

ASSESSMENT REPORT 89

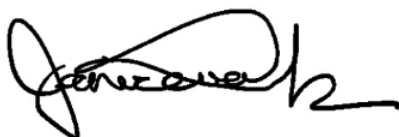
**Grants Lithium Project
Core Lithium Limited**

June 2019

Environmental Impact Assessment Process Timeline

Date	Chronology	Relevant clause under the EAAP*
8/11/2017	Notice of Intent received	6
3/05/2018	NT EPA decision issued - Environmental Impact Statement	8(2)(a)
30/06/2018	Draft Terms of Reference (TOR) released for public comment	8(3) and 8(4)
3/08/2018	Final TOR issued to proponent	8(5)(b) and 8(6)
3/11/2018	Draft EIS released for public comment for six weeks	9(1)
18/12/2018	NT EPA direction to prepare EIS Supplement issued	11A(3)(a)
22/03/2019	EIS Supplement received	12(3)
12/04/2019	Additional information requested from Proponent	14(2)(a)
12/04/2019	Additional comment requested	14(1) and 14(2)(b)
2/05/2019	Additional information received from Proponent	14
22/05/2019	Receipt of comment requested	14
17/06/2019	Assessment Report issued	14(3) and 14(4)

*Environmental Assessment Administrative Procedures



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Acting Chairperson

17 June 2019

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Acronyms, initialisms and glossary

Adaptive management	A learning-oriented approach to making decisions on the management of natural resources in the presence of incomplete knowledge or 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	Northern Territory Government Agencies having expertise and/or administrative responsibilities in respect of the Proposal
AEP	annual exceedance probability
AHD	Australian Height Datum
AMD	acid and metalliferous drainage
ANCOLD	Australian National Committee on Large Dams
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines
ARMCANZ	Agriculture and Resources Management Council of Australia and New Zealand
BoM	Bureau of Meteorology
DENR	Department of Environment and Natural Resources
DIPL	Department of Infrastructure, Planning and Logistics
DMS	dense media separation
DOEE	Department of the Environment and Energy (Australian Government)
DPIR	Department of Primary Industry and Resources
Draft EIS	Draft Environmental Impact Statement
EA Act	Environmental Assessment Act 1982
EC	electrical conductivity
EAAP	Environmental Assessment Administrative Procedures
EIA	Environmental impact assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan

Environment	All aspects of the surroundings of man including the physical, biological, economic, cultural and social aspects (section 3 of the Environmental Assessment Act 1982).
ESD	Ecologically Sustainable Development
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Australian Government)
ESCP	Erosion and Sediment Control Plan
GDE	Groundwater dependent ecosystem
ICMM	International Council on Mining and Metals
MM Act	Mining Management Act 2001
MMP	Mining Management Plan
MWD	mine water dam
NT EPA	Northern Territory Environment Protection Authority
NT	Northern Territory
PAF	potentially acid forming
Responsible Minister	Northern Territory Minister for Primary Industry and Resources
ROM	run of mine
The Minister	Minister for Environment and Natural Resources
The Proposal	Grants Lithium Project
The Proponent	Core Lithium Limited
The Supplement	The Supplement to the Draft EIS
The / this Report	Assessment Report 89, for the Grants Lithium Project
TSF	tailings storage facility
TPWC Act	Territory Parks and Wildlife Conservation Act 1976
WA	Western Australia
WDL	Waste Discharge Licence
WMP	Water Management Plan
WMPC Act	Waste Management and Pollution Control Act 1998
WRD	waste rock dump

Units and symbols

%	Percent
>/<	greater than/less than
bcm	bank cubic metre (undisturbed material volume)
dS/m	decisiemens per metre
g/cm ³	grams per cubic centimetre
Ha	Hectare
kL	Kilolitre
km	Kilometre
km ²	square kilometre
L	Litre
L/s	litres per second
Li	Lithium
M	Metre
m ³	cubic metre
mAHD	metres above the Australian Height Datum
mBGL	metres below ground level
ML	Megalitre
Mm	Millimetre
Mt	mega tonne
µS/cm	microsiemens per centimetre

Summary and recommendations

Environmental impact assessment (EIA) is a process for identifying potential environmental impacts and risks of a proposed action, evaluating the significance of those impacts and risks, and determining appropriate avoidance, minimisation and mitigation measures to reduce those impacts and risks to acceptable levels.

This Assessment Report (this Report) evaluates the environmental impacts and risks of the Grants Lithium Project (the Proposal), proposed by Core Lithium Limited (the Proponent) previously known as Core Exploration Limited. This Report concludes the assessment process by the Northern Territory Environment Protection Authority (NT EPA).

The Report is provided to the Northern Territory Minister for Environment and Natural Resources (the Minister) and to the Minister for Primary Industry and Resources (the Responsible Minister) for consideration in the development of conditions and approvals for the Proposal under the Mining Management Act 2001 (MM Act). This Report is not an environmental approval although it will guide the decision by the Responsible Minister.

The Proponent proposes to develop and operate the Proposal on mineral lease 31726 on the Cox Peninsula approximately 25km south of Darwin and 36km by road west of the nearest township of Berry Springs. The mine-site footprint encompasses 217ha of the 768ha mineral lease (approximately 28%) which is located on vacant crown land.

The Proposal consists of an open cut lithium mine and ancillary infrastructure. The ore would be mined using drill and blast methods and processed using crushing, primary screening and dense media separation (DMS) to produce lithium oxide concentrate for export. Lithium raw materials are used for lithium ion batteries in electric vehicles and energy storages. The proposed life of mine is 3 to 4 years.

The Northern Territory Environment Protection Authority (NT EPA) identified potential impacts and risks to: groundwater and surface water as a result of altered flows; soils, surface water and groundwater quality, primarily due to contamination from mining wastes; biodiversity values from direct and indirect impacts; and social, economic and cultural surroundings. Consequently, the NT EPA assessed the Proposal against the NT EPA's objectives for the key environmental factors of:

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

In making this report, the NT EPA had regard to information provided by the Proponent (Draft Environmental Impact Statement (EIS), Supplement and additional information), ten public submissions, specialist advice from NT Government advisory bodies, and relevant guidelines and standards.

The NT EPA considers the groundwater modelling sufficient to conclude that drawdown is unlikely to impact on any groundwater users or cause significant impacts to groundwater dependent vegetation communities. The NT EPA recommends that the Proponent be required to implement sustainable use of groundwater and surface water for the duration of the Proposal, and develop and implement a Water Management Plan (WMP) that includes robust pre-mining baseline groundwater information and a

comprehensive monitoring program to both refine the model and detect groundwater impacts.

The NT EPA considers that potential impacts and risks to ephemeral waterways from mine discharges can be managed and recommends that any mine-affected water is captured and contained within the mine site until monitoring and treatment indicates that controlled discharges, if necessary, can occur without adverse impacts. All active discharges to surface water would be regulated through the Mining Management Plan (MMP) or a Waste Discharge Licence (WDL), which will require appropriate compliance and flow monitoring locations, release limits and contaminant trigger levels to be established.

While the Proponent's geochemical assessment concluded that waste rock and tailings are likely to be non-acid forming and benign, the NT EPA considers the data preliminary and recommends as a precaution that an acid and metalliferous drainage (AMD) Management Plan be developed that includes validation of the sampling and geochemical assessment undertaken for the EIS and ongoing monitoring of the characteristics and potential impacts of mine waste material. Where waste characterisation or AMD monitoring confirms a risk of harm to land or water, the NT EPA recommends preventative or corrective action to ensure risks are reduced to an acceptable level, including returning AMD material to the mine pit.

The NT EPA considered the potential impacts of the Proposal on two threatened flora species listed under the Territory Parks and Wildlife Conservation Act 1976, one of which is also listed under the Environment Protection and Biodiversity Conservation Act 1999. The NT EPA is satisfied that significant impacts on all flora can be adequately avoided or managed. Any residual impacts to these species are not significant on a regional scale. The NT EPA considers that the Proposal is not likely to result in a significant impact to regional populations of any threatened fauna species that may occur in the Proposal area.

The Proposal involves leaving behind a pit void that would eventually fill with water and a combined waste rock dump and tailings storage facility as permanent features of the landscape. The NT EPA considers that closure of the Proposal must achieve the following two principal objectives for post-mining land use, consistent with WA Government Guidelines for Preparing Mine Closure Plans (herein referred to as 'the Closure Objectives'):

- be physically safe to humans and animals, geo-technically stable, geo-chemically non-polluting/non-contaminating and capable of sustaining an agreed post-mining land use
- ensure that premises are decommissioned and rehabilitated in an ecologically sustainable manner

The proposed life of the mine is only 3 to 4 years, whereas, mine legacy issues have the potential to be borne by the community and government for a much longer period. Such legacy costs must be accounted for in mine planning and closure, and be avoided.

The NT EPA considers that ensuring the Closure Objectives are met and there are no unacceptable long term impacts/costs for the local community or the taxpayer at the end of the site's economic life, prior to relinquishment, would align with the principles of ecologically sustainable development (ESD). The NT EPA recognises that a final decision on a closure option needs to be informed by a thorough and transparent evaluation of the benefits, risks and costs of all closure and rehabilitation options, including backfilling of the pit.

The NT EPA prefers that the pit be backfilled before relinquishment of the mineral lease unless the Proponent is able to demonstrate to the satisfaction of the relevant regulator and the NT EPA that retaining the final pit void would allow the above Closure Objectives to be achieved. Should expansion of mining in the region, by this or other proponents, be approved in the future then backfilling of pits with suitable mine waste materials should be mandated by government.

The NT EPA recommends that mine closure planning be included as an integral component of mine planning and that rehabilitation trials are undertaken early during operations to an approved schedule and results used to inform the progressive and final rehabilitation plans. The NT EPA recommends the Mine Closure Plan be finalised by the Proponent and approved by the Department of Primary Industry and Resources (DPIR) with advice from the NT EPA prior to mining commencing. The Mine Closure Plan is to be reviewed and updated annually throughout the life of the Proposal.

The NT EPA is satisfied that the social impact assessment method and stakeholder engagement undertaken by the Proponent for the EIS were generally adequate and has made recommendations to improve and emphasise the Proponent's social management measures and commitments. The NT EPA considers that the Proposal presents short term economic benefits for the local and regional area through employment and business opportunities, although these would disappear once mining is completed. Recommendations are made to enhance opportunities and reduce social impacts by ensuring that all relevant stakeholders, including Aboriginal people and potentially affected community members, are consulted and that their feedback is considered in the development of management plans for the Proposal.

While the NT EPA considers the potential impacts and risks have been adequately identified and assessed using available information, there is inherent uncertainty in predicting future impacts. This uncertainty is due to the complexity and variability of natural systems and, in part, the lack of site specific and baseline data provided in the EIS for some environmental risks. While there is potential for significant environmental impacts to develop over the life of the Proposal, the NT EPA considers that there are acceptable solutions to manage such impacts and uncertainties should they arise during or post-mining.

Implementation of robust monitoring programs and an appropriate adaptive management framework, developed in accordance with the NT EPA Guidance on Adaptive Management, will enable identification of changes in environmental conditions and management to adapt and respond to these changes with appropriate mitigation and contingency measures.

The NT EPA makes 17 Recommendations as an outcome of the EIA. These recommendations are for the Proponent to consider in undertaking the action and decision-makers to consider in developing approval conditions for the proposed action.

The NT EPA recommends that the environmental commitments, safeguards and recommendations outlined in the EIS, this Report and in management plans, must be implemented by the Proponent, and reviewed and enforced by the relevant regulators throughout the life of the Proposal to deliver acceptable environmental outcomes.

The NT EPA considers that, subject to the implementation of all recommendations, the Proposal 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

That the Proponent ensures that the Grants Lithium Project is implemented in accordance with all environmental commitments and safeguards:

- identified in the final Environmental Impact Statement for the Grants Lithium Project (Draft Environmental Impact Statement, Supplement to the Draft Environmental Impact Statement and Additional Information)
- recommended in this Assessment Report 89
- to the satisfaction of the relevant regulator

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

That the Proponent provides written notice in advance to the Northern Territory Environment Protection Authority and the Responsible Minister if it alters the Grants Lithium 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 have changed, in accordance with clause 14A of the Environmental Assessment Administrative Procedures.

Recommendation 3

That approvals and decisions for the Proposal have conditions that, to the satisfaction of the relevant regulator, ensure all water supply pipeline and access track construction activities, including the removal of vegetation and subsequent rehabilitation, are conducted in a manner that does not cause a material change to the shape, volume, speed and flow direction of any waterway or cause an alteration to the stability of any bed or banks of a waterway.

Recommendation 4

The Proponent must ensure the design, construction and ongoing operation of water dams is in accordance with ANCOLD guidelines. Compliance with ANCOLD guidelines must be monitored and reported by an independent engineer with appropriate qualifications and experience. The appointment of the independent engineer should be endorsed by the relevant regulator. A report on compliance with the ANCOLD guidelines should be provided to the relevant regulator and placed on the websites of (as applicable) the Proponent, the Operator and the relevant regulator.

Recommendation 5

That approvals and decisions for the Proposal have conditions that require the Proponent to update the Water Management Plan to the satisfaction of the relevant regulator prior to mining. The Plan should:

- include a framework identifying the location, timing, methods and parameters for the collection of groundwater and surface water hydrology information
- establish additional shallow groundwater monitoring sites near ephemeral drainage lines and creeks potentially impacted by groundwater drawdown and TSF seepage. The Water Resources Division, Department of Environment and Natural Resources, should be consulted in determining appropriate bore locations. Once sufficient monitoring data has been obtained, the adequacy of the location of each bore to meet its monitoring objective should be assessed. If the stated objective is not met, additional bores should be installed
- establish comprehensive and robust groundwater and surface water hydrology baseline datasets capturing seasonal variability prior to mining
- incorporate measures to monitor impacts on surface water conditions (volumes, flows and quality) across the site and downstream of the site
- incorporate measures to monitor and assess density driven outflow from the pit lake on surrounding groundwater quality
- actively and continually seek to improve knowledge of aquifers and groundwater tables, and surface water flows affected by the Proposal and incorporate these into the groundwater and surface water models at least biannually
- provide details on how water will be effectively managed during proposed operations, including minimising water consumption, maximising water reuse and minimising waste water
- report all water monitoring data with an assessment of the impacts on groundwater and surface water hydrology in a Water Management Report to be provided to the relevant regulator within six months of commencement of construction and on an agreed reporting period thereafter
- report water use performance in relation to targets, and any change to targets in Water Management Report to stakeholders
- be updated at least annually

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

Recommendation 6

That approvals and decisions for the Proposal have conditions that require the Proponent to develop an Acid and Metalliferous Drainage Management Plan to the satisfaction of the relevant regulator prior to mining that:

- is prepared in accordance with leading practice AMD management recommended in the Australian Government guidelines for preventing acid and metalliferous drainage (DIIS 2016c)
- incorporates all commitments made by the Proponent in the Environmental Impact Statement for further materials characterisation, with methods, scope, frequency and guidelines to be confirmed with the relevant regulator
- includes further assessment of AMD potential of mined materials and processing wastes, and testing for a full suite of metals and metalloids, including those elements subject to historic and proposed mining in the area (e.g. lithium, tantalum and tin), to identify the contaminants of concern for regular testing and monitoring
- includes a program for ongoing testing and classification of waste rock and tailings (solids, leachates and decant water) to inform appropriate management strategies
- includes mechanisms for adaptive management of PAF materials and AMD, if detected, in accordance with the NT EPA Guidance on Adaptive Management (NT EPA 2018d)
- requires the Proponent to develop and implement an action plan to manage AMD, if detected, to the satisfaction of the relevant regulator
- includes identification and quantification of suitable capping/encapsulation material to meet the Closure Objectives

Results of all investigations are to be reported to the relevant regulator for assessment on an agreed regular basis.

Where AMD is found in waste rock or tailings in significant quantities, such material is to be returned to the pit at the end of mining.

Recommendation 7

That approvals and decisions for the Proposal have conditions that require the Proponent to:

- contain all mine-affected water within the mine site until monitoring and treatment indicates that controlled discharges, if necessary, can occur without adverse impacts
- apply for a Waste Discharge Licence under the Water Act 1992 should discharge occur from the mineral lease
- ensure that water quality meets discharge criteria as agreed through the Mining Management Plan, or the Waste Discharge Licence if one is required
- develop as part of the Water Management Plan seasonal, site-specific surface water quality trigger values (wet/dry seasons as a minimum)

appropriate to maintain 95% level of protection of the receiving aquatic ecosystem

- undertake an assessment of the need for water treatment within water management and sediment dams, using water treatment trials. The assessment must clearly identify any water treatment additives required, their breakdown products and their potential to contaminate the environment. Polyacrylamide flocculants with more than 0.05% of the neuro-toxin acrylamide monomer should be avoided
- include any water treatment additives and their breakdown products, as determined in the above assessment, in the surface water monitoring program as part of the Water Management Plan
- demonstrate that discharge water quality can be effectively managed to ensure the activity does not adversely affect the receiving environment in terms of the declared beneficial uses and water quality objectives

Recommendation 8

That approvals and decisions for the Proposal have conditions that require the Proponent to:

- include acceptable water quality requirements for any groundwater or mine affected water used for dust suppression
- assess for and treat any soil contamination on the mine site consistent with the National Environment Protection (Assessment of Site Contamination) Measure 1999 prior to mine closure

Recommendation 9

That approvals and decisions for the Proposal have conditions that require the Proponent to include in the Water Management Plan (referred to in Recommendation 5):

- investigation of a full suite of metals and metalloids in groundwater, including those subject to historic and proposed mining in the area (e.g. lithium, tantalum and tin), to establish a baseline for groundwater monitoring
- a robust groundwater monitoring program that can quantify the extent and quality of any seepage from the proposed mine site
- appropriate trigger values based on robust pre-mining groundwater quality baseline data
- an assessment of chemicals added during processing, including an assessment of their behaviour and breakdown products in tailings, and their potential to contaminate the environment
- inclusion of applicable processing chemicals and their breakdown products, as determined through the above assessment, in the groundwater monitoring program
- contingency measures in the event that trigger values are exceeded

- a requirement that if monitoring confirms that seepage from the TSF is a potential source of contamination to groundwater and surface waterways after closure, the Proponent must install a low-permeability cover on the TSF to reduce rainfall infiltration rates into the landform or return the tailings to the pit void
- a requirement for an independent external audit of the groundwater quality monitoring program by a suitably qualified and experienced auditor after two years of tailings deposition and then annually. The appointment of the auditor is to be endorsed by the relevant regulator and the auditor is to report to the relevant regulator
- a program for on-going monitoring and any necessary remedial action post-mining operations and closure to the time of relinquishment of the mineral lease

All water quality monitoring data, trigger values, audit reports and an assessment of any impacts should be made publicly available in the Water Management Reports on the websites of (as applicable) the Proponent, the Operator and relevant regulatory authorities.

Recommendation 10

That approvals and decisions for the Proposal have conditions that require the Proponent to design all water holding structures with the potential to contain poor quality water to include a low permeability base.

Recommendation 11

That approvals and decisions for the Proposal have conditions that require the Proponent to include in the Mine Closure Plan:

- closure criteria that require pit lake water quality to meet site specific trigger values for surface water at 95% aquatic ecosystem level of protection (ANZG 2018)
- a robust monitoring program designed to validate and update modelling and determine whether or not the trajectory for pit water quality indicates closure criteria for the final pit lake can be met
- an assessment of the impact of density driven outflow of pit lake water on surrounding groundwater quality if backfilling of the pit void is not undertaken
- a contingency plan outlining trigger levels for actions, specific responses and mitigation measures, and consequences for rehabilitation and closure activities
- a requirement for an independent external audit of the pit lake water quality monitoring program and model by a suitably qualified and experienced auditor prior to relinquishment. The appointment of the auditor is to be endorsed by the relevant regulator. The auditor is to assess if closure criteria can be met at closure and post-closure. The auditor is to report to the relevant regulator

The water quality monitoring program and reports should be made publicly available on the websites of (as applicable) the Proponent, the Operator and relevant regulatory authorities.

Recommendation 12

The design, construction, management and closure of the integrated waste rock dump/tailings storage facility should be overseen by an appropriately qualified and experienced independent technical expert to provide:

- objective and independent expert review to the relevant regulator:
 - on the suitability of the site selected for the integrated waste rock dump/tailings storage facility including review of alternative sites and assessment of comparative risks
 - on the adequacy of the waste rock dump/tailings storage facility design to ensure long-term containment of tailings/residues or leachate from the waste rock dump
 - on the proposed performance monitoring program for the waste storages including potential seepage and leachates from the storage facilities
 - on decommissioning and final rehabilitation to minimise long-term risks and consequences to the environment, community, future land use and visual amenity from the waste storages
- regular inspections, auditing and reporting to the relevant regulator to ensure construction, management and closure is in accordance with the endorsed design and design objectives
- an independent assessment of the Proposal's management of tailings and residues, including performance monitoring results in an annual report to the relevant regulator and the Proponent
- an independent assessment of the quality assurance and quality control methods, procedures and tests used to verify that the technical specification is met in the course of construction
- assurance that the integrated waste rock dump/tailings storage facility, if left to remain as landforms in perpetuity, are constructed and rehabilitated to a suitable standard to achieve the Closure Objectives

The reports will be provided on the websites of (as applicable) the Proponent, the Operator and the relevant regulator.

Recommendation 13

The Proponent should:

- ensure the community is actively engaged in the decision-making process when determining blasting times, minimise the frequency and duration of any road closures, and use all reasonable efforts to restrict road closures to avoid peak traffic times to the satisfaction of the Department of Infrastructure, Planning and Logistics
- avoid blasting road closures on weekends, public holidays and peak traffic times

- implement best blasting practice to avoid impacts to public infrastructure and minimise the generation of dust, noise, vibration and fume emissions
- operate a suitable system to enable members of the public to receive up to date information on the proposed blasting schedule and associated road closures
- prepare and implement a Blast Management Plan and a Road Closure Management Plan for review and approval by the Department of Infrastructure, Planning and Logistics
- conduct periodic reviews of Blast Management Plan to evaluate performance and identify corrective action, if required
- install road signage to notify road users of blasting activities to the satisfaction of Department of Infrastructure, Planning and Logistics
- ensure protocols are in place to allow for passage of emergency vehicles during road closures

Recommendation 14

The Proponent should restrict road train haulage past the Berry Springs Primary School to outside of the hours of 07:45am to 08:45am and 2:30pm to 3:30pm on school days unless otherwise approved in writing by the Department of Infrastructure, Planning and Logistics in consultation with Berry Springs Primary School.

Recommendation 15

The Proponent must:

- develop and implement a Community and Stakeholder Engagement Plan prior to commencement of construction providing for:
 - information on recruitment to maximise local employment opportunities and to manage impacts on demand for local workers
 - demonstration that Aboriginal people, and particularly the Belyuen community, are aware of opportunities for employment and participation, and potential risks associated with mine activities impacting traditional enjoyment of cultural activities in the area
 - publication of a community complaints telephone contact number and email to allow community members to contact the Proponent in the event of any issues or concerns
 - development and implementation of a complaints management procedure that requires complaints to be recorded, investigated and abatement measures to be carried out if required, for handling community complaints and grievances for the duration of the Proposal. Noise related complaints should be reported to the Department of Primary Industry and Resources
 - ensuring the community is informed of planned blasting times well in advance

- effective ongoing stakeholder engagement and consultation on agreed post-mining closure, rehabilitation, land uses and access
- update the Social Impact Management Plan prior to the commencement of construction for approval by the relevant regulator and then update it regularly during construction and operation. The Social Impact Management Plan is to be informed by details of the matters outlined in the Blast Management Plan, Road Closure Management Plan and Community and Stakeholder Engagement Management Plan listed above
- publish a social impact management report prior to commencement of construction and then annually during operation of the Proposal. The report is to detail the effectiveness of the Social Impact Management Plan measures to manage the social impacts of the proposal. The Proponent is to make these reports publicly available on their website.

Recommendation 16

Closure of the Proposal should satisfy the following Closure Objectives for post-mining land use:

- be physically safe to humans and animals, geo-technically stable, geo-chemically non-polluting/non-contaminating and capable of sustaining an agreed post-mining land use
- ensure that premises are decommissioned and rehabilitated in an ecologically sustainable manner

Unless the Proponent can demonstrate to the relevant regulator and the NT EPA that retaining the final pit void would allow the above Closure Objectives to be achieved, the pit must be backfilled before relinquishment of the mineral lease.

Should expansion of mining in the region, by this or other proponents, be approved in the future then backfilling pits with suitable mine waste materials should be mandated by government.

Recommendation 17

The Mine Closure Plan should be finalised and approved by the DPIR with advice from the NT EPA prior to mining commencing. The final Mine Closure Plan must:

- meet the Closure Objectives
- be of a standard equivalent to or better than the minimum standard specified in the Western Australian Guidelines for Preparing Mine Closure Plans (DMP & EPA 2015) and include a system of quality assurance/quality control
- address decommissioning (including full removal) of the Mine Site Dam at the end of the 3 to 4 year life of mine, and rehabilitation and revegetation of the Mine Site Dam footprint to a condition similar to its pre-construction condition, to protect hydrological process and ecological values. A plan for decommissioning the Mine Site Dam is to be developed as part of the Mine Closure Plan, including management of sedimentation, rehabilitation and revegetation.

- address all aspects of rehabilitation and mine closure, including post-mining land use and rehabilitation objectives as agreed with stakeholders, landform designs, schedules for progressive rehabilitation, completion criteria and monitoring of rehabilitation success
- include site-specific closure criteria taking into account external threats, physical conditions of the site, species composition, structural diversity and ecosystem functionality of the revegetation, external exchanges and landscape integrity, and an overall condition of the final landform and rehabilitated ecosystems that is similar to the pre-mining condition
- manage declared weeds and exotic plants with high fuel loads until closure criteria are met, consider weed status and fire resistance of revegetated areas in closure criteria and manage fire until the majority of the woody revegetation is likely to survive the typical fire regime for the region
- include plans and a schedule for post-construction progressive rehabilitation of all areas of the water pipeline corridor and any other disturbed areas that would no longer be required
- include details of the rehabilitation trials and investigations that would inform appropriate landform covers and target ecosystems for all areas to be rehabilitated, including waste landforms and disturbed areas on rises, drainage systems and alluvial plains. The Mine Closure Plan should be updated in consideration of trial results when available
- provide for ongoing monitoring and maintenance of the site post-mining, in accordance with an approved monitoring and maintenance program that includes a trajectory to achieving closure criteria, until closure criteria are achieved and the site has been relinquished
- include details of reporting requirements to the relevant regulator on the performance of progressive rehabilitation works to inform decision-making to ensure successful post-mining rehabilitation
- include provisions for independent external audits by suitably qualified and experienced auditorsprofessionals of the development and implementation of the plan at least annually following commencement of operations, at closure and prior to relinquishment of the mineral lease
- include investigation of the long-term settling process of tailings and waste rock to inform construction of appropriate landform covers
- require independent periodic external audits by suitably qualified and experienced auditors of any pit backfilling activities including the backfill design, geotechnical information, placement, compaction, drainage and settlement of material layers and placement of any PAF material below the minimum lowest expected groundwater level

1 Introduction

1.1 Purpose of this report

Core Lithium Limited (the Proponent), proposes to develop and operate the Grants Lithium Project (the Proposal), an open cut lithium mine, located approximately 25km south of Darwin and 22km west of Berry Springs in the Northern Territory.

The Proposal has been assessed by the Northern Territory Environment Protection Authority (NT EPA) at the level of an Environmental Impact Statement (EIS) under the Environmental Assessment Act 1982 (EA Act). 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 with the potential to affect 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) who will provide the report to the Minister for Primary Industry and Resources (the Responsible Minister) to be taken into account in decisions made by the Northern Territory (NT) Government.

This Report is not an environmental approval however it will guide the decisions and conditions of approvals, authorisations and other matters.

1.2 Scope of the assessment

The NT EPA assessed the potentially significant environmental impacts and risks associated with the Proposal in line with the NT EPA's environmental factors and objectives and in accordance with the requirements of the EA Act.

The matters relating to the environment that the NT EPA considered necessary to be dealt with in the EIS for the Proposal were identified in the Terms of Reference (TOR) (NT EPA 2018c), which were developed in accordance with clauses 8(3) to (6) of the EAAP.

Based on the Notice of Intent, the NT EPA identified the following potential environmental impacts and risk categories that contributed to the decision to assess the Proposal at the level of an EIS:

- impacts on threatened species
- uncertainty about Proposal construction, operation, mine closure and rehabilitation
- impacts on surface water related to land clearing and soil erosion
- impacts on hydrological processes
- uncertainty around water demand, processing methods and potential for generation of acid and metalliferous drainage (AMD)
- contamination of surface waters, groundwater and soils
- impacts on social, economic and cultural surroundings

The Draft EIS for the Proposal was placed on public exhibition for six weeks between 3 November 2018 and 15 December 2018. A total of 16 submissions were received. These included submissions from six NT Government advisory agencies; two community groups; one non-government organisation and seven community members.

1.3 Information before the NT EPA

In making this Report, the NT EPA had regard to:

- the Notice of Intent
- the Terms of Reference
- the Draft EIS
- the Supplement to the Draft EIS
- additional information provided by the Proponent
- comments from NT Government advisory agencies on the draft Terms of Reference, Draft EIS and Supplement to the Draft EIS
- comments from the public on the draft Terms of Reference and Draft EIS
- technical and other reports and guidelines that are noted in the References (Section 8) to this Report

1.4 Approval and regulatory framework

The Proposal will require approval and regulation by the NT Government. The framework for the approvals and conditions relevant to the Proposal are provided at Section 1.7 of the Draft EIS and are summarised below.

The NT EPA provides this Report to the Minister. The Minister is required to provide a copy of this Report to the Responsible Minister, together with any written comments made by the Minister in relation to this Report. If the Minister makes a comment in relation to this Report, the Minister must comply with reporting obligations to the NT EPA, under section 8B of the EA Act.

The Proposal was not referred by the Proponent to the Australian Department of the Environment and Energy (DOEE) for assessment under the Environment Protection and Biodiversity Conservation Act 1999.

The Mining Management Act 2001 (MM Act) is the primary legislation for the authorisation of mining activities and the regulation of mining sites in the Northern Territory. The Responsible Minister, taking into consideration this Report, will decide whether to grant an authorisation under the MM Act and 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 provision of this Report to the Minister concludes the examination of the EIS by the NT EPA. The EIS and supporting documents can be viewed on the NT EPA website at: <https://ntepa.nt.gov.au/environmental-assessments/register/grants-lithium-project/draft-environmental-impact-statement>.

2 The Proposal

2.1 Proponent

The Proponent is Core Lithium Limited (ABN: 80 146 287 809), an Australian company listed with the Australian Securities Exchange. Its primary focus is development of the Grants Lithium Project.

The Proponent intends to transition its business from lithium exploration to mine development and ore processing. The Proposal would be the Proponent's first development project and the first lithium mine in the Northern Territory.

The Proponent holds exploration licences over 500km² of land in the Finnis River region where it continues to explore for other lithium deposits.

2.2 Proposal description

The Proposal includes the following key activities:

- construction and operation of an open cut mine targeting spodumene ore
- ore processing to concentrate lithium product from 1.5% to 5.5%
- expansion of an existing mine dam (Observation Hill Dam) from 364 megalitres (ML) to 628ML to increase reliable mine water supply
- transport of lithium concentrate in road trains along public roads to Darwin Port for export to international markets
- rehabilitation of mine-site infrastructure except the pit void and Observation Hill Dam

The Proposal infrastructure comprises:

- the mine site, including an open cut pit, run of mine (ROM) pad, mine processing plant, waste rock dump (WRD) incorporating a tailings storage facility (TSF), topsoil stockpile bund and bund around the site to avoid inundation
- expansion of an existing water storage dam (Observation Hill Dam)
- three new mine water storage dams comprising:
 - o one raw water dam (short term water supply for processing, dust suppression and office facilities)
 - o two mine water dams (for storage and reuse of pit water and TSF decant water)
- one new water supply dam (Mine Site Dam)
- an underground water pipeline extending 6km to the existing Observation Hill Dam
- supporting infrastructure such as access and haul roads, equipment laydown areas, car parking, wash-down facility, workshop, refuelling station, explosive storage, offices and emergency facilities

Removal of vegetation for the Proposal includes:

- clearing of 217ha for mine pit and infrastructure
- clearing of 6ha to install the water pipeline to Observation Hill Dam
- inundation of 9ha of land surrounding the Observation Hill Dam
- inundation of 19ha for the proposed Mine Site Dam

The scope of the Proposal presented in the Supplement changed substantially from the scope presented in the Draft EIS. Amended Proposal components were presented in the Additional Information and these are summarised in Section 2.2.3 of this Report. Changes between the Draft EIS and the Supplement occurred as a result of the increased mineral resource estimate following completion of the Grants deposit drilling program in 2018. The changes included:

- a 21% increase in total ore to be mined
- a 55% increase in waste rock
- an increase in pit depth from 180m to 200m
- a 70ha (or 38%) increase to the disturbance footprint
- an extended life of mine from 25 months to 35 months
- a 32% increase in greenhouse gas emissions

The NT EPA did not consider that the amendments changed the environmental significance of the Proposal, and therefore the changes were not notified under clause 14A of the EAAP. A detailed description of the Proposal initially presented in Chapter 2 of the Draft EIS was updated in Section 2 of the Supplement and Section 2 of the Additional Information.

2.2.1 Location

The Proposal is located approximately 25km south of Darwin business centre (90km by road) and 22km (36km by road) west of the nearest township of Berry Springs (Figure 1). The nearest community to the Proposal is Belyuen, 15km to the north-west.

The site access road intersects Cox Peninsula Road approximately 10km to the west of the Fog Bay Road turnoff to Dundee Beach and 20km west of the Litchfield Park Road. Bynoe Harbour Access Road turn-off is 9km to the east of the Proposal area (Figure 1).

2.2.2 Regional context

The climate of the region is tropical, characterised by distinct wet and dry seasons with an average annual rainfall of 1827mm at the Territory Wildlife Park Bureau of Meteorology weather station (station 14264), which falls predominantly between November and April. Annual average pan evaporation is 2688mm. Regional topography is generally flat with slopes in the area less than 5%.

The Proposal area is situated on rises intersected by drainage systems and alluvial plains. The proposed mine site drains into the West Arm catchment of Darwin Harbour 1.7km downstream, whereas, Observation Hill Dam drains to the Charlotte River within the Bynoe Harbour catchment (Figure 2).

The Proposal area is on and surrounded by undeveloped vacant crown land (Section 1 Hundred of Parsons). Previous mining in the surrounding area is evident from remaining tracks, minor ground disturbance and pit lakes. The closest historic mines are located 1.5km to the east and south-east of the Proposal area. The most recent mining activity in the area was the mining of tin and tantalum at Observation Hill in the 1980s and early 1990s.

The current land use at the Proposal area is mineral exploration, which extends over surrounding areas with rural living, recreation and tourism comprising the other main land uses across the Cox Peninsula. The closest conservation areas to the Proposal are Litchfield National Park located 42km to the south, and Blackmore River Conservation Reserve and Berry Springs Nature Park located 32km and 41km respectively to the east.

The Proposal is not located within the boundaries of any local government area; however, the haul route uses roads that pass through Litchfield, Palmerston and Darwin municipalities.

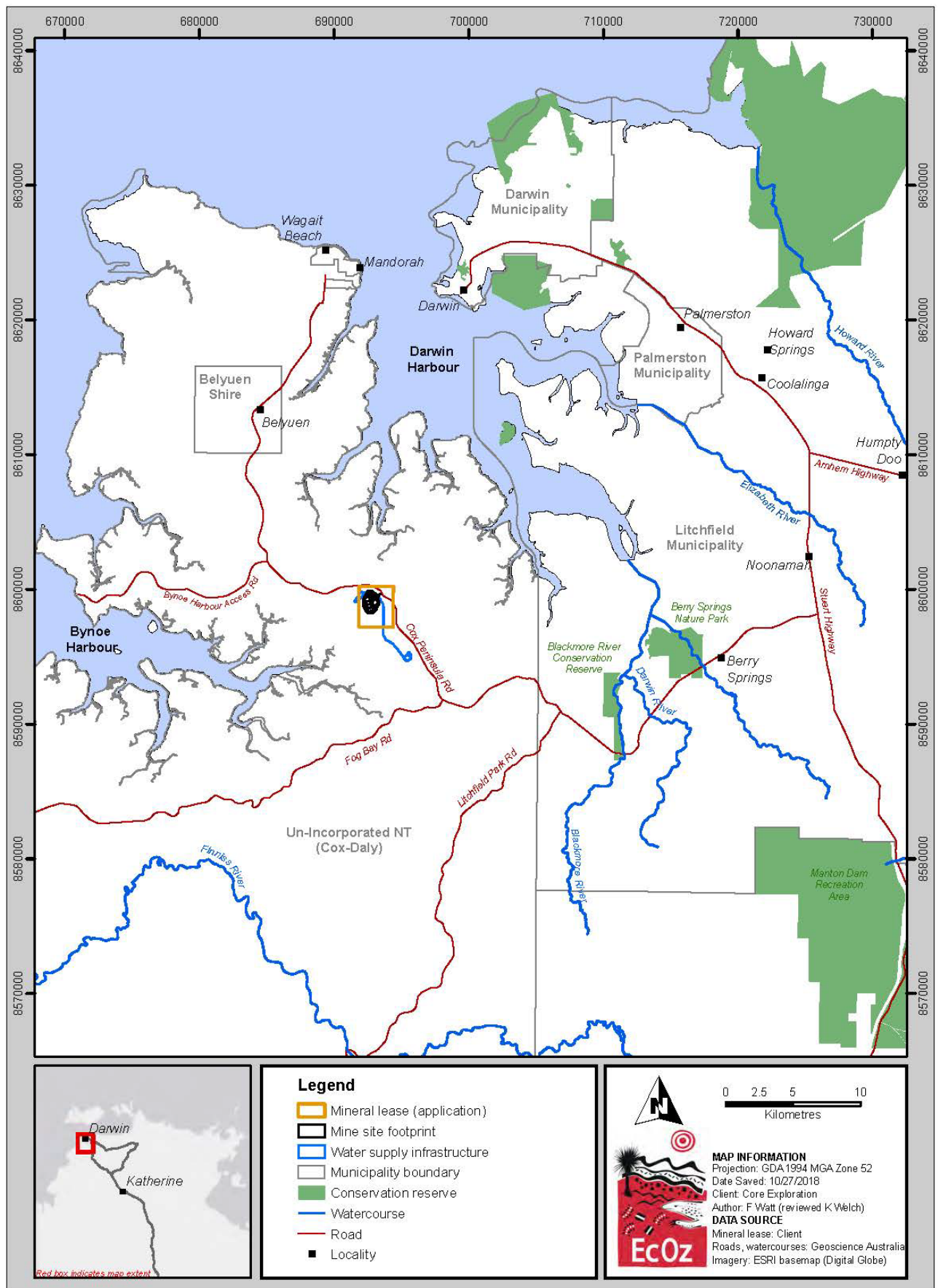


Figure 1 Project location and regional setting (source: Draft EIS)

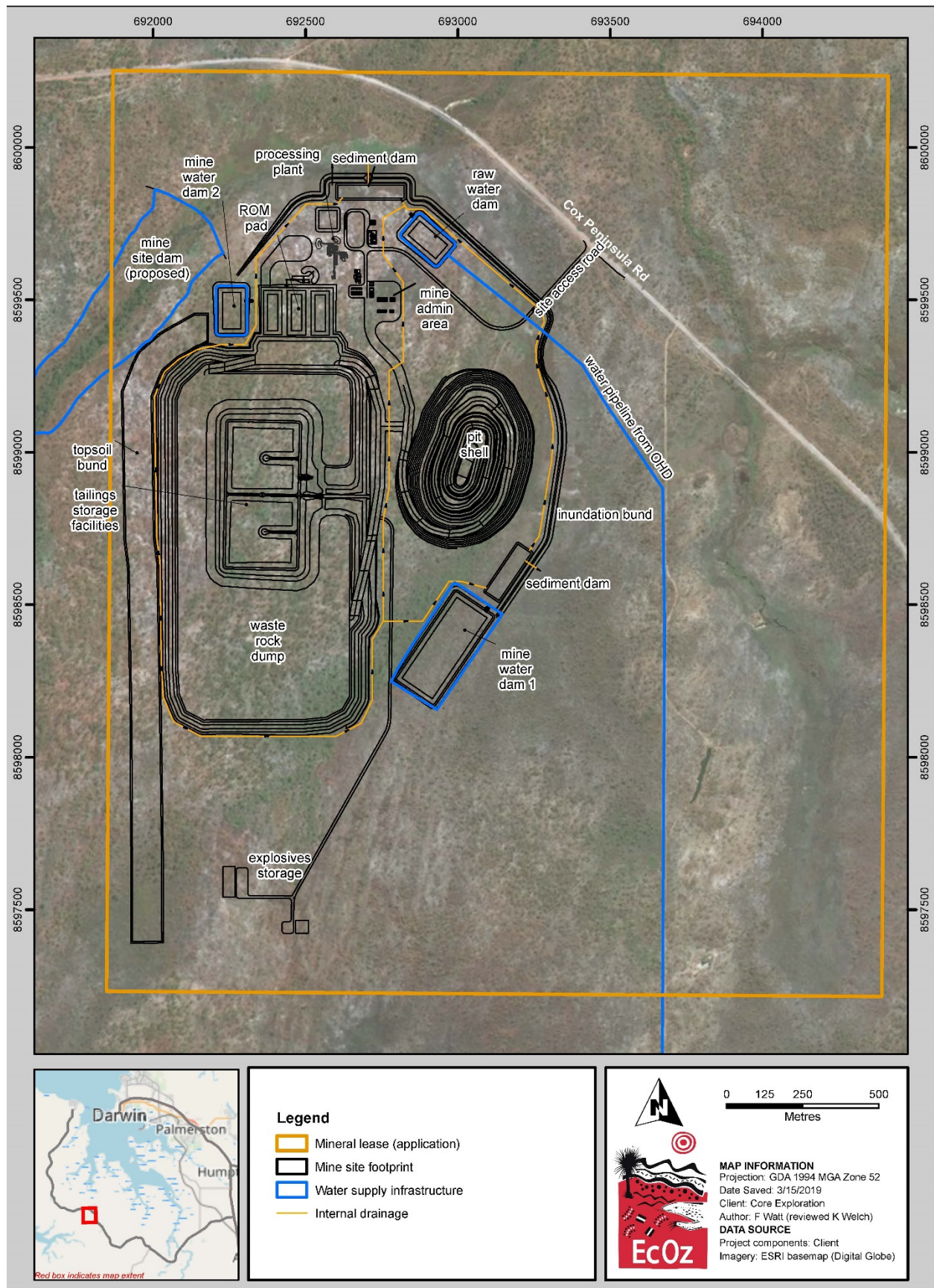
2.2.3 Overview of components

The components of the Proposal are summarised in Table 1 and their location shown in Figure 2.

Table 1 Key components and footprint of the Proposal (source: EIS Additional information)

Project aspect	Description	Scope
Material volumes	Ore mined	782,978 bank cubic metres (bcm) (2.03Mt)
	Waste mined	13,887,008bcm (36.2Mt)
Schedule	Life of Mine	35 months
Project footprint	Open pit footprint	24.3ha
	Integrated WRD/TSF footprint	88.9ha
	Topsoil stockpile	20.6ha
	Inundation bund	7.5ha
	Raw Water Dam (RWD)	2.1ha
	Other components (including mine water dam (MWD) 1 and 2)	73.6ha
	Total mine	217ha
	Water supply	38ha
Pit depth	Pit depth	200m
Mining method	Open pit drill and blast	
Mining operations	Operating hours: 24 hours, 7 days/week	
Transport	Haulage: 10 quad road train loads to port each day. Total of 20 truck trips along haul route.	
	Route: Cox Peninsula Road, through to the Stuart Highway, along the Stuart Highway to Tiger Brennan Drive and then Berrimah Road, to the East Arm Port	
Greenhouse gas emissions	Transport emissions	55,664tCO _{2-e}
	Stationary emissions	4,489tCO _{2-e}
	Land clearing	18,323tCO _{2-e}
	Total estimated emissions	78,476tCO _{2-e}
	Portion of NT annual emissions (2016)	0.48%
Water use and management	Water demand	2,018kL/day
	Sources: Groundwater inflows to pit range from 1600kL/day to 2600kL/day Make-up water to be supplied from Observation Hill Dam (volume 628ML) and Mine Site Dam (volume 387ML) Annual water use is about 737ML	
	Discharge requirements Off-site discharge of water in excess of supply requirements in November to March each year of operations	

Project aspect	Description	Scope
Workforce	Construction	200-250 people
	Operations	90 jobs
Economics	Capital cost	\$73 million
	Net Present Value	\$97 million
	Tax contribution (implied by the Proponent)	\$37.5 million
	Royalties paid to NT (implied by the Proponent)	\$32.3 million
Closure and rehabilitation	Open pit	Stabilised and abandoned with perimeter bund and left to form a pit lake
	Integrated WRD/TSF	Re-profiled to create a stable, non-polluting landform
	Infrastructure	All above-ground infrastructure will be removed
	Rehabilitation	Disturbed areas revegetated with local native species
	Public safety	Abandonment bund and signage in place to protect public safety



2.2.4 Construction

The construction period for mine infrastructure is five months, with ore processing commencing in month six. The activities during the construction phase of the Proposal would include vegetation clearing, site preparation, transportation of construction materials and equipment, and construction of mine and water supply infrastructure. Suitable pit overburden material would be used for site preparation and construction of mine site infrastructure including roads, ROM pad, integrated WRD/TSF, inundation bunds and storage dam walls. An existing track and intersection with Cox Peninsula Road would be upgraded to provide access to the Proposal area.

The Proposal includes raising the wall and spillway of the existing Observation Hill Dam to 31.5m Australian Height Datum (AHD) to increase the dam storage capacity by 58% to 628ML. This would include clearing of the additional inundation surface area which is approximately 9ha around the edge of the existing dam footprint. Material required to increase the capacity of Observation Hill Dam would be sourced from previously disturbed borrow areas.

A 6km underground polyethylene pipeline would be constructed to deliver water from Observation Hill Dam to the mine site infrastructure. Water for construction would be sourced from offsite until the Observation Hill pipeline or the Mine Site Dam is completed.

The base of the TSF and the outer wall of the integrated WRD/TSF would be established early in the construction phase from pit overburden and shallow waste rock. The TSF would be constructed to contain a 1% annual exceedance probability (AEP) event, with a spillway to withstand a 0.1% AEP flood event.

An inundation bund would be constructed around the eastern and northern extent of the mine site to divert surface runoff and prevent inundation of the mine site. The inundation bund would be designed and constructed to a 1% AEP flood height. This bund would be constructed from low permeability clay material excavated from the pit and would function as an abandonment bund following mine closure.

Construction traffic would comprise light vehicle traffic associated with the workforce and service vehicles from Darwin, and heavy vehicle traffic transporting plant, equipment and materials. Detailed descriptions of expected transport requirements are presented in Section 2.11 of the Draft EIS and Appendix G of the Supplement.

The construction workforce is estimated at 200 to 250 people, with a majority being contractors. The workforce would comprise mainly of residents from Darwin, Palmerston and surrounding areas. The local workforce would be accommodated in the community and therefore no onsite accommodation or fly-in fly-out workforce is proposed for construction.

2.2.5 Operation

A total of 2.03Mt of ore is expected to be mined over approximately three years using open pit drill and blast methods. Excavators and trucks would be used to remove and transport ore and waste rock to the ROM pad for ore processing or to the WRD for waste storage.

At the mine processing plant, ore would undergo a process of crushing, screening, and dense media separation (DMS) which involves wet screening to remove fines and vibration to separate feedstock. The feedstock material is mixed with a suspension of ferrosilicon and water which is close to the density of spodumene (2.7g/cm^3). The material is then fed through the DMS circuit which produces a concentrated product stream (5.5% lithium concentrate) and two separate waste streams, fines (tailings) and coarse rejects. Tailings would be pumped to the thickener where an inorganic polymer flocculant would be added to separate the slurry into underflow (reporting to the TSF)

and overflow (reporting back to processing circuit). The process water tank would receive water from the tailings thickener, TSF decant system and DMS circuit, with make-up water supplied from the mine water storages and surface water storages.

Transport of the concentrated product is proposed by road to Darwin Port for export to international markets. Quad-trailer road train movements are anticipated to be 10 return trips (20 movements) per 24 hour day, seven days per week for 29 months of operation.

The Proponent predicted the maximum water demand for the mine site to be 2.018ML/day (737ML/year). Water sources would consist of:

- groundwater/rainwater in-flows to the pit pumped to MWD 1 for subsequent use on the site
- surface water pumped from two off-site water supply dams (Mine Site Dam and Observation Hill Dam)

The main operational water requirements are for:

- processing by DMS (950kL/day)
- dust suppression for the pit, haul roads and WRD (1060kL/day)
- potable water for mine operations centre (8kL/day)

Potable water (8kL/day) may be sourced from the RWD, which is located within the mine site (Figure 2) and supplied by the two off-site water supply dams. Approximately 5% of the Proposal's water demand would be sourced from the two off-site dams (make-up water), while the majority would be sourced from pit water and to a lesser extent from TSF decant water. Make-up water volumes are predicted to peak at approximately 733kL/day during the first month of mining, averaging approximately 56.57kL/day after that.

On site power generation is proposed using diesel powered generators, with diesel transported to the site in tankers by licensed contractors. Bulk diesel storage would be in three 110,000L above ground tanks at the mine site, with remote storage at the integrated WRD/TSF (15,000L), Observation Hill Dam (5,000L) and MWD 1 (5,000L). Refuelling of all plant and equipment would take place within the mine operations centre.

During operations, the Proposal would provide approximately 90 jobs, with the majority being contractors. The Proposal aims to employ a majority local workforce with a portion of fly-in fly-out workers. No accommodation camp is proposed as workers would be residents or accommodated locally and would travel to and from the Proposal area for each shift. Workers would be transported from designated park and ride facilities to and from the site at the beginning and end of shifts.

2.2.6 Closure

The EIS stated that at the end of mine operations, the open pit (24.3ha) and integrated WRD/TSF (89.9ha) would remain as permanent features of the landscape. The pit void would gradually fill with water over a period of approximately 50 years, with an additional 5 years to reach a state of dynamic equilibrium where predicted pit lake levels stabilise at 7m to 8m below the existing land surface. Abandonment bunding would be established following closure to delineate the zone of instability around the pit. The Proponent proposes to install appropriate signage to restrict accessibility and warn the public of the safety hazard.

The integrated WRD/TSF would be profiled to blend in with the contours of the natural landscape, and then capped with soil and a rock mulch layer to minimise erosion during establishment of vegetation. Other mine site infrastructure would be removed and the site rehabilitated at the end of mining.

The Proponent's post-mining land use commitment is to rehabilitate the site to a stable, non-polluting landform which supports self-sustaining native vegetation comprising local species. Rehabilitation of the WRD base would be progressive. Rehabilitation of disturbed areas would involve re-profiling, ripping, covering with topsoil stored following clearing, and seeding. Progressive rehabilitation would initially be undertaken as a trial with results used to inform final rehabilitation methods and practices.

A draft Mine Closure Plan was included as Appendix D of the Draft EIS and updated in Appendix K of the Supplement.

3 Consultation

3.1 Proponent consultation

The NT EPA notes the Proponent consulted with stakeholders and the community during preparation of the Social Impact Assessment (Draft EIS Appendix L and M) in October 2017.

Further consultation was conducted from July to December 2018. Consultation included briefings, interviews and a market stall. Consultation methods included phone calls, emails, fact sheets, presentations, maps, newsletters and interview guides. The EIS stated that the Proponent engaged with approximately 25 to 30 people at the Berry Springs market stall on 26 August 2018 and provided factsheets to an additional 25 people. A summary of the organisations that were briefed and interviewed is provided in the EIS.

The key concerns raised by stakeholders during the Proponent's consultation were about blasting and road closure, heavy vehicle traffic, water use, closure planning, mining process and environmental impacts. Several stakeholders enquired about potential local employment opportunities.

The Proponent stated it emailed 14 other stakeholder groups and offered a briefing on the Proposal, however they either declined or did not respond. The Proponent also consulted with the NT government during preparation of the Supplement. Comments on the Draft EIS were responded to by the Proponent in the Supplement.

3.2 Public submissions

There were two formal opportunities for public comment under the environmental assessment process. The first opportunity was to inform the development of the EIS TOR and secondly to comment on the Draft EIS.

The draft TOR were advertised for comment between 30 June and 13 July 2018. The Proponent and four NT government agencies provided comment. No public submissions were received.

The Draft EIS for the Proposal was on public exhibition for six weeks between 3 November 2018 and 14 December 2018. Ten public submissions were received. This included submissions from the Wagait Shire Council, Berry Springs Primary School Council and Environment Centre NT, as well as seven submissions from community members.

In summary:

- the key issues raised by the Wagait Shire Council related to concerns about potential traffic delays and maintaining road access during times of blasting
- the Berry Springs Primary School Council raised concerns about potential safety risks due to increased heavy vehicle traffic passing the school

- the key issues raised by the Environment Centre NT related to:
 - o consideration of renewable energy sources for mine site power generation and offsetting emissions
 - o potential groundwater impacts and the Proposal's perceived inconsistency with the NT water allocation planning framework
 - o the proposal to retain the open pit void/lake rather than backfill the pit post-closure, citing community expectation
- local community residents raised issues relating to:
 - o road safety and deterioration of road conditions due to increased heavy vehicle traffic
 - o disruption to road users and traffic delays due to road closures
 - o potential noise impacts from blasting and truck movements
 - o potential impacts to surface water and groundwater resources from reduced flows, contamination and drawdown
 - o adequacy of closure and rehabilitation planning and alternatives for the open mine pit void (backfill or post-mining land use)
 - o impacts to flora and fauna, and introduction and spread of weeds
 - o potential downstream flooding impacts if dam walls were to fail
 - o potential cumulative impacts and assessment of this Proposal as part of a larger, long term network of lithium mines in the area
 - o quality of community engagement undertaken
 - o loss of amenity in the surrounding area

The Proponent responded in the Supplement to the issues raised in the public submissions. This information is available to the public on the NT EPA's website (<https://ntepa.nt.gov.au/environmental-assessments/register/grants-lithium-project>).

In preparing this Report, the NT EPA has considered each submission in relation to the Proposal's potential environmental impacts and risks.

The NT EPA acknowledges that the Proponent proposes to continue to engage with relevant stakeholders during implementation of the Proposal.

3.3 Consultation by NT EPA

The NT EPA consulted with nine NT Government advisory bodies in respect of the Draft EIS, Supplement and Additional Information when preparing this Report. The agencies consulted include Departments of the Chief Minister; Infrastructure, Planning and Logistics; Health; Tourism and Culture; Environment and Natural Resources; and Police, Fire and Emergency Services. In addition, the NT EPA consulted the Aboriginal Areas Protection Authority and Power Water Corporation. Following submission of the Supplement, the NT EPA engaged the Department of Primary Industry and Resources (DPIR) to provide technical information in respect of the EIS.

The NT EPA consulted with the Proponent at the NT EPA meeting held 4 to 6 December 2018.

The NT EPA has considered relevant environmental issues raised by stakeholders in making this Report.

4 Key environmental factors

Having regard to the Notice of Intent, the Draft EIS and Supplement, and comments from the public and advisory bodies during the EIS review, the NT EPA assessed the Proposal for its potential impacts on the NT EPA's factors and objectives. The NT EPA has identified the following key environmental factors that may be significantly impacted by the Proposal, and that are assessed in this Report (Table 2).

Table 2 Key environmental factors

Theme	Key environmental factor	Objective
Water	Hydrological processes	Maintain the hydrological regimes of groundwater and surface water so that environmental values are protected.
	Inland water environmental quality	Maintain the quality of groundwater and surface water so that environmental values including ecological health, land uses, and the welfare and amenity of people are protected.
Land	Terrestrial environmental quality	Maintain the quality of land and soils so that environmental values are protected.
	Terrestrial flora and fauna	Protect the NT's flora and fauna so that biological diversity and ecological integrity are maintained.
People and communities	Social, economic and cultural surroundings	Protect the rich social, economic, cultural and heritage values of the Northern Territory.

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, or that were addressed through consideration of the above factors, are summarised in Appendix 1.

The key environmental factors are discussed in Section 5 of this Report. The description of each factor shows why it is relevant and how it would potentially be affected by the Proposal. The assessment of each environmental factor contains recommendations for implementing the Proposal in a manner which protects the values associated with the factor. It concludes with a judgement by the NT EPA about whether or not the Proposal can meet the NT EPA's environmental objective for each factor.

5 Assessment of environmental factors

5.1 Overview

This section evaluates the Proposal and presents the views of the NT EPA on the environmental acceptability of the Proposal. The environmental acceptability of this Proposal was considered with regard to the principles of Ecologically Sustainable Development (ESD), through analysis of:

- the Proposal (particularly the components or activities that are likely to significantly impact the environment)
- the existing environment (particularly environmental values and sensitivities)
- the potential environmental impacts and risks of the Proposal and the evaluation of the significance of those impacts and risks

- the proposed avoidance or mitigation measures to reduce potential impacts and risks to acceptable levels and to meet NT EPA objectives

Recommendations are made in this Report to add to, 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 Proposal. 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 Proposal have not been finalised. Minor and insubstantial changes are expected in the design of the Proposal following the conclusion of the EIA process. It is necessary for approval mechanisms to accommodate subsequent changes to the environmental safeguards described in the EIS and recommendations in this Report.

If the Proponent is able to demonstrate to the NT EPA that changes are unlikely to increase potential impacts on the environment, then an adequate level of environmental protection can be achieved by modifying the conditions through relevant statutory approvals governing the Proposal. Otherwise, further environmental assessment may be required.

The NT EPA considers that this assessment is valid for five years from the date of this Report. If the Proposal has not substantially commenced in this period, the NT EPA requests that it be notified in writing by the Proponent.

Recommendation 1

That the Proponent ensures that the Grants Lithium Project is implemented in accordance with all environmental commitments and safeguards:

- **identified in the final Environmental Impact Statement for the Grants Lithium Project (Draft Environmental Impact Statement, Supplement to the Draft Environmental Impact Statement and Additional Information)**
- **recommended in this Assessment Report 89**
- **to the satisfaction of the relevant regulator**

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

That the Proponent provides written notice in advance to the Northern Territory Environment Protection Authority and the Responsible Minister if it alters the Grants Lithium 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 identifies and discusses, in relation to each key environmental factor, the environmental values and potential impacts and risks to these values based on the likely significance of potential impacts, the Proponent's investigations and studies, and the Proponent's commitments to identify, avoid, mitigate, monitor and manage the potential impacts and risks.

In defining its environmental objectives, the NT EPA also had regard to the principles of ESD articulated in the Intergovernmental Agreement on the Environment (Australian Government 1992):

- the precautionary principle
- the principle of intergenerational equity
- conservation of biological diversity and ecological integrity
- improved valuation, pricing and incentive mechanisms such as the “polluter pays” principle

The NT EPA has summarised its consideration of ESD in Appendix 2.

The NT EPA considers it essential that good mine closure planning be integrated into mine development and operations planning, particularly as the proposed life of mine is short. The NT EPA’s assessment of the Proponent’s proposed Mine Closure Plan is discussed in Section 6.

The NT EPA considers that closure of the Proposal is to achieve the following two principal objectives for post-mining land use, consistent with WA Government Guidelines for Preparing Mine Closure Plans (herein referred to as ‘the Closure Objectives’):

- be physically safe to humans and animals, geo-technically stable, geo-chemically non-polluting/non-contaminating and capable of sustaining an agreed post-mining land use
- ensure that premises are decommissioned and rehabilitated in an ecologically sustainable manner

The proposed life of the mine is only 3 to 4 years, whereas, mine legacy issues have the potential to be borne by the community and government (in the future for much longer than the proposed life of the mine).

The NT EPA considers that ensuring the Closure Objectives are met and there are no unacceptable long term impacts/costs for the local community or the taxpayer at the end of the site’s economic life, prior to relinquishment, would align with the principles of ESD, and take into account community objectives.

For the reasons discussed in Section 6, the NT EPA has a preference for backfilling the pit and has made recommendations 16 and 17 in this regard. However, for the purposes of the assessment of the following environmental factors, the assessment and associated recommendations are predicated on the basis of the proposal as submitted by the Proponent until such time as mine closure planning has determined whether the pit is to be backfilled or remain a pit void/pit lake.

5.2 Hydrological processes

5.2.1 Environmental objective

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

5.2.2 Environmental values

Surface water

The Proposal is located within the Darwin Rural Water Control District. Darwin Harbour has beneficial uses for waterways declared for agriculture, environment, cultural use, rural stock and domestic (NT Government 2010). The proposed mine site is located within the West Arm catchment of Darwin Harbour, while Observation Hill Dam is located

within the Bynoe Harbour catchment. These catchments are largely intact and undisturbed.

The proposed mine site disturbance footprint is surrounded by minor drainage lines, which join an ephemeral watercourse to the north and discharge after 1.7km into a mangrove lined tidal inlet of West Arm. Overflow of Observation Hill Dam drains first into a drainage line which then forms a first order stream that flows approximately 3km downstream into the Charlotte River. The EIS indicates that pools at the foot of the dam wall may be present throughout the year due to dam wall seepage.

In an average year, flows of downstream ephemeral creeks cease in April with the remaining pools gradually drying out in the dry season.

Surface water supports sensitive and significant vegetation types within and downstream of the Proposal area such as riparian vegetation, riparian rainforest, permanent and seasonal wetlands, and mangroves. Potential impacts on vegetation are discussed in Section 5.5 of this Report.

Groundwater

Initial groundwater investigations of the mine site indicated the presence of localised shallow aquifers in laterite associated with drainage lines, and a deeper aquifer associated with the Burrell Creek Formation. Shallow aquifer levels are highly responsive to rainfall. Diffuse rainfall is the dominant recharge and diffuse evaporation the dominant discharge mechanism of groundwater. Groundwater flow is north-east in the mine site and north to north-east in the region.

The Burrell Creek Formation aquifer has minor groundwater resources and low bore yields, typically less than 0.5L/s (NRETA 2008). Water in the aquifer is considered fresh with electrical conductivity ranging between 137 μ S/cm to 281 μ S/cm. The closest active production bores (domestic, NT Government investigation bore, Dogs Mine Bore) are approximately 13km from the Proposal area. The closest domestic water supply bore is for the Belyuen community, approximately 15km north-west of the Proposal area. Belyuen water supply is sourced from a small aquifer developed in the Welltree Metamorphics which has no direct connectivity with the Burrell Creek Formation aquifer.

The closest intensive land use is centred around Berry Springs, which utilises water resources from the high yielding Berry Springs Dolostone aquifer mainly for residential living, horticulture and stock grazing. There is no connectivity between the Berry Springs Dolostone and the Burrell Creek Formation aquifers.

Groundwater may support groundwater dependent ecosystems (GDEs). The GDE Atlas (BOM 2019) indicates that groundwater dependent vegetation communities have a low potential to occur south of the Proposal area and a moderate potential to occur to the north, west and south (downstream) of Observation Hill Dam. The EIS indicated that a riparian rainforest downstream of Observation Hill Dam may be a GDE.

5.2.3 Potential impacts

Surface water hydrology

The Proposal has the potential to impact on surface hydrology values through:

- changes to surface water flow volumes, regimes and pathways caused by mine site infrastructure including dams and discharge of excess water
- flooding caused by dam failures

Potential impacts on water quality are discussed in Section 5.2.5 of this Report.

Groundwater hydrology

The Proposal has the potential to impact on environmental values that depend on the existing hydrological groundwater regime through:

- groundwater mounding underneath the mine site due to seepage
- groundwater drawdown and/or alteration of groundwater flow directions associated with pit dewatering during mining operations and formation of a pit lake post-closure

Changes in groundwater levels and flows may have significant impacts on groundwater dependent vegetation communities.

5.2.4 NT EPA assessment

Surface water hydrology

Changes to surface water flow volumes, regimes and pathways

The Proponent's modelling indicated the proposed mine site infrastructure, two water supply dams, extractions for water supply and discharges of excess water would alter surface water flow volumes, regimes and pathways of the ephemeral watercourses surrounding and downstream of the mine site (West Arm catchment), and downstream of Observation Hill Dam (Charlotte River catchment).

In the West Arm catchment, construction and filling of the Mine Site Dam and other water holding structures would delay first flows immediately downstream of the Proposal and reduce flows in the early wet season. This would result in surface water flow reductions of up to 30% in November and 20% or less for the remainder of the wet season at the catchment outlet approximately 1km downstream of the mine site. Further downstream, at the receiving upper tidal reaches of mangrove communities, flow reductions are predicted to range from 12% to 23% during the wet season.

The modelled predictions of monthly discharges from MWD 1 range from 25ML to 134ML and could boost post-mine construction stream flow volume at the discharge point by 16% to 58% between November and December and by 2% to 6% between January and March. Note that these modelled flow reductions do not account for proposed mine water discharges from MWD 1, that are likely to occur during the same rain events, and into the same ephemeral water course. Such discharge flows could partially compensate for the predicted flow reductions.

The Proponent has committed to decommissioning the Mine Site Dam when no longer required. Should the Mine Site Dam be decommissioned at the end of the life-of-mine (3 to 4 years), the predicted surface water flow reductions and delays from the dam are not considered likely to significantly impact on the ephemeral drainage areas and creeks, and associated vegetation communities (mangroves and riparian rainforest) further downstream, with a return to more natural flow regimes expected to allow full recovery.

In the Charlotte River catchment, the upgrade and use of Observation Hill Dam for the Proposal would delay first flows and reduce surface water flows during operations. This is predicted to reduce surface water flows to the Charlotte River by 5% to 15% in the wet season. These interruptions to downstream flows would be reduced when water extraction for processing is no longer required at the end of the 3 to 4 year life of mine. Cumulative stress to downstream sensitive vegetation from extended mining and processing has not been considered in this assessment. The NT EPA makes Recommendation 5 to ensure that any impacts to hydrological processes in surface streams from the Proposal are monitored, measured, reported and managed to protect water and ecological values including beyond the 3 to 4 year life of mine.

A surface water quality monitoring program was included in the EIS as part of the Water Management Plan (WMP). While the Proponent has committed to measuring discharge volumes from MWD 1, groundwater inflows into the pit, rainfall on site and water volumes extracted from surface water storages, there is no indication in the WMP that monitoring of flow regimes in receiving water courses is proposed. This information may help to verify surface water modelling and, in conjunction with water quality and riparian health monitoring data, help detect mine-related impacts and inform appropriate mitigation actions. The NT EPA makes Recommendation 5 in this Report to ensure that surface water condition including volume and flow is monitored across the site and downstream of the site.

Monitoring of surface water flows at suitable locations downstream of water discharge points is likely to be a requirement of a WDL or authorisation under the MM Act. A surface water extraction licence is required under the Water Act 1992 for take of water from the Mine Site Dam and Observation Hill Dam. These licences would consider the loss of water to each catchment and actual take of water for both dams. Flow monitoring should be conducted downstream of Observation Hill Dam during operations to validate model predictions. Where monitoring results indicate considerable variance from modelled flow predictions, the surface water model should be recalibrated against observed flows and updated in accordance with Recommendation 5.

The 6km long water pipeline route may transect minor waterways and drainage areas. The associated clearing of a 10m wide corridor (clearing of 6ha in total) and construction of a 0.5m deep trench would have the potential to impact on these waterways. The NT EPA considers that work should be undertaken in a manner that does not cause a material change to the shape, volume, speed and flow direction of the waterway or cause an alteration to the stability of the bed or banks of the waterway, including the removal of vegetation and subsequent rehabilitation.

Recommendation 3

That approvals and decisions for the Proposal have conditions that, to the satisfaction of the relevant regulator, ensure all water supply pipeline and access track construction activities, including the removal of vegetation and subsequent rehabilitation, are conducted in a manner that does not cause a material change to the shape, volume, speed and flow direction of any waterway or cause an alteration to the stability of any bed or banks of a waterway.

Dam failure

The risk of dam failure was raised in several submissions to the Draft EIS. The Proponent assessed the overall risk of dam failures as moderate based on the likelihood of failure being rare and the consequence 'major' due to business risk for the Proponent and the potential for Cox Peninsula Road to be affected. Provided the Proponent designs, builds and maintains the two water supply dams in accordance with the Australian National Committee on Large Dams (ANCOLD) guidelines (2012) the NT EPA considers that the risk of dam failure can be managed to an acceptable level. To ensure the risk of failure is minimised, the NT EPA recommends that an appropriately qualified and experienced, independent engineer ensures the design, construction and operation of water dams comply with ANCOLD guidelines.

In a worst case scenario of a complete failure of all dams, the maximum volumes of water released to the downstream environments would be up to 628ML from Observation Hill Dam and 387ML from the Mine Site Dam. The resulting flash flooding would be greater than natural flooding during wet season storm events.

There are no residences or public infrastructure, except for Cox Peninsula Road, located downstream of the dams. The potential impacts of dam failure on the environment are

likely to be short term, localised, limited to riparian habitats and are not likely to be significant.

In response to comments received on the Draft EIS, the Proponent proposed to decommission the Mine Site Dam when it is no longer required. The Observation Hill Dam would remain in place as it is an existing dam and has some value to the local community. The presence of the Observation Hill Dam is consistent with future agricultural/grazing land use planned for the area in the Darwin Regional Land Use Plan (DLPE 2015). There will be residual risks and costs associated with the integrity of the dam and its maintenance in the long term, which are likely to be borne by the community and government.

Recommendation 4

The Proponent must ensure the design, construction and ongoing operation of water dams is in accordance with ANCOLD guidelines. Compliance with ANCOLD guidelines must be monitored and reported by an independent engineer with appropriate qualifications and experience. The appointment of the independent engineer should be endorsed by the relevant regulator. A report on compliance with the ANCOLD guidelines should be provided to the relevant regulator and placed on the websites of (as applicable) the Proponent, the Operator and the relevant regulator.

Groundwater hydrology

Groundwater mounding

Seepage from the TSF and other water holding structures could result in local recharge of the groundwater aquifers, which has the potential to cause localised mounding. Since the groundwater levels in the area are relatively shallow (registered bore data ranges from 0.2m to 11m), a groundwater mound has the potential to reach the surface in the wet season and to impact on the integrity of the TSF and other mine infrastructure.

To minimise seepage and groundwater mounding, the proposed design of the TSF maximises drainage through the structure and includes a low-permeability base and an under-drainage system to recover seepage. Despite seepage recovery, seepage rates into groundwater from the TSF are predicted to be 100kL/month during operations. Given the short life of mine, relatively low hydraulic conductivity of the underlying aquifers, and the predicted flow path of seepage towards the mine pit during operations, impacts of groundwater mounding are likely to be limited to the mine site. The NT EPA considers that the on-site impacts of groundwater mounding can be managed during operations if the WRD, TSF and other mine site infrastructure are appropriately designed and constructed to account for it.

The Proponent has committed to installing four new bores, two in the deeper Burrell Creek Formation and two in the surface laterite aquifer to monitor TSF seepage rates. The NT EPA considers that the proposed bore locations (particularly GWB13 and 14) should be reconsidered in relation to monitoring objectives in consultation with the Water Resources Division, Department of Environment and Natural Resources (DENR). At least 24 months of baseline groundwater data from existing monitoring locations is preferred prior to commencement of mining to establish seasonal variation in groundwater levels. The WMP should include appropriate contingencies in the event that standing water levels in monitoring bores show unseasonal increases.

Post-closure, the EIS indicates the TSF cover would be designed to allow rainfall to percolate through the landform without impacting on the integrity of the structure. The Proponent assumes that seepage rates would decline with no further additions of tailings; however, no modelling is evident in the EIS to verify this assumption. Groundwater mounding may occur during wet seasons post-closure when the pit void is

filled. The residual risks associated with mine site landforms would require management through ongoing maintenance and monitoring of structural integrity into the long term.

Depending on the quality of seepage from the TSF, a low-permeability cover may be required as part of mine closure, as discussed in Section 5.3 of this Report.

Groundwater drawdown

Concerns were raised in public submissions on the Draft EIS, that drawdown from deepening of the pit void could impact groundwater users. The EIS predicts that groundwater drawdown effects and redirection of groundwater flows as a result of the Proposal would be localised with the drawdown cone extending just beyond the western edge of the lease boundary when the pit is mined to maximum depth. The nearest groundwater user within the Burrell Creek Formation aquifer is 13km east of the proposed mine site. This licensed user is within a separate groundwater resource zone and, based on the Proponent's groundwater model, is unlikely to be impacted by the Proposal.

The NT EPA considers that potential impacts of a three-year groundwater drawdown of 0.1m to 0.5m depth on the vegetation communities of the surrounding ephemeral drainage areas and creeks are unknown. The NT EPA supports the installation and monitoring of additional shallow bores near ephemeral drainage lines and creeks potentially impacted by groundwater drawdown as recommended in the independent peer review of the WMP (Supplement Appendix B).

Groundwater dependent vegetation communities that may occur in the vicinity of Observation Hill Dam are outside the predicted drawdown envelope (approximately 3km south of the pit) and are therefore unlikely to be impacted. Potential impacts on GDEs are assessed further in Section 5.5.3 of this Report.

Baseline groundwater data has been recorded since mid-2017. The Proponent has committed to install additional monitoring bores to monitor the deep and shallow aquifers down gradient from the mine footprint. Bores would be installed to the south/south-west of the proposed integrated WRD/TSF facility, which straddles the catchment divide between Darwin Harbour (north) and Bynoe Harbour (west). The monitoring program would capture groundwater levels and water quality pre-mining (baseline), during mining operations and post-closure.

The NT EPA considers that the preliminary groundwater modelling predictions are based on limited data and will need to be validated with actual monitoring data. Continual review and updates of the modelling using data from the monitoring program will be required to improve its predictive capacity and enable ongoing assessment of potential environmental impacts from groundwater drawdown and TSF seepage as mining progresses.

Should the Proponent propose to expand its mining operations beyond the current scope, either within the Proposal area or within additional deposits, cumulative hydrological impacts would need to be assessed. The NT EPA must be notified of any such proposals in accordance with Recommendation 2.

Recommendation 5

That approvals and decisions for the Proposal have conditions that require the Proponent to update the Water Management Plan to the satisfaction of the relevant regulator prior to mining. The Plan should:

- **include a framework identifying the location, timing, methods and parameters for the collection of groundwater and surface water hydrology information**

- establish additional shallow groundwater monitoring sites near ephemeral drainage lines and creeks potentially impacted by groundwater drawdown and TSF seepage. The Water Resources Division, Department of Environment and Natural Resources, should be consulted in determining appropriate bore locations. Once sufficient monitoring data has been obtained, the adequacy of the location of each bore to meet its monitoring objective should be assessed. If the stated objective is not met, additional bores should be installed
- establish comprehensive and robust groundwater and surface water hydrology baseline datasets capturing seasonal variability prior to mining
- incorporate measures to monitor impacts on surface water conditions (volumes, flows and quality) across the site and downstream of the site
- incorporate measures to monitor and assess density driven outflow from the pit lake on surrounding groundwater quality
- actively and continually seek to improve knowledge of aquifers and groundwater tables, and surface water flows affected by the Proposal and incorporate these into the groundwater and surface water models at least biannually
- provide details on how water will be effectively managed during proposed operations, including minimising water consumption, maximising water reuse and minimising waste water
- report all water monitoring data with an assessment of the impacts on groundwater and surface water hydrology in a Water Management Report to be provided to the relevant regulator within six months of commencement of construction and on an agreed reporting period thereafter
- report water use performance in relation to targets, and any change to targets in the Water Management Report to stakeholders
- be updated at least annually

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

5.2.5 Conclusion against the NT EPA objective

The predicted reductions in surface water flows and delays in peak runoff caused by the Mine Site Dam and Observation Hill Dam are not considered likely to cause a significant impact on downstream ecosystems within the short term of the Proposal (i.e. 2 to 3 wet seasons). The NT EPA has recommended monitoring of downstream surface water flows to inform surface water quality monitoring and substantiate catchment yield assumptions in the surface water model. Removal of the Mine Site Dam at the end of mine life, in accordance with Recommendation 17 in this Report, would contribute to restoring natural flow regimes in order to protect hydrological processes and ecological values downstream of the mine site. Significant impacts on minor waterways and drainage areas from construction of the water pipeline are unlikely, if the NT EPA's Recommendation 3 is adhered to. Similarly, the proposed mine water discharges are not expected to significantly impact on stream flows in the ephemeral drainage areas and creeks downstream of the mine site.

In the unlikely event of a dam failure, flash flooding would impact parts of the Cox Peninsula Road. No residences or other public infrastructure are located downstream of the dams. The Mine Site Dam would be decommissioned when no longer required. The Proponent has committed to adhering to ANCOLD guidelines for construction of the Mine Site Dam and raising of the Observation Hill Dam. The NT EPA has made Recommendation 4 to ensure that the dams are designed and constructed to required specifications. Compliance with ANCOLD guidelines provides greater certainty of the structural integrity of Observation Hill Dam post-closure.

Based on the limited volume of seepage predicted, the short life of mine, the low hydraulic conductivity of the aquifer and the location of the TSF within the drawdown area of the pit, the NT EPA considers it unlikely that the groundwater mounding from the Proposal would lead to significant impacts on regional groundwater flows or on the integrity of appropriately constructed mine infrastructure. Continual monitoring of groundwater levels and flows in accordance with Recommendation 5, in conjunction with groundwater quality monitoring, would ensure impacts can be detected early and rectified in a timely manner.

Based on the localised nature (within the mineral lease) of the predicted groundwater drawdown and changes in flows, significant impacts on potential GDEs, beneficial uses and availability of water resources to the nearest users (13km from the mine site) are unlikely.

The surface water and groundwater hydrology values of the beneficial uses declared for the Darwin Harbour Region are unlikely to be impacted by the Proposal. After closure, the remaining Observation Hill Dam could provide water for beneficial uses including agriculture, rural stock and domestic purposes.

With the implementation of the Proponent's commitments and relevant management plans, regulation of mine water discharge, and the NT EPA's recommendations identified above, the NT EPA considers that the Proposal could be conducted in such a manner that its objective for hydrological processes is likely to be met.

5.3 Inland water environmental quality

5.3.1 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.

5.3.2 Environmental values

Surface water

The Proposal area is located within the West Arm catchment of Darwin Harbour, a declared Beneficial Use Area with specific Water Quality Objectives for the Darwin Harbour Region (NRETAS 2010a) for all ground, surface, marine and freshwaters within the Darwin Harbour catchment. The objectives aim to protect the beneficial uses identified for waterways in the Darwin Harbour region, namely agriculture, environment, cultural and rural stock and domestic (NT Government 2010).

Since 2009, marine water quality at West Arm was assessed as 'excellent' in the annual Darwin Harbour Report Card (DENR 2017), with the exception of 2015 when West Arm was rated as 'good'. The Darwin Harbour Report Card stated that West Arm may have cultural value to local Aboriginal people and is a popular recreational fishing area.

Groundwater

The environmental values supported by groundwater quality in the Proposal area and surrounds are riparian vegetation, and GDEs. Other groundwater users are distant from the Proposal area as described in Hydrological processes (Section 5.2.2 of this Report).

5.3.3 Potential impacts

Surface water quality

The Proposal has the potential to impact on surface water quality values through contamination from:

- AMD from mined materials, including waste rock dumps and tailings
- discharge of excess poor quality mine water (MWD 1, sediment dams)
- fuel and chemical spills
- uncontrolled discharge of process water, decant water and TSF seepage
- groundwater (MWD 1) being used for dust suppression

Contamination of surface water quality may also occur through:

- increased turbidity from mobilisation of soils/sediment in runoff during clearing, mining and closure activities, and from post-closure landforms
- interaction with groundwater, such as from groundwater mounding underneath the TSF reaching the surface

Groundwater quality

The Proposal has the potential to impact on groundwater quality values through contamination from:

- naturally occurring radioactive materials
- tailings seepage
- seepage from mine water containment facilities
- pit void/lake (post closure)

5.3.4 NT EPA assessment

Surface water quality

Potential acid and metalliferous drainage (AMD)

The risk of AMD from waste rock, and ore, was assessed through geochemical analysis of 156 samples representative of the variability within each lithology (Draft EIS, Appendix E). The Proponent provided justification for not undertaking additional sampling in the expanded pit shell based on the homogeneity of geological domains and the scarcity of pyrite (iron sulfide), which was detected in trace concentrations in 4.44m of 2,465m (0.18%) of drill core samples (Supplement - Additional Information).

The Proponent's analysis for acid drainage potential indicated waste rock materials had on average a neutral pH, generally low total sulfur concentrations and excess acid neutralising capacity, confirmed by a negative average net acid producing potential (Draft EIS, Appendix E). The EIS reported that potentially acid forming (PAF) material could be encountered randomly at depths greater than 100m but would be limited in volume. Advice from DPIR indicates that further assessment would be needed during mining to better define AMD potential within a zone of the pit approximately 20m thick around 130m below ground level. Thus a contingency plan is required to manage AMD from these materials, should they occur.

The Proponent's initial investigations of soluble and leachable metals in waste rock indicated that metalliferous drainage could occur but at low concentrations. Some samples (up to 16%) contained soluble metals (arsenic, manganese, selenium, zinc) at detectable but very low concentrations. Waste rock samples with higher sulfur content (total sulfur content greater than 0.04%) were tested as indicators of the worst-case scenario and found to leach manganese and zinc at concentrations exceeding water quality guidelines trigger levels for 95% aquatic ecosystem protection. Arsenic and copper were each detected from single samples at concentrations above trigger levels.

The Proponent's investigations to determine saline drainage potential concluded that waste rock was highly unlikely to produce saline drainage due to the very low electrical conductivities and low sulfide concentrations of samples.

While the Proponent's characterisation of mined and waste materials indicates AMD is unlikely, the NT EPA considers that there remains some uncertainty in respect of geochemistry with pit depth and AMD could occur from stored wastes and pit walls in the future. The NT EPA's preferred approach is to avoid or mitigate contamination at the source rather than to manage resultant impacts. Therefore, the NT EPA considers that an AMD Management Plan should be developed as a contingency in the event that PAF materials are encountered in greater amounts than predicted. The plan should be prepared in line with leading practice AMD management recommended in the Australian Government guidelines for preventing acid and metalliferous drainage (DIIS 2016c).

The NT EPA supports the Proponent's precautionary AMD management approach with commitments to undertake tailings characterisation prior to mining, and ongoing materials characterisation and monitoring of pit and decant water quality during mining. The NT EPA considers that further testing of waste rock should include a full suite of analytes, including lithium, tin and tantalum, to comprehensively characterise the geochemistry of the Proposal area. Ongoing geochemical testing of tailings and waste rock for the key elements subsequently identified should be undertaken as part of the AMD Management Plan.

Recommendation 6

That approvals and decisions for the Proposal have conditions that require the Proponent to develop an Acid and Metalliferous Drainage Management Plan to the satisfaction of the relevant regulator prior to mining that:

- **is prepared in accordance with leading practice AMD management recommended in the Australian Government guidelines for preventing acid and metalliferous drainage (DIIS 2016c)**
- **incorporates all commitments made by the Proponent in the Environmental Impact Statement for further materials characterisation, with methods, scope, frequency and guidelines to be confirmed with the relevant regulator**
- **includes further assessment of AMD potential of mined materials and processing wastes, and testing for a full suite of metals and metalloids, including those elements subject to historic and proposed mining in the area (e.g. lithium, tantalum and tin), to identify the contaminants of concern for regular testing and monitoring**
- **includes a program for ongoing testing and classification of waste rock and tailings (solids, leachates and decant water) to inform appropriate management strategies**

- includes a contingency plan and mechanisms for adaptive management of PAF materials and AMD, if detected, in accordance with the NT EPA Guidance on Adaptive Management (NT EPA 2018d)
- requires the Proponent to develop and implement an action plan to manage AMD, if detected, to the satisfaction of the relevant regulator
- includes identification and quantification of suitable capping/encapsulation material to meet the Closure Objectives

Results of all investigations are to be reported to the relevant regulator for assessment on an agreed regular basis.

Where AMD is found in waste rock or tailings in significant quantities, such material is to be returned to the pit at the end of mining.

Discharge of mine water

The Proponent proposes to discharge excess water from MWD 1 and sediment basins into a natural drainage line adjacent to the mine during November to May each year, when pit dewatering volumes and rainfall are predicted to be highest, and dust suppression requirements would be lowest. The predicted wet season discharge volumes range from 25ML to 134ML/month (1 to 4.5ML/day) over the mining period.

MWD 1 would contain pit water from dewatering activities and seasonal rainwater. Water quality in MWD 1 would therefore depend on groundwater quality and its exposure to any sulfide oxidation products in the pit, and the relative proportions of rainwater (dilution), which the Proponent predicts could range from 69% in the first wet season (January 2020) to 44% at the end of the second dry season (November 2020).

Discharge of mine water from MWD 1 has the potential to contaminate the downstream receiving environment due to naturally high levels of some metals and nutrients, in particular arsenic, iron, lithium, phosphorus and nitrates, in the shallow laterite and deep Burrell Creek Formation groundwater aquifers. While elevated metals may pose a toxicity risk, elevated concentrations of nutrients may lead to eutrophication and excessive algal growth in the ephemeral drainage lines and creeks.

To monitor for potential impacts of discharges from the mine site on the receiving environment, the Proponent proposes to use the Water Quality Objectives for the Darwin Harbour Region (NRETAS 2010a) indicators for 'freshwater rivers and streams' (referred to as 'the water quality objectives'). For parameters not addressed in the water quality objectives, the default trigger values from Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000, ANZG 2018) (referred to as 'the water quality guidelines') have been adopted, with a 95% aquatic ecosystem protection level for slightly to moderately disturbed ecosystems. For water quality indicators of potential environmental concern that do not have a default guideline value, the Proponent has committed to deriving site-specific trigger values in accordance with ANZG (2018), including water monitoring and eco-toxicological studies to determine appropriate trigger values for lithium and any other potential contaminants of concern.

The NT EPA prefers that the default water quality guideline values are applied, if specified, until site-specific trigger values for relevant contaminants of concern are developed for the receiving environment. The Water Quality Objectives for the Darwin Harbour Region should be used as indicators only. Trigger values and monitoring requirements would be included as conditions in the MMP under the MM Act or the WDL (if required) under the Water Act 1992.

The NT EPA supports the Proponent's commitment to ongoing water quality monitoring of pit water and MWD1 water during operations, and prior to and during discharge.

Should water quality not meet the WDL or agreed criteria, the Proponent proposes to implement mitigation measures such as:

- diluting the discharge prior to release
- filtering the groundwater coming from the pit sump and using flocculants in MWD 1 to reduce turbidity
- treating MWD 1 with coagulants to reduce metal and phosphorous concentrations

Dilution of waste water from MWD 1 prior to discharge may enable criteria for metal concentrations to be met; however, this strategy would increase discharge water volumes while loads to the receiving environment would remain unchanged. There is the potential for some contaminants identified in groundwater in the Proposal area (e.g. phosphorus), if discharged to surface water, to accumulate in sediments downstream of the mine site and become secondary diffuse sources of pollution during wet season rain events. Therefore, the NT EPA prefers that the Proponent avoids adopting a dilution strategy to reduce concentrations of phosphorus or bioaccumulating contaminants. For other constituents, the dilution ratio should not exceed 1:1. Contaminant loads in discharged waste water should be minimised to ensure that the 95% aquatic ecosystem protection levels for contaminants of concern can be maintained over time in the receiving environment.

Flocculants and coagulants should be used if discharge criteria cannot be met after the proposed minimum residence time. The types of flocculants and coagulants should be clearly identified in the MMP. If anionic polymer flocculants are used, polyacrylamide flocculants with residual amounts of more than 0.05% of the neurotoxin acrylamide monomer should be avoided, as this may present some risk to the downstream environment if discharged (NICNAS 2002). The surface water quality monitoring program should consider the potential for all chemicals used in water treatment and their breakdown products to contaminate receiving environments.

Sediment basins would be monitored for water quality to ensure they meet the WDL or agreed water quality criteria prior to release. If discharge criteria cannot be achieved after treatment, the Proponent proposes to pump water from sediment dams to either the MWDs, the TSF or pit for temporary storage. The NT EPA prefers that excess water from sediment dams not meeting discharge criteria can be stored temporarily in the MWDs and the pit if required, but not in the TSF. Storage of water in the TSF could lead to further contamination of stored water.

The NT EPA considers that the mine site should be designed to contain all mine-affected water and avoid discharging contaminated water unless required to avoid failure of water containment structures. Waste water treatment options should be trialled well before any discharges occur.

All active discharges should be controlled discharges regulated under the Water Act 1992 (if required) or the MM Act. The MMP or WDL will specify water quality criteria, trigger levels, discharge locations, schedules and conditions to be met. The licensee must do all things reasonable and practicable to ensure the activity does not adversely affect declared beneficial uses and water quality objectives.

Recommendation 7

That approvals and decisions for the Proposal have conditions that require the Proponent to:

- **contain all mine-affected water within the mine site until monitoring and treatment indicates that controlled discharges, if necessary, can occur without adverse impacts**

- **apply for a Waste Discharge Licence under the Water Act 1992 should discharge occur from the mineral lease**
- **ensure that water quality meets discharge criteria as agreed through the Mining Management Plan, or the Waste Discharge Licence if one is required**
- **develop as part of the Water Management Plan seasonal, site-specific surface water quality trigger values (wet/dry seasons as a minimum) appropriate to maintain 95% level of protection of the receiving aquatic ecosystem**
- **undertake an assessment of the need for water treatment within water management and sediment dams, using water treatment trials. The assessment must clearly identify any water treatment additives required, their breakdown products and their potential to contaminate the environment. Polyacrylamide flocculants with more than 0.05% of the neuro-toxin acrylamide monomer should be avoided**
- **include any water treatment additives and their breakdown products, as determined in the above assessment, in the surface water monitoring program as part of the Water Management Plan**
- **demonstrate that discharge water quality can be effectively managed to ensure the activity does not adversely affect the receiving environment in terms of the declared beneficial uses and water quality objectives**

Fuel and chemical spills

The risk of spills of hazardous materials, including fuels and chemicals, contaminating surface waters was assessed in the EIS as low. The Proponent intends to avoid contamination of surface water by designing facilities to prevent release of contaminants including capturing all stormwater runoff, and adopting hydrocarbon and chemical handling, storage and spill response procedures in compliance with relevant legislation and standards. A draft emergency response plan including procedures for responding to spills was presented in the Supplement.

Post-closure, all fuel storages and any residual soil contamination would be removed. In the event of early closure, potential impacts to water quality would be limited due to the relatively small amounts of hazardous materials stored on site. The Proponent has committed to removing these in an early closure event to ensure the mine site is safe and does not cause environmental harm.

The NT EPA considers that impacts on inland water environmental quality from fuel and chemical spills are unlikely to be significant if hazardous materials are managed in accordance with relevant plans and procedures.

Dust suppression

Up to 1ML/day of water, primarily from MWD 1, would be used for dust suppression. MWD 1 water consists of groundwater (pit inflow pumped to MWD 1) and incidental rainwater. As discussed above, the water in MWD 1 could contain elevated concentrations of some metals and nutrients, and the potential for accumulation of arsenic in soils warrants close attention. Dust generated and deposited in mine processing areas similarly could contain elevated levels of contaminants with potential to impact water quality.

While the EIS indicates that all surface water runoff from the mine site would be captured during operations, the NT EPA considers that water used for dust suppression should be of a quality that minimises contamination of the site and the potential for environmental harm from surface water runoff after mine closure. The use of mine water

for dust suppression should be managed through the WMP taking into account the agreed post-closure land use for the site identified in the Mine Closure Plan. Assessment and treatment of any soil contamination on the site as a result of dust deposition or dust suppression using groundwater or mine-affected water should be undertaken prior to mine closure and be consistent with the National Environment Protection (Assessment of Site Contamination) Measure 1999.

Recommendation 8

That approvals and decisions for the Proposal have conditions that require the Proponent to:

- **include acceptable water quality requirements for any groundwater or mine affected water used for dust suppression**
- **assess for and treat any soil contamination on the mine site consistent with the National Environment Protection (Assessment of Site Contamination) Measure 1999 prior to mine closure**

Increased turbidity from mobilisation of soils/sediment during clearing, mining and closure activities, and from post-closure landforms

Waste rock and soils characterisation undertaken for the EIS found that a high percentage of samples were classified as potentially dispersive. Therefore, stormwater run-off from cleared and disturbed areas, waste rock dumps, topsoil stockpiles and other exposed areas is likely to contain elevated levels of suspended sediment. If not managed appropriately, sediment laden runoff could impact receiving environments within and outside the mineral lease.

Potential impacts are proposed to be managed using a stormwater drainage system and sediment basins to capture run-off from disturbed areas for control of suspended sediment prior to discharge from the Proposal area.

The Proponent has committed to managing erosion and sedimentation risks through the implementation of an erosion and sediment control plan designed in accordance with the Best Practice Erosion and Sediment Control Guidelines (IECA 2008), including collecting all mine site runoff in sediment basins. Given the potential for dispersive soils on the mine site, it is likely that sediment particles would remain in suspension for extended periods in sediment basins. The Proponent proposes to use flocculants to reduce suspended solids to levels suitable for discharge. As noted above, the NT EPA considers that the mine site should be designed to contain all mine-affected water and to identify and assess water treatment additives, in accordance with Recommendation 7. Criteria for discharge of water from sediment basins will be determined through the MMP or a WDL.

Further discussion relating to potential impacts of erosion and sedimentation on soils and terrestrial environmental quality is provided in Section 5.4 of this Report.

Groundwater quality

Seepage from tailings facilities

Processing of fresh pegmatite ore would involve crushing, screening and DMS. The resultant tailings are expected to consist mainly of silty sands with residual amounts of flocculants (inorganic polymer) and a product separator (ferrosilicon) added during processing. The thickened tailings slurry would be pumped to the TSF.

The Proponent committed to construct the integrated TSF with a low permeability base, an underdrainage structure to recover tailings seepage and structures to collect decant water from the tailings surface. The TSF seepage and decant water would be re-used

directly in processing or stored at MWD 2. With these measures in place, seepage from the TSF is estimated to be 100kL/month during operations.

Geochemical characterisation and leach testing of tailings were not undertaken for the EIS. The Proponent has committed to characterising tailings solids as part of processing plant trials to support the detailed design of the TSF. The Proponent anticipates that the tailings would be geochemically stable and would not contain any contaminants. However, the NT EPA expects that lithium content of tailings could be elevated and considers that the geochemical characteristics of tailings should be monitored during operations to inform the potential for lithium contamination, in accordance with Recommendation 6 of this Report.

All processing chemicals (e.g. polymer flocculants, ferrosilicon) should be included in the tailings characterisation and assessment. Flocculants proposed for use should be clearly identified and approved by the relevant regulator. Flocculant dosing and application should be carefully monitored by a suitably experienced person to avoid overdosing. Polyacrylamides with more than 0.05% of the neuro-toxin acrylamide monomer should be avoided in accordance with Recommendation 7.

The Proponent's modelling indicated the majority of seepage from the integrated WRD/TSF would be captured by the pit at the end of mine life. However, the modelling indicated that the flow gradient towards the pit would be gradually reduced by the formation of the pit lake after closure, resulting in a portion of seepage flowing north towards the drainage line. The Proponent has committed to installing additional bores up-gradient and down-gradient of the integrated WRD/TSF to monitor changes in groundwater levels and water quality from seepage. Bore locations should be determined in consultation with the Water Resources Division, DENR, in accordance with Recommendation 5. A comprehensive and robust baseline dataset for groundwater should be recorded prior to commencement of mining operations to establish seasonal variation in groundwater quality.

The NT EPA considers that independent audits of the groundwater quality monitoring program should be undertaken at strategic times during and after mining to determine the adequacy and effectiveness of the program to meet its monitoring objectives (e.g. to identify potential impacts from seepage and the pit).

If monitoring confirms that seepage from the TSF is a potential source of contamination to groundwater and surface waterways after closure, the Proponent must install a low-permeability cover on the TSF to reduce rainfall infiltration rates into the landform or return the tailings to the pit void, in accordance with Recommendation 9.

Recommendation 9

That approvals and decisions for the Proposal have conditions that require the Proponent to include in the Water Management Plan (referred to in Recommendation 5):

- **investigation of a full suite of metals and metalloids in groundwater, including those subject to historic and proposed mining in the area (e.g. lithium, tantalum and tin), to establish a baseline for groundwater monitoring**
- **a robust groundwater monitoring program that can quantify the extent and quality of any seepage from the proposed mine site**
- **appropriate trigger values based on robust pre-mining groundwater quality baseline data**

- an assessment of chemicals added during processing, including an assessment of their behaviour and breakdown products in tailings, and their potential to contaminate the environment
- inclusion of applicable processing chemicals and their breakdown products, as determined through the above assessment, in the groundwater monitoring program
- contingency measures in the event that trigger values are exceeded
- a requirement that if monitoring confirms that seepage from the TSF is a potential source of contamination to groundwater and surface waterways after closure, the Proponent must install a low-permeability cover on the TSF to reduce rainfall infiltration rates into the landform or return the tailings to the pit void
- a requirement for an independent external audit of the groundwater quality monitoring program by a suitably qualified and experienced auditor after two years of tailings deposition and then annually. The appointment of the auditor is to be endorsed by the relevant regulator and the auditor is to report to the relevant regulator
- a program for on-going monitoring and any necessary remedial action post-mining operations and closure to the time of relinquishment of the mineral lease

All water quality monitoring data, trigger values, audit reports and an assessment of any impacts should be made publicly available in the Water Management Reports on the websites of (as applicable) the Proponent, the Operator and relevant regulatory authorities.

Seepage from mine water containment facilities

The EIS indicates that some water containment infrastructure on site could contain poor quality water such as water that exceeds the water quality guideline values for some contaminants and toxicants. This may be the case for MWD 1 containing groundwater, MWD 2 containing TSF decant water and potentially groundwater, and sediment dams containing mine site surface water runoff.

As with the TSF, there is the potential for groundwater contamination to occur as a result of seepage from these facilities. The NT EPA considers that all water containment infrastructure that could contain poor quality water on site should be constructed with a low permeability base to minimise seepage rates to groundwater.

Recommendation 10

That approvals and decisions for the Proposal have conditions that require the Proponent to design all water holding structures with the potential to contain poor quality water to include a low permeability base with a seepage rate of $<10^{-9}$ m/s.

Pit void/lake (post closure)

The Proponent's modelling predicts the pit void would fill with water over a timeframe of approximately 50 years after mine closure to form a pit lake. Pit water would likely contain a mix of groundwater from the deep Burrell Creek Formation aquifer and the shallow laterite aquifer, and rainwater. The pit lake is predicted to stabilise at 7m to 8 m below the surrounding land surface with overflow/discharge to the environment indicated as unlikely.

The Proponent used modelling of EC and water quality in historic mine pit BP33, which was purported to have a similar geology, as indicators of potential water quality in the pit lake after closure. The modelling indicates a small increase in EC from 40µS/cm at closure to 50µS/cm in 2090, which is slightly higher than the EC of historic pit lake BP33 (17 µS/cm to 26µS/cm) but significantly lower than the average groundwater EC (220µS/cm).

The Proponent's investigations in 2017 and 2018 indicated that water quality in the historic pit lake BP33 was generally good. EC was low (in comparison to groundwater), pH was not acidic, dissolved oxygen ranged from 60% to 100%, dissolved metal concentrations (except for the metalloid arsenic), were below laboratory detection limits, and nutrient concentrations were within the ranges found at an upstream reference site. Based on these observations, the Draft EIS concluded that water quality in the final pit lake was expected to be good. However, there are some uncertainties in relation to the potential for AMD in deeper zones of the Grants pit, as discussed previously in this Report.

The BP33 pit water is unlikely to have been influenced by equivalent geology to the proposed Grants pit, nor would the BP33 pit have comparable groundwater contribution from the deep Burrell Creek Formation aquifer over the timeframe expected for the Grants pit. Additionally, the BP33 pit lake would not be subject to the stratification regime likely to be found in the much deeper pit lake proposed by this Proponent. Geochemical reactions with the pit walls may be altered due to anoxic conditions in the proposed pit lake. Therefore, the NT EPA considers the BP33 pit lake is unlikely to be a suitable reference for predicting Grants pit lake water quality given the depth differences between the BP33 pit (15m) and the proposed Grants pit (200m).

While the Proponent's modelling predicted that the pit lake would continue to act as a net groundwater sink and would not influence groundwater quality in the surrounding aquifer, density driven outflow from the pit lake would likely occur and this could result in contamination of surrounding groundwater if the pit lake water quality is not as good as predicted in the Draft EIS. However, due to the low hydraulic conductivity of the aquifers and predicted quality of the pit lake water the impact on surrounding groundwater from density driven pit lake outflow is expected to be localised and expected to have a minimal impact on the environment.

The Proponent has committed to monitoring the pit water quality during operations. Monitoring must continue after completion of mining as the pit is allowed to fill to validate modelling predictions. This would inform the need for water treatment contingencies if pit water quality deteriorates.

If pit water quality departs significantly from modelled predictions such that the trajectory for longer term water quality in the pit lake indicates a poor quality outcome, contingency measures must be developed and implemented by the Proponent as required to ensure that closure criteria for the pit void can be met. An audit of monitoring data and the pit water quality modelling should be conducted by an independent and suitably experienced third party to assess whether the closure criteria for the pit void can be met at closure and prior to relinquishment of the mineral lease.

The need for long term monitoring of pit water quality may be avoided if the pit void is backfilled as part of mine closure. This option is discussed in Section 6.1 of this Report.

Recommendation 11

That approvals and decisions for the Proposal have conditions that require the Proponent to include in the Mine Closure Plan:

- closure criteria that require the quality of any water escaping from the pit lake to meet site specific trigger values for surface water at 95% aquatic ecosystem level of protection (ANZG 2018)
- a robust monitoring program designed to validate and update modelling and determine whether or not the trajectory for pit water quality indicates closure criteria for the final pit lake can be met
- an assessment of the impact of density driven outflow of pit lake water on surrounding groundwater quality if backfilling of the pit void is not undertaken
- a contingency plan outlining trigger levels for actions, specific responses and mitigation measures, and consequences for rehabilitation and closure activities
- a requirement for an independent external audit of the pit lake water quality monitoring program and model by a suitably qualified and experienced auditor prior to relinquishment. The appointment of the auditor is to be endorsed by the relevant regulator. The auditor is to assess if closure criteria can be met at closure and post-closure. The auditor is to report to the relevant regulator

The water quality monitoring program and reports should be made publicly available on the websites of (as applicable) the Proponent, the Operator and relevant regulatory authorities.

5.3.5 Conclusion against the NT EPA objective

While the Proponent's geochemical investigations have determined that waste rock and tailings are relatively benign, the NT EPA considers that there are a number of uncertainties that merit further investigation to inform the mine design, management practices and Mine Closure Plan. Key uncertainties include the potential for AMD to be generated from waste rock mined from deeper zones of the pit shell and the lack of understanding of tailings leachate characteristics. The NT EPA will accept that a small amount of PAF material can be encapsulated in the integrated WRD/TSF. However if there is more than a small amount of PAF and/or tailings leach AMD, then all material producing AMD must be placed in the pit below the water line.

The NT EPA considers that a precautionary approach should be taken to reduce the risk of contamination of receiving waters, particularly in the longer term after mining ceases if the pit void remains and is to fill with water as proposed. The NT EPA has made Recommendation 6 to develop an AMD Management Plan as a contingency in the event that AMD potential of mine wastes is greater than predicted. The plan would require further pre-mining analyses to identify the likely contaminants of concern as well as implementation of standard measures for ongoing monitoring and selective handling of problematic waste rock if identified. The NT EPA considers that significant impacts to water resources from AMD are unlikely if the recommendation is implemented.

The Proponent has committed to intercepting and containing surface water runoff and storing water from dewatering the mine pit within the mine site. While the quality of water contained on the mine site may be impacted by some metals and nutrients that are elevated above background, treatment and settling options are likely to reduce the loads of these contaminants prior to any off-site discharges of excess water. The NT EPA has made Recommendation 7 to ensure that all mine-affected water is contained on-site until monitoring and treatment indicates that controlled discharges, if necessary, can occur without adverse impacts. Under these conditions and regulatory requirements, the proposed mine water discharges are not expected to significantly impact water quality in the ephemeral waterways and estuary downstream of the mine site.

The NT EPA has made Recommendation 8 recognising that use of mine water, including groundwater, to suppress dust has the potential to contaminate soils on the mine site. Application of the Contaminated Site NEPM as part of mine closure requirements will ensure the risk of long term impacts to local water quality from a remediated mine site are minimised. Significant impacts to the environment from accidental spills of hazardous materials are considered unlikely with proposed controls in place. The NT EPA's Recommendations 9 and 10 ensure that seepage of potentially contaminated water from mine-water containment dams and the integrated WRD/TSF is minimised and contingencies are available to mitigate any localised impacts detected through monitoring.

Although the Proponents' modelling indicates that the water quality of the post closure pit-lake is likely to be good, there are still a number of uncertainties in relation to pit water influences. Some of these will become evident through waste rock characterisation and water quality monitoring during mining operations. The NT EPA has made Recommendation 11 to ensure that pit water quality modelling is continually validated and updated, and monitoring is conducted for a timeframe that is sufficient to determine that the trajectory for water quality is likely to meet water quality guideline values as agreed with the relevant regulator. Independent audit is included as a closure requirement under Recommendation 11 to ensure closure criteria are met prior to relinquishment, to the satisfaction of the relevant regulator. Based on these recommendations and with a requirement to mitigate sub-standard water quality, and return materials producing AMD back into the pit if significant quantities are detected, the NT EPA concludes that significant potential impacts on the surrounding environment are unlikely in the short term.

If mining continues at a nearby resource with processing at or near the Grants pit, the NT EPA considers that tailings from the further mining should be used to backfill the pit unless the Proponent can demonstrate that the Closure Objectives can be met.

With the implementation of the Proponent's commitments and relevant management plans, regulation of mine water discharge, and the NT EPA's recommendations identified above, the NT EPA considers that the Proposal could be conducted in such a manner that its objective for Inland water environmental quality is likely to be met.

5.4 Terrestrial environmental quality

5.4.1 Environmental objective

Maintain the quality of land and soils so that environmental values are protected.

5.4.2 Environmental values

The Proposal lies within the Mt Finnis pegmatite belt in the north western part of the Pine Creek Geosyncline, where pegmatites have intruded early Proterozoic shales, siltstones and schists of the Burrell Creek Formation. The topography of the mine site footprint consists of flat to gently undulating plains and low rises, with gravelly well drained soils comprising rudosols, kandosols and hydrosols.

The soil structure and landforms in the area of the Proposal are relatively undisturbed and intact, with no residences, farms or industry within the catchment. Soils are marginally acidic ($\text{pH} < 5.5$) and are not considered to be saline ($< 0.4\text{dS/m}$). A significant portion of the soils are moderately to highly sodic (exchangeable sodium percentage (ESP) $> 10\%$) and are prone to slaking, while approximately one third of samples from the pit shell are potentially dispersive (Draft EIS, Appendix E).

Soils in the Proposal area support biodiversity, seed banks and downstream surface water and groundwater quality.

5.4.3 Potential impacts

Activities associated with the Proposal that have potential to impact terrestrial environmental quality include land clearing, mining, placement of waste rock, tailings storage, soil erosion and sedimentation, and handling and use of chemicals and hazardous materials.

The potential impacts that may occur to terrestrial environmental quality as a consequence of the Proposal are:

- loss of topsoil, seed bank and soil function
- erosion of exposed soils during construction and operations
- potential contamination of land and soils as a result of:
 - o acid, metalliferous and/or saline drainage from waste rock and tailings storage
 - o accidental release of chemicals
- post closure landform instability and erosion

5.4.4 NT EPA assessment

Loss of topsoil, seed bank and soil function

Proposed land clearing and earthmoving to construct the mine and mining infrastructure will expose and disturb soils, potentially leading to a loss of topsoil and soil function if the topsoil is inappropriately handled and stockpiled during site clearing.

To maximise the value of soil resources for use in future rehabilitation, the Proponent proposes the following management measures:

- stripping the top 20cm of topsoil and storing separately in a bund to a maximum height of 1.5m
- stabilising the topsoil bund with hydromulch, grass cover, and jute matting on the external batter
- implementing a Vegetation Clearing Procedure (Draft EIS, Appendix S), and Erosion and Sediment Control Plan (ESCP) (Supplement Appendix N)
- monitoring and inspecting stockpiled topsoil for erosion and weeds

While the NT EPA acknowledges that topsoil stripping and stockpiling is generally considered best practice, there is some evidence to suggest that in the wet/dry tropics of northern Australia, stockpiled soils may lose their biological value over a relatively short time period (Reddell & Milnes 1992). Topsoil stockpiles should be maintained to maximise rehabilitation value in the context of the Proposal. The NT EPA strongly supports the implementation of rehabilitation trials but such trials must be undertaken early and in varying vegetation communities that would be subject to disturbance to determine the most effective revegetation methods for the Proposal area. The NT EPA has made Recommendation 17 in Section 6.1 of this Report in relation to rehabilitation and mine closure.

Erosion of exposed soils during construction and operations

During mine construction and operations, soil erosion could result in mobilisation of sediment to surrounding areas, as well as a loss of growth medium for rehabilitation. This would potentially impact on the terrestrial environmental quality of the surrounding habitats.

Submissions raised concerns regarding potential sedimentation of downstream waterways due to erosion from disturbed areas. The EIS states that any drainage from the Proposal area would be intercepted and contained in sediment basins. Excess mine-effected water requiring off-site discharge would be subject to treatment to meet discharge criteria under a MMP or a WDL. The EIS includes a commitment to implement best practice erosion and sediment controls prior to the commencement of construction of the Proposal. A Certified Professional in Erosion and Sediment Control developed an ESCP (Supplement Appendix N) consistent with the Best Practice Erosion and Sediment Control Guidelines (IECA 2008). The ESCP would require review and update prior to the commencement of construction, and regular review throughout the Proposal's operation and closure. Implementation of the ESCP would be monitored by a suitably qualified third-party auditor, to the satisfaction of the relevant regulator.

Approximately one-third of waste rock samples were identified by the Proponent as being potentially dispersive and prone to erosion. Therefore, further characterisation would be required to determine the physical stability of the material and suitability for use in construction of the WRD or inundation bund, or as a subsoil growth medium. The Proponent has committed to undertake further characterisation of waste rock and to selectively place dispersive waste material within the WRD so that the stability of the structure is not affected.

The NT EPA expects soil erosion by water within the mine-site to have limited consequence on the receiving environment provided these issues are managed under the proposed suite of soil and water management measures. Similarly, dust generated is not likely to be a significant matter if the proposed air quality management measures are implemented during mine construction and operation.

The NT EPA supports the Proponent's commitments to manage erosion and sedimentation through implementation of the ESCP and considers the proposed mitigation measures to be appropriate to minimise impacts to terrestrial environmental quality.

Contamination of land

Activities that may contribute to the contamination of land include:

- active mining and closure of the pit where there is potential for AMD
- design, construction and management of the integrated WRD/TSF, if leachates from waste rock and tailings contain significant contaminant loads
- storage and handling of hazardous substances

The Proponent undertook preliminary characterisation of mine waste rock to understand the potential for generation of AMD from the proposed mining operation. As discussed in Section 5.3 of this Report, the majority of waste rock is unlikely to generate AMD due to the generally low concentrations of sulfur, excess acid neutralising capacity and low EC.

The EIS states that the integrated WRD/TSF would be constructed and managed in accordance with appropriate guidelines and standards. The Proponent has provided a preliminary TSF design (Supplement, Appendix H). The TSF design would be refined during the detailed design phase and mine closure planning, informed by tailings characterisation.

Based on the results of the Proponent's initial geochemical characterisation, the NT EPA considers that contamination risks associated with AMD can be mitigated by effective quality control and handling of waste rock and disposal of a small amount of problematic mine waste in an appropriately designed and constructed WRD and TSF. Although significant impacts arising from AMD appear unlikely, the NT EPA considers that there is sufficient uncertainty around AMD potential as the pit is mined beyond 130m below

ground level to warrant a precautionary management approach. The NT EPA has made Recommendation 6 in Section 5.3.4 for an AMD management plan and ongoing waste rock and tailings characterisation and monitoring program to ensure that any problematic waste rock is appropriately managed including return of any materials producing AMD to the pit if significant quantities are detected.

The NT EPA expects that implementation of these recommendations would effectively mitigate potential AMD impacts to soil and land quality.

The Proposal includes onsite, above-ground diesel storage tanks containing approximately 350,000L. Public submissions raised concerns about the potential for hazardous materials such as fuels and chemicals to contaminate land if stored and used inappropriately, and the capability of the Proponent to respond to spills.

As discussed in Section 5.3.4, the Proponent's proposed risk controls include complying with relevant legislation, standards and guidelines; regular inspection programs to ensure structural integrity of fuel tanks and bunds; and spill management measures as part of the Environmental Management Plan (Draft EIS Chapter 10) and Draft Emergency Response Plan (Supplement, Appendix P).

The Proponent has committed to manage risks associated with the storage and use of hydrocarbons and chemicals by complying with relevant Australian Standards. All chemicals and flammable or combustible liquids stored on site that have the potential to cause environmental harm would be stored in or serviced by an effective containment system that is impervious to the materials stored and managed to prevent the release of liquids to land or waters. In addition, the Proponent is required to comply with the provisions of the NT dangerous goods legislation which would further reduce the potential for significant impacts from hydrocarbon or chemical spills on the quality of land and soils.

The NT EPA considers that impacts on terrestrial environmental quality as a result of spills of hazardous substances are unlikely to be significant and can be managed in accordance with the Proponent's commitments and relevant management plans.

Post closure landform instability and erosion

Several altered landforms are proposed to remain as permanent features of the landscape following closure, including the open pit void with abandonment bund, Observation Hill Dam, and the integrated WRD/TSF. Erosion of final landforms, potentially caused by inappropriate placement of dispersive waste materials, unconsolidated tailings in the TSF, pit wall failure or slumping, inappropriate rehabilitation works and poor drainage design, could lead to instability and potential failure of these landforms. Submissions received on the Draft EIS raised issues with the long term residual risks of the landforms and dams post closure. The NT EPA has considered the submissions and the Proponent's responses in its evaluation of the post closure residual risks and impacts of the Proposal. The NT EPA notes that mine closure would be regulated by the DPIR in accordance with the MM Act, and has recommended in Section 6.1 of this Report that, at a minimum, the closure plan meets standards specified in the WA Government Guidelines for preparing mine closure plans (DMP & EPA 2015). The Proponent may also refer to guidance provided in the Leading Practice Sustainable Development for the Mining Industry handbooks on Mine Closure (DIIS 2016a) and Mine Rehabilitation (DIIS 2016b).

The costs of long term monitoring, and any maintenance and remedial activities should be accounted for in the calculation of security required under the MM Act.

The Proponent outlined measures to minimise the potential causes of post closure instability and erosion on site within its conceptual Mine Closure Plan. Measures that require the differentiation of suitable and unsuitable material types for construction and

rehabilitation rely on good quality control and quality assurance procedures to be implemented effectively. The EIS briefly mentions quality assurance and quality control but appears to defer this responsibility to contractors. Accordingly, the NT EPA has made Recommendation 17 requiring the Proponent to include a system for quality assurance and quality control as part of its mine closure planning.

In the short-term, the NT EPA considers that erosion could be minimised through implementation of the ESCP and post-closure rehabilitation to appropriate standards. Given the short life of mine, the NT EPA expects that the Proponent would provide the relevant regulator a fully detailed and updated Mine Closure Plan prior to authorisation and commencement of the Proposal. The plan would be an integral part of the Proposal, incorporating both physical rehabilitation and socio-economic considerations; and would be designed so that the post-closure use of the site is beneficial and sustainable to affected communities in the long term. The NT EPA supports the Proponent's commitment to undertake revegetation trials early in mine operations and considers this essential in order for revegetation to be successful. Closure and rehabilitation of the Proposal area is discussed further in Section 6.1 of this Report.

The NT EPA has made recommendations requiring the design, construction, maintenance, operation and decommissioning of water storages to meet ANCOLD guidelines.

The NT EPA considers that waste storage facilities should be designed, constructed and operated to meet the Closure Objectives. The NT EPA recommends periodic inspection, review and auditing of the waste facilities by independent technical experts. This would include performance monitoring of these facilities and an assessment of the overall performance and long-term integrity, as part of a rigorous regulatory process.

Recommendation 12

The design, construction, management and closure of the integrated waste rock dump/tailings storage facility should be overseen by an appropriately qualified and experienced independent technical expert to provide:

- **objective and independent expert review to the relevant regulator:**
 - **on the adequacy of the integrated waste rock dump/tailings storage facility design to ensure long-term containment of tailings/residues or leachate from the waste rock dump**
 - **on the proposed performance monitoring program for the waste storages including potential seepage and leachates from the storage facilities**
 - **on decommissioning and final rehabilitation to minimise long-term risks and consequences to the environment, community, future land use and visual amenity from the waste storages**
- **regular inspections, auditing and reporting to the relevant regulator to ensure construction, management and closure is in accordance with the endorsed design and design objectives**
- **an independent assessment of the Proposal's management of tailings and residues, including performance monitoring results in an annual report to the relevant regulator and the Proponent**
- **an independent assessment of the quality assurance and quality control methods, procedures and tests used to verify that the technical specification is met in the course of construction**

- **assurance that the integrated waste rock dump/ tailings storage facility, if left to remain as landforms in perpetuity, are constructed and rehabilitated to a suitable standard to achieve the Closure Objectives**

The reports will be provided on the websites of (as applicable) the Proponent, the Operator and the relevant regulator.

The NT EPA considers that adherence to relevant guidelines such as ANCOLD, along with implementation of the proposed ESCP is generally appropriate to minimise instability and erosion of post-closure landforms in the short-term. The NT EPA makes Recommendation 17 in Section 6.1 to improve site rehabilitation measures and mine closure outcomes.

The NT EPA is of the opinion that the Proponent must demonstrate how the preferred final landform meets the Closure Objectives. The Proponent proposes to install an abandonment bund and signage around the pit post-closure to deter public access but not to manage the pit void post-closure. This would ultimately mean that any costs associated with long term management of the pit lake would be left to the community and the government. The potential for mine legacy issues that would otherwise be borne by the community and government in the future must be avoided. The Closure Objectives and the principles of ESD must be met and hence, the NT EPA has made Recommendation 16 in Section 6.1 of this Report.

The NT EPA is satisfied with the proposed short term erosion and sediment control measures and supports the Proponent's commitment to begin rehabilitation within the first year of operations; however, the rehabilitation strategy must be sufficient to ensure that the mine site can sustain native vegetation prior to relinquishment. Accordingly, the NT EPA makes Recommendation 17, which provides for submission of a more detailed Mine Closure Plan to the relevant regulator that better demonstrates that disturbed areas can be effectively stabilised and rehabilitated for a post-mining land use. Recommendation 12 includes provisions for periodic inspection, review and audit of the integrated WRD/TSF by independent technical experts throughout construction, management and closure.

5.4.5 Conclusion against the NT EPA objective

The NT EPA has considered the Proposal activities that have the potential to impact on terrestrial environmental quality through increased soil exposure and erosion, soil contamination from chemicals and soil quality impacts related to storage and disposal of waste rock and tailings.

The NT EPA is satisfied with the proposed short term erosion and sediment control measures and supports the Proponent's commitment to begin rehabilitation within the first year of operation. The rehabilitation strategy must ensure that the mine site can sustain native vegetation prior to relinquishment. Accordingly, the NT EPA has made Recommendation 17, which provides for submission of a more detailed Mine Closure Plan to the relevant regulator that better demonstrates that disturbed areas can be effectively stabilised and rehabilitated for a post-mining land use. Recommendation 12 includes provisions for periodic inspection, review and audit of the integrated WRD/TSF by independent technical experts throughout construction, management and closure.

The NT EPA considers that achieving the Closure Objectives will result in a good environmental outcome and has made Recommendation 16 advocating for these outcomes.

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

5.5 Terrestrial flora and fauna

5.5.1 Environmental objective

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

5.5.2 Environmental values

The Proposal is located within the Darwin Coastal bioregion. The Darwin Harbour Site of Conservation Significance is to the north-east of the Proposal. The Proposal is surrounded by native vegetation with low levels of weed infestation and an absence of large scale clearing in the region.

Minor drainage areas within the proposed mine site disturbance footprint join an ephemeral watercourse with pools present into the dry season, before discharging into a mangrove lined tidal inlet of West Arm, Darwin Harbour. Observation Hill Dam overflows into a drainage line, which forms an ephemeral creek for approximately 3km, before joining the Charlotte River.

Vegetation surveys identified six vegetation communities within the mineral lease and proposed water pipeline route that are well represented in the Darwin Coastal bioregion, and are not considered to be rare or threatened at a regional scale. More than 29% of the bioregion is protected within reserves (CAPAD 2014, NRETA 2004).

Significant and sensitive vegetation types (mangroves, riparian vegetation, wetlands (drainage areas) (as mentioned in the NT Planning Scheme and NT Land Clearing Guidelines) occur on and downstream of the mine area. Riparian vegetation and wetlands (drainage areas) occur within the Proposal area and for approximately 1.7km downstream where estuarine reaches of Darwin Harbour begin and mangrove communities occur.

Riparian vegetation has a critical role in providing ecosystem services to maintain landform and water quality, as well as providing habitat and microclimate for other species (DENR 2018). It occurs on the banks of watercourses and drainage channels, protecting banks from erosion, filtering sediment, providing shade, moderating temperature fluctuations and creating suitable breeding conditions for many aquatic species. Mangroves occur along sheltered tropical coastlines in tidal areas frequently inundated by saline water, providing spawning and nursery areas for marine species, and protecting the coastline from erosion during storm surges and cyclones.

The NT Herbarium's modelling and mapping of potential habitat indicated two threatened flora species are likely to occur within the Proposal area:

- the annual herb *Stylidium ensatum* (Endangered - EPBC Act, Endangered - Territory Parks and Wildlife Conservation Act 1976 (TPWC Act))
- the geophyte *Typhonium praetermissum* (Vulnerable - TPWC Act)

Eight threatened fauna species may occur within or immediately adjacent to the Proposal area, although the habitat is considered to be sub-optimal for all of them.

The NT EPA considers that the Proposal is not likely to result in a significant impact on regional populations of any of the threatened fauna species that may occur in the Proposal area (NT EPA 2018b).

5.5.3 Potential impacts

Terrestrial flora values have the potential to be impacted through:

- loss of native vegetation from land clearing and dam construction, in particular:

- o loss of *S. ensatum* habitat
- o loss of *T. praetermissum* habitat
- habitat degradation from
 - o altered surface water flow regimes
 - o introduction and spread of weeds
 - o changes to fire regime

5.5.4 NT EPA assessment

Loss of native vegetation due to clearing and flooding

The proposal would result in the direct removal of approximately 251ha of native vegetation comprising mostly Eucalyptus open woodland on rises and 64ha of sensitive and significant vegetation types associated with drainage systems and alluvial plains.

The NT EPA considers that the proposed clearing of native vegetation is unlikely to have a significant residual impact on native vegetation and habitats in the region. The NT EPA supports the Proponent's commitment to consider reconfiguration of site infrastructure, and encourages consideration to move the inundation bund outside of the drainage system, to minimise disturbance of sensitive/significant vegetation communities. Such reconsideration could also have a benefit of affording a higher level of protection to mine site infrastructure. A vegetation clearing procedure is proposed to ensure only the required areas are cleared, to prevent off-site impacts, and to address topsoil removal and storage for future rehabilitation of the site.

Targeted inspections of *S. ensatum* potential habitat on the mine site and downstream of Observation Hill Dam did not locate the species (Draft EIS, Appendices P and R). Considering the high detectability of the species at the time the surveys were undertaken, the NT EPA concludes that the likelihood of occurrence of *S. ensatum* is low and therefore the likelihood of a potential impact on this species is low to very low.

The EIS stated that approximately 84.3ha of *T. praetermissum* potential habitat would be removed. The Proponent's targeted surveys of potential habitat did not locate the species (Draft EIS Appendices P and Q, Additional Information). Given the species' rare and sporadic distribution in the region, the likelihood that an important population is present in the Proposal area is low and the NT EPA considers it unlikely that the proposed clearing would result in a significant impact on the population of the species at the regional scale.

Introduction and spread of weeds

Several public submissions raised concerns about weed management for the Proposal.

Construction and mining activities within the Proposal area are likely to facilitate the introduction and spread of weeds. Weeds can alter the floristic diversity of native vegetation and increase the intensity of fires, leading to degradation of fauna habitats and biodiversity values. The Proponent's field surveys indicated that weed density is low across the mineral lease, and no declared weed species were detected within the Proposal area. To minimise the potential for introduction and spread of weeds, the Proponent committed to implementing weed monitoring and management measures during all stages of the Proposal, including rehabilitation and off-site sourcing of weed free materials. The Proponent stated that its Weed Management Plans would be developed and implemented to the satisfaction of the Weeds Management Branch, DENR. The NT EPA supports this commitment, and is of the opinion that weed prevention and management activities should continue for all stages of the Proposal, including post-closure (refer to Recommendation 17). In particular, the NT EPA considers that the site should be free from weeds at the time of relinquishment.

Changes to fire regime

Fire mapping (NAFI 2019) indicates the region experiences a high fire frequency, with bushfires occurring almost every year since 2000. A further increase in fire frequency and/or intensity through an increase in fuel loads from weeds such as gamba grass, for example, would significantly affect vegetation composition and floristic diversity. Provided proposed weed and fire management are effective, the Proposal is unlikely to increase the current fire regime in the surrounding area.

Fire is recognised as a significant issue for revegetation success and will therefore need to be excluded during the Proposal's rehabilitation program. The importance of good fire management is discussed further in Section 6.1 of this Report.

Changes to surface water flow regimes

The NT EPA assessed changes to hydrological processes in detail in Section 5.2. This assessment will focus on the Proposal's impacts to downstream vegetation.

Downstream of the mine site (West Arm catchment), the greatest water flow reductions were predicted for the early wet season (November to January) until the Mine Site Dam fills and starts to overflow. Altered flows may result in the ephemeral creek remaining dry for longer, and this alteration could stress the relatively sparse riparian vegetation and aquatic habitats associated with the ephemeral creek, although these communities are adapted to seasonal flow conditions. Further downstream, freshwater runoff to the receiving mangrove community is predicted to decline by 12% to 23% for the duration of the Proposal. This landward mangrove community is mapped as *Ceriops tagal* low closed forest (Brocklehurst & Edmeades 1995, NR Maps 2019), which is generally adapted to highly variable freshwater inputs.

For the Bynoe Harbour catchment, the Proponent's modelling predicted a 5% to 15% reduction in surface water flows to the Charlotte River during the wet season. Approximately 2.8ha of riparian rainforest occurs along 750m of the Charlotte River downstream of the merging point with the Observation Hill Dam watercourse. The riparian rainforest community is adapted to highly variable stream flows and potentially accesses groundwater as a GDE.

The NT EPA broadly agrees with the Proponent's conclusion that significant impacts on downstream vegetation communities from the predicted changes in surface water flows are unlikely due to the short duration of the Proposal. This conclusion relies on additional assumptions: that these communities, which are adapted to the low/no-flow conditions of ephemeral creeks, should be sufficiently resilient to tolerate reduced surface water flows for up to three years; and that the communities will have the opportunity to recover at the end of Proposal life when flows are restored.

The NT EPA considers that the Proposal's contribution to future cumulative impacts is not well defined. Cumulative stress to downstream sensitive vegetation from extended mining and processing, has not been considered in this Report. However, the NT EPA recommends that any cumulative impacts to downstream riparian vegetation that can be reasonably attributed to the mine, are to be rehabilitated or accounted for in the final closure option, consistent with Recommendation 16.

5.5.5 Conclusion against the NT EPA objective

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

5.6 Social, economic and cultural surroundings

5.6.1 Environmental objective

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

5.6.2 Environmental values

Social and economic values

The nearest community to the Proposal is Belyuen Aboriginal community (population 175) located approximately 15km to the north-east of the Proposal area. The township of Berry Springs (population 818) is located 22km to the east (36km by road) (Australian Bureau of Statistics 2018). Other key communities considered to be part of the Proposal's area of influence are Tumbling Waters, Wagait Beach and Dundee Beach which are accessed via Cox Peninsula Road, and outer Darwin rural communities along the haul route including Noonamah, Bees Creek and Coolalinga. Darwin and Palmerston are likely to be a key source of potential employees and services for the Proposal.

The local community, tourists and recreational fishers place strong value on the natural environment. Through public participation processes including consultation interviews conducted by the Proponent, briefings and public submissions on the Draft EIS; the community identified the environment, recreational assets, community cohesion, lifestyle, amenity, health and safety as the social values that should be protected from negative environmental impacts (Draft EIS Appendix L Section 11). Economic values raised during the consultation were focussed on livelihood and economic wellbeing.

Cultural and heritage values

No registered Aboriginal sacred sites were identified within the Proposal area (Draft EIS Section 9.1). Authority Certificate RA2018/73 issued by the Aboriginal Areas Protection Authority (AAPA) identified one recorded sacred site outside of the mineral lease on the opposite side of Cox Peninsula Road. This site is upstream from the Proposal area and would not be impacted by the Proposal.

There is one Declared Heritage Area within the mineral lease in the north-west corner of the lease outside of the mine site disturbance footprint. This is listed as 'site 5' and described as a stone artefact scatter of moderate significance.

Two historic tin mine sites referred to as Good Hope Mine and Newsham's Claim, are located within the mineral lease and close to the proposed water pipeline route. These sites are not declared under the Heritage Act 2011 but do have historic heritage value.

The Proponent acknowledged during the community consultation process that areas near the site may be used by Larrakia people and Belyuen community residents for traditional cultural activities. During the Proponent's consultation, reference was made by Aboriginal custodians to the possibility of burial sites being located within the Proposal area. If burial sites are identified during construction, work shall cease and the Proponent is to report the finding to the NT Police and the NT Department of Tourism, Sport and Culture Heritage Branch.

5.6.3 Potential impacts

Social and economic impacts

The following positive and adverse impacts to social and economic surroundings may occur as a result of implementation of the Proposal:

- opportunities for employment and increased economic activity

- impacts to stakeholders and/or community members during mine construction, operation, rehabilitation and closure due to:
 - o traffic delays, and congestion
 - o road pavement degradation due to increased heavy traffic
 - o reduced community amenity due to increase in noise and/or dust especially from increased traffic and road trains
 - o environmental impacts associated with water use, mine closure and rehabilitation
 - o public access and hazards following closure
 - o loss of future land use opportunities
 - o dam failure causing downstream flooding

Cultural and heritage impacts

The following impacts to cultural and heritage surroundings may occur as a result of implementation of the Proposal:

- potential impacts to any sacred sites under the Northern Territory Aboriginal Sacred Sites Act 1989
- reduced access to traditional cultural activities and to Declared Heritage Area 'site 5'
- degradation of the significance of cultural values associated with Declared Heritage Area 'site 5'
- loss of historic values of tin mine sites which are not listed under the Heritage Act 2011

5.6.4 NT EPA assessment

Social and economic assessment

Opportunities for employment and increased economic activity

The Proponent estimates its capital expenditure will be \$A73 million during construction with revenue of \$A346 million generated. Post-tax net value is estimated at \$A97 million with implied contributions of \$A37.5 million in tax and \$A32.3 million in royalties paid to the NT government.

The Proponent's commitment to prioritising the local market in recruitment and procurement processes would generate short-term business opportunities in the Litchfield Local Government Area and the Greater Darwin region. The Proponent expects the Proposal to generate up to 250 direct jobs during construction and approximately 90 jobs during the three-year operational phase. The Proponent anticipates most of the workers would be local residents of Darwin, Palmerston and surrounding areas and will travel to and from site for each shift. The Proponent has committed to working with Aboriginal employment and training providers to identify opportunities for employment and participation for local Aboriginal people. The Proposal has the potential to improve the socio-economic status of local residents for the 3 to 4 year duration of the Proposal.

Traffic delays, and congestion

The Proposal involves drill and blast mining methods with controlled use of explosives to fracture rock for excavation. The Proponent estimates that blasting operations are likely to occur every 2 to 4 days for 3 to 4 years. At these times, the EIS states that a section of Cox Peninsula Road directly adjacent to the mine site would be closed to meet safety

requirements. The Proponent proposes to restrict any required road closures to within the periods 1:00pm to 1:15pm and 5:00pm to 5:15pm, Monday through to Friday with no road closures to occur on weekends or public holidays (Supplement Appendix L Section 4.3.2.1). DIPL has raised concerns with the proposed 5pm to 5:15pm road closure time due to this being an afternoon peak traffic time, and therefore the NT EPA considers that the Proponent should conduct road closures in consultation with and to the satisfaction of DIPL.

Traffic delays and congestion resulting from road closure associated with blasting operations were identified as key concerns for local residents through submissions received on the Draft EIS and the Proponent's community consultation. Prior to a final decision on appropriate blasting times, the Proponent would need to consider and avoid peak traffic periods based on monitoring, and community feedback.

As part of the impact mitigation measures, the Proponent has committed to notifying the communities of Belyuen and Wagait Beach two days prior to blasting operations. An effective mechanism for notification will need to be developed in consultation with the community. Signage at strategic locations on Cox Peninsula Road alerting drivers to forecast blasting times and road closures should be provided.

The EIS States that an authorised traffic management company would be contracted by the Proponent to manage public road closures in accordance with the controlling agency's requirements (Supplement Section 6). The EIS states that a process has been developed by the Proponent as part of its Blast Management Plan (Supplement Appendix L) to allow emergency vehicle passage through road closures. This would involve radio contact being established between the Traffic Controllers and the Blast Coordinator, allowing the Blast Coordinator to abort the blast and ensuring safe passage for emergency vehicles.

The NT EPA acknowledges that regular closure of Cox Peninsula Road due to blasting activities would impact road users by causing delays and traffic congestion and through generation of noise, vibration and fumes. Due to the short term life of the Proposal (maximum of four years), the NT EPA considers the mitigation measures are largely acceptable, but recognises there will be a residual impact on road users including residents and tourists. Accordingly, the NT EPA recommends the Proponent minimises the impact of road closures in relation to blasting activities.

Recommendation 13

The Proponent should:

- **ensure the community is actively engaged in the decision-making process when determining blasting times, minimise the frequency and duration of any road closures, and use all reasonable efforts to restrict road closures to avoid peak traffic times to the satisfaction of the Department of Infrastructure, Planning and Logistics**
- **avoid blasting road closures on weekends, public holidays and peak traffic times**
- **implement best blasting practice to avoid impacts to public infrastructure and minimise the generation of dust, noise, vibration and fume emissions**
- **operate a suitable system to enable members of the public to receive up to date information on the proposed blasting schedule and associated road closures including signs on Cox Peninsula Road notifying drivers of forecast blasting times**

- **prepare and implement a Blast Management Plan and a Road Closure Management Plan for review and approval by the Department of Infrastructure, Planning and Logistics**
- **conduct periodic reviews of Blast Management Plan to evaluate performance and identify corrective action, if required**
- **install road signage to notify road users of blasting activities to the satisfaction of Department of Infrastructure, Planning and Logistics**
- **ensure protocols are in place to allow for passage of emergency vehicles during road closures**

Processed lithium concentrate would be transported to Darwin Port for export with up to 20 quadruple road train movements added to the region's roads per 24 hours during operations, as well as increased light vehicle and construction traffic. The proposed transport route between the mine site and Darwin Port is approximately 95km along Cox Peninsula Road, the Stuart Highway, Tiger Brennan Drive and Berrimah Road. Key communities that could be impacted by mine-related traffic issues include Wagait, Belyuen, Tumbling Waters, Berry Springs, Noonamah, Bees Creek and Coolalinga.

In particular, the haulage route through Berry Springs passes close to sensitive premises such as residential properties, Berry Springs Primary School, a medical centre, a tavern and other amenities. This is a key concern for the community.

The Proponent acknowledged that the presence of mine-related light vehicles and haulage traffic would likely cause inconvenience, delay and noise to the community, particularly around the Berry Springs Primary School. The Proponent committed to implement measures to minimise traffic related impacts as well as ongoing stakeholder engagement throughout the life of mine. Proposed measures include:

- restricting haul truck speeds to 40km/hr within the Berry Springs school precinct (20km per hour below the signed speed limit)
- restricting haul truck movements past the school during drop off and pick up times
- monitoring haul truck speed and driver behaviour using an In-Vehicle Monitoring System with automatic notification if speed limits are exceeded
- keeping the community informed of proposed road closures for blasting activities and restricting blasting times to avoid impacting traffic on weekends and public holidays
- provision of park and ride bussing for staff

The NT EPA understands the Proponent has engaged directly with the school to address concerns about restricting truck movements at peak school times and has committed to complying with any further direction received from Department of Infrastructure, Planning and Logistics (DIPL) related to traffic safety around the school. The NT EPA supports the Proponent's commitment to restrict haulage past the Berry Springs Primary School during peak school drop off and pick up periods.

Recommendation 14

The Proponent should restrict road train haulage past the Berry Springs Primary School to outside of the hours of 07:45am to 08:45am and 2:30pm to 3:30pm on school days unless otherwise approved in writing by the Department of

Infrastructure, Planning and Logistics in consultation with Berry Springs Primary School.

The EIS includes a commitment to implement a complaints handling process for the Proposal, where any complaints received in relation to activities being undertaken by the Proponent would be investigated and resolved. The NT EPA supports the Proponent's commitment to implement a complaints handling process for the duration of the Proposal and has made Recommendation 15.

Road pavement impacts due to increased traffic

The updated Traffic Impact Study (Supplement Appendix G) indicates that the additional movement of heavy vehicles along Cox Peninsula Road generated by the Proposal will reduce the life of the road pavement by 0.5%. The Proponent has committed to undertaking a road condition survey prior to works commencing (Supplement Section 5.1.3) and repairing any damage to the road pavement attributable to the Proposal. The NT EPA notes that DIPL is satisfied that the information provided in the EIS adequately addresses potential pavement impacts.

Reduced community amenity due to increase in noise and/or dust especially from increased traffic and road trains

The NT EPA considers the proposed increase in traffic on Cox Peninsula Road would potentially impact on road users and the community due to increased noise and traffic congestion. Mine-related traffic would generate noise above background levels for receptors close to the Cox Peninsula Road. The Proponent acknowledges that road train traffic is likely to disrupt the amenity of the Berry Springs community. The NT EPA considers the Traffic Management Plan and proposed mitigation measures, including speed restrictions through Berry Springs, a process for public feedback and complaints and ongoing liaison with the DIPL regarding road usage and truck movements to be appropriate to minimise impacts to road users and communities. The NT EPA supports the Proponent's commitment to implement these measures for the duration of the Proposal and to continue its engagement with DIPL and the community on traffic matters.

Concerns were raised in submissions regarding noise and dust from construction and operations and the potential impact on rural lifestyles and general amenity in the locality. The mining lease is relatively distant from communities; the closest residence is approximately 10km south of the proposed mine site. While some woodland would be retained between the mine site and the Cox Peninsula Road, the site will be visible from the road. Noise and dust from general mining operations would also be evident from the road near the mine site. Blasting is likely to be audible over a wider area depending on meteorological conditions. No noise modelling has been conducted to predict the noise levels at the site boundary; however, blasting would be irregular, infrequent and over a short mine life.

The Proponent did not include noise monitoring results or modelling in the EIS, and did not set noise criteria. Reduced amenity due to noise and/or dust was considered by the Proponent and was not expected to have a significant impact on the amenity of the local region for residents or visitors, including from mining and haulage activities. Road trains are proposed to operate on a 24-hours per day 7 days per week haulage schedule between the mine site and Darwin Port, with approximately 10 return trips (or 20 passes) per day.

The NT EPA has concerns that the risk of night time noise from haulage activities to cause disturbance to residents on Cox Peninsula Road has not been adequately considered by the Proponent. The NT EPA considers that night time noise levels at sensitive receivers from road train hauling activities should be managed in accordance with the NT EPA Noise Management Framework Guideline (NT EPA 2018e). This would

avoid night time truck traffic noise to cause sleep disturbance to residents and generate complaints that the Proponent would be required to manage in accordance with the complaints handling process required under Recommendation 15.

Any complaints raised by local community members affected by noise from road trains at night should be managed by the Proponent as part of the complaints handling process. Corrective action by the Proponent may be required such as conducting noise monitoring to establish appropriate response trigger criteria at noise sensitive receivers. Appropriate responses may include:

- reducing noise levels at noise sensitive receiving locations
- implementing speed restrictions
- restricting haulage times

Noise complaints from noise sensitive receivers should be reported to the relevant regulator.

The Proponent proposes to conduct visual monitoring for dust along Cox Peninsula Road and to establish a public feedback and complaints system (Recommendation 15). Due to the mine site's distance from the nearest sensitive receptor and surrounding land uses, impacts from dust, noise, odour or other matters as they relate to amenity are expected to be temporary and minor, provided the Proponent implements the management measures committed to in the EIS.

Environmental impacts to water including long term residual risks

A number of public submissions raised concerns about impacts from the mine to waterways and water supplies. The technical aspects of these potential impacts are addressed in more detail in Sections 5.2 and 5.3 of this Report. Based on its assessment of hydrological processes, the Proponent concluded that groundwater supplies were highly unlikely to be affected by pit drawdown. Similarly, offsite groundwater contamination from the pit and other mine infrastructure would be unlikely to occur as any contaminants infiltrating groundwater on the site should report to the pit void, at least in the short to medium terms. Long-term infiltration predictions rely on analyses of overburden and waste rock, which currently indicate that materials in the upper areas of the pit envelope are generally benign and unlikely to result in acid, metalliferous or saline drainage; however, there is potential for exposure of problematic material in the latter stages of mining.

The NT EPA has made Recommendation 6 which specifies a program for regular geochemical testing of mining waste during operations and preparation of a management plan for any problematic materials encountered.

Several respondents raised concerns about the potential for dam failure in water holding dams, in particular the Observation Hill Dam. The NT EPA acknowledges the Proponent's commitment to design and construct the two water supply dams to ANCOLD guideline specifications and has made Recommendation 4 in this Report requiring independent engineers ensure construction of these dams is in accordance with ANCOLD guidelines.

Rehabilitation, closure and post closure concerns

Several submissions on the Draft EIS raised concerns regarding the financial capacity and commitment of the Proponent to rehabilitate the mine site, residual risks of the site following closure, including the reduced opportunities for future land uses and accessibility to human hazards at the mine site and open pit. Stakeholders queried whether the pit would be backfilled and how the Proponent would ensure the site is safely secured from public access post-mining.

The Proponent committed in the EIS to maintaining a diversion/abandonment bund around the pit following closure and installation of signage in place to inform of danger and protect public safety. No fencing is currently proposed after mine closure; however, the NT EPA considers that fencing of the pit void if not backfilled, would be safer for humans and animals and should therefore be considered as a long-term safety measure.

The Darwin Regional Land Use Plan identifies agriculture/grazing as the likely long term use of the locality. The EIS states that closure criteria and indicators identified in the Mine Closure Plan are consistent with this land use for all areas other than the proposed pit void/lake, which would be unsuitable for future land use for safety reasons related to potential pit instability.

The NT EPA supports the Proponent's commitments to rehabilitate the Proposal area in accordance with a Mine Closure Plan that has been developed consistent with the WA Government Guidelines for Preparing Mine Closure Plans (DMP 2015), with input from stakeholders and that is implemented to the satisfaction of the DPIR. The NT EPA considers it appropriate for rehabilitation of the Proposal area to be able to support the identified future agriculture/grazing land use. While the NT EPA acknowledges the Proponent proposes not to backfill the pit void due to the associated cost, the NT EPA has recommended the Proponent demonstrate how the Closure Objectives would be met without backfilling the pit, and recommends that backfilling be a closure option that is carefully evaluated. Mine closure and rehabilitation is discussed in Section 6.1 of this Report.

Use of non-renewable power sources

Submissions on the Draft EIS questioned the Proponent's proposed use of diesel generators for the mine power supply and the associated greenhouse gas emissions. The Proponent does not propose to offset its greenhouse gas emissions which are estimated at 78,475tCO₂-e over a three year life of mine. The EIS states that renewable sources of energy have not been considered as part of the Proposal due to the short mine life, perceived set-up costs and seasonal reliability of renewable energy sources.

The NT EPA notes the NT Government's Roadmap to Renewables and encourages the Proponent to further consider the use of renewable energy technologies in finalising its mine operational plans. This is discussed in Section 6.3 of this Report.

Cultural heritage assessment

The NT EPA understands there are no known registered or recorded Aboriginal sacred sites in the Proposal area and the Proponent has applied for an Authority Certificate under the Northern Territory Aboriginal Sacred Sites Act 1989 over the mine and infrastructure footprint which would document any restrictions to protect Aboriginal sacred sites. The NT EPA acknowledges the Proponent is in the process of obtaining authority certificates from the AAPA and has committed to comply with any conditions of the certificates.

There are no heritage sites within the Proposal area, however, there is one Declared Heritage Area (site 5) listed on the NT Heritage Register within ML31726. The site is located in the north-west corner of the lease outside of the proposed disturbance footprint. The Proponent has committed to implementing measures to protect this site from disturbance during the proposed works.

Two historic tin mine sites were identified close to the proposed water pipeline route which are not protected under the NT Heritage Act 2011. The NT EPA supports the Proponent's commitment to implement measures to protect identified listed and unlisted heritage sites and any previously unrecorded sites identified unexpectedly during the proposed works.

Access to the Proposal area would be restricted to the public, limiting the ability of Larrakia people and Belyuen residents to access land. The Proponent's engagement with the Belyuen community in November 2018 did not identify the area as being important for traditional cultural activities. The NT EPA notes the Social Impact Management Plan includes provisions for future engagement with relevant Aboriginal stakeholders and supports the Proponent's commitment to ensure any traditional cultural activities are not impacted by the Proposal. During consultations reference was made by Aboriginal custodians to the possibility of burial sites being located within the Proposal area and this is documented in the AAPA certificate. In the event that human remains were encountered during works, the Proponent would be required to stop work and report to the NT Police, and to the NT Department of Tourism, Sport and Culture Heritage Branch.

There is also potential for cultural values of land and water to be impacted if the environmental objectives for other factors are not met. The NT EPA considers that this can be avoided or minimised by addressing and meeting the requirements for the other environmental factors as discussed in this Report.

Summary

The NT EPA considers the proposed ongoing engagement with local communities and stakeholders during construction, operation and closure of the mine is generally appropriate. The NT EPA supports the Proponent's commitment to work with Aboriginal employment and training providers to identify opportunities for employment and participation for Aboriginal people as well as the commitment to prioritise local residents and businesses in recruitment and procurement processes.

The NT EPA considers that the physical impacts to communities in the region are unlikely to be significant and can be managed by the Proponent; however, it acknowledges that impacts to community wellbeing may arise from the presence of a mine in the locality. The Proponent will need to effectively engage with the community to provide assurance that every effort will be made to minimise the physical impacts and risks, and manage expectations so that lifestyles enjoyed in the region will not be significantly affected.

The NT EPA makes Recommendation 15 to emphasise the need for the Proponent to work with the local community to minimise negative impacts and ensure affected stakeholders have the opportunity to benefit from the Proposal.

The NT EPA has paid particular attention to the:

- Proponent's application of mitigation measures to:
 - o avoid an increase in road safety risk during peak school travel times through road train haulage time restrictions
 - o minimise traffic congestion and delays related to blasting times and road closure through ongoing communication and consultation
 - o avoid disturbance of any heritage sites and sacred sites
 - o ensure traditional cultural activities are not impacted
- the Proponent's commitment to ongoing stakeholder consultation
- the distance from the proposed mine site to the nearest sensitive receptor

The NT EPA considers that the mitigation measures presented in the EIS will, when developed as plans and procedures (e.g. Social Impact Management Plan, Traffic Management Plan, Environmental Management Plan, Mine Closure Plan, Complaints Management Process and Unexpected Heritage Finds Procedure) and implemented as

committed to by the Proponent, be effective in managing and mitigating social, economic and cultural impacts to levels that are acceptable.

The NT EPA considers, having regard to the environmental objective for Social, Economic and Cultural Surroundings, that the impacts to this factor from the Proposal are manageable and unlikely to be significant, provided the Proponent:

- obtains relevant clearances and authorities required under the Heritage Act 2011 and the NT Aboriginal Sacred Sites Act 1989 and complies with the conditions of these clearances and authorities
- conducts ongoing community engagement with local residents and stakeholders

Recommendation 15

The Proponent must:

- **develop and implement a Community and Stakeholder Engagement Plan prior to commencement of construction providing for:**
 - **information in recruitment to maximise local employment opportunities and to manage impacts on demand for local workers**
 - **demonstration that Aboriginal people, and particularly the Belyuen community, are aware of opportunities for employment and participation, and retain the opportunity for traditional enjoyment of cultural activities in the area**
 - **publication of a community complaints telephone contact number and email to allow community members to contact the Proponent in the event of any issues or concerns**
 - **development and implementation of a complaints management procedure that requires complaints to be recorded, investigated and abatement measures to be carried out if required, for handling community complaints and grievances for the duration of the Proposal. Noise related complaints should be reported to the Department of Primary Industry and Resources**
 - **ensuring the community is informed of planned blasting times well in advance**
 - **effective ongoing stakeholder engagement and consultation on agreed post-mining closure, rehabilitation, land uses and access**
 - **a commitment to prioritise local businesses in procurement processes and to identify and implement actions for additional benefits for the affected communities**
- **update the Social Impact Management Plan prior to the commencement of construction for approval by the relevant regulator and then update it regularly during construction and operation. The Social Impact Management Plan is to be informed by details of the matters outlined in the Blast Management Plan, Road Closure Management Plan and Community and Stakeholder Engagement Management Plan listed above**
- **publish a social impact management report prior to commencement of construction and then annually during operation of the Proposal. The report is to detail the effectiveness of the Social Impact Management Plan**

measures to manage the social impacts of the proposal. The Proponent is to make these reports publicly available on their website.

5.6.5 Conclusion against the NT EPA objective

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

6 Whole of environment considerations

6.1 Rehabilitation and closure

The EIS stated that the Proponent's overall closure objective for the Proposal area is for a stable non-polluting landform which supports self-sustaining native vegetation comprising local species.

The NT EPA considers that rehabilitated mines must achieve the following two principal Closure Objectives for post-mining land use, consistent with WA Government Guidelines for Preparing Mine Closure Plans):

- be physically safe to humans and animals, geo-technically stable, geo-chemically non-polluting/non-contaminating and capable of sustaining an agreed post-mining land use
- ensure that premises are decommissioned and rehabilitated in an ecologically sustainable manner.

Any residual liabilities relating to the agreed land use should be identified and agreed to by the key stakeholders.

The proposed life of mine is 3 to 4 years. The EIS states that 'the short mine life limits the opportunity to complete rehabilitation progressively'. Therefore, the majority of rehabilitation works would occur at completion of mining. Successful mine closure would rely on mine planning, including component siting and design, being integrated with closure planning at the front end. Quality assurance and quality control in materials characterisation, handling and management is essential during all phases of mining.

The Proponent prepared a conceptual Mine Closure Plan (Draft EIS, Appendix D; Supplement, Appendix K) after considering the WA Government Guidelines for Preparing Mine Closure Plans. The EIS indicates that the plan is dynamic and intended to be updated as further information relevant to mine closure planning is obtained. The NT EPA is of the view that this would include consideration of the actual characterisation of PAF materials once mining commences and the extent of AMD seepage to surface and groundwater and monitoring to validate water quality modelling and pit water quality modelling predictions. Given the short life of mine proposed, the NT EPA is of the view that the plan submitted in the EIS lacks the detail that would typically be required in a closure plan near completion of mining. A number of deficiencies were identified in the plan including the consideration for closure of the pit void, suitability of raw materials for rehabilitation, inadequacy of the revegetation strategy, and lack of evidence of quality assurance and quality control procedures for closure of the mine including construction of mine landform components.

The EIS identified two themes expressed by stakeholders during the Proponent's consultation in relation to post-closure planning and land use objective for the pit void. These included a desire for the pit to be backfilled and the alternative view that a pit lake could serve as a recreational water body or other water resource in the region. Several submissions from members of the public and a non-government organisation raised concerns regarding rehabilitation and the final landform, including the proposal not to backfill the pit void. Neither the backfilled pit void nor a recreational lake have been

adopted as options for the pit void in the Proponent's closure plan. The EIS cited economic reasons for the Proponent's preferred pit lake option. The NT EPA considers that all future options should be thoroughly and transparently evaluated from an ESD perspective.

It is the NT EPA's preference that open pit voids are backfilled and rehabilitated. The NT EPA recognises that a final decision on a closure option needs to be informed by an adequate and transparent evaluation of the benefits, risks and costs of all options (NT EPA 2018c). The EIS included the Grant's Pit Sterilisation Report (Supplement Appendix I) which presented one backfill option that did not include returning the tailings or inundation bund materials to the pit. It identified that 15.7 million cubic metres of out-of-pit material (including a 30% swell factor) would need to be returned to the pit for complete backfill but the material deficit would result in formation of a shallow lake (7 to 8m below ground level) or require importation of off-site materials to complete the backfill. The Proponent estimated that the backfill option would take approximately 10 years to complete at a cost of \$53 million (net present value).

The NT EPA is not satisfied that the Proponent has adequately evaluated all closure options in the EIS for the following reasons:

- the residual environmental and social risks, costs and benefits of the proposed pit lake were not included in the evaluation
- the evaluation did not reflect changes to the Proposal (made after the Draft EIS was published)
- information on the methods, assumptions and limitations used in the Proponent's time, cost and material calculations was not provided

Therefore the NT EPA considers that the Proponent should be required to undertake further evaluation of all mine closure options as part of Mine Closure Plan development to demonstrate to the relevant regulator and the NT EPA that any residual risks and liabilities have been reduced to an acceptable level. The NT EPA makes Recommendations 16 and 17 in this Report to ensure the Closure Objectives can be met.

The Proponent's stated post-mining land use for the mineral lease outside of the pit void abandonment bund is agricultural and grazing in line with future land use under the Darwin Regional Land Use Plan (DLPE 2015). The abandonment bund as proposed encompasses the majority of the mine site, and would act as a deterrent to public access. The integrity of the abandonment bund, particularly the incorporated WRD and TSF, would need to be maintained into the long-term requiring ongoing monitoring and maintenance. In addition to the bund, signage and fencing would also be required to discourage access to the pit. Long-term maintenance of bunding and other deterrents is not proposed and the ongoing costs likely to be incurred by the community for managing the above-ground landform and pit void in perpetuity have not been identified by the Proponent. The NT EPA is of the opinion mine legacy issues that would otherwise be borne by the community and government in the future must be avoided.

As well as the residual cost of maintaining post-closure infrastructure into the long term, there are potential residual impacts to the local environment of maintaining a pit lake. Uncertainties remain relating to chemical composition of materials in the pit walls and the long-term quality of water in the pit lake (see Section 5.3.4 of this Report). The Proponent's modelling (to 2090) predicted pit lake salinity would continue to increase over time with evaporative concentration. This could result in poor quality water forming in the pit lake beyond the modelled timeframe. In conjunction with the drop from pit edge to lake surface and structural integrity issues, the pit would be a permanent hazard in the region.

The Proponent's principal argument for not backfilling the pit, in both the Draft EIS and Supplement, was that the development of a future underground mine targeting the already defined ore resource beneath the pit would be unviable if the pit was backfilled. While the costs of backfilling would significantly reduce profit margins, the Proponent's calculations appeared to indicate that the Proposal would remain viable. However, in additional information to the NT EPA, the Proponent argued that the Proposal was unlikely to be considered financially viable if the pit void required backfilling as a condition of approval (Additional Information Section 7). The justification for this claim was given as the prohibitive cost of importing fill from off-site to complete the backfill. Questions remain around the need for external sources of backfill materials given the availability of materials in earth landforms that are proposed to be constructed on the mine site from the mine pit. The NT EPA considers that there are other options for backfilling the pit that have not been given detailed consideration by the Proponent and that efficiencies could be made and should be accounted for in ongoing refining of the Proposal and development of the mine closure plan.

The NT EPA acknowledges the potential for the remaining lithium resource to be mined at some later stage and that backfilling the pit as part of the Proposal could sterilise this resource. The NT EPA is also aware of the Proponent's plans for continued lithium mining and processing in the region and recognises the potential for the pit void to be filled with future tailings in the medium term. For example, the Proposal area may continue to be used for ore processing if other mines are established in the region and tailings could be disposed of directly in the Grants pit void. Therefore, a case may be argued for delaying backfill of the pit at the end of the proposed life of mine.

The NT EPA confirms that if there is a significant amount of material producing AMD, it must be placed in the pit and not left above the ground.

In the longer term, the NT EPA considers that backfilling the pit would be the option most likely to meet the Closure Objectives for a post-mining land use by providing the most stable storage site for mine wastes and the most ecologically sustainable option for the mine site in the longer term when all activities have ceased. A backfill strategy would ensure that the mine site can be rehabilitated to a safe, stable, non-polluting and ecologically productive part of the landscape. Further, backfilling the pit void and returning all disturbed land to its pre-mining state would broaden the options for future land uses such as for recreation, agriculture or grazing land with corresponding environmental, economic and social benefits. This would more closely align with community expectations related to mine rehabilitation and improve the social and environmental acceptability of mining in the region, both for the Proponent and generally.

The option of backfilling the pit void with mine waste should be given thorough consideration as part of mine closure planning, using a risk based approach that takes into account ESD and the potential long term costs and liabilities associated with any remaining mine landforms, as well as any liabilities relating to the agreed land use.

Recommendation 16

Closure of the Proposal should satisfy the following Closure Objectives for post-mining land use:

- **be physically safe to humans and animals, geo-technically stable, geo-chemically non-polluting/non-contaminating and capable of sustaining an agreed post-mining land use**
- **ensure that premises are decommissioned and rehabilitated in an ecologically sustainable manner**

Unless the Proponent can demonstrate to the relevant regulator and the NT EPA that retaining the final pit void would allow the above Closure Objectives to be achieved, the pit must be backfilled before relinquishment of the mineral lease.

Should expansion of mining in the region, by this or other proponents, be approved in the future then backfilling pits with suitable mine waste materials should be mandated by government.

The Proponent's Mine Closure Plan describes the closure objectives, completion criteria and monitoring for each mine site domain, aiming to achieve its ultimate post-mining land use objective and enable relinquishment of the tenements without liability. Success of mine site rehabilitation is likely to be contingent on the Proponent's revegetation program, irrespective of the agreed pit void closure strategy.

As discussed in Section 5.4.4, the NT EPA considers that the Proponent's rehabilitation strategy must be improved to ensure revegetation succeeds. The strategy in the conceptual Mine Closure Plan currently serves to address short-term erosion and sediment control issues. It does not provide confidence that stockpiled soils would provide an optimum revegetation growth medium; that contingencies in the event of rehabilitation failure are well developed; that completion criteria are adequate to achieve the closure objectives; or that monitoring is sufficiently sensitive to ensure rehabilitation is on track. Given the short-term nature of the Proposal, the Proponent's Mine Closure Plan should contain a sufficient level of detail for rehabilitation activities, particularly the revegetation trial, to commence during early operations.

The Proponent's revegetation trial focuses on its progressive rehabilitation of the WRD foundation during mining operations. While the NT EPA supports progressive rehabilitation and the need for a trial, the progressive rehabilitation strategy as proposed lacks substance other than erosion control, and does not yet communicate a means to restoring biological diversity and ecological integrity of the site. As well as the rehabilitation of earthen infrastructure, the rehabilitation strategy should take into account the rehabilitation requirements for different habitat types, such as rises, alluvial plains and drainage systems that occur within the disturbance footprint for the mine.

Management of weeds, fire and erosion is critical to the survival and growth of native revegetation and overall rehabilitation success in the Proposal area. The NT EPA considers that declared weeds and exotic plants, especially those with high fuel loads, should be appropriately managed until closure criteria are met. Fire should be excluded until the majority of the woody revegetation is sufficiently established to survive the typical fire regime for the region.

The Proponent has committed to implementing a monitoring program to assess revegetation success, erosion, sedimentation and any downstream water quality impacts. Post-closure monitoring would include assessment of the physical and geotechnical stability of post-closure landforms. The EIS indicates that the rehabilitation strategy and permanent stabilisation actions in the Mine Closure Plan would be adjusted and submitted to the relevant regulator for review and approval if rehabilitated areas were to show considerable failure. The NT EPA expects that further detail on suitable closure and completion criteria will be included in the Mine Closure Plan.

Site-specific closure criteria should be developed in consideration of the National standards for the practice of ecological restoration in Australia (Standards Reference Group 2018) taking into account existing ecosystem attributes such as occurrence of threats (e.g. degree of contamination, invasive species), physical site conditions, species composition, structural diversity, fire regime, ecosystem functionality and external exchanges (e.g. habitat connectivity). Monitoring of revegetation should be appropriately sensitive to evaluate whether rehabilitation is following an appropriate trajectory to meet

closure criteria. Triggers for early remedial action should be developed to minimise the potential for revegetation failures.

The NT EPA considers the proposed mine closure and rehabilitation planning, monitoring and management measures are generally appropriate for closure of the Proposal in the short-term with the addition of a number of specific improvements to the Mine Closure Plan. The NT EPA strongly supports the implementation of rehabilitation trials. These should be undertaken in the early stages of mine development and in varying habitats that would be subject to disturbance to determine the most effective revegetation methods for the Proposal area. Further consideration must be given to a longer-term strategy for achieving the Closure Objectives.

Recommendation 17

The Mine Closure Plan should be finalised and approved by the DPIR with advice from the NT EPA prior to mining commencing. The final Mine Closure Plan must:

- **meet the Closure Objectives**
- **be of a standard equivalent to or better than the minimum standard specified in the Western Australian Guidelines for Preparing Mine Closure Plans (DMP & EPA 2015) and include a system of quality assurance/quality control**
- **address decommissioning (including full removal) of the Mine Site Dam at the end of the 3 to 4 year life of mine, and rehabilitation and revegetation of the Mine Site Dam footprint to a condition similar to its pre-construction condition, to protect hydrological process and ecological values. A plan for decommissioning the Mine Site Dam is to be developed as part of the Mine Closure Plan, including management of sedimentation, rehabilitation and revegetation.**
- **address all aspects of rehabilitation and mine closure, including post-mining land use and rehabilitation objectives as agreed with stakeholders, landform designs, schedules for rehabilitation, completion criteria and monitoring of rehabilitation success**
- **include site-specific closure criteria taking into account external threats, physical conditions of the site, species composition, structural diversity and ecosystem functionality of the revegetation, external exchanges and landscape integrity, and an overall condition of the final landform and rehabilitated ecosystems that is similar to the pre-mining condition**
- **manage declared weeds and exotic plants with high fuel loads until closure criteria are met, consider weed status and fire resistance of revegetated areas in closure criteria and manage fire until the majority of the woody revegetation is likely to survive the typical fire regime for the region**
- **include plans and a schedule for post-construction progressive rehabilitation of all areas of the water pipeline corridor and any other disturbed areas that would no longer be required**
- **include details of the rehabilitation trials and investigations that would inform appropriate landform covers and target ecosystems for all areas to be rehabilitated, including waste landforms and disturbed areas on rises, drainage systems and alluvial plains. The Mine Closure Plan should be updated in consideration of trial results when available**

- provide for ongoing monitoring and maintenance of the site post-mining, in accordance with an approved monitoring and maintenance program that includes a trajectory to achieving closure criteria, until closure criteria are achieved and the site has been relinquished
- include details of reporting requirements to the relevant regulator on the performance of progressive rehabilitation works to inform decision-making to ensure successful post-mining rehabilitation
- include provisions for independent external audits by suitably qualified and experienced auditors of the development and implementation of the plan at least annually following commencement of operations, at closure and prior to relinquishment of the mineral lease
- include investigation of the long-term settling process of tailings and waste rock to inform construction of appropriate landform covers
- require independent periodic external audits by suitably qualified and experienced auditors of any pit backfilling activities including the backfill design, geotechnical information, placement, compaction, drainage and settlement of material layers and placement of any PAF material below the lowest expected groundwater level

6.2 Cumulative effects

The Proponent states that it is actively exploring for lithium within leases held across 500km² in the Finnis region and aims to substantially grow the mineral resource base through further drilling in 2019. Currently, its focus is on potentially mining the BP33 deposit located around 6km to the south-west of the Grants mineral lease, should the BP33 resource prove feasible.

Implementing the Proposal and expanding operations in the future would lead to cumulative impacts on the environment. The degree to which the Proponent's activities could cumulatively impact the region will be influenced by the location, number, scope and length of mining operations and whether these operations would occur concurrently or consecutively, and the risks and potential impacts associated with the various activities.

The EIS concluded that the cumulative impact potential of the Proposal was limited due to low levels of existing development in the region, the lack of foreseeable development activity in the locality limiting the likelihood of concurrent industrial activities, and the low to medium residual risk posed by the Proposal limiting the potential for legacy issues. The Proposal's contribution to cumulative impacts was summarised in the EIS as its potential impacts on flora and fauna values if additional lithium mining was proposed, due to increased risk of weed infestations and bushfire intensities from existing weed sources in the region.

As discussed in previous sections of this Report, the NT EPA considers that the environmental objectives will be achieved if the Proposal is carried out in accordance with the EIS and recommendations in this Report. However, further development of lithium resources in the region could add or multiply some effects. Adverse impacts that may be insignificant on a project scale may become significant on a regional scale, particularly when considered in conjunction with continued regional development and land cover change (whether or not these are related or external to the Proposal). The actions taken in this Proposal will need to take this into account, irrespective of the uncertainties around the Proponent's future activities in the region.

Of critical importance in minimising cumulative impact as a result of the Proposal is its management during construction and operation, and the condition of the mine site

following closure. Management of activities associated with mining and transport must be to the highest standard to ensure project-level impacts are as low as reasonably practicable. Furthermore, the mine site must be left in a condition that does not contribute to adverse impacts on future land-uses or community well-being. This may be achievable by implementing leading-practice operating standards, environmental management measures and stakeholder engagement in the Proposal.

6.3 Ecologically Sustainable Development

The EIS states that the global demand for lithium, underpinned by the growth in production of lithium-ion batteries for use in energy storage applications associated with renewable energy and electric vehicles, provides an opportunity for the Proposal to be the first phase of a longer-term lithium mining operation. Furthermore, the EIS promotes a potential benefit of long-term lithium mining in the NT as presenting opportunities for further industry development, such as lithium battery factories.

The Proponent discounts alternative energy sources to diesel in the Proposal citing the short mine life combined with set-up costs and seasonal reliability of renewable energy sources as reasons that renewable technology is considered incompatible with Proposal requirements. The NT EPA acknowledges that the life of mine, though increased since the Draft EIS, is still short and that emissions from the Proposal are likely to be relatively low (approximately 0.48% of the NT annual emissions).

The NT Roadmap to Renewables (Langworthy *et al.* 2017) commits the NT Government to a target of 50% energy for electricity consumed in the NT to come from renewable sources by 2030. The target includes energy consumed by self-generating commercial enterprises such as mines and new large industrial consumers. The NT EPA acknowledges the importance of the NT Government's renewable energy target and supports integrating renewable energy sources into new developments where practicable.

The NT Government's renewable energy target commitment, increased focus on meeting ESD principles in determining the acceptability of development projects, the potential for longer-term lithium mining operation and possible use for future ancillary activities in the region, should be sufficient incentives for the Proponent to further consider renewable energy.

The NT EPA is of the view that further assessment of power supply alternatives should be considered by the Proponent to reduce the Proposal's greenhouse gas emissions to as low as reasonably practicable, with particular regard given to renewable sources.

7 Conclusion

The NT EPA has considered the proposal by Core Lithium Limited to develop the Grants Lithium Project. The NT EPA's assessment of the Proposal identified potentially significant environmental impacts and risks associated with the environmental factors of hydrological processes, inland water environmental quality, terrestrial environmental quality, terrestrial flora and fauna and social, cultural and economic surroundings.

The NT EPA considers that, subject to the implementation of the 17 recommendations in this Assessment Report and the commitments and safeguards listed by the Proponent in the EIS, the Proposal can be implemented and 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 - Assessment of the NT EPA's environmental factors

The NT EPA assessed the environmental impact of the Proposal in line with its environmental factors and objectives (NT EPA, 2018). The following table presents environmental factors for the Proposal which, based on current knowledge, were assessed as not significant. The NT EPA considers it unlikely that implementation of the Proposal would have a significant impact on these factors and they can be managed to meet the NT EPA's environmental objective.

Environmental Factor	Assessment of the potential impacts on the environmental factor	Evaluation of why the factor is not a key environmental factor
LAND		
Landforms Objective: Conserve the variety and integrity of distinctive physical landforms so that environmental values are protected	There are no distinctive physical landforms in the area of the Proposal. There are potential impacts to the landscape from the significant height of the WRD and the significant extent of the open pit and permanent pit lake	The Proposal area does not contain distinctive landforms and proposed rehabilitation would ensure the final landform integrates into the surrounding landforms. Therefore, landforms were not identified as a key environmental factor for this assessment. The Proponent proposes to rehabilitate areas disturbed by mining activities in accordance with commitments made in the Mine Closure Plan, returning a majority of the disturbed land to a state that is comparable to the pre-mining condition. The exception to this would be the WRD which would be visible from Cox Peninsula Road and the open pit that is proposed to remain as a water filled void. The NT EPA considers it unlikely that implementation of the Proposal and the post closure presence of non-natural landforms including the WRD and open pit / pit lake would impact on the environmental values of the existing landform.
WATER		
Aquatic Ecosystems	There are no significant aquatic ecosystems in the Proposal area.	The Proponent's initial aquatic survey indicated that the ephemeral aquatic habitats downstream of the mine site are typical of low order watercourses in the NT without significant value in terms of supporting species that are range restricted or threatened. The main potential impacts would be through changes in surface water flows caused by the two water dams and a degradation in water quality caused by discharges of mine water. A water abstraction licence and authorised discharge under MM Act or WDL under Water Act would apply to discharge mine water. See Sections 5.2.4 and 5.3.4 for an assessment of potential impacts to surface water quality and flow regimes. With these regulations in place, the NT EPA concludes the Proposal is unlikely to have a significant impact on aquatic ecosystems.

Environmental Factor	Assessment of the potential impacts on the environmental factor	Evaluation of why the factor is not a key environmental factor
Benthic Habitat and Communities	There would be no significant benthic habitat or communities within or downstream of the Proposal area.	The closest marine benthic habitat and community would be located approximately 1.7km downstream of the mine site in West Arm, Darwin Harbour. The main potential impacts would be through changes in surface water flows and water quality caused by the mine water dam and discharges of mine water. If, in future, impacts are identified as having the potential to be significant, a water abstraction licence and a WDL under the Water Act or authorisation under the MM Act to discharge mine water would apply. See Sections 5.2.4 and 5.3.4 for an assessment of potential impacts to surface water quality and flow regimes. With these regulations in place, the NT EPA concludes that the Proposal would be unlikely to have a significant impact on downstream benthic habitat and communities.
Marine Environmental Quality	The Proposal area is not within Northern Territory coastal waters or estuaries.	The closest marine habitat would be located approximately 1.7km downstream of the mine site in West Arm, Darwin Harbour. The main potential impacts would be through changes in surface water flows and water quality caused by the mine water dam and discharges of mine water. If, in future, impacts are identified as having the potential to be significant, a water abstraction licence and a WDL under the Water Act or authorisation under the MM Act would apply to discharge mine water. See Sections 5.2.4 and 5.3.4 for an assessment of potential impacts to surface water quality and flow regimes. With these regulations in place, the NT EPA concludes that the Proposal is unlikely to have significant impacts on the environmental values of the key factor Marine environmental quality.
Marine Flora and Fauna	There are no marine flora and fauna in the Proposal area	The NT EPA notes that there are existing potential impacts and risks to marine flora and fauna in the West Arm catchment of Darwin Harbour. Development of the Proposal is unlikely to significantly increase risks to marine flora and fauna.
AIR		
Air quality and greenhouse gases	Dust generation Implementation of the Proposal would result in the generation of dust from land clearing, construction and mining activities and vehicle and equipment movements.	The Proponent identified dust as a key risk to air quality that would require ongoing control, monitoring and management. The two key strategies that would be employed to minimise dust emissions from the mine site are dust suppression and stabilisation of cleared areas. The Proposal EMP (Chapter 10, Draft EIS) provides details of the management provisions, targets, monitoring and corrective actions that would be implemented to ensure the impact of dust emissions are minimised. Water requirements for dust suppression have been considered in detail as part of project planning and have been factored into the water balance model provided (Appendix D, Supplement). The Erosion and Sediment Control Plan (Appendix F, Draft EIS) and the Vegetation Clearing procedure (Appendix S, Draft EIS) provide controls for stabilising cleared areas to avoid dust.

Environmental Factor	Assessment of the potential impacts on the environmental factor	Evaluation of why the factor is not a key environmental factor
	Implementation of the Proposal would result in emission of greenhouse gases from land clearing, and from combustion of diesel for onsite power generation and operation of mining equipment and vehicles.	The NT EPA considers that potential impacts could be avoided, mitigated or managed through the implementation of dust control measures as part of the MMP that would be regulated under the MM Act. The clearing of 251ha of native vegetation (mostly open woodland) would result in estimated greenhouse gas emissions of 18,323tCO_{2-e}. This is not considered to be significant on a regional or national scale. Stationary emissions are estimated at 4489tCO_{2-e}. The largest contribution to greenhouse gas emissions would be from the combustion of diesel (approximately 20,454kL) (transport) which is expected to contribute 55,664tCO_{2-e} over three years. Emissions from diesel combustion would not be significant on a regional or national scale. The NT EPA calculated that the total estimate greenhouse gas emissions from the Proposal (84080tCO_{2-e}) equates to 0.48% of the total emissions produced in the NT in 2016 and 0.015% produced in Australia in 2016 (DOEE 2018). The NT EPA supports improved energy efficiencies and for a proportion of energy to be supplied by renewable sources, which would minimise greenhouse gas emissions associated with implementation of the Proposal.
PEOPLE AND COMMUNITIES		
Human health	Implementation of the Proposal could result in potential impacts to human health via water, land, or air contamination, or through decreased community resilience.	The NT EPA considers that these potential impacts would be avoided or managed through achieving the objectives of the environmental factors for Inland water environmental quality; Terrestrial environmental quality; Air quality and greenhouse gases; and Social, economic and cultural surroundings. In addition, potential impacts to human health would be managed through a health and safety management system guided by WorkSafe Australia and AS/NZS 4801:2001 Occupational Health and Safety Management Systems (Standards Australia, 2001).

Appendix 2 – Principles of Ecologically Sustainable Development

Under the NT EPA Act, ecologically sustainable development (ESD) means using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life now and in the future can be increased.

In December 1992, the Territory Government endorsed the National Strategy for ESD and agreed, along with all other States and Territories, to the Intergovernmental Agreement on the Environment (IGAE). The NT EPA uses the four principles contained in the IGAE to demonstrate that it has considered ESD in its assessment of the Proposal and in its fulfilment of its objectives under the NT EPA Act.

ESD Guiding principle	NT EPA assessment
The precautionary principle <i>Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.</i> <i>In application of this precautionary principle, decisions should be guided by:</i> <i>(a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment</i> <i>(b) an assessment of the risk-weighted consequences of various options.</i>	In considering this principle, the NT EPA notes that Hydrological processes, Inland water environmental quality, Terrestrial environmental quality, Terrestrial flora and fauna, and Social, economic and cultural surroundings could be significantly impacted by the Proposal. The assessment of these impacts is provided in this report. The EPA notes that the Proponent has identified measures to avoid or minimise impacts. The EPA has considered these measures during its assessment. The Proponent's investigations, and proposed characterisation and/or monitoring programs for construction and operation phases, into the physical, biological, social and cultural environment provided sufficient certainty to enable assessment of a majority of the risks and potential impacts and to identify measures to avoid or minimise those risks and impacts. Some uncertainty remains regarding the Proposal's contribution to cumulative impacts and residual impacts and risks, particularly in the post closure stage. Therefore the NT EPA has made recommendations to ensure residual risk is accounted for in closure planning, and that the NT EPA provide advice on the closure plan prior to approval by the regulator and prior to commencement of mining. To address uncertainty as a result of assumptions about the resilience of riparian vegetation to recover from reduced water flows after the 3-4 year Proposal, the NT EPA makes Recommendation 5 to ensure that any impacts to hydrological processes in surface streams from the Proposal are monitored, measured, reported and managed to protect water and ecological values including beyond the 3 to 4 year life of mine. This quantification would provide some basis for calculating the residual costs associated with an unacceptable impact, and allow such cumulative impacts to be accounted for in future development in the region.

ESD Guiding principle	NT EPA assessment
	From its assessment of the Proposal, the NT EPA concludes that if its recommendations are implemented and managed as approval conditions of the Proposal, significant or unacceptable environmental impacts and risks are likely to be avoided.
The principle of intergenerational equity <i>The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.</i>	The short life of mine (3 to 4 years) of the Proposal coupled with long term rehabilitation outcomes (>50 years) creates potential for significant disparity of intergenerational equity. The NT EPA acknowledges that the Proponent may improve this disparity through commitments by the Proponent to local jobs and training (particularly for Belyuen people) and direct benefits to local businesses. The Proponent stated that the short life of mine, combined with set-up costs and seasonal reliability of renewable energy sources contribute to renewable technology being incompatible with project requirements. While this is acknowledged, the NT EPA encourages the Proponent to take a longer term view of future power supply alternatives including renewables to be more compatible with this ESD principle. The NT EPA recognised the potential for the final open pit void to have ongoing management costs, post closure and/or post relinquishment, borne by the community and government. The NT EPA recommended that unless the Proponent can demonstrate that leaving a pit lake would still allow the Closure Objectives and principles of ESD to be met, the pit void should ultimately be backfilled. From its assessment of the Proposal, the NT EPA concluded that, provided its recommendations are imposed as conditions on the implementation of the Proposal, environmental values will be protected and the health, diversity and productivity of the surrounding environment will be maintained for the benefit of future generations.
The principle of the conservation of biological diversity and ecological integrity <i>Conservation of biological diversity and ecological integrity should be a fundamental consideration.</i>	In considering this principle, the NT EPA notes that the Proposal would result in impacts and risks to Hydrological processes, Inland water environmental quality, Terrestrial environmental quality and Terrestrial flora and fauna. In assessing the Proposal, the NT EPA has considered these impacts and risks and taken into consideration measures proposed by the Proponent to avoid and minimise impacts to the affected values. The Proposal's impacts to sensitive and significant vegetation are predicted to be temporary, however there are uncertainties in this assessment. The NT EPA recommended any impacts to downstream riparian vegetation that can be reasonably attributed to the mine, are to be rehabilitated or accounted

ESD Guiding principle	NT EPA assessment
	for (in demonstrating a regional community and environmental benefit of the final closure option) if the Proposal is approved. This would allow the unanticipated residual impacts to be remediated or compensated. The NT EPA has concluded that, provided its recommendations in this Report are imposed as conditions, the Proposal would not compromise the biological diversity and ecological integrity of the affected areas.
Principles relating to improved valuation, pricing and incentive mechanisms (a) <i>Environmental factors should be included in the valuation of assets and services.</i> (b) <i>The polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance and abatement.</i> (c) <i>The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.</i> (d) <i>Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximise benefits and/or minimize costs to develop their own solution and responses to environmental problems.</i>	In considering this principle, the NT EPA acknowledges that the Proponent would take responsibility for preventing, managing and mitigating any adverse environmental impacts during all stages of the Proposal including clearing, construction, operation, decommissioning, closure and rehabilitation. The NT EPA notes that this responsibility includes: (a) valuing the Proposal's water resources (b) accounting for the costs of the residual risks associated with the Proposal's final landforms (WRD and pit lake) (c) preventing, managing and mitigating waste and pollution, including contamination of soils, groundwater and surface waters through accidental spills, uncontrolled discharges and tailings seepage (d) ensuring rehabilitation and closure are consistent with agreed outcomes, public scrutiny (reporting) without ongoing unacceptable liability to the Territory.