used. • Areas at risk of contact by above ground activities. • Minimum depth of cover. • Minimum separation of pipeline from other pipelines and services. • Need for and design of additional pipeline protection (e.g. installation of concrete slabs at road/infrastructure crossings where there is a higher risk of impact, heavier walled pipeline for identified crossings). • Crossing location, design and methodology designed and agreed with infrastructure holders. • Installation of buried marker tape above pipeline in areas at risk from excavation. • Pipeline buried for entire length of the pipeline. • Installation of pipeline marker signs at intervisible intervals, which includes information regarding the pipeline and "dial before you dig' contacts.

Hazards	Proposed Control Measure (to be confirmed during detailed design phase)
	• Dial before you dig service (on call service to provide accurate information on the location and nature of the pipeline for those undertaking any activity in the vicinity of the pipelines. • Regular patrols of the pipeline route to inspect the integrity of the pipeline route and identify any activities that may adversely impact on the integrity of the pipeline. • Regular liaison with the landowners, occupiers and infrastructure holders with regard to the above ground activities and any future development plans. • Mutually agreed work procedures for any maintenance work on other buried or above ground infrastructure intersected by the pipeline route. • Leak detection and emergency measures (see below).
Internal Corrosion	Slurry composition is not very abrasive. Internal lining of the pipelines with HDPE to prevent internal corrosion. HDPE liner is designed for the life of the pipeline. Slurry velocity is controlled to limit turbulence, but ensure that materials remain in suspension. Intelligent pigging of the pipeline to monitor pipe thickness and potential pipeline corrosion. The timing of monitoring will be determined during the development of the operating procedures. Leak detection and emergency measures (see below).
External Corrosion	External coating of pipeline. Route selected to minimise electrical interference. Comprehensive corrosion analysis at the detailed design stage to ensure that induced currents are appropriately dissipated without causing hazards or corrosion; Installation of cathodic protection (CP) measures (e.g. induced current protection, earthing beds) additional controls in areas of potential interference. Routine monitoring and maintenance of cathodic protection system. CP test points installed at critical crossings and at a minimum of 5 km intervals. Leak detection and emergency measures (see below).
Pipeline fault	Design checking and verification of pipeline materials. Steel mill verification of pipe material in accordance with material specification. X-raying of welds during construction. Pressure testing during commissioning.
Pipeline exposure or movement due to flooding – watercourse crossings	Detailed risk assessment to be completed during the detailed design phase to determine: • Confirm construction methodology. • Minimum depth of cover. • Need for and design of additional pipeline protection (e.g. backfill with geotextile layer, concrete coating of pipeline or extra weighting of the pipeline where there is a risk of buoyancy). • Installation of trench breakers to prevent tunnelling of water. • Contour banks to divert water away from the pipeline.
Leak Detection and Emergency Measures	Each pipeline will have a flow meter and pressure transmitter located at each end. The control system will monitor the flow into and out of each pipeline on a continuous basis. An alarm will occur if a mismatch in flow is detected which would indicate that a leak is occurring in the pipeline. Pressure transmitters are installed primarily to indicate an over-pressure condition. Slurry and residue pipelines can be safety shut down for short periods (several hours) and restarted (slurry and solid materials will re-suspend). Pipelines can be flushed from the mine (slurry pipeline) or refinery (residue pipelines) if

Hazards	Proposed Control Measure (to be confirmed during detailed design phase)
	longer shut down is required. Plant and residue storage facilities have capacity for flushing of the relevant pipelines. GPNL will prepare emergency response plans (ERPs) for all work areas, including the pipelines and all personnel will be trained in the plan. Upon detection or notification of a leak, the pipeline ERP will involve: • The immediate shut down of the associated pipeline. • Mobilsation of inspection crews to determine the nature and scale of the incident. • Reporting of the event to emergency services and potentially impacted landholders. • Mobilisation of the personnel and equipment of contain the leak and minimise adverse impacts to the surrounding area. • Restoration of the area to a standard to enable the pre-existing land activity to recommence.

7.3.3 Groundwater (13)

DNRW advised that the description of the existing environment for all groundwater sections in the EIS, not just the pipeline effects, does not adequately address the Terms of Reference (TOR). The TOR states that the EIS should review the quality, quantity and significance of the groundwater in the project areas. The data presented in the EIS is restricted to registered bores on the NRW Groundwater Database.

In addition to a review of registered bores on the NRW Groundwater Database, groundwater drilling was undertaken as part of the groundwater investigations for the EIS. This included the drilling of four bores at the refinery site and nine bores at the RSF. The results of these investigations are given in Sections 8.4 and 9.7 of the EIS respectively. In addition, further groundwater investigation drilling has been undertaken at the RSF since the submission of the EIS. Details of this drilling program are given in Appendix K.

The groundwater investigation for the pipeline component of the project was based on data obtained from the DNRW Groundwater Database for bores within 5 km of either side of the pipeline. The investigation identified 275 bores over the 180 km of pipeline route. The investigation identified that the groundwater level in most areas is unlikely to be shallower than 3 m and is therefore unlikely to be affected by the pipeline construction and operations. As it is expected that the pipeline will generally have a depth of cover of 750-1200 mm, no further investigation of groundwater was warranted.

Section 7.3.3.2 of the EIS did identify two areas along the pipeline route where shallower groundwater may be encountered. This was in the vicinity of Raglan Creek (KP 136-138) and possibly around KP 71-76). The EIS discussed the key activities that had the potential to impact on groundwater (if it was encountered). The primary activities associated with the pipelines with the potential to impact on groundwater if the appropriate control measures are not in place are:

- Construction of the pipeline trench in locations where shallow aquifers exist;
- Directional drilling where shallow aquifers exist;
- Dewatering of the pipeline trench, where groundwater infiltrates;
- Presence of a back-filled trench post-construction.

Potential impacts to groundwater associated with the pipelines include:

- Changes to hydrological conditions; and
- Water quality - contamination of groundwater from spilt material.

Proposed mitigation measures were included in EIS and draft Environmental Management Plan. In addition, as it is proposed to construct the crossing of Raglan Creek via directional drilling, the EIS identified that the existence of shallow groundwater will be included as a consideration in the selection of the crossing methodology and in the development of the site specific crossing plan for the crossing.

DNRW advised that not all bores are required to be registered and reliance solely on this data to make statements as to the significance of the groundwater resource in the project areas is considered inadequate.

See response above.

7.3.4 Watercourse Crossing (13)

DNRW indicated that the EIS adequately addresses issues related to watercourse crossings of the pipelines. It recognises that a riverine protection permit under the Water Act 2000 may be required for some crossings. It should be noted that in areas where a water supply scheme exists the proponent may also require approval from the relevant water service provider as part of this process.

GPNL acknowledges the advice from DNRW in regards to subsequent permits for watercourse crossings. Where necessary, such approvals will be sought from the relevant water service providers.

7.3.4.2 Watercourse Crossing Methods (1)

EPA advised that information on the pipeline design should show how the risks associated with the proposed river crossings, particularly the risk of pipe exposure at river crossings and how this will be managed. Detailed crossing plans should be prepared for each of the major stream crossings and for areas of high conservation significance including wetlands.

GPNL have addressed the risks associated with the proposed river crossings through considered route selection at the watercourse crossings and through the design of the pipeline at these crossings.

As outlined in Section 7.3.4.1 of the EIS, all watercourses crossed by the proposed pipeline have been assessed in the field to determine the optimum crossing point, and refinements were made during the field component of the water and ecological studies to further refine the proposed crossing locations.

Initial selection of the pipeline route (including watercourse crossings) commenced in early 2005. The initial crossing points for all watercourses were selected on the basis of the following criteria:

- Minimise the extent of clearing of riparian vegetation.
- Avoid permanent and semi-permanent waterholes.
- Avoid unstable and/or steep, incised banks.
- Avoid bends in the channel and confluences with other channels.

Detailed field investigations of the proposed pipeline route were then completed. These were documented in Section 5.5.2 of the EIS (refer to extract below for information related to watercourse crossings).

Route Refinement Investigations

Activity	Outcome
Helicopter Flyover	Identified preferred crossing of Fitzroy River and other water courses. Identified appropriate saddles to cross areas of hilly terrain (Kabra & Midgee). Located numerous landowner facilities that are to be avoided. Scoped approach to the refinery site in the highly constrained GSDA.

Section 10 Environmental Effects of Pipelines

Activity	Outcome
Environmental Survey Flora/Fauna Soils/Topography /Geology Water	Identified plant species protected by the EPBC and NCA Act that require clearing permits. Identified areas of high habitat value and requirement for specific management plans. Identified alternate watercourse crossing points to minimize clearing of protected plant species. Identified alternate route alignments to avoid clearing protected plant species and habitat of protected fauna species.
Construction Feasibility Survey	Confirmation of constructability of watercourse crossing locations while minimising environmental impacts. Confirmation of constructability through coastal plains. Confirmation of likely construction method at key watercourses crossing points. Confirmation of constructability of the pipeline route through the GSDA where space is limited due to use of existing infrastructure corridor.

A number of route refinements were completed and a summary of the major changes was provided in Section 5.5.2 of the EIS (refer to extract below for information related to watercourse crossings).

Summary of Route Refinement

Kilometre Point	Constraint Identified	Refined Route
KP 10 - Fitzroy River Crossing	High cliffs (10m) on south bank of Fitzroy, the existence of a gravel bar and significant riparian vegetation (primarily on north bank). High construction cost for directional drill.	Refined route utilises a gravel bar to minimize construction cost and riparian vegetation clearing. The main body (~80m) of water will be directional drilled.
KP 102-137 - Coastal Wetland	Coastal and marine plans and habitat for protected bird species located on eastern side of the Bruce Highway. Could not be avoided due to topographic constraint associated with western side of the highway.	The route has been realigned as far east as possible to avoid as far as possible lagoons, wetlands and shallow saline and freshwater drainage lines which provide potential habitat for protected bird species.
KP 136 - Raglan Creek Crossing	Closed Mangrove forest.	The route was re aligned to reduce the clearing of mangroves.

Route refinements were also made at five watercourses between KP 38 and 80.5 to minimise impacts to Black Ironbox trees, which are listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act and Nature Conservation Act*.

As outlined in the EIS, based on an initial review of crossings, horizontal directional drill (HDD) has been identified as a potential crossing method at a number of significant watercourses including the Fitzroy River, Neerkol Creek, Raglan Creek and potentially Inkerman Creek, with the remainder being crossed via open cut.

Control measures to manage potential adverse environmental impacts at watercourse crossings, which are consistent with the APIA Code of Environmental Practice, were detailed within Section 14 of the EIS – Pipeline EMP. A summary of the key watercourses (Class 1 & 2 and where a particular issue is present), watercourse characteristics, proposed crossing method, and cross references to the appropriate section of the EMP is provided in the following table.

Key Watercourses, Characteristics, Crossing method and EMP Cross Reference

Approx KP	Waterway Name / Location	Surface Water Present/ Absent	Observation Water Quality	Main Channel Width (m)	Depth to Top of Banks (m)	Comment	Class	Proposed Crossing Method / EMP Reference
5	Minor Creek	No	n/a	3	2/5	-	2	Open Cut 14.8.4.3 Water Management Plan 14.8.5.2 Black Iron Box Special Area Plan
8	Marlborough Creek	No (pond upstream)	n/a	80	5/5	Wide cobbled channel	1	Open Cut 14.8.4.3 Water Management Plan
10	Fitzroy River	Yes	Turbid	50	12	Very wide creek, evidence of gully erosion, some cobbles in channel. Sand bar at crossing point.	1	HDD 14.8.3.4 Boring and Drilling Management Plan 14.8.4.3 Water Management Plan
35	Two Mile Creek	Yes	Turbid to good	2	6	Gully and sheet erosion present on banks. Black Ironbox trees present (protected vegetation).	4	Open Cut 14.8.4.3 Water Management Plan 14.8.5.2 Black Iron Box Special Area Plan
45	Louisa Creek	Yes (downstream)	Turbid to good	13	5/1	Wide channel with some cobbles	2	Open Cut 14.8.4.3 Water Management Plan
60	Limestone Creek	Yes	Turbid	Not recorded	Not recorded	Mature Black Ironbox trees present (protected vegetation)	3	Open Cut 14.8.4.3 Water Management Plan 14.8.5.2 Black Iron Box Special Area Plan
63	Deep Creek	No	n/a	5	3/8	Steep slopes, Black Ironbox trees present (protected vegetation)	3	Open Cut 14.8.4.3 Water Management Plan 14.8.5.2 Black Iron Box Special Area Plan
73	Lion Creek	No	n/a	8	4	Weeds present at crossing, mature Black Ironbox trees present (protected vegetation)	2	Open Cut 14.8.4.3 Water Management Plan 14.8.5.2 Black Iron Box Special Area Plan
80	Neerkol Creek	Yes	Stagnant	10	7	Wide channel, Black Ironbox trees present (protected vegetation)	2	HDD 14.8.3.4 Boring and Drilling Management Plan 14.8.4.3 Water Management Plan 14.8.5.2 Black Iron Box Special Area Plan

Approx KP	Waterway Name / Location	Surface Water Present/ Absent	Observation Water Quality	Main Channel Width (m)	Depth to Top of Banks (m)	Comment	Class	Proposed Crossing Method / EMP Reference
85	Gracemere Creek	No	n/a	10	0.5/0.5	-	2	Open Cut 14.8.4.3 Water Management Plan 14.8.5.2 Black Iron Box Special Area Plan
95	Gavial Creek	No	n/a	6	8	Steep banks, cobbles and stones in channel	2	Open Cut 14.8.4.3 Water Management Plan 14.8.5.2 Black Iron Box Special Area Plan
120	Inkerman Creek	Yes	Turbid	15	1.5/1.5	Tidal creek, some mangroves, potential for ASS to be present below channel	1	Possible HDD for crossing 14.8.3.4 Boring and Drilling Management Plan 14.8.4.3 Water Management Plan 14.8.4.4 Soil Management Plan (ASS) 14.8.5.1 Wetland Habitat Area – Capricorn Yellow Chat
132	Pelican Creek	Yes	Good	8	12	Located in wetland area, low groundwater	3	Open Cut 14.8.4.3 Water Management Plan 14.8.5.1 Wetland Habitat Area – Capricorn Yellow Chat
135	Raglan Creek	Yes	Turbid	10	6/8	Tidal creek, some mangroves, potential for ASS to be present below channel	1	HDD 14.8.3.4 Boring and Drilling Management Plan 14.8.4.3 Water Management Plan 14.8.4.4 Soil Management Plan (ASS) 14.8.5.1 Wetland Habitat Area – Capricorn Yellow Chat

The method for watercourse crossings will be confirmed during the detailed design phase of the project and will be based on further investigations and information which will include (but not be limited to):

- Pipeline diameter;
- Watercourse width, depth and flow;
- Environmental sensitivity of the crossing;
- Downstream water values;
- Riverbank, geotechnical and stability concerns;
- Riverbed substrate composition;
- Hydrological data; and
- Economic concerns.

Upon confirmation of the crossing method, detailed crossing plans will be developed and submitted to the relevant regulatory agencies as part of the permitting process. Where a change to the crossing method becomes necessary, GPNL proposes the following:

- Geotechnical investigations will confirm feasibility of proposed construction method.
- Site conditions (particularly hydrologic conditions) at the time of construction will be assessed to confirm crossing method.
- The relevant regulatory agency will be notified of a proposal to change the crossing method. Notification will include the following information:
  - reasons for change;
  - description of alternate crossing method and why it was chosen;
  - assessment of potential environmental impacts if the disturbance area will be greater than the disturbance under the recommended method;
  - the procedures under the construction EMP that will apply; and
  - if the crossing was already attempted, the remedial works to be undertaken to rehabilitate the failed works.

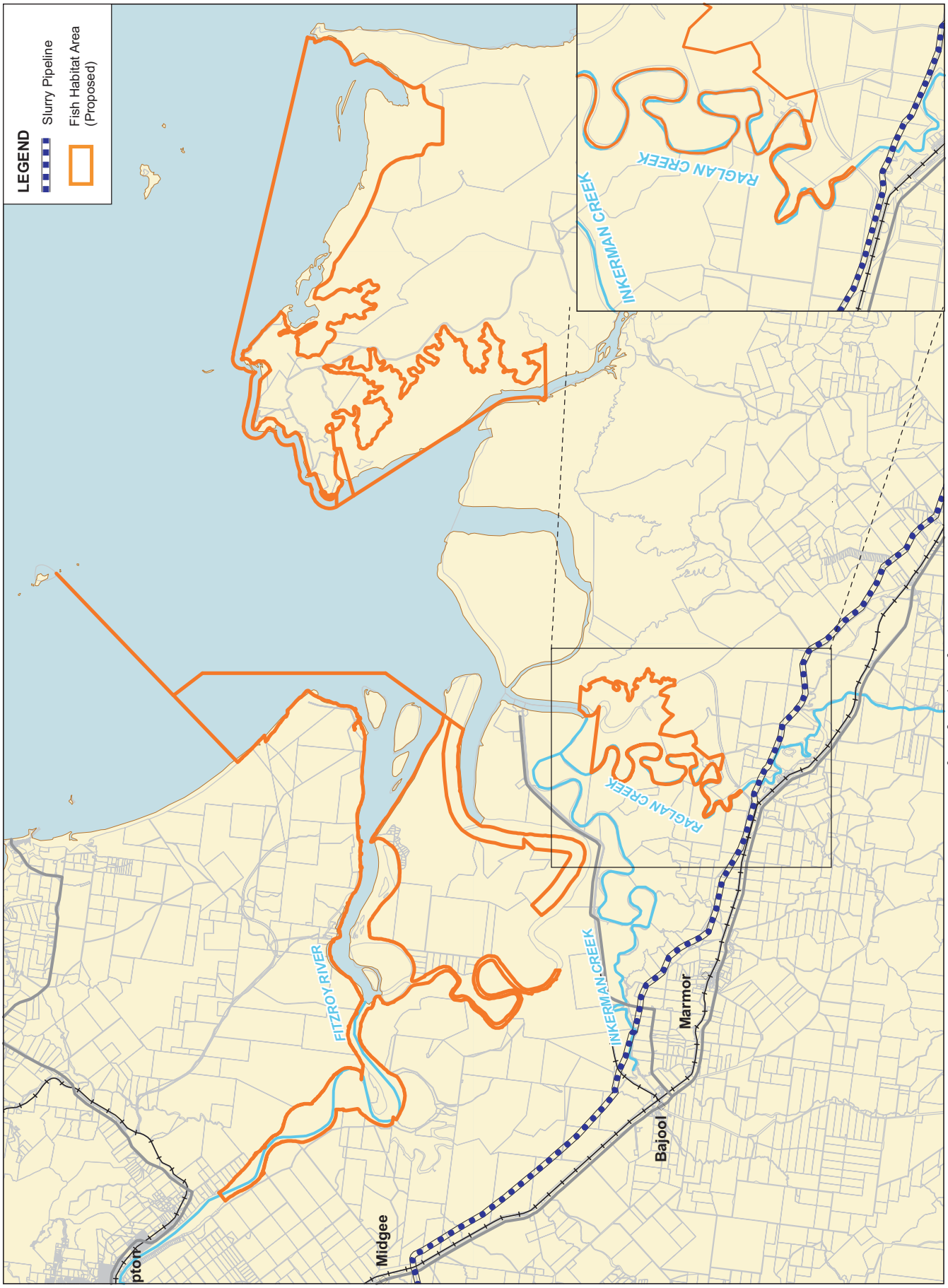
7.4 Flora (2, 13)

DPIF has a current proposal to declare a Fish Habitat Area within the tidal reaches of the Fitzroy River. The Fish Habitat Area is proposed to extend into the upper tidal reaches of Raglan Creek. It appears unlikely that the proposed pipeline corridor will intercept with the proposed FHA, however a copy of the plan has been provided for confirmation.

Figure 7.1 shows the alignment of the proposed pipeline route and the proposed Fish Habitat Area as provided by the DPIF. This indicates that the pipeline route will not be located within the proposed FHA.

DPIF has advised that development approvals will be required for any marine plant disturbance and temporary waterway barriers required for the construction of these pipelines. DPI&F will undertake detailed assessment of these applications to ensure that waterway crossing techniques are appropriate to individual sites and all impacts are justified and minimised.

As outlined in Section 7.3.4.3 of the EIS, detailed crossing plans and procedures will be developed during the detailed design phase of the project. During this phase, GPNL will liaise with the relevant regulatory agencies including the DPI&F with respect to the design of the crossing and obtaining the relevant permits and approvals under the *Waters Act 2000, Fisheries Act 1994* and/or *Coastal Protection and Management Act 1995* depending on the crossing location.



Source: Fitzroy Shire Council 2005, Rockhampton City Council, Geoscience Australia, Department of Primary Industries and Fisheries.

RLMS File No: A4_Pipeline_Layout.WOR

Client: Gladstone Pacific Nickel Ltd

RLMS

Project: GLADSTONE NICKEL PROJECT
ENVIRONMENAL IMPACT STATEMENT
SUPPLEMENTARY REPORT

Title: **PROXIMITY OF PIPELINE ROUTE TO FITZROY FISH HABITAT AREA**

Drawn: BC	Approved: KD	Date: 29-01-2008	Figure: **7.1**	Rev: A
Job No: **4262 5791**	File No: 42625791-g-255.cdr			**A4**

DNRW advised that the EIS does not clearly delineate how the proposed clearing meets the Performance Requirements in Part S of the Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions 20 November 2006 and the Regional Vegetation Management Code for Southeast Queensland Bioregion 20 November 2006.

In addition to the above, in order to adequately assess the clearing of vegetation as a result of this project, DNRW requires a detailed spatial plan of the proposed clearing application area and the provision of details on the method of clearing.

Figure 7.4.1 of the EIS summarises the regional ecosystems that will be disturbed as a result of the proposed pipeline. Table 7.5.4 includes a list of vegetation communities and areas (ha) proposed for disturbance. An outline clearing and grading management plan is included in section 14.8.3.2 of the draft EIS.

During the detailed design phase and prior to construction, GPNL will submit a vegetation clearance application to DNRW in accordance with the requirements of the *Vegetation Management Act 1999*. This application will be accompanied by a detailed analysis of how the proposed clearing will meet the performance requirements of the relevant regional management codes. It will also include a detailed spatial plan of the proposed clearing application area and details on the method of clearing.

7.4.11.3 Spread of Weeds (18)

FSC advised that for management of weeds along the route, FSCl requires comprehensive weed management procedure approved by the FSC.

Weed management programs will be undertaken for individual properties. A weed management program plan will be provided for review by Fitzroy Shire Council.

7.4.12.4 Spread of Weeds (18)

FSC respondent has advised that for management of weeds along the route, FSC requires comprehensive weed management procedure approved by the FSC.

Refer to comment in Section 7.4.11.3 above.

7.5 Fauna (1)

EPA advised that information on the impacts of the project should include discussion of the potential for fauna to be injured or orphaned. Proposed management measures should also be identified.

Section 7.5.1.2 of the EIS identified that the open trench present during pipeline construction would provide a temporary barrier to fauna movement and that there is potential for ground-dwelling fauna to fall into the trench and become trapped and exposed to overheating, dehydration, predation and / or drowning. GPNL acknowledges that the pipeline construction also has the potential for fauna to be injured or orphaned.

A range of management measures are proposed to minimise this risk. These measures include:

- Trenching will occur progressively to minimise the period of time the trench is open and the length of open trench.
- Construction will be planned where practicable to take place in the coolest and driest months (i.e. May to September), when reptiles and amphibians are least active and when conditions are most favourable for minimising mortality in the trench.
- The open trench will be surveyed on a daily basis by qualified fauna spotters and handlers. Any injured or orphaned fauna will be collected by qualified fauna spotters, recorded and additional assistance provided as necessary for any injury or ongoing care requirements.

- Ramps and trench plugs with slopes of no greater than 50% (APIA, 2005) will be located at least every 500m to assist escape for some species. Cool insulated covers will be installed in the trench at regular intervals, as well as higher platforms where there is the potential for accumulation of water within the trench.

7.8 Hazard and Risk (17)

A respondent has asked regarding the residue pipelines and residue storage area at Aldoga. What are the increased risks to the environment and community if some breach of containment occurs? Who will clean up?

Section 7.8 of the EIS includes a discussion of hazards and risks associated with the pipelines. Further discussion is given in Sections 7.3.2 and 7.8.2.1 of the EIS Supplement.

Section 13 of the EIS includes a description of project risks and risk mitigation measures and clean up actions. In the event of a spill or leak, GPNL would be responsible for clean up and remediation.

Appendix D.4 of the EIS includes a risk assessment report for the off-site pipelines.

Appendix T of the EIS includes a risk assessment report for the refinery. A release of slurry to the environment from the pipeline has been identified in the event of pipe or flange failure or vehicle impact; however, the risk of this occurring is low based on an estimated frequency of occurrence of less than one event every thousand years (E). The estimated rare consequences of such an incident may potentially include up to a single fatality or small number of people disabled (on-site), medical treatment/one person disabled, off-site release to the environment with short-term impact, and potential costs for property damage in the range of $1M to $10M. The risk assessment was conducted in general accordance with Australian Standard HB 436:2004.

7.8.2.1 Hazard Identification (1)

EPA asked that the hazard to the environment associated with the failure of pipelines during operation be revised. Details of the specification and features of the pipeline that would minimise the risk of failure or leakage should be provided.

A preliminary risk assessment of the pipeline was completed during the preparation of the EIS and identified the primary threats to the integrity of the pipeline that may lead to a release of the contents of the pipeline. A summary of the identified risks rated as medium or higher is as follows:

- Interference - Contact of pipeline by GPNL or other party, causing interference with or damage to the pipeline.
- Internal Corrosion - Damage to the pipeline from erosion of the pipeline lining and wall by slurry material.
- External Corrosion - HDPE liner failure, exposing the pipeline to corrosive environments.
- Natural Events - Damage to the pipeline from flooding over the pipeline route, inundation or fast flowing water.

A full list of the risks assessed and control measures proposed was provided in Appendix D of the EIS.

GPNL recognises that a loss of containment from the slurry pipeline has the potential to cause adverse impacts on the surrounding environment. As the slurry water will now be fresh water rather than seawater as was stated in the EIS, the key impacts of a potential release are associated with deposition of the slurry material, erosion of the receiving area, and smothering vegetation and soils within the immediate vicinity of the leak. The risk of the introduction of saltwater into a freshwater environment has been eliminated.

Details of the likely specifications and features of the pipeline that would minimise the risk of failure or leakage during operations are presented in Section 7.3.2 of this EIS Supplement.

Section 10 Environmental Effects of Pipelines

GPNL will be completing a further detailed risk assessment of the pipeline as part of the pipeline design process. The location and detailed specification for the location specific control measures will be confirmed during the detailed design phase of the project, based on the results of the risk assessment.

GLADSTONE NICKEL PROJECT ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT

Environmental Effects of Refinery 11

URS

Gladstone Pacific Nickel LTD

8.2.1.7 Flooding of Refinery Stockpile (1, 16)

(1) *EPA advised that the EIS should address means of providing an additional 0.5m freeboard, such as by either a surrounding bund or adjusting the stockpile area level to 5.8m AHD, which would limit the potential for ore and sulphur stockpile inundation during a storm surge accompanying a 1:100 year flood.*

The combination of both a 1 in 100 year event and storm surge at high tide leads to an extremely low probability of occurrence and a very low risk of environmental impact. Ore stockpile runoff in such an extreme event is unlikely to have a significant impact given the extent of inundation that would occur throughout the whole of the Gladstone region in such an event.

The rail into site is located at 8m AHD along a berm established for dredge spoil placement. This will provide an additional barrier to storm surge.

(16) *CSC/GCC advised that the Council considers that the impact of flooding of the stockpile areas should be considered by the EIS having regard for the potential for the WICT not proceeding. Alternate filling proposals should be considered.*

The design of the stockpile areas to be above any floods of less than a 1 in 100 year event is consistent with council requirements and forms the basis for typical large scale project design. As discussed above, the combination of both a 1 in 100 year event and storm surge at high tide leads to an extremely low probability of occurrence and a very low risk of environmental impact. Ore stockpile runoff in such an extreme event is unlikely to have a significant impact given the extent of inundation that would occur throughout the whole of the Gladstone region in such an event.

Should WICT not proceed, WIW will proceed as it is an integral component of the GNP. Dredged spoil from the WIW project would be available to fill the stockpile area.

8.2.1.8 Water Quality in Calliope River (1)

EPA requested that the EIS Table 8.2.6 be changed to reflect current ambient water quality by presenting data collected since STP discharges to the Calliope River ceased.

Water quality data for the Calliope River has been sourced from 10 years of EPA monitoring (1996-2006) and 2 years of data (2005-2006) from the WICT EIS (Connell Hatch, 2006). A summary of the data is given in the following table.

Calliope River Water Quality

Parameter	Minimum	20th %ile	Median	80th %ile	Maximum	n
Turbidity (NTU)	1.0	7.0	12.7	25.4	208.0	1653
Chlorophyll-*a* (µg/L)	0.5	1.4	2.5	5.0	12.2	121
Dissolved Oxygen (%sat)	66.6	84.1	89.5	97.4	134.6	1755
pH	4.60	7.61	7.90	8.08	8.70	1641
Suspended Solids (mg/L)	10.0	18.8	29.0	38.0	72.0	58
Conductivity (mS/cm)	2.1	51.6	55.3	56.8	60.0	1639
Temperature (°C)	18.8	25.5	28.8	31.2	36.4	1666
Ammonia (µg/L)	30.0	33.0	40.5	79.2	113.0	32
Nitrates and Nitrites (µg/L)	10.0	10.0	21.0	38.0	66.0	36

Parameter	Minimum	20th %ile	Median	80th %ile	Maximum	n
Total Nitrogen (µg/L)	100.0	100.0	150.0	300.0	2100.0	36
Filterable Reactive Phosphorous (µg/L)	10.0	10.0	10.0	10.0	10.0	36
Total Phosphorous (µg/L)	30.0	40.0	50.0	90.0	160.0	36
Manganese (µg/L)	4.0	5.0	7.5	28.0	97.0	24

8.2.3.1 Stormwater Management System (1, 15)

(1) *EPA recommended that potential stormwater re-use options be investigated and incorporated into the development of the site. This would follow the mitigation of potential impacts of changes to flow regime as suggested in Section 8.2.3.3 of the EIS.*

Stormwater options for reuse have been investigated at the site. A number of areas for potential harvesting have been incorporated in the design including the following:

- Maintenance and process areas will be built on bunded concrete slabs. The bunded areas will each have a sump to collect stormwater. Within areas where nickel slurry fluids are to be stored, settled or processed, stormwater collected in the bund sumps will be periodically inspected, and if necessary tested, and reused as process water.
- All runoff from the stockpile area will be collected and screened before passing to settlement ponds and subsequently re-used as make-up process water in the refinery. GPNL will operate the ore stockpile area to not cause environmental harm. No water with soluble metal concentrations above ANZECC (2000) Marine water quality guidelines (95% trigger limits) would be released from the ore stockpile area. GPNL would capture and reuse the runoff from the ore stockpiles for use in the refinery.
- The stormwater drainage system for the general refinery areas will collect and treat and/or remove the 'first flush' stormwater runoff from the non-process areas of the refinery likely to be contaminated by potentially harmful substances. This will include all paved and roofed areas. The retained first flush runoff will be reused on site while excess "clean" runoff above the first flush volume will by-pass the initial stormwater storage and discharge directly into the stormwater outlet system.

(15) *CQPA asked what points of discharge are being considered for the stockpile area and refinery site? Is discharge into the Calliope River or Anabranch?*

The precise location of the stormwater discharge points will be determined at the detailed design stage. However, given the proximity of the refinery to the Calliope River it is expected that most of the stormwater will be discharged to the river rather than to the anabranch.

8.3 Marine Environment (17)

A respondent has raised the concern that marine and land are exposed to contamination due to the process plant operations.

The EIS has shown that the refinery will not result in any unacceptable impacts due to contamination of either the marine or land environments (Section 8 of the EIS).

8.3.2.1 Methodology (1)

EPA advised that measures to minimise the risk of entrainment of marine animals by the seawater intake structure should be fully described.

Section 11 Environmental Effects of Refinery

Seawater for the refinery is now proposed to be taken from the Calliope River rather than Port Curtis as was described in the EIS. This is because the seawater demand has reduced significantly from 240 GL/y to 8 GL/y. Consequently the diameter of the intake pipe has reduced from 1,700 mm to 400 mm. This reduction in pipe size will significantly reduce the risk of entrainment of marine animals. Furthermore, a 25-50 mm square mesh frame will be placed around the intake of the pipe to further reduce the risk of entrainment.

Table 8.3.3 World Heritage Criteria (1)

EPA noted that the EIS states that there will be no disturbance to mangroves in the vicinity of the refinery. However, a section of mangroves will be cleared while laying down the discharge water pipeline across the Calliope River to the RG Tanna Coal Terminal.

Furthermore, there is no assessment of the potential long-term impacts on mangroves of the increased background level of contaminants from the proposed release of the liquor to Port Curtis. The EIS should fully address all impacts on marine plants from all potential causes.

The majority of the mangrove vegetation community clearing associated with the discharge water pipeline will occur in conjunction with the construction of an equipment wharf for the WICT Project. The location of the crossing point has been selected specifically to minimise mangrove disruption and work in with the CQPA's plans for the WICT Project. The width of mangrove fringe that may need to be cleared for the pipeline across the Calliope River will be less than 20 m. An application will be submitted to the DPIF in accordance with the requirements of Section 123 of the *Fisheries Act 1994* for mangrove clearing that may be required.

Section 8.3 of the EIS and updates in this Supplement provide an assessment of impacts to the marine environment from the wastewater discharge from the refinery. This assessment has shown that the discharge will not result in the excedence of any relevant water quality objectives beyond the initial mixing zone. These objectives have been established to protect the marine ecology including mangroves. On this basis it can be assumed that any contaminants released from the refinery will not result in any detrimental damage to the mangroves at Port Curtis.

Furthermore, GPNL participates with other local industries in the Port Curtis Integrated Monitoring Program (PCIMP) in the evaluation of the marine resources of Port Curtis including mangroves and seagrass.

Table 8.3.6 Percentiles for Water Quality Data (16)

CSC/GCC notes that the data being utilised as 'ambient' in Table 8.3.6 is from a study conducted between December 1998 and November 2001. Councils question whether this data can be considered the best representation of current 'ambient' conditions in Port Curtis.

A more recent water quality data set for Port Curtis has been sourced from 10 years of EPA monitoring (1996-2006), Marine Water Quality Program (1998-2001) and monitoring over two seasons in 2006 for the WICT EIS (Connell Hatch, 2006). A summary of the data is given in the following table.

Port Curtis Water Quality

Parameter	Minimum	20th %ile	Median	80th %ile	Maximum	n
Turbidity (NTU)	1.0	5.0	12.0	27.0	225.0	946
Chlorophyll-*a* (µg/L)	0.33	1.07	1.87	4.85	11.36	127
Dissolved Oxygen (%sat)	71.5	91.5	94.5	99.7	128.1	1035
pH	4.73	7.88	7.99	8.13	8.60	1032
Suspended Solids	2.0	12.0	24.0	48.0	116.0	331

Parameter	Minimum	20th %ile	Median	80th %ile	Maximum	n
(mg/L)						
Conductivity (mS/cm)	23.6	52.4	54.93	56.6	60.5	1036
Temperature (°C)	17.0	22.4	25.85	29.2	35.5	331
Ammonia (µg/L)	2.5	7.0	11.0	30.4	200.0	189
Nitrates and Nitrites (µg/L)	5.0	5.0	5.0	25.0	422.5	195
Total Nitrogen (µg/L)	25.0	140	190	270	2300	194
Filterable Reactive Phosphorous (µg/L)	2.5	2.5	2.5	10.0	50.0	192
Total Phosphorous (µg/L)	5.0	10.0	25.0	25.0	32.0	194
Aluminium (µg/L)	2.5	35.0	73.0	140.0	3,700.0	194
Iron (µg/L)	2.5	31.6	90.0	210.0	2,100.0	174
Nickel (µg/L)	0.5	0.5	0.5	1.5	20.0	174
Manganese (µg/L)	0.5	3.9	7.6	15.0	59.0	194
Zinc (µg/L)	0.5	0.5	0.5	3.3	14.0	174

Table 8.3.7 Sediment Contaminant Values (14)

QH noted that marine sediment data is presented in Table 8.3.7. However, there was no discussion in the EIS on the relevance of the data. Comparison of the data with the Ontario Ministry of Environment indicates that the levels of Lead, Nickel, Mercury and Chromium in some sites is higher than the lowest concentrations at which toxic effects on the marine environment become apparent. As the discharge liquid from the refinery contains many chemicals in significant concentrations, the impact of the discharge on the marine environment should be discussed in the EIS. The EIS should discuss in detail the likely increase of the pollutant chemicals in the sediment and its effect on the marine environment for the lifetime of the refinery.

The relevance of the data was presented to provide a comparison with the manganese levels that are contained in the refinery's discharge. The existing manganese levels in the mud are quite high – up to 1500 milligrams per kilogram. This reflects a process by which magnification of manganese has occurred in the muds and subsequently supports life. It also gives a clearer picture with regard to impacts on seagrass and mangroves.

As discussed in Section 8.3.10.2 of the EIS, some of the manganese in the discharge can be expected to oxidise and produce small particles of insoluble manganese dioxide (MnO_2). These particles would typically be less than 4 µm in diameter; however some may aggregate and form composite particles with a diameter of typically 20 µm. A settling rate of 0.98 m/day was derived based on a weighted mean particle size of 4 µm. As Port Curtis is well mixed due to strong tidal velocities which is reflected in relatively high suspended loads, it is unlikely that the MnO_2 particles will settle from the water column.

Due to the low likelihood of particle settlement and as a result of the existing high levels of manganese in the Port Curtis sediments to which the local ecology has adapted, the manganese in the GNP discharge will have little effect.

Other metals in the GNP discharge will be dissolved and will not effect the quality of sediments in Port Curtis GPNL plans to assist in the ongoing research and analysis in this area by partially supporting a 3-year PhD position at Central Queensland University (see Section 8.3.10.2).

Table 8.3.8 Adopted Water Quality (1, 16)

(1) *EPA advised that the EIS should consider the new data in this report for all objectives derived in respect of the Port Curtis environment. This and any other data used to develop Water Quality Objectives based on the 80%ile needs to be included in the Appendices. A statement indicating whether the data includes any occasions where dredging was carried out should be made.*

The proposed water quality objectives based on the new data are presented in the following table.

Water Quality Objectives

Constituent	Ambient Concentration	Water Quality Objective
TSS difference (mg/L)	24[1]	<5[9]
Temperature difference (^{0}C)	25.9	<5[8]
Nickel (µg/L)	0.5[1]	7.0[3]
Cobalt (µg/L)	0.4[2]	1.0[5]
Iron (µg/L)	90.0[1]	[11]
Magnesium (µg/L)	1290000[2]	NA
Aluminium (µg/L)	73.0[1]	[10]
Manganese (µg/L)	7.6[1]	340/140[4]
Zinc (µg/L)	0.5[1]	15.0[5]
Cadmium (µg/L)	0.11[1]	0.2[7]
Calcium (µg/L)	411000[2]	NA
Chlorine (µg/L)	19400000[2]	NA
Sulfate (µg/L)	2688000[6]	NA

[1] Median of monitoring data (see Table 8.3.6 above).

[2] Typical seawater value (http://www.seafriends.org.nz/oceano/seawater.htm)

[3] ANZECC/ARMCANZ http://www.mincos.gov.au/pdf/anz_water_quality/wqg-ch3.pdf (99th protection of species level)

[4] Provided by CSIRO –340 µg/L for disturbed areas and 140 µg/L for other areas

[5] ANZECC/ARMCANZ http://www.mincos.gov.au/pdf/anz_water_quality/wqg-ch3.pdf (95th protection of species level)

[6] http://www.enclabs.com/question.html

[7] ANZECC/ARMCANZ http://www.mincos.gov.au/pdf/anz_water_quality/wqg-ch3.pdf (protection of species for human protection)

[8] EPA requirement for other Gladstone project

[9] Qld Water Quality Guidelines 2006 (acceptable departure from natural or reference condition)

NA = no data available

[10] ANZECC 2000 identifies a protection level of 0.5 µg/L for dissolved aluminium. As can be seen in Table 8.3.6, the ambient dissolved aluminium concentrations in Port Curtis are significantly higher than the ANZECC guideline. However, the 0.5 µg/L trigger value referenced was based on "*low reliability data*". Low reliability values are derived from limited data and analyses and should not be used as final guidelines but as indicative interim figures, which if exceeded, suggest the need to obtain further data. ANZECC states that interim working level should be revisited as additional data become available. The additional data in Table 8.3.6 show that the site-specific ambient aluminium concentrations in Port Curtis are significantly greater than 0.5 µg/L and it is proposed that the values in Table 8.3.6 be used as the baseline aluminium concentration values for determining future impacts from discharges containing aluminium. The Queensland Water Quality Guidelines 2006 support this approach as they state that using a small departure from natural baseline conditions as a guideline is acceptable if there is good knowledge of baseline conditions. For Port Curtis there is a good knowledge of baseline conditions as 10 years of data are available.

[11] Iron is the fourth most abundant element on earth and concentrations in natural waters are influenced by the surrounding geology. ANZECC has not derived an Australian trigger value for iron due to a lack of toxicity data but a Canadian guideline of 300 µg/L is presented as an interim indicative level until additional data are established. The additional data in Table 8.3.6 show that the site-specific ambient iron concentrations in Port Curtis are less than the Canadian guideline and it is proposed that the values in Table 8.3.6 be used as the baseline iron concentration values for determining future impacts from discharges containing iron. The Queensland Water Quality Guidelines 2006 support this

approach as they state that using a small departure from natural baseline conditions as a guideline is acceptable if there is good knowledge of baseline conditions. For Port Curtis there is a good knowledge of baseline conditions as 10 years of data are available.

(1) *EPA requested clarification of where the temperature differential Water Quality Objective (WQO) will be monitored for compliance. If the proposal is to have up to a 5 °C differential at the point of discharge, the proponent should provide additional assessment of the potential impacts and the size of the mixing zone.*

The revised discharge regime from the refinery due to the change from seawater to freshwater cooling will result in a significantly reduced heat load to Port Curtis from that described in the EIS.

Blowdown from the freshwater cooling system will be reused in the process as much as possible and will not be discharged.

Liquor returning to the refinery from the RSF will be at a potential maximum temperature of approximately 50^0C. A barren liquor-to-seawater plate heat exchanger will drop the temperature of the barren liquor and raise the temperature of the incoming seawater used to slurry the ore. A second plate heat exchanger using cooling water will further lower the temperature of the barren liquor prior to discharge. The temperature will be controlled to less than 5^0C of the ambient seawater temperature based on continuous measurement of the incoming seawater. In the event that temperature of the barren liquor exceeds the target temperature, it will be recirculated to the barren liquor storage tank.

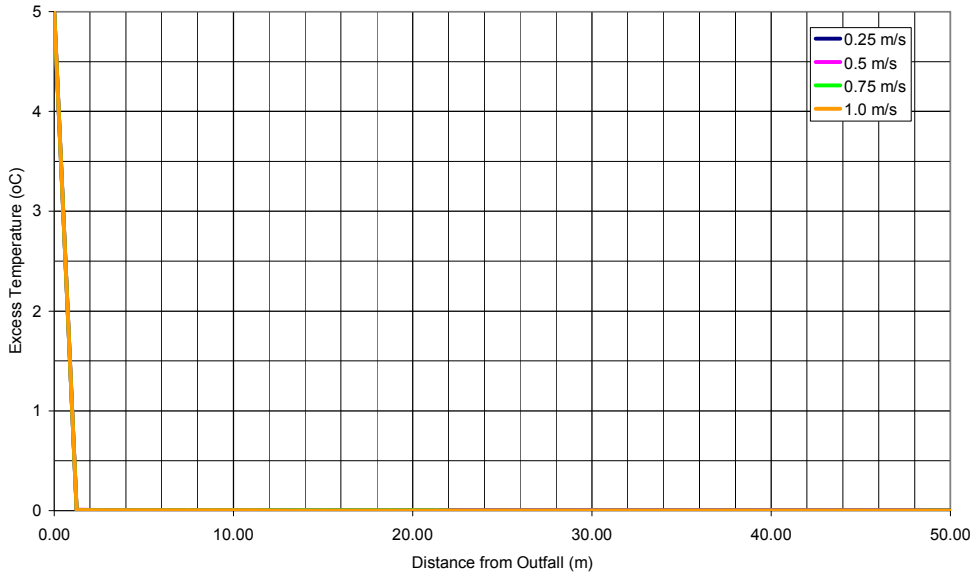
The monitoring point for temperature compliance will be at the point where the discharge leaves the refinery.

(1) *EPA requested that the EIS should discuss how the temperature differential would be managed within the stated objectives (<5º C differential) throughout the seasonal range of ambient temperatures and fully quantify and assess the impacts of raising the temperature of the seawater and benthos above the ambient range.*

As discussed above heat exchangers will be used to reduce the temperature of the discharge to less than 5^0C above ambient. The ambient temperature in Port Curtis will be included in the refinery's water quality monitoring program and will be used to determine the maximum allowable discharge temperature.

Modelling of the reduced heat load in the discharge to Port Curtis (Appendix E) shows that with a discharge of 5^0C above ambient, water temperatures will return to ambient within 2 m of the discharge location (see graph below). On this basis, temperature impacts on benthos in the vicinity would be minimal and restricted to a small area. Furthermore, as the discharge will be in an already disturbed area adjacent to reclaimed land and the RG Tanna Coal Terminal, there is unlikely to be any significant benthos present to be affected.

Predicted Centreline Temperature Differential – Stage 2

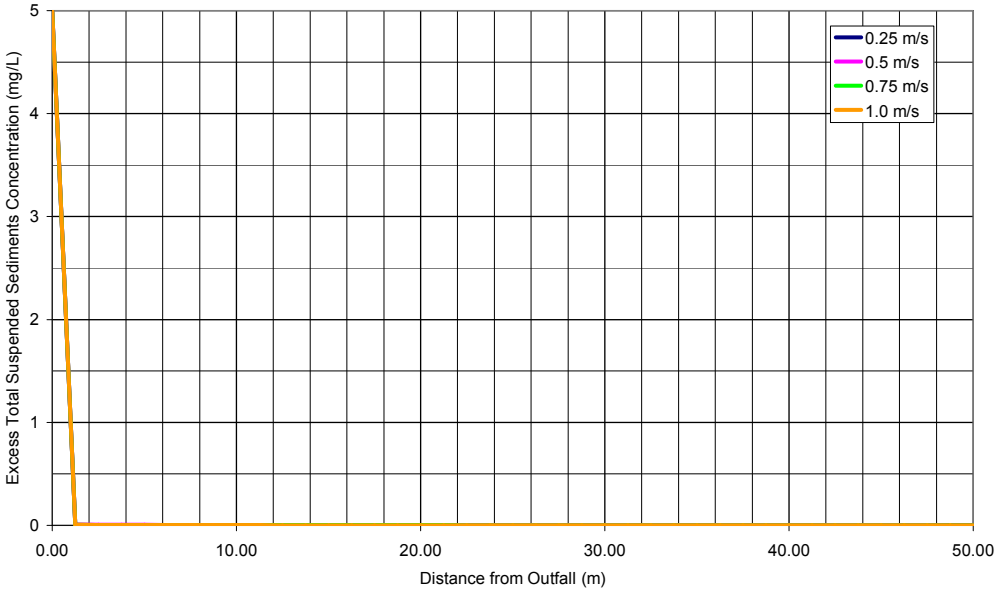


(1) *EPA recommended that the EIS should report results of monitoring undertaken at the Wiggins Island Wharf (WIW) intake location to determine the seawater quality and subsequent objectives. The consequences for suspended solids concentration and temperature on discharge characteristics should be determined.*

A discussed in Section 2.8, seawater intake is no longer proposed from WIW. A much smaller volume will be extracted from the Calliope River. Water quality data from the Calliope River are given in Section 8.2.1.8.

The temperature effects of the refinery discharge to Port Curtis are discussed above. The following graph presents the results of the assessment of suspended solids in the discharge.

Predicted Centreline TSS Differential – Stage 2



As can be seen from the above graph, ambient concentrations of suspended solids will be reached within 2 m of the discharge location.

The monitoring program for the refinery discharge to Port Curtis will include temperature and total suspended solids.

Table 8.3.9 Characteristics of Stage 1 (1)

EPA advised that the EIS should assess the influence (and consequent impacts) of the ore from all potential sources including assessment of the likely range of variability of all metals (and other contaminants of concern) in the proposed discharge liquor. Where different ore types present significant variations from the information provided in the EIS, the potential impacts should be assessed and mitigation measures proposed.

GPNL has utilised conservative ore quality with respect to the processing and effluent discharge parameters. On this basis, the process is able to handle a wide range of ores. The Marlborough ore is relatively low in cobalt and relatively low in manganese when compared to imported ore. The imported ore concentrations have been used as the basis for the estimation of manganese and other analyte discharge concentrations.

Table 8.3.10 Water Quality Objective (16)

CSC/GCC has inquired whether consideration has been given to discharging during peak tidal velocities only? Also, has consideration been given to discharging on the ebbing tide only?

Modelling of the revised discharge arrangements (Appendix E) has shown that the Port Curtis water quality objectives can be met outside of the initial mixing zone at all times of the tidal cycle. Hence it will not be necessary to limit discharging to only times of peak tidal velocities or ebbing tides.

Modelling was also undertaken under conditions of an ebb-tide-only discharge. No significant difference was observed.

8.3.8 Commercial and Recreational Fishing (14)

QH has indicated that the importance of commercial and recreational fishing in Port Curtis is discussed in section 8.3.8. However, the impacts of the refinery and the discharge of the contaminants to the marine environment on the fishing activities are not discussed in the EIS.

The potential effect of the refinery discharge on ambient water quality in Port Curtis is discussed in Section 8.3.13 of the EIS and shows that the predicted water quality concentrations will remain below the established water quality objectives. These objectives have been set on the basis of ensuring that there will be no detrimental effects to marine biota including species of interest to the commercial and recreational fishing industries in Port Curtis.

8.3.10 Ambient Water Quality Criteria (14)

QH indicated that the Water Quality Objectives seem to have been derived from various guidelines across the world. The EIS should discuss the criteria for adopting these objectives and whether the Water Quality Objectives have been approved by a regulatory agency like EPA. The water quality objectives (trigger levels) for some chemicals in the EIS are much higher as the lower levels of protection were chosen by the authors. As nickel and other pollutants are bioaccumulative, the protection levels should have been 99%. Examples given include nickel and aluminium.

Some of the water quality objectives adopted for the EIS have been modified by using additional ambient water quality data as well as applying more stringent guidelines. This has included adopting the 99th percentile species protection level for nickel. The revised objectives are given in Table 8.3.8 above.

The ANZECC 99th percentile protection level for dissolved aluminium is 0.5 µg/L. As can be seen in Table 8.3.6 above, the ambient dissolved aluminium concentrations in Port Curtis are significantly higher than the ANZECC guideline. However, the 0.5 µg/L trigger value referenced was based on "*low reliability data*". Low reliability values are derived from limited data and analyses and should not be used as final guidelines but as indicative interim figures, which if exceeded, suggest the need to obtain further data. ANZECC states that interim working level should be revisited as additional data become available. The additional data in Table 8.3.6 show that the site-specific ambient aluminium concentrations in Port Curtis are significantly greater than 0.5 µg/L and it is proposed that the values in Table 8.3.6 be used as the baseline aluminium concentration values for determining future impacts from discharges containing aluminium. The Queensland Water Quality Guidelines 2006 support this approach as they state that using a small departure from natural baseline conditions as a guideline is acceptable if there is good knowledge of baseline conditions. For Port Curtis there is a good knowledge of baseline conditions as 10 years of data are available.

8.3.10.2 Manganese Criteria Trigger Value (1, 16)

(1) *EPA requested further data on the potential manganese (Mn) toxicity issues in relation to important plants in the ecosystem considering that Mn is known to bioaccumulate up to around 100,000 times in plants. In the absence of other supporting data, the EPA will accept (upon the precautionary principle) the proposed WQO for Mn(II) as proposed by Dr Stauber (i.e., 140 µg/L in the habitat of coral, 340 µg/L in non-coral habitat).*

Due to the paucity of toxicity data for manganese in marine waters reported in the EIS, GPNL is proposing to support a PhD research program to investigate the dynamics of trace metals in Port Curtis under naturally occurring environmental conditions, and the bioaccumulation potential and toxicity of trace metals to biota. The proposed study will consist of the following two phases:

- Initially through laboratory assessments, the project will investigate the binding capacity of manganese oxides for trace metals under various simulated natural conditions (pH and dissolved oxygen). The bioaccumulation of trace metals in biota (oysters, prawns etc.) and passive sampling devices (DGT) through spiking manganese aggregates will also be assessed under similar conditions. Environmental harm to biota through toxicity testing will also be determined concurrently. An assessment of the light reducing properties and settling rates of the aggregates will also be determined.
- Secondly, in-situ field studies and/or through the use of mesocosms will be undertaken to validate the results of the laboratory studies. (A mesocosm has been defined as an experimental system that simulates real-life conditions as closely as possible, whilst allowing the manipulation of environmental factors).

Furthermore, GPNL is committed to participating in long term seagrass and mangrove studies in Port Curtis. A seagrass study is already being implemented through the Port Curtis Integrated Monitoring Program (PCIMP).

(1) *EPA recommends that the proponent re-evaluate the information provided on modelling and fate of the Mn contaminant when this new information on Mn(II) half-life becomes available.*

The initial field and laboratory manganese studies conducted by CSIRO and Central Queensland University and reported in the EIS indicated that the oxidation of dissolved manganese in the surface waters of Port Curtis may occur over timescales of weeks to months. It was noted that further work was required in order to accurately determine the rate of oxidation and also to understand the environmental factors affecting oxidation rates. This work also showed that oxidation rates at the sediment water interface were much faster. This was probably the result of bacterially-catalysed oxidation. It was recommended that further investigations be conducted in order to understand the rates of oxidation occurring at different benthic locations in Port Curtis and also understand the effects of manganese concentrations on oxidation rates.

Further work by CSIRO included the assessment of manganese oxidation rates in the laboratory under controlled incubation conditions over a 6-week period. These experiments used waters from Port Curtis containing ambient suspended sediment concentrations supplemented with added inorganic Mn(II). The effect of suspended sediment concentration on oxidation rate was also investigated in a separate experiment.

All studies were conducted jointly by the Centre for Environmental Contaminants Research, CSIRO Land and Water (CECR) and the Centre for Environmental Management (CEM) at Central Queensland University (CQU), Gladstone. Professor Barry Chiswell (NRCET) provided peer review and additional technical expertise. Laboratory and field incubation experiments were conducted in Gladstone and chemical analyses performed by CSIRO at their Lucas Heights laboratory, Sydney.

The study showed that for the manganese-spiked seawater samples, complete oxidation and precipitation of the added dissolved manganese (3000 µg/L) occurred within 21 days. The estimated half-life of dissolved manganese was between 10-11 days. Further incubation experiments conducted using seawater supplemented with additional sediment indicated that TSS concentration had little effect on the Mn oxidation rate over the range 11 to 67 mg/L of suspended solids.

The full CSIRO report is given in Appendix I.

Based on the results of this investigation, a half-life of 10 days for manganese has been used in the revised modelling of the refinery's discharge to Port Curtis

(1) *EPA has recommended that subjective opinions be replaced in the EIS with the actual value for flushing in various areas of the Port. In this instance, the modelled e-folding value should be presented (i.e. 12-16 days).*

In order to provide a high level assessment of the model performance, the flushing timescale of Port Curtis was examined. This was undertaken through the utilisation of the passive tracer transport module within RMA-11. The tracer was initially placed within Port Curtis at a nominal concentration of 100 mg/L, then transported under normal tidally varying conditions over time. All locations outside of Port Curtis were set to a concentration of 0 mg/L. The flushing timescale simulation spanned representative spring and neap tide periods.

The simulation was allowed to run until initial tracer concentrations had reduced to 37 mg/L at all locations, averaged over a 12 hour tidal period. This concentration was selected as it represents the 'e-folding' timescale associated with flushing ($1/e \sim 0.37$). This approach allows calculation of the flushing timescale at every point in the model domain, rather than a bulk calculation for the entire region.

The results showed a range of flushing timescales from 12-16 days. The longest flushing times were found in the intertidal and mangrove regions (16 days), whilst the shortest flushing times were found in the main channel (12 days). These timescales are consistent with previous estimates, providing confidence in the adopted dispersion coefficients.

Further details are provided in Appendix E.

(16) *CSC/GCC advised that the CSIRO study (Stauber 2006) in Appendix H notes that acute and chronic effects of manganese on marine organisms is usually only detectable at concentrations of >5 mg/L and that there is little overlap between typical concentrations of Mn in seawater (<0.01 mg/L) and concentrations that impact on marine organisms. However, Councils wish to know if bioaccumulation in fish or crustaceans is a cause for concern.*

As can be seen from Table 8.3.6, manganese concentrations in Port Curtis vary from 3.9 µg/L (20^{th} %ile) to 15 µg/L (80^{th} %ile). The maximum is 59 µg/L.

See the comment above regarding the PhD research program that is to be supported by GPNL to investigate this issue.

8.3.12 Refinery Discharge (14)

(14) *QH noted that Table 1.3.3 in Appendix O of the EIS indicates that the detection limits for cadmium and mercury in the residue liquor are 0.05 mg/L and 0.005 mg/L respectively. These are higher than the ANZECC/NEPC guideline values for cadmium and mercury of 0.01 mg/L and 0.002 mg/L respectively and so it is not possible to determine if the cadmium and mercury concentrations are less than the guideline values.*

Further geochemical testing has recently been undertaken on a more representative sample of the residue. This residue sample was generated from a combination of nickel ore from both Marlborough and New Caledonia. Details of the testing are given in Appendix B.

The concentration of mercury in both the residue liquor and the leachate was <0.0001 mg/L which is the limit of detection (LoD). This LoD was reduced from that which was used in the analysis reported in the EIS. GPNL has committed to having a maximum mercury concentration in the water discharged to Port Curtis of <0.0005 mg/L. As this concentration is well below the ANZECC/NEPC guideline for mercury of 0.002 mg/L, no impacts from mercury are expected.

The concentration of cadmium in the residue liquor sample is <0.05 mg/L. To assess the potential impact of cadmium on the water quality of Port Curtis, a discharge concentration of 0.05 mg/L (50 µg/L) was modelled using the near-field and far-field dispersion modelling reported in Section 8.3.12.1 below and Appendix E. The results show that the predicted concentration of cadmium outside of the initial mixing zone is less than the guideline for all modelled scenarios. The guideline adopted was the ANZECC level for the protection of species subject to human consumption. On this basis GPNL has committed to having a maximum cadmium concentration in the water discharged to Port Curtis of <0.05 mg/L.

(14) *QH commented that the discharge of further chemical substances into the harbour as proposed under the EIS is likely to further deteriorate the marine environment and impact adversely on the quality of local seafood. Therefore the EIS should undertake an assessment of the environmental and health impact of the discharges from the proposed Gladstone Nickel Project.*

Based on the modelling undertaken for the EIS and for the Supplement, there is no indication that water quality objectives will be exceeded by the proposed refinery discharge outside of the initial mixing zone. For particularly sensitive discharge components stringent guidelines have been adopted. For example, for nickel which is subject to bioaccumulation, a 99th percentile protection of species level was adopted; for cadmium, the level for species subject to human consumption was adopted. On this basis the environmental impact of the discharge is acceptable and hence there is no need to undertake a health impact assessment.

8.3.12.1 Discharge Location (1, 16)

(1) *EPA advised that given the sensitivity of modelling outcomes to the discharge location, the EIS should provide evidence of agreement for the proposed activity from CQPA that the proposed site behind Clinton Wharf is viable despite tug wharf plans, and if so remodel with the tug wharf configuration. Alternatively, the EIS should propose another discharge site with CQPA agreement, and supported by discharge modelling as for the proposed Clinton Wharf site. The EIS should discuss the effects resulting from any changes to the discharge location, (e.g. proximity of harbour environs or the sea intake) as well as reviewing associated impacts.*

The discharge to Port Curtis described in the EIS consisted of return liquor from the RSF together with the seawater used for cooling. As discussed in Section 2.11, it is no longer proposed to use seawater for cooling and hence the Port Curtis discharge will now consist of return liquor only. Consequently the volume of the Stage 2 discharge will reduce from 38,085 m^3/h to 3,420 m^3/h. In addition, GPNL has modified the process to further reduce the concentrations of manganese and cobalt in the discharge. Manganese concentrations will reduce from 130,000 µg/L to 100,000 µg/L. Cobalt has reduced from 1,000 µg/L to 700 µg/L. The modified discharge characteristics are given in the following table. While the

quality of the discharge will be the same for both Stages 1 and 2, the discharge volume will double for Stage 2 from 1,710 m^3/h to 3,420 m^3/h.

Port Curtis Discharge Quality

Constituent	Discharge Concentration (µg/L)
Nickel	5,000
Cobalt	700
Iron	3,000
Magnesium	17,900,000
Aluminium	2,000
Manganese	100,000
Zinc	40
Cadmium	50
Calcium	670,000
Chlorine	12,080,000
Sulfate	66,400,000

Due to the reduced volume of water to be discharged, the nature of the diffuser described in the EIS has changed. It is no longer necessary to use the vertical eductors along the diffuser pipeline to achieve adequate dispersion of the discharge. It is now proposed to use a conventional diffuser consisting of a pipeline laid along the seabed with 45 mm diameter discharge holes at 2 m spacing along the top of the pipe. The diffuser section of the pipes will be 200 m long with one diffuser for Stage 1 and three for Stage 2.

Due to constraints from the proposal by the CQPA to develop a tug harbour at the RG Tanna Terminal, the locations of the diffusers have been changed from that described in the EIS. The proposed locations are shown below had have been selected to ensure that they do not interfere with vessels using the tug harbour. These locations have been discussed with CQPA which considers them to be a significant improvement over the original locations.

Section 11 Environmental Effects of Refinery

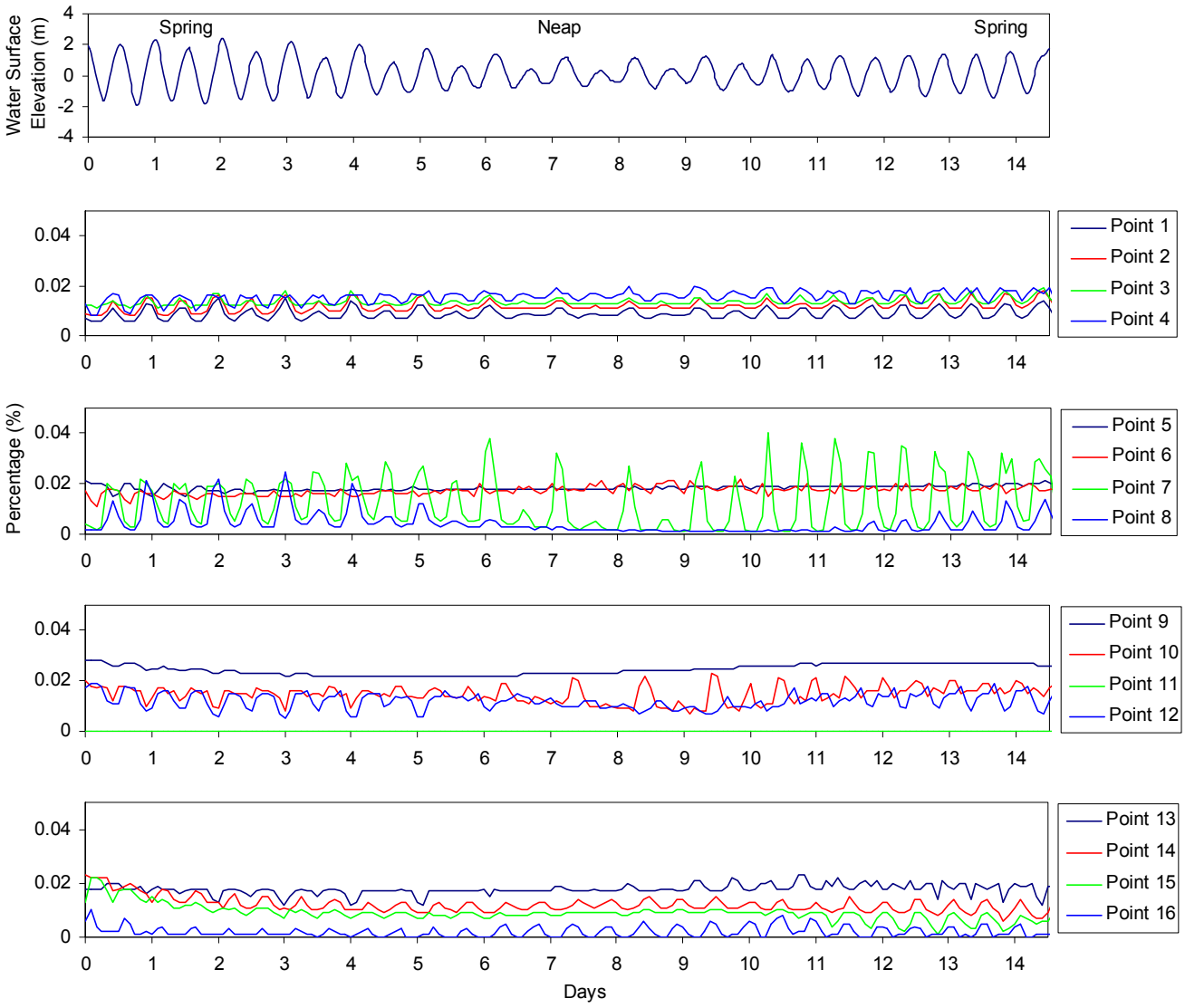
Proposed Locations of Diffusers

BMT WBM Pty Ltd undertook near-field and far-field modelling of the new discharge in a similar manner to that described in the EIS. The revised modelling included the effects of the proposed tug harbour, the reduction in the concentrations of cobalt and manganese, the reduced discharge volumes, and also the 10 day half-life for manganese as estimated by CSIRO (Appendix I). Details of the modelling and the results are given in Appendix E. The far-field concentrations were modelled at the 16 locations in Port Curtis shown in the following figure.

Location of Far-Field Modelling Points

Section 11 Environmental Effects of Refinery

The model results included the following time series data showing the temporal variation in the concentrations, with peaks and troughs occurring due to the flood - ebb tidal cycle and the spring neap cycle.



Time series of concentrations at 16 locations within Port Curtis – Stage 2

Based on the results of the modelling (far-field and near-field), the following tables summarise the total maximum pollutant concentrations predicted for Stage 2. It can be seen from these results that all water quality objectives will be met. The maximum concentrations are predicted to occur at the same location as in the EIS (point 7).

Predicted Far-Field Concentrations (µg/L) – Stage 2

Constituent	Discharge Concentration	Maximum Additional Far Field Tracer Concentration	Ambient Concentration	Total Maximum Far Field Concentration	Water Quality Objective[1]
Nickel	5000	2.10	0.5[1]	2.60	7
Cobalt	700	0.29	0.4[2]	0.69	1
Iron	3000	1.26	90[1]	91.26	[2]
Magnesium	17900000	7518	1290000[2]	1297518	NA
Aluminium	2000	0.84	73[1]	73.84	[2]
Manganese	100000	32	7.6[1]	39.6	340/140
Zinc	40	0.02	0.5[1]	0.52	15
Cadmium	50	0.021	0.1[2]	0.121	0.2
Calcium	670000	281	411000[2]	411281	NA
Chlorine	12080000	5074	19400000[2]	19405074	NA
Sulfate	66400000	27888	2688000[6]	2715888	NA

[1] See Table 8.3.3
[2] Variation from baseline (Table 8.3.6)

It can be seen from the above table that none of the identified water quality objectives will be exceeded. For both aluminium and iron where the guidelines is a comparison against existing baseline conditions it can be seen that the increase in ambient concentrations is small (1.2% and 1.4% respectively).

To assess the near-field effects, the predicted maximum far-field concentrations were added to the predicted near-field concentrations to realistically represent the mixing of the plume in receiving waters (as opposed to mixing with previously unaffected ambient water). The following table shows the Stage 2 near-field results 1,000 m downstream of the diffuser. It shows that all identifiable water quality objectives will be met at the selected point 1,000m downstream of the diffuser.

Predicted Near-Field Pollutant Concentrations (1,000m Downstream of Diffuser) (µg/L) – Stage 2

Constituent	Discharge Concentration	Concentration at 1000m	Residual Far Field Concentration[1]	Total Maximum Near Field Concentration	Water Quality Objective[2]
Nickel	5000	1.11	2.60	3.71	7
Cobalt	700	0.16	0.69	0.85	1
Iron	3000	0.67	91.26	91.93	[3]
Magnesium	17900000	3978	1297518	1301496	NA
Aluminium	2000	0.44	73.84	74.28	[3]
Manganese	100000	22	39.6	61.6	340/140
Zinc	40	0.01	0.52	0.53	15
Cadmium	50	0.011	0.121	0.132	0.2
Calcium	670000	149	411281	411430	NA
Chlorine	12080000	2684	19405074	19407758	NA
Sulfate	66400000	14756	2715888	2730644	NA

[1] See preceding table
[2] See Table 8.3.3
[3] Variation from baseline (Table 8.3.6)

The following table presents the distance downstream of the diffuser where the defined water quality objectives are predicted to be met for the four ambient current velocity cases considered.

Compliance with WQOs Downstream of Diffuser – Stage 2

Constituent	Water Quality Objective (µg/L)	Distance downstream of diffuser v=0.25m/s	Distance downstream of diffuser v=0.50m/s	Distance downstream of diffuser v=0.75m/s	Distance downstream of diffuser v=1.00m/s
Nickel	7	14m	8m	4m	2 m
Cobalt	1	31m	25m	11m	6.5m
Manganese	140	11m	6m	2.5m	1.5m
Manganese (disturbed)	340	5m	1 m	0.5m	0.3m
Zinc	15	0m	0m	0m	0m
Cadmium	0.2	3.5m	1.5m	0.9m	0.6m

(16) *CSC/GCC advised that while the EIS notes that several discharge locations were modelled, only Wiggins Island Coal Terminal and Clinton Coal Terminal Wharves were listed. Councils wish to see a more detailed assessment of potential options for locating the discharge further offshore.*

Consideration has been given to discharge locations further offshore; however, this option is generally restricted due to the need for the periodic dredging of Port Curtis to maintain navigable shipping lanes.

8.3.12.2 Discharge Arrangement (1, 15)

(1) *EPA advised that the proponent should detail investigations it will undertake to reduce contaminant loads (and hence discharge volumes) and develop a successful strategy for reducing contaminant loads. This should be provided before any approvals are sought for the expansion to Stage 2.*

The modelling in the EIS is based on consistent discharge concentrations. There is no change in concentration between Stages 1 and 2. Therefore the discharge load will increase between stages. A significant reduction in contaminant load in the discharge was made prior to releasing the EIS as compared to that described in the Initial Advice Statement (IAS). As discussed in Section 8.3.12.1 of this Supplement, the manganese and cobalt concentrations in the discharge has now been reduced even further. Manganese concentrations will reduce from 130,000 µg/L to 100,000 µg/L. Cobalt has reduced from 1,000 µg/L to 700 µg/L. The technology to reduce contaminants even further will be continually investigated by GPNL. Should new technology be developed to enable further reductions to be achieved prior to Stage 2, this will be considered.

(15) *CQPA has advised that further information is required on the location of the diffusers. The Marina and Spinnaker Park in particular were provided as a buffer between the community and industry (RGTCT). Spinnaker Park was provided as an area of parkland that the public could use to access the waters of Port Curtis with a netted beach being provided for use by the public. The downstream diffuser is located in close proximity to the beached area within the parklands of Gladstone Marina. Are there potential sediments that may impact on the quality of the sandy beach? The marina foreshores are regularly frequented by recreational fishermen. Are there any restriction imposed by the placement of the pipeline? The proposed pipeline is 1.7m diameter. What arrangements are to be made for the pipeline along the foreshore of the marina?*

GPNL has worked with CQPA and their consultants to design the pipelines and diffusers to ensure that there will be no restriction to the public's use and enjoyment of the park and beach facilities in the area. As discussed in Section 8.3.12.1, the diffusers will be much smaller than proposed in the EIS. Their diameter has reduced from 1,700 mm to 600 mm and there will be no need to include the vertical eductors. Furthermore three rather than four diffusers are now proposed and they have been moved further away from the marina and Spinnaker Park. This revised arrangement has been discussed with CQPA which considers it to be a significant improvement over the arrangement proposed in the EIS.

(15) *CQPA has advised that the eductors are located at the end of a horizontal T section. What are the dimensions of the T section? Are there risks associated with snagging the T section? The Authority has planned the area adjacent to the diffusers for stage 2 for the construction of a Tug Base. This concept requires the construction of a bund wall and dredged berthing basin for the tugs. Account needs to be made of this future development in the design of the pipeline route and detail. The protrusion of the diffusers of at least 1 .7m above the seabed may introduce some navigational issues associated with the movement of tugs. Consideration should be given to the construction of the two eductors at the western end of the line in the first stage thus leaving the options open for development in stage 2.*

As discussed above, eductors are no longer proposed and the pipe diameter has reduced from 1.7 m to 0.6 m. In addition, the diffusers have been moved further away from the navigational areas associated with the movement of tugs.

8.3.12.3 Discharge Characteristics (1)

(1) *EPA has recommended that both the Stage 1 and Stage 2 discharge characteristics be presented and their impacts modelled and described. Near and far-field modelling should be shown for Stage 1 and Stage 2 contaminant loads*

Both Stage 1 and Stage 2 discharge characteristics were modelled for both near-field and far-field and are presented in Appendix E and in relevant sections of this Supplement.

(1) *EPA recommended that information be provided with regards to reduced velocity discharge of wastewater relating to both near and far-field mixing, and the potential for the formation of acutely toxic conditions during maintenance (or any other) conditions at the refinery.*

Discharge to Port Curtis will be maintained at a relatively constant flow rate and velocity so that the modelled results are representative of the ongoing operation of the refinery. If, due to maintenance or other operational reasons there is a reduction in the amount of wastewater generated, the wastewater will be stored on site and then discharged in batches at the design flow rate.

The second part of this question contemplates acutely toxic conditions during maintenance. Plant maintenance is either planned or unplanned. This is discussed in various sections such as 8.3.12.3 (related to water discharge). In planned and unplanned situations, storage tanks between sections of the plant will be installed so that the refinery's inventory of process liquors can be stored to enable partial plant shutdowns. Typically for maintenance processes the wastewaters from cleaning would be reused in the process, added to the barren liquor stream, or collected for offsite treatment and disposal if likely to result in exceedence of discharge licence conditions. No products have been identified as being likely to generate acute toxic concentrations.

(1) *EPA advised that the EIS should provide sufficient detail, including worst case scenarios, on how the plant will manage wastewaters that do not comply with discharge limits. The EIS should present a quantitative assessment of the potential storage capacity (both in terms of volume and production time) for this 'off spec' wastewater in the RSF. Any effect of this excess liquid on the operation and capacity of the storage facility should be discussed.*

Section 11 Environmental Effects of Refinery

The production of wastewaters that do not comply with discharge limits is assessed in the EIS on the basis of a number of operating arrangements (refer to section 8.3.12.3). The design is conceptual at this stage. However, dynamic analysis of the plant will be undertaken during the detailed design phase to identify appropriate intra-process storage requirements. Existing plant operations confirm the view that elevated analyte concentrations can be controlled under most conditions. If however, concentrated waste water is generated, such as may rarely occur during cleaning or maintenance activities, the small volumes which might be generated that are unacceptable to the RSF would be transported from site via a licensed waste contractor.

8.3.13 Water Quality Impacts of Refinery (1, 14, 15, 16)

(1) *EPA requested that data is required on the slack water mixing distances during neap tides to represent the worst case scenario.*

The CORMIX model that was used to predict the near-field concentrations cannot predict concentrations with a zero velocity. At the turn of the tide the discharge from the diffuser will remain in close proximity to the discharge location as there will be no tidal movement to carry it away. These distances will be less than those given in Table 8.3.10 of the EIS.

(14) *QH noted that in the EIS, the predicted pollutant concentrations at l000 m were discussed. It is unclear why a distance of 1000 m was chosen for prediction. As the specific gravity of many contaminants is much higher than the receiving environment, the contaminants, especially heavy metals, are likely to settle down much closer to the diffuser. The modelling should have been used to predict concentrations at every 250 m (arbitrary) from the diffuser and it should also be used to predict the likely rise in sediment concentration of the chemicals. These predictions should be used to ascertain the likely affects of the pollutants on the marine environment.*

The near-field distance of 1000 m was chosen as it approximates the impact zone of works that have been undertaken or that are proposed in developing the RG Tanna coal terminal and the associated wharves.

Modelling has been undertaken to indicate at what distances downstream of the diffusers the water quality objectives will be met. These are shown in the following table. It is clear from these data that concentrations will be well below the objectives at distances well short of 250 m downstream.

Compliance with WQOs Downstream of Diffuser – Stage 2

Constituent	Water Quality Objective (µg/L)	Distance downstream of diffuser v=0.25m/s	Distance downstream of diffuser v=0.50m/s	Distance downstream of diffuser v=0.75m/s	Distance downstream of diffuser v=1.00m/s
Nickel	7	14m	8m	4m	2 m
Cobalt	1	31m	25m	11m	6.5m
Iron	196	2m	0.1m	0m	0m
Aluminium	127	2m	0.1m	0m	0m
Manganese	140	7m	6m	2.5m	1.5m
Manganese	340	5m	1 m	0.5m	0.3m
Zinc	15	0m	0m	0m	0m

Heavy metals in the discharge are in dissolved form and will not settle out. The possible exception to this is manganese which may oxidise after some time and form insoluble particles of MnO_2. This aspect has been addressed in Section 8.3.10.2 of the EIS and concluded that in active coastal environments like Port Curtis, it is unlikely that the MnO_2 particles would settle from the water column.

(15) *CQPA draws the attention of the state to the possible accumulative effects of a number of industries discharging material into port waters, which in themselves can be demonstrated to be under international standards for disposal but when combined with other discharges into port waters, may have a deleterious effect on the port environs. The monitoring of all waste discharges into the waters of Port Curtis should be a state function, similar to the monitoring of the air shed capacity of the area of Gladstone /Calliope.*

GPNL is committed to working closely with other members of the industrial community through the Port Curtis Integrated Monitoring Program (PCIMP) to undertake environmental monitoring in Port Curtis. This monitoring will incorporate cumulative discharges from the catchment and all potential sources.

(15) *CQPA has raised concerns about the nature of the discharge/deposition that will occur in the berth pockets of RG Tanna Coal Terminal. By nature of the dredging of the berths there is a potential sediment trap created. This is evidenced by the accumulation of sediments within the berth pockets which may occur either as a consequence sediment seabed movement along the current alignment or from sloughing off the dredged batter, or from the reduced velocities resulting in higher settling rates. The proximity of the berth pockets is well within the near-field modelling zone with the closest discharge point being within tens of metres of the berth pocket. The Authority requires understanding if there exists any risk of contamination of the sediments within the berths that may impact on the ability to dispose of dredged material either onto shore or at sea.*

Contaminants in the discharge are in dissolved form and will not settle out. The possible exception to this is manganese which may oxidise after some time and form insoluble particles of MnO_2. This aspect has been addressed in Section 8.3.10.2 of the EIS and concluded that in active coastal environments like Port Curtis, it is unlikely that the MnO_2 particles would settle from the water column. Furthermore manganese oxidises over a long period of time with a half life of 10 days and hence will be well clear of the RG Tanna Coal Terminal berth pocket by that time.

(16) *CSC/GCC inquired whether there are likely to be any adverse impacts on the water quality in the Gladstone marina given that the discharge location is close to this area and the marina is not well flushed?*

It can be seen from Section 8.3.12.1. that the maximum concentration percentage (concentration as a percentage of a discharge concentration of 100 concentration units) for point 7 is 0.04% while the maximum concentration for point 9 which represents the marina is 0.03%. As all the predicted concentrations at point 7 are below the relevant water quality objectives, the concentrations at the marina which will be 75% of those at point 7, will be even further below the objectives.

The predicted mean concentration percentages (dilution factors) for each of the 16 modelled points are given in the following table.

Mean Dilution Factors for 16 Locations in Port Curtis at Steady State – Stage 2

Location[1]	Mean Dilution Factors at steady state (%)
1	0.011
2	0.014
3	0.016
4	0.017
5	0.020

Location[1]	Mean Dilution Factors at steady state (%)
6	0.018
7	0.013
8	0.005
9	0.026
10	0.015
11	0.000
12	0.012
13	0.018
14	0.011
15	0.007
16	0.002

[1] See location figure in Section 8.3.12.1

It can be seen that the mean dilution factor for the marina (point 9) is 0.026%. This is significantly less than the mean dilution factor reported in the EIS of 1.06% (Table 8.3.14 of the EIS) for the previously proposed discharge arrangement. This reduction in contaminant concentrations is due to the modified diffuser arrangement which locates the diffusers further away from the marina than was proposed in the EIS.

8.3.13.2 Far-field Effects (1)

EPA requested that modelling be run again if the results of the further work into the oxidation rate of Mn(II) find the rate to be substantially different from that assumed in the EIS.

As discussed in Section 8.3.10.2, the recent CSIRO investigation has indicated that a half-life of 10 days would be appropriate for manganese (Appendix I). As a consequence of this, a half-life of 10 days has been used in the updated dispersion modelling reported in this EIS Supplement (Appendix E).

8.3.14 Discharge Pipeline Crossing Calliope (1, 15)

(1) *EPA indicated that no measurement is provided to describe what is meant by "relatively thin" fringe, in relation to the distance that mangroves will need to be cleared to allow for the laying of the cross-Calliope River pipeline. Provide the estimated measurements describing the area and quality of habitat that will need to be cleared.*

Contrary to the pipeline trenching method described in the EIS for the Calliope River crossing of the discharge pipeline, it is now proposed to construct the crossing by horizontal directional drilling. This has been made possible because the pipeline diameter has reduced from 1.7 m to 0.6 m. This method will ensure that there will be no disturbance to the mangrove fringe at the mouth of the river or to the river bed. The drill mud and sediment generated by the drilling process will be disposed of with the dredge sediment from the WIW dredging program.

(15) *CQPA noted that material excavated from the pipeline crossing of Calliope River will be placed ashore in the areas designated for dredged material disposal from the Wiggins Island berths.*

- *What is the nature of the material and are there contaminants that may impact on the onshore disposal or method of handling?*
- *With a barge mounted excavator to be used for trenching of the pipeline route, what method of transfer to the onshore disposal areas will be used?*

- *Will silt curtains be deployed around the excavator?*
- *It should be noted that the pipeline route is upstream of a significant gutter between Golding Point and Wiggins Island and that plumes entering this channel discharge directly onto seagrass beds. With a cover of less than 300mm being provided by this design, what is the nature of the material such that it will resist movement on the riverbed and provide protection from potential uplift?*
- *Potential buoyancy issues exist with a minimal cover being applied to the pipeline. How will the selected hard fill be placed over the pipeline?*

As discussed above, it is now proposed to use horizontal directional drilling techniques to construct the Calliope River crossing of the discharge pipeline. Consequently, in response to the above questions from CQPA:

- The material will be subsurface material from the beneath the bed of the river plus benign drilling mud.
- No barging operations will be necessary.
- Silt curtains will not be necessary.
- No dredge sediment plumes will be generated.
- The pipe will be placed below the level of riverbed movement.
- The depth of the pipeline will ensure that there will be no risks from buoyancy.

8.3.15 Potential Marine Impacts - Materials (15)

CQPA indicated that further understanding is required as to how Sulphur or Nickel spills to the marine environment will be cleaned up. With a fendering system and wharf construction similar to RGTCT and WICT, the main deck has approximately a four metre gap to the vessel side with the hold coaming being a further distance again. Some form of apron needs to be provided to cover the interface of vessel and wharf.

The design of wharf and unloader facilities will incorporate a discharge apron which will prevent any spillage entering the water between the berth and the ship during unloading. Clean up actions will follow spill incident response procedures and instructions will be provided in material safety data sheets. Operations will adhere to the chemical and dangerous goods management plan (Section 14.11.8 of the EIS). The emergency response management plan (Section 14.11.10 of the EIS) may be triggered in the event of a significant spill. Preventative engineering measures will be incorporated into the design of the wharf, unloader, hoppers and conveyor systems to minimise the risk of spillages. These will include purpose-built grabs, dust curtains, and folding spill trays.

Also refer to comments in Sections 8.3.15.1, 8.3.15.2 and 8.3.15.3.

8.3.15.1 Sulphur (1, 9)

(1) *EPA advised that the EIS should provide further assessment of measures to prevent dust generation. Additional information is required on the proposed 'purpose built' grab, and its effectiveness in minimising spillages and dust problems. In addition, information on alternative sulphur handling methods which limit spillage and dust emissions should be presented.*

The ship unloader will have separate specially designed grabs for sulphur to aim for zero spillage and a drop protection plate to prevent external clinging material falling into the sea between the ship and wharf. Unloader grabs shall be designed for zero spillage.

The wharf deck itself will be of a watertight construction which will allow dry and wet clean up of nickel ore and sulphur spills and prevent discharge to the sea. It is proposed to provide a slurry return system at the wharf to pump any spilt nickel ore or sulphur as a slurry back to the refinery. The pumped slurry system will collect:

- Water used to clean the wharf deck after dry clean up operations.
- Wharf surface drainage from “first flush” rainfall.
- Wash down water.

Examination of the physical properties and characteristics of imported nickel ore and sulphur has confirmed that the main parameters for design of the ship unloading and conveyor systems required to minimise dust and spillage should be based on the nickel ore material. This is because the sulphur will be in the form of a prill or pastille which significantly improves its handling capabilities and minimises the risk of dust or spillage. If the system is designed to control dust and spill generation for the nickel ore it will also be suitable for sulphur. Thus no alternative sulphur handling methods would be necessary except for ensuring minimal risk of explosion from dust.

(9) *QT noted that in relation to enclosure of conveyors, the EIS states "The wharf hoppers will discharge directly onto a covered conveyor belt for transfer to the sulphur stockpiles at the refinery". It is unclear what comprises a "covered conveyor" and the degree of enclosure. Is it fully enclosed, fully enclosed except for service windows, partly enclosed or merely covered by a roof? The nature of the "covered conveyor" needs to be more fully and accurately described.*

The majority of conveyors will be at ground (or deck) level. Where the conveyors are required to rise into transfer towers, they will be supported on steel trusses. This also permits pedestrian and vehicle access under the conveyor routes at transfer locations.

The conveyors on the wharf and jetty will be clad on both sides and the roof to shield them from wind and rain. On the balance of the conveyor system, idler-mounted wind guards and suitable partial cladding will be provided along the covered gantries and transfer towers. Dry or wet cleaning can then be undertaken on a maintenance basis to remove any spill material.

A comprehensive belt washing system will be installed at the head ends of conveyors to clean belts.

8.3.15.2 Nickel Ore (1, 9)

(1) *EPA requested an assessment of the potential for contamination of the environment by Cr (III) and Cr(VI) and to provide information on any proposed mitigation measures. The EIS should discuss the potential for ore spillage and resultant concentrations and impacts of nickel and chromium, both Cr(III) and Cr(VI), leached from the ore. These impacts should be assessed in combination with the sulphur deposits, including potential acidification in the localised area.*

GPNL will operate the ore unloading facility at WIW to minimise the risk of spillage into Port Curtis. Spill control measures to be implemented include the following:

- Wharf-based cranes will be used for increased stability and load security
- Cranes will have grabs designed to minimise load loss with a drop protection plate to prevent external clinging material from falling into the sea between ship and wharf
- Material will be unloaded directly into wharf-mounted hoppers to avoid stockpiling on the wharf.
- The wharf deck will be of a watertight construction which will allow dry and wet clean up of any spills and prevent discharge to the sea.

An assessment was made of the proposal by the QNI nickel refinery at Townsville to import nickel ore from New Caledonia. This proposal was to unload ore from a cargo vessel at a single point mooring in Halifax Bay located in the Great Barrier Reef Marine Park into open-hold shuttles by means of a ship-mounted crane. Lassing Dibben (1991) estimated that this operation could result in the spillage of a maximum of 16 tonnes per year from the unloading and transfer operations. Given the proposed above-listed control measures at WIW including the use of wharf-mounted rather than ship-mounted unloaders and the absence of open-hold shuttles, the spillage of ore into Port Curtis can be expected to be much less than 16 tonnes per year.

Section 11 Environmental Effects of Refinery

Florence *et. al. (*1994) assessed the environmental impacts from the potential spillage of New Caledonian ore into Halifax Bay. They determined that the no-effect concentration observed in the microcosm experiments range from 1-14 g/L of ore. They determined that small infrequent spills may lead to nickel and total chromium concentrations of 10-100 µg/L. based on this work Florence *et. al. (*1994) concluded that the nickel ore was not highly toxic and if spilt in the quantities predicted would not have a significant impact on the ecological health of the bay. As the likely spillage at Port Curtis from the unloading of New Caledonia ore at WIW will be much less than assessed for Halifax Bay, no significant effects on the marine ecology are expected.

In addition, GPNL will operate the ore stockpile area to not cause environmental harm. No water with soluble metal concentrations above ANZECC (2000) Marine water quality guidelines (95% trigger limits) would be released from the ore stockpile area. GPNL would capture and reuse the runoff from the ore stockpiles for use in the refinery.

Geochemical testing of the GPNL ore (from both Marlborough and New Caledonia) has been undertaken. The results are reported in Appendix B. The 1:5 (solid:water) water-extract test of the ore samples testing concluded the following:

- Leachate from the New Caledonia ore is slightly acidic (pH 5.3) and non-saline.
- Dominant major soluble ions are sodium and sulphate, although concentrations are low.
- Water extracts are low in soluble metals and metalloids.
- Only soluble aluminium, chromium, nickel and sulphur were detectable (*i.e.* above the laboratory reporting limits (LOR)) in the water extract solutions from both ores. All other metals (excluding major cations) had soluble concentrations in water extracts below the limit of detection.
- Hexavalent chromium (Cr VI) concentrations in both the Marlborough ore (0.26 mg/L) and New Caledonia ore (0.08 mg/L) were elevated with respect to the ANZECC Marine water quality guideline value of 0.0044 mg/L (95% trigger value). Trivalent chromium (Cr III) concentrations in both ore samples were below applied guideline values.
- Cobalt, nickel and manganese concentrations, which were elevated in solid ore samples, were all less than the limit of detection in the water extracts.

The concentration of soluble metals in 1:5 water extracts from ore materials is likely to be greater than would be seen in leachate produced naturally from stockpile runoff. This is due to the agitation used in the water extract method and the greater dilution that would be seen with natural rainfall runoff. However, GPNL commits to no release of potentially contaminated water to surface waters, as has been previously noted.

(1) *EPA advised that the EIS should provide additional information on the 'purpose built' grab and other methods investigated that would prevent spillage from unloading of nickel ores.*

See response to comment 8.3.15.1 above.

(9) *QT requested that the section refers to transport of ore by "covered conveyor". Again it is unclear what comprises a "covered conveyor" and the degree of enclosure. Is it fully enclosed, fully enclosed except for service windows, partly enclosed or merely covered by a roof? The nature of the "covered conveyor" needs to be more fully and accurately described. It is requested that the GPNL outline any need for or proposals to install conveyor belt scrapers or belt washing systems at conveyor transfer points to minimise nickel ore dust travel-back and dust dispersal to nearby coal stockpiles.*

See response to comment 8.3.15.1 above.

8.3.15.3 Ammonium Sulphate (9)

QT noted that paragraph 3 refers to use of a "covered conveyor" that will connect to the common-user ship loader that CQPA plans to build at Fisherman Islands' Berth No 3. Again it is unclear what comprises a "covered conveyor" and the degree of enclosure. Is it fully enclosed, fully enclosed except for service windows, partly enclosed or merely covered by a roof? The nature of the "covered conveyor" needs to be more fully and accurately described.

As discussed in Section 2.12, it is now proposed to export ammonium sulphate from the Barney Point Wharf rather than from Fisherman's Landing. At Barney Point a purpose-built storage shed will be constructed. The conveyor from the storage shed to the shiploader will be designed to the same standard as that described in Section 8.3.15.1 above for the WIW conveyors.

8.3.16.4 Ships Garbage (15)

CQPA advised that it provides a ship waste collection service under a certified agreement with AQIS.

Agreement noted.

8.5 Terrestrial Flora (13)

DNRW advised that the EIS does not clearly delineate how the proposed clearing meets the Performance Requirements in Part S of the Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions 20 November 2006 and the Regional Vegetation Management Code for Southeast Queensland Bioregion 20 November 2006.

In addition to the above, in order to adequately assess the clearing of vegetation as a result of this project, DNRW requires a detailed spatial plan of the proposed clearing application area and the provision of details on the method of clearing.

Refinery

Figure 8.5.1 of the EIS (and associated tables) summarises the vegetation communities that will be disturbed as a result of the proposed refinery footprint. Table 8.5.4 includes a list of vegetation communities and areas (ha) proposed for disturbance. An outline flora management plan is included in section 14.10.8 of the draft EIS.

During the detailed design phase and prior to construction, GPNL will submit a vegetation clearance application to DNRW in accordance with the requirements of the *Vegetation Management Act 1999*. This application will be accompanied by a detailed analysis of how the proposed clearing will meet the performance requirements of the relevant regional management codes. It will also include a detailed spatial plan of the proposed clearing application area and details on the method of clearing.

As discussed in Section 2.4, the refinery layout has changed from that presented in the EIS and the rail spur has been included. These changes have resulted in a change to the proposed extent of vegetation clearance. The extent of clearing now proposed is summarised in the following table.

Extent of Vegetation Clearing Proposed for Stages 1 and 2

Unit No	Regional Ecosystem	Stages 1 and 2 Clearing		Area in Sub-region (ha)
		Area (ha)	% of Sub-region	
1a	RE 12.1.2	1.3	0.00	15,242
1b	RE 12.1.2	2.3	0.02	15,242
1c	RE 12.1.3	0.1	0.00	16,580
2b	RE 12.3.7	0.4	0.01	7,774
2c	RE 12.3.11	8.5	0.73	1,168
2d	RE12.3.11	5.7	0.49	1,168
2e	RE 12.3.11	13.2	1.13	1,168
2g	RE 11.3.4	32.8	0.21	15,722
2k	RE 11.3.29	0.75	0.14	529
3a	RE 12.11.6	19.7	0.01	178,480
4a	n/a	4.5	-	n/a
4b	n/a	0.5	-	n/a
Total		89.75	-	-

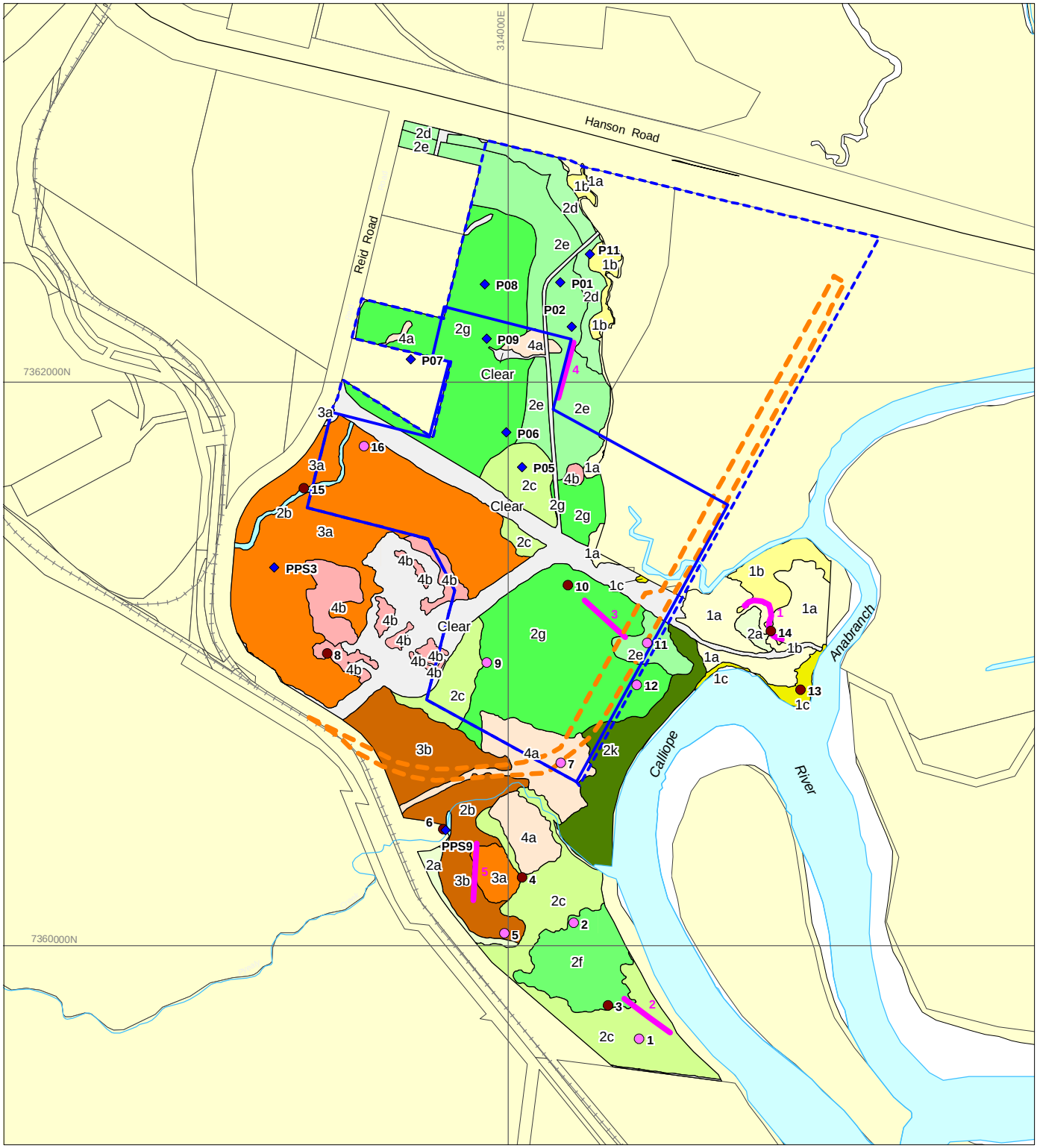
Vegetation Unit 2g (*Eucalyptus tereticornis* and/or *Eucalyptus* spp. tall woodland on alluvial plains) is the most cleared community (32.8 ha). Its conservation significance is Of Concern (RE 11.3.4). When viewed in the broader context of impact to regional biodiversity, the disturbance constitutes approximately 0.21 % of this community within the sub-region.

The vegetation communities of conservation significance to be cleared are as follows:

- Vegetation Unit 2c: *Eucalyptus tereticornis, Lophostemon suaveolens, Corymbia intermedia* and *Corymbia clarksoniana* Woodland with a grassy understorey on alluvial plains near coast (Of Concern RE 12.3.11). There will be 8.5 ha of this vegetation type cleared. This impact represents less than 1% of the area of this vegetation community within the sub-region.
- Vegetation unit 2d: *Melaleuca viridiflora +/- Eucalyptus tereticornis* Open Woodland on alluvial plains near coast (Of Concern RE 12.3.11). There will be 5.7 ha of this vegetation cleared. This impact represents less than 0.5% of the area of this community in the sub-region.
- Vegetation unit 2e: *Eucalyptus tereticornis, Lophostemon suaveolens* and *Melaleuca nervosa* Open Forest Woodland on alluvial plains near coast (Of Concern RE 12.3.11). There will be 13.2 ha of this community cleared. This impact represents approximately 1.1% of the area of this community in the sub-region.
- Vegetation Unit 2g: *Eucalyptus tereticornis* and/or *Eucalyptus spp*. tall woodland on alluvial plains (Of Concern RE 11.3.4). There will be 32.8 ha of this community cleared. This RE is considered an outlier within the Burnett-Curtis Hills and Ranges sub-region where only 2 ha is currently mapped by DNRW (Accad et al., 2006). However, when compared with the extent of this community present within the adjacent Mount Morgan Ranges sub-region, this disturbance constitutes 0.14% of its area within that sub-region.
- Vegetation maps are included on Figure 8.1.

8.6 Terrestrial Fauna (1, 13)

(1) EPA has requested information on the potential impact of accidental importation of invasive species (such as snails) with ore or other materials shipped from overseas, the likelihood of such an event, and potential mitigation measures, should be discussed.



NOTE: Refer to Figure 8.1b for Vegetation Communities Legend

0 250m 500m
Scale 1:20 000 (A4)
MGA Z56, GDA94

11 Flora primary sampling site
6 Flora secondary sampling site
1 Fauna transect location

Rail Spur Footprint
Proposed Disturbance Area
Proposed Development Footprint

Client: Gladstone Pacific Nickel Ltd

Project: GLADSTONE NICKEL PROJECT
ENVIRONMENTAL IMPACT STATEMENT
SUPPLEMENT

Title: **VEGETATION COMMUNITIES AND FLORA/FAUNA SAMPLE SITES - REFINERY SITE**

URS

Drawn: VH	Approved: CMP	Date: 29-01-2008	Figure: **8.1a**	Rev:A
Job No: **4262 5791**	File No: 42625791-g-232.wor			**A4**

	Community Description	Regional Ecosystem
1a	Marine Sand Flats	RE 12.1.2
1b	*Sporobolus virginicus* grassland on marine clay plains	RE 12.1.2
1c	Mangrove shrubland to low closed forest on marine clay plains and estuaries	RE 12.1.3
2a	*Eucalyptus tereticornis* Woodland to Open Forest	RE 12.3.3
2b	*Eucalyptus tereticornis, Casuarina cunninghamiana,+/- Callistemon viminalis and Melaleuca leucadendra* Fringing Forest on Quaternary alluvial plains along watercourses	RE 12.3.7
2c	*Eucalyptus tereticornis, Lophostemon suaveolens, Corymbia intermedia* and *Corymbia clarksoniana* Woodland with a grassy understorey on alluvial plains near coast	RE 12.3.11
2d	*Melaleuca viridiflora +/- Eucalyptus tereticornis* Open Woodland on alluvial plains near coast	RE 12.3.11
2e	*Eucalyptus tereticornis, Lophostemon suaveolens and Melaleuca nervosa* Open Forest Woodland on alluvial plains near coast	RE 12.3.11
2f	Open-forest of *Eucalyptus siderophloia* with vine forest understorey on sub-coastal Quaternary alluvial plains	RE 12.3.11a
2g	*Eucalyptus tereticornis* and/or *Eucalyptus spp.* tall woodland on alluvial plains	RE 11.3.4
2k	*Eucalyptus crebra* Woodland on alluvial plains	RE 11.3.29
3a	*Corymbia citriodora, Eucalyptus crebra* open forest on metamorphics ± interbedded volcanics	RE 12.11.7
3b	*Eucalyptus crebra* woodland on metamorphics ± interbedded volcanics	RE 12.11.7
4a	Modified pastoral grassland with scattered emergent Eucalypt spp.	n/a
4b	Non remnant shrubby regrowth of Acacia and / or Eucalypt spp.	n/a

Client: Gladstone Pacific Nickel Ltd

Project: GLADSTONE NICKEL PROJECT ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT

Title: **VEGETATION COMMUNITIES - REFINERY SITE**

URS

Drawn: VH | Approved: CMP | Date: 29-01-2008

Job No: **4262 5791** | File No: 42625791-g-232.wor

Figure: **8.1b**

Rev:A

A4

Section 11 Environmental Effects of Refinery

The proposed importation of mineral ores and other materials from overseas sources (including New Caledonia) provides a potential source for the introduction of invasive weed species and invertebrate pest species such as the giant African snail (*Achatina fulica)*.

Mineral ores will be mined from greater than 2 m below the surface and therefore are considered to be of lower risk for the importation of invasive species from the source of operation. However the potential remains for importation of pest species via soil contamination and other vectors present in shipping containers. This risk will be minimised by strict adherence to the current quarantine requirements of the Australian Quarantine and Inspection Service (AQIS) which regulates the importation of mineral resources. Steps undertaken by AQIS to regulate the importation of pest species vary depending on the type of ship, port of origin and cargo and include:

- Regular inspection of container ships for pest species.
- Treatment of high risk materials by heat or gamma ray treatment of soils, or by fumigation of empty pallets and ground stacked shipping containers.

If infestation or contamination is found on inspection, then the consignment must be held and the contaminants removed or treated by an AQIS-approved method, or the consignment must be re-exported or destroyed at the importer's expense.

Protocols for monitoring the presence of potential pest species will include three-monthly inspections by a qualified botanist/zoologist of the ore handling area at the wharf and around stockpiles within the plant site. Inspections will focus on searching for potential pest and weed species declared by AQIS.

In the advent of an invasive pest species being introduced via importation of mineral ore, corrective actions will be implemented which will include investigation into the cause of the pest species introduction and appropriate corrective actions required to overcome the problem and prevent recurrence.

Specific control methods will vary depending on the pest species and may require a long term co-ordinated approach. For example a successful eradication campaign for giant African snail in Gordonvale, Queensland involved an intensive eight-month program of community education, snail collection and baiting (DPIF, 2007).

A draft quarantine EMP is given below.

Operational Policy	To prevent the introduction and spread of weed and pest species associated with the importation of mineral ores and other materials into Australia from New Caledonia and other overseas sources.
Performance Criteria	No new pest or weed infestation at the port or refinery sites or surrounding areas as a result of importation of mineral ores and other materials from overseas.
Management (Control) Strategy	**Overseas Controls** Mineral ore stockpiles for export are to be stored in a way to prevent contamination from surface soil (e.g. stored on a bed of basement rock). Stockpiles are not to contain any potential weed/pest vectors including surface soil, overburden, tree roots, seeds, live or dead animals, animal waste or other organic matter. All vegetation is to be cleared around the stockpiles to maintain a buffer of at least 50 m. Where ore has been stored for more than three months the stockpile will be inspected and treated where required to remove or destroy weeds, seedlings and other organic material. A declaration will be obtained from the mineral ore supplier with each shipment that the above measures have been followed. A requirement will be included in the shipping contract that the ships' holds be checked for birds and other live animals prior to departure. This inspection would need to be recorded into the ship's log. **Site Controls** All ships will be subject to quarantine inspection as per AQIS requirements prior to unloading of cargo. Any material spilled during onto the vessel deck or wharf while unloading will be collected and transported to the refinery stockpiles.

	All employees associated with the unloading and transport of materials will be given training regarding the significance of quarantine protection and to identify weeds/pests declared by AQIS. All drainage from stockpiles on the refinery site will be collected in stormwater ponds to prevent spread of potential weeds/pests downstream.
Monitoring and Auditing	Ongoing monitoring and review of the transport and containment of mineral ore will be undertaken to determine the effectiveness of this management plan. This will be done in conjunction with AQIS. Three-monthly inspections will be undertaken by a qualified botanist/zoologist of ore handling area at the wharf and around stockpiles within the refinery site. The inspection will focus on searching for pest/weed species declared by AQIS. Implementation of pest control/weed spraying as necessary.
Reporting and Corrective Actions	The site environmental representative will maintain records of all monitoring and inspection activities and report results to the refinery manager at agreed intervals. Recommendations and corrective actions arising from inspections shall be implemented. If any incidences of weeds or pest species declared by AQIS are detected outside quarantine areas, AQIS will be contacted and activities in that area shall cease immediately. The environmental representative will implement control actions in consultation with AQIS and review management procedures. Non-compliance and incident reporting will be reviewed and closed out by the site environmental representative to ensure prompt rectification and change management as required.

(13) DNRW noted that there are areas within the refinery site that contain essential habitat as shown on the essential habitat map for the Wallum Froglet (Crinia Tinnula).

An area of wooded vegetation in the north western section of the refinery site is identified as essential habitat for the wallum froglet (*Crinia tinnula*) as delineated by EPA essential habitat mapping (EPA, 2007). This species is currently listed as Vulnerable under the Qld *Nature Conservation (Wildlife) Regulation, 2006.* Clearing is proposed within this area, however the proposed development would not currently meet the acceptable solution of performance requirement S.8 under a DNRW clearing application, which states that an application should 'maintain the current extent of essential habitat'.

It is important to note the context with which the EPA designation of 'essential habitat' is made, to assess whether the designation is relevant to the vegetation at this site. Habitat factors required to map essential habitat for the wallum froglet consist of a vegetation community that provides for: acidic, soft waters of Melaleuca swamps, sedgeland, wet and dry heathland and wallum/woodland areas in sandy coastal lowlands, and occasionally in adjacent forests with healthy understorey (EPA, 2007).

The designation of essential habitat at the refinery site in this instance is based on the indicated presence of RE 12.3.12 (*Melaleuca viridiflora* woodland on alluvial plains) from EPA 1:100,000 RE mapping for the site, which accounts for the essential habitat factors recognised above. However, vegetation mapping undertaken for the EIS flora study shows that RE 12.3.12 is in fact not present at the refinery study site. The vegetation community in question was found to consist of RE 12.3.11 (*Eucalyptus siderophloia, E. tereticornis, Corymbia intermedia* open forest on alluvial plains). This community does not present the essential habitat factors required for the wallum froglet.

In addition to this, no actual occurrences of the wallum froglet were recorded during the baseline fauna survey studies for the plant site, nor are any records known for the species from any previous studies for the region. Surveys undertaken for the fauna study at site 4 (within the area in question) reveal a low amphibian diversity with only two frog common species found.

It should also be noted that the accepted known distribution of the wallum froglet (coastal areas from northern NSW to the northern tip of Fraser Island) does not extend as far north as the study area (Cogger, 2000 and Robinson, 2003). The closest confirmed record for this species based on EPA and Queensland Museum data is at Littabella National Park approximately 120 km south east of the study area (Noleen Kunst, EPA pers. comm. 2007)

Consultation undertaken with the Queensland EPA, confirms that the area of habitat in question has been identified as potential essential habitat for the wallum froglet based solely on habitat modelling for this species, not on any known distribution records. (David McFarland, EPA pers. comm. 2007).

Given the above information it is considered unlikely that suitable habitat to support the presence of the wallum froglet occurs anywhere within or adjacent to the refinery site and that it is also unlikely that this species would be expected to be present at all within the locality. Essential habitat factors for the wallum froglet are not present on the site and so any application for clearing under the *Vegetation Management Act, 1999* would meet the essential habitat performance requirement.

8.7 Air Quality (8, 14, 17, 21)

(8) *QR advised that GPN's plant will contribute to the Gladstone Air Shed; therefore the EIS should spell out how they will monitor air quality to be able to determine their contribution to the air shed.*

Air quality monitoring is currently undertaken in the Gladstone region by the EPA. There are a number of EPA monitoring sites at Targinnie, Clinton and South Gladstone. The sites monitor a number of parameters including ozone, nitrogen dioxide, sulphur dioxide, particulate matter (<10 μm), benzene and toluene. This monitoring network is used by the EPA to evaluate the cumulative air quality implications for all industries in Gladstone, and will include the impacts from GNP once operational.

In-stack monitoring will be conducted for the site operations, in accordance with licence requirements, to determine the levels of pollutants that are released to air from the site. Further details of the proposed stack monitoring program are presented in this document, in response to submissions for Section 8.7.7 of the EIS.

(17) *A respondent has raised concerns regarding increased air pollution levels and particulate fallouts in which their rainwater collection and air quality will be exposed to in the future.*

Section 8.7 of the EIS provided a discussion of the air quality issues arising from the proposed development, including the existing and modelled predictions of future air quality, details of air quality emissions and controls to be implemented as well as the proposed air quality monitoring program. The EIS indicates that the air pollution levels caused by the GNP will be within applicable guidelines and no significant effects on rainwater collection and air quality are expected.

(21) *A respondent has raised concerns over the quantity of dioxins to be released into the atmosphere from the stacks and the quantity of metals settling in water bodies frequented by wildlife.*

The process is such that dioxin formation and emission is unlikely, and therefore there is unlikely to be any dioxin impacts due to GPNL air emissions.

Predicted air quality impacts have shown that ambient levels of metal compounds will be low and well within air quality guidelines for human health. No impacts are expected from any metals that may deposit on waterways.

(21) *A respondent has raised concerns that there is not enough open space and protecting trees, provision of sufficient green spaces or regional tracts of open space acting as carbon sinks to absorb and offset the concentrations of pollutants including those from the proposed in the Gladstone State Development Area as a matter addressed in the State's CQ2010 project.*

Areas of vegetation to be cleared at the refinery site will be restricted to the minimum area required for the refinery earthworks and possibly the construction pad (s.8.5.10.1). A rehabilitation strategy will be prepared and implemented for the areas to be disturbed, particularly areas surrounding the refinery that are disturbed during the construction phase but are not required for the operational phase (s.8.5.10.4).

8.7.3.2 Legislative Framework National (1)

EPA requested that the EIS and Appendix M be corrected to indicate that the EPP(Air) applies to Queensland's air environment, not just residential or 'sensitive' locations.

It is acknowledged that the air quality goals set out in the Queensland Environmental Protection (Air) Policy (EPP (Air)) are applicable for Queensland's air environment. As stated in the EPP (Air), these do not apply where workplace air quality legislation applies, or inside a dwelling, motel, educational institution or medical centre. Consideration of potential impacts at locations other than those sensitive receptor locations that were identified in the EIS are addressed by the contour plots of pollutants, as discussed below.

Predicted ground level concentrations of all contaminants were presented in the EIS (Appendix M) as tabular data of results at receptor locations. Contour plots over the modelled region were included for some pollutants (SO_2, NO_2, TSP and PM_{10}). Additional figures are provided in Appendix G of this EIS Supplement for hydrogen sulphide, sulphuric acid mist, nickel, cadmium, mercury and odour. These contour plots illustrate the predicted ground-level concentrations of pollutants over the region. Implications for health-based air quality guidelines are discussed in Appendix G.

EPA requested that the EIS provide:

- *an explanation of the conversion efficiency of the sulphuric acid plant during 'normal' operating conditions*
- *an estimate of the frequency and duration of periods when the sulphuric acid plant will not be operating at the stated conversion rates*
- *how emissions will be minimised during periods of lower conversion efficiency.*
- *Identification of the type of fuel to be used during pre-heating*
- *likely emissions during pre-heating*
- *quantification of emissions from the sulphuric acid plant during pre- heating, start up and upset conditions*
- *the expected duration and frequency that the plant will operate in each of these conditions.*

Where these are significantly different to the emissions identified in the steady state conditions used in the modelling, identify the potential impact of this on ambient air quality.

The EIS outlined the possible range of efficiencies for the sulphuric acid plant design to highlight that GNP will employ best practice technology in the design of this plant. The acid plant design in the EIS was based on 99.8% efficiency for normal operation of the plant. Preliminary information available from sulphuric acid plant suppliers indicates that the conversion efficiency during normal operating conditions is typically better than the limit mentioned in the EIS. On this basis, the plant's operational efficiency has now been set at 99.85%.

Further design work by GPNL has increased the refinery's requirements for sulphuric acid in the process from 3.3 Mt/y to 4.5 Mt/y. The use of a 99.85% efficiency will ensure that the total SO_2 emission rate will be the same as that used in the EIS, namely 152 g/s of SO_2. The SO_2 production per tonne of acid will be reduced to 0.975 kg/t acid with the increased acid conversion efficiency.

The increased acid demand will require the construction of an additional acid plant on site for Stage 2. This means that for Stage 2 there will be four acid plants operating at the refinery rather than three as described in the EIS.

The increased production of sulphuric acid also has implications for the release of sulphuric acid mist from the acid plant stacks. More efficient acid mist eliminators have been included in the design of the sulphuric acid plant. These are capable of achieving a reduced acid mist emission rate of 0.04 kg H_2SO_4/ t of 100% acid.

Section 11 Environmental Effects of Refinery

Revised stack parameters for the sulphuric acid plants are presented in the following table.

Revised source parameters for air emissions from Sulphuric Acid Plant, Stages 1 and 2

Source name	No. stacks, Stages 1 and 2	Stack height m	Stack diameter m	Stack exit velocity m/s	Stack exit temp °C	SO2 emission rate per stack, g/s	Sulphuric acid mist emission rate per stack, g/s
Sulphuric Acid Plant	4	60	2.67	15	82	38	1.6

Revised modelling results for SO_2 and sulphuric acid are presented in the following table. Results for SO_2 are presented as cumulative impacts with other industrial sources, while sulphuric acid emissions from the refinery in isolation are presented. These show that predicted impacts for both pollutants are well below relevant air quality guidelines at residential locations. These predictions are similar to the results presented in the EIS. Revised figures showing the air quality impacts for SO_2 due to the refinery and background industrial sources as well as for sulphuric acid mist over the modelling region are presented in Appendix G.

Modelled ground-level concentrations of SO_2 and Sulphuric Acid due to the Refinery (Stage 2) and background industrial sources (µg/m³)

Emission	Averaging time	Clinton area	Yarwun Area	Rural-residential	EPA Monitoring sites	EPP (Air) Guideline
Sulphur dioxide	10 minute 99.9th	618	349	497	473	700
	1 hour 99.9th	432	244	347	330	570
	24 hour	97	65	85	85	100
	Annual	12	17	17	14	60
Sulphuric acid (refinery in isolation)	3 minute	4	9	10	11	33, Vic SEPP

The shut down frequency for the sulphuric acid plant is predicted to be once every eighteen months based on a 10-day outage for maintenance associated with catalyst replacement. Additional outages will occur based on sulphuric acid consumption within the process plant. During the refinery's initial start up phase over the first two years when the plant is operating at 50% and 80% capacity respectively, additional shutdowns will occur. However a mitigation measure to be undertaken by GNP includes the provision of an acid tank terminal facility at Fisherman's Landing. This will enable the operation of the sulphuric acid plant to continue for longer periods than would otherwise be the case.

Upset conditions for the sulphuric acid plant will occur only during start-up of the plant as the conversion efficiency builds to its operational level of 99.85% efficiency. Since four separate acid plants will be installed on site, they will be started up independently to minimise the potential for peak emissions from the site. Full efficiency is achieved within 12 to 24 hours of start-up. During the start-up of the sulphuric acid plant(s) there will be a visible plume from the exhaust stack. This disappears typically in a few hours as the plant catalyst reaches full activity and temperatures reach steady operation. No data are available on the concentration of SO_2, SO_3 and acid mist during this period, which constitutes the plume. Start-ups of the acid plants are expected to be less frequent than yearly.

The fuel used during pre-heating will be natural gas. Emissions during pre-heating will be largely CO_2 and nitrogen. These emissions have been included in the air quality modelling.

8.7.7 Emission Rates (1)

EPA advised that the EIS should identify the characteristics of the nickel dryer including the release point for emissions to air, any pollution control devices used and expected emission characteristics during both normal and upset operating conditions.

Additional information is sought on air emissions from the hydrogen plant, power station, air separation unit and hydrogen sulphide plant including:

- *anticipated production rate and material throughput;*
- *frequency and duration of operation;*
- *potential for any emissions to air during normal or atypical operating conditions; and*
- *approaches to pollution control.*

Where design of the GPNL plant does not have sufficient detail to provide the required information, reference should be made to existing plant with similar characteristics.

The nickel dryer is expected to release only very small quantities of H_2S. As outlined in Section 8.7.7.1 of the EIS, the H_2S emission rate is much lower than emissions from the neutralisation plant, with an emission rate of 0.00002 g/s per stack. This source has been included in revised modelling of H_2S from the plant, as detailed in Appendix G.

The hydrogen plant requires natural gas and heat from the combustion of natural gas to generate hydrogen gas for use in the process. The emissions to air are NO_x and CO_2 (products of combustion). These have been incorporated into the dispersion modelling and greenhouse gas assessments respectively.

Emissions to air from the hydrogen sulphide plant, due to emergency de-pressurisation of the plant, process plant vent gases and relief valve discharges, are directed to the H_2S vent scrubber and then to the plant vent regenerative thermal oxidiser. The regenerative thermal oxidiser is also the back-up control device in the event of a failure of the scrubber. These control measures ensure that H_2S cannot be released from the hydrogen sulphide plant, as it is all combusted to SO_2 prior to release.

The air separation plant separates oxygen and nitrogen from the air for use in the process. It does not have any releases to atmosphere except for inert gases that are naturally occurring in the air.

The power plant is designed to recover heat from the sulphuric acid plant and hydrogen plant to generate steam and power for use in the Refinery. Supplementary fuel combustion using natural gas is required for periods when the acid plant is off-line. Emissions of SO_2, NO_x and CO_2 have been estimated for the project and are addressed in the air quality and greenhouse gas assessments.

The concentration of soluble manganese in the discharge water stream will be reduced by using sulphur dioxide. This will be by the use of a mixture of SO_2 and air in the final neutralisation step. Design is based on 95% utilisation of SO_2 in the reaction tanks, with the residual 5% in the exhaust gas stream from these reactors. A limestone scrubber will be included on the exhaust, to reduce the SO_2 to low levels. Slurry from the scrubber will be used in the refinery.

Emission estimation and dispersion modelling of mercury, cadmium, cobalt, nickel and metal particulates was undertaken using the maximum concentration guidelines from the NSW Department of Environment and Climate Change. This approach was adopted due to limited design information on these contaminants. Information from comparable facilities could not be located, as these metal emissions are dependent on a combination of the refining process and the ore used in the process. Due to commercial sensitivities, results of stack testing at other refineries are not made publicly available. The operation of the facility is committed to improving on the maximum limits specified by the NSW DECC, with the installation of control devices if deemed necessary once the plant is operational.

Annual monitoring of in-stack emissions will be conducted to determine the levels of pollutants released from the operation of the refinery. The emission release points identified in the EIS will be tested for the

following pollutants as appropriate for each stack, using sampling methods that are acceptable to the EPA:

- SO_2;
- NO_x (including NO_2 and NO);
- Sulphuric Acid;
- H_2S;
- Nickel particulate;
- Nickel Carbonyl;
- Cobalt particulate;
- Cadmium;
- Mercury;
- Total metal particulates;
- Total Suspended Particulate (TSP);
- PM_{10}; and
- Odour.

It is proposed that any pollutants that are below detection limits for two successive years will be not be tested in subsequent annual test programs. The results of the annual stack tests will be included in annual reporting to the Queensland EPA.

EPA requested that all sources of odour and potential for odour release during commissioning and upset conditions should be assessed.

The sources of odour and potential for odour during normal and upset conditions of operation are discussed in sections 8.7.7.1 and 8.7.7.3, respectively, and Appendix M of the EIS. The main odorous compound emitted will be hydrogen sulphide, with other sources of odour being from SO_2 and NO_x. Revised emission rates for H_2S and odour have been modelled, with results presented in Appendix G. These results show that odour impacts from the Refinery operations are expected to be well below the EPA's odour guideline at all locations on the modelling grid.

Upset conditions and releases during operation of the hydrogen sulphide plant will be controlled through a regenerative thermal oxidiser. This will eliminate odorous compounds. A key part of the process is to extract air from various tanks and other sources of emissions to avoid releases to the environment.

EPA advised that estimates of potential emissions of mercury, cadmium, cobalt, nickel and metal particulates from the proposed refinery be used to identify potential off site impacts. Where design of the GPNL plant does not have sufficient detail to provide the required information, reference should be made to existing plants with similar characteristics. Also, a mass balance approach could be used to demonstrate the fate of these contaminants.

Referring to information from similar plants is unlikely to be appropriate and provide a measure of accuracy suitable for the EIS. The table 8.7.11 in the EIS provides some key emission data with regard to nickel, cadmium and mercury. In this it is indicated that predicted concentrations of cadmium for Stage 2 are below 9% of the EPA guideline and 35% of the World Health Organisation guideline. Mercury is less than 1% of the World Health Organisation guideline. The predicted ground level concentrations of nickel are also well below the World Health Organisation risk criteria at all residential locations. Consequently the conclusion was drawn that a more detailed health risk assessment was not required.

EPA requested that the EIS identify means to eliminate any potential increase in cadmium concentrations.

Cadmium concentrations have been included in the modelling, using the maximum emission concentration from the NSW Department of Environment and Climate Change. Process modelling during development of the project design does not anticipate that any cadmium will be released at all from the refinery's air release points. Cadmium has been included in the dispersion modelling as a precautionary measure to evaluate potential impacts of all emissions. As noted above, data on emissions of cadmium from comparable refineries are not available.

The results of annual stack testing will be used to confirm the presence or absence of cadmium in the plant emissions. If required, appropriate control measures for cadmium will be installed on the plant.

EPA advised that the modelling results for pollutants presented in the EIS Table 8.7.11 and Appendix M, Table 1.20 be presented as contour maps to aid interpretation.

Contour maps have been provided in Appendix G, with a discussion on the air quality implications for the modelled region.

8.7.7.2 Materials Handling Emissions (9, 15)

(9) *QT advised that while it is suggested that the high moisture content of imported ore of 35% will reduce dust by 90% due to high moisture content and the covered conveyor, it is unclear whether the use of water sprays is optional control measure or whether they will actually be installed. GPNL is requested to specify and make clear if water spray systems will actually be installed and used as an integral part of their dust management system.*

Water spray systems are an integral part of the system both in terms of management of spillage and as dust control. Specialised dust reduction sprays are also used on sulphur to assist in localised management of sulphur dust occurring. Further detailed descriptions of the dust suppression included in the EIS, and modelling of dust impacts due to the importation of additional sulphur, are presented in Appendix G.

(15) *CQPA advised that, as previously stated, the moisture content of ore removed from the vessels' holds appears to vary significantly. Inspections at other facilities indicate that this varies from dust to mud. Options must be available for the addition of water to the conveyor stream at the source (hopper) and each transfer point. Advice is provided that ore and sulphur will be handled at the stockpile by front end loaders (2- 25). Dust generation from the traversing of end loaders around the stockpile base is a major source of dust generation through the physical movement of the loaders and the potential crushing of the ore. Additional details are sought on the method of dust control (monitors, water trucks, etc).*

The design of the wharf, unloader, conveyor and stockpile loading facilities has been undertaken in conjunction with CQPA. The facilities incorporate a number of mitigation measures associated with dust control. Water sprays will be incorporated into the design and operation to control dust emissions from stockpile areas.

Dust generation due to the activity of front end loaders on the ore and sulphur stockpiles has been included in the inventory of dust-generating activities on site.

8.7.8.3 Air Quality Impacts from Materials Handling (9)

QT requested GPNL to clarify if these concentrations include the concentrations from materials handling both at ship-loading/unloading and the conveyors as well as from the Refinery itself, or whether it is from materials handling specifically at the Refinery Site only.

The modelled concentrations include emissions from materials handling operations at the ship loader, stockpiles, refinery, conveyors and Fisherman's Landing. The sources included are outlined in detail in Section 8.7.7.2 of the EIS.

This EIS Supplement notes that ammonium sulphate will no longer be exported through Fisherman's Landing, hence changes in the dust impact due to shipping through Barney Point have been included in Appendix G. Other changes to materials handling requirements, namely the use of rail to transport the local ore from Marlborough and increased stockpile capacity due to the higher requirement for sulphur in the process have been included in new modelling of dust impacts, which are presented in Appendix G.

8.8 Noise (15)

CQPA has advised that a significant source of noise to be identified will be the operation of conveyors and shiploaders at the wharf. The conveying system by nature of its length has a cumulative affect. Similarly warning sirens and signals associated with shiploader movement and conveyor start up are strong noise source even though for only a short time. It is not apparent from the work undertaken by ASK Consulting Engineers (Appendix N) that the noise sources have been accounted for these systems.

The Wiggins Island Coal Terminal Environmental Impact Statement (Connell Hatch, 2006) (WICT EIS) addressed potential noise and vibration issues associated with the construction and operation of the Wiggins Island Coal Terminal (WICT) which also included Wiggins Island Wharf which will be used by the GNP for importing ore and sulphur. The main difference between the coal terminal and nickel refinery use would be that the coal is loaded while the nickel ore and sulphur are unloaded. This difference is unlikely to result in significantly different noise levels as the same types of equipment are involved in each process (i.e. conveyors, transfer stations, material handling noise etc). Thus it can be assumed that the nickel refinery unloading operations will produce noise levels that are similar to the coal terminal's loading noise levels. In terms of operational noise aspects, the conclusions of the WICT EIS are summarised as follows:

- Dominant noise sources were stockyard conveyors and outloading conveyors.
- At all mainland receptors, predicted noise levels were acceptable under neutral meteorological conditions, and with only minimal exceedences (2 dB(A)) under adverse meteorological conditions.
- No noise controls are proposed for mainland receptors.
- At the Tide Island receptor, the noise levels were considered to warrant further detailed investigation, including baseline noise monitoring.

Noise from the conveyors from the Wiggins Island Wharf to the refinery has been modeled using the PEN model. The predicted noise levels with adverse meteorological conditions (i.e. night inversion) at the eight receptor locations identified in the GNP EIS (Figure 8.8.1) are detailed in the following table.

Predicted Noise Levels from Port-Refinery Conveyor Operations

Receptor1	Predicted Noise Level (Inversion Conditions) Leq, dB(A)
S1	26
S2	25
S3	14
S4	25
S5	17
S6	26
S7	25
S8	18

[1] (Figure 8.8.1 of EIS)

The above results show that the predicted noise levels are up to 26 dB(A) at Locations S1 and S6. Noise levels of 14 dB(A) to 26 dB(A) would not be expected to be intrusive given the existing noise environment.

Overall, noise from the two enclosed conveyors between the wharf and the nickel refinery stockpiles are considered to be compliant.

CQPA understand that the nickel ore will not be screened at the loading port with the result that the ore unloaded will be variable in size and as such may require primary crushing at the ship unloader. If this is to be the operation, the noise impacts for the crusher need to be considered.

Primary crushing will be undertaken at the port of loading and there is no intent to screen and crush as part of the unloading process at Wiggins Island Wharf.

8.8.2.2 Long-term Monitoring Results (1)

EPA advised that additional long–term noise monitoring should be carried out in winter months, when background noise levels are lower and inversion conditions are likely.

Additional noise monitoring has been undertaken during winter. It consisted of both long term (1 week) and short term (15 minutes) monitoring undertaken during July 2007. The results of the additional noise monitoring are given in Appendix J.

8.8.3.1 Noise Criteria (14)

QH noted that S4 resident will have their house and land in the GSDA either purchased or reclaimed while the S2 resident will be left untouched despite the increase in noise that GNP will create. Has consultation with nearby residences in relation to noise levels and their impacts at night been discussed? Has GPNL spoken to residents about potentially reclaiming the nearby residents' land? Has GPNL taken into consideration the social health aspect of the nearby residents if land is resumed?

The S2 receptor is located adjacent to the Cement Australia plant, and is across the road from the Yarwun Alumina Refinery and Transpacific's facility on Landing Road. R2 is also adjacent to Yarwun Alumina's alumina/bauxite conveyor that operates 24 hours per day. All of these major industrial facilities are much closer to S2 than is the nickel refinery. It is understood that the landowner is seeking land resumption through the state government to facilitate a transfer to an alternative location.

8.8.4.3 Predicted Noise Levels from Stage 2 Operations (1)

EPA requested that the plant noise data be inputted to another model which could provide accurate results during inversion conditions at locations S3 and S8.

Noise modelling of the proposed refinery has been undertaken using the SoundPLAN software, in addition to modelling undertaken for the EIS which used PEN software. The results of this modeling are given in Appendix J. SoundPLAN is an internationally recognised noise modelling program, that uses 3D modelling techniques and a range of calculation algorithms to predict noise levels.

The results of the modeling results from both models are summarised in the following table.

Comparison of PEN and SoundPLAN Model Results

Noise Criterion	Assessment of Results from PEN Model (as per ASK report 3600R01)	Assessment of Results from SoundPLAN Model
1. EcoAccess	All receptors acceptable with neutral or	Exceedance at S1 at night (2 to 5 dBA),

Noise Criterion	Assessment of Results from PEN Model (as per ASK report 3600R01)	Assessment of Results from SoundPLAN Model
	inversion conditions.	and S4 during day (1 dBA) & night (7 dBA).
2. WHO – Continuous	Sleep disturbance criterion is exceeded at S2 with temperature inversion conditions. Annoyance criterion is achieved at all receptors with neutral or inversion conditions.	Sleep disturbance criterion is exceeded at S2 & S4. Annoyance criterion is exceeded at S2 & S4 with inversion conditions.
3. WHO – Intermittent	Not considered relevant.	Not considered relevant.
4. Low Frequency	All receptors considered acceptable.	Not assessed.
5. 'Background Plus'	Exceedance at S2 with inversion conditions, and at S4 with neutral or inversion conditions.	Exceedance at S2 at night with inversion, and S4 during day & night.

From the above table it can be seen that the increase in noise levels with the SoundPLAN model results in a number of exceedences depending on which criterion is considered.

As for the PEN model, exceedences are noted at locations S2 and S4, which are in industrial areas. With SoundPLAN, exceedence is now noted at location S1, in the Gladstone suburb of Clinton.

At location S1 the exceedance of the EcoAccess criterion is unlikely to cause complaint as the predicted noise level, 30 to 33 dB(A) LAeq,adj, is below the existing background noise level of 40 to 42 dB(A) L_{90}. The noise levels at this location are therefore considered acceptable.

As discussed above, S2 is located in a heavy industrial area and the landowner is seeking land resumption through the state government to facilitate a transfer to an alternative location. The house at S4 is likely to be resumed as part of the WICT project and hence its use as a residential property would cease.

It should also be acknowledged that the refinery is located within an approved industrial estate, and under the EPP(Noise), the refinery is therefore considered a beneficial asset. This allows the EPA to relax noise limits on the understanding that the industry provides economic benefits to the area.

Based on the predicted noise levels from both models, the noise impact from the refinery operations is considered compliant.

8.8.5.5 EPA Background Plus (16)

CSC/GSS advised that the noise assessment conducted for the project does not consider the impacts from any additional rail transport.

Where inputs and outputs are proposed to be transported via the existing rail infrastructure through Gladstone, the impact from noise on the local amenity of areas needs to be assessed. The EIS should be supplemented to include this assessment.

Rail Traffic

Data were obtained from QR for the number of train movements at Mt Miller, between Gladstone and Yarwun. On the weekdays, the typical number of daily train movements was 80, whereas on weekends the daily train movements was halved to approximately 40. The trains use the railway line 24 hours/day, 7 days/week.

The additional train movements generated by the GNP will be 3 trains per day (6 movements).

Given that the proposed trains will be similar to the existing trains, an increase of 6 train movements per day equates to an 8% increase on weekdays and 15% increase on weekends. These increases are small

and it is not expected that residents near to the rail track would notice the difference. Therefore, on the basis of this data, the rail noise impact is considered acceptable.

Rail Unloading

The typical sound power level of a rail unloading station is of the order of 118 dB(A). This additional noise source was added to the PEN noise model of the site to determine the noise levels at existing residents. The unloading station location is over 3.5 km from the nearest residence.

The predicted noise levels from rail unloading with adverse meteorological conditions (i.e. night inversion) at receptor locations are detailed in the following table.

Predicted Noise Levels from Rail Unloading Operations

Receptor1	Predicted Noise Level (Inversion Conditions), Leq, dB(A)
S1	27
S2	25
S3	20
S4	30
S5	22
S6	23
S7	21
S8	23

[1] (Figure 8.8.1 of EIS)

From Table 6.1 it can be seen that the predicted noise level from the rail unloading is up to 30 dB(A) at location S4. Location S4 is subject to existing background noise levels of 37 dB(A) to 42 dB(A) L_{90}, and therefore short periods of noise levels of 30 dB(A) would not be intrusive. Furthermore, S4 is likely to be resumed as part of the WICT project and hence its use as a residential property would cease.

Noise levels at other locations are 20 dB(A) to 27 dB(A), which would not be expected to be intrusive given the existing noise environment.

Overall, noise from the rail unloading station is considered to be compliant.

CSC/GCC noted that the requirements for construction to occur during the hours of 6am-6pm will be included as a condition of approval as will the need to notify the local community of atypical noise events.

The proposed hours of construction will exceed the range proposed from 6am to 6pm. It is therefore proposed to negotiate with the local community and local residents regarding work hours. This will provide the project some flexibility whilst enabling residents to be informed and aware of out-of-hours construction which may be required as part of the project. The limitations to construction times has the potential to increase the duration of project and increase the duration of construction noise for the period of delay.

8.8.5.6 Haulage Truck Noise (1)

EPA indicated that the EIS agrees with the recommendation of the traffic report that heavy vehicles are not allowed to use the Calliope River Road between dusk and dawn in order to restrict traffic noise. However, this recommendation is not incorporated in the environmental management plan. It is recommended that the EMP be amended to state that heavy vehicles would not use Calliope River Road between dusk and dawn.

GPNL will minimise night-time heavy vehicles as much as possible and will liaise with the community and local councils to arrive at mutually acceptable arrangements. Calliope River Road is a major access route from the Bruce Highway to the Yarwun area which has recently been upgraded to make it more suitable for heavy vehicles. Using alternative routes may create conflict by forcing trucks to utilise other routes between dusk and dawn particularly through Gladstone, which would have larger impacts. There is also limited ability to restrict trucks from utilising this road outside of normal hours.