

TNG LIMITED

DRAFT ENVIRONMENTAL IMPACT
STATEMENT

DARWIN PROCESSING FACILITY

**EXECUTIVE
SUMMARY**

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This Environmental Impact Statement (EIS) outlines the proposal by TNG Pty Ltd (TNG) to develop the Darwin TIVAN® Processing Facility (the Project). The Project incorporates processing of magnetite concentrate to produce higher value products for export from East Arm Wharf to international customers. The Processing Facility is located on Lot 1817, Hundred of Ayers, Middle Arm Industrial Precinct, (658 Channel Island Road) Wickham, approximately 16 kilometres (km) south east of Darwin, Northern Territory (NT) (Figure ES-1).

The NT environmental assessment process is currently administered under the *Environmental Assessment Act 1982* (the EA Act), *Environmental Assessment Amendment Act 1994* (the EAA Act), and their Administrative Procedures. These Acts and Procedures establish the environmental impact assessment framework in the NT.

The Northern Territory Environment Protection Authority (NT EPA) determined that the proposal requires assessment under the *Environmental Assessment Act* on the 15 January 2016 and released Terms of Reference (TOR) for preparation of an EIS on 20 May 2016; with expiry of the TOR subsequently extended to 20 November 2019 on request of the Proponent. The EA and EAA Acts will soon be replaced by the new Environment Protection Act 2019 (EP Act) and associated Regulations. Following commencement of the new EP Act, in accordance with sections 296, the Project will continue to be assessed under the EA Act, albeit with a modified process. The Project will also require an environmental approval from the Minister for Environment and Natural Resources, in accordance with section 301 of the EP Act.

On 4 January 2016 a delegate of the Commonwealth Minister for the Environment determined that the proposed Project was a controlled action and, as such, required assessment and an approval decision under the *Environmental Protection and Biodiversity Conservation Act* (EPBC Act). The relevant controlling provisions under the EPBC Act included potential significant impacts on Listed threatened species and communities (sections 18 & 18A); and Listed migratory species (sections 20 & 20A). Agreement between the Commonwealth and NT governments enables the bilateral assessment of an EIS by both the Commonwealth and NT governments. This Project is being assessed by the NT EPA under the bilateral agreement.

This draft EIS has been prepared by TNG and will be placed on public exhibition for a period of 12 weeks from 30 November 2019 to 21 February 2020. During this time, members of the public, local and NT government agencies and other stakeholders, are invited to provide comment on the draft EIS. The purpose of this EIS is to inform the public, NT EPA and other decision-making authorities about the Project and its potential environmental impacts. It addresses potential environmental impacts associated with both construction and operation of the Processing Facility.

Any comments received by the close of the public review period will be addressed in a Supplement to the EIS, which will be prepared by TNG and submitted to the NT EPA for assessment. If the Supplement is submitted after commencement of the new EP Act (as anticipated), the Supplement will be made available for public comment for 15 business days (EP Act s296(2)(c)). The EIS, submissions and TNG's responses to the submissions (the Supplement) will then facilitate the NT EPA's assessment.

The proposed Darwin TIVAN® Processing Facility will take suitable ore directly from the Mount Peake mine site (Figure ES2). Discovered by TNG in early 2008, the Mount Peake deposit is one of the largest known vanadium projects in Australia. The Mount Peake mine site is located in the Arunta Geological Province approximately 235 km north-west of Alice Springs in the Northern Territory and is 100%-owned by TNG. The mine site received Federal environmental approval on 11 May 2018 under the EPBC Act, which followed the NT EPA's assessment report in January 2018. A Mining Management Plan was submitted to the NT Department of Primary Industry and Resources for assessment in September 2019. The expected Life of Mine is 42 years; including 37 years of production and 4 years of construction and closure activities.

The proposed Darwin TIVAN® Processing Facility has a design life of 40 years, reflecting that of the mine site. A summary of the Project is provided in Table ES1.



Figure ES-1: Location of Darwin Processing Facility - NT context



Legend

- Darwin locations
- Lot 1817, Hundred of Ayers
- Darwin Processing Facility Envelope



1:300,000 GDA 94 MGA Zone 52
Date: 22/11/2019

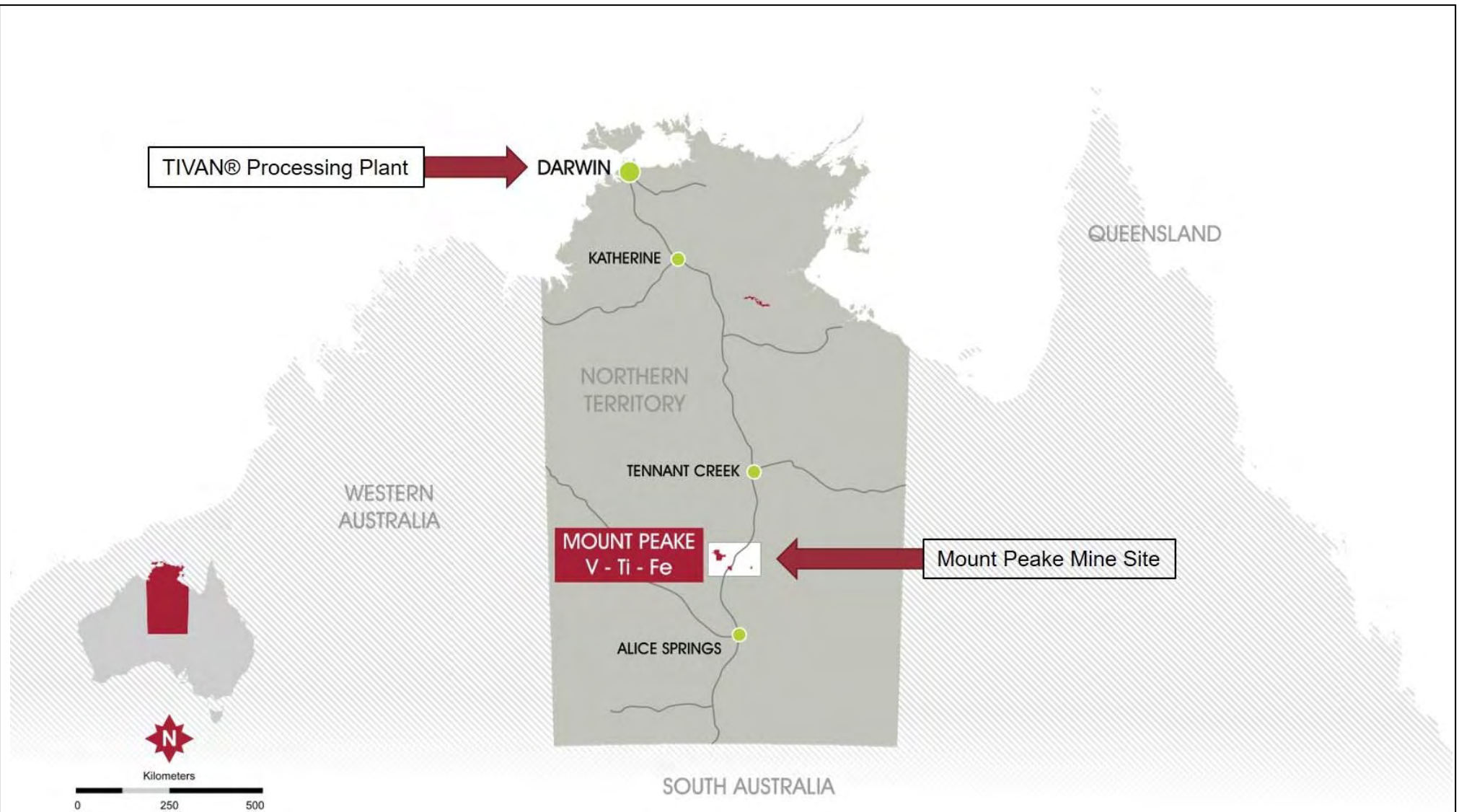



Figure ES2: Location of the Darwin Processing Facility – National Context

Table ES1: Darwin TIVAN® Processing Facility – summary

Project title	Darwin TIVAN® Processing Facility	
Proponent Name	TNG Pty Ltd	
Site Name	Lot 1817, Hundred of Ayers, Middle Arm Industrial Precinct, (658 Channel Island Road) Wickham	
Short Description	<p>The purpose of the Project is processing magnetite concentrate (concentrate) to produce higher value products titanium dioxide, vanadium pentoxide and ferric oxide, for export from East Arm Wharf to international customers.</p> <p>The proposal includes:</p> <ul style="list-style-type: none"> • Clearing of a partially vegetated allotment formerly utilised for extractive industries; • Construction and operation of a magnetite concentrate Processing Facility; • Development of support infrastructure, including workshops and stores, office/administration buildings, laydown areas, water storage and treatment facilities, car parking, electrical sub-station, access roads and outfall pipeline; • Construction and operation of a rail siding, unloading and loadout facilities on the Adelaide-Darwin railway; and • Loading of trains at the rail siding, with products to be railed to East Arm Wharf. 	
Operational Requirements		
Throughput	700,000 tonnes per annum (tpa)	
Operating hours	The Processing Facility will operate 24 hours per day, seven days per week.	
Products	Titanium Dioxide Pigment (TiO₂)	
	World demand	6,700,000 tpa
	TNG's average production	100,000 tpa (1.5% of world demand)
	Main usage	Paint, plastics, paper and inks
	Vanadium Pentoxide (V₂O₅)	
	World demand	160,000 tpa (equivalent of 90,000 tpa V units)
	TNG's average production	6,000 tpa (3.8% of world demand)
	Main usage	Steel, superalloys, chemicals, catalysts and energy storage (vanadium redox batteries)

Ferric Oxide (Fe ₂ O ₃)											
	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-bottom: 1px solid black;">World demand</td> <td style="width: 50%; border-bottom: 1px solid black;">104 million tpa (seaborne market)</td> </tr> <tr> <td style="border-bottom: 1px solid black;">TNG's average production</td> <td style="border-bottom: 1px solid black;">500,000 tpa (0.5% of world demand)</td> </tr> <tr> <td>Main usage</td> <td>Steelmaking</td> </tr> </table>	World demand	104 million tpa (seaborne market)	TNG's average production	500,000 tpa (0.5% of world demand)	Main usage	Steelmaking				
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Main usage	Steelmaking										
											
Reagents	<ul style="list-style-type: none"> • several acids, bases and oxidants. • several solid reagents including metals, hydroxides, limestone, diatomaceous earth, sulfur, organic polymers (flocclants) and inorganic salts. 										
Power Usage (petajoules/annum)	1.368										
Average Water Use (Gigalitres (GL) per annum)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">TIVAN® Process</td> <td style="width: 50%;">1.6</td> </tr> <tr> <td>Pigment Plant</td> <td>6.8</td> </tr> <tr> <td>Utilities</td> <td>2.6</td> </tr> <tr> <td>Total – Operations</td> <td>11</td> </tr> <tr> <td>Total - Construction</td> <td>1.25</td> </tr> </table>	TIVAN® Process	1.6	Pigment Plant	6.8	Utilities	2.6	Total – Operations	11	Total - Construction	1.25
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Pigment Plant	6.8										
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Total - Construction	1.25										
Natural Gas Usage (petajoules per annum)	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Third-party power supply</td> <td style="width: 50%;">5.40</td> </tr> <tr> <td>Processing Facility</td> <td>4.82</td> </tr> </table>	Third-party power supply	5.40	Processing Facility	4.82						
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Train movements	<p>On average:</p> <ul style="list-style-type: none"> • three train loads of concentrate per week will be delivered to the Processing Facility from Mount Peake; and • seven train movements between the Processing Facility and East Arm Wharf will occur weekly 										
Traffic movements	<p>Daily vehicle movements external to the site (primarily between the site and the East Arm Wharf) will include:</p> <ul style="list-style-type: none"> • 4 isotainer truck movements; • 10 quad road train movements; • 2 flatbed truck movements; • 4 fuel/lubrication truck movements; • 16 light vehicle movements; and • light vehicle and/or bus movements associated with employees travelling to and from the site. 										
Waste products	<ul style="list-style-type: none"> • The wastewater treatment plant will reduce the toxicants to levels acceptable for discharge prior to disposal through the ocean outfall pipeline into East Arm. The plant will discharge an average of 0.026 GL of wastewater per day via the ocean outfall (9.5 GL/annum). The peak discharge rate for the plant is 0.032 GL per day. • Wastewater precipitate from the pigment plant, the TIVAN® Process and collected stormwater undergoes sedimentation and filtration to produce a filter cake and filtrate. The filter cake is transported by train to the Mount Peake site for disposal. • The neutralised digest residue tailings will be produced at a rate of 50 kilotonnes per annum. The residue will be stockpiled before transporting by train to Mount Peake for disposal in the Integrated Waste Landform. 										

	<ul style="list-style-type: none"> Dry magnetic separation non-magnetics will be produced at a rate of 570 tpa. The waste is inert and is not expected to contain any contaminants and will be transported back to Mount Peake for disposal in the Integrated Waste Landform.
Workforce	<p>Construction workforce estimated to be approximately 700 – 1000 personnel.</p> <p>Operations workforce estimated to be approximately 600 personnel.</p>

The Project, with associated access roads, supporting infrastructure and services comprises a development envelope of approximately 264 hectares (ha), of which 180 ha has been previously disturbed. The proposed layout is shown in Figure ES-3, with disturbance figures detailed in Table ES2.

Table ES2: Darwin TIVAN® Processing Facility – proposed extent of physical elements

Item	Disturbance Area (ha)
Process plant buildings and storage areas	110
Rail siding	15
Access and site roads	25
Additional plant infrastructure	70
Water pipeline	15
Miscellaneous (firebreaks, areas between buildings and roads, drainage infrastructure, fencing)	29
Total	264

The Project site is within the Darwin Coastal Bioregion, as classified by the Interim Biogeographic Regionalisation for Australia. A key feature of the bioregion is the Darwin Harbour Site of Conservation Significance (**SoCS**). In the NT there have been 67 sites identified as SoCS. The Darwin Harbour is a SoCS and as such the entire Project falls within the Darwin Harbour SoCS. Additionally, the Port of Darwin is a Nationally Important Wetland and is listed on the Directory of Important Wetlands in Australia. The fringing mangroves and waterways adjacent to Lot 1817 Hundred of Ayres are within the boundaries of the Port of Darwin Nationally Important Wetland.

The key environmental factors listed in Table ES3 were identified by the NT EPA to be relevant for the Project. These factors have been assessed in detail in the EIS.

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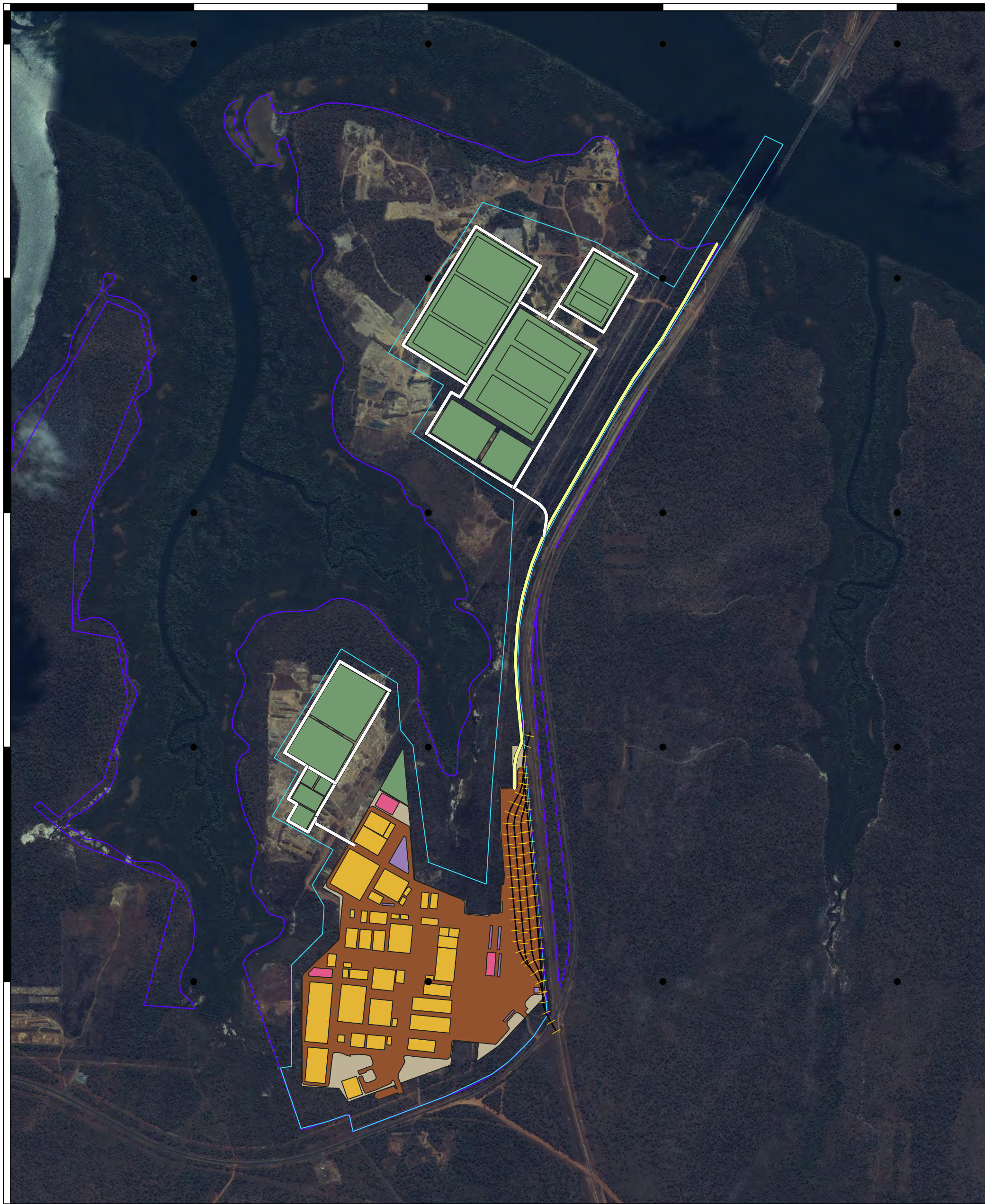


Figure ES-3: Lot 1817 and the Darwin Processing Facility Site Layout

Date: 22/11/2019

Legend

- Darwin Processing Facility EIS Envelope (TNG Oct 2019)
- Processing Facility Buildings (SMS Sept 2019)
- Storage Areas (SMS Sept 2019)
- Ponds (SMS Sept 2019)
- Additional Plant Infrastructure (TNG Sept 2019)
- Proposed Access Road (SMS Sept 2019)
- Rail Spurs (SMS Sept 2019)
- Easement (Road Waste Pipeline TNG Sept 2019)
- Lot 1817 Hundred of Ayers

0 1 km



GDA 94 MGA Zone 52
Scale 1:15,000
Drawn by ems@animalplantmineral.com.au

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Table ES3: Environmental Factors and objectives against which the Project impacts must be assessed

Theme	Factor	Objective
Land	Terrestrial Environmental Quality	Maintain the quality of land and soils so that environmental values are maintained.
	Terrestrial Flora and Fauna	Protect the NT's flora and fauna so that biological diversity and ecological integrity are maintained.
Water	Hydrological Processes	Maintain the hydrological regimes of groundwater and surface water so that environmental values are protected.
	Inland water environmental quality	Maintain the quality of groundwater and surface water so that environmental values including ecological health, land uses, and the welfare and amenity of people are protected.
Sea	Marine Environmental Quality	Maintain the quality and productivity of water, sediment and biota so that environmental values are protected.
	Benthic Habitat and Communities	Protect benthic communities and habitats so that biological and functional diversity and ecological integrity are maintained.
	Marine Flora and Fauna	Protect marine flora and fauna so that biological diversity and ecological integrity are maintained.
Air	Air Quality and Greenhouse Gases	Maintain air quality and minimise emissions and their impact so that environmental values are protected.
People and Communities	Social, economic and cultural surroundings	Protect the rich social, economic, cultural and heritage values of the Northern Territory.
	Human Health	Ensure that risks to human health are identified, understood and adequately avoided and / or mitigated.

To inform assessment of Project construction and operational activities against each of the above factors, TNG initiated the technical studies listed in Table ES4.

Table ES4: Technical studies conducted by TNG to inform the EIS.

Author	Title	EIS Appendix
Advisian (2019)	TNG Darwin Processing Facility Hydrology and Coastal Assessment	Appendix N
Animal Plant Mineral (2019)	Flora and Vegetation Surveys <ul style="list-style-type: none"> • Mid-dry season Terrestrial Flora Survey • Late-wet season Flora and Vegetation Survey • Early-wet season Targeted Searches • Wet season Targeted Searches 	Appendix L
Animal Plant Mineral (2019)	Fauna Surveys <ul style="list-style-type: none"> • Wet season Threatened and Migratory species – Shorebird Survey • Mid-dry season Terrestrial Fauna Survey • Early-wet season Fauna Survey • Wet season Bird Survey • Late-wet season Terrestrial Mammal survey 	Appendix L

Aurora Environmental (2019)	Darwin Processing Facility – Climate Change Impact Assessment	Appendix V
Baird Australia (2019a)	TNG Darwin Outfall: Hydrodynamic Modelling Report	Appendix P
Elton Consulting (2019)	Darwin Processing Facility: Socio-economic Impact Assessment	Appendix F
Golder Associates (2019a)	Preliminary Site Investigation and Shallow Soil Baseline Assessment – Proposed TNG Plan Lot 1817 Hundred of Ayers, Darwin, NT	Appendix H
Golder Associates (2019b)	Hydrogeological Study TNG Darwin Process Facility	Appendix M
O2 Marine (2019a)	Darwin Processing Facility: Marine Environmental Quality Site Investigation	Appendix Q
O2 Marine (2019b)	Darwin Processing Facility: Marine Environmental Quality Monitoring and Management Plan	Appendix R
O2 Marine (2019c)	Darwin Processing Facility: Benthic Habitats and Communities	Appendix S
O2 Marine (2019c)	Darwin Processing Facility: Marine Fauna	Appendix T
Tonkin Consulting (2019a)	Darwin Processing Facility: Traffic Impact Assessment	Appendix X
Tonkin Consulting (2019b)	Darwin Processing Facility: Traffic Management Plan	Appendix Y
Vipac Engineers and Scientists (2019a)	Darwin magnetite concentrate processing facility – Air quality assessment	Appendix U
Vipac Engineers and Scientists (2019b)	Darwin Processing Facility: Noise Impact Assessment.	Appendix Z

Consideration of outcomes from the technical studies and development of a Project risk assessment identified potential impacts requiring management. The key potential impacts, mitigating measures and how the Project meets the requirements of the Objectives is summarised in Table ES5.

Table ES5: Summary of potential impacts, proposed mitigation and outcomes

Terrestrial Environmental Quality	
Potential Impacts	<ul style="list-style-type: none"> Loss of soil structure leading to erosion impacts Contamination of terrestrial environment
Mitigation	<p><u>Mitigation hierarchy</u>: avoid, minimise, rehabilitate</p> <p><u>Pathway: Exposure to COPC's from fly-tipped waste</u></p> <ul style="list-style-type: none"> Removal of fly-tipped waste from the site using accredited waste specialists Inspection of disturbed areas and fly-tipped waste for the presence of asbestos; removal, transport and disposal of asbestos using licensed specialists. <p><u>Pathway: Disturbance of ASS</u></p> <ul style="list-style-type: none"> Undertake a geotechnical assessment prior to construction to identify areas of occurrence of ASS. Disturbance of ASS to be avoided where possible, including constructing infrastructure on piles above ground level. Excavated ASS to be treated during construction in accordance with the requirements of the ASS Management Plan to prevent acidic fluids leaching into surface water or groundwater.

Pathway: Incorrect handling of ASS

- Material free of ASS will be used to construct any bunds that may be required.
- Preparation of compliant ASS treatment pads. The area will be fully contained/constructed such that drainage/runoff water from the pad is directed to an appropriate receptacle for testing and treatment (if required).
- Any spilled ASS material is to be transferred to the treatment pad immediately.
- Awareness Training of ASS handling requirements will be provided to personnel involved with the movement of soils, particularly during the construction phase.

Pathway: Incorrect treatment of ASS/PASS

- ASS treatment pads will have a guard layer of agricultural lime applied at a nominal rate of 10kg/m².
- ASS material will be transferred to the treatment pad and placed on top of the guard layer. If ASS is to be treated in more than one layer, enough time will be allowed for validation testing and compliance of a layer before addition of extra material.
- ASS material is to be spread out in windrows of 300 mm loose thickness for drying. Once dry, fine agricultural lime will be applied evenly over the surface and thoroughly mixed into the soil.
- The Acid Neutralising Value of the agricultural lime supplied may not be 100% (as assumed for pure lime) and will be identified from documentation provided by the lime supplier. If less than 100%, a correction factor of 100/ Acid Neutralising Value will be applied to reach the equivalent of pure fine agricultural lime.
- Treated ASS shall not be removed from the site until validation monitoring indicates that performance indicators have been met.

Pathway: Retained water becomes acidified

- All stormwater or ASS leachate from stockpiles or other exposed areas shall be diverted to a retention ponds for monitoring and treatment (if required).
- pH, water level, Electrical Conductivity, total iron and aluminium concentrations to be monitored within any pond of retained water in current operation.
- Hydrated lime to be available for pH adjustment of water if required.
- Monitoring of wastewater conducted prior to discharge must indicate parameters comply with the performance indicators.

Pathway: Soil erosion resulting in disturbance of ASS or Sedimentation of the Adjacent Environment

- Implementation of the Erosion and Sediment Control Plan (**ESCP**) and Water Management Procedure (EP-10) in the Environmental Management Plan (EMP) to avoid erosion.
- Vegetation clearing to be undertaken in stages and in dry season conditions wherever possible.
- Erosion protection measures (bunding, spoon drains, silt fencing and sediment ponds) will be installed to contain any erosion.

Pathway: Incorrect storage of lime and hydrated lime leading to death of vegetation

- Lime will be stored in a containment area adjoining the treatment pad (so that any discharge from the area is directed into the treatment pad).
- Appropriate weatherproof storage of hydrated lime.

Pathway: Integrity of infrastructure compromised due to exposure to acidic environment

- Disturbance of ASS to be avoided where possible, including constructing infrastructure on piles above ground level.
- Project design to incorporate corrosion resistant materials where required.

Pathway: Contamination during Project operations phase

- Ensure stockpiles of bulk materials are located well clear of any waterway or drainage systems.

	<ul style="list-style-type: none"> • Construct bunds around fuel and chemical storage areas according to Australian Standards 1940: 2017 – <i>The Storage and Handling of Flammable and Combustible Liquids</i> (unless quantity of the liquid stored is within that allowable as minor storage), environmental protection licence or Major Hazard Facility licence requirements. • Train personnel in implementation of safe work practices to minimise risks and impacts of spillage of fuels, chemicals and other contaminants. • Train personnel in incident reporting and emergency management procedures and encourage the reporting of issues and near misses. • Record and report all POL, chemical and hazardous substance spills. • Ensure personnel have access to spill kits that contain an absorbent material, clearly marked oily waste disposal drum and a shovel. • In the event of a chemical or hazardous substance spill, containment measures should be enacted and Material Safety Data Sheet (MSDS) requirements complied with. • In the event of a POL spill less than 20L on soil, remove the soil and dispose of in oily waste disposal drum. • In the event of a POL spill of between 20 and 80L, soak up as much as possible using absorbent, and turn/aerate the soil to allow natural processes (i.e. aeration and microbial systems) to breakdown the organic compounds (i.e. hydrocarbons). Remove contaminated soil if the spill occurs in the vicinity of drainage lines and waterways. If on a hard surface such as road or concrete, use absorbent and dispose in the oily waste disposal drum. • In the event of a POL spill greater than 80L, all contaminated soil is to be removed, and disposed of in a clearly marked oily waste disposal drum. • MSDSs are to be located within storage areas, as well as centrally located and readily available to staff for use in case of an emergency. MSDSs are to remain current at all times. • Undertake validation sampling of soil if the spill, or combined record of spills, is greater than 80L to confirm all contaminated soil has been removed. • All contaminated soil and absorbent in the oily/chemical waste disposal drum should be disposed of by a licensed waste contractor. • Keep sites free from build up of waste materials by directing regular clean ups; • Avoid storing large volumes of materials on site; • Ensure equipment and vehicles have been washed down and inspected for POL leaks, prior to being transported to work sites; • Ensure wastewater from concrete batching plant (used during the construction phase only) is contained and treated; • Ensure herbicides used for weed control are registered and only applied by appropriately trained personnel.
<p>Outcomes</p>	<p><u>Residual Impact:</u></p> <p>The Project will expose, utilise and produce some materials capable of causing pollution.</p> <p>In the case of ASS, well-established approaches to their management should ensure there is no capacity for pollution to occur.</p> <p>Well-designed facilities and managed procedures for handling and storage of potential pollutants should ensure there is no capacity for pollution to occur.</p> <p>The Project can also address some historical pollution from historic mining and current uncontrolled waste dumping at the site.</p> <p><u>Offset:</u></p> <p>None required.</p> <p>TNG considers that the EPA’s objective for Terrestrial Environmental Quality can be achieved with the implementation of appropriate mitigation activities.</p>

Flora and Vegetation	
Potential Impacts	<ul style="list-style-type: none"> • Increase in the protection level of flora species at the state or federal level • Increase in the protection level of vegetation at the state or federal level
Mitigation	<p><u>Mitigation hierarchy: avoid, minimise, rehabilitate</u></p> <p><u>Pathway: Vegetation clearing</u></p> <ul style="list-style-type: none"> • Vegetation clearing is undertaken only in approved areas. • Implement the Ground Disturbance and Vegetation Clearing Procedure (EP-05) contained within the EMP. • Development and implementation of an internal Ground Disturbance Permit system whereby no land clearing is undertaken without completing a series of checks to ensure: <ul style="list-style-type: none"> ○ The proposed clearing has been approved; ○ Conditions in relation to soil and subsoil recovery, weed management, fauna clearing and other requirements have been assigned; ○ Approved permits are assessed for compliance with permit conditions; and ○ Proposed area of clearing is demarcated prior to clearing to avoid excessive or prohibited clearing. • Recover topsoil and utilise the seed bank to conduct rehabilitation of disturbed areas as they become available. <p><u>Pathway: Decrease of populations of conservation significant flora</u></p> <ul style="list-style-type: none"> • Prior to commencement of construction review the development envelope of the Project to ensure populations of the following flora species are excluded where possible: <ul style="list-style-type: none"> ○ <i>Cycas armstrongii</i> (VU); ○ <i>Tricoryne elatior</i> (NT); ○ <i>Polymeria pusila</i> (DD); and ○ <i>Buchnera</i> sp. ciliate bracts (DD). • Ensure vegetation clearing occurs only in approved areas. <p><u>Pathway: Alteration and sedimentation of surface water flows from erosion</u></p> <ul style="list-style-type: none"> • Implementation of the ESCP and Implementation of the Water Management Procedure (EP-10) contained within the EMP including: <ul style="list-style-type: none"> ○ Use of swales and sediment basins where required; ○ Use of minor diversions where required; and ○ Maintain natural flow paths wherever possible. <p><u>Pathway: Uncontrolled fire</u></p> <ul style="list-style-type: none"> • Implementation of the Fire management Plan including: <ul style="list-style-type: none"> ○ Mine personnel will be trained in fire protection; ○ The site will be equipped with fire suppression equipment; ○ A hot work permit system will be implemented; and • Grassy weeds will be controlled. <p><u>Pathway: Spread of existing weed infestations or introduction of new weed species</u></p> <ul style="list-style-type: none"> • Implementation of the Weed Management Procedure (EP-08) contained in the EMP including: <ul style="list-style-type: none"> ○ Review existing weed mapping and signpost areas of significant weed infestation; ○ Educate mine personnel on the identification and management of key weed species; ○ Implement weed hygiene procedures; ○ Use the Ground Disturbance Permit System in the Ground Disturbance and Vegetation Clearing Procedure (EP-05) as specified in the EMP to assess the risk of spreading weeds when undertaking land clearing; and

	<ul style="list-style-type: none"> ○ Routinely undertake site infestation control measures and monitoring of infestations. <p><u>Pathway: Increase of dust loads on vegetation arising from construction</u></p> <ul style="list-style-type: none"> ● Implementation of the Dust Emission Management Procedure (EP-11) contained within the EMP including: <ul style="list-style-type: none"> ○ Regular watering of active, potentially dust generating areas and stockpiles; ○ Efficient and effective machinery operation; ○ Limit vegetation and soil clearing; and ○ Biannual photographic monitoring of vegetation health at site. <p><u>Pathway: Low quality, saline and/or contaminated water contaminating soil and impacting vegetation</u></p> <ul style="list-style-type: none"> ● Water storage facilities and /or hazardous materials will be restricted to designated impermeable storage areas located at least 50m from any vegetation. Storage areas will be bunded and have appropriate drainage systems designed to capture any potential spills or leaks. ● Water used for dust suppression will be of a quality that does not negatively impact flora and vegetation. <p><u>Pathway: Increase of dust loads on vegetation arising from operation</u></p> <ul style="list-style-type: none"> ● Implementation of the Dust Emission Management Procedure (EP-11), in the EMP, including: <ul style="list-style-type: none"> ○ Maintain the concentrate at Dust Extinction Moisture level; ○ Use of water sprays or misting nozzles during stacking operations; ○ Misting sprays on reclaim feeders; ○ Fogging sprays at transfer points; ○ Physical enclosure of transfer points and operating equipment; ○ Select operational procedures to take place inside sheds; ○ Open areas not required for vehicle access for operations will be sprayed with hydro mulch or sealed through the application of dust suppressant chemicals; and ○ Active road surfaces sealed, treated with a dust suppressant chemical or sprayed with water.
<p>Outcomes</p>	<p><u>Residual Impact:</u></p> <p>Loss of 86.3 ha of high quality native vegetation and 107.7 ha of lower quality previously disturbed vegetation. However, the project aims to repurpose or rehabilitate a portion of the land that is currently completely degraded.</p> <p>Some local loss of flora listed under the TPWC Act. No impact on any threatened species and no significant impact on any other species of conservation significance at the regional scale – no increase in the protection level of flora or vegetation at the state or federal level.</p> <p><u>Offset:</u></p> <p>None proposed.</p> <p>TNG considers that the EPA’s objective for Flora and Vegetation can be achieved with the implementation of appropriate mitigation activities.</p>
<p>Terrestrial Fauna</p>	
<p>Potential Impacts</p>	<ul style="list-style-type: none"> ● Increase in the protection level of fauna species at the state or federal level ● Reduction in fauna habitat quality
<p>Mitigation</p>	<p><u>Mitigation hierarchy:</u> avoid, minimise, rehabilitate</p> <p><u>Pathway: Vegetation clearing resulting in loss of fauna</u></p> <ul style="list-style-type: none"> ● Implement the Ground Disturbance and Vegetation Clearing Procedures (EP-05) within the EMP and Biodiversity Management Plan (BMP), including: <ul style="list-style-type: none"> ○ Pre-clearance fauna trapping and translocation.

Pathway: Vegetation clearing resulting in loss of fauna habitat

- Ensure habitat to be cleared is well represented elsewhere on the Middle Arm Peninsula, and in the region.
- Implement the Ground Disturbance and Vegetation Clearing Procedures (EP-05) within the EMP (Appendix D) and BMP, including:
- Development and implementation of an internal Ground Disturbance Permit system, whereby no land clearing is undertaken without completing a series of checks to ensure:
 - The proposed clearing has been approved;
 - Conditions in relation to fauna clearing and other requirements have been assigned.
- Approved permits are assessed for compliance with permit conditions.

Pathway: Habitat fragmentation

- Site layout design to be compact and reduce areas of habitat fragmentation where possible.

Pathway: Uncontrolled fire causing loss of individuals and habitat destruction

- Implementation of the Fire Management Plan (Appendix K) including:
 - Site personnel will be trained in fire protection;
 - The site will be equipped with fire extinguishers and other fire prevention measures; and
 - A hot work permit system will be implemented
- Grassy weeds will be controlled.

Pathway: Vehicle strike

- Maintain suitable speed limits.
- Erect warning signs in any locations where fauna are regularly sighted.
- Ensure employee and local contractor awareness of local fauna and encourage reporting of sightings and any incidents of vehicle strike.

Pathway: Increase in the abundance of introduced fauna

- Ensure all putrescible waste is securely stored until removed from site
- Monitor sightings of feral fauna and undertake control measures in consultation with stakeholders.

Pathway: Lighting, noise and vibrations altering natural behaviour

All light sources will be aimed towards work areas and away from surrounding habitat, using light shields as necessary to minimise light spill.

Pathway: Fauna entrapment in infrastructure

- Fence settling ponds
 - Install fauna egress points in water storage dams and / or sumps
- Ensure vegetation around barbed wire fences is kept to a minimum
- Avoid the use of barbed wire in fences where possible.
- Barbed wire fences will be regularly inspected for trapped animals (particularly bats), and mitigation measures explore, including:
 - Covering top strand of barbed wire with a PVC pipe shroud; and
 - Tying flag tape to barbed wire.

Outcomes

Residual Impact:

Loss of up to 264 ha of mixed quality habitat. However, the project will rehabilitate a portion of land that is currently completely degraded outside of the development envelope within Lot 1817 and will utilise 180 ha of previously disturbed land within the development envelope.

Fragmentation of remnant fauna habitat will be increased however the existing fauna habitat is already fragmented by former and current land uses.

	<p>The habitat loss and fragmentation is negligible at the regional scale.</p> <p>No loss of important populations of conservation significant fauna.</p> <p><u>Offset:</u></p> <p>None proposed.</p> <p>TNG considers that the EPA’s objective for Fauna can be achieved with the implementation of appropriate mitigation activities.</p>
Hydrological Processes	
Potential Impacts	<ul style="list-style-type: none"> • Site flooding or inundation from storm surge • Reduction in aquifer recharge • Alteration of aquifer characteristics
Mitigation	<p><u>Mitigation hierarchy:</u> avoid, minimise</p> <p><u>Site flooding or inundation from storm surge</u></p> <ul style="list-style-type: none"> • In general, locate primary infrastructure in areas above the 1 % AEP flood levels. • Model 0.1% AEP inundation and flood levels and locate processing plant infrastructure above these levels. • ESCP recommendation for a diversion bund around site infrastructure to be implemented. <p><u>Reduction in aquifer recharge</u></p> <ul style="list-style-type: none"> • Retain as much of Lot 1817 in a condition that will assist recharge of aquifer. This includes retaining (and/or enhancing through site rehabilitation activities) existing vegetation and soils. <p><u>Alteration of aquifer characteristics</u></p> <ul style="list-style-type: none"> • Retain as much of the existing laterite substrate (potential aquifer) as possible within the Project area to avoid significant interference with the structure of the aquifer. • Rehabilitate sites at the completion of construction where they are not required for operations, including replacement of subsoils and topsoils as appropriate and undertake ripping and seeding with local provenance native taxa to enhance potential infiltration.
Outcomes	<p><u>Residual Impact:</u></p> <p>No material change to surface water movement or volume is anticipated and no groundwater users will be affected.</p> <p><u>Offset:</u></p> <p>None required.</p> <p>TNG considers that the EPA’s objective for Hydrological Processes can be achieved with the implementation of appropriate mitigation activities.</p>
Inland Water Environmental Quality	
Potential Impacts	<ul style="list-style-type: none"> • Contamination of surface and groundwater systems
Mitigation	<p><u>Mitigation hierarchy:</u> avoid, minimise, rehabilitate</p> <p><u>Pathway:</u> Disturbance of ASS during clearing and earthworks</p> <p>ASS is to be managed in accordance with the ASS Management Plan.</p>

Pathway: Water pooling, sedimentation and contamination during Project operations phase

Implement the Hazardous Material Management Procedure (EP-13) , within the EMP, including the following:

- Ensure stockpiles of bulk materials are located well clear of any waterway or drainage systems;
- Train personnel in implementation of safe work practices to minimise risks and impacts of spillage of fuels, chemicals and other contaminants;
- Train personnel in incident reporting and emergency management procedures and encourage the reporting of issues and near misses;
- Construct bunds around fuel and chemical storage areas according to *Australian Standards 1940:2017* (unless quantity of the liquid stored is within that allowable as minor storage).

Pathway: Contamination of surface and groundwater systems through leaks or spills

Implement the Hazardous Material Management Procedure (EP-13) , within the EMP, including the following:

- Record and report all POL, chemical and hazardous substance spills
- Ensure personnel have access to spill kits that contain an absorbent material, clearly marked oily waste disposal drum and a shovel.
- In the event of a POL spill less than 20L on soil, remove the soil and dispose of in oily waste disposal drum.
- In the event of a POL spill of between 20 and 80L, soak up as much as possible using absorbent, and turn/aerate the soil to allow natural processes (i.e. aeration and microbial systems) to breakdown the organic compounds (i.e. hydrocarbons). Remove contaminated soil if the spill occurs in the vicinity of drainage lines and waterways. If on a hard surface such as road or concrete, use absorbent and dispose in the oily waste disposal drum.
- In the event of a POL spill greater than 80L, all contaminated soil is to be removed, and disposed of in a clearly marked oily waste disposal drum.
- Undertake validation sampling of soil if the spill, or combined record of spills, is greater than 80L to confirm all contaminated soil has been removed
- All contaminated soil and absorbent in the oily waste disposal drum should be disposed of at a designated oily waste disposal site approved by Darwin authorities.
- If pooled water becomes contaminated, e.g. through a diesel spill, ensure it is contained and removed (and not discharged to sewerage system or natural water courses)
- In the event of a chemical or hazardous substance spill ensure all requirements of the Material Safety Data Sheet (MSDS) are complied with.
- MSDSs are to be located within storage areas, as well as centrally located and readily available to staff for use in case of an emergency. MSDSs are to remain current at all times.
- Any spillage of wastes, contaminants or other materials shall be cleaned up as quickly as practicable using procedures that prevent contaminants or material being transferred to the stormwater drainage system;
- The stormwater system for the site shall be inspected regularly to identify any failures and, if necessary, repairs shall be undertaken;
- Chemical storage and handling areas shall be bunded and shall have drainage lines separate from the stormwater drainage, to reduce the likelihood of chemical contamination of stormwater.

Pathway: Erosion and sedimentation impacting on water quality

- Implementation of the ESCP (contained within Appendix O) and Implementation of the Water Management Procedure (EP-10) contained within the EMP (Appendix D) including:
 - Use of swales and sediment basins where required; and
 - Use of minor diversions where required.
- Ensure stockpiles of bulk materials are located well clear of any waterway or drainage systems;
- The stormwater system for the site shall be inspected regularly to identify any failures and, if necessary, repairs shall be undertaken

	<ul style="list-style-type: none"> Utilise appropriate drainage infrastructure (drains, culverts) to maintain existing surface water flowpaths where possible. Stormwater within the development envelope will be contained and directed to the wastewater treatment plant during operations prior to discharge.
Outcomes	<p><u>Residual Impact:</u></p> <p>With implementation of management strategies, no material change to surface or ground water quality is anticipated. No impact on other water users.</p> <p><u>Offset:</u></p> <p>None required.</p> <p>TNG considers that the EPA’s objective for Inland Water Environmental Quality can be achieved with the implementation of appropriate mitigation activities.</p>
Marine Environmental Quality	
Potential Impacts	<ul style="list-style-type: none"> Reduction in Marine Environmental Quality
Mitigation	<p><u>Mitigation hierarchy:</u> avoid, minimise, rehabilitate</p> <p><u>Pathway: Discharge of wastewater through ocean outfall</u></p> <ul style="list-style-type: none"> Outfall location to be selected based upon dispersion modelling to ensure dilutions are adequate to reduce concentrations within small mixing zone; Implementation of the Marine Environmental Quality Monitoring and Management Plan (MEQMMP); Develop wastewater treatment plans and quality control processes to support operation of the Processing Facility Obtain and comply with Mixing Zone Licence Conditions Obtain and comply with Waste Discharge Licence Conditions <p><u>Pathway: Non-process waste management</u></p> <p>Appropriate Domestic and Industrial Waste Management Procedure (EP-14), within the EMP, to be implemented for the Site including:</p> <ul style="list-style-type: none"> Recyclable materials, including cardboard, paper, glass, batteries, waste hydrocarbon drums and scrap metal, will be recycled wherever possible; Housekeeping inspections of all work areas will be undertaken weekly; Littering on site is prohibited and work and office sites are to be kept clean and tidy; Rubbish containers are to be carried in all vehicles and provided at all work area; Waste management will be addressed in the site induction. <p><u>Pathway: Chemical Spills</u></p> <p>Chemical management is detailed in Terrestrial Environmental Quality.</p> <ul style="list-style-type: none"> Implement management procedures detailed in the EMP (refer to Hazardous Material Management Procedure (EP-13), Appendix D). Implementation of the MEQMMP. <p><u>Pathway: Sedimentation impacts from clearing</u></p> <ul style="list-style-type: none"> Limit clearing of mangrove areas to the minimal requirements. Implement management procedures detailed in EMP (refer to Ground Disturbance and Vegetation Clearing Procedure (EP-05)). <p><u>Pathway: ASS risk from pipeline construction</u></p>

	<ul style="list-style-type: none"> • Avoid excavation of ASS as part of the installation of the outfall pipeline. • Implement management procedures detailed in ASS MP. • Should ASS be inadvertently liberated, implement protocols of the ASS Management Plan.
Outcomes	<p><u>Residual Impact:</u></p> <ul style="list-style-type: none"> • Designation of a spatially defined licenced mixing zone (HD LEP), required to provide a zone where initial dilution of wastewater discharge can occur prior to meeting the required percentile of natural background conditions. • Application of Environmental Quality Criteria (EQC), as defined within the MEQMMP, for the HD LEP nominally defined as the 10th or 90th percentiles of natural background conditions; • Application of the EQC, as defined within the MEQMMP, nominally defined as the 20th or 80th percentiles of natural background conditions for all waters outside of the licensed mixing zone (SMD LEP); and • Short term, highly localised stratification of the water column parameters salinity and temperature during and post discharge. <p>Whilst these are residual impacts, the impact of this altered marine environmental quality on the systems they support is not considered to be significant or above the levels of species protection assigned to the HD LEP.</p> <p><u>Offset:</u></p> <p>None required.</p> <p>TNG considers that the EPA’s objective for Marine Environmental Quality can be achieved with the implementation of appropriate mitigation activities.</p>
Benthic Habitat and Communities	
Potential Impacts	<ul style="list-style-type: none"> • Loss of Benthic Habitat and Communities • Reduction in the quality of Benthic Habitat and Communities
Mitigation	<p><u>Mitigation hierarchy:</u> avoid, minimise</p> <p><u>Pathway: Installation of outfall/discharge pipeline impacting intertidal and subtidal BHC</u></p> <ul style="list-style-type: none"> • Undertake a survey of the pipeline route prior to installation. • Detailed high resolution BHC validation mapping of pipeline corridor to ensure avoidance of higher value BHC. • Utilise existing disturbed areas to locate pipeline. • Locate pipeline in area of least sensitive BHC environments. • Implementation of the EMP to minimise risk of unplanned disturbance on BHC during pipeline installation. <p><u>Pathway: Discharge of process wastewater impacting BHC</u></p> <ul style="list-style-type: none"> • Process wastewater discharge is detailed in Marine Environmental Quality Environmental Factor (chapter 7-7). • Detailed high resolution BHC mapping of proposed outfall location, mixing zone and surrounding sensitive areas. • Outfall location to be selected based upon suitable void of 250 m minimum to the nearest sensitive hard substrate communities. • Dispersion modelling to ensure dilutions are adequate to reduce concentrations within small mixing zone. • Implementation of the MEQMMP. • Develop wastewater treatment plans and quality control processes to support operation of the Processing Facility. • Obtain and comply with Mixing Zone Licence Conditions.

	<p>Obtain and comply with Waste Discharge Licence Conditions.</p> <p><u>Pathway: Uncontrolled stormwater flows causing erosion of coastal areas impacting BHC</u></p> <ul style="list-style-type: none"> • Implementation of the ESCP (Appendix N) and Water Management Procedure (EP-10) to avoid erosion. • Vegetation clearing to be undertaken in stages and in dry season conditions wherever possible. • Erosion protection measures (bundling, spoon drains, silt fencing and sediment ponds) will be installed to contain any erosion. • Establish buffer zones between the intertidal BHC and the adjacent Development Envelope. • Maintain natural groundwater seepage and stormwater runoff flows into the adjacent intertidal zone. <p><u>Pathway: Contamination during Project operations phase from chemical leaks or spills impacting BHC</u></p> <p>Hazardous materials management at the Project is detailed in Terrestrial Environmental Quality Factor</p> <ul style="list-style-type: none"> • Implement the Hazardous Material Management Procedure (EP-13). • Materials management to be in accordance with Australian Standard 1940: The Storage and Handling of Flammable and Combustible Liquids, MSDS, licences and permit requirements. • Spill response protocols developed to ensure uncontained materials are addressed prior to entering the marine environment. <p><u>Pathway: Non-process waste impacting BHC</u></p> <p>Appropriate Domestic and Industrial Waste Management Procedure (EP-14) to be implemented for the Site, including:</p> <ul style="list-style-type: none"> • Recyclable materials, including cardboard, paper, glass, batteries, waste hydrocarbon drums and scrap metal, will be recycled wherever possible; • Housekeeping inspections of all work areas will be undertaken weekly; • Littering on site is prohibited and work and office sites are to be kept clean and tidy; • Rubbish containers are to be carried in all vehicles and provided at all work area; • Waste management will be addressed in the site induction.
<p>Outcomes</p>	<p><u>Residual Impact:</u></p> <ul style="list-style-type: none"> • Direct impacts includes the removal, burial or replacement of existing substrate for the pipeline footprint and the immediate area surrounding the outfall. • Indirect impacts as a result of possible impacts extending beyond the immediate Development footprint. This impact is considered temporary in that the substrate is not altered permanently and recovery, at varying time scales, of BHC is expected. <p>The residual impact is considered not to be significant.</p> <p><u>Offset:</u> None required.</p> <p>TNG considers that the EPA’s objective for Benthic Habitat and Communities can be achieved with the implementation of appropriate mitigation activities.</p>
<p>Marine Fauna</p>	
<p>Potential Impacts</p>	<ul style="list-style-type: none"> • Increase in the protection level of marine fauna species at the state or federal level • Reduction in marine fauna habitat quality
<p>Mitigation</p>	<p><u>Mitigation hierarchy: avoid, minimise</u></p> <p><u>Pathway: Death or injury to fauna from ingestion or entanglement in non-process waste</u></p> <p>Litter that is generated during both construction and operation phases of the Project will be managed in accordance with the Domestic and Industrial Waste Management Plan (EP-14) and compliance with the requirements of the <i>Marine Pollution Act</i> (NT) and the <i>Waste Management and Pollution Control Act</i></p>

Pathway: Changes in habitat quality due to increased sedimentation

- Implementation of the ESCP and Water Management Procedure (EP-10) in the EMP to avoid erosion
- Vegetation clearing to be undertaken in stages and in dry season conditions wherever possible.
- Erosion protection measures (bundling, spoon drains, silt fencing and sediment ponds) will be installed to contain any erosion.

Pathway: Exposure to contaminants from leaks or spillage of hazardous substances

Implement the Hazardous Material Management Procedure (EP-13) , within the EMP (Appendix D).

- Construct containment areas compliant with appropriate standards well clear of any waterway or drainage system.
- Educate workforce on reporting and management of spillages.
- Actively manage all spillages and recover contaminated material.
- Construct bunding and pipelines with spill protection.
- Erosion protection measures (bundling, spoon drains, silt fencing and sediment ponds) will be installed to contain any erosion.
- Rehabilitation of disturbed areas not required for infrastructure
- Undertake regular inspections.
- Remediate contaminated soils in accordance with applicable regulations.

Pathway: Loss of habitat

- Undertake a survey of the pipeline route prior to installation.
- Utilise existing disturbed areas to locate pipeline.
- Detailed high resolution BHC mapping survey of pipeline corridor and outfall area is required to ensure avoidance of higher value BHC that may be of significance to marine fauna.

Pathway: Changes in marine habitat quality from the treated wastewater ocean outfall

- Design of the Wastewater Treatment Plant to criteria that:
 - meets the ANZG (2018) 95% SPL default guideline values
 - do not result in an accumulation of contaminants over time
- Discharge only during ebb tides to ensure maximum dilutions are achieved and marine environmental impacts do not arise upstream during flood tides
- Selection of a wastewater ocean outfall locations that ensures an appropriate level of ecological protection can be achieved
- Monitoring water quality parameters at the ocean outfall
- Updating predictive numerical modelling of water quality associated with the outfall using monitoring data

Outcomes

Residual Impact:

- There are no significant habitats (i.e. nesting, nursery, foraging or breeding areas), for any marine fauna species listed under the EPBC Act or TPWC Act within the Project area;
- It is unlikely individual harm will occur to any of the listed marine fauna species as they are all highly mobile species and would move away from affected areas;
- There will be no declines in the population of the range of species protected under both Commonwealth and state legislation;
- No reductions in populations of species of local and regional importance; and
- No reduction in the biodiversity of marine fauna in the Project area or surrounds.

The residual impact is considered not to be significant.

Offset:

	<p>None required.</p> <p>TNG considers that the EPA's objective for Marine Fauna can be achieved with the implementation of appropriate mitigation activities.</p>
Air Quality and Greenhouse Gasses	
Potential Impacts	<ul style="list-style-type: none"> • Reduced Air Quality • Increased Greenhouse Gas emissions
Mitigation	<p><u>Mitigation hierarchy</u>: avoid, minimise</p> <p><u>Pathway: Fugitive dust</u></p> <ul style="list-style-type: none"> • Implement the Dust Emission Management Procedures (EP-11) within the EMP (Appendix D), including: <ul style="list-style-type: none"> ○ Regular watering of active areas and stockpiles areas; ○ Use of dust control equipment and housekeeping practices within the Processing Facility; and ○ Vehicle speeds on site roads will be restricted. <p><u>Pathway: Particulate emissions</u></p> <ul style="list-style-type: none"> • All predictions for all pollutants at the modelled sensitive receptors for the operation of the Project (including background) are below the relevant criteria and therefore no mitigation measures are required. <p><u>Pathway: CO₂ emissions from mobile plants</u></p> <ul style="list-style-type: none"> • Implement the Greenhouse Gas Emissions Procedures (EP-12) within the EMP <p><u>Pathway: Stack emissions</u></p> <ul style="list-style-type: none"> • Use scrubbers for the control of atmospheric emissions from the Project stack sources, including stacks in the following process areas: <ul style="list-style-type: none"> ○ Oxide roasting; ○ Acid regeneration; and ○ Tail gas scrubber. • Key process vessels and equipment should be insulated to minimise energy loss. • Comply with requirements of the Environmental Protection Licence, where applicable. <p><u>Pathway: Indirect CO₂ emissions from use of electricity</u></p> <ul style="list-style-type: none"> • Implement the Greenhouse Gas Emissions Procedures (EP-12) within the EMP, including: <ul style="list-style-type: none"> ○ Energy saving devices will be used where possible and based on the energy star ranking standard. • Consideration will be given to the use of alternative energy sources such as solar panels where feasible, as the Project progresses. • Key process vessels and equipment should be insulated to minimise energy loss. <p><u>Pathway: Inundation from extreme storm surge</u></p> <ul style="list-style-type: none"> • Mitigation measures for storm surges are detailed in Hydrological Processes.
Outcomes	<p><u>Residual Impact</u>:</p> <ul style="list-style-type: none"> • Stack emissions; and • Greenhouse gas emissions from Project operations.

As air quality at sensitive receptors is within criteria, and through implementation of management measures, the residual impact is not considered significant.

Offsets:

No offsets are required.

In consideration of the outcomes of the EIA and proposed management measures, TNG considers that the EPA’s objective for air quality, GHG emissions, and climate change can be achieved.

Social, Economic and Cultural Surroundings

Potential Impacts	<p><u>Potential Positive Impacts</u></p> <ul style="list-style-type: none"> • Employment opportunities • Provision of skills training, apprenticeships and scholarships; • Economic stimulus for local businesses; • Improved local housing market, particular for those looking to sell their homes; • Moderate population increase resulting in additional investment in local infrastructure and services. <p><u>Potential Negative Impacts</u></p> <ul style="list-style-type: none"> • Reduced housing affordability • Reduced Public Access and Safety • Contamination or restriction in use of Elizabeth River resulting in impacts on recreational pursuits • Noise Impacts • Traffic Impacts • Reduced Visual amenity • Light impacts • Impacts to Cultural Heritage
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Mitigation	<p><u>Mitigation hierarchy: avoid, minimise</u></p> <p><u>Reduced housing affordability</u></p> <ul style="list-style-type: none"> • Establish partnerships with Litchfield and Palmerston Councils to collaborate on local housing issues. • Investigate options for entering into partnerships and share-value agreements with local temporary accommodation providers to house construction and operational staff. <p><u>Public Access and Safety</u></p> <ul style="list-style-type: none"> • Install a boundary fence, entry gate, gate house and signage to deter unauthorised access to the site • Develop a Supply Chain Management Plan covering a wide range of transportation and supply chain matters, including public safety along transport routes and managing third party personnel conduct at work. • Ensure emergency exit points are situated at strategic locations around the site, for use in an emergency. • Ensure sufficient lighting and signage is installed to avoid injury to public within the vicinity of the site. <p><u>Contamination or restriction in use of Elizabeth River resulting in impacts on recreational pursuits</u></p> <ul style="list-style-type: none"> • Implement mitigating strategies detailed in chapter 7.5 – Hydrological Processes • Implement mitigating strategies detailed in chapter 7.7 – Marine Environmental Quality • Ensure Elizabeth River Boat Ramp access is maintained at all times
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- Develop a Community and Stakeholder Engagement Plan, including mechanisms for providing information on Project activities and for identifying and addressing ongoing concerns throughout the life of the Project
- Implement a Complaints and Grievance Protocol, incorporating prompt mitigation of concerns as appropriate

Noise Impacts

- Incorporate noise management into the EMP EP-21 (Appendix D).
- Provide an induction to construction personnel (including sub-contractors) addressing responsibilities with regard to noise management outlined in the EMP.
- Ensure truck drivers are informed of designated vehicle routes, parking locations, delivery hours and minimising engine braking and idling.
- Provide education through toolbox meetings of supervisors, operators and sub-contractors on the need to minimise noise.
- Select appropriately sized equipment for the task, such as earthmoving/excavation equipment.
- Avoid noisy plant working simultaneously where possible.
- Ensure all equipment is equipped with appropriate noise controls (e.g. mufflers, silenced exhausts, acoustic enclosures, flashing lights as an alternative to reversing beepers) and equipment is shut down and not left idling when not in use.
- Ensure equipment is operated in the correct manner and adequately maintained – including replacement of engine covers, tightening of rattling components, repair of leakages in air lines and shutting down equipment not in use.
- Consider the use of temporary solid screens for noise mitigation of noisy stationary equipment.
- Consider the use alternatives to ‘beeper’ style reversing alarms, such as broadband style alarms (or quacker alarms).
- Establish a Complaints and Grievance Protocol to address noise complaints.

Traffic Impacts

- Develop a Traffic and Transport Management Plan
- Design site access and egress to ensure safety is maintained for TNG staff and public road users.
- Liaise with appropriate regulators to ensure adequate signage is installed to notify public road users of trucks entering and exiting the site.
- Provide a bus service to and from the site for staff, reducing traffic volumes on roads in the vicinity of the Project.
- Investigate options of utilising existing infrastructure for ‘Park and Ride’ locations.
- Review the potential for cyclist infrastructure to provide a safe link for staff travelling to and from the site by bicycle.
- Develop safe and efficient parking on the site.
- Maximise the length of the proposed rail siding line to minimise the potential for delay at the level crossings.
- Liaise with rail providers to review timing of rail movements to minimise impact on road traffic as much as practicable.

Reduced visual amenity

- Ensure core Processing Plant infrastructure is constructed on the southern peninsula of the site, reducing visual impacts from Palmerston and the Elizabeth River Boat Ramp.
- Maintain the mangrove belt around the boundary of the site.
- Maintain screening vegetation along Channel Island Road wherever possible.
- Establish landscaping around the site to improve amenity.

Light impacts

- Design lighting in accordance with Australian Standard 4282:1997 ‘Control of the obtrusive effects of Outdoor Lighting’
- Install directional lighting wherever possible to reduce ‘light spill’ effects.

	<ul style="list-style-type: none"> Establish a Complaints and Grievance Protocol to capture any issues related to light impacts from the Project. <p><u>Impacts to Cultural Heritage</u></p> <ul style="list-style-type: none"> Include management of Cultural Heritage values into the EMP (refer to Aboriginal and Cultural Heritage Procedure (EP-04) in Appendix D). Develop a Code of Conduct for workers and inductions that cover awareness and protection of heritage values. Any previously unrecorded archaeological sites encountered will be reported to the Northern Territory Heritage Branch for advice on how to respond. Procedures for unexpected heritage finds will be included in the EMP (refer to Aboriginal and Cultural Heritage Procedure (EP-04) in Appendix D). Ensure soil material originating from the site remains within the site and is not disposed off-site. Comply with the conditions and requests of the Authority Certificate obtained from AAPA. Establish a process of stakeholder engagement and participatory planning with the Larrakia people. Engage with relevant Indigenous stakeholders to ensure traditional activities in nearby areas are understood and not impacted. In the event that any skeletal remains are unearthed TNG will stop work and immediately report such disturbance to the Northern Territory police, and to the Director Heritage Branch, Department of Tourism and Culture. Implement mitigating strategies for environmental factors applicable to the Project to ensure no downstream impacts occur to heritage items and values as a result of Project activities.
<p>Outcomes</p>	<p><u>Residual Impact:</u></p> <ul style="list-style-type: none"> During the construction phase of the Project, issues related to recreational amenity, social cohesion and community wellbeing are likely to be at the forefront. Longer-term, the operations of the Project will have positive impacts on the economic prosperity of Greater Darwin and across the Northern Territory Identified negative social impacts can be mitigated or enhanced through the implementation of effective management plans, engagement with, and participation of, the various project stakeholders through the life of the project. <p><u>Offsets:</u></p> <p>No offsets are required.</p> <p>TNG consider that development of the Project will be consistent with the NT EPA’s objectives for social, economic and cultural values and will have a net positive impact on the local, regional and national community and economy.</p>
<p>Human Health and Safety</p>	
<p>Potential Impacts</p>	<ul style="list-style-type: none"> Increased risk to human safety Reduction in human health
<p>Mitigation</p>	<p><u>Mitigation hierarchy: avoid, minimise</u></p> <p><u>Pathway: Release of hazardous materials through road or rail accident</u></p> <ul style="list-style-type: none"> Engage specialist third party contractors to conduct road and rail transport requirements for the Project. Ensure all vehicles are licensed and carry appropriate equipment to respond to a spill, including PPE. Apply <i>Australia Dangerous Goods Code (ADG Code) for Transport by Road and Rail</i> requirements to all transport activities. Ensure loads are appropriately secured prior to leaving the site. Establish designated transport routes to avoid local residential areas. Establish collaborative relationships with local emergency services, ensuring they are aware of the Project activities, including transport of materials via road and rail. Identify all major incidents and hazards that could result from Project operations.

- Conduct and document a safety assessment in relation to the operation of the facility, which involves a comprehensive and systematic investigation and analysis of all aspects of risks to health and safety that could occur in the operation of the Major Hazard Facility.
- Implement control measures that eliminate or minimise the risk of a major incident occurring at the Project.
- Establish a Safety Management System (SMS) for the operation of the Project.
- Prepare a Safety Case for the Facility that demonstrates that the Project SMS will control risks arising from major incidents and hazards that could cause a significant impact. The Safety Case must demonstrate the adequacy of the measures to be implemented by the operator to control risks associated with the occurrence of major incidents.

Pathway: Release of hazardous materials within the Project area

Management of hazardous materials on site is addressed in chapter 7-2. Specific to human health, the following will also be implemented:

- Staff will be provided with sufficient training to competently and safely handle hazardous materials.
- Appropriate PPE will be provided to all staff working with hazardous materials on site.
- Change management protocols will be established to ensure requirements of any new materials brought to site are understood and additional measures can be implemented, where required.
- *Australian Dangerous Goods Code* requirements for storage compatibility will be adhered to.
- Spill response procedures and equipment will be available and understood by employees and contractors at the site.

Pathway: Explosion on site

- Design and construction of the Facility in accordance with Australian and International Standards, Building Codes and Licence requirements.
- Control of emission of flammable vapours, gases and mists (e.g. through the use of enclosed container and transfer systems, vapour recovery connections, sufficient ventilation).
- Elimination of ignition sources from hazardous areas.
- Installation of leak detection systems.
- Storing the minimum required quantities of flammable / explosive materials.
- Control of 'hot work' through an established permitting system.
- Good housekeeping practices on site.
- Implement the ERP, as required.

Pathway: Fire resulting from Project activities

- Implement the Emergency Response Plan, as required.
- Implement the Fire Management Plan.
- Ensure fire response equipment (e.g. fire breaks, extinguishers, fire reels) is available, operational and maintained. Fire extinguishers to be used in accordance with *Australian Standard 1841.1-2007 (Portable Fire Extinguishers – General Requirements)*.
- Fire hydrants will be connected on a ring main throughout the Facility, designed as per *Australia Standard 2419.1-2005 (Fire Hydrant Installations)*. Fire water will be sourced from the fire water surge tank.
- A foam injection and deluge system will be required for the solvent extraction mixer settling units where the organic solution is used. The foam deluge system shall be designed as per *Australian Standard 2118.3-2010 (Automatic Fire Sprinkler Systems – Deluge Systems)*.
- Use of firewalls between high risk units where appropriate.
- Personnel trained in the use of fire response equipment.
- 'Hot work' permit system in operation. Where there is a perceived high risk (e.g. on Total Fire Ban days), ensure trained personnel are on standby when hot work is carried out on site.
- Deliberate lighting of fires on site to be prohibited.

Pathway: Bioaccumulation of metals within marine species consumed by community members

	<ul style="list-style-type: none"> • Management of wastewater discharge quality, and therefore the impact on marine species potentially consumed by community members, is addressed in Marine Environmental Quality. <p><u>Pathway: Personnel exposure to climatic elements</u></p> <ul style="list-style-type: none"> • All personnel (including contractors and office workers) will be trained in the risks associated with climate exposure, the signs and symptoms of over-exposure to heat and its effects (e.g. dehydration) and what to do in case of an emergency. First-aid facilities will be equipped to provide at least an initial response to incidents of this type. • Drinking water will be available across the site at clearly signposted locations. • To reduce sun exposure appropriate PPE (e.g. long sleeved shirts, trousers, hats and/or helmets) and sunscreen will be made available and their use made compulsory. • Develop and implement Cyclone Response Plan. <p><u>Pathway: Animal bites and biting insects</u></p> <ul style="list-style-type: none"> • Site induction and personnel training to address potential risks associated with biting animals, how to avoid them and what to do in case of a bite or emergency. • Personnel provided PPE to provide protection from biting animals and deter biting insects e.g. boots, gloves, long sleeves, trousers. • Implement Biting Insects Management Plan
<p>Outcomes</p>	<p><u>Residual Impact:</u></p> <p>Some residual risk remains after the implementation of mitigation measures, however, these are of a low risk level that is expected to be acceptable to TNG and the NT community.</p> <p>In consideration of the proposed management measures, TNG considers that the EPA’s objective for human health can be achieved with the implementation of appropriate mitigation activities.</p>

TNG acknowledges the significant biodiversity of the area in which it seeks to operate. The assessment of potential impacts has highlighted those values and other aspects of the Project to be considered and managed. TNG has concluded that this Project (which requires less than 100 ha of undisturbed land clearing due to utilisation of previously disturbed areas) can be implemented without a loss of biodiversity – the existing protection level of flora and fauna will not change as a result of this project. Implementation of a range of mitigation measures will ensure the biodiversity impacts of the project are minimised.

TNG also acknowledges the potential for pollution of soil and water and is cognisant of the importance of the adjacent marine environment. TNG will implement mitigating measures to address potential impacts and is proposing to continue investigations during operations. The ultimate aim is to ensure all Project activities are controlled, materials are safely transported and stored such that the values of the Project area and the adjacent environment are protected.

TNG anticipates that, should this proposal receive approval, the Darwin TIVAN® Processing Facility will provide benefit to the Darwin and greater NT community, particularly in relation to employment opportunities and economic stimulus, and can be managed in such a way to minimise environmental impacts and meet the objectives of the NT EPA.