



Environment Protection Act (EP Act) Referral Supporting Information Document

**Finniss Lithium Project
BP33 Underground Mine
Cox Peninsula, Northern Territory**

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APPENDIX E	AAPA CERTIFICATE

ACRONYMS

AAPA	Aboriginal Areas Protection Authority
AMD	Acid mine drainage
ANZG	Australian New Zealand Guidelines
ARD	Acid rock drainage
BCF	Burrell Creek Formation
BGL	Below ground level
BJV	Bynoe Joint Venture
BOM	Bureau of Meteorology
CBF	Cemented past fill
CXO	Core Exploration
DENR	Department of Environment and Natural Resources (Northern Territory) – formerly DLRM
DIPE	Department of Infrastructure Planning and Environment
DIPL	Department of Infrastructure, Planning and Logistics
DLRM	Department of Land Resource Management
DoEE	Department of the Environment and Energy (Commonwealth)
DPIR	Department of Primary Industry and Resources
EC Australia	EnviroConsult Australia
EIS	Environmental Impact Statement
EL	Exploration Licence
EMP	Environmental Management Plan
EPBC Act	Environment Protection and Biodiversity Conservation Act (1999) (Commonwealth)
ESCP	Erosion and Sediment Control Plan
GDE	Groundwater dependant ecosystems
MA	Mining Authorisation
ML	Mineral Lease
ML(A)	Mineral Lease Application
MMA	Mining Management Plan
MNES	Matters of National Environmental Significance
MRE	Mineral resource estimate
MSD	Mine settling dam
MTA	Mineral Titles Act
NAF	Non-acid forming
NAFI	Northern Australia and Rangelands Fire Information
NLC	Northern Land Council
NMD	Neutral mine drainage
NOI	Notice of Intent
NT	Northern Territory
NTG	Northern Territory Government
NT EPA	Northern Territory Environment Protection Authority
OHD	Observation Hill Dam
PAF	Potentially acid forming
RAR	Return air raise
RF	Rock fill

ROM	Run of mine
RWD	Raw water dam
SD	Saline drainage
SIA	Social impact assessment
SoCS	Sites of Conservation Significance
SWL	Standing water level
TDS	Total Dissolved Solids
TIS	Traffic Impact Statement
TO	Traditional Owner
TPWC Act	Territory Parks and Wildlife Conservation Act (Northern Territory)
WDL	Waste Discharge Licence
WONS	Weed of National Significance
WRD	Waste rock dump
UG	Underground
VCL	Vacant Crown land

1 INTRODUCTION

Core Lithium Limited (Core) is proposing to expand its proposed Finnis Lithium Project mining activities on the Cox Peninsula, 33 km west of Berry Springs. Core currently holds Mining Authorisation (MA) 1020-01 pursuant to the *Mining Management Act* for open pit mining and processing of the Grants ore resource on Mineral Lease (ML) 31726. Core is proposing to develop an underground mine at the BP33 resource, located approximately 3.5 km south-east of the Grants site. The project will involve underground mining of ore and trucking to the Grants processing plant via a 7.5 km purpose built haul road.

The action is being referred to the NT Environmental Protection Authority (NT EPA) for consideration under section 48 of the *Environmental Protection Act*. This document provides supplementary information to the Referral Form and has been prepared with reference to the guidelines document '*Referring a Proposed Action to the NT EPA: Environmental impact assessment guidance for proponents.*'

As the operation of the Grants processing plant was assessed previously under the *Environmental Assessment Act*, a separate 'notice of alteration' was submitted to the NT EPA to address the extended period of ore processing operations at Grants. On 25 June 2020 the NT EPA issued their decision that the proposed extension does not require further assessment.

1.1 Proposal title

BP33 Lithium Project (BP33 Project).

1.2 Contact Details

Proponent		Environmental Consultant	
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1.3 Background

The BP33 deposit has been mined previously for a number of years in the 1980's and 1990's as an open pit mine. The ore was trucked to a central processing facility located nearby at Observation Hill. The Observation Hill processing facility operated for over a decade. Core holds approximately 400 km² of granted exploration tenements across the Bynoe pegmatite field. The area has a long history of exploration and mining activity, with the majority of the known resources discovered in the late 1800's to early 1900's. The Finnis Lithium Project comprises a number of pegmatite prospects that are being explored by Core (refer Figure 3-1).

Core currently holds MA 1020-01 pursuant to the *Mining Management Act* for mining and processing of the Grants ore resource on Mineral Lease (ML) 31726. That project was assessed under the *Environmental Assessment Act* and the NT EPA completed Assessment Report 89 in June 2019.

Further exploration drilling programs across the Finnis Lithium Project area in 2018-2019 have identified a number of satellite ore resources nearby the Grants project, that offer potential to extend the life of mine for the Finnis Lithium Project. Core is currently progressing feasibility studies for mining of ore at the BP33 and

Carlton deposits. Ore mined at these deposits will be trucked to the Grants processing facility and the life of mine would be extended from the current 3 years, out to 7+ years.

Each new mine will require approval under the *Mining Management Act* and may also require assessment under the *Environment Protection Act* if there is potential for significant impact to the environment. The BP33 Lithium Project planning is now sufficiently advanced to allow Core to submit a Referral. Mining of the Carlton resource, located immediately adjacent to Grants, will be the subject of a separate Referral once the details of the mine plan are further developed.

1.4 Location and tenure

The BP33 project is located 2.5 km south-west of the Cox Peninsula Road, approximately 33 km west of the Berry Springs Township. The location is shown on Figure 1-1 and the land information details are set out in Table 1-1.

Two Mineral Leases (ML32074 and ML32346) cover the BP33 project. ML32074, the proposed site for the box-cut was granted 12 December 2019, under the *Mineral Titles Act (MTA)*. ML32346, the site proposed for the BP33 underground and associated surface infrastructure is pending approval.

Whilst the project area is not located within the boundaries of any local government area, the haul route is along Northern Territory Government (NTG) controlled main roads that pass through the areas of Litchfield, Palmerston and Darwin municipalities. The site is not serviced by mains power, water or sewage, and the closest police and fire emergency services are located at Humpty Doo (60 km by road). Medical general practitioner services are available in Berry Springs and the closest hospital is the Palmerston Regional Hospital (70 km by road).

Table 1-1. Land information for the project area

Latitude	-12.71°
Longitude	130.79°
Area	61.4 hectares
Tenement details	EL30015, ML32074, EL29698, ML(A)32346
Street address	2873 Cox Peninsula Road, Cox Peninsula
Parcel description	Section 1 Hundred of Parsons & Section 2746 Hundred of Hughes
Zoning	Rural
Tenure	Vacant Crown Land owned by the NT Government Area
Local Government Area	Unincorporated (Cox-Daly) area

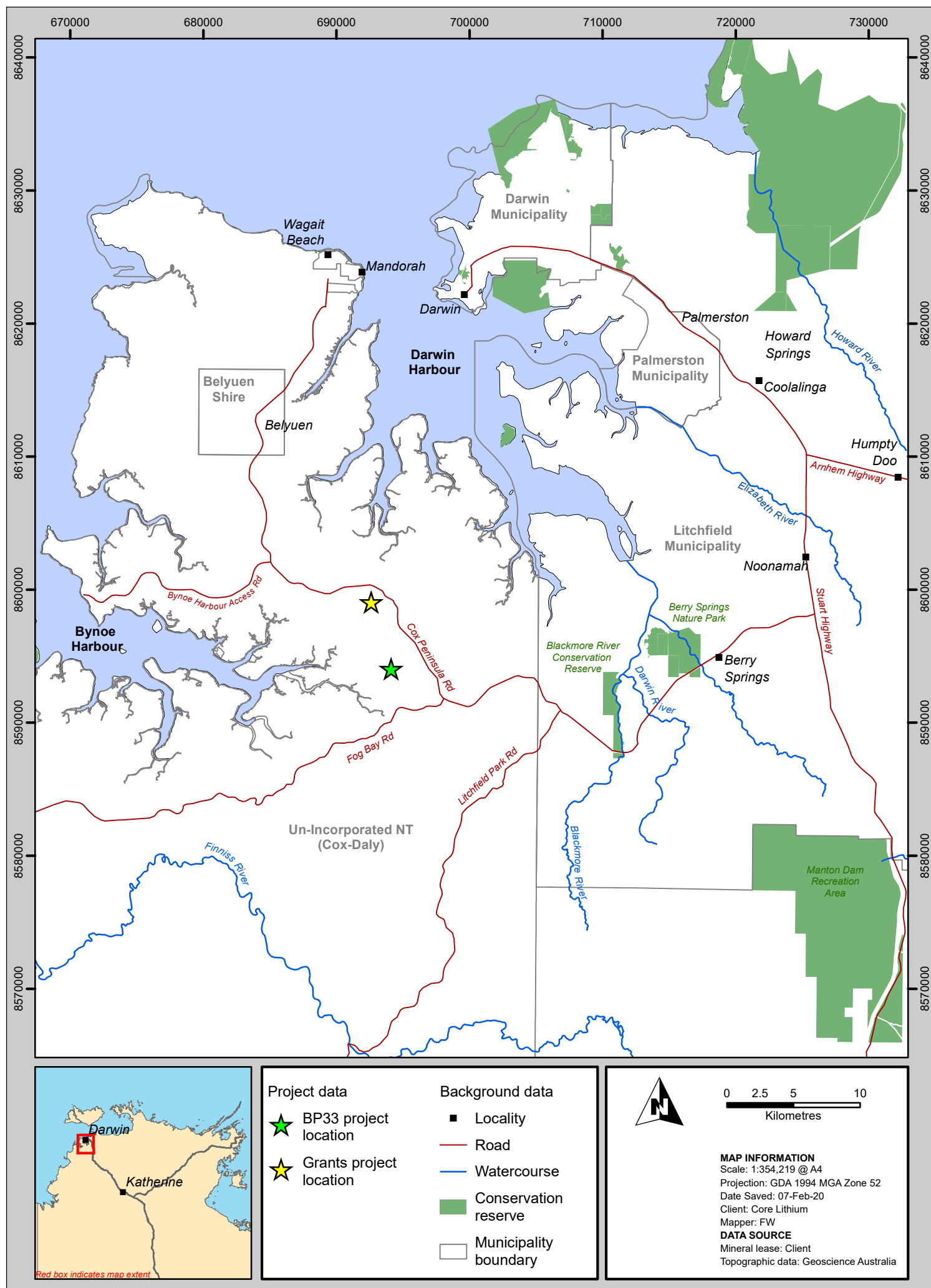
1.5 Project benefits

BP33 will benefit the NT economy, both directly through contracting and employment and indirectly through payment of taxes and royalties. Opportunities for community benefits from the Grants project were identified as part of the Social Impact Assessment (SIA) undertaken by True North (2018). The Community Benefits Plan prepared for Grants project (see Table 1-2 below) will be adopted across the Finnis Lithium Project more broadly. The plan details the actions that will be undertaken by Core to maximise local community benefits, targets/performance indicators that will be used to measure social performance and monitoring / reporting processes.

Table 1-2. Community benefits plan for Finniss Lithium Project

Opportunity	Objective / outcome	Management provisions	Targets / performance indicators	Monitoring	Response	Reporting & Record-keeping
Local communities benefit through distribution of sponsorship funds.	Maximise benefits to the local community	Establish a sponsorship budget. Prepare a sponsorship plan, prioritising projects that benefit community groups and young people in the project's local area. Identify sponsorship objectives in conjunction with the community.	Core recognised as actively contributing to the local community.	Produce annual reports outlining sponsorship expenditure, with a short summary of what was achieved.	NA	Annual reporting against objectives for communities /groups as a result of sponsorship.
Local businesses benefit from winning contracts.	Maximise local content. Build the capacity of local small businesses.	Recruitment and procurement processes prioritising the local market. Package and promote tenders to suit local capacity and prepare businesses for competitiveness and standards required by Core. Proactive identification of local business with the capability to work on the project. Agreements with contractors to specify local service and supply requirements.	Business and industry satisfied with the number and value of contracts awarded locally. Positive feedback about the level of local content.	Monitoring of feedback from business and industry on level of local content.	Meetings with job service providers to investigate and address issues.	Progress reports to stakeholders. Report against indicators including the number and value of local contracts awarded.
Boost to direct and indirect local employment, through jobs on the project or throughout the local supply chain.	Maximise the recruitment and retention of local workers, both directly and with contractors	Recruitment and procurement processes prioritising the local market. Package and promote tenders to suit local capacity. Ongoing communication with the community and stakeholders to manage local content expectations Work with local job providers. Good communication about jobs available on the project.	Number and total value of local contracts and jobs awarded in line with industry/community expectations.	Monitoring of feedback from business and industry on level of local employment and local contracts awarded.	NA	Progress reports to stakeholders. Report against indicators including the number and value of local contracts awarded and local job figures for the project.
Local economies stimulated through payments to workers, contractors and local companies.	Local economic growth through contracts and increased	Recruitment and procurement processes prioritising the local market.	Local industry satisfied with action taken to increase local participation.	Monitoring of feedback from business and industry on level of local content.	Communicate progress against objectives.	Progress reports to stakeholders. Report against indicators including the number and

Opportunity	Objective / outcome	Management provisions	Targets / performance indicators	Monitoring	Response	Reporting & Record-keeping
	discretionary expenditure.	Package and promote tenders to suit local capacity where feasible.				value of local contracts awarded and the amount and proportion of expenditure in the local economy.
Employment opportunities for local Indigenous people	Maximise Indigenous employment on the project, direct and with contractors.	Work with Indigenous employment and training providers. Provide support to contractors to employ and train local Indigenous people. Liaise with other large projects about the opportunities to transition staff.	Number of Indigenous jobs awarded in line with Government and community expectations.	Feedback from Government, Indigenous stakeholders and the community on the level of Indigenous employment on the project.	Meet with Indigenous employment and training providers.	Progress reports to stakeholders. Report against indicators including Indigenous employment figures.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\19171 - BP33 NOI\01 Project Files\Report maps\Figure 1-1. Map of project location and regional setting.mxd

Figure 1-1. Map of project location

2 REGULATORY CONTEXT

This section provides an overview of the key Commonwealth and NT environmental and heritage legislation applicable to the project, and key approvals, licences or permits received and/or required to proceed.

2.1 Commonwealth

2.1.1 Environment Protection and Biodiversity Conservation (EPBC) Act 1999

The *EPBC Act* is the Australian Government's key environmental legislation. Approval under the *EPBC Act* may be required for any proposed action likely to have a significant impact on a matter protected by that Act. The environment assessment and approvals process of the *EPBC Act* aims to protect Matters of National Environmental Significance (MNES), as well as the environment in general where actions proposed are on, or will affect Commonwealth land, and/or where Commonwealth agencies are proposing to take an action. section 15 of this NOI considers potential impacts to, MNES and concludes that the proposal is unlikely to be a controlled action and does not require referral under the *EPBC Act*.

2.1.2 Native Title Act 1993

The project area is not located on land subject to native title claim and therefore the *Native Title Act* does not apply.

2.1.3 National Greenhouse and Energy Reporting Act 2007

The land clearing and energy use associated with the proposal will not exceed the thresholds for reporting under the *National Greenhouse and Energy Reporting Act 2007*.

2.2 Northern Territory

2.2.1 Mineral Titles Act 2010

The *Mineral Titles Act (MTA)* establishes the framework within which activities to explore for and mine mineral resources can occur. It sets out the administrative processes for authorising activities through the granting of a title. Lithium Developments Pty Ltd hold Exploration Licence (EL)30015 and EL29698 over the BP33 project area. Two MLs have been applied for over the area, ML32074 and ML(A)32346. ML(A) 32346 is currently pending approval.

2.2.2 Mining Management Act 2001

Prior to any activities taking place on a granted EL or ML, a Mining Authorisation (MA) must be obtained under the *Mining Management Act (MMA)*. An application for an authorisation must be accompanied by a Mining Management Plan (MMP). There is currently an approved MMP in place for exploration activities on EL29698, for the Grants Lithium Project, which covers sections of the MLs proposed for the BP33 project. There is not an approved MMP for EL30015.

An authorisation and MMP will be submitted for the mining activities, which will be subject to assessment by the Department of Primary Industry and Resources (DPIR). Once approved the MMP will be available to the public, excluding commercial-in-confidence information. This is the primary environmental approval applicable to the operation of the BP33 project.

Core currently holds a MA 1021-01 under the *Mining Management Act* for the project activities associated with the development and mining of the Grants ore resource over a period of approximately three years. As aforementioned, a Notice of Alteration has been prepared to notify the NT EPA of the altered activities proposed by Core for the Grants Project. An amended MA will be required.

2.2.3 Traffic Act 1987

Under the *Traffic Act*, permit approval is required where construction activities are within a NT road reserve. A Development Approval (DA) and Traffic Impact Statement (TIS) was submitted with Grants MMP, to enable the use of public roads to haul processed ore from the Grants processing facility to Darwin Port. This statement will be amended in accordance with the Notice of Alteration of the Grants processing facility.

2.2.4 Water Act 1992

The *Water Act 1992* (NT) is the overarching legislation to water mitigation in the NT. The *Water Act* provides for the investigation, allocation, use, control, protection and management of surface water and groundwater resources, as well as the administrative process for licensing these activities. Under this Act the Water Regulations 1992 (NT), Water Control Districts, Allocation Plans, groundwater extraction licences and surface water extraction licences are some of the measures used to mitigate, assess and control water resources in the NT. The project will require water for operational dust suppression and processing. The project area is located in the Darwin Rural water control district (DRWCD) and is required under the *Water Act* to submit a surface water extraction licence application to extract water from Observation Hill Dam (OHD) and a groundwater extraction licence application to extract water from bores.

A Waste Discharge Licence (WDL) may be required in the event that any wastewater will be disposed of off-site.

2.2.5 Other approvals, permits and licences

Other key approvals, permits and licences that may be required under NT Government legislation are discussed in Table 2-1.

Table 2-1. Other relevant NT legislation and approvals

Legislation	Relevance to project
Bushfires Management Act 2016	The project area is located within the declared Northern Fire Protection Zone, permits and conditions apply.
Building Act 1993	The mine site is located within the Darwin Building Control Area. Building and occupancy permits will be required. A registered certified plumber will conduct any upgrades required to the wastewater management system (septic).
Crown Lands Act 1992	The proposed Mineral Leases (ML) are located on Vacant Crown Land (VCL).
Dangerous Goods Act 1998	Provides for the safe storage and handling of dangerous goods. The storage and transport of explosives requires an approval to be obtained from Worksafe NT. Explosives will be stored in a magazine to be constructed at the mine site. An Explosives Business Licences will be obtained. All fuel storages must meet <i>Australian Standard 1940: Storage and Handling of Flammable and Combustible Liquids</i>
Heritage Act 2011	All sites on the NT Heritage Register and archaeological sites are protection under this <i>Act</i> . The proposal will not affect any sites listed on the NT Heritage Register. A number of unregistered historic mining site, were identified the closest being 500m from the WRD pad. Core does not propose any activities that would disturb this site.
Northern Territory Aboriginal Sacred Sites Act 1989	Provides for the protection and registration of sacred sites by the traditional owners or the custodians. Authority Certificate RA2018/73 has been provided by the Aboriginal Areas Protection Authority to ensure the protection of sacred sites throughout the project.
Public and Environmental Health Act 2011	Approvals will be required for onsite wastewater management systems that accept black and greywater from ablutions. These approvals are obtained from Department of Health.

Legislation	Relevance to project
Territory Parks and Wildlife Conservation (TPWC) Act 1976	Applies statutory obligations in relation to the protection of flora and fauna. This Act allows the listing of threatened species with special conservation status, and requires a permit to be obtained prior to interference with these species. This NOI considers the potential for the project to impact on threatened species (Section 7).
Soils Conservation and Land Utilisation Act 1969	Provides for the prevention of soil erosion and for the conservation and reclamation of soil. Erosion and Sediment Control Plans will be required to facilitate compliance with the general provisions of this Act.
Waste Management and Pollution Control Act 1998	This Act provides for the protection of the environment by encouraging effective waste management, and pollution prevention and control practices. The Act establishes which activities require environmental protection approvals or licences, and establishes environmental nuisances as an offence. For wastes that are removed for off-site disposal, waste management contractors engaged by the project and facilities accepting listed wastes must be licensed under this Act.
Weeds Management Act 2001	Declares certain plants to be weeds, classifies weeds according to management requirements, and places obligations on landowners and occupiers to manage weeds. Desktop and field assessments have identified listed weeds within the project area (see section 7.2.3). A Weed Management Plan will be required for this project to facilitate compliance with this Act.
Work Health and Safety (National Uniform Legislation) Act 2011	Mine sites in the NT must not permit any mining activity or a related mining activity to be carried out unless the mine operator has given to the regulator an RMP for the mine site that has been certified in accordance with regulation 614.

3 DESCRIPTION OF PROPOSAL

The information presented in this section has been summarised from the draft Finniss Underground Mining Study (OreWin, 2019) and preliminary mine design details compiled in TME Consulting (2019), as well as from information supplied by Core. The mine design is preliminary and will be refined through a more detailed study in early 2020. The design concept has been developed to a point where future refinements are unlikely to significantly alter the environmental impacts associated with the BP33 project. However, if major changes to the design concept are required then Core is aware of the requirement to notify the NT EPA.

3.1 Overview

The BP33 Lithium Project (referred to herein in as the 'BP33 project' or 'the proposal') will involve underground mining of ore and trucking to the Grants processing plant via a 7.5 km purpose built haul road. The key components of the BP33 project are as follows:

- Construction of site infrastructure, including a contractor's area (storage and maintenance), internal access roads and drainage infrastructure, water storages and Run of Mine (RoM) pad.
- Excavation of a box-cut portal to an approximate depth of 60-70 m to remove weathered waste rock and provide a stable foundation for construction of an underground portal.
- Construction of a 450 m long decline from the base of the box-cut to the top of the spodumene and progressive construction of a further 1.7 km of decline over the mine life to connect lower levels of the underground mine.
- Establishment of two onsite waste rock dumps (WRD) for temporary storage of oxide waste rock (from the box-cut) and transitional/fresh waste rock (from the underground) prior to progressively backfilling the material.
- Underground mining of the resource over nine production levels using sublevel retreat mining methods over a life of mine of approximately four years.
- Transport of the mined ore approximately 7.3 km along a dedicated haul road (to be constructed) to the Grants processing plant.

All processing requirements of BP33 ore resource are assessed in the Grants EIS and Notice of Alteration, and will therefore not be addressed in detail in this Referral. The processing details are summarised below:

- Crushing, screening and water-based processing of ore to increase the lithium concentration in the product from 1.42% to 5.5%.
- Deposition of rejects and tailings in the Grants Project WRD and Tailings Storage Facility (TSF).
- Haulage of the product in road trains along public roads to Darwin Port for export.

3.2 Resource details

The resource target at BP33 is pegmatite, a granite type rock containing spodumene ($\text{LiAlSi}_2\text{O}_6$), which is a source of lithium. The defined resource at BP33 deposit announced in 2019 is 2.15 million tonnes (Mt) of spodumene, containing approximately 1.51% concentration by weight of lithium oxide (Li_2O). The deposit is a narrow ~40 m wide near vertical pegmatite with drilling to date intersecting pegmatite down to 400 m vertical depth (Figure 3-1).

Following further drilling of the deposit in late 2019, Core hopes to release a revised Joint Ore Resources Committee (JORC) compliant Mineral Resource Estimate (MRE) in Quarter 1 2020. The preliminary mine design presented in this document is based on mining 2.09 Mt of ore at 1.42% Li_2O .

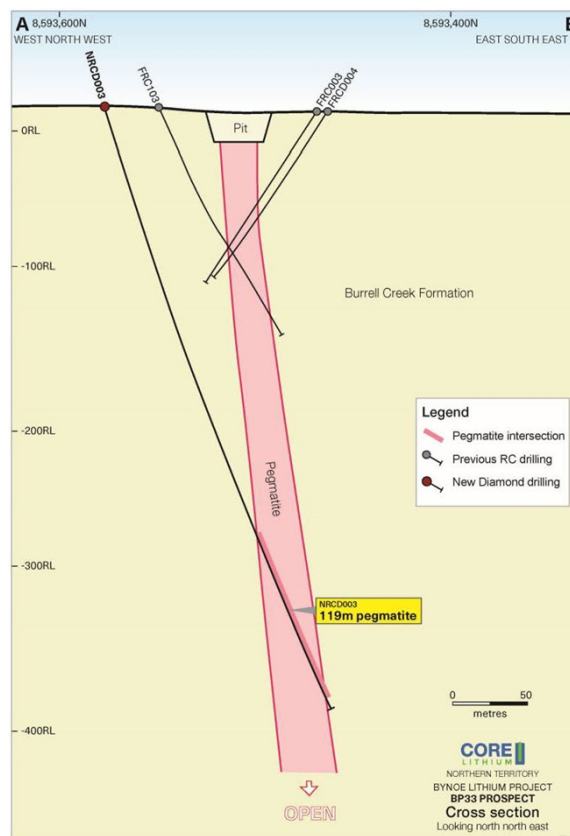


Figure 3-1. Cross section at BP33 showing pegmatite intersections in previous and recent drilling.

3.3 Footprint and site layout

The proposed mine site is situated within ML(A)32346, which covers 535 ha. The mine site footprint is approximately 88 ha. The footprint of the haul road from BP33 to Grants is approximately 12.5 ha (13 m wide by 7.3 km long). An additional 0.4 ha will be required for installation of a water pipeline from OHD to the mine site. A preliminary site layout is provided in Figure 3-3 and the haul road route is shown in **Figure 3-4**.

3.4 Project components

Design concepts for the key mine site components are described below in the subsequent sections.

3.4.1 Access

Site access will be via an existing access track from Cox Peninsula Road, which will be widened to 13 m and upgraded to heavy vehicle standard. The distance from the Cox Peninsula Road intersection to the BP33 mine site is 2.5 km. There will be a number of internal light vehicle and heavy vehicle access roads between the various mine site components.

3.4.2 Contractor's area

The contractor's area will comprise a raised compacted pad with a footprint of approximately 6.4 ha. The area will accommodate office and staff facilities, laydown and storage areas, maintenance workshop, fuel storage and refuelling, power generators. Fuel storages and maintenance areas will be bunded with drainage directed to a sump for removal of hydrocarbons. Wastewater from staff amenities will be directed to a septic system designed and constructed in accordance with the *Code of Practice for Onsite Wastewater Management* (July, 2014).

3.4.3 Box-cut

To provide geotechnical stable conditions for development of the underground portal, a box-cut will be excavated. The box-cut will cover an area of six hectares and will be excavated to at least 10 m below the oxidised waste rock, a depth of 60-70 m.

A two-metre high safety bund with a base width of 7.3 m surrounds the box-cut excavation, five metres from the crest. The bund is a safety measure and will prevent surface water run-off entering the box-cut excavation. On the western side of the box-cut, a contour drain will capture surface water run-off from the adjacent elevated areas to reduce the risk of water build up behind the safety bund.

A sump and pump system in the base of the box-cut will be used for dewatering of rainfall and groundwater inflows. Further detail on site water management is provided in 3.12.

3.4.4 Underground mine

A portal installed near the base of the box-cut and a 400m decline will be used to the top of the ore body. A further 1.7 km of decline constructed over the life of mine will provide access to each production level, down to a depth of approximately 320 m below surface.

The underground mine will comprise ten production levels. Each level will contain stope access from the decline, sump/drainage, ventilation network and a turning/stockpile bay. The underground mine will be ventilated via a dedicated raise bored Return Air Raise (RAR) to the surface.

A schematic of the underground design for the life of mine is provided in Figure 3-2.

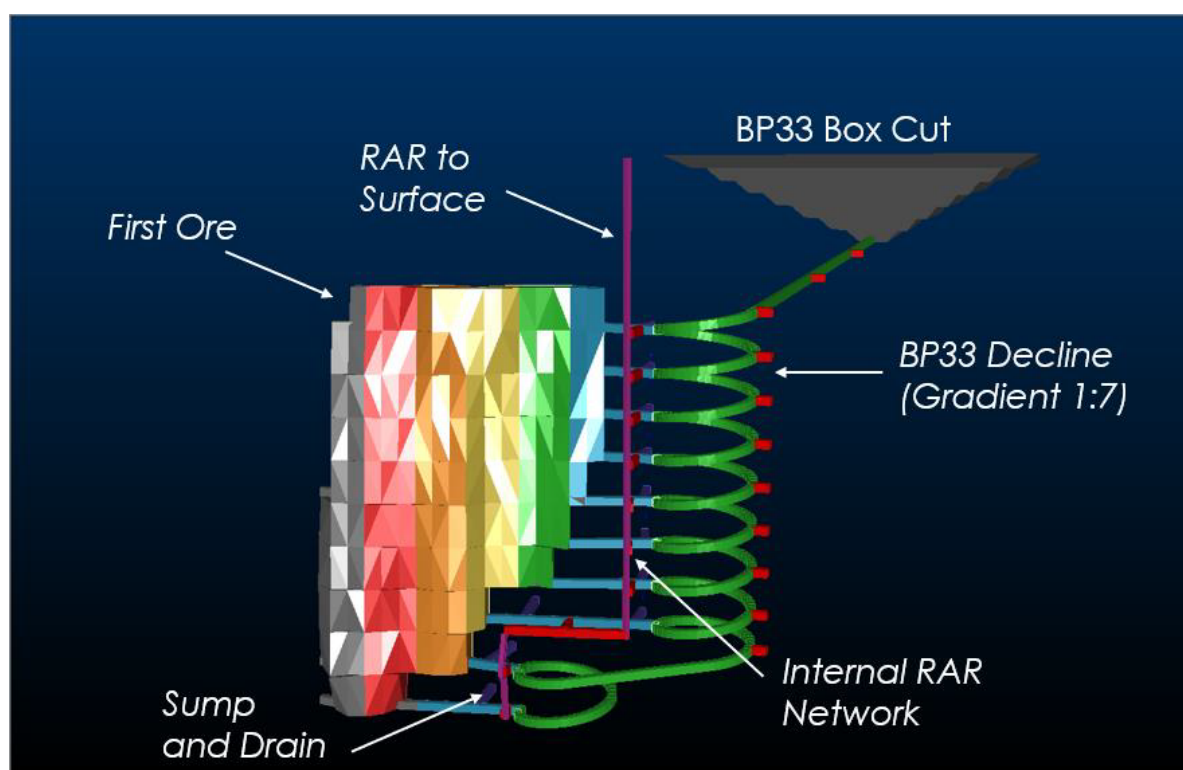


Figure 3-2. BP33 underground design for life of mine

3.4.5 Explosives compound

The explosives compound will be re-located from Grants mine site at the cessation of mining for use at BP33. It will be located at a safe separation distance from the mine administration area and the Cox Peninsula road. The explosives compound will be approximately 27 m (w) x 86 m (l), within which there will be an explosives magazine, a detonator magazine, a 65,000 kg bulk emulsion tank and two cubed freight containers for storage of ammonium nitrate. The compound design will comply with Australian Standard AS2187 Explosives – Storage, transport and use, which includes requirements for perimeter man-proof fencing and access restrictions, signage and surveillance monitoring, minimum separation distances between materials storages and construction of earth bunds around magazines. Pursuant to the NT Dangerous Goods Regulations, Core will apply for an explosives business licence, which will licence the storage facility and handling of explosives on the mine site.

3.4.6 Run of Mine (ROM) pad

A ROM pad will be constructed for temporary storage of mined ore ready for transport to the Grants processing facility. The ROM pad will be a raised compacted pad with a footprint of approximately 6.5 ha. The pad will have capacity to store two 60,000 tonnes ore stockpiles. Drainage from the ROM pad will enter the internal stormwater drainage network and sediment basins that will discharge clean water off-site.

3.4.7 Waste Rock Dumps

Two separate waste rock dumps (WRD) will be established for temporary storage of waste rock prior to it being used to backfill the underground mine and box-cut. WRD 1 will accept oxide waste rock excavated from the box-cut. WRD 2 will accept transitional and fresh waste rock from the underground. The physical and geochemical characteristics of the waste rock materials is discussed in 3.11.

WRD 1 has a design capacity of 2 million m³ and will cover a footprint of approximately 16.1 ha. The WRD will be constructed in three lifts; a base lift of 1-3 m to established a flat surface and two 10 m lifts. This WRD will accept excess oxide waste material not allocated to construction of mine site facilities. The WRD will be up to 25 m high on completion of mining. The mine closure concept involves using all of the material in WRD 1 to backfill the box-cut excavation.

WRD 2 has a design capacity of 170,000 m³ and will cover a footprint of approximately 2.8 ha. Initially, oxide waste material excavated from the box-cut will be used to construct a flat compacted low permeability 1-2 m pad. The WRD will be constructed in a single 10 m lift. This WRD will accept only transitional and fresh waste rock, which will be used to progressively backfill the underground mine as each production level is complete to maintain stability as the mine progresses. On completion of underground mining activities, the material remaining in WRD 2 will be used to backfill the decline.

3.4.8 Water storages

A Raw Water Dam (RWD) will be constructed to store water for use in dust suppression and to supply the mine site facilities. The preliminary design capacity is 6.25 ML, which will be refined through the detailed design phase. The dam will be filled by pumping water from the nearby Observation Hill Dam.

A Mine settling dam (MSD) will be constructed to store and treat sediment laden water dewatered from the underground (i.e. groundwater inflows) and/or box-cut (i.e. rainfall). The preliminary design capacity is 156 ML, based on groundwater flow rates measured by the exploration team during drilling. The required capacity will be reassessed following completion of groundwater modelling (expected mid 2020). The dam will be a turkey's nest type construction and will allow for removal of sediments so that the water can either be reused onsite or discharged. Details of the site water management system are provided in 3.12.

The dam designs will be prepared on completion of site investigations and testing of the foundation and embankment materials. The design concept is a full perimeter embankment, with materials for construction won from within the storage areas (cut / fill balance). The designs will include a low permeability basal liner and erosion protection.

3.4.9 Drainage and sediment basins

Clean stormwater runoff will be diverted around the site components by a series of diversion bunds and drains. Internal to the mine site a stormwater drainage network will provide for collection and treatment of water in sediment basins prior to controlled discharge off site or returned to OHD for re-use. The sediment basins will be located at the base of WRD 1, WRD 2, and the RoM Pad. A toe drain will be constructed around the perimeter of the WRDs and RoM to direct surface flows to the sediment basins. The sediment basins will be sized and constructed appropriately to manage the infrastructure catchment flows. The sediment basins will be monitored for sediment load, particularly following the first wet season post construction, and sediment cleaned out as required to prevent risk of downstream sedimentation.

3.4.10 Topsoil and sub-soil stockpiles

Approximately 8.3 ha of flat ground has been allocated to storage of topsoil and subsoil stripped from the site. Further detail of the volumes and storage requirements are provided in 3.6.2.

3.4.11 Water pipeline

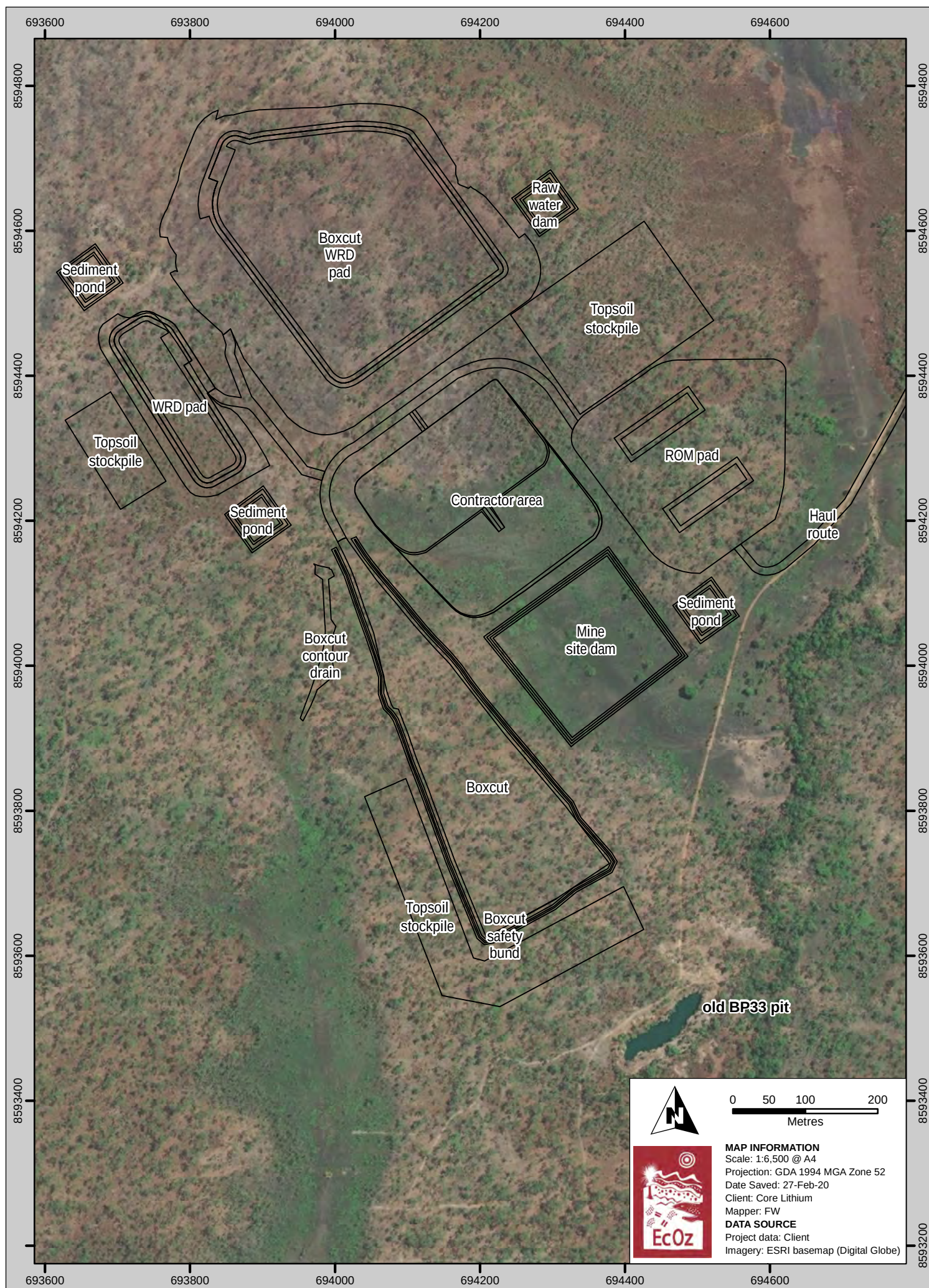
A water pipeline will be installed between the OHD and the mine site. The pipeline will be constructed of polyethylene plastic and will be buried to a sufficient depth to provide for protection from bushfire. The pipeline is approximately 1.4 km and traverses alongside the existing access track, which will be widened and upgraded for use as a haul road (refer Section 3.4.12). The 800 m section of water pipeline from the OHD pump station to the edge of the mine site will require clearing of an additional 5 m wide corridor alongside the haul route (i.e. 0.4 ha footprint). The 600 m of the pipeline corridor from the RWD to the intersection of the haul road is within the mine site footprint. The proposed pipeline route is shown on Figure 3-4.

3.4.12 Haul road

A 7.3 km dedicated haul road will provide for transport of ore from the BP33 ROM pad to the Grants processing facility. From the mine site, the proposed haul route follows an existing access road north for 2.2 km towards the Cox Peninsula Road. The route then turns to the west and follows existing tracks to the west and north for 3.3 km. The final 1.8 km of the route into the Grants processing facility traverses new ground.

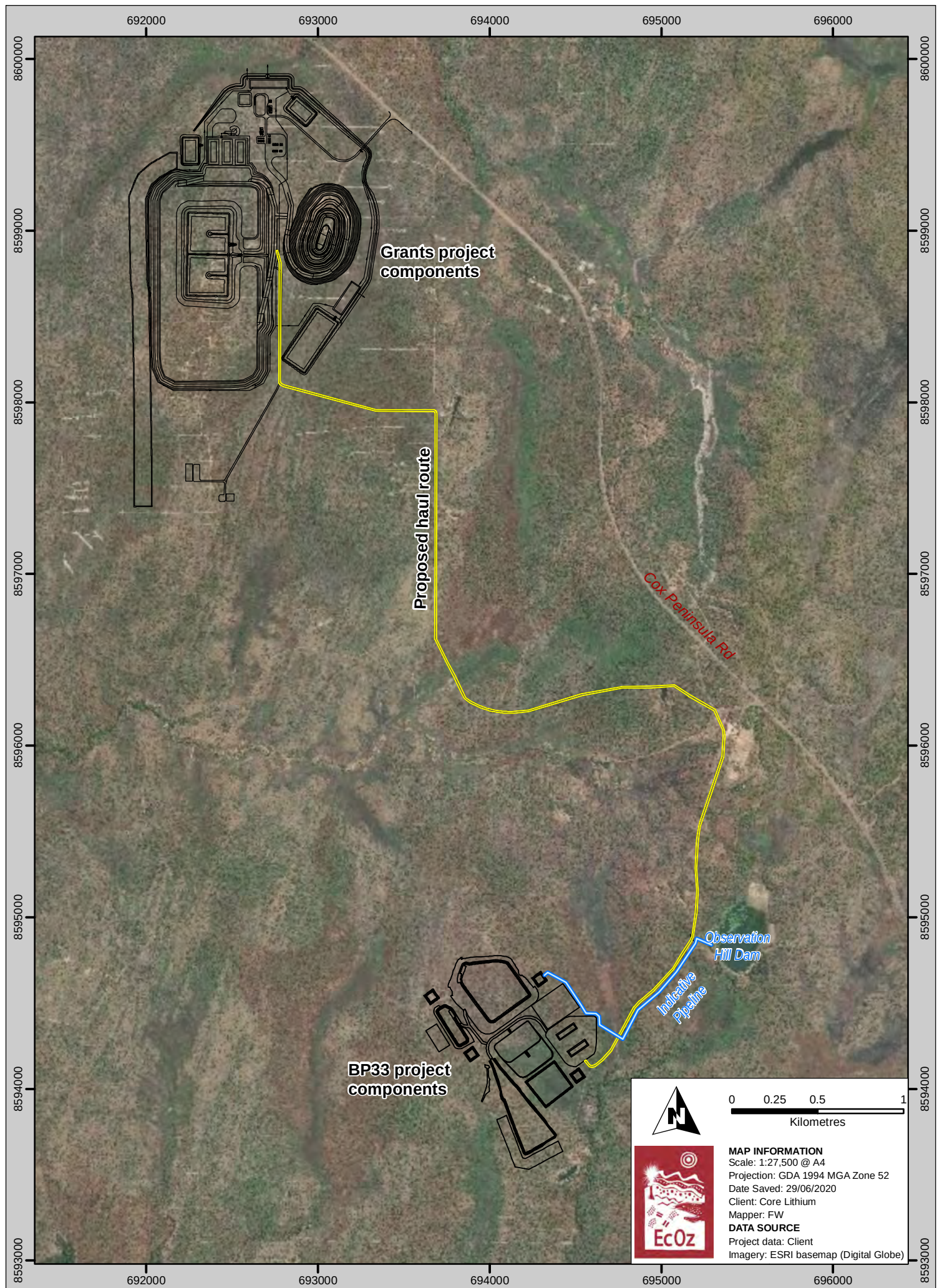
The road has an 11 m pavement design width to cater for single trailer 'Bigfoot' haulage (3.5 m wide). Total corridor width will vary pending cut and fill, and drainage requirements. Assuming a nominal corridor width of 13 m, the haul route footprint is approximately 12.5 ha.

Engineered designs will be prepared following site surveys. The road design criteria will be to provide all year heavy vehicle access.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ19171 - BP33 NOI\01 Project Files\Report maps\Figure 3-3. Map of mine site footprint and preliminary layout.mxd

Figure 3-3. Map of mine site footprint and preliminary layout



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ19171 - BP33 NOI\01 Project Files\Report maps\Figure 3-4. Map of haul route from BP33 to Grants.mxd

Figure 3-4. Map of haul route from BP33 to Grants

3.5 Project schedule

Construction of the aboveground mine components and excavation of the box-cut is expected to take approximately 6 months. The production phase associated with extraction of 2.09 Mt of ore is expected to be 44 months. Mine closure and rehabilitation is expected to take a further five months following removal of the last ore. An indicative schedule is provided in Table 3-1.

Table 3-1. Indicative project schedule

Schedule	Months 1-6	Month 7-50	Months 51-55	Month 66 onward
Phase	Construction	Production	Closure and rehabilitation	Post-closure
Duration	6 months	44 months	5 months	Ongoing
Activities	Construction of infrastructure and box-cut; removal of oxide waste	Underground construction, mining, ore processing and transport to Port	Backfilling, removal of infrastructure and revegetation.	Monitoring of the mine site until rehabilitation completion criteria are achieved and the site is relinquished.

3.6 Construction

Construction will take approximately 6 months. Key stages and activities are summarised below in subsequent sections.

3.6.1 Vegetation clearing

Work at the site will commence with surveying of site boundaries and clearing of vegetation. There will be minimal staging of vegetation removal as all areas of the project footprint will be constructed on within the first six months of the project schedule. Vegetation will be cleared by bulldozer and pushed into windrows outside of the mine site footprint but within the ML. Vegetation debris will be windrowed along the contour and either retained for use in rehabilitation or burnt under a permit from Bushfires NT. Details of clearing methods, staging and controls will be included in a Vegetation Clearing Procedure submitted with the Mine Management Plan (MMP).

3.6.2 Top soil stripping and storage

Topsoil will be stripped from all cleared areas to a depth of 100 mm and subsoil will be stripped to a depth of 400 mm. It has been estimated that a total of 61,250m³ of topsoil and 189,806m³ of subsoil will be produced from all mining components and the haul road, for the duration of the mine life. These materials will be stockpiled separately for later use in rehabilitation, with indicative stockpile locations shown on the site layout map (refer to Figure 3-3). Stockpile heights will be limited at a maximum height of 2m with subsoil placed in a maximum of 3m high stockpiles. The actual height and slope requirements will depend on the materials characteristics and final stockpile locations. Batter slopes will be minimised to maintain the structural integrity and soil seed bank. The design criteria and controls required for each stockpile will be detailed in an Erosion and Sediment Control Plan prepared in accordance with the *Best-practice Erosion and Sediment Control Guidelines* (IECA 2008), which will be submitted with the MMP.

3.6.3 Box-cut excavation

The box-cut will be excavated using conventional truck and shovel methods, excepting the bottom 10 m bench, which will require drill and blast. Excavation of the box-cut will remove approximately 1.4 million bank cubic

metres (bcm) of oxide waste material (TME, 2019). The material will be used for construction of the safety bund, diversion bunds and drainage, contractor's area pad, underground WRD pad, ROM pad, water storages and access roads. Excess materials and/or materials that do not meet construction specifications will be placed in WRD 1 where they will be stored for up to four years, prior to being used to backfill the box-cut on completion of mining activities.

3.6.4 Bulk earthworks

The oxide waste rock material excavated from the box-cut will be the primary source of construction materials for the mine site. Materials specifications, sources and construction treatments, will be developed following further geotechnical testing, the results of which will be supplied with the MMP submitted to DPIR as part of the Mining Authorisation (MA) process. As overburden material is excavated from the box-cut, materials meeting the specifications for use in site construction will be sent to temporary stockpiles located close to each works area. Materials that do not meet construction specifications and/or excess to requirements, will be taken to WRD 1.

3.6.5 Haul road and water pipeline construction

Preparation of the haul road and water pipeline corridor will involve removal of approximately 8-10 m of vegetation alongside the existing cleared access track to increase the corridor width to nominally 13 m wide. The entire 13 m wide corridor will require clearing for the last 1.8 km of the route into the Grants mine site, as there is no existing track in this area. Cleared vegetation will be windrowed alongside the corridor and then spread out to prevent concentration of surface water flows. Remaining vegetation, topsoil and subsoil all to be stockpiled within the final haul road disturbance corridor, either in discrete stockpiles and /or along the road length to one side. Procedures for vegetation clearing and management of debris will be documented in a Vegetation Clearing Procedure that will be submitted with the MMP.

Cut and fill requirements for the haul road will be determined during detailed design. Where fill is required, materials are expected to be sourced locally from existing borrow areas on Core's leases, Grants WRD (oxide materials) or the BP33 box-cut oxide material.

During construction, roadside drainage (swale drains) and watercourse crossings will be constructed according to the engineered design specifications. Temporary and permanent erosion and sediment control requirements will be specified in an ESCP consistent with the *Best-practice Erosion and Sediment Control Guidelines* (IECA 2008).

3.7 Mining operations

The sections below describe the key activities involves in the mining operation.

3.7.1 Material volumes

The total quantities of waste and ore moved over the life of mine is shown in Table 3-2 and an indicative monthly material movements schedule is provided in Figure 3-5.

Table 3-2. Material volumes and tonnage

Material	Volume (bcm)	Tonnage (kt)
Oxide waste (box-cut)	1,000,000	2,000
Transitional/fresh waste (from underground)	85,000	229
Ore (production tonnes)	776,000	2,095
Total		

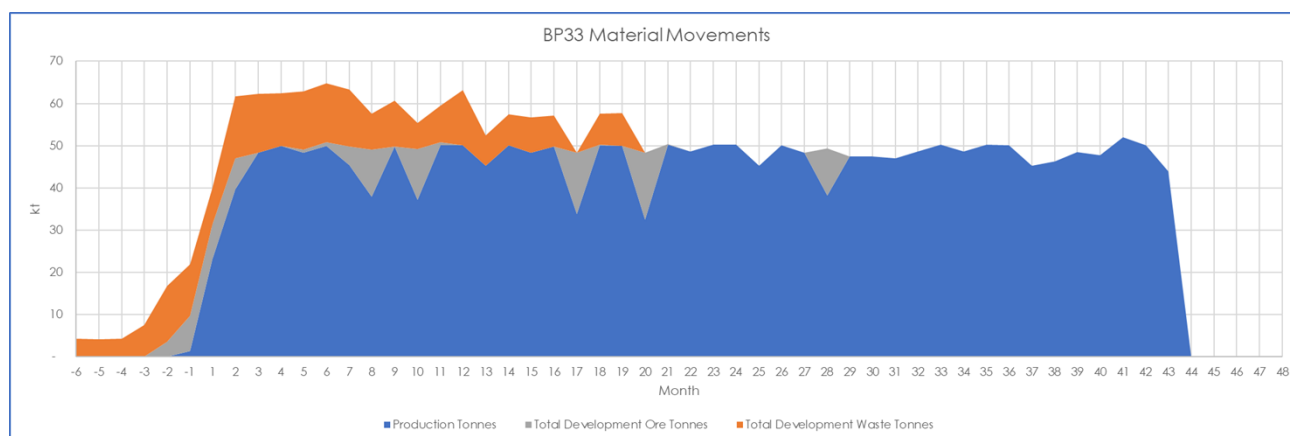


Figure 3-5. BP33 material movements over Life of Mine

3.7.2 Mining method

The mining method currently selected for the BP33 resource is sublevel open stope with pillar support. The narrow (10 m to 35 m) ore body width, vertical orientation, and competent host rock ground conditions allows sublevel retreat mining to be a viable low-cost mining method.

Drill and blast methods will be used to extract the ore, which will be removed by loaders leaving behind an open space referred to as a stope. Mined material will be stockpiled on the production level or loaded directly onto 90 tonnes capacity underground dump trucks. It is estimated that 40% of the ore removal will be achieved by control methods.

Ore will be hauled to the surface via the decline. It is estimated that there will be 18 truck trips per day to haul 1,669 tonnes to the ROM pad.

A geotechnical study is currently being undertaken to assess BP33 ground characteristics and provide geotechnical design inputs for the underground mine.

Underground mining methods options as outlined in the Finnis Lithium Project Geotechnical assistance for underground prospects Carlton and BP33 resources, SRK Consulting, 2020, are outlined below.

Long-hole retreat

Long-hole Retreat (LHR) with cemented paste fill (CPF) or rock fill (RF). CPF is an engineered material that can be designed for either overhand or underhand mining permitting pillarless, top down mining implementation. It is a proven method use for pillarless mining methods. CPF provides many other mining advantages (e.g. pipeline delivery, rapid filling, independent of production fleet, etc).

AVOCA

AVOCA mining with dry RF remains a viable mining method, however, is a bottom-up extraction meaning development advances retreating upwards into a sill pillar which can be a higher stress domain at greater depths.

Sub-level shrinkage

Sub-level shrinkage (SLS). A continuous fill' mining method with a production front like a sublevel cave (SLC) operation; however, classified backfill is placed into the top of the production zone as opposed to requiring the overlying strata to cave. Continuous fill is placed in the mining void to mitigate of potential risks associated with long-term void stability and air blast potential due to the limited 'caveability' of the material within the cave zone. The available fill material must be sourced disused waste rock from mine development or a suitable quarried material.

3.7.3 Underground mobile fleet

The mobile fleet that will be deployed underground is shown in Table 3-3.

Table 3-3. Mobile diesel fleet requirements

Type	Equipment	Rated kW	Number
Loaders	R2900	305	1
	R1700	269	1
Trucks	AE45B	439	2
Road Maintenance	Grader	150	1
Drilling	Production	150	1
	Development	150	1
Integrated Tool Carrier	IT	100	1
General	Charge Rig	100	1
	Light vehicles	150	4

3.7.4 Production

The combined development and production ore in the preliminary BP33 mine design includes 2.09 Mt at 1.42% Li₂O, as shown in Table 3-4 (OreWin, 2019). The mining production rate is expected to be between 600,000 tonnes per annum and 1,000,000 tonnes per annum. The production schedule for the life of mine is shown in Figure 3-6.

Table 3-4. BP33 mining production summary

	Tonnes (kt)	Li ₂ O (%)
Ore development	99	1.41
Production	1,996	1.42
Total Production	2,095	1.42

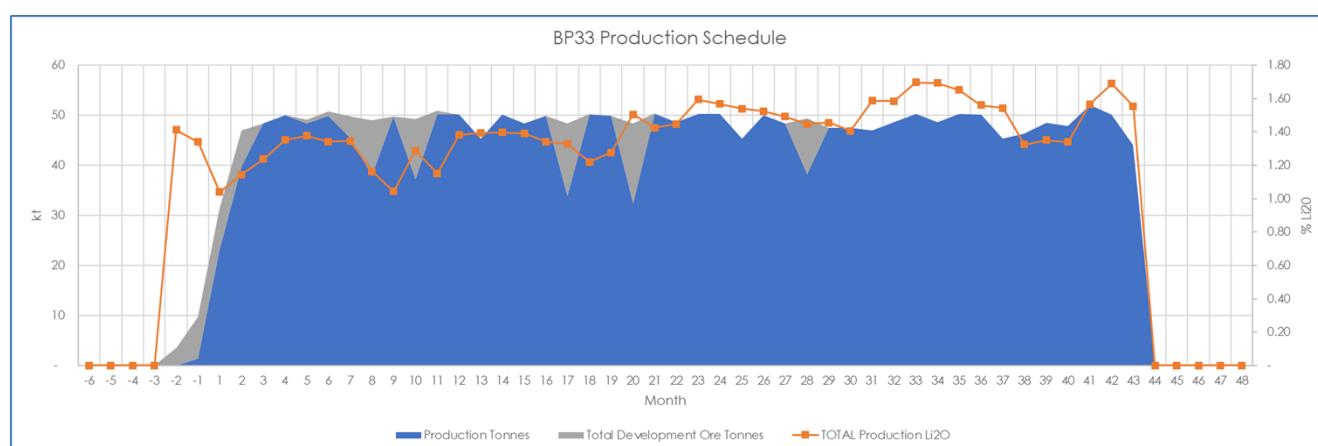


Figure 3-6. Production schedule for life of mine

3.8 Processing

Ore stockpiled on the BP33 ROM pad will be hauled to the processing facility established as part of the Grants Lithium Project. The BP33 Lithium Project proposal does not involve any changes, additions or increase in production outputs from the processing facility. The ore mined at BP33 will be used to continue production from the processing plant only after the Grants ore resource is exhausted.

3.9 Transport

The product will be loaded onto road trains for transport to Darwin Port (East Arm). The total distance to the Port is 94.5 km. The haul route is along 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. The

The anticipated truck movements along the transport route are up to 10 return trips per day (or 20 passes along any given section of the route). The BP33 proposal will not increase the frequency of haul truck trips on public roads, as the rate of production from the processing plant will remain the same. BP33 Project will extend the timeframe that the haul route is in operation from 3 years to 7+ years (i.e. there will be 10 return truck trips per day for 7 years). The risks associated with extending the timeframe of haul route operation are assessed in the Notice of Alteration submitted for the Grants Project.

3.10 Workforce

During construction, it is estimated that peak workforce will be 60 people.

The Finniss Lithium Project will employ between 125 and 150 personnel. The workforce composition will be as follows:

- Management/Supervision/Professionals – 20 %
- Contractors (Mining, Processing and Haulage) - 58 %
- Trades – 22 %.

The workforce is expected to comprise mainly of residents of Darwin, Palmerston or surrounding areas. There will be no on-site accommodation camp as part of the project; workers will be expected to travel to/from site for each shift. The travel time from Darwin/Palmerston to the site is around one hour.

Belyuen is the closest community to the project area. Core has committed to working with indigenous employment and training providers to maximise opportunities for employment of people from Belyuen and the broader region. The extended mine life achieved by the BP33 deposit means that there will be increased opportunities, whereas previously the short mine life limited opportunities to those people with pre-existing skills sets and prior experience in construction/mining.

Where skill requirements and/or lack of available personnel necessitates fly-in/fly-out arrangements for a portion of the workforce, the project would use existing commercial accommodation in the region. As the operational workforce is relatively small, the project will not result in additional demand for accommodation that cannot be met by existing service providers.

3.11 Waste rock management

The weathered material excavated from the box-cut (~1.4 million bcm) will be placed in the surface box-cut WRD 1. WRD 1 is temporary and will be used to completely backfill the box-cut on mine closure.

WRD 2 will comprise of transitional and fresh material from the underground (~170,000m³), and will be temporarily stored on the surface. From month five of the production schedule, the material will be used to progressively backfill the underground stopes as mining is completed on each production level.

On completion of mining, there will be no material remaining on the surface.

The sections below summarise the materials characteristics and management requirements.

3.11.1 Geochemical characterisation

An assessment of the geochemical characteristics of the waste rock and ore/tailings that will be produced at the BP33 mine has been undertaken by Environmental Geochemistry International Pty Ltd (EGi) (refer Appendix A). Key findings are summarised below.

Geology of the BP33 resource is almost identical to that of the Grants resource (located ~5 km to the north of BP33). Within the weathering zones there are two predominate lithologies, phyllite and pegmatite. The ore (spodumene), is located within the fresh pegmatite and the Phyllite is associated with the Burrell Creek Formation (BCF).

Fifty-four samples were selected by EcOz from holes drilled in July 2018 (FRC166 – FRC171) (Figure 3-7) and submitted for a limited suite of analyses comprising Total S, paste pH and EC (1:5) and exchangeable cations. A further 44 samples were selected from holes drilled during September 2019 (NRC129 and FRC212 – FRC214) (Figure 3-7).. The remaining 44 samples were submitted for a more comprehensive suite of analyses comprising Total S, acid neutralising capacity (ANC), net acid generation (NAG), paste pH and EC (1:2), exchangeable cations, soluble metals, leachable metals, and naturally occurring radioactive materials (NORM) measuring radiation dose.

Based on the results of test conducted on the samples described above, the following conclusions can be made:

Sampling adequacy

- The rock type and oxidation profiles for samples used for geochemical analysis indicate that these samples reasonably represent the lithology and oxidation profile of waste rock and ore from all drill holes and therefore the waste rock and ore in the BP33 deposit overall.
- The samples used for this initial geochemical study would appear to adequately cover variations in rock types and alterations that will be encountered during the mining operation.

Waste rock

- Oxidised waste rock samples, representative of material that will be encountered in the boxcut, are largely devoid of sulphur and are classified as non-acid forming (NAF). Water extracts have very low salinity. This indicates that oxidised waste rock, which will form the majority of rock excavated during development of the box cut and the majority of waste rock generated during the project as a whole, will present a very low risk of acid rock drainage (ARD) or saline drainage (SD). However, drainage from oxidised rock stored in the box cut WRD may contain low concentrations of aluminium and zinc.
- Transitional waste rock, which will comprise a small portion of the rock removed during development of the box cut and the mine decline, is generally low in sulphur content and can, in the main, be classified as NAF. Transitional samples also gave water extracts with low salinity. These results show that transitional rock will present a low risk of ARD or SD.
- Fresh waste rock will comprise the major portion of rock removed during development of the underground mine and therefore of waste rock stored in the underground WRD. However, the volume of fresh waste rock mined will be relatively small (<10% of the total volume). Fresh waste rock is generally low in sulphur content, but with some areas of higher sulphur associated with fresh phyllite. Most fresh waste rock can be classified as NAF, but there is evidence that fresh phyllite may include PAF material. This material appears to have limited readily available ANC. Fresh waste rock samples also produced water extracts with low salinity, although salinity was higher than for other rock types. Fresh rock may also contain water leachable arsenic and zinc. These results show that fresh waste rock may present some risk of ARD and/or arsenic and zinc in drainage from the UG WRD, but further testing is required to confirm these findings and to quantify the likely volume of PAF material.

- The potential radiation dose from all of the samples tested was well below guidelines for occupational radiation exposure, indicating that these materials are unlikely to pose a risk from radiation exposure.

Ore and Tailings

- Testing of ore samples showed that this material is devoid of sulphur and can be classified as NAF, indicating very low risk of ARD from tailings produced from processing of the ore. Water extracts from the ore also had relatively low salinity, but higher than any of the waste rock samples tested, indicating low risk of SD from tailings.
- The potential radiation dose from all of the samples tested was well below guidelines for occupational radiation exposure, indicating that these materials are unlikely to pose a risk from radiation exposure.

3.11.2 Knowledge gaps

It is clear that the weathered material presents very low risk of ARD, SD and NMD. However, there remains some uncertainty around the acid generating properties of fresh waste rock samples with higher sulphur content (>0.2% S). The current geochemical test results are under-represented in samples with higher sulphur content, preventing better definition of the amount of PAF material present in fresh phyllite and development of potential segregation criteria, should this type of material require specific management to prevent ARD.

Results also indicate that drainage from oxidised rock stored in the Box cut WRD may contain low concentrations of aluminium and zinc and some of the fresh rock stored on the UG WRD may contain water leachable arsenic and zinc. These waste storages will be temporary, with waste rock returned underground or into the box cut. However, the results to date provide no information on the kinetics of aluminium, arsenic and zinc leaching and whether this could be an issue during short-term surface storage.

The following further testing has been recommended by EGi to clarify these issues and will be undertaken by Core as the development of BP33 progresses:

- Complete ANC and NAG testing on selected samples from drill holes FRC166 – FRC171, focusing on, but not exclusively, samples with sulphur content >0.2 %S. Ideally all fresh and transitional waste rock from the 2018 drill holes should be included in the test program.
- Kinetic testing (leach columns) of weathered and fresh rock samples to confirm initial results of aluminium, iron and arsenic leachability and to define the kinetics of this process.

3.11.3 Acid Rock Drainage Management

Current test results suggest that the risk of ARD from surface storage of waste rock from the underground mine will be low, due to the likely low volume of PAF material present in fresh waste rock. The risk of ARD is further limited by the fact that waste rock will be stored temporarily on the surface and then backfilled (refer section 3.7). However, currently there is insufficient evidence to say conclusively that there will be no PAF material removed from the underground mine which may require management to mitigate ARD whilst the material is on the surface. Depending on outcomes from the recommended follow-up tests, it may be necessary to undertake more detailed static testing to refine ARD classification of some waste rock, in addition to kinetic testing to provide better definition of the ARD properties of any PAF material identified. These more detailed tests, if required, would inform ARD management plans should the need arise. The contingency management plan for PAF material will be segregation and selective placement within WRD 2 so it can be identified and priority backfilled, reducing the opportunity for potential ARD.

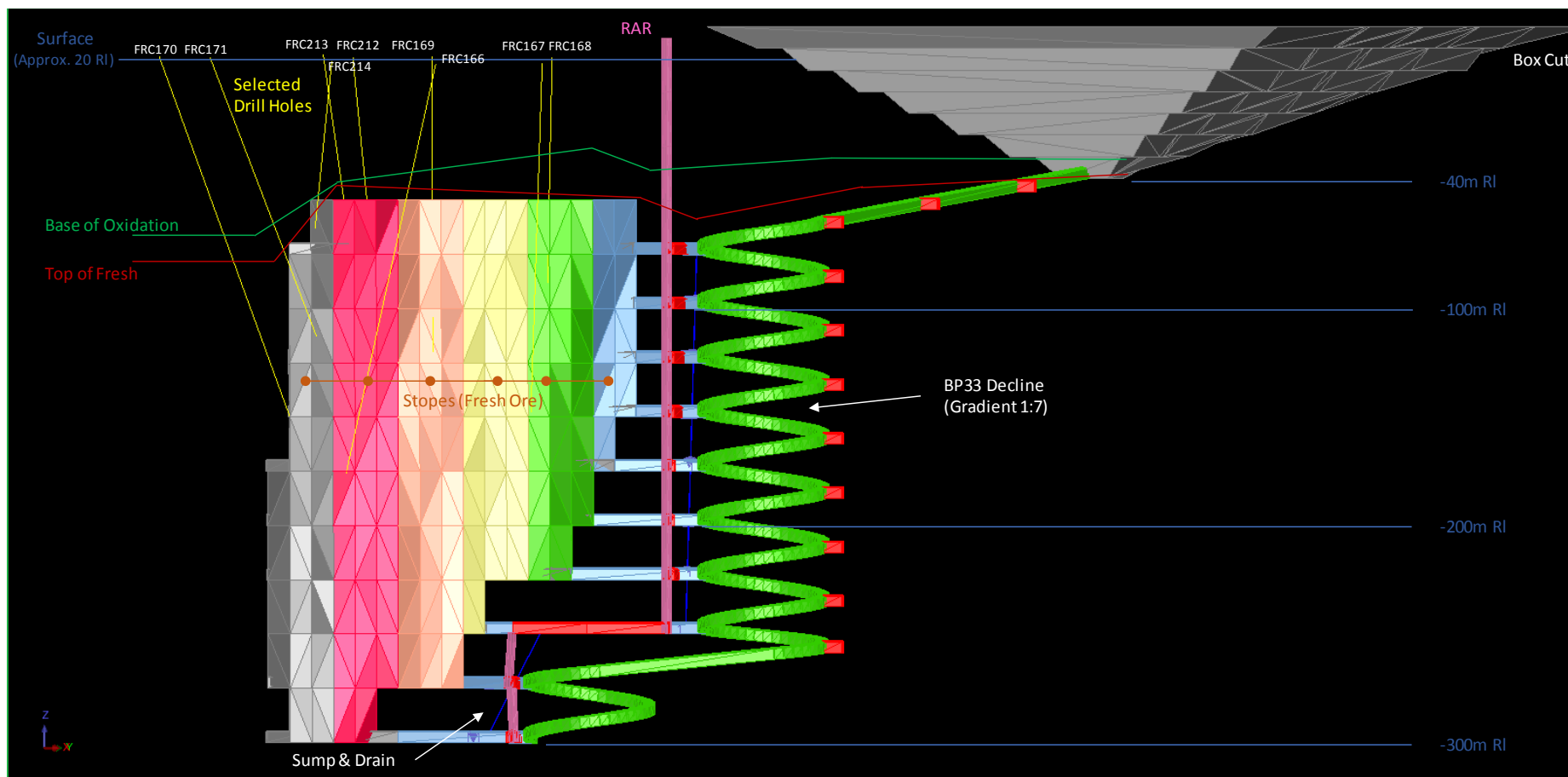


Figure 3-7. Location of drill holes for waste characterisation sampling

3.12 Water use and supply

The anticipate water use, water sources under consideration and proposed water management system for the BP33 mine are outlined below.

3.12.1 Water demand

Water demand will largely be for underground mining, surface amenities and dust suppression (haulage operations, RoM and WRDs). The total estimated water demand is 1,047.5 kl/day. The estimated percentage from each consumer is shown in Figure 3-8. Approximately 2,478.2 kl/day will be lost from the system due to evaporation from surface infrastructure (OHD, box-cut, landforms, RWD, MSD and sediment basins).

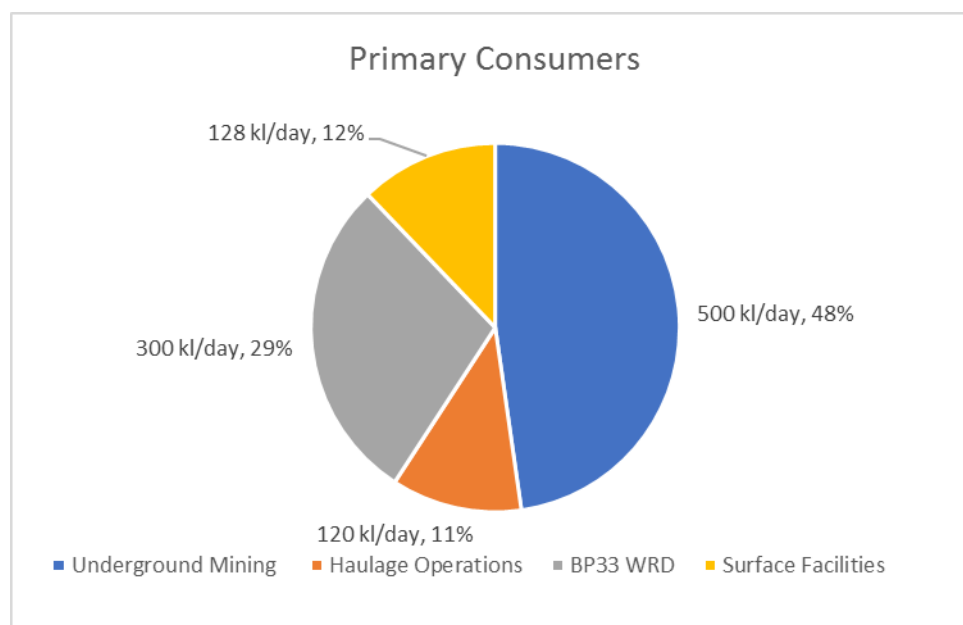


Figure 3-8. Primary water consumers

3.12.2 Water sources

Water sources for the mine will comprise of surface water and groundwater from the following:

- OHD receiving catchment inflows
- Underground mine intercepted water (pumped into MSD)
- Groundwater and rainfall in-flows to the box-cut.

If following further groundwater investigations, the volumes available from dewatering is less than anticipated, the following supplementary water supplies will be further investigated.

- Water extracted from a bore field subject to licencing under the *Water Act*.
- Water pumped from the old mine pits across the lease area, subject to water quality testing and confirmation of no potential for exposure of PAF materials in pit walls.

The total estimated primary contributions is 3,024 kl/day, sourced from the OHD, UG intercepted groundwater and a borefield. The estimated percentage from each contributor is shown in Figure 3-9. The total estimated secondary contributions (WRD runoff capture, box-cut return and UG return) is 1.758 kl/day.

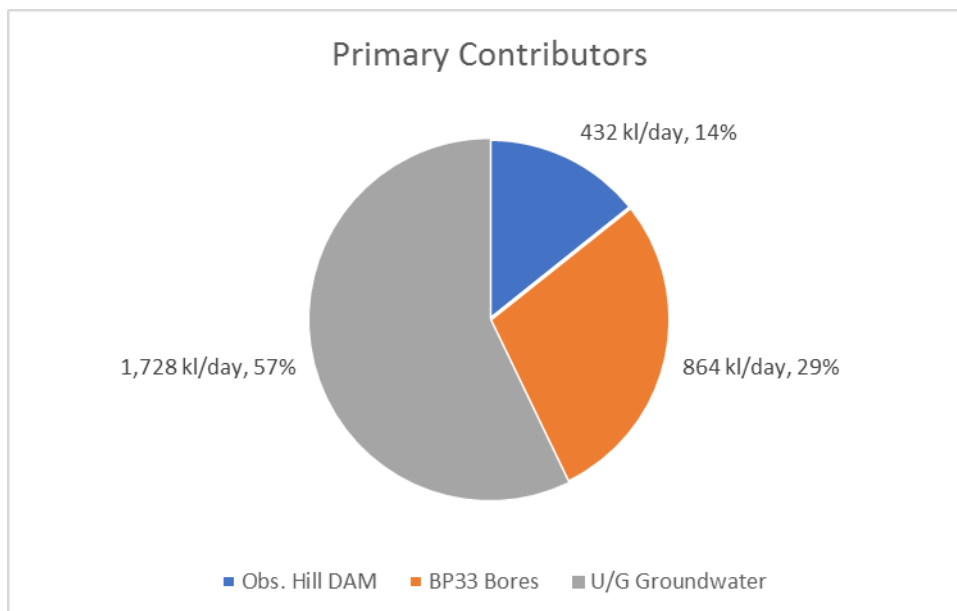


Figure 3-9. Primary water sources

3.12.3 Water management system

A conceptual site water management system is shown in Figure 3-10. Layout of the water management infrastructure is shown in Figure 3-3. The system components are described below

Observation Hill Dam (OHD)

OHD is an existing dam and will be the primary water supply for the Grants processing facility and the BP33 underground mine. The OHD is filled by rainfall and surface water flows each wet season. The OHD will be used for processing, dust suppression and surface amenities.

Raw Water Dam (RWD)

A small constructed RWD will receive water from the OHD and will be used primarily for dust suppression and as a secondary supply to the UG operations as required. Any excess water will be returned to OHD.

Mine Settling Dam (MSD)

Inflow of groundwater underground will be pumped to the surface via mono pumps. The underground water will be pumped into a mine settlement dam (MSD) on the surface located near the box-cut. Sufficient water retention time will allow the sediment to settle within the MSD prior being pumped through a filtration unit and re-used underground for dust suppression and operations.

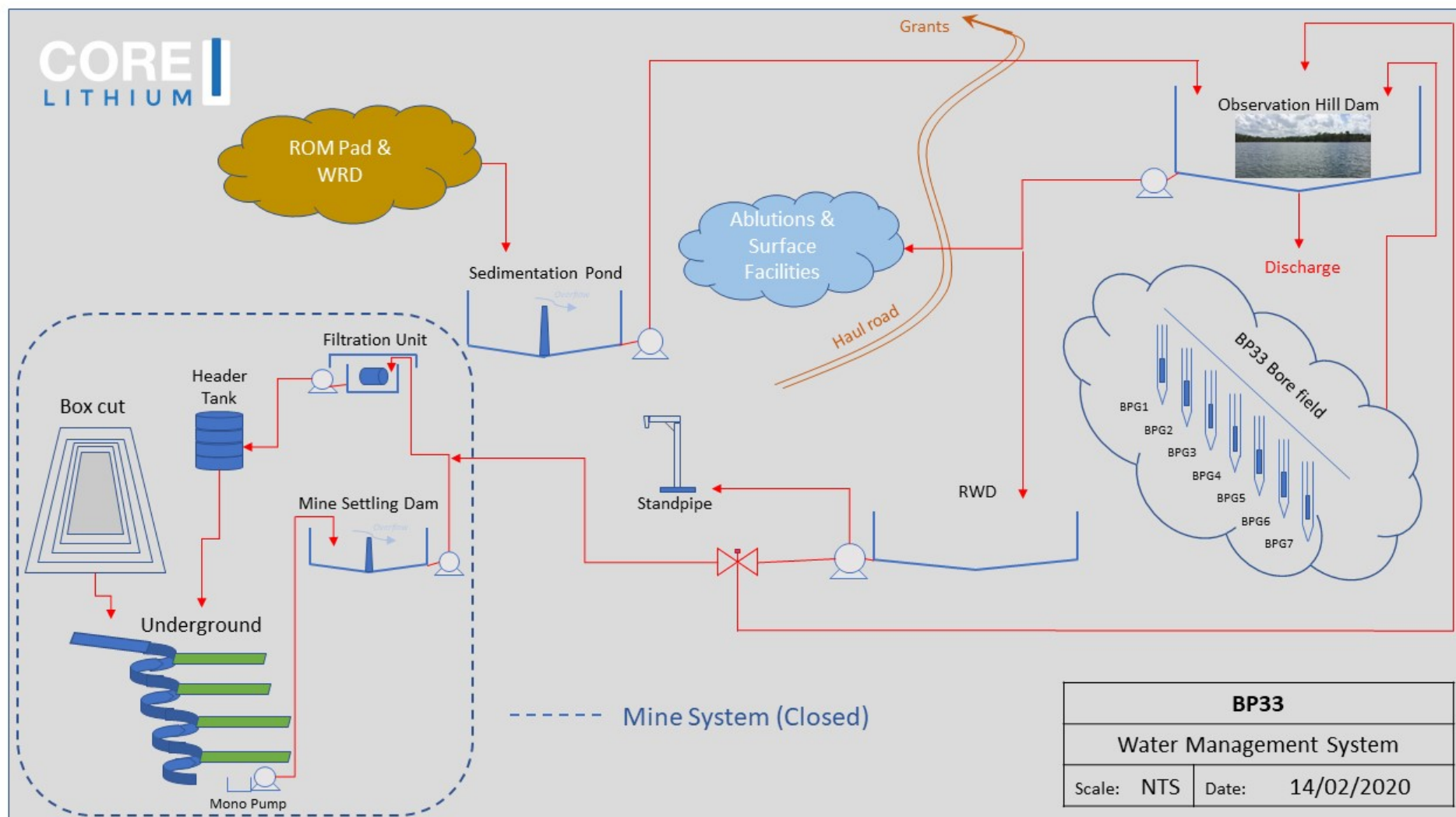
Groundwater bores

Groundwater bores may be used to supplement the water supply if a water deficit could occur. The requirement for this supplementary supply will depend on the volumes of groundwater flowing in to the underground, which will be available for reuse. Following installation of monitoring bores in 2020, a groundwater model will be developed and the requirement and feasibility of installing a production bore field will be reassessed. Bore permits and groundwater extraction licences would be required under the *Water Act*.

Sediment basins

A series of sediment basins will be constructed on site to manage sediment laden water. The sediment basins will be placed at the base of the WRDs and ROM pad, with a series of water diversion drains surrounding the landforms to effectively capture the water shed from each facility.

Figure 3-10. Water management schematic



3.12.4 Water Mass Balance

Factoring in the estimated site inputs and outputs, the overall water balance is summarised in Table 3-5 below. This indicates that there is sufficient water available to supply the mine with a surplus of approximately 1,256 kl/day that will be stored in OHD.

Table 3-5. BP33 water supply and demand

Water balance	Kl/day
Total estimated supply	4,782
Total estimated usage	3,525.7
Balance	1,256

3.13 Wastewater discharge requirements

Both the box-cut and the underground mine will require de-watering during development and operations. Excess water will be pumped to the MSD to remove sediments and any other contaminants. Potential contaminant sources include explosives residues and parameters such as Arsenic, Total Phosphorous, Reactive Phosphorous and Lithium, which from the groundwater monitoring at Grants Project nearby, are known to be naturally elevated in the groundwater compared to surface water.

Water that is excess to the operational requirements will be treated if required and pumped to OHD. The requirement for treatment and suitable methods will be further developed once the expected discharge water quality is known with greater certainty, following installation of monitoring bores in late 2020.

During the wet season, OHD will discharge over the existing dam wall to an ephemeral creek into the Charlotte River. A Waste Discharge Licence will be applied for under the *Water Act*.

3.14 Energy demand and sources

At the time of this referral the project power requirements are proposed to be met by on site diesel-powered generators; however, the feasibility of connecting to mains power was under consideration. It is anticipated that the fuel requirement for the diesel-powered generators will be 605 kL per year. In addition, the mining fleet is forecast to require approximately 16,800kL over the life of the mine; the bulk of this (over 75%) will be required during the first 12 months.

3.15 Handling (storage and transport) of hazardous substances

Hazardous substances and indicative quantities to be stored on site are as follows:

- Diesel – multiple locations using wrap tanks or bunded storage facilities ranging in size from 5,000 litres to 50,000 litres. Maximum quantity stored on site will be ~110,000litres.
- Greases, oils and lubricants – multiple locations using wrap tanks or bunded storage facilities ranging in size from 5,000 litres to 50,000 litres
- Oxygen and Acetylene
- Cleaning chemicals – degreasers in 1,000 litre tanks.

All hazardous substances will be stored, used and managed in accordance with their SDSs (including appropriate bunding requirements). Core will maintain a hazardous substance register for the site, which will include storage location, summary of hazardous/dangerous goods status and links to Safety Data Sheets (SDSs). The register will be located in the site office as well as in the chemical store.

3.16 Air emissions

Underground mining has the potential to produce dust emissions. The project's water requirements for dust suppression includes 120 kl/day for haulage, 300 kl/day WRD/RoM and 500 kl/day underground, a total of 920 kl/day which is expected to minimise dust emissions.

Exhaust emissions will be produced by the on-site diesel generators and operation of heavy plant and equipment. Given the relatively small-scale of the proposed activity, the emission levels are not anticipated to be a magnitude that would cause any measurable changes in air quality beyond the mine site.

Preliminary greenhouse gas emissions estimates indicate the project will be below the reporting threshold under the *National Greenhouse and Energy Reporting Act (2007)*.

3.17 Noise emissions

Noise emissions will occur from machinery and equipment operating 24 hours. As the site is remote from residences and other land users, and there are no sensitive habitat nearby, noise emissions are not anticipated to affect any sensitive receptors.

3.18 Closure and rehabilitation

At completion of UG mining activities at BP33, the UG and box-cut will be completely backfilled, no waste material will remain on the surface and the site will be revegetated. A Mine Closure Plan will be developed for submission with the MMP. Closure and rehabilitation of BP33 will involve the following:

- Progressively backfill the UG mine stopes using fresh rock from the UG WRD and additional backfill material sourced from the Grants WRD.
- Reclaim material from the box-cut WRD to completely backfill the box-cut.
- Spread the safety bund over the top of the finalised surface of the box-cut.
- Re-profiling of the final surface.
- Subsoil and topsoil re-spreading and contour ripping.
- Revegetation and weed control.

Figure 3-11 shows the estimated material (kt) that will be backfilled into the box-cut (2,000 kt) and the underground (229 kt from BP33 development WRD), the remainder of material will be required to be sourced from the Grants WRD (1,065 kt) to complete the backfill. All of the excavated box-cut material will be returned to the box-cut. This is scheduled to occur at the cessation of mining, following completion of the UG backfill (Figure 3-12). The development WRD will be progressively returned as backfill UG, proposed to be completed by month 19 (Figure 3-12). Grants WRD will be brought back from Grants to BP33 from month 11 to month 41 (Figure 3-13), utilising the return haul trucks that run from the BP33 ROM to the Grants processing facility.

An initial assessment of the suitability of soil materials on site for use in rehabilitation was undertaken as part of the geochemical study (EGi, 2020). Four soil samples were analysed for the parameters in Table 3-6.

Table 3-6. BP33 Soil analysis

Parameter	Relevance
pH	pH of soils – suitability for plant growth
Electrical Conductivity (EC)	Measure of salinity
Bulk density (BD)	Water holding capacity / compaction potential
Particle size distribution (PSD)	Particle size distribution informs the assessment of erosion and sodicity risks
Emerson Aggregate Test	Soil stability - dispersive or sodic materials
Cation Exchange Capacity (CEC) and exchangeable cations	Capacity to hold cations and potential sodicity

Parameter	Relevance
Trace metals	Potential toxic elements
Organic matter / Total organic carbon (TOC)	Soil fertility - indicator of soil nutrient store
Total Nitrogen (TN) & Total Phosphorus (TP)	Soil fertility - nutrients available for plant uptake
Naturally occurring radioactive material (NORM)	Radioactive materials

Overall, the results suggest that soil at the site is an infertile, gravelly sandy loam. The Emerson test indicates that the soil should be non-dispersive, but given the low organic matter level and sandy texture the soil likely has poor structure and limited water-holding capacity, and therefore could be susceptible to erosion under wet conditions. It is expected successful rehabilitation will require increasing the physical and chemical fertility of the soil to some extent, consistent with the proposed final end use (EGi, 2020).

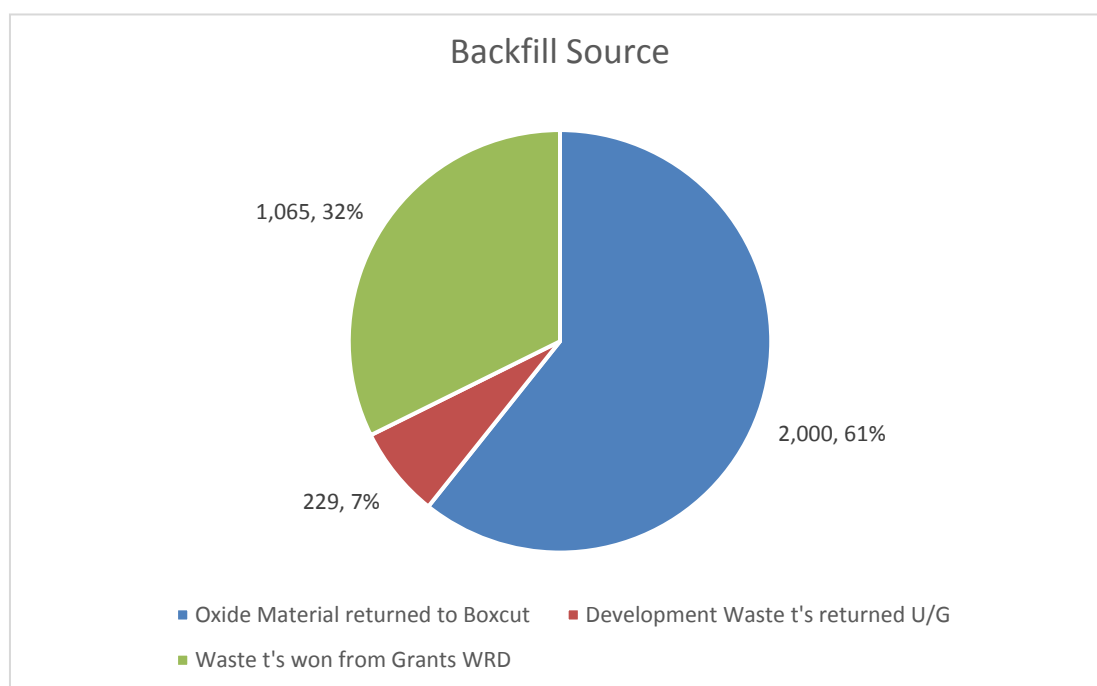


Figure 3-11. Backfill material volumes and source

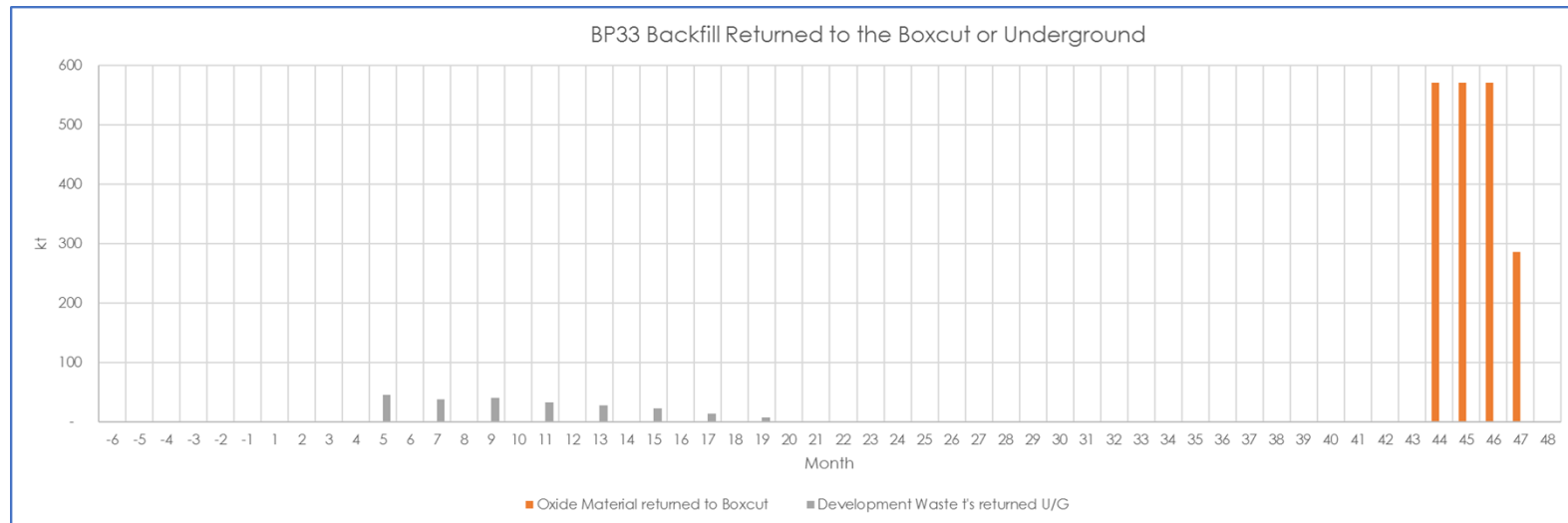


Figure 3-12. Box-cut and underground backfill schedule

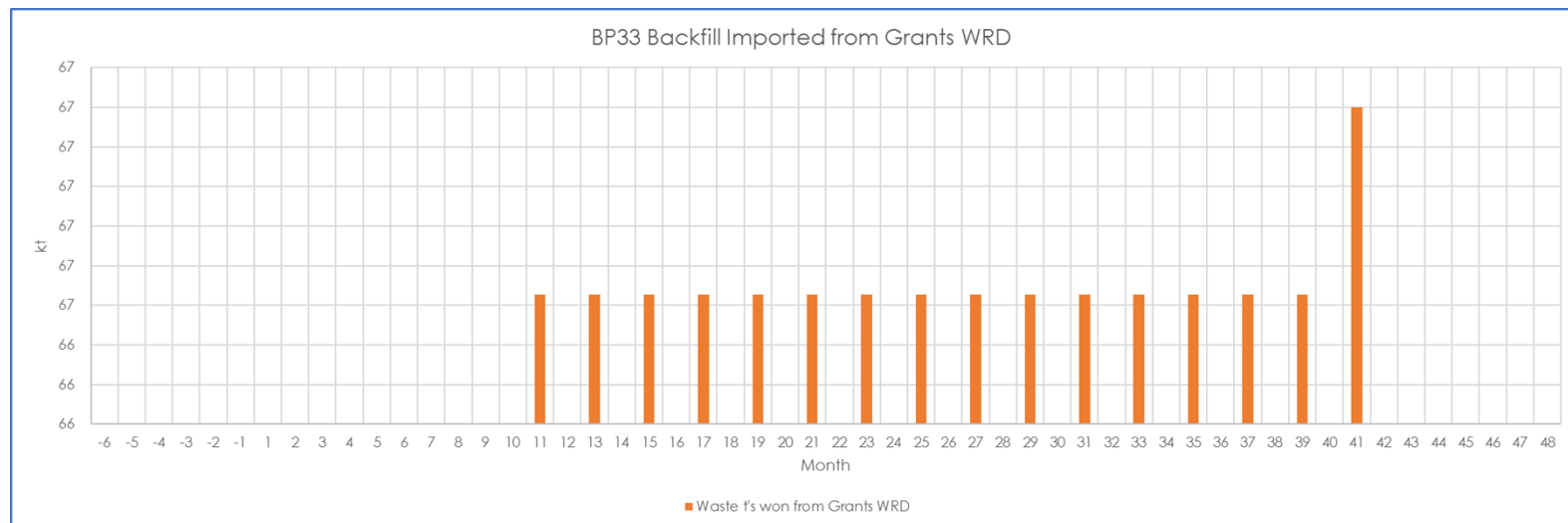


Figure 3-13. Backfill material schedule sources from Grants WRD

4 ALTERNATIVES

The following alternatives are being considered during the planning phase for BP33.

Open cut versus underground mining:

An assessment of open cut versus underground mining was undertaken and determined that BP33 resource would be an underground mine. Underground mining was more feasible, targeted the ore body and provided less dilution. This is also a preferred option to reduce the footprint and waste volumes produced.

Waste dump versus backfilling:

The preferred closure option for BP33 to comply with NT EPA recommendations involves backfilling. Core has undertaken analysis and determined that backfilling is feasible. Backfilling BP33 will offer the added benefit of reducing the final size of the Grants WRD.

Site layout

The mine site layout has been subject to a number of iterations to utilise the local topography where possible to minimise water flows into the mining area. The box cut and WRD locations have been sited outside of areas subject to inundation or flooding.

Haul route

Two options were considered for the haul route between BP33 and Grants.

Option 1 (the shortest route) involved constructing a haul road cross-country from the BP33 ROM pad to connect to an existing track through to Grants. Option 1 would require clearing of a 10 m wide corridor and would involve crossing a number of seasonally inundated areas. The route would traverse potential habitats for threatened plant species *Stylidium ensatum* and *Typhonium praetermissum*, and surveys would be required to confirm presence/absence of these species.

Option 2 (the preferred option) follows existing tracks north from the ROM pad and then west to Grants. This option is 1.7 km longer than Option 1, but is preferred as it follows higher ground and requires less land clearing and disturbance.

Water sources

To ensure a reliable water supply for the mining operations, Core is has identified multiple water sources including surface water supply from OHD and groundwater bores. The volumes of water extracted from each source will depend on how much water can be harvested and captured for reuse. The site groundwater model (once developed in late 2020) will increase the certainty of predicted volumes available for reuse and in turn will inform the requirement for supplementary groundwater extraction.

Power supply

The longer mine life achieved by adding BP33 to the Finnis Lithium Project, in addition to the Grants mine, allows for Core to assess the feasibility of alternative power supplies. The feasibility of connection to mains power is currently under consideration. If feasible, this would remove the requirement for onsite diesel power generation; however, generators would still be required as back up.

5 EXISTING ENVIRONMENT

This section provides an overview of the existing environmental values and significant sites within the project area. Where relevant, these are described in detail in subsequent chapters for the particular environmental factors pertinent to this project area.

5.1 Climate

The region of the project area experiences a tropical climate with a distinct Dry season (May to October) and Wet season (November to April). Typically, for this region, humidity, maximum and minimum temperatures are highest in the Wet season, and annual evaporation far exceeds annual rainfall.

Climate observations are made by the Bureau of Meteorology (BoM). The closest BoM weather monitoring station to the site is Southport (station number 04206) this captures the rainfall data. As for the evaporation and temperature data this is captured from Darwin Airport (station number 014015). SILO data from 1971 to 2018 were used for surface water modelling. The average monthly rainfalls and evaporation based on SILO data at the BP33 site are shown in Figure 5-1.

Wind direction is predominately from the north through west most of the year (August to March) and particularly during the wet season (September to March). During the dry months (April to July) winds come predominately from the east.

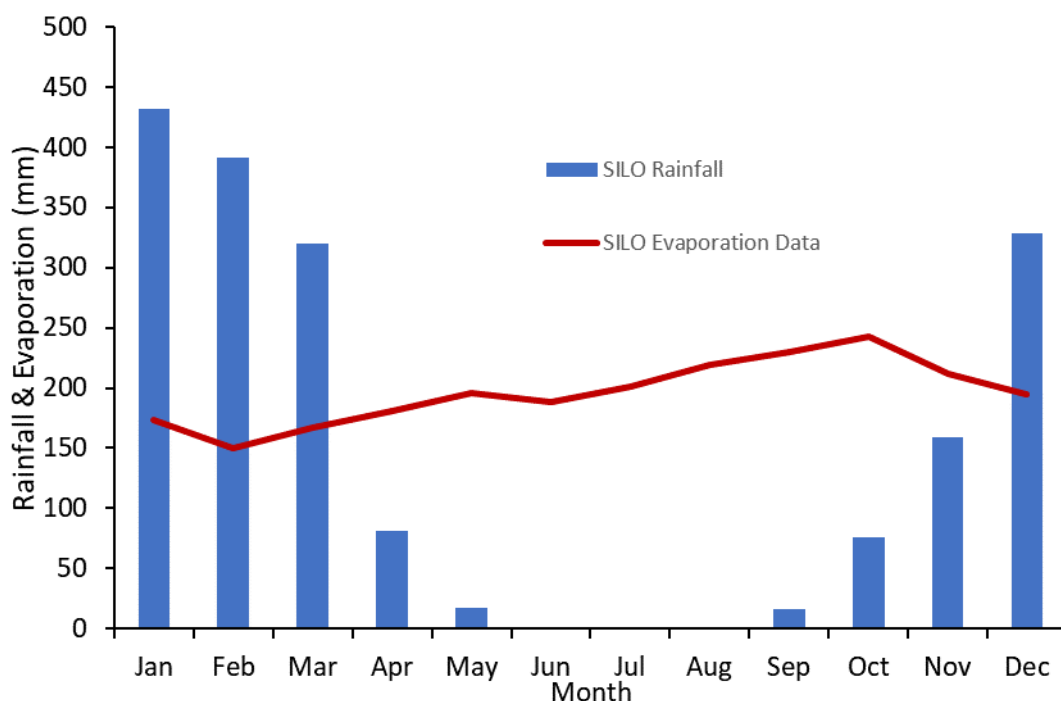


Figure 5-1. Average monthly rainfall and evaporation for SILO data from 1971 to 2018

5.2 Land use history

Aforementioned the BP33 deposit has been mined previously for a number of years in the 1980's and 1990's as an open pit mine. The ore was trucked to a central processing facility located nearby at Observation Hill. The Observation Hill processing facility operated for over a decade. The project area is surrounded by undeveloped Vacant Crown Land (VCL) – Section 1 Hundred of Parsons and Section 2746 Hundred of Hughes. Currently, the main land-use is mining exploration. A number of historic exploration tracks and mine sites are visible on aerial photography of the surrounding areas; the closest sites are located 2.5 km to the northeast. These sites have relatively small-scale visible ground disturbance and historic pit lakes. Tin (Sn) and Tantalum (Ta) have been mined in the Bynoe Pegmatite area for over 100 years. The most recent mining activities in the area were in the 1980's to early 1990's, when tin and tantalum were mined at Observation Hill. The Observation Hill Dam (OHD) has old pipeline and pumping infrastructure present from when it was used as a water supply for mining activities.

Greenbushes Tin Ltd commenced exploration in the Bynoe pegmatite district in 1979, assessing the alluvial and soft rock tin-tantalum potential of the belt. This was the commencement of the first and only systematic exploration of the Bynoe pegmatite district prior to the current work by Core. During the following period (1980–1989), the tin-tantalum mining footprint became significantly larger, but mine life continued to be short and sporadic. This period of increased tin-tantalum production commenced in 1980, from pegmatites at Observation Hill and Tinpot in the Bynoe area. Production from Observation Hill (Vultan Minerals Ltd) was a result of Greenbushes' trial mining of alluvial and weathered pegmatite.

In 1982, exploration for tantalum and tin only increased in tempo as Greenbushes formed the Bynoe Joint Venture (BJV) with Barbara Mining Corporation. The BJV was active in the Observation Hill and Leviathan area during 1982–1999, mapping individual pegmatites, costeaning, auger drilling and trial mining.

During the period 1995–1999, Greenbushes commenced mining a number of new pegmatites in the Observation Hill area, including small open-cut mines (Booths South, Lees, Yan Yams, Hang Gong, Highland, BP33, Rubik's and Carlton) and processing them through their Observation Hill trial plant. Julia Corp undertook systematic RC drilling at various pegmatites in the Bynoe field, including Ah Hoys, Kelly's and BP33. Their objective was to refine resource models for Sn-Ta, but these proved uneconomic.

Work by Liontown Resources through 2016 and 2017 has identified highly weathered and leached spodumene mineralisation from dump samples, and significant lithium mineralisation at depth in many prospects that have been drilled (McDonald, 2018). In early 2016, Core Exploration (CXO) commenced exploration on EL29698 for lithium mineralisation.

The site has not previously or currently regulated as a contaminated site under the *WMPC Act*. No evidence of significant erosion was observed from review of aerial imagery.

5.2.1 Surrounding land uses

Much of the surrounding area including Grants, BP33, Observation Hill and other pegmatite deposits were covered historically by granted Extractive Mineral Lease MLN16. The surrounding land uses are categorised by the zoning developed under the NT Planning Scheme, in accordance with the *Planning Act* (NT). The land surrounding the project area is zoned Rural (R). There are no nearby residences, farms or industries within the catchment areas upstream or downstream, and no commercial or domestic uses for which surface water or groundwater is currently being extracted anywhere near the project area. Cox Peninsula Road is the closest gazetted road, approximately 2km from the Run of Mine (RoM) pad.

The area is also heavily covered in granted Exploration Licences (EL) for exploration of mineral resources for potential mining activities. North of the project area Core have the Grants Lithium Project (Grants) which is proposed to be an open-cut lithium mine. The Grants and BP33 projects propose to use the same water resource, OHD and processing facility at Grants. It is proposed BP33 will be mined once the Grants project has been completed.

There are no sensitive land uses within 1 km of the project operations area, this is clarified under the Human Health theme in Table 6-1. No evidence of significant erosion was observed from review of aerial imagery.

5.3 Natural environment

5.3.1 Landform and soils

The project area broadly comprises of well-drained low hills and rises, intersected by seasonally waterlogged drainage systems and alluvial plains. The land is generally flat, with a slope of 5%.

There are predominantly of two soil groups in the BP33 proposed disturbance area - Rudosols and Hydrosols. Rudosols are very shallow soils or those with minimal development. Hydrosols are seasonally inundated and generally occur on coastal floodplains, swamps and drainage lines.

5.3.2 Vegetation

The vegetation of the Mineral Lease's (MLs) is characterised in Table 7-1. Ground-truthed land units within survey area, and is predominately Eucalypt tall open forest, typically consisting of Darwin Woollybutt (*Eucalyptus miniata*) and Darwin Stringybark (*E. tetrodonta*). The proposed mining method will reduce the amount of vegetation disturbance required, in comparison to open-cut mining method.

5.3.3 Surface water

The project area is located in the Finnis River drainage basin; the Charlotte River runs approximately 2.5 km to the south of the project area, located within the Bynoe Harbour catchment. There are no permanent watercourses in the immediate vicinity, of the proposed project area. However, multiple minor drainage lines flow from the project area into the Charlotte River (Figure 5-2). Each of the drainage lines have evident dense riparian rainforest outlining the watercourse, located downstream of the proposed project developments. On the western edge of the site is a small drainage line, which is downstream of the Observation Hill Dam (OHD). Section 9 discusses further detail about the potential impacts on aquatic environmental quality.

Surface flows in the area follow the topography gradient of the drainage lines to the south west of the project area; towards the Charlotte River, and into Bynoe Harbour. The harbour is captured under the Fog Bay area, which has a declared beneficial use under the *Water Act* of aquatic ecosystem protection and recreational water quality aesthetics. Section 10 discusses further details about the potential impacts on inland water environmental quality and the mitigation measures to be implemented.

5.3.4 Groundwater

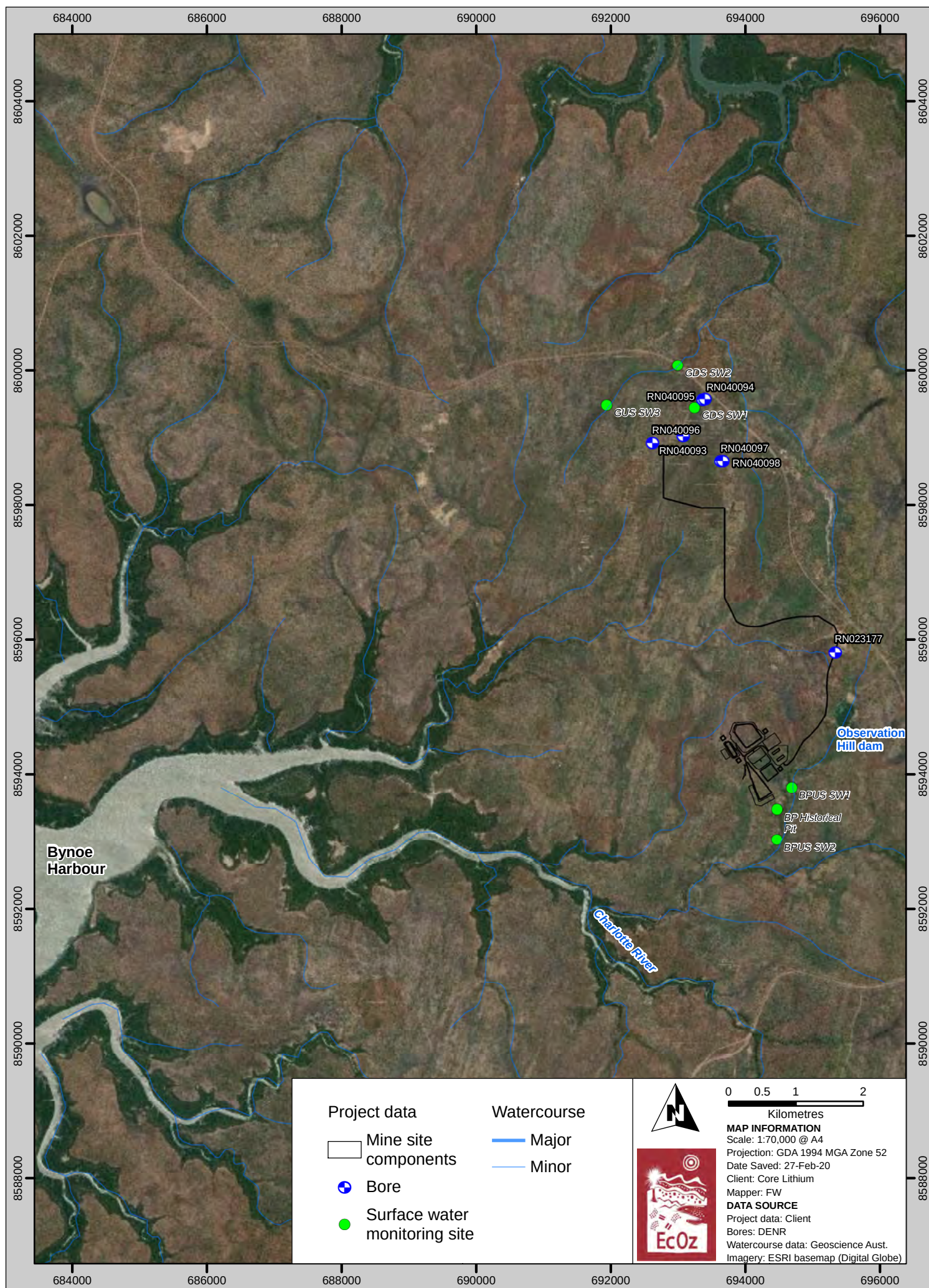
The project area is underlain by the Burrell Creek Groundwater System (DENR 2018a). The aquifer is described as fractured and weathered rocks, the rock is mostly weakly fractured so is a comparatively poor aquifer. There is limited use of this aquifer for domestic, stock or agricultural water supply. The only registered bores in proximity to the ML are those installed by Core and previous mining operators; there are no other groundwater users within 9 km.

The project area is in the Darwin Rural Water Control District. As per the NT Government Gazette No. G25 (DENR 2019b), the district has the following declared beneficial uses:

- Agriculture
- Aquaculture
- Public water supply
- Environment
- Cultural
- Industry
- Rural stock and domestic
- Mining activity
- Petroleum activity.

The Berry Springs Dolostone aquifer is located around 16 km east of the project area. There are current concerns regarding over-extraction from this aquifer, and water allocation is subject to the Berry Springs Water Allocation Plan 2016-2026 (DLRM 2016). The Burrell Creek Groundwater aquifer beneath the project area has no connection to the Berry Springs Dolostone aquifer.

The location of regional aquifers is shown in Figure 5-2. Further detail in relation to groundwater conditions is provided in 5.3.4.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\IEZ19171 - BP33 NOI\01 Project Files\Report maps\Figure 5-1. Map of surface water catchments, watercourses and bores relevant to the project footprint.mxd

Figure 5-2. Map of surface water catchments, watercourses and bores relevant to the project footprint

5.4 Significant sites or features

There are no National parks or Sites of Conservation Significance (SoCS) within the catchment upstream or immediately downstream of the proposed project area or Observation Hill Dam. Marine and aquatic ecosystems in the surrounding areas are described below.

5.4.1 Charlotte River

The Charlotte River, located approximately 2.5 km south west of the site, flows into a tidal inlet of the Bynoe Harbour catchment. All minor drainage lines on or within the proximity of the project area will drain into the Charlotte River, with surface water shed off the project area in a south-western direction towards the lower reaches of the Charlotte River.

The exiting OHD, proposed to supply a portion of mining water requirements, is situated at the headwaters of a drainage line that flows to the lower reaches of the Charlotte River. The watercourse downstream of OHD, starting from a point around 2 km downstream of the dam wall has a well-developed channel and riparian vegetation. This section of watercourse may be a groundwater Dependent Ecosystem (GDE) and hold some ecological values. Further consideration of these values and potential impacts is provided in section 7 and 9.

5.4.2 Bynoe Harbour

Bynoe Harbour is located approximately 7 km downstream of the Charlotte River. Bynoe Harbour is utilised for both recreational and commercial purposes, with the mangrove communities within the harbour constituting 6% of the total mangrove area in the Northern Territory (DIPE 2003). The harbour's mangrove communities are supported by small tidal creeks (EcOz 2019).

5.5 Heritage

Based on a search of the NT Heritage Register, the nearest site protected under the *NT Heritage Act* is 'Site 5', a previously recorded Aboriginal archaeological site. This site, approximately 6 km to the north-west of the proposed mine site, is a stone artefact scatter of moderate site significance.

A number of historic mining sites, listed on the NT Heritage Register but not protected under the *NT Heritage Act*, were identified by the search. The closest of these – 'Goulden Boulder Mine' – is approximately 500 m from the WRD pad. Core does not propose any activities that would disturb this site.

None of the sites listed in the NT Heritage Register are intersected by the project components.

An Authority Certificate (ref C2019/024) has been granted to Core over the areas covered by ML31726, MLN16, EL29698 and EL30015, for activities authorised under the *Mining Management Act*. There are no Aboriginal Sacred Sites or restrictions identified on the certificates (see Appendix E).

6 POTENTIAL IMPACTS – OVERVIEW

The NT EPA currently uses 13 environmental factors to provide a systematic approach to organising environmental information and to establish benchmarks for assessing impacts. The contextual information about the existing environment documented in section 5 was used to undertake a preliminary assessment of potential impacts to each factor. The results are summarised in Table 6-1.

The assessment indicates that the BP33 underground mine proposal has potential to impact six environmental factors, namely terrestrial ecosystems; terrestrial environmental quality; inland water environmental quality; aquatic ecosystems; hydrological processes and social, economic and cultural surroundings. Potential impacts to these ‘proposal specific factors’ are discussed in the subsequent sections of this document.

Table 6-1. Environmental factors and potential impacts

Theme/Factor	Environmental values and sensitivities	Does the proposed action have the potential to significantly impact values or sensitivities?
LAND Terrestrial ecosystems	- Vegetation in disturbance footprint is common and widespread with no unique habitat values. - Riparian vegetation downstream is a significant vegetation type that may be sensitive to changes in water flows and quality. - Threatened fauna species could utilise habitats but no core or critical habitat present. - Threatened plant <i>Typhonium praetermissum</i> not present – confirmed by field survey - Threatened plant <i>Stylidium ensatum</i> considered unlikely to be present – to be confirmed by field survey June/July 2020 - Weed infestations appear to be confined to previously disturbed areas. Weed density is relatively low.	Yes - Potential for indirect impacts to riparian vegetation due to alteration of groundwater levels and flows associated with dewatering and groundwater extraction. - Potential for impact to threatened plant species <i>Stylidium ensatum</i> uncertain, but to be confirmed by field survey June/July 2020. - Introduction and spread of weeds has potential to increase bushfires and risks to biodiversity.
LAND Terrestrial environmental quality	- The project area broadly comprises of well-drained low hills and rises, intersected by seasonally waterlogged drainage systems and alluvial plains. The land is generally flat with a slope of 5%. - Waste rock characterisation indicates a low risk of ARD for the majority of mined materials. There is some uncertainty in relation to the presence of PAF material in the fresh phyllite waste rock. - No evidence of pre-existing contamination.	Yes - Current test results suggest that the risk of ARD from surface storage of waste rock from the underground mine will be low, due to the likely low volume of PAF material present in fresh waste rock and proposed backfilling of all waste material. - Currently there is insufficient evidence to say conclusively that there will be no PAF material removed from the underground mine which may require management to mitigate ARD whilst the material is on the surface.
LAND Landforms	No distinctive landscape features present	No
WATER Aquatic ecosystems	- Watercourse downstream of mine site is mapped as a moderate potential GDE. - Aquatic surveys (macroinvertebrates and fish) undertaken by GHD (2017) at a site 2.5km downstream found communities considered typical of low order watercourses in the NT.	Uncertain - The potential impact to aquatic ecosystems will depend on the duration and extent of groundwater drawdown associated with dewatering and groundwater extraction, and the extent to which that affects surface flows in the watercourse. - Localised drawdown of groundwater would be unlikely to significantly affect aquatic ecosystems. However, if wet season and early dry season flows are affected over a wider area, then the aquatic ecosystem in the watercourse could be impacted. As there is some uncertainty about impacts to groundwater hydrology, the potential for impacts to aquatic ecosystems is uncertain.

Theme/Factor	Environmental values and sensitivities	Does the proposed action have the potential to significantly impact values or sensitivities?
WATER Inland water environmental quality	Surface water - Minor ephemeral watercourse flows within 100m of mine site infrastructure. - Discharges south-west to Charlotte River, which flows into Bynoe Harbour. - Site located in Darwin Rural Water Control District with declared beneficial uses. - No known consumptive uses of surface water downstream of mine site. - No known sources of contamination.	Yes - Water quality downstream of the mine site could be affected by discharge of sediments, hydrocarbon contamination (leaks and spills) and discharge of excess water dewatered from the underground mine. - Discharges will occur from the OHD, which is proposed to be used as a water source and storage, subject to verification of discharge water quality. - The potential for ARD contamination of surface or groundwater is considered low but there remains some uncertainty to be addressed by further studies.
WATER Hydrological processes	Groundwater - Shallow groundwater. Area downstream of mine site mapped as GDE. - Groundwater aquifer low yielding. No consumptive uses within 10 km. - Declared beneficial uses for the Fog Bay Area – aquatic ecosystem protection. - The groundwater flow is assumed be consistent with topographic gradient and flows in a south westerly direction towards the lower elevations of Bynoe Harbour. - The groundwater aquifer beneath the project area has the potential to support GDEs.	Surface water - No - Hydrologic and flood inundation modelling shows only a slight decrease in downstream flows for the mining scenario. ($<1 \text{ m}^3\text{s}^{-1}$ difference between pre and post mining), thus very unlikely to affect natural flow regimes (EnviroConsult Australia, 2020). - Extraction of water from the OHD has been modelled to decrease flows in the downstream ephemeral creek by 20-30% in an average wet season (EnviroConsult Australia, 2018); however, the impact on flows in the Charlotte River is less than 3%. This level of reduction is considered unlikely to impact the downstream riparian and aquatic ecosystems that depend on these flows. Groundwater - Yes - Uncertainty exists with respect to potential groundwater drawdown and alteration of flows associated with groundwater extraction from the proposed BP33 bore field and dewatering of the underground mine. - Drawdown is unlikely to impact other consumptive uses due to the large distance between the mine and other registered production bores. If drawdown is significant and occurs over an extended period of time, this could have indirect impacts on riparian vegetation downstream of the mine, which appear to have a level of groundwater dependence.
SEA Marine flora and fauna	Project activities are unlikely to interact with the marine ecosystem	No
SEA Benthic habitat & communities		
SEA Marine environmental quality		
SEA Coastal processes		

Theme/Factor	Environmental values and sensitivities	Does the proposed action have the potential to significantly impact values or sensitivities?
AIR Air quality & greenhouse gases	- No sensitive receptors located within 10km - Main source of emissions will be from the project power supply, which is currently from diesel generators. - Feasibility of connecting to mains power is currently under consideration.	No - Dust emissions will be mitigated using standard measures and the site is remote from sensitive receptors. - The proposed activities will not trigger reporting threshold requirements for greenhouse gas emissions.
PEOPLE & COMMUNITIES Social and economy / culture and heritage	- Mine site located on vacant crown land with no existing land use within 13km. - Nearest communities are Belyuen, Wagait Beach and Berry Springs. - Cox Peninsula Rd will be used to haul ore from the Grants mine site to Darwin Port. This aspect of the proposal is covered - No known Aboriginal sacred sites or archaeological heritage sites, site conditions indicate a low likelihood of unexpected finds.	No - The mine site is remote from residential areas and sensitive receptors, existing land uses and there is no public access to the area. - Material haulage from BP33 mine to the Grants processing plant will be along private access tracks with no public access. - The operation does not involve the use of hazardous materials or chemicals that could impact water quality for consumptive uses. - Groundwater extraction and dewatering will not impact other groundwater users as the distance to the nearest active production bore is over 10km. - The Social Impact Assessment and Management Plan prepared for the Grants Lithium Project adequately capture the risks associated with an extension to the life of mine. - The BP33 project will extend the period of operation of haul trucks along Cox Peninsula Road, but will not increase traffic volumes. The use of the haul route has been subject to detailed assessment as part of the Grants Lithium Project EIS (EcOz 2018a) and the potential impacts and risks associated with an extended period of use have been addressed in a separate variation to that proposal. - Commitments made by Core in relation to road signage, emergency access, pavement maintenance and speed restrictions at the Berry Springs School will continue to apply for as long as the haul route is in use.
PEOPLE & COMMUNITIES Human health	- Mine site located 13km from nearest residence or other land use. No sensitive landuses present. - No consumptive uses of surface water or groundwater downstream. Some limited recreational use/fishing in Charlotte River. - Haul route along public road passes Berry Springs Primary School.	No - Underground blasting and other mine site noise will not be audible at receptors. - The mined material and product is benign and does not contain any components that could pose a health risk to workers or the community. - The operation does not involve the use of hazardous materials or chemicals that could contaminate waters downstream in Charlotte River. - Groundwater contamination is not expected to occur due to low risk of ARD and small volumes of hydrocarbons in use. If some level of contamination did occur there would be no risk to community health as the contamination would be localised and there are no consumptive users nearby.

7 TERRESTRIAL ECOSYSTEMS

7.1 Factor objective

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

7.2 Receiving environment

The information for this section is largely derived from the ecology survey report presented in Appendix B, as well as information presented in the Grants Project EIS.

7.2.1 Vegetation

Vegetation communities on ML32074 and ML32346 were surveyed and mapped at 1:10,000 scale by EcOz Environmental Consultants (see Appendix B). Brief descriptions and areas of each of the vegetation communities are outlined in Table 7-1 and shown in Figure 7-1.

Land unit 2a1 – *Eucalyptus miniata* and *Eucalyptus tetradonta* mid high woodland on rises – is the most widespread in the proposal area, followed by land unit 5a – *Eucalyptus alba* mid open woodland in alluvial plains. There are also significant areas of poorly drained *Grevillea pteridifolia*, *Pandanus spiralis*, and *Lophostemon lactifluus* shrublands.

Table 7-1. Ground-truthed land units within survey area

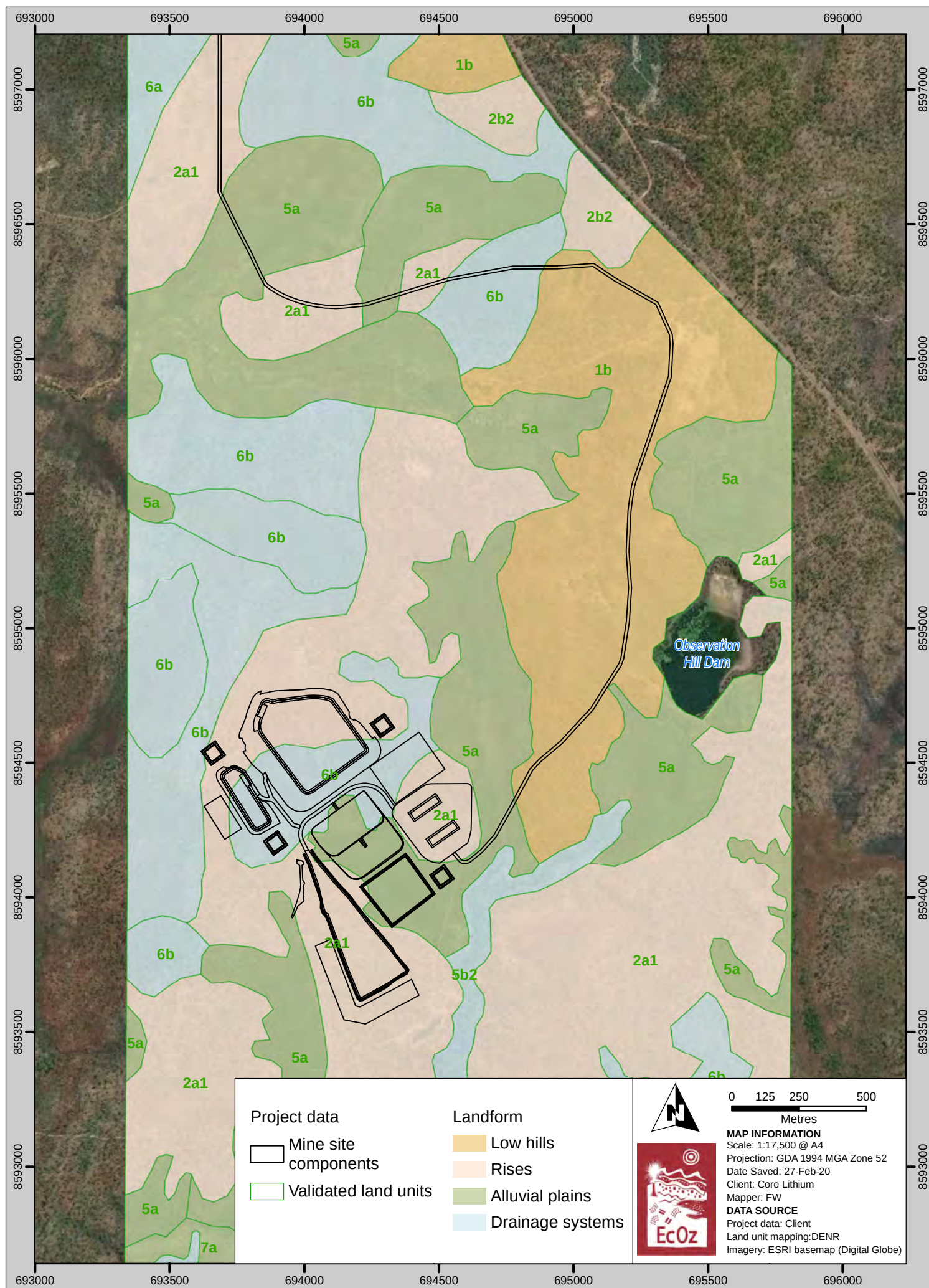
No.	Landform	Vegetation description	Total (ha)
1b	Low hills	<i>Eucalyptus tetradonta</i> , <i>Eucalyptus miniata</i> , <i>Eucalyptus tectifica</i> mid woodland over <i>Terminalia ferdinandiana</i> , <i>Eucalyptus tetradonta</i> , <i>Erythrophleum chlorostachys</i> mid open shrubland over <i>Alloteropsis semialata</i> , <i>Eriachne</i> sp mid tussock grassland	130.4
2a1	Rises	<i>Eucalyptus miniata</i> , <i>Eucalyptus tetradonta</i> mid high woodland over <i>Erythrophleum chlorostachys</i> , <i>Livistona humilis</i> , <i>Eucalyptus miniata</i> mid open shrubland over <i>Alloteropsis semialata</i> , <i>Eriachne</i> sp mid tussock grassland	386.3
2b2	Rises	<i>Eucalyptus tetradonta</i> , <i>Eucalyptus miniata</i> , <i>Eucalyptus tectifica</i> mid woodland over <i>Terminalia ferdinandiana</i> , <i>Eucalyptus tetradonta</i> , <i>Erythrophleum chlorostachys</i> mid open shrubland over <i>Alloteropsis semialata</i> , <i>Eriachne</i> sp mid tussock grassland	16.1
5a	Alluvial plains	<i>Eucalyptus alba</i> mid open woodland over <i>Pandanus spiralis</i> , <i>Lophostemon lactifluus</i> , <i>Xanthostemon paradoxus</i> mid sparse shrubland over <i>Sorghum intrans</i> , <i>Imperata cylindrica</i> mid tussock grassland <i>Grevillea pteridifolia</i> , <i>Pandanus spiralis</i> , <i>Lophostemon lactifluus</i> mid sparse shrubland over <i>Alloteropsis semialata</i> , <i>Sorghum intrans</i> mid tussock grassland	244.2
7a	Alluvial plains	<i>Grevillea pteridifolia</i> , <i>Pandanus spiralis</i> , <i>Lophostemon lactifluus</i> mid sparse shrubland over <i>Alloteropsis semialata</i> , <i>Sorghum intrans</i> mid tussock grassland	47.1
5b2	Drainage system	<i>Melaleuca leucadendra</i> , <i>Corymbia polycarpa</i> , <i>Xanthostemon eucalyptoides</i> mid open forest over <i>Pandanus aquaticus</i> , <i>Xanthostemon eucalyptoides</i> , <i>Leptospermum madidum</i> tall shrubland over sedge sp., <i>Alloteropsis semialata</i> high open tussock grassland	40.6
6a		<i>Corymbia polycarpa</i> , <i>Erythrophleum chlorostachys</i> , <i>Corymbia confertiflora</i> mid open woodland over <i>Grevillea pteridifolia</i> , <i>Xanthostemon paradoxus</i> , <i>Livistona humilis</i> mid shrubland over <i>Alloteropsis semialata</i> , <i>Eriachne</i> sp mid tussock grassland	8.8

No.	Landform	Vegetation description	Total (ha)
	Drainage system		
6b	Drainage system	<i>Corymbia polycarpa</i> , <i>Erythrophleum chlorostachys</i> , <i>Corymbia confertiflora</i> mid open woodland over <i>Grevillea pteridifolia</i> , <i>Xanthostemon paradoxus</i> , <i>Livistona humilis</i> mid shrubland over <i>Alloteropsis semialata</i> , <i>Eriachne sp</i> mid tussock grassland	229.3

7.2.2 Sensitive vegetation types

In the NT, sensitive vegetation types are those considered significant under the *NT Land Clearing Guidelines* (DENR 2019a) due to their unique and/or inherently high biodiversity values. These types include rainforest, vine thicket, closed forest, riparian vegetation, monsoon vine forest, and vegetation containing large tree with hollows suitable for fauna habitat.

The only sensitive vegetation type relevant to the project is the narrow fringe of riparian vegetation along an ephemeral watercourse downstream of the project area – land unit 5b2, as shown in Figure 7-1. The well-developed riparian vegetation indicates some level of groundwater dependence supporting this vegetation community throughout the dry season; however, there is no evidence of spring-fed surface water flows. The potential impacts of groundwater dependant ecosystems (GDEs) in relation to hydrological processes is discussed in section 10.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\IEZ19171 - BP33 NOI\01 Project Files\Report maps\Figure 7-1. Map of validated land units relevant to the project area.mxd

Figure 7-1. Map of ground-truthed land units relevant to the project area

7.2.3 Weeds

Field survey determined that weed density is relatively low across the project area, despite a land use history of exploration activities and resource extraction. A few Gamba Grass and Perennial Mission Grass plants were observed along the access track from the Cox Peninsula Rd.

The Project area lies within the *Darwin Regional Weed Management Plan 2015-2020* (DLRM 2015). Weed species identified as a priority in that plan that have been recorded within 20 km buffer of the Project area are presented in Table 7-2. The buffered zone surrounding the Project area was chosen to account for potential weed spread and/or introduction.

Table 7-2. Declared weed species within a 20 km buffer surrounding the Project area

Common name	Botanical name	Class*	WoNS**	Status in management plan	Records within Project footprint
Gamba Grass	<i>Andropogon gayanus</i>	B	Yes	Priority	Yes
Bellyache Bush	<i>Jatropha gossypifolia</i>	A	Yes	Priority	
Mimosa	<i>Mimosa pigra</i>	B	Yes	Priority	-
Olive Hymenachne	<i>Hymenachne amplexicaulis</i>	B	Yes	Priority	-
Parkinsonia	<i>Parkinsonia aculeata</i>	B	Yes	Priority	-
Perennial Mission Grass	<i>Cenchrus polystachios</i>	B	-	Priority	Yes
Grader Grass	<i>Themeda quadrivalvis</i>	B	-	Priority	-

* Some species of introduced flora are declared to be weeds under the NT *Weeds Management Act* because of the environmental and economic harm they can cause. Class A weeds are to be eradicated by land owners and occupiers. Class B weeds must have their growth and spread controlled by land owners and occupiers.

** Weeds of National Significance (WoNS).

7.2.4 Other threatening processes

According to the Northern Australia and Rangelands Fire Information database, the project area and surrounds has burnt patchily between eight and ten times in the past decade. This high fire frequency is typical of woodlands in the region.

The usual suite of introduced fauna species – particularly Feral Pig, Cane Toad, Black Rats and Feral Cats – are expected to be present within the project area.

7.2.5 Threatened species

The Commonwealth and NT threatened species search tools identified 73 threatened species (Commonwealth and/or Northern Territory-listed) with the potential to occur in the region of the project. For each species, the likelihood of it occurring within the project footprint was then assessed based on habitat requirements, distribution, and the number and dates of proximate records – see Appendix B.

Species with a high or medium likelihood of occurring within the project footprint are listed in Table 7-3.

Table 7-3. Threatened species ‘likelihood of occurrence’ assessment results (excluding low likelihood species)

Likelihood	Scientific name	Common name	Class	Status	
				NT	Cth
HIGH	<i>Geophaps smithii smithii</i>	Partridge Pigeon (eastern subspecies)	Birds	VU	VU
	<i>Mesembriomys gouldii gouldii</i>	Black-footed Tree-rat (Kimberley and mainland NT subspecies)	Mammals	VU	EN
	<i>Saccolaimus saccolaimus (nudiclunatus)</i>	Bare-rumped Sheath-tail Bat	Mammals	-	VU
	<i>Typhonium praetermissum</i>	A herb	Plants	VU	-
MEDIUM	<i>Tyto novaehollandiae kimberli</i>	Masked Owl (northern subspecies)	Birds	VU	VU
	<i>Dasyurus hallucatus</i>	Northern Quoll	Mammals	CR	EN
	<i>Rattus tunneyi</i>	Pale Field-rat	Mammals	VU	-
	<i>Varanus mertensi</i>	Mertens' Water Monitor	Reptiles	VU	-
	<i>Varanus mitchelli</i>	Mitchell's Water Monitor	Reptiles	VU	-
	<i>Varanus panoptes</i>	Floodplain Monitor	Reptiles	VU	-
	<i>Stylidium ensatum</i>	Trigger Plant	Plants	EN	EN

Key: CR = Critically Endangered, EN = Endangered, VU = Vulnerable, Cth – Commonwealth, NT – Northern Territory.

A discussion was had with David Rhind from the Flora and Fauna Division of the Department of Environment and Natural Resources (DENR) on 25 September 2019 to ensure that these results aligned with the concerns of the department. Based on that discussion, and the previous information requirements of the Grants Project EIS, surveys were then only undertaken for the threatened flora species that could potentially be present (EcOz 2018d). This is because for the threatened fauna species, there are many areas of suitable habitat for these species throughout the Cox Peninsula, and the quality of that habitat within the project area is similar to that elsewhere in the region. If these species are present, the project area does not contain important habitat for them.

The following conclusions can be drawn in regards to the two threatened flora species (for more detail, see Appendix B):

- Areas within the project footprint that were modelled by DENR as being moderate likelihood habitat for *Typhonium praetermissum* were surveyed. Targeted surveys for the species in accordance with DENR guidelines did not detect the species. Previous surveys undertaken for Grants Lithium Project also did not detect the species. The species is very unlikely to occur in the area.
- There are areas within the project footprint that are modelled by DENR as being potentially-suitable habitat for *Stylidium ensatum*. A survey for this species in similar habitat for the Grants Project did not result in any detections and DENR stated agreement that, despite the ‘low’ level of survey effort, the species is unlikely to occur. As the species can only be detected in June-July, the areas of potentially suitable habitat in the BP33 footprint will be surveyed in June/July 2020 to verify the absence of the plants. The species is very unlikely to occur in the area; however, if it was detected in survey then further consideration would need to be given to whether the species would be significantly impacted.

7.3 Potential impacts & proposed mitigation

The following potential impacts on terrestrial ecosystems associated with the proposal are:

- Removal of vegetation and habitat for threatened species
- Impacts to riparian vegetation due to reduction in flows

- Reduced habitat quality for flora and fauna due to noise, dust and other disturbance
- Introduction and spread of weeds

The significance of these impacts is further discussed in the sections below.

Other potential impacts to flora and fauna associated with project activities could include direct mortality due to road kill and interactions with land clearing machinery. This impact will be minimised through standard environmental controls included in a Mining Management Plan (MMP) and are not expected to be significant.

7.3.1 Removal of vegetation and habitat for threatened species

The primary source of removing vegetation and habitat within the project area will be land clearing. Land clearing will occur during the construction phase of the project, and will be conducted in accordance with the *Land Clearing Guidelines* (DENR 2019a). The total area of vegetation / habitat that will be lost is approximately 100.9 ha (88 ha site layout footprint and 12.9 ha haul road and water pipeline). None of the vegetation types are rare or threatened.

The majority of the disturbance will occur in land unit 1b and 5a, which supports *Eucalyptus* woodland, open woodland vegetation communities and poorly drained shrublands dominated by *Grevillea pteridifolia*, *Pandanus spiralis* and *Lophostemon lactifluus*. The *Eucalyptus* communities are the most widespread land over type in the Greater Darwin region (Hempel 2003). For each of the land units that occur within the project area, the loss associated with the proposal equates very small proportion of the extent mapped within the Greater Darwin region.

Loss of these *Eucalyptus* woodland habitats is expected to have a limited impact to fauna because the area is relatively small and the affected habitat types are well represented in the surrounding areas. Aside from the BP33 and Grants project areas, there are no other industrial development in close proximity that would deter use of these habitats. Habitat values within the disturbed area may return to some extent in the years' post-closure as the disturbed areas will be backfilled and rehabilitated. However, as rehabilitation success on mine sites is highly variable it is expected that some reduction of habitat value will be a permanent feature of the project area, and indeed already is due to previous mining disturbance.

The land clearing associated with the proposal is not expected to have a significant impact on flora and fauna. Core will adopt the Vegetation Clearing Procedure submitted for the Grants Lithium Project to ensure that potential impacts are minimised by clearing within approved areas only and using methods that will prevent off-site impacts. A Mine Closure Plan will also be developed to provide a strategy and work plan with the objective that rehabilitation areas are comprised of a 'self-sustaining native vegetation groundcover, comparable to that of the surrounding ecosystems'. Successful rehabilitation would further reduce impacts to flora and fauna; however, if rehabilitation were to fail, due the small area of affected habitat, the proposal is still unlikely to have any significant impact.

7.3.2 Impacts to riparian vegetation due to reduction in flows

Field surveys did not identify any sensitive vegetation types within the direct disturbance footprint. However, riparian vegetation occurs along the ephemeral stream downstream of Observation Hill Dam (OHD) and the mine site. This vegetation could be indirectly affected if the proposal was to significantly reduce either surface or groundwater flows through the dewatering of the box-cut / underground mine and the extraction of water from OHD. Hydrologic modelling shows a slight decrease in downstream flows cause by construction of the mine site ($<1 \text{ m}^3\text{s}^{-1}$ difference between pre and post mining), thus very unlikely to affect natural surface flow regimes (EnviroConsult Australia, 2020).

The OHD has been in place since the 1980s and the reduction in early season flow over that time (which will not change with the current proposal) has not resulted in the loss of riparian vegetation. This vegetation appears to be naturally adapted to highly variable stream flows (EcOz 2018a) and is considered unlikely to be affected by an extended period of water extraction from OHD. However, there is some uncertainty with respect to the potential level of groundwater drawdown during mining, the time it will take for groundwater levels to recover post-mining and subsequent response of the riparian community to these changes. Core's plan for

installing investigative and monitoring bores that will allow for development of a site-specific groundwater model for the BP33 site is outlined in section 10.3.3.

In terms of scale, it is considered likely that if impacts to riparian vegetation did occur, they would be localised to within the drawdown cone around the mine site. The severity of potential impacts to the riparian vegetation within this area will depend on the extent and duration of lowered groundwater levels, which will be known once the site-specific groundwater model is developed. Given the ephemeral nature of the watercourse and it's relatively small contribution to the Charlotte River, if the worst-case scenario occurred and the riparian vegetation was severely degraded, it is considered unlikely that this would affect biodiversity or ecological integrity within the main river system.

The response of the riparian vegetation to changes in groundwater levels is difficult to predict. In this case, a monitoring program will be developed for implementation during mining to detect impacts to riparian vegetation and allow for adaptive management and/or rehabilitation of damage. Baseline surveys of the aquatic ecology and riparian vegetation species composition and structure have been undertaken at locations downstream of BP33, refer GHD (2017) and EcOz (2019). A monitoring program will be included in the MMP that will provide for annual monitoring to compare ecosystem health during mining and post-closure, to these baseline conditions.

7.3.3 Reduced habitat quality for flora and fauna due to noise and dust

A reduction in fauna habitat quality in the immediate vicinity of the project area will occur due to noise emissions from machinery and equipment, which will operate 24 hours during operations. Dust deposition on plants will also occur within a short distance around the disturbance footprint. These impacts are not expected to alter species composition or abundance because the project area does not provide core habitat for any threatened fauna species, and no sensitive habitats are present (such as wetlands or roost sites). Any temporary displacement of fauna would be into surrounding habitats of similar quality. The quality of habitat around project area is expected to return within months' post-closure.

Core will implement dust and noise controls on the as a safety required and these controls will minimise potential environmental impacts. Emissions are not expected to have a significant impact on flora and fauna.

7.3.4 Introduction and spread of weeds

Any introduction and spread of weeds by machinery and equipment has the potential to reduce habitat quality in the surrounding area due to competition with native species. The project area currently has low levels of existing weed infestation; however, Gamba grass and Perennial mission grasses are key weeds of concern. During site visits by EcOz, both species were determined to be present in the existing disturbed areas within the project area.

Experience on mine / extractive sites in the region shows that these grassy weeds are easily introduced and once present are likely to proliferate in disturbed areas. Without management, weed infestations could be expected to persist, and possibly proliferate, in the project area following mine closure. Core will implement a Weed Management Plan prior to and during construction / operations, and measures to ensure the machinery, equipment and materials that are brought onto site are declared 'weed free'. Core are committed to utilise localised topsoil and subsoil from the box-cut and UG mine to backfill for concurrent rehabilitation, in preparation for closure of the mine.

Further weed monitoring and controls will be addressed in the Mine Closure Plan, which will be submitted as part of the MMP under the *Mining Management Act*. This plan will incorporate the requirements of the *Darwin Regional Weed Management Plan 2015-2020* (DLRM 2015), *Weed Management Plan for Gamba Grass* (DENR 2018b) and Northern Territory Weed Management Handbook (NT Government 2018).

Weeds are not expected to cause a significant impact to flora and fauna values; however, without effective management, the increased bushfire risk associated with grassy weeds could further degrade habitat quality in the area surrounding the project area, which is already affected by frequent bushfires. Ongoing weed

monitoring will be included in the MMP and weed control will occur in accordance with legislative obligations under the *Weed Management Act*.

7.4 Assumptions

Direct impacts to flora and fauna are expected to be localised within the project footprint and unlikely to affect biodiversity or ecological integrity based on the following assumptions:

- The vegetation in the project footprint is well represented in surrounding areas.
- The footprint does not contain any significant or sensitive vegetation types.
- There is a low likelihood of any threatened flora being present. The assumption that the threatened *Stylidium ensatum* does not occur in the project footprint, will be verified by field surveys in July 2020. If the species were found then Core would consult with DENR and submit a variation to this Referral if the species will be significantly impacted.
- The area is unlikely to provide critical habitat for any threatened fauna species.
- Land clearing will be conducted in accordance with the *Land Clearing Guidelines* (DENR 2019a).
- The riparian vegetation downstream of the mine site is naturally adapted to highly variable stream flows (EcOz 2018a). It is assumed that the habitat is unlikely to be significantly affected by an extended period of dry season no flow conditions associated with surface water extraction from OHD. The OHD will still overflow during the wet season and provide flows to the downstream watercourse.
- If groundwater drawdown affects riparian vegetation, it is assumed that the impact would be localised to within the drawdown cone around the mine site. Given the ephemeral nature of the watercourse and it's relatively small contribution to the Charlotte River, if riparian vegetation was degraded in a localised area, it is unlikely that this would affect biodiversity or ecological integrity within the main river system.
- A monitoring program will be developed for implementation during mining to detect impacts to riparian vegetation and allow for adaptive management and/or rehabilitation of damage.
- The proposal does not involve activities that pose a significant risk of moving weeds off-site and compliance with obligations under the *Weed Management Act* will limit weed spread.

7.5 Relevant Policy & Guidance

- Department of the Environment and Natural Resources (2019). *Land Clearing Guidelines*
- Department of the Environment, Water, Heritage and the Arts (2013). *Significant Impact Guidelines regarding Matters of National Environmental Significance*
- Northern Territory Environment Protection Authority (NT EPA) (2013). *Guidelines for Assessment of Impacts on Terrestrial Biodiversity*
- Department of Land Resource Management (2015). *Darwin Regional Weed Management Plan 2015 – 2020*
- Department of Environment and Natural Resources (2018). *Weed Management Plan for Gamba Grass (Andropogon gayanus)*
- NT Government (2018). *Northern Territory Weed Management Handbook*

7.6 Ecologically sustainable development

The precautionary principle has been adopted by acknowledging assumptions and uncertainties that exist in relation to the assessment of potential impacts and risks to terrestrial ecology. To verify assumptions and reduce uncertainty, Core has made commitments to undertake further surveys for the threatened plant species, *Stylidium ensatum*, and implement a riparian vegetation monitoring program during operations and post-closure. A monitoring program will allow for quantification of impacts and remediation (if possible), and will provide data that will allow for cumulative impacts to be accounted for in future development assessments.

The principle of intergenerational equity has been considered in mine closure planning. The BP33 mine closure concept involves removal of all infrastructure, backfilling the mine and rehabilitation with native vegetation species. The closure objective for the site will be to establish a safe, stable and non-polluting site with a self-sustaining native vegetation community; that provides similar habitat value to that which existed pre-mining. The waste characterisation studies undertaken to date indicate that the proposal is not expected to result in legacy contamination issues, that would prevent achievement of the closure objectives. Once the closure objectives are achieved, it is not expected that there will be any limitations on land use by future generations.

The principle of conservation of biodiversity and ecological integrity has been considered in the assessment of potential impacts to terrestrial ecosystems. The proposal will result in the loss of vegetation and habitat within the 100.9 ha project footprint; however, by avoiding direct impacts to sensitive vegetation types and threatened species and implementing weed control measures; regional biological diversity and ecological integrity should be maintained. Whilst there is some uncertainty about the potential impacts to riparian vegetation associated with changes in hydrology, it is a reasonable assumption that if these impacts were to occur they would be localised and not at a scale that would result in impacts to biological diversity and ecological integrity in the Charlotte River system or Bynoe Harbour. This assumption will be verified by monitoring during operations and post-closure.

The principle of improved valuation, pricing and incentive mechanisms has been addressed by adopting a mine closure strategy that provides for backfilling of the mine to avoid any future impacts to land use. A bond will be paid that will provide for remediation of the site so that these costs are not borne by the community if Core is unable to achieve the agreed closure objectives.

7.7 Residual impact

The proposal will result in removal of 100 ha of vegetation and fauna habitat, and is likely to introduce weed infestations that will require effort to control. Rehabilitation may return some habitat value to the site; however, it is unlikely that the species composition and structure will be exactly as it is now.

There is some uncertainty about the potential for impacts to downstream riparian vegetation associated with groundwater drawdown, which is planned to be resolved through development of a site-specific groundwater model and monitoring of groundwater levels and downstream aquatic and vegetation health during mining and post-closure. The absence of the threatened plant *Stylidium ensatum* is to be verified through field surveys in June/July 2020. The results of these studies will be reported in the MMP.

In summary, the following detailed mitigation and monitoring measures will be included in the MMP:

- Vegetation Clearing Procedure
- Weed Management Plan
- Site-specific groundwater modelling report including groundwater drawdown contours and assessment of potential impacts to watercourses
- Water Management Plan detailing a groundwater, surface water and aquatic monitoring program
- Mine Closure Plan.

Subject to effective implementation of these measures, the proposal is considered unlikely to have significant impacts on flora and fauna.

8 TERRESTRIAL ENVIRONMENTAL QUALITY

8.1 Factor objective

Protect the quality and integrity of land and soils so that environmental values are supported and maintained.

8.2 Receiving environment

8.2.1 Land unit mapping

Land unit mapping, vegetation within a relevant area of the project area was surveyed and mapped at 1:10,000 scale by EcOz Environmental Consultants (see Appendix B). Brief descriptions and areas of each landunit are outlined in Table 8-1 and shown in Figure 7-1.

The project area broadly comprises well-drained low hills and rises, intersected by seasonally waterlogged drainage systems and alluvial plains. The land is generally flat, with a slope of 5%, except for short section of steep ridges traversed by the haul road from BP33 to the Grants Project (land unit 1b). The proposed mine site occurs predominately on land characterised as low rises with gravelly well-drained soils (land unit 2a1). The contractor area and sections of the RoM Pad, topsoil stockpiles and the box-cut waste rock dump (WRD) pad, are located on broad drainage floors (land unit 6b). Only a small section of the haul road and the contractors' area is located on narrow alluvial plains and upland terrain (land unit 5a). Both land units 6b and 5a are classified as having 'severe level of seasonal water logging'.

Observation Hill Dam (OHD) is located on narrow upland alluvial plains (land unit 5a), which are associated with ephemeral drainage lines. The pre-existing water pipeline corridor traverses mainly low rises with gravelly well-drained soils (land unit 2a1) and broad drainage floors (land unit 6b). Short sections of the route traverses steep ridges (land unit 1b) and narrow alluvial plains (land unit 5a).

Table 8-1. Ground-truthed land units within survey area

No.	Landform	Drainage	Soil	Total (ha)
1b	Low hills	Very rapid	Rudosols	130.4
2a1	Rises	Rapid	Rudosols	386.3
2b2	Rises	Rapid	Kandosols	16.1
5a	Alluvial plains	Slow (subject to waterlogging and inundation)	Hydrosols	244.2
7a	Alluvial plains	Moderate (occasional inundation)	Kandosols	47.1
5b2	Drainage system	Poor (waterlogged in wet-season)	Hydrosols	40.6
6a	Drainage system	Very poor (subject to wet-season inundation)	Hydrosols	8.8
6b	Drainage system	Poor (waterlogged in wet-season)	Hydrosols	229.3

8.2.2 Soil characterisation

A number of surface soil samples from exploration drill holes were sampled and soil characteristics analysed as part of the geochemical characterisation program. Section 3.11.1 summarises the soil characterisation results from the complete report provided at Appendix A.

8.2.3 Sub-surface materials characteristics

The sub-surface materials (waste rock) characterisation undertaken for the project is described in section 3.11 from the complete report at Appendix A.

The oxide material that occurs from near the surface down to approximately 60 m has been geochemically characterised as non-acid forming (NAF) and the results indicate there is a low risk of acid rock drainage (ARD) or saline drainage (SD).

The fresh zone material below this depth also largely classifies as NAF; however, the analysis undertaken to date is not sufficient to be certain of the volumes of potential acid forming (PAF) material present. Further characterisation of fresh zone materials will be undertaken to confirm the expected volumes of PAF as per the recommendations provided by Environmental Geochemistry International (EGi) in the report at Appendix A.

8.3 Potential impacts & proposed mitigation

The potential impacts on terrestrial environmental quality associated with the proposal are:

- Soil erosion due to increase runoff and alteration of flow paths
- Soil and land contamination due to acid rock drainage (ARD)
- Soil and land contamination from storage of hydrocarbons in project area.

The significance of these impacts is further discussed in the sections below.

8.3.1 Soil erosion

The contour drain incorporated on the western side of the box-cut design will divert surface water flow around the box-cut, towards a natural topographic low to the south west of the project area. As for the Waste Rock Dump material, this will be used to backfill the underground concurrently during operations and waste on the surface will be kept for a minimum, therefore minimising the erosion potential. The extent of alteration of flow paths have been modelled and has confirmed that surface water flow paths will be localised with minimal increase of runoff (EC Australia 2020). The alteration of the existing extent of the haul road from the project area to the proposed Grants project will require clearing and earthworks, which if not appropriately managed, could alter localised surface water flow paths and cause erosion.

Exposed surfaces after clearing will be most susceptible to erosion by rainfall during the first wet season of operations. The potential for erosion will be minimised by adopting appropriate design criteria for infrastructure components (i.e. construction of water storages, site drainage and diversion bunds will be suited to high rainfall conditions experienced within the project area) and stabilising cleared areas as soon as practicable following clearing and construction. Core will implement a Vegetation Clearing Procedure akin to that used for the Grants Project and an Erosion Sediment Control Plan (ESCP) that complies with the *Best Practice Erosion and Sediment Control Guidelines* (IECA, 2008).

Experience on other mine sites within monsoonal climate conditions of the NT, indicates that erosion is likely to occur within the disturbance area and along the haul roads. Effective implementation of the controls proposed in the Vegetation Clearing Procedure and ESCP, are expected to limit the extent of erosion to within the project area and prevent the movement of significant amounts of sediment off-site. Post-closure erosion risks are limited due to the closure strategy involving removal of infrastructure, backfilling and return to pre-mining surface levels.

Due to the short mine life and the economics underpinning the project, the likelihood of early closure is considered low. However, early closure is likely to pose an increased risk of erosion as landforms (i.e. box-cut, remaining WRD) will not be stabilised or rehabilitated. As a result, potential impacts to land and soils could be more severe. The level of risk will depend on the timing and current status of the site when closure occurs. Closure early during the life of mine and/or during the Wet season poses the greatest risk of more severe erosion that could lead to off-site impacts. Risk assessment and mitigation is expected to be addressed

in a Care and Maintenance Plan, which is a legal requirement under the *Mining Management Act*. Closure works would then either be undertaken by Core or by DPIR using the security bond.

8.3.2 Acid Rock Drainage

A significant issue often associated with mining activities relates to the potential for production of Acid Rock Drainage (ARD), which can result in acidic, metalliferous or saline discharges to the surrounding land and soils. The waste rock characterisation work undertaken for the project area indicates that the majority of the waste material is categorised as low risk of ARD (see section 3.11). Further assessment is required to determine the volume of PAF material that may be within the fresh zone material.

The waste rock characterisation work indicated that the transitional and fresh WRD material, which could contain small volumes of PAF, will be concurrently backfilled into the stopes of the underground as mining progresses as a stability control measure. On completion of mining, the oxide WRD material will be used to backfill the box cut. This will reduce the amount of time the material will be exposed to oxidising conditions, and therefore inherently lowers the risk of ARD. Kinetic testing is required to determine with confidence the risk of ARD from the fresh/transitional WRD over the short timeframe of surface exposure.

Based on the above information, it is unlikely that ARD will be produced. In the event that ongoing characterisation work identified PAF materials, the volumes are expected to be small and there are adequate contingencies available to minimise and manage the material to prevent impacts to surrounding land and soils (i.e. short-term encapsulation with NAF material from the oxide (box cut) WRD) and prioritisation of material for use in backfill). Core will undertake further geochemical characterisation of waste rock pre-commencement of mining and during mining as recommended by Environmental Geochemistry International (Appendix A). Details of the sampling and analysis and contingency measures for PAF materials will be included in an ARD Management Plan, which is required to be submitted with the MMP.

Further discussion of potential water quality impacts is provided in section 10. A Water Management Plan akin to the Grants Project, will include surface water and groundwater monitoring program that will provide for early detection of any contaminated mine drainage issues.

8.3.3 Hydrocarbon contamination

Hydrocarbon contamination of land and soils could be caused by leaks and spills from diesel fuel storages. The project design comprises above-ground fuel tanks and designated refuelling and waste storage areas which, combined with the short mine life, minimises risks associated with diffuse pollution over time, and also the risks associated with failure of the fuel storage tanks and containment bunds. The refuelling areas will comprise of an impervious surface and stormwater drainage pits. Storage and handling procedures that minimise risks to people and the environment are prescribed under the *Australian Standard AS1940 Storage and handling of flammable and combustible liquids* and the *Dangerous Goods Act*. Adoption of these measures onsite will minimise the likelihood of major contamination incidents occurring. However, as is the case with all industrial activities, spills are still likely to occur and will need to be contained.

Any contamination of soil or land resulting from hydrocarbon spills, will be excavated and remediated as soon as practicable. Storage and handling of hydrocarbons will be controlled in accordance with *Work Health and Safety Regulations* and, under normal conditions of use, are unlikely to be released to the environment. The Environmental Management Plan (EMP) will document monitoring procedures for fuel storages for leaks/spills, and spill response procedures, which all personnel on site will be trained in. Effective implementation of these measures should ensure that any soil contamination is limited to within the immediate areas around fuel storage and refuelling areas, and does not result in any measureable impacts to surface or groundwater quality. Further discussion of potential inland water environmental quality impacts is provided in section 10.

Based on the above information, the potential impact on terrestrial environmental quality from hydrocarbon contamination is low risk, with the implementation of the appropriate measures.

8.4 Assumptions

Impacts to land and soil are expected to be localised with the project footprint and unlikely to affect the quality of land and soils or associated environmental values based on the following assumptions:

- Land clearing will be conducted in accordance with the *Land Clearing Guidelines* (DENR 2019a).
- Surface flow alteration will be localised.
- Fuel storage will be in accordance with AS 1940-2004, and the proposed volume will be 50,000L in an above ground tank.
- There is a low likelihood of ARD occurring.
- No waste rock material remaining at surface at closure of project.
- Haul road constructed along existing track to accepted standards for the regional rainfall conditions.

8.5 Relevant policy and guidance

The policies and guidelines taken into account for potential impacts on terrestrial environmental quality are:

- International Erosion Control Association Australasia (2008) - *Best Practice Erosion and Sediment Control (BPESC)*
- Global Acid Rock Drainage (GARD) Guide, International Network for Acid Prevention
- Preventing Acid and Metalliferous Drainage, Leading Practice Sustainable Development Program for the Mining Industry, Commonwealth of Australia, 2016
- Australian Standard - AS1940 *Storage and handling of flammable and combustible liquids*.

8.6 Ecologically sustainable development

The precautionary principle has been adopted by acknowledging assumptions and uncertainties that exist in relation to the assessment of potential impacts and risks associated with AMD. To verify assumptions and reduce uncertainty, Core has made commitments to prepare an ARD Management Plan covering testing for PAF materials and management. PAF materials will be progressively backfilled into the underground mine.

The principle of intergenerational equity has been considered in mine closure planning. The BP33 mine closure concept involves removal of all infrastructure, backfilling the mine and rehabilitation with native vegetation species. The closure objective for the site will be to establish a safe, stable and non-polluting site with a self-sustaining native vegetation community. The waste characterisation studies undertaken to date indicate that the proposal is not expected to result in legacy contamination issues that would prevent achievement of the closure objectives. Once the closure objectives are achieved, it is not expected that there will be any limitations on land use by future generations.

The principle of improved valuation, pricing and incentive mechanisms has been addressed by adopting a mine closure strategy that provides for backfilling of the mine to avoid any future impacts to land use. A bond will be paid that will provide for remediation of the site so that these costs are not borne by the community if Core is unable to achieve the agreed closure objectives.

8.7 Residual impact

The proposal will result in the disturbance of soils and land that will result in localised alteration of surface flow paths and potentially increase erosion risk. These risks are expected to be temporary as the mine closure strategy provides for returning the site to the pre-development landform.

The risk of ARD occurring and resulting in impacts to surrounding land and soils is considered to be inherently low due to low PAF volumes identified in the waste characterisation studies to date, and the ability to use PAF

materials to progressively backfill the underground stopes. Fuel storages have the potential to locally contaminate the land and soil if the appropriate mitigation measures are not implemented and managed accordingly. Operational controls will limit the risk of spills/leaks resulting in large-scale soil contamination. Fuel storages will be removed during mine closure and minor areas of soil contamination removed. The proposal is not expected to result in any residual soil contamination.

In summary, the following detailed mitigation and monitoring measures will be included in the MMP:

- Vegetation Clearing Procedure
- Erosion and Sediment Control Plan (ESCP)
- ARD Management Plan covering testing for PAF materials and management
- Emergency Response Plan addressing spill response and soil remediation
- Mine Closure Plan.

Subject to effective implementation of these measures, the proposal is considered unlikely to have significant impact on land and soils.

9 AQUATIC ECOSYSTEMS

9.1 Factor objective

Protect aquatic habitats and flora and fauna to maintain environmental values including biological diversity of flora and fauna and the ecology functions they perform.

9.2 Receiving environment

A minor ephemeral creek flows past the BP33 mine site. The creek has evident dense riparian rainforest outlining the watercourse and is potentially dependent on groundwater discharge, from the Burrell Creek groundwater system. Small pools of water have been observed in this area during the mid to late dry season site surveys (EcOz 2018a). Aquatic surveys (macroinvertebrates and fish) undertaken by GHD (2017) at a site 2.5km downstream found communities considered typical of low order watercourses in the NT.

9.3 Potential impacts & proposed mitigation

The potential impacts on aquatic ecosystem associated with the proposal are:

- Reduced habitat quality and biodiversity due to alteration of surface and groundwater hydrology
- Reduced habitat quality and biodiversity due to water quality impacts.

The sections below consider the severity and extent of these impacts.

9.3.1 Reduced habitat quality and biodiversity due to alteration of stream flows

Indirect impact to downstream aquatic ecosystems in the minor streams into the Charlotte River could occur as a result of drawdown in the Burrell Creek groundwater system due to dewatering of the box-cut. There is some uncertainty with respect to the potential level of groundwater drawdown during mining, the time it will take for groundwater levels to recover post-mining and subsequent response of the watercourse to these changes. Core's plan for installing investigative and monitoring bores that will allow for development of a site-specific groundwater model to address these information gaps is outlined in section 10.3.3.

In terms of scale, if stream flows are reduced it is considered likely that would be localised to within the groundwater drawdown cone around the mine site and therefore impacts would be confined to the ephemeral watercourse upstream of the confluence with Charlotte River. Localised reduction in stream flows in the wet season and early dry season could reduce the quality of aquatic habitats within a section of the watercourse. Given the aquatic community in the watercourse is typical of a low order watercourse in the Top End, if the worst-case scenario occurred and the aquatic communities were altered, it is considered unlikely that this would affect biodiversity or ecological integrity within the Charlotte River system.

9.3.2 Reduced habitat quality and biodiversity due to water quality impacts

Indirect impacts to aquatic ecosystems could also occur due to impacts to off-site water quality associated with erosion and off-site movement of sediments, mine water discharges and/or ARD. Sections 10 of this NOI assesses these risks and outlines the mitigation measures and monitoring that will be undertaken to minimise water quality impacts. The waste rock characterisation and groundwater information available from the Grants project bores indicate there are no significant contaminant sources at the mine site. There is an increased likelihood of elevated turbidity due to the close proximity of the disturbance footprint to the watercourse. Any measurable change in the downstream water quality has potential to alter diversity and abundance of macroinvertebrates and fish in the ephemeral watercourse. As long as monitoring and corrective actions are effectively implemented, the likelihood of significant impacts to aquatic ecosystems will be low.

The response of the downstream aquatic communities to changes in water flows and quality is difficult to predict and therefore will need to be monitored. The surface and groundwater monitoring program implemented at the mine site will provide for early detection of water quality impacts. An aquatic monitoring program will also be developed for implementation during mining to detect impacts to riparian vegetation and allow for adaptive management and/or rehabilitation of damage. Baseline surveys of the aquatic species composition and structure have been undertaken at locations downstream of BP33, refer GHD (2017). A monitoring program will be included in the MMP that will provide for annual monitoring to compare ecosystem health during mining and post-closure, to these baseline conditions.

9.4 Assumptions

Potential impacts to aquatic ecosystems are inherently linked to water quality hydrological processes, and the maintenance of riparian vegetation communities. The potential impacts to these factors are assessed in Sections 7, 10 and 11. It is assumed that if these factors are not significantly impacted, then aquatic communities will be protected.

9.5 Relevant policy and guidance

- Australia and New Zealand Governments (2011), *Guidelines for Fresh and Marine Water Quality*
- AUSRIVAS NT Sampling and Processing Manual
- Lamche, G. (2007). The Darwin-Daly Regional AUSRIVAS Models –Northern Territory: User Manual. Aquatic Health Unit –Department of Natural Resources, Environment and the Arts. Report 06/2007D.

9.6 Ecologically sustainable development

The precautionary principle has been adopted by acknowledging assumptions and uncertainties that exist in relation to the assessment of potential impacts and risks to aquatic ecosystems. To verify assumptions and reduce uncertainty, Core has made commitments to implement a surface water and groundwater monitoring program that will provide for early detection of impacts to water quality and hydrology, so that contingency measures can be implemented to avoid impacts to aquatic ecosystems. The operational monitoring programs will also include monitoring of aquatic communities and riparian vegetation monitoring during operations and post-closure. A monitoring program will allow for quantification of impacts and remediation (if possible), and will provide data that will allow for cumulative impacts to be accounted for in future development assessments.

The principle of intergenerational equity has been considered in mine closure planning. The closure objective for the site will be to establish a safe, stable and non-polluting site. The waste characterisation studies undertaken to date indicate that the proposal is not expected to result in legacy contamination issues, that would degrade downstream water quality and result in long-term impact to aquatic ecosystems. There will be a long-term impact to surface water flows associated with the OHD remaining in place and it is uncertain how the aquatic ecology will be affected by this. However, as the stream is ephemeral and does not have high habitat values, the level of impact is not expected to be unacceptable to the point that would justify removing the dam.

The principle of conservation of biodiversity and ecological integrity has been considered in the assessment of potential impacts to aquatic ecosystems. Whilst there is some uncertainty about the potential impacts to aquatic ecology associated with changes to water quality and availability, it is a reasonable assumption that if these impacts were to occur they would be localised and not at a scale that would result in impacts to biological diversity and ecological integrity in the Charlotte River system or Bynoe Harbour. This assumption will be verified by monitoring during operations and post-closure.

The principle of improved valuation, pricing and incentive mechanisms has been addressed by committing to monitoring programs during operations and post-closure that will provide for quantification of impacts to aquatic ecosystems.

9.7 Residual impact

Aquatic ecosystems in the ephemeral watercourse downstream of the BP33 mine could be indirectly impacted if there were sustained reduction of flows. There is some uncertainty about the potential for impacts associated with groundwater drawdown, which will be resolved through installing investigation bores and development of a site-specific groundwater model, and monitoring of groundwater levels and downstream aquatic health during mining and post-closure. Given the small contribution of the watercourse to the Charlotte River catchment, it is considered unlikely that the project would cause impacts to aquatic ecosystems in the higher order watercourses of the Charlotte River. Subject to effective implementation of the site ESCP and water quality management measures, extended impacts to water quality should not occur to an extent that would impact aquatic ecosystems.

In summary, the following detailed mitigation and monitoring measures will be included in the MMP:

- Site-specific groundwater modelling report including groundwater drawdown contours and assessment of potential impacts to watercourses
- Water Management Plan detailing a groundwater, surface water and aquatic monitoring program, and a Trigger Action Response Plan (TARP).

Subject to effective implementation of these measures, the proposal is considered unlikely to have significant impact on aquatic ecosystems.

10 HYDROLOGICAL PROCESSES

10.1 Factor objective

Protect the hydrological regimes of groundwater and surface water so that environmental values are maintained.

10.2 Receiving environment

10.2.1 Surface water

The project area is located in the Charlotte River catchment of Bynoe Harbour. A minor ephemeral watercourse flows along the eastern boundary of the mine site and discharges off the southern boundary of the ML and into the Charlotte River, 2.5km downstream. The watercourses in the ML are ephemeral and generally cease to flow by April-May each year. There are no permanent watercourses; however, the manmade OHD is a permanent waterbody. The catchment boundaries and drainage lines are shown in see Figure 5-2.

Catchment model

EnviroConsult Australia Pty Ltd (EC Australia) (2020) conducted a hydrology and flood inundation modelling for the project area. The complete report is provided at Appendix C and key information is summarised below.

There are 2 sub-catchments of the Charlotte River impacted by ML(A)32346. These are referred to in the model as catchment A and catchment B (see Figure 10-1). Most of the natural drainage on the lease drains south towards a right-bank tributary of the Charlotte River. A small portion flows east towards a separate right bank tributary. Watercourses have a gentle slope of $\approx 0.5\%$ to their confluence with Charlotte River.

The sub-catchments covered by the BP33 ML comprise less than 10% of the Charlotte River catchment area. The area of the BP33 disturbance footprint covers 3.3% of the sub-catchments in ML, and less than 1% of the Charlotte River catchment area.

Storm surge

Storm surge data are available from the NTG for Darwin Harbour and parts of Bynoe Harbour. Storm surge extents for primary surge 1%AEP and secondary surge 0.1%AEP events are shown in Figure 10-2. There is little penetration of the storm surge into mine affected catchments apart from a small amount in the lower tidal reaches. The level of the primary storm tide is 4.6mAHD. The outlet of mine-affected catchments in Catchment A is at ≈ 5.4 mAHD, and Catchment B is at ≈ 2.9 mAHD. The highest astronomical tide (HAT) at Burge Point is 3.6mAHD. The lowest point in the proposed mine infrastructure is 23mAHD at the southwest corner of the boxcut bund and is ≈ 2 km upstream from the storm tide level in Charlotte River. It is unlikely that storm surge will affect the proposed mine infrastructure and ML(A)32346.

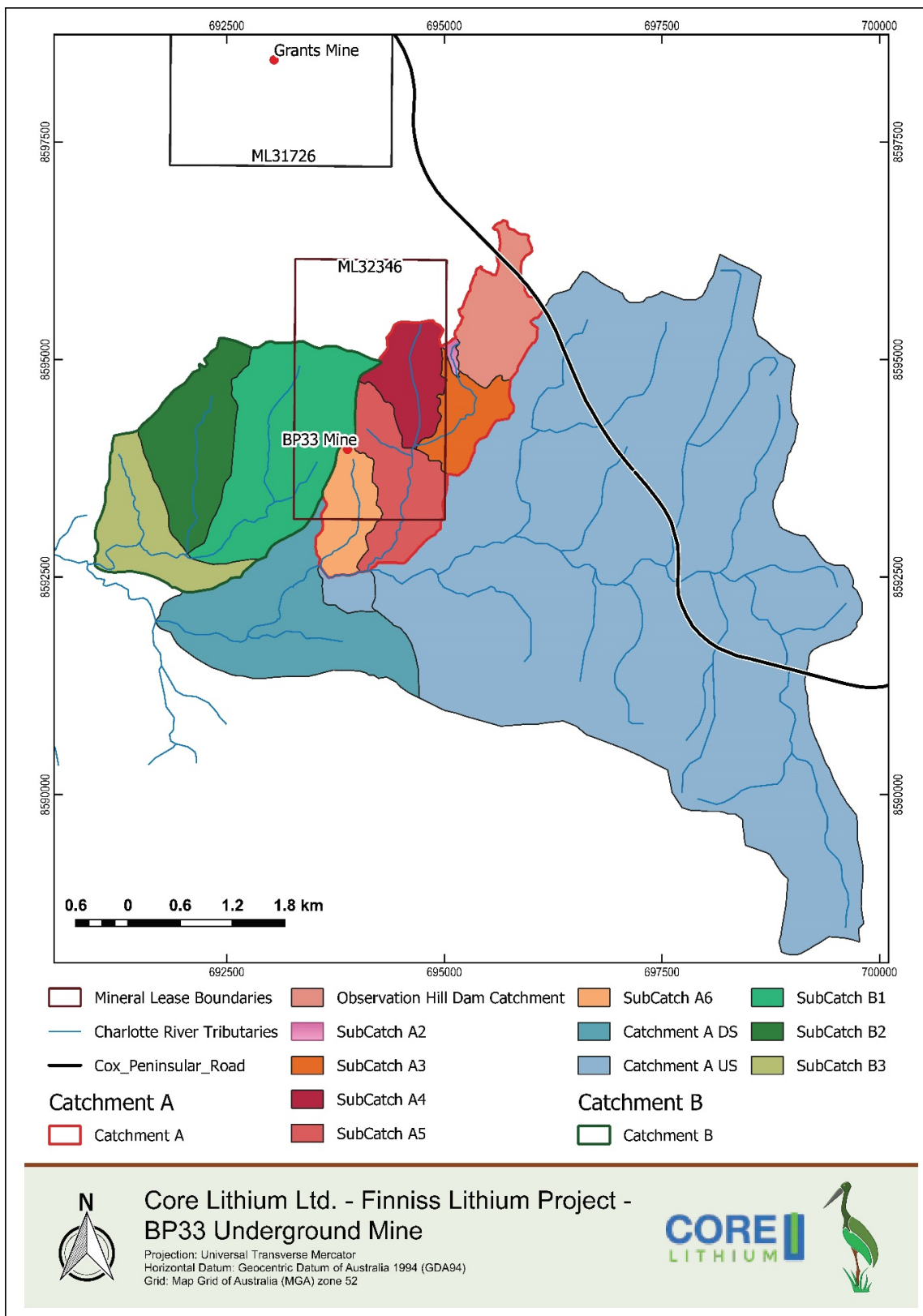


Figure 10-1. Sub-catchments of Charlotte River (A) and Bynoe Harbour (B) in proximity to proposal

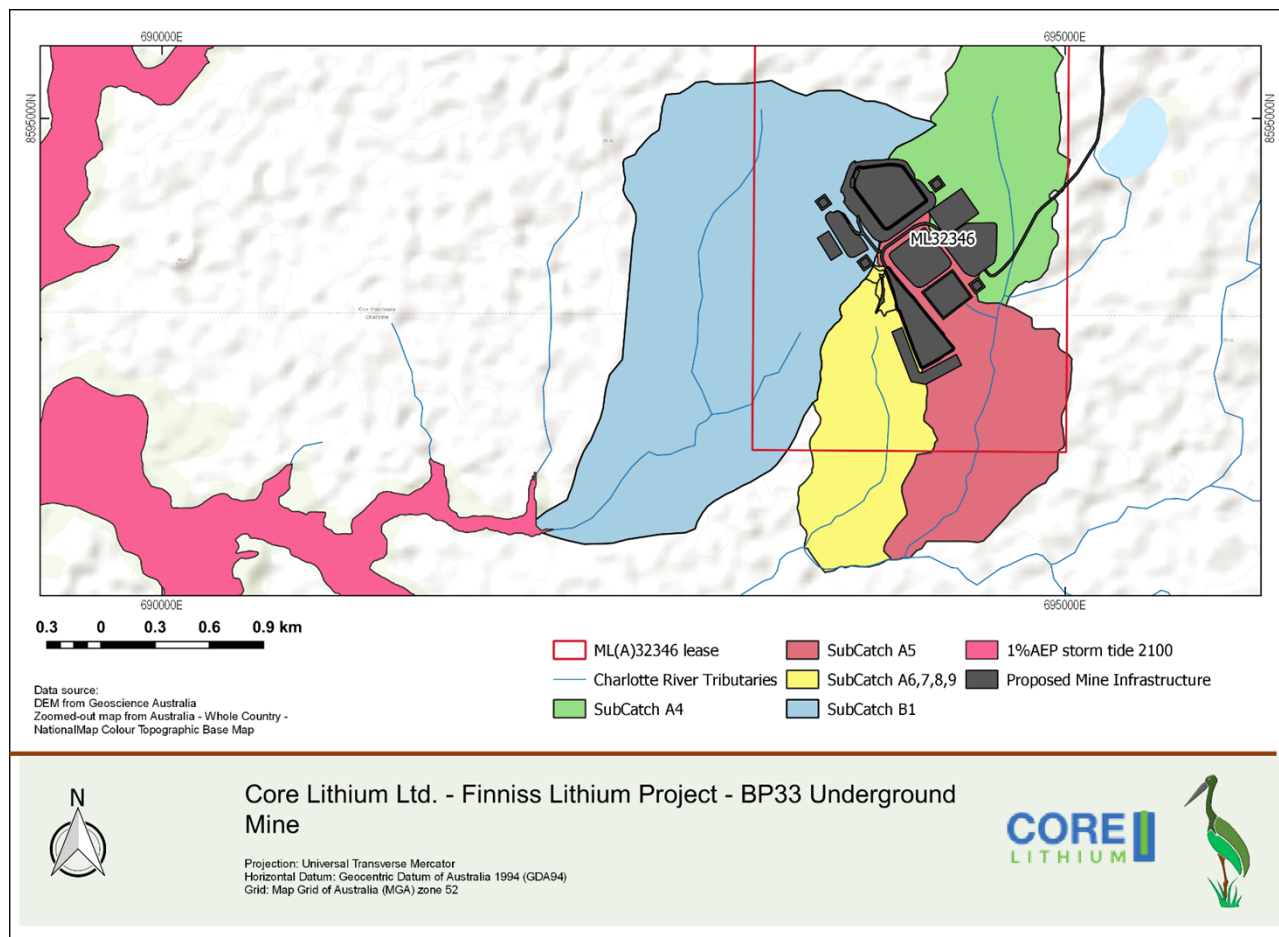


Figure 10-2. Storm surge extent

10.2.2 Groundwater

A desktop groundwater assessment was conducted for the BP33 project area (Groundwater Enterprises 2020) (Appendix D). The Burrell Creek Groundwater System underlies the project area, which is the same system as the Grants Lithium Project area 3.5 km north-west. The desktop assessment recommended thirteen groundwater investigation bores be drilled in various locations within the BP33 project area to obtain baseline data to inform numerical groundwater modelling. The bores are to target various formations within the Burrell Creek Groundwater system to enable the development of an overall understanding of the formations. Core plans to drill these bores in 2020 and commence monitoring to establish a baseline water level and water quality dataset prior to mining.

Burrell Creek Formation

The Burrell Creek Formation forms the main aquifer. The bores drilled at Grants deposit indicate that there are two differing aquifers in the Burrell Creek Groundwater system, the deep Burrell Creek Formation (BCF) aquifer and the alluvial aquifer. Similarly, to other groundwater systems, the Burrell Creek Groundwater system is a fill and spill system, which is reliant on annual wet season rainfall to replenish the resource (DENR, 2018).

The BCF aquifer is a marginal fractured rock aquifer with typical bore yields of less than 0.5 L/s; largely due to the lack of primary porosity and open fracturing within the formation. Higher yields (2 L/s) have been recorded where drilling intersects fracture zones or bands of quartz veining. The groundwater flow direction is not known with certainty; however, it is assumed that it is consistent with the topographic gradient, with groundwater moving from the northeast around Observation Hill Dam (OHD) towards the lower elevations of Bynoe Harbour (Groundwater Enterprises 2019).

Groundwater is typically intersected at the base of the weathering zone/transition into fresh Burrell Creek Formation. At the Grant's deposit groundwater investigation bores intersected the upper groundwater zone in

the Burrell Creek Formation between 50 m and 60 m below ground level. Limited information is available at BP33, however, anecdotal observations from mineral drilling suggests holes intersect groundwater between 60 m and 80 m depth.

The closest groundwater bore to BP33 is RN023177 located 2.5 km north of the historic BP33 pit lake. It is constructed in the Burrell Creek Formation and has a reported yield of 1.75 L/s and a standing water level of 8.5 m below ground. To provide information on groundwater levels at BP33, Core Lithium dipped a series of exploration bores around the site in late October 2019. The groundwater levels have been corrected to account for the dip of the exploration holes. The depth to groundwater ranges from 4.2 to 10.5 m below ground being typically shallower in the east between the pit lake and the drainage line (see Figure 10-3).

The Burrell Creek Formation is largely fine grained and characteristically weathers to clay. Where heavily weathered the Burrell Creek is likely to be less permeable relative to fresh rock due to the higher likelihood of fractures staying open in the more competent, unweathered rock. Hydraulic conductivities from slug tests undertaken at the Grants deposit range from 0.003 – 0.017 m/day, no storage estimates are available for the Burrell Creek Formation. Anecdotal information from mineral drilling and diamond coring at BP33 suggests the pegmatite is very competent and has limited potential to form an aquifer.

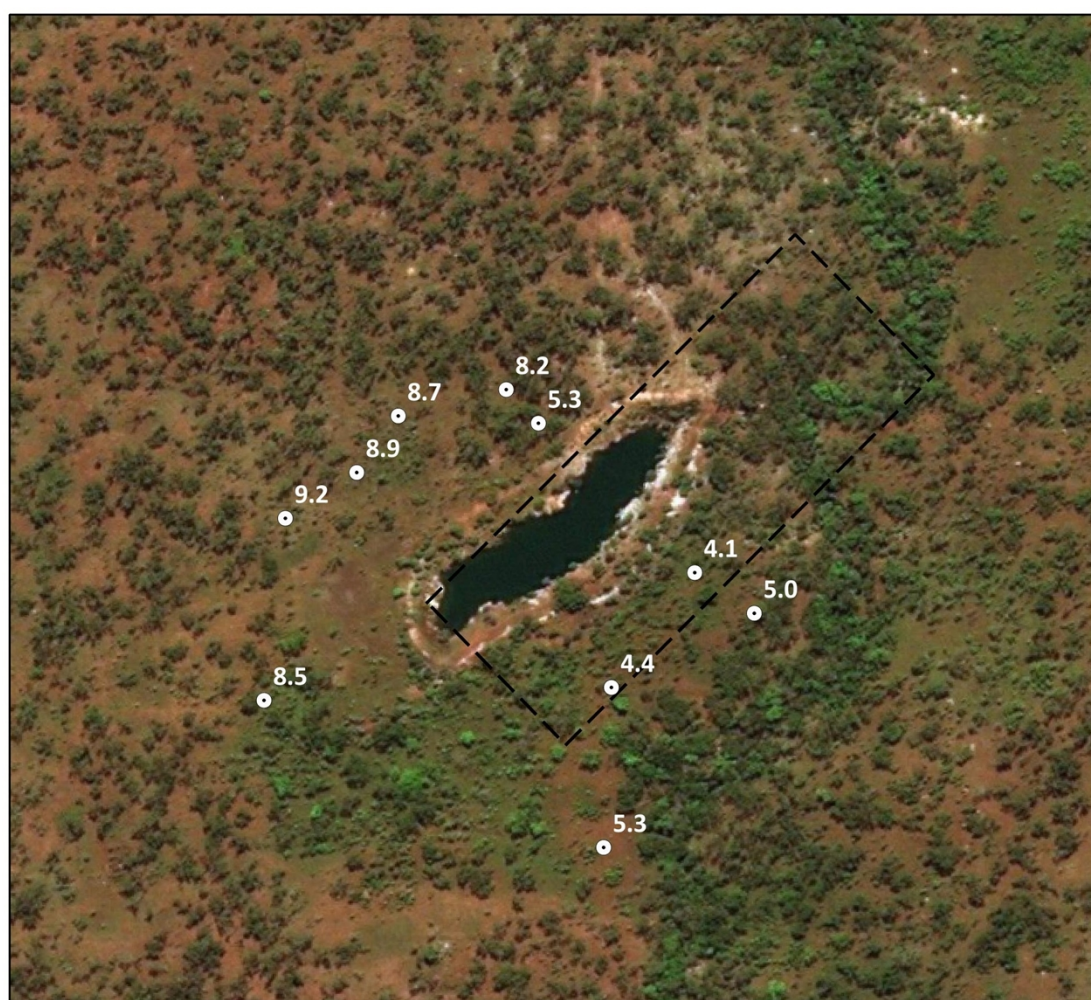


Figure 4-1 BP33 Depth to Groundwater

 Approx. extent of underground workings
  Depth to groundwater October 2019 (mBGL)
 0 50 100 m
 GDA 94 Zone 52, 1:30 00 @ A4



Figure 10-3. Depth to groundwater (from Groundwater Enterprises, 2019)

Alluvial aquifer

There is limited information on the groundwater characteristics of the alluvial deposits as no bores have been constructed in this unit at BP33. Auger drilling and costeaning undertaken by Greenex Mining along the drainage lines south of OHD in the 1980s provide some insight into groundwater occurrence within the alluvial deposits. Mollemans and Hatcher (1988) report that costeans (a shallow exploration pit/trench) excavated along the Booths alluvial deposit north of BP33 frequently collapsed due to the ingress of water. They suggest that seepage from OHD may provide a permanent source of water to the alluvial channels downstream of the dam. The presence of relatively persistent pools of water along the drainage line south of OHD and shallow groundwater levels (<5 m) adjacent to BP33 support this theory.

The aquifers are likely to operate at a very local scale, being of both limited lateral extent (200 – 300 m) and thickness (up to 6 m). Groundwater flow directions within the alluvial aquifer are likely to be consistent with the surface water gradient and generally flow from north to south past BP33.

10.2.3 Groundwater bores

The site is located in the Darwin Rural Water Control District where licences are required for extraction of groundwater. There are no active groundwater bores within 9 km of the BP33 site. The closest groundwater bore to BP33 is RN023177, located 2.5 km north of the historic pit. RN023177 was drilled in 1984 and was constructed in the Burrell Creek Formation as a potential water supply bore for Greenex mining operations at Observation Hill. The bore is not currently in use. The next closest groundwater bore RN038217 is located 9 km south of BP33 on the Fog Bay Road. RN038217 was drilled in 2013 to provide a domestic water supply.

10.2.4 Groundwater dependent ecosystems

Groundwater dependent Ecosystems (GDEs) have been identified using the GDE Atlas, a national dataset of Australian GDEs developed by the Bureau of Meteorology (BOM, 2019) to assist groundwater management and planning. Figure 10-4 maps the terrestrial ecosystem layer in the vicinity of BP33. This layer shows the potential for ecosystems that rely on the subsurface presence of groundwater – including vegetation ecosystems such as forests and riparian vegetation. Four mapped categories are presented: known GDEs based on regional studies and high, medium and low GDE potential based on remote sensing and image analysis. The GDE Atlas maps an area of medium GDE potential (shown in green in Figure 10-4) along the drainage lines to the immediate east and south of BP33.

The potential GDE zone is located approximately 280 m downstream from the edge of the box-cut and 200 m from the edge of the topsoil stockpile. Late-Dry season (October 2017) site inspections of the watercourse by EcOz found pools but no visible flows at the point starting around 2 km downstream of the dam wall (EcOz 2018b). Along these drainage lines there is dense riparian habitats present (refer to 7.2.2 for further information).

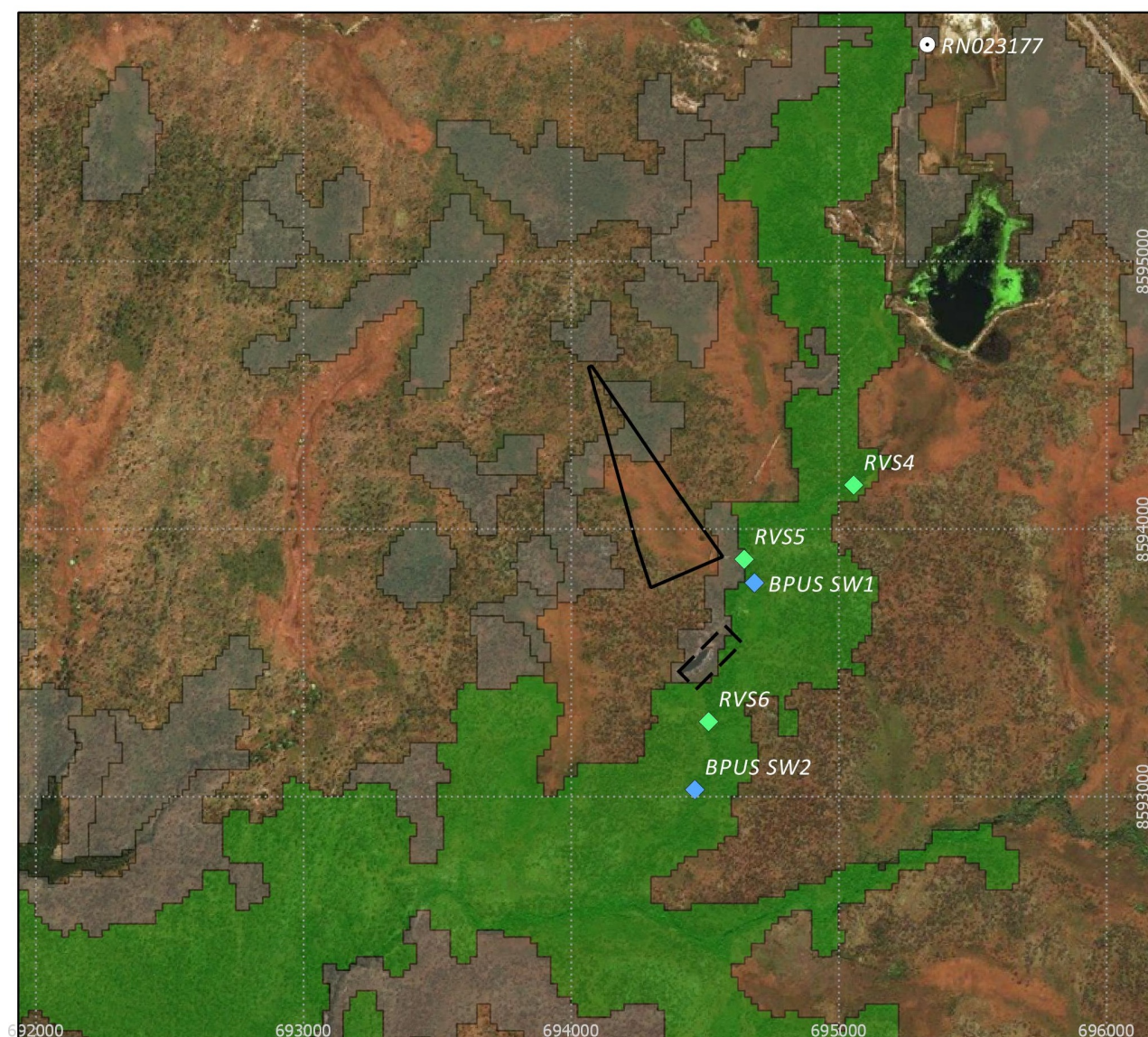


Figure 5-1 BP33 Groundwater Receptors

Proposed BP33 mine workings

- Approx. extent of box cut
- - - Approx. extent of underground workings

BP33 Existing monitoring sites

- ◆ Surface water monitoring site
- ◆ Vegetation monitoring site

- Registered groundwater bores

Terrestrial GDE Potential (Bom, 2019)

- Known GDE
- High potential GDE
- Moderate potential GDE
- Low potential GDE



0 300 600 m

GDA 94 Zone 52,
1:25 000 @ A4

Figure 10-4. Groundwater Dependent Ecosystems mapping (from Groundwater Enterprises, 2019)

10.3 Potential impacts & proposed mitigation

The following are potential impacts on hydrological processes associated with the proposal:

- Alteration of surface flows
- Downstream flooding
- Drawdown of groundwater levels in aquifer.

The sections below consider the severity and extent of these impacts and implications for protection of environmental values.

10.3.1 Alteration of surface flow

The combined impact of the mine site infrastructure and box-cut has the potential to change the original surface drainage and result in some reduction in flow at the catchment outlets that discharge to Charlotte River (Bynoe Harbour) downstream of the mine site. The potential impacts of the proposal on flow regimes has been modelled by suitably qualified hydrologists (SWES, 2020). Findings are summarised below from the full report provided at Appendix C.

The modelling indicates that there will be localised alteration of surface flow paths that will not significantly impact outside of the project area, but will have implications for erosion and sediment control. Core has designed the box-cut to incorporate a contour drain on the western side, to divert surface water run-off from adjacent elevated areas. The contour drain will direct water flows towards a natural topographic low to the south-west, as depicted in Figure 3-3. A drainage network system and sediment dams will be installed on-site to manage watershed with best practice principles. The pre and post mining flow paths are shown in Figure 10-5 and Figure 10-6.

There will be little impact ($<1 \text{ m}^3\text{s}^{-1}$), on natural surface water flow regimes in comparison to pre-mining conditions, which is expected given the small portion of the catchment affected by the mine site infrastructure. The alteration of surface flow is unlikely to cause any measurable impacts to hydrological processes and environmental values of the Charlotte River (Bynoe Harbour).

The above assessment of impacts to surface water flows does not include the reduction in flows associated with using the Observation Hill Dam (OHD) as a water source. This aspect was assessed in the Grants Project Environmental Impact Statement (EIS) and potential impacts will not be increased as a result of BP33, which will require water only once the Grants Project is completed.

The affected ephemeral creek line downstream of OHD discharges to Charlotte River. Modelled reduction in average wet season discharges from the creek into Charlotte River is 20-30%; however, the impact on flows in the river is less than 3%. There are no other water users downstream that would be affected by the dam being in place and the modelled reductions would not be noticeable to recreational users of Charlotte River or Bynoe Harbour. The potential impacts to riparian habitats in the ephemeral watercourse upstream of the confluence with Charlotte River are considered in section 7.3.2. The response of this vegetation to an extended period of reduced flows are not expected to be significant; however, monitoring will be required to verify this assumption.

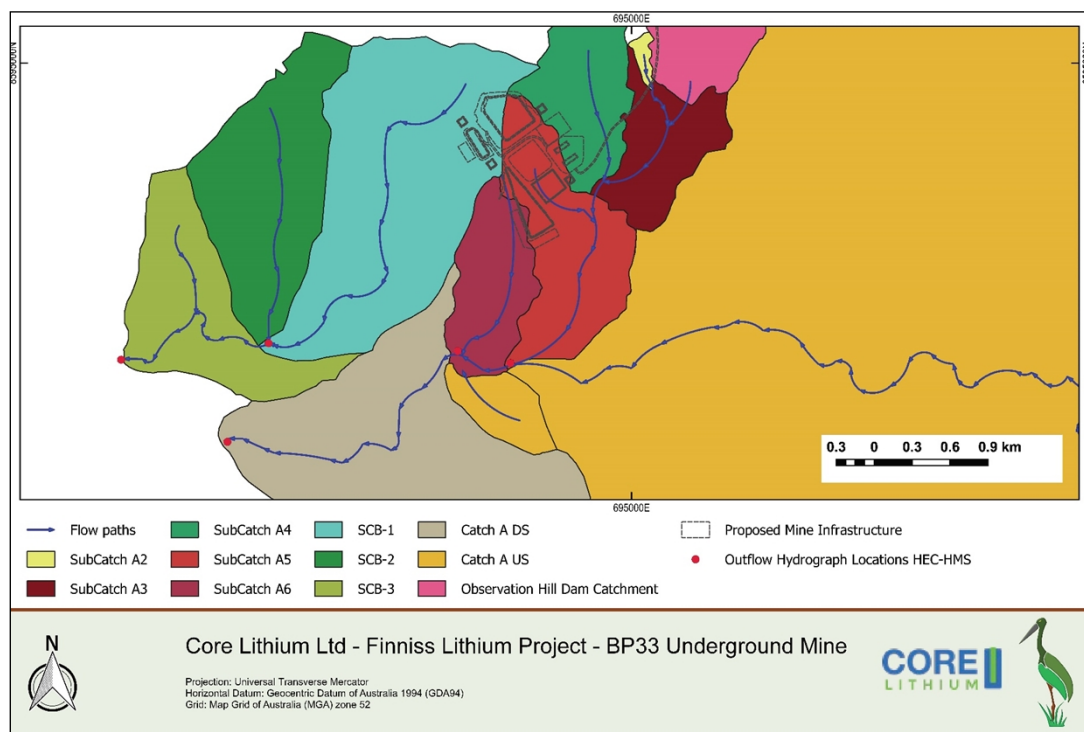


Figure 10-5. Pre-mining flow paths and sub-catchments (from SWES, 2020)

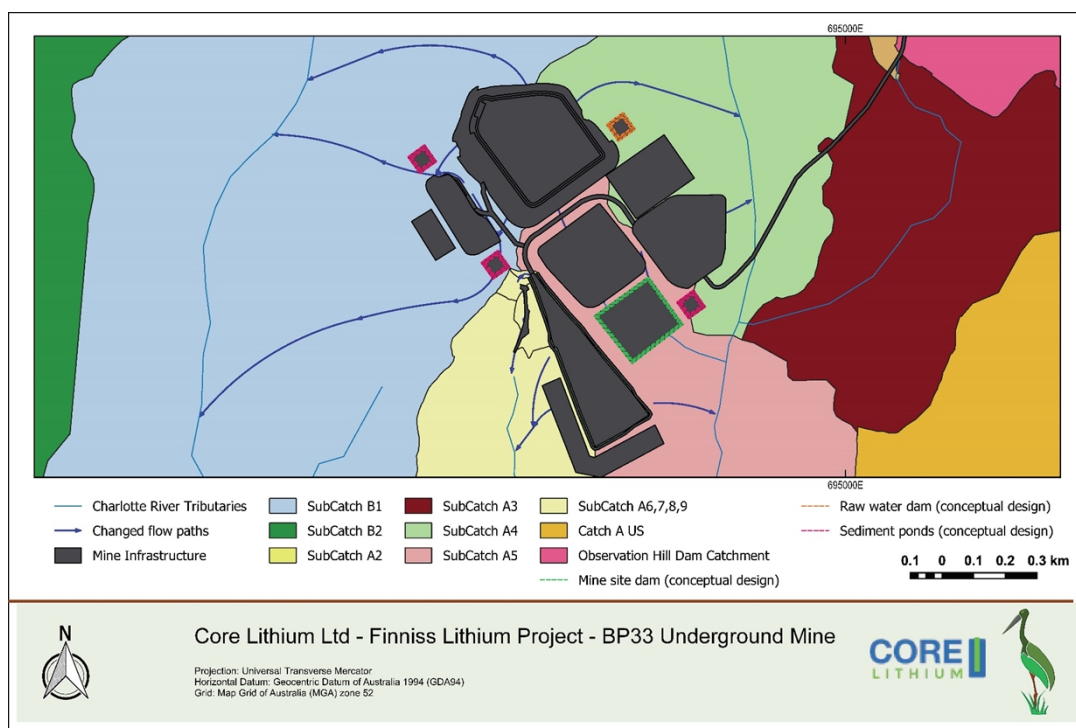


Figure 10-6. Flow paths and sub-catchments with mine infrastructure in place (from SWES, 2020)

10.3.2 Downstream flooding

A 1%AEP (Annual Exceedance Probability) rainfall event was used to assess flood inundation in the mine affected catchments (refer Appendix C). The flood inundation modelling indicated that there is little difference in inundation between pre-mining and mining conditions apart from some rainfall being stored in the box-cut. For floodplain inundation, further downstream, there is negligible difference between pre-mining and mining conditions. Storm surge modelling was also conducted and concluded that it is unlikely that storm surge from Bynoe harbour will affect the proposed mining infrastructure in the project area. The report concluded that there is no increased flood threat to environments downstream of the project area, with the construction of the mining infrastructure. It is not expected that waterbodies downstream would receive a sudden surge in flow; therefore, it is not expected to impact any environmental values.

The construction of mining infrastructure and a possible dam wall failure at OHD has the potential to cause flooding to environments downstream of the project area. A possibility of a dam wall failure at OHD is unlikely as the design of the dam extension has been derived in accordance to the dam consequence categories accessed in accordance with the ANCOLD guidelines (ANCOLD 2012). These guidelines are the accepted national standard applicable for water or tailings dams with the potential to cause loss of life or significant environmental or physical damage through operation or failure. An emergency spillway for the dam has been designed to pass a 0.1% AEP event, thus reducing the likelihood of dam wall failure. The OHD dam wall lift has been approved under the Grants Project MMP.

In the very unlikely event of a dam wall failure, the waterbodies downstream would receive a sudden surge in flow. Any flood water impact would be over a short period of time and would discharge to the receiving waters of the Charlotte River. The OHD is known to passively overflow in previous wet seasons, and there aren't any known impacts associated with this overflowing.

10.3.3 Drawdown of groundwater levels in aquifer

There is a risk that dewatering of the box-cut and the underground (UG) mine and/or extraction of groundwater as a supplementary water supply will drawdown the groundwater levels in the aquifer. There is some uncertainty with respect to groundwater drawdown during mining, the time it will take for groundwater levels to recover post-mining. Core's plan for installing investigative and monitoring bores that will allow for development of a site-specific groundwater model for the BP33 site is outlined in section 10.3.3.

There is a risk that groundwater extraction and dewatering will lower groundwater levels beneath the nearby drainage lines and reduce groundwater availability to the GDEs. The potential impacts of reduced flows on the riparian vegetation and aquatic communities are discussed in section 7.3.2 and section 9.3.1. The extent and thickness of the alluvial aquifer, and the degree of connection with the Burrell Creek Formation aquifer represent key unknowns in determining the potential impact on the GDEs from the proposed mining activities. No impacts are expected on groundwater production in the area surrounding BP33 as the nearest active groundwater bore is located 9 km to the south.

A groundwater and aquatic monitoring program will be developed for implementation during mining to detect changes in groundwater levels and monitor impacts to riparian vegetation and aquatic communities. The monitoring program will allow for adaptive management and/or rehabilitation of damage. Baseline surveys of the aquatic ecology and riparian vegetation species composition and structure have been undertaken at locations downstream of BP33 refer GHD (2017) and EcOz (2019). A monitoring program will be included in the MMP that will provide for annual monitoring to compare ecosystem health during mining and post-closure, to these baseline conditions.

10.4 Assumptions

There is some uncertainty about the potential for impacts to nearby groundwater dependent watercourses associated with groundwater drawdown, which it is assumed will be resolved through installing investigation bores and development of a site-specific groundwater model, and monitoring of groundwater levels and downstream riparian and aquatic health during mining and post-closure. Given the small contribution of the

potentially affected watercourses to the Charlotte River catchment, it is considered unlikely that groundwater drawdown associated with the project would cause impacts to riparian or aquatic ecosystems in the higher order watercourses of the Charlotte River. This is based on the assumption that drawdown will be limited to within 1 km of the mine site, but would need to be reassessed if the groundwater model indicates a wider area of impact.

10.5 Relevant policy & guidance

- NT Water Allocation Planning Framework
- NT Government Gazette No. G25 – Darwin Rural Water Control District
- ANCOLD (2012). *Guidelines on the Consequence Categories for Dams*

10.6 Ecologically sustainable development

The precautionary principle has been adopted by acknowledging assumptions and uncertainties that exist in relation to our understanding of groundwater hydrology and how this will be impacted by the proposal. To verify assumptions and reduce uncertainty, Core has made commitments to installing a network of monitoring bores and developing a groundwater model that will enable prediction of potential drawdown impacts to nearby watercourses.

The principle of intergenerational equity has been considered in mine closure planning. The closure objective for the site will be to establish a safe, stable and non-polluting site. Backfilling and re-instatement of the mine site will largely re-instate surface water and groundwater hydrologic regimes. There will be a long-term impact to ephemeral surface water flows associated with the OHD remaining in place; however, the reduction in flow will not be detectable in the Charlotte River. Removing the OHD to re-instate flows is likely to be considered unacceptable to the community and would possibly further limit future land use, which is constrained by water availability.

The principle of improved valuation, pricing and incentive mechanisms will be addressed by valuing the water resources used by the proposal. A water licence will be required under the *Water Act* for extraction of surface water from OHD and for any proposed extraction of groundwater.

10.7 Residual impact

The hydrologic model indicates that the proposal is unlikely to have a significant impact on surface water flows or flooding. There will be no impact to other consumptive users of groundwater due to distance and lack of aquifer connectivity.

In summary, the following detailed mitigation and monitoring measures will be included in the MMP:

- Site-specific groundwater modelling report including groundwater drawdown contours and assessment of potential impacts to watercourses
- Water Management Plan detailing a groundwater, surface water and aquatic monitoring program, and a Trigger Action Response Plan (TARP).

In addition, a licence will be obtained under the *Water Act*, for extraction of water from OHD. The licence application will require assessment of sustainable levels of extraction and the licences conditions will require monitoring and reporting of water use.

Subject to resolution of the uncertainties that exist in relation to groundwater use as a water supply, drawdown and associated impacts to GDE's, it is considered that the project can proceed without significant impact on hydrological processes.

11 INLAND WATER ENVIRONMENTAL QUALITY

11.1 Factor objective

Protect the quality of groundwater and surface water so that environmental values including ecological health, land uses and the welfare and amenity of people are maintained.

11.2 Receiving environment

11.2.1 Surface water quality

There are no consumptive users of surface water downstream of the proposal area. The Charlotte River and Bynoe Harbour support freshwater and marine ecosystems that depending on good water quality, and these areas also have recreational value for local people.

Baseline surface water monitoring in the freshwater watercourses of Charlotte River catchment has been undertaken since February 2017. The baseline water quality conditions are summarised in Table 11-1.

Table 11-1. Summary of baseline water quality recorded in watercourses within the Charlotte River catchment

Parameter	Charlotte River catchment – baseline water quality summary
Electrical Conductivity (EC)	Water in the Observation Hill dam, BP33 pit and in the ephemeral drainage line upstream and downstream of the BP33 is always fresh, with EC concentrations generally lower than 35 µS/cm, and always well below the water quality objective of 200 µS/cm.
pH Dissolved Oxygen (DO)	Natural background pH varies widely at all four sites – ranging between 5.06 and 9.31, and often outside the objective range. DO also varies widely, but remains within the objective range with a median DO of 80 % saturation. This is because these parameters are highly changeable depending on sunlight levels, the time of day, rainfall, streamflow, and aquatic plant biomass. Total alkalinity is low (less than 8 mg/L) which means the water has little buffering capacity to neutralise acids and stabilise pH. Anion, cation and alkalinity levels are higher at these sites, which indicates they receive some input from groundwater. Low DO levels can occur during low flow conditions due to organic matter breakdown and the absence of fresh oxygenated rainwater inputs.
Turbidity:	Levels are generally always low, even during high rainfall periods; remaining below 9 NTU and well below the water quality objective of 20 NTU.
Dissolved metals	Concentrations are below laboratory detection limits and, as such, below the water quality objectives for cadmium, chromium, copper, lead, nickel, selenium, zinc, tin and mercury. Aluminium is sometimes above the water quality objective at the drainage line sites (BPUS SW1 and BPDS SW2). The drainage line sites and OHD dam site are above laboratory detection limits for arsenic (up to 0.002 mg/L), but remain below the water quality objective. Lithium concentrations for all sites is up to 0.008 mg/L; which is also higher than the mine footprint sites. The source of elevated arsenic and lithium is from groundwater inflows. Iron concentrations are always below the detection limit at the impounded water sites (OHD and BP33 Historic Pit) and relatively high (up to 0.38 mg/L) at the drainage line sites. The source of this is not known, but possibly is the result of groundwater inputs from the shallow laterite aquifer.
Nutrients	Concentrations of Oxides of Nitrogen (NO _x) are generally above the water quality objective; often up to 0.04 mg/L. Whereas TN, TP and reactive phosphorus are generally always below the water quality objective with the exception of some isolated TN, TP and reactive phosphorus spikes.
Hydrocarbons	TPH/TRH and BTEXN concentrations are generally always below detection limits.

11.2.2 Groundwater quality

Core has collected two years of baseline groundwater quality data from bores in the Burrell Creek Groundwater System at the Grants Lithium Project area. As the exploration drilling program logs indicate that the underlying geology is very similar between the two site, the monitoring data collected at Grants can be used to provide an indication of the water quality characteristics. Baseline groundwater quality sampling of the aquifer is summarised in (EcOz 2018c), which compared the sample results of the six monitoring bores in the Burrell Creek formation (BCF) to the freshwater rivers and streams *Water Quality Objective for Darwin Harbour Region* (NRETAS 2010) ('objectives'), which would be the receiving environment for any mine water discharges.

An analysis of the groundwater quality is in Table 11-2 and Table 11-3 below.

Table 11-2. Summary of baseline water quality recorded in deep monitoring bores

Parameter	BCF aquifer (deep) – baseline water quality summary
EC	The BCF aquifer is moderately fresh, with EC concentrations ranging between 137 and 281 μ S/cm. This EC range extends above the water quality objective applying to surface water (200 μ S/cm).
pH	Groundwater pH is generally close to neutral – ranging between 6.41 and 7.52, and within the water quality objective range.
DO & Oxygen Reduction Potential (ORP)	As expected for water that has been out of contact with the atmosphere for a period, DO is low and oxidation reduction potential (ORP) always reduced (i.e. negative).
Bicarbonate alkalinity as CaCO₃	Moderate, with concentrations increasing with depth into the aquifer – i.e. deeper groundwater below 88 m is between 97 and 143 mg/L, and shallower groundwater between 67 and 107 mg/L.
Hardness as CaCO₃	Relatively low throughout the BCF aquifer (less than 42 mg/L), which is considered 'soft', and low in dissolved ions such as calcium and magnesium.
Dissolved metals	- Concentrations are below laboratory detection limits for all metals except aluminium, arsenic, zinc, lithium and iron. Nickel levels were mostly very low and below the detection limit, and always well below the objective. Similarly, aluminium and zinc concentrations are predominantly below the water quality objective and not considered elevated in the BCF aquifer. - Lithium has no water quality objective. In relative terms, lithium concentrations are much higher in the BCF aquifer compared to surface water concentrations. Levels in groundwater are up to 1.73 mg/L, recorded in the mine pit bore, whereas surface waters are below 0.002 mg/L. - Iron has no water quality objective. Concentrations are up to 0.77 mg/L in the weathered BCF compared to up to 0.33 mg/L in the fresh BCF; both of which are significantly higher than surface water levels around the mine footprint (up to 0.10 mg/L). - Arsenic concentrations in the BCF aquifer are significantly elevated above the water quality objective. The median concentration for all four bores is 0.060 mg/L, which is more than 4.5 times higher than the water quality objective (0.013 mg/L). The BCF aquifer is a known 'high' risk aquifer for arsenic (see Karp 2008).
Nutrients	Total Nitrogen concentrations in the BCF aquifer are predominantly below the water quality objective. NO _x concentrations are above the water quality objective at least 50 % of the time; however, the levels remain well within the baseline surface water range of NO _x concentrations. In contrast, TP and reactive phosphorus concentrations are always above the respective water quality objective, and also well above levels measured in surface waters, which were predominantly below the objectives. The high phosphorus concentrations appear associated with the mineralogy of the BCF; in particular, that of the more weathered zones, reducing in concentration with depth.
Hydrocarbons	Concentrations are below detection limits.

Table 11-3. Summary of baseline water quality recorded in shallow monitoring bores

Parameter	Laterite surface aquifer – baseline water quality summary
EC	Water quality of the shallow laterite aquifer largely reflects the water chemistry expected of rainwater and stream water, showing this aquifer is closely connected to surface water. EC is low (below 26 $\mu\text{S}/\text{cm}$), and pH is relatively acidic and reflective of rainwater, which is naturally acidic in the tropical Darwin region.
pH	Groundwater pH is slightly acidic – ranging between 4.6 and 5.16, which is lower than the water quality objective range 6.0-7.5.
DO & ORP	DO and ORP are higher than in the BCF aquifer; and indicative of an aquifer recently recharged with fresh oxygenated rainwater. Further, the negligible alkalinity, hardness and dissolved major cation concentrations in this aquifer are similar to that measured in the surface water around the mine footprint.
Bicarbonate alkalinity as CaCO_3	Low between 3 mg/L and 7 mg/L.
Hardness as CaCO_3	Low (generally less than 1mg/L), which is considered 'soft', and very low is dissolved ions.
Dissolved metals	- The laterite surface aquifer has higher concentrations of copper, lead and zinc than the BCF aquifer, and lower concentrations of arsenic and lithium (largely remaining below the objective for arsenic). Aluminium levels are comparable to the BCF aquifer however, exceed the objective more frequently because of the lower pH. Iron levels are comparable to the weathered zone BCF aquifer and higher than in the surface water around the mine footprint. - Similarly, to the BCF aquifer, all other metal concentrations are below detection limits (i.e. cadmium, chromium, selenium, tin and mercury). Nickel levels are mostly very low and always below the objective. - Copper and zinc concentrations are always above the respective water quality objective, and significantly higher than in both the BCF aquifer and surface water, which are mostly below detection limits. Lead was above the objective on one occasion. - The higher copper, lead, and zinc levels in GWB10 compared to the bores in the BCF aquifer is possibly related to the weathered laterite host rock. It is not possible to determine the reason without more data collected from other bores screened in this same aquifer. It is possible the elevated copper and lead concentrations (and a proportion of the zinc concentrations) are associated with poor bore construction.
Nutrients	TN concentrations are predominantly below the water quality objective, and NO_x concentrations are generally above the water quality objective but within the baseline surface water range of NO_x concentrations. More data is required from this bore (and other bores to be installed in this shallow aquifer) to determine the pattern of NO_x and TN concentrations. TP and reactive phosphorus concentrations are generally above the water quality objectives and also above the baseline surface water concentrations; although much lower than in the BCF aquifer, presumably from the oxidation and precipitation of phosphorus on reaction with iron and aluminium in the groundwater.
Hydrocarbons	Concentrations are always below detection limits.

11.3 Potential impacts & proposed mitigation

The potential impacts to water quality associated with the proposal are:

- Increased turbidity in downstream watercourses from erosion run off from project area
- Contamination of surface water by mine drainage and water discharges
- Contamination of groundwater aquifer from mine drainage
- Bacterial contamination due to leaks from onsite wastewater management system
- Hydrocarbon and other chemical contamination due to leaks and spills.

The sections below consider the severity and extent of these impacts and implications for ecological health, land uses, and the welfare and amenity of people.

11.3.1 Increased turbidity from run off

Turbidity in the watercourses downstream of the project area could be increased through erosion of exposed surfaces in conjunction with wet season rainfall. The initial site clearing and construction is scheduled to occur during the Dry season, and therefore exposed surfaces will be most susceptible to erosion by rainfall during the first Wet Season of operations. The potential for erosion will be minimised by adopting appropriate design criteria for infrastructure components (i.e. stockpile slopes, box-cut, WRD and haul route will be suited to the high rainfall conditions).

During operations it is expected that surface water run-off within the project area will contain high levels of suspended sediments. These could move off-site into the minor drainage lines if not adequately captured and controlled. Sediment settling ponds and a mine settling dam (MSD) have been incorporated into the mine design to capture stormwater runoff from the ROM pad, the WRDs and water extracted from the underground (UG) mine. The areas will be designed in accordance with the *Best Practice Erosion and Sediment Control Guidelines* to provide sufficient retention time for the majority of sediments to fall out and flocculants may be added to further reduce sediment loads. The water will then be utilised in the water reuse system on site, with excess water pumped to the OHD for storage and reuse.

Details of the construction operational erosion control measures will be provided in an Erosion and Sediment Control Plan (ESCP) developed in accordance with the *Best Practice Erosion and Sediment Control Guidelines* (IECA, 2008). The Water Management Plan submitted with the MMP will detail surface water monitoring program and TARP that will provide for detection of turbidity impacts and corrective actions to ensure impacts do not continue over an extended period of time.

In a regional context, there are no important aquatic habitats present in the downstream watercourses, within which some increase turbidity may be experienced. Potential impacts to aquatic ecosystems are specifically discussed in section 9.

11.3.2 Contamination of surface water from mine drainage / discharges

Water quality in surface watercourses discharging to the Charlotte River could be impacted by poor quality drainage from the mine site. A significant water quality issue associated with mining activities relates to the potential for production of Acid Rock Drainage (ARD), which can result in acidic, metalliferous or saline discharges into surface water and/or groundwater. The risk of ARD associated with the BP33 mining proposal was considered earlier in this NOI, in section 8.3.2. It was concluded that it is unlikely that ARD will be produced; however, further sampling and analysis is required to determine PAF volumes and leaching potential associated with short-term (up to 3 years) of surface exposure. Contingency measures for any PAF materials encountered will be included in an ARD Management Plan, which is required to be submitted with the MMP. Subject to effective identification and management of PAF materials, it is considered unlikely that ARD will result and cause water quality impacts.

Dewatering of the UG mine and box-cut of groundwater has potential to contaminate of surface water, if the water sources are not naturally chemically similar. Groundwater sampling conducted in the Burrell Creek Groundwater system at the Grants Project, indicates that the groundwater is naturally elevated in arsenic, phosphorous and lithium compared to the surrounding surface water quality. Discharge of this groundwater has the potential to impact the water quality of surface water in the project area. At the Grants Lithium Project, excess water will require treatment and/or dilution prior to discharge in order to comply with water quality objectives, and it is anticipated this will also be required at BP33. Following installation of the BP33 investigative bores, baseline groundwater quality monitoring will be undertaken to inform consideration of treatment requirements and options. The experience at Grants Project, will also inform this assessment.

Details of the site water management system, including treatment, discharge volumes, timing and a monitoring program, will be provided in the Water Management Plan submitted with the MMP. Subject to Core being able to demonstrate the excess water can be treated and/or diluted to achieve compliance with agreed water quality objectives, there should be no significant impact to downstream water quality.

11.3.3 Contamination of groundwater aquifer from mine drainage

Contamination of the groundwater aquifer could occur through exposure of PAF materials in the underground mine or drainage/seepage from the WRD's during operations and post-closure. As discussed above, subject to further sampling and analysis to determine PAF volumes, leaching rates and associated management requirements, the risk of ARD is considered to be low. The WRD's and mine water storages will have a low permeability base to minimise seepage to groundwater. The WRD's will be used to backfill the underground stopes and box cut, and therefore will not pose a risk of extended seepage to the groundwater aquifer.

As a result of the low risk of ARD and monitoring programs that provide for early detection of water quality issues, the proposal is unlikely to significantly impact groundwater quality. In the event that minor exceedances of water quality criteria for groundwater do occur, the potential impacts are limited by a lack of surface water / groundwater connectivity and the absence of other groundwater users in proximity to the project area.

11.3.4 Bacterial contamination

Bacterial contamination of surface water or groundwater could be caused by leaks from the onsite wastewater management system into groundwater. The system type and design is yet to be finalised, but will be based on maximum number of staff onsite during construction / operations and will be installed by a licenced plumber in accordance with the *NT Code of Practice for Onsite Wastewater Management*. The location and design of the system will also be subject to a wastewater works design approval by the NT Department of Health pursuant to the *Public and Environmental Health Act*.

During operations, the wastewater management system will be regularly inspected for evidence of leaks. As the site is located close to Darwin, any malfunction of the system will be addressed by calling out a licenced contractor. As a result of these measures, any leaks will be confined to short period and are unlikely to be of a scale that would result in any major or sustained exceedances of water quality criteria for bacteriological contaminants at downstream surface water monitoring sites or monitoring bores. Baseline monitoring of bacterial contamination in the receiving waters has been undertaken and a Water Management Plan will be implemented by Core and will include monitoring of surface water sites in the Charlotte River catchment to ensure the water quality is not altered. Monitoring bores down-gradient of the wastewater disposal system will also be sampled.

Given the absence of other water users and the relatively small scale contribution of the project area catchment to discharges to Charlotte River (i.e. any contamination would be significantly diluted before discharge to the River), any minor exceedances of water quality criteria are unlikely to have a significant impact on any environmental values.

11.3.5 Hydrocarbon contamination

Hydrocarbon contamination of surface water or groundwater could be caused by leaks and spills from diesel fuel storages or run-off from workshop/parking areas. There are no other chemicals that will be used onsite in significant quantities.

The risks of hydrocarbon contamination to land and soils were discussed in detail in section 8.3.3, which concluded that the proposal poses an inherently low risk of off-site contamination due to the relatively small volumes on site. Spills and leaks can be expected to occur; however, they would be detected either through visual inspections or by the presence of hydrocarbons in water quality samples collected during routine surface and groundwater water monitoring programs. Spill response will be addressed in the Emergency Response Plan submitted with the MMP. The Water Management Plan will include a TARP with hydrocarbon triggers.

Based on the above information, it is very unlikely that the project will result in any major or sustained exceedances of water quality criteria for hydrocarbons and other chemical contaminants at downstream surface water monitoring sites or monitoring bores. The controls in place are expected to provide for detection and containment of contamination, so that treatment can occur prior to release to the environment. In the event of early closure, releases of hydrocarbon-contaminated water could occur when fuel is present onsite but the water management system is not monitored. The potential impacts to water quality under this scenario are

limited by the relatively small volumes stored on site (<50,000L), which would be removed within a short time following the closure.

11.4 Assumptions

The key risks to water quality associated with the proposal relate to increased turbidity in downstream surface waters due to erosion and run-off and discharge of excess water, and altered chemical composition in downstream surface waters due to discharge of groundwater dewatered from the underground mine and box cut. It is unlikely that there will be significant ARD issues at the site, based on the assumption that the waste rock is largely NAF, will be backfilled and further sampling and analysis will be undertaken to determine PAF volumes and management requirements. Hydrocarbon or bacterial contamination sources are limited and routine monitoring programs will allow for early detection and corrective action, which will limit the duration and extent of any impacts so they are not significant.

11.5 Relevant policy & guidance

- Australia and New Zealand Governments (2011), *Guidelines for Fresh and Marine Water Quality*
- Natural Resources, Environment, the Arts and Sports (2010) - *Water Quality Objective for Darwin Harbour Region*
- AS/NZS 1547:2012 - On-site domestic wastewater management
- Land Capability Guidelines (2014) - Land Capability Assessment for Onsite Wastewater Management Guidelines
- International Erosion Control Association Australasia (2008) - *Best Practice Erosion and Sediment Control (BPESC)*
- *Global Acid Rock Drainage (GARD) Guide*, International Network for Acid Prevention
- *Preventing Acid and Metalliferous Drainage, Leading Practice Sustainable Development Program for the Mining Industry*, Commonwealth of Australia, 2016
- Australian Standard - AS1940 *Storage and handling of flammable and combustible liquids*.

11.6 Ecologically sustainable development

The precautionary principle has been adopted by acknowledging assumptions made when assessing potential impacts to water quality. Core has made commitments to undertake surface water and groundwater monitoring during operations to verify these assumptions and to allow for action to be taken to address water quality issues if they arise.

The principle of intergenerational equity has been considered in mine closure planning. The closure objective for the site will be to establish a safe, stable and non-polluting site. The waste characterisation studies undertaken to date indicate that the proposal is not expected to result in legacy contamination issues that would degrade downstream water quality. To verify this Core has made commitments to prepare an ARD Management Plan covering testing for PAF materials and management. PAF materials will be progressively backfilled into the underground mine to minimise generation of acid or metalliferous drainage.

The principle of improved valuation, pricing and incentive mechanisms will be addressed by monitoring that will allow for quantification of impacts to water quality, so that these can be addressed during mine closure.

11.7 Residual impact

The Proposal is expected to result in short-term water quality impacts during construction and mining, mainly associated with increased turbidity. Any contamination will be detected through surface water and groundwater quality monitoring programs that will provide for contingency measures to be implemented when

trigger values are exceeded, to avoid sustained water quality impacts. Following cessation of mining and assuming successful rehabilitation of the site, there is not expected to be any long-term impacts to water quality.

In summary, the following detailed mitigation and monitoring measures will be included in the MMP:

- Erosion and Sediment Control Plan (ESCP) that provides for minimising erosion and off site movement/release of sediments
- ARD Management Plan covering testing for PAF materials and management
- Emergency Response Plan addressing spill response and soil remediation
- Water Management Plan including details of the site water management system, predicted discharge volumes and water quality, treatment, discharge timing and a monitoring program and TARP that will detect and respond to impacts to surface water and groundwater quality
- Mine Closure Plan that provides for leaving a safe stable and non-polluting landform.

Subject to effective implementation of mitigation measures, it is considered that the project can proceed without significant impact on downstream water quality.

12 SOCIETY AND ECONOMY

12.1 Objectives

Maintain or enhance the social and economic values for current and future generations of Territorians.

12.2 Receiving environment

12.2.1 Social and economic environment

The area immediately surrounding the project area is sparsely populated. Mining exploration is the main land-use in the area, and rural living, recreation and tourism occur across the peninsula more broadly.

The mine site located on vacant crown land with no existing land use within 13km. There is no public access to the site; however, it is known that some local people currently access the area around OHD. The nearest communities are Belyuen, Wagait Beach and Berry Springs.

The haul route to Darwin Port is along the Cox Peninsula Road. The use of this route was assessed as part of the Grants Lithium Project EIS. The BP33 project will extend the period of operation of haul trucks along Cox Peninsula Road, but will not increase traffic volumes. The use of the haul route has been subject to detailed assessment as part of the Grants Lithium Project EIS and the potential impacts and risks associated with an extended period of use have been addressed in a separate variation to that proposal. Commitments made by Core in relation to road signage, emergency access, pavement maintenance and speed restrictions at the Berry Springs School will continue to apply for as long as the haul route is in use.

12.3 Potential impacts & proposed mitigation

The following are potential impacts by project activities to social, economic and cultural surroundings:

- Pressure on police and emergency services
- Loss of future land-use opportunities.

12.3.1 Pressure on police and emergency services

Road trauma, bushfires, spills, workplace incidents or other emergencies could increase pressure on emergency services. Community members, St John Ambulance and NT Police expressed concern about increased road trauma with tourists and local traffic sharing the road with industrial traffic on Cox Peninsula Road where overtaking is difficult. In response to concerns raised by the community during the Grants Lithium Project planning, Core has made a number of commitments to ensure road safety and minimise inconvenience to other road users. These measures are listed below:

- Core has been engaging directly with the Department of Infrastructure, Planning and Logistics (DIPL) to ensure we understand the requirements that will apply to use of the Cox Peninsula Road as a haul route.
- Traffic Impact Statement assesses safety risks and provides details of road signage requirements, management of road closures for blasting and provisions for pavement condition inspections and corrective maintenance. Noting that road closures for blasting will not be required as part of the BP33 mining activities as the site is located further from the road and therefore does not pose a safety risk.
- Haulage contractor QUBE, has drafted a Journey Management Plan, which details risk mitigation strategies for every stage of the journey between the mine site and the port. The plan addresses the safety requirements that will be applied at every intersection along the route and through high traffic areas.

- Trucks will be speed limited to 80 km/hr through intersections and the Berry Springs township, and further limited to 40km/hr through the Berry Springs school precinct (20km/hr below the signed speed limit).
- Truck speeds will be monitored through the use of In-vehicle Management Systems that track speed, fatigue and driver behaviour in real time. The school will be 'geofenced' in the IVMS to a restricted speed, which will result in automatic notification to QUBE headquarters if speed limits are exceeded.
- Core have engaged directly with the Principal of Berry Springs Primary School making a commitment that truck movements will be restricted past the school during drop-off and pick-up times (7:45 to 8:45am and 2:30 to 3:30pm).

Bushfires NT confirmed that the area surrounding the site has a high incidence of bushfires. A project Emergency Management and Response Plan is a standard requirement for all mine sites. This plan will address bushfire response, including engagement with Bushfires NT. Firebreaks will be maintained around the project area.

12.3.2 Loss of future land-use opportunities

Post-closure, the box-cut and underground will be completely backfilled through concurrent backfilling from stockpiled material (WRD 1 and WRD 2), for the duration of the mining operations. All mining infrastructure will be removed as part of the Mine Closure Plan. The surface will be re-profiled and rehabilitated to enable the project area to be restored to a pre-mining state. Historically, the success of rehabilitation on mining sites has been variable, in relation to vegetation regeneration for suitable habitat for fauna and erosion. Revegetation of mining areas and the potential for future erosion are two factors that limit the success of rehabilitation. Refer to sections 7.3 and 8.3.1 for further on the succession of rehabilitation on mining sites in term of these two limiting factors.

As part of the Mine Closure Plan, endorsement of the post-mining land use, closure objectives and completion criteria will be sought from the key stakeholders (DPIR, DIPL, DENR and the NT EPA). Core will undertake ongoing rehabilitation, erosion and water monitoring with the objective of rehabilitating the project area with a "stable, non-polluting landform with self-sustaining native vegetation groundcover, comparable to that of the surrounding ecosystems." Effective implementation of the Mine Closure Plan is expected to ensure that loss of future land use is confined to the immediate project area.

12.4 Assumptions

The following assumptions have been made in assessing the potential impacts of the BP33 mining proposal on society and the economy:

- The mine site is remote from residential areas and sensitive receptors, existing land uses and there is no public access to the area. Noise and dust emissions from the site are unlikely to be noticeable to the community or users of Cox Peninsula Road.
- Material haulage from BP33 mine to the Grants processing plant will be along private access tracks with no public access.
- The operation does not involve the use of hazardous materials or chemicals that could impact water quality for consumptive uses.
- Groundwater extraction and dewatering will not impact other groundwater users as the distance to the nearest active production bore is over 10km.

12.5 Relevant policy and guidance

The policies and guidelines taken into account for potential impacts on the social, economic and cultural surroundings are:

- Australian Standard 3671-1989 (1989) *Acoustics – Road traffic noise intrusion – Building siting and construction*
- NT EPA (2014) *Noise Guidelines for Development Sites in the Northern Territory*
- NT EPA (2018) *Northern Territory Noise Management Framework Guidelines*

12.6 Ecologically sustainable development

The precautionary principle has been adopted by acknowledging assumptions and uncertainties made when assessing potential impacts the environment, which could then be borne by the community in the event of early or unforeseen closure of the mine. Core has made commitments to undertake further studies and implement monitoring programs that will ensure that the final mine closure plan is informed by good information about the risk profile of the site. If unexpected long-term contamination risks are identified, then the final mine closure plan will be amended as required to address these risks.

The principle of intergenerational equity has been considered in mine closure planning. The BP33 mine closure concept involves removal of all infrastructure, backfilling the mine and rehabilitation with native vegetation species. The closure objective for the site will be to establish a safe, stable and non-polluting site with a self-sustaining native vegetation community. The waste characterisation studies undertaken to date indicate that the proposal is not expected to result in legacy contamination issues that would prevent achievement of the closure objectives. Once the closure objectives are achieved, it is not expected that there will be any limitations on land use by future generations.

The principle of improved valuation, pricing and incentive mechanisms has been addressed by adopting a mine closure strategy that provides for backfilling of the mine to avoid any future impacts to land use. A bond will be paid that will provide for remediation of the site so that these costs are not borne by the community if Core is unable to achieve the agreed closure objectives.

12.7 Residual impact

The BP33 underground mine is not expected to directly impact on the community during operations. All mining activities will take place in an area that is not accessed by the public and there is not expected to be any offsite impacts that would impact the community. The mining activities will extend the period of operation of the Grants Lithium Project processing facility and associated impacts to the community associated with use of the Cox Peninsula Road as a haul route to the Port. These issues and risks were assessed in the variation notice submitted to the NT EPA for the Grants Lithium Project.

The Social Impact Assessment and Management Plan prepared for the Grants Lithium Project adequately capture the risks associated with an extension to the life of mine. It is assumed that the SIMP and other management plans referenced in that plan (i.e. traffic management, emergency response), will be adopted and extended to cover the BP33 mining proposal.

The extension of mine life associated with the BP33 mine, will allow Core to further consider employment and training for local people, in particular in Belyuen, where previously the short mine life limited these opportunities.

13 CONSULTATION

Throughout 2017-2018, Core engaged with stakeholders during project planning and as part of the Social Impact Assessment (SIA) process. Engagement has occurred through a variety of means including face-to-face meetings with service agencies and NGO's (i.e. government, councils, Berry Springs School, Environment Centre, Chamber of Commerce, St Johns Ambulance), distribution of project fact sheets and community meetings. Core has made a commitment to ongoing engagement and communication with stakeholders, and as the project moves closer to commencement, will have in place an ongoing Stakeholder Engagement Plan.

It is Core's understanding that the NT EPA will make this notice available for public comment in May 2020 under the requirements of the new *Environment Protection Act*. This will allow for the community and other stakeholders to review and comment on this new proposal.

Prior to the public comment period, Core plans to re-engage stakeholders to provide a project update. A key objective of this engagement will be to maximise public participation in the environmental assessment process.

14 CUMULATIVE IMPACTS

The NT EPA require a description of any potential cumulative impacts associated with the proposal. Cumulative impacts can be defined as effects on environmental and social values which are caused by a combination of past, current and reasonably foreseeable future developments. The sections below provide further detail in relation to the past, currently proposed and reasonably-foreseeable future activities that were considered as part of the cumulative impact assessment.

14.1 Past and current land use

The past and current land uses are described in section 5.2 and key information is summarised below.

The project area is located on undeveloped Vacant Crown Land (VCL) and is surrounded by this land tenure. Currently, mining exploration is the main land-use in the area; with rural living, recreation and tourism occurring across the peninsula more broadly. Historically there have been a number of exploration and mine operations established in the peninsula area that have since ceased operation. These sites have relatively small-scale visible ground disturbance and historic pit lakes.

The level of impact associated with past and current land-used is summarised below:

- Review of satellite imagery indicates that land clearing and soil disturbance / erosion has occurred on a very small scale and impacts appear to be localised.
- Weed infestation appears to be more localised compared to other areas in the region where there is a higher level of rural sub-division and industrial land-use.
- Baseline surface water and groundwater quality monitoring undertaken in the Charlotte River catchment, and in historic pit lakes, indicates that the water quality has not been impacted by past or current land use.
- The project area does receive frequent bushfires, which has degraded habitat values. The cause of this impact is likely to be a combination of current land-use (i.e. informal recreation and camping activities, mining exploration) and lack of active fire management across the large areas of VCL.
- There is a relatively low level of road traffic associated with the existing land-uses and minimal heavy vehicle traffic (i.e. road trains).

Based on these observations, the main residual environmental impacts associated with past or current land-uses are associated with weed invasion, localised erosion and bushfire. Land clearing appears to be localised in scale, and therefore will not be discussed in terms of a cumulative impact in relation to past and current activities. As for weed invasion, there is a potential cumulative impact, as weed infestations introduced by current and past land-use activities may be spread by the project activities. The proposal is not expected to alter fire regimes in the region.

14.2 Reasonably foreseeable future activities

Currently Core are progressing to establish the Grants Lithium Project (Grants), which is proposed to be an open-cut lithium mine. This development is located north of the project area. As previously stated this proposal will utilise the same water resource (OHD) and processing facility planned to be constructed within the Grants mineral lease (ML).

There is some rural sub-division occurring in Cox Peninsula area; however, the land tenure (large areas of Crown and Aboriginal land), distance to service centres and limitations of water supply, are likely to mean this will remain small-scale.

There are three small ML's along Fogg Bay Road to the south of the project area. These are held by Outback Metals and Victory Polymetallic. Internet searches did not identify any publicly-available information to suggest

foreseeable development on these leases. Ten granted ELs cover a large portion of the Cox Peninsula; however, the majority of these EL's are held by Core's lithium development company and make up the Finnis Lithium Project area. If further lithium resources are defined, then Core may propose further mining operations in coming years and extend the use of the Grants Processing facility. Future activities could contribute to cumulative impact to terrestrial ecosystems associated with the increase of land being cleared and disturbed, and habitat degradation as a result of weed infestation.

14.3 Assessment

To consider the cumulative impacts of the proposal, the potential impacts identified under each of the previously described environmental factors were assessed under the cumulative context as defined above. Land clearing and weed invasion have been identified as potential cumulative impacts to the environmental values in the Cox Peninsula area, and more broadly the catchment of the Charlotte River. Cumulative impacts of each environmental factor is summarised below.

Weed invasion

Weed density is relatively low across the project area, despite a previous land use history of exploration activities and resource extraction. There is potential for a cumulative impact associated with weed infestation due to the increased use of the project area. Project activities in association with the Grants Project may spread weeds. The risk of weeds being transported on equipment or vehicles is the same as any mining operations. It is important to note that the development / use of the area also provides an opportunity for improved weed control as weed mitigation measures are a requirement and responsibility of land users under the *Weed Management Act 2001*. It is expected that there will be a cumulative impact associated with weed infestation due to increase of land use; however, appropriate management can control it.

Land Clearing

It is proposed that an approximate total area of 345 hectares of land will be disturbed for the development of the two projects (245 ha Grants – excluding the existing OHD and 100 ha BP33). The majority of the land is *Eucalyptus* woodland (land unit 2a1). Both projects are surrounded by well-established *Eucalyptus* woodland, and do not contain any sensitive or significant habitats.

Core will implement a Vegetation Clearing Procedure for both sites, with the objective to minimise the potential clearing impacts onsite and off-site. A Mine Closure Plan will also be developed for the both project areas. The plan will provide a strategy and work plan with the objective of restoring rehabilitated areas to a 'self-sustaining vegetation groundcover, comparable to that of the surrounding ecosystems'.

In response to NT EPA recommendations on the Grants Lithium Project, to limit cumulative impacts the BP33 Mine Closure Plan will incorporate the concurrent backfilling of the underground (UG) and the box-cut during mining to restore the project area to a pre-mining state. This will limit the long-term implications of the project area, as successful rehabilitation will reduce the impacts to flora and fauna. As for the Grants Project the rehabilitation plan will incorporate the removal of all infrastructure (apart from fencing surrounding the open pit) and stabilisation of the landforms created from mining (i.e. the open pit, waste rock dumps and tailings dams).

It is not expected that there will be a significant long-term cumulative impact associated with land clearing of the project area. Other cumulative impacts that have been assessed and have not been deemed to be a potential impact are discussed below.

Other non-cumulative potential impacts

There is limited cumulative impacts associated with socio-economic impacts, as the mining of the project area will occur post mining of the Grants Project, therefore can make use of the same processing facility, haul route and workforce without increase the intensity of impacts. The extent of the impact will be prolonged and not increased. The cumulative impacts to water quality are also not expected as the waste characterisation work undertaken for the project area and Grant's indicates the geology is geochemically benign and therefore acid

rock drainage (ARD) is not expected to be an issue, or any uncertain material can be managed accordingly in the short-term until it is backfilled. Backfilling of the box-cut and UG will significantly reduce the potential for ARD.

Drawdown of groundwater from aquifer is currently unknown for the project area, however, it is considered that there will not be a cumulative impact for the same reason as there will not be a socio-economic cumulative impact. The same water resource will be utilised for both the project area and Grants, however not at the same time. The use of the water resource will be extended from just the mine-life of the Grants project to include the mine-life of the BP33 project area.

14.4 Summary

The assessment indicates that there is limited potential for long-term cumulative impacts associated with the proposal for the following reasons:

- Apart from the Grants Project (which will cease mining operation prior to commencement of BP33), there are low levels of existing industrial development in the peninsula region and therefore a low level of existing environmental impact.
- The BP33 Project will begin operation once the mining of the Grant Lithium Project resource has ceased (approximately two to three years LOM), meaning the higher intensity impacts associated with mining operations (i.e. road use, noise, dust and social / community impacts) will not overlap and intensity of these impacts will not increase.
- The mine life of the BP33 Project is four years, and it is unlikely that this project will overlap with any future mining developments that are not yet proposed. As there are no ML applications current within close proximity to the project area.
- The implementation of the Mine Closure Plan and the concurrent backfilling of the box-cut and UG, limits the potential for legacy issues that would contribute to cumulative impacts.

There is some potential for cumulative impact to flora and fauna environmental values associated with proliferation of weed infestations. However, the use of appropriate management mitigation measures can limit the potential impact.

15 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

There are nine Matters of National Environmental Significance protected under the *EPBC Act*:

- World Heritage properties
- National Heritage places
- Wetlands of international importance (listed under the Ramsar Convention)
- Listed threatened species and ecological communities
- Migratory species protected under international agreements
- Commonwealth Marine Areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mines)
- A water resource, in relation to coal seam gas development and large coal mining development.

Based on the information presented in this report, the proposed project has the potential to impact upon listed threatened species, which were previously considered in section 7.2.5 of this NOI. There are three Commonwealth-listed threatened species – Bare-rumped Sheath-tail Bat, Black-footed Tree-rat and Partridge Pigeon – that have a high likelihood of occurring within the Project footprint based on the presence of suitable habitat and recent proximate records.

Loss of habitat due to land clearing is the key potential impact to these species. Mortality/disturbance due to use of machinery/operations may also negatively impact them. The potential impacts and mitigation measures are summarised below:

- Loss of habitat – Approximately 100.5 ha will be cleared for the Project components (pit, waste rock dump, haul road etc.). This clearing is concentrated within the *Eucalyptus* woodland and open *Eucalyptus* woodland vegetation types. These habitats may be utilised by both all three species; however, these habitats dominate the broader region, which is sparsely developed. The removal of relatively small areas of *Eucalyptus* woodland habitats is not expected to have a significant impact on these species due to the regional availability of similar habitats.
- Mortality during land clearing – Direct mortality is a potential impact to the Bare-rumped Sheath-tail Bat and Black-footed Tree-rat during vegetation clearing; however, these species are mobile and are expected to avoid operating machinery. Further, the main risk would be associated with the species sheltering in tree hollows. Tall trees with hollows do occur in the Project footprint, but are low in abundance. It is not expected that project activities will cause direct mortality to Partridge Pigeon.

Based on the above, the proposed activities are not expected to significantly impact on any listed threatened species. Core is not proposing to submit an EPBC referral.

16 LIKELIHOOD OF SIGNIFICANT IMPACT

Based on the project details and characteristics of the receiving environment described in this NOI, it was determined that the BP33 proposal has potential to impact on terrestrial ecosystems, aquatic ecosystems, terrestrial environmental quality, inland water environmental quality, hydrological processes and social, economic and cultural surroundings. For each of these 'proposal specific' environmental factors, this NOI has documented an assessment of potential impacts based on desktop information and studies undertaken by suitably qualified people. The assessment also takes into account the design criteria and operational controls proposed by Core Lithium, routine mitigation measures/plans required to be included in MMP's and their likely effectiveness.

16.1 Factors that will not be significantly impacted

The available information about environmental values and the mining proposal indicates with a reasonable level of certainty that subject to implementation of proposed mitigation measures and monitoring programs, the proposal is unlikely to have a significant impact on biodiversity, environmental quality or social, economic and social surroundings. The mitigation and monitoring measures proposed for these aspects are summarised below and are routine for mining proposals. The details of these programs will be subject to scrutiny by DPIR through the MMP and Mining Authorisation process under the *Mining Management Act*.

16.2 Uncertainty

There are information gaps that currently make it difficult to assess with certainty the level of impact to hydrological processes (groundwater only) and water quality. Further information is required to address information gaps as summarised below.

16.2.1 Hydrological processes

There is uncertainty about the potential for groundwater drawdown and impacts to nearby watercourses (riparian vegetation and aquatic communities). It is known that other consumptive users of groundwater will not be impacted due to distance and lack of connectivity between aquifers.

The ephemeral watercourse that could be impacted by groundwater drawdown is a high order stream that flows into the Charlotte River. It has a narrow zone of dense riparian vegetation and because it is ephemeral supports a low diversity aquatic community only during the wet season and early dry season. Under a worst-case scenario, these communities could be impacted. Impacts are considered unlikely to extend to the Charlotte River proper located 2.5 km downstream because the watercourse is a minor tributary that contributes a small portion of flows.

The uncertainty that exists in relation to groundwater impacts is proposed to be resolved through installing investigation bores and development of a site-specific groundwater model. A groundwater investigation plan is included at Appendix D and Core plans to install bores in 2020. This will allow for commencement of baseline monitoring with a view towards the groundwater model being developed by mid-2021. The site-specific groundwater model is critical not only to assessing potential environmental impacts, but also to the next phase of mine design, as it will inform dewatering requirements and associated sizing of onsite water storages. It is proposed that the groundwater model will be developed in 2021 and will be submitted as supporting information to the Water Management Plan submitted with the MMP.

A groundwater and aquatic monitoring program will be developed for implementation during mining to detect changes in groundwater levels and monitor impacts to riparian vegetation and aquatic communities. The monitoring program will allow for adaptive management and/or rehabilitation of damage. Baseline surveys of the aquatic ecology and riparian vegetation species composition and structure have been undertaken at locations downstream of BP33 refer GHD (2017) and EcOz (2019). A monitoring program will be included in

the MMP that will provide for annual monitoring to compare ecosystem health during mining and post-closure, to these baseline conditions.

Subject to resolution of the uncertainties that exist in relation to groundwater drawdown and associated impacts to GDE's, it is considered that the level of impact is unlikely to be of a magnitude that cannot be mitigated to an acceptable level. The mitigation and management measures proposed by Core will be subject to assessment by DPIR as part of the Mining Authorisation process under the *Mining Management Act*. This process is expected to ensure that the project can proceed without significant impact on hydrological processes.

16.2.2 Inland water quality

With respect to water quality, there is some uncertainty with respect to whether the groundwater dewatered from the underground mine and box cut will require a level of treatment and/or dilution to allow for discharge of excess water during the wet season without exceeding water quality objectives. The baseline groundwater sampling undertaken for Grants Project indicates that some metals and nutrient parameters are naturally elevated in the groundwater and requires a level of treatment. In the absence of site-specific groundwater quality information, it is not known with certainty if treatment will be required at BP33. However, the surface water monitoring data collected downstream of the BP33 site indicates the surface water quality is more similar to groundwater than is the case at Grants Project. The reason for this is that the watercourse downstream of BP33 naturally receives groundwater discharges.

Following installation of groundwater bores at BP33, baseline water quality sampling will be undertaken to allow for characterisation of water quality, which will inform subsequent detailed design of the onsite water management system and treatment processes. It is proposed that details of the discharge water quality, treatment processes (if required) and monitoring, including a robust baseline dataset, will be detailed in the Water Management Plan submitted with the MMP. The adequacy of these measures will be assessed by DPIR as part of the Mining Authorisation process under the *Mining Management Act*. Further to this, Core will be required to apply for a Waste Discharge Licence under the *Water Act* and comply with the conditions of this licence. It is considered that these processes should provide for adequate scrutiny of Core's approach to managing mine site discharges to ensure protection of downstream water quality.

16.3 Summary of mitigation measures

The key mitigation measures proposed throughout this NOI are summarised below:

- Vegetation Clearing Procedure
- Weed Management Plan
- Erosion and Sediment Control Plan (ESCP)
- ARD Management Plan covering testing for PAF materials and management
- Site-specific groundwater modelling report including groundwater drawdown contours and assessment of potential impacts to watercourses
- Water Management Plan including details of:
 - Site water management system
 - Predicted discharge volumes and timing
 - Discharge water quality
 - Treatment requirements to achieve water quality objectives
 - Groundwater, surface water and aquatic monitoring programs
 - A TARP that will detect and respond to impacts to surface water and groundwater quality to ensure they do not occur over an extended period.

- Emergency Response Plan addressing spill response and soil remediation
- Mine Closure Plan that provides for backfilling the underground and box cut and leaving a safe stable and non-polluting landform.
- Water Management Plan detailing a groundwater, surface water and aquatic monitoring program.
- An updated Social Impact Management Plan expanded to include both Grants and BP33.

Core is committed to undertaking further baseline studies and assessments required to inform the above management plans. This work is planned to take place 2020-2021.

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