Northern Territory Environment Protection Authority

ASSESSMENT REPORT 85

MOUNT PEAKE PROJECT
TNG LIMITED

January 2018

Environmental Impact Assessment Process Timelines

Date	Process
05/07/2013	Notice of Intent for Mount Peake Project received by NT EPA
13/11/2013	NT EPA decision – Environmental Impact Statement required
18/11/2013	Australian Government decision –Controlled Action under EPBC Act, to be assessed under Accredited Assessment with NTG
07/03/2014	Terms of Reference issued to Proponent by NT EPA
13/02/2016	Draft EIS released for public comment for six weeks
18/04/2016	NT EPA direction to prepare EIS Supplement issued
18/04/2017	EIS Supplement received by NT EPA
09/05/2017	Additional information requested from Proponent by NT EPA
22/11/2017	Additional information received by NT EPA
19/01/2018	Assessment Report issued

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19 January 2018

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Important Disclaimer

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Abbreviations and glossary

ABCC	Acid Buffering Characteristic Curve
ACM	Acid Consuming Material
Adaptive management	A learning-oriented approach to making decisions on the management of natural resources in the presence of uncertainty. It involves iterations of decision making, monitoring, and assessment of system responses, leading to adapted decision-making (Lee 2014)
Additional Information	Additional information to the Draft EIS and the Supplement
Advisory bodies	Agencies having administrative responsibilities in respect of the proposed action
ADWG	Australian Drinking Water Guidelines
AMD	Acid and Metalliferous Drainage
ANC	Acid Neutralising Capacity
ANZECC	Australian and New Zealand Environment and Conservation Council
ARI	Average Recurrence Interval
ARMCANZ	Agriculture and Resources Management Council of Australia and New Zealand
ASLP	Australian Standard Leaching Procedure
ASX	Australian Securities Exchange
BMP	Biodiversity Management Plan
CLC	Central Land Council
DENR	Department of Environment and Natural Resources
DESCP	Drainage, Erosion and Sediment Control Plan
DPIR	Department of Primary Industry and Resources
Draft EIS	Draft Environmental Impact Statement
EA Act	*Environmental Assessment Act*
EAAP	Environmental Assessment Administrative Procedures
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement – includes the draft EIS, Supplement and Additional Information
Environment	All aspects of the surroundings of man including the physical, biological, economic, cultural and social aspects (Section 3 of the *Environmental Assessment Act*)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GDE	Groundwater Dependent Ecosystems
GHG	greenhouse gas

GL	Gigalitre (a billion litres)
ha	Hectares
ICMM	International Council on Mining and Metals
IWL	Integrated Waste Landform
KNAG	Kinetic Net Acid Generation
mbs	metres below surface
MLpa	Million litres per annum
MM Act	*Mining Management Act*
MMP	Mining Management Plan
MNES	Matter of National Environmental Significance
MPA	Maximum Potential Acidity
MSDS	Material Safety Data Sheet
Mt	Million tonnes
Mtpa	Million tonnes per year
NAF	non-acid forming
NAG	Net Acid Generation
NAPP	Net Acid Producing Potential
NBMMP	Non Benign Materials Management Plan
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
NTG	Northern Territory Government
Operator	The operator for a mining site referred to in section 9 (1) of the *Mining Management Act*
PAF	Potentially Acid Forming
PPL	Perpetual Pastoral Lease
Regulatory agency	Agency responsible for administering the *Mining Management Act*
Relevant regulator	Responsible Minister or delegate or agency responsible for administering the relevant legislation, in most cases the *Mining Management Act*. This could, in future, include the *Water Act* and subsequent legislation as the NTG progresses its regulatory reform program
Responsible Minister	Northern Territory Minister for Primary Industry and Resources
ROM	Run of Mine
SIMP	Social Impact Management Plan
Supplement	The Supplement to the Draft EIS
TDS	Total Dissolved Solids
The Australian Government Minister	Australian Government Minister for Environment and Energy

The Minister	Northern Territory Minister for Environment and Natural Resources
The Project	Mount Peake Project
The Proponent	TNG Limited
the/this Report	This Assessment Report 85, for the TNG Mount Peake Project
ToR	Terms of Reference for the EIS
TPWC Act	*Territory Parks and Wildlife Conservation Act*
TSF	Tailings Storage Facility
WMPC Act	*Waste Management and Pollution Control Act*
WONS	Weeds of National Significance
WRD	Waste Rock Dump

Summary and recommendations

Environmental impact assessment (EIA) is a process for identifying the potential environmental impacts and risks of a proposed action, evaluating the significance of those impacts and risks and determining appropriate avoidance, minimisation/mitigation measures to reduce those impacts and risks to acceptable levels. This Assessment Report (the Report) examines the EIA of the Mount Peake Project (the Project), proposed by TNG Limited (the Proponent). This report marks the end of the assessment process by the Northern Territory Environment Protection Authority (NT EPA).

This Report is not intended to provide an environmental approval although it will guide the decision for a mining authorisation (by the responsible Minister) and the decision for an approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The report is provided to the Northern Territory Minister for Environment and Natural Resources (the Minister) and for the Minister for Primary Industry and Resources (the responsible Minister) as a guide to conditions and approvals that could be required for the Project.

The Proponent is proposing to develop and operate the Mount Peake Project, a polymetallic (titanium, vanadium, iron) mine, located approximately 235 km north-northwest of Alice Springs in the Northern Territory (NT). The Project includes an open pit mine with a processing facility to produce magnetite concentrate and an associated Integrated Waste Landform (IWL) to store tailings and waste rock, an accommodation village, water abstraction from a new borefield accessing the Hanson River palaeovalley aquifer, and an ore concentrate load-out facility next to the Adelaide – Darwin Railway at Adnera. These would be linked by a proposed haulage road and service roads, and service corridors for electricity and water. The Project is anticipated to operate for 19 years. It is expected that the Project will mine approximately 9.4 Million tonnes per year (Mtpa) of ore and waste yielding 1.8 Mtpa of magnetite concentrate. The refining of the magnetite concentrate would occur at a proposed refinery located in Darwin and is not included in this assessment.

The NT EPA initially identified that potential environmental impacts and risks to the environment were: contamination of groundwater from waste storage facilities, the pit and spills of chemicals and toxicants; contamination of surface water from spills and elevated sediment loads in run-off; groundwater drawdown from water abstraction for project needs and associated environmental and social impacts; impacts on biodiversity values and threatened species; impacts to sites of historic and cultural significance; and alteration to the social demographic, culture and economies in the local region. These potential impacts and risks contributed to the decision to assess the Project at the level of an Environmental Impact Statement (EIS).

The Project was determined to be a controlled action under the EPBC Act for likely significant impacts on listed threatened species and communities – according to sections 18 and 18A in the EPBC Act. The NT EPA has assessed the Project (EPBC 2013/7027) on behalf of the Australian Government in accordance with an accredited assessment process.

In making this Report, the NT EPA had regard to the information provided by the Proponent, submissions on the Draft EIS, the Supplement, advice from specialists from the Northern Territory Government as well as relevant guidelines and standards. Following submission of the Supplement by the Proponent, the NT EPA requested, and was provided, additional information to complete the assessment. The NT EPA has assessed the Project against the NT EPA's objectives for the key environmental factors of: Hydrological processes; Inland water environmental quality; Terrestrial flora and

fauna; and Social, economic and cultural surroundings. Other environmental factors are addressed in Appendix 1.

The Project is in an arid zone of Australia where groundwater is a scarce and valuable resource. The proposed borefield would abstract water from a groundwater resource that is poorly understood. There is uncertainty around the potential impacts of this abstraction to groundwater dependent vegetation. Over the course of the environmental assessment the Proponent modified tailings management from a wet tailings slurry to emplacement of 'dry' stacked filtered tailings. The NT EPA acknowledges that this change has resulted in a significant reduction in water required for the Project. The NT EPA recommends that the Proponent be required to implement practices for the sustainable use of groundwater for this Project. This includes minimising water consumption, applying corporate water governance and providing open and transparent reporting of the use of that groundwater resource. The NT EPA makes the recommendation for the development of a **Water Abstraction Management Plan** to ensure monitoring and updated groundwater models are used for adaptive management responses to achieve sustainable groundwater use in relation to current and future use for pastoral purposes and reliance of groundwater dependent vegetation on the water resource. The NT EPA also recommends transparent reporting of water management in an annual Water Management Report. While an adaptive management response to water abstraction is considered necessary, the NT EPA emphasises that adaptive management should not be viewed as an appropriate response or substitute for the provision of sufficient baseline information.

Surface water flows in the Project area are episodic with many years between flow events, and large flows spread laterally from channels across floodplains as sheetflow. Interruption of this sheetflow by construction of the haulage road has the potential to cause indirect impacts to the culturally important plant *Ipomoea polpha* subsp. *latzii (*giant sweet potato). Provision of engineered drainage structures within the haul road should mitigate indirect impacts to the giant sweet potato and the NT EPA makes recommendation 7 to ensure that monitoring is adjusted in response to further surface flow modelling, and occupancy modelling for the species. The NT EPA notes that co-location of the haulage road with an existing track six kilometres to the north of the recorded population of giant sweet potato, would avoid direct impacts and fragmentation of habitat for the species. The NT EPA recommends the selected alignment of the haul road minimises direct impacts to giant sweet potato habitat, noting that avoidance of the habitat would negate requirements for currently proposed mitigation and monitoring. Other potential impacts to surface water hydrology from the haulage road crossing the Hanson River, Murray Creek and other minor watercourses can be appropriately mitigated by construction of 'at-grade' floodways. However as this still allows floodwater occasionally over the road, there remains uncertainty over whether this floodway design will remain suitable for mine operation over the longer term and the NT EPA makes recommendation 8 to ensure any future changes to floodwater design undergo appropriate assessment and approval.

The NT EPA considers that there is a residual risk of acid and metalliferous drainage (AMD) occurring in the future and recommends further testing of mined and waste rock to inform detailed design for an updated Non Benign Material Management Plan to be implemented. If additional testing results in a change to the management of mined and waste materials, further environmental assessment may be required. The change in proposed tailings management and inclusion of the IWL came late in the assessment process and the NT EPA recommends independent technical review of the design, and annual inspection and auditing of the IWL to ensure that the IWL is operated as intended, meets expected outcomes and to promote a transparent regulatory process. If this is achieved, the proposed change to dry stacking tailings management would reduce the potential for impacts on groundwater environmental quality. As the assessment process has involved a number of iterations of documentation the NT EPA recommends that the Water Management Plan is updated, with expanded analysis of metals in

groundwater monitoring as a precautionary measure and to ensure adequate baseline information is collected prior to operations commencing.

The NT EPA has considered the potential impacts of the Project on three threatened fauna species listed under the EPBC Act and one threatened species listed under Territory legislation (*Territory Parks and Wildlife Conservation Act*). For all fauna species the NT EPA is of the opinion that significant impacts can be adequately avoided or managed, or are not significant on a regional scale. Any residual impacts to these species are likely to be acceptable.

After mining, the pit and IWL would remain as permanent landscape features. A localised groundwater sink in the form of a pit lake would remain at the bottom of the mine void. The NT EPA considers it an unacceptable closure outcome with ongoing groundwater drawdown impacts from this sink and alternatives are to be addressed in the Proponent's Mine Closure Plan. High flows in Murray Creek have the potential to flood the pit and alter the downstream flow regime. The Proponent has proposed a flood levee and the NT EPA has made recommendation 9 to ensure the flood levee design provides certainty that the environmental values would be maintained in Murray Creek and the Hanson River downstream.

The NT EPA considers that effective long term containment of mining waste, post-closure or following unforeseen closure, is essential to ensure protection of the environment. The NT EPA has recommended that mine closure planning be an integral part of mine planning and that progressive rehabilitation is undertaken according to an approved schedule during Project operations, noting that dry stacking of tailings facilitates progressive rehabilitation. This would lower the risk of environmental harm during and after the life of the Project including any period of care and maintenance. The NT EPA recommends the Mine Closure Plan be updated prior to any approvals or decisions for the Project to inform the mining security bond required under the *Mining Management Act* (MM Act) and that it be regularly reviewed and updated throughout the life of the Project. The NT EPA recommends that the security bond be revised periodically based on the updated site activities and Mine Closure Plan to ensure the costs of rehabilitation and post-closure liabilities are not borne by the NTG and the community, in the event of the Operator abandoning the site or becoming insolvent. The NT EPA considers that surface water run-off management is critical in respect of placed dry stacked tailings and has recommended the final design of the IWL demonstrates this will be achieved.

The NT EPA makes 20 recommendations as an outcome of the EIA. These recommendations are for the Proponent and decision-makers to consider with respect to conditions of future approval processes and for the execution of the proposed action. The NT EPA emphasises that as the site specific and baseline data provided is not robust for some environmental risks, uncertainty remains around the potential for significant environmental impacts over the life of the Project. The NT EPA recommends that the environmental commitments, safeguards and recommendations outlined in the EIS, this Assessment Report and in the final management plans, must be implemented by the Proponent and reviewed and enforced by the relevant regulator throughout the life of the Project to deliver acceptable environmental outcomes.

The NT EPA considers that, subject to the implementation of the recommendations, the Project can be managed in a manner that is likely to meet the NT EPA's objectives and avoid significant or unacceptable environmental impacts and risks.

List of Recommendations

Recommendation 1

The Proponent or Operator shall ensure that the Mount Peake Project is implemented in accordance with all environmental commitments and safeguards:

- **identified in the final Environmental Impact Statement for the Mount Peake Project**
- **recommended in this Assessment Report 85.**

The Northern Territory Environment Protection Authority considers that all safeguards and mitigation measures outlined in the Environmental Impact Statement are binding commitments made by the Proponent.

Recommendation 2

The Proponent or Operator shall provide written notice to the Northern Territory Environment Protection Authority and the responsible Minister if it alters the Mount Peake Project and/or commitments, safeguards or mitigation measures in the Environmental Impact Statement in such a manner that the environmental significance of the action may change, in accordance with clause 14A of the Environmental Assessment Administrative Procedures.

Recommendation 3

Before approvals or decisions are given or made for the Project, the Proponent or Operator shall provide to the relevant regulator a Water Abstraction Management Plan for the Mount Peake Project. The Water Abstraction Management Plan must, at a minimum provide:

a) **a full description of the groundwater model, assumptions and parameters including accurate and regular water level and quality data**
b) **ongoing refinement and outputs of the Class 1 numerical model of aquifer drawdown prepared for the Project and presented in the EIS**
c) **revised model outputs for estimated groundwater drawdown for the Projected life of the Project and recovery of groundwater levels post-closure (including modelling to 200 years)**
d) **conducting an ongoing review of the model and assessing the validity of the assumptions underpinning the model**
e) **model updates and monitoring data reviews at year 5, 10 and 15 at the borefield and mine site**
f) **a framework identifying the location, timing, methods and parameters for the collection of further information on baseline groundwater levels, flow directions and flow rates to understand natural variance and hydrological conditions in the borefield and mine site**
g) **additional details of all monitoring bores, including the lithology and aquifers intersected and the purpose of monitoring at each bore**
h) **confirmation that all bores and bore meters will be constructed, operated and registered in accordance with the 'Minimum construction requirements for water bores in Australia' as published by the National Uniform Drillers Licensing Committee and the Department of Environment and Natural Resources 'Non-urban water metering code of practice for water extraction licences'**

i) **measures to quantify and record the volume of water abstracted from the borefield and mine site to support minimum monthly reporting of pumping records from individual bores**

j) **an independent peer review of the updated Water Abstraction Management Plan by a suitably qualified independent professional**

The Water Abstraction Management Plan should be developed and implemented to the satisfaction of the relevant regulator.

Recommendation 4

The Water Abstraction Management Plan established in recommendation 3 must include assessment and management of any stock bores that could be impacted by the Project in agreement with the owners and/or operators of those bores. This is to include:

a) **a program to monitor water levels at those bores to detect whether levels are within observed baseline conditions**

b) **measures to ensure identified groundwater user bores remain operational or provide make good arrangements if existing stock bores are impacted by aquifer drawdown**

c) **a mechanism by which the Proponent will redress any limitations on future stock bore use and development imposed by aquifer drawdown by the mine.**

Recommendation 5

The Water Abstraction Management Plan established in recommendation 3 must incorporate an adaptive management framework to guide the continuous refinement of management response to potential impacts to phreatophytic vegetation. This is to include:

a) **update analysis of potential impacts to phreatophytic vegetation based on the mapped vegetation units identified in the Supplement (Appendix K), revised numerical modelling of groundwater drawdown, and a more conservative threshold for potential impacts of groundwater drawdown in excess of 15 metres below surface (mbs)**

b) **a revised program for monitoring the condition of phreatophytic vegetation, consistent with that set out in the Additional Information, and with additional bore siting east of the pit along Murray Creek**

c) **a revised program for monitoring groundwater levels (drawdown) consistent with that set out in the Additional Information, and with additional bore siting at Stirling Swamp**

d) **trigger values that will be used to initiate management responses to groundwater draw down and impacts to phreatophytic vegetation detected by the monitoring programs referred to in b) and c)**

e) **consultation and engagement with Aboriginal people in the development and determination of the trigger values referred to in d)**

f) **management response options in the event that trigger levels are exceeded including:**

- **a reduced pumping regime at the borefield**

- **further water conservation measures at the mine, or**
- **provision of alternative/supplementary water supply to the mine**

g) **an independent peer review of the proposed program for monitoring the condition of phreatophytic vegetation and groundwater trigger levels by a suitably qualified independent professional.**

Recommendation 6

Mining approvals in relation to groundwater abstraction should include conditions that require the Proponent or Operator to:

a) **allocate clear responsibilities and accountabilities for water use and management**

b) **provide, in the Water Management Plan, regular updates of the projected water balance for the Project, including detailed estimates for the various phases of the Project and specifying the source and quantity of the water to be used**

c) **demonstrate how water considerations are integrated in Project planning including final Project design and technologies**

d) **report on continual improvement initiatives in water use and efficiencies including the provision of relevant water use targets**

e) **provide details on how water will be effectively managed during Project operations, including minimising water consumption, maximising water reuse and preventing waste water including unnecessary or excessive flow or flood of water**

f) **abstract water from bores only when equipped with operating flow meters**

g) **record the volume of water abstracted from the borefield and the mine site as reported in the Water Abstraction Management Plan (recommendation 3)**

h) **provide an annual Water Management Report to stakeholders. This is to include water use performance, performance in relation to triggers and any change to triggers.**

Public disclosure of the Water Management Plan and annual Water Management Report shall be provided on the websites of (as applicable), the Proponent or Operator and relevant regulatory authorities.

Recommendation 7

Mining approvals should include conditions that require the Proponent or Operator to provide to the relevant regulator an updated Biodiversity Management Plan for approval that includes a revised monitoring program for the giant sweet potato that addresses:

a) **modelling of expected changes in surface water flow from the proposed haulage road in relation to distribution of potential habitat**

b) **further occupancy modelling studies**

c) **preliminary trigger point values and the process by which those values will be refined following the collection of further baseline data**

d) **the identification of contingency measures.**

Recommendation 8

Mining approvals should include conditions that require the Proponent or Operator to:

a) implement the haulage road crossings of the Hanson River and Murray Creek 'at-grade' to ensure existing surface flows are not impeded

b) submit the final design or future planned works for a different engineered approach to the crossings for approval by the relevant regulator.

Recommendation 9

Before approvals or decisions are made for the Project, the Proponent or Operator shall provide to the relevant regulator an updated pit flood protection levee design that includes:

a) an updated surface water modelling and risk assessment to determine the adequacy of design criteria for the pit flood protection levee bund

b) a final levee design to an applicable Annual Recurrence Interval event that would avoid surface flows reporting to the pit during operation and post closure

c) final levee design that would maintain the existing surface hydrological regime in Murray Creek

The detailed pit flood protection levee design is to be peer reviewed by an appropriately qualified independent professional and implemented to the satisfaction of the relevant regulator.

Recommendation 10

Before approvals or decisions are given or made for the Project, the Proponent or Operator is to provide to the relevant regulator an updated Drainage, Erosion and Sediment Control Plan. The Drainage, Erosion and Sediment Control Plan must, at a minimum:

a) include standard drawings of all proposed Erosion and Sediment Control structures, including the integrated waste landform sediment pond, and techniques to assist with correct implementation on the ground

b) address all proposed infrastructure including but not limited to the mine site, haulage/access roads, the accommodation village, and the Adnera load out facility

c) be reviewed and approved by a Certified Professional in erosion and sediment control.

Recommendation 11

Before approvals or decisions are given or made for the Project, the Proponent or Operator shall provide to the relevant regulator an updated Non Benign Materials Management Plan for the Mount Peake Project. The Non Benign Materials Management Plan must, at a minimum, provide:

a) results of additional testing for contaminants of concern to confidently demonstrate there is a low risk of contaminants from all waste streams and stockpiled ore

b) **an expanded program of barrel leach tests to address the long-term leachate generation from wastes and updated results from barrel leach tests already underway**

c) **further development of measures to reactively manage AMD should they occur over the life of the mine including assessment criteria, trigger and action levels for groundwater monitoring**

d) **increase the number of waste rock tests occurring to provide stronger evidence that the production and variability of Neutral Mine Drainage within waste material will not be significant**

e) **consolidate relevant management measures contained in the AMD Management Plan submitted with the Draft EIS.**

Recommendation 12

Before approvals or decisions are given or made for the Project, the Proponent or Operator shall engage an appropriately qualified, independent and experienced person to review and report on the design of the Integrated Waste Landform. The review shall provide to the relevant regulator:

a) **objective and independent expert review that the siting of the integrated waste landform is suitable to minimise environmental risks**

b) **objective and independent expert review that the integrated waste landform design parameters are adequate to ensure long-term containment of tailings/waste rock or leachate**

c) **objective and independent review that surface water runoff from the integrated waste landform during construction, operation and post closure is suitable to minimise environmental risks**

d) **objective and independent expert review of the decommissioning and final rehabilitation to minimise long-term risks to the environment, community, future land use and visual amenity from the integrated waste landform.**

Recommendation 13

Mining approvals should include conditions that require the Proponent or Operator to engage an appropriately qualified, indpendent and experienced person to conduct an annual audit and inspection of the Integrated Waste Landform. The annual audit and inspection report shall provide to the relevant regulator:

a) **objective and independent expert review that the construction and operation of the integrated waste landform is in accordance with the endorsed design**

b) **objective and independent expert review of the performance of the filtered dry stack tailings including achievement of the expected moisture content and dealing with dry stack tailings in any weather conditions (including management of dust during dry conditions and management of surface water runoff in wet conditions)**

c) **objective and independent expert review of the proposed performance monitoring program and results for the integrated waste landform including potential seepage and leachates and management of surface water runoff and erosion.**

The annual audit and inspection report shall be provided on the websites of (as applicable), the Proponent or Operator and the relevant regulatory authority.

Recommendation 14

Before approvals or decisions are given or made for the Project, the Proponent or Operator shall provide to the relevant regulator an updated Water Management Plan addressing site risks at the Adnera load out facility. The updated Water Management Plan, at a minimum, must provide:

- **a) site drainage arrangements and other management measures to ensure that potentially contaminated run-off is contained on-site**
- **b) a groundwater monitoring program including establishment of baseline groundwater quality to ensure leachate or runoff from stockpile does not impact groundwater.**

Recommendation 15

Before approvals or decisions are given or made for the Project, the Proponent or Operator shall provide to the relevant regulator for approval an updated Water Management Plan for the Mount Peake Project. The Water Management Plan must, at a minimum, provide:

- **a) monitoring program that would provide additional baseline groundwater quality data for a minimum of 12 months**
- **b) baseline analysis and a monitoring program for the full suite of metals at groundwater monitoring bores including those near Murray Creek and Mud Hut Swamp**
- **c) a monitoring program for the bore monitoring network representing the integrated waste landform, ore stockpiles, water storage areas, including location and frequency of sampling**
- **d) reporting of QA/QC of data collected.**

Recommendation 16

Prior to the commencement of any clearing or construction, the Proponent must define and implement a suitable haul/access road alignment for approval by the relevant regulator that minimises the direct impact on giant sweet potato *Ipomoea polpha* subsp. *latzii* within the Project area. The Proponent should:

- **a) whenever possible, select an alignment that minimises disturbance to vegetation and habitat with particular emphasis on minimising impacts to the Long Range Hills population of giant sweet potato**
- **b) avoid clearing vegetation in areas mapped as potential *Ipomoea polpha* subsp. *latzii* habitat vegetation unless strictly essential**
- **c) ensure any clearing of vegetation for the haul/access road has a Ground Disturbance Clearing Permit issued by the Environmental Manager**
- **d) clearly mark areas of land to be cleared and areas to be retained (No-Go areas) so impacts do not extend further than needed**
- **e) clear vegetation areas progressively and incrementally as needed instead of large-scale clearing**

f) **monitor the population at reference points identified in the *Ipomoea polpha* subsp. *latzii* monitoring program (referred to in Recommendation 7)**

g) **rehabilitate borrow pits if it is determined they are a known habitat for *Ipomoea polpha* subsp. *latzii***

h) **rehabilitate the haulage road if the final alignment does not avoid giant sweet potato habitat.**

Recommendation 17

Before approvals or decisions are given or made for the Project, the Proponent shall develop the mitigation measures and actions identified in the Biodiversity Management Plan, including:

a) **selection of infrastructure alignments that minimises, where practicable, disturbance to vegetation and habitat, with particular consideration given to minimising impacts to threatened species habitat**

b) **a procedure for pre-clearance surveys for threatened species habitat**

c) **development of a surveillance framework whereby any sightings, detection of animal sign (e.g. tracks, burrows, scats) or vehicle strikes are reported and trigger a reassessment of the mitigation measures and the need for monitoring**

d) **collection of additional data for occupancy models for threatened species**

e) **procedures for avoiding and/or managing the risk of introduced fauna on threatened species**

f) **procedures for managing fire risk from the Project on habitat for threatened species**

g) **weed hygiene and control procedures for avoiding the introduction and/or spread of weeds into habitat for threatened species**

h) **develop and implement mitigation tools pertaining to threatened species (e.g. Fire management plan, Domestic and Industrial Waste Management Plan, Weed Management Plan) and that are included in the Biodiversity Management Plan.**

Recommendation 18

The Proponent or operator shall establish a community consultation group with Aboriginal people and relevant stakeholders to provide a forum to:

a) **consult with Aboriginal people on matters relating to the Project workforce, to maximise benefits for local employment, and to manage cumulative impacts on demand for local workers and overall employment opportunities**

b) **consult with Aboriginal people on the appropriate response if monitoring of ground water drawdown is shown to influence the culturally significant phreatophytic vegetation**

c) **consult with Aboriginal people on the status and acceptability of impacts to the giant sweet potato population bisected by the haul/access road and determine contingency plans if unacceptable impacts arise**

d) **consult with Aboriginal people on the final alignment of the haul/access road and the borrow pits**

e) **undertake ongoing stakeholder and Aboriginal people consultation on agreed post mining land rehabilitation and uses.**

Recommendation 19

Approvals and decisions for the Project should have conditions that require the iterations of Mine Closure Plan to include:

a) **alternative risk-based rehabilitation options, including progressive backfilling, that identify a range of closure scenarios and strategies for the integrated waste landform and the pit and provide justification that the preferred closure option minimises environmental risks**

b) **identification and management of knowledge gaps relating to closure-specific technical information; including environmental baseline data, waste characterisation, pit lake characterisation, and review of monitoring data; to inform sustainable mine closure**

c) **details of pre-closure research trials, investigations and modelling aimed at closing knowledge gaps to inform detailed rehabilitation design. These are to include, but not limited to, vegetation trials, final cover materials, capping design, surface runoff and groundwater studies particularly in respect of drawdown in the vicinity of the mine pit and final pit lake water quality.**

The Mine Closure Plan is to be peer reviewed by an appropriately qualified independent professional prior to submission to the relevant regulator.

Recommendation 20

Before approvals or decisions are given or made for the Project, the Proponent or Operator shall provide to the relevant regulator an updated Mine Closure Plan.The Mine Closure Plan must:

a) **provide details on the performance of progressive rehabilitation works and incorporation of progressive rehabilitation in mine planning activities**

b) **address all aspects of rehabilitation and mine closure, including stakeholder agreed post mining land use, rehabilitation objectives, completion criteria and rehabilitation monitoring (see recommendation 18)**

c) **include details of the pre-closure research trials and investigations that would inform, guide and support appropriate cover systems and rehabilitation of ecosystems for closure**

d) **include final landform designs that are consistent with surrounding topography of the area and consistent with current standards and best practice**

e) **include final IWL design that demonstrates assured surface runoff management post closure in respect of the placed dry stacked tailings**

f) **include refined modelling of the water balance and water quality of the pit lake**

g) **include a commitment to ensure all landforms, including the pit lake and the levee are safe and stable**

h) **include an adaptive management approach in response to progressive rehabilitation performance monitoring results to ensure rehabilitation is successful**

i) **establish ongoing monitoring and maintenance of the site post mining in accordance with an approved monitoring and maintenance program until such time as the relevant regulator directs.**

Approvals and decisions in relation to the Project shall include conditions that require reporting to the relevant regulator on progressive rehabilitation works and performance.

1 Introduction

1.1 Purpose of this report

TNG Limited (the Proponent), proposes to develop and operate the Mount Peake Project (the Project), a polymetallic mine, located approximately 235 km north-northwest of Alice Springs in the Northern Territory (NT).

The Project has been assessed by the Northern Territory Environment Protection Authority (NT EPA) at the level of Environmental Impact Statement (EIS) under the *Environmental Assessment Act* (EA Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in accordance with an accredited assessment process.

The NT EPA has prepared this Assessment Report (this Report) in accordance with section 7(2)(g) of the EA Act and clause 14(3) of the Environmental Assessment Administrative Procedures (EAAP). The purpose of this Report is to ensure that matters affecting the environment to a significant extent are fully examined and reported. This Report is provided to the Northern Territory Minister for Environment and Natural Resources (the Minister), and the Minister for Primary Industry and Resources (the responsible Minister) to be considered in decisions made by the Territory Government. This Report it is not intended to provide an environmental approval although it will guide the decision for a mining authorisation (by the responsible Minister) and guide the Proponent in the execution of the Project. This report should inform regulatory decisions regarding conditions for construction, operation and closure; during the approval and ongoing authorisation decisions for the life of the Project.

This report is also provided to the Australian Government Minister to assist with the making of a decision for an approval under the EPBC Act (by the relevant delegate).

1.2 Scope of the assessment

The matters relating to the environment the NT EPA considered necessary to be dealt with in the EIS for the Project were identified in the Terms of Reference (NT EPA, 2015) in accordance with clause 8(3) to (6) of the Environmental Assessment Administrative Procedures.

The referred Project activities assessed within this Report include development and operation of the proposed Mount Peake mine, associated infrastructure and transport of ore concentrate to a load-out facility next to the Adelaide to Darwin railway for transport to Darwin.

The Draft EIS for the Project underwent a six-week public exhibition period between 13 February 2016 and 25 March 2016. A total of 17 submissions were received. These included submissions from 13 NTG advisory agencies; the Australian Department of Environment; and two non-government organisations representing the interests of the environment and Aboriginal people and affected communities.

The Proponent separately proposes to refine the ore concentrate into the target products of vanadium pentoxide (V_2O_5), titanium dioxide (TiO_2) pigment, and pig iron (Fe_2O_3) for export, finding uses in high strength steel (vanadium pentoxide), high technology and the medical industry (titanium dioxide) and steel manufacturing (pig iron). Refining is proposed at a facility to be constructed in Darwin. The Darwin refinery is not assessed in this Report and is the subject of a separate EIS.

1.3 Approval and regulatory framework

The Project will require approval and regulation by the Northern Territory and Australian Governments. The framework for approval and regulation of the Project is provided in Chapter 4 of the Draft EIS and is summarised below, with an emphasis on the obligations and requirements of the Northern Territory Government (NTG).

The key legislative instruments for the Project are:

- an authorisation under the *Mining Management Act* (MM Act)
- an approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The NT EPA provides this Report to the Minister. The Minister is required to provide a copy of the Report to the responsible Minister (the Minister for Primary Industry and Resources). The responsible Minister, taking into consideration this Report, will then make a decision as to whether or not the Project should be authorised under the *Mining Management Act* and if so, the conditions that may be applied.

Section 8A(2) of the EA Act requires the responsible Minister to give the NT EPA notice of the decision as soon as practicable, but within seven days, after making the decision. Alternatively, if the decision by the responsible Minister is contrary to this Report, the responsible Minister must comply with reporting obligations to the NT EPA and the Legislative Assembly in accordance with section 8A(3) of the EA Act.

The making of this Report and providing it to the Minister and to the Australian Government Minister marks the completion of the examination of the EIS by the NT EPA. The EIS and supporting documents can be viewed on the Project page on the NT EPA website at: https://ntepa.nt.gov.au/environmental-assessments/register/mount-peake-project

2 The Project

2.1 Proponent

The Proponent is TNG Limited, an Australian resources company listed with the Australian Securities Exchange (ASX). Its primary focus is development of its Mount Peake Vanadium-Titanium-Iron Project.

TNG has been actively exploring in the Mount Peake area since 2006, and discovered mineralisation in 2007/8. TNG considers the Mount Peake Project to be a world class project with the refined products from the proposed mining comprising: vanadium pentoxide (8% global demand), titanium dioxide (2% global demand) and pig iron (0.05% global production) (TNG, 2015).

The Proponent states that it has not been subject to any proceedings under Australian Government, State or Territory law with respect to the protection of the environment or the conservation and sustainable use of natural resources.

2.2 Project description

The Project is located 235 km north north-west of Alice Springs and 50 km west of the Stuart Highway in the Northern Territory (Figure 1).The climate of the region is arid to semi-arid with a mean annual rainfall of about 320 mm which falls predominantly between November and March. The closest settlements are the homestead of Anningie Station (~30 km south-west of the mine site) and the Aboriginal community of Wilora, located 20 km to the north of the haul/access road and 50 km east of the mine site. Ti

Tree is the closest town, 52 km from the mine site. Access to the Project site would be from a proposed access/haulage road of approximately 100 km.

The current land use at the Project location and surrounding areas is cattle grazing. The majority of the Project is situated on the Stirling Perpetual Pastoral Lease (PPL 1103), including all mining components and most of the proposed access road. Parts of the proposed access road (~18 km) pass through Anningie Perpetual Pastoral Lease (PPL 1057). A small section (< 2 km) of the proposed access road passes through Crown Land (NT Por 4346) adjacent to the Stuart Highway. The footprint of the Project is defined by several Mineral Lease Applications (Appendix 2), as outlined below for the individual components.

The Project footprint comprises the proposed mine site, borefield, accommodation village and ore concentrate load-out facility, linked by proposed access roads and service corridors (Figure 1). The maximum area of disturbance associated with the Project would be approximately 735 ha, comprising the Project components summarised in Table 1 (Additional Information).

Table 1. Key components and disturbance area for Mount Peake Project. Source: Additional Information.

Feature	Description	Area (ha)
Open cut mine pit	2000 m length, 600 m width, 125 m depth providing up to 9.6 Mtpa of ore and waste.	77
Integrated Waste Landform	Co-disposal of waste rock and dry-stacked tailings material; landform to have 40 m final height, with 10 m batter height and 65 Mt capacity.	237
Long-term ore stockpiles	4 x long term ore stockpiles 4 Mt capacity.	47
Mine facilities	Including ROM pad, process plant, mine offices and workshops, fuel storage facility, water treatment plant, power station, magazines, weighbridge and site roads.	71
Accommodation village	To accommodate 130 personnel expanding to 175 personnel in year 5, including sewage treatment plant.	6
Access/Haul Road	100 km haulage route between mine site and Adnera load-out facility, including access from Stuart Highway for small vehicles and supplies, underpass under the Stuart Highway for haul traffic, and two 5 m traffic lanes with two 0.5 m shoulders.	234
Borefield, delivery line and access road	Borefield infrastructure including delivery pipe-line, access road and power line.	50
Road base borrow areas	Borrow pits to be established to provide road base for the access/haul road outlined above.	3
Turkey's nest	6 m x 6 m turkey's nest and standpipe for storage of dust suppression water.	-
Adnera load-out facility	Rail siding, site-office and hardstand for magnetite ore concentrate storage and loading adjacent to the Alice Springs to Darwin railway.	10
Total		**735**

Chapter 2 of the Draft EIS presents a detailed description of the Project although substantial changes were made over the course of the environmental assessment.

Amended Project elements were presented in the Additional Information and these are summarised in Table 2 and discussed further in section 4 of this Report.

Table 2. Changes to the Mount Peake Project proposed in the Additional Information.

	Draft EIS	**Additional information**
Tailing Storage Facility (TSF)	TSF with capacity up to 63.41 Mt Footprint 475 ha	TSF removed from the process. Tailings material will be filtered and dry-stacked Footprint integrated within the **Integrated Waste Landform (IWL)**
Waste Rock Dump (WRD)	WRD with capacity up to 70 Mt Footprint 90 ha	WRD has now been reconfigured as an **IWL** which will allow for the joint disposal of waste rock and dry-stack tailings Footprint 237 ha
Water usage	2625 MLpa 12 bores	1750 MLpa 9 bores
Disturbance footprint	1060 ha	735 ha

2.2.1 Construction and operation

The Project includes mining of a polymetallic (vanadium, titanium, iron) ore body and processing to produce a magnetite concentrate. Expected mine life is 19 years, including two years construction and two years closure and rehabilitation. Mining is expected to be in full production from years five to fifteen and would operate 24 hours a day in two 12-hour shifts. It is expected that the Project will mine approximately 9.4 Million tonnes per year (Mtpa) of ore and waste yielding 1.8 Mtpa of magnetite concentrate. Initial mining would focus on the southern portion of the mine area where overburden is most shallow, and the highest grades exist. Mining would progress in five intermediate but overlapping stages within the pit shell, developed to minimise waste movement and haulage distances. At the end of mining, the pit would be 2000 m long, 600 m wide and 125 m deep.

Once mined, ore would be processed on-site by crushing, grinding and magnetic separation to produce a magnetite concentrate that would be stockpiled on-site. Mine-site infrastructure associated with these Project activities include the Run of Mine (ROM) pad, processing plant, raw water dam, water treatment plant and power station (Figure 2). Processing would occur 24 hours a day, seven days a week.

2.2.2 Water supply

The proposed water source for the Project is a new borefield to be established in the Hanson River alluvial aquifer, approximately 20-30 km north-east of the mine site (Figure 1). When the mine is at full production, the water requirement would be around 1750 ML per annum (MLpa) for mining, processing, dust suppression and potable use.

Each of the nine bores would be on raised pads to provide flood protection. A service infrastructure corridor would connect the bores to the mine site; including above-ground water transfer pipelines, overhead powerlines and minor roads. This corridor would be about 10 m wide, upgraded from existing tracks. The borefield and corridor would disturb an estimated 50 ha.

At the water treatment plant within the mine site, water would be treated using multi-media filters, reverse osmosis and sodium hypochlorite or similar. Water for the accommodation village would be supplied by a pipeline located within the corridor of the access road.

2.2.3 Power supply

The power demand for the Project is estimated at 24 MW at full production, with a total of 2500 Gigawatt Hours of electricity to be produced over the life of the Project. Power would be supplied by gas fired generating sets. Emergency backup and construction power would be provided by diesel generators. Power would be distributed by overhead powerlines throughout the mine site and to the borefield and accommodation village.

Gas would be provided from the Amadeus Gas Pipeline where the pipeline crosses the access road, just west of the Stuart Highway. Gas would be delivered to the mine site by tankers and stored in intermodal containers.

The Proponent is evaluating the potential use of solar photovoltaics and battery storage in conjunction with gas power generation, however, a decision to proceed has not yet been made.

2.2.4 Workforce

The construction workforce for the Project is estimated to peak at 225 and the operations workforce at 170. It is expected that almost all of the workforce would be fly-in fly-out to Ti Tree. All workers would be transported to and from the site by bus from Ti Tree for their rostered work periods.

Project staff would be housed in a purpose built accommodation village at a site approximately ten kilometres east of the mine site (Figure 1).

2.2.5 Access road transport

Ore concentrate would be hauled from the mine site to the Adnera Loadout Facility by a fleet of five triple side tipper road trains, each of 140 tonne capacity. Transport operations would occur 24 hours a day, with approximately four road train movements per hour in either direction. Loads would be covered to prevent dust generation.

A two-lane gravel access/haul road would be constructed to connect the mine site, Stuart Highway, and Adnera Loadout Facility. The road would include an underpass of the Stuart Highway to prevent road trains crossing the highway. At-grade connections from the Stuart Highway to the access road would be provided for vehicles accessing the mine site and Adnera load-out facility. Construction of the underpass would involve temporary diversion of the Stuart Highway.

The access road would incorporate floodways that cross the Hanson River, Murray Creek and other minor watercourses. Construction of the road would require the establishment of borrow pits. The location and footprint of these is yet to be determined as they rely on road alignment.

The access road would also be used to transport workers by bus to and from the accommodation village and Ti Tree airport via the Stuart Highway for their rostered work periods. Buses would also transport workers on the access road to and from the mine site at the beginning and end of shifts.

All reagents and consumables to be used at the Project would be transported via the access road by truck from the Stuart Highway in up to four deliveries per day.

At the Adnera Loadout Facility, ore concentrate would be stockpiled for subsequent loading and transport by rail on the Adelaide to Darwin railway line. A 1.8 km rail siding would be constructed for a train of 1.5 km length, with hardstand and stockpiles for up to

150 000 tonnes of ore concentrate. Ancillary facilities constructed at Adnera would include a site office and ablutions, water bore, diesel generator and fuel storage.

2.2.6 Decommissioning and closure

At the end of mining, the mine pit (77 ha) and the IWL (237 ha) would remain as permanent landscape features. A saline pit lake would remain at the bottom of the mine void. The Proponent proposes to block off vehicle access and fence the pit for safety and to deter wildlife usage. Abandonment bunding would be established around the pit to restrict accessibility within the zone of instability associated with the pit.

Progressive rehabilitation is proposed for the IWL. Other mine site and project related infrastructure and equipment would be removed and the sites rehabilitated at the end of mining. Some Project components such as the haulage road and rail siding infrastructure may remain after mine closure, if agreement is reached with the landowner and relevant government agencies.

Rehabilitation of the IWL would involve a combination of deep ripping of the surfaces on contour, spreading of previously cleared topsoil at a thickness of up to 20 cm (or at a depth capable of achieving rehabilitation requirements) and reseeding at a time that would potentially benefit from rainfall events. The completed outside faces of the IWL would be rehabilitated progressively. Drainage structures would be constructed to collect and direct run-off (Additional Information).

The intent of mine closure is to return the land, as close as is reasonably practical, to its pre-disturbance condition, with safe and stable landforms that support vegetation growth and enable potential future uses of the site. The proposed final land use is cattle grazing. A Conceptual Mine Closure Plan was included in the Draft EIS (Appendix M), and would be continually revised and updated as part of the Mining Management Plan (MMP) during the planning, construction and operation of the Project.

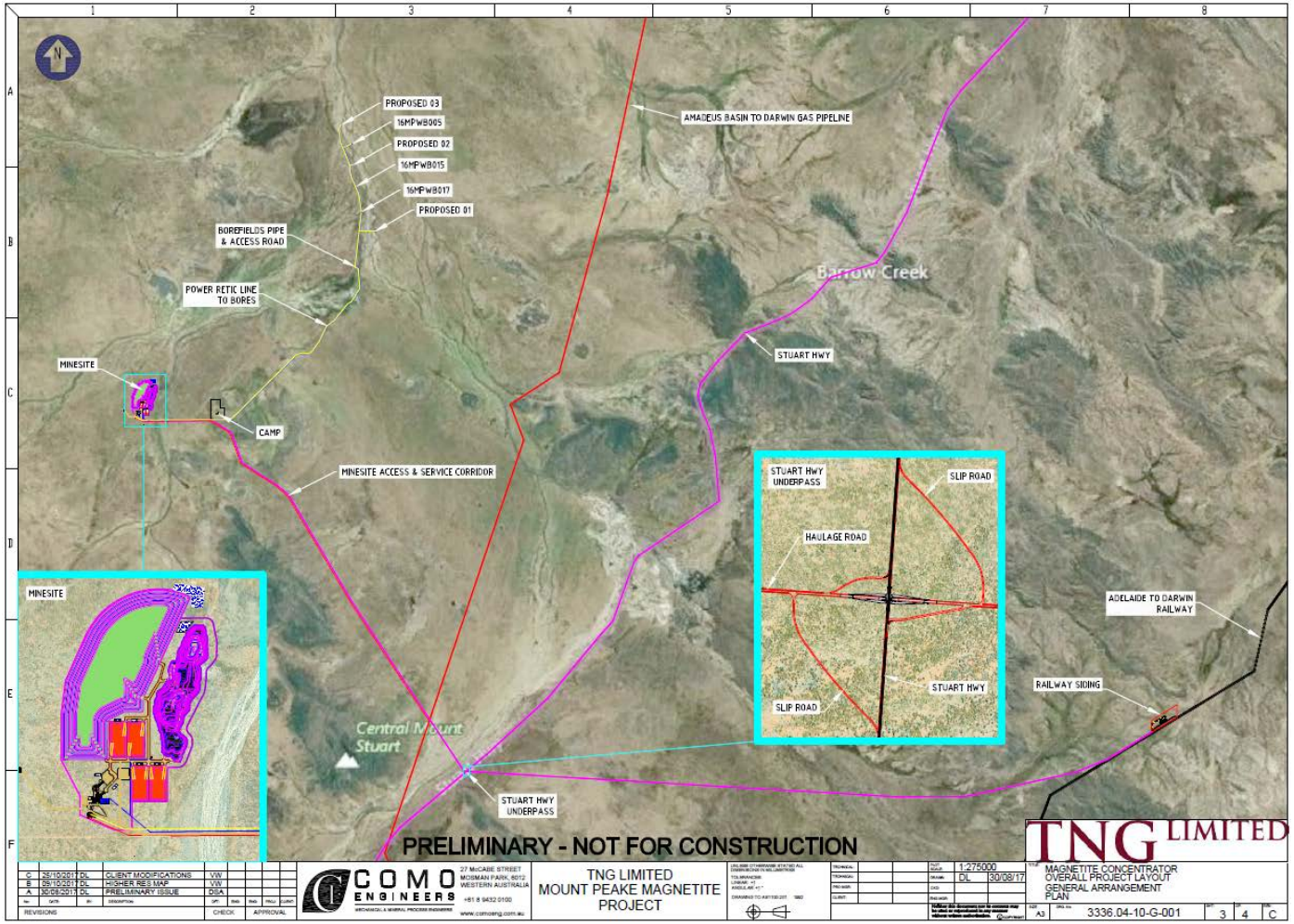

Figure 1. Mount Peake Project schematic layout including the mine site, the Stuart Highway Underpass and the Adnera Railway siding facilities. Source: Additional information.

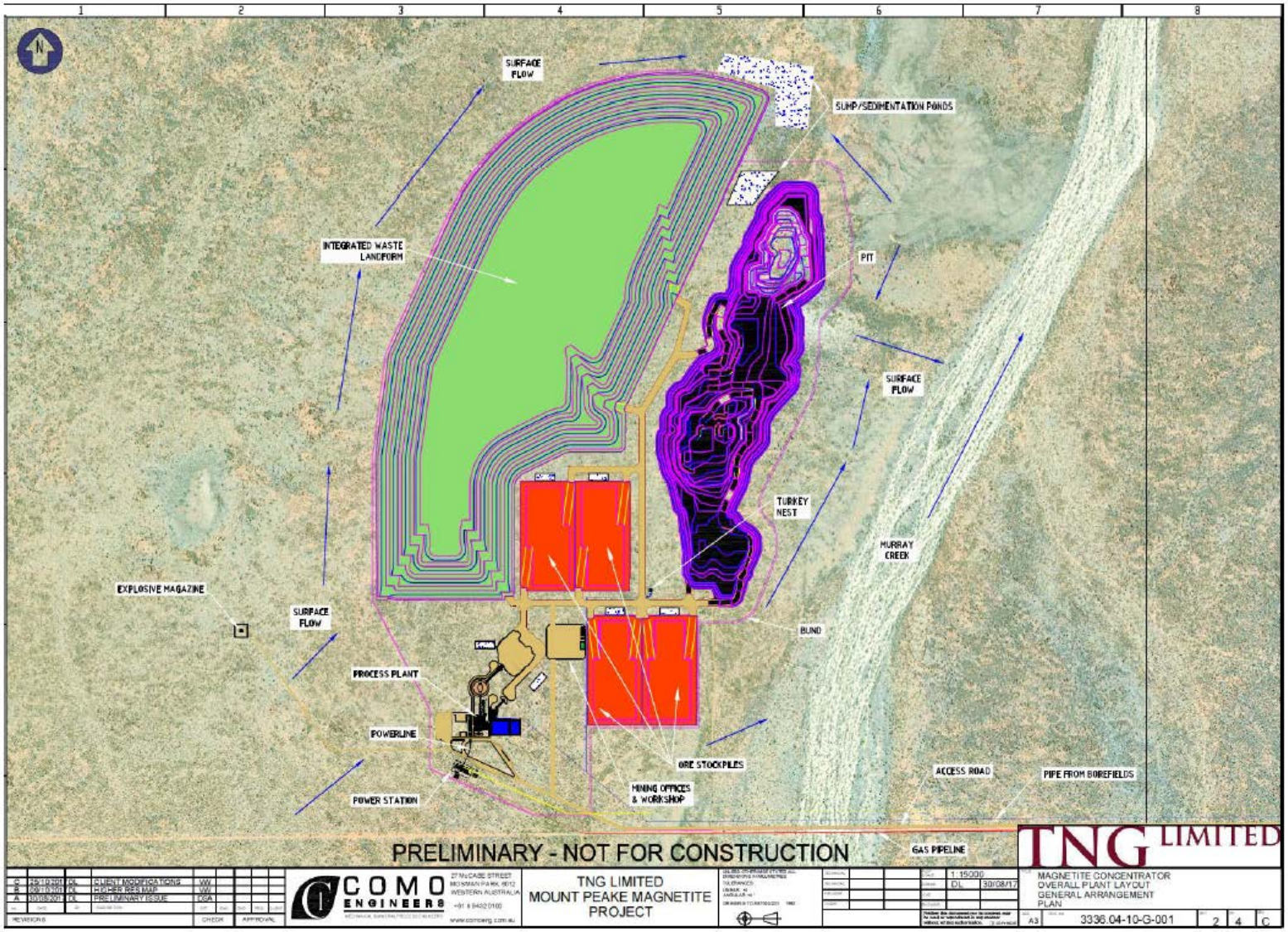

Figure 2. Schematic representation of the mine site Mount Peake Project. Source: Additional Information.

3 Key environmental factors

Having regard to the Notice of Intent, the Draft EIS and Supplement, further additional information, and comments from the public and advisory bodies during the EIS review, the NT EPA identified the following key environmental factors that may be impacted by the Project:

- Hydrological processes
- Inland water environmental quality
- Terrestrial flora and fauna
- Social, economic and cultural surroundings.

The NT EPA has considered the importance of other environmental factors during the course of its assessment. Those factors that were not identified as key environmental factors are summarised at Appendix 1 of this Report.

The key environmental factors are discussed in sections 4.1 to 4.4 of this Report. The description of each factor shows why it is relevant and how it would be affected by the Project. The assessment of the factors is where the NT EPA decides whether or not the Project has met the NT EPA's environmental objective for each factor.

The NT EPA identified the following potential environmental impacts and risks that contributed to the decision to assess the Project at the level of an EIS:

- potential acidic and/or metalliferous drainage (AMD) may occur from the waste rock and tailings storage and other mine infrastructure to contaminate water resources
- surface water quality may be impacted by spills to water surface and runoff with hazardous substances or elevated sediment content
- contamination of groundwater may occur through leaks from storages or pipelines and spills during handling of contaminants, chemicals and toxicants
- water source may not be sufficient to supply the needs of the Project or it will not be sufficient without causing environmental or social impacts
- biodiversity values, conservation status, diversity, geographic distribution or productivity of local native flora or fauna species or ecosystems may be degraded by Project actions
- the Project may result in significant impacts to species or communities listed as threatened under the EPBC Act and/or *Territory Parks and Wildlife Conservation Act* (TPWC Act)
- construction of the Project has the potential to damage areas or degrade values of sites or items which have historic, cultural heritage significance and/or Aboriginal heritage significance
- operations associated with the life of the Project and increased human activities in the Project area have the potential to change the social demographic, culture and economies.

Information requirements based upon identified potential impacts and risks were described in the Terms of Reference for the Project (NT EPA, 2015). The Proponent submitted the EIS to address the NT EPA's requirements.

4 Environmental Impact Assessment

The purpose of this section is to evaluate the Project and to present the view of the NT EPA on the environmental acceptability of the Project. The environmental acceptability of this Project is based on an analysis of:

- the proposed action (particularly which components or activities are likely to significantly impact the environment)
- the existing environment (particularly environmental values and sensitivities)
- the potential environmental impacts and risks of the Project and the evaluation of the significance of those impacts and risks
- proposed avoidance or minimisation/mitigation measures to reduce potential impacts and risks to acceptable levels and to meet NT EPA objectives.

Conclusions drawn and recommendations made in this Report are derived from consultation on the final EIS with advisory bodies, the NT EPA's examination of the EIS (henceforth Draft EIS), the Supplement (henceforth Supplement) to the EIS and the additional information (henceforth Additional Information) supplied by the Proponent at the request of the NT EPA, and responses from the Proponent to comments. Recommendations are made in this Report to add, emphasise or clarify any commitments made by the Proponent, where the proposed avoidance or minimisation/mitigation measures are considered insufficient or where a safeguard is deemed particularly important.

In this Report, the recommendations (in **bold**) are preceded by text that identifies issues and undertakings associated with the Project. For this reason, the recommendations should not be considered or read in isolation.

The NT EPA acknowledges that detailed design and operational plans for the Project have not been finalised. This report will inform the granting and the decision of conditions for the mining authorisation under the MM Act.

It is likely that there will be minor and insubstantial changes to the Project following the conclusion of the EIA process. It will be necessary for approval mechanisms to accommodate subsequent changes to the environmental safeguards described in the final EIS, Additional Information and recommendations in this Report.

Provided the Proponent is able to demonstrate that changes are unlikely to significantly increase potential impacts on the environment, an adequate level of environmental protection could be achieved by modifying the conditions attached to relevant statutory approvals governing the Project. These could include application of an agreed adaptive management framework. Otherwise, further environmental assessment may be required.

Recommendation 1

The Proponent or Operator shall ensure that the Mount Peake Project is implemented in accordance with all environmental commitments and safeguards:

- **identified in the final Environmental Impact Statement for the Mount Peake Project**
- **recommended in this Assessment Report 85.**

The Northern Territory Environment Protection Authority considers that all safeguards and mitigation measures outlined in the Environmental Impact Statement are binding commitments made by the Proponent.

Recommendation 2

The Proponent or Operator shall provide written notice to the Northern Territory Environment Protection Authority and the responsible Minister if it alters the Mount Peake Project and/or commitments, safeguards or mitigation measures in the Environmental Impact Statement in such a manner that the environmental significance of the action may change, in accordance with clause 14A of the Environmental Assessment Administrative Procedures.

The remainder of this section of this Report discusses the key environmental factors and potential impacts and risks to those factors based on likely significance, and the Proponent's investigations and studies and/or commitments to identify, avoid, mitigate, monitor and manage the potentially significant environmental impacts and risks. For each key environmental factor, the NT EPA assesses whether or not the proposal meets its environmental objective for that factor.

4.1 Hydrological processes

4.1.1 Environmental objective

Maintain the hydrological regimes of groundwater and surface water so that environmental values are protected.

4.1.2 Groundwater hydrology

4.1.2.1 Environmental values

Groundwater resources in the Project area are not well studied but are generally characterised as comprising intact aquifers with variable water quality and suitability for consumptive use for pastoralism or agriculture. Regional mapping indicates aquifers associated with fractured and weathered rocks. Aquifers also occur within the river sands and gravels that formed the channel systems within relict drainage features. Two of these are relevant to the Project: the Ti Tree Basin and the Hanson River palaeovalley.

The Ti Tree Basin is a significant groundwater resource for the region, occurring within the Ti Tree Water Control District and for the most part to the south of the proposed mine. Groundwater within the basin generally flows from south to north, with discharge presumed to occur towards the Hanson River and Stirling Swamp (50 km south east of the mine site). Advice from the Department of Environment and Natural Resources (DENR) suggests other discharge mechanisms must be occurring, with discharge through transpiration of deep rooted trees a likely process. The ecological values of Stirling Swamp are described in section 4.1.3.1. The Ti Tree Basin supports significant horticultural use and groundwater extraction is managed through the Ti Tree Water Allocation Plan (DNRETAS, 2009). Other consumptive use of groundwater includes community and domestic supply.

Recent investigations in the Ti Tree Basin commissioned by DENR indicate mountain front recharge (infiltration of runoff near base of ranges) is the main source of groundwater recharge. In the Project area, surface-groundwater linkage occurs through flood outs on the floodplains that separate Bloodwood, Murray Creeks and Hanson River. These are important additional sources of groundwater recharge. Advice from DENR suggests that infiltration through ephemeral river channels is likely to be significant but not the major source. Much of the groundwater recharge is lost through use by vegetation.

The Hanson River palaeovalley is less well understood, with investigatory mapping and drilling occurring as part of the Project. The palaeovalley is 2-10 km wide and continues from the northern discharge of the Ti Tree Basin, passing through Stirling Swamp and

connecting with the existing Hanson River channel. The channel then passes through the Project area before continuing north for approximately 200 km. Consumptive use is currently limited to stock bores. Project water is proposed to be extracted from this aquifer through the development of a borefield, with groundwater levels presently at a depth of around 10 metres below surface (mbs).

Drilling at the mine site and surrounds indicate a basement of hard rock that is largely unfractured, offering low volumes of groundwater at depths of around 20 to 22 mbs.

In-situ values supported by groundwater hydrological processes in the Project area and surrounds include:

- riparian vegetation associated with shallow groundwater
- facultative phreatophyte vegetation associated with groundwater
- groundwater dependent ecosystems (GDEs): Stirling Swamp located 50 km east from the mine site and a Site of Conservation Significance
- stygofauna potentially located in the interstitial spaces within the aquifer.

Several tree species in the Project area are facultative phreatophytes, meaning that they partially rely on subsurface groundwater for their persistence. These trees may access groundwater down to a level of about twenty metres below surface. It is likely that they are not fully dependent on groundwater, but rely on that source of water during periods of drought (Supplement, Appendix K; Additional Information, Appendix 4). These species are not considered significant, except when they occur in riparian vegetation.

4.1.2.2 Potential impacts

Construction and operation of the Project has the potential to result in the following direct impacts on groundwater hydrological processes:

- drawdown in aquifers resulting from groundwater abstraction at both the borefield and mine site
- removal of the ore body aquifer and subsequent permanent drawdown of the groundwater at the mine site pit
- altered flow of groundwater – spatially, temporally and in quantity.

Construction and operation of the Project has the potential to result in the following indirect impacts to in-situ and extractive values supported by groundwater hydrological processes:

- reduced groundwater availability for existing and future consumptive uses (stock, community and domestic supply)
- changes to groundwater availability (through reduced groundwater levels or altered frequency or timing of water table fluctuations) for riparian and phreatophytic vegetation, with associated decline in vegetation condition or mortality
- reduction in the quality of habitat and values of GDEs including stygofauna
- potential impacts to trees and associated places of cultural significance that are groundwater dependent.

4.1.2.3 NT EPA assessment

Borefield groundwater abstraction

The Proponent requires water for construction activities, mine operation, dust suppression and potable supplies for the workforce.

Water for the Project is planned to be sourced from a borefield to be constructed 38 km north east of the proposed mine site, targeting the Hanson River palaeovalley aquifer. Nine production bores are proposed. Proposed water extraction from the borefield is 1.22 GL/yr (years 1-4 of mining), and 1.75 GL/yr (years 5-17 of mining).

The Proponent conducted a drilling and testing program between 2015-16 to assess the potential for groundwater supply from the Hanson River palaeovalley. Seventeen monitoring and production bores were drilled at targeted locations over a distance of approximately 50 km along the Hanson River (Figure 3).The drilling program was limited to the western half of the palaeovalley due to limited access to the east.

The Proponent has assessed the potential impacts to groundwater hydrology by calibrating the model using steady-state and then undertook predictive simulations using transient mode, as recommended by the Australian Groundwater Modelling Guidelines (Barnett, et al., 2012). The model presented a period of 100 years, including two stages of borefield operation (years 1-4, and 5-17). The model also presented post-cessation of mining, with no borefield abstraction for a period of 83 years to predict groundwater level recovery in the palaeovalley.

The Proponent acknowledges that the model is a Class 1 (low confidence model) but considers that the modelled results are conservative, with recharge inputs low and representing only a small percentage of annual rainfall. Recharge in arid areas is however episodic, occurring via indirect pathways such as stream flow losses rather than direct infiltration across the whole domain modelled. Calculated recharge inputs used in the model are annual representations of more significant but infrequent recharge events. The Proponent acknowledges that the infrequent nature of flood events is problematic to account for in modelling and favourably asserts that this could result in a sudden recovery of groundwater levels that have declined from pumping. A less favourable implication is that natural decline of groundwater levels between recharge events may be larger than anticipated through the model. This in turn has implications for the need for ongoing monitoring, and the adaptive management arrangements necessary to adjust water extraction in light of any adverse outcomes.

The modelled maximum drawdown at the bore field is predicted to reduce with lower water extraction following the Project change from ‘wet’ tailings management to the ‘dry stacking’ method. At the borefield a maximum groundwater drawdown of up to 9 m at year 17 is predicted. The modelled drawdown of the aquifer is predicted to decrease significantly at distance from the borefield with the 1 m drawdown contour extending to a maximum distance of around 5.7 km to the south of the borefield and 3.7 km to the north, at the end of 17 years. At 100 years, the modelled groundwater levels are predicted to recover in the area of the borefield, with maximum drawdown reducing to around 3 m. The spatial extent of drawdown is predicted to increase with the 1 m drawdown contour reaching 16 km from the borefield, as groundwater from storage drains to the recovering borefield.

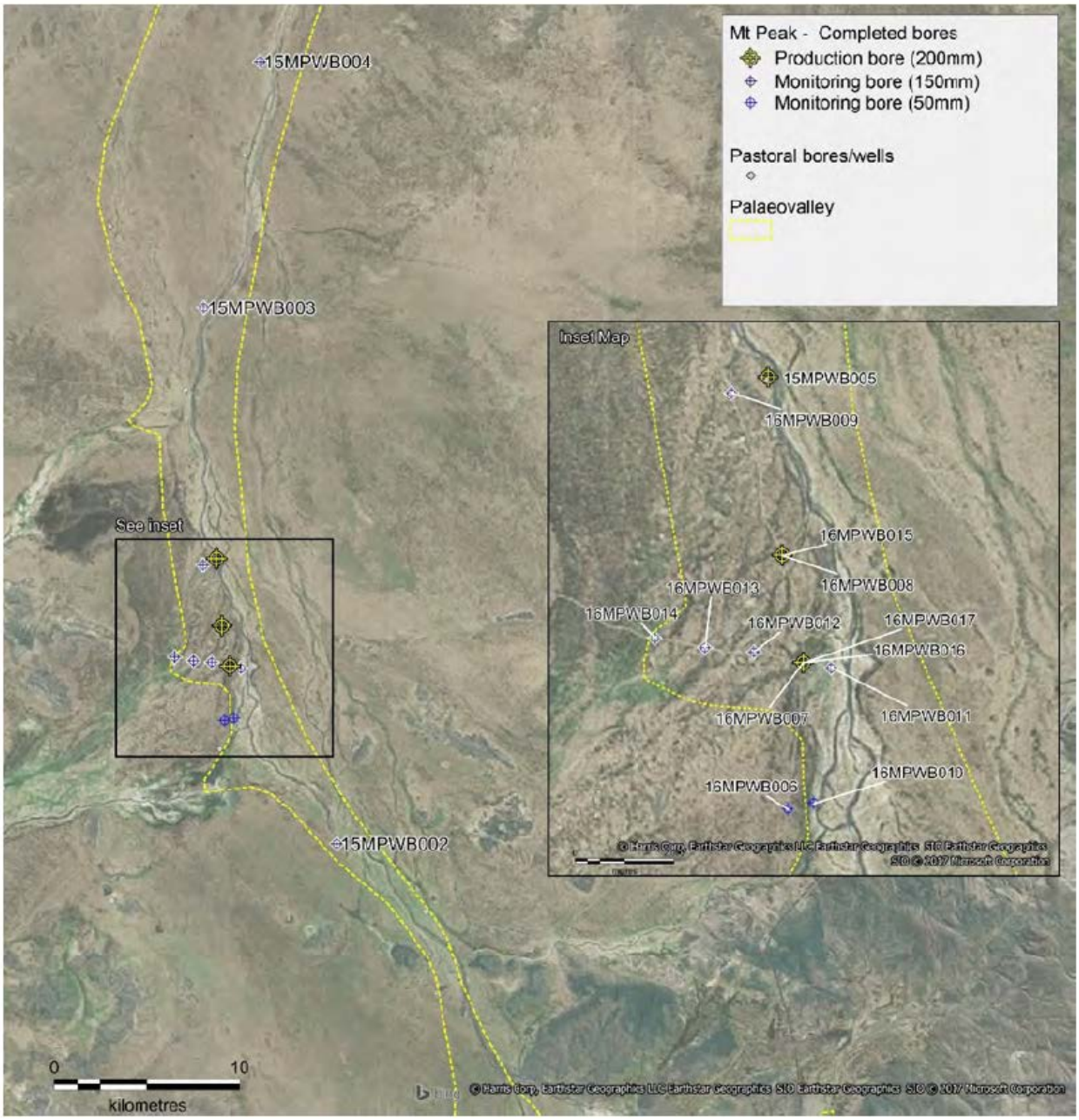

Figure 3. Proposed borefield locations for the Mount Peake Project. Source: Supplement to the Draft EIS.

The Proponent has acknowledged the uncertainty around the predicted groundwater drawdown from the abstraction and through the Water Management Plan and in commitments made for the Project (Additional Information, Appendix 10) proposes to undertake:

- monitoring of groundwater levels
- further development of the numerical model to improve confidence levels, following additional drilling to complete the borefield
- implementation of mitigation options including modification of the pumping regime if significant impacts associated with lowering of the groundwater table are identified

- preparation of a Borefield Management Plan
- baseline assessment of potentially impacted stock bores.

A borefield monitoring plan (water level and quality) comprising locations between pumping bores and at the extents (especially to the north and south) of the borefield was recommended (Additional Information, Appendix 3) to further assess baseline groundwater conditions and to monitor aquifer performance and to feed back into modelling data. This recommendation was not specifically included in the Proponent's commitments (Additional Information, Appendix 10).

The NT EPA is of the opinion that there is limited accuracy in the quantitative predictions from a preliminary class 1 model and notes continual model review based on real monitoring data is the preferred option to assess potential impacts. The NT EPA considers it would be appropriate to update the model frequently (e.g. at year 5, 10 and 15). This will improve its predictive capacity and enable a better assessment of potential environmental impacts of water abstraction and subsequent drawdown. It will require updating the groundwater monitoring program to inform the model, updating the groundwater model for the revised mining period (currently 17 years) and improving the estimation of recharge rates. As mine development proceeds, water requirements will increase over a number of years, providing opportunity for the acquired knowledge to be incorporated into future decision making using an adaptive management approach. The NT EPA recommends modelling updates are incorporated into a **Water Abstraction Management Plan,** separate from the Water Management Plan and integrated with the proposed Borefield Management Plan to ensure monitoring results and model outputs for all water abstraction (borefield and mine pit) inform adaptive management responses.

Adaptive management is an approach suitable for managing potential uncertain impacts to groundwater drawdown from mining projects in Australia. It includes developing management objectives, targets/triggers, actions to mitigate the risk, monitoring programs, evaluating monitoring data and changing the management regime when triggers are reached (Lee, 2014). While adaptive management is a structured response to the need for decision making in the face of uncertainty, the NT EPA observes that the baseline groundwater data for the Project provided by the Proponent is not robust and considers that adaptive management should not be viewed as an appropriate response or substitute for the provision of sufficient baseline information.

The NT EPA recommends mining authorisations to clearly define specific adaptive management responses for groundwater management for the Project. Such responses should be aimed at smaller, more frequent and reversible decisions in order to avoid larger irreversible impacts and are best approached as a structured approach to learning how the groundwater system and the values it supports respond to drawdown, in order to adapt, learn and better manage within acceptable limits of change. The NT EPA notes that robust adaptive management frameworks require appropriate legal and policy frameworks to support definitions, transparency, obligations and standards (Lee, 2014) that are beyond the scope of this project-based environmental assessment but considers that the Proponent can and should provide additional clarity to its adaptive management response and the actions it intends to take. Recommendations 3 to 6 are made to support adaptive management responses to the uncertainties presented by groundwater extraction for the Project.

Recommendation 3

Before approvals or decisions are given or made for the Project, the Proponent or Operator shall provide to the relevant regulator a Water Abstraction Management Plan for the Mount Peake Project. The Water Abstraction Management Plan must, at a minimum provide:

- **a) a full description of the groundwater model, assumptions and parameters including accurate and regular water level and quality data**
- **b) ongoing refinement and outputs of the Class 1 numerical model of aquifer drawdown prepared for the Project and presented in the EIS**
- **c) revised model outputs for estimated groundwater drawdown for the Projected life of the Project and recovery of groundwater levels post-closure (including modelling to 200 years)**
- **d) conducting an ongoing review of the model and assessing the validity of the assumptions underpinning the model**
- **e) model updates and monitoring data reviews at year 5, 10 and 15 at the borefield and mine site**
- **f) a framework identifying the location, timing, methods and parameters for the collection of further information on baseline groundwater levels, flow directions and flow rates to understand natural variance and hydrological conditions in the borefield and mine site**
- **g) additional details of all monitoring bores, including the lithology and aquifers intersected and the purpose of monitoring at each bore**
- **h) confirmation that all bores and bore meters will be constructed, operated and registered in accordance with the 'Minimum construction requirements for water bores in Australia' as published by the National Uniform Drillers Licensing Committee and the Department of Environment and Natural Resources 'Non-urban water metering code of practice for water extraction licences'**
- **i) measures to quantify and record the volume of water abstracted from the borefield and mine site to support minimum monthly reporting of pumping records from individual bores**
- **j) an independent peer review of the updated Water Abstraction Management Plan by a suitably qualified independent professional**

The Water Abstraction Management Plan should be developed and implemented to the satisfaction of the relevant regulator.

Mine site groundwater drawdown

The depth of mining at the pit will intersect the water table and require dewatering for the life of the mine. This is an unavoidable consequence of the Project. Dewatering is expected to yield only low volumes of water based on airlift testing of exploration drill-holes in 2014. With groundwater occurring at 20-22 mbs, less than 0.5 L/sec yield was sustained from five of the 11 holes tested. The remaining six failed to provide sustained flows.

At the end of mining, the modelled drawdown of the aquifer is predicted to reach a maximum of 80 m in the area immediately around the deepest part of mining and rapidly decrease with distance from the pit. The 1 m drawdown contour at the end of mining is modelled to occur to a maximum distance from the pit of around 1.3 km to the east and west. Drawdown of up to 10 m is expected at the western side of Murray Creek. Due to the relatively localised drawdown, no drawdown impacts at 17 years are expected within

the area of Mud Hut Swamp (8 km to the north of the mine pit). After 100 years the modelled 1 m drawdown contour increases in extent to around 4 km from the mine pit (Additional Information, Appendix 3).

The pit is proposed to remain after mining and standing water will persist. Predicted inflow to the pit is expected to be relatively low, reflective of the low permeability of the pit wall. The model predicts a pit lake approximately 10 m deep at its deepest part, would form in the mine void following cessation of mining. Levels in the pit lake would stabilise after about one year, with inflow then becoming equal to evaporation. The pit lake would become increasingly saline (Draft EIS).

While groundwater drawdown at the mine site presents a relatively small and discrete area of permanent impact in the region, current modelling indicates an increasing area of impact after mining cessation (to 200 years). The NT EPA considers it is not an acceptable closure outcome to allow a permanent landform that results in continued groundwater drawdown impacts and this is discussed further in section 5. Additional groundwater investigations, further modelling and definition of the confined nature of the localised pit aquifer should be provided as part of the Water Abstraction Management Plan outlined in recommendation 3 of this Report.

Groundwater drawdown – impacts to users

The modelled groundwater drawdown at year 17 is predicted to be up to 2 m at existing active stock bores closest to the borefield. This may lead to stock bore infrastructure being inadequate and the Proponent has committed to a make good agreement with the owners prior to developing the borefield. The NT EPA considers this an appropriate first step however adaptive management arrangements over the life of the Project should not be limited to existing stock bores and should appropriately respond to any limitations on future stock bore development imposed by drawdown at the borefield.

Groundwater drawdown at the pit is not predicted to impact on existing pastoral bores. Drawdown of <0.05 m is predicted at Mud Hut and Boko bores, 9 and11 km from the mine site respectively (Additional Information, Appendix 3).

Recommendation 4

The Water Abstraction Management Plan established in recommendation 3 must include assessment and management of any stock bores that could be impacted by the Project in agreement with the owners and/or operators of those bores. This is to include:

a) a program to monitor water levels at those bores to detect whether levels are within observed baseline conditions

b) measures to ensure identified groundwater user bores remain operational or provide make good arrangements if existing stock bores are impacted by aquifer drawdown

c) a mechanism by which the Proponent will redress any limitations on future stock bore use and development imposed by aquifer drawdown by the mine.

Groundwater drawdown – impacts to groundwater dependent ecosystems

Three mapped vegetation communities associated with ephemeral/episodic waterways and run-on areas of alluvial floodplains were assessed as potential GDEs, supporting facultative phreatophytic vegetation such as river red gum (*Eucalyptus camaldulensis*), ghost gum (*Corymbia aparrerinja*), desert bloodwood (*Corymbia opaca*) and bean tree (*Erythrina vespertilio*). Two of these communities: riparian woodland along watercourses

and drainage channels, and low corymbia woodland on loamy alluvial plains were mapped as occurring within the predicted drawdown contours of the borefield and mine pit (Supplement, Appendix K).

The Proponent assessed the impacts of groundwater drawdown to facultative phreatophytic vegetation by assuming that their roots reach depths of no greater than 20 mbs. On this basis the Proponent predicts (based on the numerical modelling of aquifer drawdown) that impacts on phreatophytic vegetation within the identified vegetation types are only anticipated in the vicinity of the borefield where groundwater drawdown exceeds 10 m (the existing water table being at approximately 10 mbs). Approximately 2200 individual trees could be impacted at the end of mining with impacts potentially occurring over approximately 39 km of the Hanson River (out of a length of 310 km) (Supplement, Appendix K; Additional Information, Appendix 4). These predictions however, remain uncertain. Revised predictions under the lower water consumption currently proposed and revised groundwater drawdown modelling have not been made. Aquifer drawdown may not occur as modelled and the response of phreatophytic vegetation is poorly understood.

The DENR has advised that the facultative phreatophytic trees may access groundwater down to a level of about 15 mbs, rather than the 20 m assumed by the Proponent. With current groundwater levels at the borefield at approximately 10 mbs, potential impacts may arise from groundwater drawdown of greater than 5 m, rather than the 10 m assumed by the Proponent.

Notwithstanding these uncertainties, DENR has advised that it is reasonably likely that many trees in the affected area would survive, although some thinning through death and/or reduced canopy size or vigour is likely. A monitoring program was requested and provided by the Proponent in the Additional Information. The NT EPA considers that the proposed monitoring program will adequately detect impacts to phreatophytic vegetation in the vicinity of the borefield. However the program needs to be integrated into a **Water Abstraction Management Plan** and trigger values for determining a management response developed to ensure that the pumping regime can be adjusted in response to adverse monitoring results. This is particularly important given the uncertainty of the groundwater drawdown predictions attached to the numerical modelling.

Comment on the Draft EIS identified that both individual trees and the vegetation assemblages containing phreatophytic vegetation in the Project area are culturally significant to Aboriginal people. The Central Land Council (CLC), representing Aboriginal people, expressed the view the death of local riverine vegetation was an unacceptable risk and that the Proponent should consider alternative options and mitigation measures. The Proponent has yet to report on engagement with Aboriginal people on the implications of potential tree dieback associated with groundwater drawdown. The NT EPA considers that engagement with Aboriginal people and incorporation of their views in future decisions on water abstraction should form a component of an adaptive management framework for water abstraction, particularly in light of the uncertainties associated with the numerical modelling, actual occurrence of facultative phreatophytic vegetation and their groundwater dependencies and their response to changes in water table levels. This approach would be consistent with the draft Western Davenport Water Allocation Plan which acknowledges that Aboriginal cultural values may be threatened by inadequate participation in water planning and governance and indicates engagement is a necessary management strategy. The Community Consultation Group as outlined in recommendation 18 would provide the forum to engage with Aboriginal people on the management of water abstraction and culturally important phreatophytic vegetation.

Although vegetation types likely to support facultative phreatophytic vegetation were mapped within the drawdown contours of the mine pit, potential impact to groundwater dependent vegetation at Murray Creek was assessed by the Proponent as unlikely because current groundwater levels are 22 mbs and beyond the reach of facultative

phreatophytes. The Proponent has nevertheless committed to monitoring standing water levels at a groundwater monitoring site east of the pit although no monitoring of phreatophytic vegetation condition is proposed. Given the uncertainties associated with the impact analysis and the significant cultural value of vegetation assemblages containing facultative phreatophytic vegetation, the NT EPA considers that a precautionary approach should be taken and the **Water Abstraction Management Plan** should provide for monitoring of vegetation condition in the vicinity of Murray Creek, east of the pit.

On the basis of the model predictions, the Proponent has assessed that water abstraction from the borefield is unlikely to impact groundwater levels at Stirling Swamp and outflow of the Ti Tree basin. No groundwater monitoring is proposed at Stirling Swamp or in areas between the swamp and the borefield although the Proponent notes that other sites may be added to the groundwater monitoring regime during development and/or operations (Additional Information). Given the low confidence attached to the groundwater model, the NT EPA considers that a precautionary approach should be taken and groundwater monitoring established to determine a baseline and detect changes to groundwater levels at Stirling Swamp. Trigger values and contingency actions for responding to adverse impacts should be developed as part of the **Water Abstraction Management Plan**.

Due to the relatively localised predicted groundwater drawdown at the mine pit, the Proponent predicts no impacts to Mud Hut Swamp (1 m drawdown contour at 100 years is approximately 4 km from the mine pit whereas Mud Hut Swamp is 8 km north of the mine pit). As a precautionary measure, the Proponent has committed to monitoring standing water levels and the condition of phreatophytic vegetation at a groundwater monitoring site at Mud Hut Swamp (Additional Information, Appendix 4).

Stygofauna have been found in unconfined aquifers elsewhere in central Australia and it is possible that they are present in the Project borefield. Although the Proponent has not surveyed for stygofauna, analysis was presented in the revised Biodiversity Management Plan (Additional Information, Appendix 4) indicating that the thickness of the alluvial units at the borefield and the predicted depth to water table at the end of mining would preclude impacts to any suitable confined habitats where stygofauna are likely to exhibit high levels of endemism. The Proponent's analysis indicates any impact to stygofauna in these unconsolidated river sands arising from aquifer drawdown at the borefield, will not have a significant impact on diversity at the population or species level. The NT EPA considers it is unlikely that stygofauna would be significantly impacted by borefield water abstraction.

Recommendation 5

The Water Abstraction Management Plan established in recommendation 3 must incorporate an adaptive management framework to guide the continuous refinement of management response to potential impacts to phreatophytic vegetation. This is to include:

a) **update analysis of potential impacts to phreatophytic vegetation based on the mapped vegetation units identified in the Supplement (Appendix K), revised numerical modelling of groundwater drawdown, and a more conservative threshold for potential impacts of groundwater drawdown in excess of 15 metres below surface (mbs)**

b) **a revised program for monitoring the condition of phreatophytic vegetation, consistent with that set out in the Additional Information, and with additional bore siting east of the pit along Murray Creek**

c) a revised program for monitoring groundwater levels (drawdown) consistent with that set out in the Additional Information, and with additional bore siting at Stirling Swamp

d) trigger values that will be used to initiate management responses to groundwater draw down and impacts to phreatophytic vegetation detected by the monitoring programs referred to in b) and c)

e) consultation and engagement with Aboriginal people in the development and determination of the trigger values referred to in d)

f) management response options in the event that trigger levels are exceeded including:

- **a reduced pumping regime at the borefield**
- **further water conservation measures at the mine, or**
- **provision of alternative/supplementary water supply to the mine**

g) an independent peer review of the proposed program for monitoring the condition of phreatophytic vegetation and groundwater trigger levels by a suitably qualified independent professional.

Sustainable water use

The Project is located in an arid region where groundwater resources are a shared resource and have high value. Further investigation and production bores need to be drilled to definitively establish water supply for the Project. This should be undertaken before commencement of major works for the Project. The NT EPA considers the Proponent is obligated to minimise groundwater abstraction to demonstrate best practice in water stewardship and responsible and sustainable water management. The International Council on Mining and Metals (ICMM) provides guidance with the aim to achieve a safe, fair and sustainable mining industry (ICMM, 2017). Water stewardship is one of the principles underpinning a best practice framework for sustainable development in the mining industry. The commitments under the ICMM water stewardship framework include:

- apply strong and transparent corporate water governance
- manage water at operations effectively
- collaborate to achieve responsible and sustainable water use.

During the course of the assessment the Proponent was requested to examine water conservation measures. In response, the Proponent altered the intended tailings management from pumping a wet tailings slurry to a tailings storage facility (TSF), to depositing filtered non-magnetic tailings material in an IWL containing both tailings and waste rock. The ‘dry stacking’ tailing management process will result in 70% recovery of water that would otherwise have been pumped as a tailings slurry to a TSF (now not required). The change in tailings management has resulted in considerably reduced water requirements for the Project (Table 3). Project water requirements were reduced by 22% for Stage 1 and 34% for Stage 2.

Table 3: Revised water requirements for TNG Mount Peake Project. Source: Additional Information.

Water requirement	Years 1-4 (GL/yr)	Years 5-17 (GL/yr)
Draft EIS	1.56	2.63
Revised in Additional Information	1.22	1.75

The change in tailing management to 'dry stacking' by the Proponent has resulted in a significant reduction in water required for the Project. The NT EPA recommends sustainable use of groundwater by the Proponent which includes minimising water consumption over the whole of life of the mine, applying corporate water governance and providing open and transparent reporting of the use of that groundwater resource. These should be outlined in the Water Management Plan, separate to the **Water Abstraction Management Plan** discussed above.

The numerical model indicates that most groundwater extracted could be sourced from existing storage within the borefield aquifer. The NT EPA notes however, that the Hanson palaeovalley system subject to water abstraction for the Project is not recognised in the draft Western Davenport Water Allocation Plan and consequently that the aquifer storage, sustainable yield and consumptive pool for the Southern Ranges Management Zone identified in the draft Plan, does not recognise this resource. While the relatively high salinity of the groundwater is unlikely to support other uses such as horticulture or agriculture the draft Plan acknowledges that mining within the district could affect water availability. An appropriate management strategy for the sustainable yield in the plan is to be reviewed and informed by decisions regarding future mine operations.

Recommendation 6

Mining approvals in relation to groundwater abstraction should include conditions that require the Proponent or Operator to:

- **a) allocate clear responsibilities and accountabilities for water use and management**
- **b) provide, in the Water Management Plan, regular updates of the projected water balance for the Project, including detailed estimates for the various phases of the Project and specifying the source and quantity of the water to be used**
- **c) demonstrate how water considerations are integrated in Project planning including final Project design and technologies**
- **d) report on continual improvement initiatives in water use and efficiencies including the provision of relevant water use targets**
- **e) provide details on how water will be effectively managed during Project operations, including minimising water consumption, maximising water reuse and preventing waste water including unnecessary or excessive flow or flood of water**
- **f) abstract water from bores only when equipped with operating flow meters**
- **g) record the volume of water abstracted from the borefield and the mine site as reported in the Water Abstraction Management Plan (recommendation 3)**
- **h) provide an annual Water Management Report to stakeholders. This is to include water use performance, performance in relation to triggers and any change to triggers.**

Public disclosure of the Water Management Plan and annual Water Management Report shall be provided on the websites of (as applicable), the Proponent or Operator and relevant regulatory authorities.

Summary

The NT EPA notes the action taken by the Proponent over the course of the environmental assessment to reduce proposed water consumption by changing from 'wet' tailings management to 'dry stacking' of filtered material.

The NT EPA considers that there is potential for impacts on groundwater hydrological processes and associated environmental values. The numerical modelling presented by the Proponent indicates that significant impacts are unlikely however the modelling is preliminary with limited accuracy in the quantitative predictions. Additional uncertainty remains on the potential impacts to phreatophytic vegetation in response to groundwater drawdown. Although the potential impacts to stygofauna have not been fully assessed, based on the risk assessment presented by the Proponent, the NT EPA is of the opinion that potential impacts to stygofauna are likely to be highly localised.

The Proponent proposes measures to monitor standing water levels and potential impacts to groundwater dependent vegetation; however, the manner in which any adverse outcomes of monitoring will be used to initiate management responses is unclear. In recognition of this lack of clarity and the uncertainty of numerical modelling upon which predicted impacts are based, the NT EPA makes recommendation 3 for a **Water Abstraction Management Plan** to improve its predictive capacity to enable appropriate management responses.

Recommendation 4 would provide mitigation to potential impacts of groundwater users and the NT EPA makes recommendation 5 to inform groundwater trigger values and provide an expanded monitoring regime in relation to potential impacts to groundwater dependent vegetation and Stirling Swamp. As groundwater dependent vegetation is of cultural importance to Aboriginal people and Aboriginal people, engagement is recommended in the development of trigger values. Recommendation 6 reinforces good water stewardship in recognition that in an arid zone where groundwater is a precious resource it is important for the Project to use water conservatively to reduce potential impacts from groundwater drawdown.

The mining of the ore body would permanently alter local groundwater hydrological processes, resulting in a localised groundwater sink. The NT EPA considers it an unacceptable closure objective for ongoing drawdown impacts from this sink and this is to be addressed in iterations of the Proponent's Mine Closure Plan outlined in recommendation 19. The NT EPA makes recommendation 3 for further investigations to more accurately define the localised pit aquifer and extent of impacts to be implemented in the **Water Abstraction Management Plan**.

4.1.3 Surface water

4.1.3.1 Environmental values

Watercourses in the Project area generally flow north and surface flow is episodic with many years often separating flow events. Watercourses are sandy and highly braided. Surface water flow is likely to spread laterally from channels, across floodplains as low energy sheetflow. Significant surface water - groundwater interactions can occur within the vicinity of the creeks and rivers.

The mine site is adjacent to Murray Creek (approximately 3 km to the east) and near Bloodwood Creek (5 km to the west). These are tributaries of the Hanson River, the main watercourse draining the western part of the Ti Tree Basin and flowing north, flooding out into the Tanami Desert, west of Tennant Creek.

Bloodwood Creek feeds Mud Hut Swamp (8 km north of the mine site), which is a Site of Conservation Significance, as it is able to retain water for lengthy periods after rainfall and flow events supporting wetland birds, fish and plants. It is the largest swamp in the Burt Plains Bioregion.

Stirling Swamp (12 km north of the access/haulage road) is an interim floodout area for the Hanson River and a Site of Botanical Significance. The low rocky ranges South of Stirling Swamp comprise the Bush Potato Site of Botanical Significance. Encompassing both botanical sites is the Anmatyerr North Site of Conservation Significance which supports diverse wetland habitats populations of threatened and culturally important flora species (dwarf desert spike-rush and giant sweet potato), other plants endemic to the Northern Territory and threatened fauna species. The proposed haulage road bisects the Anmatyerr North Site of Conservation Significance.

The haulage road intersects the Hanson River, approximately 40 km south east of the mine site. To the south (~10 km) of the proposed haulage road is Wood Duck Swamp, a Site of Conservation Significance with ecological values associated with holding water for many months in an otherwise arid environment.

The regional surface hydrology in relation to Project components is shown in Figure 3.

Due to the infrequent episodic flow regimes, there is little consumptive use of surface water and the draft Western Davenport Water Allocation Plan states that outside of stock and domestic, licensing of surface water extraction would not be considered.

4.1.3.2 Potential impacts

Construction and operation of the Project has the potential to result in the following direct impacts on surface water hydrological processes:

- changes to flow regimes of watercourses and associated processes of erosion and sediment deposition, within and adjacent to the Project area
- changes to natural drainage patterns from construction of impervious hardstands and re-contouring land for proposed infrastructure.

Construction and operation of the Project has the potential to result in the following indirect impacts to in-situ values supported by surface water hydrological processes:

- reduction in habitat quality to surface water dependent flora species (e.g. giant sweet potato).

4.1.3.3 NT EPA assessment

Changes in localised runoff pathways - Haulage road

Construction of the haul road has the potential to interrupt sheetflow across floodplains, creating shadow zones and indirect impacts to habitat values down gradient from the road. The Proponent provided analysis of elevation data and aerial imagery indicating the alignment of the haul road is associated with areas where sheet flow may be the dominant surface water runoff response. Of particular importance is habitat supporting the culturally important giant sweet potato (see section 4.3.2) which was reassessed by the Proponent in the Additional Information, as additionally occurring to the north (and down gradient) of the proposed haulage road.

The Proponent has proposed to mitigate impacts to surface water hydrological processes that may indirectly impact the giant sweet potato by incorporating regularly spaced culverts in the construction of the haulage road, to prevent the creation of sheetflow shadow zones. The NT EPA considers that implementation of culverts is likely to reduce impacts to the culturally important species although there remains uncertainty

on the net effects for the species. The Biodiversity Management Plan submitted by the Proponent acknowledges that it is possible that some areas of suitable habitat may exhibit lower soil moisture post construction of the haulage road, leading to a decline in giant sweet potato numbers, while other areas may show an increase in soil moisture, favouring plant numbers over time. In response the Proponent has committed to:

- model and map expected changes in surface water flow from the proposed road and how they may change the distribution of potential habitat
- undertaking additional monitoring and further occupancy modelling studies for the giant sweet potato
- upon receipt of the relevant permit, collecting giant sweet potato seeds, particularly from plants likely to be impacted from the road construction, and conducting revegetation trials to offset loss of plants.

Trigger points in the monitoring program for the giant sweet potato have not been provided and are proposed to be determined from further detailed review of published literature and site-specific baseline data collected prior to groundwater extraction activities. No contingency measures are provided in the monitoring program

The NT EPA notes that impacts to the giant sweet potato could be avoided with a more northerly placement of the haulage road. This is discussed in section 4.3.2.

Recommendation 7

Mining approvals should include conditions that require the Proponent or Operator to provide to the relevant regulator an updated Biodiversity Management Plan for approval that includes a revised monitoring program for the giant sweet potato that addresses:

a) modelling of expected changes in surface water flow from the proposed haulage road in relation to distribution of potential habitat

b) further occupancy modelling studies

c) preliminary trigger point values and the process by which those values will be refined following the collection of further baseline data

d) the identification of contingency measures.

The proposed haulage road also intersects the Hanson River, Murray Creek, Wood Duck Creek and other minor tributaries where there is potential for floodwater to backup and sediment movement to be restricted. The drainage lines of Murray Creek and the Hanson River are stated to be reasonably well defined and relatively narrow whereas there is no evidence of a single specific drainage line associated with Wood Duck Creek and surface flows is more likely to present as sheet flow. The Proponent undertook modelling and has proposed to:

- construct the watercourse crossing at Hanson River, Murray Creek and some minor watercourses ‘at-grade’ (replicating the existing surface level of the river bed) to minimise risk of impeding surface flows
- provide regularly spaced culverts to ensure sheet flows associated with Wood Duck Creek are not interrupted by the eastern end of the haul road.

The NT EPA considers the 'at-grade' construction of haulage road crossings to be an acceptable measure to reduce risk to surface water hydrological processes. However, the proposed floodway construction will not provide flood protection and restrictions on road access to the mine can be expected during flood events. The Proponent has indicated that road design and assessment will consider the need for trafficability and the trade-offs to mine operations. The NT EPA considers that with the uncertainty associated with modelled flood predictions it remains possible that the Proponent may require access to a different engineered standard in the future if the impacts of road flooding on mine operation are unacceptable.

The NT EPA is satisfied that the implementation of culverts and 'at-grade' construction of crossings can mitigate impacts to Wood Duck Swamp from the construction of the haulage road.

Recommendation 8

Mining approvals should include conditions that require the Proponent or Operator to:

a) **implement the haulage road crossings of the Hanson River and Murray Creek 'at-grade' to ensure existing surface flows are not impeded**

b) **submit the final design or future planned works for a different engineered approach to the crossings for approval by the relevant regulator.**

Changes to flow regimes of Murray Creek - pit flooding

The proposed mine pit is approximately 3 km to the west of Murray Creek. Ingress of flood water into the mine pit could potentially alter the timing and volume of surface water moving downstream, alter the sediment deposition regime, and have indirect impacts to associated habitat values. A flood risk assessment was conducted by the Proponent in the Draft EIS and refined in subsequent assessment documentation. Preliminary modelling determined that there is the potential for the pit to flood in a 72-hour 100-year Average Recurrence Interval (ARI) storm event and that a flood protection levee will be required for protection of the pit.

The Proponent has incorporated the levee into the revised design of the mine site. The levee would be designed at a minimum to ensure that a 1 in 100 year, 72 hour ARI rain event and resulting surface flows will not overtop the levee. The proposed levee would be a permanent feature post closure. The NT EPA considers that the proposed levee would not be enough to ensure that flood waters are permanently excluded from entering the pit post closure.

The NT EPA is of the opinion the final pit flood protection levee design would be dependent on site-specific circumstances such as the likelihood of overtopping and consequences of bund failure and flooding of the mine pit during operation and post closure. The Proponent intends to conduct further surface water modelling adjacent to the pit and undertake a risk assessment prior to deciding on a final levee design. During the detailed engineering process for the bund, the Proponent will determine the adequacy of the proposed design criteria based on surface hydrology characteristics and potential impacts from a flood event greater than a 1 in 100 year ARI event occurring. This information would determine whether the flood protection levee bund is designed to a higher ARI event to provide a greater level of confidence that environmental values are maintained in Murray Creek and the Hanson River downstream.

Recommendation 9

Before approvals or decisions are made for the Project, the Proponent or Operator shall provide to the relevant regulator an updated pit flood protection levee design that includes:

a) an updated surface water modelling and risk assessment to determine the adequacy of design criteria for the pit flood protection levee bund

b) a final levee design to an applicable Annual Recurrence Interval event that would avoid surface flows reporting to the pit during operation and post closure

c) final levee design that would maintain the existing surface hydrological regime in Murray Creek

The detailed pit flood protection levee design is to be peer reviewed by an appropriately qualified independent professional and implemented to the satisfaction of the relevant regulator.

Changes to natural drainage patterns - mine site and infrastructure drainage

Construction of the mine site infrastructure would require the re-contouring of land and redirection of surface water flows, potentially concentrating water and altering erosion and sediment deposition.

The Proponent has proposed layout considerations and engineering controls to mitigate site drainage impacts on surface water hydrology from the mine site including:

- diverting runoff from disturbed and rehabilitated areas into appropriately sized sediment ponds, avoiding discharge directly into the natural system
- rip-rap protection for earthwork embankments adjacent to drainage channels
- installing drains and bunding around the base of stockpiles to retain runoff and prevent inflow of external drainage
- capturing all surface water from mine site internally and reusing where possible
- shaping the top of the IWL so that water drains inwards therefore preventing run-off during operation.

The proposed sediment pond at the north end of the IWL is critical infrastructure for successfully managing site drainage. The sediment pond will need to be designed to provide an appropriate residence time to both attenuate flows leaving the site and provide an appropriate residence time for solids to fall out of suspension. Water would then be released and flow toward Murray Creek. Surface water flow in relation to proposed mine site infrastructure is shown in Figure 4.

The Proponent prepared a preliminary Drainage, Erosion and Sediment Control Plan (DESCP) in the Draft EIS. The preliminary DESCP, as submitted, lacks standard drawings of all proposed Erosion and Sediment Control structures and techniques to assist with correct implementation on ground and only provides erosion and sediment control information for the major infrastructure associated with the mining operations. As tailings management changed to dry stacking in an Integrated Waste Landform, there has been significant mine site changes since the preliminary DESCP was prepared.

The Proponent indicated in the Supplement that the required detail will be included in a finalised DESCP and applied to all proposed infrastructure, following detailed project design. The Additional Information and accompanying updated commitments table (Additional Information, Appendix 10) indicate that the Proponent intends for the DESCP to be updated when detailed mine site layouts are completed, and that the updated plan will be reviewed and approved by a Certified Professional in erosion and sediment control.

The disturbance footprint at the mine site is approximately 440 ha comprising a small proportion of the total Murray Creek catchment of 950 km^2. The NT EPA considers that site drainage impacts to surface water hydrological processes can be managed through layout and engineering. The NT EPA expects that more detailed designs for managing site drainage at the mine site will be submitted as part of the mining authorisation for the Project and considers that review and approval of the DESCP by a Certified Professional will provide additional surety that appropriate controls will be implemented.

Recommendation 10

Before approvals or decisions are given or made for the Project, the Proponent or Operator is to provide to the relevant regulator an updated Drainage, Erosion and Sediment Control Plan. The Drainage, Erosion and Sediment Control Plan must, at a minimum:

a) include standard drawings of all proposed Erosion and Sediment Control structures, including the integrated waste landform sediment pond, and techniques to assist with correct implementation on the ground

b) address all proposed infrastructure including but not limited to the mine site, haulage/access roads, the accommodation village, and the Adnera load out facility

c) be reviewed and approved by a Certified Professional in erosion and sediment control.

Summary

The Proponent has provided appropriate mitigation of potential impacts of sheetflow shadows, down gradient from the haulage road, through use of engineered drainage structures. Over the course of the assessment the Proponent provided improved analysis of indirect impacts of altered surface hydrology to the culturally important giant sweet potato and has developed a robust management plan including additional monitoring, occupancy model and seed collection/revegetation trials. Recommendation 7 is made to ensure that the monitoring plan is adjusted in response to further surface flow modelling, and occupancy modelling for the species.

The NT EPA considers that the potential impacts to surface water hydrology from the haulage road crossing of Hanson River, Murray Creek and other minor watercourses has been appropriately mitigated by construction of ‘at-grade’ floodways. As this provides no flood protection for vehicle traffic, there remains some uncertainty over whether this floodway design will remain suitable for mine operation over the longer term and the NT EPA makes recommendation 8 to ensure any future changes to floodwater design undergo appropriate assessment and approval.

The mine pit would be a permanent feature, with the potential to flood during high flows in Murray Creek and altering the downstream flow regime. The Proponent has proposed a flood levee and the NT EPA has made recommendation 9 to ensure the flood levee design provides permanent exclusion of flood waters from entering the pit.

The NT EPA considers that impacts on surface water flows from site drainage can be managed and mitigated through site layout and engineering, informed by further development of the DESCP and review and approval by a Certified Professional in erosion and sediment control. Well informed engineered design and construction of stormwater and storage infrastructure should attenuate surface flows, manage flow velocities and contain surface water during peak rainfall events. Recommendation 10 is made to ensure there is no ambiguity over the scope of the DESCP.

4.1.4 Conclusion against NT EPA Objective

With the implementation of the relevant management plans and recommendations identified above, the NT EPA considers that the Project could be conducted in such a manner that its objective for hydrological processes is likely to be met.

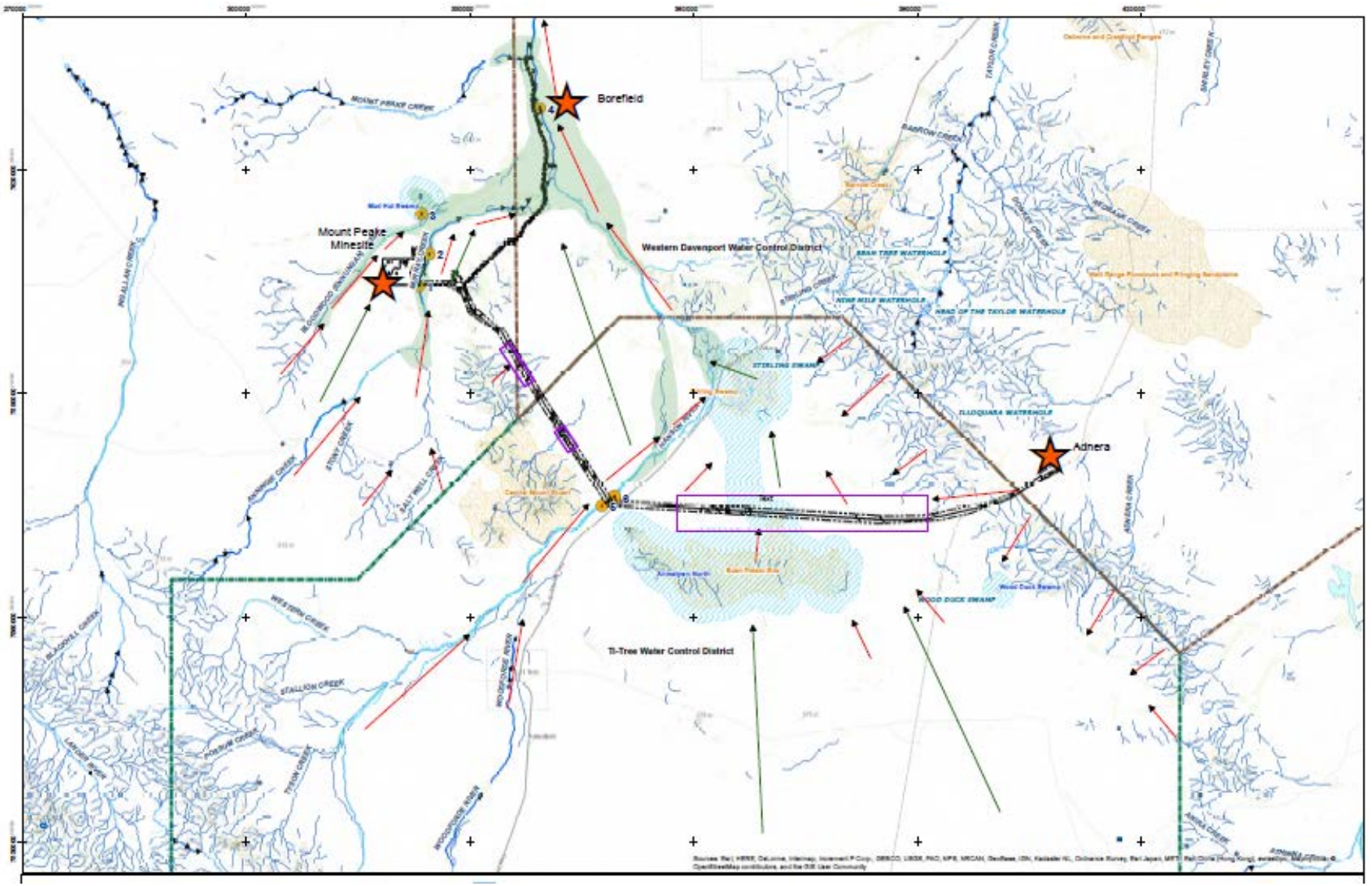

Figure 4. Mount Peake Project regional hydrology. Source: Additional Information.

4.2 Inland water environmental quality

4.2.1 Environmental objective

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.

4.2.2 Groundwater quality

4.2.2.1 Environmental values

Groundwater quality in the area of the pit and borefield was assessed between 2014 and 2017. Groundwater quality in the area of the pit was sampled from 11 exploration holes both within and adjacent to the pit area. Groundwater was measured at a depth around 20-22 mbs. Additional groundwater sampling was conducted on a bore (09MPRC001) that is located within the pit to a depth of around 30 mbs. Groundwater ingress to the bore is likely from the upper weathered zone and minor seepage from the alluvial cover. The results of this sampling were presented in the Additional Information.

Groundwater quality at the borefield was determined from 17 bores drilled between 2015 and 2016 (only Total Dissolved Solids (TDS) and pH analysed for 11 bores). The Proponent undertook additional sampling of groundwater quality at the nearest pastoral bore to the proposed mine pit (Boko's Bore, located 15 km from the proposed pit) and the results presented in the Additional Information (Appendix 5).

Groundwater in the vicinity of the proposed pit was reported in the Draft EIS (Appendix O, Acid Mine Drainage Plan) as saline (TDS 6000 – 8000 mg/L) with more recent (2017) sampling reported in the Additional Information indicating slightly less brackish water (TDS 1030 mg/L). Measured metal concentrations were generally elevated both in comparison to the nearest stock bore and assessment criteria. Copper, lead, zinc and boron all exceeded the ANZECC & ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality for protection of 99% of freshwater aquatic ecosystem species (FAE99%). Zinc exceeded the FAE99% criteria by ten times. Lead exceeded the NHMRC & NRMMC Australian Drinking Water Guidelines (2011) by ten times the criteria (Additional Information, Appendix 5).

Water quality at the borefield was found to be brackish to saline (TDS: 370-28380 mg/L).Other analytes showed some exceedances of relevant guidelines, particularly zinc and magnesium (Supplement, Appendix D). Existing bores in the vicinity of the borefield and mine pit are used for stock watering.

4.2.2.2 Potential impacts

Construction and operation of the Project has the potential to result in the following direct impacts on groundwater environmental quality:

- potential acid and metalliferous drainage (AMD) from the mined materials
- infiltration or leachate, including sodic drainage from the IWL, Run of Mine Pad, other mine site infrastructure and the Adnera load out facility, causing a reduction in the quality of groundwater exceeding the relatively high naturally-occurring background levels for salinity and metals
- leachate from waste water treatment at the accommodation village causing a reduction in the quality of groundwater.

Additional contaminants may be added to groundwater via the infiltration of contaminated surface water. This is discussed below in section 4.2.3.

4.2.2.3 NT EPA assessment

The Proponent developed a hydrogeological conceptual model for the Project area, informed by results of test bores. Groundwater flow within the area of the pit is described as minimal (not requiring significant dewatering) with the overlying shallow alluvial sediments (to a depth of up to 20 m) not revealing significant groundwater. Any potential seepage from the IWL, if not captured by drainage infrastructure has been assessed by the Proponent as likely to migrate to the Pit.

Test drilling was also conducted at two locations on the eastern bank of Murray Creek, immediately east of the proposed mine site. Quaternary alluvials were intersected for the upper 10-14 m, with fresh rock or the Central Mount Stuart Formation basement intersected for the remainder of each hole. No groundwater flow was identified. The Proponent considers that riparian vegetation in this area is therefore unlikely to rely on groundwater resources.

While preliminary investigations suggest that the mine site and surrounds has poor groundwater resources, potential connectivity with other aquifers and associated pathways for groundwater contamination have not been fully resolved.

Potential AMD from mined and waste materials

The potential for contaminants leaching from waste rock, ore, and tailings were tested using chemical analyses and presented in the Acid Mine Drainage - Assessment and Management Plan (Draft EIS, Appendix O), an updated Acid and Metalliferous Drainage Assessment (Supplement, Appendix F) and in the Adverse Materials Supplementary Investigation Memorandum (Additional Information, Appendix 5).

Drilling samples recovered from various stages of resource drilling were analysed using:

- laboratory X-Ray fluorescence (Stage 1): 2012 drilling data was analysed on a total of 5002 samples, and the 2015 drilling data was analysed on 299 samples
- laboratory X-Ray fluorescence (Stage 1): a full ‘soils’ suite assessment was undertaken on waste material (in particular sulfur data at low detection levels), on 1023 primary samples
- static AMD, kinetic and leachability testing by ALS laboratories (Stage 2) representing the ore body (209 samples), various waste rock types (196 samples), tailings (four samples).

X-Ray fluorescence, static and kinetic analysis indicated that the waste and ore was low in sulfur with 98.6% of the samples recording total sulfur less than 0.2%. The low sulfur concentrations found in the analysis for waste and ore indicate that the material is unlikely to generate acid. Furthermore, all samples returned negative values for net acid producing potential (NAPP), with the Proponent indicating that all the material can be classified as either acid-consuming material (ACM) or non-acid forming (NAF). No samples were determined within the potentially acid forming (PAF) range. All material groups (ore and waste types) have a median Neutralisation Potential Ratio (NPR) of 3 or greater suggesting overall sufficient buffering capacity.

Samples with higher sulfur and/or metal data were further tested using kinetic NAG acid buffering characteristic curve (ABCC) analysis and Australian standard leaching procedure (ASLP) testing. The higher sulfur/metal data were found to be associated with a higher acid neutralising capacity due to the presence of silicates (micas/clays). Given this, the waste rock and ore is considered to have adequate acid neutralising capacity and a very low risk of acid leachate generation.

Total metal analyses indicate some samples contained arsenic, selenium and vanadium elevated above background values; however, the Proponent has indicated that average

results were not significantly elevated. ASLP testing indicated that aluminium, arsenic, boron, cadmium, copper, iron, lead, nickel, selenium and zinc exceeded the ANZECC Guidelines for 99% species protection. Aluminium, arsenic, copper, iron, lead, nickel, and zinc exceeded the ANZECC level by a factor of more than 10 in some samples. Only iron and aluminium exceeded more than 10 times Australian Drinking Water Guidelines (ADWG), although these are both relatively insoluble in circum-neutral oxidising conditions and are unlikely to be significantly elevated in actual waste rock leachate. The Proponent has concluded that the waste rock is within acceptable limits for unlined storage (Supplement, Appendix F).

The Proponent has recently commenced on-going barrel leach tests on samples representing waste and ore. To date these samples have demonstrated relatively neutral pH (109 and 209 days since the establishment of the tests, for simulated rainfall). The Proponent reports that to date there has been no leachate generated for samples under natural rainfall conditions due to lack of rainfall (Additional Information, Appendix 5).

The Proponent has prepared a Non Benign Materials Management Plan (NBMMP) (Additional Information, Appendix 6) to bring together the management of any PAF, alkaline, saline or metalliferous leachate generating waste. A key component of the NBMMP is ongoing testing that will be required during the operation of the mine and the Proponent has proposed:

- ongoing barrel leach testing (pre-production and production phases)
- yet to be determined additional geochemical data collection to confirm the absence or presence of adverse material within all waste streams (production phase) – to be assessed against key assessment criteria to allow the early identification and mapping of any PAF
- if PAF material is identified, a further testing regime to confirm and estimate material volume.

Reactive management arrangements contained within the NBMMP for PAF material include:

- designed and engineering of the IWL to allow appropriate storage and segregation of non-benign materials
- for low volumes of isolated PAF material co-mingling with waste deposition within the IWL.

Although the Proponent's analysis of mined and waste materials indicates AMD is unlikely, the NT EPA considers that there remains a possibility that AMD could occur at some time in the future. Continued barrel leach testing is proposed, and the Department of Primary Industry and Resources (DPIR) advised that the number of tests needs to be increased and replicates introduced to provide a more robust case that the IWL will not impact on the surrounding environment. Arrangements contained within the NBMMP require further development of assessment criteria, reactive management measures, and trigger and action levels for groundwater monitoring. The NT EPA is satisfied that this can be adequately addressed through approval processes under the MM Act.

The Proponent's analysis of contaminants has omitted analytes that were requested during the course of the assessment including aluminium and uranium. The DPIR has advised and the NT EPA agrees that the omission of these analytes without an understanding of whether they are present in significant amounts, has potential implications for waste management and could require reconsideration of the waste management program for the Project. Additional test work is required and the results used to confirm detailed design of the IWL and other mine infrastructure to ensure management of contaminants in leachates. The NT EPA makes recommendation 11 to

confirm the contaminant characteristics of mined and waste materials and expects the Non Benign Materials Management Plan (NBMMP) would be revised continually throughout the mine life to ensure management strategies are modified if required and implemented.

If the additional test work identifies contaminants (e.g. aluminium and/or uranium) within the mined and waste materials necessitating revised waste management arrangements including changes to the IWL, the Proponent would be required to submit a clause 14A notice of alteration to the NT EPA and the responsible Minister for consideration under the *EA Act*.

The updated table of commitments (Additional Information, Appendix 10) provided with the Additional Information includes references to the Draft EIS documentation and an AMD Management Plan. The Proponent has also provided measures in the NBMMP (Additional Information, Appendix 6). The NT EPA considers that any ambiguity in the measures proposed should be clarified in a finalised NBMMP.

Recommendation 11

Before approvals or decisions are given or made for the Project, the Proponent or Operator shall provide to the relevant regulator an updated Non Benign Materials Management Plan for the Mount Peake Project. The Non Benign Materials Management Plan must, at a minimum, provide:

a) results of additional testing for contaminants of concern to confidently demonstrate there is a low risk of contaminants from all waste streams and stockpiled ore

b) an expanded program of barrel leach tests to address the long-term leachate generation from wastes and updated results from barrel leach tests already underway

c) further development of measures to reactively manage AMD should they occur over the life of the mine including assessment criteria, trigger and action levels for groundwater monitoring

d) increase the number of waste rock tests occurring to provide stronger evidence that the production and variability of Neutral Mine Drainage within waste material will not be significant

e) consolidate relevant management measures contained in the AMD Management Plan submitted with the Draft EIS.

Infiltration of leachate from Integrated Waste Landform and other mine site infrastructure

The Proponent has assessed the mined and waste material as likely to have low potential for AMD, alkaline, and sodic drainage, suitable for unlined storage in a proposed IWL. The Run of Mine (ROM) pad and other mine infrastructure are other sources of leachate infiltration.

The shift by the Proponent from ‘wet’ tailings management in the originally proposed Tailings Storage Facility to dry stacking of filtered tailings at the IWL combined with the arid conditions at the mine site reduce the risks of infiltration of leachate. Potential seepage will be intercepted by drainage infrastructure and if not captured the Proponent has assessed seepage would likely to migrate to the pit (Additional Information, Appendix 5).

Conceptual design for the IWL was provided in the Additional Information. The IWL would be located along the western side of the pit. The height and slope would be designed to ensure that the final structure is stable and not prone to significant erosion.

At the end of mining the IWL is planned to be approximately 40 m high. The Proponent has indicated that the top of the IWL will be shaped for water to drain inwards. The design can facilitate encapsulation cells if required to contain PAF material.

The IWL will be built up progressively from the southern end of the pad northwards. Out-facing batters will be constructed along at least one half of the boundary and the remaining open area will be used to expand into as the need arises. The initial placement will be along the southern boundary (i.e. aligned with the berm drainage system) to prevent runoff from up-gradient areas into the working operations of the IWL. Outer batters will be constructed of waste rock material ensuring tailings are contained within the structure and not exposed on the outer surfaces. The construction of the IWL will enable progressive rehabilitation.

The NT EPA considers that the management of tailings and waste rock must provide a facility that is safe and stable for the very long term, and which has very low adverse environmental outcomes (European Commission, 2012). The Proponent has indicated that the IWL would be designed with the objective that post rehabilitation it would be safe, stable and non-polluting. The NT EPA acknowledges the Proponent's change to dry stack tailings management that forms part of the IWL operation and considers this would minimise seepage impacts. However the change in tailings management and concept of an IWL was introduced late in the assessment of the Project and the NT EPA makes recommendation 12 to ensure the final IWL design and construction achieves expected outcomes for management of tailings and waste rock.

To ensure that the IWL is operating as intended and management objectives for tailings and waste rock are being met the NT EPA recommends an annual inspection and audit of the IWL by an independent technical expert to provide an overview of the IWL performance**.** Performance monitoring of the IWL is important to indicate changes and provide early warnings which could indicate potential operating or environmental issues as well as providing an assessment of the overall performance and long-term integrity (European Commission, 2012). Recommendation 13 is made to provide additional certainty that the IWL is performing to achieve expected environmental outcomes and further promotes a transparent auditing and regulatory process.

Recommendation 12

Before approvals or decisions are given or made for the Project, the Proponent or Operator shall engage an appropriately qualified, independent and experienced person to review and report on the design of the Integrated Waste Landform. The review shall provide to the relevant regulator:

a) objective and independent expert review that the siting of the integrated waste landform is suitable to minimise environmental risks

b) objective and independent expert review that the integrated waste landform design parameters are adequate to ensure long-term containment of tailings/waste rock or leachate

c) objective and independent review that surface water runoff from the integrated waste landform during construction, operation and post closure is suitable to minimise environmental risks

d) objective and independent expert review of the decommissioning and final rehabilitation to minimise long-term risks to the environment, community, future land use and visual amenity from the integrated waste landform.

Recommendation 13

Mining approvals should include conditions that require the Proponent or Operator to engage an appropriately qualified, indpendent and experienced person to conduct an annual audit and inspection of the Integrated Waste Landform. The annual audit and inspection report shall provide to the relevant regulator:

a) **objective and independent expert review that the construction and operation of the integrated waste landform is in accordance with the endorsed design**

b) **objective and independent expert review of the performance of the filtered dry stack tailings including achievement of the expected moisture content and dealing with dry stack tailings in any weather conditions (including management of dust during dry conditions and management of surface water runoff in wet conditions)**

c) **objective and independent expert review of the proposed performance monitoring program and results for the integrated waste landform including potential seepage and leachates and management of surface water runoff and erosion.**

The annual audit and inspection report shall be provided on the websites of (as applicable), the Proponent or Operator and the relevant regulatory authority.

The Proponent reports that based on the ASLP results, drainage is likely to be neutral (pH between 6.5 to 8.5), with a range of 6.7 to 9.4 and a median of 8.1. This range corresponds with the minimum solubility of most common environmentally significant metals, including aluminium and arsenic. Preliminary barrel leach test results are all between 7.31 and 8.8. In contrast, the Kinetic NAG (KNAG) test pH ranged from 4.87 to 7.32 which indicates there may be some buffering by oxidising minerals.

The Proponent considers the material represents low risk of generating dissolved metals, does not require specific management and that it will have ongoing monitoring to deal with potentially slightly alkaline leachate and runoff (Additional Information, Appendix 5 and 6).

The NT EPA considers that the risks of alkaline drainage have been adequately assessed and that subject to further measures to develop the NBMMP contained in recommendation 11, the mitigation proposed is likely to be sufficient to avoid significant impact to groundwater quality.

Testing indicates that leachate from waste rock may be sodic and cause soil dispersion if irrigated onto local soils. To date, the specific source of sodic material has not been determined and the NBMMP recommend further testing during excavation to delineate locations and materials.

The Proponent has indicated that sodic drainage can be managed by capping waste rock within the IWL with non-dispersive soils on closure, diverting runoff to holding ponds via armoured drainage channels and by amending impacted soils or treating leachate with lime, if soil contact is likely (Supplement). Alternatively, capping soils can be ameliorated with agricultural lime or gypsum to reduce sodicity, depending on soil pH, in accordance with standard agricultural practice (Additional Information, Appendix 6).

As the majority of potentially sodic material would be deposited in the IWL, the Proponent considers that minimal seepage is expected to drain from the waste rock. The IWL would be surrounded with an engineered drainage channel, with dedicated

monitoring points to gauge runoff volumes and assess water quality (Additional Information, Appendix 6).

The NT EPA considers that the risks of sodic drainage have been adequately assessed and that the above mitigation measures proposed are likely to be sufficient to avoid significant indirect groundwater quality impacts.

Other sources of contaminated seepage include water storage dams, storage of ore concentrate at the Adnera load out facility and the waste water release at the accommodation village.

The Proponent has indicated that the Raw Water Dam and Process Water Dam will be lined with a synthetic membrane. Seepage will therefore be avoided.

Ore (magnetite) concentrate would be stockpiled at the Adnera load out facility prior to transfer and transport by rail. While a hardstand is proposed at the load out facility, the provided designs are unclear on whether stockpiled material would be stored on the hardstand or on unlined ground. The Proponent has provided a Material Safety Data Sheet (MSDS) for magnetite indicating the material is insoluble and has generally considered the concentrate to be benign. It would appear that ore stockpiles would be stored uncovered at the load-out facility. A sediment pond/sump would be installed adjacent to stockpile to contain surface run off and water reused to manage dust from the concentrate stockpiles (Additional Information, Appendix 9).The NT EPA does not consider that the Proponent has conclusively demonstrated that the ore concentrate is inert and that this has led to the environmental risks at the Adnera load out facility potentially being understated, and mitigation poorly defined. The NT EPA takes a precautionary approach and makes recommendation 14 to address this.

Recommendation 14

Before approvals or decisions are given or made for the Project, the Proponent or Operator shall provide to the relevant regulator an updated Water Management Plan addressing site risks at the Adnera load out facility. The updated Water Management Plan, at a minimum, must provide:

a) site drainage arrangements and other management measures to ensure that potentially contaminated run-off is contained on-site

b) a groundwater monitoring program including establishment of baseline groundwater quality to ensure leachate or runoff from stockpile does not impact groundwater.

The wastewater treatment and disposal system servicing the accommodation village and other facilities will require a wastewater works design approval from the Department of Health. The EIS has not included information in relation to wastewater generation, treatment and disposal from the accommodation village facilities to enable detailed assessment of the wastewater treatment system however, the Proponent has acknowledged the need to obtain approval from the Department of Health and the NT EPA is satisfied that this process will ensure significant impacts from effluent disposal are mitigated.

Groundwater contamination

If contamination of groundwater were to occur as a result of the Project, it could impact other users of the resource, including the environment. Riparian and other groundwater dependent vegetation could be adversely affected by contaminants, which may compound any impacts from groundwater drawdown (discussed in section 4.1.2, Hydrological processes). Contamination could also limit the use of the groundwater for extractive purposes.

The Proponent has indicated that any potential seepage is likely to eventually migrate to the pit, noting that groundwater flow within the area of the pit is minimal and that overlying shallow alluvial sediments do not offer significant groundwater supplies. Given the lack of users of groundwater within the area of the mines site and general poor quality due to high salinity and elevated metals, the Proponent has assessed indirect impacts on resource use as unlikely (Additional Information, Appendix 5).

The Proponent has committed to implementing a groundwater monitoring network around the operational mining area to determine baseline groundwater conditions and to detect any potential seepage and changes in groundwater quality and groundwater levels. Monitoring would be targeted to areas affected by pit dewatering, but operational areas would also be included. These would include multiple monitoring bores to represent the IWL, ore stockpiles and water storage areas. The Proponent has noted that changing alkalinity is generally a good early indicator of deteriorating conditions in leachate from an IWL containing PAF or alkaline material, and can therefore be tracked as an 'early warning' mechanism.

The monitoring bore to the east of the pit will include standing water level and selected metals, providing important information to detect seepage that may impact nearby Murray Creek. The NT EPA notes that proposed monitoring of groundwater adjacent to Mud Hut Swamp would not include metals. Given that some analytes have not yet been tested in the mined and waste materials (recommendation 11), the NT EPA considers that an appropriate precautionary measure would be to include the full suite of metals at groundwater monitoring bores including those near Murray Creek and Mud Hut Swamp.

Preliminary groundwater quality assessment criteria have been proposed in the NBMMP with the sampling suites and adopted criteria, to be modified once baseline conditions (pre mining) are determined. Trigger and action levels have yet to be determined but would be based on annual mean background concentrations, with the baseline data collected for at least a year to detect any natural seasonal variations (Additional Information, Appendix 6).The NT EPA notes that the Water Management Plan submitted as part of the Environmental Management Plan for the Project (Draft EIS, Appendix N) has not been updated to reflect changes in tailings management and waste management infrastructure, and that the updated commitments table provided in the Additional Information largely reflects those measures outlined in the Draft EIS. As project design and testing of mined and waste materials have changed and been clarified considerably through the assessment process, the NT EPA makes recommendation 15 to ensure that an updated Water Management Plan is prepared for consideration by the relevant regulator, alongside an updated NBMMP (recommendation 11), prior to Project approval.

The Proponent has indicated that the length of ground water monitoring following active mining is yet to be determined. The NT EPA considers that the post closure monitoring period should be agreed to by the relevant regulator at a later date prior to acceptance of the final rehabilitation and closure plan as referred to in recommendations 19 and 20 in section 5.

Recommendation 15

Before approvals or decisions are given or made for the Project, the Proponent or Operator shall provide to the relevant regulator for approval an updated Water Management Plan for the Mount Peake Project. The Water Management Plan must, at a minimum, provide:

a) monitoring program that would provide additional baseline groundwater quality data for a minimum of 12 months

b) baseline analysis and a monitoring program for the full suite of metals at groundwater monitoring bores including those near Murray Creek and Mud Hut Swamp

c) a monitoring program for the bore monitoring network representing the integrated waste landform, ore stockpiles, water storage areas, including location and frequency of sampling

d) reporting of QA/QC of data collected.

Summary

The NT EPA acknowledges the Proponent's change to dry stacking tailings management for disposal in an Integrated Waste Landform and providing the IWL is operated as intended and meets expected outcomes, it would reduce the potential for impacts on groundwater environmental quality and associated environmental values. Mined and waste materials have undergone improved characterisation through the stages of environmental assessment and although significant impacts arising from AMD are unlikely, the NT EPA considers that there remains a residual risk of AMD occurring in the future. The NT EPA has made recommendation 11 for further testing to inform detailed design and allow for an updated NBMMP to be implemented, noting that if additional testing results in a change to the management of mined and waste materials, further environmental assessment may be required.

The change in tailings management has come late in the assessment process. The NT EPA makes recommendations 12 and 13 to ensure regular technical review and oversight of waste storages (IWL) occurs by an independent expert. As the assessment process has involved a number of iterations of documentation the NT EPA makes recommendations 14 and 15 to ensure that the Water Management Plan is updated, with expanded analysis of metals in groundwater monitoring as a precautionary measure and to ensure adequate baseline information (including at the Adnera load-out facility if required) is collected prior to operations commencing.

4.2.3 Surface water

4.2.3.1 Environmental values

Little information is available on surface water quality due to the lack of permanent surface water in the area and the infrequency of flows in local watercourses.

Baseline water quality conditions were obtained from surface water samples collected from sites within and adjacent to the Hanson River due to a flood event in January 2017 (Supplement, Appendix J). The Proponent provided no assessment of the monitoring results against relevant water quality guidelines and no comparable information is available from Bloodwood Creek, Mud Hut Swamp or Murray Creek, located near or adjacent to the proposed mine site.

4.2.3.1 Potential impacts

The construction and operation of the Project may have the following potential impacts to surface water quality:

- saline run off from use of pit dewater
- project activities that disturb soils/substrate such that sediments are mobilised in water
- spills of any reagents or fuels (etc.) used in the Project

- erosion and mobilisation of ore concentrate at the Adnera load out facility (refer to recommendation 14, section 4.2.2).

Contamination of surface water could also affect groundwater indirectly via infiltration to groundwater aquifers.

4.2.3.1 NT EPA assessment

Any contaminated surface water flow off the mine site has the potential to impact downstream environments, including riparian ecosystems and lands on pastoral stations with current or intended organic produce certification.

The Proponent has assessed that surface water from the mine site is unlikely to impact surrounding vegetation. All mine site water is to be internally captured or reused for dust suppression or evaporated. Surface water from the mine site has been assessed as extremely unlikely to enter the catchment of Mud Hut Swamp and vegetation at the borefield is downstream from mine and connected to Murray Creek only after significant flooding events. In either circumstance any mine site water reaching sensitive receptors is stated to be first filtered through the sediment pond (Additional Information). The sediment pond would be designed to provide an appropriate residence time to enable a significant proportion of solids to fall out of suspension. Water would then be released and make its way toward Murray Creek. A surface water monitoring site would be constructed downstream of the outfall to monitor flow, salinity, sediment and other selected analytes.

The NT EPA accepts the difficulty of establishing robust baseline for surface water quality conditions with the ephemeral flows present in the Project area. Surface water quality is also likely to vary considerably over the course of flow or flood events. This makes assessment of likely or actual impacts difficult during the operational phase and the implementation of reactive management measures more problematic. In the view of the NT EPA, this reinforces the importance of preventative measures. In this respect the change to dry stack tailings eliminates the risk of catastrophic failure and tailings run-out associated with conventional storage facilities, provided the IWL is operated as intended. The NT EPA notes however, that avoidance of concentrated runoff water flows directed at the IWL and internal drainage within the IWL in respect of dry stack tailing storage, is a key design consideration for these types of facilities (Davies, 2011). This is considered further in section 5.

The Proponent indicates that further water and sediment sampling will occur prior to operations commencing and be monitored during operations, with details to be incorporated into the adaptive site water monitoring and management plan. During flow events, where access is possible, sampling of surface water will be undertaken at Murray Creek (upstream and downstream), Bloodwood Creek, and Hanson River (borefield, highway and downstream). Baseline data will be established and used for comparison with ANZECC/ARMCANZ 2000 Australian Water Quality Guidelines for Fresh and Marine Waters, Livestock Use (Additional Information). The Proponent has also committed to undertake a baseline water quality survey (following rainfall) of Mud Hut Swamp.

The NT EPA considers that the Proponent has provided general details of potential contamination pathways in surface water run-off from the mine-site to sensitive receptors and conceptual design of sediment ponds for filtering mine-site water before surface drainage enters the wider environment. The effectiveness of the proposed measures will depend significantly on their finalised design and the location on mine infrastructure and will need to be incorporated into an updated Water Management Plan and DESCP.

Saline run-off and drainage

Saline mine dewater is proposed to be used for dust suppression. Deposited salts may dissolve during rain events and migrate in surface water flows, becoming concentrated off-site. The Proponent has indicated that water carts will utilise directional sprays to contain water within bunds to ensure no overspray of saline water to adjacent areas and that deposited salts will only be mobilised as far as sediment ponds/sumps. Upon maintenance, potentially saline sediment will be deposited in the IWL.

On the haul/access road the Proponent considers that run-off will occur quickly from the compacted surface in a 'first flush' of run-off, will be directed to sediment basins/table drains adjacent to the haul/access road and then be either leached to depth or quickly diluted by subsequent run-off from the haul/access road and by sheet flow from the surrounding area.

The NT EPA considers that the risks of saline drainage and run-off have been adequately assessed and that the mitigation proposed is likely to be sufficient to avoid significant indirect impacts to surrounding soils.

Spills of reagents or fuels

The release, discharge or spill of any hazardous substance (including reagents or fuels) that could contaminate surface water would be prevented and mitigated in accordance with the Hazardous Substances Management Plan (Draft EIS Appendix F of Appendix N) that would be reviewed during the mining authorisation process. The plan specifies that storage of hazardous substances would be in accordance with Australian standards, codes and regulations, including bunding, and appropriate clean-up procedures to reduce the potential for surface water contamination.

The NT EPA considers that impacts on environmental values from spills of hazardous substances are unlikely to be significant and can be managed in accordance with the relevant plan.

Summary

The NT EPA considers that impacts on inland water quality values from the potential contamination of surface water associated with Project activities can be effectively avoided or mitigated in accordance with measures, management plans and strategies outlined in the EIS. It will be important for the planned baseline monitoring of surface water quality to occur as opportunity arises during episodic flow events and for the finalised design of sediment ponds in relation to the layout of mine site infrastructure, to be addressed in updated Water Management Plan, DESCP and the MMP.

4.2.4 Conclusion against NT EPA objective

With the implementation of relevant management plans and recommendations identified above, the NT EPA considers that the Project could be conducted in such a manner that its objective for inland water quality is likely to be met.

4.3 Terrestrial flora and fauna

4.3.1 Terrestrial flora and fauna objective

Protect the NT's flora and fauna so that biological diversity and ecological integrity are maintained.

4.3.2 Terrestrial flora

4.3.2.1 Environmental values

The Project area is located within the Burt Plain Bioregion characterised by plains and low rocky ranges with extensive mulga and other acacia woodlands coverage. This bioregion represents about 5% of the Northern Territory with less than 0.3% of the bioregion under national park or other conservation reserves. Fine scale vegetation mapping identified eight types of vegetation communities within the Project area, with mulga shrublands and triodia hummock grasslands as the most abundant vegetation communities. All vegetation communities are widespread and well represented within the bioregion. Riparian woodland is considered a sensitive vegetation type in the NT (NRETAS, 2010) as it plays a critical role in providing ecosystem services to maintain landform and water quality, as well as providing habitat and microclimate for other species (DLRM, 2017). It occurs along water courses and drainage channels.

Potentially groundwater dependent ecosystems (GDEs), associated with riparian vegetation, occur along the Hanson River and have the potential to be impacted by groundwater drawdown from the borefield as mentioned in section 4.1.2. Five facultative phreatophyte species occur within the Project: ghost gum coolabah (*Eucalyptus victrix*), desert bloodwood (*Corymbia opaca*), bean tree (*Erythrina vespertilio), r*iver red gum (*Eucalyptus camaldulensis*) and smooth-barked coolibah (*Eucalyptus victrix*).

A site survey identified 238 flora species (233 native and five introduced) including the dwarf desert spike - *Eleocharis papillosa,* listed as Vulnerable in the EPBC Act. Although habitat for the dwarf desert spike was found within the Project area, no individuals were recorded. Suitable habitat and known sightings of *E. papillosa* occur within Stirling Swamp (50 km south east of the mine site and 12 km north of the haul/access road) and potential habitat occurs at Mud Hut Swamp. Five introduced species have been recorded, with high abundance of the invasive buffel grass (*Cenchrus ciliaris*).

Targeted surveys across parts of the Project area in April 2013 and November 2016 and presented in the Draft EIS and the Supplement, respectively did not identify any individuals of the culturally significant species *Ipomoea polpha* subsp. *latzii* (giant sweet potato) recorded from Long Range hills (Crase, et al., 2010); however this species was detected in abundance in September/October 2017 and presented in the Additional Information.

The giant sweet potato is a rare plant which is endemic to Central Australia (Crase, et al., 2010) and is of cultural significance to the local Anmatjerre people with their tubers a highly regarded ‘bush tucker’. Giant sweet potato is a low scrambling tuber plant inhabiting grassy shrublands with red clay loam soils with a mulga (*Acacia aneura*) and witchetty bush (*A. kempeana*). Although originally known only from a discrete area surrounding Ti Tree, about 200 km north of Alice Springs, recent studies identified extant populations in Tinfish-Low Level, Atatirk and Long Range (Crase, et al., 2010). The population relevant to this assessment is located at the base of Long Range Hills. Giant sweet potato depends on a relatively high soil moisture content to survive.

4.3.2.2 Potential impacts

Groundwater Dependent Ecosystems (GDEs)

The construction and operation of the Project has the potential direct and indirect impacts to GDEs through:

- aquifer drawdown and groundwater abstraction resulting in changes in groundwater availability for riparian and phreatophytic vegetation, including those of cultural significance

- spatial, temporal and quantity changes in groundwater flow resulting in a reduction of the quality of habitat and values of GDEs.

*Giant sweet potato (*Ipomoea polpha *subsp.* latzii*)*

Construction of the Project's haul/access road could result in fragmentation of two large units of vegetation where *Ipomoea polpha* subsp. *latzii* (giant sweet potato) occurs and changes to the hydrological regime. Potential indirect impacts to giant sweet potato include changes to the population as a result of dust from weeds, changes in fire regime and dust from construction, operation and vehicle movements.

4.3.2.3 NT EPA assessment

Groundwater Dependent Ecosystems (GDEs)

Changes to hydrological processes due to the Project are likely to impact on riparian woodland and other groundwater dependent vegetation. Irreversible losses of riparian vegetation in the vicinity of the Project are not considered significant as some species are facultative phreatophytes. This has been assessed in the Groundwater Hydrology section (4.1.2). Additionally, recommendation 7 has been drafted to mitigate potential impacts to these ecosystems.

*Giant sweet potato (*Ipomoea polpha *subsp.* latzii*)*

Construction of the Project's haul/access road and its corridor could result in the fragmentation of two large units of vegetation where giant sweet potato occurs, to the north and south of the proposed haul/access road. Additionally, the borrow pit may intersect a known population of giant sweet potato. The Proponent proposes to select a haul/access road alignment that minimises, where practicable, disturbance to giant sweet potato and its habitat; however, due to the distribution of the giant sweet potato population within the Project area, some plants (ca. 924 individuals or 0.1% of the local population) will be lost when clearing for the haul/access road construction. *Ipomoea polpha* subsp*. latzii* presents healthy subpopulations in Tinfish-Low Level and Atatirk (14 km to the east of the Long Range population) in a joint area of about 2000 ha (Crase, et al., 2010) and are not to be impacted by the Project. Overall, Crase et al. (2010) reports that the total number of individuals of *I. polpha* subsp. *latzii*, their density and area of occupancy were greater than in the past, indicating that the population has not been impacted by fires and drought.

To minimise impacts to the local population, the Proponent proposes to clear along the shortest alignment through the noted giant sweet potato population distribution (Additional Information, Annex 4) jointly with the implementation of a Ground Disturbance Procedure to reduce the chance of unnecessary clearing. The NT EPA notes there is an existing track occurring six kilometres to the north of the detected population of giant sweet potato that could be used as the haul/access road and considers this alternative route would avoid direct impacts on the species and the requirement for mitigation and monitoring.

Giant sweet potato is dependent on soil moisture content, and the proposed haul/access road is expected to disrupt local water flow patterns. A detailed analysis of the impact of altered water flow for giant sweet potato and proposed mitigation measures regarding sheetflow are described in Section 4.1.3. The NT EPA has made recommendation 7 to address this impact.

As the Project occurs in a low rainfall area, the construction (e.g. blasting, digging and dumping) and operation (e.g. vehicle movement) of the Project will generate dust which could damage both plants existing along the haul/access road or new recruits into the population. However, giant sweet potato grows rapidly and dies back annually, hence making it difficult to assess the potential damage of dust on the population. This impact

could be determined by means of annual monitoring of emerging plants after a rainfall event and comparing them with control populations once the haul/access road has been constructed and haulage commences.

With the construction of the haul/access road, there is a potential impact of the arrival and spread of buffel grass (*Cenchrus ciliaris*) impacting the population of giant sweet potato. Although not a declared weed, *Cenchrus ciliaris* has become a problem as it supports intense fires, can inhibit abundance of native ground layer plants and reduces biodiversity and diversity of livestock diets. The NT EPA considers that strict weed hygiene measures should be taken to minimise the spread of buffel grass and is outlined in recommendation 17.

Recommendation 16

Prior to the commencement of any clearing or construction, the Proponent must define and implement a suitable haul/access road alignment for approval by the relevant regulator that minimises the direct impact on giant sweet potato *Ipomoea polpha* subsp. *latzii* within the Project area. The Proponent should:

a) **whenever possible, select an alignment that minimises disturbance to vegetation and habitat with particular emphasis on minimising impacts to the Long Range Hills population of giant sweet potato**

b) **avoid clearing vegetation in areas mapped as potential *Ipomoea polpha* subsp. *latzii* habitat vegetation unless strictly essential**

c) **ensure any clearing of vegetation for the haul/access road has a Ground Disturbance Clearing Permit issued by the Environmental Manager**

d) **clearly mark areas of land to be cleared and areas to be retained (No-Go areas) so impacts do not extend further than needed**

e) **clear vegetation areas progressively and incrementally as needed instead of large-scale clearing**

f) **monitor the population at reference points identified in the *Ipomoea polpha* subsp. *latzii* monitoring program (referred to in Recommendation 7)**

g) **rehabilitate borrow pits if it is determined they are a known habitat for *Ipomoea polpha* subsp. *latzii***

h) **rehabilitate the haulage road if the final alignment does not avoid giant sweet potato habitat.**

Summary

A thriving population of giant sweet potato was found along the proposed haul/access road and proposed borrow pit and if proposed impact mitigation measures are successfully implemented, it is unlikely that the population would be impacted significantly.

The NT EPA considers that the direct impacts from vegetation clearing are unlikely to be significant as all of the vegetation types to be cleared are well represented in the region. The NT EPA also considers that potential indirect impacts to vegetation from weeds, fire and dust are unlikely to be significant, and can be appropriately managed in accordance with standard management plans. NT EPA makes recommendation 5 to address potential impacts to riparian vegetation and other groundwater dependent vegetation from groundwater drawdown (section 4.1.2).

4.3.3 Terrestrial fauna

4.3.3.1 Environmental values

The Draft EIS and Supplement presented limited information relating to terrestrial fauna with distributions determined from desktop database searches. The Draft EIS and Supplement included a qualitative and inferred habitat assessment, opportunistic observations and two limited field surveys (9-14 April 2013 and 21-24 November 2016). A fauna likelihood of occurrence assessment on threatened, near threatened and data deficient species was undertaken based on the qualitative habitat assessment. Expert advice from DENR concurs that only three EPBC Act Vulnerable species (*P. lateralis*, *M. lagotis* and *L. kintorei*) and one TPWC Act Vulnerable species (*D. blythi*) have the potential to occur within the Project area.

Additional fauna surveys were undertaken in September/October 2017, comprising 150 x 1 km transects surveyed for the black-footed rock-wallaby (*Petrogale lateralis*), greater bilby (*Macrotis lagotis*) and the great desert skink (*Liopholis kintorei* (Additional information, Appendix 4, Figure 3.1 and 3.2.). These fauna surveys[1] identified 116 fauna species including 24 mammals, 58 birds and 34 reptiles (Additional Information, Appendix 4). These fauna surveys were carried out in accordance with the Northern Territory Survey Methods for Flora and Fauna Surveys used for Standard Biodiversity Unit Survey Sites whilst all targeted mammal and reptiles surveys for those species included in the EPBC Act were carried out under the Survey Guidelines for Australia's Threatened Mammals (DSEWPaC, 2011b) and the Survey Guidelines for Australia's Threatened Reptiles: Guidelines for Detecting Reptiles Listed as Threatened Under the EPBC Act (DSEWPaC, 2011a).

During the baseline surveys three threatened species (*P. lateralis*, *M. lagotis* and *L. kintorei*) listed under the EPBC Act were identified as being present or potentially present in the Project area. The threatened (TPWC Act) brush-tailed mulgara was also incorporated in this assessment (Additional Information, Appendix 4). A summary of the threatened fauna considered for this report is presented in Table 3 and key environmental values per species are stated below:

- **Black-footed rock-wallaby (MacDonnell Ranges race) *Petrogale lateralis*** (Vulnerable – EPBC Act) is a medium size macropod marsupial. This subspecies is distributed in the MacDonnell Ranges bioregion where it prefers rocky habitats, especially those with abundance of caves, crevices and overhangs where it rests during the day. It occurs on different rock types although its specific habitat requirements results in a scattered distribution across the landscape, particularly areas with tall shrubland and understory grasses and herbs. When exotic predators are present, *P. lateralis* prefers to feed near shelter; however they can disperse up to several hundred meters to forage (Pearson, 2013). *Petrogale lateralis* was observed in the greater Project area during an aerial survey in 2013 and a highly likely scat was found in 2017.

- **Greater bilby - *Macrotis lagotis*** (Vulnerable – EPBC Act and TPWC Act) is a medium-sized omnivorous, solitary and strictly nocturnal marsupial. It often occurs in low densities. It inhabits hummock grassland habitats, predominantly comprising spinifex, with an overstorey of acacia and melaleuca. *Macrotis lagotis* was historically found over 70% of mainland Australia and after European settlement its

[1] Study area includes the proposed mine site, accommodation area, a 1 km wide corridor along the proposed access road and the proposed rail siding facility (Supplement).

population declined to approximately 20% of its original range, most likely due to predation by and competition with introduced species. Habitat degradation from overgrazing and changes in fire regime are also key threats. Although this species is currently recorded in Queensland, Western Australia and the Northern Territory, historical records show the presence *M. lagotis* in the Project area pre-1970 (Pavey, 2006). *Macrotis lagotis* was not sighted within the Project area during the biodiversity surveys in 2013, 2016 and 2017 although the presence of possible diggings/scratchings in suitable habitat may indicate its presence (Additional Information, Appendix 4).

- **Great Desert Skink - *Liopholis kintorei*** (Vulnerable – EPBC Act and TPWC Act) is a large sedentary nocturnal skink that lives in family groups creating extensive burrows. This species is endemic to the Australian arid zone in the western desert region of the Northern Territory, Western Australia and South Australia. *Liopholis kintorei* generally lives in grass sandplains and dunefield swales with triodia grassland, scattered shrubs and occasional tress (*Acacia* spp., *Eucalyptus* spp., *Hakea* spp., *Grevillea* spp.) (McAlpin, 2011). One *L. kintorei* was observed in November 2016. As there are no historical records of this species within 50 km of the Project area, this area may be considered outside the normal geographic distribution of *L. kintorei* (Cogger, 2014).

- **Brush-tailed Mulgara - *Dasycercus blythi*** (Vulnerable TPWC Act) is a stocky rat-sized nocturnal carnivorous marsupial that inhabits from the Simpson Desert across to the Tanami and Great Sandy Deserts. It prefers to occupy habitats with spinifex (*Triodia* spp.) grasslands and sand plains and swales between low dunes and in areas with open mulga (*Acacia aneura*) woodland overstory. It is relatively sedentary and builds a complex burrow system. This species used to be widespread in the central deserts region of Australia, but it has been declining since the 1930s and it has now a restricted and fragmented distribution. There is one historical record for the Mount Peake area from 1901.

Table 3. Targeted fauna surveys on the Mount Peake Project area. Source: Additional Information, Appendix 4.

Name		Status		Fauna surveys		
Common	**Scientific**	**EPBC**	**TPWC**	**Apr/13**	**Nov/16**	**Sep/Oct 17**
Black-footed Rock Wallaby (MacDonnell Ranges Subspecies)	*Petrogale lateralis*	VU	NT	Presence in broader area confirmed by GHD ecologist during aerial vegetation mapping	Not observed	Scat identified as highly likely
Greater Bilby	*Macrotis lagotis*	VU	VU	Possible diggings/scratchings in suitable habitat	Not observed	Not observed
Great Desert Skink	*Liopholis kintorei*	VU	VU	Not observed	Observed at one location	Not observed
Brush-tailed Mulgara	*Dasycercus blythi*	-	VU	At least one active burrow recorded	Not observed	Not observed

4.3.3.2 Potential impacts

Construction and use of the haul/access road has the potential to result in the following impacts to threatened species:

- loss of habitat and habitat fragmentation as a result of clearing of native vegetation
- increased mortality associated with road strikes: vehicles movement is likely to cause ongoing fauna strikes particularly at night
- impacts to habitat as a result of dust, erosion and sedimentation from constructions, operation and vehicle movement
- impacts to habitat as a result of changes in fire regime
- impacts to habitat as a result of introduction and spread of weed species
- competition and predation from introduced fauna.

4.3.3.3 NT EPA assessment

Clearing of native vegetation and habitat fragmentation

Suitable potential habitat for threatened species occurs throughout the735 ha Project area. The Project would require the clearing of the following amount of suitable potential habitat for threatened species (Table 4):

- *Macrotis lagotis* - 642 ha
- *Liopholis kintorei* - 282 ha
- *Dasycercus blythi* - 294 ha

No suitable habitat for black-footed rock-wallaby was found within the Project footprint therefore clearing is unlikely to impact *P. lateralis*. There are about 62 ha of rocky ranges and breakaways with caves and crevices in the immediate vicinity of the haul/access road, which could indicate the existence of *P. lateralis* in the Project area albeit in low densities.

A total of 642 ha is suitable potential *M. lagotis* habitat; however, given that this species was not sighted within the Project area, it is unlikely that they will be impacted. However, as *M. lagotis* is highly mobile, there might be animals that move within the proposed footprint prior to commencement of the clearing. In light of this, the Proponent suggests pre clearing inspections in optimal potential *M. lagotis* habitat in order to minimise any possible direct impacts.

Approximately 282 ha of Triodia grasslands on sandy plains will be impacted by the Project, which is most likely where *L. kintorei* inhabits. However, the only sighted individual was observed at the edge of an access track in open sandplain with spinifex understory, approximately 7 km from the haul/access road. As the great desert skink is a highly sedentary and gregarious species it is unlikely that individuals will move into Project areas during construction or operation as they will be deterred by the anthropogenic activities within the mine.

The Project will clear 294 ha of potential *D. blythi* habitat. As this species was not recorded within the Project area during the biodiversity surveys, it is unlikely it will be impacted by the Project.

As there is potential for natural movement of the threatened species into the area, the Proponent has developed an occupancy model for *P. lateralis*, *M. lagotis*, *L. kintorei* and *D. blythi*. This type of modelling gathers presence/absence data, estimates the area occupied and then compares it over time and space to identify possible population changes/increases. Data from the targeted biodiversity survey in November 2017 represent the first of the minimum required two surveys to undertake occupancy

modelling. This survey is proposed to be repeated in 2018. Details of the occupancy model are presented in the Additional Information, Appendix 4.

The NT EPA considers that the lack of individuals found in surveys and low number of secondary signs (a scat and a sighting) during surveys and searches suggests that the site does not provide habitat for important populations of these species and there is low potential for a significant residual impact. Furthermore, the clearing of suitable habitat would be relatively small in comparison to the known occurrence and area of suitable habitat offsite.

Road strikes

Vehicle movement on the haul/access roads could yield fauna strikes that could potentially kill or injure *P. lateralis*, *M. lagotis*, *L. kintorei* and *D. blythi* (Table 4). To manage the potential impacts of vehicle movements on these species, the Proponent has committed to implementing a Traffic Management Plan. This includes the following commitments to mitigate the risk of fauna strikes:

- reduce speed limits (i.e. signage) in areas to be optimal greater bilby potential foraging habitat
- establishment of additional monitoring transects where the haul/access road bisects potential greater bilby habitat
- fitting all vehicles with noise emitting animal deterrents
- reduce vehicle speeds between sunset and sunrise
- minimise night-time traffic when practicable.

As sightings of threatened species were minimal, the NT EPA considers that this threat is unlikely to be significant. The Proponent has developed a Monitoring and Threat Abatement Plan (Additional Information, Appendix 4) which includes a fauna monitoring register for injured and killed threatened species (Additional Information, Appendix 4) with a contingency plan for road strikes, including reporting sightings and vehicle strikes on any of the vehicle tracks or haul road areas. The proposed Threatened Species Monitoring Program (Additional Information, Appendix 4) includes trigger points and additional mitigation actions if road strikes are found. To minimise road strike impact, the NT EPA considers that monitoring and recording of fauna strikes and fatalities should be implemented by the Proponent to identify trends and performance of its mitigation measures. Provided that fauna strikes and fatalities do not occur more frequently than predicted, the NT EPA is satisfied with the proposed measures to be included and implemented in the Biodiversity Management Plan (BMP).

Changes in fire regime

Changes to the fire regimes is considered to be a key threat to the threatened species which prefer a patch-burning regime rather than large-scale wildfires (Table 4). Large-scale fire events increase the risk of mortality through the removal of vegetative cover and the loss of food resources. To address potential impacts from wildfires, the Proponent commits to implementing a Fire Management Plan for the Project Area which should consider the implementation of Aboriginal people fire management practices ('Right Way Fire') to ensure that landscape is burnt as a mosaic. The NT EPA considers the Fire Management Plan should outline how the proposed fire management measures would ensure the habitat requirements of the species are met.

Table 4. Comparative table of potential threats and mitigation procedures for the threatened fauna species within the Mount Peake Project area. Source: Additional Information, Appendix 4.

		Black-footed Rock-Wallaby	Greater Bilby	Great Desert Skink	Brush-tailed Mulgara	Management Plan
THREATS						
Potential direct impacts	Clearing of native vegetation	X	X	X	X	Ground Disturbance Procedure
	Habitat fragmentation	X	X	X	X	
	Erosion and sedimentation		X			Drainage, Erosion and Sediment Control Plan
	Dust		X	X	X	Air and Dust Management Plan
	Road strikes	X	X	X	X	Traffic Management Plan
Potential indirect impacts	Introduction and spread of weed species		X	X	X	Weed Management Plan
	Changes in fire regime	X	X	X	X	Fire Management Plan
	Competition and predation from introduced fauna	X	X	X	X	Biodiversity Management Plan
	Waste material as an attractant to feral predators	X	X	X	X	Waste Management Plan
PROPOSED RESPONSES						
Monitoring	Sighted/detected within Project area	scat		sighting		
	Develop occupancy model	X	X	X	X	Biodiversity Management Plan
	Additional monitoring transects where the haul/access road bisects threatened species habitat		X	X	X	
Mitigation	Road alignment to minimise disturbance to vegetation and habitat	X	X	X	X	
	Speed limit reduction (e.g. signage) around threatened species habitat	X	X	X	X	Traffic Management Plan
	Noise emitting animal deterrent fitted in vehicles	X	X		X	Traffic Management Plan
	Reduce vehicle speed between sunset and sunrise	X	X	X	X	Traffic Management Plan
	Minimise night traffic when practicable	X	X		X	Traffic Management Plan

Introduced species

As sightings of threatened species were minimal, the NT EPA considers that this threat is unlikely to be significant.

Construction activities are likely to facilitate the introduction and dispersal of introduced species within the Project area. Weeds could degrade potential threatened species habitat available through competition with native flora species. Nineteen weed species were found within the Burt Plain bioregion although only five were found within the Project area, none of these are Weeds of National Significance (WONS) (Additional Information). Some weeds can also change fire regime through increased fire intensity (e.g. buffel grass) by contributing a higher fuel load. Project activities would increase the potential for weed invasion along access roads in suitable habitat for *L. kintore*i. Buffel grass (*Cenchrus ciliaris*) and couch grass (*Cynodon dactylon*) are known threats to biodiversity in the bioregion (Neave, et al., 2006). To address potential impacts from weeds, the Proponent committed to preparing and implementing a Weed Management Plan for the Project Area. The Weed Management Plan would include weed hygiene procedures, monitoring and control measures (Table 4).

Five non-native fauna species have been documented within the Mount Peake Project area, including predators such as feral cats (*Felis catus*) and feral dogs (*Canis lupus familiaris*) and grazing herbivores like the rabbit (*Oryctolagus cuniculus*), donkey (*Equus asinus*) and cattle (*Bos taurus*). These species prey on threatened species and/or compete for resources and are listed as key threatening processes under the EPBC Act (DoE, 2015; DSEWPaC, 2011c). While it is acknowledged that these threats currently exist in the region, the Project may introduce new resources (food/water sources) to the landscape, potentially increasing predator/competitor densities. This may increase the rate of predation and/or level of competition for listed threatened species. The Proponent has developed a Monitoring and Threat Abatement Plan (Additional Information, Appendix 4) which includes a fauna monitoring register for non-native predators (Additional Information, Appendix 4).

Recommendation 17

Before approvals or decisions are given or made for the Project, the Proponent shall develop the mitigation measures and actions identified in the Biodiversity Management Plan, including:

- **a) selection of infrastructure alignments that minimises, where practicable, disturbance to vegetation and habitat, with particular consideration given to minimising impacts to threatened species habitat**
- **b) a procedure for pre-clearance surveys for threatened species habitat**
- **c) development of a surveillance framework whereby any sightings, detection of animal sign (e.g. tracks, burrows, scats) or vehicle strikes are reported and trigger a reassessment of the mitigation measures and the need for monitoring**
- **d) collection of additional data for occupancy models for threatened species**
- **e) procedures for avoiding and/or managing the risk of introduced fauna on threatened species**
- **f) procedures for managing fire risk from the Project on habitat for threatened species**

g) weed hygiene and control procedures for avoiding the introduction and/or spread of weeds into habitat for threatened species

h) develop and implement mitigation tools pertaining to threatened species (e.g. Fire management plan, Domestic and Industrial Waste Management Plan, Weed Management Plan) and that are included in the Biodiversity Management Plan.

The NT EPA notes that the submission of the Biodiversity Management Plan under the *Mining Management Act* would protect threatened species from the mining aspects of the Project. To ensure threatened species and biodiversity are protected during the construction and operation of the remaining components of the Project, the NT EPA considers that it would be appropriate for the Minister for the Environment and Energy to require that the Biodiversity Management Plan is submitted for approval under the EPBC Act.

Summary

The NT EPA has considered the potential impacts of the Project on four threatened species and considers that significant impacts to those species are unlikely. This is due to the apparent absence of these species within the Project area and the regionally small area of potential habitat being impacted and/or the proposed avoidance and management measures proposed to be implemented by the Proponent. The implementation of the BMP at recommendation 17 with relevant management sub-plans (Fire Management Plan, Weed Management Plan) would contribute to avoiding or reducing the potential impacts and risks of the Project on the above species. The implementation of the management plans to address key threats to the species would ensure that the Project does not result significant impacts to the species.

Additionally, the proposed actions outlined in this report are not inconsistent with the black-footed rock-wallaby (Pearson, 2013), giant desert skink (McAlpin, 2011)and greater bilby (Pavey, 2006) recovery plans and are consistent with the fox, cat and European rabbit threat abatement plans (DSEWPaC, 2011c; DSEWPaC, 2011d; DoE, 2015). The NT EPA considers that the potential impacts to these species are unlikely to be significant.

4.3.4 Conclusion against NT EPA objective

With the implementation of relevant management plans and recommendations identified above, the NT EPA considers that the Project could be conducted in such a manner that its objective for terrestrial flora and fauna is likely to be met.

4.4 Social, economic and cultural surroundings

4.4.1 NT EPA objective

To protect the rich social, economic, cultural and heritage values of the Northern Territory.

4.4.2 Socio-economic considerations

4.4.2.1 Environmental values

The region's economic values largely relate to pastoralism (cattle grazing), with pastoral leases occupying about 82% of the area (Neave et al. 2006). The Project's social values are associated with its location in a remote area of Central Australia, with the closest town being Ti Tree (population 143) located approximately 52 km south from the mine site. The closest settlements are the homestead of Anningie Station (~30 km south-west of the mine site) and the Aboriginal community of Wilora, with a population of 129, is located ~20 km north of the eastern portion of the access road. Stirling Station covers

most of the Project area with a small portion of the haul/access road on the adjacent Anningie Station.

4.4.2.2 Potential impacts

The construction and operation of the Project would have the following potential impacts and risks to the environmental values for economic, social and cultural surroundings:

- positive impacts on employment and economic activity
- negative social interactions between local community and work force, possibly reducing community wellbeing
- increased demand on local infrastructure and services
- construction traffic impacting on users of the Stuart Highway.

4.4.2.3 NT EPA assessment

The construction and operation of the Project would provide local economic benefits to businesses as well as employment opportunities through the provision of resources, staff and services. The Project proposes an estimated capital expenditure of $310 million during construction and an annual operational expenditure of $105 million over the life of the Project (Additional Information, Appendix 8). It is expected that through the sourcing of goods and services the Project would generate business opportunities in the regional area and the wider area of influence, potentially including Alice Springs. Where possible, the Project will source goods and services from local suppliers in nearby communities. The Proponent aims to conduct an 'Opportunities for local businesses' expo at Wilora, Ti Tree, Barrow Creek and Alice Springs.

The Project is expected to provide up to 225 jobs during construction (2018-2019) and 170 jobs during operation (2019-2036). Most of the workers will be fly-in fly-out (FIFO) to the Ti Tree airport facility (70 km from the mine site) with bus transport to the Project's accommodation facility hence it is unlikely to generate demand for local accommodation, housing or community services. The upgrade of the Ti Tree airstrip will generate additional short term employment during construction, and long-term employment for staff manning the terminal. The Proponent aims to hire local workforce with a target of 15% Aboriginal workforce. Although potential draw of existing workers from other industries may occur, the Proponent is committed to long term employment, skills training and mentoring for Aboriginal people from the Project Area. The proposed Indigenous Workforce Management Strategy will help manage the Project workforce, maximise benefits for local employment and manage cumulative impacts on demand for local workers and employment opportunities to ensure that benefits from mining activities, such as employment and training are shared with local communities (Supplement).

The Proponent has committed to establish a TNG Community Benefit Fund to provide support for social infrastructure, education programs or other suitable development activities in the regional area (Additional Information, Appendix 8). The Project's staff would receive cultural awareness training to become aware of the different language groups and cultural sensitivities relevant to the Aboriginal people within the Project area as well as surrounding language groups and Aboriginal communities (Additional Information, Appendix 9). Moreover, possible impacts on community values and conditions would be mitigated through a proposed Grievance Management Procedure allowing the community to express concerns and the Proponent to respond appropriately.

The Proponent has developed a Social Impact Management Plan (SIMP) (Additional Information, Appendix 8) which summarises the potential social impacts of the Project and identifies the measures and plans/policies that would be implemented to avoid or

manage the identified potential impacts. To ensure engagement from the Indigenous workforce, the Proponent would implement the Indigenous Community Engagement and Workforce Management Strategy (Additional Information, Appendix 7) which aims to develop and deliver increased employment opportunities for local Aboriginal people in the vicinity of the Project. The Strategy includes provisions for a culturally safe and respectful workplace which will achieve sustainable employment for Indigenous people. The Indigenous Community Engagement and Workforce Management Strategy (Additional Information, Appendix 7) outlines how local Indigenous communities are to be consulted, what matters they are to be consulted on and during which phases (Planning and Approvals, Construction, Operations and Closure) of the Project. The NT EPA considers that a consultation group should be formalised, with all parties understanding the purpose of consultation and their own role in it.

Recommendation 18

The Proponent or operator shall establish a community consultation group with Aboriginal people and relevant stakeholders to provide a forum to:

a) **consult with Aboriginal people on matters relating to the Project workforce, to maximise benefits for local employment, and to manage cumulative impacts on demand for local workers and overall employment opportunities**

b) **consult with Aboriginal people on the appropriate response if monitoring of ground water drawdown is shown to influence the culturally significant phreatophytic vegetation**

c) **consult with Aboriginal people on the status and acceptability of impacts to the giant sweet potato population bisected by the haul/access road and determine contingency plans if unacceptable impacts arise**

d) **consult with Aboriginal people on the final alignment of the haul/access road and the borrow pits**

e) **undertake ongoing stakeholder and Aboriginal people consultation on agreed post mining land rehabilitation and uses.**

Potential impacts to users of the Stuart Highway include interacting with increased vehicle movements (e.g. transfer bus and other mine site vehicles) each day between the mine site and rail loadout facility. To minimise any inconveniences, an at-grade intersection will be established between Stuart Highway and the haul/access road which will be designed in consultation with the NT Department of Transport. This will allow separating mine traffic from highway traffic. A traffic assessment indicates that the proposed increase in traffic is unlikely to impact the capacity of the highway as it currently operates at around 3% of its designed capacity.

Summary

The NT EPA considers that the proposed involvement of local communities and Aboriginal people during the different needs of the Project (e.g. provision of services, labour) is appropriate. Additionally, the NT EPA considers that the proposed Indigenous workforce management strategy is appropriate as well as the inclusion of local employees. The Proponent aims to provide training to maximise long-term employment as well as minimising skilled labour draw from other businesses within the Project. The NT EPA makes recommendation 18 to ensure that benefits from mining activities, such as employment and training are shared with local communities as well as possible impacts on culturally significant vegetation and post mining land rehabilitation and uses.

The NT EPA considers the proposed increase in traffic to the Stuart Highway is not likely to impact current use of the road, and considers that the use of the proposed engineering solutions (e.g. underpass, at-grade intersection) are appropriate.

The NT EPA is satisfied with the mitigation tools (e.g. Social Impact Management Plan, Workforce Management Strategy, Community Benefit Fund, Grievance Management Procedure) as presented in the Additional Information (Appendix 9) and that their development and implementation will ensure the environmental objective for this factor is likely to be met.

4.4.3 Cultural heritage values

4.4.3.1 Environmental values

No historic heritage sites or areas of potential archaeological deposit were identified within the study area (Draft EIS, Appendix K). One sacred site at the north-east of the pit was located as part of a sacred sites survey.

4.4.3.2 Potential impacts

The pit flood levee is in the vicinity of an Aboriginal sacred site and has the potential to disturb the site.

4.4.3.3 NT EPA assessment

The Proponent sought sacred sites clearance by the CLC on behalf of Aboriginal people. The CLC identified a Sacred Site Exclusion Zone and Restricted Work Area over parts of the mine site, accommodation village, transport corridor, rail siding, pipeline and borefield. In order to authorise any sacred site clearance, the Proponent will need to apply for a certificate issued by the Aboriginal Areas Protection Authority (AAPA).

For the sacred site identified at the north east of the pit, the Proponent has committed to constructing the flood bund/levee in a manner which avoids impact to this sacred site. The NT EPA sought assurance from the Proponent that the proposed levee would not impact on an Aboriginal sacred site located to the north east of the pit. The Proponent committed to constructing the flood levee so as to avoid impact to the sacred site.

The commitment by the Proponent to obtain an AAPA certificate under the *Northern Territory Aboriginal Sacred Sites Act* would identify the location of any sacred site(s) and associated restricted works area(s). The NT EPA expects that the Proponent would undertake the action in a manner consistent with any conditions of the certificate to avoid impacts on the registered sacred site.

Summary

The NT EPA is satisfied that the Proponent has correctly identified the cultural values of the site. The Proponent will be required to apply for an Authority certificate issued by AAPA and implement design and management controls to ensure that the sacred site at the northeast of the pit will not be impacted.

4.4.4 Conclusion against NT EPA objective

With the implementation of relevant management plans and recommendations identified above, the NT EPA considers that the Project could be conducted in such a manner that its objective for social, economic and cultural surroundings objective is likely to be met.

5 Whole of Project considerations

5.1 Closure and rehabilitation

The NT EPA considers that greenfield mining development in the Territory should integrate mine closure planning with mine planning, and that this should include best practice closure and rehabilitation requirements prior to authorisation of mining activities. In the absence of Mine Closure Guidelines in the Northern Territory, the NT EPA refers to the principles of mine closure planning listed in the WA Guidelines for Preparing Mine Closure Plans (DMP, 2015). The NT EPA recognises that mine rehabilitation and closure planning occurs at all stages of mining and that the Mine Closure Plan should be based on the WA Mine Closure Guidelines (or subsequent NT Mine Closure Guidelines) with regular review, development and continuous improvement throughout the life of the mine including any period of care and maintenance.

The NT EPA is of the opinion that the current closure plan (Draft EIS, Appendix M) presented by the Proponent is conceptual and notes that the Additional Information has updated the closure concepts in respect of the proposed IWL which replaces the WRD and TSF proposed in the Draft EIS. The Proponent has stated that this Conceptual Mine Closure Plan would be updated and to be submitted to DPIR.

The NT EPA notes that under the MM Act, a mining security bond would be required for the Project that would be utilised by the NTG, if required, to prevent, minimise or rectify environmental harm or for the completion of rehabilitation. The NT EPA recommends the security bond be revised based on the updated Mine Closure Plan to ensure the costs of rehabilitation and post-closure liabilities are not borne by the NTG and the community, in the event of the Operator abandoning the site or becoming insolvent. From the mine approval stage throughout the mine life, the Mine Closure Plans should demonstrate that ecologically sustainable mine closure can be achieved, consistent with agreed post-mining outcomes and land uses, and without unacceptable liability to the NTG (DMP, 2015).

Post closure, the pit is proposed to remain an open void and contain a pit lake that would become saline and require restricted access by people and fauna. Conceptual closure includes the IWL allowing for co-disposal of 65 Mt of waste and approximately 60 Mt of tailings, 40 metres high and covering 237 ha (Additional Information, section 2.1.2). The Proponent considers that the proposed sequence of mining is the most geotechnically and economically feasible however, it precludes the potential for pit backfilling. While it is the NT EPA's preference that open pits or voids be progressively backfilled and that this option is thoroughly and transparently evaluated in the iterations of mine closure plans over the life of the project, the NT EPA also understands that there are other considerations that will need to be taken into account, including economic, before such decisions are made. The NT EPA considers the Proponent should provide alternative risk based rehabilitation options in future iterations of the closure plan as site-specific information about the site and pit is collected over time and technology and management evolves. To address this, NT EPA makes recommendation 19 to ensure alternative rehabilitation options are considered prior to acceptance of the Mine Closure Plan by the regulator.

The Mine Closure Plan will be continually reviewed over the mine’s life and further work on final rehabilitation of the final landforms can be provided during the operational phase. The NT EPA considers the Proponent should demonstrate that progressive backfilling of the mine pit is not a viable option and provide a cost benefit analysis highlighting alternative rehabilitation options in future iterations of the closure plan. This includes a comparison of the long term or residual environmental risk between the current conceptual closure plan (including an open pit lake with uncertain extent and duration of groundwater loss/drawdown impacts, and IWL structures on the surface) and other alternatives including backfill of the final void with any mined waste materials that

may present long-term risks to the environment. The mining security bond can be adjusted to reflect the proposed design and progressive rehabilitation works.

The design of the IWL is to be based on further characterisation of representative waste rock to inform selective placement of the various waste types and must meet specific management criteria, as discussed in section 4.2.1.3. This would ensure IWL design, including cover design, is appropriate for successful closure. The NT EPA notes that the IWL is a highly engineered structure, consisting of standard 10 m batter heights of up to 40 m and recommends the Proponent consider alternative landforms that may blend more with the surrounding landscape and retain stability for the long term.

The NT EPA recommends that the Proponent demonstrates that these proposed final landforms and rehabilitation closure strategies support the principle closure objectives for rehabilitated mines in accordance with the WA Guidelines. This will also include consultation between the Proponent and stakeholders as outlined in recommendation 18 on the agreed rehabilitation objectives and post mining land uses. The Mine Closure Plan should demonstrate that the rehabilitated mine will be safe to humans and animals, geo-technically stable, non-polluting/non-contaminating and capable of sustaining an agreed post-mining land–use (DMP, 2015).

Recommendation 19

Approvals and decisions for the Project should have conditions that require the iterations of Mine Closure Plan to include:

a) **alternative risk-based rehabilitation options, including progressive backfilling, that identify a range of closure scenarios and strategies for the integrated waste landform and the pit and provide justification that the preferred closure option minimises environmental risks**

b) **identification and management of knowledge gaps relating to closure-specific technical information; including environmental baseline data, waste characterisation, pit lake characterisation, and review of monitoring data; to inform sustainable mine closure**

c) **details of pre-closure research trials, investigations and modelling aimed at closing knowledge gaps to inform detailed rehabilitation design. These are to include, but not limited to, vegetation trials, final cover materials, capping design, surface runoff and groundwater studies particularly in respect of drawdown in the vicinity of the mine pit and final pit lake water quality.**

The Mine Closure Plan is to be peer reviewed by an appropriately qualified independent professional prior to submission to the relevant regulator.

The NT EPA is of the opinion that **progressive rehabilitation** should be implemented as part of Project planning and operations. Effective early planning would minimise rehabilitation costs and **progressive rehabilitation** would provide an early indication of rehabilitation success to aid in meeting closure outcomes (Australian Government, 2016). It is known that one of the main advantages in the use of dry stack tailings as proposed in the IWL, is the ease of progressive rehabilitation and closure of the Project (Davies, 2011).The NT EPA notes that the Proponent has indicated that construction of the IWL will enable progressive rehabilitation. Areas cleared would be sufficient for construction only and further clearing to accommodate expansion of the landform for the shallower slopes at closure would only occur prior to rehabilitation. Clearing would be staged to allow for progressive (approximately five year) stages of operation (Additional Information, section 3.2.2.2).Staged completion of the IWL would enable rehabilitation

works to be completed and rehabilitated during operations, rather than commencing rehabilitation works a few years pre-closure.

The NT EPA expects **progressive rehabilitation** to be an integral part of the Project and makes recommendation 20 to ensure sustainable closure and rehabilitation includes **progressive rehabilitation** of the IWL during operations. This would allow learnings from research, site investigations and rehabilitation performance monitoring to be responded to adaptively throughout the mine life. The NT EPA considers that mining authorisation should include conditions for **progressive rehabilitation**. This would reduce the disturbance footprint of the Project at any one time and could correspondingly reduce the mining security bond held by the relevant regulator. This would reduce the potential financial and environmental risks and post closure liabilities to the NTG and the community in the event of unforeseen closure or the Operator abandoning the site or becoming insolvent.

The NT EPA notes that the change in tailings management to disposal of 'dry stacked' material in the IWL has been made by the Proponent late in the assessment process. Davies (2011) considers that the most important closure element for dry stacked tailings is an assured surface runoff management plan. Cover material is required to resist runoff erosion, prevent dusting and to create an appropriate growth media for rehabilitation. The NT EPA makes recommendation 19 to ensure this is a prominent consideration in the development of the Mine Closure Plan.

The Proponent states that post closure, monitoring of groundwater at the monitoring bores would occur annually for five years (Draft EIS, Appendix M). The NT EPA considers that it is premature to determine the length of required groundwater monitoring post closure and states the need to define such monitoring with the regulator.

The Conceptual Mine Closure Plan provides for some infrastructure associated with other Project components such as the haulage road, Adnera load-out facility and the accommodation village to remain if beneficial and agreement is reached with the relevant party/landholder. Otherwise infrastructure would be removed and the site rehabilitated so that it is stable and non-eroding. The Conceptual Mine Closure Plan provides a general closure objective that areas disturbed by mining activities should have vegetation communities that are representative of the region and provide habitat for local fauna. This would also be consistent with return of the affected land to pastoral use.

Recommendation 20

Before approvals or decisions are given or made for the Project, the Proponent or Operator shall provide to the relevant regulator an updated Mine Closure Plan.The Mine Closure Plan must:

a) **provide details on the performance of progressive rehabilitation works and incorporation of progressive rehabilitation in mine planning activities**

b) **address all aspects of rehabilitation and mine closure, including stakeholder agreed post mining land use, rehabilitation objectives, completion criteria and rehabilitation monitoring (see recommendation 18)**

c) **include details of the pre-closure research trials and investigations that would inform, guide and support appropriate cover systems and rehabilitation of ecosystems for closure**

d) **include final landform designs that are consistent with surrounding topography of the area and consistent with current standards and best practice**

e) **include final IWL design that demonstrates assured surface runoff management post closure in respect of the placed dry stacked tailings**

f) **include refined modelling of the water balance and water quality of the pit lake**

g) **include a commitment to ensure all landforms, including the pit lake and the levee are safe and stable**

h) **include an adaptive management approach in response to progressive rehabilitation performance monitoring results to ensure rehabilitation is successful**

i) **establish ongoing monitoring and maintenance of the site post mining in accordance with an approved monitoring and maintenance program until such time as the relevant regulator directs.**

Approvals and decisions in relation to the Project shall include conditions that require reporting to the relevant regulator on progressive rehabilitation works and performance.

6 Matters of National Environmental Significance

The Australian Government Minister for the Environment and Energy has determined that the proposal is a controlled action under the EPBC Act as it is likely to have a significant impact on one or more Matters of National Environmental Significance (MNES). It was determined that the proposed action is likely to have a significant impact on the following matters protected by the EPBC Act:

- Listed threatened species and communities (sections 18 and 18A)

The NT EPA has assessed the controlled action on behalf of the Australian Government under an accredited assessment process. The Project has been assessed in accordance with section 87(4) of the EPBC Act and schedule 4 of the EPBC regulations.

This assessment report is provided to the Australian Government Minister for the Environment and Energy who will decide whether or not to approve the proposal under the EPBC Act. This is separate from any Northern Territory approval/s that may be required.

The NT EPA has assessed this factor to address the requirements of the EA Act and the EPBC Act in accordance with the accredited assessment process. The information used in this assessment was provided by the Proponent in the EIS (the Draft EIS, Supplement and Additional Information) and included consideration of the following plans, conservation advice and policies:

- EPBC Act Environmental Offsets Policy (DSEWPaC, 2012)
- a recovery plan for the Great Desert Skink (*Liopholis kintorei*) (McAlpin, 2011)
- National Recovery Plan for the Greater bilby (*Macrotis lagotis*) (Pavey, 2006)
- Recovery plan for five species of rock wallabies: Black-footed rock-wallaby (*Petrogale lateralis*), Rothschild rock wallaby (*P. rothschildi*), short eared rock wallaby (*P. brachyotis*), monjon (*P. burbidgei*) and nabarlek (*P. concinna*) 2012-2022 (Pearson, 2013)
- Threat abatement plan for predation by feral cats (DoE, 2015)

- Threat abatement plan for competition and land degradation by rabbits (DSEWPaC, 2011c)
- Threat abatement plan for predation by the European red fox (DSEWPaC, 2011d)
- Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses (DSEWPaC, 2012)
- Threat abatement advice for ecosystem degradation, habitat loss and species decline in arid and semi-arid Australia due to the invasion of buffel grass (*Cenchrus ciliaris* and *C. pennisetiformis*) (DoE, 2015)
- Conservation advice for the great desert skink (Threatened Species Scientific Committee, 2016) and greater bilby (Threatened Species Scientific Committee, 2016).

The NT EPA has prepared this assessment using the information provided by the Proponent in the EIS (the Draft EIS and Supplement). Additional resources have been considered in assessing the impacts of the Project and have been referenced where relevant.

6.1 Threatened species

The EPBC Act provides for the protection of the environment and key matters of national environmental significance. The Project was determined to be a controlled action due to the likely significant impacts on threatened species and communities. The potential for impact on relevant threatened species has been assessed in detail in section 4.3.3 of this report.

The NT EPA makes the following conclusions regarding the acceptability of any impacts on the four species listed under the EPBC Act that have suitable habitat in the Project area.

Vulnerable species

- The black-footed rock-wallaby (*Petrogale lateralis*, McDonnell Ranges Race) was not detected in targeted surveys although one scat was seen in the greater Project area. The NT EPA considers it is unlikely the Project would have an impact on this species.
- Only one great desert skink (*Liopholis kintorei*) was sighted during the targeted biodiversity surveys. The NT EPA considers it is unlikely that this species would be impacted by the Project. The NT EPA considers that the impacts to this species from clearing of suitable habitat would be acceptable.
- The greater bilby (*Macrotis lagotis*) was not detected in targeted surveys, and is unlikely to occur in the area to be impacted by the Project. The NT EPA notes that 642ha of suitable habitat will be impacted. This impact is not considered significant due to the quantity of suitable habitat available for the species and the absence of the species from the habitat being impacted.
- The dwarf desert spike (*Eleocharis papillosa)* was not detected in targeted surveys. Although suitable habitat for *E. papillosa* occurs on the Project area, the species is absent and the Project is unlikely to impact on adjacent important populations of this species.

The NT EPA considers that any potential impacts of the Project on species listed under the EPBC Act can be adequately avoided or managed, or are not significant on a regional scale. Any residual impacts to these species are likely to be acceptable.

7 Conclusion

In making this Report, the NT EPA had regard to the information provided by the Proponent, submissions on the Draft EIS, the Supplement, advice from specialists from the Northern Territory Government as well as relevant guidelines and standards. Following submission of the Supplement by the Proponent, the NT EPA requested, and was provided, additional information to complete the assessment. The NT EPA has assessed the Project against the NT EPA's objectives for the key environmental factors of: Hydrological processes; Inland water environmental quality; Terrestrial flora and fauna; and Social, economic and cultural surroundings. Other environmental factors are addressed in Appendix 1.

The Project is in an arid zone of Australia where groundwater is a scarce and valuable resource. The proposed borefield would abstract water from a groundwater resource that is poorly understood. There is uncertainty around the potential impacts of this abstraction to groundwater dependent vegetation. Over the course of the environmental assessment the Proponent modified tailings management from a wet tailings slurry to emplacement of 'dry' stacked filtered tailings. The NT EPA acknowledges that this change has resulted in a significant reduction in water required for the Project. The NT EPA recommends that the Proponent be required to implement practices for the sustainable use of groundwater for this Project. This includes minimising water consumption, applying corporate water governance and providing open and transparent reporting of the use of that groundwater resource. The NT EPA makes the recommendation for the development of a **Water Abstraction Management Plan** to ensure monitoring and updated groundwater models are used for adaptive management responses to achieve sustainable groundwater use in relation to current and future use for pastoral purposes and reliance of groundwater dependent vegetation on the water resource. The NT EPA also recommends transparent reporting of water management in an annual Water Management Report. While an adaptive management response to water abstraction is considered necessary, the NT EPA emphasises that adaptive management should not be viewed as an appropriate response or substitute for the provision of sufficient baseline information.

Surface water flows in the Project area are episodic with many years between flow events, and large flows spread laterally from channels across floodplains as sheetflow. Interruption of this sheetflow by construction of the haulage road has the potential to cause indirect impacts to the culturally important plant *Ipomoea polpha* subsp. *latzii (*giant sweet potato). Provision of engineered drainage structures within the haul road should mitigate indirect impacts to the giant sweet potato and the NT EPA makes recommendation 7 to ensure that monitoring is adjusted in response to further surface flow modelling, and occupancy modelling for the species. The NT EPA notes that co-location of the haulage road with an existing track six kilometres to the north of the recorded population of giant sweet potato, would avoid direct impacts and fragmentation of habitat for the species. The NT EPA recommends the selected alignment of the haul road minimises direct impacts to giant sweet potato habitat, noting that avoidance of the habitat would negate requirements for currently proposed mitigation and monitoring. Other potential impacts to surface water hydrology from the haulage road crossing the Hanson River, Murray Creek and other minor watercourses can be appropriately mitigated by construction of 'at-grade' floodways. However as this still allows floodwater occasionally over the road, there remains uncertainty over whether this floodway design will remain suitable for mine operation over the longer term and the NT EPA makes recommendation 8 to ensure any future changes to floodwater design undergo appropriate assessment and approval.

The NT EPA considers that there is a residual risk of acid and metalliferous drainage (AMD) occurring in the future and recommends further testing of mined and waste rock to inform detailed design for an updated Non Benign Material Management Plan to be implemented. If additional testing results in a change to the management of mined and waste materials, further environmental assessment may be required. The change in proposed tailings management and inclusion of the IWL came late in the assessment process and the NT EPA recommends independent technical review of the design, and annual inspection and auditing of the IWL to ensure that the IWL is operated as intended, meets expected outcomes and to promote a transparent regulatory process. If this is achieved, the proposed change to dry stacking tailings management would reduce the potential for impacts on groundwater environmental quality. As the assessment process has involved a number of iterations of documentation the NT EPA recommends that the Water Management Plan is updated, with expanded analysis of metals in groundwater monitoring as a precautionary measure and to ensure adequate baseline information is collected prior to operations commencing.

The NT EPA has considered the potential impacts of the Project on three threatened fauna species listed under the EPBC Act and one threatened species listed under Territory legislation (*Territory Parks and Wildlife Conservation Act*). For all fauna species the NT EPA is of the opinion that significant impacts can be adequately avoided or managed, or are not significant on a regional scale. Any residual impacts to these species are likely to be acceptable.

After mining, the pit and IWL would remain as permanent landscape features. A localised groundwater sink in the form of a pit lake would remain at the bottom of the mine void. The NT EPA considers it an unacceptable closure outcome with ongoing groundwater drawdown impacts from this sink and alternatives are to be addressed in the Proponent's Mine Closure Plan. High flows in Murray Creek have the potential to flood the pit and alter the downstream flow regime. The Proponent has proposed a flood levee and the NT EPA has made recommendation 9 to ensure the flood levee design provides certainty that the environmental values would be maintained in Murray Creek and the Hanson River downstream.

The NT EPA considers that effective long term containment of mining waste, post-closure or following unforeseen closure, is essential to ensure protection of the environment. The NT EPA has recommended that mine closure planning be an integral part of mine planning and that progressive rehabilitation is undertaken according to an approved schedule during Project operations, noting that dry stacking of tailings facilitates progressive rehabilitation. This would lower the risk of environmental harm during and after the life of the Project including any period of care and maintenance. The NT EPA recommends the Mine Closure Plan be updated prior to any approvals or decisions for the Project to inform the mining security bond required under the *Mining Management Act* (MM Act) and that it be regularly reviewed and updated throughout the life of the Project. The NT EPA recommends that the security bond be revised periodically based on the updated site activities and Mine Closure Plan to ensure the costs of rehabilitation and post-closure liabilities are not borne by the NTG and the community, in the event of the Operator abandoning the site or becoming insolvent. The NT EPA considers that surface water run-off management is critical in respect of placed dry stacked tailings and has recommended the final design of the IWL demonstrates this will be achieved.

The NT EPA makes 20 recommendations as an outcome of the EIA. These recommendations are for the Proponent and decision-makers to consider with respect to conditions of future approval processes and for the execution of the proposed action. The NT EPA emphasises that as the site specific and baseline data provided is not robust for some environmental risks, uncertainty remains around the potential for significant environmental impacts over the life of the Project. The NT EPA recommends that the environmental commitments, safeguards and recommendations outlined in the

EIS, this Assessment Report and in the final management plans, must be implemented by the Proponent and reviewed and enforced by the relevant regulator throughout the life of the Project to deliver acceptable environmental outcomes.

The NT EPA considers that, subject to the implementation of the recommendations, the Project can be managed in a manner that is likely to meet the NT EPA's objectives and avoid significant or unacceptable environmental impacts and risks.

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Appendix 1. Additional factors

Environmental Factor	Description of the Project's likely impacts on the environmental factor	Evaluation of why the factor is not a key environmental factor
Landforms **Objective**: Conserve the variety and integrity of distinctive physical landforms so that environmental values are protected	Impacts to landforms would occur through the following Project activities: • Creation of a permanent open-pit (~125 m deep) • Creation of permanent integrated waste landform with a 10 m batter and a 40 m maximum dump height	Landforms were not identified as a preliminary key environmental factor for this assessment. Having regard to the following: • The landforms surrounding the mine site are not considered to be physically distinctive • The Project's surrounding area and intended land-use after cessation of mining activities is broad-scale pastoralism that would not be significantly affected by the presence of an open pit that is effectively isolated (e.g. two-tiered fence) • The mine site is located in a near flat landscape adjacent to the northern end of the Djilbari Hills, with hills up to 50 m tall. The integrated waste landform will be lower than these hills (maximum 50 m high) and not visible from the Stuart Highway, 50 km to the west the NT EPA considers that it is unlikely that the Project would have a significant impact on Landforms and can be managed to meet the NT EPA's environmental objective. The NT EPA drafted recommendation 20 to address this.

Environmental Factor	Description of the Project's likely impacts on the environmental factor	Evaluation of why the factor is not a key environmental factor
Air quality and greenhouse gases **Objective**: Maintain air quality and minimise emissions and their impact so that environmental values are protected	Potential impacts to air quality and greenhouse gas (GHG) emissions would occur through the following Project related activities: • Fuel combustion for power generation and vehicle use • Clearing of 735 ha of vegetation • Use of explosives • Wastewater treatment • Transport of construction materials and employees to and from the site. • Dust generated by the Project either from the mining process itself as well as from haulage of the concentrate.	Air quality and greenhouse gases were not identified as a preliminary key environmental factor for this assessment. Having regard to the following: • The clearing of 735 ha of vegetation would be unlikely to result in GHG emissions that are significant on a national scale. • Transport related emissions, including GHG, would be unlikely to be significant on a national scale. • The implementation of the Dust Management Plan would minimise the generation and mobilisation of dust and impacts on sensitive receptors. • An alternative power technical and feasibility study was commissioned in October 2017. If successful, renewable energy will account for 26% of the total generation, providing a significant reduction in greenhouse gas emissions. the NT EPA considers that it is unlikely that the proposal would have a significant impact on Air Quality and Greenhouse Gases and this factor can be managed to meet the NT EPA's environmental objective.

Appendix 2. Geographic coordinates defining the Project area (datum: GDA94)

Project component	Mineral Lease	Point	Latitude	Longitude
Mine site	ML29855, ML28341 and ELR29627	1	21°37'15''	133°14'41''
		2	21°37'16''	133°16'60''
		3	21°36'30''	133°16'60''
		4	21°36'30''	133°17'36''
		5	21°36'28''	133°17'36''
		6	21°36'28''	133°17'52''
		7	21°36'30''	133°17'52''
		8	21°36'30''	133°18'00''
		9	21°38'30''	133°17'60''
		10	21°38'30''	133°17'30''
		11	21°38'60''	133°17'30''
		12	21°38'60''	133°17'10''
		13	21°39'16''	133°17'10''
		14	21°39'14''	133°14'40''
Mine camp	ML29856	15	21°38'15''	133°20'05''
		16	21°38'15''	133°20'32''
		17	21°38'37''	133°20'31''
		18	21°38'37''	133°20'45''
		19	21°39'09''	133°20'45''
		20	21°39'09''	133°20'05''