NEWCREST MINING LIMITED

Havieron Project
Inland Waters Management Plan

Statement on the Martu

Newcrest acknowledges, recognises and respects Martu as traditional owners and custodians of the landscape on which the company operates. Martu have told Newcrest that their society, spiritual beliefs, cultural identity and traditions are intimately interconnected with their ngurra (lands) and that the Tjukurrpa (creation and law times) operates simultaneously in the past, present and future.

Newcrest recognises it is operating within a cultural landscape and that Martu hold the protection, nurturing and management of this landscape of paramount importance. It is through this understanding, that Newcrest also places the health of the cultural landscape as a priority in everything it does, as both a partner and a guest on Martu ngurra.

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Abbreviations

Abbreviation	Full Description
DWER	Department of Water and Environmental Regulation
DMIRS	Department of Mines, Industry Regulation and Safety
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GLOS	Groundwater Licence Operating Strategy
Greatland	Greatland Pty Ltd
IUCN	International Union for Conservation of Nature
Newcrest	Newcrest Operations Limited

1. INTRODUCTION

1.1 Project

The proposed Havieron Underground Mine Gold Project (Havieron; the Project) is located approximately 45 km east of Newcrest Telfer Gold Mine and within the Shire of East Pilbara (Figure 1). The project is a joint venture between Newcrest Operations Limited (Newcrest) and Greatland Pty Ltd (Greatland).

The Project has a staged approvals approach, with current approvals supporting Stage 1 activities; the development of a boxcut and an underground decline, to a depth of 420 m below ground level (mbgl) within Permian Cover. Construction of these approved project aspects commenced December 2020. Stage 1 of the Project requires clearing of 147 ha of new disturbance and will use 56 ha of the existing approved disturbance on the tenements shown in Table 1.

Table 1: Tenements

Tenement	Area	Holder	Status
M45/1287	3,186 ha	Newcrest Operations Limited Greatland Pty Ltd	Granted
L45/636	980 ha	Newcrest Operations Limited	Pending

Newcrest currently seeks approval of Stage 2 of the Project, which includes the development of the underground mine and associated infrastructure (infrastructure corridor to Telfer):

- Clearing of 530 ha of new disturbance and use of 200 ha of currently approved disturbance including Stage 1 (191 ha) and existing disturbance within proximity to Telfer (9 ha);
- Development of an underground mine;
- Construction and operation of a 50 km infrastructure corridor from Havieron to Telfer Gold Mine for the transport of ore, water, electricity and site access;
- Continued abstraction of up to 2 GL per year of groundwater; and
- Expansion of associated infrastructure.

The location of the Disturbance Envelope and Proposed Layout is shown in Figure 2. The Project has been designed to maximise the use of existing disturbed areas.

1.2 Scope

This Inland Waters Management Plan is intended to provide a framework to ensure potential impacts on the water resources due to the proposed project are minimised to the maximum extent practicable. This version has been developed for use in the assessment of the project under Part IV of the *Environmental Protection Act 1986* and to demonstrate how the Environmental Protection Authority's objective for inland waters – "to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected" – will be met.

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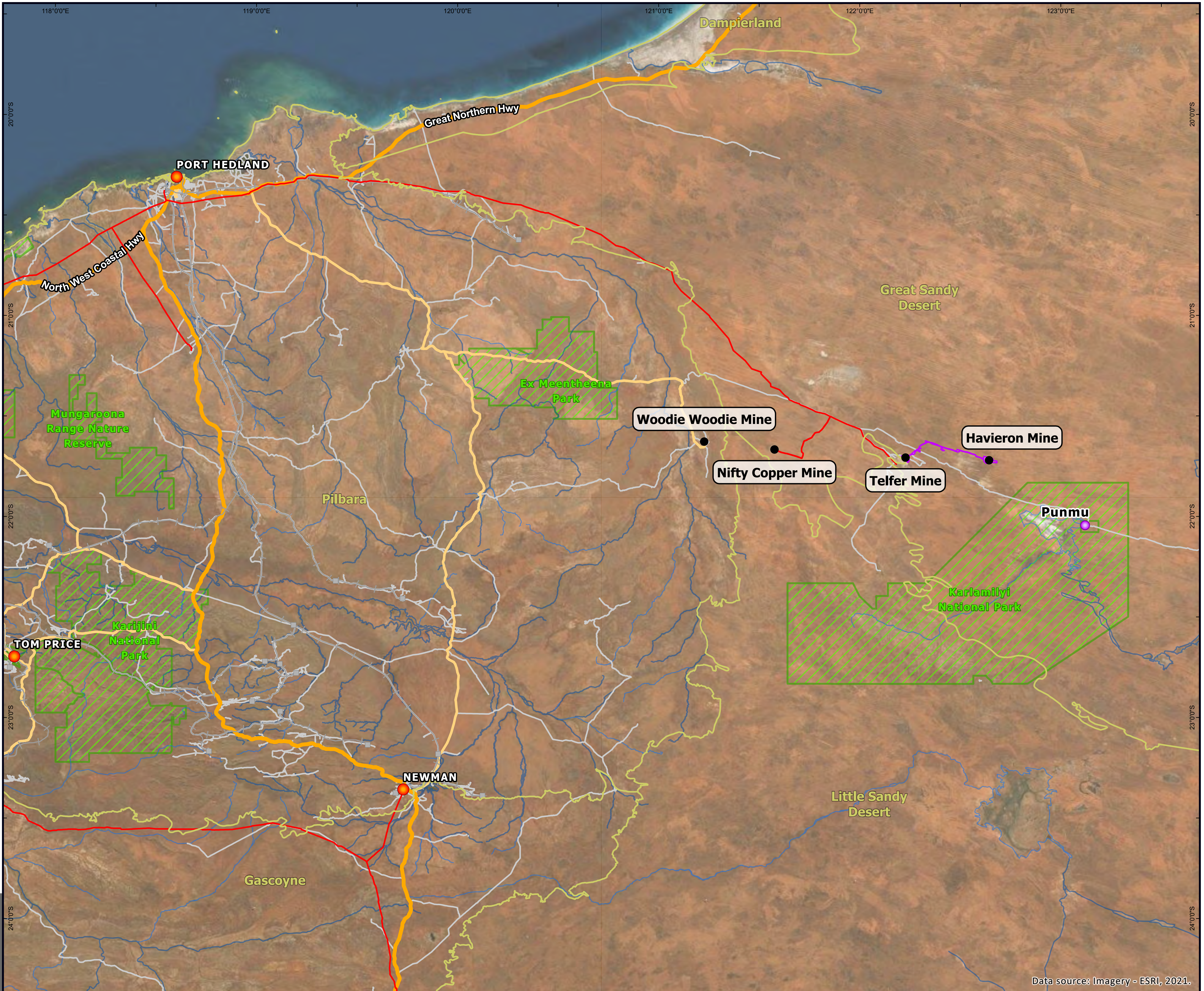


LEGEND

- Indigenous Communities
- Development Envelope
- Conservation
- IBRA7 Regions

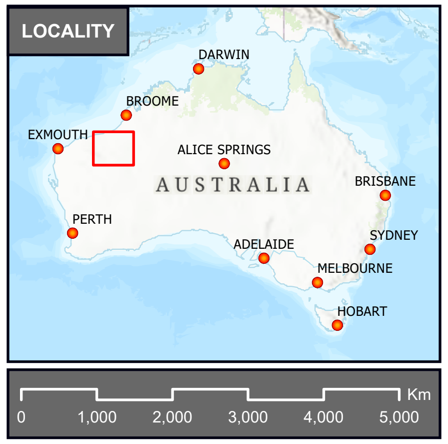
Pipelines
- Gas

Rail Network
- Railway Stations
- Railway Lines

Current Roads
- Freeway / Highway
- Main Road
- Minor Road

Water Courses
- Major River
- Minor River

LOCALITY



PROPOSAL LOCATION
Havieron Mine Site

Stage 2 Referral

0 20 40 60 80 Km

Coordinate System:
Scale @ A3:

Prepared:	N Johnston	Date:	11/10/2021
Reviewed:	G Barrett	Revision:	A
Project:	TE21074		

Figure 1

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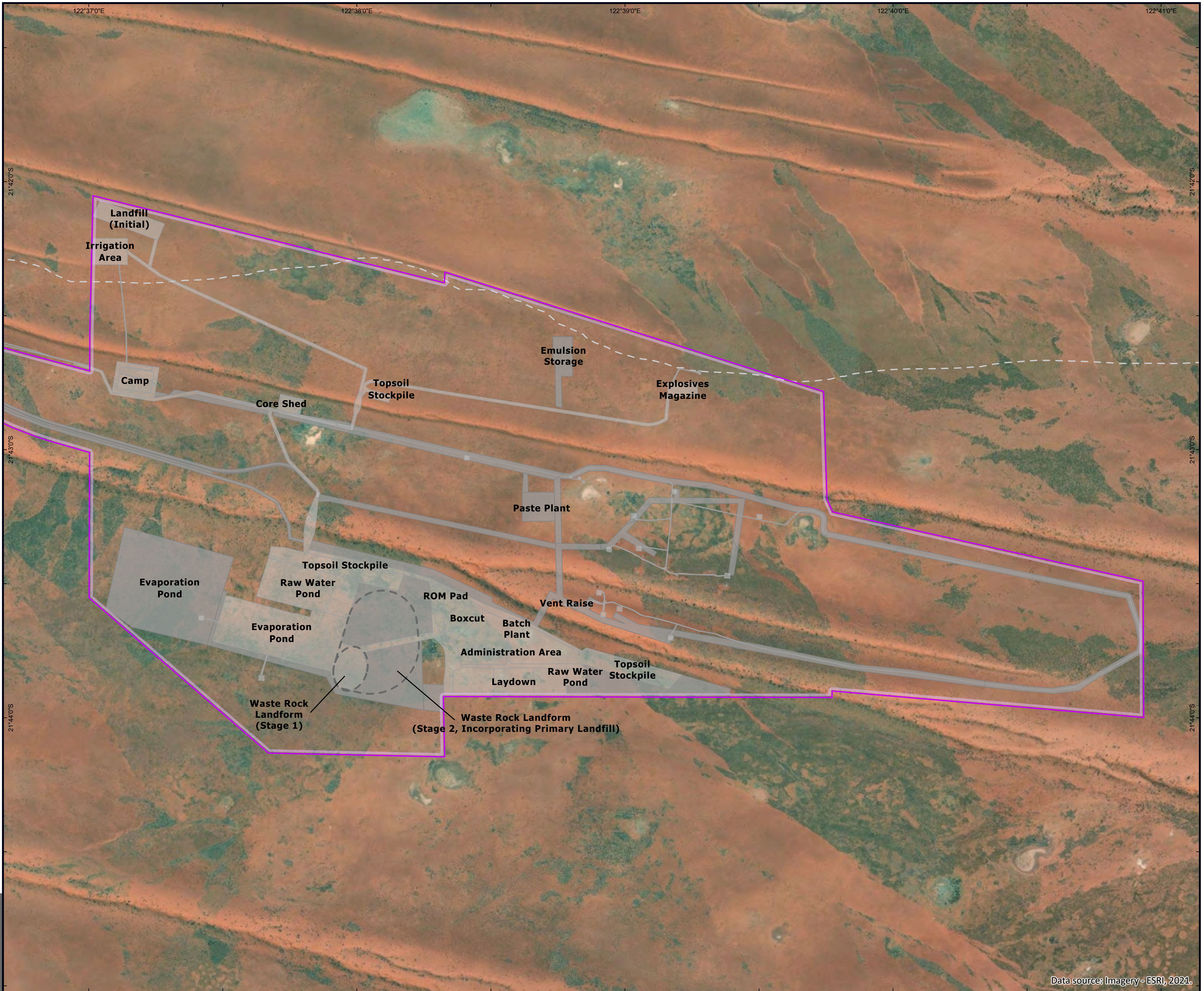
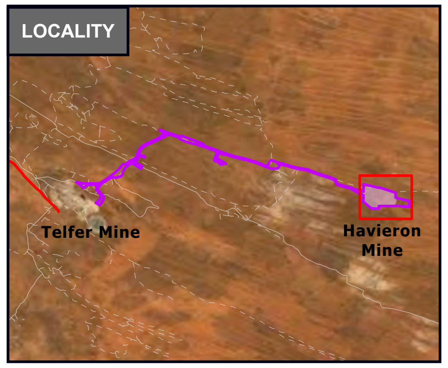


LEGEND

- Development Envelope
- Indicative Footprint (Stage 1)
- Indicative Footprint (Stage 2)
- Regional Roads and Tracks

LOCALITY



Kilometers: 0, 10, 20, 30, 40, 50

DEVELOPMENT ENVELOPE and INDICATIVE FOOTPRINT

Havieron Mine Site

Stage 2 Referral

Metres: 0, 200, 400, 600, 800, 1,000

Coordinate System: GCS GDA 1994

Scale @ A3: 1:25,000

Prepared:	N Johnston	Date:	7/10/2021
Reviewed:	G Barrett	Revision:	A
Project:	TE21074		

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Figure 2

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1.3 Objectives

The primary objective of this Management Plan is 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.

The existing and potential uses are considered to be the following:

- Use of the cultural landscape of the Martu;
- Provision of surface water resources following rainfall events that provide a food and water source to fauna species;
- Provision of surface water resources following rainfall events which supports vegetation communities;
- Provision of groundwater aquifers that support subterranean fauna species;
- Provision of groundwater aquifers that will support the Project;
- Provision of groundwater resources to the surrounding environment, including the Percival Palaeovalley; and
- Provision of ground or surface water resources that support cultural heritage sites.

The management objectives are:

- Avoid alteration of natural surface water flows;
- Minimise discharges of sediment to the environment from disturbed areas during significant rainfall events;
- Minimise groundwater quality contamination from waste rock leachate, aquifer cross contamination or evaporation pond seepage;
- Minimise contamination from hydrocarbons, saline water and sewage effluent;
- Minimise impacts on potential significant subterranean fauna habitat;
- Minimise impacts to culturally significant surface water resources; and
- Minimise impacts to off-tenure water resources.

1.4 Rationale and Approach

The Project has been designed to avoid and minimise impacts to water resources located within the footprint. Results of baseline surveys, assumptions and uncertainties informing the management approach are summarised in the sections below.

This WMP has been developed to reflect the following legislation and associated approvals:

- *Environmental Protection Act 1986* (WA) (EP Act) (Part V) - A Department of Water and Environmental Regulation (DWER) Works Approval Application will be required to construct the landfill, evaporation ponds and sewage facility. Following construction, a DWER Part V Prescribed Premises licence will be required for the following:
    - Category 6 – Mine dewatering;
    - Category 63 – Class I Inert landfill site; and

  - Category 64 – Putrescible landfill.

The final landfill approvals required will depend on the final designs.

A DWER Registration Application will be submitted for the following Category:

  - Category 85– Sewage facility.

- *Mining Act 1978* – the WMP supports a Mining Proposal submission for Stage 2 of the Havieron Project.
- *Rights in Water and Irrigation Act 1914* (WA) *(*RIWI Act) - The following Licence to Take Water (Section 5C) approvals are in place:
  - GWL204105(1) for the abstraction of 20,000 kL on E45/2962, E45/3261, E45/4701 and L45/537 for the service corridor water bores for road construction, maintenance and mineral exploration purposes;
  - GWL202749(2) for the abstraction of 130,000 kL on E45/2962, E45/3261, E45/4701 and L45/537 for the mineral exploration and mining camp purposes.

  An amendment to GWL202749(2) has been submitted to increase the abstraction of up to 1,550 ML/annum for mine dewatering.

  The following Licence to Construct or Alter Well (Section 26D; CAW) approvals are in place:

  - CAW204633(1)
  - CAW204495(1)
  - CAW204138(1)
  - CAW204104(1)
  - CAW203828(1)
  - CAW202747(1).

Once all approvals are obtained, relevant water related conditions will be included in the WMP.

The WMP has been developed to align with Newcrest's obligations under the following frameworks:

- Minerals Council of Australia - Newcrest has committed to develop sustainable site water management practices via the Water Accounting Framework (WAF). The commitment to WAF enables water management practices to also align with frameworks for the Global Reporting Initiative (GRI) and Australian Water Accounting Standard (AWAS).
- International Council on Mining and Metals (ICMM) - The ICMM actively supports the mining and metals industry to raise standards and improve performance across the priority areas of environmental stewardship, the role of mining and metals in society and human well-being. As an ICMM member, Newcrest commits to implementing the ICMM 10 principles, including working under the water stewardship framework.

2. HAVIERON ENVIRONMENTAL VALUES AND POTENTIAL IMPACTS

2.1 Surface Water

The Project is classified as being part of the Sandy Desert river basin within the Western Plateau drainage division. The Sandy Desert River Basin is an internally draining basin with a catchment area of approximately 43,752,400 ha.

Lake Dora is a major inland salt lake that is located approximately 40 km southeast from the Project area. Lake Dora is the lowest topographic feature within the catchment and receives periodic freshwater inflows, from the southwest via the Rudall River and from the southeast via a chain of lakes. These short, ephemeral creeks and rivers would only flow after heavy rainfall. Ephemeral clay pans and playa lakes are widespread within the region, being fed by run-off from adjacent dunes and minor creeks.

To the north, Lake Waukarlycarly is also part of the Percival Lakes drainage system, the same drainage system in which Havieron occurs. However there is a drainage divide in the system between Havieron and Lake Waukarlycarly (Figure 3). At Havieron, the surface drainage flows west towards the Percival lake system and then south toward Lake Dora. North of the drainage divide, surface water flows toward Lake Waukarlycarly. Therefore, any changes to surface water flows in the Havieron catchment will not affect Lake Waukarlycarly.

There are no defined drainage lines within the Project area. Runoff is derived from linear, westerly-trending sand dunes. It discharges between these dunes after heavy rainfall as sheet flow and accumulates into widespread clay pans and playa lakes where it temporarily ponds while it infiltrates and evaporates.

The local topographic gradient from the Project area is towards the west, towards a broad zone of calcrete. This zone forms a topographical low point within the greater catchment region suggesting that the area is a regional sink within which surface water flow would pond, until it is either evaporated or infiltrates forming groundwater recharge to the underlying aquifer.

At the local level, a number of small clay pans occur within the proposed mine area (Figure 4). These are dependent on small scale runoff during rainfall events and are not believed to be directly connected to groundwater although some accumulated water may infiltrate the unsaturated zone beneath the clay pans and move towards the water table (Figure 5). The clay pans have cultural significance to the Martu People.

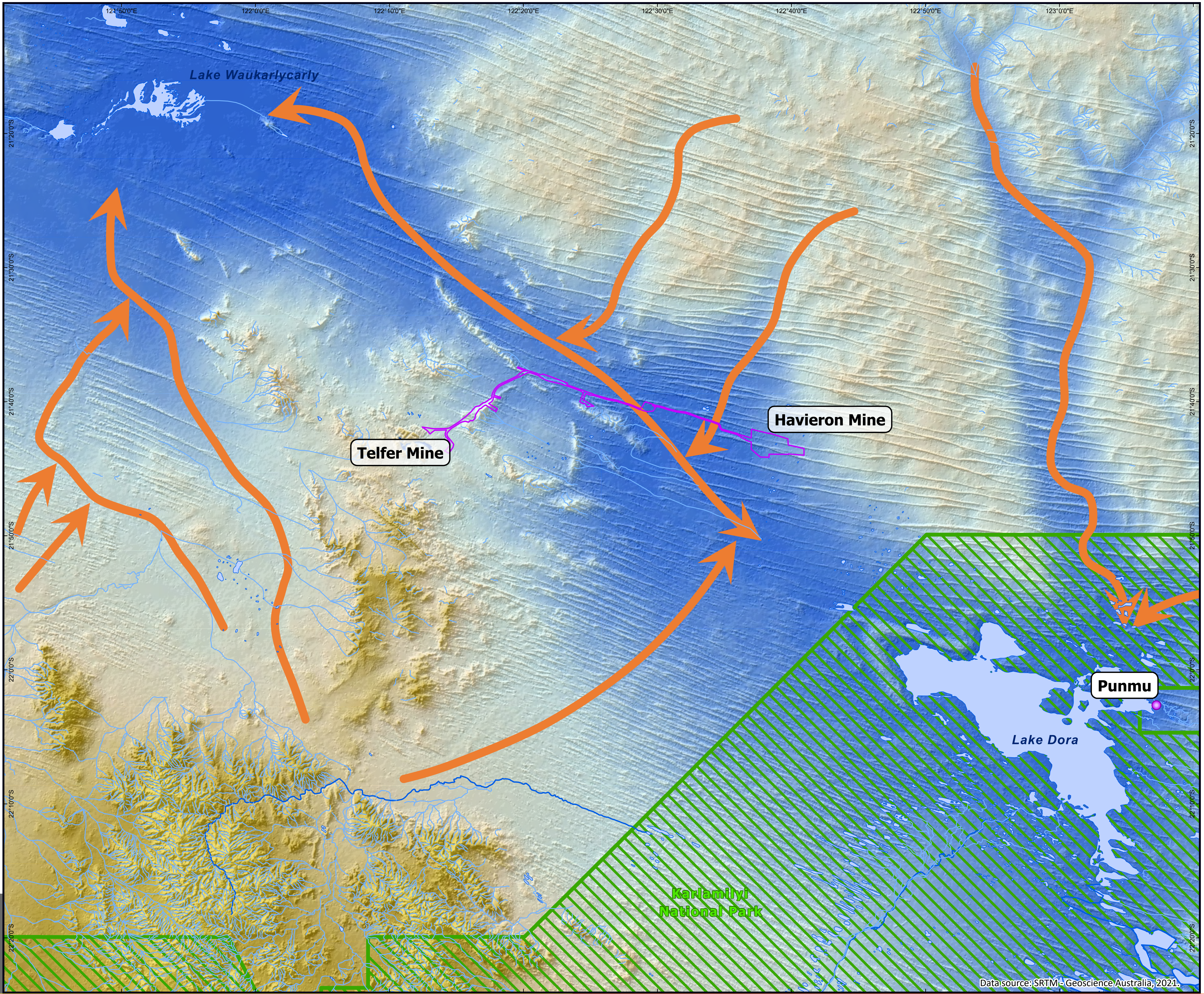
As part of flood modelling, the Proposed Layout was amended to ensure key infrastructure is located outside of the 1 in 100 ARI flood event.

2.2 Ground Water

2.2.1 Regional Hydrogeology

Havieron is located in the Paterson province. The Paterson province is located to the east of the Archaean Pilbara Craton. Multiple deformed and metamorphosed Palaeo- to Mesoproterozoic sedimentary and igneous rocks of the Rudall Complex form basement in the area (Hickman and Bagas, 1998; Bagas, 2004), and are overlain by sedimentary rocks of the Neoproterozoic Yeneena and northwest Officer basins. These are in turn overlain by Phanerozoic sedimentary rocks of the Canning Basin.

At Havieron, the Canning Basin includes the early Permian Paterson Formation. The Paterson Formation is laterally equivalent to the Grant Group, plus the Poole Sandstone, and the mid-Permian Triwhite Sandstone (Liveringa Group) which are well exposed elsewhere in parts of the Canning Basin (for example along the shores of Lake Dora to the south-east of Havieron).



LEGEND

- Indigenoius Communities
- Development Envelope
- Conservation Zone

Hydrology

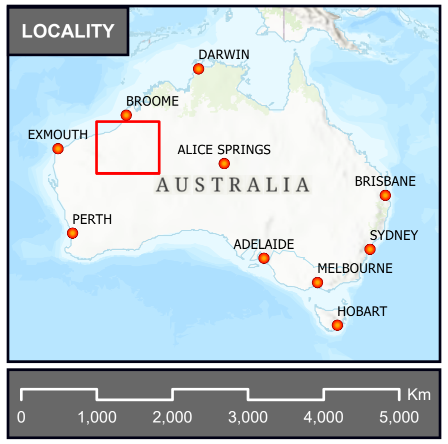
- Major River
- Minor River
- Waterbody

Terrain (SRTM)

- High
- Low

- Interpreted Palaeovalley

LOCALITY



Interpreted Palaeovalleys

(Adapted from English et al 2015)

Havieron Mine Site

Stage 2 Referral

N

0 5 10 15 20 Km

Coordinate System: GCS GDA 1994
Scale @ A3: 1:500,000

Prepared:	N Johnston	Date:	11/10/2021
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Project:	TE21074		

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Figure 3

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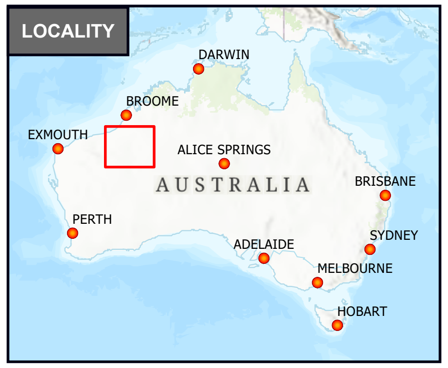
LEGEND

- Development Envelope
- Indicative Footprint (Stage 1)
- Indicative Footprint (Stage 2)
- Claypan Areas

Current Roads

- Regional Roads and Tracks

LOCALITY



CLAYPANS MAPPED WITHIN DEVELOPMENT ENVELOPE and SURROUNDING AREA

Havieron Mine Site

Stage 2 Referral

N

0 250 500 750 1,000 Metres

Coordinate System: GCS GDA 1994
Scale @ A3: 1:39,063

Prepared: N Johnston	Date: 21/09/2021
Reviewed: G Barrett	Revision: A
Project: TE21074	

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Figure 4

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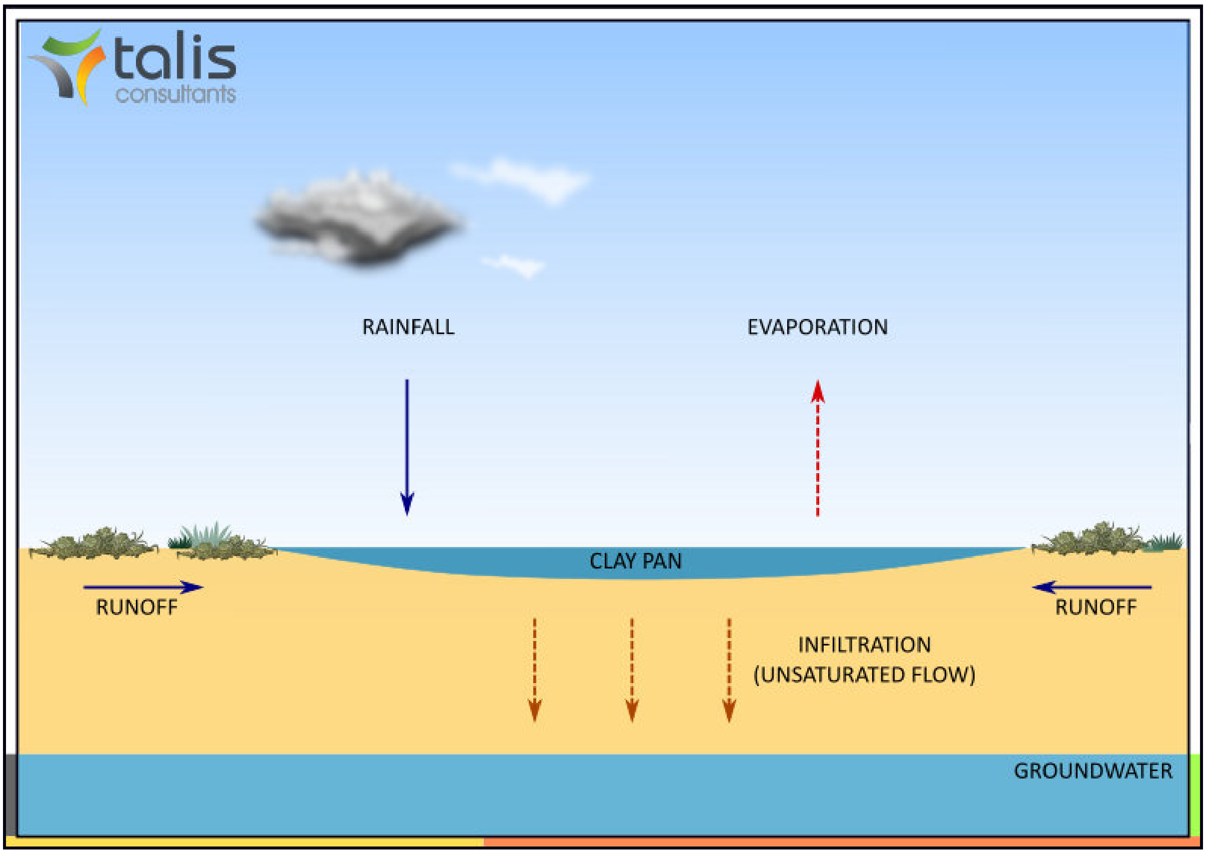

Figure 5: Hydrological model of a clay pan

Non-glaciogenic paleovalleys such as the Percival Paleovalley (Figure 6) are of presumed Cenozoic age. In places, these river valleys have been incised down to the Permian sediments. Away from the paleovalley, the surface geology is dominated by Quaternary-aged aeolian sand dunes, characteristic of the Great Sandy Desert.

About 30 km west of Havieron, remnants of the Permian-Carboniferous fluvio-glaciation landforms outcrop, however, these outcrops are not present proximal to Havieron. Regionally the topographical lows of interdunal swales where the superficial deposits have completely eroded, the Permian-aged Paterson Formation is exposed.

It is suggested there may be a number of potential non-glaciogenic paleovalleys of presumed Cenozoic age in the vicinity of the Project. The most significant valley near Havieron, the Percival Paleovalley (Figure 6), is a large NW-SE valley about 4-5 km west of the Project at about 242 m AHD elevation. The valley seems to correlate well with mapped massive calcrete outcrops. The Project is at about 250 mAHD elevation and the topography grades to the west towards the Paleovalley. The Paleovalley drains to Lake Dora, a Ramsar wetland, at about 237 m AHD elevation 40 km south-east of Havieron.

2.2.2 Havieron Hydrogeological setting

A conceptual hydrogeological model has been developed (Rockwater 2020; 2021b) as shown in Figure 7. The water table is generally greater than 10 m at the Project, becoming shallow to the west (up to 5 m depth from ground level). Hydrogeological works by Rockwater have identified four key aquifer units at the Project, in order from the surface:

1. Unconfined/Perched Aquifer;
2. Upper Confined Aquifer;
3. Lower Confined Aquifer; and
4. Proterozoic Aquifer (fractured).

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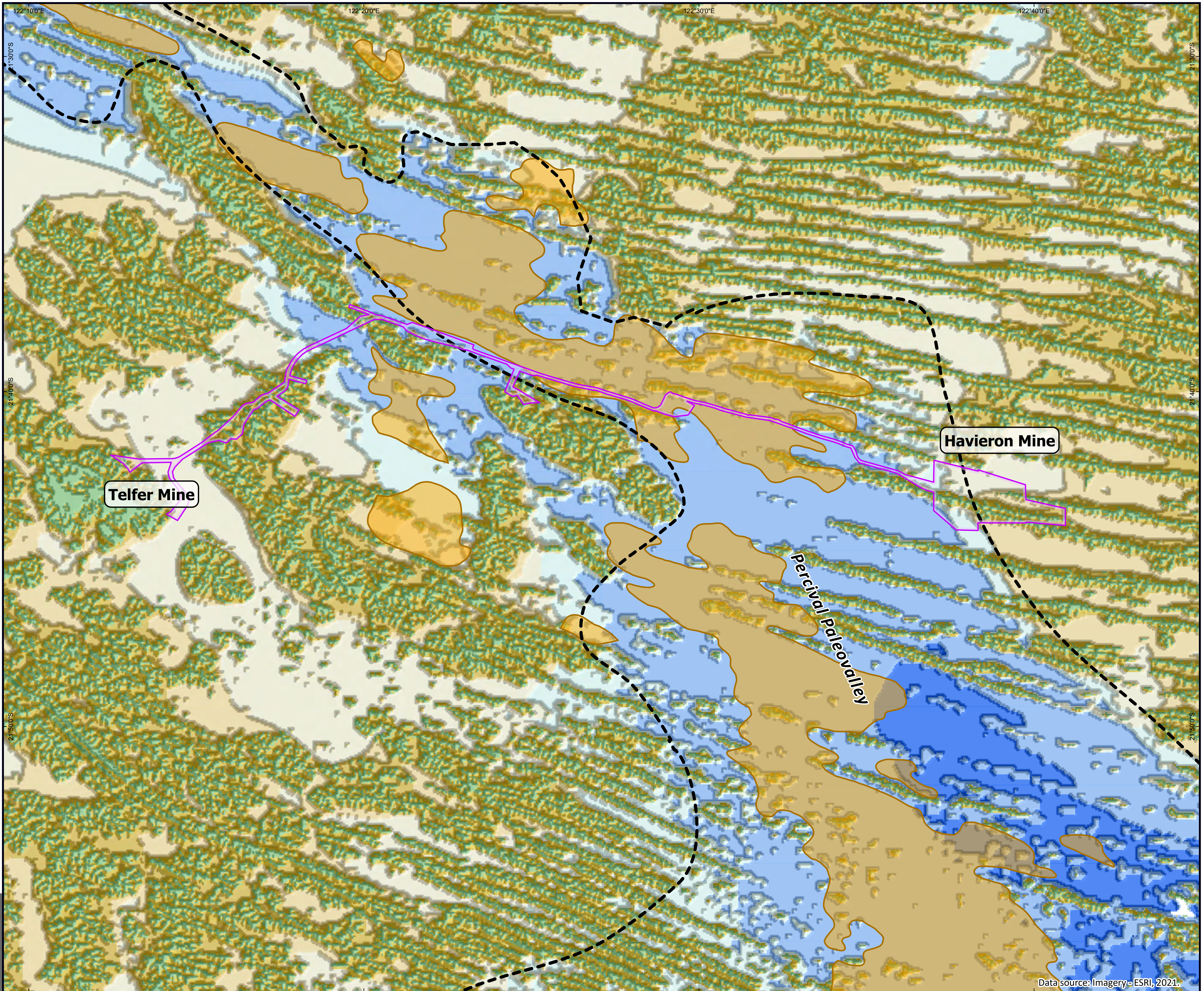


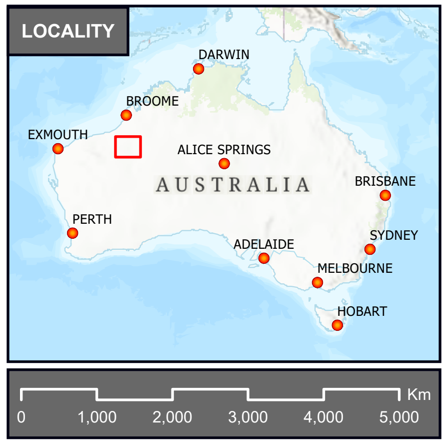
LEGEND

- Development Envelope
- Palaeovalley
- Calcrete Outcrops

Multi-resolution Valley Bottom Flatness (MrVBF)

Value

9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0



REGIONAL HYDROGEOLOGY SETTING

Havieron Mine Site

Stage 2 Referral

N

0 1 2 3 4 5 6 7 Kilometers

Coordinate System: GCS GDA 1994
Scale @ A3: 1:200,000

Prepared:	N Johnston	Date:	15/09/2021
Reviewed:	G Barrett	Revision:	A
Project:	TE21074		

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Figure 6

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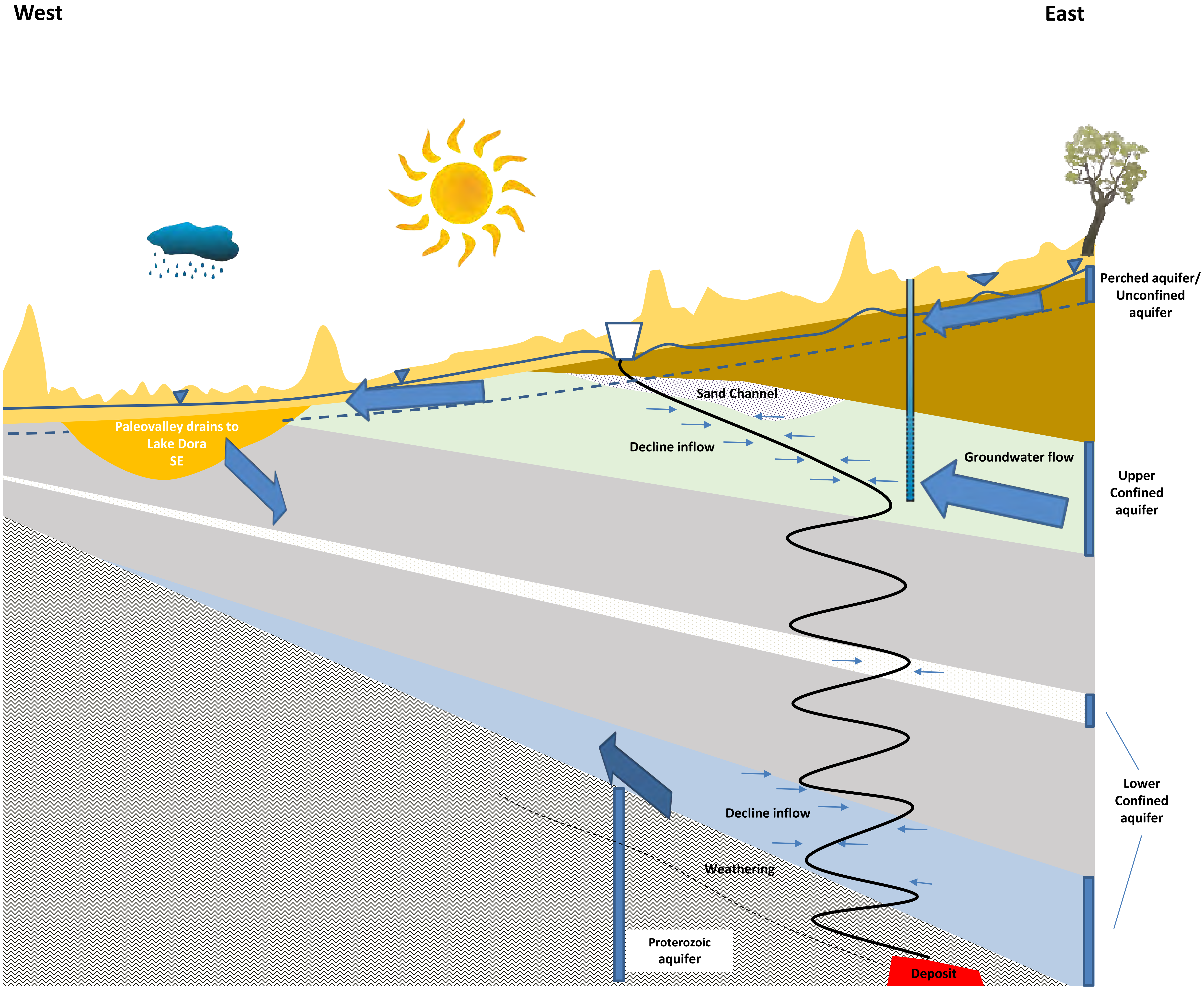
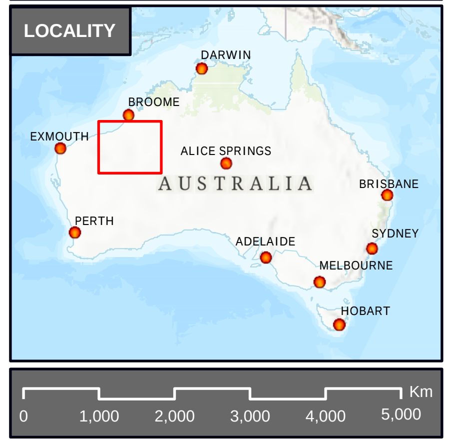


LEGEND

- Superficial cover(perched aquifer)
- Base of saprolite (perched aquifer)
- Percival Paleovalley
- UWM (aquitard)
- Sand at base of UWM (aquifer)
- UFT (aquifer)
- LCS (aquitard)
- LST (aquifer)
- LSL (aquitard)
- LFT (aquifer)
- Basement (aquitard)
- Havieron boxcut
- Decline
- Groundwater flow direction



Havieron Conceptual Model
(Adapted from Rockwater 2021)
Havieron Mine Site

Stage 2 Referral

Prepared:	N Johnston	Date: 11/10/2021	
Reviewed:	G Barrett	Revision:	A
Project:	TE21074		

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Figure 7

The aquifers listed in points 1 to 3 above have a regional extent and are thought to occur outside of the extent of the tenement. These aquifers are described below with key characteristics summarised in Table 2. The key hydrogeological features include:

- Groundwater flow is from the east to the west from about 240 m AHD to 247 m AHD in the Upper Confined Aquifer;
- Vertical head gradients between the cover and Upper Confined Aquifer where Upper Mudstone (UWM) (mudstone) is thick;
- Strong vertical gradient across the LCS unit (Upper Siltstone) consistent with the head difference between the Upper and Lower Confined Aquifer and the low hydraulic conductivity of the Siltstone unit; and
- Groundwater flow in the Lower Confined Aquifer is south to north.

Table 2: Havieron - aquifer characteristics

Aquifer	Depth	Primary Porosity / Fractured	Salinity (mg/L TDS)	Water elevation RL
Unconfined/ Perched Aquifer	Within the uppermost 10 m of saturated saprolite	Primary Porosity	15,000 – 40,0001F0F[1] - Highly saline - Hypersaline	240 – 250
Upper Confined Aquifer	Top of aquifer from 10 m in the west to up to 110 m in the east	Both	2,000 - 20,0002F1F[2] - Brackish – Highly saline	240 – 247
Lower Confined Aquifer	Typically about 150 m deeper than the Upper Confined Aquifer	Both	55,000 - Hypersaline	221 - 235
Proterozoic Aquifer	Underlying the Lower Confined Aquifer	Fractured	N/D	N/D

Note: N/D = Not determined

2.2.2.1 Unconfined/ perched aquifer

The Unconfined/Perched Aquifer is predominantly made up of weathered Permian material and is relatively thin (<10 m thickness); in the east the saprolite overlies fresh mudstone of low permeability and it is hydraulically disconnected from the underlying Upper Confined Aquifer, in the west the mudstone is thin or absent and there is hydraulic connection between the two units. The undifferentiated Quaternary cover is generally unsaturated but is included in this aquifer where the sequence is saturated.

Groundwater chemistry is saline, slightly alkaline with a sodium-chloride type with elevated sulphate concentrations. Dissolved iron concentration is approximately 0.45 mg/L.

2.2.2.2 Upper confined aquifer

The Upper Confined Aquifer is made up of glacial tillite and, nearby to the project area, a more permeable palaeochannel sandstone fill occupies a locally incised glacial valley. This is the major aquifer at Havieron. It flows from east to west, discharging into the calcrete aquifer to the west. The aquifer is slightly brackish and may be recharged by leakage of fresher groundwater from the younger Triwhite Sandstone where the Numkambah Formation is thin or absent to the east of the model area. Minor rainfall recharge may also occur where the overlying mudstone is thin or absent.

The groundwater is slightly alkaline with a sodium-chloride type with elevated sulphate concentrations and dissolved iron concentrations of approximately 0.64 mg/L.

2.2.2.3 Lower confined aquifer

The lower aquifer is made up of glacial tillite with a mud matrix to sand matrix. It is separated from the upper aquifer by a thick succession of siltstone. The aquifer is hypersaline and has a different

[1] As measured near Playa lakes, hundreds of metres away from the Playas, salinity likely to be around 2,000 – 5,000 mg/L

[2] Increasing with depth

potentiometric surface from the Upper Confined Aquifer. Based on limited data from deep Permian bores penetrating the aquifer, it appears to flow from south to north in a similar fashion to the deep formations of the Canning Basin. It is likely that the unit is laterally in connection with the Grant Group which is saline in the area. The Grant Group is likely to provide pressure support and control groundwater flow in this aquifer which does not outcrop in the model area.

The groundwater is slightly circumneutral, of a sodium-chloride type with elevated concentrations of sulphate and dissolved iron concentrations are about 4.8 mg/L.

2.2.2.4 The Proterozoic Aquifer

The Proterozoic aquifer is comprised of bedded sediments of the Proterozoic Yeneena Basin. The mineralisation is understood to be hosted in the eastern limb of a fault propagated anticlinal fold. The bedded sediments were brecciated by this deformation, cemented and then replaced by sulphide minerals, followed by a dolerite intrusion. The Proterozoic formation has negligible primary porosity and groundwater is only hosted in the weathered contact with the overlying Permian strata or in fractures, which are most notable in the dolerite dike.

There are no bores drilled directly into the Proterozoic aquifer, so there are no water levels or salinity data for this aquifer. However, the water level is likely to be similar to the Lower Confined Aquifer and the salinity is likely to be more saline. There is no recharge to the Proterozoic aquifer in the project area.

2.2.2.5 Beneficial users

The results of the hydrogeological assessment indicate that dewatering of the proposed underground decline is likely to be localised to an area close to the mine within the Paterson Formation rather than regionally extensive.

The nearest listed Important Wetland is the Lake Dora (Rudall River) system, which is located 35 km south east of the Project Area. The bio-region is known to support small permanent wetlands associated with palaeo-drainage lines with fresh-water springs and seepages considered significant water sources with biological and cultural significance. Environmental and cultural surveys have not identified any such fresh-water springs and the distance to Lake Dora would not result in any impacts on the wetland from the implementation of the project.

More specifically, the zone of impact is predicted to be about 10.3 km x 8.0 km in the Upper Confined Aquifer and 16.1 km x 17 km in the Lower Confined Aquifer for a conservative modelling scenario. The hydrogeological assessment showed minor drawdown in the Unconfined Aquifer.

The Punmu aboriginal community is located on the eastern shore of Lake Punmu (10,000 kL water entitlement) 35 to 40 km to the south east of Havieron. The water supply at Punmu is from the Triwhite Sandstone which is laterally equivalent to the Paterson Formation at Havieron but significantly more permeable. No impact to the Punmu water resources is expected. No other significant beneficial groundwater users are potentially impacted by the Project.

Given the potential significance of surface water features, new disturbance to clay pans and salt lakes will not occur. The mine area contains a number of small clay pans (Figure 4). Ongoing consultation with WDLAC will occur to minimise impacts to these areas.

2.3 Flora and Vegetation

Within the Havieron Project Area, 11 vegetation types were recorded and mapped (Strategen JBS&G 2020a, 2020b, 2020c, 2021). In addition, cleared areas were also classified. The dominant vegetation type in the unburnt area was recorded as type 6b (8,872.94 ha) which was 62.37% of the entire Survey Area. This vegetation type is typified by *Acacia stellaticeps* and *Triodia* grass lands dominated by *T. basedowii* with scattered Senna and Grevillea shrubs.

One vegetation type, 6i, was restricted within the survey area, and contained scattered *Eucalyptus victrix*, a species associated with increased water availability. The only location was a small area

(0.5 ha) within the mine footprint, close to the proposed west rock landform, although it is not scheduled for clearing.

Eucalyptus victrix is an opportunistic water user with 'intermediate' groundwater dependency as evidenced by leaf potential, daily transpiration rates and canopy conductance when compared to other phreatophytic vegetation (O'Grady et al. 2009). *Eucalyptus victrix* is recognised to be less reliant on groundwater access and is known to survive solely on vadose soil water sources. This vegetation community is located within an area of localised water collection, potentially capturing surface water runoff during periods of heavy rainfall. Additionally, no other known groundwater dependant taxa are present within this vegetation type. Based on this, *Eucalyptus victrix* is likely to be primarily reliant on surface water within this vegetation and as such, vegetation type 6i is unlikely to represent a Groundwater Dependant Ecosystem (GDE).

The 6i vegetation community is located outside of the potential drawdown associated with the unconfined aquifer, although it is within predicted area of impact associated with the Upper Confined Aquifer. The unconfined aquifer is predicted to be between 15,000 – 40,000 mg/L, indicating it is unlikely to support the *Eucalyptus victrix* due to aquifer salinity.

None of the vegetation associations mapped and described are listed as Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs).

2.4 Terrestrial Fauna

2.4.1 Overview

A total of 106 vertebrate fauna species, comprising 19 mammal species (16 native and three introduced), 45 bird species, 37 reptile species and five amphibian species were recorded from the Study Area (Biologic 2020a, 2020b, 2021a, 2021b, 2021c). All species recorded were typical of assemblages for the broad fauna habitats present within the Great Sandy Desert region.

Five conservation significant vertebrate fauna species were recorded within the Study Area; the greater bilby, northern marsupial mole, brush-tailed mulgara, western pebble-mound mouse and gull-billed tern.

2.4.2 Fauna Habitats

At a species level, habitats mapped (Figure 8) within the Study Area were assessed for the provision of critical habitat for conservation significant species (areas necessary *"for activities such as foraging, breeding, roosting, or dispersal"*). Within these categories, habitat types were recognised as providing primary habitat (i.e. critical habitat as per the definition above), or secondary habitat (i.e. habitats not critical for foraging, breeding, roosting or dispersal, but may support such activities and/ or habitats of marginal suitability for such activities).

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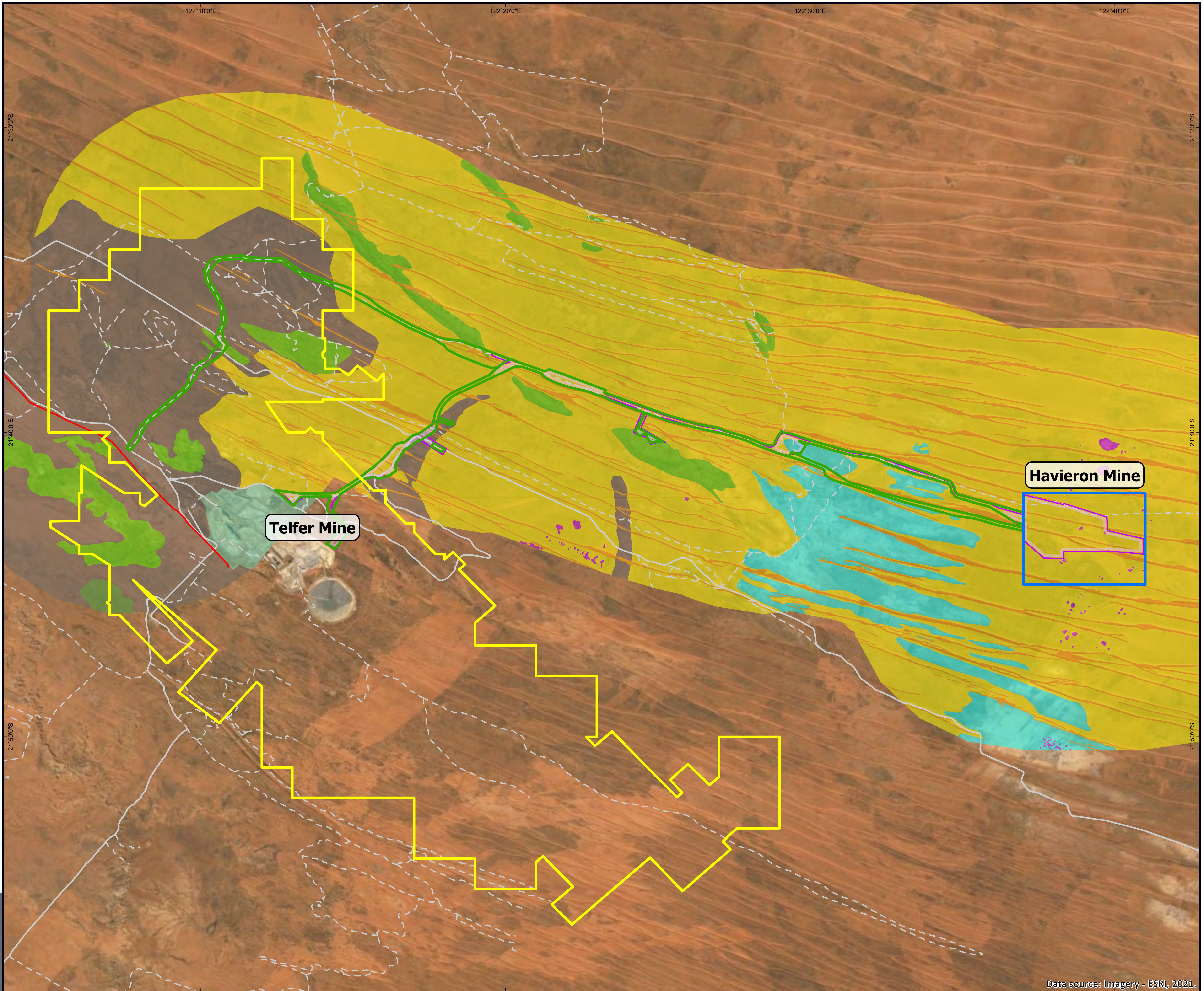


LEGEND

Development Envelope

Fauna Survey Area

- Biologic 2020a
- Biologic 2021a
- Spectrum 2021

Fauna Habitats

- Claypan
- Cleared/Disturbed
- Saltpan
- Sand Dune
- Sand Plain
- Stony Hill, Breakaway
- Stony Plain

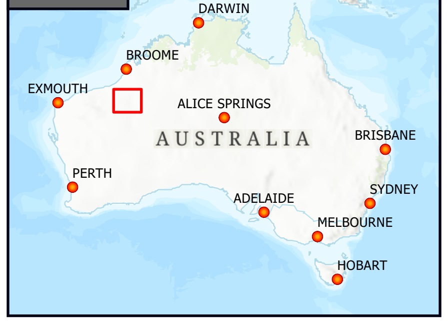
Pipelines

- Gas

Current Roads

- Minor Road
- Regional Roads and Tracks

LOCALITY



FAUNA SURVEY HABITATS

Havieron Mine Site

Stage 2 Referral

0 2 4 6 8 10 Km

Coordinate System: GCS GDA 1994

Scale @ A3: 1:220,000

Prepared:	N Johnston	Date:	15/09/2021
Reviewed:	G Barrett	Revision:	A
Project:	TE21074		

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NEWCREST MINING LIMITED

Figure 8

Document Path: \\server\Talis\SECTIONS\Environment\Projects\TE2021\TE21074 - Havieron approvals\GIS\Maps\Havieron_TE21074_EPA_Assesment\Havieron_TE21074_EPA_Assesment.aprx

Of the six broad fauna habitats occurring within the Study Area, Sand Plain, Sand Dune and Saltpan habitats provide suitable habitat, for the highest number of species of conservation significance. This includes primary breeding, nesting/roosting and/or foraging habitats for night parrot, greater bilby, great desert skink, mulgara and northern marsupial mole, particularly in areas not affected by recent widespread fires within and in the broader vicinity of the Study Area, where vegetation structure and composition provide optimal habitat for the species. Potential foraging habitat is also provided for grey falcon and peregrine falcon. Although a large extent of these habitat's occurrence within the Study Area is in various stages of post-fire regrowth, and therefore providing suboptimal primary habitat, they are still likely to provide secondary foraging and/or dispersal habitat for these species. All the species have the potential to occur in these habitats within the Study Area as residents, with suitable habitat, in the form of both primary and secondary habitats, present to support all life stages of each species. The occurrence of these species and extent of their occurrence within these habitats is likely to be dependent on vegetation cover and seasonality, with higher likelihood of occurrence likely to occur in unburnt areas which are more likely to provide primary breeding or nesting/roosting habitat and following rainfall events when seasonal foraging habitat is likely to be more abundant.

Saltpan habitat provides suitable habitat for night parrot, particularly in areas where larger mature spinifex (*Triodia* species) occurs near chenopods (*Atriplex* and *Tecticornia* species), which together provide suitable primary nesting/roosting and primary (annual) foraging habitat for the species. In contrast, foraging habitat provided by Sand Plain and Stony Plain habitats are likely to only provide secondary (seasonal) foraging habitat. Saltpan habitats may also provide suitable habitat for migratory shorebirds; however, the value and extent of species' occurrence would be seasonal, particularly following high rainfall events when it is most likely to be inundated and utilised by migratory shorebirds and waterbirds.

Stony Plain and Stony Hill, Breakaway or Other Outcropping habitats provide suitable habitat for western pebble-mound mouse and brush-tailed mulgara, particularly where suitable burrowing substrates, and resources (pebbles) permitting burrow and mound construction are present. Stony Plain habitat may also provide suitable foraging habitat for night parrot, grey falcon and peregrine falcon.

The value of claypans as a habitat would be seasonal and dependent on high rainfall events, when it is most likely to be utilised by migratory shorebirds and waterbirds. During this time, when claypan habitats are inundated, shorebird and waterbird occurrence is still likely to be intermittent as larger areas of more suitable habitat (i.e. salt lakes) in the vicinity of the Study Area (e.g. Lake Dora, ~30 km SE of the Study Area) are more likely to be utilised, with occurrence within the Study Area likely to be representative of opportunistic visitation while transiting. The small extent and relatively isolated nature of claypan habitat within the Study Area is also likely to influence infrequent occurrence by these species, particularly as they remain dry for a large portion of the year.

All broad fauna habitats occurring within the Study Area are well represented more broadly outside the Study Area, with the extent of habitats within the Study Area often forming part of larger continuations of these habitats beyond the Study Area. Sand Plain and Sand Dune habitats are relatively widespread in areas adjacent to the Study Area and occur more broadly across the Great Sandy Desert bioregion where they are representative of the dominant broad fauna habitats occurring in the region. Due to the common and widespread occurrence of these habitats beyond the Study Area and more broadly throughout the Great Sandy Desert bioregion, it is unlikely that such species would be solely dependent on the extent of these habitats occurring within Study Area itself.

2.5 Subterranean Fauna

2.5.1 Subterranean Fauna Habitat

The Proposal predominantly hosts widespread geological and hydrogeological units that may offer limited habitat to stygofauna. It is considered that prospective stygofauna habitat requires a saturated aquifer, providing water, and lithology containing suitable permeability.

Prospective stygofauna habitat is considered to be the:

- Unconfined / perched aquifer, and
- Upper confined aquifer.

Other aquifers, including the deeper Proterozoic aquifers, are not prospective for stygofauna due to salinity and depth.

Potential habitats for troglofauna appear to be very low to absent within the Project area, which is supported by the current survey findings of only one troglofaunal species at the Project area, located approximately 3 km east from the mining area.

2.5.2 Subterranean Fauna Survey Results

Five field trips took place between November 2019 and May 2021, sampling 58 holes at the Havieron Project and 41 in the Telfer region. In total, 203 subterranean fauna samples were collected recording a total of 796 subterranean fauna specimens comprising approximately 27% stygofauna (154 specimens), 69% amphibious (398 specimens) and 4% troglofauna (24 specimens).

The large number of amphibious worms collected at the Project and Telfer were collected from various geological units and aquifers. One amphibious morphospecies, *Enchytraeidae* \`sp. Biologic-OLIG024\` was recorded from the Project Area and at regional reference sites at Telfer. Two morphospecies, *Enchytraeidae* \`sp. Biologic-OLIG023\` and *Enchytraeidae* \`sp. Biologic-OLIG025\`, were only collected from within the Project Area, however, neither of these were from sites with significant projected drawdown. The species are located in an area of less than 2 m drawdown in the unconfined aquifer with minimal drawdown in the saprolite (Rockwater 2020b).

Within the Project Area, only three stygofauna morphospecies was recorded: an amphipod, *Paramelitidae* \`sp. Biologic-AMPH027\`, an ostracod, *Humphreyscandonini* sp. *indet*. *Paramelitidae* \`sp. Biologic-AMPH027\` and an undescribed *Microcerberidae* species. *Paramelitidae* \`sp. was represented by 11 specimens collected from a single water bore outside of drawdown impacts and in a bore 12 km to the west towards the Percival paleochannel.

Humphreyscandonini sp. *indet*. was represented by two valves (shells) collected in a single sample from within projected drawdown impacts in a hole that targeted alluvials and calcareous cement. This taxon has not been recorded since the original record, which consisted of dead valves (shells). The record occurred in a historical water production bore adjacent to a claypan, on the periphery of prospective stygofauna habitat. It is possible that either the records washed into the bore from the adjacent claypan or it no longer exists in the areas due to changes to prospective stygofauna habitat. Sediment hatching trials (Biologic 2021c) identified Ostracod individuals in the adjacent claypan.

Paramelitidae sp. Biologic-AMPH027 was recorded on numerous occasions at a historical camp production bore. It is noted that this bore intercepts the Upper Confined Aquifer, which does not have an overlying Unconfined Aquifer. It is inferred that the Upper Confined Aquifer may recharge at this location, therefore potential recharge from rainfall events may occur. In addition, significant prospective stygofauna habitat may exist. The species has been recorded in the regional area (12 km to the east).

The *Microcerberidae* species was recorded at the historical camp production bore, similar to *Paramelitidae* sp. Biologic-AMPH027. Other undescribed species of the taxa have been recorded in the regional area, however the taxa has not been identified elsewhere.

Based on the results obtained, the upper unconfined aquifer appears to represent moderately prospective stygofauna habitat, whereas the two confined aquifers by their nature are unlikely to be prospective, except where they outcrop (away from the Project) and are no longer covered by impermeable layers. The unconsolidated nature of the upper unconfined aquifer is likely to provide reasonable vertical and lateral connectivity and although pore spaces are small, there may be localised patches of calcrete or shallow alluvium that acts as refuges to small communities. The only records of true stygofauna from the Project come from three bores/holes that targeted alluvium/calcrete.

2.6 Havieron Project Impacts

The Project activities that could have potential impacts to water resources include:

- installation of exploration holes and water wells (monitoring or production) – potential impacts to groundwater quality due to inter-aquifer flow (if bores are not discreetly screened in individual aquifers and no seals are in place between the intersected aquifers)
- groundwater abstraction – impacts to local (on-tenure) and regional (off-tenure) water levels and potential impacts to water quality
- underground mine construction – potential impacts to groundwater quality due to inter-aquifer flow
- underground mine construction – potential impacts to groundwater quality due to leaching of acid and/or metalliferous and/or saline drainage
- installation of infrastructure and landforms – potential impacts to surface water flows
- installation of waste rock landform – potential impacts to surface water quality and groundwater quality due to leaching of acid and/or metalliferous and/or saline drainage
- stormwater diversion from operational areas - potential impacts to surface water flows and surface water quality
- transport of raw and hypersaline water from decline to storage ponds - potential impacts to surface water quality
- discharge of sewage effluent to irrigation field – potential impacts to surface water quality and groundwater quality
- storage of raw water and hypersaline water in evaporation ponds – potential impacts to surface water quality, groundwater levels and groundwater quality
- use, transport and storage of hydrocarbons and chemicals - potential impacts to surface water quality
- dust suppression – potential impacts to surface water quality.

2.6.1 Dewatering and Abstraction

Modelling results indicate that inflows to the decline and underground will peak 3 to 4.5 years from the commencement of dewatering, at about 33 L/s and then taper off to about 22 L/s in the longer-term. When incorporated with the borefield supply, this indicates that up to 1.5 GL/a may be required during the peak period of dewatering, with 0.8 to 1.2 GL/a required on an ongoing basis (Rockwater 2021b). These predicted inflows may be conservative, as modelling doesn't incorporate the planned lining of the decline with shotcrete which is expected to reduce inflows.

The required dewatering rate for the decline will be greatest when intercepting the Lower Confined Aquifer, but is predicted to drop as the aquifer around the decline gets depressurised. The zone of impact in the Lower Confined Aquifer is predicted to be approximately 2.5 km x 2.5km.

While additional modelling is being undertaken, no impacts to off-tenure water resources or the Percival Paleochannel are expected based on current modelling. The target Permian aquifers have a regional extent beyond the predicted zone of impact and the water balance predicts the throughflow from the model area will remain positive for both the Upper Confined aquifer and Lower Confined Aquifer. This will ensure there is no significant regional reversal of the groundwater flow direction and/or impact on regional groundwater resources away from the Havieron deposit (Rockwater 2020a).

Production and monitoring bores that will be used during the life of the operation are shown in Figure 9.

The Project currently has a Groundwater Licence (GWL204105(1)) which covers the area to the west of the mining area and allows abstraction of 20,000kL of water per year. Due to the small volume of water expected, impacts to groundwater resources are considered minimal. It is expected that at least one of the production bores will be installed within the Percival Palaeovalley, with an associated regional monitoring bore to be installed, however locations require confirmation.

2.6.2 Evaporation Pond Storage

The evaporation ponds consist of a raw water pond and a hypersaline pond and have been sized on current water balance knowledge. The design intent of the pond is to provide water storage and evaporation of mine water and site run-off (from the WRL and boxcut during rainfall events). The pond sizing may be subject to further review and refinement as further information is known while maintaining good engineering design.

The location of the evaporation pond was selected based on the following:

- Location is below natural ground level associated with the boxcut to avoid potential ingress of water in the unlikely event of an embankment failure.
- Location is outside of the 1 in 100 year flooding event
- Sufficient WRL storage capacity for the potential life of mine is included.

2.6.3 Waste Rock Landform

The Waste Rock Landform (WRL) will accommodate waste rock production from the underground decline and mining operation. As a result of waste material characterisation, the following was identified:

- Up to 1,500,000 m^3 of waste rock requires management as per Table 3;
- Whilst some Potentially Acid Forming (PAF) materials were identified, no management measures are proposed due to their low proportion relative to NAF material;
- Some metalliferous leachate may occur. In particular, elevated Aluminium has been identif d in waste rock leachate, particularly in Saprock material;
- The majority of waste rock types have potential for dispersive material and shall not be placed on the WRL outer surface.
- Dispersive and potential metalliferous material will be placed within an encapsulation core (Figure 10) surrounded by at least 5m of rock armouring with cover of Lower Tillite material to encapsulate dispersive materials (Figure 11). A base of Saprolite material shall be placed to minimise infiltration.

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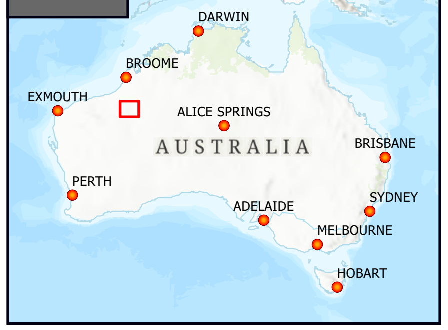
LEGEND

- Bore Locations
- Development Envelope
- Indicative Footprint (Stage 1)
- Indicative Footprint (Stage 2)

Current Roads

- Regional Roads and Tracks

LOCALITY



UNCLASSIFIED PRODUCTION and MONITORING BORES

Havieron Mine Site

Stage 2 Referral

0 100 200 300 400 500 Meters

Coordinate System: GCS GDA 1994
Scale @ A3: 1:15,000

Prepared:	N Johnston	Date:	30/11/2021
Reviewed:	G Barrett	Revision:	A
Project:	TE21074		

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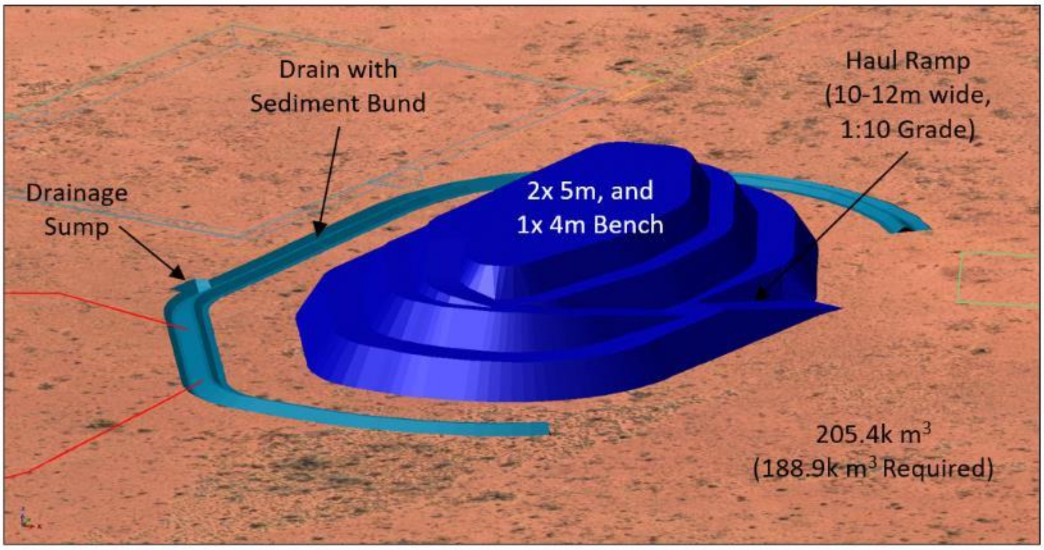
Figure 9

Table 3: Waste Rock Volumes Produced by Decline Development and Underground Mining

Depth	Geology	Rock Type	Volume (m^3)	Proportion (%)
	Permian	Saprolite	2,072	0.12
		Shale	24,097	1.36
		Sandstone	182,429	10.30
		Mudstone	6,565	0.37
		Upper Tillite	50,489	2.85
		Lower Tillite	84,745	4.79
		Conglomerate	29,213	1.65
		Siltstone	74,510	4.21
	Proterozoic	Dolerite	380,586	21.49
		Crescent Zone	16,156	0.91
		Crackle Breccia	81,877	4.62
		Calcite Cemented Breccia	197,943	11.18
		Bedded Sediments	615,618	34.76
		Actinolite cemented Breccia	24,593	1.39
Total			1,770,893	100

Monitoring bores have been placed within the rock armouring portions of the WRL and on the perimeter of the post-closure WRL, in the unconfined aquifer (Figure 9). Monitoring bores are positioned within potential flow pathways in an expanded drawdown or within natural flow pathways (east and west directions).



2x Vertical Exaggeration

Figure 10: WRL encapsulation core design

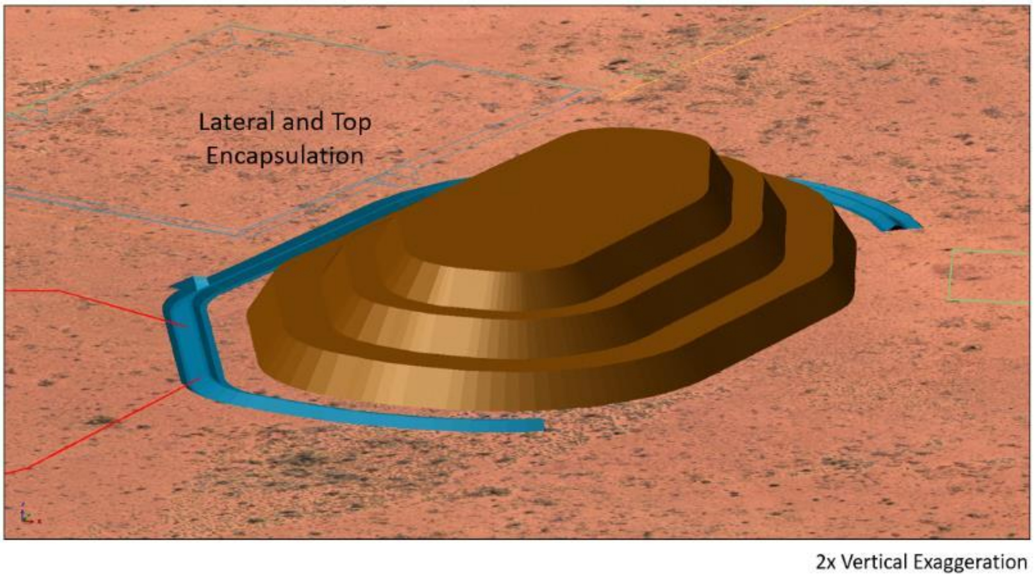


Figure 11: WRL rock armour design

2.6.4 Surface Water Impacts

To minimise any dispersive material from the WRL run-off during operations, a sediment drain is to be installed during dispersive material deposition, to flow into a sediment sump, which will be pumped into the adjacent evaporation ponds, particularly in significant rainfall events (Figure 11). The following sediment controls are proposed:

- Sediment bund and drainage channel have been included at the toe of the WRL;
- Sediment bund is 1 m wide, 0.75 m high with side slopes at 1:3;
- Toe drain is 0.75 m deep to drain 1 m wide at the base with side slopes at 1:3. A sump will be provided at the lowest point to collect runoff, prior to pumping to the evaporation ponds and will be adequately size to capture runoff in a significant rainfall event. The sump will have a floating sump pump and will not be lined, to allow removal of accumulated sediment back to the encapsulation core.

Surface water samples are to be taken in significant rainfall events.

All key infrastructure has been placed outside of the 1 in 100 flooding extent. However, additional surface water controls will be implemented as required, including sediment bunds/sumps, import of road base and V drains.

2.6.5 Irrigation Field

As per Works Approval W6435/2020/1, a 4 ha irrigation field was installed. The Irrigation Field is located outside of the 1 in 100 year flooding extent and discharge criteria and monitoring requirements are included in the Works Approval.

2.6.6 Hydrocarbons

Hydrocarbon use and storage will occur, with a fuel storage facility to be developed. Discharged water from workshops and washdown bays will migrate to an Oil Water Separator. Cleaned water will be re-used as a dust suppression on roads while residual oil will be removed offsite for recycling.

2.6.7 Dust Suppression

Dust suppression will be undertaken with water sources from dewatering, production bores and the RO Plant brine. No hypersaline (35,000 mg/L or higher salinity) will be used for dust suppression.

3. MANAGEMENT PLAN PROVISIONS

3.1 Management Approach

The primary objective of this WMP is 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. To meet this objective, management provisions have been established for the potential impacts.

Management-based provisions relate to management actions and may be used where the part of the environment is not capable of objective measurement and reporting, given uncertainty exists for pathways and receptors. Therefore, management-based provisions have been established to specify management objectives, actions and targets, particularly for impacts that are non-quantifiable based on current information. As monitoring is undertaken and additional data is gathered, the management targets are expected to be reviewed and quantifiable outcome-based provisions established. Early response triggers are detailed in Section 2.2.

The management approaches discussed in this document are based and developed around the mitigation hierarchy of avoid, minimise, rehabilitate and offset to ensure impacts to the water resources have been avoided or reduced to as low as reasonably practicable. Management measures have been designed to minimise the impacts of the Project.

3.2 Focus on Avoidance

Havieron Project infrastructure has been designed to avoid impacts to water resources as follows:

- Placement of key infrastructure (WRLs, boxcut, evaporation ponds, camp, landfill and irrigation area) outside of 1 in 100 year flooding extent
- Production bores designed to avoid any significant subterranean fauna habitat, which based on current survey results may be associated with claypans
- Evaporation ponds for disposal of mine dewater to minimise impacts to surface water and ground water.

3.3 Minimising impact

Project design has included management actions and design criteria to minimise impact to water resources, including:

- Placement of deleterious waste rock material within an encapsulation core with a sediment capture bund
- Groundwater abstraction production bores avoid claypan environments, to minimise impacts of any significant subterranean fauna habitat
- Discrete screening of bores to avoid aquifer cross contamination

Applicable management actions and targets to minimise impacts are proposed in Table 4.

3.4 Remediation actions where impacts cannot be avoided

In the event of unacceptable impact to the environment, remedial actions will be undertaken. Consultation with the DWER and/or the Department of Mines, Industry Regulation and Safety (DMIRS) will be undertaken to confirm adequacy of actions.

3.5 Rationale for choice of provisions

The mitigation hierarchy is based on the objective of avoiding and minimising impacts to levels as low as reasonably practical. The management approach is informed by results of baseline surveys and the WMP will be updated as further information is available.

3.6 Management-based provisions

The primary objective of this WMP is 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. The existing and potential uses are considered to be the following:

- Provision of surface water resources following rainfall events that provide a food and water source to fauna species
- Provision of surface water resources following rainfall events which supports vegetation communities
- Provision of ground water aquifers that support subterranean fauna species
- Provision of ground water aquifers that will support the Havieron Project
- Provision of ground water resources to the surrounding environment, including the Percival Palaeovalley
- Provision of ground or surface water resources that support cultural heritage sites

The associated management objectives are:

- Avoid alteration of natural surface water flows
- Minimise discharges into the environment during significant rainfall events from sediment and waste rock material
- Minimise groundwater quality contamination from waste rock leachate, aquifer cross contamination or evaporation pond seepage
- Minimise contamination from hydrocarbons, saline water and sewage effluent
- Minimise impacts on potential significant subterranean fauna habitat
- Minimise impacts to culturally significant surface water resources
- Minimise impacts to off-tenure water resources.

Based on the Mining Proposal Project Risk Assessment (Table 4), this WMP has specifically been developed to meet the following Environmental Outcomes:

- The WRL is safe, stable and non-polluting with metalliferous and dispersive material suitably contained and not released to the environment
- The use of hydrocarbons and chemicals does not result in contamination to the surrounding environment
- Discharge into evaporation ponds has no adverse impact on groundwater contamination
- No significant cross contamination of groundwater aquifers
- Minimise impacts to significant subterranean fauna habitat, culturally-significant surface water resources and off-tenure water resources.

Implementing the following management actions will help to reduce impacts associated with the Project on the water resources.

Table 4: Havieron risk analysis and evaluation

Management Objective	Environmental Outcome	Risk	Cause	Inherent Risk: Consequence	Inherent Risk: Likelihood	Inherent Risk: Risk Ranking	Risk Treatment	Residual Risk: Consequence	Residual Risk: Likelihood	Residual Risk: Risk Ranking	Monitoring	Reporting
Minimise discharges into the environment during significant rainfall events from sediment and waste rock material Minimise impacts to culturally significant surface water resources	Minimise impacts to culturally significant surface water resources and off-tenure water resources	Erosion and sediment run-off from cleared land impacting on surrounding soil and vegetation	Erosion of disturbed areas, particularly in rainfall events resulting in sediment movement	Minor	Likely	Medium	• Minimise clearing • Avoidance of new disturbance to claypans (50m buffer) • Monitor groundwater levels around selected clay pans in the project area • Avoidance of flooding areas as per 1 in 100 ARI flood modelling • Installation of bunding, V drains and sediment ponds in operational areas to retain any sediment movement where required • Minimise clearing in sandy areas and areas with >40% vegetation cover • Import of material for sheeting to prevent soil erosion and sediment movement • One vegetation community (6i) may have some dependence upon surface water. Visual observations of vegetation community will occur to determine any project impacts	Minor	Unlikely	Low	Refer to Table 10. Workplace Inspections - Refer to Table 6.	Annual Environmental Report – DMIRS
	Minimise impacts to culturally significant surface water resources	Surface water inflow to clay pans within mine area is substantially reduced.	Local reduction of catchment area due to mine infrastructure; lack of drainage structures	Minor	Likely	Medium	• Design drainage so that 'clean' water flows to clay pans. • Development, in partnership with Martu, a monitoring program to assess the health of the claypans. • Develop a cultural landscape management plan.	Minor	Likely	Medium		Liaison with WDLAC.
	The WRL is safe, stable and non-polluting with metalliferous and dispersive material suitably contained and not released to the environment.	Vegetation and soil impacts Surface water impacts	Dispersive material movement resulting in contaminated surface water Unstable WRL from gullies and erosion	Major	Possible	Medium	• Waste characterisation completed • Encapsulation of dispersive material within competent inert (Lower Tillite) material • Any surface water run-off from WRL material to be captured in sediment drains and discharged into evaporation ponds • Waste rock classification system • Waste rock deposition plan • Survey set out of material placement to ensure sufficient space for encapsulation • Monthly survey of waste rock volumes • Use of rock armour or vegetation debris to reduce impact of overland flows if sand is used on slopes • Geotechnical studies, physical field trials and building to robust design • Monitor existing WRL's for both gully and sediment discharge erosion • Endeavour to develop in field physical monitoring of sediment discharge to provide quantitative measures • Further kinetic testing and LEAF analysis to be undertaken as part of Mine Closure Plan • Encapsulation of metalliferous material within competent inert (Lower Tillite) material • Any surface water run-off from metalliferous material to be captured in sediment drains and discharged into evaporation ponds • Minor PAF volumes identified (6%)	Major	Unlikely	Medium	Refer to Table 10. Workplace Inspections - Refer to Table 6.	Annual Environmental Report – DMIRS
Minimise groundwater quality contamination from waste rock leachate, aquifer cross contamination or evaporation pond seepage Minimise impacts to off-tenure water resources		Vegetation and soil impacts Surface water impacts Groundwater impacts	Acid, saline and metalliferous drainage	Major	Possible	Medium		Major	Unlikely	Medium	Refer to Table 8.	Annual Environmental Report – DMIRS Groundwater Monitoring Review & Summary
	No impact to the environment outside of the Project footprint	Odours and groundwater contamination	Leachate from putrescible waste disposal in landfill	Minor	Likely	Medium	• Earthen bunding located around the perimeter of the landfill to prevent surface water inflows (Stage 1 landfill) • Operation of domestic landfill in accordance with DWER Licence/Amendment Notices (including any monitoring bore requirements)	Minor	Unlikely	Low	Refer to Table 8.	Annual Environmental Report - DWER

Management Objective	Environmental Outcome	Risk	Cause	Inherent Risk			Risk Treatment	Residual Risk			Monitoring	Reporting
				Consequence	Likelihood	Risk Ranking		Consequence	Likelihood	Risk Ranking		
	No significant cross contamination of groundwater aquifers	Cross contamination of aquifer impacting on ground water	Cross aquifer contamination of groundwater through drilling between aquifers, boxcut or decline development	Major	Almost Certain	High	• No positive water flows encountered to date (no pressurised aquifer) • Decline will be plugged at identified aquitards upon closure • GLOS and monitoring • Water bores to be constructed as per CAW requirements • Suitably qualified personnel to design water bores • Isolate the Upper Confined Aquifer with a pressure grouted casing in bores targeting the Lower Confined Aquifer • Should mining after the construction of the decline not proceed, the decline will be plugged in a way that prevents any hydraulic connection between the two aquifers • Should mining after the construction of the vent shafts not proceed, the shafts will be plugged in a way that prevents any hydraulic connection between the two aquifers • Groundwater monitoring • Mine Closure Plan includes further investigation into back-filling the boxcut or pit lake studies, including groundwater recovery rates • Plug and abandon any exploration holes putting the two aquifers in contact. This may be undertaken in accordance with the Mandatory Requirements set out in Chapter 18 – Bore Decommissioning of 'Minimum Construction requirements for Water Bores in Australia, Third Edition'	Major	Unlikely	Medium	Refer to Table 8.	Annual Environmental Report – DMIRS Groundwater Monitoring Summary & Review
	Discharge into evaporation ponds has no adverse impact on vegetation health or groundwater contamination	Saline water discharge impacting on soils, vegetation and groundwater	Evaporation pond seepage	Major	Likely	High	• Construction of evaporation ponds as per DWER Works Approval Application • Evaporation ponds High Density Poly Ethylene (HDPE) lined • Regular inspections	Major	Unlikely	Medium	Refer to Table 8.	Annual Environmental Report – DWER Groundwater Monitoring Summary & Review
Minimise contamination from hydrocarbons, saline water and sewage effluent Minimise impacts to culturally significant surface water resources		Saline water discharge impacting on soils and vegetation	Evaporation pond overtopping Failure of evaporation pond embankments	Major	Possible	Medium	• 0.8 m freeboard calculated by engineers (Wood 2020) and wave capacity incorporated into freeboard • Site water balance completed and evaporation sized appropriately • Sufficient capacity in evaporation ponds for WRD and boxcut runoff in 1 in 100 ARI rainfall event • Management of evaporation ponds as per DWER Licence • Crest of embankment to be graded inwards to drain water into pond • Training of personnel in spill response procedures • Surrounding V Drain to minimise surface water ponding against base of embankment in rainfall event • Suitable construction material used	Major	Rare	Low	Refer to Table 10. Workplace Inspections - Refer to Table 6.	Annual Environmental Report – DMIRS & DWER

Management Objective	Environmental Outcome	Risk	Cause	Inherent Risk: Consequence	Inherent Risk: Likelihood	Inherent Risk: Risk Ranking	Risk Treatment	Residual Risk: Consequence	Residual Risk: Likelihood	Residual Risk: Risk Ranking	Monitoring	Reporting
Minimise impacts to off-tenure water resources	The use of hydrocarbons and chemicals does not result in contamination to the surrounding environment	Surface or groundwater contamination from hydrocarbons	Hydrocarbon spills, including from vehicles or refuelling	Minor	Likely	Medium	• All hydrocarbons and dangerous goods on site will be stored and handled as per regulatory requirements • Vehicle inspections upon arrival at site and pre-start inspections • Hydrocarbon spill kits • Incident clean up and reporting • Routine maintenance of all vehicles • Refuelling bay with sumps • Hydrocarbon contaminated soils to be taken to bioremediation facility for treatment • Waste oil tank stored in a bunded area and disposed of by a licenced contractor • Hydrocarbon contaminated material and oil filters will be stored in fully enclosed metal bins and then removed by a licensed contractor • All vehicle washdown bays will have vehicle wash down water directed to a sump for treatment in an oily water separator. Treated water will be discharged into the evaporation ponds and will be sampled monthly for hydrocarbon levels	Minor	Unlikely	Low	Refer to Table 10. Workplace Inspections - Refer to Table 6. Quarterly review of incident and inspection reporting	Annual Environmental Report - DMIRS
	No impact to the environment outside of the Project footprint	Contaminated water from drilling impacting on surface/ground water	Drilling sumps overflowing of drill wastewater Uncontrolled discharge of drilling fluids	Minor	Likely	Medium	• Sufficient sump capacity as part of the design • All biodegradable drilling fluids (no petroleum based fluids) • No unauthorised disposal of drilling fluids. No disposal of drilling fluids into clay pans or onto ground where migration to clay pans may occur • Water used for drilling shall be clean and free of contaminants. • Line sumps to ensure containment	Minor	Unlikely	Low	Workplace Inspections - Refer to Table 6.	Annual Environmental Report - DMIRS
	No impact to the environment outside of the Project footprint	Saline water discharge impacting on soils and vegetation	Dust suppression	Minor	Likely	Medium	• Hypersaline water (approximately greater than 35,000 mg/L Total Dissolved Solids) will not be used for dust suppression • Raw water quality is considered acceptable, with no elevated metals • Any high traffic roads which require regular dust suppression will have windrows and V-drains constructed to contain any accumulated salinity • Sediment sumps will be constructed if required and any saline accumulation will be disposed into evaporation ponds • Water cart will utilise dripper bars where possible to minimise over-spray into adjacent vegetation	Minor	Unlikely	Low	Refer to Table 10. Workplace Inspections - Refer to Table 6.	Annual Environmental Report - DMIRS
	No impact to the environment outside of the Project footprint	Soil and groundwater contamination	Untreated waste water spill from the waste water treatment plant (WWTP) Nutrient loading in irrigation area Treated effluent quality exceedance from WWTP	Minor	Likely	Medium	• Regular WWTP inspections • Third party supply and maintenance of WWTP • Appropriate design of facilities (for volume) • Inspection of tanks daily • Windrows to prevent vehicle interactions with pipeline • Signage indicating presence of pipelines • All containment infrastructure will be built in accordance with relevant Australian Standards • WWTP alarm system • Pipeline contains treated water and is not a pressurised process. Low risk process and does not require regular inspections • Report any spills of untreated effluent to DWER • Effluent discharge limits to be implemented • Discharge limit exceedance to be reported and discharge to cease • Ongoing WWTP maintenance, inspections and servicing	Minor	Unlikely	Low	Refer to Table 10. Workplace Inspections - Refer to Table 6.	Annual Environment al Report - DWER

Management Objective	Environmental Outcome	Risk	Cause	Inherent Risk: Consequence	Inherent Risk: Likelihood	Inherent Risk: Risk Ranking	Risk Treatment	Residual Risk: Consequence	Residual Risk: Likelihood	Residual Risk: Risk Ranking	Monitoring	Reporting
Minimise impacts on potential significant subterranean fauna habitat Minimise impacts to off-tenure groundwater resources (including Percival Palaeovalley) Minimise impacts to culturally significant surface water resources	Avoidance of significant subterranean fauna habitat No impact to off-tenure groundwater resources	Impacts to Subterranean fauna species or claypans	Dewatering from production bores, boxcut and decline development	Major	Likely	High	• Subterranean fauna surveys completed, extent of species investigated and identification of areas for avoidance • Avoidance of production bores within 100 m of claypans • If additional production bores are required, a review of hydrogeological drawdown model will occur to determine if further subterranean fauna sampling is required • Groundwater abstraction licence and associated Operating Strategy includes monitoring requirements • Monitoring of abstraction volumes and adjacent monitoring bores (flow meters installed) • Annual groundwater monitoring report	Major	Unlikely	Medium	Refer to Table 8.	Annual Environmental Report – DMIRS Groundwater Monitoring Summary & Review
		Depletion and drawdown on groundwater impacting other beneficial ground water use	Drawdown of existing groundwater bores	Minor	Likely	Medium	• Hydrogeological assessment and modelling completed • Groundwater abstraction licence and associated Operating Strategy includes monitoring requirements • Monitoring of abstraction volumes and adjacent monitoring bores (flow meters installed) • No GDEs in the project area. One vegetation community (6i) is not considered a GDE, however may be reliant upon surface water. Visual observations of vegetation community will occur to determine any project impacts from drawdown • Monitor groundwater levels near mine site clay pans • Groundwater Licence Operating Strategy (GLOS) as per Groundwater Licence application	Minor	Unlikely	Low	Refer to Table 8.	Annual Environmental Report – DMIRS Groundwater Monitoring Summary & Review
Avoid alteration of natural surface water flows	No impact to the environment outside of the Project footprint	Alteration of stream flow impacting on vegetation	Infrastructure impacting surface water flow	Minor	Likely	Medium	• Surface water flood modelling • placement of key infrastructure outside of flooding zone • inspections following flood events to identify any failure of controls (bund breaches, blocked culverts) • minimal fill material will be used on the service corridor, therefore minimal surface water obstructions • If required, culverts or floodways will be installed to maintain surface water flows • One vegetation community (6i) may be dependent upon surface water. Visual observations of vegetation community will occur to determine any project impacts	Minor	Unlikely	Low	Workplace Inspections - Refer to Table 6	Annual Environmental Report - DMIRS

4. IMPLEMENTATION

Implementation of the WMP will be assisted through an Environmental Management System that will incorporate systems, processes, procedures and work instructions relating to the management, monitoring and reporting components of the WMP.

Newcrest is committed to conducting activities at Havieron in an ecologically responsible manner. The key roles and responsibilities are listed in Table 5.

Table 5: Summary of roles and responsibilities for implementing the WMP

Role	Responsibility
Havieron General Manager	• Overall accountability for the development, authorisation and implementation of the management plans • Ensuring that systems exist, and adequate resources are allocated to assist in the implementation of the plan.
Operational Managers	• Ensure that operational controls are implemented, maintained and adequately resourced • Ensure that appropriate records are maintained and made available as required. • Participate in regular reviews of the plan (For applicable departments) • Ensure that the operational aspects of the procedure are consistent and compatible with other operational procedures and activities • Control of water movements to meet site requirements (flow rate/timing) • Collection and storage of data from flowmeters used for licenced water abstraction and water balance • Maintain sufficient capacity in surface water infrastructure • Manage water supply and demand in-line with priority order for dewatering / abstraction • Operation and maintenance of the surface and ground water management system • Maintenance (including calibrations) and operation of equipment to measure dewatering, supply and abstractions.
Environmental Department	• Participate in meetings that relate to the management plan and provide advice on the environmental implications of any changes that may be proposed • Provide advice on implementing appropriate control measures to prevent impact of any changes to the procedure on the environment • Be responsible for scheduling and implementing the reviews, audits and inspections • Be responsible for scheduling and implementing the environmental monitoring program, reviews, audits and inspections • Undertake or coordinate water investigations when triggers are breached.
All personnel	• Inducted prior to commencement of work on site • Comply with all legal requirements and the requirements of the WMP • Attend environmental inductions and any other training required • Participate in toolbox meetings and encourage personnel to suggest improvements.

4.1 INCIDENTS AND CORRECTIVE ACTIONS

Environmental incidents are defined as breaches or non-adherences to objectives and procedures applied to the project and prescribed in the WMP. Environmental incidents are to be reported to the Environmental Department by the person responsible for the incident or the first person at the site of an incident.

The Environmental Department will assess the type and severity of the incident in accordance with internal procedures. Relevant personnel shall be notified and consulted whether the incident requires notification to regulatory agencies.

4.2 MONITORING

Table 6 provides a summary of the monitoring actions required to implement this WMP. Baseline data will be collected through reference sites and upon installation of monitoring locations (if appropriate). It is expected that sufficient baseline information will be collated within the first 12 months of operation (approximately 2024) to allow a revision of the WMP.

Table 6: Monitoring action summary

Monitoring Event	Monitoring Action	Frequency
Groundwater Monitoring	• Groundwater Monitoring as per Table 7 details the proposed monitoring locations, however these may change dependent on final Project footprint. Table 8 details the monitoring schedule with laboratory analysis included in Table 9.	
Surface water Monitoring	• Water Monitoring as per Table 10.	
Irrigation Field Monitoring	• Water Monitoring as per Table 10.	
Oil Water Separator Monitoring	• Water Monitoring as per Table 10.	
Dust suppression Monitoring	• Water Monitoring as per Table 10.	
Impacts outside of Project footprint	• A general compliance inspection is to be conducted to identify any impacts outside of the Project footprint. This may include vegetation decline, sedimentation, saline accumulation, hydrocarbon staining or fauna habitat impacts.	Monthly

4.2.1 GROUND WATER MONITORING

The specific purpose of the groundwater monitoring strategy is to measure the impacts of the development of the borefield and to ensure the long-term sustainable use of the aquifer for the life of the project.

The establishment of a monitoring system will provide advance warning of any changes required in the borefield-pumping strategy. This may be achieved by comparing observed and model-calculated drawdowns for bores within the modelled zone of impact and confirming no drawdown for the regional bores located outside of the zone of impact (HAE004 and HAE006).

Nine monitoring bores are installed allowing measurements of groundwater levels, physical parameters and providing access for sampling of groundwater quality in both the confined and unconfined aquifers. The monitoring bores are on telemetry, recording water levels, Electrical Conductivity (EC) and pH.

Flow meters of an approved type according to the Rights in Water and Irrigation (Approved Meters) Order 2009 will be/are installed on all production and injection bores and daily total flow volumes will be/are recorded by telemetry. Installed water meters will be tested for calibration in accordance with manufacturer’s specifications.

Climate data are to be sourced from nearby Bureau of Meteorology stations at Telfer or onsite data when a weather station is established. The reports submitted will include rainfall, temperature and evapotranspiration data.

The monitoring carried out will depend on whether the operational status of the project, or its individual licensed water sources is active or inactive. Locations are exempt from monitoring if safe access cannot be made for groundwater sampling.

Production bore water levels are to be measured in installed dip tubes using a tape or using pressure transducers and data loggers. The phase of pumping (pump 'on' or 'off') will be recorded against each measurement. Monitoring bore water levels will be measured with an electronic water level indicators or transducers.

Field chemical data in monitoring bores will be measured using calibrated meters. Water samples will be collected in the monitoring bores for chemical analyses using a sampling pump or bailer or via sampling taps in the production bores.

Should monitoring at any time indicate a need for prompt action to prevent or reduce a deleterious effect on groundwater resources, Newcrest will report and liaise with DWER regarding corrective actions.

Table 7 details the proposed monitoring locations, however these may change dependent on final Project footprint. Table 8 details the monitoring schedule with laboratory analysis included in Table 9.

Table 7: Ground Water Monitoring Locations

Bore ID	Construction	Easting	Northing	Screen Interval	Ground Level	Drilled Depth	Aquifer	Purpose
Production Bores – Impact sites								
HAVWB05	2020	430295	7608610	13.0 - 25.0	260.539	31.1	Unconfined	Service Corridor Production Bores
HAVWB06	2020	446403	7603402	12.4 - 24.4	241.219	25.1	Unconfined	
HAHY025	2021	460720	7598696	TBC	TBC	120	Upper Confined	Camp Production Bore
HAHY026	2021	460720	7598696	TBC	TBC	30	Upper Confined	
HAVWB09	2020	464131	7598198	93.4 - 183.4	256.065	195	Upper Confined	Decline Construction Production Bore
HAVWB10	2020	463982	7597785	88.5 - 166.5	256.856	185	Upper Confined	
HAVWB11	2020	463711	7597344	103.3 - 169.3	262.17	175	Upper Confined	
HAVWB12	2020	464486	7597648	99.3 - 183.3	258.315	199.3	Upper Confined	
HAVWB13	2020	464098	7597213	80.9 - 170.9	261.117	195.2	Upper Confined	
Evaporation Pond Monitoring Bores – Impact sites								
HAHY017	2021	461080	7597325	TBC	TBC	20	Unconfined	Identify potential impacts from evaporation ponds
HAHY023	TBC	461473	7596919	TBC	TBC	270	Upper confined	

Bore ID	Construction	Easting	Northing	Screen Interval	Ground Level	Drilled Depth	Aquifer	Purpose
HAHY022	TBC	461469	7596912	TBC	TBC	90	Unconfined/Upper Confined	
Monitoring Bores – Impact sites								
HAHY015	TBC	462498	7597637	TBC	TBC	250	Upper confined	Monitor impacts from decline construction and associated area of impact
HAHY014	TBC	464476	7597195	TBC	TBC	TBC	Upper Confined	
HAHY024	TBC	463532	7598265	TBC	TBC	70	Upper Confined	
HAHY001	2020	462968	7597434	14.4 – 60.40	254.4	60.4	Upper Confined	
HAHY002	2020	462685	7597272	13.16 – 49.16	252.9	50	Upper Confined	
HAHY003	2020	463177	7597298	12.8 – 100.8	253.6	120	Upper Confined	
HAHY004	2020	464661	7598032	89.0 – 167	258.2	180	Upper Confined	
HAHY007	2020	464660	7598022	82.1 – 166.1	257.9	167.6	Upper Confined	
HAVWB04	2019	463700	7597812	38.0 – 86.0	-	100	Upper Confined	
HAVWB08	2020	463837	7598076	29.5-89.5	255.729	91.5	Upper Confined	

Bore ID	Construction	Easting	Northing	Screen Interval	Ground Level	Drilled Depth	Aquifer	Purpose
HAHY025	TBC	460720	7598696	TBC	TBC	120	Upper Confined	Monitor impacts from Camp Production Bore (HAVWB07)
HAHY026	TBC	460720	7598696	TBC	TBC	30	Unconfined	Monitor potential impacts from Camp Production Bore (HAVWB07)
HAE013_U	2020	463532	7598265	3.55 – 17.55	255.1	17.55	Unconfined	Identify potential impacts from area of impact on prospective stygofauna habitat. No impacts are expected at these sites.
HAE014	2020	463113	7597211	3.58 – 15.58	253.3	15.58	Unconfined	Confirm prospective stygofauna habitat modelling, with these sites not considered to have significant habitat. Identify potential impacts from area of impact (no impacts are expected at these sites).
Monitoring bores – Reference Sites								
HAHY016	TBC	462498	7597637	TBC	TBC	25	Unconfined	Identify any potential impacts for impacts to
HAHY008	TBC	461815	7598249	TBC	TBC	250	Upper confined	
HAHY009	TBC	461815	7598249	TBC	TBC	21	Unconfined	

Bore ID	Construction	Easting	Northing	Screen Interval	Ground Level	Drilled Depth	Aquifer	Purpose
HAHY012	TBC	462071	7598630	TBC	TBC	250	Upper confined	prospective stygofauna habitat. Baseline monitoring locations outside area of impact.
HAHY013	TBC	462071	7598630	TBC	TBC	25	Unconfined	
HAHY010	TBC	462791	7598447	TBC	TBC	30	Unconfined	
HAHY011	TBC	464278	7599023	TBC	TBC	25.4	Unconfined	
HAVWB03	2019	461440	7598802	46.0 – 100.0	-	100	Upper Confined	
VWPs – Impact sites								
HAGT008	2020	463760	7597397	164.0 & 353.0	260.5	420	Upper & Lower Confined	Monitor impacts from decline construction and associated area of impact
HAGT011	2020	463643	7597505	118.5 & 414.8	261.5	444.6	Upper & Lower Confined	
HAHY005	2020	463515	7598287	377.4	254.7	429.6	Lower Confined	
WRL Monitoring Bores – Impact sites								
HAHY018	TBC	461940	7596963	TBC	TBC	30	Unconfined	Identify potential impacts from WRL
HAHY019	TBC	462120	7597027	TBC	5257	30	Unconfined	
HAHY020	TBC	462111	7597093	TBC	5257	30	Unconfined	
HAHY021	TBC	461917	7596963	TBC	5257	30	Unconfined	
Landfill Monitoring Bores – Impact sites								
TBC	TBC	TBC	TBC	TBC	TBC	TBC	TBC	Identify potential impacts from Landfill

Table 8: Ground Water Monitoring Schedule

Bore	Frequency	Records
ACTIVE OPERATIONS		
Production bores	Monthly	○ Extraction (via flow meter) ○ Water level
	Quarterly	○ pH (field) ○ Electrical conductivity (field) ○ Temperature(field)
	Annually	Groundwater samples for comprehensive components analysis (Table 9)
Monitoring bores	Monthly	Water Level
	Quarterly	○ pH (field) ○ Electrical conductivity (field) ○ Temperature (field)
	Annually	Groundwater samples for comprehensive components analysis (Table 9)
Evaporation Pond and WRL Monitoring Bores	Monthly	○ Water Level ○ pH (field) ○ Electrical conductivity (field) ○ Temperature (field)
	Six-monthly	Groundwater samples for comprehensive components analysis (Table 9)
Regional Bores	Quarterly	Water Level
INACTIVE OPERATIONS		
Production bores	Quarterly	○ Extraction, if applicable (via flow meter) ○ Water level
	Bi-Annually	○ pH (field) ○ Electrical conductivity (field) ○ Temperature(field)
	Annually	Groundwater samples for comprehensive components analysis (Table 9)
Evaporation Pond and WRL Monitoring Bores Monitoring Bores	Bi-Annually	Water Level
	Annually	○ pH (field) ○ Electrical conductivity (field) ○ Temperature (field) ○ Groundwater samples for comprehensive components analysis (Table 9)
Regional Bores	Nil	Nil

Table 9: Laboratory Analytes

Major Components Analysis	Comprehensive Analysis
pH	pH
Conductivity	Conductivity
Total Dissolved Solids	Total Dissolved Solids
Total Hardness (as CaCO3)	Total Hardness (as CaCO3)
Total Alkalinity (as CaCO3)	Total Alkalinity (as CaCO3)
Calcium	Calcium
Magnesium	Magnesium
Sodium	Sodium
Potassium	Potassium
Ammonia	Ammonia
Phosphate	Phosphate
Carbonate	Carbonate
Sulphate	Sulphate
Nitrate	Nitrate
Silica	Nitrite
Aluminium - Dissolved	Silica
Iron - Dissolved	Aluminium - Dissolved
Manganese - Dissolved	Arsenic - Dissolved
	Cadmium - Dissolved
	Chromium - Dissolved
	Iron - Dissolved
	Lead - Dissolved
	Manganese - Dissolved
	Mercury - Dissolved
	Selenium - Dissolved
	Zinc - Dissolved
	Copper – Dissolved
	Molybdenum – Dissolved
	Nickel – Dissolved
	Silver - Dissolved
	Total Kjeldahl Nitrogen
	Total Phosphorus

4.2.2 SURFACE WATER AND OTHER WATER MONITORING

The specific purpose of the surface water monitoring strategy is to monitor any potential contamination associated with surface activities. The monitoring schedule detailed in Table 10 focusses on obtaining surface water samples during significant rainfall events to confirm effectiveness of controls and monitoring potential sources of contamination.

Table 10: Surface Water and Other Monitoring Schedule

Location ID	Easting	Northing	Frequency	Records
Surface Water - Reference				
Off-site Surface Water Reference	TBC	TBC	During significant rainfall event	○ pH (field) ○ Electrical conductivity (field) ○ Temperature(field) ○ Total Suspended Solids (laboratory) ○ Comprehensive components analysis (Table 9)
Surface Water – Mine site clay pans				
Surface water inflows	TBC	TBC	During and following significant rainfall event	○ pH (field) ○ Electrical conductivity (field) ○ Temperature(field) ○ Total Suspended Solids (laboratory) ○ Extent of inundation
WRL – Impact sites				
Sediment Drain - Exterior	TBC	TBC	During significant rainfall event	○ pH (field) ○ Electrical conductivity (field) ○ Temperature(field) ○ Total Suspended Solids (laboratory) ○ Comprehensive components analysis (Table 9)
Sediment Sump - Exterior	TBC	TBC	During significant rainfall event	○ pH (field) ○ Electrical conductivity (field) ○ Temperature(field) ○ Total Suspended Solids (laboratory) ○ Comprehensive components analysis (Table 9)
Evaporation Pond – Impact sites				
Dust suppression	TBC	TBC	Monthly	○ pH (field) ○ Electrical conductivity (field) ○ Temperature (field) ○ Total Dissolved Solids (laboratory)
Evaporation Pond discharge	TBC	TBC	Quarterly	○ pH (field) ○ Electrical conductivity (field) ○ Temperature (field)
			Annually	○ Comprehensive components analysis (Table 9)
Irrigation Field – Impact sites				
TBC	TBC	TBC	Continuous	○ Flow volume to irrigation field

Location ID	Easting	Northing	Frequency	Records
			Daily	○ Residual Free Chlorine ○ pH
			Monthly	○ Biological Oxygen Demand ○ Total Suspended Solids ○ Total Nitrogen ○ Total Phosphorous ○ E.coli ○ Total Dissolved Solids
Oil Water Separator Discharge – Impact sites				
TBC	TBC	TBC	Monthly	○ Hydrocarbons suite

4.3 DEVELOPMENT OF TRIGGER AND THRESHOLD CRITERIA

Preliminary trigger and threshold criteria based on preliminary data have been used for early phases of construction. Project trigger and threshold criteria will be developed based on baseline data and groundwater modelling. Baseline data will be sufficient when a stable pattern is established and seasonal variations are considered.

Project trigger and threshold criteria will be developed prior to the commencement of operations.

4.4 REPORTING

The reporting requirements relating to the implementation of the WMP are detailed in Table 11.

All data collected will be presented graphically with time scales to facilitate the comparison of data. Long term graphical trends from previous years' will be included in the monitoring reviews. Groundwater conditions will be compared to annual and long-term rainfall for evidence of recharge or lack of recharge during the monitoring period.

Monitoring data will be reviewed in the annual reports, as appropriate in conjunction with the proponent, to ensure compliance with groundwater licence conditions. The monitoring schedule may be amended as required, in consultation with DWER and DMIRS.

Table 11: Reporting actions

Notification Event	Action	Responsibility	Timing
Management Target Exceedance	In the event that monitoring or investigations indicate that management targets are exceeded, Newcrest will: - report exceedances of preliminary threshold criteria in writing to DWER and DMIRS within 21 days of the exceedance being identified - provide a report to DWER and DMIRS within 90 days of the exceedance - provide advice to WDLAC within 90 days of the exceedance	Environmental Department	Exceedances reported within 21 days of identification Report on exceedance within 90 days of identification
Annual Environmental Reporting	Preparation of an Annual Environmental Report (AER) to DMIRS	Environmental Department	Annually as per tenement conditions

Notification Event	Action	Responsibility	Timing
Annual Environmental Reporting	Preparation of an Annual Environmental Report (AER) to DWER as per any Part V Annual Environmental Reporting guidelines	Environmental Department	Annually as per DWER Licence
Groundwater monitoring summary	Preparation of a report as per Operational Policy 5.12, to include all monitoring data collected from production, VWP, and monitoring bores, including climatic, abstraction and injection rates, water levels, physical parameters and groundwater chemistry, and the impacts of abstraction.	Environmental Department	Due 1 October each year, after licence is awarded
Groundwater monitoring review	Preparation of a report as per Operational Policy 5.12, to include monitoring data from the Havieron borefield, monitoring bores located near the decline together with data from other regional bores. Regional trends and the impact of abstraction will be discussed.	Environmental Department	Due 1 October every three years
Evaluation and revision of the WMP	A review of this WMP will be undertaken every two years. Any significant changes will require review and approval from DMIRS.	Environmental Department	Every two years

5. ADAPTIVE MANAGEMENT AND WMP REVIEW

Newcrest recognises the dynamic nature of ecosystems, that additional monitoring and technical studies will occur and supports adaptive management under this WMP. Adaptive management involves:

- implementing mitigation measures
- monitoring and evaluation against management targets (including early response triggers)
- systematically adapting management and mitigation measures and monitoring to meet the environmental objectives.

As detailed in the Mining Proposal and Mine Closure Plan and this WMP, further monitoring and technical studies will occur as per Table 12. Whilst Project impacts are not expected to be significant, Newcrest proposes to undertake further technical investigations, in particular to further define baseline hydrogeological setting and support closure designs. It is expected that the WMP will be updated every two years. The management measures proposed are expected to minimise any potential impact to the water resources.

Table 12: Additional technical studies and monitoring

Item	Detail	Timeframe
Monitoring Program	Installation of monitoring bores as per WMP and Groundwater Licence Operating Strategy (GLOS) and confirmation of baseline and regional water quality and groundwater levels. It is noted locations may vary.	Prior to commencement of operations
Boxcut – back-filling (Mine Closure Plan)	Investigation into back-filling boxcut and appropriate waste material to confirm back-filling design.	Prior to commencement of operations
Waste Rock characterisation (Mine Closure Plan)	Kinetic and LEAF analysis of waste rock material	Prior to commencement of operations
WRL design (Mine Closure Plan)	Rehabilitation trials for WRL cover	Prior to commencement of operations

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