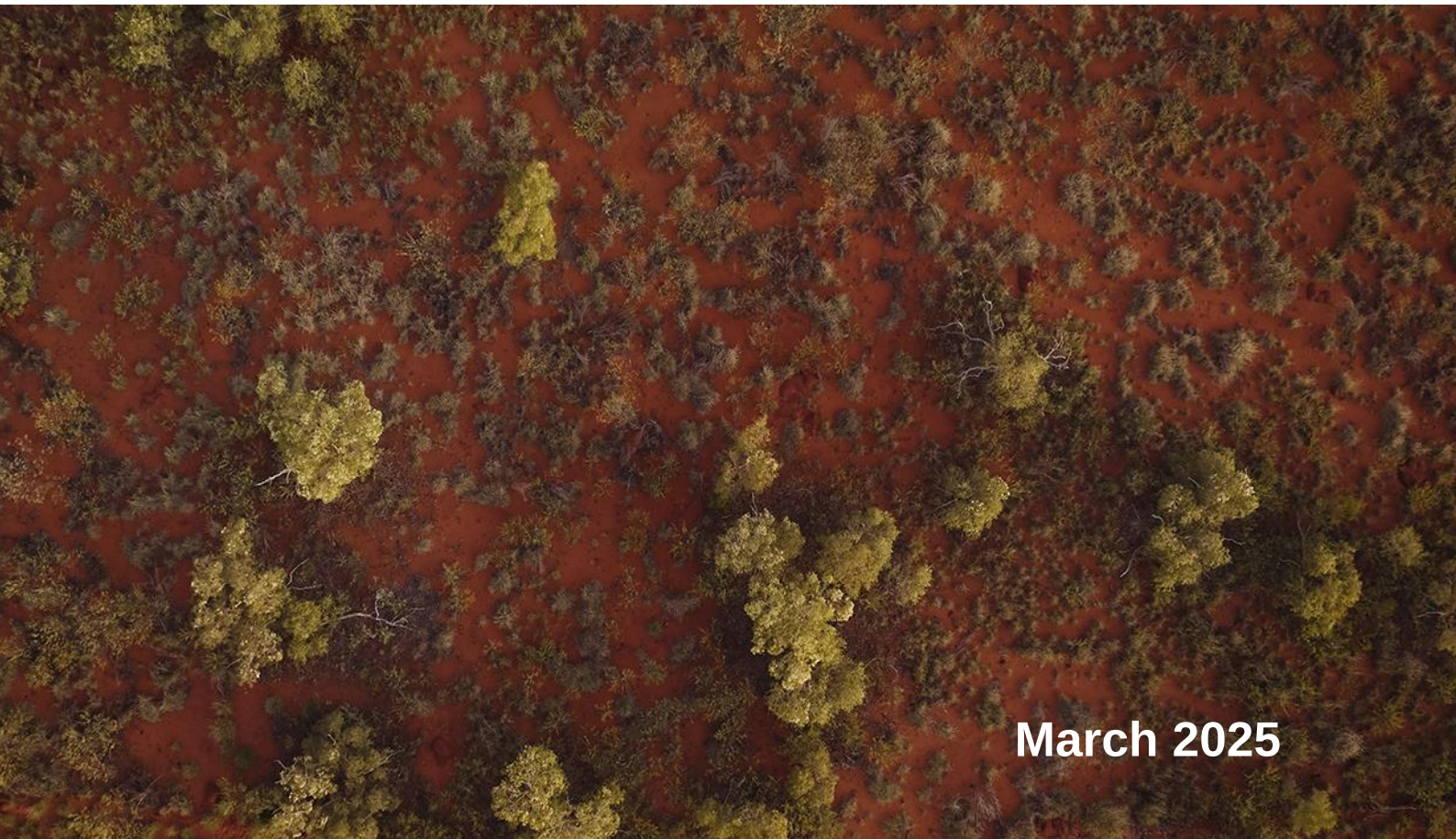
DE GREY MINING LTD

SECTION 38 REFERRAL SUPPORTING DOCUMENT

HEMI GOLD PROJECT

ASSESSMENT NUMBER: 2380



March 2025

REVISION HISTORY

Rev	Description	Date
0	Referal Supporting Document	23.05.2023
1	Addressing EPA comments on initial referral	06.11.2024
2	Addressing EPA and public submission comments	25.03.2025

AUTHORISATIONS

Task	Name	Company	Signature	Date
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Prepared by

Prepared for

EXECUTIVE SUMMARY

Overview

This document has been prepared to support a referral under Section 38 of the *Environmental Protection Act 1986* (EP Act) for the Hemi Gold Project (the Proposal; Hemi) located approximately 85 km south of Port Hedland in Western Australia (WA). The Proposal lies within the Chichester and Roebourne subregions of the Pilbara region, as described by the Interim Biogeographic Regionalisation for Australia (IBRA). It is relatively flat country comprising predominantly of spinifex grasslands and is located between the Yule and Turner Rivers.

De Grey Mining Ltd (De Grey) acknowledges the Traditional Owners of the land on which the Proposal is located – the Kariyarra People, whose Prescribed Body Corporate is the Kariyarra Aboriginal Corporation (KAC). Early and frequent consultation and negotiations between De Grey and KAC have culminated in a Native Title Mining Agreement, referred to as the De Grey / Kariyarra Mining Agreement (the Agreement), which was executed on 15 December 2022. De Grey believes the Agreement will deliver outstanding outcomes for KAC and the broader community.

The Proposal is predominately located on the Indee Station Pastoral Lease with a small portion of the northern miscellaneous licences intersecting the Mundabullangana Station Pastoral Lease. An access agreement for exploration and mining activities has been signed with the Indee Pastoral Lease holder. Regular engagement with the pastoral leaseholders and Kariyarra People has been ongoing since 2016. In 2020, a broader formal engagement process commenced with other stakeholders including the Port Hedland community as well as government departments at a local, state and federal level. Feedback from stakeholders has been documented throughout this process and a comprehensive Social Impact Assessment (Umwelt, 2022b) has been completed.

Proposal Content

The key components of the Proposal comprise open cut mining of gold bearing ore from six pits collectively known as the Hemi deposits (Aquila, Brolga, Crow, Diucon, Eagle, and Falcon). Ore will be processed on site at a rate of ~10 million tonne per annum (mtpa) over an anticipated 15-year life of mine (inclusive of two years of dewatering), with processing waste (tailings) discharged to an Integrated Waste Landform (IWL) Tailings Storage Facility (TSF). Tailings are classified as non-acid forming (NAF) due to the nature of the ore and the use of pressure oxidation treatment followed by neutralisation, which effectively removes any acid generation potential from the tailings.

Waste rock mined from the pits will be stockpiled on surface, forming permanent waste rock landforms (WRL). Waste characterisation studies for the Proposal show that most of the waste at Hemi does not pose a risk of acid and metalliferous drainage (AMD) and only a small proportion (~5%) of samples were potentially acid forming (PAF). Both the TSF and WRLs have been designed to ensure that long-term geochemical and physical stability is achieved.

Mining at Hemi will extend below the water table requiring dewatering for safe mining operations. De Grey's approach to the management of dewatering has been developed in accordance with the Department of Water and Environmental Regulation's (DWER) policy on the use of mine dewatering surplus (DWER, 2020c). The following water use hierarchy has generally been adopted:

- Mitigation of environmental impacts – used for dust suppression.
- Support fit-for-purpose on-site activities – used in the ore processing plant when this becomes operational in year three of the Proposal.
- Transfer of water to local third parties – consultation is in progress with interested parties.
- Reinjection into the upper and lower alluvium/palaeochannel aquifers – reinjection borefields will be located north and south of mining infrastructure.
- Controlled release into designated watercourse - surplus water that is of an acceptable quality to be released into the Turner River.

Modelled abstraction rates are up to 30 GL/year for the first four years of dewatering. De Grey proposes to reinject approximately 50% of the abstracted water during this period back into the upper and lower alluvium/palaeochannel aquifers upstream and downstream of the pits. After three years, dewatering abstraction rates decline to approximately 18 GL/year and are less than 10 GL/year from year 8. Reinjection volumes decline with abstraction. For the first three years of dewatering, the Proposal is estimated to discharge up to 8 GL/year of surplus water into the Turner River . Once the processing plant is commissioned and operating at nameplate capacity, the utilisation of abstracted groundwater in the processing will reduce discharge into the Turner River (initially up to 60% gradually increasing to 80 - 100% until the end of the Proposal). Intermittent discharge of up to 4 GL/annum may occur in years 4 – 6 and intermittent discharge of 0 – 2 GL/year is expected from year seven until the end of the Proposal. These may vary depending on unscheduled shut-downs and significant rainfall events.

Preliminary hydrogeological modelling indicates that due to low groundwater flow and high evaporation rates, the hydraulic gradient will remain post-closure. Thus, pit lakes will act as a groundwater sink, continually drawing in groundwater as it evaporates from lake surfaces. This continual cycle of recharge and evaporation may lead to increased salinisation of the pit lakes.

Preliminary modelling indicates that the post-closure groundwater drawdown depression will not adversely affect the Yule River, or its permanent pools that are potentially groundwater-fed.

Infrastructure corridors have been included in the Proposal's Development Envelope to allow connection to existing electrical or gas infrastructure. Measures to reduce emissions have been integrated into Proposal design, these include:

- A preferred option to source power from the North West Interconnected System (NWIS) under a power purchase agreement (PPA) rather than dedicated onsite hybrid diesel, gas, renewable generation;
- The potential for future on-site or grid connected renewable sources;
- Optimisation of haulage distances and mine design for waste and ore;
- Consideration of energy efficiency in the selection of the communition circuit; and
- Selection of the pressure oxidation processing method that requires less lime dosing and energy than other processing methods.

After avoidance measures, scope 1 emissions are projected to exceed 100,000 tonnes CO_2e/annum. De Grey has identified additional mitigation measures to be implemented over the life of the Proposal to meet the trajectory of net zero scope 1 and scope 2 emissions by 2050. [redacted] A Greenhouse Gas Environmental Management Plan has been prepared to explain in more detail De Grey's commitment.

Other infrastructure to support the Proposal will include offices, workshops, laydown areas, explosives magazines, airstrip, accommodation village, wastewater treatment, landfills, surface water management infrastructure, pipelines, and borrow pits.

Environment

Development of this proposal will require clearing of up to 5,830 ha of native vegetation on pastoral leases within a Development Envelope of 22,194 ha. Detailed flora and vegetation assessments have been undertaken across the Development Envelope. The Gregory Land System Priority Ecological Community (PEC) has been identified on the De Grey mining tenements and has been specifically excluded from the Proposal's Development Envelope with a 300 m buffer applied to further mitigate impacts. No Threatened flora or Threatened Ecological Communities (TEC) listed under WA State legislation have been identified in the Development Envelope. One Federally listed threatened species, *Seringia exastia*, was recorded within the Development Envelope. This species was recently delisted under the WA *Biodiversity Conservation Act 2016* following taxonomic review and is considered a widespread and common species in the region.

Detailed fauna and habitat assessments have been undertaken across the Development Envelope including aquatic fauna, short range endemics (SRE), subterranean fauna and vertebrate terrestrial fauna. No Threatened or Priority aquatic fauna species or SRE species were recorded.

Stygofauna are known to occur within and outside the proposed impact (groundwater drawdown) area. The presence of an extensive and unrestricted upper and lower alluvium/palaeochannel aquifers that is preserved within the known ranges of stygofauna species, makes it unlikely that the Proposal will have adverse impacts on the biological diversity and ecological integrity of the stygofauna population.

Extensive vertebrate fauna surveys recorded the following protected species within the Development Envelope:

- Visual records of the Northern Quoll (*Dasyurus hallucatus*) (Endangered) along the Turner River.
- Secondary signs of the Greater Bilby (*Macrotis lagotis*) (Vulnerable): Diggings were recorded from one location within the Development Envelope. The species is likely to be an uncommon resident to the Spinifex Sandplain, Sandplain Drainage and Sand Dune habitats in the Development Envelope.
- Acoustic recordings of the Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*) (Vulnerable): The call was detected at two sites within the Development Envelope. The species is likely to forage in the Development Envelope and along the Yule and Turner Rivers. No suitable roosting habitat is present in the Development Envelope.

The Yule River, Turner River and Rocky Outcrops are identified as critical habitat for the Northern Quoll. Consequently, De Grey has applied the following controls to minimise impacts to the Northern Quoll:

- Exclusion of the Yule River and surrounding associated foraging habitat from the Development Envelope.
- Exclusion of all Rocky Outcrop fauna habitat type from the Development Envelope.
- Limited disturbance to the Major River (Turner River) habitat to the minimum required for the dewatering pipeline corridor and outfall which comprises less than 2.5 % of the mapped extent of the Major River Habitats of the Yule and Turner Rivers.
- Ensure discharge to the Turner River does not cause habitat loss from erosion and/or changes to water quality.

The common and widespread Spinifex Sandplain and Sandplain Drainage habitats are considered to be critical habitat for the Greater Bilby. De Grey has avoided disturbance to areas where secondary signs of the Greater Bilby have previously been recorded. These habitat types are regionally common, representing 32,068 ha or ~92% of the 34,688 ha fauna survey area.

The Proposal will not disturb any registered Aboriginal heritage sites. There are unregistered Aboriginal heritage sites in the Development Envelope, and the Kariyarra People have asked that De Grey and the EPA do not publicly disclose the location of these sites. Two of these sites, discovered during heritage surveys, contain artefact scatters. De Grey has consulted with the Kariyarra People about the salvaging of these artefacts.

Air quality, noise and visual amenity assessments have been completed for the Proposal, all of which assess the Proposal as having a low level of impact on these factors.

An Environmental Management Plan is included as part of this Referral Supporting Document. This includes measures specific to these two species as well as general measures to protect all native fauna at the Proposal.

Environmental Outcomes and Proposed Offsets

The environmental and social impact assessment presented in this document demonstrates that the Proposal has the potential to have a significant residual impact to the Terrestrial Fauna Environmental Factor due to the:

- Clearing of up to 5,100 ha of Spinifex Sandplain habitat within the Development Envelope that is considered critical habitat for the Greater Bilby.
- Clearing up to 800 ha of Sandplain Drainage habitat within the Development Envelope that is considered critical habitat for the Greater Bilby.
- Clearing up to 10 ha of Major River habitat within the Development Envelope that is considered critical habitat for the Northern Quoll, Pilbara Olive Python and Grey Falcon.

Environmental offsets are proposed for this clearing and are discussed in Section 15.

Subject to conditions recommended conditions and implementation of offsets De Grey considers that the Proposal can be managed to meet the EPA's objective relating to environmental protection. A number of peer reviews of this report have been undertaken, including a review by Dr. Paul Vogel, with feedback incorporated into the submission.

The environmental and social impact assessment demonstrates that comprehensive engagement with key stakeholders has been undertaken, informing the design of a Proposal that will deliver long-lasting benefits to the region, stakeholders, and inter-generational benefits to the Kariyarra People.

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GLOSSARY

Term	Definition
°	Degrees
°C	Degrees Celsius
µg/m^3	Microgram per cubic meter
µS/cm	Microsiemens per centimetre
A	Archaeological
AD	Proposed Total Annual Discharge
AEP	Annual exceedance probability
AER	Annual Environmental Report
Ag	Silver
Al	Aluminium
AMD	Acid and Metalliferous Drainage
ANC	Acid Neutralising Capacity
ANCOLD	Australian National Committee on Large Dams
ANE	Ammonium Nitrate Emulsion
ANZG	Australian & New Zealand Guidelines
As	Arsenic
Au	Gold
B	Boron
BC Act	*Western Australian Biodiversity Conservation Act 2016*
Beneficiation	A physical treatment process of ore which results in a more concentrated form of the product.
Bi	Bismuth
BLSE	Black Shale
$CaCO_3$	Calcium Carbonate
CASA	Civil Aviation Safety Authority
Cd	Cadmium
CEO	Chief Executive Officer
CH_4	Methane
CHMP	Cultural Heritage Management Plan
CIL	Carbon-in-Leach
cm	Centimetres
CO_2	Carbon Dioxide
CO_2-e/annum	Carbon Dioxide equivalent per annum
CoA	Commonwealth of Australia
Cr	Critically Endangered
Cr	Chromium
Cs	Caesium
Cu	Copper
dB	Decibels

Term	Definition
dB(A)	A-weighted decibel – expression of the relative loudness of sounds as perceived by the human ear
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate change, Energy, the Environment and Water
DE	Development Envelope
DEG	De Grey
DEM	Digital Elevation Model
DEWHA	Department of the Environment, Heritage, Water and the Arts
DMA	Decision Making Authority
DEMIRS	Department of Energy, Mines, Industry Regulation and Safety
DoE	Department of Education
DoEE	Department of Environment and Energy
Doré	Bars consisting of a semi-pure alloy of gold and silver as opposed to bullion which are gold bars of high purity
DoW	Department of Water
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Planning, Lands and Heritage
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
DSO	Direct Shipping Ore
DWER	Department of Water and Environmental Regulation
E	Ethnographic
EC	Electrical conductivity
eDNA	environmental DNA - organismal DNA that can be found in the environment
EIA	Environmental Impact Assessment
En	Endangered
EP Act	*Environmental Protection Act 1968*
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESG	Environmental, Social and Governance
ETA	Environmental Technologies and Analytics
Fe	Iron
FIRK	Felsic Intrusive
FY	Financial Year
Ga	Gallium
GAI	Global Abundance Index
GDV	Groundwater dependent vegetation
GHG	Greenhouse Gas
GHG EMP	Greenhouse Gas Environmental Management Plan
GIS	Geographic Information System
GL/year	Gigalitres per year
GL/month	Gigalitres per month

Term	Definition
Greenfields	No existing mining or processing operations within the Development Envelope
ha	Hectares
HAS	Herring Storer Acoustics
HFCs	Hydro fluorocarbons
Hg	Mercury
HPGR	High Pressure Grinding Rolls
IBRA	Interim Biogeographic Regionalisation for Australia
IIRK	Intermediate Intrusive
IUCN	International Union for the Conservation of Nature
IUCN "Near Threatened"	Evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
IUCN "Vulnerable"	On the verge of extinction unless the circumstances threatening its survival and reproduction improve.
IUCN Red List	Is a critical indicator of the health of the world's biodiversity.
IWL	Integrated Waste Landform
KAC	Kariyarra Aboriginal Corporation
KCGM	Kalgoorlie Consolidated Gold Mines
kgH_2SO_4/tonne	Kilograms of sulfuric acid per tonne
kl/day	Kilolitres per day
km	Kilometre
km^2	Square kilometres
L_{A10}	Noise level exceeded for 10% of the measurement period
LC	Low Capacity
LCS	Low carbon scenario
LG	Low-grade
Li	Lithium
LOM	Life of Mine
LV	Light Vehicle
m	Metre
Mi	Migratory
m^3/s	Cubic metres per second
MCP	Mine Closure Plan – Statutory approval required under the *Mining Act 1978*
mg/L	Milligrams per litre
MIRK	Mafic Intrusive
MIRP	Mafic Intrusive (Plagioclaise)
ML/day	Megalitres per day
Mn	Manganese
MNES	Matters of National Environmental Significance
Mo	Molybdenum
MP	Mining Proposal – *statutory approval required under the Mining Act 1978*

Term	Definition
MPA	Maximum Potential Acidity
MRF	Mine Rehabilitation Fund
mtpa	million tonne per annum
N/A	Not Applicable
N_2O	Nitrous oxide
NAF	Non-Acid Forming
NAG	Net Acid Generation
NAPP	Net Acid Producing Potential
NEPM-NPI	National Environmental Protection Measures – National Pollutant Inventory
NGER Act	*National Greenhouse and Energy Reporting Act 2007*
Ni	Nickel
NMD	Neutral metalliferous drainage
NNTT	National Native Title Tribunal
NTD	Native Title Determination
NPR	Neutralisation Potential Ratio – ratio of ANC to MPA in mine waste.
NWIS	North West Interconnected System - supplies electricity to several major towns and resources projects in the Pilbara region.
Ops	Operation
OS	Other specially protected species
PAF	Potentially Acid Forming
Pb	Lead
PDWSA	Public Drinking Water Source Area
PEC	Priority Ecological Community
PFCs	Perfluorocarbons
PHIA	Port Hedland International Airport
PM_{10}	Particulate matter with an equivalent aerodynamic diameter of 10 µm or less.
$PM_{2.5}$	Particulate matter with an equivalent aerodynamic diameter of 2.5 µm or less
PoW	Program of Work
POx	Pressure oxidation - A process used to extract gold, copper, zinc, molybdenum, and uranium from refractory ore bodies. The process utilizes elevated temperatures, elevated pressures, and oxygen to liberate the minerals from refractory ores.
ppm	Parts per million
QFPY	Quartz Feldspar Porphyry
Re	Rhenium
Restricted distribution	A species is said to be restricted when it can only be found in a small geographic area; it has a small geographic range, e.g., Short Range Endemic (SRE) fauna species.
RIWI Act	*Rights in Water and Irrigation Act 1914*
ROM	Run-of-Mine
S	Sulfur
Sb	Antimony
SBIA	Social Baseline and Impact Assessment

Term	Definition
Scope 1 greenhouse gas emissions	Direct emissions from owned or controlled sources.
Scope 2 greenhouse gas emissions	Emissions released from the indirect consumption of an energy commodity
Scope 3 greenhouse gas emissions	Emissions that are not produced by the company itself, and not the result of activities from assets owned or controlled by them, but by those that it is indirectly responsible for, up and down its value chain.
SDST	Sandstone
SF_6	Sulfur hexafluoride
SHLE	Shale
SRK	SRK Consulting (Australasia)
SLST	Siltstone
SPRAT	Species Profile and Threats
SRE	Short Range Endemics
SWS	Surface Water Solutions
Ta	Tantalum
Tailings	Processing waste
tCO_2-e/Oz	Ton of carbon dioxide emission per ounce
TDS	Total Dissolved Solids
Te	Tellurium
TEC	Threatened Ecological Communities
Ti	Titanium
TN	Total Nitrogen
TP	Total Phosphate
TRANS	Transported
TSF	Tailings Storage Facility
TSP	Total Suspended Particulates
TSSC	Threatened Species Scientific Committee
U	Uranium
UC	Uncertain
UMRK	Ultramafic Rock
Undescribed species	A species which has never received a species name in a formal scientific publication
UNFCCC	United Nations Framework Convention on Climate Change
V	Vanadium
Vu	Vulnerable
W	Tungsten
WA	Western Australia
WRL	Waste Rock Landform
WSE	Water surface elevation
YRWR	Yule River Water Reserve
Zn	Zinc

1. INTRODUCTION

1.1 Purpose and Scope

This document has been prepared to provide the necessary information to allow the assessment of the Hemi Gold Project (the Proposal; Hemi) under Part IV of the *Environmental Protection Act 1986* (EP Act). Hemi is located approximately 85 km south of Port Hedland in Western Australia (Figure 1-1).

The document considers all phases of Proposal implementation, including construction, commissioning, operation and closure. Cumulative impacts with other Proposals are also addressed. The potential impacts to key environmental factors, as identified by the EPA, are described in detail and assessed using relevant studies specific to the Proposal. This document summarises and describes the Proposal specific environmental studies conducted for the Proposal as relevant to the environmental impact assessment (EIA). Technical reports used in preparing this document are provided as appendices. The proposal has been prepared in accordance with the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual* (2021a).

1.2 Proponent Details

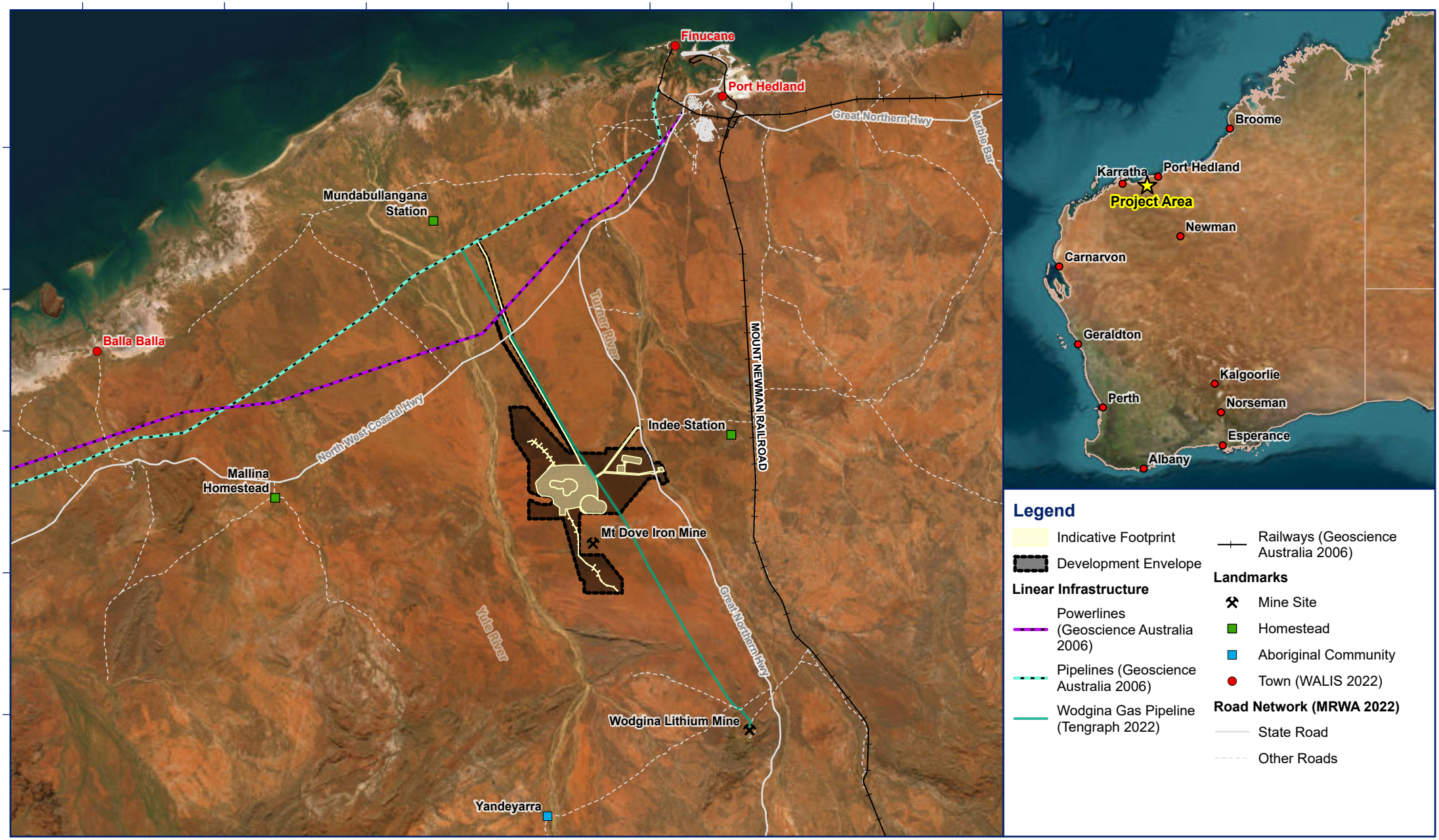
De Grey Mining Ltd (De Grey) is the proponent of the Hemi Gold Project. The Proposal will proceed on the following mining tenure:

- Mining Lease M47/1628 held by Last Crusade Pty Ltd, a wholly owned subsidiary of De Grey. This lease application includes the Hemi deposits and the surrounding area.
- Miscellaneous Licences L45/600, L45/604, L 45/605, L45/612, L45/720 (pending), L45/721 (pending), L45/768 (pending), L47/967 (pending), L47/975 (pending), L47/1047 (pending), L47/1048, L47/1049, L47/966 (pending), L47/963 (pending), L45/642, L47/1069 (pending), L47/1070, L47/1071 held or submitted by De Grey. These will be used for supporting infrastructure.

The Proposal's Development Envelope and the lease and licence boundaries (collectively referred to as Mining Tenements), are shown in Figure 1-2.

All compliance and regulatory requirements regarding this referral should be forwarded by email, post or courier to the following address:

Proponent:	De Grey Mining Ltd
Address:	Ground Floor, 2 Kings Park Road, West Perth, WA, 6005
Contact:	Sarah Thomas
Title:	Environment Manager
Phone:	+61 8 6109 6825
Email:	sarah.thomas@degreymining.com.au



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Updated/Reviewed by: KM/EL

RPMGLOBAL

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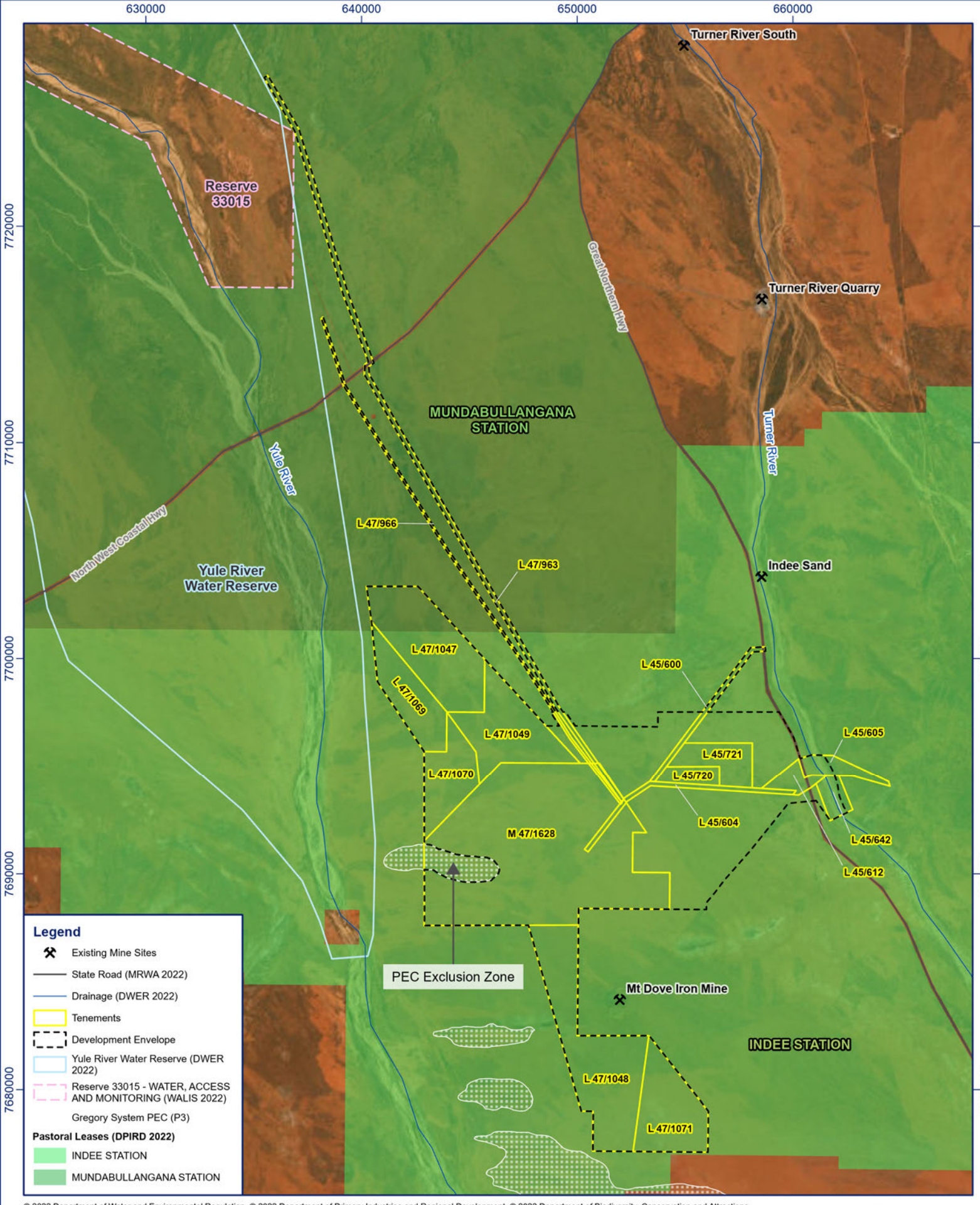
PROJECT		CLIENT
November 2024	Hemi Gold Project - Referral Supporting Document	DE GREY MINING LTD
Figure 1-1		
ADV-AU-00673	Location Plan and Development Envelope	



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Updated/Reviewed by: KM/EL

RPMGLOBAL

PROJECT

Hemi Gold Project - Referral Supporting Document

Mining Tenements and Development Envelope

Figure 1-2 | ADV-AU-00673 | November 2024

CLIENT

DE GREY MINING LTD

2. THE PROPOSAL

2.1 Proposal Content

The key components of the Proposal are listed below. These will be within the Proposals Development Envelope, which is shown on Figure 1-1 and in more detail on Figure 1-2:

- Open cut mining of gold bearing ore from six pits collectively known as the Hemi deposits (Aquila, Brolga, Crow, Diucon, Eagle, and Falcon).
- Construction and subsequent operation of a ~10 million tonne per annum (mtpa) processing plant.
- Storage of tailings in a 2-cell, Integrated Waste Landform (IWL) Tailings Storage Facility (TSF).
- Water supply from the local groundwater aquifer with accompanying groundwater and surface water management infrastructure to facilitate mine dewatering and aquifer reinjection.
- Discharge of surplus water that is of acceptable quality into the Turner River.
- Stockpiling of waste rock to be rehabilitated to form safe, stable and non-polluting Waste Rock Landforms (WRLs).
- Stockpiling of lowgrade ore separately from waste rock for future processing (or rehabilitation) after highgrade ore is exhausted.
- Two linear infrastructure corridors to access the Karratha to Port Hedland Gas Pipeline and the electrical grid, north of the Hemi deposits. Once a decision is made regarding power supply, redundant corridors can be removed from the Development Envelope.
- Two linear infrastructure corridors for a sealed access road; dewatering infrastructure and potential power infrastructure, east of the Hemi deposits.
- Power supply consisting of connection to the North West Interconnected System (NWIS) with potential for an onsite solar farm.
- Construction and operation of a sealed airstrip that can accommodate the operation of aircraft with capacity for approximately 100 passengers.
- Construction of additional supporting infrastructure including offices, workshops, laydowns, explosives magazines, accommodation village, wastewater treatment, landfills, surface water management infrastructure, pipelines, and borrow pits.
- An anticipated 15year Life of Mine (including an initial two-year dewatering phase), followed by a closure phase.

2.2 General Proposal Description

A proposal summary and key characteristics are provided in Table 2-1 and Table 2-2.

Table 2-1: General Proposal Content Description

Proposal Title	**Hemi Gold Project**
Proponent Name	De Grey Mining Ltd (ACN 094 206 292)
Short Description	This Proposal is for the construction and operation of the Hemi Gold Project, located 85 km south of Port Hedland (Figure 1-1). The Proposal includes excavation of open pits; mine dewatering; surplus water management including reinjection and controlled discharge; construction of waste rock landforms and lowgrade stockpiles; and construction and operation of onsite processing facilities, an Integrated Waste Landform (IWL) Tailings Storage Facility (TSF) and other supporting infrastructure. The anticipated mine life is 13 years; however, this may be extended if mineral exploration finds additional resources. The Proposal's Development Envelope spans two pastoral leases (Figure 1-2), covering land predominantly used for cattle grazing and traditional purposes. There are operational and historic mine sites in the vicinity.

Table 2-2: Proposal Content Elements

Proposal Element	Location / Description	Maximum Extent, Capacity or Range
Physical elements		
Mine elements including: • Open Pits • Waste Rock Landforms • Low-grade Stockpiles • Haul Roads • Topsoil Stockpiles	Figure 2-1	Up to 5,830 ha of disturbance inside a Development Envelope of 22,194 ha.
Mine dewatering infrastructure including: • Abstraction and reinjection borefields • In pit sumps • Pipelines • Water management ponds • An outfall in the Turner River		
Processing elements including: • Run of mine pad and ore stockpiles • Processing plant • Tailings storage facility • Tailings and return water pipelines • Process water ponds • Secondary crushing station and conveyors		

Proposal Element	Location / Description	Maximum Extent, Capacity or Range
Support infrastructure including: • Airstrip • Accommodation village • Access and haulage roads • Power and pipeline corridors • Offices • Workshops • Laydown areas • Explosives magazines and compounds • Wastewater treatment plant • Surface water management infrastructure • Borrow pits • Landfills • Other ancillary infrastructure		
Operational elements		
Mine dewatering	Figure 2-1	Up to 30 GL/year
Aquifer reinjection		Up to 100% of water abstracted
Surplus water discharge		Up to 10 GL/year for the first three years Up to 4 GL/year in years 4 – 6. Up to 2 GL/year thereafter
Mineral processing		~10 million tonnes per annum
Tailings deposition		Up to 130 million tonnes of wet tailings
Greenhouse gas emissions – based on Low Carbon Scenario		
Maximum annual emissions		
Scope 1	Plant and Equipment; processing: Approximately 225 $ktCO_2$-e	
Scope 2	Electricity Use: Approximately 231 $ktCO_2$-e	
Average annual emissions over life of mine		
Scope 1	Plant and Equipment; processing: Approximately 148 $ktCO_2$-e	
Scope 2	Plant and Equipment: Approximately 121 $ktCO_2$-e	
Total Emissions (based on annual average scope 1 and scope 2)		
Approximately 3.7 $MtCO_2$-e		
Commissioning		
Commissioning of the processing facility to be undertaken subject to operational limits described above.		
Rehabilitation and closure		
The Proposal has considered mine closure in its design. Progressive rehabilitation will be undertaken over the life of mine and landforms will be in consideration of the existing landscape and be safe, stable and non-polluting. Stakeholder consultation over mine closure and acceptable post-mining land uses will be ongoing during operations. At the cessation of mining and processing, infrastructure will be decommissioned and removed (unless otherwise agreed with relevant stakeholders), closure earthworks completed, and native vegetation re-established. Abandonment bunds will restrict access to post-closure pit lakes. A conceptual Mine Closure Plan (MCP) has been included with the referral. This will form the basis of an operational MCP to be prepared and submitted to the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) prior to construction.		

Proposal Element	Location / Description	Maximum Extent, Capacity or Range
Other elements which affect extent of effects on the environment		
Proposal time: Proposed commencement in 2025.	Maximum Proposal life: ~15 years	Limited by the capacity of the TSF, currently anticipated to be 13 years, preceded by two years of dewatering and followed by mine closure activities.

2.3 Justification

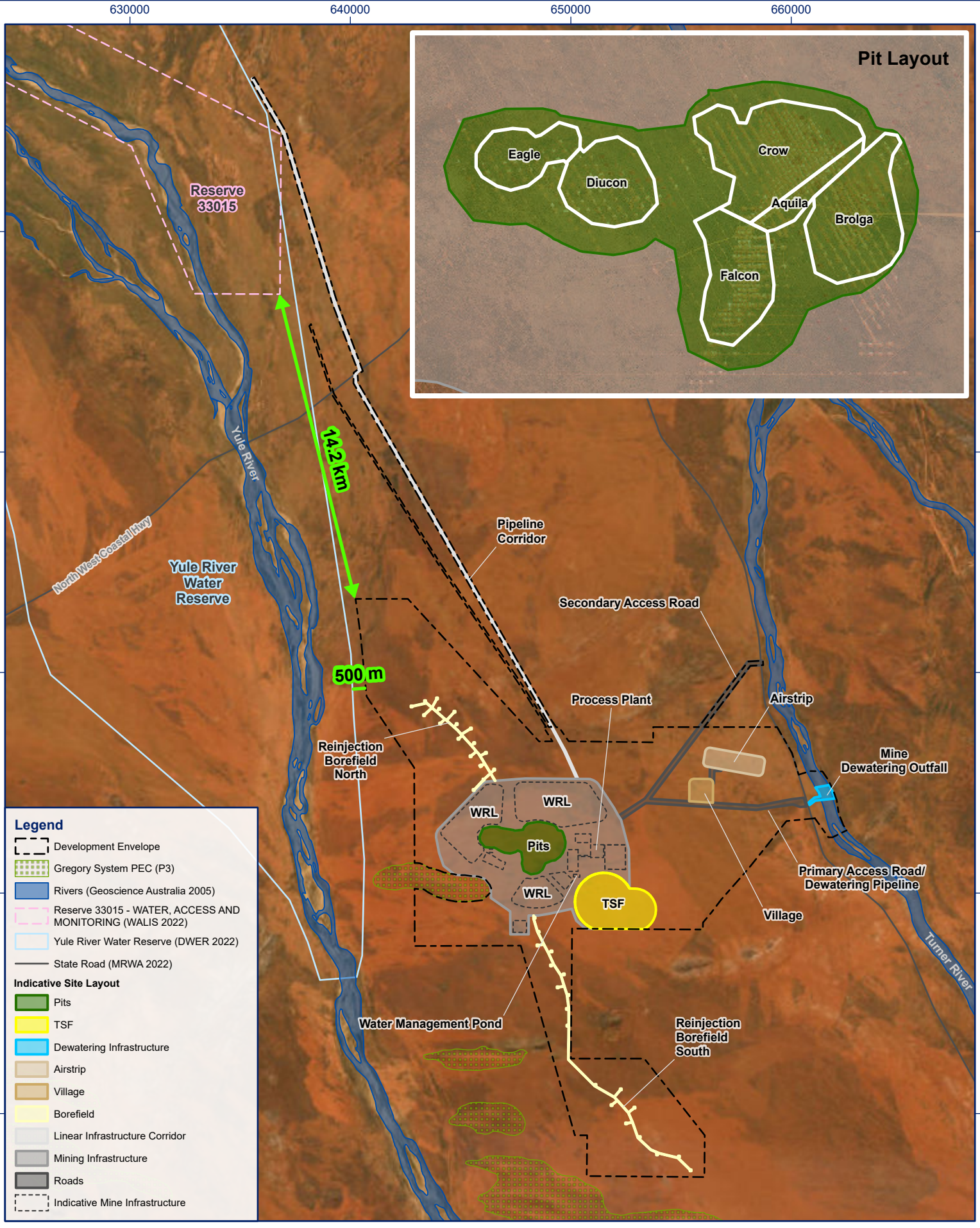
Mining of the Hemi deposits will provide Australian gold to global markets. The Proposal has been designed to maximise the extraction and processing of the gold ore within identified environmental and regulatory constraints as efficiently and economically as possible, whilst minimising adverse impacts to the environment and community, and delivering socio-economic benefits.

The Proposal will provide a range of direct and indirect benefits to the local, state and federal economies over its 13-year life. The Proposal is expected to bring net social benefits to Western Australia (WA) including expected direct employment for an average of over 500 people during operations.

The Proposal's social benefits encompass:

- Sustained commodity diversification within the Pilbara.
- Operation of a Pressure Oxidation treatment plant in the Pilbara. This will increase the viability of other reserves containing gold ore best suited to this treatment.
- Increase to the national income due to gold exports.
- Approximately $9.1 billion project expenditure.
- Approximately $11.2 billion of economic value added.
- Payment of an estimated $2.1 billion in royalties to the WA Government and corporate income taxes to the federal government.
- Payment of tenement rents, payroll taxes and mine rehabilitation fund levies to the WA Government.
- Payment of council rates to the Shire of Port Hedland.
- Support the local, state and national economy by creating demand for goods and services.
- Provide direct and indirect employment opportunities.
- Provide vocational training and business opportunities.
- Increased and ongoing additions to environmental and heritage understanding of the area.
- Presence in the area enables broader implementation of programs to improve the integrity of environmental values in the area (e.g. feral animal control, weed control, bushfire management).
- Royalty payments, employment and business opportunities for the Traditional Owners.

Gold is one of the few metals that is indestructible and 100% recyclable. It is used as a store of wealth; in jewellery; and in advanced medical and technical applications.



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Projection: GDA2020 MGA Zone 50
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Indicative Site Layout and Disturbance Footprint

Figure 2-1 | ADV-AU-00673 | November 2024

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2.4 Local and Regional Context

The Proposal lies predominantly within the Chichester subregion (PIL1) with northern infrastructure areas within the Roebourne subregion (PIL4) of the Pilbara region, as described by the Interim Biogeographic Regionalisation for Australia (IBRA) Version 7 (DoE, 2012). The subregions are situated on the northern end of the Pilbara Craton. Illustrative images of the Proposal area and an adjacent section of the Turner River are presented in Plate 2-1, Plate 2-2 and Plate 2-3.

The Chichester subregion has large areas of basaltic ranges amongst undulating Archean granite and basalt plains. These plains support a shrub steppe characterised by *Acacia inaequilatera* over hummock grasslands with *Eucalyptus leucophloia* tree steppes occurring on the ranges. Drainage of the subregion occurs through many rivers running north including the De Grey, Oakover, Nullagine, Shaw, Yule, Turner and Sherlock Rivers (Kendrick P & McKenzie N., 2001).

The Roebourne subregion has quaternary alluvial and older colluvial coastal and sub-coastal plains. These plains support grass savannah of mixed bunch and hummock grasses and dwarf shrub steppe of *Acacia stellaticeps* or *Acacia pyrifolia* and *Acacia inaequilatera*. Uplands are dominated by *Triodia* hummock grasslands. Resistant linear ranges of basalts occur across the coastal plains, with minor exposures of granite (Kendrick P & Stanley F, 2001).

The Hemi deposits are located 5 km east of the boundary of the Yule River Water Reserve (YRWR), a Priority 1 Public Drinking Water Source Area (PDWSA). The Water Corporation maintains a borefield, 30 km north of the Hemi deposits inside the YRWR in Reserve 33015 as part of the Port Hedland Region water supply. The Water Corporation borefield abstracts water from a shallow alluvial aquifer beneath the Yule River.

The Yule River and Reserve 33015 have been excluded from the Development Envelope. The detailed hydrogeological modelling predicts that the Yule River and Reserve 33015 will not be directly or indirectly impacted by drawdown or mounding from abstraction or reinjection.

A section of a proposed surface infrastructure corridor is ~25m from the water supply borefield (Reserve 33015) at the closest point. No abstraction or reinjection of groundwater associated with the Proposal is proposed within 14 km of the boundary of Reserve 33015. The YRWR and Reserve 33015 are shown in relation to the Development Envelope in Figure 1-2.

The Proposal is predominately located on the Indee Station Pastoral Lease with a small portion of the northern miscellaneous licences intersecting the Mundabullangana Station Pastoral Lease. An access agreement for exploration and mining activities has been signed with the Indee Pastoral Lease holder, with an agreement in discussion with Mundabullangana Station Pastoral Leaseholder.

The Proposal is on the lands of the Kariyarra People, and in the Kariyarra Native Title determination (National Native Title Tribunal Number WCD2018/015). Native Title matters are managed by the Prescribed Body Corporate, the Kariyarra Aboriginal Corporation (KAC), based in Port and South Hedland. A Native Title Mining Agreement, that includes land access arrangements was executed with the Kariyarra People on 15 December 2022.

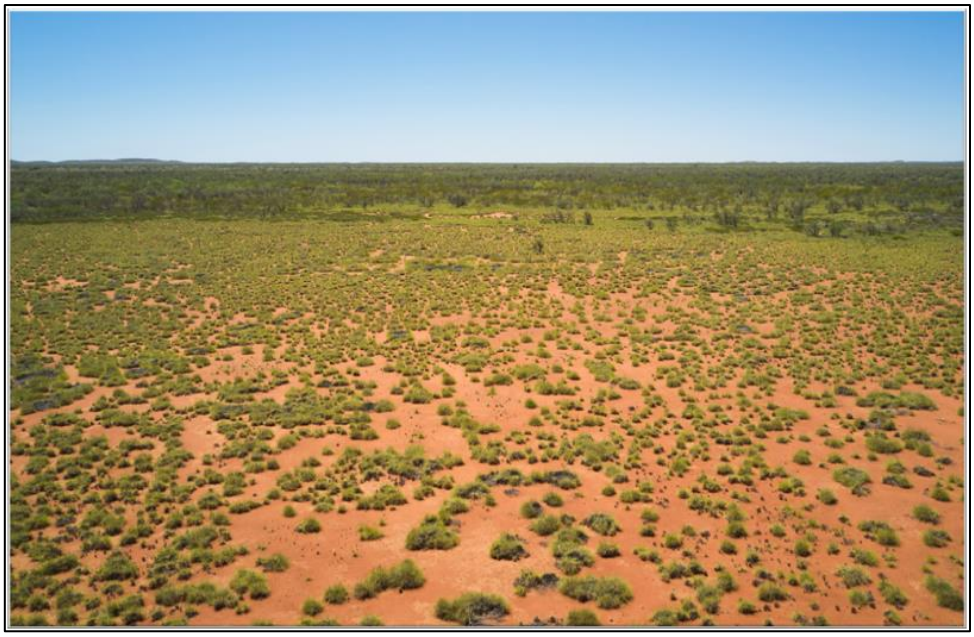


Plate 2-1: Vegetation typical of the Proposal's Development Envelope

Plate 2-2: Spinifex grasslands typical of the Proposal's Development Envelope

Plate 2-3: Turner River Approximately 4 km Downstream of Proposed Surplus Water Outfall, Showing the Restricted Channel During Low Rainfall or Drought Periods

2.5 Existing On-site Activities

The Proposal is a greenfields project, with no existing mining or processing operations within the Development Envelope. Existing land uses include pastoralism, mineral exploration and traditional land uses. There are existing mining operations and associated infrastructure, e.g., railways, within the Proposal's vicinity. The closest mines, both in care and maintenance, are the Atlas Iron Mt Dove Iron Ore Mine, 8 km south of Hemi, and the Indee Gold Mine, 25 km to the west.

Several sand mining operations are located in and adjacent to the Turner River downstream of the Proposal's surplus water outfall, with the closest being 9 km downstream. These mining operations involve the extraction of sand from the riverbed during no flow conditions. As the Proposal's discharge of surplus water will temporarily influence the river's no flow conditions, De Grey has engaged with the operators closest to the Proposal.

Existing exploration and pastoral disturbance of around 700 ha at the Proposal includes laydown areas, access roads and tracks; core yards; drill pads and sumps. The exploration disturbance is authorised and managed via Programs of Work (PoWs) issued by DEMIRS in accordance with the *Mining Act 1978* (Mining Act). This disturbance will either be rehabilitated in accordance with approval conditions or used for the proposed mining operation.

The following activities do not form part of the scope of the Proposal that was referred to the EPA:

- Existing, ongoing and future exploration activities and support infrastructure;
- Resource definition drilling;
- Feasibility-related studies including but not limited to ongoing testwork, geotechnical and geophysical assessments, water monitoring and management trials/activities;
- Heritage, environmental and geotechnical surveys; and
- Any associated rehabilitation.

Pastoral activities will continue to occur in the area.

2.6 Proposed Infrastructure and Development Envelope

An indicative site layout is presented in Figure 2-1. The outcomes of environmental investigations and consultation with the Kariyarra People undertaken during the Proposal's prefeasibility study have resulted in the following areas being excluded from the Proposal's Development Envelope (Figure 2-2):

- The Yule River, YRWR and associated Reserve 33015.
- Critical fauna habitat in and adjacent to the Yule River.
- Critical fauna habitat associated with the Rocky Outcrop habitat type.
- Critical fauna habitat associated with the Sand Dune habitat-type.
- Gregory Land System Priority Ecological Community (PEC) sand dune and associated heritage site.

The following areas are inside the Development Envelope, but infrastructure has been designed to avoid significant impacts, where reasonably practicable, as follows:

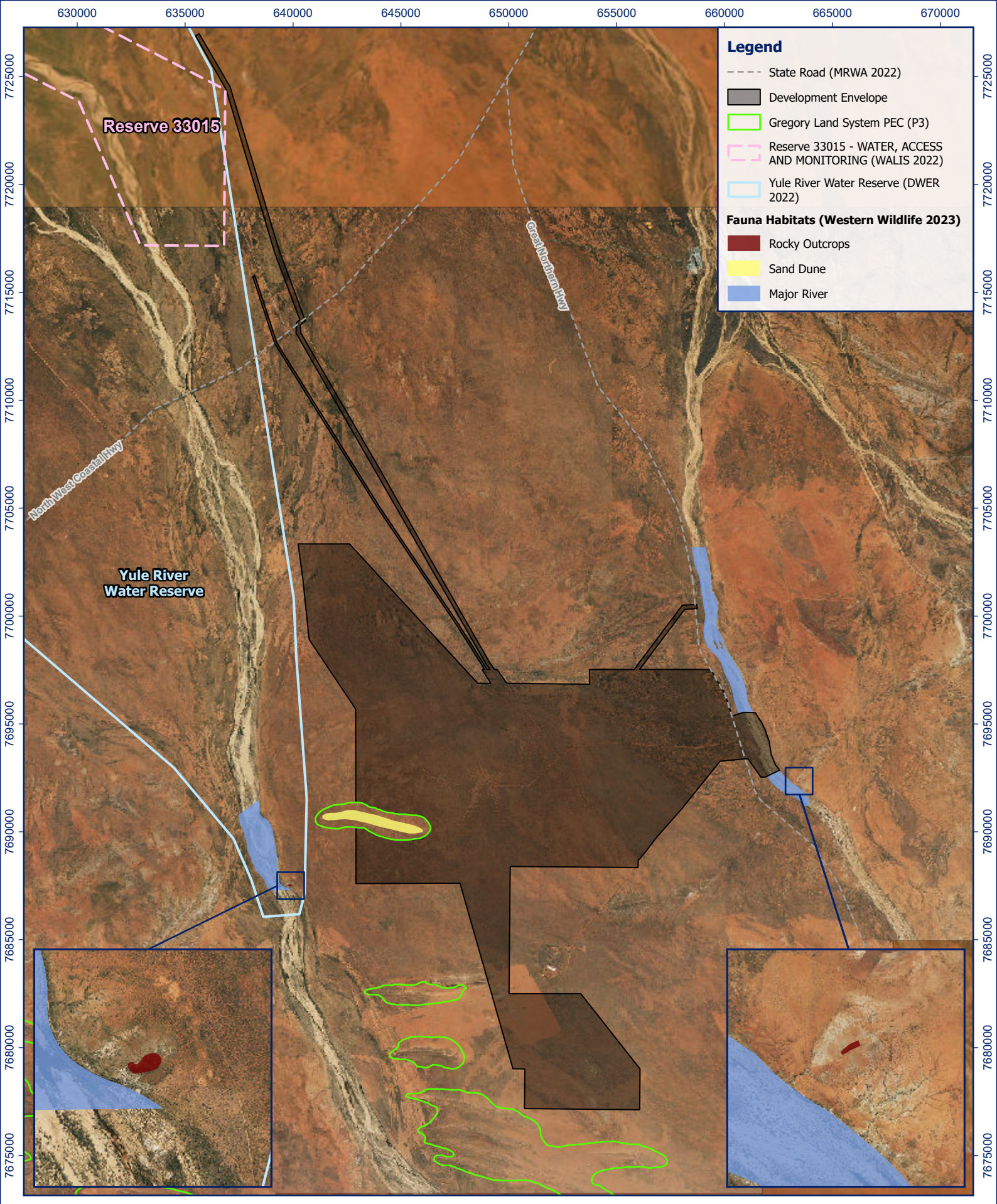
- Critical fauna habitat[1] along the Turner River, with an upper clearing limit of 10 ha (of 797 ha mapped in the Turner River and 1,231 ha mapped in the Yule and Turner Rivers, or less than 0.5% of the mapped extent of the Major River habitats of the Yule and Turner Rivers) for the surplus water outfall.
- Critical Northern Quoll habitat[1] within 1 km of Turner River, with direct disturbance limited to 41 ha (or less than 1% of 2,446 ha mapped near the Turner River and 3,002 ha mapped near the Yule and Turner Rivers) for the surplus water pipeline and access road.
- Critical Greater Bilby habitat across the Development Envelope, with an upper clearing limit of 800 ha for Sandplain Drainage habitat (of 9,349.5 ha mapped) and 5,100 ha of Spinifex Sandplain (of 22,718.6 ha mapped) for mine infrastructure.

[1] As defined in relevant federal government guidance, see Section 10.3. These habitats exist either side of the Turner River along its 200+ km length.

Disturbance to the common and widespread Spinifex Sandplain and Sandplain Drainage habitats, considered critical habitat for the Greater Bilby, has been minimised with avoidance of areas where secondary signs of the Greater Bilby have previously been recorded. These habitat types are regionally common, representing 32,068 ha or ~92% of the 34,688 ha fauna survey area. This level of abundance is congruent with the cumulative impact assessment where an estimated 2 million hectares of Greater Bilby habitat were identified within 100 km of the Proposal and an estimated 14 million hectares in the IBRA region. Additional detail and context on the species and habitats present are provided in Section 10 and potential cumulative impacts to species and habitats are assessed in Section 18.6.

Other aspects considered in the optimisation of the Proposal design include:

- The TSF has been located in a nonmineralised area to avoid resource sterilisation and the possible need to excavate and move deposited tailings in future.
- WRLs have been located outside of the zone of geotechnical instability of the proposed pits.
- Maintenance of access to the sand dune for the Kariyarra People which is considered to hold cultural value.



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Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Development Envelope Exclusions

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Figure 2-2	ADV-AU-00673	November 2024

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2.7 Mining Operations

De Grey proposes to mine six open pits at Hemi. These are the Aquila, Brolga, Crow, Diucon, Eagle and Falcon pits (Figure 2-1). These will start as discrete pits, however, will form two separate voids at the end of mining.

The mining operations will require approval under the Mining Act with the mine plan will be based on:

- Detailed geotechnical studies and assessment in accordance with regulatory and industry standards for wall and bench configurations to prioritise pit stability and safe operations. General design parameters are provided in Table 2-3, however these will vary depending on factors such as pit wall lithology and groundwater inflows.
- Optimisation of net present value – the sequence of mining ore and waste from the various open pits initially targets those deposits that provide the most financially advantageous outcome.

Table 2-3: General Pit Design Parameters

Material	Bench Height (m)	Batter Angle (°)	Berm Width (m)	Inter-ramp Angle (°)
Transported	10	70	5.5	47.5
Paleochannel	10	35	5	27.5
Saprolite	10	70	8	40.5
Transitional	10	52 - 85	4 - 7	40 - 52
Fresh	20	70 - 85	8.0 - 8.5	52.5 - 63

2.8 Mine Dewatering and Groundwater Reinjection

Mining at Hemi will be conducted below the water table where mine dewatering is required for safe operations. Abstraction and reinjection activities will commence approximately 24 months prior to the operation of the processing plant and approximately 12 – 15 months prior to mining to lower the alluvial aquifers in the vicinity of the Hemi deposits. Mine dewatering will continue for the duration of the Proposal. The detailed hydrogeological modelling assessment includes a conceptual water balance for the model's domain, which estimates that it has a long-term average inflow and outflow rate of 8.65 GL/year. Chart 2-1 shows the expected groundwater abstraction yearly over the Proposal lifetime.

De Grey's approach to the management of mine dewatering has been developed in accordance with the Department of Water and Environmental Regulation's (DWER) policy on the use of mine dewatering surplus (DWER, 2020c). The following hierarchy has generally been adopted:

- Mitigation of environmental impacts – used for dust suppression.
- Support fit-for-purpose on-site activities – used mainly in the ore processing plant when this becomes operational in year three of the Proposal, but also for construction activities, potable water, camp and other low-volume activities.
- Transfer of water to local third parties – consultation is in progress with interested parties.
- Reinjection into the upper and lower alluvium/palaeochannel aquifers – reinjection borefields will be located north and south of the mining infrastructure.
- Controlled release into designated watercourse - surplus water of an acceptable quality to be released into the Turner River.

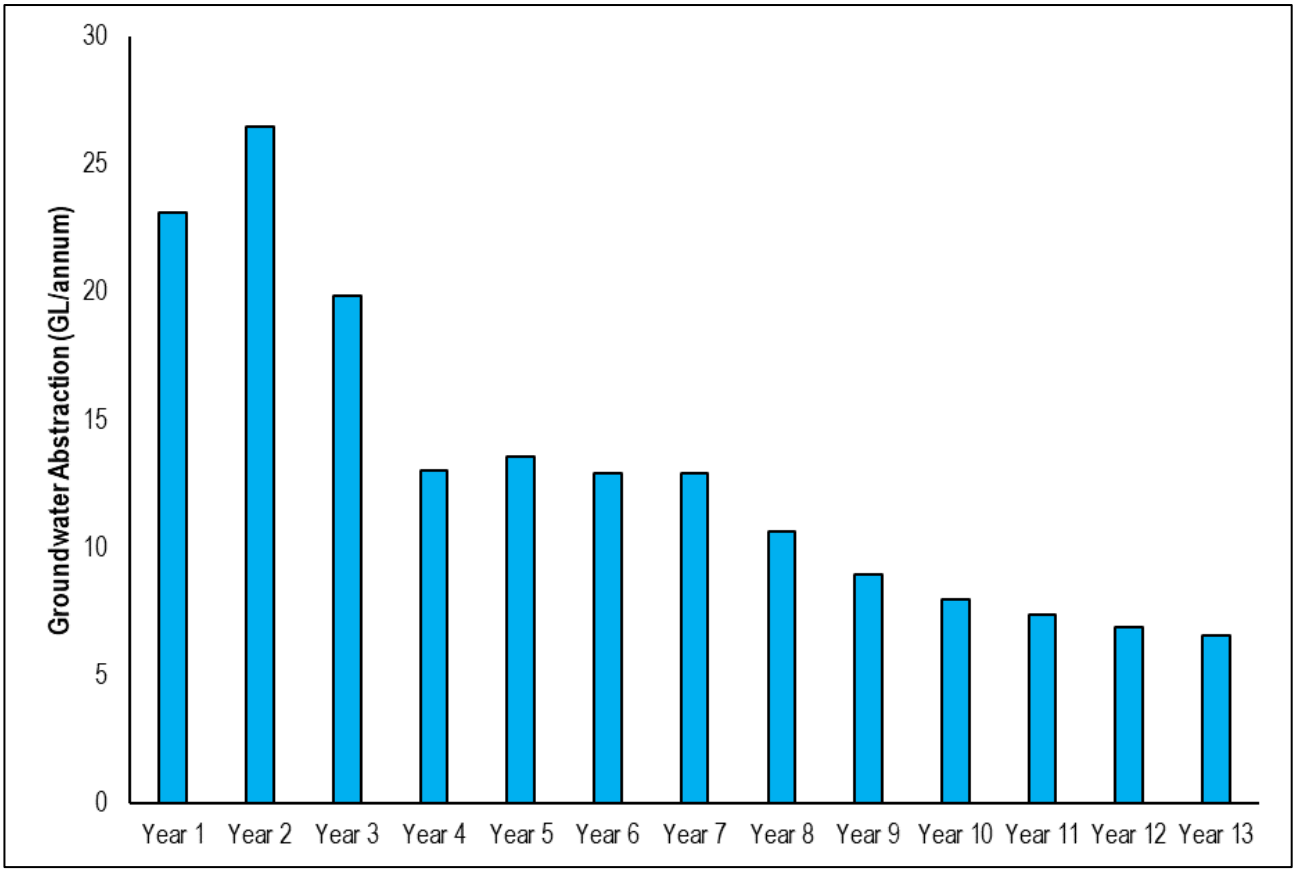


Chart 2-1: Expected Annual Groundwater Abstraction

Modelled abstraction rates are up to 30 GL/year for the first three years of dewatering. De Grey proposes to reinject approximately 50% of the abstracted water during this period back into the aquifer upstream and downstream of the pits. After three years, dewatering abstraction rates decline to approximately 13 GL/year and are less than 10 GL/year from year 9. Reinjection volumes decline as abstraction declines. The model predicts a decrease in the alluvial aquifer's volume by approximately 7% upon completion of abstraction.

2.8.1 Dewatering and Reinjection System

The groundwater system at Hemi is considered amenable to dewatering by borefield systems, with some additional abstraction occurring from in-pit floor sumps. The dewatering system has been designed to manage large volumes of dewatering required from the alluvial aquifers (upper and lower alluvium/palaeochannel) and to manage water quality challenges posed by the existing naturally-elevated arsenic levels in the water that interacts with the orebody.

The Proposal addresses this challenge by distinguishing two dewatering discharge stream types, primarily related to concentrations of arsenic and other trace metals. This is further explained in Section 8.3.2.

2.8.2 Production Bores

Groundwater will be abstracted from a network of approximately 122 production bores. Most bores will be located outside the planned pits (ex-pit), with some bores located in-pit. The borefield has been designed with pairs of deep and shallow abstraction bores in locations to manage distinct water quality encountered through different depths. This arrangement will allow better separation of groundwater based on quality content at these locations.

Individual bore yields and water quality characteristics will be confirmed as bores are drilled, developed, and pump tested and sampled for water quality.

2.8.3 Reinjection Bores

Two reinjection borefields are proposed – Reinjection Borefield North (RBN) and Reinjection Borefield South (RBS) (Figure 2-3). Reinjection bores will target the thickest and most permeable sections of the upper and lower alluvium/palaeochannel aquifers, focusing on locations that will also minimise drawdown extension towards identified environmental values.

Particle tracking analysis of the RBS completed for 200 years, along with modelling of dewatering drawdown, has identified that some reinjected water is expected to recirculate through the aquifer and return to the pits within the life of the Proposal. However, the southernmost bores within the RBS may take a longer period to return water to the pits due to the distance and flow velocities. In the RBN, most reinjected water is expected to follow natural flow paths away from the pits, though some bores, located in the southernmost portion of the RBN, may recirculate back to the pits. Up to 50% of water abstracted will be reinjected.

2.8.4 Surplus Water Discharge to the Turner River

The proposed location of the Turner River outfall is shown in Figure 2-3. The outfall will be designed to ensure impacts to the Turner River are as low as reasonably practicable. The design is being undertaken in consultation with the Traditional Owners. Discharge will be managed in accordance with the water quality requirements as per the Environmental Management Plan (EMP) (Appendix 1).

The Proposal is estimated to discharge up to 10 GL/year of surplus water into the Turner River for the first three years of dewatering. Once the processing plant is commissioned and ramped up to nameplate capacity, the utilisation of abstracted groundwater in the processing will reduce discharge into the Turner River (initially up to 60%, gradually increasing to 80 - 100% until the end of the Proposal). Intermittent discharge of up to 4 GL/year may occur in years 4 to 6, and up to 2 GL/year is expected from year 7 until the end of the Proposal. Predicted discharge volumes are shown in Chart 2-1. These may vary depending on unscheduled shut-downs and significant rainfall events.

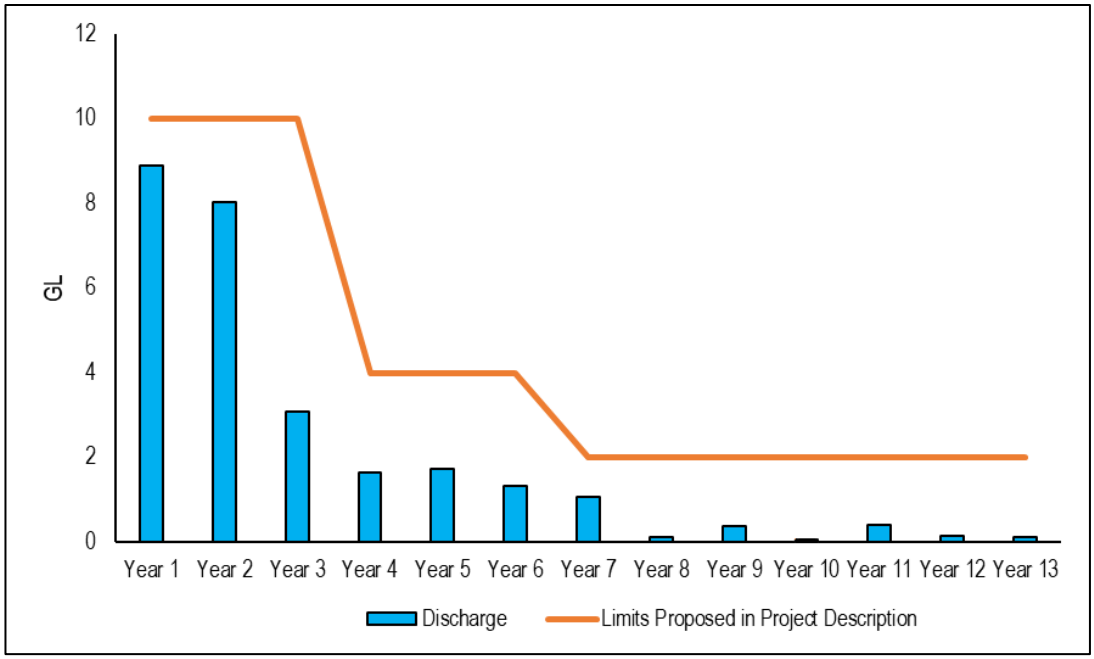


Chart 2-2: Base Case dewatering and Proposal Water Balance Rates

De Grey is also exploring opportunities to export surplus water to third parties for pastoral, commercial or mining use. Any commitment to a third-party offtake arrangement will be determined according to their requirements. Before any water is supplied, De Grey will monitor the aquifer's response to the dewatering against the hydrological modelling estimate to ensure that any contracted offtake quantities can be supplied for the period of the contract.

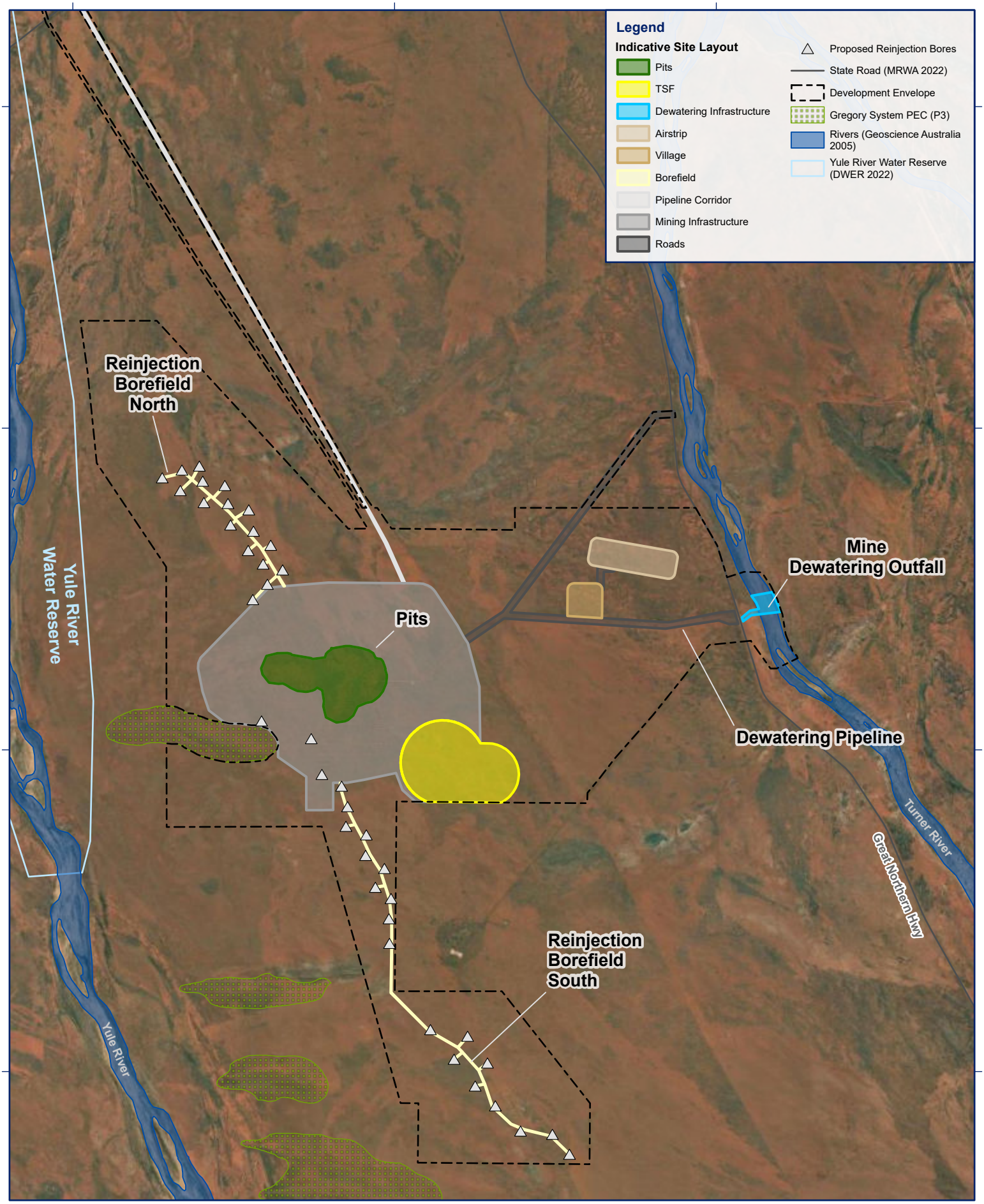
Detailed hydrogeological modelling indicates that drawdown and mounding will not impact the Yule River, including culturally significant pools or potential groundwater dependent vegetation (GDV). The model also indicates that a drawdown of less than 2m will extend to the YRWR area after year 9. Although no impacts are expected on the Yule River bore field, De Grey is committed to implementing an EMP to follow the drawdown advancement and to implement actions to avoid extension of the drawdown to that area.

De Grey will deepen or replace three pastoral bores that may be impacted by drawdown and observe two others that may be affected. It is unlikely that this action will cause a significant impact to the Atlas Iron borefield (currently in care and maintenance). Additional detail is provided in Section 8.

The annual abstraction and discharge rate is such that De Grey will apply for a Works Approval and an Environmental Licence under Part V of the EP Act, which will authorise the abstraction and subsequent surplus water discharge to the Turner River and reinjection into the upper and lower alluvium/palaeochannel aquifers (see Section 4.3.2).

The hydrogeology of the Proposal is described in Section 8.3.1 together with additional detail on the proposed dewatering strategy. The groundwater model was prepared by Geowater Consulting Pty Ltd (Geowater). The groundwater assessment report, prepared by Geowater is included as Appendix 2.

A peer review of the groundwater model has been undertaken by Jurassic Groundwater and is included in Appendix 3.



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Projection: GDA2020 MGA Zone 50
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Indicative Mine Dewatering Infrastructure

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Figure 2-3	ADV-AU-00673	November 2024

2.9 Waste Rock Landforms

Mine waste will be deposited into external Waste Rock Landforms (WRLs). Benign waste material will also be used as construction material for the TSF outer embankments, the base of the Run of Mine (ROM) pad, abandonment bunds, other hardstands, roadbase and to line drains where required. The WRLs have been located outside of zone of geotechnical instability of the open pits, but as close as reasonably practicable to minimise haulage distances and associated greenhouse gas emissions. At this stage of feasibility planning, backfilling of mine waste into pits is not reasonably practicable due to scheduling constraints and mineralisation being open at depth. Should the option become feasible, De Grey would seek appropriate approvals from DEMIRS, if required.

Waste characterisation studies for the Proposal completed by SRK Consulting (Australasia) Pty Ltd (SRK) show that most of the waste at Hemi does not pose a risk of acid and metalliferous drainage (AMD) and only a small proportion (~5%) of samples were potentially acid forming (PAF). Approximately 20% of the nonacid forming (NAF) samples had a sufficient sulfide content to pose a potential neutral or saline mine drainage risk.

Kinetic leach column tests were conducted on 15 waste rock samples. The objectives of the kinetic testing are to measure: the rate of sulfide oxidation; the concurrent rate of acid neutralisation; and solute release rates. The results indicate that leachates are circum-neutral, and concentrations of trace metals are typically low or below detection limits.

Waste lithologies with saline, neutral or acidic mine drainage risk will be encapsulated into specifically designed cells within waste rock landforms to limit exposure to oxygen and water required for AMD reactions to proceed. Measures to manage mine waste will be detailed in the Mining Proposal (MP) and MCP, required for the Proposal under the Mining Act, and will be assessed by DEMIRS.Further detail on waste characterisation studies (including assessment reports) was presented in Section 13 of the original Referral Supporting Document (RSD) submitted to the EPA on 8 June 2024.

While the Proposal's landforms will be visible from some locations, their design is such that they are in keeping with existing landforms. As such, De Grey considers that the visual impact of the Proposal will not be significant.

2.10 Low-grade Stockpiles

Lowgrade ore, that is less economical to process during the initial years of the Proposal's operation, will be placed into separate low-grade stockpiles (LG stockpiles). The LG stockpiles are scheduled to be processed after high-grade stocks are exhausted or when excess plant capacity allows processing. The management of these stockpiles will be detailed in the MP. In the unlikely event that this ore is not processed, the MCP will detail how the stockpiles will be rehabilitated, typically as though they were WRLs. Ongoing waste characterisation studies suggest that the lowgrade ore has a higher sulfide content than the waste rock and may present a risk of saline drainage or neutral metalliferous drainage (NMD) if not managed appropriately.

2.11 Processing

The Hemi deposit can be classified as semi refractory ore that requires a pre-treatment oxidation stage before the gold can be extracted using standard leaching processes. A comparison of the technologies available to provide this pre-treatment was undertaken (see Section 3.2), with pressure oxidation (POx) presenting the best option. Although POx is not a new process and is a wellproven- technology[2], there are no POx gold plants currently operating in Australia[3]. Rather than choosing to haul extracted ore or concentrates to Port Hedland for export and processing at an established POx plant in Papua New Guinea, China, the Philippines or Namibia, De Grey has chosen to process the gold ore on site. This provides several benefits, including reduction in scope 3 greenhouse gas emissions, and health and safety risks associated with road haulage.

A 10 million tonne per annum processing plant will be constructed to produce gold doré from gold-bearing ore. The process will consist of:

- A two-stage crushing circuit, followed by high pressure grinding rolls and grinding in a ball mill to reduce ore particle size.
- A gravity gold leaching circuit.
- A flotation circuit that separates out sulfide-bearing material into a flotation concentrate.
- A pressure oxidation (POx) circuit that oxidises the sulfides in the flotation concentrate and converts ore into a form amenable to carboninleach processing.
- A carboninleach circuit that treats concentrate from the POx circuit as well as flotation tailings.
- An electrowinning circuit.
- A refining furnace that produces gold doré.

Tailings will be passed through a thickener to recover process water and then pumped as a slurry to the TSF. A process flowsheet is provided in Figure 2-4. The proposed location of the processing plant is shown in Figure 2-1. The process selection was based on economic, technical, and environmental, considerations and was supported by metallurgical testwork and financial evaluation.

As part of the Proposal, De Grey may construct a secondary crushing station as mining progresses and haulage distances increase. Crushed ore will most likely be transported by conveyor to the processing plant. This arrangement is likely to reduce diesel consumption associated with haulage in the later stages of the Proposal.

Visual impacts associated with industrial infrastructure (such as the processing plant POx stack and vapour release) are expected to be insignificant given their limited height and scale when compared to the surrounding mine waste landforms and natural terrain. Processing and beneficiation of mineral ore is a prescribed activity under the *Environmental Protection Regulations 1987* and De Grey will apply for a Works Approval and Environmental Licence under Part V of the EP Act to construct, commission and operate the processing plant.

[2] De Grey identified 18 POx gold plants in nine countries constructed since 1985 when assessing the most viable processing technology.
[3] A POx gold plant at the Hillgrove Mine in New South Wales is in care and maintenance.

2.12 Tailings Storage

Tailings at Hemi are proposed to be stored in an Integrated Waste Landform (IWL), hereafter referred to as the TSF. The TSF is proposed to be a single landform, likely to consist of two cells which will be constructed together or in a staged manner. The embankments will be lifted as tailings deposition progresses to accommodate approximately 130 million tonnes of tailings. A design plan is provided in Figure 2-5 and a cross section through the embankments in Figure 2-6.

CMW Geosciences' geotechnical engineer designed the TSF in accordance with Australian National Committee on Large Dams (ANCOLD) requirements and the design report is included as Appendix 4. Land and Marine Geological Services Pty Ltd has provided peer review to CMW. A third-party review report will be supplied as part of the MP submission.

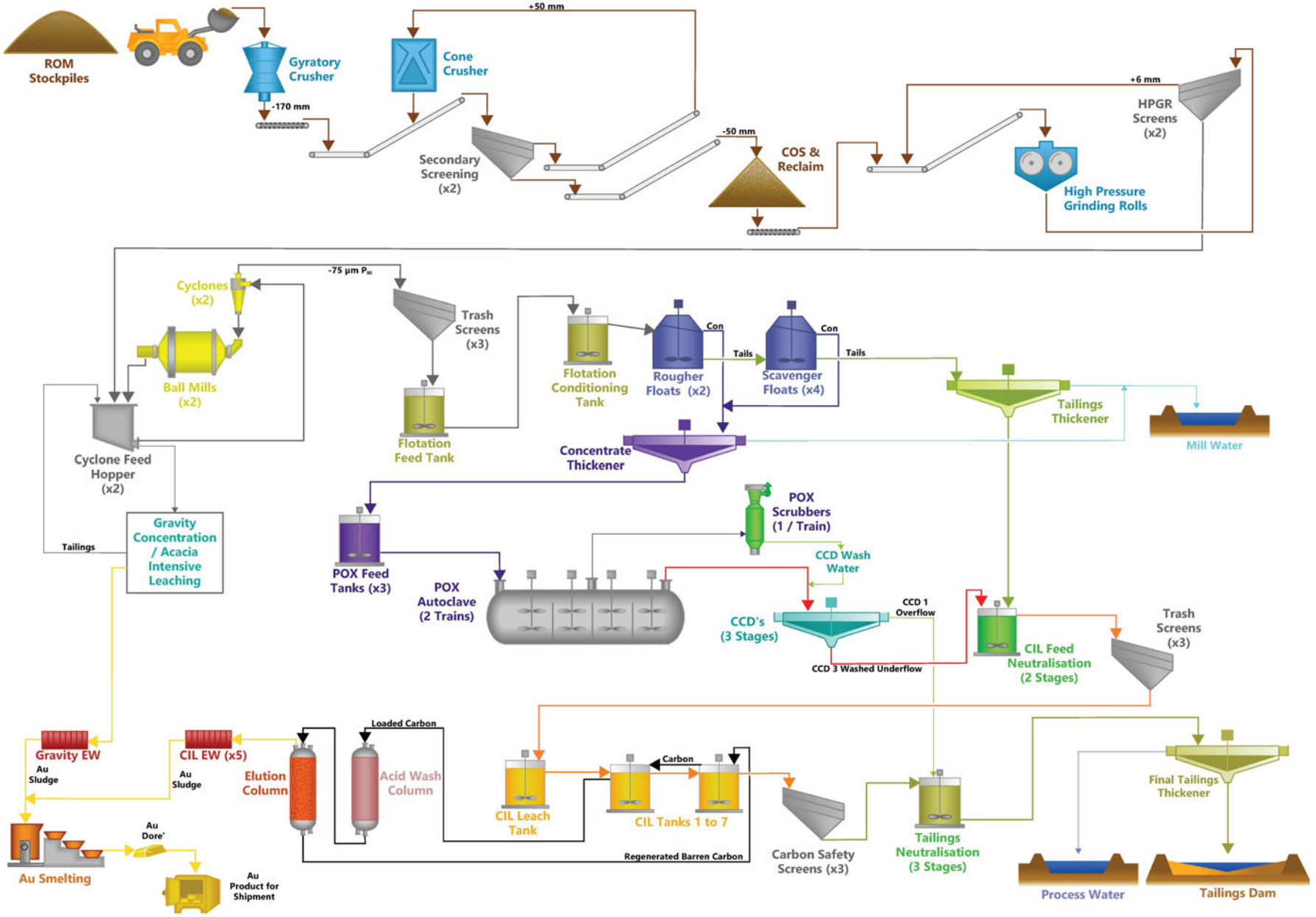
Embankments are to be constructed out of mine waste with a low permeability upstream zone of clayey mine waste materials. The floor of the TSF is currently proposed to consist of:

- A 0.5 m compacted clay liner placed in a 300 m radius of the central decants, with a permeability $<10^{-8}$ m/s.
- A 0.5 m compacted clay liner placed over stony ground in the northwest of the TSF, with a permeability $<10^{-8}$ m/s.
- In-situ material compacted to 0.3 m, with a permeability of $<10^{-8}$ m/s over the remainder of the TSF floor.

Tailings will be deposited sub-aerially via spigots and beached towards central decants. Measures to reduce seepage from the TSF include:

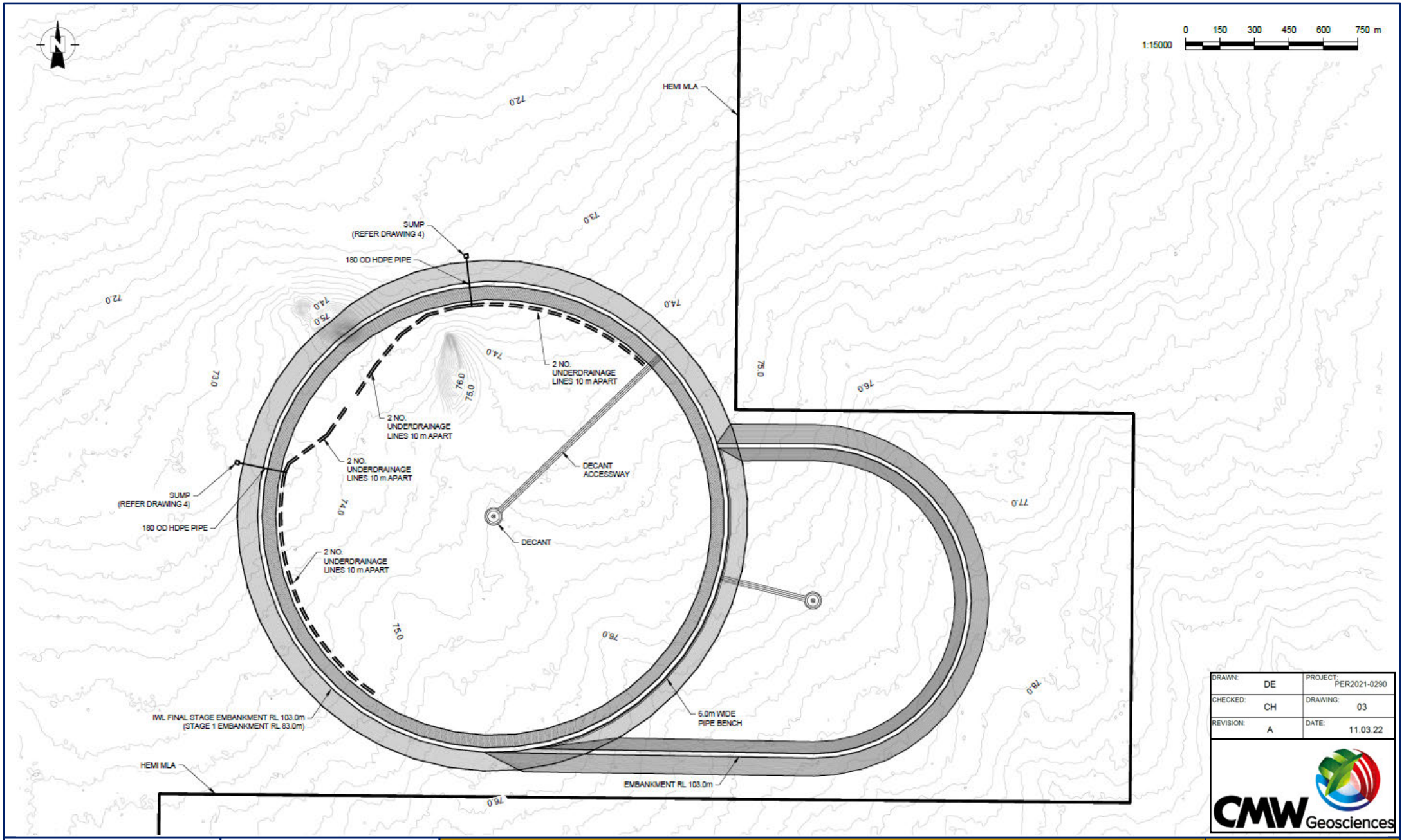
- Compacted foundation.
- 0.5 m thick compacted clay liner 300 m around central decant.
- Treatment of tailings through a thickener to reduce water outputs to the TSF.
- Collection of surface water from central decant for reuse in the processing plant.
- Collection of water from base of tailings via an underdrainage system for reuse in the processing plant.
- Construction of cut-off trench at the base of embankments to limit lateral movement of seepage.
- Installation of embankment piezometers to monitor the phreatic surface.
- Operation in conformance with a TSF Operating Strategy.

Tailings characterisation for the Proposal has been undertaken by SRK (2022). Tailings are non acid-forming and decant water quality is expected to be alkaline (pH 9) and brackish (ca. 3,700 µS/cm). Analysis of cyanide, metals and metalloids present in tailings leachate and supernatant has been undertaken as part of materials characterisation studies. De Grey proposes to treat the return decant water with Caros Acid to remove cyanide so as to not impact the flotation process. This will effectively limit the concentration of cyanide in recycled return water within the processing circuit and within the tailing's slurry deposited in the TSF. The materials characterisation report is included as Appendix 5.



PROJECT		CLIENT
November 2024	Hemi Gold Project - Referral Supporting Document	DE GREY MINING LTD
Figure 2-4		
ADV-AU-00673	Process Flow Sheet	

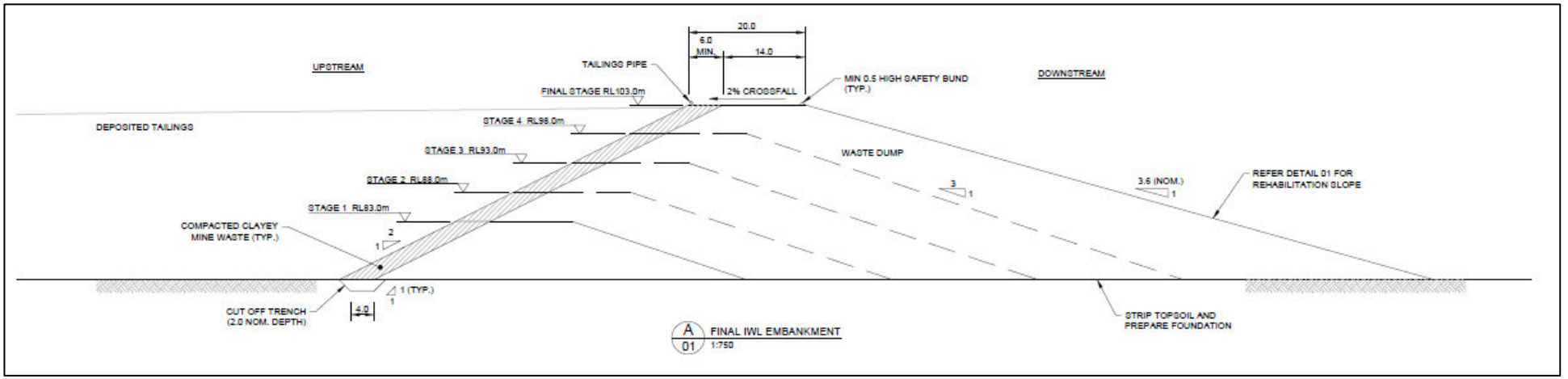
RPMGLOBAL



PROJECT		CLIENT
November 2024	Hemi Gold Project - Referral Supporting Document	DE GREY MINING LTD
Figure 2-5		
ADV-AU-00673	Indicative TSF Design Plan	

RPMGLOBAL

Figure 2-6: Cross Section of Indicative TSF Embankment



Source: (CMW, 2022)

Under the Mining Act, De Grey must operate the TSF in accordance with an approved TSF Operating Strategy and a certified tailings engineer must periodically (usually once per year) inspect and certify that the facility has been constructed and is being operated in accordance with its approved design.

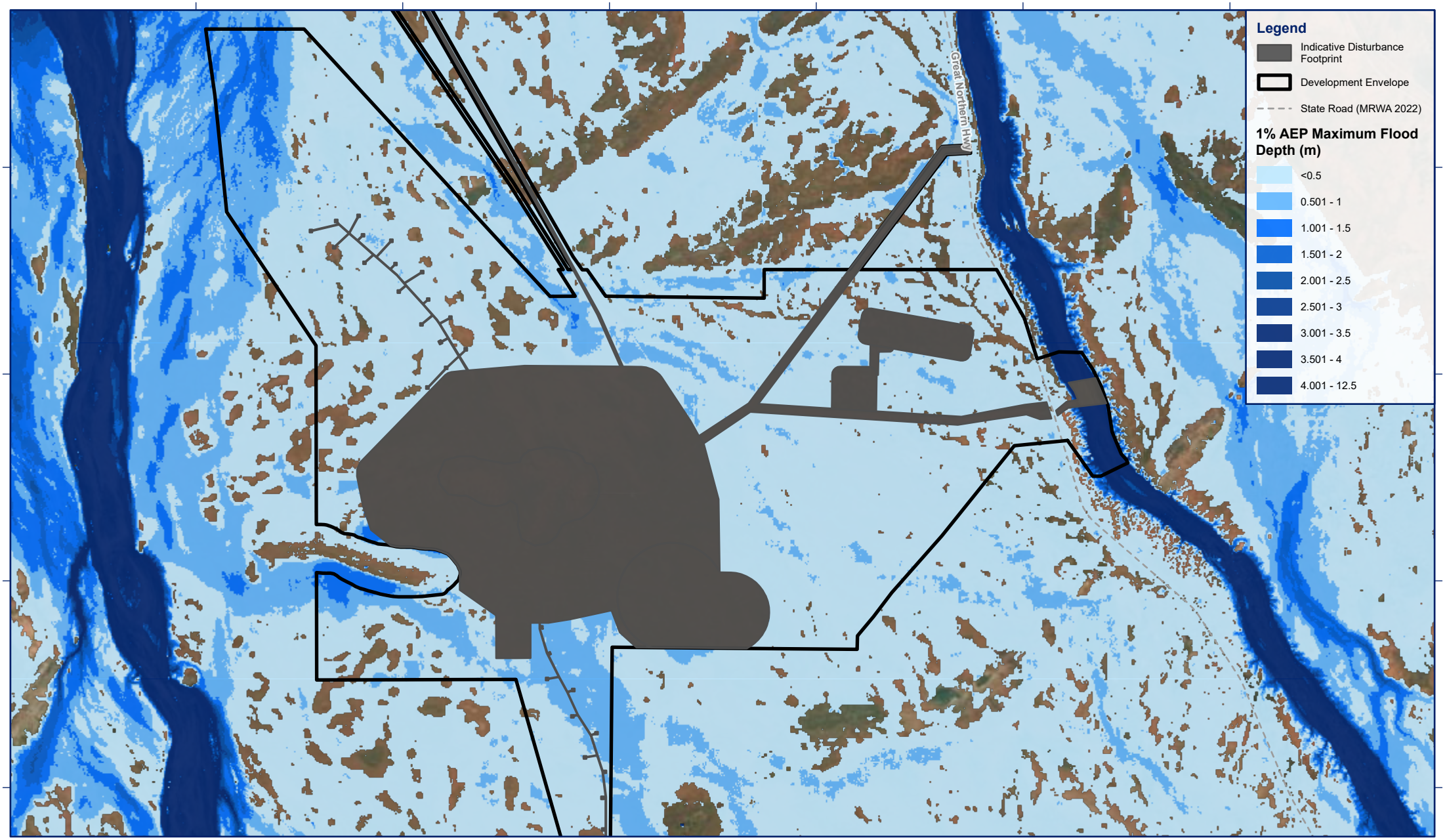
De Grey's application for a Works Approval and Environmental Licence under Part V of the EP Act will include the construction, commissioning and operation of the TSF, as well as tailings and water return pipelines. De Grey will comply with any environmental monitoring requirements which form part of the Part V Licence.

2.13 Surface Water Management

Flood modelling for the Proposal, based on Yule and Turner River catchment areas, was undertaken by Surface Water Solutions and Geowater in July 2022 (Geowater, 2023b) and closure flood modelling and surplus water discharge modelling by Surface Water Solutions in November 2022 (SWS, 2022b). The reports are included as Appendix 2 and Appendix 6 respectively. Further detail on hydrology is provided in Section 8.

The predicted 1% annual exceedance probability (AEP) flood depths are shown in Figure 2-7. These are considered conservative as it is unlikely that maximum floods will occur in the Yule and Turner Rivers concurrently as the catchments are separate and large. Large flows in the Yule and Turner Rivers are not expected to cause flooding at the Proposal; however, shallow sheet flow with low velocities generated by rainfall is expected in a 1% AEP event within the Development Envelope. The average flow velocity of 0.4 m/s is less than the 2 m/s threshold typically adopted for the provision of rock armour protection. Surface flows from within the Development Envelopes catchment is unlikely to impact upon the Turner or Yule Rivers.

De Grey will construct surface water management infrastructure and will rock armour the toes of landforms to prevent erosion where flood modelling indicates erosion to the landform due to surface water flow is likely. These industry standard measures will be detailed in the Proposal's MP and MCP.



Projection: GDA2020 MGA Zone 50
Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Updated/Reviewed by: KM/EL

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N

Scale: 1:120,000

0 1 2 4 km

PROJECT		CLIENT
November 2024	Hemi Gold Project - Referral Supporting Document	DE GREY MINING LTD
Figure 2-7		
ADV-AU-00673	Predicted 1% AEP Flood Depths at Closure	

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2.14 Power Supply

Operation of the processing plant and support infrastructure requires electrical power. Power will be purchased under a power purchase agreement (PPA) from a power provider to the North West Interconnected System (NWIS), no onsite gas fired power generation will occur.

[redacted]

The mine fleet will initially operate on diesel which will be trucked to site and stored in tanks in accordance with Australian Standards. Mobile diesel generators will also be used to power some electrical equipment where construction of powerlines is not practicable. Electric mine vehicle technology is still being developed and is currently not commercially available. De Grey expects this technology to become available during the Proposal life.

2.15 Airstrip

The Proposal will be a fly-in fly-out (FIFO) operation comprised of both fly-in, fly-out and residential workers. The majority of personnel will be transported to site by plane.

A sealed airstrip, with capacity for jet aircraft having approximately 100 seats, will be constructed at the Proposal in accordance with Civil Aviation Safety Authority (CASA) standards. The proposed location is shown in Figure 2-1. The use of nearby third-party airstrips is also being considered.

2.16 Accommodation Village

De Grey will construct an accommodation village designed to accommodate the required workforce. This will be designed to contemporary standards and relevant health and safety requirements. The accommodation village will include rooms, messing facilities, recreational and social facilities. The accommodation village has been located away from the mining operation and processing facilities to ensure personnel are not exposed to industrial noise at night and air and dust pollution is minimised. The proposed location is shown in Figure 2-1.

Potable water for the village will be sourced from dewatering bores and treated to meet the health requirements in the Australian Drinking Water Guidelines (NHMRC, 2011). Wastewater will be treated and disposed of in an irrigation area. De Grey will apply for all the necessary health and building permits from the Town of Port Hedland for the kitchen and wastewater facilities.

Wastewater treatment is a prescribed activity under the *Environmental Protection Regulations 1987* and De Grey will construct, commission and operate any wastewater treatment in accordance with a Works Approval and Environmental Licence from DWER.

Overflow accommodation is commercially available in Port Hedland and will be utilised if required. Existing camps owned and operated by De Grey as well as other third parties, may also be utilised as required. A portion of the workforce may also live locally.

2.17 Other Infrastructure

Other infrastructure required to support the mining operation includes, but is not limited to:

- Workshops.
- Administration buildings.
- Washdown facilities.
- Bioremediation facilities.
- Communication facilities.
- Borrow pits.
- Laydown areas.
- Landfill and waste management facilities.
- Monitoring bores.
- Haul and access roads.
- Pipeline and powerline corridors.
- Water storage ponds.
- Topsoil stockpiles.
- Explosives magazine and ammonium nitrate emulsion (ANE) compound.
- Gatehouse and security.

2.18 Mine Closure

Under the Mining Act, an approved MCP, prepared in accordance with the Statutory Guidelines for Mine Closure Plans (DMIRS, 2020), is required before the Proposal can proceed. A revised MCP must be submitted every three years or whenever a significant change to approved operations occurs. Revised MCPs must demonstrate that the site is working towards closure and addressing any gaps and commitments in the previous plan.

De Grey has developed a Conceptual MCP (Appendix 7) for the Proposal that details how the Proposal will be rehabilitated to an acceptable and agreed post-mining land use. This will include:

- Decommissioning and removal of unwanted infrastructure such as buildings, pipelines and the processing plant.
- Closure earthworks to ensure that mine landforms are safe, stable and non-polluting.
- Identification and removal of any residual contamination.
- Respreading of topsoil and revegetation with native species representative of the area to the extent feasible and informed by trials and research undertaken during the life of mine.
- Construction of abandonment bunds around pits.
- Construction of permanent surface water management infrastructure.
- The outcomes of stakeholder engagement and associated agreed post-mining land uses.

Closure criteria and monitoring requirements will also be specified in the MCP and monitoring must demonstrate that these are either achieved or sustainably progressing towards achievement before a mining tenement can be relinquished. Any infrastructure such as bores and roads that stakeholders want to retain must be legally transferred.

Identification of post-closure land uses is a critical collaborative process in mine closure. De Grey will maintain its ongoing engagement with Traditional Owners, pastoral leaseholders and other stakeholders throughout the Proposal to agree on the post-closure objectives and land uses.

2.19 Excluded Activities

The following activities do not form part of the scope of the Proposal under assessment by the EPA:

- Existing, ongoing and future exploration activities and support infrastructure.
- Resource definition drilling.
- Feasibility-related studies, including but not limited to, ongoing testwork, geotechnical and geophysical assessments, water monitoring and management trials/activities.
- Heritage, environmental and geotechnical surveys.
- Any associated rehabilitation.

3. PROPOSAL ALTERNATIVES

3.1 Production of Concentrate Instead of Gold Doré

As there is no operating gold POx plant in Australia that could process the Hemi gold ore, De Grey considered production of a gold ore concentrate instead of gold doré. The gold ore concentrate could be shipped to suitable processing plants in Papua New Guinea, China, the Philippines, Namibia, or Eastern Europe. The advantages of this option include reduced capital and closure costs; reduced power requirements for processing; and fewer chemical reagents needed for processing. This option would also significantly reduce scope 1 and scope 2 emissions from Hemi and assist with state and federal greenhouse gas (GHG) obligations.

This was rejected due to several factors, primarily associated with Proposal economics and GHG emissions. Regarding the latter, while GHG emissions and chemical use would be decreased at Hemi, actual emissions and chemical use associated with the Proposal may increase if the concentrate is refined using less efficient methods overseas. Emissions associated with the transport of concentrate are also higher than those associated with the transport of gold doré.

3.2 Processing Method

Gold ore at Hemi is classified as semi refractory, meaning that a portion of the gold is locked up in the atomic lattice (or in solid solution) of sulfide minerals. These sulfide minerals can be readily recovered via flotation into a concentrate which releases any associated gold when subjected to oxidisation. Oxidation allows the released gold to be recovered via conventional carbon-in-leach (CIL) processing. Thus, the processing method must include oxidisation, and measures to avoid acidic tailings and bioavailable arsenic arising from the natural occurrence of sulfur and arsenic in the ore.

De Grey considered three methods for processing the semi refractory ore from the Hemi deposits:

- Pressure oxidation (POx) which converts goldbearing ore into a form amenable to standard CIL processes.
- Ultrafine grinding plus atmospheric oxidation.
- Bacterial (or biological) oxidation.

Although all three options have a demonstrated technical ability to oxidise the sulfide material concentrate and achieve high gold recovery, POx provided the lowest capital and operating costs as well as additional environmental benefits, relative to the next best option, including:

- 20% lower energy consumption.
- 25% lower chemical use.
- 25% lower GHG emissions.
- Arsenic is converted to an insoluble, stable arsenate form.
- Following oxidation of sulfides to sulfuric acid, the slurry is neutralised with lime. This means the POx process removes acidity from the tailings and renders them nonacid forming.

3.3 Discharge of Surplus Water to the Yule River

De Grey originally considered disposing a portion of the surplus water into the Yule River. This option was ultimately rejected as:

- The YRWR is important to Port Hedland's water supply.
- There are permanent groundwater fed pools of Aboriginal cultural heritage significance along the section of the Yule River that would be affected by any discharge.
- Typically, better quality (lower salinity) water is associated with the Yule River compared to the Turner River.
- Aquatic ecology surveys concluded that the Yule River is of higher ecological value than the Turner River.
- The volume of water requiring discharge significantly decreases in the third year of the Proposal, limiting the benefits of using both rivers.
- The Turner River is already subject to sand mining operations where sand from the riverbed is progressively extracted for construction purposes and naturally replaced during flood events. The granting of clearing permits, as recently as 2021, and Mining Proposals for these operations, which permit the clearing of riparian vegetation and some Priority species, without the need of offsetting, indicates that these impacts to the river have been considered manageable.

3.4 Reinjection of Abstracted Groundwater

De Grey during early design works assessed two options for reinjection into the borefield being 30% of total abstracted water or 50% of total abstracted water. It was determined that there were significant design and cost benefits associated with the 30% option including but not limited to:

- Reduced energy use associated with the operation of the reinjection infrastructure.
- The construction and maintenance of ~20 instead of ~40 reinjection bores.
- Lower abstraction requirements due to less water being recirculated back to the pits.

Despite this, the 30% option was rejected as it required more than double the surplus water discharge into the Turner River, which would result in an extended wetting front and a longer temporary disruption to the river's hydroperiod. In addition, the 50% option reduces the cumulative loss of groundwater as more water is returned to the aquifers.

3.5 Power Supply

De Grey considered alternative power supply options including the generation of power on-site using natural gas as the fuel source. The power requirement for the Proposal at the commencement of processing operations is approximately 65 MW.

The Proposal location is suitable for solar power generation, but not amenable to wind turbine power generation based on existing technology and geographical location. An islanded on-site power generation approach without a viable battery storage solution would therefore limit the penetration of renewable power to around 25% to 30%, unless there was a subsequent connection to the NWIS grid.

Despite the aforementioned technical limitations, De Grey has included an area adjacent to the proposed processing plant for solar generation should this be required, due to delays in connection to the NWIS grid at the commencement of the Proposal.

3.6 Infrastructure Corridors

De Grey considered alternative infrastructure corridor routes to connect to existing gas and power supply infrastructure. As these would have created disturbance in the YRWR and included crossings of the Yule River, these alternative routes were rejected and excluded from the Proposal's Development Envelope.

3.7 Workforce Accommodation in Port Hedland

The option of accommodating personnel in Port Hedland rather than in an onsite accommodation village was considered. While this would likely reduce the capital and closure costs of the Proposal and the amount of clearing, De Grey rejected this option due to:

- Road safety concerns associated with a daily 85 km commute to and from Port Hedland.
- Road safety concerns associated with the number of light and heavy vehicles that use the Great Northern Highway.
- Fatigue management and associated safety concerns on the mine site due to the time required for commuting.
- The potential strain to housing availability and support services in Port Hedland.
- Greenhouse gas emissions associated with daily commuting.

3.8 Use of Port Hedland International Airport

De Grey considered using the Port Hedland International Airport (PHIA) as the primary airport instead of constructing an airstrip at the Proposal. This would likely reduce the capital and closure costs of the Proposal as well as the amount of clearing. This option was rejected as:

- Road safety concerns associated with the 85 km commute to and from Port Hedland, particularly when demobilising night shift.
- Fatigue management concerns on shift change days due to the time required for commuting creating additional safety risks for personnel.
- The potential strain to the airport with additional flights and passengers at the Port Hedland airport.
- Productivity loss associated with time spent travelling to and from Port Hedland.
- Benefits associated with a direct route for personnel to access site in the event of restrictions at PHIA.

Notwithstanding, an agreement is in place with PHIA for the use of their facilities in emergencies or when the Proposal's airstrip is unavailable. Under normal circumstances, the bulk of the FIFO workforce will use the Proposal airstrip, with limited use of PHIA by some personnel.

4. LEGISLATIVE CONTEXT

4.1 Environmental Protection Act 1986 Part IV

The EP Act is WA's primary environmental legislation governing environmental protection and impact assessment. Part IV, Division 1 of the EP Act, provides for the referral and assessment of proposals that may significantly affect the environment. The EPA Services division within DWER administers the environmental impact assessment process in accordance with relevant policies and guidelines.

The Proposal was referred to the EPA on 8 June 2023. On 12 October 2023, the EPA determined that the Proposal would be assessed under Part IV of the EP Act. The level of assessment was set at Assessment on Referral Information with additional information and public review. The EPA identified the potential key environmental factors as Inland Waters (Section 8), Flora and Vegetation (Section 9), Terrestrial Fauna (Section 10), Subterranean Fauna (Section 11), Social Surroundings (Section 12), Greenhouse Gas Emissions (Section 13) and Air Quality (Section 14).

This revised referral document has been prepared in accordance with the request for further information and the relevant policies and guidelines to meet the requirements of s40(2)(b) of the EP Act. This document is now published for four weeks, during which time the public is invited to comment. Refer to the **Invitation to make a submission** section at the beginning of this document for guidance on how to make a submission and the closing date for submissions.

After the public review period, the EPA will assess the Proposal through consideration of the documentation, any submissions received, and the Proponent's responses to any submissions received. The EPA also considers applicable policies and guidelines and may seek advice from relevant government agencies. The EPA will then prepare an assessment report recommending whether the Proposal should be approved and, if so, any implementation conditions that should apply. The EPA Assessment Report and Recommendations (EPA Report) will be made public. The EPA Report will be provided to the Minister for the Environment, who will decide whether the Proposal may be implemented and, if so, any implementation conditions and procedures which will apply.

4.2 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the primary Commonwealth environmental legislation protecting Matters of National Environmental Significance (MNES) and is administered by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW).

De Grey referred the Proposed Action to DCCEEW on 15 May 2023. On 15 November 2023, De Grey received formal notification from a delegate of the Minister for the Environment and Water that the Proposed Action is a Controlled Action under section 75 of the EPBC Act, to be assessed by Preliminary Documentation. The relevant Matter (the controlling provision) is 'Listed threatened species and communities' (section 18 and 18A of the EPBC Act) and 'Listed migratory species' (section 20 and 20A).

De Grey did not seek an accreditation of the Part IV EP Act assessment for the purpose of the EPBC Act assessment and approval. Assessment of the Proposed Action by DCCEEW is currently being undertaken (see Section 16 for further information).

4.3 Other State Approvals and Regulation

Provisions in the EP Act (Section 44 (2AA) allow the EPA and the Minister for Environment to consider other statutory decisionmaking processes that may mitigate environmental impacts and ensure that environmental factor objectives are met.

Interim EPA guidance (EPA, 2021c) outlines aspects that the EPA will consider when assessing whether an alternative Decision-Making Authority (DMA) can effectively mitigate the environmental impacts of a proposal. These are:

- The ability of the DMA to consider the impact of the proposal.
- The process that the DMA uses to assess the potential impacts of the activity on the environment.
- The relevant considerations which the DMA can take into account in decision making.
- The conditions that may be applied as a result of the decision-making process.
- Likely outcomes.

Other legislation and its applicability to environmental factors is described in Table 4-1. Descriptions of DMAs relevant to the Proposal and an analysis against the interim guidance follow in Section 4.3.1 to 4.3.3. In the sections of this document that address each environmental factor, where another legislative instrument is applicable, this is specified for each impact identified.

Table 4-1: Assessment of Legislation

Decision-making authority	Legislation or Agreement regulating the activity	Proposal Element and Approval required	Does statutory decision-making process mitigate impacts on the environment?
Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)	*Mining Act 1978*	• Proposal will proceed on Mining Act tenure. All disturbance and infrastructure require an approved MP and MCP. • Tenement conditions will specify an inspection schedule for the TSF by a certified tailings engineer.	**Yes** – mitigates potential impacts to: • Inland Waters. • Flora and Vegetation. • Terrestrial Flora. • Subterranean Fauna. • Landforms. • Terrestrial Environmental Quality. • Social Surroundings. • Air Quality. DEMIRS has developed its own environmental objectives, which approximate EPA factor objectives for Terrestrial Fauna, Flora and Vegetation, Inland Water and Terrestrial Environmental Quality in relation to Mining Proposals only. Mining Proposals address all Proposal elements and activities and consider the likely environmental impacts within an 'Environmental Group Site' (a grouping of mining tenements that make up a mining operation). DEMIRS aims to focus its assessment on factors not regulated elsewhere (e.g., such as key environmental factors assessed under Part IV of the EP Act). Stakeholder engagement will occur during preparation but there is no provision for public comment or appeal on a mining proposal. Approved mining proposals will typically, be made available to the public on the DEMIRS website. Approval of a mining proposal will usually include environmental monitoring and reporting requirements.
DEMIRS – Native Vegetation Branch	*Environmental Protection Act 1986,* Part V, Division 2 – Clearing of Native Vegetation	• Clearing of native vegetation on mining tenements. • A Native Vegetation Clearing Permit is issued following an assessment of the Proposal against the State's 10 clearing principles.	**Yes** – mitigates potential impacts to: • Flora and Vegetation. • Terrestrial Fauna. DEMIRS undertakes assessment of Native Vegetation Clearing Permits against ten clearing principles as listed under Schedule 5 of the EP Act.

Decision-making authority	Legislation or Agreement regulating the activity	Proposal Element and Approval required	Does statutory decision-making process mitigate impacts on the environment?
DWER – Industry Licencing Branch	*Environmental Protection Act 1986,* Part V, Division 3 – Licences and Works Approvals	Works Approvals and Environmental Licences are required to construct, commission, and operate the following: • Processing Plant and TSF. • Dewatering discharge to Turner River and reinjection into upper and lower alluvium/palaeochannel aquifers. • Wastewater Treatment Facility. • Landfill facilities. • Bulk storage of chemicals. • Tyre storage.	**Yes** – mitigates potential impacts to: • Inland Waters. • Flora and Vegetation. • Terrestrial Fauna. • Subterranean Fauna. • Terrestrial Environmental Quality. • Social Surroundings. • Air Quality. Works approvals and licences regulate industrial emissions and discharges to air, land or water and apply to 'prescribed premises' categories defined in Schedule 1 of the Environmental Protection Regulations. Assessments consider the risk to the environment, public health and amenity and the controls proposed to mitigate these risks. Compliance monitoring and reporting are included in standard conditions of approval. Works Approvals and Environmental Licences regulate emissions and discharges and also set general conditions for chemical storage, housekeeping, noise and dust inside a prescribed premises boundary.

Decision-making authority	Legislation or Agreement regulating the activity	Proposal Element and Approval required	Does statutory decision-making process mitigate impacts on the environment?
DWER – Water Branch	*Rights in Water and Irrigation Act 1914*	• A 26D Licence to construct bores and a 5C Licence to abstract groundwater is required for mine dewatering. • Licence conditions set a maximum discharge limit and will likely require the implementation of a Groundwater Operating Strategy and monitoring requirements.	**Yes** – mitigates potential impacts to: • Inland Waters. • Subterranean Fauna. RiWI Act processes regulate the extraction of water associated with mine dewatering, but not disposal. The licence application is advertised for public comment when a significant impact on the water resource is expected, or the request is to take more than 1 GL/a. No appeal rights exist to the public on licence decisions. Assessments of licence applications to take groundwater include consideration of environmental and social impacts, including effects on: • Groundwater resource - availability, allocation and quality • Groundwater dependent ecosystems • Other groundwater users. Hydrogeological studies are required to inform the assessment, including the potential impacts of taking water. Licence conditions will usually include requirements to undertake and report groundwater volume and quality monitoring to ensure detrimental impacts on the environment, other users and the groundwater resource are no more than predicted. Surface water impacts may be considered in the assessment but are not essential.
Department of Planning, Lands and Heritage (DPLH)	*Aboriginal Heritage Act 1972*	• Impacts to Aboriginal heritage. • Consents to disturb and a Cultural Heritage Management Plan to ensure that the heritage values of sites are maintained.	**No**. S.16 and 18 authorisations are predominately related to authorisations to impact heritage sites and therefore not expected to regulate impacts to the environment.

Decision-making authority	Legislation or Agreement regulating the activity	Proposal Element and Approval required	Does statutory decision-making process mitigate impacts on the environment?
Clean Energy Regulator	*National Greenhouse and Energy Reporting Act 2007*	• Limits set on greenhouse gas emissions from facilities	**Yes** The Safeguard Mechanism is the Australian Government's policy for reducing emissions at Australia's largest industrial facilities. It sets legislated limits on the greenhouse gas emissions of these facilities. These emissions limits will decline, predictably and gradually. These limits will help achieve Australia's emission reduction targets of 43% below 2005 levels by 2030 and net zero by 2050.

4.3.1 Mining Act Approvals and Regulation

The Proposal will proceed on mining tenure and requires parallel approval and regulation under the Mining Act. DEMIRS and the WA Minister for Mines are responsible for the implementation of the Mining Act.

DEMIRS is guided by its Environmental Objectives Policy for Mining (DMIRS, 2020a), according to this policy, the principal objective for environmental regulation is:

"*Resource industry activities are designed, operated, closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed environmental outcomes and post-mining land-uses without unacceptable liability to the State.*"

The policy lists DEMIRS' key environmental objectives for the key environmental factors that are relevant to mining activities. In a similar manner to the EPA, DEMIRS considers the impacts of a proposal against these objectives, which are shown alongside relevant EPA environmental factors in Table 4-2. An analysis of DEMIRS assessment against the EPA's interim DMA guidance is provided in Table 4-3.

Table 4-2: DEMIRS Key Environmental Objectives

Factor	Objective	EPA Equivalent Environmental Factor
Biodiversity	To maintain representation, diversity, viability and ecological function at the species, population, and community level.	• Flora and Vegetation • Terrestrial Fauna • Subterranean Fauna
Water Resources	To maintain the hydrological regimes, quality and quantity of groundwater and surface water to the extent that existing and potential uses, including ecosystem maintenance, are protected.	• Inland Waters • Social Surroundings.
Land and Soils	To maintain the quality of land and soils so that environmental values are protected.	• Landforms • Terrestrial Environmental Quality • Air Quality • Social Surroundings
Rehabilitation and Mine Closure	Mining activities are rehabilitated and closed in a manner to make them physically safe to humans and animals, geo-technically stable, geo-chemically non-polluting/non-contaminating, and capable of sustaining an agreed post-mining land use, and without unacceptable liability to the State.	• Social Surroundings • Human Health • Flora and Vegetation • Terrestrial Fauna • Subterranean Fauna • Inland Waters • Landforms • Terrestrial Environmental Quality

Table 4-3: DEMIRS Assessment of Proposals with Reference to EPA's Interim DMA Guidance

Aspect	Description
The ability of the DMA to consider the impact of the proposal**.**	De Grey must submit an MP and MCP to DEMIRS which must be assessed and approved prior to commencement of mining operations.

Aspect	Description
The process that the DMA uses to assess the potential impacts of the activity on the environment.	DEMIRS assesses each Project on a case-by-case basis and must ensure that each application complies with statutory guidance. The assessment considers all elements and activities with an Environmental Group Site (the mining tenements that make up the operation). Mining tenement applications may be objected to by members of the public. Although members of the public may not comment or appeal an MP or MCP, statutory guidance requires stakeholder consultation be undertaken prior to approval submission and DEMIRS will consider this aspect during assessment. DEMIRS has administrative agreements with other DMAs (including the EPA) that detail the circumstances where DEMIRS will refer an application or seek advice.
The relevant considerations which the DMA can take into account in decision making**.**	Statutory guidance for MPs (DMIRS, 2020c) and MCPs (DMIRS, 2020b) give DEMIRS a broad mandate to assess the environmental impacts of a project and ensure that it meets the Environmental Objectives Policy for Mining. The MP considers the impacts associated with construction and operation and the MCP considers the longterm impacts associated with closure, relinquishment of the tenement and the return to an acceptable post-mining landuse. Proponents must: • Characterise and describe the existing environment. • Describe the proposal including key elements. • Present an environmental risk assessment that considers all potential environmental risk pathways and appropriate mitigation and monitoring measures. • Set environmental outcomes, performance criteria and monitoring requirements. • Provide a description of the environmental management system. An MP must provide baseline data, obtained through field surveys, to understand the pre-existing assemblages, diversity, condition and ecological function of flora, fauna (including SREs and subterranean fauna) and ecosystem(s). Adequate materials characterisation, hydrological and hydrogeological assessment is required, and sufficient data must be provided to enable DEMIRS to undertake an appropriately informed risk assessment. Surveys must be undertaken, and data collected in accordance with the relevant EPA technical guidance. DEMIRS can condition a project to provide ecological offsets through its delegated authority to determine applications for Native Vegetation Clearing Permits. The WA Offset Policy (The Government of Western Australia, 2011) also states that offsets can be considered when determining MPs.
The conditions that may be applied as a result of the decision-making process.	The proponent makes environmental commitments in the MP and MCP that will be agreed by DEMIRS. Once an MP is approved a standard condition will be applied to the mining lease that will require the leaseholder to: • Implement the Project in accordance with the MP and MCP. The Environmental Offsets Policy (The Government of Western Australia, 2011) includes a provision for environmental offsets associated with MPs. • Submit an Annual Environmental Report (AER). This includes compliance with approvals as well as monitoring results. • Resubmit a revised MCP every three years. Progress towards addressing closure gaps must be demonstrated in each revision. DEMIRS may also apply non-standard tenement conditions for specific environmental measures. DEMIRS will assess compliance on an ongoing basis via the AER mechanism; periodic site inspections; and in response to any environmental incidents. Adaptive management measures can be applied through the triennial updating of the MCP. In the event of poor environmental performance, DEMIRS may request that the leaseholder lodge performance bonds and in extreme cases withdraw the mining tenement.

Aspect	Description
Likely Outcome.	DEMIRS' assessment will focus on all environmental risks, with a particular focus on the management of mine wastes, the stability of landforms, and the formation of post-mining pit lakes. The assessment will also consider noise and dust impacts as well as impacts to terrestrial and subterranean fauna; flora and vegetation; and inland waters. DEMIRS will only approve a project once it is satisfied that it can be designed, operated, closed, decommissioned and rehabilitated in an ecologically sustainable manner.
Conclusion.	Factor objectives for Flora and Vegetation, Terrestrial Fauna and Subterranean Fauna can be met via regulation under the Mining Act. Along with regulation under Part V of the EP Act, Mining Act regulation will ensure that factor objectives for Social Surroundings and Air Quality are met.

4.3.2 DWER Part V – Division 3 Approvals and Regulation

DWER is responsible for Part V, Division 3 of the EP Act which regulates emissions and discharges to the environment. DWER also has responsibility for enforcement of several regulations which it considers during assessments. These include:

- *Environmental Protection Regulations 1987*.
- *Environmental Protection (Unauthorised Discharge) Regulations 2004.*
- *Environmental Protection (Noise) Regulations 2004.*
- *Environmental Protection (Controlled Waste) Regulations 2004.*
- *Environmental Protection (NEPM-NPI) Regulations 1998.*
- *Environmental Protection (Concrete Batching and Cement Product Manufacturing) Regulations 1998.*
- *Environmental Protection (Abrasive Blasting) Regulations 1998.*
- *Clean Air (Determination of Air Impurities in Gases Discharged to the Atmosphere) Regulations 1983.*
- *Environmental Protection (Clearing of Native Vegetation) Regulations 2004.*

DWER will assess a proposal in accordance with the following guidance:

- Guideline: Regulatory Principles (DWER, 2020a).
- Guideline: Industry Guide to Licencing (DWER, 2019b).
- Guideline: Risk Assessment (DWER, 2020b).
- Procedure: Prescribed Premises Works Approvals and Licences (DWER, 2019c).

The objectives and principles of the EP Act (see Section 6) apply to DWER and the EPA. DWER's Regulatory Principles (DWER 2020a) comprise:

- **Risk-based regulation:** The department will regulate to ensure there is not an unacceptable risk of harm to public health or the environment.
- **Evidence-based decision-making:** The department will use the information it already has and ask applicants to provide any technical and general information it needs to support its assessment of the risks of the proposed activity and to conduct its regulatory functions.

- **Application of Environmental Standards:** The department will establish Environmental Standards that set out what levels of environmental performance it requires for certain regulated activities. It will base these on the hierarchy of preventing, controlling, abating and mitigating pollution and environmental harm.
- **Appropriate conditions:** The department will issue licences and approvals with conditions to prevent an unacceptable risk of harm to public health or the environment. Conditions will be justifiable, clear and enforceable.
- **Fair and equitable decision-making processes:** The department's decisions about licensing, approvals, compliance and enforcement should result in consistent outcomes under similar circumstances.
- **Engagement, consultation and transparency**: The department will consider all responses to public advertisements and results of consultation on licensing and approval applications and decisions.
- **Competitive neutrality**: The department will administer environmental regulation to minimise unnecessary competitive distortion between industry participants. Note that applicants' technology, process and site selection may require different levels of environmental performance.

The relevance of DWER regulation to the EPA's environmental factor objectives is discussed in Table 4-4.

Table 4-4: DWER Part V Assessment of Projects with Reference to EPA's Interim DMA Guidance

Aspect	Description
The ability of the DMA to consider the impact of the proposal?	A proponent must apply for an Environmental Licence and Works Approval for emissions and discharges to the environment that exceed thresholds in Schedule 1 of the *Environmental Protection Regulations 1987*. For this Proposal, infrastructure requiring approval includes: • Processing Plant and TSF. • Dewatering discharge to Turner River and reinjection into the aquifer. • Wastewater Treatment Facility. • Landfill facilities. • Bulk storage of chemicals. • Tyre storage. These approvals are required in addition to the approval under Part IV of the EP Act for the Proposal.
The process that the DMA uses to assess the potential impacts of the activity on the environment.	The principles and objectives in the EP Act (See Section 6) apply to DWER and the EPA. DWER takes a risk-based approach to ensure that a proposal does not pose an unacceptable risk to the environment (described above). DWER considers each application on a case-by-case basis, based on the types of emissions; receiving environment; exposure pathways and sensitive receptors. All Works Approval and Licence applications are advertised, and the public may object and appeal. DWER will consider all feedback from the public. Once infrastructure has been constructed, a proponent must submit a compliance report to DWER that demonstrates that construction is in accordance with approval conditions. A commissioning report may also be requested by DWER.

Aspect	Description
The relevant considerations which the DMA can take into account in decision making?	DWER takes a risk-based approach to assessing approval applications and setting conditions. DWER's risk assessment is formally captured in a decision document appended to the Works Approval or Licence. DWER will consider each discharge and its potential impact on the receiving environment. For example, DWER will consider the quality and quantity of water to be discharged to the Turner River and set conditions to ensure that risks to the river are mitigated. The decision document addresses each identified risk associated with emissions from the Project and justifies the conditions set or if no condition is required for that emission.
The conditions that may be applied as a result of the decision-making process	DWER has the authority to set enforceable conditions on Works Approvals and Licences. These will set: • The volumes of wastes that can be discharged. • Limits and targets for the levels of pollutants in discharges. • Monitoring requirements. • Mandatory cleaning up of spills. • Requirements for storing hydrocarbons and chemicals. • Freeboard requirements for the TSF and certain process water ponds. • Bunding requirements for wet processing units. • Inspection requirements for the TSF; tailings; and return water pipelines. • Commissioning requirements. Standard conditions will also set regular compliance reporting and annual environmental reporting requirements. DWER has the authority to enter Prescribed Premises and assesses compliance via annual reporting; incident reporting; and site inspections. In the event of non-compliance or environmental harm, DWER has the authority to issue Environmental Protection Notices or Closure Notices to proponents that contain conditions to rectify environmental harm. DWER may also levy financial penalties or, in the case of serious environmental harm, prosecute offenders.
Likely Outcome	DWER will regulate the following environmental impacts associated with the Project under Part V of the EP Act: • Quality and quantity of surplus water discharge to Turner River (Inland Waters) and aquifer reinjection (Inland Waters). • Construction and operation of the TSF (Inland Waters). • Spills of hydrocarbons, chemicals, and tailings (Inland Waters and Social Surroundings) • Landfill and wastewater treatment plant (Inland Waters). • Dust emissions (Social Surroundings). • Noise (Social Surroundings). DWER will only grant a Works Approval or Environmental Licence if it is satisfied that there is not an unacceptable risk of harm to public health or the environment.
Conclusion	Regulation by DWER will ensure that environmental factor objectives are not compromised due to emissions and discharges to air, land and water from the Proposal.

4.3.3 Rights in Water and Irrigation Act 1914

DWER is responsible for the regulation of groundwater abstraction under the *Rights in Water and Irrigation Act 1914* (RIWI Act). The processes DWER follows to assess groundwater licence applications in proclaimed areas are detailed in:

- Operational policy no. 5.12 – Hydrogeological reporting associated with a groundwater well licence (DoW, 2009).

The relevance of DWER regulation to interim EPA guidance on DMAs is discussed in Table 4-5.

Table 4-5: DWER RIWI Assessment with Reference to EPA's Interim DMA Guidance

Aspect	Description
The ability of the DMA to consider the impact of the proposal?	Abstraction of groundwater in the Pilbara requires a 5C Licence under the RIWI Act. DWER has the authority to consider potential impacts to the environment and other groundwater users when assessing a Groundwater Licence application. Construction of the proposed outfall may require a Bed and Banks Permit from DWER which will include an assessment of impacts to the Turner River.
The process that the DMA uses to assess the potential impacts of the activity on the environment.	DWER will set a level of hydrogeological assessment based on consideration of the following factors: • Existing groundwater users. • Proposed volume of abstraction. • The presence of groundwater dependent ecosystems (GDEs) or other environmental receptors. De Grey has undertaken an H3 hydrogeological assessment to demonstrate that abstraction will not impact Yule and Turner River pools and other groundwater users.
The relevant considerations which the DMA can take into account in decision making?	DWER will consider the following when assessing the Groundwater Licence application: • Modelled drawdown and drawup zones. • Chemical analyses of groundwater. • Potential impacts to environmental receptors. • Other groundwater users. • The current level of allocation in the region. • Existing salinity.
The conditions that may be applied as a result of the decision-making process.	Groundwater Licences are issued with enforceable conditions. These may include: • Annual abstraction volumes. • The purposes for which water may be abstracted. • A requirement to prepare and implement a Groundwater Operating Strategy. This is also assessed and approved by DWER and details how water will be abstracted; what the potential environmental impacts are and monitoring requirements. • Reporting requirements.
Likely Outcome	DWER will regulate impacts associated with the abstraction of groundwater through a Groundwater Licence and Groundwater Operating Strategy.
Conclusion	Regulation by DWER will ensure that environmental factor objectives are not compromised due to groundwater abstraction.

5. STAKEHOLDER ENGAGEMENT

Since 2016, De Grey has engaged with the pastoral leaseholders and Kariyarra People. In 2020, broader engagement commenced with community groups and the Port Hedland community in general as well as with local, state and federal government stakeholders as part of an ongoing stakeholder engagement process.

A Social Impact Assessment (SIA) (Umwelt, 2022b) was commissioned in 2021 to support the development of the Proposal. Through stakeholder identification and subsequent engagement, the SIA established the social factors that may potentially be impacted by the Proposal. The stakeholder identification process considered groups or individuals that:

- Live, work, or recreate near the Proposal.
- Have an interest in the Proposal.
- Use or value a resource associated with the Proposal.
- Are affected by the Proposal.

The SIA also leveraged the extensive engagement with key stakeholders that the De Grey Community Relations team have been undertaking in the Pilbara since 2021, accessing their established stakeholder register and Community Relations Plan 2021-2025. Since then, De Grey have established a Community and Social Performance (CSP) Management System that provides a set of governing documents for community engagement. At the beginning of 2024, De Grey implemented INX InForm, a system to record stakeholder engagement and manage obligations.

Several engagement mechanisms have been used to undertake consultation with stakeholders and to undertake the Proposal's SIA process. These include the Community, Government and the Traditional Owners.

5.1 Community

Community engagement has occurred though:

- Website and monthly community newsletter.
- Proposal Briefings, personal meetings, and one-on-one discussions with key stakeholders e.g., Traditional Owners, pastoralists, community groups. This builds on over 160 formal briefings and engagements.
- Town Hall Meetings targeting the broader community. The inaugural meeting was held on 22 March 2022 with 30 attendees. Further Town Hall Meetings were held on 24 June 2022 and 8 November 2022.
- Personal meetings/ interviews with 33 participants across 26 stakeholder groups.
- Attendance at Port Hedland community and business events, engaging with 21 individuals across 14 stakeholder organisations.

5.2 Government

Engagement with Government agencies include:

- Meetings with EPA Services (DWER) on 11 February 2022, 16 November 2022, 25 January 2024, 18 April 2024, 2 May 2024, 3 July 2024, 26 August 2024 and 25 September 2024. Items discussed include overview of the Proposal; environmental studies; environmental factors, potential impacts, pathways forward, environmental outcomes and management approaches.
- Meeting in February 2022 and formal correspondence with DEMIRS.
- Aboriginal Cultural Heritage Act 2021 Co-design Workshop in April 2020, hosted by the Department of Planning, Lands and Heritage (DPLH).
- Meetings with the Department of Climate Change, Energy, the Environment and Water (DCCEEW) in August 2022, 14 March 2024, 2 May 2024, 3 July 2024, 31 July 2024, 28 August 2024 and 30 September 2024.
- Various meetings with Town of Port Hedland with various councillors, officers, the Chief Executive Officer (CEO) and Mayor.
- Deputations to three full Town of Porth Hedland council meetings, attended by various councillors, officers, the CEO, Mayor and members of public: 3 November 2021, 1 and 15 December 2021.

5.3 Kariyarra Aboriginal Corporation RNTBC (KAC) and its members who are the Traditional Owners

Engagement with the KAC and its members include:

- Nineteen heritage surveys completed within the development envelope with the Kariyarra over a four-year period.
- The development and implementation of a Negotiation Protocol.
- Seven formal negotiation meetings in 2021 in Port Hedland and West Perth.
- Separate meetings with 10 of the 11 apical family groups (one group declined the offer of a meeting).
- Meeting with Elders and Knowledge Holders at the proposed mine site on 1 September 2022, 13 – 14 August 2024 and 16 – 18 September 2024.
- Meeting with Elders and Knowledge Holders at South Hedland on 29 September 2022 and 12 September 2024
- Native Title Community Meeting was held 28 November 2022 with approximately 100 attendees and representatives of each of the11 family groups. Unanimous vote to enter into Native Title Mining Agreement with De Grey.
- Entering into a Native Title Mining Agreement, referred to as the De Grey / Kariyarra Mining Agreement, executed on16 December 2022.
- Regular attendance of De Grey Community Relations Manager at KAC board meetings.

De Grey has incorporated feedback from stakeholders into its planning to ensure implementation of the Proposal does not compromise the values of the area or the interests of the key stakeholders.

A copy of the Stakeholder Consultation Register is provided as Appendix 8. Additional detail on consultation is provided in Section 12.3. Consultation and engagement with stakeholders will be ongoing throughout the Proposal.

6. ENVIRONMENTAL PRINCIPLES

In preparing this document, De Grey has considered the '*The Statement of Environmental Principles, Factors, Objectives and Aims of EIA*' (EPA, 2023d). The Principles of the EP Act and how they apply to the proposal are outlined in Table 6-1.

Table 6-1: EP Act Principles

Principle	Detail	Proposal Consideration
The Precautionary Principle.	Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the Precautionary Principle, decision should be guided by: • Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and • An assessment of the risk-weighted consequences of various options.	• Technical studies associated with the Proposal have been undertaken by subject matter experts. • Peer review of groundwater studies. • Initial flora survey was peer reviewed to ensure confidence in assessment of impacts. Additional flora work was commissioned based on peer review and used as the basis for the assessment of the Proposal. • Independent expert review of the Greenhouse Gas Management Plan. • Study areas are typically four to six times the indicative disturbance footprint and the baseline environmental is well characterised. • There is a high degree of confidence in the data, assessment and conclusions drawn from these assessments. • De Grey has carefully considered the impacts of the Proposal and taken all practicable steps to avoid impacts.
The principle of intergenerational equity.	The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	The Proposal provides a significant social and economic opportunity through: • Direct employment opportunities. • Support to local businesses as preferred suppliers. • Indirect employment opportunities. • Increased economic activity in the community. De Grey has engaged with the traditional knowledge holders to ensure the traditional values of the land are not compromised and are developing an Aboriginal Cultural Heritage Management Plan as part of its Native Title Mining Agreement. De Grey has also consulted with pastoral leaseholders and will minimise the impact of the mining operation on pastoral activities. De Grey has developed a decarbonisation plan to reduce its GHG emissions over the life of the Proposal, as a contribution to reducing the impacts of climate change on future generations.

Principle	Detail	Proposal Consideration
		Mine closure planning is a fundamental aspect of intergenerational equity. At the cessation of mining, De Grey will rehabilitate the Proposal to a state suitable for existing pastoral, traditional or other land uses that may be identified by stakeholders. Closure requirements will be captured in an MCP to be approved by DEMIRS prior to the commencement of operations and required to be reviewed and approved by DEMIRS every three years. The costs of closure will be reviewed regularly with adequate provision made in the financial statements. To the extent practicable De Grey will rehabilitate the Proposal in a progressive manner prior to closure.
The principle of the conservation of biological diversity and ecological integrity.	Conservation of biological diversity and ecological integrity should be a fundamental consideration.	Conservation of local biological diversity was a primary consideration in the design of the Proposal. The layout design has completely avoided impacts to the Gregory Land System PEC and avoided impacts to critical fauna habitat to the greatest extent reasonably practicable. The impact to conservation significant flora and fauna is minimal and does not present a significant risk to the biodiversity or ecological integrity of the receiving environment.
Principles relating to improved valuation, pricing and incentive mechanisms.	(a) Environmental factors should be included in the valuation of assets and services. (b) The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance or abatement. (c) The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes. (d) Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.	(a) Environmental management, including qualified site personnel, consultants, ongoing studies and equipment have been incorporated into the Proposal's costs. (b) De Grey will pay fees associated with estimated emissions to the environment through applications for Works Approval and Licence under Part V of the EP Act (consistent with the polluter pays principle). (c) Fees associated with EP Act and EPBC Act referrals will also apply. (d) Continuous improvement by De Grey over the life of mine (LOM) will reduce ongoing costs and overall impact to the environment. Opportunities may include: • Further minimisation of clearing. • Reducing waste through recycling schemes. • Progressive rehabilitation to restore natural ecosystems and reduce Mining Rehabilitation Fund (MRF) costs. • Adoption of Environment, Social and Governance (ESG) principles and policies. • Implementation of technology to reduce GHG emissions.

Principle	Detail	Proposal Consideration
The principle of waste minimisation.	All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.	De Grey will use groundwater from dewatering activities for mineral processing dust suppression and domestic water, reducing the amount of surplus water needing to be discharged into the environment. Existing roads and tracks have been utilised in the Proposal's design. Waste generated on site will be segregated and reused or recycled where reasonably practicable. Process tailings will be contained in an IWL, constructed using waste rock and clay materials extracted from the pits.

7. ENVIRONMENTAL FACTORS

7.1 Overview

De Grey referred the Proposal to the EPA under Part IV of the EP Act on 8 June 2023. The Chair of the EPA determined the Proposal was to be assessed by 'Assess – Additional Assessment Information (public review)' on 16 October 2023 for the following environmental factors:

- Inland Waters (Section 8)
- Flora and Vegetation (Section 9)
- Terrestrial Fauna (Section 10)
- Subterranean Fauna (Section 11)
- Social Surroundings (Section 12)
- Greenhouse Gas Emissions (Section 13)
- Air Quality (Section 14)

An environmental impact assessment has been undertaken for the Proposal and is described in the following sections for the relevant environmental factors. The assessment considers the objectives for each factor, as defined in the DWER *Statement of Environmental Principles, Factors and Objectives.* The assessment also considers the DWER guidance around assessment of significance, where it is applicable to the factor.

The assessment of holistic impacts has been undertaken in parallel with the assessment of individual impacts to a preliminary environmental factor; where an impact could influence another environmental factor this has been identified as potentially contributing to a holistic impact. These outcomes from the assessment of each preliminary environmental factor are then considered holistically in Section 15.

The assessment has taken a dual approach to the consideration of cumulative impacts:

1. Within individual factors when certain impacts in isolation are insignificant, consideration has also been given to whether the aggregation of impacts could result in a significant impact to the environmental factor. For example, impacts from noise, light spill, dust, and changes to visual amenity may each be insignificant, but together may result in a significant impact to an environmental or cultural value. In these instances, De Grey has considered all the potential impacts within each factor assessment cumulatively when determining whether the factor objective is likely to be met.

2. For each preliminary key environmental factor an appropriate area of influence has been determined and publicly available data on other Proposals within this area sourced. A cumulative impact assessment has then been undertaken, considering the impacts of these Proposals together with those of the Hemi Proposal.

A detailed description of the determination of the areas of influence, the Proposal identified, and the outcomes of the assessment are provided in Section 18.

7.2 Project Team Members and Surveys Completed

Environmental impact assessment requires robust scientific characterisation of the receiving environment as well as any potential impacts. De Grey has assembled a Project Team of well-established Perth based consultants with experience in mining projects in the Pilbara, supplemented by its own in-house expertise. Together this Project Team has undertaken a comprehensive suite of environmental studies to characterise the existing baseline environment and analyse potential impacts. The environmental studies and their authors are summarised in Table 7-1. Credentials for each consultancy included in the Project Team can be accessed via the web links provided in Table 7-1.

Detail on studies completed is provided under the relevant environmental factor section. The areas surveyed are typically four to six times the indicative disturbance footprint and the baseline environment is well characterised.

Table 7-1: Summary of Supporting Studies

Aspect	Consultant	Description	Status
Hydrogeology	Geowater Consulting, support by De Grey field staff. http://geowater.net.au/ Peer review by Jurassic Groundwater.	• Pump testing of aquifers. • Water balance. • Numerical modelling of drawdown and mounding. • Particle tracking analysis for reinjection.	Final modelling report attached as Appendix 2. Peer review report attached as Appendix 3. Short term reinjection trial attached as Appendix 9.
Hydrogeology – Closure	De Grey Mining Limite	• Pit lake modelling at closure. • Steady state drawdown contours	Hemi pit lake model attached as Appendix 10. Conceptual Long-term Drawdown at 200 years attached as Appendix 11.
Hydrology	Surface Water Solutions (SWS) in conjunction with Geowater Consulting https://www.surfacewater.biz/	• Groundwater quality sampling. • Surface water quality sampling.	Groundwater monitoring in December 2020; April 2021; October 2021 to December 2021; January 2022; February 2022, March 2022, April 2022, June 2022, July 2022, November 2022, April 2023 and ongoing. Surface water monitoring Mach 2022, May 2022, July 2022, September 2022, February 2023 and ongoing. Groundwater and surface water assessment report attached as Appendix 2.
		• Pit lake modelling for closure.	Preliminary modelling described in Conceptual MCP, attached as Appendix 7**.** Refinement of model ongoing.
Ecological Risk	MBS Environmental	• Tier 2 Ecological Risk Assessment of dewater discharge to Turner River • Ecotoxicity assessment of dewater discharge on organisms that utilise the habitat.	Tier 2 Ecological Risk Assessment attached as Appendix 12. Tier 3 ecotoxicology assessment memo addendum is provided in Appendix 13.

Aspect	Consultant	Description	Status
Aquatic Ecology	Stantec https://www.stantec.com/en	• Baseline assessment of Yule and Turner Rivers. • Desktop analysis and database searches. • Sampling in November 2021 and May 2022. • Species identification and assessment of conservation significance. • Analysis of water and sediment testing results. • eDNA analysis. • Ecological assessment of river systems.	Final report attached as Appendix 14.
		• Opportunistic wet season sampling in July 2022 after heavy rain in Pilbara.	Memorandum attached as Appendix 15.
Flora and Vegetation	Ecoscape https://ecoscape.com.au/	• Desktop study and database searches. • Flora and vegetation survey in March 2021.	Data included in Flora and Vegetation Baseline Report prepared by Umwelt attached as Appendix 16.
	Umwelt https://www.umwelt.com.au/	• Desktop study and database searches. • Multiple flora and vegetation surveys from March to July 2022. • Incorporation of 2021 survey data undertaken by Ecoscape. • Incorporation of 2010 Mt Dove survey data. • Incorporation of 2024 survey data • Analysis of vegetation types and species present.	Final report attached as Appendix 16.
	Umwelt https://www.umwelt.com.au/	• Analysis of the status of *Seringia exastia* at the Project.	Memorandum attached as Appendix 17.
	Umwelt https://www.umwelt.com.au/	• Desktop assessment of proposed 300 m buffer around Gregory Land System PEC.	Final memo attached as Appendix 18.

Aspect	Consultant	Description	Status
	Umwelt https://www.umwelt.com.au/	• Flora and vegetation survey of the proposed maximum wetted front of the Turner River undertaken in May 2024. • Analysis of vegetation types and species present.	Final report attached as Appendix 19.
Vertebrate Fauna	Western Wildlife https://www.eca.org.au/find-a-consultant/jennifer-wilcox/?category=terrestial-vertebrate-fauna	• Desktop study and database searches. • Detailed surveys in September 2021 and March 2022. • Additional targeted surveys in August 2022 and April and May 2024. • Analysis of habitats and species present.	Final report attached as Appendix 20.
Short-range Endemic Fauna	Bennelongia https://www.bennelongia.com.au/	• Desktop study and database searches. • Surveys in November 2021 and April 2022. • Habitat mapping. • Identification of species and analysis of potential for short-range endemism.	Final report attached as Appendix 21.
Subterranean Fauna	Bennelongia https://www.bennelongia.com.au/	• Desktop study and database searches. • Analysis of stygofauna and troglofauna habitat potential. • Three rounds of stygofauna sampling between October 2021 and May 2022. • Targeted stygofauna sampling in May 2024. • One round of troglofauna sampling in October 2021. • Identification of species present and analysis of potential for restricted distribution.	Final report attached as Appendix 22. Targeted survey memo attached as Appendix 23.
	De Grey Mining Ltd	• Assessment of available habitat for stygofauna.	Final report attached as Appendix 24.

Aspect	Consultant	Description	Status
TSF Design	CMW Geosciences (CMW) https://www.cmwgeosciences.com/	• Design of TSF. • Stability assessment and geotechnical assessment. • TSF water balance.	Permitting design report attached as Appendix 4.
Noise	Herring Storer Acoustics (HSA) https://www.hsacoustics.com.au/	• Identification of potential receptors. • Modelling of proposed operation and assessment of likely noise levels and compliance at receptors.	Final report attached as Appendix 25.
Emissions Projections and decarbonisation strategy	Wood https://www.woodplc.com/	• Estimation of GHG emissions. • Benchmarking. • Scope 3 review.	Final report attached as Appendix 26.
GHG Management Plan	RPMGlobal https://rpmglobal.com/	• Development of GHG EMP to explain how greenhouse gas is integrated to meet the requirements of WA EPA Environmental Factor Guideline.	Greenhouse Gas Management Plan attached as Appendix 27. Peer review of GHG EMP attached as Appendix 28.
Air Quality	Environmental Technologies & Analytics https://envanalytics.com.au/	• Identification of potential receptors. • Modelling of proposed operation and assessment of likely air quality impacts.	Final report attached as Appendix 29.
Cultural Heritage	Terra Rosa - https://terrarosaconsulting.com.au/ Gavin Jackson - http://www.gavinjacksoncrm.com.au/ Scarp Archaeology - https://scarp.com.au/ Human Terrains - https://www.humanterrains.com.au/	• Ethnographic and archaeological heritage surveys.	Survey reports issued to De Grey.
	Scarp Archaeology https://scarp.com.au/	• Review of all previous surveys. • Compilation of Geographic Information System (GIS)data.	Survey reports issued to De Grey.
	Sticks and Stones https://sandscrm.com/	• Social Surroundings consultation	Reports issued to De Grey.

8. ENVIRONMENTAL FACTOR - INLAND WATERS

8.1 EPA Objective

The EPA objective for inland waters is "*to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected"* (EPA, 2018).

8.2 Policy and Guidance

The following guidance is applicable to this factor:

- *Environmental Factor Guideline: Inland Waters* (EPA, 2018).
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018).
- *Western Australian water in mining guideline* (DoW 2013).
- *Use of mine dewatering surplus* (DWER, 2020c).
- *Operational policy no*. 5.12 – Hydrogeological reporting associated with a groundwater well licence (DoW, 2009).
- *Australian groundwater modelling guidelines* (Barnett B et al., 2012)
- *Australian Rainfall and Runoff: A Guide to Flood Estimation* (Ball J et al., n.d.)

8.3 Receiving Environment

8.3.1 Hydrogeology

Groundwater studies for the Proposal have been undertaken by Geowater (2023a). A copy of Geowater's report is provided in Appendix 2.

Unless otherwise referenced, the text in this section of the document is drawn from Geowater's report, with detailed monitoring results and predicted values provided in the report. A peer review of the groundwater model has been completed by Jurassic Groundwater (2023) and is provided as Appendix 3.

The groundwater model was prepared to support an H3 Hydrogeological Assessment in accordance with DoW (2009). Due to the high permeability and extent of the alluvium in and surrounding the Hemi deposit, a large model domain of 1,520 km^2 was considered, including the Yule and Turner Rivers (Figure 8-1).

Figure 8-2 presents the hydrostratigraphy of the Hemi Deposit, highlighting placement of the following different aquifer zones:

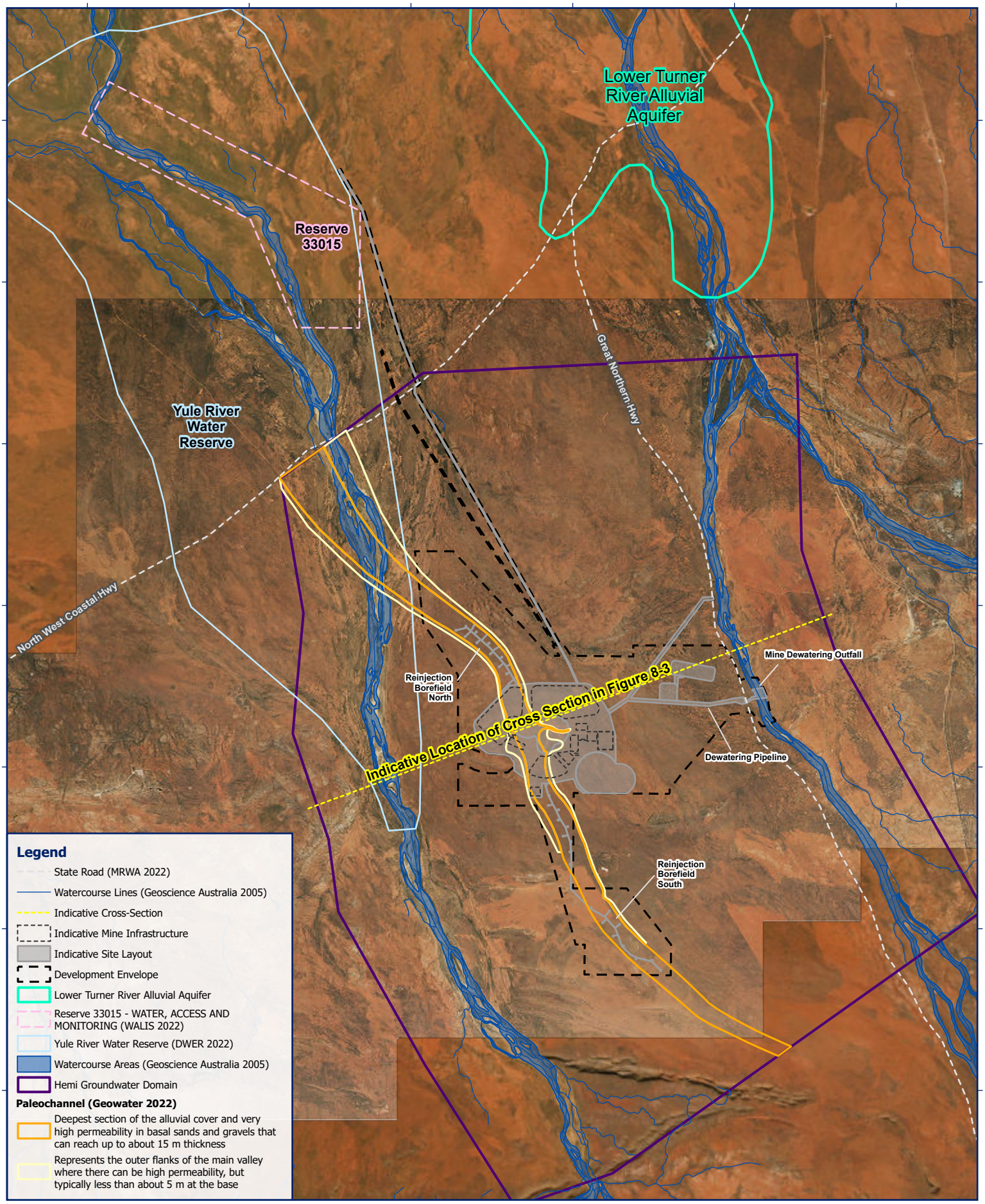
- Upper Alluvium – laterally extensive aquifer system with low to moderate permeability and saturated thickness. The saturated extent includes the Yule, but not the Turner River.
- Lower Alluvium (Palaeochannel) – basal palaeochannel sands and gravels with high permeability and storage values. This Palaeochannel is generally 1 km to 2 km wide and drains northwards towards the coast. Figure 8-1 depicts palaeochannel extension.
- Saprolite Zone – uppermost sections of weathered bedrock with limited permeability.

- Saprock Zone – lower section of weathered profile consisting of moderately to slightly weathered rock. Low to moderate fractured rock permeability in the igneous intrusives.
- Fresh bedrock – unweathered rock with limited permeability, particularly below 150m depth. Does not form aquifer zones at or near the Hemi Deposit.

Considering the hydrogeological cross-section presented in Figure 8-3, the following key aspects of Hemi's groundwater system are interpreted:

- Saprolite and saprock generally do not hold significant amounts of groundwater. This layer acts as a weak barrier to water flow (aquitard) and is unlikely to be a major water source during mining activities.
- Groundwater at Hemi is more likely to be found in fractured zones within igneous rock intrusions and near the contact zones between different rock types. These fractures provide pathways for water movement but have limited storage capacity. These fractures also become tighter and less permeable with depth.
- Bedrock permeability is very limited, likely becoming impermeable with no storage of water below approximately 150 m.
- Hemi's shallow and deeper aquifers connect to nearby Atlas Iron – Mt Dove borefield and Indee pastoral bores.
- Limited, although significant, rain replenishes groundwater at Hemi (1 - 3 % on average). This rate is even lower near the exposed rock. Salinity levels increase eastward.

The depth to groundwater is typically 6 m – 12 m below the ground surface, and hydraulic gradients and flow are relatively uniform in a north-northwest direction. Regional depth to the water table and water table contours are shown in Figure 8-4.



Scale: 1:300,000

0 2.5 5 10 km

N

Projection: GDA2020 MGA Zone 50

Created/Reviewed By: KM/EL

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Hemi Gold Project - Referral Supporting Document

Groundwater Model Domain

Figure 8-1 | ADV-AU-00673 | November 2024

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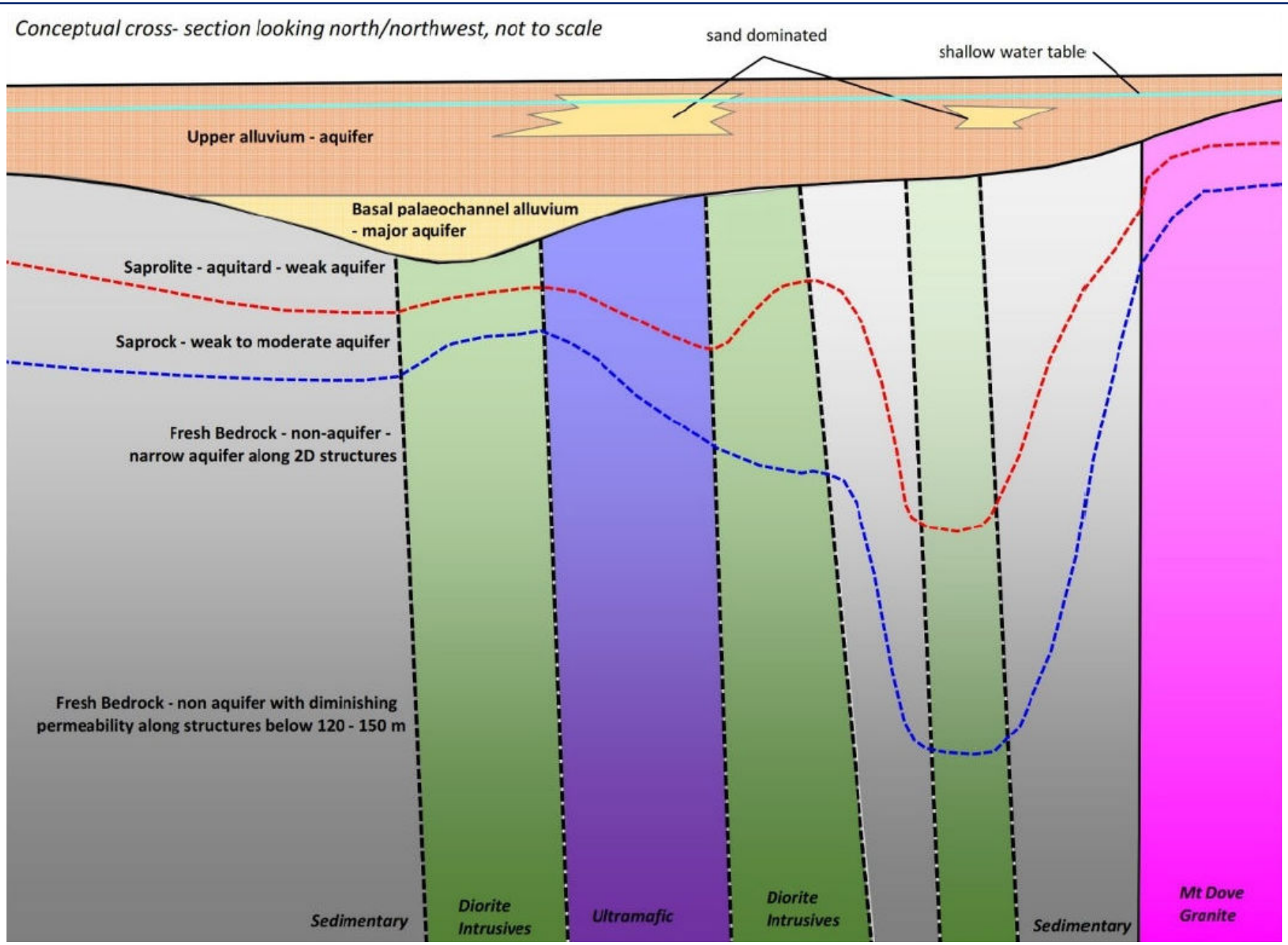

Source: Geowater 2023

PROJECT		CLIENT
November 2024	Hemi Gold Project - Referral Supporting Document	
Figure 8-2		
ADV-AU-00673	Project Aquifer Mapping	

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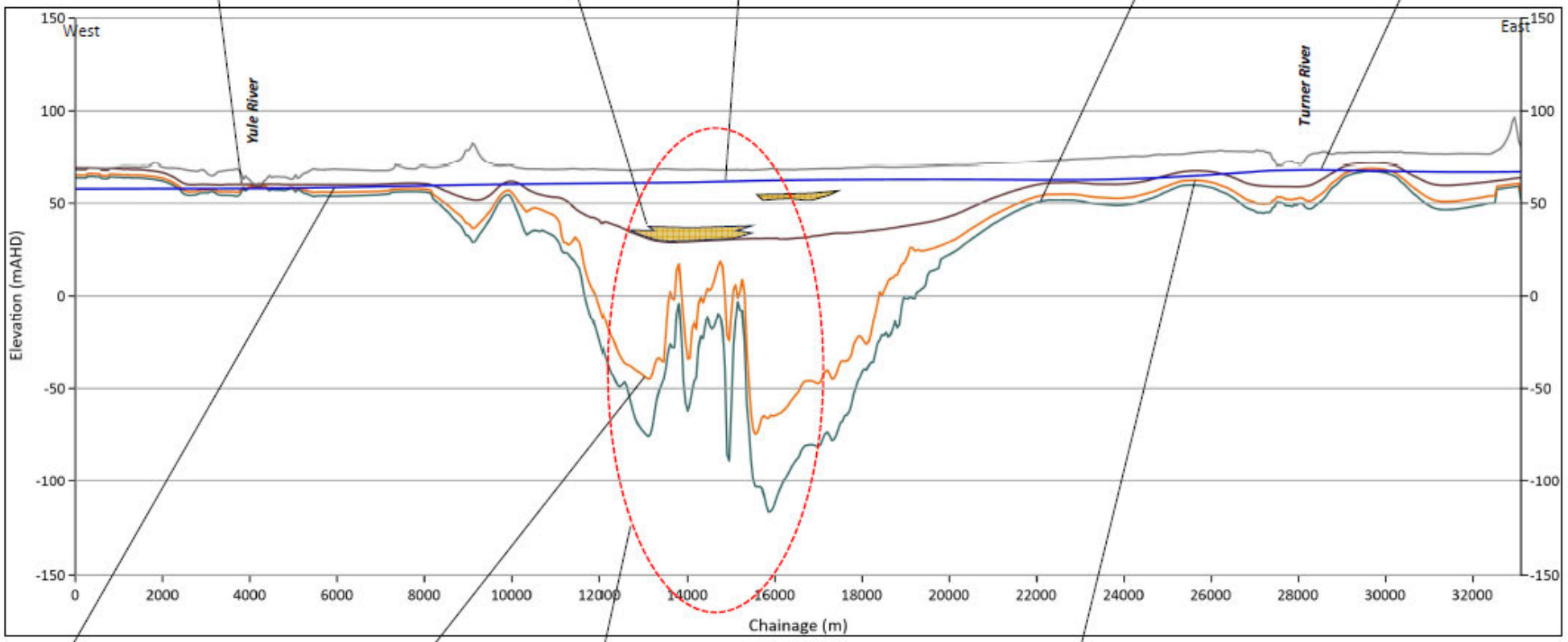
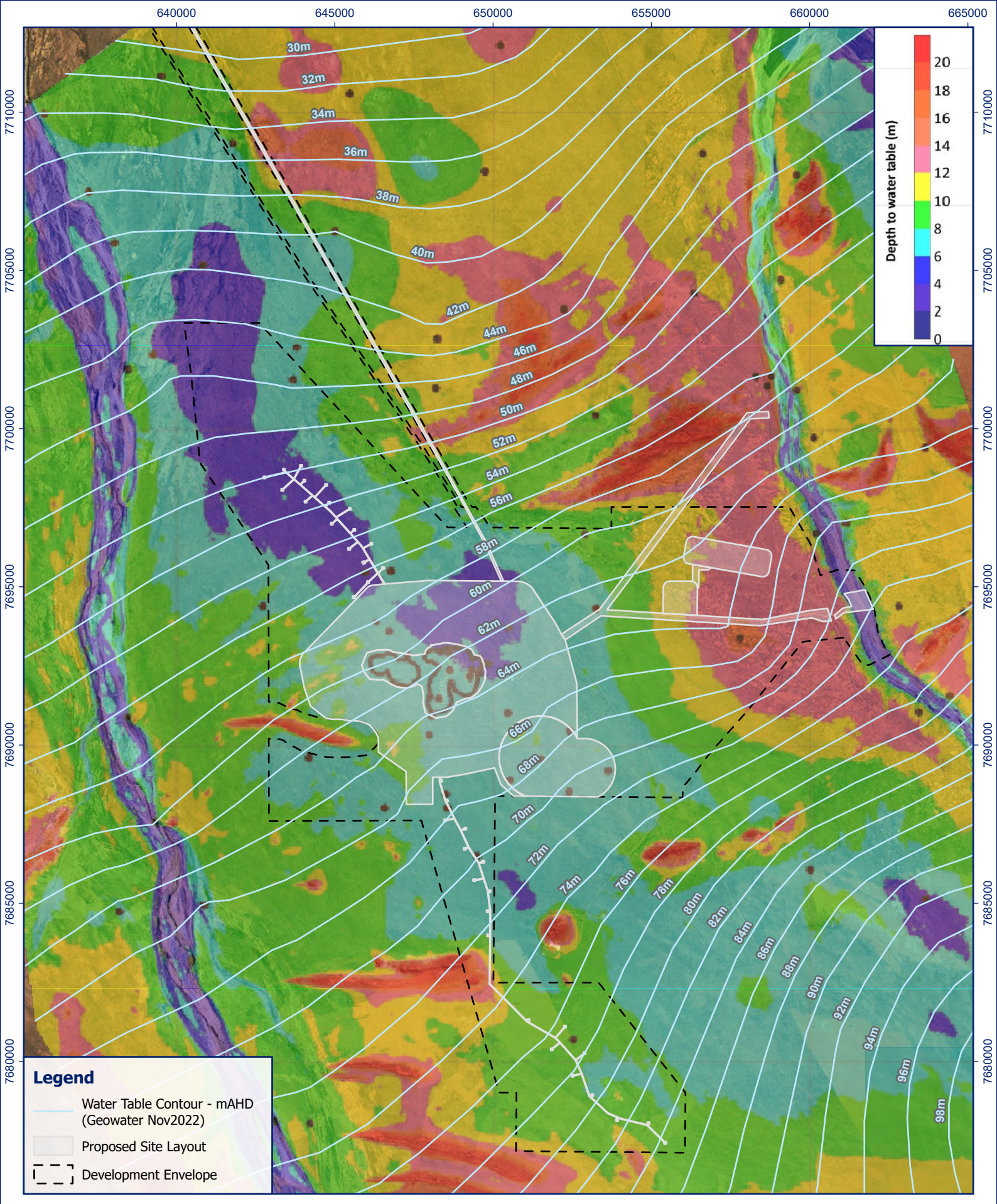


Source: Geowater 2022

PROJECT		CLIENT
November 2024	Hemi Gold Project - Referral Supporting Document	DE GREY MINING LTD
Figure 8-3		
ADV-AU-00673	East-West Hydrogeological Cross Section over Hemi Deposits	

RPMGLOBAL



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N

Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Water Table Depth and Contours

CLIENT

DE GREY MINING LTD

Figure 8-4	ADV-AU-00673	November 2024

8.3.2 Groundwater Quality

Over 120 groundwater samples from the Proposal and monitoring bores within the model domain area have been analysed since December 2020. Groundwater quality at the Proposal is generally fresh to brackish (800 – 1,100 mg/L TDS), circum-neutral to alkaline (pH 7.5 – 8.5), with naturally elevated hardness (average 270 mg/L as $CaCO_3$). Groundwater in alluvium and saprock have similar salinities.

Groundwater quality along the Turner River is more variable than at the Proposal. Zones of higher salinity (1,000 – 1,350 mg/L) near southern monitoring bores (4 km upstream of the proposed dewatering outfall) indicate limited recharge during flood events in bedrock dominated reaches of the river. Lower salinities (350 – 500 mg/L) further north indicate potential recharge zones from river flooding events.

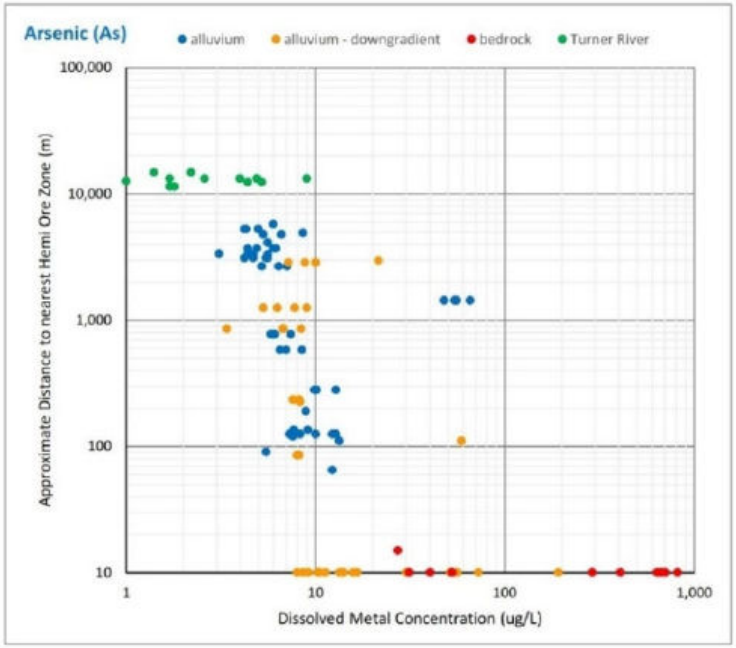
The Hemi gold deposits are associated with naturally elevated levels of pyrite and arsenopyrite. Trace metal analysis of groundwater in some bores that intersect the Hemi deposits shows higher levels of naturally occurring arsenic, chromium, uranium and vanadium than in other bores within the Proposal's Development Envelope and along the Turner River.

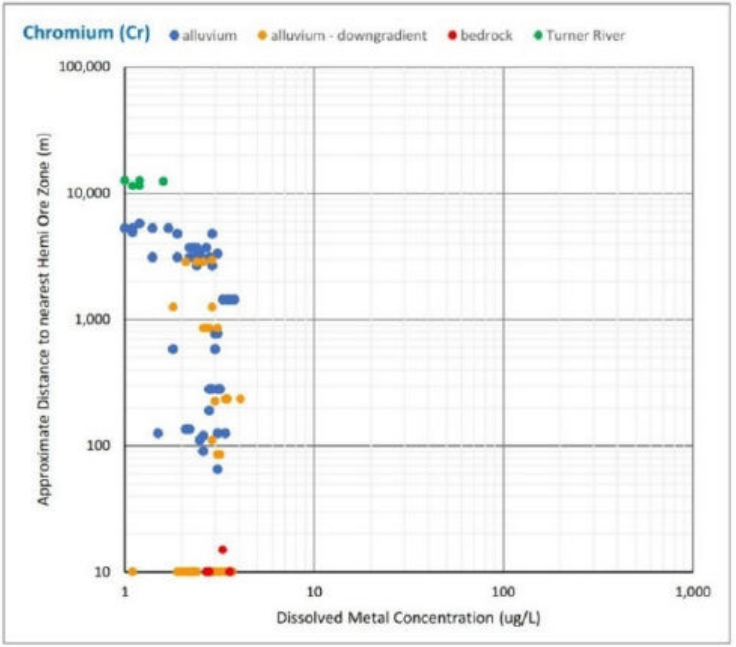
The naturally occurring levels of arsenic, chromium, uranium and vanadium in groundwater (bedrock and alluvium) at the Proposal and the Turner River are plotted by distance from the Hemi deposits in Chart 8-1.

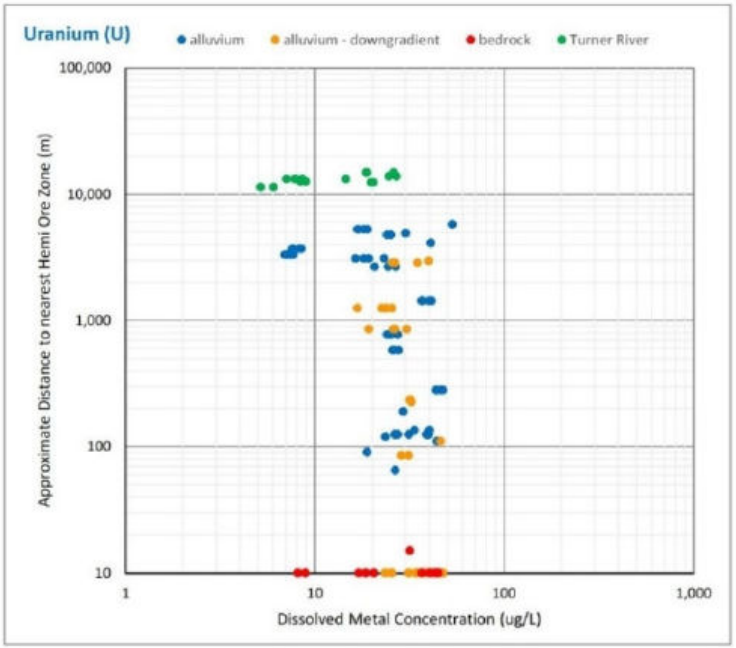
The following conclusions can be drawn from this analysis:

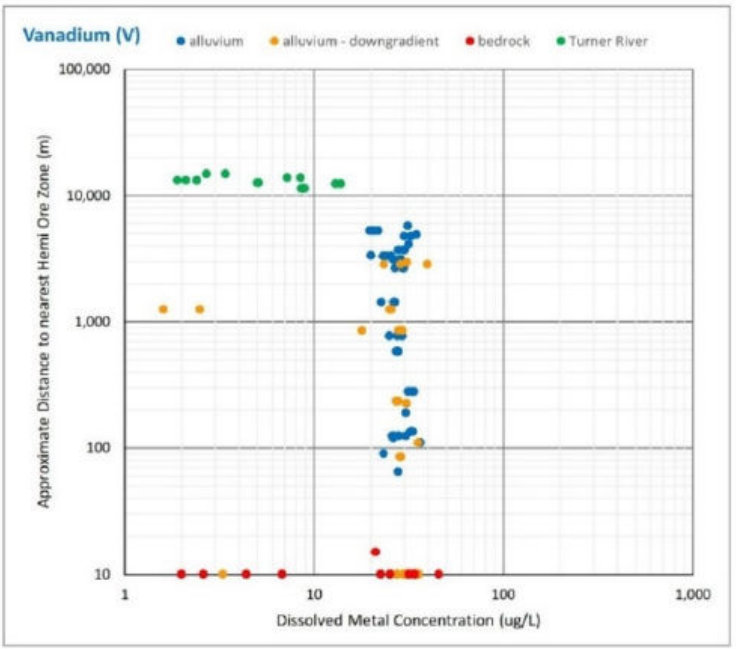
- Bedrock samples are from the ore zone only and present the highest arsenic levels.
- Arsenic in alluvium downgradient of known ore zones is higher than in alluvium up-gradient of ore zones. This indicates that the gold deposit (which mining will remove) is a contributing source of naturally occurring arsenic in groundwater.
- Arsenic levels in the bedrock are 2 to 3 orders of magnitude higher than those in the upper geological gradients. Until bedrock levels are reached, arsenic levels in the water to be abstracted are expected to be at the same levels as those in the Turner River. There are a few exceptions in the alluvium at up and down-gradient locations that will be characterised and managed according to their arsenic concentration.
- Alluvium bores with higher chromium levels are typically found upgradient and laterally distant from the Hemi ore zones. This suggests the elevated chromium is not directly related to the Hemi gold deposit.
- Groundwater near the Turner River typically has lower arsenic levels than the bedrock, lower vanadium and chromium levels than groundwater in the region of the Hemi deposits, and similar levels (same order of magnitude) of uranium compared to the regions of the Hemi deposits.
- Uranium and vanadium levels are similar in bedrock zones and up-gradient and down-gradient alluvium, suggesting that the distribution of these metals is not specifically related to the gold deposit. The presence of these metals may be due to the Proposal being downgradient from a large granodiorite dome located to the southeast.

Additional details on groundwater quality are provided in Section 3.1 of the hydrogeology report (Appendix 2).









Source: Geowater 2022

PROJECT	CLIENT
Hemi Gold Project - Referral Supporting Document	DE GREY MINING LTD
Dissolved Trace Metals by Distance from Deposits	
RPMGLOBAL | Chart 8-1 | ADV-AU-00673 | November 2024	

The Proposal water management strategy distinguishes two dewatering discharge stream types, primarily related to concentrations of arsenic and other trace metals:

- Type I contains <24 µg/L of dissolved arsenic (As).
- Type II contains >24 µg/ L of dissolved arsenic (As).

The Proposal has characterised Type I and Type II water streams based on analysis of over 350 water quality samples collected to date. The threshold of 24 µg/L of dissolved arsenic was defined based on the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) 2018 guidelines which safeguard 95% of aquatic species. Groundwater with naturally elevated concentrations of dissolved arsenic (Type II) will be reinjected into the Reinjection Borefield South (RBS) and become available for re-abstraction after two to ten years, at which time it will be directed for use in the processing plant.

Groundwater with naturally lower concentration of dissolved Arsenic (Type I) will be suitable for discharge to the Turner River, aquifer reinjection at both Reinjection Borefield North (RBN) and RBS and for camp and potable water supplies (once treated).

As boreholes are drilled, developed, and pump tested, water quality sampling will be conducted to determine whether the water quality falls under Type I or Type II classification.

8.3.3 Hydrology

A surface water assessment for the Proposal has been summarised and described in the hydrogeology report (Geowater, 2023b) in Appendix 2.

This assessment is the primary source for the information in this section, unless otherwise referenced. For detailed monitoring results and predicted values, please refer to Appendix 2.

Additional assessment of closure criteria and the Turner River discharge was undertaken by Surface Water Solutions (SWS, 2022b), included in Appendix 6.

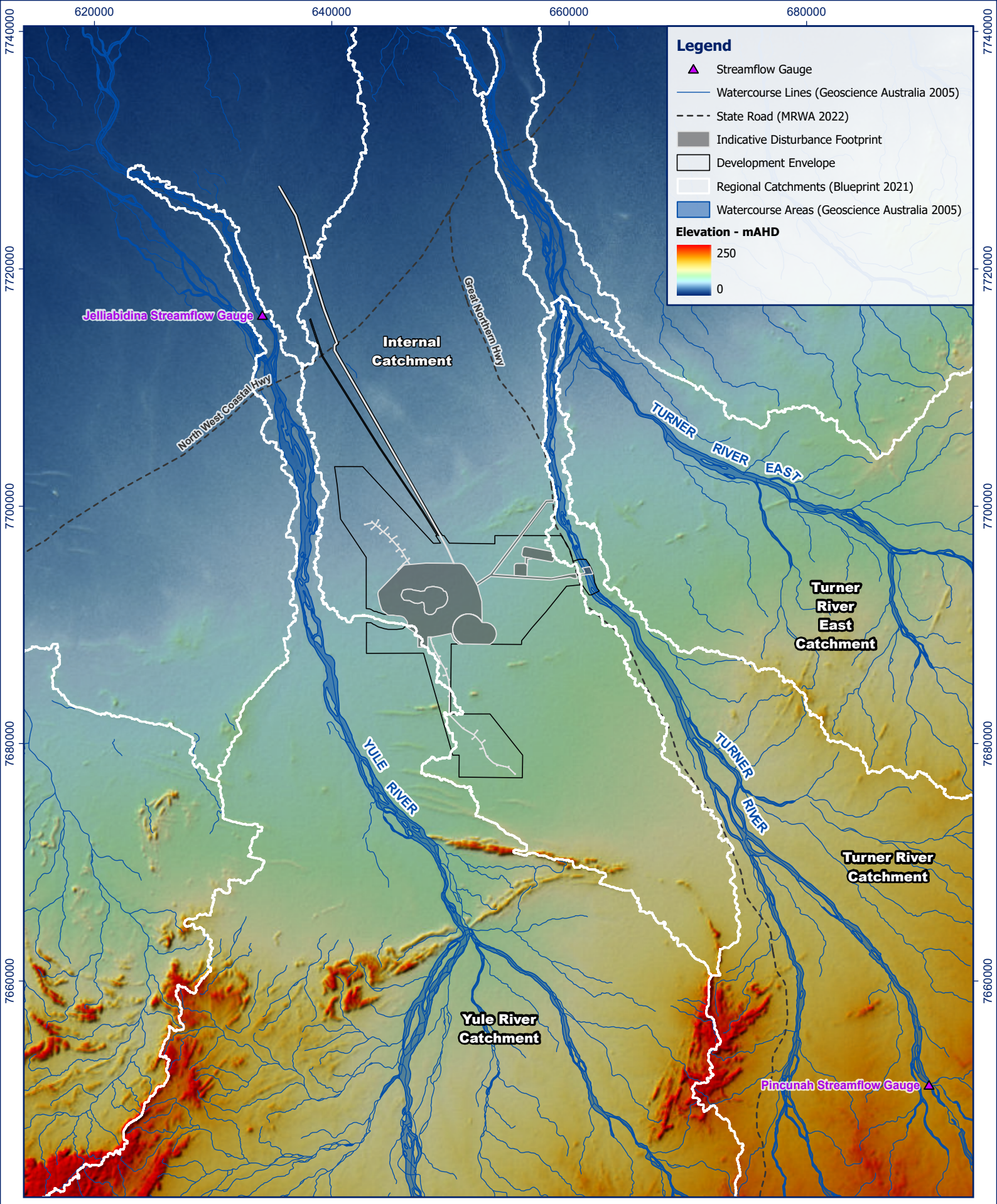
The Proposal is situated on a relatively flat plain not crossed by any tributaries or creeks, within an internal catchment between the Yule River, located nine kilometres to the west, and Turner River, located 14 kilometres to the east (Figure 8-5). The highest elevation within the Development Envelope is 109 mAHD, situated at the southern portion, while 95% of the terrain is between 54 and 94 mAHD.

At the Hemi deposit, this internal catchment drains an upstream area of around 528 km^2. The Yule and Turner River catchment areas upstream of the Proposal are 8,337 km^2 and 2,225 $km^{2,}$ respectively. The Turner River flow is smaller than the Yule River with a lower peak discharge rate due to its smaller catchment area. Its headwaters commence below Pullcunah Hill and drain northward via a braided river channel.

Despite an upstream catchment area of approximately 528 km^2, no clearly defined drainage lines occur within the Development Envelope, except for the eastern end of the Development Envelope, which encompasses a small area of the Turner River. The Great Northern Highway separates the central mining and infrastructure area from the Turner River. Drainage lines, creeks and rivers in the Pilbara are typically ephemeral and flow for only a short duration following rainfall events. Modelling predicts that prior to surface water management controls, stormwater flow will result in sheet flow over much of the internal catchment containing the Proposal, draining to the north/northwest and eventually forming a series of disorganised drainage lines. Drainage within the internal catchment does not flow to the Turner or Yule River systems. Proposed surface water controls will manage stormwater runoff within the Proposal indicative disturbance footprint.

Surface Water Solutions (SWS, 2023) conducted a flood modelling exercise for the Hemi area for 20% AEP (1-in-5 years) and 1% AEP (1-in-100 years) events. Conservatively, the model assumed peak river flows in the Turner and Yule Rivers simultaneously and coincident in time with peak local rainfall events (Figure 8-6).

The modelled 5-year event predicts minimal flooding limited to existing river channels with no significant impact on the immediate Hemi area. The modelled 100-year event predicts overflow from the Turner River, potentially creating an eastern anabranch and widespread shallow flooding northwest of Hemi. However, large river flows are unlikely to cause flooding at Hemi. Heavy rainfall pooling and sheet flow will cause most localised flooding within the Proposal area, with water draining to the northwest.



Scale: 1:400,000

0 2.5 5 10 km

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Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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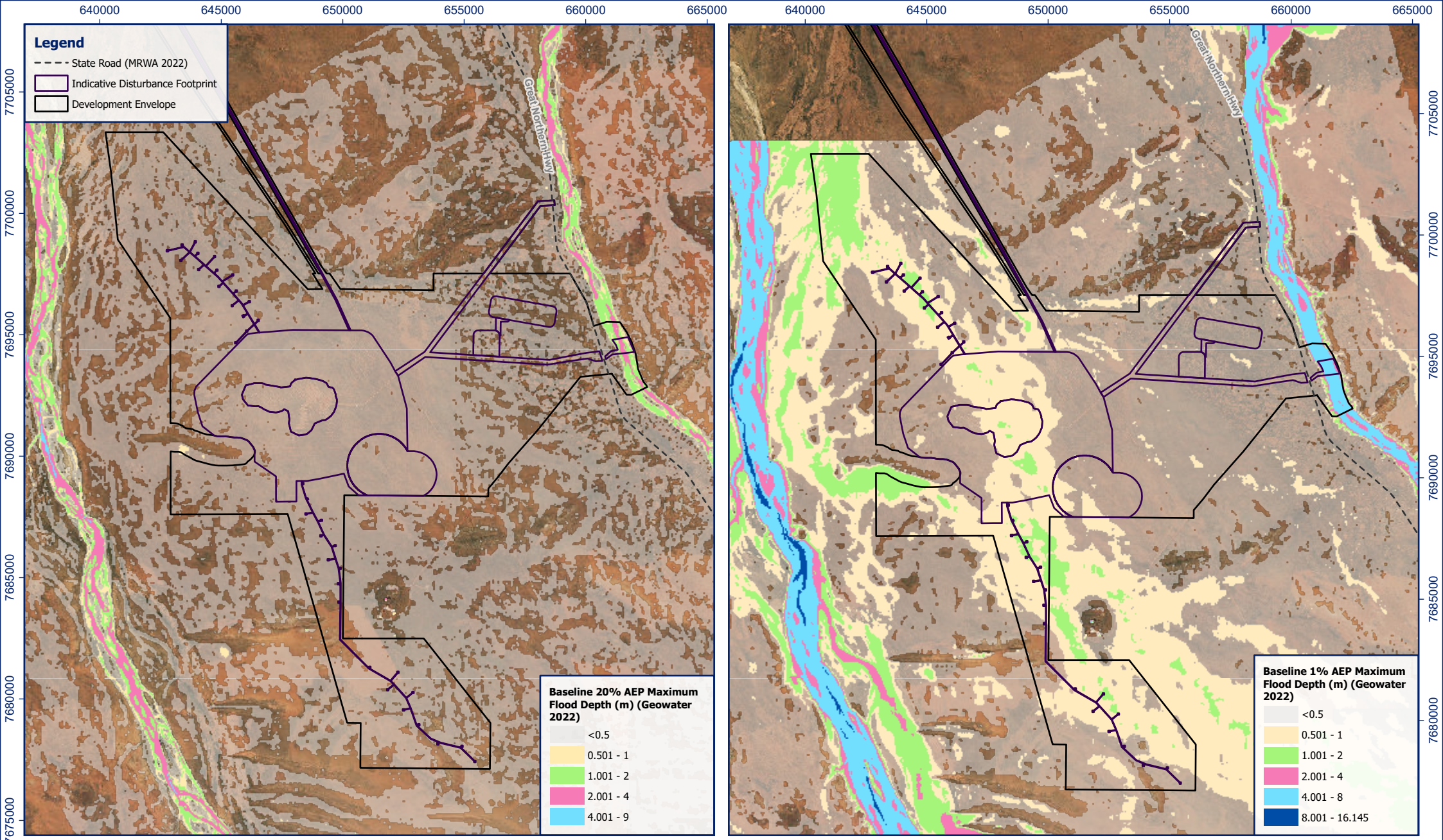
Catchments

CLIENT

DE GREY MINING LTD

Figure 8-5	ADV-AU-00673	November 2024



Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Scale: 1:200,000

0 1.25 2.5 5 km

PROJECT		CLIENT
November 2024	**Hemi Gold Project - Referral Supporting Document**	DE GREY MINING LTD
Figure 8-6		
ADV-AU-00673	**Flood Assessment**	

8.3.4 Riverine Pools

The Turner and Yule Rivers are ephemeral, flowing only after seasonal heavy rainfall. Despite this, both rivers contain permanent (Yule River) or semi-permanent pools (Yule and Turner River), with the Yule River boasting larger and more persistent ones. To understand the aquatic ecology of these pools, Stantec Limited (Stantec, 2022) conducted a dual phase baseline aquatic ecology survey in the Yule and Turner Rivers in November 2021 (dry season) and May 2022 (wet season). Pools were mapped using a combination of literature sources, historic aerial imagery, and data from government departments as shown in Figure 8-7. Stantec sampled those pools containing water and where access was feasible during the survey period. A copy of Stantec's survey report is included in Appendix 14.

The 2022 Pilbara wet season was unusually dry, with typical wet season conditions not eventuating until later in the year. Stantec subsequently undertook an additional post-flood survey in July 2022 to characterise the Yule and Turner Rivers after rainfall, providing additional insights into the wet-season conditions across the Pilbara region. The survey memo (Stantec, 2023) is attached as Appendix 15.

Unless otherwise referenced, the text in this section of the document is drawn from the Stantec report and memorandum. Detailed monitoring results can be found in the Stantec (2022, 2023) reports.

8.3.4.1 Yule River

The Yule River, which has been excluded from the Development Envelope, contains permanent pools and supports riverine and groundwater dependant vegetation. Based on satellite imagery and known pools, Stantec narrowed down potential pool locations. Of the eight potential pools identified, seven contained water in at least one monitoring campaign.

Based on water and biota presence, two pools (YRU1 and YRU2) were classified as semi-permanent and the other five pools as permanent (YRU1-A, YR1, YR2, YRD1 and YR3 - also called Jelliabidina PoolFigure 8-7). Based on satellite imagery, DWER (Geowater, 2023) has identified several other pools along the Yule River. Most of them were classified as either semi-permanent or intermittent, with two permanent pools (Jelliabidina pool and unnamed) mapped.

Consultation with the Traditional Owners has identified two pools of cultural heritage significance in the Yule River, Papawilyuwihi Pool and Mardagubbidina Pool. The river is used for stock water, and groundwater beneath the alluvial sediments 35 km northwest of the Hemi deposits is a source of drinking water for Port Hedland, with an established borefield north-northwest of the Proposal, within a Public Drinking Water Source Area (PDWSA).

Recognising the importance of these semi-permanent and permanent pools within the Yule River for maintaining ecological values and cultural significance, De Grey has proposed outcomes-based provisions (Section 8.5.1) for the Yule River which is supported by an Environmental Management Plan (EMP). These provisions will utilise a three-tiered approach with early warning, trigger, and threshold bores. Early warning bores will provide an initial indication of potential groundwater drawdown approaching the Yule River. Trigger bores will signal the need for investigation and potential mitigation measures if drawdown reaches a predetermined level. Finally, threshold bores will indicate if intervention strategies are necessary to protect the ecological and cultural values of the pools.

This outcome-based approach ensures a proactive and measured response to safeguard the integrity of the Yule River pools and the potential GDVs present in the river channel.

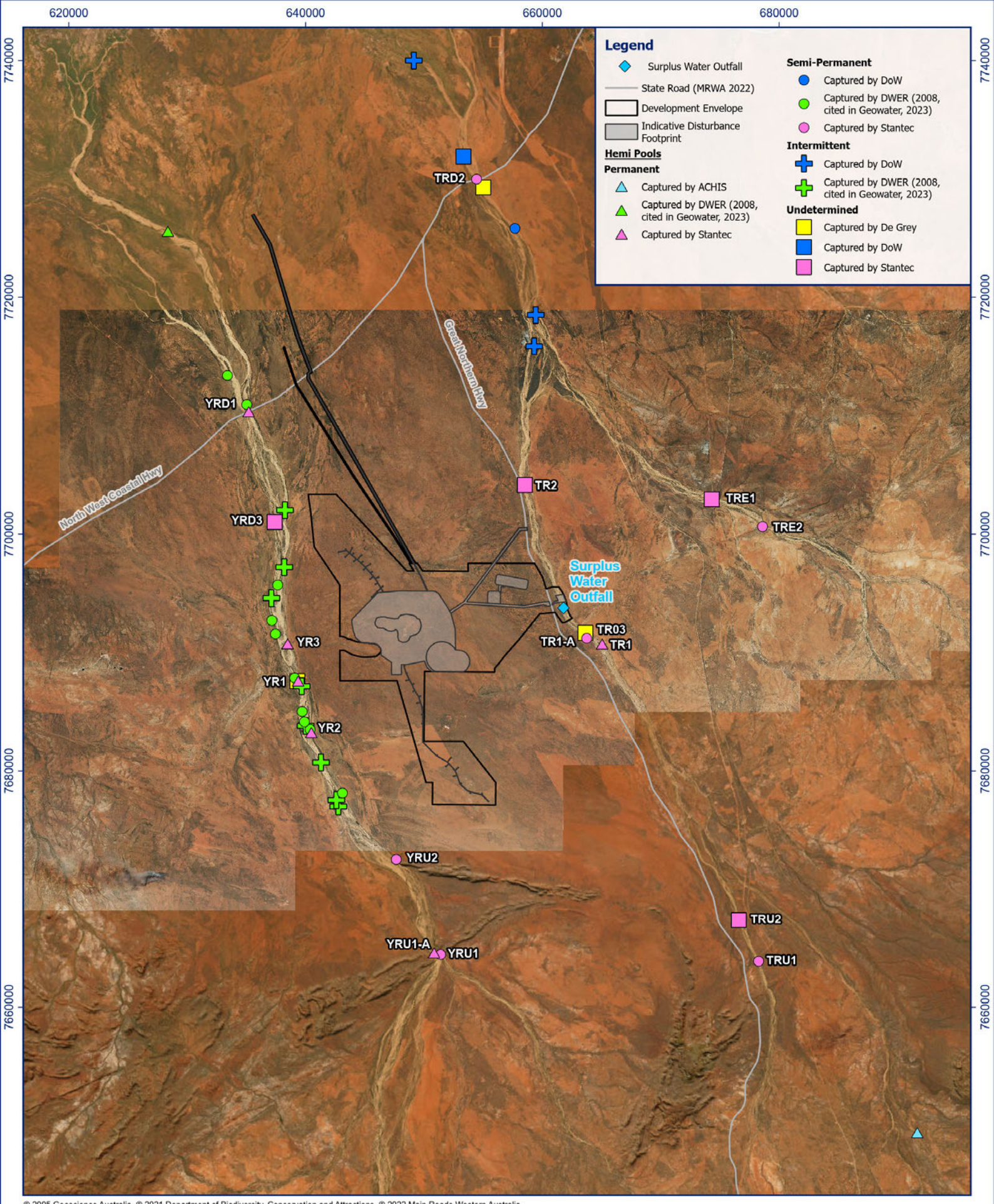
8.3.4.2 Turner River

Stantec (2022, 2023) mapped eight potential pools along the Turner River, selecting sites based on a review of satellite imagery and known (named) pools. Locations were then ground-truthed in the field to assess accessibility and the presence of surface water. Of the eight pools mapped, five contained water during at least one sampling campaign. Stantec then classified them as permanent (TR1) and semi-permanent (TRE2, TRU1, TRU2 and TRD2). Based on aerials, DoW (2011) mapped additional pools along the Turner River and classified them as either semi-permanent or intermittent, with one classified as being undetermined. De Grey has identified another pool, named Kunagunarinna Pool, situated 54 km upstream of the proposed dewatering outfall (currently undefined).

While some pools exist downstream of the proposed discharge outfall, as shown in Figure 8-7, they are all temporary and rely on seasonal rainfall to maintain their water levels. Among these, the semi-permanent Pool TRD2 was consistently sampled throughout the study, as it contained at least some water in the dry season (November 2021), wet season (May 2022) and post-flood (July 2022) surveys. This site is located approximately 40 km downstream of the proposed discharge of surplus water, and functions as a semi-permanent pool situated beneath the Great Northern Highway bridge.

Considering that Pool TRD2 was observed with water in both wet and dry seasons and is the only pool within the wetting front, De Grey has reviewed aerial imagery to determine whether it had periods of complete dryness. This precautionary measure was taken to confirm that TRD2 is semi-permanent. Figure 8-8 presents aerial imagery captured on 1 January 2024, providing additional evidence that water availability in TRD2 varies over time and that the pool experiences periodic drying phases, supporting the classification as semi-permanent. In addition to TRD2, Figure 8-8 shows Moorambine pool which has previously been classified as undetermined by DoW. From this figure it can be seen that Moorambine pool also experiences periods of dry conditions, indicating that it cannot be considered a permanent pool.

As stated by Stantec, pools on the Turner River are seasonal and semi-permanent and considered to be of low to moderate ecological value. Several pools were in a recessional phase or dry during the wet season survey. By comparison, pools on the Yule River were more numerous, larger, more permanent, potentially groundwater-fed and considered to hold moderate to high ecological value. As discussed in Section 3.3, due to its higher ecological and heritage value, the Proposal has avoided any impacts on the Yule River; thus, it is not the primary focus of this assessment.



Scale: 1:400,000

0 2.5 5 10 km

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Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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PROJECT	CLIENT
Hemi Gold Project - Referral Supporting Document	DE GREY MINING LTD
Pools Mapped Along The Yule And Turner River	
Figure 8-7 | ADV-AU-00673 | March 2025	

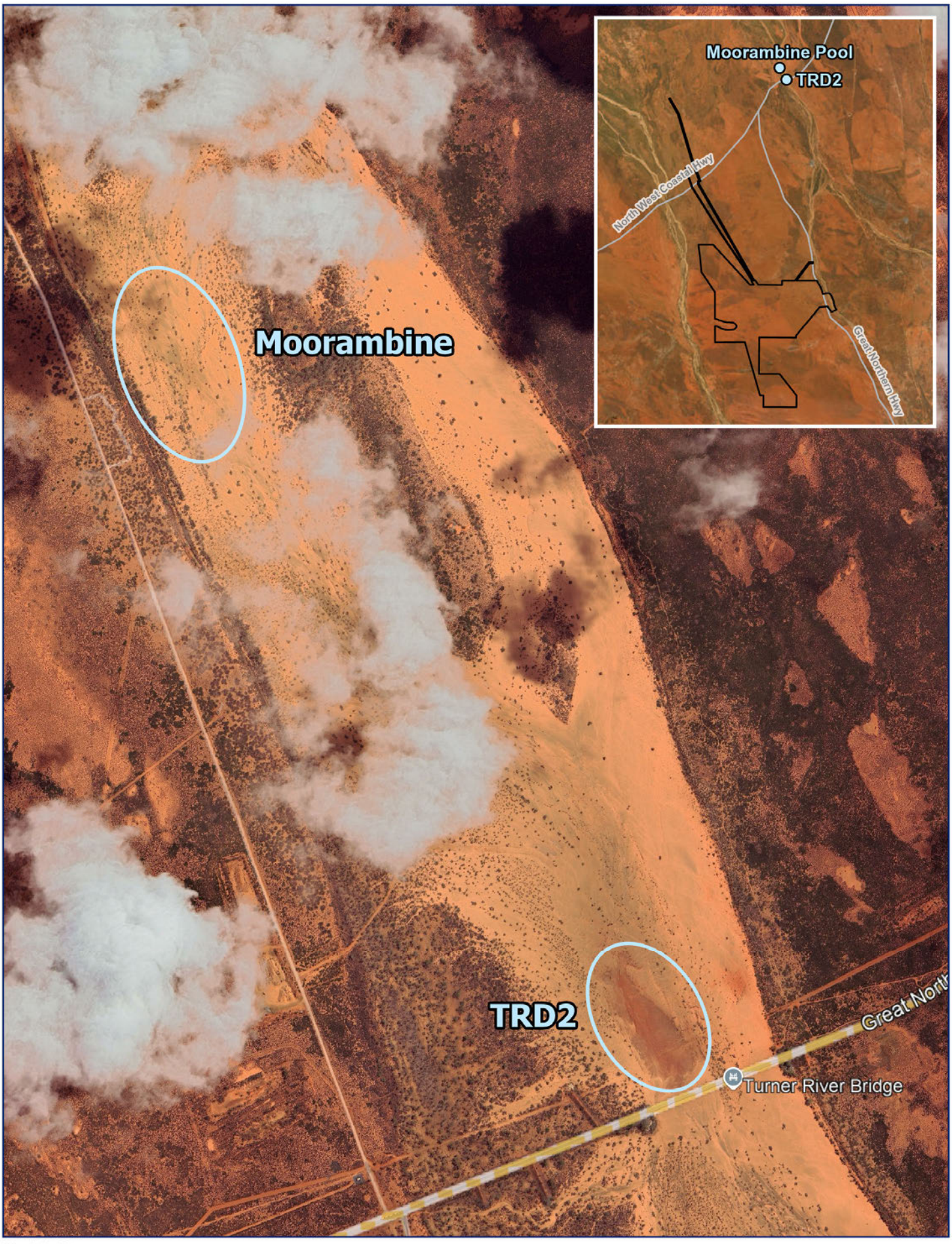

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Image Captured: 01 Jan 2024 - © Airbus 2025
Created/Reviewed By: KM/EL

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PROJECT			CLIENT
Hemi Gold Project - Referral Supporting Document			DE GREY MINING LTD
TRD2 and Moorambine Pools Observed In A Dry Condition			
Figure 8-8	ADV-AU-00673	March 2025	

8.3.4.3 Water Quality

Baseline water quality was assessed by Stantec (2022, 2023), who sampled water in the Turner River from four pools in the dry season of 2021, five pools in the wet season of 2022 and four pools after a flood event in 2022. De Grey also sampled the Turner River in 2022. The Stantec and De Grey results are summarised and compared to relevant ANZG Guidelines in Table 8-1. Exceedances of guideline values are highlighted with a distinct background colour (light yellow).

When present, water in the Turner River is circumneutral to alkaline and fresh to brackish depending on the amount of evapoconcentration- in pools after a flow event. Nitrogen and phosphorus levels over ANZG guidelines may be attributed to enriched groundwaters and unrestricted livestock access. Naturally occurring aluminium, arsenic, boron, chromium, copper, nickel, uranium and zinc were also recorded in excess of ANZG guidelines for sporadic samples. Although the maximum mercury value (Table 8-1) exceeds the ANZG guideline, all dissolved mercury results were below the reporting limit. This indicates that no mercury was detected in the samples, and the exceedance is due to the reporting limit being higher than the toxicant guideline.

The Turner River also supports an extensive riverine and groundwater dependant ecosystem and is used for various purposes, including pastoralism (stock), domestic use and limited mining/quarrying (Stantec, 2022).

Additional information on the water quality in the Yule and Turner Rivers is presented in more detail in the aquatic ecology survey reports attached as Appendix 14 and Appendix 15.

Table 8-1: Turner River Water Quality Summary

Parameter		Units	Samples	LoR	Values						ANZG (2018)	
					Minimum	P_{20}	Median	Mean	P_{80}	Maximum	Stressor DGV	Toxicant DGV
General	pH (unit)	-	22	-	7.36	7.984	8.43	8.5	8.992	9.5	6.5 - 8.0	-
	Total Dissolved Solids	mg/L	22	1	143	158	384	1,182	2,280	4,610	-	-
	Dissolved Oxygen	mg/L	9		2.09	4.7	5.59	6	7.42	10.43	-	-
	Dissolved Oxygen	%	9		25.4	54.48	67.7	75	103.8	125	90	120
	Electrical Conductivity	(µS/cm)	22	1	225	240.4	591	1,853	3,592	7,090	250	-
	Total Suspended Solids	mg/L	22	5	2.5	2.5	10	36	47.6	163	-	-
	Turbidity	NTU	13	0.1	0.5	2.98	6	25.3	13.4	130	15	-
Major Ions	Sodium	mg/L	22	1	13	28.2	81.5	306	535.8	1280	-	-
	Magnesium	mg/L	22	1	5	5.2	13.5	39	69.8	126	-	-
	Calcium	mg/L	22	1	7	10.2	15.5	20	29.2	50	-	-
	Potassium	mg/L	22	1	2	3	5	12	20.8	46	-	-
	Chloride	mg/L	22	1	11	30.2	91.5	452	889.2	1880	-	-
	Sulphate	mg/L	22	1	2	3.2	16.5	29	49.8	136	-	-
	Bicarbonate	mg/L	22	1	48	77.2	151	233	310	833	-	-
	Carbonate	mg/L	22	1	0.5	0.5	13.5	53	141.6	208	-	-
Nutrients	Total Nitrogen	mg/L	13	0.1	0.2	0.64	1	3.6	3.4	15.6	0.3	-
	Total Phosphorus	mg/L	13	0.01	0.02	0.024	0.04	0.12	0.086	0.56	0.01	-
	Total Kjeldahl Nitrogen	mg/L	13	0.1	0.2	0.48	1	3.6	3.4	15.6	-	-
	Nitrite + Nitrate	mg/L	13	0.01	0.005	0.005	0.005	0.043	0.005	0.48	0.7	2.1
Metals & Trace Elements	Aluminium	mg/L	22	0.005	0.0025	0.0025	0.005	0.0109	0.0106	0.06	-	0.055
	Arsenic	mg/L	22	0.0002	0.0005	0.0007	0.0017	0.0052	0.00716	0.028	-	0.024
	Barium	mg/L	22	0.0005	0.034	0.057	0.0813	0.0904	0.105	0.202	-	-
	Boron	mg/L	22	0.005	0.023	0.0442	0.11	0.396	0.764	1.45	-	0.94
	Cadmium	mg/L	22	0.00005	0.000025	0.000025	0.000025	0.00004	0.00005	0.00005	-	0.002
	Chromium	mg/L	22	0.0002	0.0001	0.0001	0.0005	0.0004	0.0005	0.0007	-	0.00031
	Cobalt	mg/L	22	0.0001	0.00005	0.00005	0.00045	0.0004	0.0005	0.0027	-	-

Parameter		Units	Samples	LoR	Values						ANZG (2018)	
					Minimum	P_{20}	Median	Mean	P_{80}	Maximum	Stressor DGV	Toxicant DGV
	Copper	mg/L	22	0.0005	0.0005	0.00054	0.00095	0.0017	0.0014	0.013	-	0.0014
	Iron	mg/L	22	0.002	0.003	0.0082	0.025	0.031	0.0388	0.16	-	0.7
	Lead	mg/L	22	0.0001	0.00005	0.00005	0.00005	0.0003	0.0005	0.0005	-	0.0034
	Manganese	mg/L	22	0.0005	0.001	0.00232	0.005	0.037	0.032	0.41	-	1.9
	Molybdenum	mg/L	22	0.0001	0.0004	0.00056	0.001	0.003	0.0039	0.015	-	-
	Mercury	mg/L	22	0.00004	0.00002	0.00005	0.00005	0.00005	0.00005	0.0001	-	0.00006
	Nickel	mg/L	22	0.0005	0.00025	0.0005	0.001	0.003	0.002	0.0192	-	0.011
	Selenium	mg/L	22	0.0002	0.0001	0.00022	0.0005	0.002	0.005	0.005	-	0.008
	Uranium	mg/L	22	0.00005	0.00052	0.000858	0.0025	0.0044	0.00593	0.016	-	0.0005
	Vanadium	mg/L	22	0.0002	0.0006	0.0023	0.005	0.005	0.00788	0.0112	-	-
	Zinc	mg/L	22	0.001	0.0025	0.0025	0.0075	0.0114	0.0178	0.045	-	0.008

P_{20} = 20th percentile; P_{80} = 80th percentile; LoR = Limit of Reporting (can vary between sampling events); Results below LoR are presented at half the LoR. Data from Stantec (2022, 2023) and sampling by De Grey.

Pool TRD2 demonstrates seasonal variations in water volume, depth, and quality. During the dry season (November 2021) and post-flood period (July 2022), the pool was a broad, shallow body of water exceeding 100 m in length and 30-50 m wide. Clear water with depths ranging from 0.5 to 1.5 m was observed. However, the wet season (May 2022) coincided with a significant reduction in water volume. During this period, TRD2 contracted to a much smaller size (around 15 m by 5 m) and became shallower (0.4 m deep).

The wet season, characterised by reduced pool size and volume, also resulted in a deterioration of water quality. This was evidenced by increased turbidity, algal blooms, and the presence of deceased fish. Habitat complexity remained limited throughout the year, with only scattered boulders present on the sandy substrate. Notably, the pool entirely lacks aquatic macrophytes and riparian vegetation. The margins of the pool consist of silty clay, which becomes anoxic during the wet season.

The water quality recorded for this pool is presented in Table 8-2. Exceedances of guideline values are highlighted with a distinct background colour (light yellow). In general, the TRD2 water quality presents similar patterns to the average water quality of the river (Table 8-1):

- pH remained slightly alkaline throughout the monitoring campaigns, while electrical conductivity varied greatly.
- The spike in several parameters in May 2022, where the pool had retreated to a small area (15 m by 5 m and 0.4 shallow), may be associated with the concentration due to evaporation, as well as biologic activity (algae/cyanobacteria blooming).
- Post-flood monitoring (Jul. 2022) revealed higher concentration of chromium and zinc, compared to previous samples. However, they are in the same magnitude order.
- Presence and variation in metals concentration is likely related to erosion in the catchment area.

Table 8-2: TRD2 Pool - Water Quality Summary

Parameter		Units	LoR	Nov. 2021 (Dry Season)	May 2022 (Wet Season)	Jul. 2022 (Post-Flood)	ANZG (2018)	
							Stressor DGV	Toxicant DGV
General	pH (unit)	-	-	9.05	8.92	8.25	6.5 - 8.0	
	Total Dissolved Solids	mg/L	1	670	4,610	217	-	-
	Dissolved Oxygen	mg/L		7.87	4.1	-	-	-
	Dissolved Oxygen	%		113.7	48.6	-	90	120
	Electrical Conductivity	(µS/cm)	1	1,030	7,090	334	250	-
	Total Suspended Solids	mg/L	5	19	163	<5	-	-
	Turbidity	NTU	0.1	9.7	130	2.3	15	-
Major Ions	Sodium	mg/L	1	158	1,280	34	-	-
	Magnesium	mg/L	1	38	126	9	-	-
	Calcium	mg/L	1	16	13	24	-	-
	Potassium	mg/L	1	9	46	4	-	-
	Chloride	mg/L	1	216	1,880	38	-	-
	Sulphate	mg/L	1	6	18	12	-	-
	Bicarbonate	mg/L	1	200	833	143	-	-
	Carbonate	mg/L	1	55	142	<1	-	-

Parameter		Units	LoR	Nov. 2021 (Dry Season)	May 2022 (Wet Season)	Jul. 2022 (Post-Flood)	ANZG (2018)	
							Stressor DGV	Toxicant DGV
Nutrients	Total Nitrogen	mg/L	0.1	2	15.6	0.2	0.3	-
	Total Phosphorus	mg/L	0.01	0.02	0.56	0.01	0.01	-
	Total Kjeldahl Nitrogen	mg/L	0.1	2	15.6	0.2	-	-
	Nitrite + Nitrate	mg/L	0.01	<0.01	<0.01	0.04	0.7	2.1
Metals & Trace Elements	Aluminium	mg/L	0.005	0.06	<0.01	<0.005	-	0.055
	Arsenic	mg/L	0.0002	0.005	0.028	0.0007	-	0.024
	Barium	mg/L	0.0005	0.049	0.057	0.0632	-	-
	Boron	mg/L	0.005	0.25	1.45	0.033	-	0.94
	Cadmium	mg/L	0.00005	<0.0001	<0.0001	<0.00005	-	0.002
	Chromium	mg/L	0.0002	<0.001	<0.001	0.0005	-	0.00031
	Cobalt	mg/L	0.0001	<0.001	<0.001	0.0001	-	0.0014
	Copper	mg/L	0.0005	0.001	<0.001	0.0009	-	0.0014
	Iron	mg/L	0.002	0.06	<0.05	0.006	-	0.7
	Lead	mg/L	0.0001	<0.001	<0.001	<0.0001	-	0.0034
	Manganese	mg/L	0.0005	0.02	0.005	0.0251	-	1.9
	Molybdenum	mg/L	0.0001	0.002	0.015	0.0008	-	0.034
	Mercury	mg/L	0.00004	<0.0001	<0.0001	<0.00004	-	0.00006
	Nickel	mg/L	0.0005	0.001	0.007	0.0008	-	0.011
	Selenium	mg/L	0.0002	<0.01	<0.01	<0.0002	-	0.008
	Uranium	mg/L	0.00005	0.003	0.014	0.00248	-	0.0005
	Vanadium	mg/L	0.0002	<0.01	0.01	0.0024	-	0.006
	Zinc	mg/L	0.001	<0.005	<0.005	0.016	-	0.008

This data has served as a baseline for De Grey to establish appropriate water quality criteria for Proposed discharge to the Turner River as it was the only pool downstream of the proposed discharge outfall that was able to be consistently sampled. The criteria considered natural variations and flood influences to ensure discharged water maintains or improves upon the existing river quality. Consequently, monitoring individual pools within the Turner River may not be necessary, as long as the discharged water meets the established criteria.

8.3.4.4 Aquatic Ecology

The aquatic ecology assessment includes aspects relevant to the Terrestrial Fauna, Flora and Vegetation, and Inland Waters Environmental Factors. To present the findings of the aquatic ecology assessment holistically, all aspects are summarised in this section.

The ecological characteristics of the Yule and Turner Rivers are described in Table 8-3. Pools on the Turner and Yule Rivers were characterised by:

- Nutrient enrichment from livestock.

- Increase in salinity due to evaporation.
- Natural mineralisation of surface waters (Al, As, B, Cu, Zn and U).
- Natural mineralisation of sediments (Cr and Ni).

As detailed in Section 3.3, the Yule River's ecological and heritage significance has influenced Proposal design to minimise any potential impacts. Consequently, the primary focus of this assessment remains the Turner River aquatic habitat.

The Turner River, like many Pilbara river systems, exhibits a diversity of aquatic habitats. These include permanent and semi-permanent pools, alongside stretches that experience extended dry periods and only flow during significant rainfall events, typically associated with tropical low-pressure systems. However, the frequency and number of permanent and semi-permanent pools within the Turner River are limited.

The proposed discharge of surplus water to the Turner River will cause a temporary shift from seasonal to continual flows. The shift is expected to be approximately one year of continual flow at the greatest extent of discharge and up to 2.5 years' flow closer to the discharge point, with some intermittent discharge continuing for the life of the mine. The continual discharge will create additional aquatic habitat that favours species adapted to perennial flows. However, it should be noted that:

- The affected area is a relatively small portion of the Turner River system.
- The aquatic species found in the Turner River are typically widespread throughout the Pilbara region and have the ability to disperse or recolonize suitable habitats.
- These species are also adapted to naturally variable hydrological regimes, making them resilient to temporary changes.

The following aquatic fauna were recorded in the Turner River during the dual-phase survey:

- Six aquatic macrophytes.
- 58 phytoplankton.
- 42 diatoms.
- 116 aquatic invertebrates.
- 10 fish.

None of the aquatic species recorded in the Yule and Turner Rivers were listed as threatened under the EPBC Act or BC Act or listed as Priority species.

One species listed as Vulnerable and one as Near Threatened on the International Union for the Conservation of Nature (IUCN) Red List were recorded in the Turner River. Moreover, three species recorded in the Turner River were considered endemic to the Pilbara. Further details on these species are provided in Table 8-3.

The following terrestrial vertebrates identified in the Turner River are considered in the Terrestrial Fauna section (Section 10):

- Seven waterbirds.

- One amphibian.
- One mammal.

The opportunistic survey (Stantec, 2023) showed a lower diversity of aquatic macrophytes, algae, invertebrates, and fish compared to the baseline, likely due to the recent high flows. The species recorded were consistent with the previous survey. This survey found the Turner River had larger surface water pools compared to the smaller remnant pools observed in the dual-phase study, which would be expected for a post-rainfall survey. The Yule River, on the other hand, consistently held larger waterbodies across all surveys and likely provides a more important refuge for aquatic life during dry periods.

The survey results align with the baseline study, suggesting a low risk to aquatic life in the Turner River from the proposed discharge.

Table 8-3: Summary of Ecological Values From the Dual-Phase Survey

Aspect	Turner	Yule
Hydrology/ Habitat	• Semi-permanent pools influenced by rainfall, contracting or drying during low rainfall conditions (except for one permanent, TR1, located upstream of the outfall, which retains water due to underlying bedrock). • Limited instream habitat in smaller pools characterised by sandy substrate, absence of submerged macrophytes and turbid water.	• Larger permanent, potentially groundwater fed pools and semi-permanent pools. • Dominantly on substrate with minimal seasonal variation in pool size and depth between wet and dry season. • Complex instream habitats (macrophytes, undercut banks, woody debris, detritus, and overhanging trees), characterised by silt-clay substrate, dense macrophytes and increased water clarity.
Water Quality	• Moderately to strongly alkaline pH. • Freshwater (<5,000µS/cm) except for two locations with >5,000µs/cm (TR1 – upstream of outfall and TRD2 – downstream of outfall). • Elevated nutrients (TN & TP) due to unrestricted livestock access. • Generally low metals except for some minor exceedances of ANZG (2018) Guideline Values for Al, As, B, Cu, Zn, and U across sites. • Similar water quality results across seasons, due to low rainfall conditions.	• Circumneutral to strongly alkaline pH. • Freshwater (<5,000µS/cm) except for one location (YRU1) (>8,000µs/cm). • Elevated nutrients (TN & TP) due to unrestricted livestock access. • Generally low metals except for some minor exceedances of ANZG (2018) Guideline Values for B, Cu, Zn, and U across sites. • Similar water quality across seasons, due to low rainfall conditions.
Sediment Quality	• Circumneutral to strongly alkaline pH. • Generally low salinity, low nutrients and low metals. • Ni slightly above ANZG (2018) Guideline Values for one location (TR1-A).	• Circumneutral to strongly alkaline pH. • Generally low salinity, nutrients and metals levels. • Cr slightly above ANZG (2018) Guideline Values for one location (YR3). • Ni above ANZG (2018) Guideline Values for several sites and above the high guideline value for one location (YR3).
Primary Producers	• Six macrophytes. • 58 phytoplankton. • 42 diatoms. • All have a Pilbara wide, or more diverse distribution. • Limited primary productivity in receding pools.	• Nine macrophytes. • 55 phytoplankton. • 45 diatoms. • All have a Pilbara wide, or more diverse distribution. • Primary productivity generally higher and more diverse than Turner River.

Aspect	Turner	Yule
2nd and 3rd order consumers	• 116 aquatic invertebrates. • 10 fish (five new records for the river). • Seven waterbirds. • One frog. • One mammal. • Most species with a common and widespread distribution across the Pilbara and Northern Australia.	• 159 aquatic invertebrates. • 12 fish species (three new records for the river). • Nine waterbirds. • One reptile. • Most species with a common and widespread distribution across the Pilbara and Northern Australia.
EPBC Act and BC Act Listed Taxa	• *Dasyurus hallucatus* (Northern Quoll).	• None recorded.
IUCN-Listed taxa	• *Eurysticta coolawanyah* (damselfly) – Vulnerable. • *Ephippiorhynchus asiaticus australis* (Black Stork) - Near Threatened	• *Eurysticta coolawanyah* (damselfly) – Vulnerable. • *Hemicordulia koomina* (dragonfly) – Vulnerable. • *Anguilla bicolor* (Indonesian shortfinned eel) – Near Threatened.
Pilbara endemic species	• *Sternopriscus pilbaraensis.* • *Tiporus tambreyi.* • *Laccobius billi.*	• *Tiporus tambreyi.* • *Laccobius billi.* • *Anisops nabillus.* • *Ictinogomphus dobsoni.*
Ecological Value	• Low to Moderate. **Justification:** smaller, more ephemeral pools with less habitat complexity.	• Moderate to High. **Justification:** larger, more permanent pools with complex structural habitats.

8.3.5 Surplus Water Discharge

Modelling of the surplus water discharge into the Turner River has been undertaken by SWS (2022b) (see Appendix 6). Hydrological modelling indicates that at the predicted surplus water discharge rates during the Proposal's first three years (see Section 2.8), the wetting front will advance from the outfall at a rate of approximately 5 km per month. The wetting front is not predicted to extend beyond 50 km downstream of the outfall. This extent will be reached at month eight and will be maintained for 14 months before discharge volumes decline, and the wetting front begins to recede.

The modelled maximum extent of the wetting front is shown in Figure 8-9. SWS (2022b) observed a natural flow rate at the proposed discharge outfall of around 60 ML/day on 3 June 2022, which is 2.5 times greater than the proposed maximum discharge. Figure 8-10 and Figure 8-11 represent this natural flow at the discharge outfall and at the Indee causeway (2.1 km downstream), respectively.

The DoW (2011) identified the Lower Turner River Alluvial Aquifer as a potential freshwater source and established a sustainable allocation limit, based on a risk-based approach. This area is located approximately 25 km downstream of the discharge outfall and is depicted in Figure 8-1. The surplus water discharge is expected to reach the aquifer, however, is not expected to have an impact due to (Geowater, 2023b):

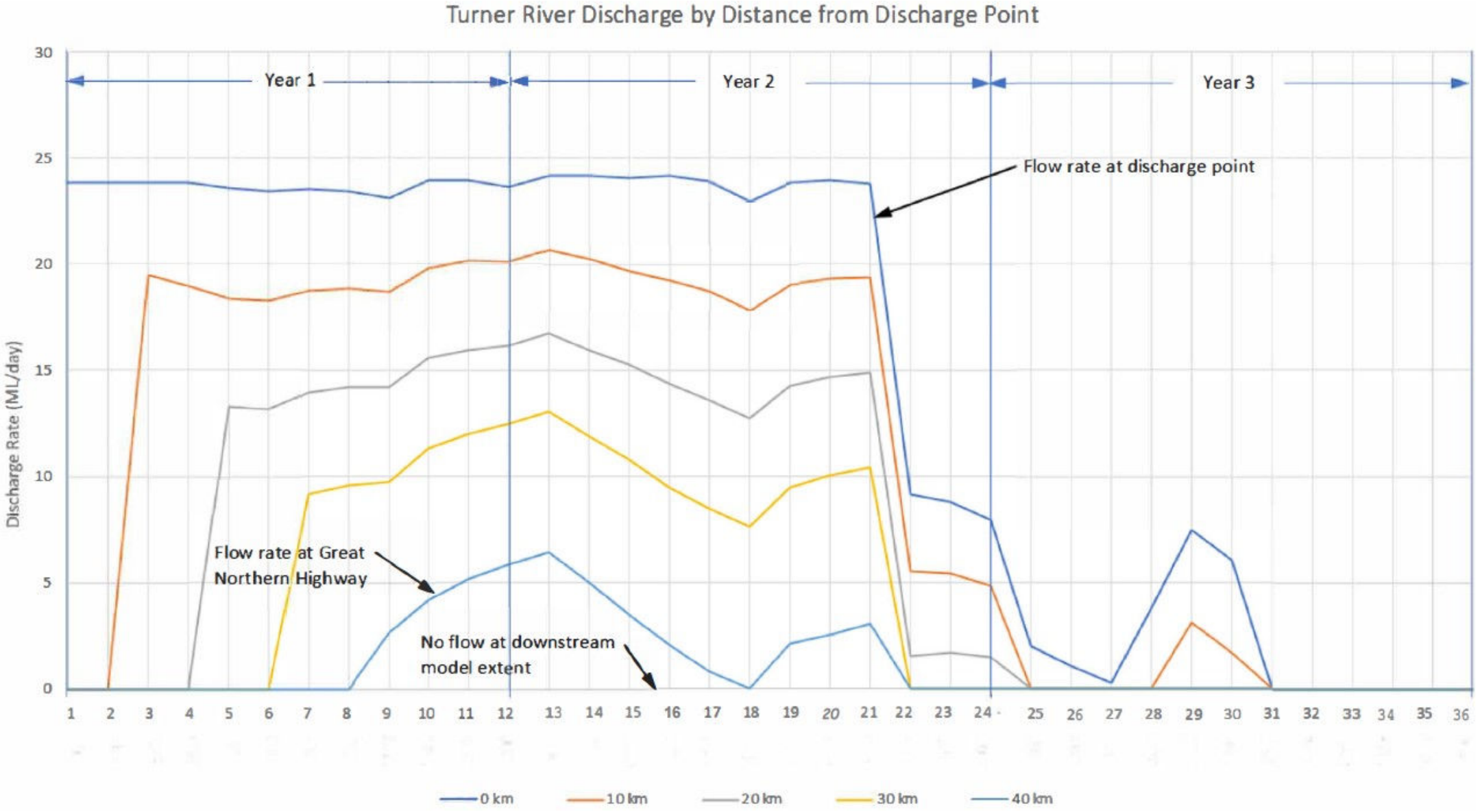
- The discharge water quality is comparable to the local groundwater quality.
- The discharge is minimal compared to natural flood events that regularly recharge the aquifer.
- The lateral extension of water table mounding is limited around the river channel.

A Tier 2 Ecological Risk Assessment (ERA) was undertaken to evaluate the potential impacts on the Turner River ecosystem from the discharge of surplus water (MBS, 2024b). This assessment, provided as Appendix 12, considered the existing surface water quality of the Turner River, potential ecological receptors and the quality of the groundwater that will be discharged. The key findings were as follows:

- Raw groundwater proposed to be discharged into the Turner River was found to contain naturally elevated dissolved concentrations of uranium (28–31 µg/L) and vanadium (28–30 µg/L).
- These concentrations were considerably higher than the ANZG (2018) low reliability freshwater species protection guidelines for uranium (0.5 µg/L) and vanadium (6 µg/L).
- Selected raw groundwater arsenic concentrations (6–36 µg/L) were also elevated with respect to ANZG (2018) freshwater species protection guidelines (13 µg/L).
- The Turner River is naturally enriched in uranium, with a mean concentration of 5.3 µg/L, far above the ANZG (2018) guideline value of 0.5 µg/L for species protection.
- Average vanadium concentrations of 4.1 µg/L in the Turner River are comparable to the ANZG (2018) low-reliability (limited toxicity data) freshwater species protection value of 6 µg/L.
- Given the low reliability of ANZG (2018) freshwater species protection guidelines for uranium and vanadium and the elevated concentrations of uranium and to a lesser extent vanadium and arsenic present in the Turner River, a series of site-specific trigger values were generated.
- Modelling and laboratory tests indicate that soil-based holding ponds (with a residency time of three hours) and/or iron oxide treatments effectively reduce vanadium and arsenic concentrations to below trigger levels, while uranium remains largely unaffected.

Based on these results, a Tier 3 ERA was undertaken on representative discharge water (direct toxicity assessment) to further understand the potential impacts of the proposed discharge on aquatic biota in the Turner River ecosystem (Appendix 13). The result of this assessment concluded that:

- Discharge of representative water treated via soil-based holding ponds showed no deleterious effects on a range of Pilbara based biota within the Turner River system, even at uranium concentrations of 33 µg/L. Tested species included freshwater cladoceran, rainbowfish, freshwater hydra, duckweed, and green algae, with results indicating that the planned discharge would not have significant adverse acute or chronic effects on these organisms. Therefore, the establishment of provisional trigger values for naturally occurring uranium, suggested prior to conducting this ecotoxicological test, is deemed unnecessary, as the planned discharge is not expected to have significant adverse effects on the biota of the Turner River.
- Radiological risks from untreated discharge water are minimal at the population level for organisms residing in or utilising the Turner River, even under conservative scenarios.
- The impact on Turner River sediments and hydrology due to surplus water discharge was considered low, with the 50-km wetting front predicted to inundate less than 6% of the river width, posing minimal ecological risk over the three-year discharge period.



Source: SWS 2022

PROJECT		CLIENT
November 2024	Hemi Gold Project - Referral Supporting Document	
Chart 8-2		
ADV-AU-00673	Development of Turner River Wetting Front by Distance from Outfall	

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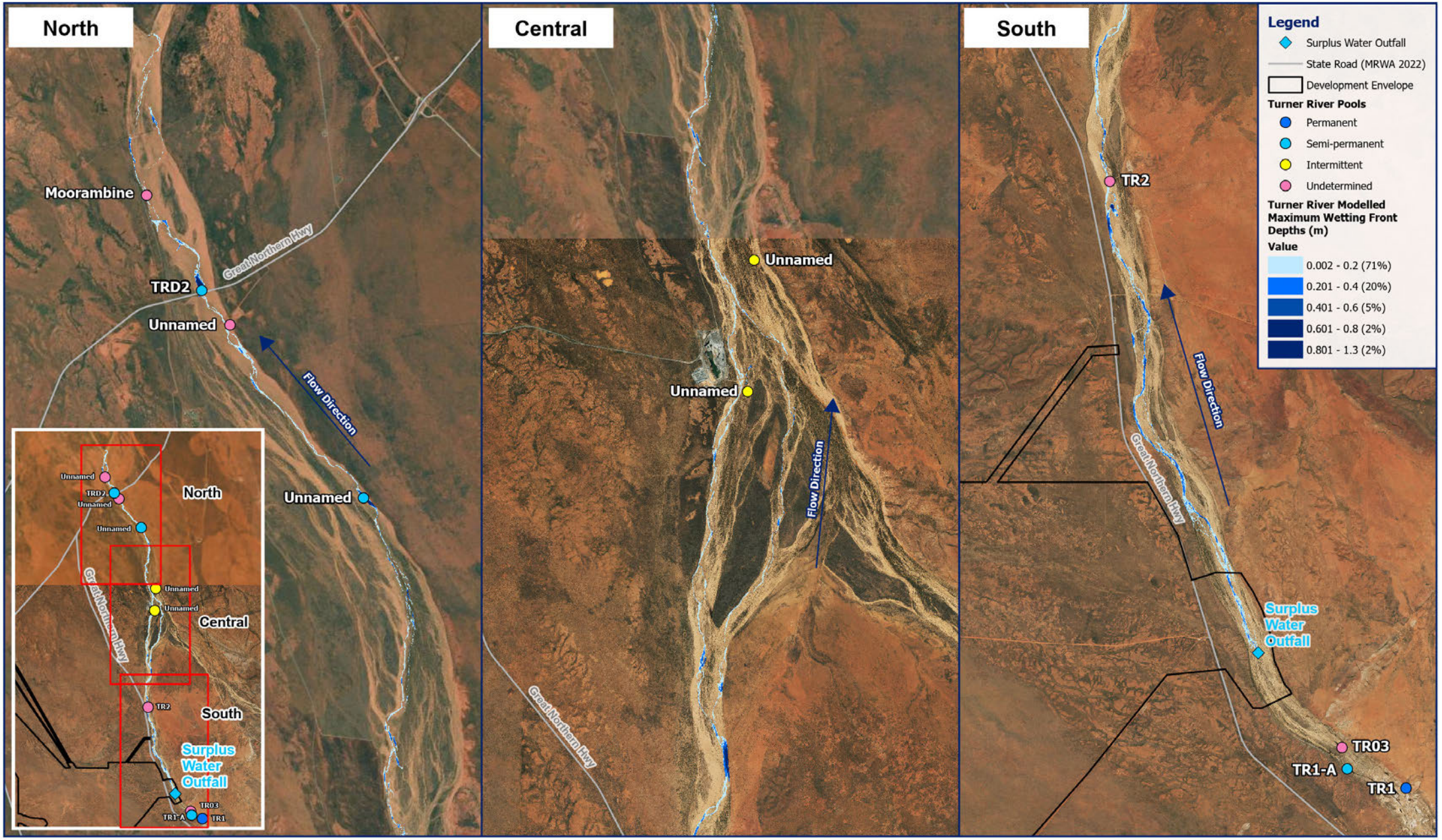

Projection: GDA2020 MGA Zone 50
Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Created/Reviewed by: KM/EL

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Scale: 1:600,000

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PROJECT		CLIENT
March 2025	Hemi Gold Project - Referral Supporting Document	DE GREY MINING LTD
Figure 8-9		
ADV-AU-00673	Surplus Water Discharge Wetting Front Extent	

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The expected depth range of the area of surplus water discharge in the Turner River is provided in Table 8-4. The majority of the surplus water discharge area is expected to be shallow with 71% less than 20 cm deep and 91% less than 40 cm deep. The maximum expected depth is 130 cm in pools or depressions, however only 2% of the discharge area is expected to exceed 80 cm in depth. In comparison, a 10% AEP event spreads across more than 80% of the river at a depth of approximately 3.5m.

Table 8-4: Modelled Depth Range of Surplus Water Discharge in the Turner River

Depth (cm)	Percentage of Surface Area	Cumulative Percentage
0.2 – 20	**71%**	**71%**
20 - 40	**20%**	**91%**
40 – 60	**5%**	**96%**
60 – 80	**2%**	**98%**
80 – 130	**2%**	**100%**

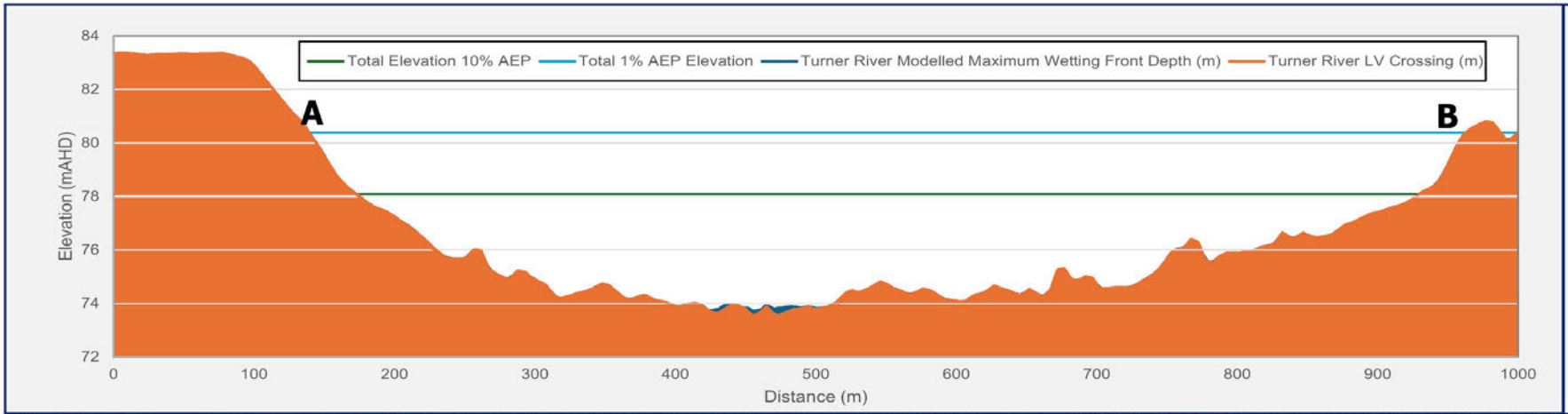
Surplus water discharge will temporarily alter the wet-dry cycle of the Turner River. SWS prepared three cross sections of the Turner River:

1. At the outfall (Figure 8-10).
2. 2.1 km downstream of the outfall (Figure 8-11).
3. 4 km downstream of the outfall (Chart 8-3).
4. 12 km downstream of the outfall (Chart 8-4).

Due to the width of the Turner River at these locations (circa 1.5 km), the charts' horizontal scale (width) is very compressed relative to the vertical scale (depth). Figure 8-10 shows that the maximum modelled flow depth at the outfall is approximately 30 cm deep, covering a width of approximately 50 m or 3.5% of the average width of the Turner River, being principally contained within the river's low flow channel.

At the 4 km and 12 km locations the modelled high and low-flow surplus water discharge conditions are compared to flow events, expressed as Annual Exceedance Probabilities (AEP) (Chart 8-3 and Chart 8-4). The discharge will be restricted to approximately 160 m or 10% of the average width of the Turner River, being principally contained within the river's low flow channel. Depth of water will vary.

The discharge area is significantly narrower than the riverbed and shallower than natural flood events and is not predicted to have any long-term impacts to river morphology.

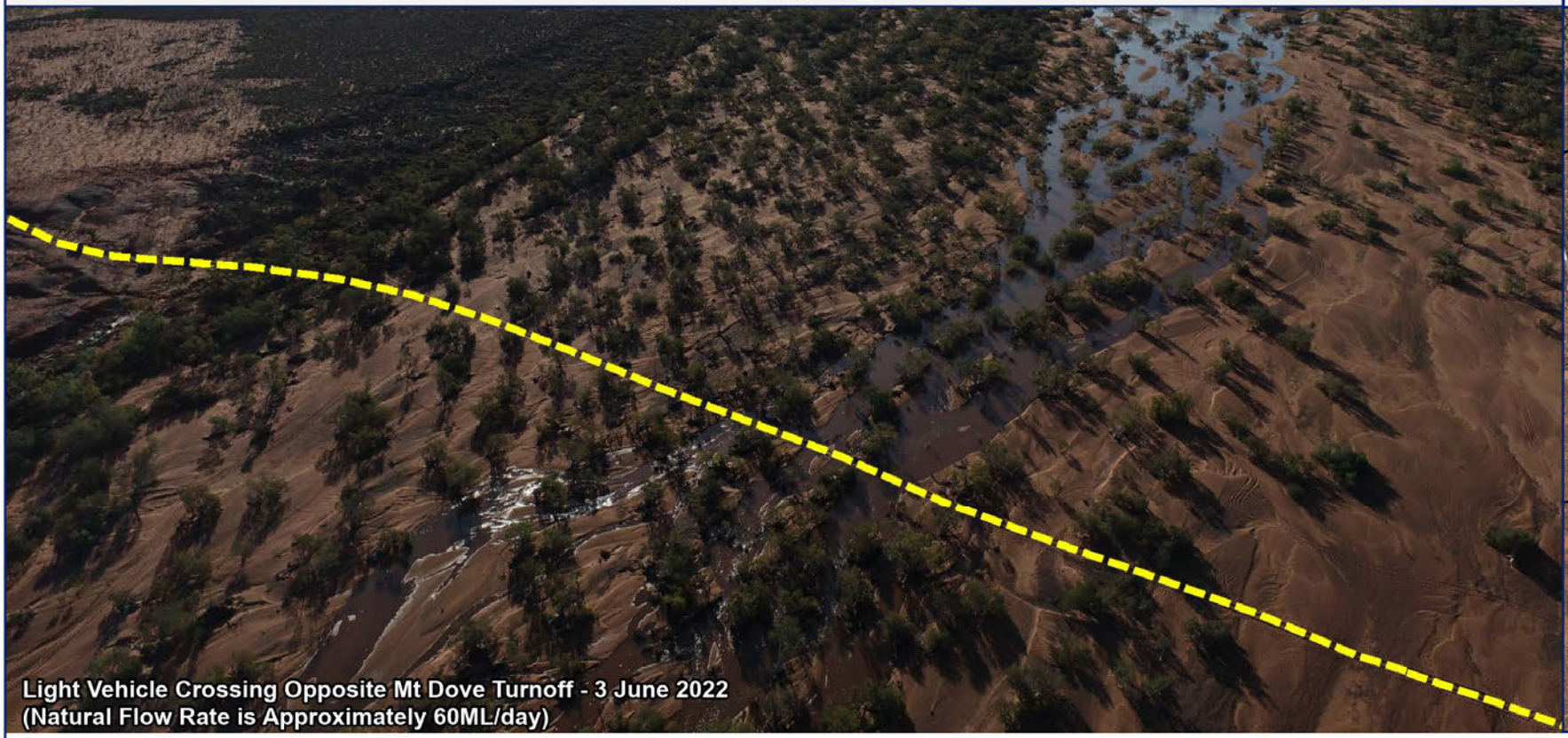


Legend

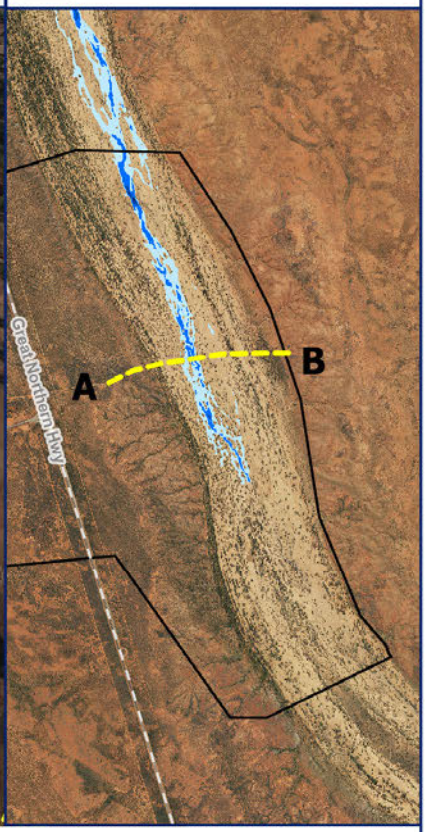
- Turner River Indee Causeway
- State Road (MRWA 2022)
- Development Envelope

Turner River Modelled Maximum Wetting Front Depths (m)

- 0.002 - 0.2 (71%)
- 0.201 - 0.4 (20%)
- 0.401 - 0.6 (5%)
- 0.601 - 0.8 (2%)
- 0.801 - 1.3 (2%)



Light Vehicle Crossing Opposite Mt Dove Turnoff - 3 June 2022
(Natural Flow Rate is Approximately 60ML/day)



Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Created/Reviewed By: KM/EL

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Scale: 1:40,000

0 0.25 0.5 1 km

PROJECT		CLIENT
March 2025	Hemi Gold Project - Referral Supporting Document	DE GREY MINING LTD
Figure 8-10		
ADV-AU-00673	Wetting Front Modelling and Comparable River Flow Near Outfall	

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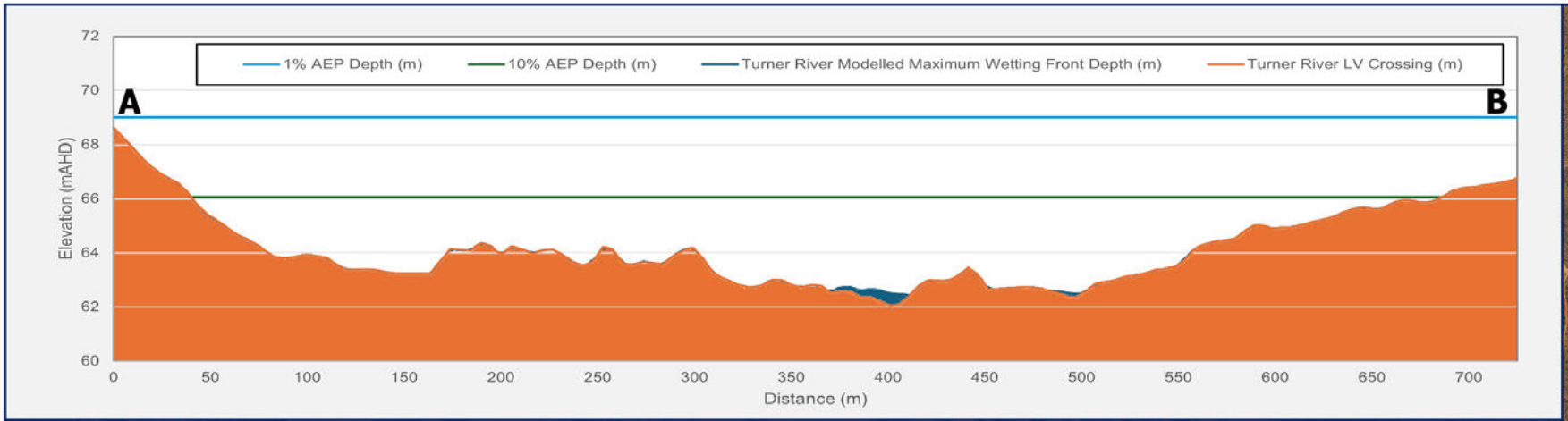

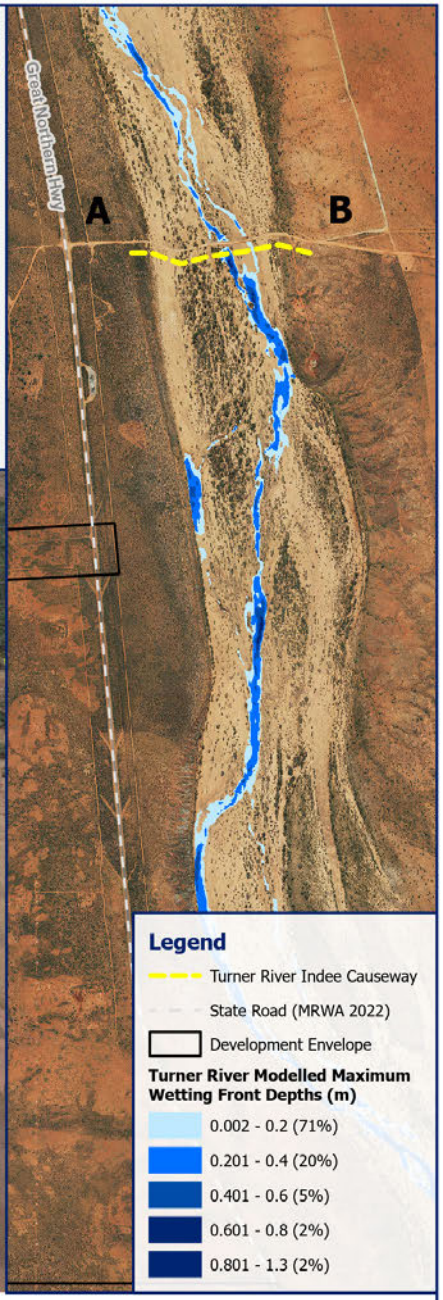

Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Created/Reviewed By: KM/EL

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Scale: 1:30,000

0 0.25 0.5 1 km

PROJECT		CLIENT
March 2025	Hemi Gold Project - Referral Supporting Document	DE GREY MINING LTD
Figure 8-11		
ADV-AU-00673	Wetting Front Modelling and Comparable River Flow at Indee Causeway (2.1 km downstream of outfall)	

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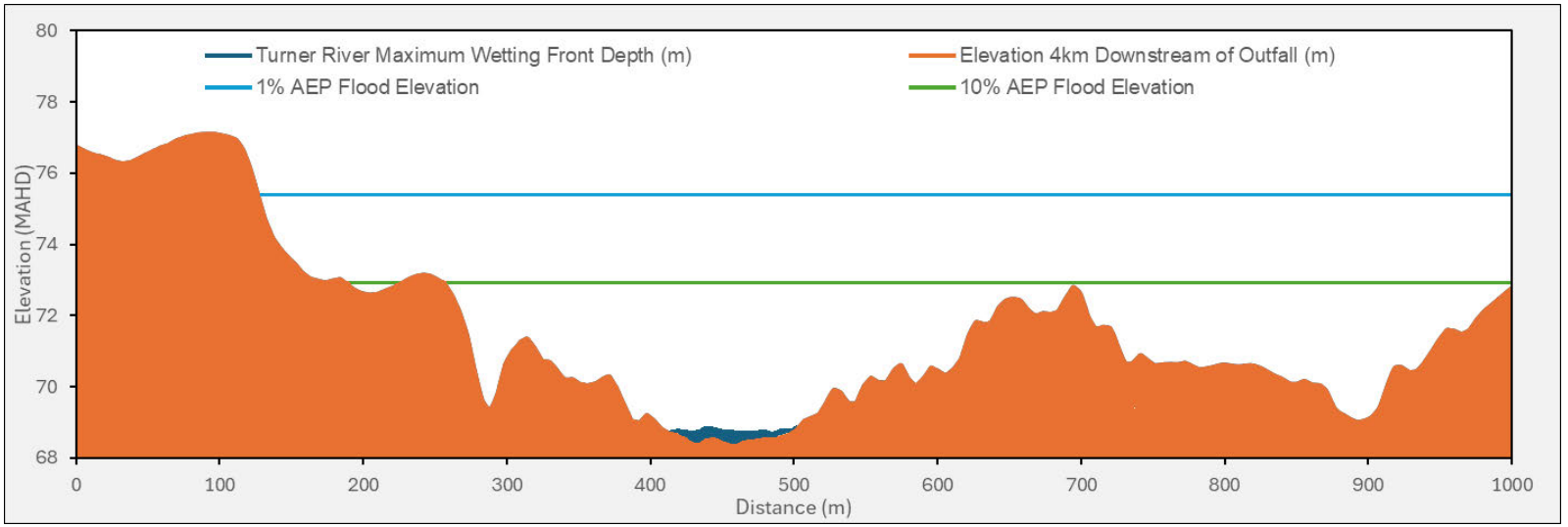


Chart 8-3: Cross Section of Turner River 4 km Downstream of Outfall

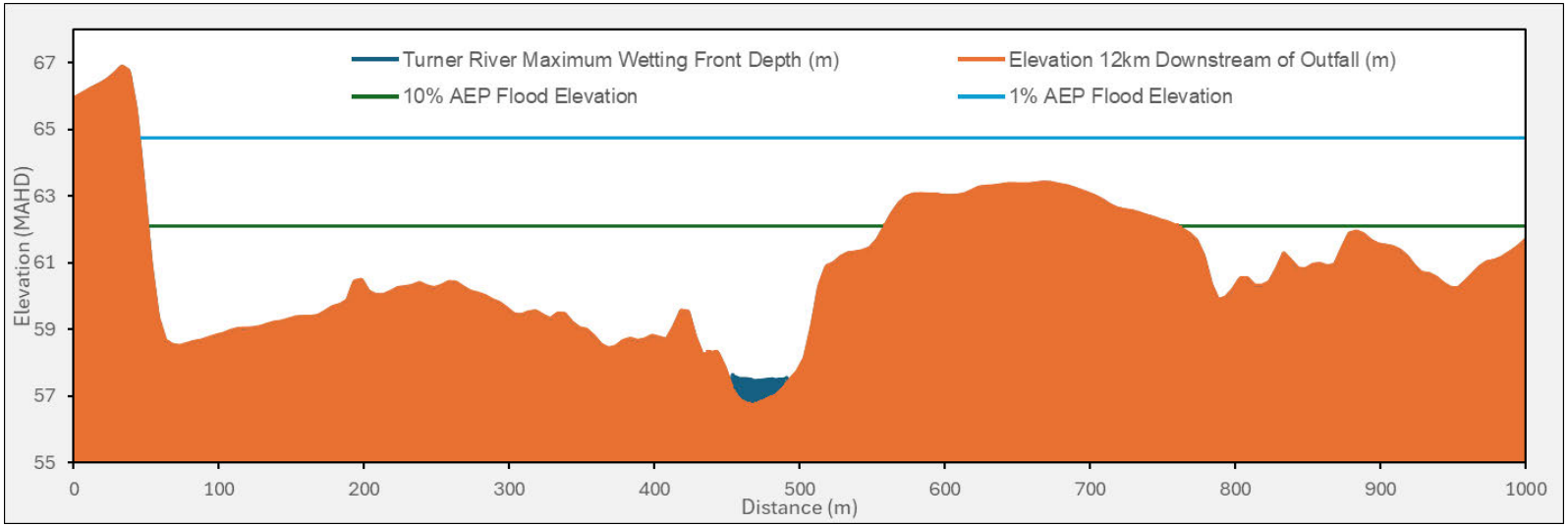


Chart 8-4: Cross Section of Turner River 12 km Downstream of Outfall

DWER maintains a gauging station at Pincunah (Figure 8-5) with publicly available monthly flow data. De Grey has used this data to compare natural flows to proposed surplus water discharge. The data was adjusted to account for the location of the Hemi discharge point, assuming it would receive approximately four-thirds the flow measured at Pincunah. The greatest monthly flow of the Turner River for each year from 1986 to 2023 and the total annual flow is compared to the proposed surplus water discharge in Chart 8-5.

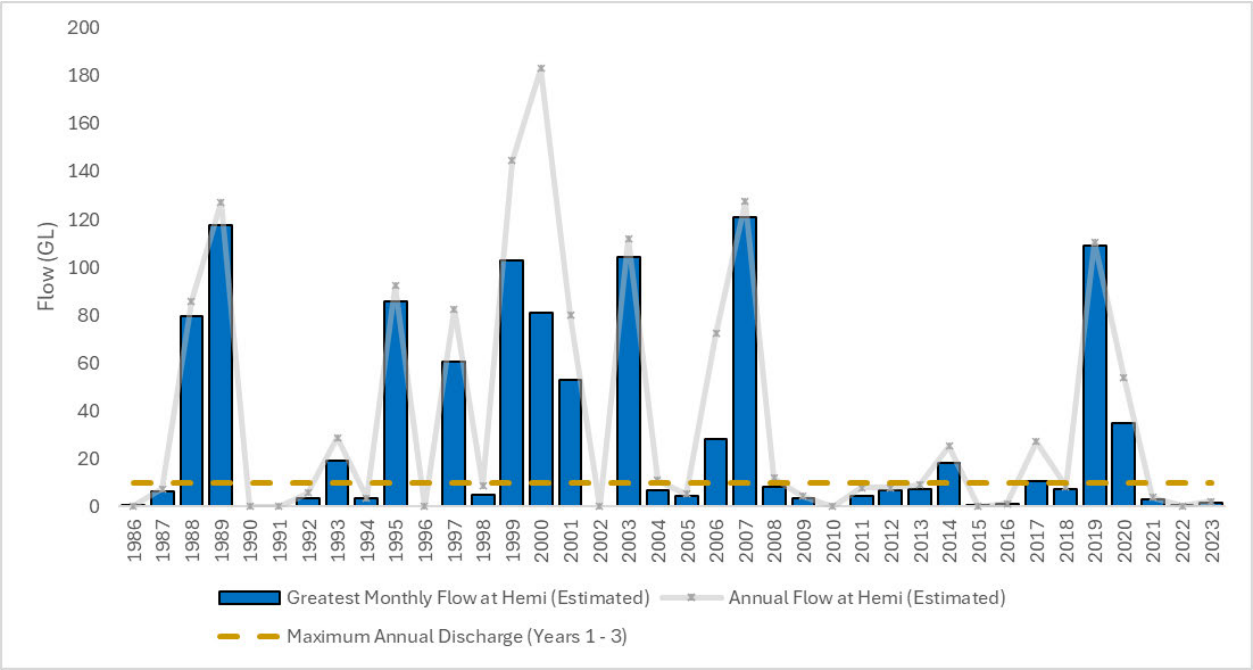


Chart 8-5: Maximum Monthly and Annual Estimated Flow in the Turner River Compared to Maximum Annual Discharge

Chart 8-5 shows that natural monthly flows, within a year, often significantly exceed the proposed total annual surplus discharge. This indicates that the river can experience high flow events, even during years with overall low precipitation. Additionally, the fact that the highest monthly flow for most years accounts for the majority of the annual flow suggests a seasonal pattern with concentrated rainfall in certain months (summer). Consequently, for most of the year, the river is dry.

8.3.6 Groundwater Dependent Vegetation (GDVs)

Umwelt undertook an assessment of GDVs as part of flora and vegetation studies for the Proposal (Umwelt, 2024a). Vegetation along the Yule and the Turner Rivers contains obligate phreatophyte species[4] and is considered groundwater dependent. A copy of the survey report is attached as Appendix 16.

Vegetation along the Yule and Turner Rivers is situated beyond the 1 m dewatering drawdown contour (Figure 8-12) and as a result it has been determined that the Proposal's dewatering program will not impact the rivers' GDVs.

[4] The species require continual access groundwater and can cope with having some or all roots permanently inundated.

Nevertheless, as noted before, the Turner River typically exists in a dry state with occasional flow events. The Proposal proposes to discharge water for an extended period, potentially transforming the river into a continuously flowing system for approximately 2.5 years. This change in the river's hydrology could impact plant and animal life adapted to the dry cycles, and the presence of permanent water could alter predator-prey relationships within the food web. However, these are deemed low-risk (MBS, 2024). Details on measures to manage these potential impacts are detailed in the following sections.

8.3.7 Existing Groundwater Use

Existing groundwater users within the surrounding area include mining (Mt Dove Iron Ore Mine Borefield), pastoralism (Indee Station) and mineral exploration.

In addition to the above, the Water Corporation operates the Yule River Borefield for public drinking water supply for the town of Port Hedland. The supply bores are located near the eastern banks of the Yule River between 32 – 45 km northwest of the Proposal. This area is protected by the Yule Public Drinking Water Supply area which extends southwards along the Yule River to within approximately 6 km from the Proposal.

8.4 Potential Impacts and Mitigation Measures

Potential impacts, mitigation measures and predicted outcomes are provided in Table 8-6. Additional information on certain impacts is also provided under the relevant subheadings below.

8.4.1 Mine Dewatering

As discussed in Section 2.8, dewatering is required to allow safe mining below the water table. Surplus water will be reinjected into the upper and lower alluvium/palaeochannel aquifers described in Section 8.3 as well as discharged into the Turner River. Water management ponds will also be constructed for the Proposal.

The abstraction borefield has been designed so that groundwater, depending on its quality, can be directed for discharge, reinjection or reuse, according to its quality, as presented in Section 2.8. Reinjection bores will target the upper and lower alluvium/palaeochannel aquifers. Due to high connectivity, localised mounding is expected. To ensure that shallow rooting vegetation is not impacted by mounding, the reinjection borefield has been designed with spacing of less than 400 m to ensure that the water table remains deeper than 2 m below ground level.

The modelled extent of groundwater drawdown (defined as the area where drawdown is expected to be no more than 0.5, 1 and 2 m, noting that there is an observed natural variation in groundwater levels of 2 m in the region) is shown in Figure 8-12, along with an indicative area of mounding at reinjection borefields in year 3, which will later also be dewatered. Drawdown and reinjection are not predicted to impact either the Yule or Turner Rivers, and the Yule River borefield on Reserve 33015. By year 15, the model shows that the 0.5 m drawdown while proximate, will not impact, the Yule River channel and/or any potential GDVs, whilst the drawdown will be approximately 5 km from the Turner River channel.Considering the 2 m drawdown contour, which accounts for the observed natural variation in groundwater levels, drawdown is expected to remain at 1.5 km from the Yule River and 6.2 km from the Turner River, ensuring that no riparian vegetation or GDVs within these water systems will be impacted. Therefore, no impacts are expected on riparian vegetation, GDVs or on riverine pools.

The drawdown area is predicted to reach a small portion of the YRWR, between years 9 and 15. This Public Drinking Water Source Area (PDWSA), classified as a P1 protection zone, aims to completely prevent any degradation of the quality of the water source. This specific PDWSA prioritises the protection of the Yule River channel, which is the primary source for aquifer recharge (Water and Rivers Commission, 2000). Therefore, the extension of the water drawdown of less than 2 m towards the YRWR is not expected to impact the integrity or yield of the Yule River Borefield, as modelling has predicted there will be no impact on the Yule River channel. The Environmental Management Plan (EMP) (DEG-EN-RP-0007) makes provision for measures to monitor the drawdown and undertake actions to avoid further extension to the YRWR and the Yule River.

It is likely that the proposed dewatering will impact five pastoral bores. De Grey will replace these bores in consultation with the pastoral leaseholder. Moreover, some Atlas Iron production bores may be impacted by up to 1 m in drawdown, which is unlikely to impact yields. As dewatering and reinjection proceed, these bores will first experience mounding and higher groundwater levels before drawdown reaches them. Although the Atlas Iron site is in care and maintenance with limited borefield use, the model assumed full capacity operation of this borefield, which provides a conservative (worst-case) scenario.

The post closure long term drawdown from the Proposal is shown in Figure 8-13.with further information provided in Appendix 11.

As recharge rates are low, groundwater recovery is slow and long term drawdowns are predicted to be reached after approximately 200 years. Long term drawdowns are expected due to the continued effect of evaporation from the pit lakes.

For the first three years of dewatering, the Proposal is estimated to potentially discharge up to 10 GL/year of surplus water to the Turner River. Once the processing plant is commissioned and operating at nameplate capacity, the utilisation of abstracted groundwater for processing will reduce discharge into the Turner River (initially up to 60%, gradually decreasing by up to 80 - 100% until the end of the Proposal). Intermittent discharge of up to 4 GL/year may occur in years 4 – 6, and 2 GL/year is expected from year seven until the end of the Proposal. The Proposal’s water balance is illustrated in Chart 8-6.

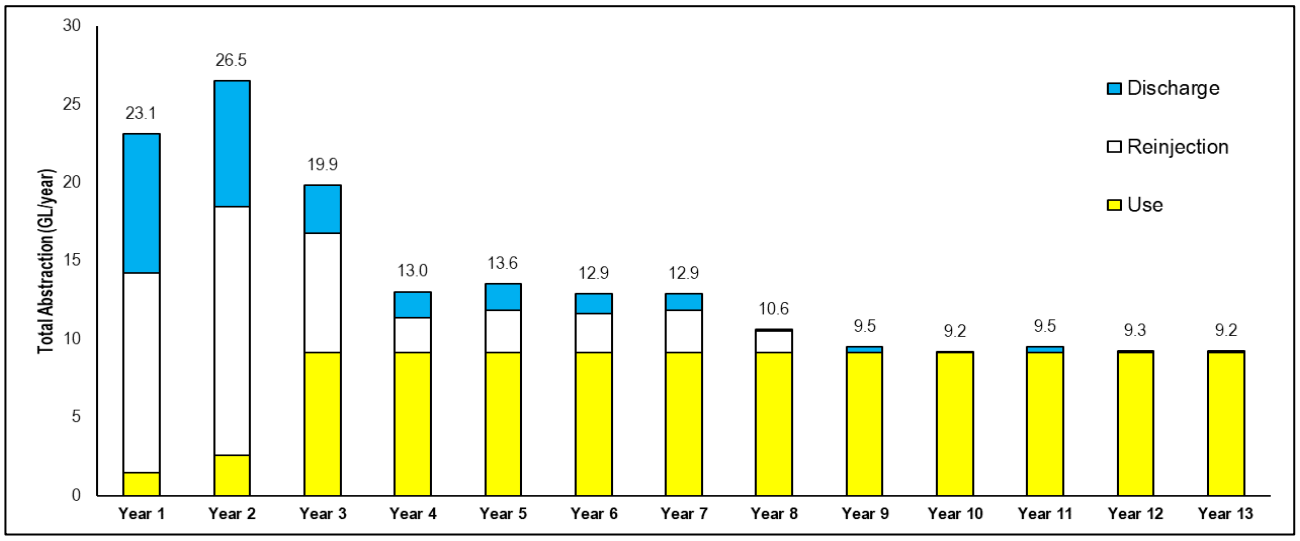
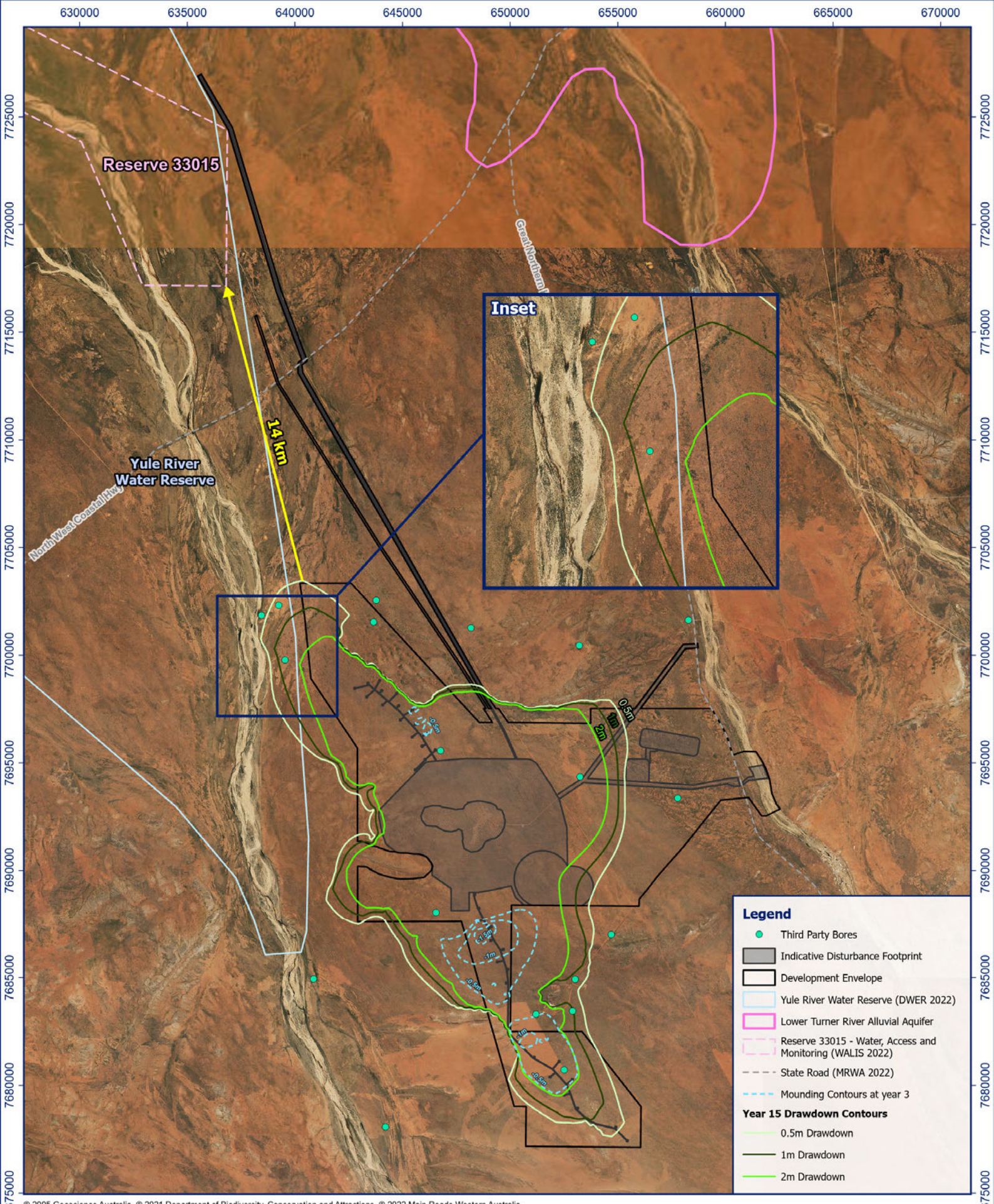


Chart 8-6: Base Case dewatering and Proposal Water Balance Rates



Scale: 1:220,000

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Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Created/Reviewed By: KM/EL

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PROJECT

Hemi Gold Project - Referral Supporting Document

Groundwater Drawdown and Mounding

CLIENT

DE GREY MINING LTD

Figure 8-12	ADV-AU-00673	March 2025

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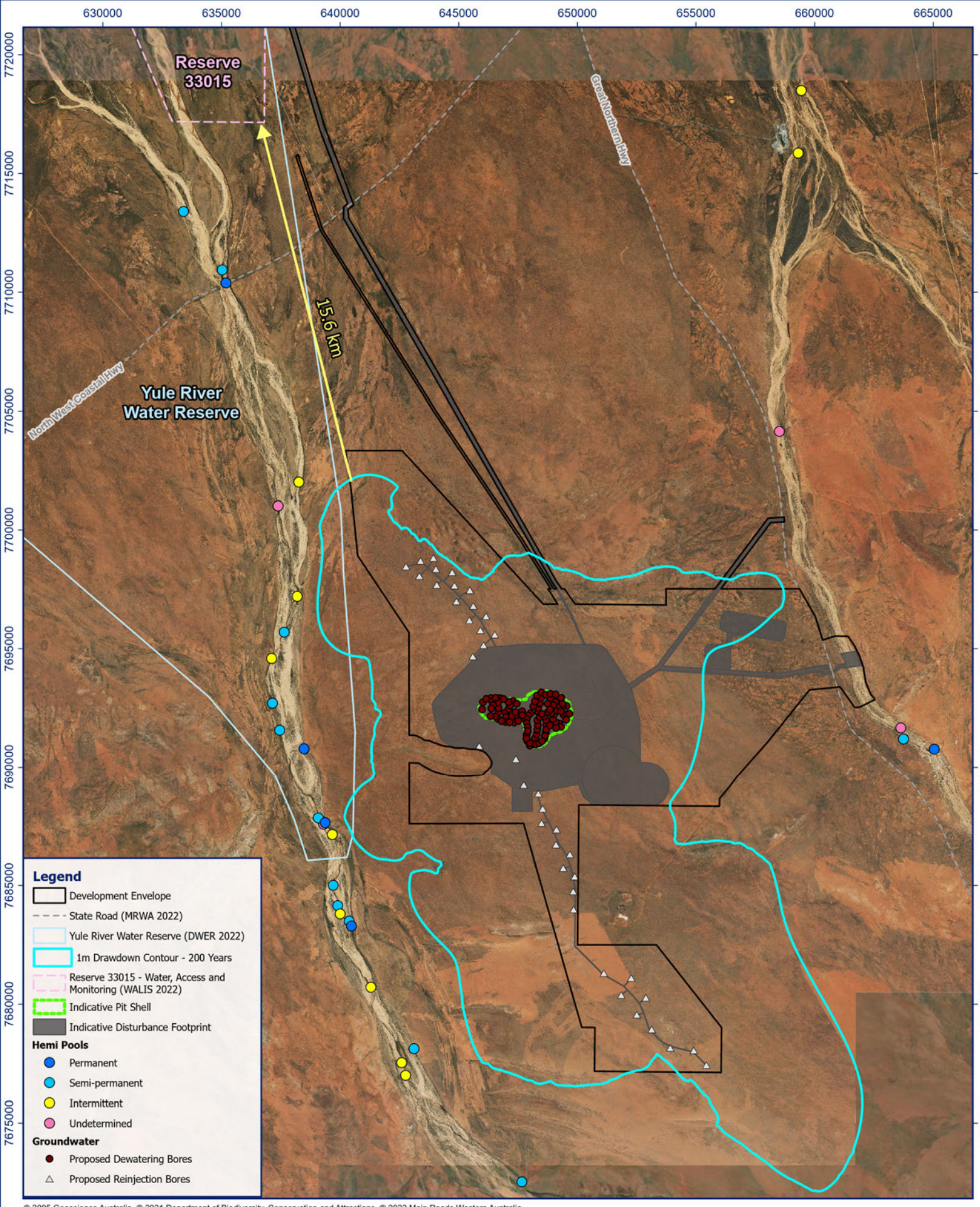

Projection: GDA2020 MGA Zone 50
Scale: 1:200,000
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Created/Reviewed By: KM/EL
Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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PROJECT	CLIENT
Hemi Gold Project - Referral Supporting Document	DE GREY MINING LTD
Post Closure Drawdown	
Figure 8-13 | ADV-AU-00673 | March 2025	

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8.4.2 Water Quality Management

De Grey proposes the reinjection of surplus water into the upper and lower alluvium/palaeochannel aquifers of the proposed open pits. Particle tracking modelling (Figure 8-14) undertaken for 200 years for the RBS predicts that reinjected water will recirculate back into the pits for subsequent re-abstraction and reuse as process water. The management of abstracted groundwater will follow these priorities:

- Water suitable for discharge (Type I): Prioritised for reinjection via any reinjection bore. If reinjection capacity is exceeded, water may be discharged into the Turner River prior to being held in soil-based holding pond/s, with a residency time of three hours to allow for the sorption of arsenic and vanadium to natural soils.
- Water unsuitable for discharge (Type II): Reinjected in locations where particle tracking modelling shows water will recirculate back into the open pits, from where it can be abstracted for re-use.
- Water unsuitable for discharge (Type II): Prioritised for re-use in the processing plant once this is operational.

De Grey engaged MBS (2024b) to undertake a Tier 3 ecological risk assessment (ERA) to inform the proposed groundwater quality management system and discharge criteria (Appendix 13). The ERA identified two potential concerns regarding the discharge quality: increased metal concentrations and radiation associated with increased naturally occurring uranium concentrations. To address these concerns, MBS proposed several mitigation options, including:

- Conducting ecotoxicity tests on pond-treated water to determine if the remaining uranium levels (26-30 µg/L) represent a risk to aquatic life. These tests demonstrated that, despite elevated uranium concentrations, there were no observed deleterious effects on aquatic species in the Turner River, even at undiluted concentrations of 33 µg/L.
- Utilising ion exchange as a backup option to remove uranium from a portion of the discharge water. Based on successful ecotoxicity results, this option may be reduced or eliminated, with the soil pond-treated water being safe for discharge.
- Exploring opportunities to share surplus water for mining or agricultural use, thus reducing the need for discharge into the Turner River.

To demonstrate compliance with discharge criteria to the Turner River, a monitoring program will be implemented, focusing on:

- Routine water sampling of both influent and effluent from the treatment ponds to verify the removal efficiency of arsenic and vanadium.
- Periodic sediment analysis of soil-based holding ponds to assess accumulation and inform maintenance schedules.
- Adaptive management strategies to address any unexpected exceedances in water quality parameters.

These measures have been incorporated into the EMP, to enable effective management of potential impacts to riverine pools, water quality, and hydrological changes.

Groundwater quality management will be further supported by a groundwater quality model that assigns a quality status to each dewatering bore. This model will determine whether water is reinjected, treated, or discharged without further treatment. De Grey intends to exhaust all reinjection and reuse opportunities before discharging any water into the Turner River. Additionally, opportunities to export surplus water to third parties for alternative uses are being investigated.

When applying for a Part V works approval and environmental licence for dewatering infrastructure, De Grey will present the groundwater quality management system and associated discharge criteria to the Department of Water and Environmental Regulation (DWER). Upon approval, DWER will establish discharge criteria on the environmental licence and set the necessary monitoring and reporting requirements. It is anticipated that a groundwater operating strategy will be a condition of the groundwater licence under the RIWI Act, with DWER coordinating both groundwater and environmental licensing to adequately regulate groundwater abstraction and discharge.

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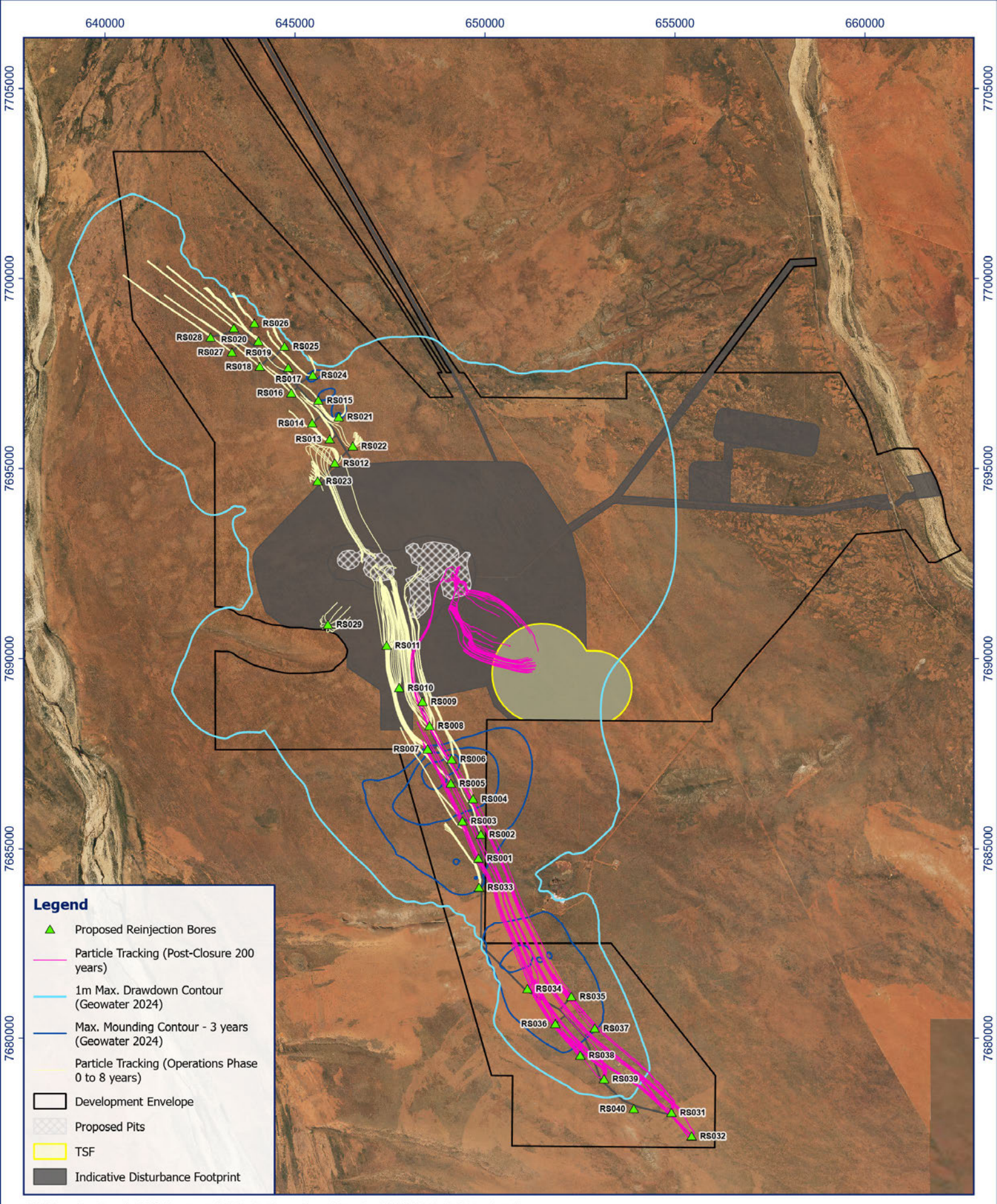

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Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Created/Reviewed By: KM/EL

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PROJECT

Hemi Gold Project - Referral Supporting Document

Particle Tracking Results

CLIENT

DE GREY MINING LTD

Figure 8-14	ADV-AU-00673	March 2025

8.4.3 Post-Closure Pit Lakes

With the cessation of dewatering at closure, groundwater flow into pit voids together with rainfall and surface water run-off, will accumulate to form pit lakes. Groundwater flow will occur due to the natural flow path becoming re-established and due to the presence of a hydraulic gradient associated with the groundwater drawdown depression created by the dewatering.

Forward particle tracking (200 years) confirms that all injected water from the southern bore field will ultimately discharge into the pit void post-closure, reinforcing the role of the pit lakes as a long-term hydraulic sink. This ensures that any remaining high-arsenic reinjectant water will be removed from the aquifer system between Hemi and Mt Dove.

Hydrogeological modelling indicates that due to low groundwater flow and high evaporation rates, the hydraulic gradient will remain post-closure. Thus, the pit lakes will act as a groundwater sink, continually drawing in groundwater as it evaporates from lake surfaces (Appendix 10).

Pit lake modelling predicts that water salinity will slowly climb in both voids due to evapo-concentration effects, reaching up to 2,000 – 15,000 mg/L after 866 years. Groundwater drawdown modelling indicates that the post-closure groundwater drawdown depression will not adversely affect the Yule River, or its permanent pools that are potentially groundwater-fed nor the Turner River or semi-permanent pools (Appendix 10).

The data available considerably influences the accuracy of hydrogeological modelling, with the intended use of the modelled results matched to the appropriate calibration standards set out in the Australian Modelling Guidelines (Barnett B et al., 2012). While De Grey's model is appropriately calibrated, once dewatering and monitoring commence, the model's performance can be further enhanced through ongoing recalibration based on monitoring data. Continual improvement in knowledge and understanding of closure issues is a standard requirement of mine closure planning under the Mining Act. DEMIRS will be updated on the ongoing collection of data and the current status of pit lake modelling as part of the ongoing revisions of the MCP. Preliminary pit lake modelling is included in the Conceptual MCP, attached as Appendix 7. Kinetic leach column testing that is currently underway will be used to assign source terms to the pit walls as part of the ongoing refinement of the pit lake water quality modelling.

Potential impacts and proposed mitigation measures are assessed in Table 8-6.

8.4.4 Surplus Water Discharge

Groundwater levels will temporarily increase during and following discharge along the extent of the discharge wetting front. Discharge is predicted to remain within the low flow channel and the increase in groundwater levels as a result of discharge is likely to be limited (SWS, 2022b).

Based upon modelling of the surface water discharge undertaken by SWS (2022b), it is considered likely that two semi-permanent and one intermittent pools may experience a change to their hydrological regime during periods of maximum discharge with no impacts during periods of minimum discharge. No permanent pools occur within the Turner River.

The discharge is expected to create additional aquatic habitat that favours resident fauna or species adapted to perennial flow, resulting in a change to the dominant biological communities during the discharge period. Stantec however considered it highly unlikely that any species would be lost from the Turner River given the broader distribution of the aquatic biota recorded as these taxa are typically known to occur in waterbodies throughout the Pilbara and have the ability to actively disperse and recolonise newly created flows or pools (Stantec, 2022).

Additionally, the aquatic biota inhabiting these waterways are inherently resilient, due to the highly variable hydrological regimes and fluctuating water quality conditions that are typical of the Pilbara region. In the Turner River, this will enable aquatic biota to persist and adapt to any temporary changes from proposed discharge. A staged reduction in discharge will also allow the system to return to a post natural state prior to complete cessation.

In addition to the above, water quality trigger and threshold criteria have been proposed in the EMP based upon an analysis of site specific surface water quality from the Turner River.

8.4.5 Aquifer Reinjection

Up to 50% of surplus dewater is proposed to be reinjected into the aquifer system both up- and down-gradient of the open pits. Additional reinjection, up to 100%, may be considered following submission of an updated groundwater model that incorporates the full reinjection scenario and is approved by the CEO of the EPA.. This water management strategy has the benefit of partly mitigating maximum amounts of drawdown and aquifer depletion, however potential adverse impacts associated with the proposed aquifer reinjection comprise:

- Causing baseline water tables to rise (mounding) to a level whereby:
  - Shallow rooted vegetation may be adversely impacted.
  - Troglofauna habitat is lost.
  - Salinisation of the water table zone occurs via near-surface evaporation.
- Differences in water quality between the native groundwater and injected water leading to adverse impacts on nearby groundwater users and environmental values.

De Grey has undertaken a short term reinjection trial (Appendix 9) with larger scale trials planned. Results from the short term trial and awareness of the potential mounding effects was used explicitly in deriving the proposed reinjection bore locations, reinjection rates and durations. A criterion to prevent the mounding of the water table from becoming any shallower than 3 m below ground level was applied in the reinjection model simulations.

Figure 8-12 show the predicted levels of water table mounding during the early years of the Proposal where reinjection rates are the greatest. These show the maximum extent of mounding over the broader reinjection borefield area is between 2 – 2.5 m. This is not likely to have any adverse impacts given that baseline water table in these areas occurs between 5 – 8 m below ground level.

The results of the short-term (2 week) reinjection trial are consistent with the modelled amounts of mounding. Two monitoring bores set within the shallower levels of the alluvial aquifer (HMB055 and HMB072) and located between 10 -170 m from the reinjection bore, only produced mounding of 0.6 – 0.7 m during the trial. Extrapolating these results over a two year period indicates that mounding of 0.8 – 1.0 m can be expected.

The water quality of dewatering discharge would be similar to the native water quality of the alluvial aquifer in the proposed aquifer reinjection years. Table 8-5 provides a summary comparison of salinity, pH and several trace metal levels between the Proposal area and proposed aquifer reinjection areas based on groundwater samples collected between 2021 and 2023. The table indicates that dissolved arsenic levels at Hemi are higher than in the alluvial aquifer in reinjection areas. However, the tabled values do not represent the likely averaged metal levels of actual dewatering discharge, as the summary does not incorporate the 'flow weighting' effects of combining high permeability alluvial aquifer water (with typically low arsenic levels) with low permeability bedrock water (with higher arsenic content in some areas) that will occur as a result of dewatering, i.e., the mean and median values in the table are biased (to higher levels) by bedrock samples collected near ore zones.

Table 8-5: Comparison of the Proposal's Groundwater Quality and Ambient Groundwater Quality in the Reinjection Borefield Areas

Analyte	Reinjection Borfield Areas				Proposal Groundwater			
	Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median
Arsenic (µg/L)	2.7	11.8	6.8	6.7	3.4	818.0	70.0	12.3
Uranium (µg/L)	6.4	34.9	23.5	24.9	7.0	114.0	33.2	32.5
Vanadium (µg/L)	0.8	39.7	26.5	28.5	0.3	45.6	27.3	28.8
Boron (mg/L)	0.29	0.62	0.49	0.50	0.29	0.80	0.52	0.52
Strontium (mg/L)	0.32	1.94	0.60	0.58	0.17	0.85	0.61	0.60
pH	7.9	8.5	8.1	8.1	7.7	9.1	8.1	8.1
TDS (mg/L)	840	993	909	916	667	1,741	1,029	1,049

Notwithstanding the expected low average trace metal content of dewatering discharge proposed for aquifer reinjection, any individual dewatering bores that abstract exceptionally high levels of dissolved arsenic would be designated and managed as 'Type II' water for reinjection into the RBS. Once the ore processing and TSF circuit is commissioned, any Type II water would be preferentially directed to the ore processing water stream.

To consider the fate of any reinjected Type II water, the groundwater model applied particle tracking to the alluvial aquifer model layers, with particles 'released' in RBS and tracked for 200 years. Figure 8-14 shows the particle tracking paths from each reinjection bore and confirms that all injected water from the RBS will ultimately discharge into the pit void post-closure, reinforcing the role of the pit lakes as a long-term hydraulic sinks.

8.4.6 Potential for Drawdown to Affect Other Users

Based upon the 0.5 m drawdown contour at the end of mining as presented in Figure 8-12 and the 1 m long term drawdown contour as presented in Figure 8-13 there is potential for drawdown to impact upon five pastoral bores. De Grey will deepen or replace pastoral bores that may be impacted by drawdown and observe any others that may be affected. It is unlikely that the Proposal will cause a significant impact to the Atlas Iron borefield (currently in care and maintenance).

Groundwater abstraction for the Proposal will not have an adverse impact on the operation or sustainability of the Yule River Borefield. Figure 8-12 and Figure 8-13 show that the maximum drawdown extends approximately 11 kilometres to the northwest of the Proposal and that Water Corporation production bores are located a further 20 – 34 km away.

The predicted groundwater levels confirm the lack of potential for ‘interference’ or cumulative impacts between the two borefields. This is consistent with expectations, as the Yule River Borefield is configured and operated such that most of the groundwater it abstracts is low-salinity water derived from, and replenished by, large, albeit irregular, river flow events adjacent to the borefield. This was confirmed in the 2010 numerical modelling by MWH which determined that the median aquifer recharge from Yule River flows and flooding (from 6 km south of the North-West Coastal Highway crossing to the coast) is about 16 GL/year (MWH, 2010). Public Hansard records from 2020 reveal that annual Yule Borefield abstraction over the twenty year period to 30 June 2019 ranged between 2.8 – 7.2 GL and averaged 4.9 GL.

The Yule River Water Reserve occurs closer to the Proposal than the actual Yule River Borefield and the groundwater modelling indicates that drawdowns of up to almost two metres may occur within a small area of the water reserve. The limited magnitude and area of the predicted drawdown would not materially alter the amounts of groundwater throughflow and river recharge the alluvial aquifer relies on to sustain the current ecosystems and Water Corporation abstractions within the reserve.

Based upon these mitigation measures , as well as the rigorous monitoring regime, De Grey does not anticipate its activites will result in a significant impact to any current or future water users in the area.

Table 8-6: Assessment of Impacts to Inland Waters

Potential Impacts	Interconnected Factors for Holistic Assessment	Mitigation Measure	Other Decision-Making Process Relevant?	Effectiveness of the Control
Direct Impacts				
Dewatering drawdown impacting GDVs and Pools along the Yule and Turner riverbeds and banks during and post mining.	• Terrestrial Fauna • Terrestrial Flora and Vegetation	• All operational water demand will be supplied from mine dewatering in the first instance (where feasible) reducing the requirement for water supply volumes. • The water management strategy includes the reinjection of surplus water to reduce the extent of drawdown. • Groundwater will be abstracted according to programs that have been modelled to ensure dewatering volumes are minimised while ensuring safe access to below water table mine pits. Ongoing groundwater level monitoring will be used to review and calibrate the groundwater models and adjust dewatering programs as required. • Dewatering to be undertaken in accordance with the RIWI Act Licence to take groundwater. • Implement groundwater level monitoring for the Yule River, with early response, trigger and threshold criteria to ensure the Yule River is not impacted. • Preliminary modelling indicates that the post-closure groundwater drawdown will not adversely affect the Yule or Turner Rivers. • Updating/recalibration the groundwater model at least annually for the first three years reducing to tri-annual thereafter. • Groundwater bores will be decommissioned in accordance with relevant guidelines, once no longer required.	• DWER RIWI Act: Groundwater Licence (5C) and Operating Strategy for dewatering and abstraction requires Proponents to provide detail on abstraction, operating strategy and management of groundwater levels. • DEMIRS Mining Act: Mining Proposal and Mine Closure Plan	• GDVs and pools at the Yule and Turner Rivers are not expected to be affected by dewatering activities attributable to the Proposal. • Abstraction and associated limits will be subject to assessment by DWER. DWER will effectively regulate impacts associated with the abstraction of groundwater through a Groundwater Licence and Groundwater Operating Strategy. • Pit lake water quality and closure outcomes will be effectively regulated by DEMIRS through the Mine Closure Planning Process. • The models used to optimise and balance the dewatering program are recognised across industry as best practise. • Ongoing monitoring of groundwater levels across the area will be used to adapt the program as necessary to achieve the desired environmental outcome.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		• Annual limit on groundwater abstraction. • No measurable drawdown extending to the Yule and Turner Rivers attributable to dewatering associated with the Proposal		• Proposal definition as per the Proposal Content Document • Outcomes based provision in the EMP
Dewatering drawdown impacts the yield of pastoral and/or Atlas Iron Mt Dove bores	• Social Surroundings	• Reinjection of surplus water to reduce the extent of drawdown. • Deepening or replacement of impacted bores. • Dewatering undertaken in accordance with the RIWI Act 5C Licence to take groundwater and associated Groundwater Operating Strategy and associated monitoring required. • Updating/recalibration the groundwater at least annually for the first three years reducing to tri-annual thereafter.	• DWER RIWI Act: Groundwater Licence (5C) and Operating Strategy for dewatering and abstraction requires Proponents to provide detail on abstraction, operating strategy and management of groundwater levels.	• De Grey will deepen or replace impacts to bores in consultation with the appropriate stakeholders.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practises and RIWI Act		RIWI Act Licence
Dewatering drawdown impacts yield of Watercorp Yule River Borefield	• Social Surroundings	• Reinjection of surplus water to reduce the extent of drawdown. • Dewatering undertaken in accordance with the RIWI Act 5C Licence to take groundwater and associated Groundwater Operating Strategy and associated monitoring required. • The drawdown area is predicted to reach a small portion of the Yule River Water Reserve, between years 9 and 15. This specific reserve prioritises the protection of the Yule River channel, which is the primary source for aquifer recharge. Therefore, the extension of the water drawdown of less than 2 m towards the Yule River Water Reserve is not expected to impact the integrity or yield of the Yule River Borefield Reserve 33015 (Water Corporation borefield) • Updating/recalibration the groundwater at least annually for the first three years reducing to tri-annual thereafter	• DWER RIWI Act: Groundwater Licence (5C) and Operating Strategy for dewatering and abstraction requires Proponents to provide detail on abstraction, operating strategy and management of groundwater levels.	• The yield of the Yule River Borefield is not expected to be affected by the Proposal. This avoidance strategy removes the potential impact source and therefore has a high level of certainty. Avoidance is the first and preferred strategy in the EPA mitigation hierarchy.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		Groundwater drawdown will be limited to be no less than 15km from Reserve 33015 (Water Corporation borefield).		Ministerial condition limiting groundwater drawdown to no less than 15 km of Reserve 33015 (Water Corporation borefield).

Potential Impacts	Interconnected Factors for Holistic Assessment	Mitigation Measure	Other Decision-Making Process Relevant?	Effectiveness of the Control
Surplus water discharge causing erosion of riverbanks and changes to geomorphology	• Terrestrial Fauna • Terrestrial Flora and Vegetation	• Outfall and associated infrastructure will be designed, constructed and maintained so as to minimise flow velocities and scour potential. • Regular inspections of outfall infrastructure during dewatering discharge to verify that operation is as designed. • Erosion presence and extent inspected during annual field riparian vegetation monitoring transects in the dry season. • Implement phased reduction in dewatering discharge resulting in a minimised risk of impact to geomorphology of the Turner River. • Discharge of surplus water undertaken in accordance with Part V EP Act Operating Licence limits, to be verified via water metering at outfall. • All outfall infrastructure will be removed at closure unless required for a future use identified through the mine closure planning process.	• DWER Part V EP Act: Works Approval and Operating Licence for discharge to the Turner River • DWER Bed and Banks Permit • DEMIRS Mining Act: Mining Proposal and Mine Closure Plan	• Part V Works Approval and Operating Licence conditions will minimise risk of potential impacts. • The design of the surplus mine water outfall is being developed in consideration of environmental and social values and in consultation with the Traditional Owners. This is expected to provide a highly effective control. • Engineering controls to limit erosion are standard practice that can be adapted/expanded if regular post-flood inspections observe evidence of excessive erosion. • Removal of infrastructure at closure is standard practice for Mine Closure. Removal of outfall infrastructure will reinstate uninterrupted flows in the Turner River.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		• Annual limit on dewatering discharge to the Turner River. • During periods of no natural flow, the discharge "wetting front" (affected area) in the Turner River will be no greater than 50 km downstream of the discharge location.		• Proposal definition as per the Proposal Content Document. • Ministerial condition limiting the wetting front in the Turner River to no greater than 50 km downstream of the discharge location under natural no flow conditions.
Reinjection of poor-quality water within the borefields impacts aquifer.	• Social Surroundings	• Management of two dewatering discharge stream types: Type I contains <24 µg/L of naturally occurring dissolved arsenic (As III) and Type II contains >24 µg/ L of dissolved arsenic (As III) • Dewatering bores will be quality tested and classified as either Type I or II. • Type I quality groundwater is prioritised for reinjection into the RBN • Type II quality groundwater is prioritised for reinjection into RBS where water will recirculate back to the pits and be used in the Processing Plant. • Groundwater model predicts that reinjected water will not extend towards the Yule River or Yule River Water Reserve. • Reinjection undertaken in accordance with a Part V EP Act Operating Licence.	• DWER Part V EP Act: Works Approval and Operating Licence for discharge to the Turner River • DWER RIWI Act: Groundwater Licence (5C) and Operating Strategy	• Part V Works Approval and Operating Licence conditions will minimise risk of potential impacts. • Reinjection of abstracted dewatering water is anticipated to be managed in accordance with Environmental Licence conditions. • The management strategy for reinjection of groundwater has been developed specifically for the Proposal to ensure Tier 1 waters are reutilised in processing and/or end up in the pits. Tier 2 waters will be reinjected into the aquifer and become available for ecological and social uses. This control is considered effective.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practices, Part V EP Act and RIWI Act.		DWER Part V EP Act Operating Licence
Surface water diversions around infrastructure impact natural flows, increase erosion and impact infiltration and recharge.	• Terrestrial Flora and Vegetation • Subterranean Fauna	• The Proposal's central mining and infrastructure area within the Development Envelope avoids creeks and clearly defined drainage lines • Landforms to be rock armoured at the base to prevent erosion where flood modelling indicates long term impacts. • Diversions designed to return surface water to natural flows where reasonably practicable. • All linear infrastructure will be removed at closure unless required for a future use identified through the mine closure planning process.	• DEMIRS Mining Act: Mining Proposal and Mine Closure for management of surface water changes	• Minimum design requirements for linear infrastructure are standard practice and effective at preventing ponding and maintaining flow regimes downstream. • Engineering controls will limit potential impacts are far as reasonably practicable. • Proper implementation of Mine Closure Plan will minimise risk of potential impacts.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practises and Mining Act		Mining Act Mining Proposal

Potential Impacts	Interconnected Factors for Holistic Assessment	Mitigation Measure	Other Decision-Making Process Relevant?	Effectiveness of the Control
Indirect Impact				
Discharge of surplus water of unsuitable quality into the Turner River impacting aquatic ecology.	• Terrestrial Fauna • Terrestrial Flora and Vegetation	• Manage two dewatering discharge stream types: Type I contains <24 µg/L of dissolved arsenic (As III) and Type II contains >24 µg/ L of naturally occurring dissolved arsenic (As III). • Poorest quality groundwater prioritised for reinjection in locations where recirculation back to the pits is predicted. • Type I surplus dewatering water to be retained in water management ponds to allow further reduction of metal concentrations (vanadium) and suspended solids prior to discharge to Turner River. • All discharge of surplus water and monitoring to be undertaken in accordance with a Part V Environmental Licence to ensure it is within approved water quality parameter. • Implement water quality monitoring prior to discharge to the Turner River, with early response, trigger and threshold criteria.	• DWER Part V EP Act: Operating Licence for discharge to the Turner River	• Discharge is anticipated to be managed in accordance with EMP and Part V EP Act Operating Licence conditions.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		Discharge into the Turner River will meet approved site-specific water quality criteria		Outcomes based provisions in the EMP
Discharge of sediment-laden surplus water into Turner River, causing excessive turbidity and impacting aquatic ecology.	• Terrestrial Fauna • Terrestrial Flora and Vegetation • Social Surroundings	• Surplus water will be passed through a settling pond(s) to reduce suspended solids before discharge. • Implement a regular maintenance program for settling ponds to ensure efficient sediment removal throughout the Proposal life. • Dewater from the borefields, which contain less sediment than in-pit sumps, will be prioritised for discharge. • All discharge of surplus water and monitoring to be undertaken in accordance with a Part V Environmental Licence to ensure it is within approved water quality parameters.	• DWER Part V EP Act: Operating Licence for discharge to the Turner River.	• Discharge is anticipated to be managed in accordance with licence conditions that regulate water quality of surplus water discharge. • Standard practices for mining operations which are effective in managing potential impacts
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practices and Part V EP Act		Part V EP Act Operating Licence
Contamination of surface water and groundwater from acid and metalliferous mine drainage or neutral mine drainage.	• Subterranean Fauna	• Waste characterisation results have shown the risk of AMD/NMD formation is low. • Mine design will avoid exposure of materials that pose a high risk of AMD/NMD formation. • Identification of high-risk waste material and implementation of appropriate stockpiling and handling strategies to prevent AMD/NMD formation by, for example, encapsulating away from the edges of WRLs. • High risk waste material will be encapsulated within NAF material within waste landforms (away from exposed edges of WRLs) to minimise potential for contaminated leachate. • Surface water drains to contain run-off from WRLs. • Implementation of the Proposal in accordance with the management commitments made in an approved MP and MCP. • Any contamination will be appropriately managed at closure, as per the *Contaminated Sites Act 2003*.	• DWER Part V EP Act: Operating Licence • DEMIRS Mining Act: Mining Proposal and Mine Closure Plan	Standard practices for mining operations which are effective in managing potential impacts
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practises, Part V EP Act and Mining Act		Part V EP Act Operating Licence and Mining Act Mining Proposal.

Potential Impacts	Interconnected Factors for Holistic Assessment	Mitigation Measure	Other Decision-Making Process Relevant?	Effectiveness of the Control
Contamination of groundwater due to seepage from the landfill, TSF and wastewater treatment plants	• Subterranean Fauna	**TSF** • Construction of TSF as per approved designs to minimise seepage, including but not limited to: – Compacted low-permeability liner: A 0.5 m thick clay liner with a co-efficient of permeability of $<10^{-8}$ m/s extends 300 m from the decant area to reduce seepage. Underdrainage system: Collects seepage water at the base of the TSF for reuse in processing. This system has a capacity of approximately 544 L/min. – Cut-off trench: Installed at the base of the embankment to reduce horizontal seepage movement. – Supernatant water recovery: Designed to recover 100% of process water discharged to the TSF, significantly limiting seepage. – Seepage monitoring: Vibrating wire piezometers (VWPs) will be installed along embankments to track groundwater levels and detect seepage movement. – . – Operation of TSF in accordance with TSF Operating Strategy and Environmental Licence. • TSF located upgradient of pits, such that any seepage will flow towards the pits and ultimately be reused or be diluted in the post-closure pit lake (Figure 8-14). • POx ore processing method converts arsenic in ore to insoluble arsenate form and produces a tailings that compacts to form relatively impermeable layers. • Recovery of decant water for reuse in the processing plant. • Piezometers for environmental monitoring of water levels and quality. • Construction and commissioning in accordance with Part V EP Act Works Approval. • Operation in accordance with Part V EP Act Operating Environmental Licence. • Operation in accordance with TSF Operating Strategy under the Mining Act. • Implement a groundwater monitoring program around the TSF perimeter to track water quality parameters and detect any potential seepage impacts. **Landfill** • All waste disposal will occur above the water table to prevent direct interaction with groundwater. • Only approved waste types will be accepted, with strict controls to prevent the disposal of hazardous or unauthorised materials. • Waste will be progressively covered to reduce exposure, prevent windblown litter, and limit water infiltration. • Once landfill cells are filled, they will be completely backfilled and shaped into mounded, water-shedding structures to prevent surface water infiltration and minimise the risk of leachate generation. • A groundwater monitoring program will be implemented to track key water quality parameters around the landfill perimeter, ensuring early detection of any potential impacts. **Wastewater Treatment Plant** • Treated effluent will be discharged via sprayfields, designed based on site-specific soil properties and phosphorus loading capacity. • The sprayfields will be maintained to avoid pooling, minimising the risk of excessive percolation into groundwater. • A groundwater monitoring program will track key water quality parameters around the wastewater treatment plant to ensure early detection of any potential changes. • The WWTP will use membrane bioreactor treatment to remove nutrients, organic matter, and pathogens before effluent discharge. • All sludge will be collected by a licensed contractor and disposed of at the onsite putrescible landfill, preventing potential leachate formation. • A 2 m high fence will enclose the wastewater treatment plant and sprayfield to prevent fauna access, reducing disturbance and limiting secondary impacts on water quality.	• DWER Part V EP Act: Works Approval and Operating Licence • DEMIRS Mining Act: Mining Proposal	• Proper implementation of standard management actions and Part V and Mining Act conditions will minimise risk of potential impacts. • Standard practices for mining operations which are effective in managing potential impacts
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practices, Part V EP Act and Mining Act.		Part V EP Act Operating Licence and Mining Act Mining Proposal.

Potential Impacts	Interconnected Factors for Holistic Assessment	Mitigation Measure	Other Decision-Making Process Relevant?	Effectiveness of the Control
Groundwater mounding in the vicinity of TSF impacting vegetation through seepage.	• Subterranean Fauna	• Construction of TSF as per approved designs to minimise seepage, including but not limited to: – Compacted foundation and clay liner around decant to reduce permeability and minimise seepage. – Construction of underdrainage system to collect seepage from the base of tailings. – Operation of TSF in accordance with TSF Operating Strategy and Environmental Licence. • Recovery of decant water for reuse in the processing plant. • Piezometers for environmental monitoring of water levels and quality. • Piezometers for environmental monitoring of water levels and quality. • Construction and commissioning in accordance with Part V EP Act Works Approval. • Operation in accordance with Part V EP Act Environmental Licence. • Operation in accordance with the TSF Operating Strategy under the Mining Act.	• DWER Part V EP Act: Works Approval and Operating Licence • DEMIRS Mining Act: Mining Proposal	• Proper implementation of standard management actions and Part V and Mining Act conditions will minimise risk of potential impacts. • Standard practices for mining operations which are effective in managing potential impacts
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practices, Part V EP Act and Mining Act.		Part V EP Act Operating Licence and Mining Act Mining Proposal.
Overtopping of TSF releasing decant water and/or tailings into the environment	• Terrestrial Fauna • Terrestrial Flora and Vegetation • Inland Waters	• Construction and commissioning in accordance with Part V EP Act Works Approval. • Operation in accordance with Part V EP Act Environmental Licence. • Operation in accordance with the TSF Operating Strategy under the Mining Act. • Maintain an operating freeboard sufficient to contain a 1-in-1,000-year, 72hour rainfall event. • Daily inspections of operating freeboard. • TSF to be capped with a store and release cover at closure.	• DWER Part V EP Act: Works Approval and Operating Licence • DEMIRS Mining Act: Mining Proposal	• Proper implementation of standard management actions and Part V and Mining Act conditions will minimise risk of potential impacts. • Standard practices for mining operations which are effective in managing potential impacts
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practices, Part V EP Act and Mining Act.		Part V EP Act Operating Licence and Mining Act Mining Proposal.
Post-closure pit lakes with deteriorating water quality over time	• Terrestrial Fauna • Subterranean Fauna	• Develop and implement a monitoring program to track water quality parameters in the pit lakes over time, using the data to refine predictions (model) of long-term water quality. • Develop and implementation of the approved MCP. • Ongoing monitoring and pit lake modelling to be undertaken throughout the LOM	• DEMIRS Mining Act and Mine Closure Plan	Standard practices for mining operations which are effective in managing potential impacts
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practises and Mining Act.		Mining Act Mining Proposal and Mine Closure Plan.
Contamination of surface or groundwater due to hydrocarbon and chemical spills	• Terrestrial Fauna • Terrestrial Flora and Vegetation • Subterranean Fauna	• Chemicals, diesel, oil and waste oil stored in accordance with Australian Standards. Facilities containing hydrocarbons and/or chemicals will be designed within bunds to contain at least 110% of the contents of the material stored • Refuelling and fuel delivery inlets will be located on concrete or HDPE-lined pads to contain any drips or spills. The pads will drain to a sump to allow removal of collected material • Overland pipes containing hazardous materials will be installed within bunds with catchment sumps constructed at low elevations points as required to provide containment capacity in the case of a pipeline leak • Flow sensors would be fitted along pipelines to allow detection of loss of contents • Isolation valves will be installed at appropriate intervals along pipelines • Spill kits will be located at strategic locations throughout the project area and employees trained in their use • Surface water to be diverted around operational areas. • Potentially contaminated run-off will be contained within suitable-sized bunds and passed through oily water separators and the like. • Provide regular training for staff on spill prevention, response procedures, and proper cleanup techniques. • Compliance with Dangerous Goods Licencing requirements • Hazardous spills will be cleaned up and contaminated soils will either be remediated or removed from site by a licensed third party. Incident investigation would be undertaken as required to determine the cause of environmentally harmful spills/leaks and control measures identified to prevent future incidents. As required, spills would be reported to the relevant authorities. • Decommissioning and removal of all hazardous storages and hazardous materials pipelines	• DWER Part V EP Act: Operating Licence • DEMIRS Mining Act: Mining Proposal	• Standard practices for mining operations which are effective in managing potential impacts

Potential Impacts	Interconnected Factors for Holistic Assessment	Mitigation Measure	Other Decision-Making Process Relevant?	Effectiveness of the Control
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practices, Part V EP Act and Mining Act.		Part V EP Act Operating Licence and Mining Act Mining Proposal.
Contamination of groundwater due to seepage from landfill	• Subterranean Fauna	• Any landfill to be operated in accordance with Environmental Licence. • No waste will be disposed of below the water table. • A waste management system will be implemented to ensure that no unauthorised wastes are disposed of. • Waste will be progressively covered. • Once cells are filled, they will be completely backfilled and mounded so they are watershedding structures. • Implement a groundwater monitoring program to track water quality parameters around the landfill perimeter.	• DWER Part V EP Act: Operating Licence	Standard practices for mining operations which are effective in managing potential impacts
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practises and Part V EP Act		Part V EP Act Operating Licence

8.5 Environmental Outcomes

Environmental outcomes, in the context of this Proposal, refer to the predicted state of the environment after the Proposal is implemented. De Grey outcomes for Inland Waters seek to:

- Be specific and measurable, clearly describing quantifiable environmental conditions.
- Have a defined spatial and temporal extent.
- Aim to achieve the Environmental Protection Authority's (EPA) objectives for inland waters.

In consideration of the proposed avoidance and management measures and likely residual impacts associated with the Proposal, the predicted environmental outcomes and objectives that apply to Inland Waters are set out below.

8.5.1 Groundwater Abstraction

Limit the Proposal's groundwater abstraction to up to:

- 30 GL/a for years 1 – 4
- 18 GL/a for years 5 – 7
- 11 GL/a for years 8 – 15

Until such time as De Grey submits an updated groundwater model inclusive of additional abstraction (up to 30 GL/a) to the satisfaction of the CEO of the EPA.

8.5.2 Groundwater Reinjection

Limit the Proposal’s reinjection of groundwater to up to 50% of groundwater abstracted until such time as De Grey submits an updated groundwater model inclusive of additional reinjection (up to 100%) to the satisfaction of the CEO of the EPA.

8.5.3 Surplus Water Discharge

Limit the Proposal’s surface water discharge to the Turner River up to:

- 8 GL/a for years 1 - 2
- 4 GL/a for years 3 – 6
- 2 GL/a for years 7 - 15

Until such time as De Grey submits an updated model inclusive of additional surface water discharge (up to 10 GL/a for years 1 - 3) to the satisfaction of the CEO of the EPA.

8.5.4 Yule River

The following environmental outcomes are proposed in relation to the Yule River and Public Drinking Water Reserve:

- No direct impact from groundwater drawdown upon identified permanent and semi-permanent pools located along the Yule River, or the Yule River itself, attributable to the Proposal.

- No indirect impact to groundwater quality greater than site specific criteria upon identified permanent and semi-permanent pools located along the Yule River, or the Yule River itself, attributable to the Proposal.
- No indirect impact to groundwater quality greater than site specific criteria within the Yule Public Drinking Water Reserve attributable to the Proposal.

To meet the above environmental outcomes, De Grey will implement the EMP as per Appendix 1.

8.5.5 Turner River

In addition to the environmental outcomes provided under Section 8.5.3 for surplus water discharge, the following environmental outcomes are proposed in relation to the Turner River:

- During periods of no natural flow, the discharge "wetting front" (affected area) in the Turner River will not extend more than 50 km downstream of the discharge point for the first three years, followed by a reduction in subsequent years.
- The discharge water quality will meet site-specific water quality criteria established for the Turner River.

To meet the above environmental outcomes, De Grey will implement the EMP as per Appendix 1.

8.5.6 Public Drinking Water Reserve

The following environmental outcomes are proposed in relation to Reserve 33015 (Water Corporation borefield):

- Groundwater drawdown will be limited to no closer than 15 km from Reserve 33015 (Water Corporation borefield) as shown in Figure 8-12.

8.6 Conclusion

The groundwater and surface water assessments, combined with De Grey's proposed management measures, demonstrate that potential impacts to the hydrological and hydrogeological regimes of the Yule and Turner Rivers can be effectively managed, ensuring that the EPA's Inland Waters factor objective is met. The results indicate that:

- The Yule and Turner Rivers are outside of the modelled drawdown zones.
- Mounding caused by reinjection of mine dewater into the upper and lower alluvium/palaeochannel aquifers is not predicted to significantly impact the Yule or Turner Rivers or YRWR.
- Reinjection and dewatering activities will not significantly impact GDVs.
- There will be no significant impacts to the pastoral leaseholder's access to groundwater.
- The quality of the water discharged into the Turner River is not predicted to alter the environmental value of the Turner River ecosystem.
- No contamination to groundwater or surface water from landform leachates is predicted.

Impacts, when considered both individually and cumulatively, associated with changes to the hydrological and hydrogeological regimes are able to be managed (as described in Table 8-6) such that the EPA's Inland Waters factor objective is met for the Proposal during and post mining.

9. ENVIRONMENTAL FACTOR - FLORA AND VEGETATION

9.1 EPA Objective

The EPA objective for flora and vegetation is "*to protect flora and vegetation so that biological diversity and ecological integrity are maintained"* (EPA, 2016a).

9.2 Policy and Guidance

The following guidance is applicable to this factor:

- *Environmental Factor Guideline: Flora and Vegetation* (EPA, 2016a)
- *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016d).

9.3 Receiving Environment

Detailed flora and vegetation surveys were undertaken for the Proposal in accordance with the requirements of EPA technical guidance (EPA, 2016d), in March 2021 (Ecoscape), March to July 2022 and April to May 2024 (Umwelt). The flora survey area of 32,467 ha (including approximately 2,950 ha along the modelled wetted front of the Turner River) is larger than the 22,194 ha Development Envelope and over five times larger than the 5,830 ha indicative disturbance footprint. The survey area and flora survey effort are shown in Figure 9-1.

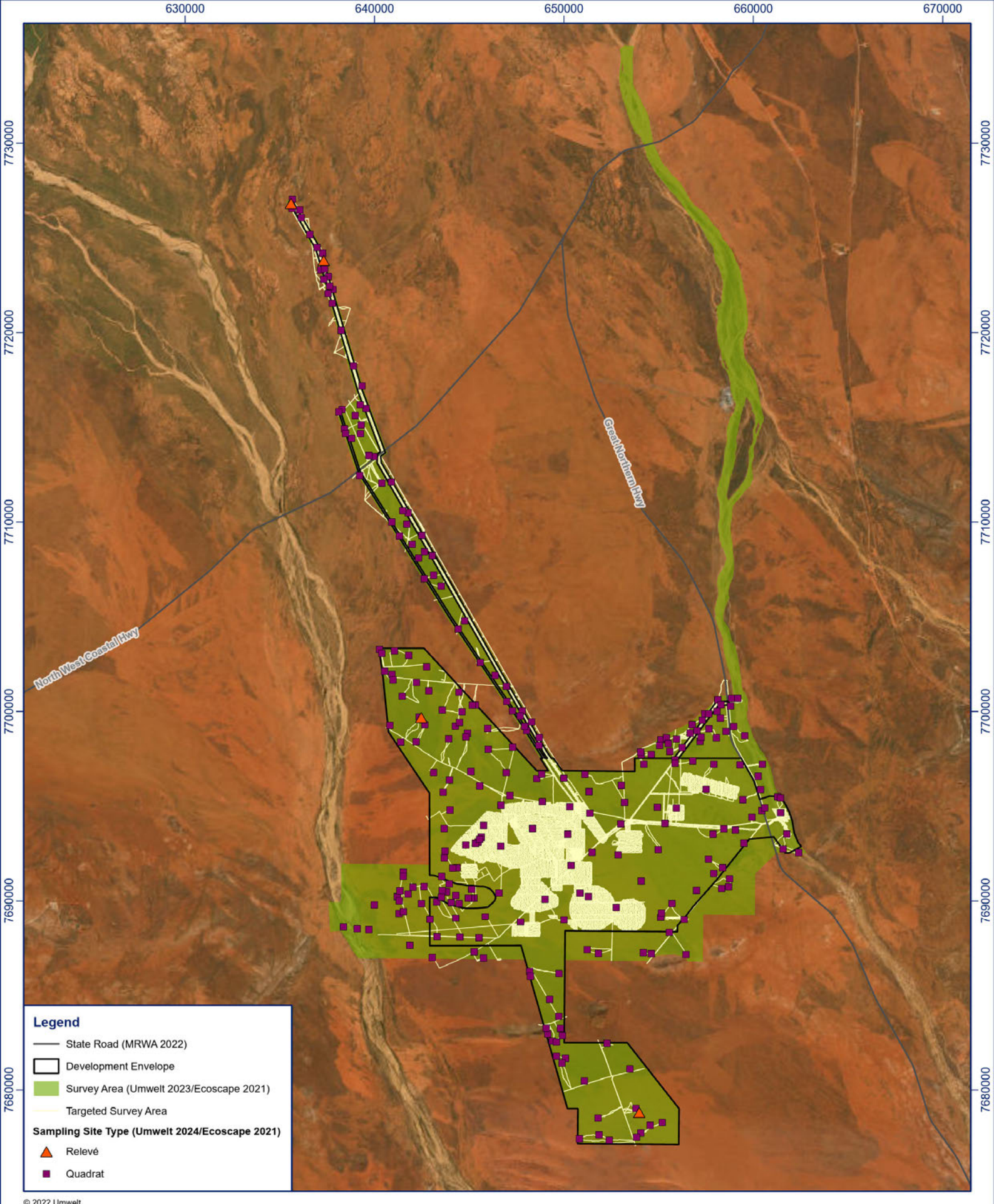
Within the survey boundary 4,675 ha was targeted for significant flora species and vegetation in both 2022 and 2024.

The quadrats surveyed by Ecoscape in March 2021 were revisited by Umwelt in 2022 to ensure both consultants datasets were comparable. The northwest corner of each quadrat in all field surveys was recorded in accordance with technical guidance (a safer and more practical option for field consultants than establishing permanent markers).

A copy of the Umwelt (2024a) survey report is attached as Appendix 16. This report includes flora and vegetation details from a survey undertaken by Ecoscape in 2021. Unless otherwise referenced, the text in this section of the document is drawn from Umwelt's report and for brevity the reader is referred to the report for detailed results. A separate report detailing the flora and vegetation along the Turner River is provided as Appendix 19.

The following were identified during the flora surveys:

- 17 native vegetation types
- Five Priority 3 species.
- One Priority Ecology Community (PEC) Priority 3: Gregory Land System (excluded from the Development Envelope).
- One potentially undescribed species: *Polymeria* sp. nov.
- Ten introduced flora taxa.



Scale: 1:250,000

0 2.5 5 km

N

Projection: GDA2020 MGA Zone 50
Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Updated/Reviewed by: KM/EL

RPMGLOBAL

PROJECT

Hemi Gold Project - Referral Supporting Document

Flora Survey Coverage

Figure 9-1 | ADV-AU-00673 | March 2025

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9.3.1 Vegetation Communities

A total of 17 Vegetation Types (VT's) were mapped by Umwelt (2024a) across the survey area and are considered to belong to five broad vegetation groups:

- **Group 1**: Hummock grasslands on low-lying flood plains and flats on clay or sandy loams (VT 1).
- **Group 2**: Tussock grasslands in clay pans (VT 2).
- **Group 3**: Low woodlands and tall shrublands over low shrublands and hummock grasslands on plans, in minor drainage lines and low stony rises and hills on clay and sandy loams (VTs 3-15).
- **Group 4:** Mid to low woodlands and tall shrublands over low shrublands and hummock grasslands in river channels (VT 16).
- **Group 5**: Tall shrublands over low shrublands and tussock hummock grasslands on red sand dunes (VT 17).

Three VT's were mapped by Ecoscape (2021) outside of the Development Envelope.

Each vegetation type is described in Table 9-1 and shown in Figure 9-2, Figure 9-3 and Figure 9-4.

The Proposal is situated predominantly on the active Indee Station Pastoral Lease, with the northern infrastructure corridors traversing across the Mundabullangana Station Pastoral Lease. Although cattle are known to impact native vegetation, the vegetation at the Proposal is mostly undisturbed and in excellent or very good condition. The exception being areas which have been disturbed by exploration activities and infrastructure corridors, as well as by cattle grazing and trampling. A map of vegetation condition is provided in Figure 9-5 with condition categories as per EPA (2016d).

9.3.2 Groundwater Dependent Vegetation

The Yule River is located west of the Development Envelope. Permanent pools within the river support riparian and GDV. These pools also hold cultural significance for Traditional Owners. Additionally, the shallow alluvial aquifer beneath the Yule River serves as a source of stock water and supplies drinking water for the town of Port Hedland via a borefield situated downstream and outside the Proposal's influence area.

The Turner River shares similar flow characteristics with the Yule River; however, it possesses a smaller catchment area. Similar to the Yule River, the Turner River contains semi-permanent pools, including Kunagunarinna Pool (upstream) and Moorambine Pool (downstream).

VT 16, which is comprised of all vegetation in the Turner River channel and VT EcMaEvMW which is comprised of all vegetation in the Yule River are considered to represent groundwater dependent vegetation (GDV), these VT's are characterised by the presence of obligate and potentially facultative phreatophytes (in particular *Melaleuca argentea* and *Eucalyptus camaldulensis* subs. *refulgens*).

9.3.3 Ecological Communities

One Priority Ecological Community (PEC), the Gregory Land System, was identified during the flora surveys. The PEC is recorded as VT 17 and is described in Table 9-1 and shown in Figure 9-3. It is classified as a Priority 3 PEC with key threats listed by DBCA as altered fire regimes leading to loss of trees and shrubs, over grazing by cattle and feral horses and severe weed invasion (DBCA, 2023).

The Gregory Land System PEC is described as linear dunes and restricted sandplains supporting shrubby hard spinifex (and occasionally soft spinifex) grasslands. The Gregory Land System was mapped by the Department of Agriculture in 2004 over the same area and is described as comprising of linear dunes of deep red sands and swales and sandplains with concave, gently inclined marginal slopes near dunes with deep red sands (Umwelt, 2024).

Table 9-1: Vegetation Types

Code	Description	Area Mapped (ha)	Image Example
Umwelt (2024)			
Group 1			
1	Low isolated shrubs dominated by *Acacia stellaticeps* and *Pluchea tetranthera* over low hummock grassland dominated by *Triodia longiceps* and *Triodia epactia* over ephemeral low sparse sedgeland, tussock grassland and forbland of mixed taxa including *Fimbristylis dichotoma*, *Bulbostylis barbata*, *Calandrinia stagnensis*, *Streptoglossa decurrens* and *Eriachne aristidea* on red-brown clay loam, sandy clay loam or sandy clay on plains and flats.	1,198.0	
Group 2			
2	Low tussock grassland to sparse tussock grassland dominated by a combination of *Eriachne glauca* var. *glauca*, *Eriachne benthamii* and *Eriachne flaccida* over low sparse hummock grassland of *Triodia epactia* and *Triodia longiceps* over ephemeral low sparse sedgeland and forbland of mixed species including *Cyperus iria*, *Fimbristylis dichotoma*, *Neptunia dimorphantha*, *Marsilea hirsuta* and *Calandrinia pumila* on orange, red-brown or brown clay in clay pans.	39.8	

Code	Description	Area Mapped (ha)	Image Example
Group 3			
3	Low woodland to open woodland dominated by *Corymbia candida* subsp. *candida* over tall shrubland to open shrubland dominated by *Acacia colei* and *Acacia tumida* var. *pilbarensis* over low open to sparse shrubland of mixed species including *Pluchea tetranthera*, *Afrohybanthus aurantiacus* and *Sida rohlenae* subsp. *rohlenae* over low open to sparse hummock grassland dominated by *Triodia epactia* over low sparse tussock grassland of mixed species including *Chrysopogon fallax*, *Aristida holathera* var. *holathera*, *Eragrostis eriopoda*, *Eriachne obtusa* and *Cenchrus ciliaris* on orange sandy or sandy clay loam on flats.	83.3	
4	Tall sparse shrubland of mixed species including *Acacia ancistrocarpa, Acacia inaequilatera*, *Acacia colei* and *Melaleuca lasiandra* over low open to sparse shrubland dominated by Acacia stellaticeps, Pluchea tetranthera, Sida arenicola and *Corchorus elachocarpus* over low hummock grassland to open hummock grassland dominated by *Triodia epactia*, *Triodia lanigera* and *Triodia schinzii* on red or red-brown sandy loam on plains.	3,788.0	

Code	Description	Area Mapped (ha)	Image Example
5	Tall open to sparse shrubland dominated by *Acacia trudgeniana* and *Acacia colei* over low open to sparse shrubland dominated by *Acacia stellaticeps*, *Corchorus incanus* subsp. *incanus* and *Pimelea ammocharis* over low hummock grassland of *Triodia epactia* over low sparse tussock grassland of mixed species including *Aristida holathera* var. *holathera*, *Eragrostis eriopoda*, *Chrysopogon fallax* and *Eriachne obtusa* on red-brown clay or sandy loam on plains.	958.6	
6	Tall sparse shrubland dominated by *Acacia trachycarpa* and *Acacia colei* over low sparse shrubland of mixed species including *Acacia stellaticeps* and *Corchorus incanus* subsp. *incanus* over low hummock grassland dominated by *Triodia lanigera* on red-brown sandy loam on low dunes within river channels.	1.8	

Code	Description	Area Mapped (ha)	Image Example
7	Tall sparse shrubland dominated *by Acacia tumida* var. *pilbarensis* over low sparse shrubland dominated by *Corchorus incanus* subsp. *incanus* and *Tephrosia rosea* var. *clementii* over ephemeral low sparse forbland and grassland of mixed species including *Calocephalus beardii*, *Aristida contorta*, *Eragrostis cumingii*, *Indigofera colutea* and *Perotis rara* on brown sandy loam with granite outcropping and stones on and around low granite outcrops.	24.2	
8	Low open woodland to isolated trees dominated by *Corymbia hamersleyana* over tall open to sparse shrubland dominated by *Acacia bivenosa*, *Acacia inaequilatera*, *Grevillea wickhamii* subsp. *aprica* and *Hakea loreus* subsp. *loreus* over low sparse shrubland of mixed species dominated by *Acacia stellaticeps*, *Scaevola amblyanthera* var. *centralis* and *Corchorus elachocarpus* over low hummock grassland dominated by *Triodia epactia* on red or red brown clay or sandy loam with calcrete and silica stones, occasionally with calcrete or silica outcropping, on low rises or plains.	204.8	

Code	Description	Area Mapped (ha)	Image Example
9	Tall sparse shrubland of mixed species including *Acacia inaequilatera* and *Grevillea wickhamii* subsp. *aprica* over low sparse shrubland of mixed species dominated by *Corchorus parviflorus* over low hummock grassland dominated by *Triodia wiseana* and *Triodia epactia* on red-brown clay loam with chert stones and often chert outcropping on hills and low rises.	66.1	
10	Tall open to sparse shrubland dominated by *Acacia ancistrocarpa*, *Acacia inaequilatera*, *Acacia sericophylla*, *Acacia acradenia* and occasionally *Melaleuca lasiandra* over low shrubland to sparse shrubland dominated by *Acacia stellaticeps* and occasionally *Sida arenicola*, *Indigofera monophylla*, *Pluchea tetranthera* and *Corchorus parviflorus* over low hummock grassland to open hummock grassland dominated by *Triodia lanigera* and/or *Triodia schinzii* on red or red-brown sandy loam on plains.	17,317.0	

Code	Description	Area Mapped (ha)	Image Example
11	Low open woodland to isolated trees of *Corymbia hamersleyana* over tall open to sparse shrubland dominated by *Acacia orthocarpa*, *Acacia inaequilatera* and *Grevillea wickhamii* subsp. *aprica* over low sparse shrubland dominated by *Acacia stellaticeps* over low hummock grassland dominated by a combination of *Triodia lanigera, Triodia angusta*, *Triodia epactia* and *Triodia chichesterensis* on red or red brown sandy or clay loam with primarily quartz and calcrete stones, occasionally with calcrete or quartz outcropping, on low rises and undulating plains.	271.1	
12	Isolated low trees dominated by *Corymbia hamersleyana* over low open to sparse shrubland of mixed species including *Acacia inaequilatera*, *Acacia acradenia*, *Acacia ancistrocarpa* and *Grevillea wickhamii* subsp. *aprica* over low sparse shrubland of mixed species dominated by *Goodenia stobbsiana* over low hummock grassland dominated by *Triodia epactia* and occasionally *Triodia wiseana* on red or red-brown clay loam with silica and chert stones and often silica and chert outcropping on low rises.	68.4	

Code	Description	Area Mapped (ha)	Image Example
13	Low open woodland dominated by *Corymbia hamersleyensis* and/or *Corymbia candida* subsp. *candida* over tall open to sparse shrubland dominated by *Acacia ancistrocarpa*, *Acacia tumida* var. *pilbarensis*, *Acacia acradenia* and *Acacia colei* over low hummock grassland of *Triodia epactia* on red or red-brown clay or sandy loam on flats or plains.	118.1	
14	Tall open shrubland to isolated shrubs dominated by *Acacia ancistrocarpa*, *Acacia colei* and *Acacia inaequilatera* over low open shrubland to isolated shrubs dominated by *Acacia stellaticeps* and *Pluchea tetranthera* over low hummock grassland dominated by *Triodia epactia* on red or red brown sandy or clay loam on plains and flats.	4,020.9	

Code	Description	Area Mapped (ha)	Image Example
15	Low open woodland of *Eucalyptus victrix* over tall sparse shrubland dominated by *Acacia colei* over low open hummock grassland of *Triodia epactia* over ephemeral low sparse herbland of mixed species including *Bergia perennis* subsp. *perennis, Marsilea hirsuta*, *Cyperus iria* and *Centipeda minima* subsp. *macrocephala* on pale brown sandy clay loam on the margins of clay pans.	3.4	
Group 4			
16	Mid to low open woodland dominated by *Eucalyptus camaldulensis* subsp. *refulgens* and *Melaleuca argentea* over tall sparse shrubland dominated by *Melaleuca glomerata*, *Acacia coriacea* subsp. *pendens* and *Acacia trachycarpa* over mid to low sparse shrubland dominated by *Acacia pyrifolia* var. *pyrifolia, Crotalaria cunninghamii* and *Corchorus incanus* subsp. *incanus* over low sparse hummock grassland dominated by *Triodia epactia* over low sparse sedgeland dominated by *Cyperus vaginatus* on pale red or brown sand with patchy mixed stones in river channels.	3,503.7	

Code	Description	Area Mapped (ha)	Image Example
Group 5			
17	Gregory Land System: Tall open to sparse shrubland dominated by *Acacia sabulosa* over mid open to sparse shrubland of mixed species dominated by *Corchorus incanus* subsp. *incanus*, *Sida arenicola*, *Ptilotus arthrolasius*, *Gyrostemon tepperi* and *Triumfetta deserticola* over low open to sparse hummock grassland dominated by *Triodia lanigera* and *Triodia schinzii* over low sparse tussock grassland dominated by *Aristida holathera* var. *holathera* and *Eragrostis eriopoda* on red sand on dunes.	101.1	
Ecoscape (2021)			
AiAacAanTOS	*Acacia inaequilatera*, *Acacia acradenia* and *Acacia ancistrocarpa* tall open shrubland over *Triodia epactia* and *Triodia lanigera* low hummock grassland	1,148.6	

Code	Description	Area Mapped (ha)	Image Example
AiAanGwMSS	*Acacia inaequilatera*, *Acacia ancistrocarpa* and *Grevillea wickhamii* mid sparse shrubland over *Triodia epactia*, *Eriachne mucronata* and *Triodia wiseana* low hummock grassland/ tussock grassland.	1.8	
EcMaEvMW	*Eucalyptus camaldulensis* subsp. *refulgens*, *Melaleuca argentea* and *Eucalyptus victrix* mid woodland over *Acacia trachycarpa* and *Acacia pyrifolia* var. *pyrifolia* tall open shrubland over *Aristida holathera*, *Afrohybanthus aurantiacus* and *Cyperus vaginatus* mid sparse tussock grassland/low sparse shrubland/low sedgeland	423.4	
C	Disturbed Land (including land under rehabilitation)	698.4	
Total*		**34,041**	

*Rounded up to the nearest hectare.

9.3.4 Significant Flora Species

No species listed under the BC Act (WA) were identified during the flora surveys, with a total of five species listed by DBCA as Priority 3 recorded. A sixth species was originally recorded in the 2022 survey, *Eragrostis crateriformis* (P3), however was delisted prior to the 2024 targeted survey. This species has been removed from the impact assessment of the Proposal. The five species recorded include:

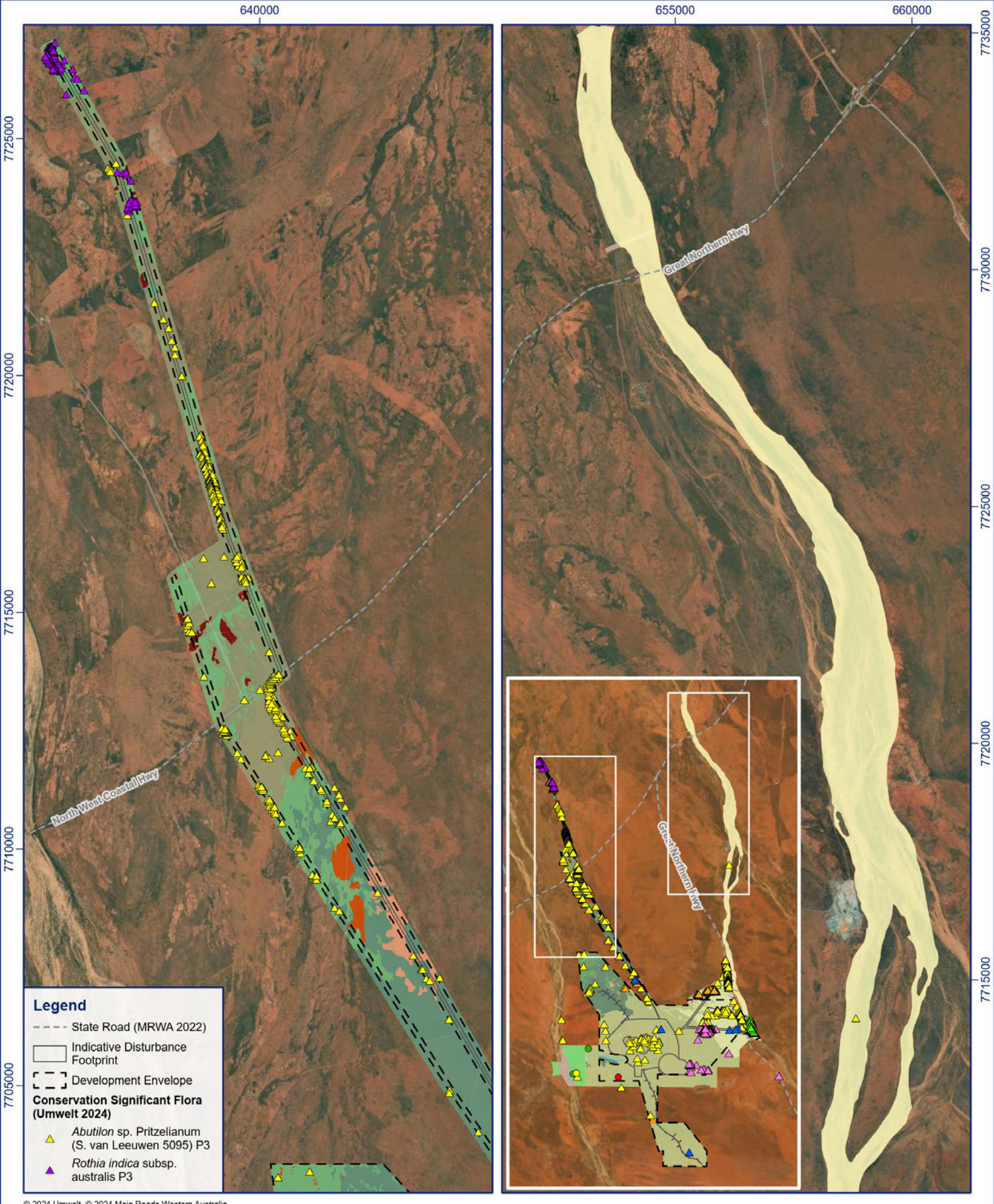
- *Abutilon* sp. pritzelianum (P3)
- *Euploca mutica* (P3)
- *Gymnanthera cunninghamii* (P3)
- *Rothia indica* subsp. *australis* (P3)
- *Triodia chichesterensis* (P3)

Recordings of significant species, including the potentially undescribed *Polymeria* sp. nov., collected during the field surveys are shown in Figure 9-2, Figure 9-3 and Figure 9-4. It should be noted that the percentage impacts present a predicted impact based on current indicative disturbance footprint (Table 9-3).

Specimens of the potentially undescribed taxon, *Polymeria* sp. nov., collected during the 2022 field survey were lodged with the WA Herbarium where it matched with five other specimens previously submitted across the Pilbara region. The survey area occurs within its known range. The taxon is yet to be formally named and recent feedback by the WA Herbarium suggests this process is unlikely to be finalised during the assessment of the Proposal. Based on current knowledge, the WA Herbarium have advised it is likely to be classified as a Priority 3 species (poorly known species, known from several locations).

Polymeria is a genus of plants in the family Convolvulaceae, that are usually perennials and can either be herbs or herbaceous climbers. There are 11 described species of *Polymeria* and are typically found across northern areas of Western Australia, with small populations across the Northern Territory and central Queensland. There is limited specific research on the fire ecology of *Polymeria*, however it is possible the species may benefit from fire as a mechanism for seed germination. This aligns with the recordings across the survey area, which were all recorded in recently burnt areas.

The targeted survey in 2024 focused on areas that had been burnt in the last 5 years in VT's that had previously recorded *Polymeria*. Locations recorded in the 2022 survey were prioritised, however only three aged individuals were recorded in 2024 at known locations.



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Projection: GDA2020 MGA Zone 50

Aerial: Esri, TerraColor, SPOT Imagery, Landsat, DigitalGlobe, GeoEye IKONOS, AeroGRID, Maxar, Earthstar Geographics and the GIS User Community

Updated/Reviewed By: KM/EL

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Hemi Gold Project - Referral Supporting Document

Vegetation Types and Priority Species - North

Figure 9-2	ADV-AU-00673	March 2025

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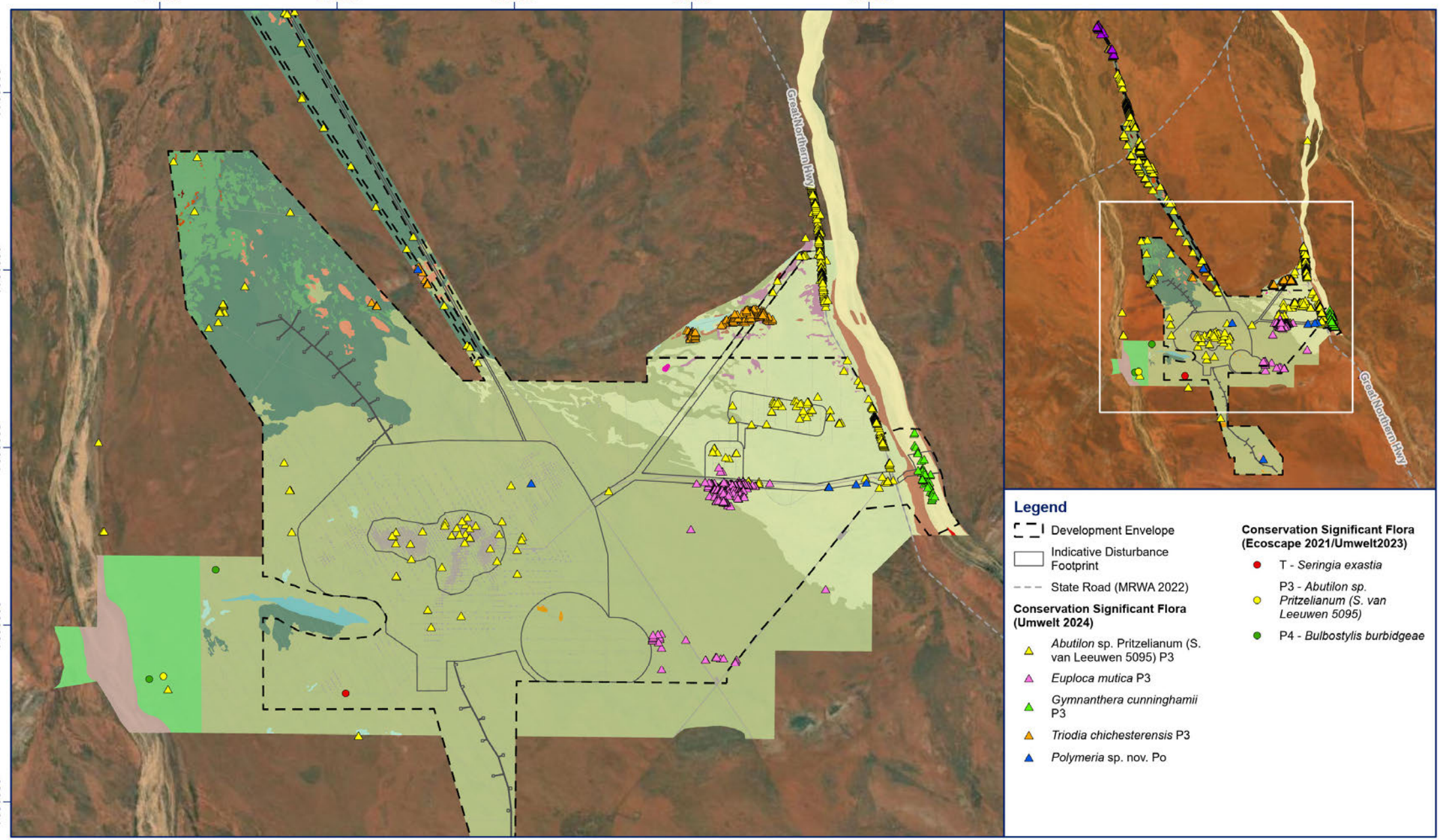

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Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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Scale: 1:140,000

0 1 2 4 km

PROJECT		CLIENT
March 2025	Hemi Gold Project - Referral Supporting Document	DE GREY MINING LTD
Figure 9-3		
ADV-AU-00673	Vegetation Types and Priority Species - Central	

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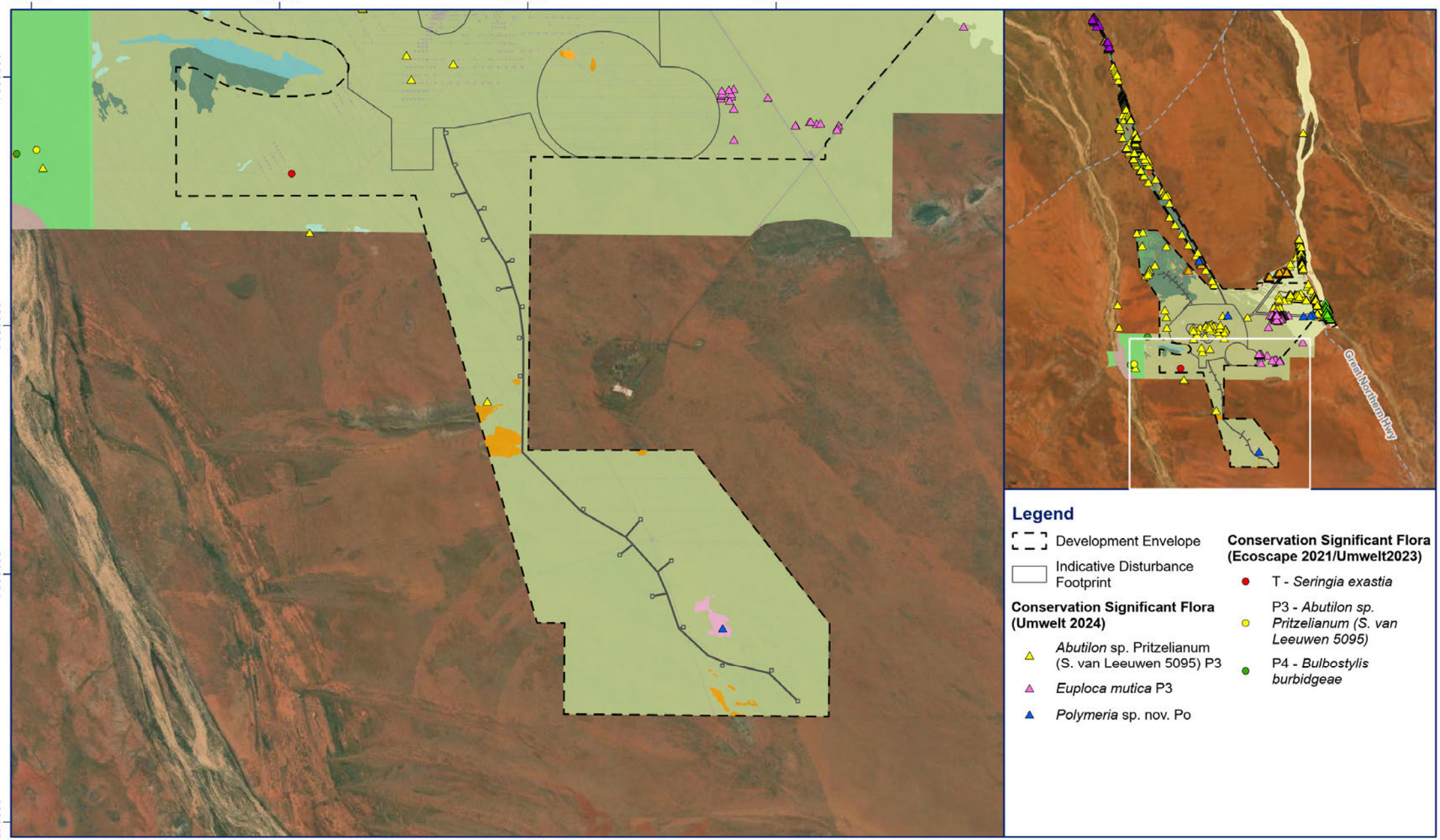

Projection: GDA2020 MGA Zone 50
Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Updated/Reviewed By: KM/EL

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Scale: 1:100,000

0 1 2 km

PROJECT		CLIENT
March 2025	Hemi Gold Project - Referral Supporting Document	DE GREY MINING LTD
Figure 9-4		
ADV-AU-00673	Vegetation Types and Priority Species - South	

Legend

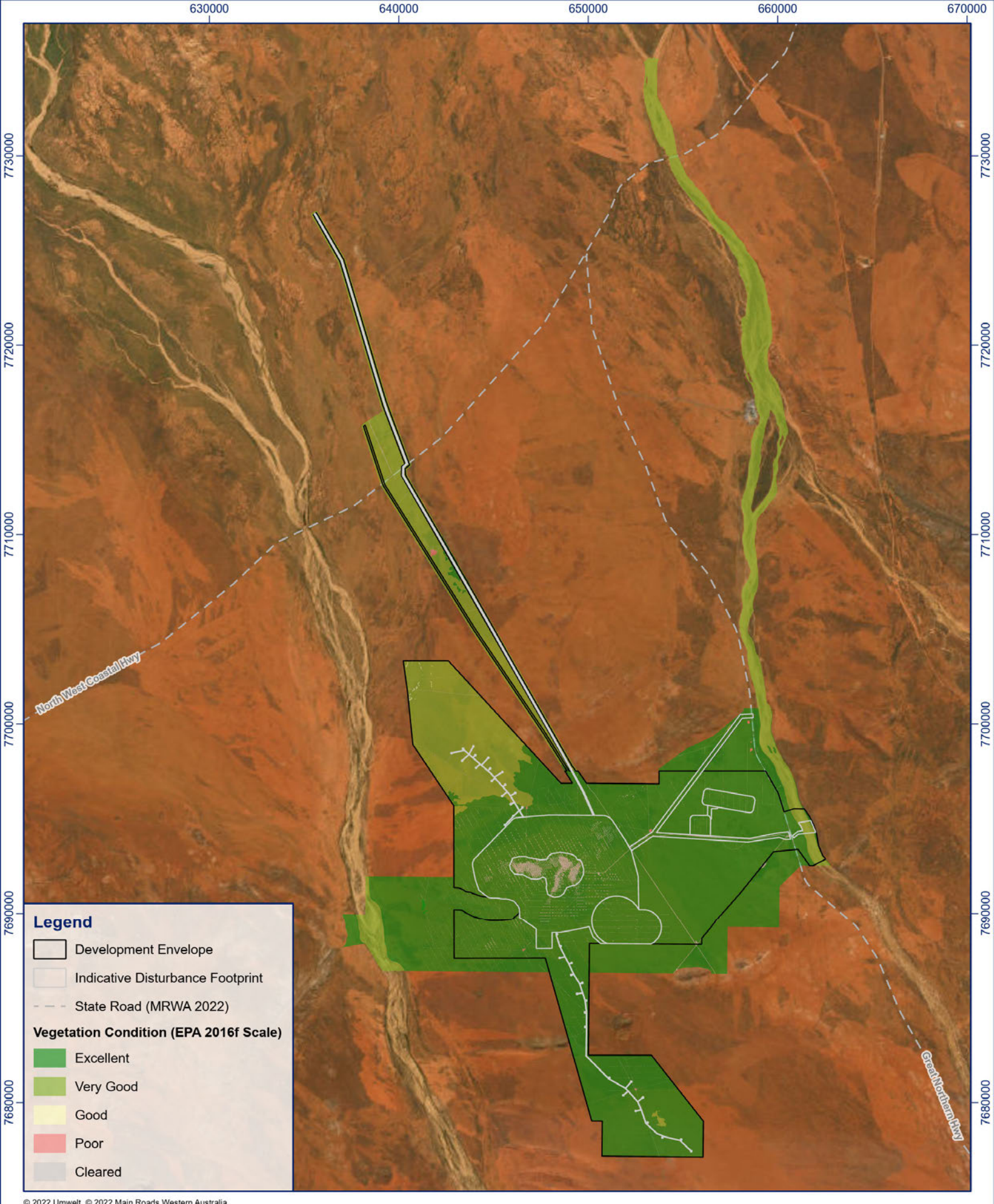
Vegetation Type - Description (Umwelt 2023)

- Low isolated shrubs including Acacia stellaticeps and Pluchea tetranthera over low hummock grassland dominated by Triodia longiceps and Triodia epactia over ephemeral low sparse sedgeland, tussock grassland and forbland of mixed taxa including Fimbristylis dichotoma, Bulbostylis barbata, Calandrinia stagnensis, Streptoglossa decurrens and Eriachne aristidea on red-brown clay loam, sandy clay loam or sandy clay on plains and flats
- Low tussock grassland to sparse tussock grassland dominated by a combination of Eriachne glauca var. glauca, Eriachne benthamii and Eriachne flaccida over low sparse hummock grassland of Triodia epactia and Triodia longiceps over ephemeral low sparse sedgeland and forbland of mixed species including Cyperus iria, Fimbristylis dichotoma, Neptunia dimorphantha, Marsilea hirsuta and Calandrinia pumila on orange, red-brown or brown clay in clay pans
- Low woodland to open woodland dominated by Corymbia candida subsp. candida over tall shrubland to open shrubland dominated by Acacia colei and Acacia tumida var. pilbarensis over low open to sparse shrubland of mixed species including Pluchea tetranthera, Afrohybanthus aurantiacus and Sida rohlenae subsp. rohlenae over low open to sparse hummock grassland dominated by Triodia epactia over low sparse tussock grassland of mixed species including Chrysopogon fallax, Aristida holathera var. holathera, Eragrostis eriopoda, Eriachne obtusa and Cenchrus ciliaris on orange sandy or sandy clay loam on flats
- Tall sparse shrubland of mixed species including Acacia ancistrocarpa, Acacia inaequilatera, Acacia colei and Melaleuca lasiandra over low open to sparse shrubland dominated by Acacia stellaticeps, Pluchea tetranthera, Sida arenicola and Corchorus elachocarpus over low hummock grassland to open hummock grassland dominated by Triodia epactia, Triodia lanigera and Triodia schinzii on red or red-brown sandy loam on plains
- Tall open to sparse shrubland dominated by Acacia trudgeniana and Acacia colei over low open to sparse shrubland dominated by Acacia stellaticeps, Corchorus incanus subsp. incanus and Pimelea ammocharis over low hummock grassland of Triodia epactia over low sparse tussock grassland of mixed species including Aristida holathera var. holathera, Eragrostis eriopoda, Chrysopogon fallax and Eriachne obtusa on red-brown clay or sandy loam on plains
- Tall sparse shrubland dominated by Acacia trachycarpa and Acacia colei over low sparse shrubland of mixed species including Acacia stellaticeps and Corchorus incanus subsp. incanus over low hummock grassland dominated by Triodia lanigera on red-brown sandy loam on low dunes within river channels
- Tall sparse shrubland dominated by Acacia tumida var. pilbarensis over low sparse shrubland dominated by Corchorus incanus subsp. incanus and Tephrosia rosea var. clementii over ephemeral low sparse forbland and grassland of mixed species including Calocephalus beardii, Aristida contorta, Eragrostis cumingii, Indigofera colutea and Perotis rara on brown sandy loam with granite outcropping and stones on and around low granite outcrops
- Low open woodland to isolated trees dominated by Corymbia hamersleyana over tall open to sparse shrubland dominated by Acacia bivenosa, Acacia inaequilatera, Grevillea wickhamii subsp. aprica and Hakea loreus subsp. loreus over low sparse shrubland of mixed species dominated by Acacia stellaticeps, Scaevola amblyanthera var. centralis and Corchorus elachocarpus over low hummock grassland dominated by Triodia epactia on red or red brown clay or sandy loam with calcrete and silica stones, occasionally with calcrete or silica outcropping, on low rises or plains
- Tall sparse shrubland of mixed species including Acacia inaequilatera and Grevillea wickhamii subsp. aprica over low sparse shrubland of mixed species dominated by Corchorus parviflorus over low hummock grassland dominated by Triodia wiseana and Triodia epactia on red-brown clay loam with chert stones and often chert outcropping on hills and low rises
- Tall open to sparse shrubland dominated by Acacia ancistrocarpa, Acacia inaequilatera, Acacia sericophylla, Acacia acradenia and occasionally Melaleuca lasiandra over low shrubland to sparse shrubland dominated by Acacia stellaticeps and occasionally Sida arenicola, Indigofera monophylla, Pluchea tetranthera and Corchorus parviflorus over low hummock grassland to open hummock grassland dominated by Triodia lanigera and/or Triodia schinzii on red or red-brown sandy loam on plains
- Low open woodland to isolated trees of Corymbia hamersleyana over tall open to sparse shrubland dominated by Acacia orthocarpa, Acacia inaequilatera and Grevillea wickhamii subsp. aprica over low sparse shrubland dominated by Acacia stellaticeps over low hummock grassland dominated by a combination of Triodia lanigera, Triodia angusta, Triodia epactia and Triodia chichesterensis on red or red brown sandy or clay loam with primarily quartz and calcrete stones, occasionally with calcrete or quartz outcropping, on low rises and undulating plains
- Isolated low trees dominated by Corymbia hamersleyana over low open to sparse shrubland of mixed species including Acacia inaequilatera, Acacia acradenia, Acacia ancistrocarpa and Grevillea wickhamii subsp. aprica over low sparse shrubland of mixed species dominated by Goodenia stobbsiana over low hummock grassland dominated by Triodia epactia and occasionally Triodia wiseana on red or red-brown clay loam with silica and chert stones and often silica and chert outcropping on low rises
- Low open woodland dominated by Corymbia hamersleyensis and/or Corymbia candida subsp. candida over tall open to sparse shrubland dominated by Acacia ancistrocarpa, Acacia tumida var. pilbarensis, Acacia acradenia and Acacia colei over low hummock grassland of Triodia epactia on red or red-brown clay or sandy loam on flats or plains
- Tall open shrubland to isolated shrubs dominated by Acacia ancistrocarpa, Acacia colei and Acacia inaequilatera over low open shrubland to isolated shrubs dominated by Acacia stellaticeps and Pluchea tetranthera over low hummock grassland dominated by Triodia epactia on red or red brown sandy or clay loam on plains and flats
- Low open woodland of Eucalyptus victrix over tall sparse shrubland dominated by Acacia colei over low open hummock grassland of Triodia epactia over ephemeral low sparse herbland of mixed species including Bergia perennis subsp. perennis, Marsilea hirsuta, Cyperus iria and Centipeda minima subsp. macrocephala on pale brown sandy clay loam on the margins of clay pans
- Mid to low open woodland dominated by Eucalyptus camaldulensis subsp. refulgens and Melaleuca argentea over tall sparse shrubland dominated by Melaleuca glomerata, Acacia coriacea subsp. pendens and Acacia trachycarpa over mid to low sparse shrubland dominated by Acacia pyrifolia var. pyrifolia, Crotalaria cunninghamii and Corchorus incanus subsp. incanus over low sparse hummock grassland dominated by Triodia epactia over low sparse sedgeland dominated by Cyperus vaginatus on pale red or brown sand with patchy mixed stones in river channels
- Tall open to sparse shrubland dominated by Acacia sabulosa over mid open to sparse shrubland of mixed species dominated by Corchorus incanus subsp. incanus, Sida arenicola, Ptilotus arthrolasius, Gyrostemon tepperi and Triumfetta deserticola over low open to sparse hummock grassland dominated by Triodia lanigera and Triodia schinzii over low sparse tussock grassland dominated by Aristida holathera var. holathera and Eragrostis eriopoda on red sand on dunes
- Disturbed land

Vegetation Type - Description (Ecoscape 2021)

- Acacia ancistrocarpa, Acacia inaequilatera and Acacia acradenia tall sparse shrubland
- Eucalyptus camaldulensis subsp. refulgens, Melaleuca argentea and Eucalyptus victrix mid woodland
- Acacia inaequilatera, Acacia ancistrocarpa and Grevillea wickhamii mid sparse shrubland

	PROJECT	CLIENT
RPMGLOBAL	Hemi Gold Project - Referral Supporting Document	DE GREY MINING LTD
	Vegetation Types and Priority Species - Legend	
	ADV-AU-00673	March 2025



Scale: 1:250,000

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Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Updated/Reviewed by: KM/EL

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PROJECT

Hemi Gold Project - Referral Supporting Document

Vegetation Condition

Figure 9-5	ADV-AU-00673	March 2025

CLIENT

DE GREY MINING LTD

9.4 Potential Impacts and Mitigation Measures

9.4.1 Vegetation Communities

Of the total 17 VT's, 16 occur within the Development Envelope and 13 within the indicative disturbance footprint. Vegetation Types recorded in the Development Envelope and indicative disturbance footprint are described in Table 9-2.

Vegetation types with small extents in the flora survey area are unlikely to be regionally restricted and apart from the Gregory Land System PEC (excluded from the Development Envelope), all sampled vegetation is likely to occur over relatively large areas in the region (Umwelt, 2024a).

Table 9-2: Vegetation Type Areas

Code	Area Mapped (ha)	Area in Development Envelope (ha)	Area in Indicative Disturbance Footprint (ha)
Umwelt (2024)			
1	1,198.1	817.9 (68.3%)	33.1 (2.8%)
2	39.8	7.1 (17.9%)	0.5 (1.2%)
3	83.3	19.7 (23.6%)	2.2 (2.6%)
4	3,789.8	2,853.3 (75.3%)	88.1 (2.3%)
5	958.6	281.2 (29.3%)	67.8 (7.1%)
6	1.8	0.1 (7.1%)	0 (0%)
7	24.2	24.2 (100%)	0 (0%)
8	204.8	133.3 (65.1%)	13 (6.3%)
9	66.1	66.1 (100%)	6.1 (9.2%)
10	17,319.5	14,170.3 (81.8%)	4,533.5 (26.2%)
11	271.1	102.2 (37.7%)	14.8 (5.5%)
12	68.4	13.8 (20.2%)	6.4 (9.4%)
13	118.1	36.9 (31.2%)	17.6 (14.9%)
14	4,020.9	2876 (71.5%)	556.5 (13.8%)
15	3.4	3.4 (100%)	0 (0%)
16	3,503.7	180.8 (5.1%)	10 (0.4%)*
17	101.1	0 (0%)	0 (0%)
Ecoscape (2021)			
AiAacAanTOS	1,148.6	0 (0%)	0 (0%)
AiAanGwMSS	1.8	0 (0%)	0 (0%)
EcMaEvMW	423.4	0 (0%)	0 (0%)
C	698.4	607.1 (86.9%)	451.7 (64.7%)

* De Grey is proposing an upper clearing limit for VT 16 (which is considered to be GDV) to provide for Project flexibility

9.4.2 Groundwater Dependent Vegetation

9.4.2.1 Groundwater Drawdown

Groundwater drawdown is not predicted to extend to the Yule River channel, its riparian vegetation, or any GDV. The modelled 0.5 m and 1 m drawdown contours over the Proposal's life (15 years) and 1 m contour for long-term drawdown (200 years) are presented in Figure 8-12 and Figure 8-13 and indicate that drawdown will approach but not impact the Yule River.

Similar to the Yule River, groundwater drawdown is not predicted to extend to the Turner River channel, its riparian vegetation, or any GDV. The modelled 0.5 m and 1 m drawdown contours over the Proposal's life (15 years) and 1 m contour for long-term drawdown (200 years) are presented in Figure 8-12 and Figure 8-13 and indicate that drawdown will remain approximately 5 km from the Turner River.

9.4.2.2 Surplus Water Discharge

For the first three years of dewatering, up to 10 GL/year of surplus water is proposed to be discharged into the Turner River, then up to 4 GL/year in years four to six and then up to 2 GL/year from year seven until the end of the Proposal. The wetting front is predicted to advance from the discharge outfall at approximately 6 km per month to a maximum extent of 50 km downstream (SWS, 2022b). This extent is predicted to be reached at month eight and maintained for 14 months before discharge volumes decline and the wetting front begins to recede.

Potential impacts to riparian and GDV from dewater discharge include:

- Decline in health or death of mature trees (particularly *Eucalyptus camaldulensis*) due to prolonged inundation.
- Increase in abundance of species tolerant to flooding (such as *Melaleuca argentea*), and subsequent death of new recruits in areas not naturally flooded once discharge ceases.
- Increase in feral herbivore activity due to increased water availability, causing trampling of vegetation and bank erosion.
- Increased abundance of existing weed populations.

Hydrological modelling for discharge of surplus water to the Turner River (Surface Water Solutions, 2022) predicted:

- The wetting front will progress downstream at a rate of approximately 6 km per month and will be maintained at the maximum extent (~50 km down channel) for about 14 months before receding back to ~25 km downstream of the outfall and then gradually receding further as the discharge reduces over time. The wetting front is not predicted to extend to the coast, which is approximately 60 km from the discharge outfall.
- Maximum discharge flow rates will be less than 0.1% of the 10% AEP flood event for the Turner River on a peak flow and volumetric basis. Natural highest monthly flows on the Turner River frequently and often significantly exceed the predicted total monthly discharge.
- Under maximum discharge conditions, the inundated area will cover approximately 5% (30 to 50 m) of the Turner River channel width. The discharge water will not overtop the banks.
- Water depth of most of the surplus water discharge area is expected to be between 15–20 cm. Only 2% of the total discharge area is expected to exceed 80 cm in depth.

- The discharge area is significantly narrower than the riverbed and shallower than natural flood events.

Recognising the importance of the Yule and Turner Rivers, as well as riparian vegetation and GDVs associated with them, outcome-based provisions are proposed for each River in Section 9.5. Monitoring to ensure these environmental outcomes are being met has been included within the EMP. In particular, the EMP aims to monitor and manage potential impacts of groundwater drawdown and dewater discharge on the Turner River riparian and GDV. By monitoring both direct and indirect effects of dewater discharge, and implementing adaptive management strategies, the EMP seeks to ensure the protection of Turner River (Appendix 1).

9.4.3 Ecological Communities

The Gregory Land System PEC has been excluded from the Development Envelope with a minimum buffer of 300 m between the mapped PEC and the Development Envelope (which aligns with the DBCA boundary to ensure protection of the PEC) as shown in Figure 9-6.

Umwelt assessed the appropriateness of the 300 m buffer applied by De Grey to ensure the PEC is protected from both direct and indirect impacts from the Proposal. The memo is provided as Appendix 18. No direct impacts are predicted as the PEC is entirely excluded from the Development Envelope. Potential indirect impacts identified by Umwelt include dust generation, spread of weeds, fragmentation, changes to surface water hydrology, groundwater drawdown and groundwater discharge. Buffer areas are required to be assessed on a case-by-case basis as there are limited studies indicating what an appropriate distance would be. After considering the Proposal activities and the implementation of mitigation measures for dust suppression and weed management, Umwelt further concluded that that groundwater drawdown and groundwater discharge will not impact the PEC based on the attributes of the vegetation. As such the 300 m buffer is considered an appropriate buffer to prevent direct and indirect impacts from the Proposal on the PEC.

9.4.4 Significant Species

An assessment of impacts to the populations of significant species recorded at Hemi is provided in Table 9-3. Regional recordings have been added to the total abundance of each species to provide a holistic assessment of the direct impact of the Proposal. Targeted surveys were prioritised in the indicative disturbance footprint, suggesting there may be more populations within the wider survey area and beyond.

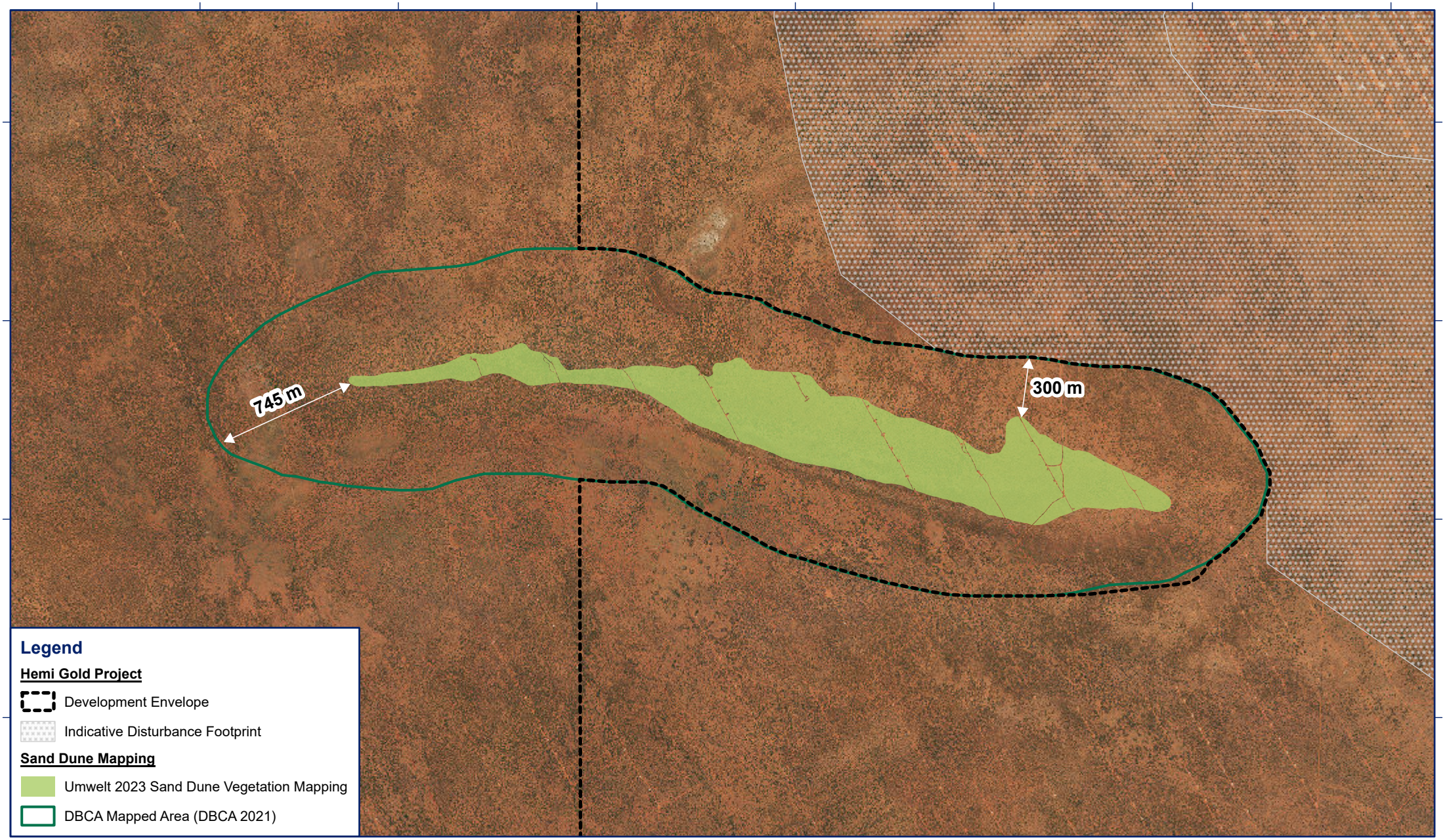
Table 9-3: Significant Flora

Species	Status	Recordings			Individuals Outside Development Envelope	Individuals in Development Envelope	Individuals in Indicative Disturbance Footprint
		Hemi Survey	Regional*	Total			
Abutilon sp. *Pritzelianum*	Priority 3	6,579	1,046	7,625	3,703 (48.5%)	3,922 (51.5%)	721 (9.5%)
Euploca mutica	Priority 3	1,399	374	1,773	377 (21.3%)	1,396 (78.7%)	471 (26.5%)
Gymnanthera cunninghamii	Priority 3	116	190	306	190 (62.1%)	116 (37.9%)	35 (11.4%)
Rothia indica subsp. *australis*	Priority 3	6,226	212	6,438	3,379 (52.5%)	3,059 (47.5%)	991 (15.4%)
Triodia chichesterensis	Priority 3	72,944	2,237	75,181	51,230 (68.1%)	23,951 (31.9%)	1,504 (2%)
Polymeria sp. nov.	Unclassified	73	5**	78	5 (6.4%)	73 (93.6%)	10 (12.8%)

*Additional individual numbers recorded on Florabase. Where a population was identified and no abundance was recorded, a nominal number of one was applied.

**Samples held by WA Museum. A representative number of 1 has been used for each sample, however total numbers of the population at each location could be more. All located outside of the Development Envelope.

Identified potential direct and indirect impacts from the Proposal and proposed mitigation measures are assessed in Table 9-4.



Projection: GDA2020 MGA Zone 50

Updated/Reviewed By: KM/EL
Aerial: May 2021

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Scale: 1:25,000

0 250 500 m

PROJECT		CLIENT
November 2024	Hemi Gold Project - Referral Supporting Document	DE GREY MINING LTD
Figure 9-6		
ADV-AU-00673	Gregory Land System PEC	

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Table 9-4: Assessment of Impacts to Flora and Vegetation

Potential Impacts	Interconnected Factors for Holistic Assessment	Mitigation Measure	Other Decision-Making Process Relevant?	Effectiveness of the Control
Direct Impacts				
Habitat loss, degradation and fragmentation due to clearing.	• Terrestrial Fauna • Inland Waters	• Avoidance of the Gregory Land System PEC by exclusion from the Development Envelope. • Implement upper clearing limits for VT 16. • Limiting clearing to the minimum required. • Using previously disturbed areas to the extent reasonably practicable. • No unauthorised off-road driving. • Progressive rehabilitation where feasible. • Implementation of an internal permitting system to ensure clearing only in approved ground disturbance areas and within approved upper clearing limits. • Site inductions program to provide information on vegetation protection and internal permitting system. • Stripping and stockpiling of topsoil for subsequent rehabilitation to preserve seed bank. • Annual review of clearing areas. • Preparation and implementation of a Mine Closure Plan consistent with DEMIRS Guidelines for Mine Closure Plans.	• DEMIRS Mining Act Mining Proposal and Mine Closure Plan	• The Development Envelope has been optimised where reasonably practicable with significant vegetation, the Gregory Land System PEC being avoided. The complete avoidance of an impact is considered a highly effective control and is the preferred strategy in the EPA's mitigation hierarchy. • The use of upper clearing limits will ensure that the Proposal's impact on these vegetation types does not exceed the upper limits proposed. These limits will be enforced through De Greys permitting system and site induction programs giving it a high level of certainty. • The utilisation of existing disturbed areas for the construction of Proposal elements minimises the amount of vegetation that will be cleared. • The MCP must detail all legal obligations for rehabilitation and closure that affect post-mining land use and closure outcomes.
		Proposed Limit on Impact to Ensure Environmental Outcome • Clearing will be limited to no more than 5,830 ha within a Development Envelope of 22,194 ha. • Clearing will be limited to no more than 10 ha of VT 16.		**Mechanism for Limit** • Ministerial Condition with a limit of 5,830 ha of clearing within the Development Envelope. • Ministerial condition with an upper clearing limit for VT 16.
Loss of significant flora.	N/A	• Limiting clearing to the minimum required. • Using previously disturbed areas to the extent possible. • No unauthorised off-road driving. • Implementation of an internal permitting system for clearing which will enable the avoidance of known locations of Priority species to extent reasonably practicable. • Stripping and stockpiling of topsoil for subsequent rehabilitation to preserve seed bank. • Periodic review of gazettes to ensure that no species known to occur are listed as Threatened flora. • Preparation and implementation of a Mine Closure Plan consistent with DEMIRS Guidelines for Mine Closure Plans	• DEMIRS Mining Act Mining Proposal and Mine Closure Plan	• The use of GIS and internal permit system for clearing will ensure that the Proposal's impact on known locations of significant flora will be avoided to the extent reasonably practicable.
		Proposed Limit on Impact to Ensure Environmental Outcome • No limits proposed – managed through standard industry practice and Mining Act		**Mechanism for Limit** Mining Act Mining Proposal
Indirect Impacts				
Surplus mine water discharge impacting riparian vegetation, GDVs and/or the wet/dry cycle of the Turner River.	• Terrestrial Fauna • Inland Waters	• Discharge to the Turner River will be minimised by reinjection of groundwater within the aquifer. • Surplus water discharge will be managed such that the wetting front does not extend beyond 50 km downstream of the outfall. • Discharge modelling shows wetting front is confined to main channel of river. • Abstracted groundwater will be used on-site for operational, environmental and management purposes to minimise discharge as far as practicable. • Blending of varying quality bore water to achieve a discharge water quality that does not adversely differ from that that the riparian vegetation is typically exposed to.	• DWER Part V EP Act Operating Licence for discharge to the Turner River. • DWER Bed and Banks Permit for impacts to Rivers. • DEMIRS Mining Act Mining Proposal and Mine Closure Plan.	The surplus water management strategy is consistent with the water use hierarchy in DoW Water in Mining Guidelines.
		Proposed Limit on Impact to Ensure Environmental Outcome • During periods of no natural flow, the discharge "wetting front" (affected area) in the Turner River will not extend more than 50 km downstream of the discharge point for the first three years, followed by a reduction. • Discharge of surplus mine water to the Turner River does not cause significant long-term impact to the Turner River riparian vegetation health.		**Mechanism for Limit** • Ministerial condition limiting the wetting front in the Turner River to 50 km under natural no flow conditions. • Implementation of the EMP.

Potential Impacts	Interconnected Factors for Holistic Assessment	Mitigation Measure	Other Decision-Making Process Relevant?	Effectiveness of the Control
Sudden reduction in surplus mine water discharge volume to Turner River resulting in impacts to riparian vegetation/GDVs.	• Terrestrial Fauna • Inland Waters	• Implement phased reduction in surplus mine water discharge resulting in a minimised risk of impact to riparian vegetation/GDVs. • Phased reduction in surplus mine water discharge in year three to minimise impacts to vegetation as a result of a sudden change. • Discharge of surplus mine water to continue for LOM at reduced volumes/intermittently, giving vegetation and aquatic fauna the opportunity to normalise. • Establishment of early response, trigger and threshold criteria for mature tree and understory riparian vegetation health along the Turner River. • Rehabilitation of discharge outlet area.	• DWER Part V EP Act Operating Licence for discharge to the Turner River. • DEMIRS Mining Act Mining Proposal and Mine Closure Plan.	These measures have been developed in consultation with industry leading botanists to determine appropriate early response, trigger and threshold criteria for monitoring of the riparian vegetation along the Turner River. The proposed monitoring and response actions are considered a highly effective control.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		Discharge of surplus mine water to the Turner River does not cause significant long-term impact to the Turner River riparian vegetation health.		Implementation of the EMP.
Groundwater mounding at reinjection borefields.	• Flora and Vegetation • Subterranean Fauna	• Reinjection rates limited such that mounding remains >2 m below ground level (bgl). • Use of multiple reinjection bores sufficiently spaced to control mounding to an acceptable level. • Reinjection into permeable upper and lower alluvium/paleochannel aquifers to limit mounding. • Use of mine water as process water from year 3 to minimise reinjection volumes. • Third-party offtake options to be considered.	• DWER Part V EP Act Operating Licence.	This strategy will effectively remove any potential pathway for impact to vegetation as a result of changes to water availability in the root zone.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		Proposal limit on groundwater mounding to remain >2 m bgl.		Ministerial condition with limit to groundwater mounding to 2 m from surface within the reinjection borefield.
Introduction of new invasive plant species or spread of existing invasive species.	• Terrestrial Fauna	• Implementation of a vehicle and equipment hygiene system. • Site inductions program to provide information on weeds identification and weed hygiene. • Any machinery used in the removal of weed infested materials will be cleaned down before entering or leaving the work site to prevent the introduction and spread of weeds into new areas. • Any soil or materials imported onto the worksite will be from weed-free areas • Restricting vehicles movements to existing roads and tracks, as far as practicable. • Weed control measures if required during all phases of the Proposal (including rehabilitation).	• DEMIRS Mining Act Mine Closure Plan.	• The mitigation measures will minimise the spread and introduction of weed species within the Development Envelope. • These measures have been implemented at other operations in the Pilbara and are considered effective.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No new WoNS introduced, attributable to the Proposal.		Implementation of weed management strategy.
Degradation of vegetation from dust deposition and potential change to fire regime.	• Terrestrial Fauna • Social Surroundings	• Implementation of dust suppression techniques such as sprayers on crushers and water trucks is expected to help minimise dust generation during construction and operation. • Limiting the amount of disturbed land to as small as reasonable reducing the amount of dust producing surfaces. • Clearing activities not to be undertaken when fire danger rating is catstrophic. • Using a permit system for hot work. • Installation of fire breaks around critical infrastructure. • Effective maintenance of vehicles. • Provision of fire extinguishers in all vehicles. • Emergency response as required. • Conducting any controlled burns in consultation with relevant stakeholders. • Including fire education in the site induction. • Weed control.	No	• These measures align with current industry standards for managing dust suppression. The management strategies will minimise the amount of dust generated from the Development Envelope. • These management strategies have been implemented across mining operations in the Pilbara and are regarded as having a high level of certainty.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practices.		N/A
Fragmentation due to land clearing	• N/A	• Limiting clearing to the minimum required reducing fragmentation and barrier to pollination. • Implementation of an internal permitting system for clearing which will enable the avoidance of known locations of Priority species to extent reasonably practicable. • Using previously disturbed areas to the extent reasonably practicable. • Undertake progressive rehabilitation to minimise cleared areas where practicable and revegetate using local native species, where practicable		• The use of GIS and internal permit system for clearing ensure that the Proposal's impact on known locations of significant flora will be avoided to the extent reasonably practicable. • The MCP must detail all legal obligations for rehabilitation and closure that affect post-mining land use and closure outcomes.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practices.		N/A

9.5 Environmental Outcomes

Environmental outcomes, in the context of this Proposal, refer to the predicted state of the environment after the Proposal is implemented. De Grey outcomes for Flora and Vegetation seek to:

- Be specific and measurable, clearly describing quantifiable environmental conditions.
- Have a defined spatial and temporal extent.
- Aim to achieve the Environmental Protection Authority's (EPA) objectives for inland waters.

In consideration of the proposed avoidance and management measures and likely residual impacts associated with the Proposal, the predicted environmental outcomes and objectives that apply to Flora and Vegetation are set out below.

- Clearing will be limited to no more than 5,830 ha within a Development Envelope of 22,194 ha.
- Clearing will be limited to more than 10 ha of VT 16.
- During periods of no natural flow, the discharge "wetting front" (affected area) in the Turner River will not extend more than 50 km downstream of the discharge point for the first three years, followed by a reduction in subsequent years.
- Discharge of surplus mine water to the Turner River does not cause significant long-term impact to the Turner River riparian vegetation health.
- Limit groundwater mounding to no greater than 2 m from surface in the reinjection borefields.
- No new WoNS introduced, attributable to the Proposal.

De Grey will implement the EMP provided as Appendix 1 to achieve these outcomes.

9.6 Conclusion

As a result of the flora and vegetation surveys undertaken at Hemi and subsequent design and management considerations, De Grey concludes:

- Excluding the Gregory Land System from the Development Envelope and inclusion of a 300 m buffer from the Development Envelope conserves the ecological value of the PEC.
- There will be no impacts to Threatened flora species listed under the BC Act or Priority 1 or 2 species listed by DBCA.
- Priority 3 species will be avoided where reasonably practicable, however the Proposal is not predicted to result in a significant impact to known species nor result in a change to their conservation status since 76% of individuals occur outside of the indicative disturbance footprint.
- Based upon feedback from the WA Herbarium 1(8 January 2024) *Polymeria* sp. nov is likely to be a Priority 3 species due to the fact that the species collected from within the Development Envelope is within the known range of 5 other specimens collected and yet to be identified, As such the Proposal is is not predicted to result in a significant impact.
- Limiting the clearing of regionally common native vegetation associations to up to 5,830 ha in a 22,194 ha Development Envelope will not have a significant impact on biological diversity of the region.
- Mitigation measures for weed infestation and spread will reduce the impact to the condition of the surrounding native vegetation.
- Riparian vegetation will not be negatively impacted long-term downstream of the Turner River outfall.

Significant impacts to flora and vegetation that may affect biological diversity and ecological integrity are not predicted when considered both individually or cumulatively. De Grey considers that the proposed management measures will ensure that the EPA's Flora and Vegetation factor objective is met.

10. ENVIRONMENTAL FACTOR - TERRESTRIAL FAUNA

10.1 EPA Objective

The EPA objective for terrestrial fauna is *"to protect terrestrial fauna so that biological diversity and ecological integrity are maintained"* (EPA, 2016c).

10.2 Policy and Guidance

The following guidance is applicable to this factor:

- *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA, 2020b).
- *Environmental Factor Guideline: Terrestrial Fauna* (EPA, 2016c).
- *Technical Guidance – Sampling of Short-Range Endemic Invertebrate Fauna* (EPA, 2016e).

10.3 Receiving Environment

10.3.1 Vertebrate Fauna

Western Wildlife completed a detailed vertebrate fauna survey in accordance with the requirements of EPA Technical Guidance (EPA, 2020b), over two seasons in September 2021 and March 2022, with additional targeted surveys in August 2022 and April 2024. The survey area encompasses the Proposal's Development Envelope and extends to the Yule and Turner Rivers, covering 34,688 ha. The survey area, fauna habitat types and survey effort is illustrated in Figure 10-1 and the survey report (Western Wildlife, 2024) is attached as Appendix 20. Unless otherwise referenced, the text in this section of the document is drawn from Western Wildlife's survey report, with detailed monitoring results available in the report.

Aquatic ecology surveys undertaken by Stantec also identified terrestrial vertebrate species along the Yule and Turner Rivers and confirmed the presence of the Northern Quoll along the Turner River (Stantec, 2022). The results of these studies are provided in Section 8.3.4.

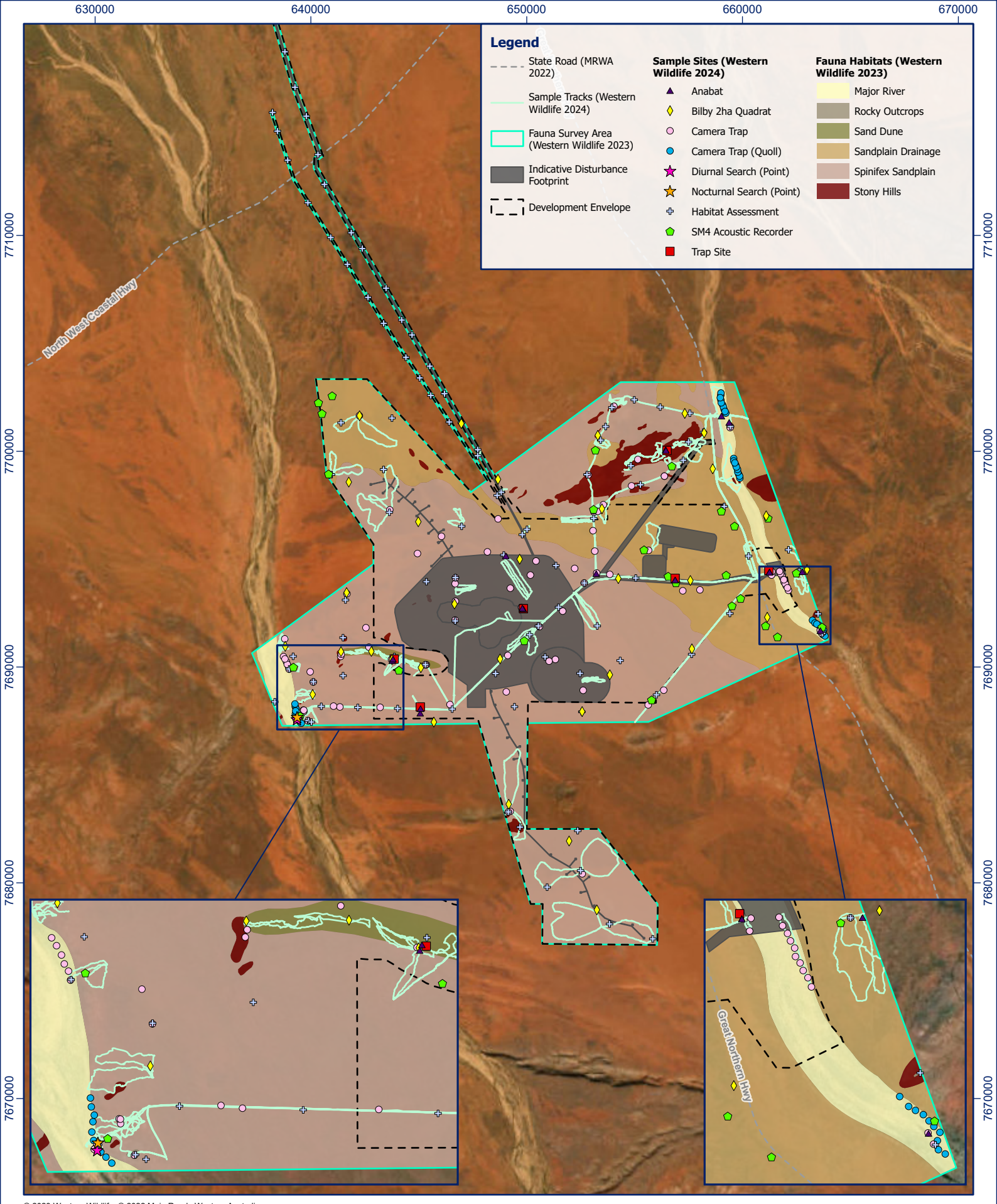
Six fauna habitats were identified and mapped within the survey area as described in Table 10-1 and shown in Figure 10-1. None of the identified habitats supports a particularly unique faunal assemblage and although relatively diverse, the fauna present are typical of the Pilbara Bioregion. Two of the habitats present – Rocky Outcrop and Sand Dune (which have been excluded from the Development Envelope) – are limited in extent in the study area and the bioregion. Section 18.6 considers cumulative fauna impacts at a regional scale.

Table 10-1: Vertebrate Fauna Habitats

Vegetation Type	Key Elements	Representative Photo	Mapped within Study Area (ha)
Spinifex Sandplain	• Consolidated sands suitable for burrowing reptiles and mammals.		22,718.6
Sandplain Drainage	• Consolidated sands suitable for burrowing reptiles and mammals. • Claypans of various sizes that hold water and may be breeding. • Habitat for frogs. • Mature spinifex in some areas, where encouraged by water runoff and/or protection from fire.		9,349.5
Sand Dune	• Loose flowing sands provide habitat for fossorial reptiles.		190.1
Stony Hills	• Minor drainages lines (not mapped separately) provide dense habitat for birds. • Small stones suitable for Western Pebble-mound Mouse. • Minor rocky outcrops provide shelter for rock-dwelling reptiles.		1,196.4

Vegetation Type	Key Elements	Representative Photo	Mapped within Study Area (ha)
Major River	• Likely to function as a corridor for fauna movement. • Waterholes provide habitat for bathing and drinking, as well as breeding habitat for frogs. • Tree hollows for arboreal reptiles, bats and hollow-nesting birds. • Leaf litter accumulations and woody debris in the creek bed • Provides habitat for reptiles.	 	1,231.9
Rocky Outcrops	• Outcropping rocky areas, boulders, overhangs and rock crevices provide shelter for reptiles and mammals (no large caves present).		1.5
	Total*		**34,688**

*Rounded up to the nearest one.



Scale: 1:220,000

0 1.25 2.5 5 km

N

Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Fauna Habitats and Survey Effort

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Figure 10-1	ADV-AU-00673	November 2024

The faunal assemblage in the survey area comprises predictions drawn from a literature review and Western Wildlife's survey recordings, and is as follows:

- 10 frog species predicted, six recorded.
- 115 reptile species predicted, 56 recorded.
- 165 bird species predicted, 89 recorded.
- 36 native mammal species predicted, 22 recorded.
- Eight introduced mammal species predicted, six recorded.

Species accumulation curves were calculated for frogs, reptiles, birds and mammals and for all habitats combined to determine if the recorded species where representative of the predicted faunal assemblage. Overall, a large proportion of the fauna species able to be recorded through systematic methods, were recorded.

A total of 31 significant species were predicted to potentially occur in the study area, consisting of:

- Nine Threatened species (listed under the EPBC Act and BC Act).
- 12 Migratory species (listed under the EPBC Act and BC Act).
- One Specially Protected species (listed under the BC Act).
- Eight Priority species (listed by DBCA).
- One Locally Significant species (identified by Western Wildlife).

The 31 conservation significant species were assigned a likelihood of occurrence based on the criteria presented in Table 10-2. The conservation status of these 31 species and their assigned likelihood of occurrence within the survey area are summarised in Table 10-3.

Table 10-2: Criteria for assessing likelihood of occurrence

Likelihood	Criteria
Unlikely	• The study area is outside the current known distribution of the species as presented in the literature. • No suitable habitat was identified as being present during the field survey. • For some species, individuals may occur occasionally as vagrants, especially if suitable habitat is located nearby, but the study area itself would not support the species. • May include species generally accepted as being locally extinct. • These species are not considered to potentially occur.
Possible	• The study area is within or just outside the current known distribution of the species, as presented in the literature. • Any habitat present is either limited in extent or of marginal quality at best. • No recent or nearby records of the species on databases. • The species is generally known to be less common in the vicinity of the study area (e.g., for inland sites, where the species usually occurs on the coast).
Potential	• The study area is within the current known distribution of the species, as presented in the literature. • Habitat of reasonable quality was identified as being present during the field survey. • There are some recent and/or nearby records of the species of databases.
Likely	• The study area is well within the current known distribution of the species, as presented in the literature. • Habitat of good quality was identified as being present during the field survey. • Many recent and nearby records of the species on databases.
Known to Occur	• The species was positively identified in the study area during this field survey or recorded as occurring in the study area on previous recent field surveys. • Note that for a species ‘known to occur’, the habitat may still be marginal and therefore the population may be small, or the species may visit the site irregularly.

Source: Western Wildlife (2024, p. 26)

Table 10-3: Summary of Conservation Significant Fauna

Species	Conservation Status				Likelihood of Occurrence	Recorded in Development Envelope	Notes
	EPBC Act	BC Act	DBCA Priority	Locally Significant			
Threatened Species:							
Pezoporus occidentalis – Night Parrot	En	Cr			Possible	Not Recorded	This species has been recorded at only at a few locations across Australia. The limited patches of mature spinifex habitats in the study area are technically suitable habitat.
Dasyurus hallucatus – Northern Quoll	En	En			Known to occur	Recorded in Development Envelope	Recorded in the study area in September 2021 and March 2022. Likely to be a resident of the Rocky Outcrops (excluded from the Development Envelope) and Major River habitats, dispersing and foraging in adjacent habitats.
Macrotis lagotis – Greater Bilby	Vu	Vu			Known to occur	Secondary signs recorded	Secondary signs, mostly of old burrows (inactive but active in the past year) recorded (outside of Proposal indicative disturbance footprint)
Rhinonicteris aurantia – Pilbara Leaf-nosed Bat	Vu	Vu			Known to occur	Recorded	Recorded in the study area on acoustic detectors in September 2021 and March 2022. Likely to be a regular foraging visitor to all habitats, particularly of the Rocky Outcrops and Major River habitats. No roosts were recorded within the Development Envelope, with the closest known roost 17 km south of Development Envelope.
Macroderma gigas – Ghost Bat	Vu	Vu			Likely	Not Recorded	Likely to be a regular foraging visitor to all habitats. No roosts were recorded within the Development Envelope, with the closest known roost 35 km south of the Proposal.

Species	Conservation Status				Likelihood of Occurrence	Recorded in Development Envelope	Notes
	EPBC Act	BC Act	DBCA Priority	Locally Significant			
Liasis olivaceus barroni – Pilbara Olive Python	Vu	Vu			Likely	Not Recorded	Known to occur nearby, this species is likely to be a foraging visitor and possible breeding resident of the Major River and Rocky Outcrop habitats.
Falco hypoleucos – Grey Falcon	Vu	Vu			Likely	Not Recorded	Known to occur nearby, this species is likely to be a foraging visitor to open habitats and possible breeding resident of the Major River habitat.
Migratory Species:							
Charadrius veredus – Oriental Plover	Mi	Mi			Possible	Not recorded	May be a non-breeding summer visitor to open plains and recently burnt areas, but there are very few records of this species in the region.
Actitis hypoleucos – Common Sandpiper	Mi	Mi			Likely	Not recorded	Non-breeding summer visitor to waterholes on Major Rivers, possibly also to claypans in the Sandplain Drainage habitat.
Calidris acuminata – Sharp-tailed Sandpiper	Vu & Mi	Mi			Potential	Not Recorded	Non-breeding summer visitor to waterholes on Major Rivers, possibly also to claypans in the Sandplain Drainage habitat.
Calidris melanotos – Pectoral Sandpiper	Mi	Mi			Possible	Not Recorded	May be a non-breeding summer visitor to waterholes on Major Rivers, possibly also to claypans in the Sandplain Drainage habitat.
Calidris ruficollis – Red-necked Stint	Mi	Mi			Potential	Not Recorded	Non-breeding summer visitor to waterholes on Major Rivers, possibly also to claypans in the Sandplain Drainage habitat.
Tringa glareola – Wood Sandpiper	Mi	Mi			Likely	Not Recorded	Non-breeding summer visitor to waterholes on Major Rivers, possibly also to claypans in the Sandplain Drainage habitat.

Species	Conservation Status				Likelihood of Occurrence	Recorded in Development Envelope	Notes
	EPBC Act	BC Act	DBCA Priority	Locally Significant			
Tringa nebularia – Common Greenshank	En & Mi	Mi			Likely	Not Recorded	Non-breeding summer visitor to waterholes on Major Rivers, possibly also to claypans in the Sandplain Drainage habitat.
Tringa stagnatilis – Marsh Sandpiper	Mi	Mi			Potential	Not Recorded	Non-breeding summer visitor to waterholes on Major Rivers, possibly also to claypans in the Sandplain Drainage habitat.
Pandion cristatus – Eastern Osprey	Mi	Mi			Potential	Not Recorded	Foraging visitor to waterholes on Major Rivers. No breeding habitat present.
Apus pacificus – Fork-tailed Swift	Mi	Mi			Known to occur	Not Recorded	Recorded in the study area, however outside of the Development Envelope, in March 2022. Although likely to occur on occasion, this species is largely aerial in Australia so the terrestrial habitats in the study area are unlikely to be of particular importance to the species.
Glareola maldivarum – Oriental Pratincole	Mi	Mi			Potential	Not Recorded	Non-breeding summer visitor to open plains or claypans in the Sandplain Drainage habitat.
Gelochelidon nilotica – Gull-billed Tern	Mi	Mi			Potential	Not Recorded	Foraging visitor to waterholes on Major Rivers. No breeding habitat present.
Hydroprogne caspia – Caspian Tern	Mi	Mi			Likely	Not Recorded	Foraging visitor to waterholes on Major Rivers. No breeding habitat present.
Plegadis falcinellus – Glossy Ibis	Mi	Mi			Potential	Not Recorded	Occasional foraging visitor to waterholes on Major Rivers. No breeding habitat present.
Specially Protected Species:							
Falco peregrinus – Peregrine Falcon		OS			Potential	Not Recorded	This species potentially occurs as a foraging visitor but breeding habitat is limited in the study area.

Species	Conservation Status				Likelihood of Occurrence	Recorded in Development Envelope	Notes
	EPBC Act	BC Act	DBCA Priority	Locally Significant			
Priority Species:							
Ctenotus nigrilineatus – Pin-striped Finesnout Ctenotus			P1		Possible	Not Recorded	This species is known from very few records, but habitats in the study area may be suitable.
Anilios ganei – Gane's Blind Snake			P1		Possible	Not Recorded	This species is known from very few records, but habitats in the study area may be suitable.
Ozimops cobourgiana – Northern Coastal Free-tailed Bat			P1		Known to occur	Recorded	Recorded in the study area on acoustic detectors in March 2022. Likely to be a foraging visitor to most habitats, may roost in tree hollows in the Major River habitat.
Dasycercus blythi – Brush-tailed Mulgara			P4		Known to occur	Recorded	Recorded in the study area in September 2021, March and August 2022. Likely to be a common resident of the Spinifex Sandplain and Spinifex Drainage habitats. Of the seven records within the Development Envelope, only one recording in the indicative disturbance footprint.
Lagorchestes conspicillatus – Spectacled Hare-wallaby			P4		Likely	Not Recorded	This species is known to occur in the region and suitable habitat is present in the Spinifex Sandplain and Sandplain Drainage habitats.
Sminthopsis longicaudata – Long-tailed Dunnart			P4		Potential	Not Recorded	This species is known to occur in the region, and potentially suitable habitat is present in the Stony Hills and Rocky Outcrops.
Leggadina lakedownensis – Lakeland Downs Mouse			P4		Potential	Not Recorded	This species is known to occur in the region, and potentially suitable habitat is present in the Sandplain Drainage habitat.

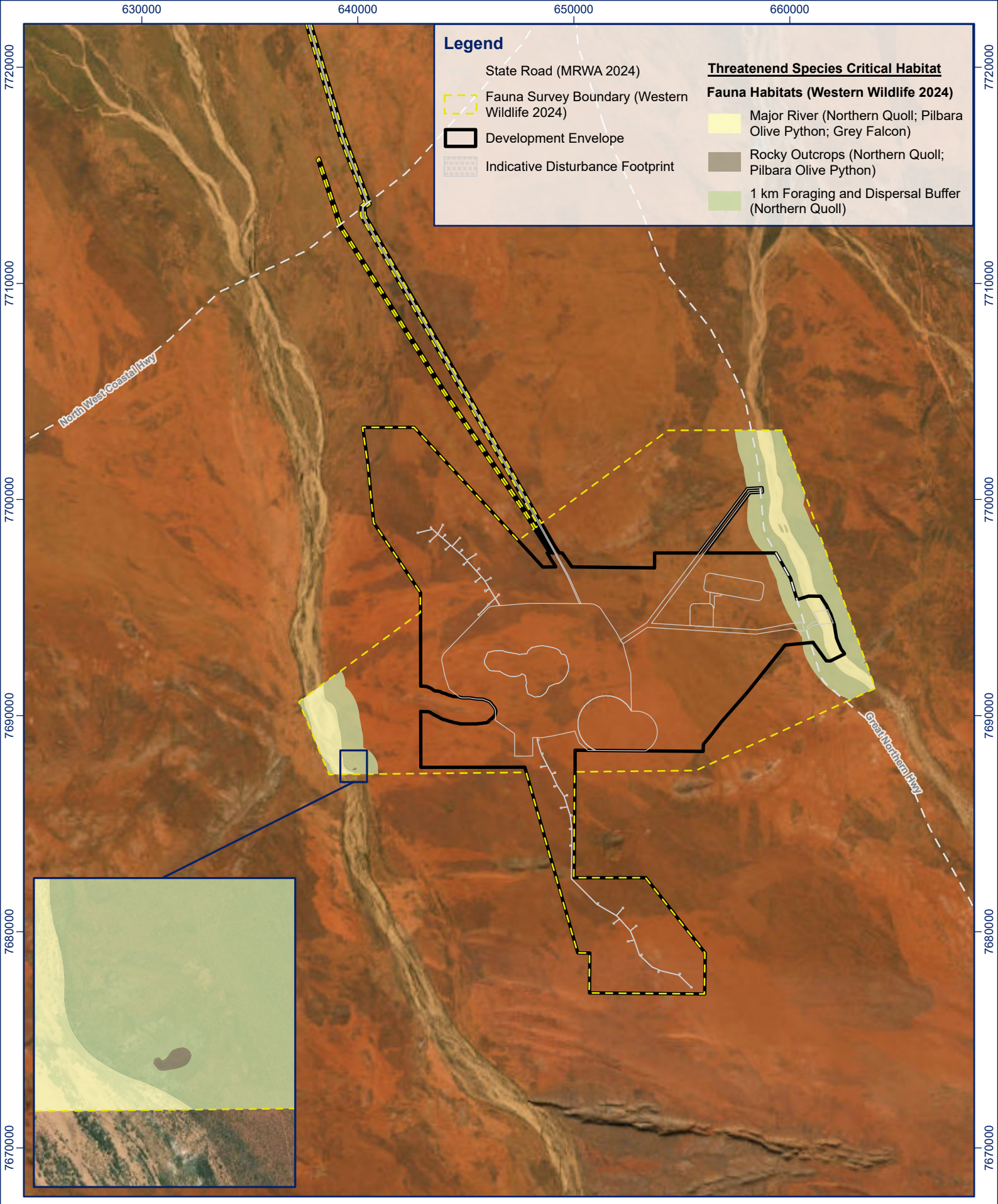
Species	Conservation Status				Likelihood of Occurrence	Recorded in Development Envelope	Notes
	EPBC Act	BC Act	DBCA Priority	Locally Significant			
Pseudomys chapmani – Western Pebble-mound Mouse			P4		Known to occur	Recorded	Likely to be a common resident of the Stony Hills habitat. A total of nine recordings within the Development Envelope, all of which are historic mounds with no recordings located within the indicative disturbance footprint.
Locally Significant							
Stipiturus ruficeps – Rufous-crowned Emu-wren				LS	Known to occur	Recorded	Recorded on acoustic detectors in April 2024. Likely to occur where mature spinifex is present. Recorded elsewhere on De Grey exploration tenements.

Critical habitat for Threatened Species is described in Table 10-4. The mapped extent of critical habitat types for the Northern Quoll; Grey Falcon and Pilbara Olive Python are shown in Figure 10-2 and critical habitat for the Greater Bilby is shown in Figure 10-3. Critical habitat for the Greater Bilby is common and widespread at the Proposal and wider Pilbara bioregion.

There is no significant or important habitat for migratory birds present at the Proposal (Western Wildlife, 2024).

Table 10-4: Critical Habitat for Threatened Species

Species	Critical Habitat
Northern Quoll	Critical habitat is shown in Figure 10-2 and includes: • Rocky Outcrop and any foraging/dispersal habitat within 1 km (does not occur in the Development Envelope). • Major River and any foraging/dispersal habitat within 1 km. Critical Major River habitat extends beyond the fauna survey area along the Yule River (~250 km long) and Turner River (~220 km long).
Greater Bilby	Critical habitat is shown in Figure 10-3 and includes: • Sand Dune. • Spinifex Sandplain. • Sandplain Drainage. Critical habitat is common and widespread at the Proposal and wider Pilbara bioregion.
Pilbara Leaf-nosed Bat	Critical habitat is diurnal roosts. There is no diurnal roosting habitat within the Development Envelope with the closest known roosts at Yule River (17 km south), East Turner River (40 km southeast) and Abydos (64 km southeast).
Ghost Bat	Critical habitat is Category 1 and 2 and some Category 3 roosts and foraging habitat within 12 km (Western Wildlife, 2024). There is no critical habitat within 12 km of the Proposal.
Pilbara Olive Python	Critical habitat is shown in Figure 10-2 and includes: • Rocky Outcrop. • Major River. Critical Major River habitat extends beyond the fauna survey area along the Yule (~250 km long) and Turner Rivers (~220 km long).
Night Parrot	The key habitats for the Night Parrot are thought to be chenopod shrublands and Spinifex grasslands, with the chenopod shrublands a refuge during dry conditions (Garnett et al., 2011). The Spinifex Sandplain and Sandplain Drainage habitats provide potential breeding and roosting habitat within the study area (patches of mature spinifex), however due to consistent fires, the Development Envelope lacks suitable mature ring-forming spinifex suitable for roosting.
Grey Falcon	Critical habitat is shown in Figure 10-2 and includes: • Major River. Critical Major River habitat extends beyond the fauna survey area along the Yule (~250 km long) and Turner Rivers (~220 km long).



Scale: 1:220,000

0 2.5 5 km

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Projection: GDA2020 MGA Zone 50
Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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Mapped Critical Habitat Types for the Northern Quoll; Grey Falcon and Pilbara Olive Python

Figure 10-2 | ADV-AU-00673 | November 2024

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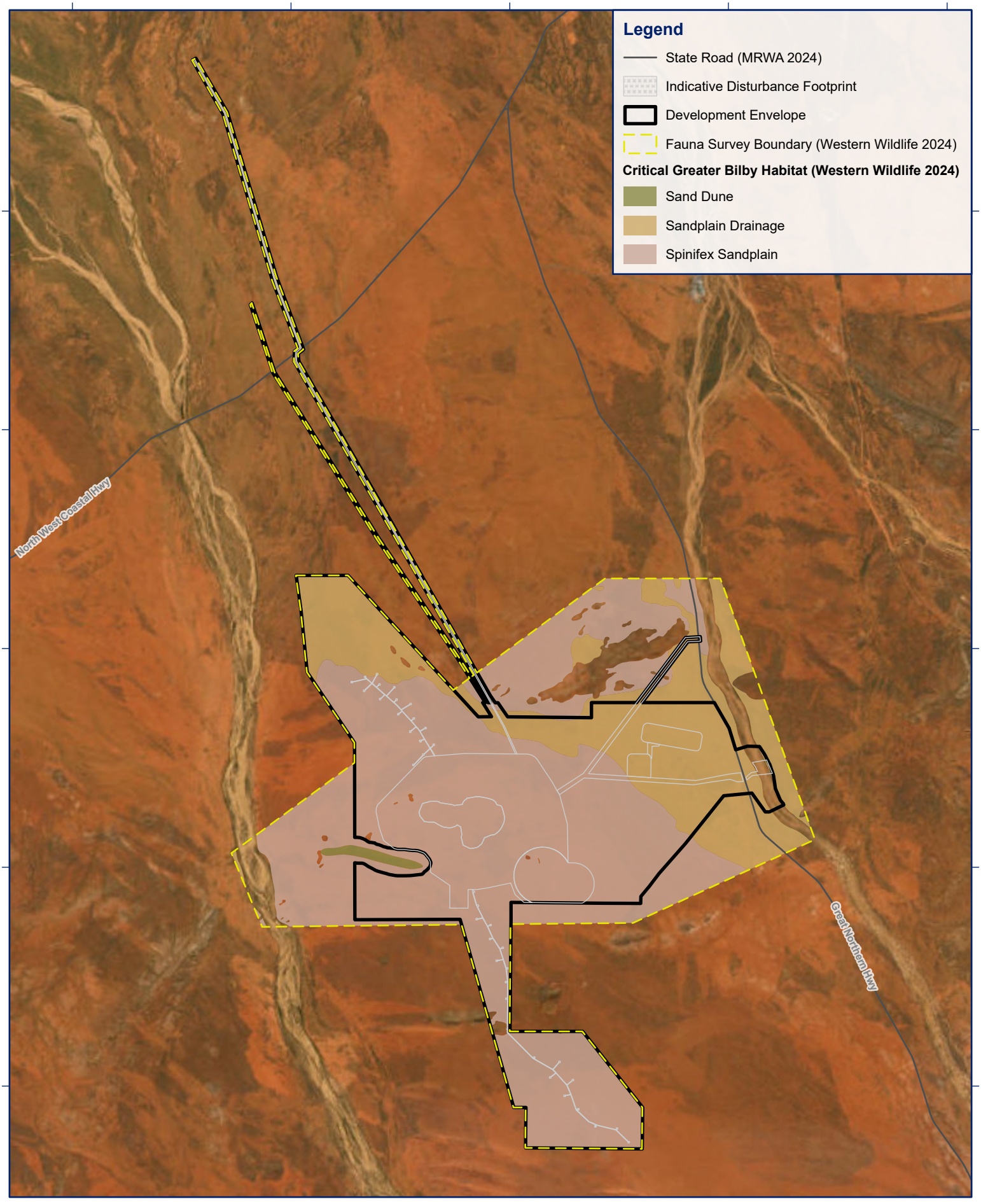

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Projection: GDA2020 MGA Zone 50
Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Updated/Reviewed by: KM/EL

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PROJECT	CLIENT
Hemi Gold Project - Referral Supporting Document	DE GREY MINING LTD
Mapped Critical Habitat for Greater Bilby	

Figure 10-3	ADV-AU-00673	November 2024

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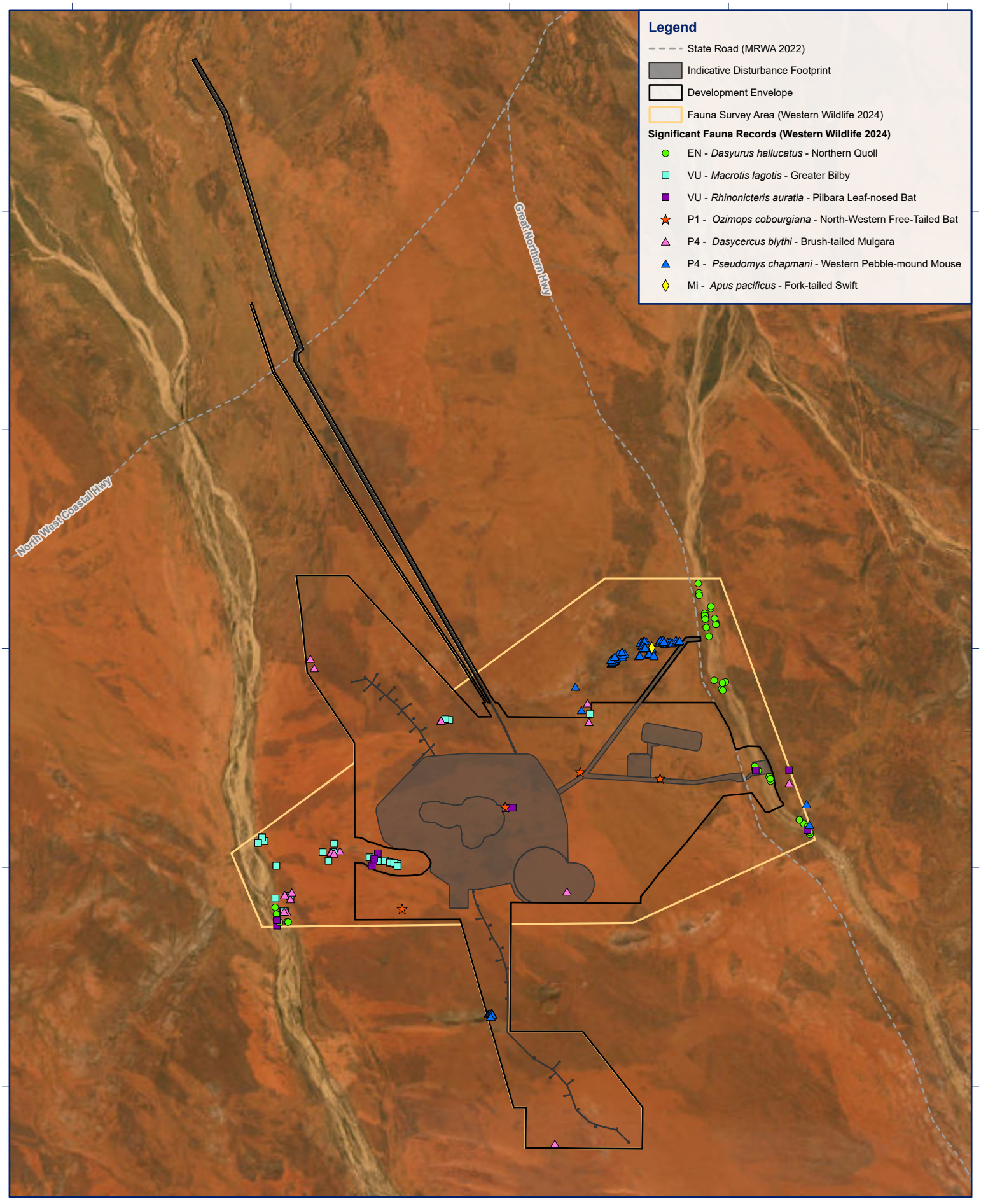

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Projection: GDA2020 MGA Zone 50
Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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Hemi Gold Project - Referral Supporting Document

Significant Species Records

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Figure 10-4	ADV-AU-00673	November 2024

10.3.2 Short Range Endemic Fauna

Bennelongia undertook a desktop assessment of potential SRE fauna followed by field surveys in November 2021 and April 2022 in accordance with the requirements of EPA technical guidance (EPA, 2016e). The survey report (Bennelongia, 2023b) is attached as Appendix 21. Unless otherwise referenced, the text in this section of the document is drawn from Bennelongia's report; detailed monitoring results can be found in the report.

Six potential SRE habitats were identified across the Development Envelope and have been aligned with vertebrate fauna habitat mapping presented in Section 10.3.1. These habitats are described in Table 10-5 and shown on Figure 10-5.

SRE sampling was undertaken at 18 sites at the Proposal (Figure 10-5). 685 specimens from at least 28 species belonging to SRE groups were identified in two rounds of sampling. Of these, six species have potentially restricted distributions meaning that they are potential SREs.

Table 10-5 presents the determination of the SRE status of these six species using the Western Australia Museum (WAM) classification system for SREs, which recognises three categories:

1. Confirmed SRE species have a known distribution range smaller than 10,000 km^2. The taxonomy is well known, and the group well represented in collections and/or via comprehensive sampling.
2. Potential SRE species belong to a group with gaps in our knowledge of its distribution, either because the group is not well represented in collections, taxonomic knowledge is incomplete, or the distribution is poorly understood due to insufficient sampling.
3. Widespread (not SRE) species have a known distribution range larger than 10,000 km^2. The taxonomy is well known, and the group well represented in collections via comprehensive sampling.

Bennelongia's experience is that in many surveys most species fit the Potential SRE category, but the likelihood of species within the category actually being SREs varies substantially. To increase the accuracy of categorisation, Bennelongia sub-divides the Potential SRE category into three subcategories:

A. **Data deficient Potential SRE**, indicating that insufficient data are available to determine SRE status. Insufficiency of data may be caused either by a lack of geographic or taxonomic information, or because the individuals sampled are not identifiable to species level (e.g. wrong sex, juvenile, damaged). This category is applied only to those species that belong to a known SRE Group, rather than being applied to any undescribed species in the survey.

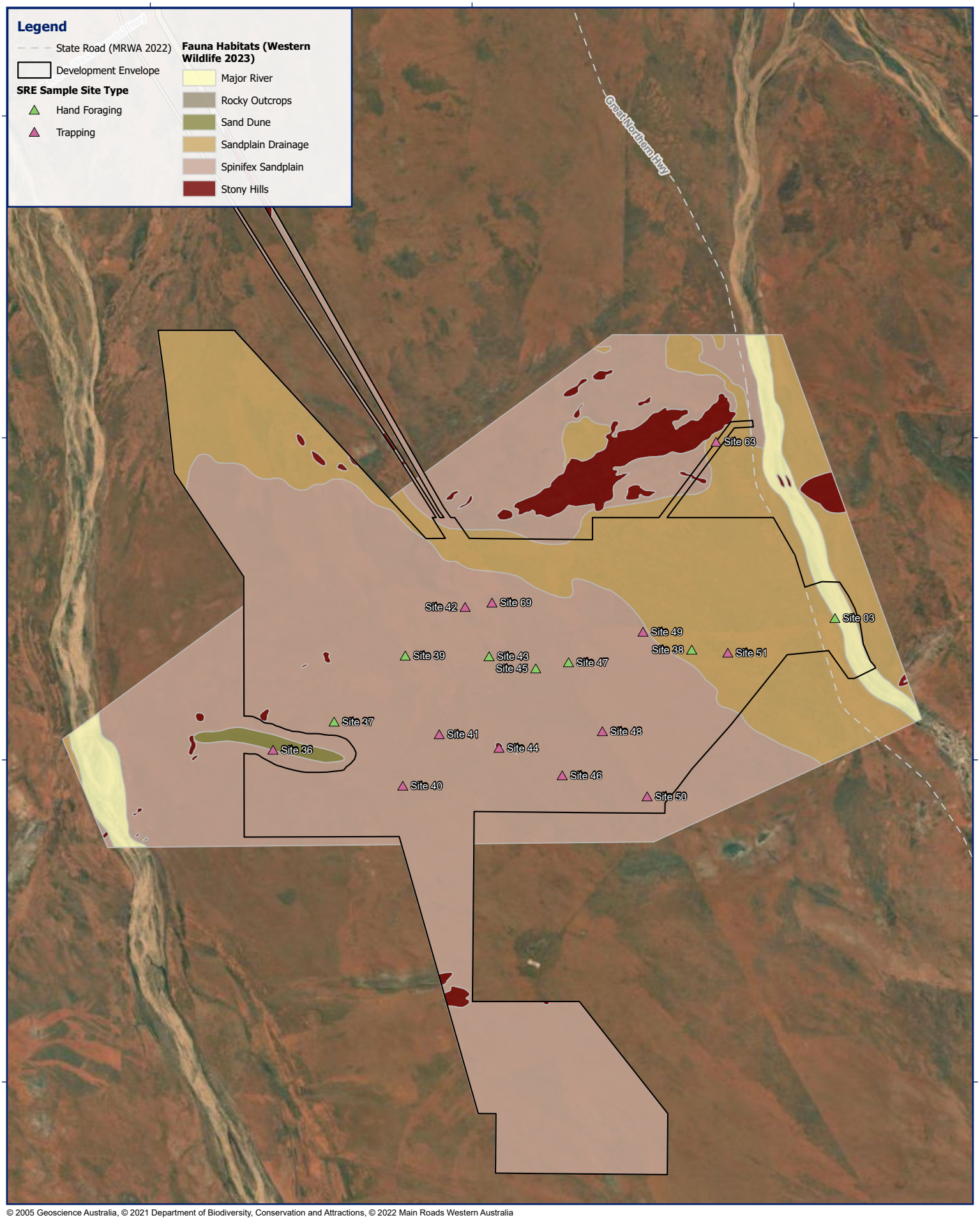
B. **Unlikely Potential SRE** species are either from taxonomic groups that are not usually SREs or were collected from many sites and/or widespread or multiple habitats.

C. **Potential SRE** species are from taxonomic groups in which SREs are likely, and when specimens have been collected from one or very few sites and/or habitats.

Table 10-5: Potential SRE Habitat Types

SRE Habitat	Aligned Fauna Habitat	Vegetation	Sun Exposure	Soil/geology	Area Mapped (ha)	Potential SRE Species Located
Sandplain	Spinifex Sandplain	Spinifex dominated landscape with Acacia and Eucalyptus trees.	Very high, some protection around bushes and trees (variable density amongst sites).	Red sandy clay topsoil	17,439.83	• *Dampetrus* `BOP017` • *Synothele* `BMYG195`
Drainage sandplain	Sandplain Drainage	Acacia shrubland over scattered spinifex.	Very high, some protection under trees and in litter.	Red clay to clayey sand	8,106.35	• *Afrosternophorus* `BPS436`
Outcrop/stony hills	Stony Hills	Acacia shrubland.	High, some protection under trees.	Red clay	378.63	• No potential SREs recorded.
Sand dunes	Sand Dune	Spinifex dominated, with Acacia and salt bushes.	Moderate, cover provided by bush, under spinifex and leaf litter.	Red sand to clayey sand	64.38	• *Austrohorus*`BPS411`
Creek drainage	Major River	Associations of Eucalyptus and Acacia trees.	High, some protection under trees.	Brown sand	804.59	• *Oratemnus* `BPS437` • *Laevophiloscia* 'BIS546'

(Bennelongia, 2023b, p. 18)



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Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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SRE Survey Effort and Habitat Types

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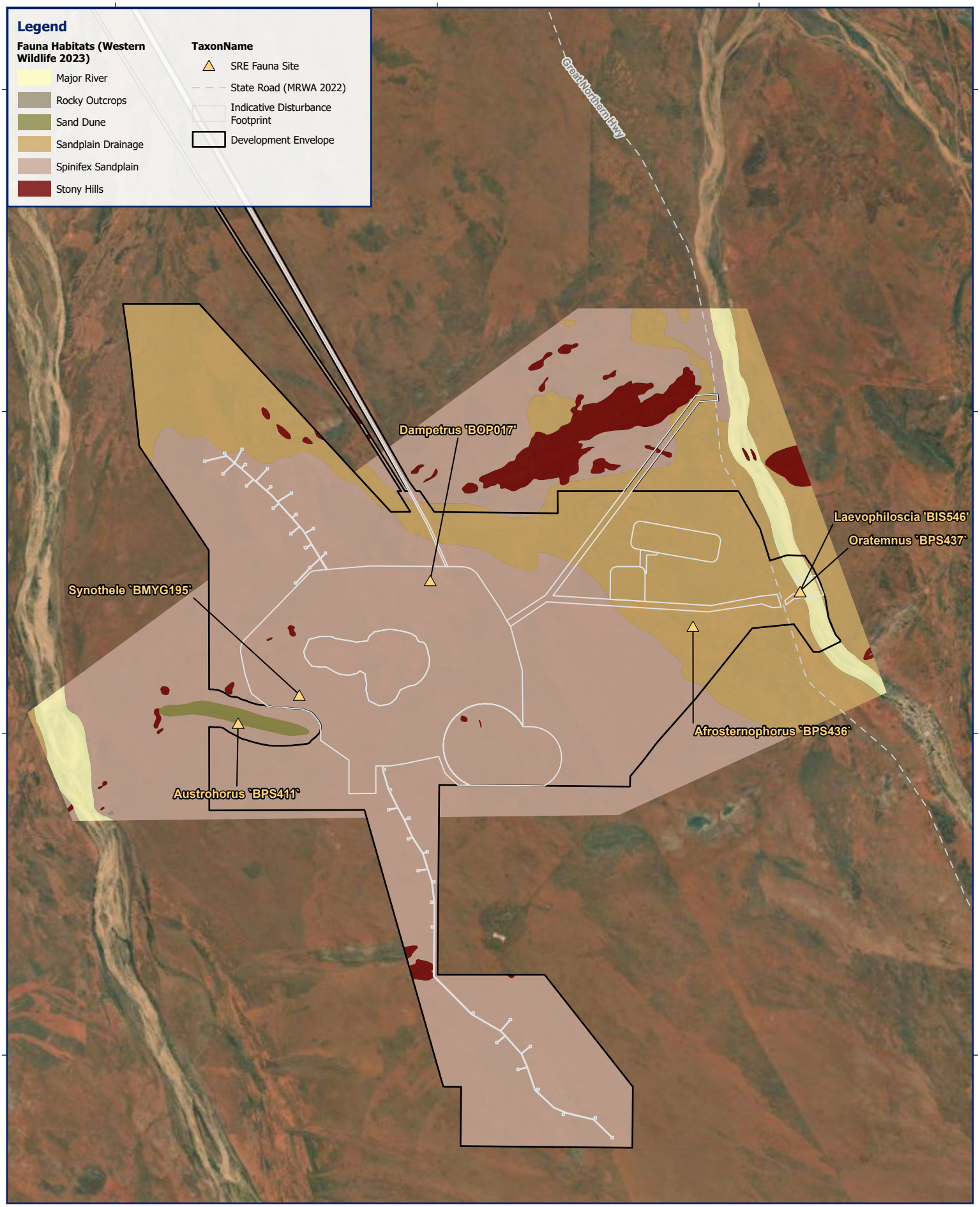
Figure 10-5	ADV-AU-00673	November 2024



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Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Fauna Habitats and Potential SRE Records

Figure 10-6 | ADV-AU-00673 | November 2024

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10.4 Potential Impacts and Mitigation Measures

10.4.1 Vertebrate Fauna

A summary of the fauna habitat types within the Development Envelope and indicative disturbance footprint is provided in Table 10-6. The Sand Dune and Rocky Outcrop habitat are excluded entirely from the Development Envelope.

Table 10-6: Proposed Impact to Fauna Habitat Types

Vegetation Type	Key Elements	Mapped with Study Area (ha)	Area inside Development Envelope (ha)	Area inside Indicative Disturbance Footprint (ha)
Spinifex Sandplain	• Consolidated sands suitable for burrowing reptiles and mammals.	22,718.6	15,809.8 (69.6%)	5,100.0* (22.4%)
Sandplain Drainage	• Consolidated sands suitable for burrowing reptiles and mammals. • Claypans of various sizes that hold water and may be breeding. • Habitat for frogs. • Mature spinifex in some areas, where encouraged by water runoff and/or protection from fire.	9,349.5	6,029.4 (64.5%)	800.0* (8.5%)
Sand Dune	• Loose flowing sands provide habitat for fossorial reptiles.	190.1	0 (0%)	0 (0%)
Stony Hills	• Minor drainages lines (not mapped separately) provide dense habitat for birds. • Small stones suitable for Western Pebble-mound Mouse. • Minor rocky outcrops provide shelter for rock-dwelling reptiles.	1,196.4	172.9 (14.5%)	33.3 (2.8%)
Major River	• Likely to function as a corridor for fauna movement. • Waterholes provide habitat for bathing and drinking, as well as breeding habitat for frogs. • Tree hollows for arboreal reptiles, bats and hollow-nesting birds. • Leaf litter accumulations and woody debris in the creek bed • Provides habitat for reptiles.	1,231.9	181.2 (14.7%)	10* (0.8%)
Rocky Outcrops	• Outcropping rocky areas, boulders, overhangs and rock crevices provide shelter for reptiles and mammals (no large caves present).	1.5	0 (0%)	0 (0%)

* De Grey is proposing an upper clearing limit for Spinifex Sandplain, Sandplain Drainage and Major River habitat types to provide for Project flexibility.

10.4.2 Short Range Endemic Fauna and Habitat

Of the six potential SRE invertebrates recorded from the Proposal area:

- One species (Afrosternophorus `BPS436`) was found to occur in a restricted/isolated habitat type, namely the Sand Dune Habitat type. This habitat has been excluded from the Development Envelope and will not be directly, nor indirectly impacted. This species is considered an Unlikely Potential SRE.
- Two species (Oratemnus `BPS437` and Laevophiloscia 'BIS546') were found in the Major River habitat type. Impacts to this habitat type will be minor in nature (10 ha) with sufficient habitat remaining post implementation of the Proposal for these species. Oratemnus `BPS437` is considered an Unlikely Potential SRE while Laevophiloscia 'BIS546' is considered a Data Deficient Potential SRE.
- Two species (Dampetrus `BOP017`and Synothele `BMYG195`) were found in the Spinifex Sandplain habitat type. Whilst approximately 5,100 ha of this habitat type will be impacted by the Proposal, this habitat type is common in the region and well connected. Approximately 17,000 ha of this habitat type will remain post implementation of the Proposal. These species are considered Unlikely Potential SREs.
- One species (Austrohorus`BPS411`) was found in the Sandplain Drainage habitat type. Impacts to this habitat type (800 ha) are limited to linear infrastructure and the accommodation village. This habitat type, similar to the Spinifex Sandplain habitat type, is common in the region and well connected. Approximately 8,500 ha of this habitat type will remain post implementation of the Proposal. This species is considered an Unlikely Potential SRE.

Identified potential direct and indirect impacts from the Proposal and proposed mitigation measures are assessed in Table 10-7, whilst Table 10-8 addresses potential impacts and mitigation measures specific to significant species identified as likely to occur in the Development Envelope.

Table 10-7: Assessment of Impacts to Vertebrate Fauna

Potential Impacts	Interconnected Factors for Holistic Assessment	Mitigation Measure	Other Decision-Making Process Relevant?	Effectiveness of the Control
Direct Impacts				
Habitat loss and fragmentation impacting fauna populations	• Flora and Vegetation	• The Development Envelope and indicative disturbance footprint have been modified during the design phase to avoid direct impacts to high significance vertebrate fauna habitat where practicable. This includes the avoidance of Rocky Outcrop and Sand Dune habitat types which have been removed from the Development Envelope. • The Development Envelope and indicative disturbance footprint have been designed to minimise where practicable disturbance of Spinifex Sandplain, Sandplain Drainage and Major River habitats which are considered critical habitat for significant species. • Clearing of critical habitat will be restricted through authorised extents. • Implementation of an internal permitting system to ensure clearing only in approved ground disturbance areas and within approved upper clearing limits. • Preclearance surveys for the Greater Bilby to be undertaken in accordance with the EMP (Appendix 1). • Known location of significant fauna habitat types will be included in the Proponents GIS system to ensure impacts to known locations of significant habitat types are minimised and adhere to authorised extents. • Limiting clearing to the minimum required. • Using previously disturbed areas to the extent reasonably practicable. • Annual review of clearing areas. • Preparation and regular update of a MCP consistent with DEMIRS Guidelines for MCPs. • Rehabilitation will be undertaken progressively to minimise disturbed areas and therefore reduce fragmentation and barriers to fauna movement.	• DBCA – s.14 BC Act approval required for disturbance of habitat for significant species.	• There are no industry or best practice standards established in relation to habitat protection. Avoidance is the first and preferred step in the mitigation hierarchy and therefore is consistent with the EPA '*Statement of environmental principles, factors, objectives and aims of EIA'* (EPA, 2023d). The Development Envelope has been optimised where reasonably practicable with significant habitat, such as the Rocky Outcrop and Sand Dune habitats being excluded from the Development Envelope. The complete avoidance of an impact is considered a highly effective control. • The use of upper clearing limits will ensure that the Proposal's impact on critical habitat types does not exceed the upper limits proposed. These limits will be enforced through De Greys permitting system and site induction programs giving it a high level of certainty. • There are no industry or best practice standards established in relation to protection of native fauna from habitat fragmentation. Where avoidance is not reasonably practicable, minimisation of impacts is the next preferred step in the mitigation hierarchy and therefore is consistent with the EPA's '*Statement of environmental principles, factors, objectives and aims of EIA*' (EPA, 2023d) • Statutory Guidelines for MCPs are available and are consistent with industry-leading practice. The MCP must detail all legal obligations for rehabilitation and closure that affect post-mining land use and closure outcomes.
		Proposed Limit on Impact to Ensure Environmental Outcome • Avoid, or otherwise minimise direct and indirect impact form the Proposal upon Greater Bilby and Northern Quoll critical habitat. • Clearing will be limited to no more than 5,830 ha within a Development Envelope of 22,194 ha. • Clearing will be limited to no more than 5,100 ha of Spinifex Sandplain habitat within the Development Envelope (considered critical habitat for the Greater Bilby). • Clearing will be limited to no more than 800 ha of Sandplain Drainage habitat within the Development Envelope (considered critical habitat for the Greater Bilby). • Clearing will be limited to no more than 10 ha of Major River habitat within the Development Envelope (considered critical habitat for the Northern Quoll). • Avoid, where reasonably practicable, large hollow forming trees suitable for Northern Quoll and Grey Falcon within the Major River habitat. • Preclearance surveys for the Greater Bilby.		**Mechanism for Limit** • Ministerial condition requiring the avoidance, or otherwise minimisation of direct and indirect impacts to critical habitat types. • Ministerial condition with an upper clearing limit for Spinifex Sandplain, Sandplain Drainage and Major River habitat types. • Ministerial condition requiring the avoidance, where reasonably practicable, of large hollow forming trees suitable for Northern Quolls within the Major River habitat type. • Implementation of the EMP (Appendix 1).
Loss of fauna individuals	• N/A	• Preclearance surveys for the Greater Bilby to be undertaken in accordance with the EMP (Appendix 1). • Progressive clearing to allow fauna to migrate away from clearing activities or machinery movements. • Clearing will commence, where reasonably practicable, from a disturbed vegetation edge to an undisturbed area (to encourage mobile fauna to relocate to adjacent areas naturally). • Implement speed limits for mine vehicles on unsealed roads and tracks within the Development Envelope based on a risk assessment that considers environmental values (in addition to safety/other required legislation). • Driving mine vehicles at night will be limited to the extent reasonably practicable, which will minimise interaction with nocturnal species (noting operations will be 24 hours). • No unauthorised off-road driving. • Roadkill will be removed from trafficable areas to reduce the risk of an increase in predators. • Site induction programs will provide information on significant fauna including their appearance and habitats. Training would also discuss standard operating procedures in the event of fauna interactions. • Artificial water sources at turkeys' nests and sediment ponds will have egress points. • Drains across the Development Envelope will include fauna egress points. • The top edges of artificial water source trenches and borrow pits will be sloped to enable fauna egress. • Tailings and process water pipelines subject to an inspection each shift for leaks/spills. This will also identify fauna that may have become trapped within the drains. • Borrow pits would be designed, constructed and rehabilitated to minimise surface water ponding. • Sightings and incidents will be reported.	• No	• The use of the controls listed are well-established management measures utilised in industry to ensure that Proposal impacts on native fauna are limited. These measures will minimise impacts to fauna species.

Potential Impacts	Interconnected Factors for Holistic Assessment	Mitigation Measure	Other Decision-Making Process Relevant?	Effectiveness of the Control
		• Preparation and regular update of a MCP consistent with DEMIRS Guidelines for MCPs.		
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		Preclearance surveys for the Greater Bilby.		Implementation of the EMP.
Loss of SRE species and SRE habitat	• Terrestrial Fauna	• The Development Envelope and indicative disturbance footprint have been modified during the design phase to avoid direct impacts to SRE habitat types that represent restricted/isolated habitats for potential SRE species (Rocky Outcrop and Sand Dune Habitats). • Clearing limits applied to significant species Major River habitat will also result in limits to potentially suitable SRE habitat. • Implementation of an internal permitting system to ensure clearing only in approved ground disturbance areas and within approved upper clearing limits. • Preparation and regular update of a MCP consistent with DEMIRS Guidelines for MCPs.	• No	• There are no industry or best practice standards established in relation to habitat protection. Avoidance is the first and preferred step in the mitigation hierarchy and therefore is consistent with the EPA Statement of environmental principles, factors, objectives and aims of EIA. The Development Envelope has been optimised where reasonably practicable with restricted/isolated habitats, such as the Rocky Outcrop and Sand Dune habitats being excluded from the Development Envelope. The complete avoidance of an impact is considered a highly effective control. • Statutory Guidelines for MCPs are available and are consistent with industry-leading practice. The MCP must detail all legal obligations for rehabilitation and closure that affect post-mining land use and closure outcomes.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		Limit to clearing of significant species habitats will also protect potential SRE habitats.		Clearing limits to be included as a Ministerial Condition

Collision with fences and powerlines	• N/A	Proposal is on an active pastoral lease where cattle fencing is used. De Grey will manage the potential impacts of fencing by:
		  • Minimising fencing to amount required.
		  • Not using barbed wire fencing where practicable.
		• If barbed wire fencing is required (due to legislative, safety or pastoral requirements), the top strands will be plain wire, and 10 cm disc bat reflectors to be used.
		  • Regular inspections of fenced areas.
		  • Reporting of all fauna related incidents.
			• No	• Reflectors on fences are best practice and consistent with Conservation Advice for bat species.
				• The use of the controls listed are well-established management measures utilised in industry to ensure that Proposal impacts on native fauna are limited.

		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practises		N/A
Post closure mine voids creating water source in arid area, increasing feral predator numbers. Evapoconcentration of metals and metalloids in mine voids causing sickness or death of fauna that drink or are exposed to pit lake water.	• Subterranean Fauna • Inland Waters	• The Hemi Pits are located between the Yule and Turner Rivers. The Proposal is on an active pastoral lease and pastoral activities include the provision of water for livestock. • De Grey will construct abandonment bunds around mine voids which will limit access. • Preliminary pit lake modelling is included in the Conceptual MCP. Pits are expected to become saline as they approach steady-state conditions and will not provide a water source in the medium to long term. Ongoing monitoring and pit lake modelling to be undertaken throughout the operation and included in revisions to the Mine Closure Plan	• DEMIRS Mining Act Mining Proposal and Mine Closure Plan	• Continual improvement in knowledge and understanding of closure issues is a standard requirement of mine closure planning under the Mining Act. DEMIRS will be updated on the ongoing collection of data and the current status of pit lake modelling as part of the ongoing revisions of the MCP.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practises		N/A
Indirect Impact				
Habitat degradation associated with construction and operational activities, including dust and altered fire regimes.	• Flora and Vegetation.	• Clearing activities will not be undertaken when the fire danger rating is catastrophic. • Using a permit system for hot work. • Installation of fire breaks around critical infrastructure. • Effective maintenance of vehicles. • Provision of fire extinguishers in all buildings and vehicles. • Emergency response as required. • Conducting any controlled burns in consultation with relevant stakeholders. • Including fire education and management in the site induction. • Use of water carts with water sourced from dewatering activities and sprayers on crushers. • During high winds, topsoil and overburden stripping and other high generating dust activities would be restricted if risk-based assessment measures determine dust cannot be adequately controlled.	• No	• These measures align with current industry standards for managing fire and dust. The management strategies will minimise the potential for fire and dust generation within the Development Envelope. • These management strategies have been implemented across mining operations in the Pilbara and are regarded as having a high level of certainty.

Potential Impacts	Interconnected Factors for Holistic Assessment	Mitigation Measure	Other Decision-Making Process Relevant?	Effectiveness of the Control
		• Implement speed limits for mine vehicles on unsealed roads and tracks within the Development Envelope based on a risk assessment that considers environmental values (in addition to safety/other required legislation).		
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practises		N/A
Changes to fire intensity, due to introduction and spread of weeds, impacting fauna habitat.	• Flora and Vegetation.	• Implementation of a vehicle and equipment hygiene system. • Site inductions program to provide information on weeds identification and weed hygiene. • Any machinery used in the removal of weed infested materials will be cleaned down before entering or leaving the work site to prevent the introduction and spread of weeds into new areas. • Any soil or materials imported onto the worksite will be from weed-free areas • Restricting vehicles movements to existing roads and tracks, as far as practicable. • Weed control measures if required during all phases of the Proposal (including rehabilitation).	• DEMIRS Mining Act Mine Closure Plan.	• The mitigation measures will minimise the spread and introduction of weed species within the Development Envelope. • These measures have been implemented at other operations in the Pilbara and are considered effective.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practises		N/A
Predation and/or competition with feral predators	• N/A	• Implementing best practice waste management measures. • Report sightings of feral fauna by personnel as environmental incidents in the incident register. • Limiting the creation of permanent water bodies. • Fencing of artificial water sources where practicable and the putrescible landfills. • Monitoring and control measures will be undertaken as required, in co-operation with regional control programs and the Traditional Owners. • Prohibiting feeding of feral fauna. • Prohibiting pets on site.	• DWER Part V EP Act Operating Licence for landfill	• These measures have been implemented at other operations in the Pilbara and are considered effective.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practises and Part V EP Act.		Part V EP Act Operating Licence
Loss of Traditional Owner knowledge and land management.	• Social Surroundings	• Loss of traditional knowledge can result in alterations to landscape and habitats. This is not anticipated to occur as a result of the Proposal. • Assist Traditional Owners in facilitating awareness-raising activities to maintain cultural significance, traditional ecological knowledge, and land management skills.	• No	• On 15 December 2022 De Grey executed a Native Title Mining Agreement with the Karriyarra People which includes measures and commitments to maintain and enhance traditional knowledge and land management practices.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through the Native Title Mining Agreement		N/A
Accidental introduction and establishment of the Cane Toad.	• N/A	• Implement additional vehicle hygiene measures for vehicles arriving from known cane toad range (Kimberley, Northern Territory). • Avoiding the creation of artificial water sources to the extent practicable. • Educating personnel on the Cane Toad in the site induction. • Reporting any confirmed sightings to DBCA. • Humane disposal of any Cane Toads found.	• No	• The Cane Toad is currently not established in the Pilbara. De Grey will prevent its activities from accidentally introducing the Cane Toad in line with advice from stakeholders.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through the Native Title Mining Agreement		N/A
Sickness or death due to drinking of process water or supernatant on TSF by fauna species.	• N/A	• Ponds to be fenced to prevent access. • Access to TSF to be restricted by construction of bunds and gates as required. • Nonlethal deterrents to be installed if required. • Operation of the TSF and associated decant pond in accordance with the TSF Operating Strategy.	• DWER Part V EP Act Operating Licence • DEMIRS Mining Act Mining Proposal	• These measures have been implemented at other operations in the Pilbara and are considered effective.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practices, Part V EP Act and Mining Act.		Part V EP Act Operating Licence and Mining Act Mining Proposal
Drowning in raw or process water ponds.	• N/A	• Ponds to be fenced to limit access. • Non-lethal deterrents to be installed if required. • Fauna egress matting to be installed.	• DWER Part V EP Act Operating Licence • DEMIRS Mining Act Mining Proposal	• These measures have been implemented at other operations in the Pilbara and are considered effective.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practices, Part V EP Act and Mining Act.		Part V EP Act Operating Licence and Mining Act Mining Proposal

Table 10-8: Species Specific Management and Mitigation Measures for Significant Fauna

Species	Potential Impacts	Critical Habitat	Extent	Mitigation Measures	Assessment
Northern Quoll (EN)	• Habitat loss. • Population isolation and fragmentation. • Accidental vehicle strike. • Loss or injury of individuals during clearing and general operations. • Introduction and increases of feral fauna species, including cane toads, foxes and cats. • Project activities may increase the risk of accidental fire ignition.	Critical habitat is shown in Figure 10-2 and includes: • Rocky Outcrop and any foraging/ dispersal habitat within 1 km. • Major River and any foraging/dispersal habitat within 1 km.	Clearing of up to 10 ha of Major River habitat.	• The Development Envelope and indicative disturbance footprint have been modified during the design phase to avoid direct impacts to critical Northern Quoll habitat. This includes the avoidance of Rocky Outcrop and Major River (Yule) habitat types which have been removed from the Development Envelope. • The Development Envelope and indicative disturbance footprint have been designed to minimise where practicable direct impacts to critical Northern Quoll habitat where practicable. This includes the minimisation of impact to Major River (Turner River) habitats to as low as reasonably practicable. • Preclearance surveys for the Northern Quoll to be undertaken in accordance with the EMP (Appendix 1). • Clearing of Major River critical habitat will be restricted to an authorised extent of no more than 10 ha. • Large hollow forming trees suitable for Northern Quoll within the Major River habitat will be avoided where reasonably practicable. • Implementation of an internal permitting system to ensure clearing only in approved ground disturbance areas and within approved upper clearing limits. • Known location of significant fauna habitat types will be included in the Proponents GIS system to ensure impacts to known locations of significant habitat types are minimised and adhere to authorised extents. • Using previously disturbed areas to the extent reasonably practicable. • Annual review of clearing areas. • Progressive clearing to allow fauna to migrate away from clearing activities or machinery movements. • Clearing will commence, where reasonably practicable, from a disturbed vegetation edge to an undisturbed area (to encourage mobile fauna to relocate to adjacent areas naturally). • Implement speed limits for mine vehicles on unsealed roads and tracks within the Development Envelope based on a risk assessment that considers environmental values (in addition to safety/other required legislation). • Driving mine vehicles at night will be limited to the extent reasonably practicable, which will minimise interaction with nocturnal species (noting operations will be 24 hours). • No unauthorised off-road driving. • Roadkill will be removed from trafficable areas to reduce the risk of an increase in predators. • Site induction programs will provide information on significant fauna including their appearance and habitats. Training would also discuss standard operating procedures in the event of fauna interactions • Preparation and regular update of a MCP consistent with DEMIRS Guidelines for MCPs • Rehabilitation will be undertaken progressively to minimise disturbed areas and therefore reduce fragmentation and barriers to fauna movement.	• Disturbance of Northern Quoll critical habitat (Rocky Outcrop and Major River (Yule River) habitat) has been avoided through exclusion from the Development Envelope. • Disturbance of Northern Quoll critical habitat (Major River habitat) has been minimised to an upper clearing limit of 10 ha. • Fragmentation of an important population is not predicted. Northern Quoll habitat is widespread across the region. • The mining and processing infrastructure location does not coincide with the Northern Quoll population. • The EMP outlines measures for minimise direct and indirect impacts on the Northern Quoll. • The clearing of 10 ha of Major River habitat is considered a significant residual impact. Offsets have been proposed for this clearing and are discussed in Section 15.

Species	Potential Impacts	Critical Habitat	Extent	Mitigation Measures	Assessment
Greater Bilby (VU)	• Habitat loss • Population isolation and fragmentation. • Accidental vehicle strike. • Loss or injury of individuals during clearing and general operations. • Increase in predation by foxes and cats. • Project activities may increase the risk of accidental fire ignition.	Critical habitat is shown in Figure 10-3 and includes: • Sand Dune. • Spinifex Sandplain. • Sandplain Drainage. Critical habitat is common and widespread within the Development Envelope and wider Pilbara bioregion.	Clearing of • Up to 5,100 ha of Spinifex Sandplain habitat. • Up to 800 ha of sandplain drainage habitat.	• The Development Envelope and indicative disturbance footprint have been modified during the design phase to avoid direct impacts to critical Greater Bilby habitat. This includes the avoidance of the Sand Dune habitat type which has been removed from the Development Envelope. • The Development Envelope and indicative disturbance footprint have been designed to minimise where practicable direct impacts to critical Greater Bilby habitat where practicable. This includes the minimisation of impact to Spinifex Sandplain and Sandplain Drainage habitats to as low as reasonably practicable. • Clearing of Spinifex Sandplain critical habitat will be restricted to an authorised extent of no more than 5,700 ha. • Clearing of Sandplain Drainage critical habitat will be restricted to an authorised extent of no more than 800 ha. • Preclearance surveys for the Greater Bilby to be undertaken in accordance with the EMP (Appendix 1). • Implementation of an internal permitting system to ensure clearing only in approved ground disturbance areas and within approved upper clearing limits. • Known location of significant fauna habitat types will be included in the Proponents GIS system to ensure impacts to known locations of significant habitat types are minimised and adhere to authorised extents. • Using previously disturbed areas to the extent reasonably practicable. • Annual review of clearing areas. • Progressive clearing to allow fauna to migrate away from clearing activities or machinery movements. • Clearing will commence, where reasonably practicable, from a disturbed vegetation edge to an undisturbed area (to encourage mobile fauna to relocate to adjacent areas naturally). • Implement speed limits for mine vehicles on unsealed roads and tracks within the Development Envelope based on a risk assessment that considers environmental values (in addition to safety/other required legislation). • Driving mine vehicles at night will be limited to the extent reasonably practicable, which will minimise interaction with nocturnal species (noting operations will be 24 hours). • No unauthorised off-road driving. • Roadkill will be removed from trafficable areas to reduce the risk of an increase in predators. • Site induction programs will provide information on significant fauna including their appearance and habitats. Training would also discuss standard operating procedures in the event of fauna interactions • Preparation and regular update of a MCP consistent with DEMIRS Guidelines for MCPs • Rehabilitation will be undertaken progressively to minimise disturbed areas and therefore reduce fragmentation and barriers to fauna movement.	• The definition of critical habitat for the Greater Bilby is broad and encompasses all habitats where it is recorded. • The Proposal requires the clearing of critical habitat however is not predicted to impact a current population. • Disturbance of Greater Bilby critical habitat (Sand Dune) has been avoided through exclusion from the Development Envelope. • Disturbance of Greater Bilby critical habitat (Spinifex Sandplain and Sandplain Drainage) has been minimised to an upper clearing limit of 5,100 and 800 ha. • Fragmentation of an important population is not anticipated. Greater Bilby habitat is widespread across the region. • The EMP outlines measures for minimise direct and indirect impacts on the Greater Bilby, including preclearance surveys. • The clearing of 5,100 and 800 ha of Spinifex Sandplain and Sandplain Drainage habitats is considered a significant residual impact. Offsets have been proposed for this clearing and are discussed in Section 15.
Pilbara Leaf-nosed Bat (VU)	• Habitat loss • Accidental vehicle strike. • Collision with fences, especially those with barbed wire.	Critical habitat is diurnal roosts (Category 1, 2 and 3 roosts) and foraging habitat includes Priority 3 (Rocky Outcrop), Category 4 (Major Watercourses) and Priority 5 (Open Grassland and Woodland) habitat types (Western Wildlife, 2024) or any habitat within 20 km of a diurnal roost.	• There is no critical habitat (diurnal roosts) or foraging within the Development Envelope.	• Minimising fencing to amount required. • Barbed wire fencing will be avoided in most instances. • If barbed wire fencing is required (due to legislative, safety or pastoral requirements), the top strands will be plain wire, and 10 cm disc bat reflectors to be used. • Regular inspections of fenced areas. • Reporting of all fauna related incidents.	No significant impact is predicted to the Pilbara Leaf-nosed Bat as a result of the Proposal as no diurnal roosts or are present within the Development Envelope with the nearest roost 17 km South of the main mine area. Suitable foraging habitat (Priority 1, 2 and 3) was also not mapped within the Development Envelope. The Proposal is not anticipated to result in a significant impact to the regional population or impact the recovery effort of the Pilbara Leaf-nosed Bat.

Species	Potential Impacts	Critical Habitat	Extent	Mitigation Measures	Assessment
Ghost Bat (VU)	• Habitat loss • Accidental vehicle strike • Collision with fences, especially those with barbed wire. • Competition for prey with foxes and feral cats.	Critical habitat is diurnal roosts (Category 1 and 2 roosts) and foraging habitat within 3 km (Western Wildlife, 2024 pg.82) or 12 km (Bat Call, 2021).	There is no critical or foraging habitat within the Development Envelope.	• Minimising fencing to amount required. • Barbed wire fencing will be avoided in most instances. • If barbed wire fencing is required (due to legislative, safety or pastoral requirements), the top strands will be plain wire, and 10 cm disc bat reflectors to be used. • Regular inspections of fenced areas. • Reporting of all fauna related incidents. • Reporting of all fauna related incidents.	No significant impact is predicted to the Ghost Bat as a result of the Proposal as no diurnal roosts are present within the Development Envelope, with the nearest 35 km south of the main mine activities. Suitable foraging habitat was mapped during the field surveys across the study area, however as the Development Envelope is outside of the 12 km foraging buffer surrounding the known diurnal roost, it is not considered critical habitat for the species. De Grey believes the Proposal will not have any direct or indirect impacts on the Ghost Bat.
Pilbara Olive Python (VU)	• Habitat loss • Population isolation and fragmentation • Accidental vehicle strike. • Loss or injury of individuals during clearing and general operations. • Increase in predation by foxes and cats • Predation of food sources by cats and foxes. • Project activities may increase the risk of accidental fire ignition. • Changes in local hydrology due to surplus water discharge. • Death from mistaken identification as a poisonous brown snake.	Critical habitat is shown in Figure 10-2 and includes: • Rocky Outcrop. • Major River.	Clearing of up to 10 ha of Major River habitat.	• The Development Envelope and indicative disturbance footprint have been modified during the design phase to avoid direct impacts to critical Pilbara Olive Python habitat. This includes the avoidance of Rocky Outcrop and Major River (Yule) habitat types which have been removed from the Development Envelope. • The Development Envelope and indicative disturbance footprint have been designed to minimise where practicable direct impacts to critical Pilbara Olive Python habitat where practicable. This includes the minimisation of impact to Major River (Turner River) habitats to as low as reasonably practicable. • Clearing of Major River critical habitat will be restricted to an authorised extent of no more than 10 ha. • Implementation of an internal permitting system to ensure clearing only in approved ground disturbance areas and within approved upper clearing limits. • Known location of significant fauna habitat types will be included in the Proponents GIS system to ensure impacts to known locations of significant habitat types are minimised and adhere to authorised extents. • Using previously disturbed areas to the extent reasonably practicable. • Annual review of clearing areas. • Progressive clearing to allow fauna to migrate away from clearing activities or machinery movements. • Clearing will commence, where reasonably practicable, from a disturbed vegetation edge to an undisturbed area (to encourage mobile fauna to relocate to adjacent areas naturally). • Implement speed limits for mine vehicles on unsealed roads and tracks within the Development Envelope based on a risk assessment that considers environmental values (in addition to safety/other required legislation). • Driving mine vehicles at night will be limited to the extent reasonably practicable, which will minimise interaction with nocturnal species (noting operations will be 24 hours). • No unauthorised off-road driving. • Roadkill will be removed from trafficable areas to reduce the risk of an increase in predators. • Site induction programs will provide information on significant fauna including their appearance and habitats. Training would also discuss standard operating procedures in the event of fauna interactions • Preparation and regular update of a MCP consistent with DEMIRS Guidelines for MCPs • Rehabilitation will be undertaken progressively to minimise disturbed areas and therefore reduce fragmentation and barriers to fauna movement.	• Disturbance of Pilbara Olive Python critical habitat (Rocky Outcrop and Major River (Yule River) habitat) has been avoided through exclusion from the Development Envelope. • Disturbance of Pilbara Olive Python critical habitat (Major River habitat) has been minimised to an upper clearing limit of 10 ha. • Fragmentation of an important population is not predicted. Pilbara Olive Python habitat is widespread across the region. • Fragmentation of an important population is not predicted. Pilbara Olive Python habitat is widespread across the region. • The mining and processing infrastructure location does not coincide with the Northern Quoll population. • The low impact clearing of the Turner River for dewatering discharge is not predicted to impact the overall habitat quality or result in a population decline. Disruptions to the breeding cycle are not predicted with the majority of the habitats within the Development Envelope not considered critical for the species.

Species	Potential Impacts	Critical Habitat	Extent	Mitigation Measures	Assessment
Night Parrot (EN)	• Habitat loss • Accidental vehicle strike. • Loss or injury of individuals during clearing and general operations. • Project activities may increase the risk of accidental fire ignition. • Collision with barbed wire fences. • Increase in predation by foxes and cats.	Habitats present in the Development Envelope lack the large spinifex clumps required for breeding habitat, due to regular fires by the pastoralist. Clumps may be present in very small patches at a scale far finer than habitat mapping, in areas naturally protected from fire.	There is no critical or foraging habitat within the Development Envelope	• Implementation of an internal permitting system to ensure clearing only in approved ground disturbance areas and within approved upper clearing limits. • Limiting clearing to the minimum required. • Using previously disturbed areas to the extent reasonably practicable. • Annual review of clearing areas. • Minimising fencing to amount required. • Barbed wire fencing will be avoided in most instances. • If barbed wire fencing is required (due to legislative, safety or pastoral requirements), the top strands will be plain wire, and 10 cm disc bat reflectors to be used. • Regular inspections of fenced areas. • Reporting of all fauna related incidents. • Preparation and regular update of a MCP consistent with DEMIRS Guidelines for MCPs • Rehabilitation will be undertaken progressively to minimise disturbed areas and therefore reduce fragmentation and barriers to fauna movement.	Night Parrots are unlikely to be present in the Development Envelope due to large clumps of spinifex suitable for nesting present in only small, isolated patches across the Development Envelope. Pre-clearance surveys designed for the Greater Bilby will be conducted across the Spinifex Sandplain and Sandplain Drainage habitats and are likely to flush roosting Night Parrot if located within the indicative disturbance footprint.
Grey Falcon (VU)	• Habitat loss, including nesting habitats. • Accidental vehicle strike • Project activities may increase the risk of accidental fire ignition. • Increased predation by cats. • Collision with barbed wire fences.	Critical habitat is shown in Figure 10-2 and includes: • Major River.	Clearing of up to 10 ha of Major River habitat.	• The Development Envelope and indicative disturbance footprint have been modified during the design phase to avoid direct impacts to critical Grey Falcon habitat. This includes the avoidance of the Major River (Yule) habitat type which has been removed from the Development Envelope. • The Development Envelope and indicative disturbance footprint have been designed to minimise where practicable direct impacts to critical Grey Falcon habitat where practicable. This includes the minimisation of impact to Major River (Turner River) habitats to as low as reasonably practicable. • Clearing of Major River critical habitat will be restricted to an authorised extent of no more than 10 ha. • Implementation of an internal permitting system to ensure clearing only in approved ground disturbance areas and within approved upper clearing limits. • Known location of significant fauna habitat types will be included in the Proponents GIS system to ensure impacts to known locations of significant habitat types are minimised and adhere to authorised extents. • Using previously disturbed areas to the extent reasonably practicable. • Annual review of clearing areas. • Progressive clearing to allow fauna to migrate away from clearing activities or machinery movements. • Clearing will commence, where reasonably practicable, from a disturbed vegetation edge to an undisturbed area (to encourage mobile fauna to relocate to adjacent areas naturally). • Implement speed limits for mine vehicles on unsealed roads and tracks within the Development Envelope based on a risk assessment that considers environmental values (in addition to safety/other required legislation). • Driving mine vehicles at night will be limited to the extent reasonably practicable, which will minimise interaction with nocturnal species (noting operations will be 24 hours). • No unauthorised off-road driving. • Roadkill will be removed from trafficable areas to reduce the risk of an increase in predators. • Site induction programs will provide information on significant fauna including their appearance and habitats. Training would also discuss standard operating procedures in the event of fauna interactions • Preparation and regular update of a MCP consistent with DEMIRS Guidelines for MCPs. • Rehabilitation will be undertaken progressively to minimise disturbed areas and therefore reduce fragmentation and barriers to fauna movement.	The proposed clearing of the Major River habitat of the Turner River for mine surplus water discharge will avoid the removal of tall trees suitable for nesting, where reasonably practicable, and is not predicted to impact the overall habitat quality or result in a population decline

10.5 Environmental Outcomes

Environmental outcomes, in the context of this Proposal, refer to the predicted state of the environment after the Proposal is implemented. De Grey outcomes for Terrestrial Fauna seek to:

- Be specific and measurable, clearly describing quantifiable environmental conditions.
- Have a defined spatial and temporal extent.
- Aim to achieve the Environmental Protection Authority's (EPA) objectives for Terrestrial Fauna.

In consideration of the proposed avoidance and management measures and likely residual impacts associated with the Proposal, the predicted environmental outcomes and objectives that apply to Terrestrial Fauna are set out below.

- Avoid, or otherwise minimise direct and indirect impact form the Proposal upon Greater Bilby and Northern Quoll critical habitat.
- Clearing will be limited to no more than 5,830 ha within a Development Envelope of 22,194 ha.
- Clearing will be limited to no more than 5,100 ha of Spinifex Sandplain habitat.
- Clearing will be limited to no more than 800 ha of Sandplain Drainage habitat.
- Clearing will be limited to no more than 10 ha of Major River habitat.
- Avoid, where reasonably practicable, large hollow forming trees suitable for Northern Quoll within the Major River habitat.
- Implement preclearance surveys for the Greater Bilby and Northern Quoll.

De Grey will implement the EMP as per Appendix 1 to achieve these outcomes.

10.6 Conclusion

The significant residual impact, after implementation of the mitigation hierarchy is:

- Clearing of up to 5,100 ha of Spinifex Sandplain habitat within the Development Envelope that is considered critical habitat for the Greater Bilby.
- Clearing up to 800 ha of Sandplain Drainage habitat within the Development Envelope that is considered critical habitat for the Greater Bilby.
- Clearing up to 10 ha of Major River habitat within the Development Envelope that is considered critical habitat for the Northern Quoll, Pilbara Olive Python and Grey Falcon.

Environmental offsets are proposed for this clearing and are discussed in Section 15. Subject to conditions recommended above and implementation of offsets De Grey considers that the Proposal can be managed to meet the EPA's objective to protect Terrestrial Fauna so that biological diversity and ecological integrity are maintained.

11. ENVIRONMENTAL FACTOR - SUBTERRANEAN FAUNA

11.1 EPA Objective

The EPA objective for subterranean fauna is "*to protect subterranean fauna so that biological diversity and ecological integrity are maintained"*.

11.2 Policy and Guidance

The following guidance is applicable to this factor:

- *Technical Guidance – Subterranean Fauna Surveys for Environmental Impact Assessment* (EPA, 2021d)
- *Environmental Factor Guideline – Subterranean Fauna* (EPA, 2016b)

11.3 Receiving Environment

11.3.1 Subterranean Fauna Habitat

Due to the subterranean nature of the habitat, 3D habitat modelling was undertaken in Leapfrog Geo™ v 2023.2.3 (a leading 3D geological modelling software suite) of prospective above and below water table subterranean habitats to inform the impact assessment. The determination of prospective habitats was predominantly based on lithological information derived from downhole drill logging data and bore logs, diamond drill cores, hydrogeological information, geophysical survey information, and structural information. The assessment was targeted at detecting the most likely geological and hydrogeological strata where suitable cavities, fractures and porous zones occur, providing habitat and habitat connectivity for subterranean fauna. Further details of the habitat modelling methodology are available in Appendix 24. Unless otherwise referenced, the text in this section of the document is drawn from this report.

The detailed study and evaluation of stygofauna and troglofauna habitat at the Proposal compared various geological profiles with the presence and absence of stygofauna. Through this analysis five distinctive geological profiles were identified, these have been termed Type S and T for stygofauna and troglofauna respectively. The habitats identified were:

- **Type S1 (below water table) and T1 (above water table) Upper Aeolian, Colluvium and Alluvium** - A laterally extensive facies consisting of unconsolidated clay, mud, silt and lesser sand. This domain of the groundwater aquifer is considered to have low to high permeability (clay/mud content dependent) and is largely saturated (Plate 11-1).
- **Type S2 (below water table) and T2 (above water table) Lower Colluvium and Alluvium** – A similar system to the upper alluvium, but which notably is defined as the palaeochannel facies and contains unconsolidated sands and gravels and lesser silts. This is the main host to the groundwater aquifer system and has high permeability and storage values (Plate 11-1).
- **Type S3 (below water table) and T3 (above water table) Saprolite and Saprock** – A compact clay dominant domain with lesser silt, sand and clasts of highly weathered rock. This domain contains minor volumes voids or fractures that occur in association with shear zones and faults but also part of the natural development of the profile during a deep tropical weathering event (Plate 11-1).

- **Type S4 (below water table) and T4 (above water table) Joint Weathered Bedrock Basement** – A weathered fractured bedrock (incipiently weathered rock) domain with minor clays/oxides on the joint surfaces. The joints increase in spacing as a result of the incipient weathering (Plate 11-1).
- **Type S5 (below water table) and T5 (above water table) Fresh Bedrock Basement** – Fresh bedrock with no signs of incipient weathering of the rock mass. Generally low joint/fracture frequency spacing. Local areas of increased fracturing present where faults are present (Plate 11-1).

Of these geological profiles:

- Type S1/T1 (upper aeolian, colluvium and alluvium) and S2/T2 (lower colluvium and alluvium) were found to characteristically form fractures, interstices, cavities and vugs below and above the water table, which allow for fauna dispersal and nutrient infiltration and thus provide core habitat for stygofauna and troglofauna.
- Type S3/T3 (saprolite and saprock) and S4/T4 (joint weather bedrock) were found to form minor voids and fractures below and above the water table, as compared to Types S1/T1 and S2/T2, which may allow for some level of fauna dispersal and nutrient infiltration thus providing additional, but not core habitat for stygofauna and troglofauna.
- Type S5/T5 was found to lack fractures, interstices, cavities and vugs below the water table and thus were of limited potential habitat.

Based on the understanding of the geological profiles identified as preferred habitat for stygofauna and troglofauna, the De Grey geological database was analysed to develop both a map of surface geology showing the presence of productive core habitats in geological profiles Type S1/T1 and Type S2/T2 (Figure 11-1), additional habitats in geological profiles Type S3/T3 and S4/T4 (Figure 11-2) and unproductive habitats in geological profile Type S5/T5 (Figure 11-3). Additionally, this habitat has been modelled in 3D, with a cross and long section though the Development Envelope presented in Figure 11-4 and Figure 11-5.

Based on the extensive drilling data and 3D model, an estimate of habitat volume for each productive geological profile is provided in Table 11-1. Also included are potential impacts to this habitat based upon the predicted end of mining 1 m drawdown associated with the Proposal.

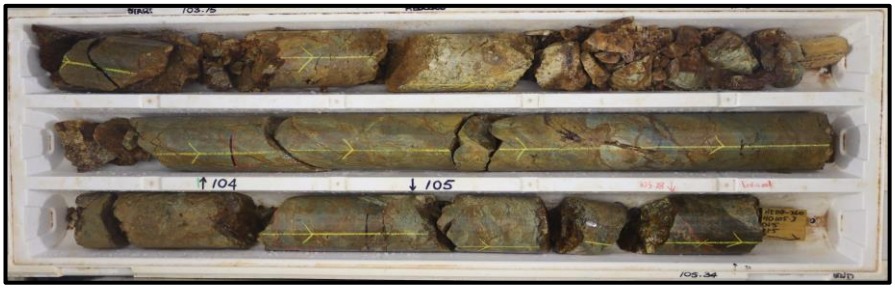
Table 11-1: Summary of Estimated Volume of Stygofauna and Troglofauna Habitat

Geological Domain	Estimated Volume of Habitat (m^3)	
	Stygofauna (S)	Troglofauna (T)
Type 1	15,269,725,414	20,774,000,000
Type 2	2,468,774,592	164,490
Type 3	8,369,896,552	149,671,500
Type 4	6,046,909,091	115,073,340

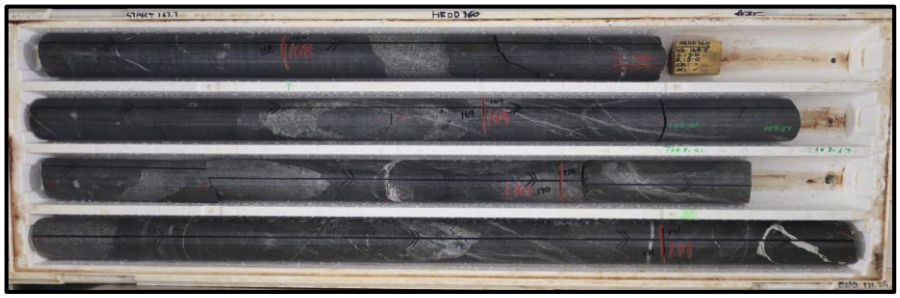
Type S1 (Below Water Table) and T1 (Above Water Table) – Upper Alluvium

Type S2 (Below Water Table) and T2 (Above Water Table) – Lower Alluvium

Type S3 (Below Water Table) and T3 (Above Water Table) – Saprolite - Saprock

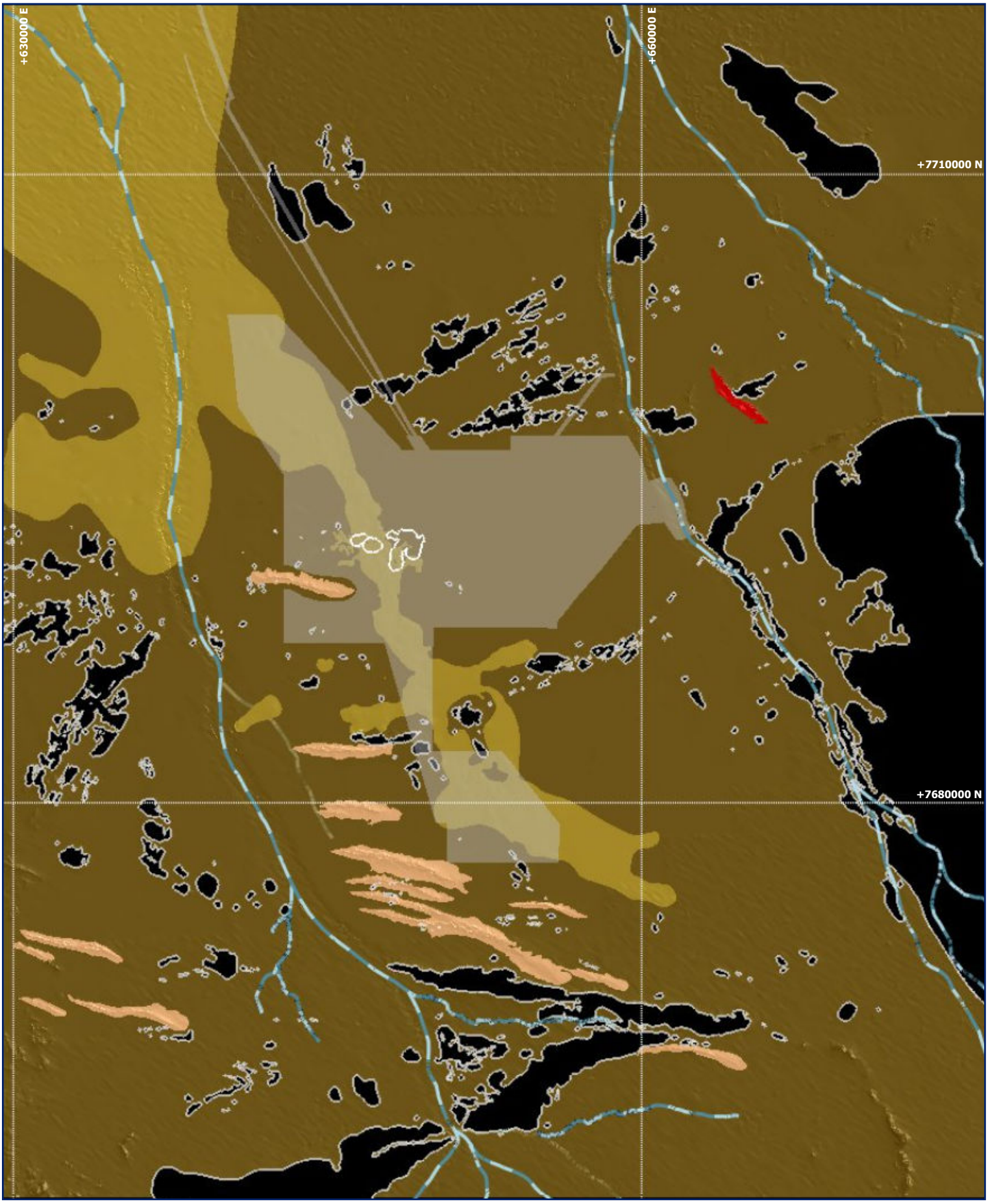


Type S4 (Below Water Table) and T4 (Above Water Table) – Fractured Bedrock



Type S5 (Below Water Table) and T5 (Above Water Table) – Bedrock

Plate 11-1: Borehole Examples of Type S1 – S5 and T1 – T5 Geological Profiles/Habitat Types



Legend

- Type S1 (Below Water Table)/Type T1 (Above Water Table)
- Type S2(Below Water Table)/Type T2 (Above Water Table)
- Type S3 (Below Water Table)/Type T3 (Above Water Table)
- Type S4 (Below Water Table)/Type T4 (Above Water Table)
- Type S5 (Below Water Table)/Type T5 (Above Water Table)
- PISOLITIC LIMONITE
- AEOLIAN DUNES

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Spatial Extent of Potential Core Stygofauna and Troglofauna Habitat (Type S1/T1 and S2/T2) Across the Study Area

Figure 11-1	ADV-AU-00673	November 2024

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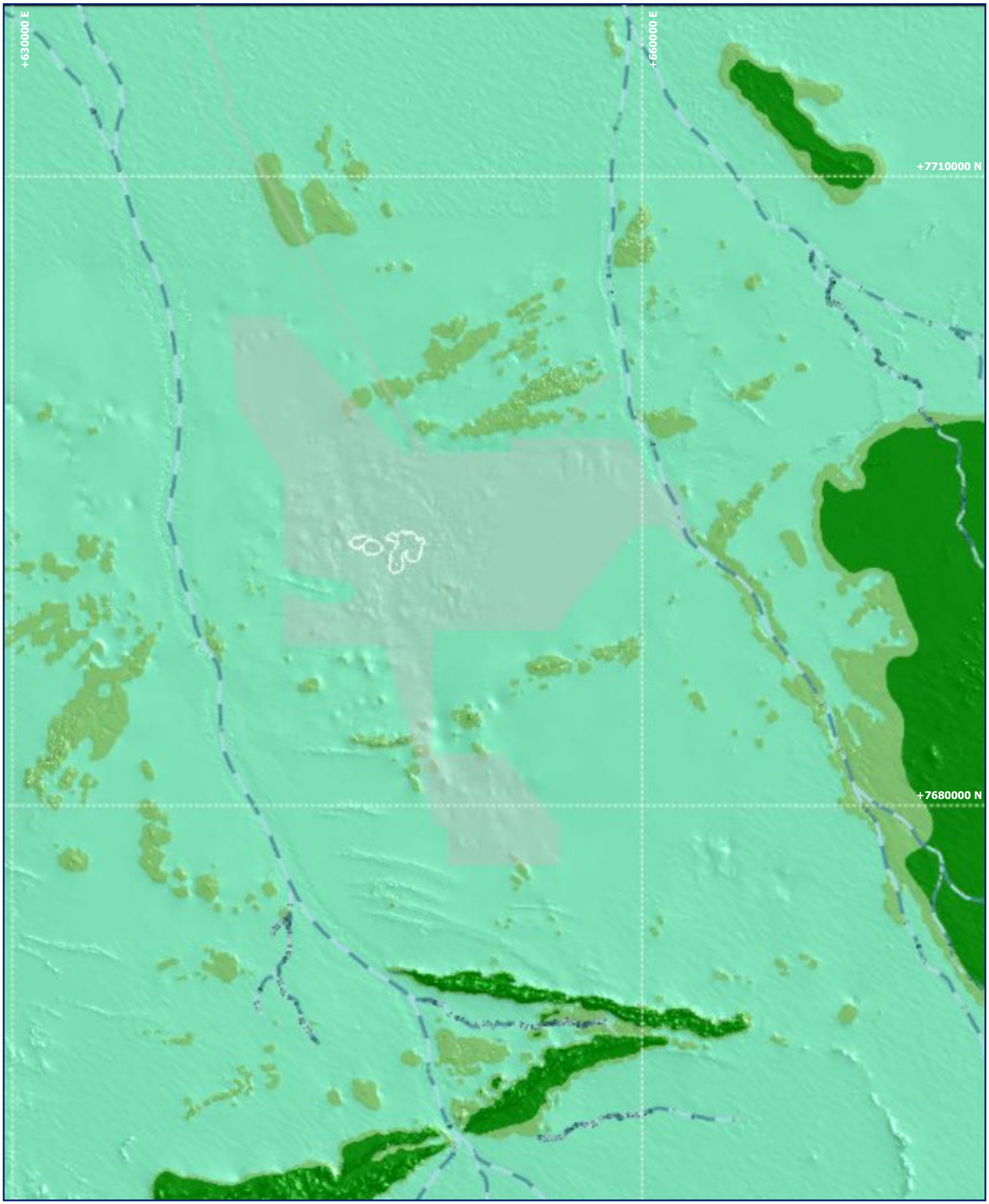

Legend

- Type S1 (Below Water Table)/Type T1 (Above Water Table)
- Type S2(Below Water Table)/Type T2 (Above Water Table)
- Type S3 (Below Water Table)/Type T3 (Above Water Table)
- Type S4 (Below Water Table)/Type T4 (Above Water Table)
- Type S5 (Below Water Table)/Type T5 (Above Water Table)
- PISOLITIC LIMONITE
- AEOLIAN DUNES

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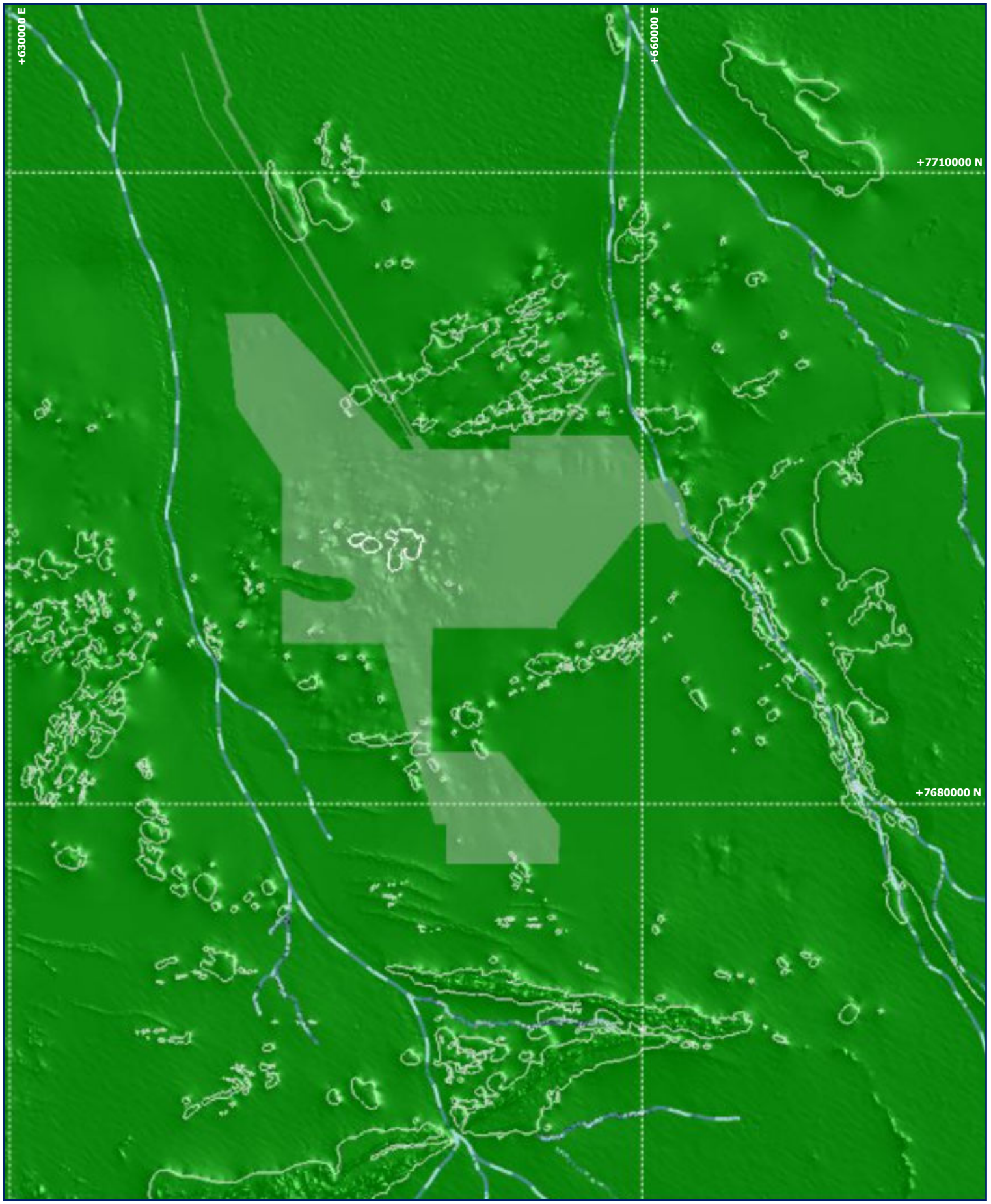
Spatial Extent of Additional Stygofauna and Troglofauna Habitat (Type S3/T3 and S4/T4) Across the Hemi Region	
Figure 11-2 | ADV-AU-00673 | November 2024	



Legend

- Type S1 (Below Water Table)/Type T1 (Above Water Table)
- Type S2(Below Water Table)/Type T2 (Above Water Table)
- Type S3 (Below Water Table)/Type T3 (Above Water Table)
- Type S4 (Below Water Table)/Type T4 (Above Water Table)
- Type S5 (Below Water Table)/Type T5 (Above Water Table)
- PISOLITIC LIMONITE
- AEOLIAN DUNES

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Spatial Extent of Limited Stygofauna and Troglofauna Habitat (Type S4/T4) Across the Hemi Region

Figure 11-3	ADV-AU-00673	November 2024

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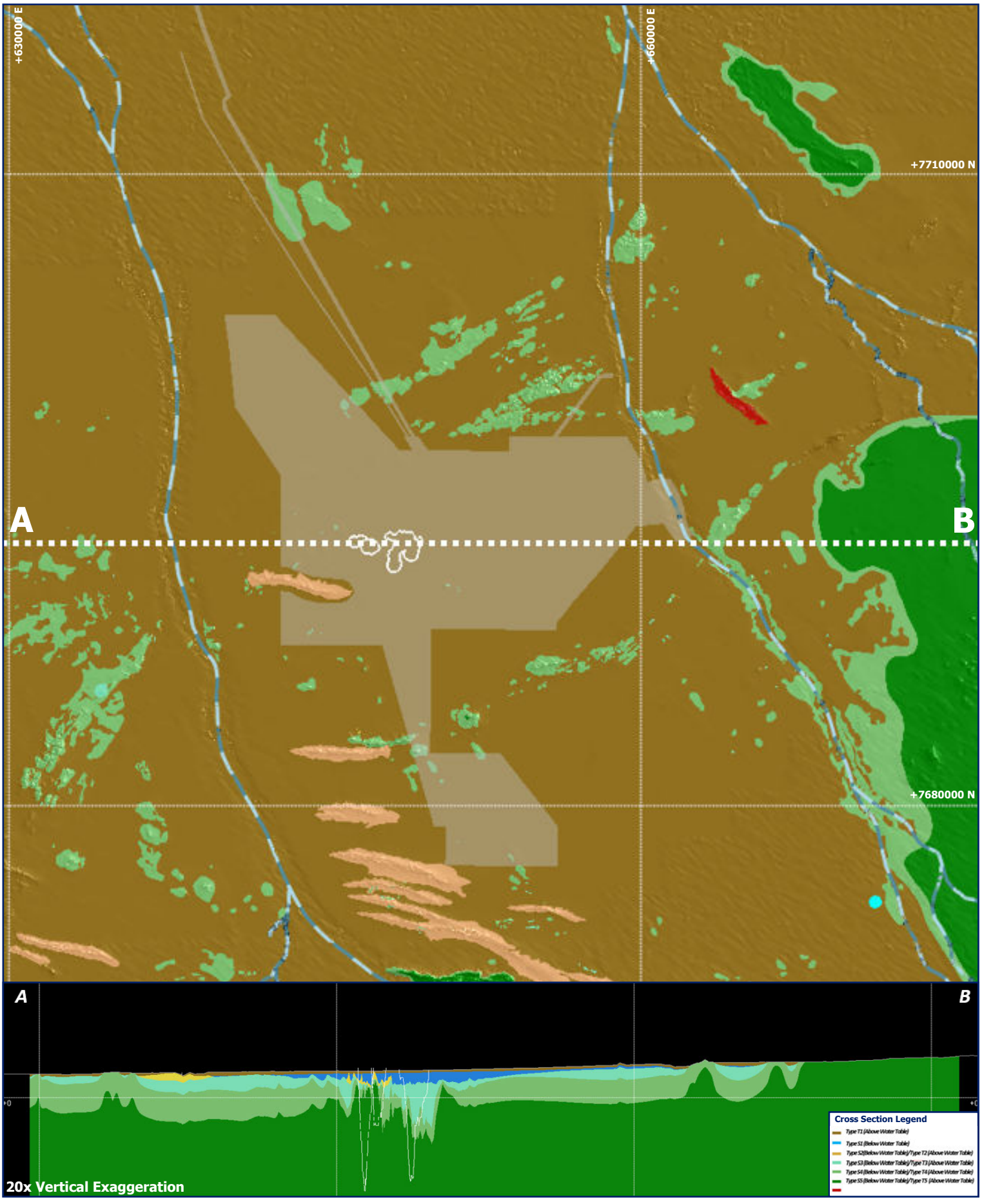

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- Type S1 (Below Water Table)/Type T1 (Above Water Table)
- Type S2(Below Water Table)/Type T2 (Above Water Table)
- Type S3 (Below Water Table)/Type T3 (Above Water Table)
- Type S4 (Below Water Table)/Type T4 (Above Water Table)
- Type S5 (Below Water Table)/Type T5 (Above Water Table)
- PISOLITIC LIMONITE
- AEOLIAN DUNES

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3D Cross Section through the Development Envelope of Core (Type S1/T1 and S2/T2), Additional (Type S3/T3 and S4/T4) and Limited (Type S5/T5) Stygofauna and Troglofauna Habitat within the Study Area

Figure 11-4	ADV-AU-00673	November 2024

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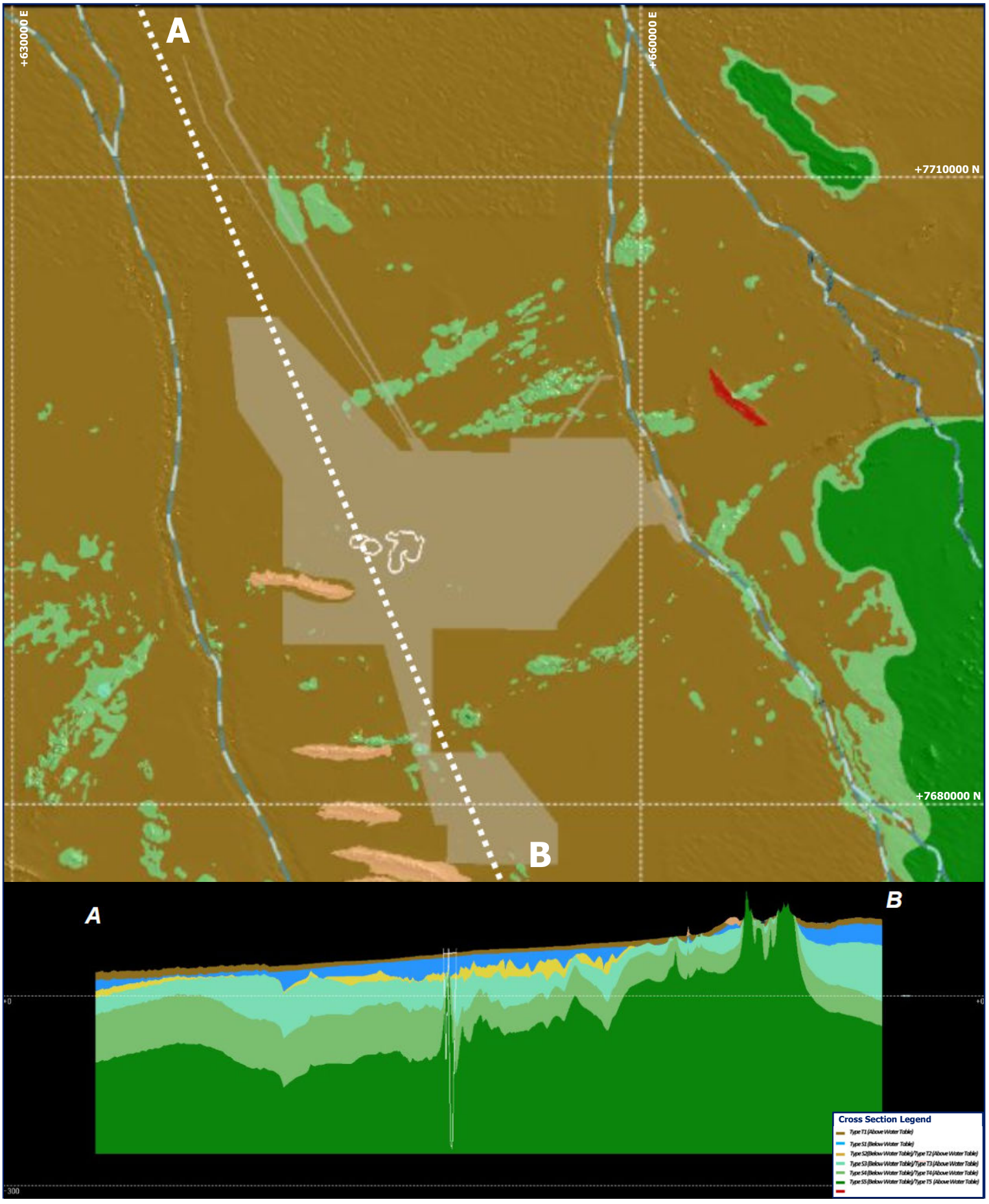

Legend

- Type S1 (Below Water Table)/Type T1 (Above Water Table)
- Type S2(Below Water Table)/Type T2 (Above Water Table)
- Type S3 (Below Water Table)/Type T3 (Above Water Table)
- Type S4 (Below Water Table)/Type T4 (Above Water Table)
- Type S5 (Below Water Table)/Type T5 (Above Water Table)
- PISOLITIC LIMONITE
- AEOLIAN DUNES

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3D Long Section through the Development Envelope of Core (Type S1/T1 and S2/T2), Additional (Type S3/T3 and S4/T4) and Limited (Type S5/T5) Stygofauna and Troglofauna Habitat within the Study Area

Figure 11-5	ADV-AU-00673	November 2024

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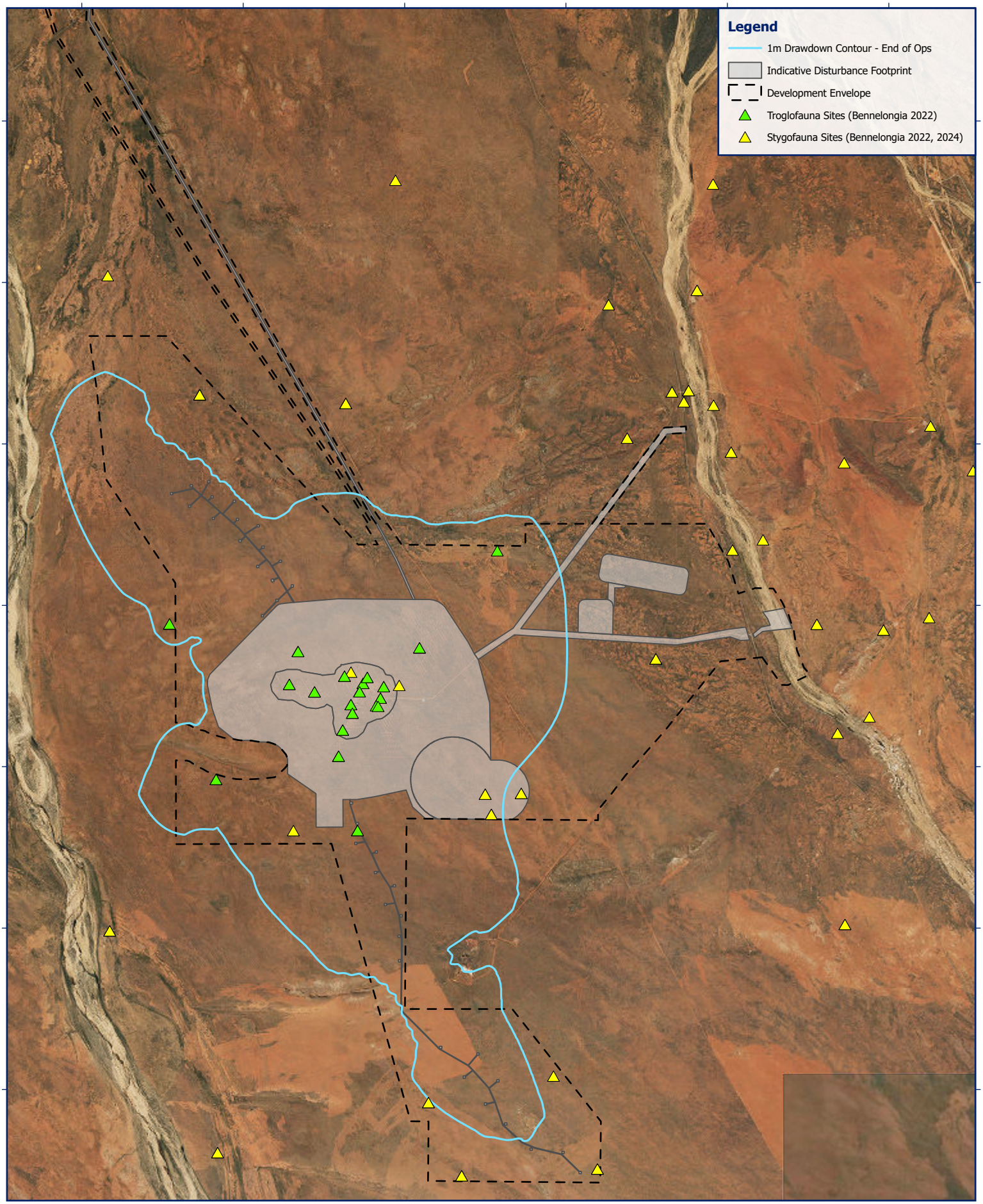
11.3.2 Subterranean Fauna Assemblage

Subterranean fauna surveys for the Proposal were undertaken by Bennelongia and consisted of a desktop assessment followed by field and targeted surveys. The subterranean fauna reports (Bennelongia, 2023a) are attached as Appendix 22. Unless otherwise referenced, the text in this section of the document is drawn from these reports, and detailed monitoring results can be found in the reports.

The desktop assessment identified that the shallow alluvial aquifer (upper and lower) at the Proposal is considered high prospective habitat for stygofauna and subsequently a level 2 survey was completed. The shallow water table was considered less prospective for troglofauna although some potential habitat was identified in the vicinity of the proposed pits, as such a level 1 survey was undertaken.

Sampling was conducted in accordance with EPA Technical Guidance (EPA, 2021d). Surveys consisted of three rounds of sampling for stygofauna (October 2021, December 2021, March 2022) and one round of sampling for troglofauna (October 2021). No troglofauna were recorded during the survey, therefore Bennelongia (2023a) considered the troglofauna community depauperate and recommended additional sampling was not required. In each round, 40 bores and drill holes were sampled for stygofauna, while 20 holes were sampled once for troglofauna. A targeted survey for stygofauna was also completed in early 2024, which sampled 33 sites (Bennelongia 2024).

Sampling for stygofauna focused on the stygofauna impact area, defined as the zone where dewatering drawdown is expected to be 1 m or more as well as suitable reference sites outside of this zone. Sampling for troglofauna focused on the mine impact area as well as suitable reference sites. A map of sampling locations and the impact areas is provided in Figure 11-6.



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Projection: GDA2020 MGA Zone 50
Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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Subterranean Fauna Sampling Locations

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11.3.2.1 Stygofauna

A total of 3,967 stygofauna specimens were collected representing at least 52 species (Table 11-2 and Figure 11-7 to Figure 11-12). Of the 52 species, 27 were collected from the impact area, with 14 being considered widespread species (i.e. occurring within the region or wider area) and eight occurring beyond the impact area (i.e. occurring beyond the 1 m drawdown contour). The remaining five species (Parastenocaris 'BHA392', Brevisomabathynella `BSY226', Paramelitidae `BAM210`, Microcerberidae `BIS464' and Microcerberidae `BIS544') have only been identified from within the impact area, however, are expected to occur outside based on habitat availability and connectivity.

11.3.2.2 Troglofauna

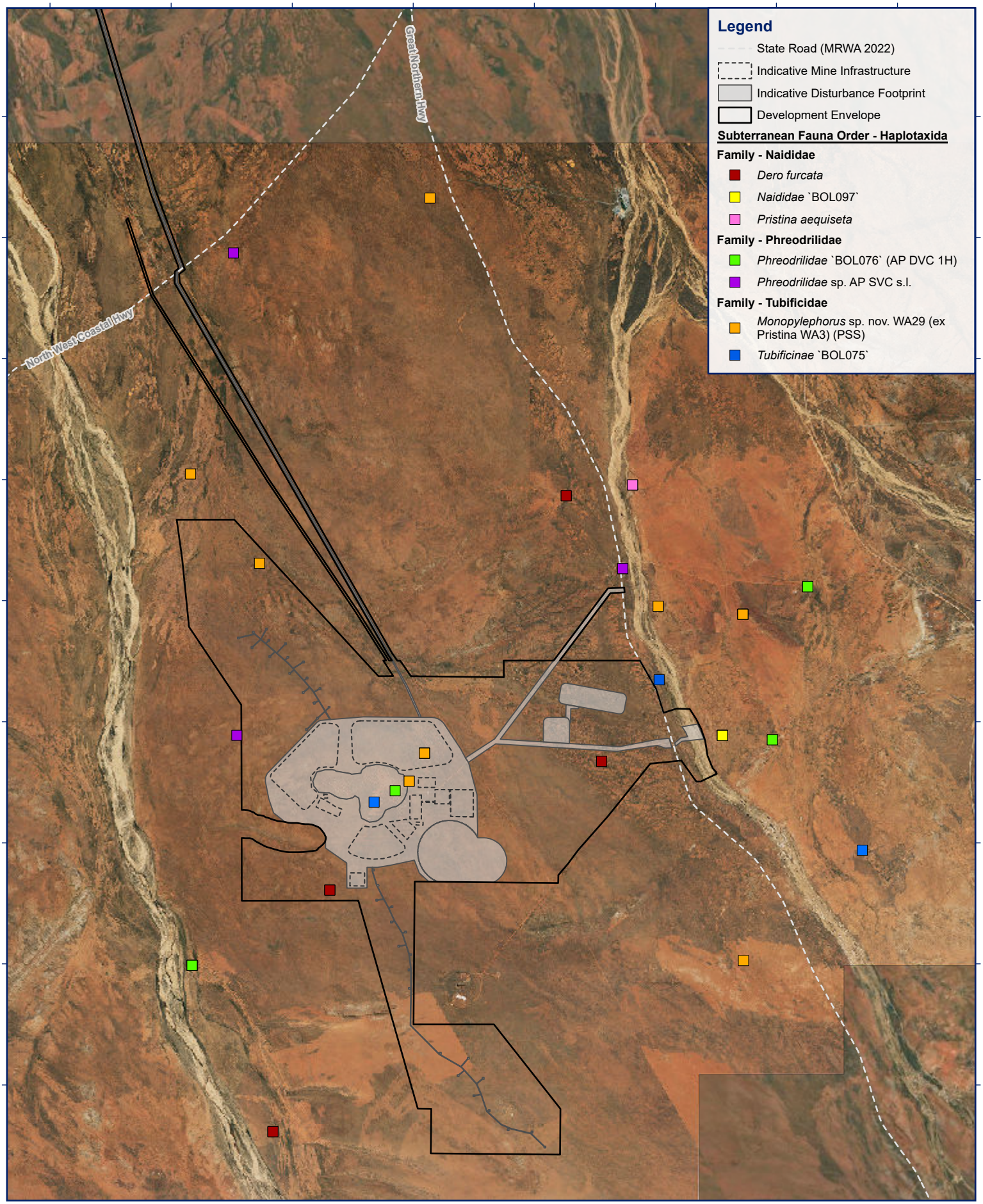
A total of two troglofauna specimens were collected representing one species, namely the dipluran *Parajapygidae* `BDP208` (Table 11-2 and Figure 11-13). These specimens were collected as bycatch from stygofauna sampling, with no troglofauna recorded from targeted sampling for troglofauna that was initially undertaken for the Proposal.

Table 11-2: Subterranean Fauna Found to Occur within the Proposal and Regional Area

Higher Classification	Lowest Identification	Total Number of Specimens	Inside Impact Area	Outside Impact Area	Distribution
Stygofauna					
Haplotaxida					
Naididae	*Dero (Aulophorus) furcatus*	180	X	X	Widespread
	Naididae `BOL097`	15		X	Known from single bore
	Pristina aequiseta	18		X	Widespread
Phreodrilidae	Phreodrilidae `BOL076` (AP DVC 1H)	194	X	X	Linear range of 30 km
	Phreodrilidae sp. AP SVC s.l.	4	X	X	Widespread
Tubificidae	Monopylephorus sp. nov. WA29 (PSS)	68	X	X	Widespread
	Tubificidae `BOL075`	58	X	X	Linear Range of 20 km
Enchytraeida					
Enchytraeidae	Enchytraeidae `2 bundle` s.l. (short sclero 4 per seg)	41		X	Known from single bore
	Enchytraeidae `3 bundle` s.l. (short sclero)	437	X	X	Linear range of 23 km
Podocopida					
Candonidae	*Areacandona akatallele*	62		X	Widespread
	Areacandona incogitata	49		X	Linear Range of 80 km
	Areacandona iuno	18		X	Widespread
	Areacandona yuleae	27	X	X	Widespread
	Areacandona ?quasilepte	3		X	Known from single bore
	Areacandona `BOS1625`*	17	X	X	Linear range 19 km
	Areacandona `BOS1627`	1		X	Known from single bore
	Areacandona `BOS1653`	33	X	X	Linear range 19 km
	Candonidae `BOS1657`	12		X	Known from single bore
Cyprididae	*Cypretta seurati*	296	X	X	Widespread

Higher Classification	Lowest Identification	Total Number of Specimens	Inside Impact Area	Outside Impact Area	Distribution
	Cyprinotus kimberleyensis s.l.	228		X	Widespread
	Riocypris fitzroyi	189	X	X	Widespread
	Sarscypridopsis aculeata	190		X	Linear range of 26 km
	Stenocypris malcolmsoni	92	X	X	Widespread
Darwinulidae	*Vestalenula marmonieri*	54	X	X	Widespread
Cyclopoida					
Cyclopidae	*Apocyclops dengizicus*	26		X	Linear range of 8 km
	Cyclopidae Unk Gen `BCY110`	3		X	Linear range of 28 km
	Diacyclops `BCY087`	316	X	X	Linear range of 40 km
	Diacyclops scanloni	8		X	Widespread
	Dussartcyclops 2222 `BCY093`	26	X	X	Linear range of 16 km
	Mesocyclops brooksi	11		X	Widespread
	Mesocyclops notius	50	X	X	Widespread
	Microcyclops varicans	194	X	X	Widespread
	Orbuscyclops westaustraliensis	9	X		Widespread
Harpacticoida					
Ameiridae	*Megastygonitocrella trispinosa*	636	X	X	Widespread
	Megastygonitocrella unispinosa	2	X		Widespread
Canthocamptidae	*Elaphoidella humphreysi*	39	X	X	Widespread
Parastenocarididae	*Parastenocaris* `BHA392`	2	X		Known from single bore
	Parastenocaris `BHA393`	2		X	Known from single bore

Higher Classification	Lowest Identification	Total Number of Specimens	Inside Impact Area	Outside Impact Area	Distribution
Syncarida					
Parabathynellidae	*Atopobathynella* `BSY225`	13	X	X	Linear range of 21 km
	Brevisomabathynella `BSY226`	1	X		Known from single bore
Amphipoda					
Eriopisidae	*Nedsia* `*hurlberti* group` sp. 1 spine	293		X	Linear range of 35 km
	Eriopisidae `BAM149` (sp. 1 group)	11		X	Linear range of 30 km
	Pilbarana `BAM219`	3		X	Linear range of 13 km
Paramelitidae	Paramelitidae `BAM210`*	3	X		Linear range of 7 km
	Paramelitidae Genus 2 `BAM209`	8		X	Linear range of 10 km
	Paramelitidae_gen_nov_1_AMP002	1		X	Widespread
	Paramelitidae `BAM238`	2		X	Known from single bore
	Paramelitidae Genus 2 sp. B22	5		X	Known from single bore
Microcerberidae	Microcerberidae `BIS464`	11	X		Linear range of 2.6 km
	Microcerberidae `BIS544`	14	X		Linear range of 1.3 km
	Microcerberidae `BIS545`	1		X	Known from single bore
	Microcerberidae `BIS579`	9		X	Known from single bore
Troglofauna					
Diplura					
Parajapygidae	Parajapygidae `BDP208`	2	X		Known from a single bore



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Projection: GDA2020 MGA Zone 50
Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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Location of Stygofauna Fauna Recorded from the Proposal Area Haplotaxida 168

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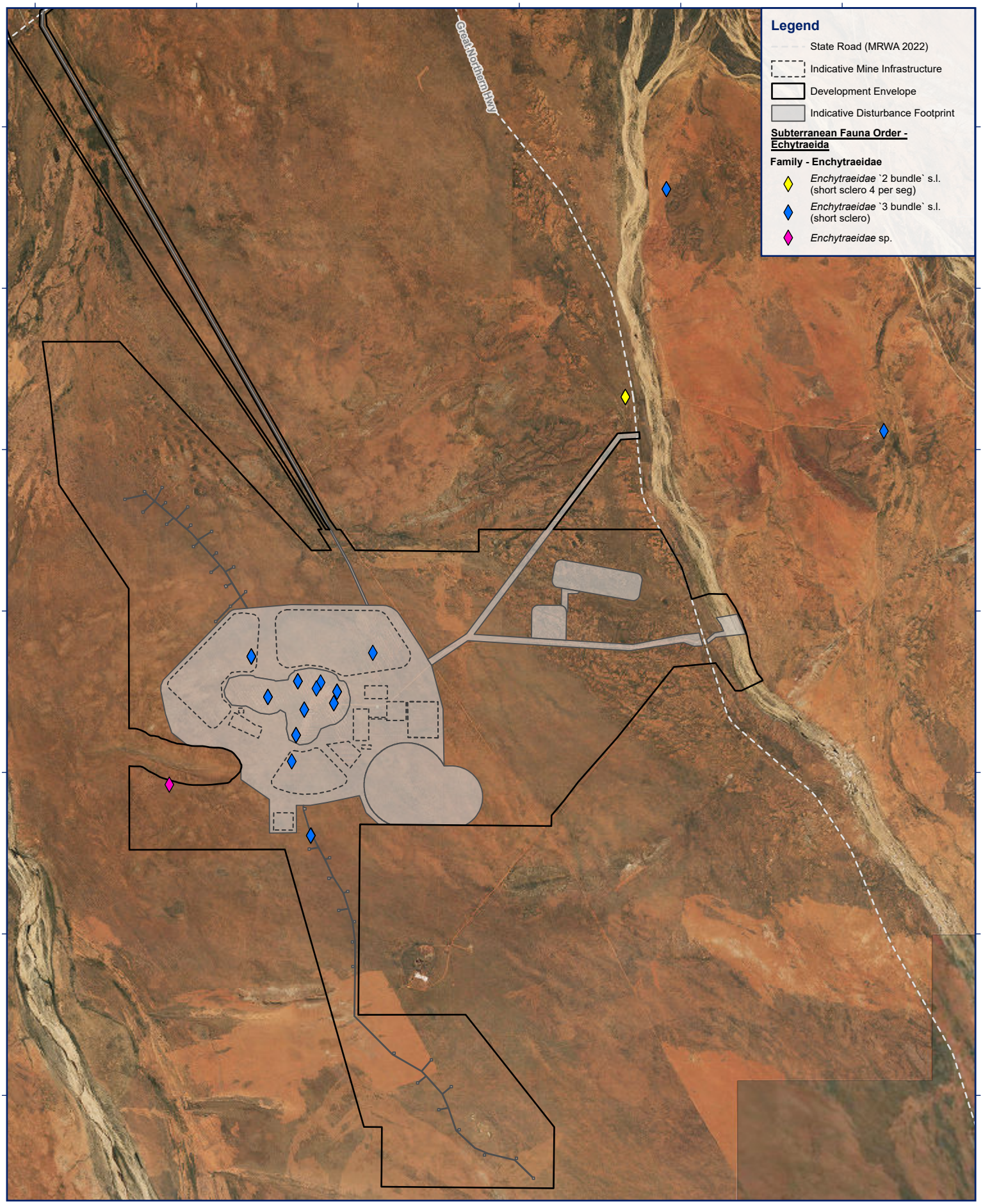

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Location of Stygofauna Fauna Recorded from the Proposal Area Enchytraeida

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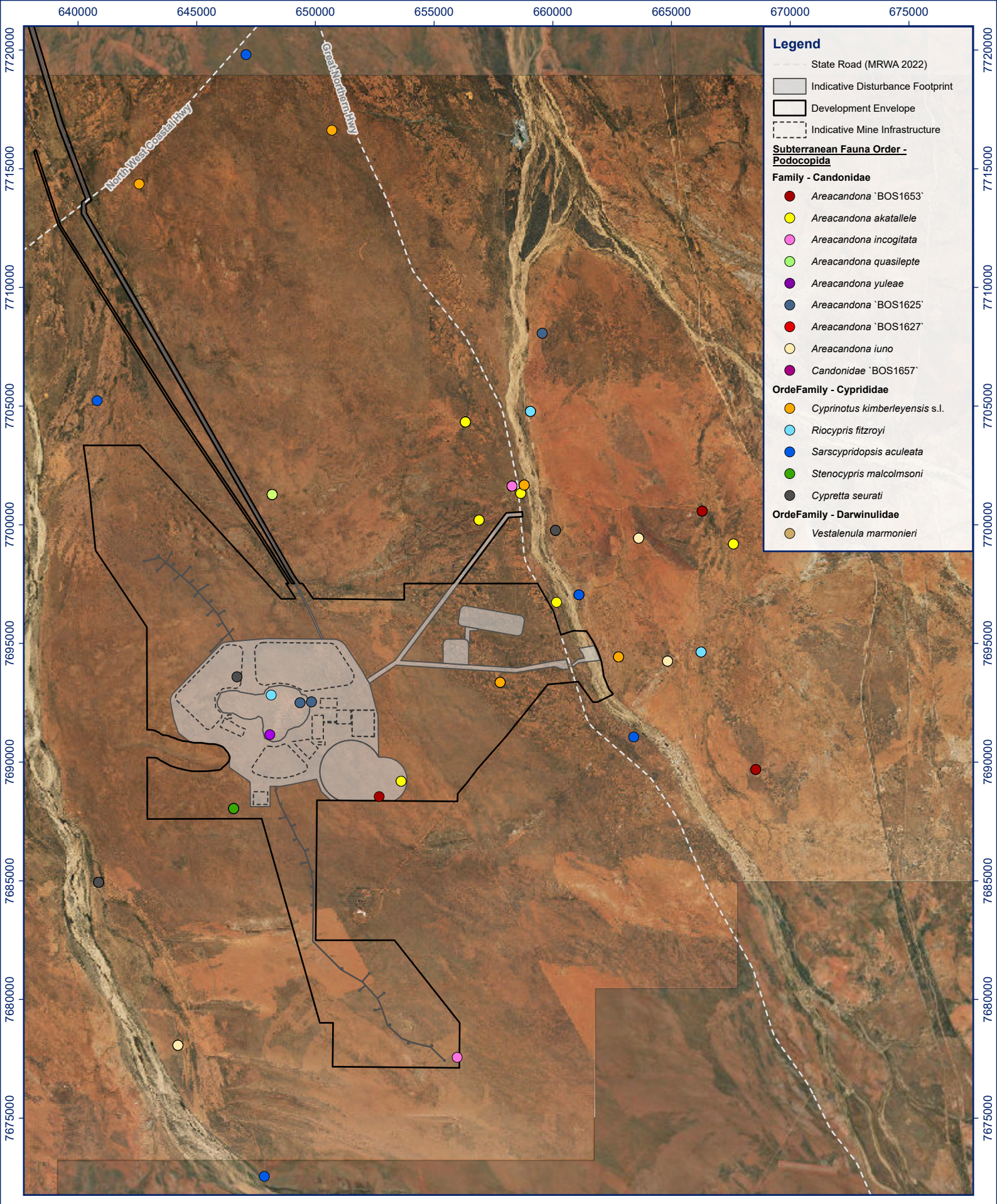
Figure 11-8	ADV-AU-00673	November 2024



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Location of Stygofauna Fauna Recorded from the Proposal Area Podocopida

Figure 11-9	ADV-AU-00673	November 2024

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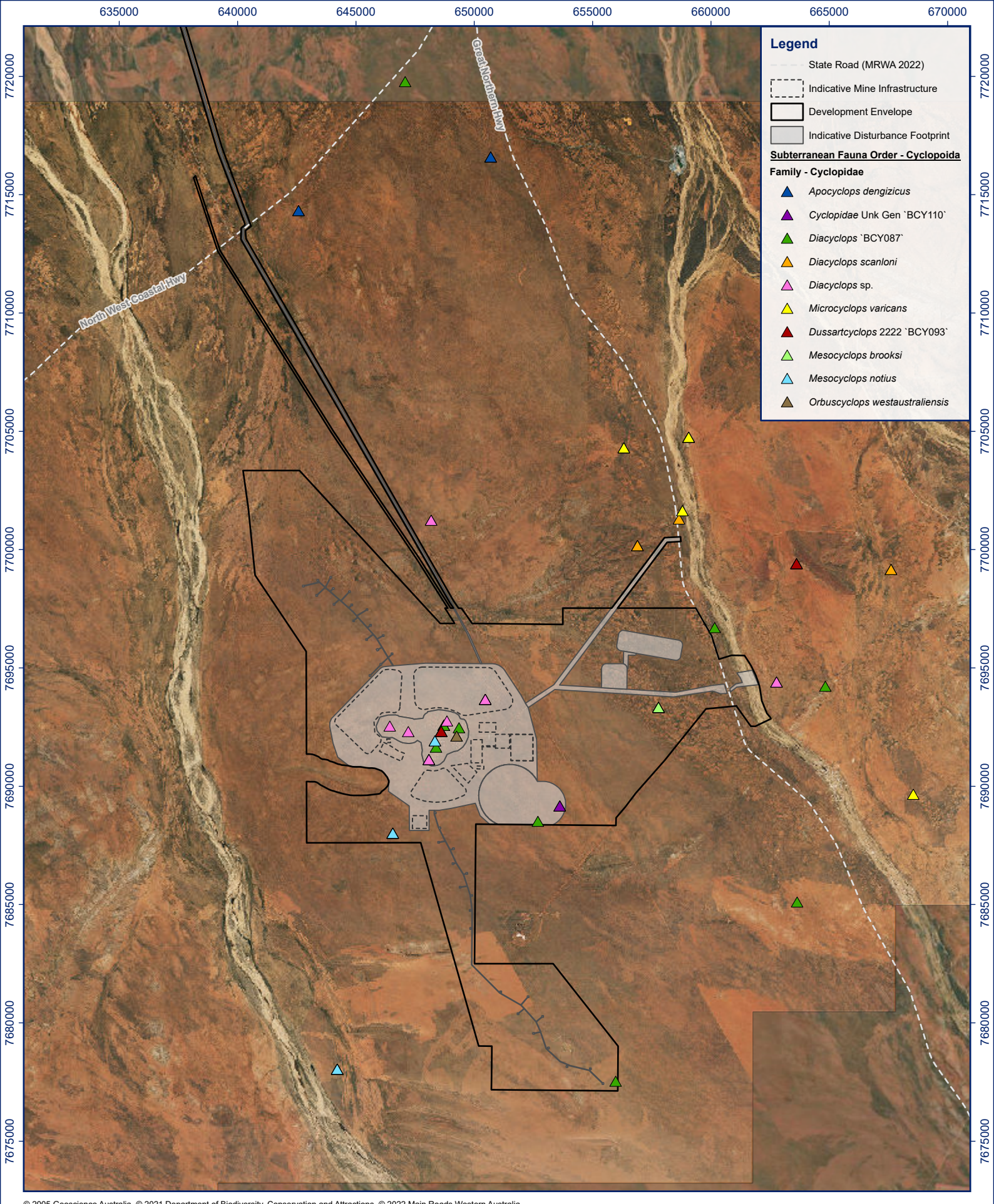

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Projection: GDA2020 MGA Zone 50
Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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Location of Stygofauna Fauna Recorded from the Proposal Area Cyclopoida

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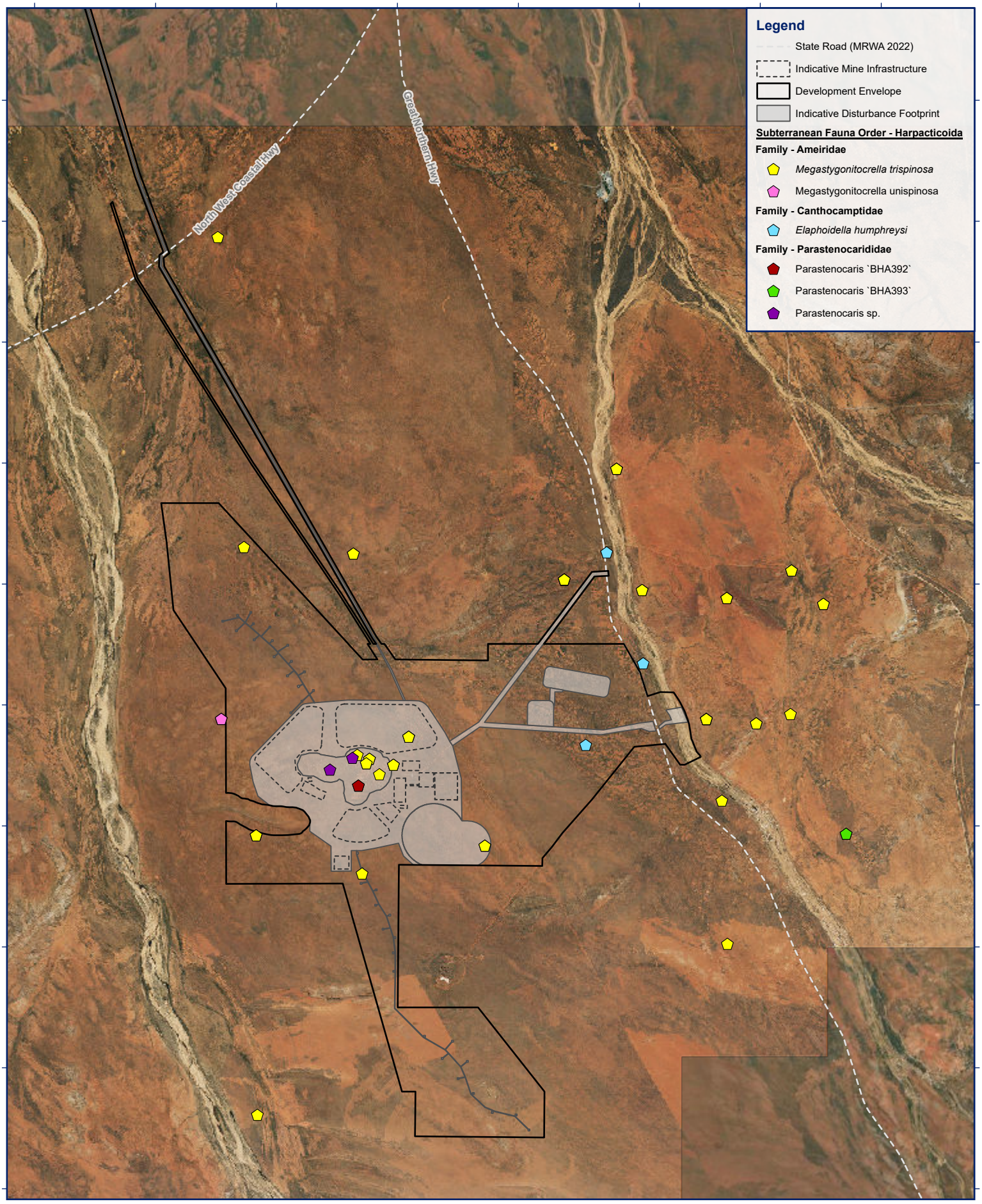
Figure 11-10	ADV-AU-00673	November 2024



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Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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Location of Stygofauna Fauna Recorded from the Proposal Area Harpacticoda

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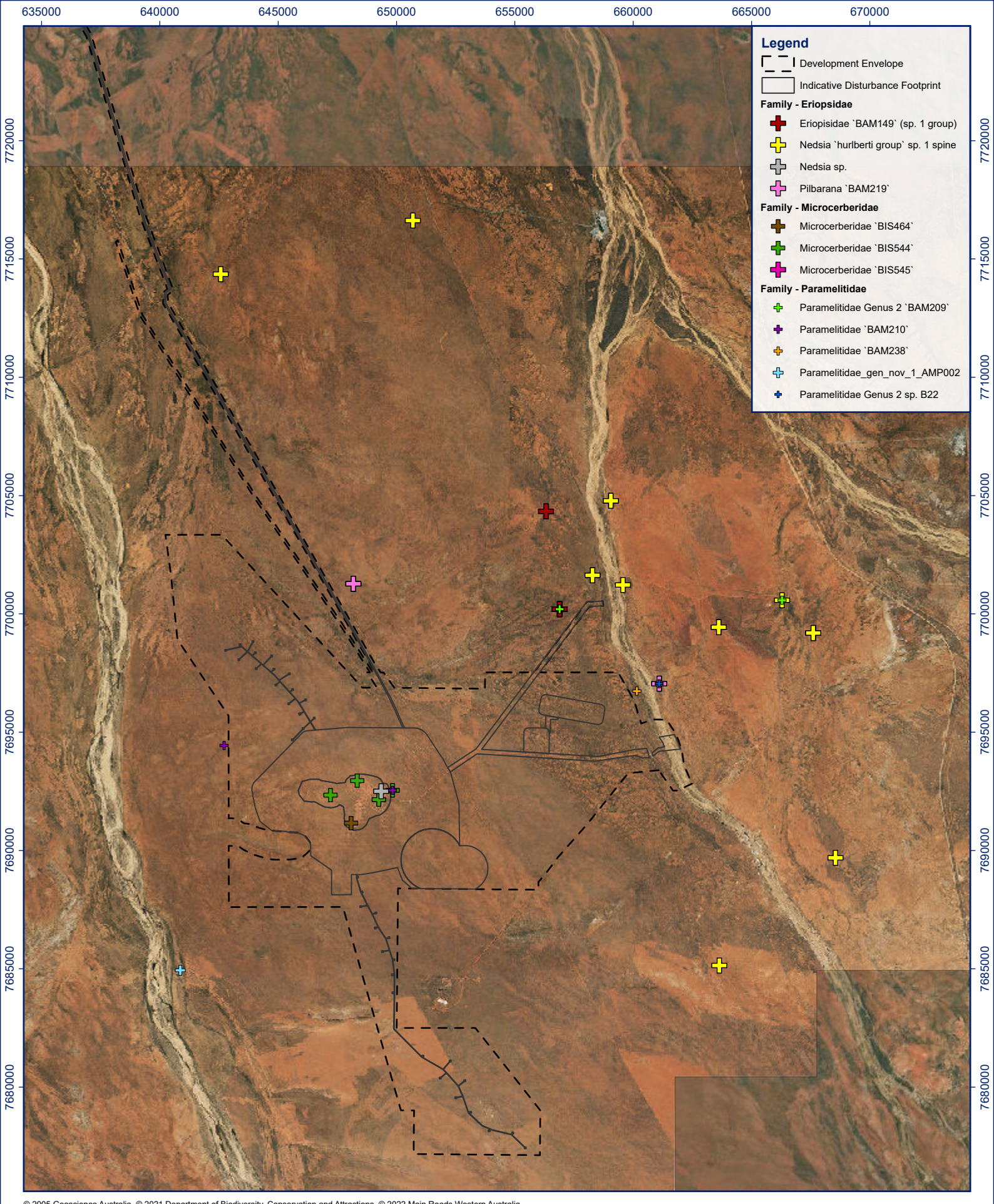
Figure 11-11	ADV-AU-00673	November 2024



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Projection: GDA2020 MGA Zone 50
Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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Location of Stygofauna Fauna Recorded from the Proposal Area Amphipoda

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Figure 11-12	ADV-AU-00673	November 2024

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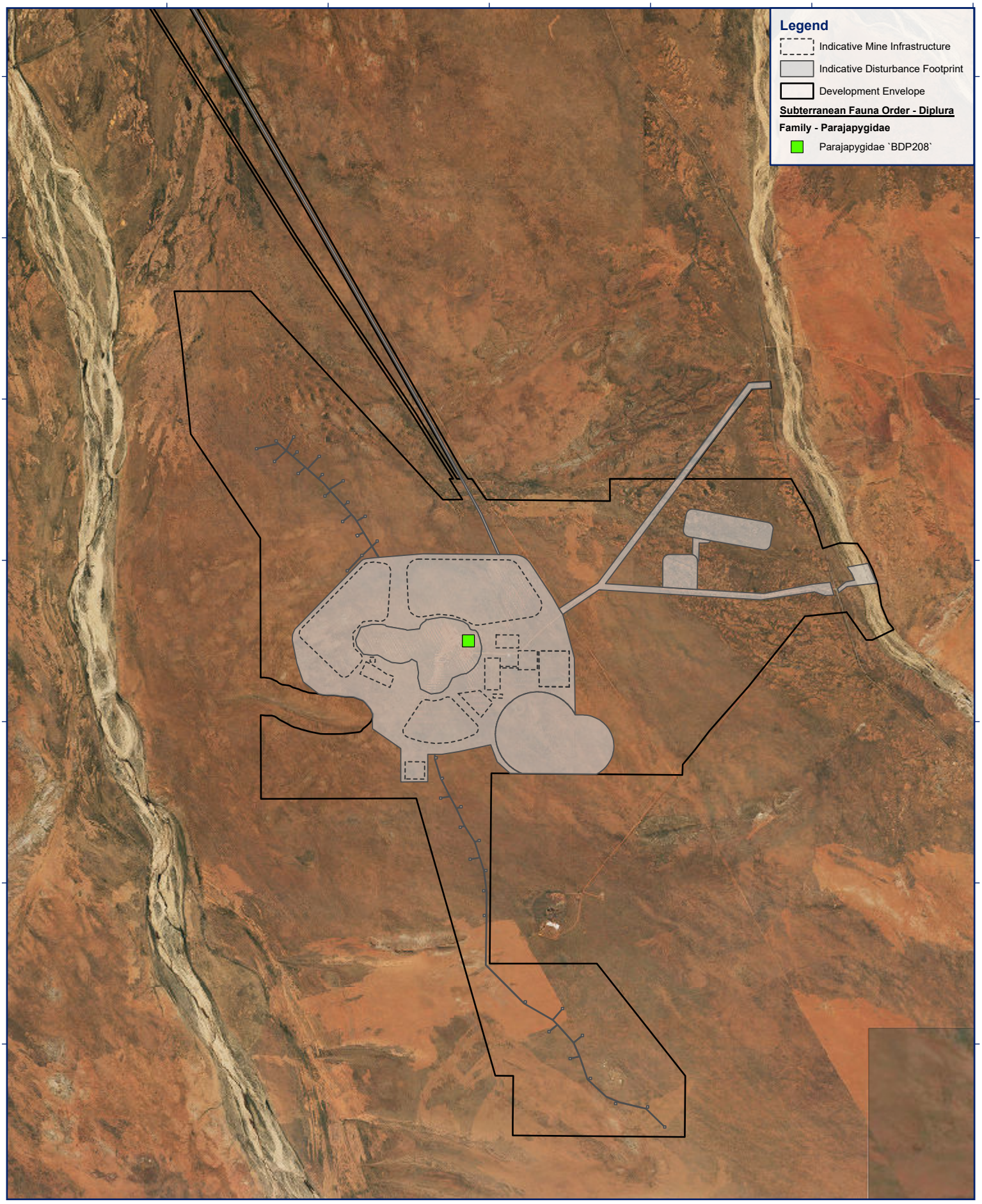

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Projection: GDA2020 MGA Zone 50
Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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Location of Troglofauna Fauna Recorded from the Proposal Area Diplura

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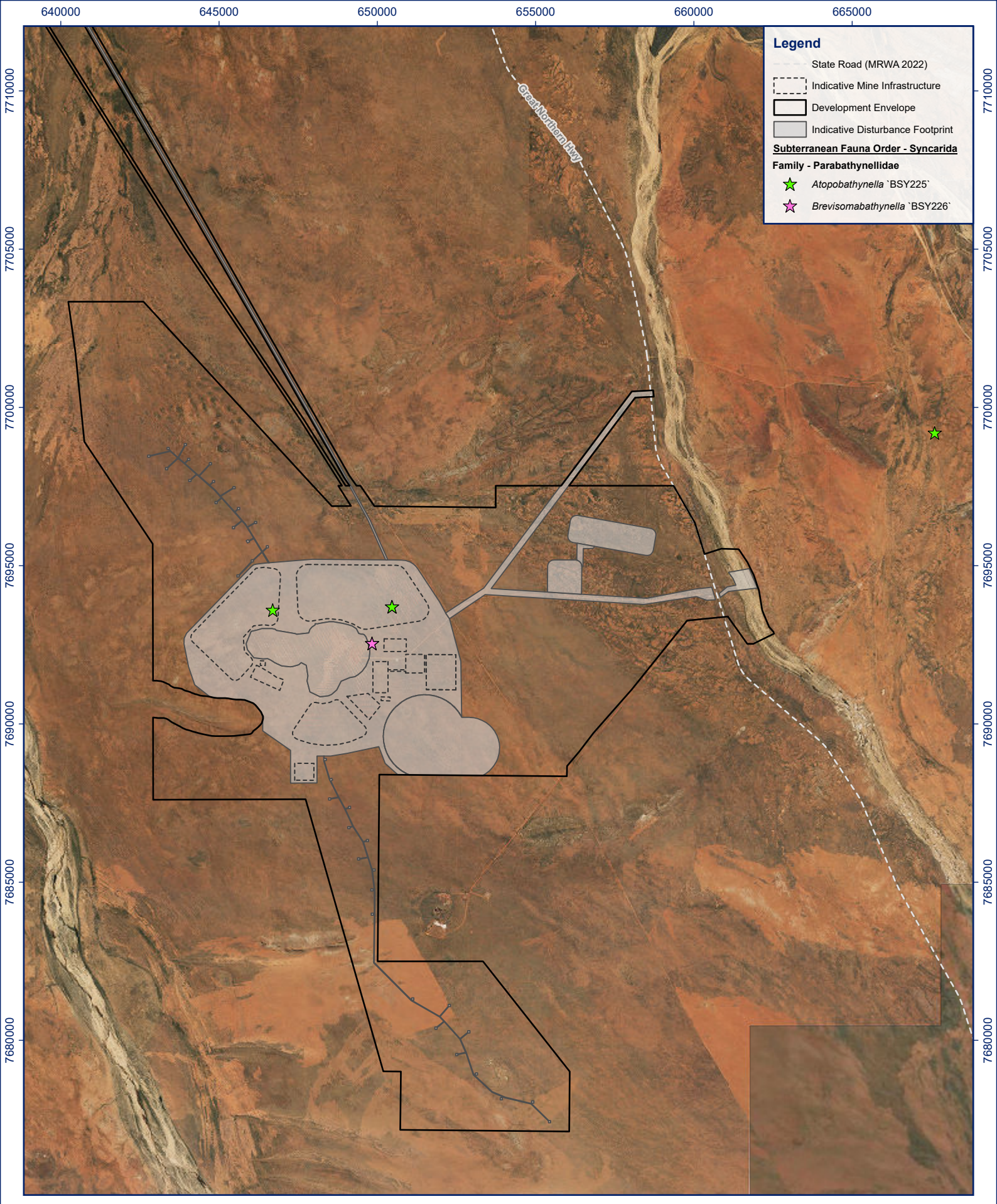

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Projection: GDA2020 MGA Zone 50
Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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Location of Stygofauna Fauna Recorded from the Proposal Area Syncarida

Figure 11-14	ADV-AU-00673	November 2024

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11.4 Potential Impacts and Mitigation Measures

11.4.1 Subterranean Fauna Habitat

The spatial context of this assessment includes both those areas where stygofauna habitat may be directly removed through the development of open pit mines and as a result of groundwater drawdown resulting from dewatering and borefield abstraction, whilst for troglofauna it includes habitat which is directly impacted by the proposed open pits (i.e. the area to be mined) and groundwater mounding within the reinjection borefield.

To determine the full extent of impacts resulting from development of an open pit mine, mine dewatering and borefield abstraction and mounding, a numerical groundwater model was developed (Geowater, 2023a). Emphasis was placed on the accuracy of this model to ensure that it could be used to make accurate predictions regarding potential impacts to stygofauna. To this end, the model has been subject to a peer review and range of sensitivity analysis to ensure that the model was conservative for the purpose of impact assessment.

Using the groundwater contours from the groundwater model and the volume of the open pits, the volume of stygofauna and troglofauna habitat loss was calculated and is presented in Table 11-3.

Table 11-3 shows that the predicted percentage habitat loss compared with the total mapped extent of those habitat types is small, and sufficient interconnected habitat is likely to be available in the surrounding landscape for stygofauna to persist during and after mining.

Table 11-3: Spatial Extent and Volume of Stygofauna Habitat Within Impact Area and Remaining

Geological Domain	Unit	Estimated Volume of Habitat		Estimated Volume of Habitat Impacted		Estimated Volume of Habitat Remaining	
		Stygofauna (S)	Troglofauna (T)	Stygofauna (S)	Troglofauna (T)	Stygofauna (S)	Troglofauna (T)
Type 1	(m^3)	15,269,725,414	20,774,000,000	4,614,900,000	19,547,600	10,654,825,414	20,754,452,400
	(%)	100.0	100.0	30.2	0.1	69.3	99.9
Type 2	(m^3)	2,468,774,592	164,490	392,090,000	38,382	2,076,684,592	126,108
	(%)	100.0	100.0	30.2	0.1	84.1	76.7
Type 3	(m^3)	8,369,895,552	149,671,500	618,578,251	0	7,751,317,301	149,741,379
	(%)	100.0	100.0	7.4	0.0	92.6	100.0
Type 4	(m^3)	6,046,909,091	115,073,340	137,192,402	0	5,909,716,689	115,084,848
	(%)	100.0	100.0	2.3	0.0	97.7	100.0

11.4.2 Subterranean Fauna Assemblage

The impact assessment focuses on those species considered to be potentially restricted to within the impact area, represented by the predicted end of mining 1 m drawdown contour for stygofauna and the mine pits and mounding area for troglofauna. These species are presented in Table 11-4 and shown on Figure 11-15.

Table 11-4: Potentially Restricted Stygofauna and Troglofauna Species within Impact Areas

Lowest Identification	Linear Range	Number of Individuals Collected	Habitat Collected From
Stygofauna			
Parastenocaris 'BHA392'	Found in 1 bore	2	Type S1 and S3
Brevisomabathynella `BSY226'	Found in 1 bore	1	Type S1
Paramelitidae `BAM210`	7 km	3	Type S1 and S3
Microcerberidae `BIS464'	Found in 1 bore	1	Type S1 and S2
Microcerberidae `BIS544'	1.3 km	14	Type S1, S2 and S3
Troglofauna			
Parajapygidae `BDP208`	Found in 1 bore	2	Type T1

11.4.3 Groundwater Contamination

As discussed in Section 8.4.5 the water quality of dewatering discharge would be similar to the water quality of the alluvial aquifer in the proposed aquifer reinjection years. Notwithstanding the expected low average trace metal content of dewatering discharge proposed for aquifer reinjection, any individual dewatering bores that abstract exceptionally high levels of dissolved arsenic would be designated and managed as 'Type II' water for reinjection into the RBS. Once the ore processing and TSF circuit is commissioned, any Type II dewatering discharge would be preferentially directed to the ore processing water stream.

To consider the fate of any reinjected Type II water, the groundwater model applied particle tracking to the alluvial aquifer model layers, with particles 'released' in RBS and tracked for 200 years. Figure 8-14 shows the particle tracking paths from each reinjection bore and confirms that all injected water from the RBS will ultimately discharge into the pit void post-closure. Based upon the above an "contaminants" are expected to be localised and/or captured by any pits being dewatered during operations or by any pit-lakes that form post-mining. Therefore, it is unlikely that there will be a significant impact to stygofauna from the Proposal.

Table 11-5: Application of the Mitigation Hierarchy for Subterranean Fauna

Potential Impacts	Interconnected Factors for Holistic Assessment	Mitigation Measure	Other Decision-Making Process Relevant?	Effectiveness of the Control
Direct Impacts				
Loss of individuals or reduction in stygofauna habitat Loss of individuals or reduction in troglofauna habitat	• Inland Waters • Flora and Vegetation	• Pit dewatering will be minimised to that required to safely access below water table resources. • The water management strategy includes the preferential reinjection of surplus water to the aquifer. This strategy will result in a recharge at those locations to minimise the total export of water from the aquifer. • The water management strategy will ensure that groundwater mounding in the reinjection borefields remains 2 m below natural surface area. • Groundwater will be abstracted in compliance with an approved Groundwater Licence and Operating Strategy. • Updating/recalibration of the groundwater models at least annually for the first three years reducing to tri-annual should no difference be observed between the predicted and actual model. • Preparation of a Mine Closure Plan consistent with DEMIRS Guidelines for Mine Closure Plans	• Yes – Groundwater Licence limiting the total abstraction volume per annum and associated Groundwater Licence Operating Strategy (stygofauna). • Yes – Part V licence conditioning aquifer reinjection. • Yes – Mining Proposal and Mine Closure Plan limiting pit development.	There are no industry or best practise standards established in relation to the protection of subterranean fauna and /or habitat protection. Minimisation of impacts to species and /or habitat is considered the most effective control.
		Proposed Limit on Impact to Ensure Environmental Outcome • Annual limit on groundwater abstraction. • Proposal limit on groundwater mounding.		**Mechanism for Limit** • Ministerial condition with annual limit on groundwater abstraction. • Ministerial Condition with limit to groundwater mounding to 2 m from surface within the reinjection borefields.
Indirect Impacts				
Changes to surface inputs of flow/volume of water, nutrients and oxygen Changes to structure and presence of underground voids Desiccation of subterranean habitat Contamination from spills, leaching and incidents	• Inland Waters	• Clearing and/or disturbance to remain within the approved Development Envelope and minimised to that required. • Surface compaction will be limited to those areas requiring it. • Appropriate design of waste landforms specifically encapsulation of any potential PAF material and minimisation of oxidation to prevent changes to groundwater. • Construction and maintenance of surface water drainage systems to control and contain runoff from mining areas and divert clean stormwater away from pits and other mining disturbance. • Processing method selected converts arsenic in ore to insoluble arsenate form. • Construction of TSF as per approved designs to minimise seepage, including but not limited to: – Compacted foundation and clay liner around decant to reduce permeability and minimise seepage. – Construction of underdrainage system to collect seepage from the base of tailings. • Operation of TSF in accordance with TSF Operating Strategy and Environmental Licence. • TSF located up gradient of pits. Any seepage will likely flow towards the pits and ultimately be reused in the processing. • Monitoring of groundwater quality during operations. • Provision of spill kits and implementation of management procedures. • Preparation of a Mine Closure Plan consistent with DEMIRS Guidelines for Mine Closure Plans.	• Yes – Part V Works Approval and Operating Licence to operate TSF • Yes – Mining Proposal and Mine Closure Plan limiting pit development.	These measures are standard business practice and are considered effective controls in minimising indirect impacts on subterranean fauna.
		Proposed Limit on Impact to Ensure Environmental Outcome		**Mechanism for Limit**
		No limits proposed – managed through standard industry practices, Part V EP Act and Mining Act.		Part V EP ACT Operating Licence and Mining Act Mining Proposal.

11.5 Potential Restricted Subterranean Fauna

11.5.1 Stygofauna

11.5.1.1 Parastenocaris `BHA392`

Six Parastenocaris specimens were collected from four different bores. Sequencing identified two distinct species, *Parastenocaris* 'BHA392' and *Parastenocaris* 'BHA393'.

Parastenocaris 'BHA392' (two specimens) was collected from within the proposed drawdown area (Figure 11-15), whilst *Parastenocaris* 'BHA393 (two specimens) were found approximately 20 km from the Proposal.

The remaining two specimens could not be sequenced, however Bennelongia state that it is highly likely that these specimens are *Parastenocaris* 'BHA392' and have treated them as conspecific. These two specimens occur approximately 1.3 km from *Parastenocaris* 'BHA392'.

Based upon habitat modelling and analysis of bore log details, *Parastenocaris* 'BHA392' was found to occur within the Type S1 and S3 habitat which have been shown to be extensive and well connected in the local and regional area (Figure 11-1 to Figure 11-5), with approximately 10,654,825,414 m^3 (69.3%) and 7,751,317,301 m^3 (92.6%) remaining post implementation of the Proposal.

Taking into consideration the availability of suitable habitat within the likely range of the species it can reasonably be assumed that *Parastenocaris* 'BHA392' will occur and persist outside of the proposed drawdown area.

11.5.1.2 Brevisomabathynella `BSY226`

A single specimen of the syncarid *Brevisomabathynella* `BSY226', was collected from within the proposed drawdown area (Figure 11-15). As there is only one record of this species it is difficult to infer its range, however, according to Bennelongia, syncarids often have ranges of between 5 and 30 kms.

Based upon habitat modelling and analysis of bore log details, *Brevisomabathynella* `BSY226' was found to occur within the Type S1 habitat which has been shown to be extensive and well connected in the local and regional area (Figure 11-1 to Figure 11-5), with approximately 10,654,825,414 m^3 (69.3%) of habitat remaining post implementation of the Proposal.

Taking into consideration the availability of suitable, interconnected habitat within the likely range of this species it can be reasonably assumed that *Brevisomabathynella* `BSY226' will occur and persist outside of the proposed drawdown area.

11.5.1.3 Paramelitidae `BAM210`

Three specimens of Paramelitidae 'BAM210' were collected from two different bores which are located approximately 7 km apart. Of these specimens two are located inside the proposed drawdown area, whilst one is on the periphery (Figure 11-15).

Closer examination of the individual collected on the periphery of the drawdown area shows that it occurs within the 2 to 4 m drawdown contour and within the Type S1 and S3 habitats. As vertical habitat has been shown to extend to approximately 30 m at this location, approximately 90% of habitat will remain for this species. Additionally, as discussed in Section 11.3.1, it has been shown that Type S1 habitats are extensive and interconnected across the landscape.

Based upon this it can be concluded that there is a high likelihood of continuity of habitats for at least 7 km for Paramelitidae 'BAM210' (noting that it is unusual for Paramelitid amphipods to have restricted distributions, and they tend to have catchment scale ranges (Bennelongia, 2023a) and it can reasonably be assumed that the species will occur and persist outside of the proposed impact area.

11.5.1.4 Microcerberidae `BIS464` and `BIS544`

Twenty-five Microberids specimens were collected from seven different bores. Sequencing identified four distinct species, Microcerberidae `BIS464`, Microcerberidae `BIS544`, Microcerberidae `BIS545`and Microcerberidae `BIS579`.

Microcerberidae `BIS464` (1 specimen) and Microcerberidae 'BIS544' (14 specimens) were collected from within the proposed drawdown area (Figure 11-15), whilst Microcerberidae `BIS545`and Microcerberidae `BIS579 were found to occur in bores located 12 and 15 kms away.

Based upon habitat modelling and analysis of bore log details, Microcerberidae `BIS464` was found to occur within the Type S1 and S3 habitats, whilst Microcerberidae 'BIS544' was found to occur within the Type S1, S2 and S3 habitats. These have been shown to be extensive and well connected in the local and regional area (Figure 11-1 to Figure 11-5), with approximately 10,654,825,414 m^3 (69.3%), 2,076,684,592 m^3 (84.1%) and 7,751,317,301 m^3 (92.6%) remaining post implementation of the Proposal.

Taking into consideration the availability of suitable, interconnected habitat within the likely range of these species it can be reasonably assumed that Microcerberidae `BIS464` and Microcerberidae `BIS544` will occur and persist outside of the proposed drawdown area.

11.5.2 Troglofauna

11.5.2.1 Parajapygidae `BDP208`

Parajapygids are typically root-feeding species found in deep subsoil where there is 100% humidity (Sendra et al., 2021). Records of Parajapygids in the Pilbara are common however few species are represented by multiple records.

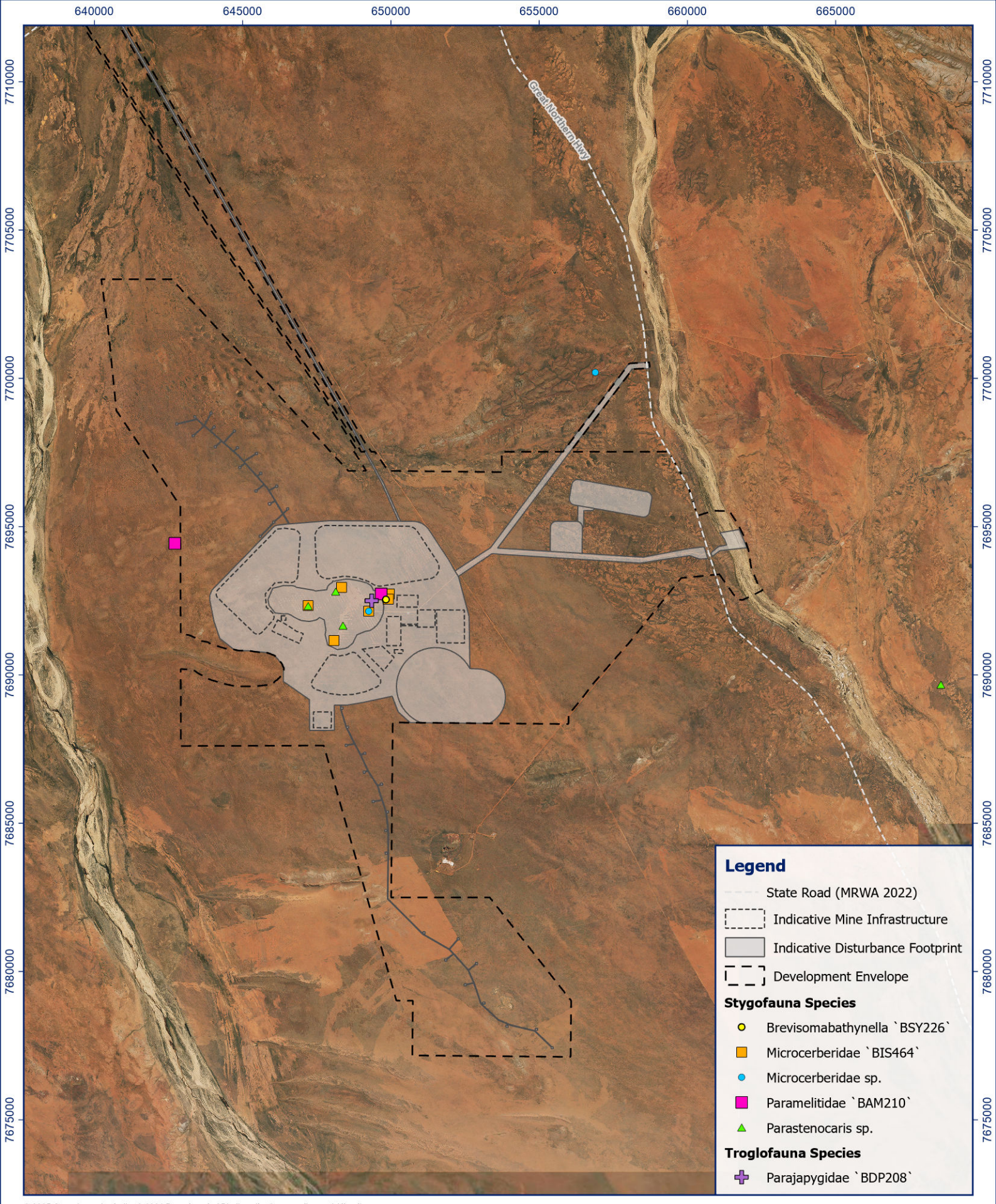
The median linear range of troglofauna in the Pilbara has been estimated at 5 km (Halse and Pearson, 2014). However, the variation in range is large and it is likely that species with small ranges mostly occur in rock, while species in various detritals most likely have relatively large ranges.

Of the eight Parajapygids that have at least three recorded locations, three are known to have linear ranges varying from 0.8 – 49 km (mean 17 km, median 14 km). The species with limited ranges occurred in association with strong landscape features, such as Mesas, whilst those species with larger ranges were found to occur in valleys or flat areas. Given the characteristics of the Proposal landscape (sandplains with no topographical features such as mesas), Parajapygidae `BDP208` is likely to have a range substantially larger than 5 km (Bennelongia, 2023a).

Based upon habitat modelling and analysis of bore log details, Parajapygidae `BDP208` was found to occur within the Type T1 habitat. This habitat has shown to be extensive and well connected in the local and regional area (Figure 11-1 to Figure 11-5), with approximately 20,754,452,400 m^3 (99.9%) remaining post implementation of the Proposal.

Taking into consideration the availability of suitable habitat within the likely range Parajapygidae `BDP208` it can be reasonably assumed that Parajapygidae `BDP208` will occur and persist outside of the proposed impact area.

In addition to the above Bennelongia (2023a) consider that sampling results for troglofauna strongly indicate that the troglofauna community within the Proposal area is depauperate and that in such circumstances any troglofauna species present will be a wide ranging rather than an endemic species.



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Projection: GDA2020 MGA Zone 50

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Potentially Restricted Stygofauna and Troglofauna Species and Range

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Figure 11-15	ADV-AU-00673	November 2024

11.6 Environmental Outcome

An environmental outcome, in the context of EIA, is the state of the environment at a point in time during implementation or after a Proposal has been implemented. Environmental outcomes:

- Be specific and measurable, clearly describing quantifiable environmental conditions.
- Have a defined spatial and temporal extent.
- Aim to achieve the EPA's objectives for Subterranean Fauna.

In consideration of the proposed avoidance and management measures and likely residual impacts associated with the Proposal, the predicted environmental outcomes that apply to Subterranean Fauna are set out below:

Minimise direct and indirect impacts to subterranean fauna, where reasonably practicable.

To meet the above environmental outcome the Proponent shall:

- Limit the Proposals groundwater abstraction to up to:
  - 30 GL/a for years 1 – 4;
  - 18 GL/a for years 5 – 7; and
  - 11 GL/a for years 8 – 15.

  Until such time as De Grey submits an updated groundwater model inclusive of the additional abstraction (up to 30 GL/a) to the satisfaction of the CEO of the EPA.
- Limit groundwater mounding to no greater than 2 m from surface within the reinjection borefields.

11.7 Conclusion

Groundwater and subterranean fauna assessments commissioned by De Grey have informed the following conclusions in relation to subterranean fauna:

- The Project does not host a rich troglofauna community due to the shallow water table.
- Subterranean fauna are known to occur within and outside of the proposed impact (groundwater drawdown) area, however the presence of extensive and unrestricted habitats that will remain post implementation of the Proposal within the known ranges of subterranean fauna species makes it unlikely that the Proposal will have adverse impacts on the persistence of subterranean fauna species in the area.
- De Grey's proposed management approach to maintain groundwater quality will ensure the integrity of the subterranean fauna habitat is maintained.

When all the potential impacts in Table 11-5 are considered individually and cumulatively, significant impacts to Subterranean Fauna are not predicted. De Grey considers that the proposed management measures will ensure that the EPA's Subterranean Fauna factor objective is met.

12. ENVIRONMENTAL FACTOR - SOCIAL SURROUNDINGS

12.1 EPA Objective

The EPA objective for social surroundings is "*to protect social surroundings from significant harm"*. For the purposes of the definition of environment, the social surroundings of man are the aesthetic, cultural, economic and social surroundings to the extent that those surroundings directly affect or are affected by a person's physical or biological surroundings (EPA, 2023a).

12.2 Policy and Guidance

The following legislation and guidance are of relevance to this factor:

- *Environmental Factor Guideline - Social Surroundings* (EPA, 2023a)
- *Technical Guidance Environmental Impact Assessment of Social Surroundings – Aboriginal Cultural Heritage* (EPA, 2023c).
- *Guidance for the Assessment of Environmental Factors: Assessment of Aboriginal Heritage* (EPA, 2004).
- *Environmental Protection (Noise) Regulations 1997*.
- *Aboriginal Heritage Act 1972* (WA) (AH Act)
- *Native Title Act 1993* (Cth).
- *Aboriginal and Torres Strait Islander Act 2005* (Cth).

12.3 Traditional Owner Consultation

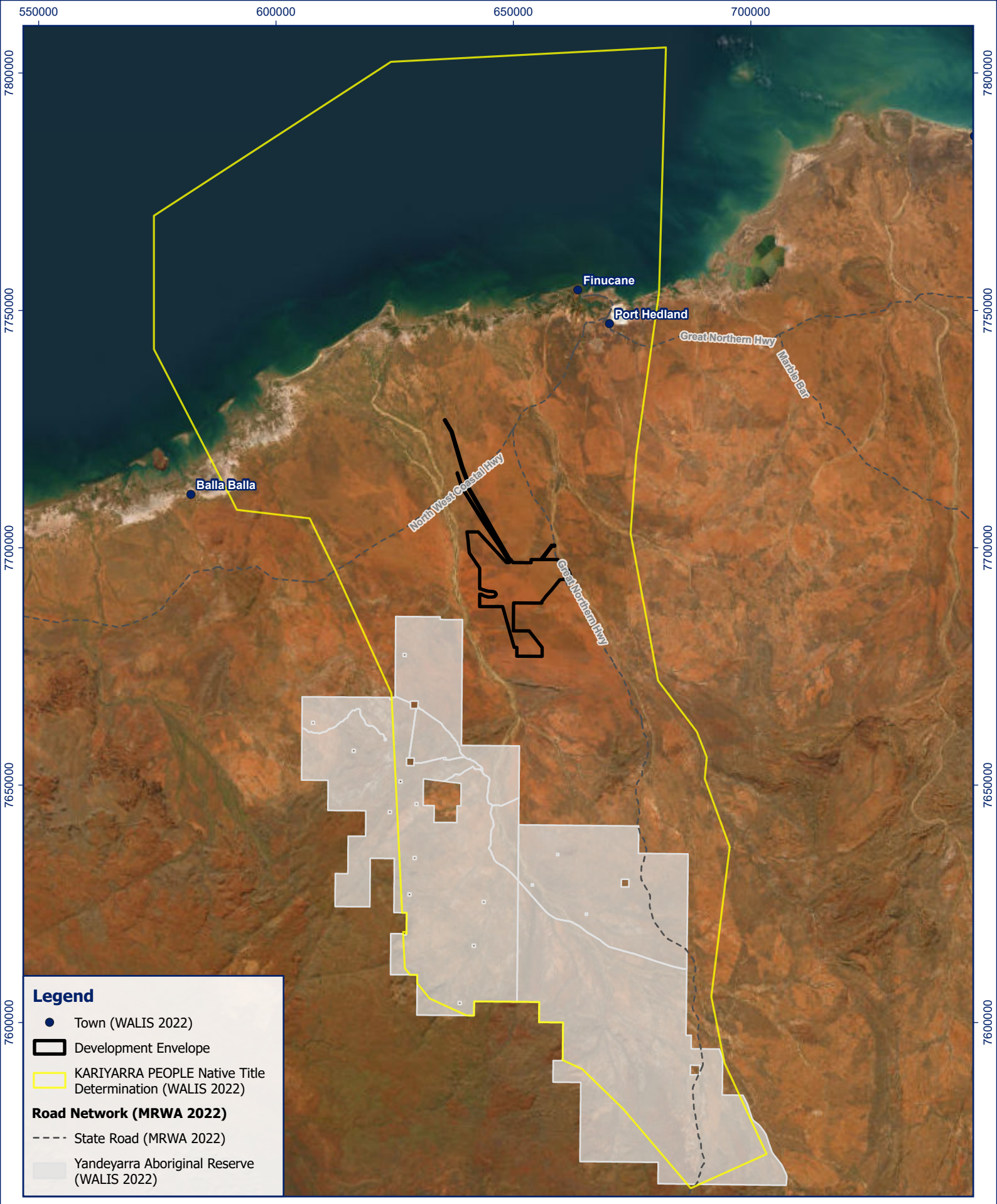
The Proposal is situated on the lands of the Kariyarra People, and in the Kariyarra Native Title Determination (National Native Title Tribunal Number WCD2018/015). Native Title rights and interests are held on trust by the Prescribed Body Corporate, the Kariyarra Aboriginal Corporation (KAC), for the Kariyarra People based in Port and South Hedland. De Grey's Native Title and Heritage team manages all consultation and cultural heritage surveys with the Kariyarra, and the De Grey's board most recently met with representatives of KAC in 2024.

12.3.1 Kariyarra Aboriginal Corporation

The traditional lands of the Kariyarra People are around the town of Port Hedland, east of the Sherlock River and surrounding the Yule River. The Kariyarra Country is bound by Ngarla Country to the northeast, Nyamal Country to the east and Ngarluma Country to the west.

Kariyarra Native Title was determined in December 2018 and cover approximately 17,354 km² of traditional Kariyarra country, encompassing Port Hedland, the Aboriginal community of Yandeyarra, several pastoral leases, and mining operations.

The landmark determination of Native Title for the Kariyarra People was achieved 22 years after the first Kariyarra Native Title determination application was made in 1996. The Kariyarra Native Title Determination Area, shown in relation to the Yandeyarra Reserve and the Development Envelope in Figure 12-1, is home to places of special significance to the Kariyarra People, including ceremonial sites, song lines, permanent pools, and natural resources.



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Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Kariyarra Native Title Determination Area	
Figure 12-1 | ADV-AU-00673 | November 2024	

12.3.2 Negotiation Protocol

In January 2021, formal consultation and negotiations commenced between De Grey and KAC to progress the development of a Native Title Mining Agreement (the De Grey / Kariyarra Mining Agreement).

The negotiation process was formalised through execution of a Negotiation Protocol on 13 July 2021. This sets out details of how the negotiation would be carried out between the parties to reach the end point of a mutually beneficial Native Title Mining Agreement. The Negotiation Protocol (Table 12-1) clearly defined matters to be discussed.

Table 12-1: Negotiation Protocol

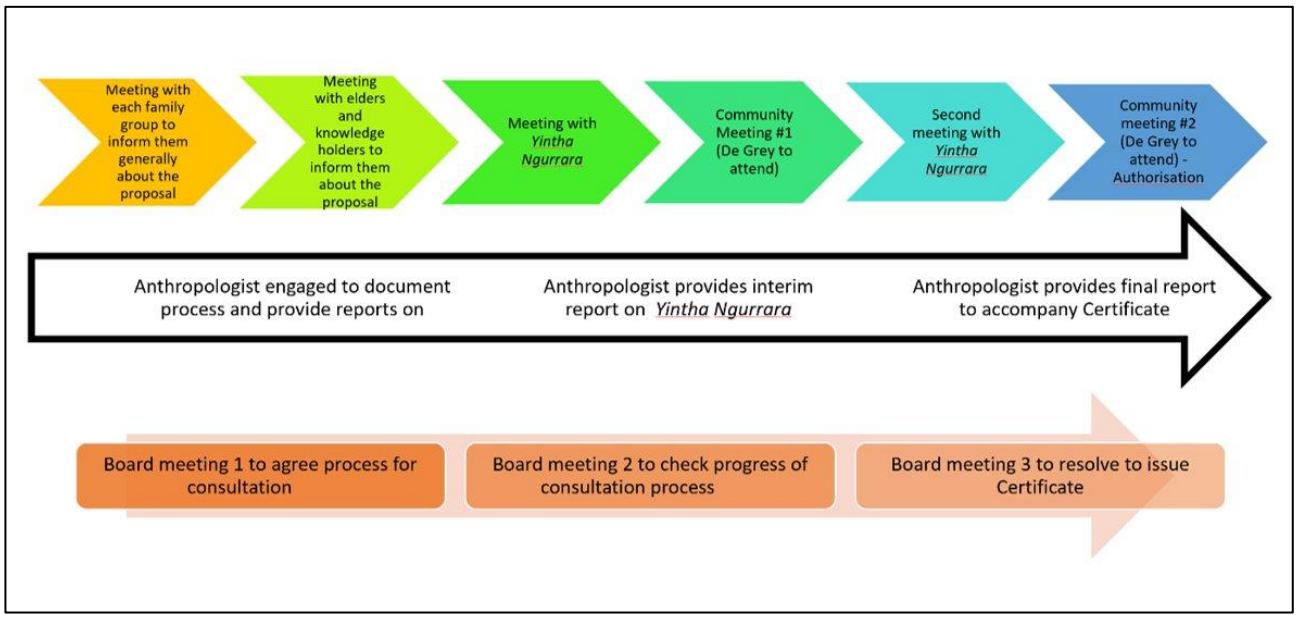
Protocol Aspect	Items Covered
Culture, country and community	• Heritage protection and avoiding damage to sites. • Facilitating 'caring for country' obligations. • Support for law and country. • Environmental assurances. • Processes for involving Traditional Owners in environmental matters through Social Surroundings consultation meetings.
Relationship between KAC and De Grey	• Development of long-term relationship between KAC, the Native Title Holders and De Grey. • The process for ongoing consultation between the parties. • How KAC will support De Grey to create a safe, productive and culturally aware workplace.
Access and consent	• Access by De Grey and its employees / contractors on relevant parts of the Determination Area. • Access by Native Title Holders to the Proposal over the LOM.
Community development	• Business and employment opportunities for Native Title Holders. • Training opportunities for Native Title Holders. • Economic development opportunities for Native Title Holders. • Providing a legacy for Native Title Holders.
Compensation	• Nature and quantum of compensation. • KAC, and any other entities advised by KAC, to hold compensation and other community benefits.
People's lives	• Minimising any adverse impacts of the Proposal on Native Title Holders. • Minimising any adverse impacts of the Proposal on Native Title rights and interests. • Maximising education, training and mentoring opportunities.
Mining agreement	• Structure and content of Mining Agreement. • Strong processes for implementation of the Mining Agreement.
Commercial matters	• Providing commercial and contracting opportunities during the entire mine life to Native Title Holders and Native Title entities.

De Grey presented to the KAC board eight times throughout the negotiation in South Hedland or West Perth about the Proposal. In addition, De Grey also conducted numerous separate meetings with the negotiation group and lead a formal community meeting in late 2022 with all 11 family representatives. The parties have built a positive relationship over the period.

12.3.3 Community Consultation

The boards of KAC and De Grey agreed the main terms of the De Grey/Kariyarra Mining Agreement (financial and non-financial) in December 2021. A formal consultation process then commenced between De Grey and Native Title holders which included extensive consultation (Figure 12-2).

Figure 12-2: Consultation Process



12.3.4 Apical Family Group Meetings

The Kariyarra Native Title Determination comprises eleven Apical Ancestor family groups who are legal representatives of the Kariyarra Native Title Holders. Each separate family group has been extensively engaged with and consulted throughout this Native Title Mining Agreement-making process. Upon commencement of community consultation, De Grey engaged two consultants to complete separate pieces of work, aligned with objectives of the De Grey/Kariyarra Mining Agreement.

A consultant from Circle Advisory, James Kernaghan, took each Apical ancestor family group through a Social Impact Assessment process where impacts, risks and benefits of the Proposal were captured through ten full-day workshops (one of the family groups, whose focus is coastal areas, chose not to participate). Information provided by the family groups was collated and used for the purposes of developing a Social Impact Assessment for KAC, independent to the Social Impact Assessment completed by Umwelt for De Grey in January 2022.

A consultant from Human Terrain Anthropology, Roina Williams, attended all family group meetings where information was captured to produce a comprehensive set of confidential Cultural Heritage Management Plan documents, specific to the Native Title Mining Agreement.

Senior representatives from De Grey attended each family group meeting, to present comprehensive information on elements of the De Grey/Kariyarra Mining Agreement, the Proposal, proposed mining areas, environmental considerations, and to answer any questions of the groups.

Out of the 11 Apical Ancestor family groups, 10 of them spent a full day at the South Hedland KAC office learning about the Proposal and what meaning it has to them. The remaining group was invited, however chose not to attend as the Proposal is out of their area of focus as they are the coastal family group. De Grey has presented extensive summaries to the family's nominated board member ensuring they are aware of the details of the Proposal.

12.3.5 Yintha Ngurrara Meetings

The Kariyarra People use the term Yintha Ngurrara to refer to their Elders and Knowledge Holders.

On 1 September 2022, De Grey hosted a full-day on-country Yintha Ngurrara meeting at the proposed Hemi mine and infrastructure site and exploration camp. The meeting was attended by senior leaders of De Grey, including the Managing Director, Technical Director, General Manager Community Relations and other senior exploration and Project development representatives from the company.

Buses took approximately 30 elders and Knowledge Holders and De Grey participants to specific locations relevant to the group. The entire delegation spent time on Country learning more about the Proposal and discussing boundaries, proposed location of infrastructure, heritage and matters of importance to the group.

After the meeting, the parties agreed to move the boundary of the mining area to ensure the Proposal did not impact areas that are important areas to the group including the sand dune area that has been excised from the Development Envelope. An Aboriginal cultural heritage management plan (ACHMP) is being developed with the group allowing the salvage of two sites within the proposed disturbance footprint. A letter of no objection has been received from KAC for a Section 18 application under the AH Act, with the application awaiting determination for the salvage of the two sites.

On 29 September 2022, De Grey attended the second Yintha Ngurrara meeting in South Hedland and gave the group of around 50 attendees a further development update and answered questions to do with environmental concerns and water.

On 28 November 2022, a Native Title Community meeting was held with approximately 100 attendees including representatives from each of the 11 apical family groups. This included a majority vote to enter into the De Grey/Kariyarra Mining Agreement with De Grey. The De Grey/Kariyarra Mining Agreement was executed on 16 December 2022[5].

All levels of personnel (including senior management) from De Grey attend KAC board meetings regularly; present to family groups on request; walk on archaeological heritage surveys to better understand any issues and/or concerns directly from Traditional Owners on-country; and ensure De Grey's senior team members are familiar with the group and matters important to them, specifically related to heritage and culture.

12.3.6 Implementation Committee Meetings

De Grey holds regular implementation committee meetings with KAC as under the De Grey/Kariyarra Mining Agreement. The functions of the implementation committee include:

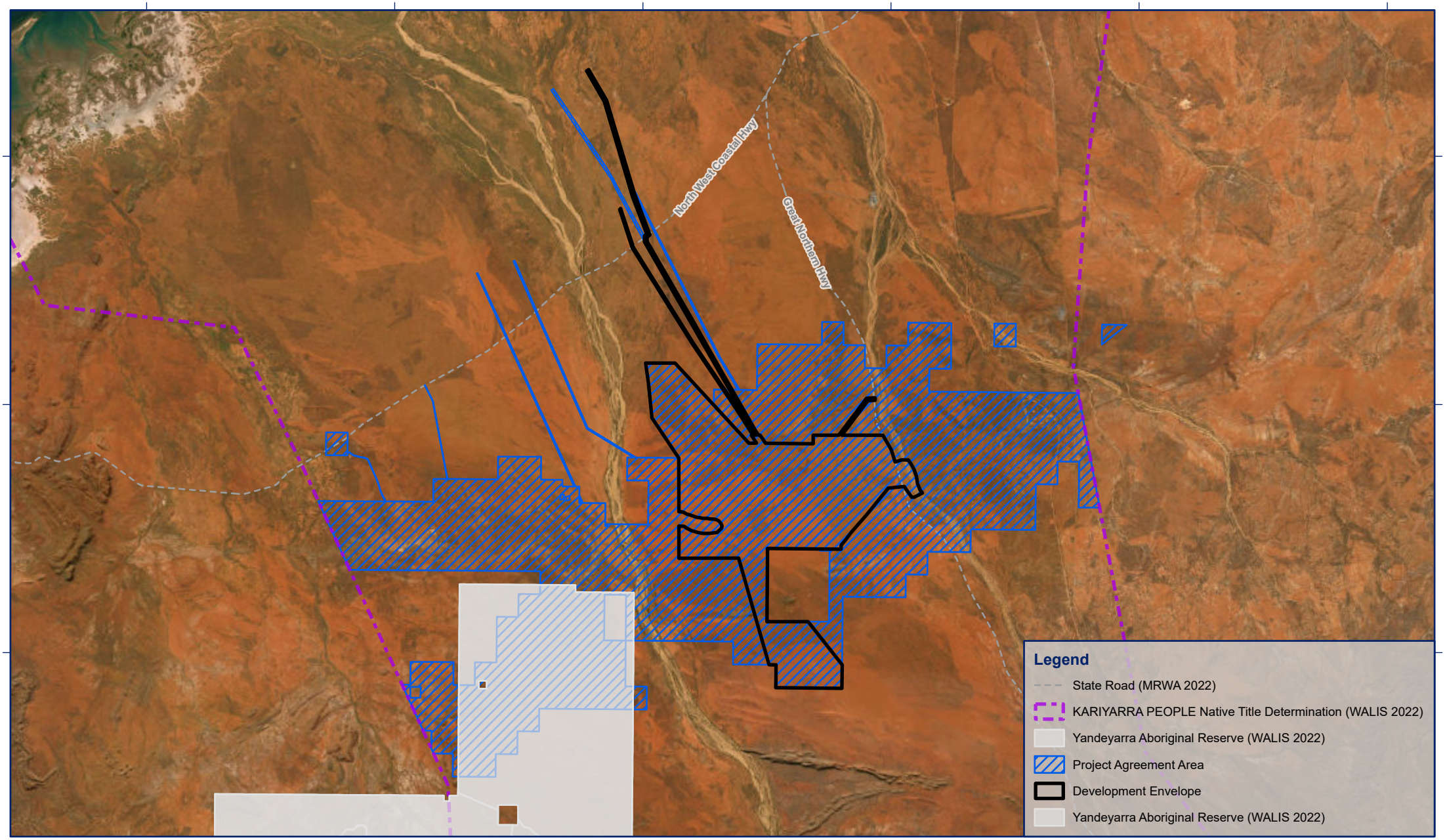
- Fostering a strong and constructive relationship between the Parties.
- Monitoring of the implementation of the operational aspects of the Agreement.

5 De Grey released an announcement to the ASX on 16 December 2022. To view the announcement please click here.

- Monitoring the implementation of the Strategies (employment and contracting).
- Monitoring the implementation of the Social Impact Management Plan.
- Monitoring the outcomes achieved through the Indigenous Engagement Strategy.
- Monitoring the implementation of the heritage protocol and any agreed Aboriginal cultural heritage management plans.
- Agree to and oversee a code for ensuring maximum access of the Kariyarra people to the Agreement Area.
- Provide non-binding recommendations to the Parties in relation to the manner in which the operational aspects of the Agreement may be implemented.

12.3.7 Native Title Mining Agreement Boundaries and Provisions

Through extensive consultation and engagement with the Kariyarra People, the area shown in Figure 12-3 was defined as the Proposal Agreement Area as agreed by KAC, Kariyarra Native Title Holder and De Grey. The Proposal Agreement Area extends beyond Hemi and includes De Grey's wider mineral exploration activities and will be reviewed when required. Given the terms of the agreement, De Grey believes the Proposal will present positive benefits upon KAC and the broader community.



Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Updated/Reviewed by: KM/EL

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Scale: 1:400,000

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November 2024	**Hemi Gold Project - Referral Supporting Document**	DE GREY MINING LTD
Figure 12-3		
ADV-AU-00673	**Kariyarra People and De Grey Native Title Agreement Areas**	

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12.4 Receiving Environment

12.4.1 Aboriginal Heritage Surveys

De Grey takes its obligations with respect to the assessment and management of Aboriginal cultural heritage seriously, with surveys extending across the Proposal Agreement Area and other relevant areas of the Kariyarra determination area.

Since 2018, De Grey has completed a comprehensive series of archaeological and ethnographic heritage surveys, engaging external consultants. In January 2022, Scarp Archaeology, one of these external consultants, conducted a full review of all previous heritage surveys, ensuring De Grey employees are working with comprehensive, credible and reliable heritage information on an accurate and detailed GIS dataset.

Heritage clearances since 2018 have consisted of 19 surveys on Kariyarra Country and included archaeological (A) and/or ethnographic (E) surveys (Table 12-2) and shown in Figure 12-4.

The survey work has been completed on a regular schedule in collaboration with the KAC. A specific focus has been placed on ensuring the correct apical family groups, who have cultural knowledge of the Development Envelope, have approved all heritage work.

Table 12-2: Heritage Surveys Completed on and Around Hemi

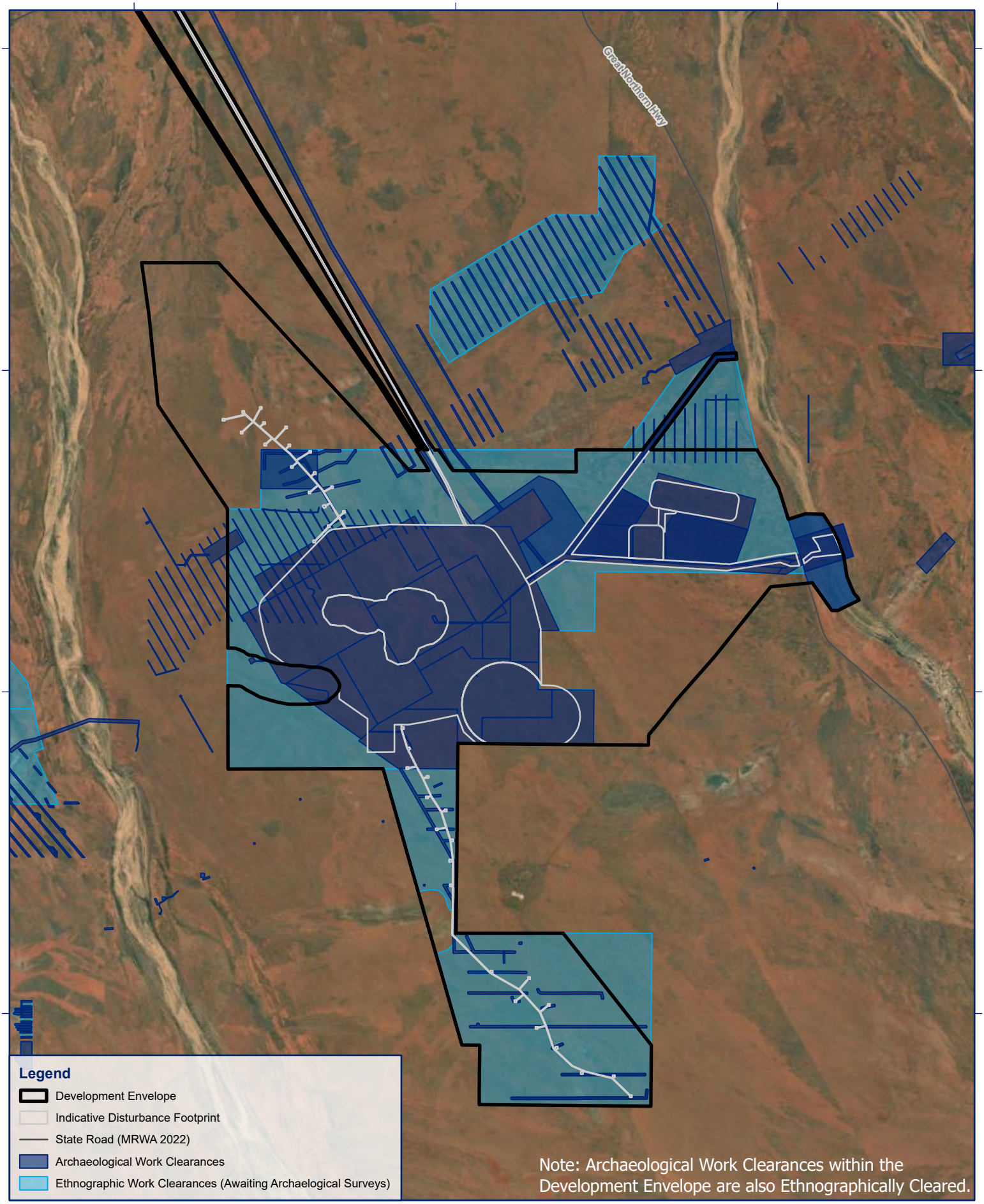
#	Consultant Group	Author/s	NT Group	Year	Type	Level
1	Terra Rosa	Monks and Morison 2018	Kariyarra	2018	A, E	Work program clearance
2	Gavin Jackson	Ryan et al 2019	Kariyarra	2018	A, E	Work program clearance
3	Gavin Jackson	Ryan et al 2021	Kariyarra	2019	A, E	Work program clearance
4	Scarp Archaeology	Slack 2022a	Kariyarra	2021	A	Site identification
5	Scarp Archaeology	Slack 2022b	Kariyarra	2021	A	Site avoidance
6	Human Terrains	Williams 2021	Kariyarra	2021	E	Site identification
7	Human Terrains	Williams 2022	Kariyarra	2021	E	Site avoidance
8	Scarp Archaeology	Slack 2022	Kariyarra	2022	A	Site identification and site avoidance
9	Scarp Archaeology	Slack 2022	Kariyarra	2022	A	Site identification and site avoidance
10	Scarp Archaeology	Slack 2022	Kariyarra	2022	A	Site identification and site avoidance
11	Scarp Archaeology	Slack 2022	Kariyarra	2022	A	Site identification and site avoidance
12	Scarp Archaeology	Slack 2023	Kariyarra	2023	A	Site avoidance
13	Human Terrains	Williams 2023	Kariyarra	2023	E	Site identification and site avoidance
14	Scarp Archaeology	Slack 2023	Kariyarra	2023	A	Site avoidance

#	Consultant Group	Author/s	NT Group	Year	Type	Level
16	Scarp Archaeology	Goranitis 2023c	Kariyarra	2023	A	Site identification and site avoidance
17	Heritage WA	Czerwinski 2024	Kariyarra	2024	E	Site avoidance
18	Scarp Archaeology	Slack 2024	Kariyarra	2024	A	Site avoidance
19	Scarp Archaeology	Burnett 2023	Kariyarra	2023	A	Site avoidance

A = Archaeological; E = Ethnographic

Approximately 10,059 ha of archaeological heritage surveys and approximately 18,147 ha of ethnographic surveys have been completed within the Development Envelope to date. The methods used ensured every part of the area has been surveyed in detail, on foot, by Kariyarra Traditional Owners, with specialist archaeologists and/or anthropologists in attendance each time. Additional heritage surveys are scheduled to complete coverage of the Development Envelope on a priority basis. De Grey will ensure disturbance activities will not be undertaken in any unsurveyed areas through a robust ground disturbance permit procedure and program.

The surveys have allowed De Grey staff to learn more about the land and cultural practices of the Kariyarra People.



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Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Aboriginal Heritage Survey Areas

Figure 12-4 | ADV-AU-00673 | November 2024

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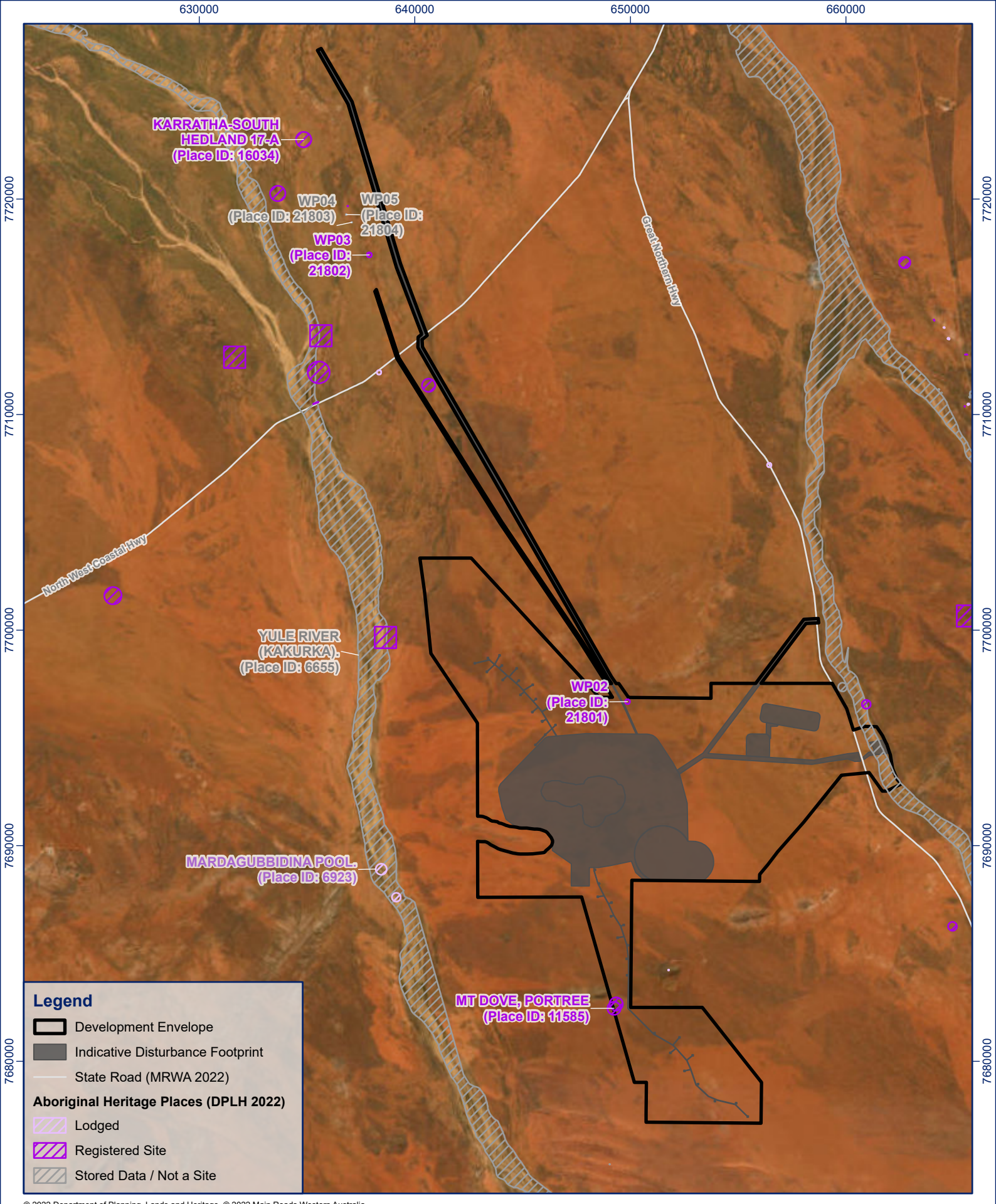
12.4.2 Aboriginal Heritage Sites

Details of lodged and registered aboriginal heritage sites are provided in Table 12-3 and shown in Figure 12-5.

The KAC has requested that the details and locations of other heritage sites identified at the Proposal are kept confidential. Accordingly, De Grey has provided details of these sites separately and in confidence in Appendix 30.

Table 12-3: DPLH Register of Places and Objects Aboriginal Heritage Sites

Tenement	Type	Place ID	Name	Description	Restrictions
L47/963	Registered	21801	WP02	Artefacts/Scatter	No
L47/1048	Registered	11585	Mt Dove, Portree	Engraving	No
	Registered	11638	Mt Dove, Upper Yule	Artefacts/Scatter, Ritual/Ceremonial, Engraving, Traditional Structure	No
M47/1628	Lodged	40638	DG-19-01	Artefacts/Scatter	No
	Lodged	40703	DG-22-01	Artefacts/Scatter, Quarry	No



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Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Registered Aboriginal Heritage Sites

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Figure 12-5	ADV-AU-00673	November 2024

12.4.3 Social Surroundings Surveys

De Grey has undertaken Social Surroundings consultation through the KAC/Implementation Committe to engage with the nominated knowledge holders for the Proposal. Knowledge holders were selected by the KAC/Implementation Committee. Social Surroundings consultation were also attended by independent third party consultants for the KAC/Implementation Committee. Social Surroundings consultation focused on, but was not limited to the following matters:

- Ground and surface water including alteration of water and proposed monitoring and management approaches to reinjection and surplus water discharge.
- Flora and Fauna including proposed monitoring and management approaches and potential partnerships.
- Traditional Owner knowledge, including cultural values, both tangible and intangible.
- Infrastructure placement and the management of chemicals, waste and tailings.
- Noise.
- Visual amenity.
- Continued access to country.
- Dust.

12.4.4 European Heritage

The Heritage Council of Western Australia maintains a State Register of Heritage Places under the *Heritage Act 2018* (WA). No Heritage Places are listed within the Development Envelope and the closest nonindigenous heritage site is 13 km east of the Hemi deposits, outside of the Development Envelope:

- Place 18421, Indee Station (site of plane crash) was registered on 28 November 2007. The site is the location where 31 people lost their lives after their plane crashed on 31 December 1968, making it one of the worst aviation disasters in Australian history (Heritage Council, 2022).

12.4.5 Pastoral Leases

The Proposal is predominately located on the Indee Station Pastoral Lease with a small portion of the northern miscellaneous licences intersecting the Mundabullangana Station Pastoral Lease. An access agreement for exploration and mining activities has been signed with the Indee Pastoral Lease holder.

12.4.6 Public and Recreational Facilities

Proposal landforms may be visible from the Great Northern Highway. This impact is unlikely to be significant for amenity from travelling vehicles, however visual amenity impacts have been assessed at public rest stops (See Section 12.5.2).

Historically, there has been a recreational caravan park at the Indee Station Homestead. This is no longer open to the public; however potential impacts have been assessed at this location.

12.5 Potential Impacts and Mitigation Measures

In addition to direct disturbance, social surroundings may be impacted by noise, odour, visual amenity and dust. Impediments to access may also impact social surroundings even if a significant site is not otherwise impacted.

Amenity impacts due to dust are discussed in Section 14 Additional detail on noise; visual amenity; and management of heritage sites is discussed under the sections below and an impact assessment table is provided in Table 12-6.

De Grey has considered the potential impacts outlined in the environmental factor guideline and considers those to be relevant to the Proposal include:

- Noise (direct).
- Impacts to access, landscape and amenity (direct).
- Alteration of water (direct)
- Disturbance of cultural heritage sites and values (direct).
- Degradation of cultural heritage through dust deposition (indirect).

12.5.1 Noise

Construction and operation of the Proposal will result in an increase to background noise and vibration levels. A noise assessment for the Proposal was undertaken by Herring Storer Acoustics. A copy of their report (Herring Storer, 2022) is attached as Appendix 25. Unless otherwise referenced, the text in this section of the document is drawn from Herring Storer's report; detailed predictions can be viewed in the report.

Noise receptors that were considered as part of the assessment:

- Indee Station and Caravan Park.
- Mallina Homestead.
- Mt Dove Camp.

Noise modelling assumed that all equipment was operating at the same time above the ground, and under maximum transmission conditions (temperature inversion with light winds blowing from source to receptor). The assumed weather conditions will only occur on occasion, and as mining progresses below the surface, pit walls and associated waste rock landforms will attenuate noise.

Under the *Environmental Protection (Noise) Regulations 1997* (Noise Regulations), De Grey must not cause noise at sensitive receptors to exceed assigned levels. If a premises is exposed to more than one source of industrial noise, then noise received from the Proposal must be at least 5 dB less than assigned levels.

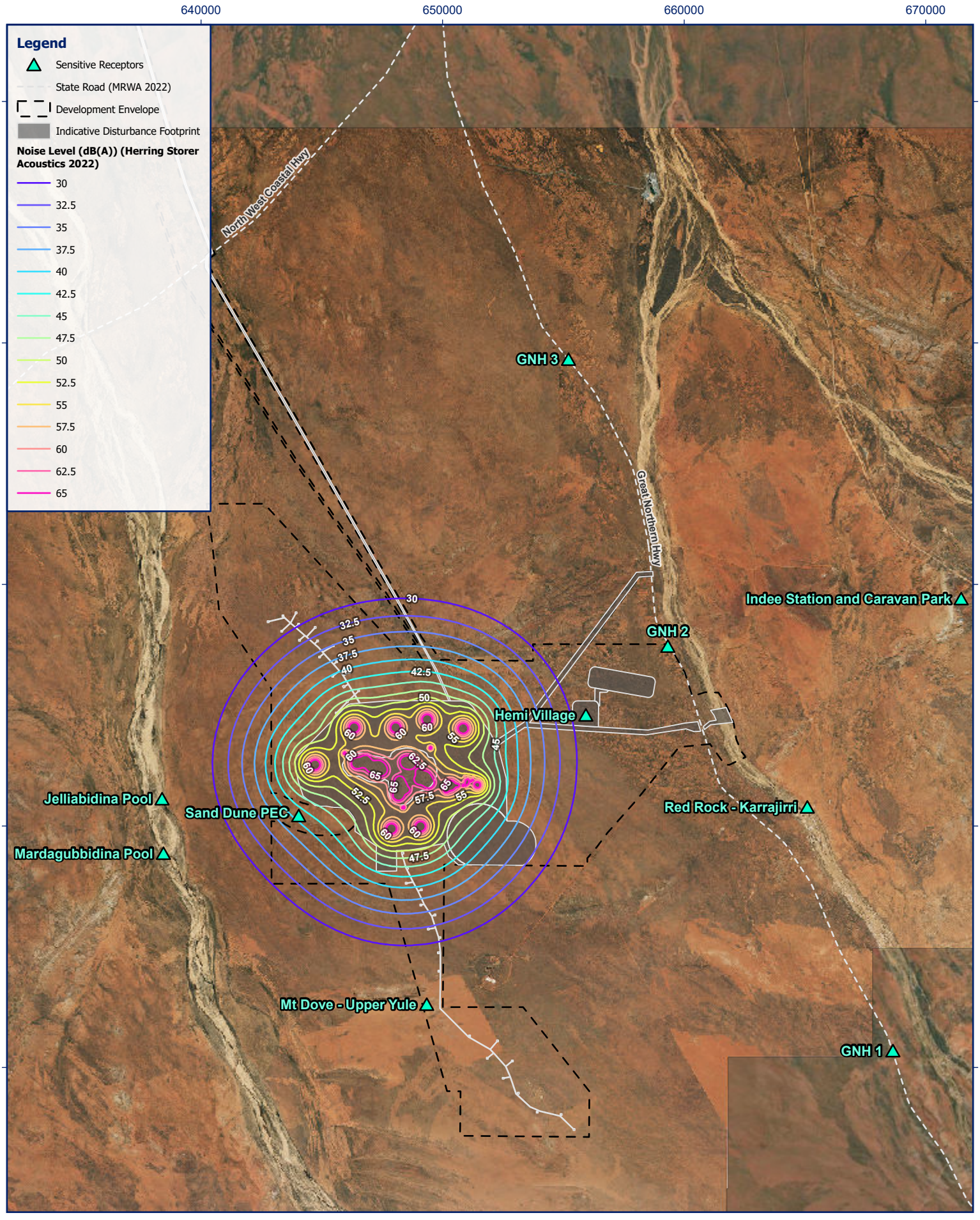
The assigned noise levels depend on the day of the week and the time of day. The lowest assigned noise level is 35 dB (similar to the noise experienced in a library) between 2200 and 0700 hours Monday to Saturday and 0900 hours on Sunday and public holidays. As the Proposal will operate continuously this is the most applicable assigned level.

Noise levels at receptors are compared to assigned levels in Table 12-4 and are compliant with the Noise Regulations. If a sensitive receptor is exposed to other industrial noise sources, then the assigned level is reduced to 30 dB. Although not currently applicable to the Proposal, modelled noise levels are also compliant with this assigned level and are also presented in Figure 12-6.

The Proposal is not expected to significantly contribute to noise at assessed receptors.

Table 12-4: Assessment of Noise Levels at Receptors

Receptor	Assessable Noise Level L_{A10} dB(A)	Time of Day	Applicable LA10 Noise Level (dB)		Compliance with Regulations
			Without contributing Noise	With contributing Noise	
Indee Station and Caravan Park	9	Night (22:00 to 07:00)	35	30	Compliant
Mallina Homestead	1				Compliant
Mt Dove Camp	24				Compliant



Scale: 1:200,000

0 1.25 2.5 5 km

N

Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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Modelled Noise Levels

Figure 12-6 | ADV-AU-00673 | November 2024

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12.5.2 Visual Amenity

The Proposal has the potential to impact on the visual amenity values of the area. There is an element of subjectivity in visual amenity assessment. For example, some stakeholders may place different values and levels of importance on changes to views and associated amenity compared to others.

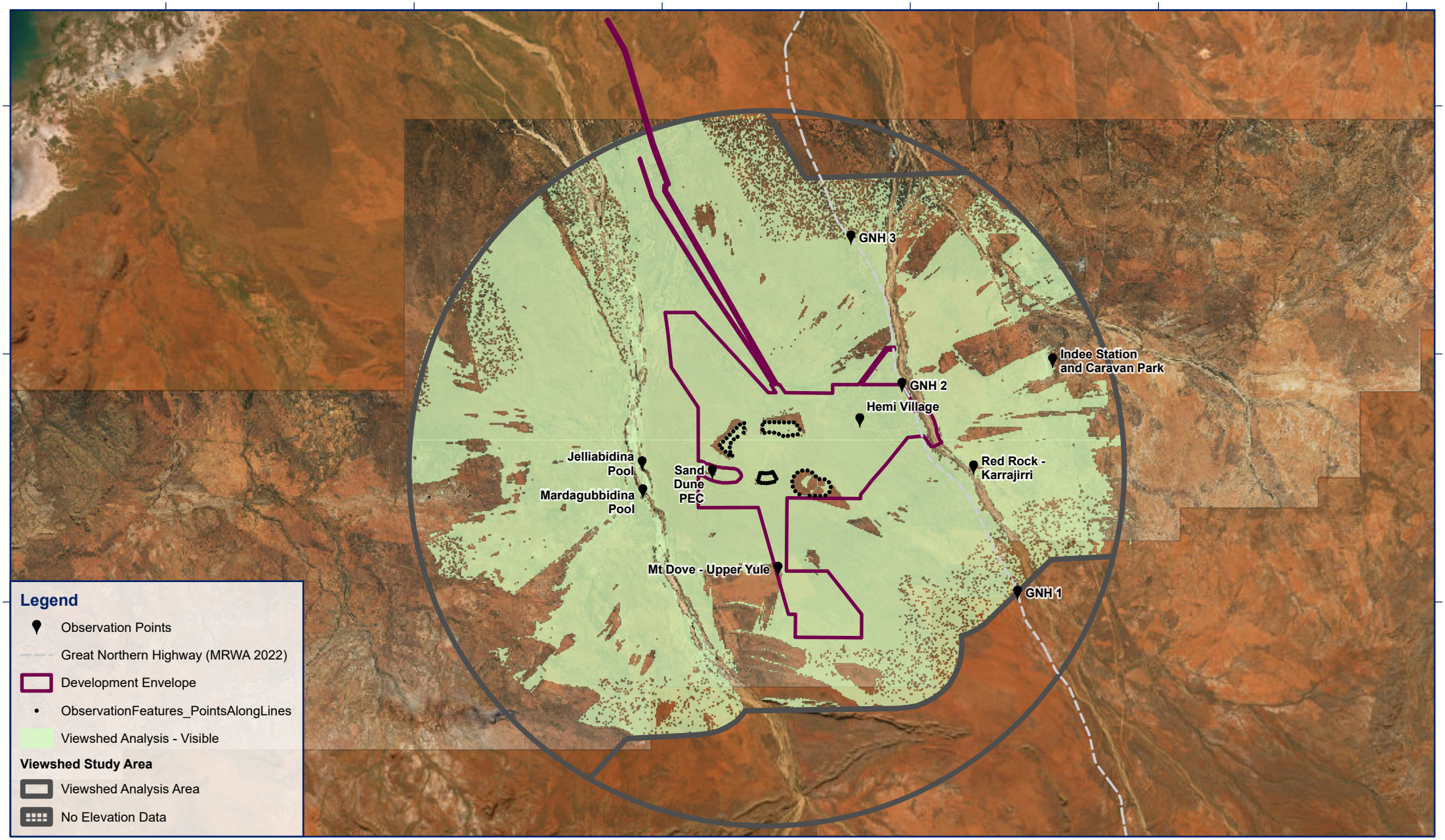
Non-condensable gases of carbon dioxide, nitrogen and argon (impurities in the oxygen supply) and oxygen accumulate from the POx process require continuous venting to control the pressure within the processing infrastructure. The vent gases are washed with raw water to recover entrained slurry and solids prior to release of the steam to the environment through stacks on the processing plant.

Visual impacts associated with industrial infrastructure (such as the processing plant POx stack and vapour release) are expected to be insignificant given their limited height and scale when compared to the surrounding mine waste landforms and natural terrain. Further, the visual impacts will be temporary and will cease upon closure when all industrial infrastructure is decommissioned and removed. On this basis, the visual impact assessment has focussed on significant, permanent changes to the landscape associated with the mine waste landforms.

To assess potential impacts associated with development of permanent landforms at the Proposal, a visual impact assessment was undertaken. This comprised the following:

- Viewshed calculation of Proposal landforms within a Geographic Information System to determine their visibility within a 25 km radius. This is a screening analysis undertaken using a digital terrain model in combination with the final landform designs. The calculation is conservative in that it does not consider potential vegetation screening effects or diminishing visibility due to distance; in practice these factors will reduce visibility within the calculated viewshed.
- Using the viewshed to assist with the identification of potentially sensitive areas or points of interest for further assessment. Consideration was given to areas of known significance, e.g., culturally significant areas, or other areas that may be valued for their views of the landscape, e.g., public highway rest stops and viewpoints. A total of nine points of interest were identified.
- Line of sight assessments for each point of interest to further assess the visibility of Proposal landforms, undertaken using detailed topography data and photographs taken at eye level (1.5 m above ground level).
- Creation of photomontages of full height landforms at each point of interest.

The viewshed results are presented in Figure 12-7. The line of sight results are summarised in Table 12-5 with reference to Figure 12-8: to Figure 12-15. While the Proposal's landforms will be visible from some locations, their design is such that they are in keeping with existing landforms within the viewshed analysis area. As such, De Grey considers that the visual impact of the Proposal will not be significant.



Projection: GDA2020 MGA Zone 50

Aerial: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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N

Scale: 1:400,000

0 2.5 5 10 km

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Figure 12-7		
ADV-AU-00673	Viewshed Analysis	

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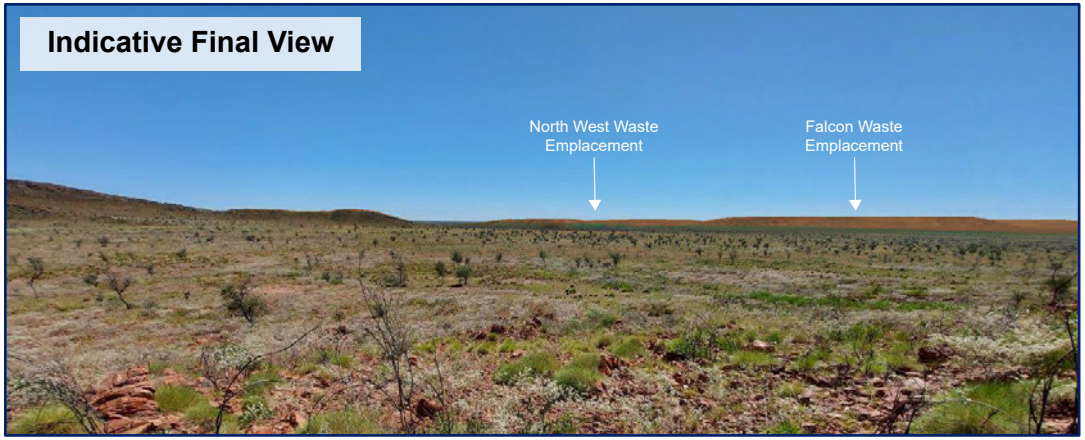
Table 12-5: Visual Amenity Impacts at Socially Significant Sites

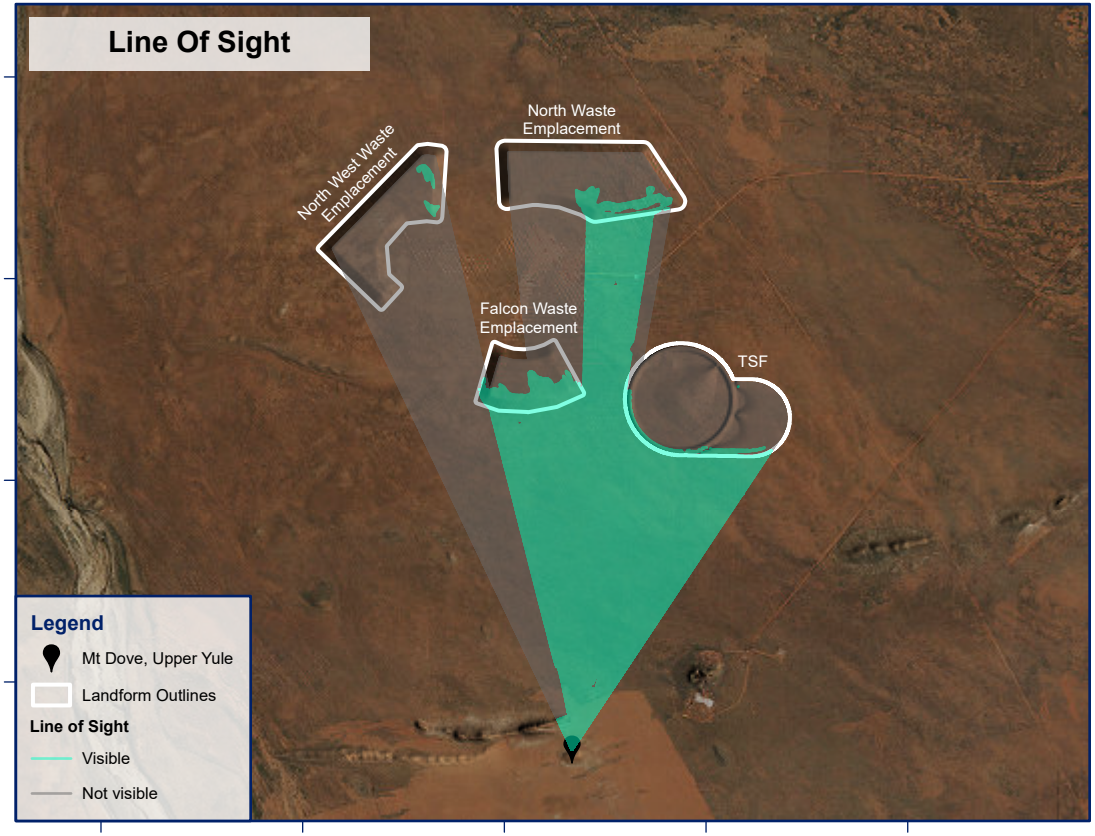
Site	Type	Impact	Figure Reference
Mt Dove (Upper Yule)	Aboriginal Heritage Site	Northwest WRL and Falcon WRL visible, however are lower than surrounding landforms and conform to existing landscape. Revegetation will further blend landform into landscape. Visual amenity is not significantly impacted.	Figure 12-8:
Mardagubbidina Pool	Aboriginal Heritage Site	No change – landforms are not visible.	Figure 12-9
Jelliabidina Pool	Aboriginal Heritage Site	No change – landforms are not visible.	Figure 12-10
Sand Dune PEC	Aboriginal Heritage Site	Falcon WRL and TSF visible from this location. Height and slope of landforms have been designed to minimise visual impacts and conform as far as reasonably practicable to existing landscape. View is changed; however amenity is not significantly impacted.	Figure 12-11
Indee Station and Caravan Park	Indee Station Homestead; recreational facility for public use	No change – landforms are not visible.	Figure 12-12
Great Northern Highway Rest Stop 1	Public Use Facility	Northwest WRL is just visible above horizon but conforms to existing landscape. Revegetation will further blend landform into landscape. Visual amenity is not significantly impacted.	Figure 12-13
Great Northern Highway Rest Stop 2	Public Use Facility	Parts of Falcon WRL visible and North West WRL visible, however landscape is not significantly altered. Revegetation will further blend landform into landscape. Visual amenity is not significantly impacted.	Figure 12-14
Great Northern Highway Rest Stop 3	Public Use Facility	TSF and Northwest WRL just visible, however landscape is not significantly altered. Revegetation will further blend landform into landscape. Visual amenity is not significantly impacted.	Figure 12-15
Red Rock - Karrajirri	Aboriginal Heritage Site	Negligible change	Figure 12-16

Current View

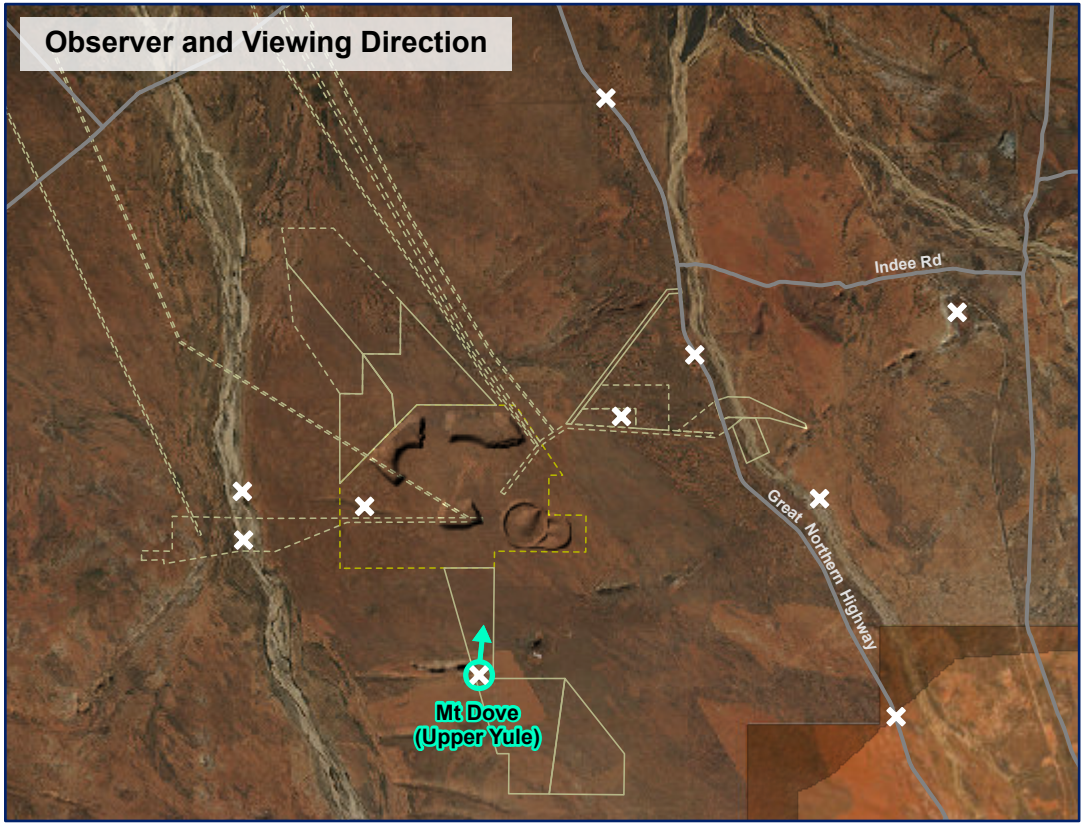
Indicative Final View



Line Of Sight



Observer and Viewing Direction



Projection: GDA2020 MGA Zone 50

Aerial: May 2021 / Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Updated/Reviewed by: KM/EL

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N

Scale: 1:150,000

0 1 2 4 km

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Figure 12-8		
ADV-AU-00673	Line of Sight Assessment - Mt Dove (Upper Yule)	

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