

Phil's Creek Haul Road Realignment

Clearing Permit Supporting Documentation – Revision 0

L47/569, L47/626, L47/627, L47/950, L47/951, L47/952,
L47/953 and L47/954



Proponent: Mineral Resources Limited
Address: 20 Walters Drive, Osborne Park WA, 6017
Postal Address: Locked Bag 13, Osborne Park DC, Osborne Park, WA 6916
Corporate contact: Matthew Blacklow
Phone: (08) 9315 8582
Email: Matthew.Blacklow@mrl.com.au

Revision History

Rev	Issue Date	Prepared By	Reviewed by	Approved By	Document Purpose
A	02/06/2022	Talis Consultants	M. Blacklow	M. Blacklow	Supporting Document to NVCP Application. First Draft – MinRes Review
0	10/08/2022	Talis Consultants	M. Blacklow	P. de San Miguel	Supporting Document to NVCP Application. Final for submission

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

TABLE OF CONTENTS

ABBREVIATIONS.....	5
1. Introduction.....	7
1.1 Project Background.....	7
1.2 Purpose.....	7
1.3 Approvals.....	10
2. Purpose Permit Area.....	11
2.1 Boundary.....	11
2.2 Tenure and Land Access.....	11
3. Proposed Activities.....	12
3.1 Description of Proposed Activities.....	12
3.1.1 Haul Road and Drainage.....	13
3.1.2 Borrow Pits.....	13
3.1.3 Topsoil and Vegetation Stockpiles.....	13
3.1.4 Turkey’s Nest and Groundwater Bore.....	13
3.1.5 Laydown Area.....	14
3.2 Method of Vegetation Disturbance.....	14
3.3 Rehabilitation and Maintenance.....	14
3.4 Indicative Timeline.....	14
4. Relevant Environmental Characteristics.....	15
4.1 Climate.....	15
4.2 Regional Setting.....	16
4.3 Land Use.....	16
4.4 Geology.....	16
4.4.1 Regional Geology.....	16
4.4.2 Local Geology.....	17
4.4.3 Waste Rock.....	17
4.5 Hydrology.....	18
4.5.1 Flooding Potential.....	19
4.6 Land Systems and Soils.....	21
4.6.1 Land Systems.....	21
4.6.2 Soil Characteristics.....	21
4.6.3 Land Degradation Summary.....	22
4.7 Flora and Vegetation.....	25
4.7.1 Pre-European Vegetation.....	25
4.7.2 Conservation Significant Flora.....	25

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

4.7.3 Introduced Flora 26

4.7.4 Conservation Significant Vegetation 27

4.7.5 Vegetation 28

4.7.6 Vegetation Condition 29

4.7.7 Groundwater Dependent Vegetation 29

4.8 Fauna 31

4.8.1 Fauna Habitat 31

4.8.2 Conservation Significant Fauna 32

4.8.3 Short Range Endemics 35

5. Stakeholder Consultation..... 37

6. Avoidance and Mitigation Measures..... 38

7. Ten Clearing Principles 39

8. Summary and Conclusions..... 44

9. References 45

List of APPENDICES 46

TABLES

TABLE 2-1: PROJECT TENEMENTS..... 11

TABLE 3-1: SUMMARY OF PROPOSED DISTURBANCE FOR THE PROPOSAL 12

TABLE 4-1: ESTIMATED PHIL'S CREEK HAUL ROAD CATCHMENT AREAS (AQ2, 2021) 18

TABLE 4-2: LAND SYSTEM ASSOCIATIONS 21

TABLE 4-3: SUMMARY OF DESKTOP RESULTS FOR CONSERVATION SIGNIFICANT TAXA.... 26

TABLE 4-4: WEEDS RECORDED WITHIN THE PROPOSAL AREA (RAPALLO 2021A)..... 27

TABLE 4-5: VEGETATION TYPES (RAPALLO 2021A) 28

TABLE 4-6: FAUNA HABITATS WITHIN PROPOSED PERMIT AREA (RAPALLO 2022A)..... 31

TABLE 6-1: SITE SELECTION – AVOIDANCE AND MITIGATION 38

TABLE 7-1: ASSESSMENT OF PROPOSED VEGETATION CLEARING AGAINST THE TEN CLEARING PRINCIPLES, AVOIDANCE AND MITIGATION MEASURES 40

FIGURES

FIGURE 1-1: SITE LOCALITY AND LAND USE..... 8

FIGURE 1-2: PERMIT APPLICATION AREA 9

FIGURE 4-1: MEAN ANNUAL TEMPERATURE FOR NEWMAN AIRPORT STATION (ID (007176) (1996-2022) 15

FIGURE 4-2: MEAN RAINFALL (MM) NEWMAN AERO (007176) RECORDED BETWEEN 1971-2022 16

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

FIGURE 4-3: HYDROLOGY AND SURFACE WATER CATCHMENTS 20

FIGURE 4-4: LAND SYSTEMS..... 23

FIGURE 4-5: SOIL MAPPING UNITS 24

FIGURE 4-6: VEGETATION MAPPING..... 30

FIGURE 4-7: FAUNA HABITAT MAPPING..... 34

FIGURE 4-7: SHORT RANGE ENDEMIC SURVEY AND POTENTIAL SRE LOCATIONS 36

ATTACHMENTS

- A Biological Reports
- B Spatial Data
- C Proof of Ownership (Tenure Holdings)

ABBREVIATIONS

ABBREVIATION	DESCRIPTION
AEP	Annual exceedance probability
AH Act	Aboriginal Heritage Act 1974
BC Act	Biodiversity Conservation Act 2016
BoM	Bureau of Meteorology
CID	Channel Iron Deposits
DAFWA	Department of Agriculture and Food of Western Australia
DAWE	Australian Department of Agriculture, Water and the Environment
DBCA	Western Australian Department of Biodiversity, Conservation and Attractions
DE	Development Envelope (Proposed Permit Area)
DMIRS	Western Australian Department of Mines, Industry Regulation and Safety
DWER	Western Australian Department of Water and Environmental Regulation
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EP Act	Environmental Protection Act 1986
EPA	Western Australian Environmental Protection Authority
ESA	Environmentally Sensitive Area
GIS	Geographic Information Systems
GWL	Ground Water Licence
ha	Hectare
IBRA	Interim Biogeographic Regionalisation for Australia
km	Kilometre
m	Metre
mBGL	metres below groundwater level
MP	Mining Proposal
MCP	Mine Closure Plan
MNES	Matters of National Environmental Significance
MinRes	Mineral Resources Limited
MRWA	Mine Roads Western Australia
NVCP	Native Vegetation Clearing Permit
PEC	Priority Ecological Community
Proposed Permit Area	Phil's Creek Haul Road Realignment Project – NVCP Application Area
SMU	Soil Mapping unit

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

SRE	Short Range Endemic
TEC	Threatened Ecological Community
TPFL	Threatened and Priority Flora database
WA	Western Australia
WAH	Western Australian Herbarium
WONS	Weeds of National Significance

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

1. INTRODUCTION

1.1 PROJECT BACKGROUND

Mineral Resources Limited (MinRes) operate the Phil's Creek Iron Ore Mine (Phil's Creek Mine) located approximately 90 km north-west of Newman and 270 km south of Port Hedland, in the Pilbara region of Western Australia. The Phil's Creek Mine ore product, together with ore from MinRes's nearby Iron Valley Mine, is transported to Port Hedland, by road trains for overseas export (Figure 1-1).

As part of the haulage route, MinRes utilises the existing Phil's Creek Haul Road constructed between the Phil's Creek Mine and the Main Roads Western Australian (MRWA) Roy Hill-Munjina Road. Due to ongoing access issues with portions of the existing Phil's Creek Haul Road, MinRes are seeking to safeguard their export route by duplicating a portion of the road to secure long-term access. This will be achieved by realigning their current haulage route to utilise two newly constructed sections of haul road.

The Phil's Creek Haul Road realignment has been split into three sections; a northern, central and southern portion. The central portion of the haul road is currently being assessed to better understand the areas Aboriginal heritage values. For this reason, the central portion of the haul road realignment has been excised from this Project and MinRes propose only to develop the northern and southern sections and connect back onto the existing Phil's Creek Haul Road (in-between the two new sections), to allow for continued access.

This Project involves the construction and use of the northern and southern portions of the Phil's Creek Haul Road realignment and also includes construction of road connections, referred to as 'tie-in's'. These tie-in sections are required to connect the existing sections of the Phil's Creek Haul Road with the newly constructed sections proposed within this Application.

The Project's regional location is shown on Figure 1-1.

1.2 PURPOSE

MinRes require a Native Vegetation Clearing Permit (NVCP) issued under the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (*Clearing Regulations*) to clear native vegetation to construct the Project. The Project area is defined as the northern and southern sections of the proposed haul road, together with the four tie-in sections, to form the Proposed Permit Area.

The purpose of this supporting document is to support the NV-F01 Application for a purpose permit required for the Project (this Application), to seek approval to clear of up to 70 hectares (ha) of native vegetation within a 246 ha Proposed Permit Area (Figure 1-2).

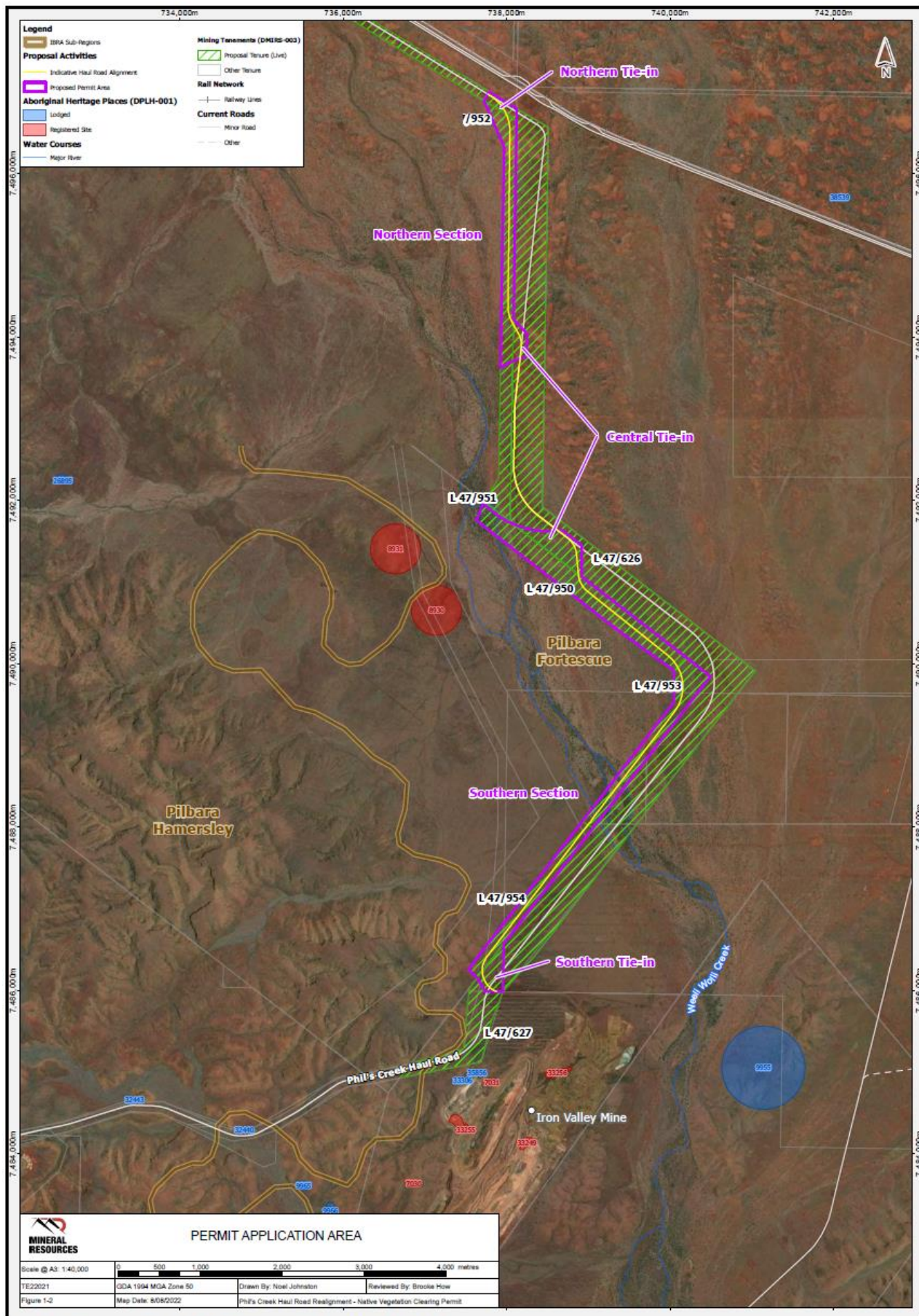


FIGURE 1-2: PERMIT APPLICATION AREA

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

1.3 APPROVALS

The Project's tenure is granted by the Department of Mines, Industry Regulation and Safety (DMIRS), under Miscellaneous Licences L47/569, L47/626 and L47/627, L47/950, L47/951, L47/952, L47/953, and L47/954.

The Phil's Creek Haul Road was constructed under existing approvals, including Mining Proposal for Phil's Creek Haul Road (REG ID 39123) and clearing was approved under NVCPs 5073/1, 5407/2 and 5527/1.

MinRes are currently progressing with approvals under the *Mining Act 1978* relating to this Project. A Mining Proposal (MP; ENV-TS-RP-0396) and supporting Mine Closure Plan (MCP; ENV-TS-RP-0397) will be submitted to DMIRS in accordance with DMIRS 2020 *Statutory Guidelines for Mining Proposals* and DMIRS 2020 *Statutory Guidelines for Mine Closure Plans*, respectively, for the construction, operation and planned closure of the proposed haul road. The expectation is that these submissions will be assessed concurrently with this application.

The Project will require water for construction and dust suppression which will be sourced from MinRes's nearby Iron Valley Mine (as shown on Section 3.1) as well as an existing bore and turkeys nest located on Tenement L47/626. Excess dewater abstracted at the Iron Valley operation will be managed under GWL 182884(4) and GWL 179365(9) which covers water abstracted from the L47/626 bore that is stored in a turkey's nest dam and currently used for dust suppression of the existing haul road alignment.

2. PURPOSE PERMIT AREA

2.1 BOUNDARY

The boundary for all clearing activities proposed in this Application are within a 246 ha Proposed Permit Area. The boundary of the Purpose Permit Area is shown on Figure 1-2.

and geographic information system (GIS) spatial data has been provided as Attachment B.

2.2 TENURE AND LAND ACCESS

The activities associated with this Application will be undertaken wholly within eight mineral tenements granted by DMIRS as listed in Table 2-1 below. These tenements are all held by Process Minerals International Pty Ltd, a wholly owned subsidiary of MinRes. Copies of the tenure holdings are provided as Attachment C.

TABLE 2-1: PROJECT TENEMENTS

TENEMENT	AREA (HA)	HOLDER	STATUS	EXPIRY
L47/569	114.00	Process Minerals International Pty Ltd	Live	21/03/2034
L47/626	491.00	Process Minerals International Pty Ltd	Live	21/03/2034
L47/627	52.00	Process Minerals International Pty Ltd	Live	21/03/2034
L47/950	74.04	Process Minerals International Pty Ltd	Live	26/05/2043
L47/951	41.98	Process Minerals International Pty Ltd	Live	26/05/2043
L47/952	39.80	Process Minerals International Pty Ltd	Live	26/05/2043
L47/953	45.66	Process Minerals International Pty Ltd	Live	26/05/2043
L47/954	34.86	Process Minerals International Pty Ltd	Live	26/05/2043

3. PROPOSED ACTIVITIES

3.1 DESCRIPTION OF PROPOSED ACTIVITIES

The Project requires clearing of up to 70 ha of native vegetation within the 246 ha Proposed Permit Area, as shown on Figure 1-2.

MinRes propose to realign a portion of their current haulage route between the Phil's Creek Mine and the Roy Hill-Munjina Road. This will require the construction of two new sections of haul road and four tie-in sections reconnecting back with the existing Phil's Creek Haul Road. The four tie-in sections are required to connect the following sections of road:

- the existing Phil's Creek Haul Road with the proposed southern section of the realignment (within tenements L47/627 and L47/954)
- the proposed southern section of the realignment back onto the central portion of the existing Phil's Creek Haul Road (within tenements L47/950 and L/47/626)
- the central portion of the existing Phil's Creek Haul Road with the northern section of the proposed realignment (within tenements L47/626 and L47/951)
- the northern section of the proposed realignment back onto the existing Phil's Creek Haul Road at the northern extent (involving tenements L47/952 and L47/569).

Whilst this Project is in development, MinRes have continued use of the existing Phil's Creek Haul Road until the new sections of haul road have been constructed and commissioned for use. The Project requires clearing for the following activities:

- Haul road and drainage
- Borrow pits
- Topsoil and vegetation stockpiles
- Turkey's nest and groundwater bore
- Laydown area.

A summary of the proposed clearing for each of the Project activities is provided in Table 3-1.

TABLE 3-1: SUMMARY OF PROPOSED DISTURBANCE FOR THE PROPOSAL

OTHER MINE ACTIVITY	PROPOSED DISTURBANCE PER TENEMENT (HA)							
	L47/569	L47/626	L47/627	L47/950	L47/951	L47/952	L47/953	L47/954
Haul Road	1.54	4.81	1.44	7.56	0.99	10.66	10.51	10.02
Borrow Pits	2.00	2.00	2.00	2.00	1.50	3.00	2.00	3.00
Turkey's Nest & Groundwater Bore	-	-	-	-	0.55	-	-	0.50
Stockpiles (Topsoil and Vegetation)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Laydown	-	-	-	0.50	0.50	0.50	-	-
TOTAL	3.79	7.06	3.69	11.31	3.79	14.41	12.76	13.77

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

3.1.1 Haul Road and Drainage

The Proposed Permit Area has been designed to allow for flexibility in the final road alignment route to vary based on site-specific conditions encountered during construction. Within the Proposed Permit Area, the actual haul road disturbance will be approximately 47.53 ha, to allow for a road corridor up to a maximum width of 45 m. The northern section of the haul road is approximately 3.34 km in length and the southern section is approximately 7.14 km in length. The indicative haul road alignment is shown on Figure 1-2.

The Project will source road construction material from waste rock stockpiles from the nearby Iron Valley Mine. All material has undergone geochemical testing and waste characterisation to ensure its suitability for use as a road construction base and poses a very low contamination risk to the surrounding environment (refer to Section 4.4.3).

The proposed haul road will cross the minor ephemeral Weeli Wolli Creek at two locations within the Proposed Permit Area, as shown on Figure 1-2. The existing Phil's Creek Haul Road also crosses this creek and existing management measures have been successful at mitigating any impacts to the natural regime of the creek. As such, MinRes propose to implement similar measures including the construction of floodways to maintain the natural flow of surface water in the area. All floodways will be constructed within the nominated 45 m road corridor and informed by the outcomes of flood modelling conducted for the Project by consultant hydrologists (refer to Section 0).

3.1.2 Borrow Pits

In the event there is a requirement for additional local material to be sourced from borrow pits, this Application has made an allowance for vegetation clearing to cover borrow pits within each tenement in the Proposed Permit Area. Borrow pits constructed under this Application would not exceed 3 ha in size and locations will be determined based on site-specific geotechnical review by qualified civil engineers and aim to minimise disturbance to vegetation wherever possible. These allowances are also summarised per tenement in Table 3-1.

3.1.3 Topsoil and Vegetation Stockpiles

Vegetation and topsoil will be removed and stockpiled in accordance with MinRes's existing Land Clearing Procedure (MRL-EN-PRO-0004) and Site Disturbance Permit Procedure (MRL-EN-PRO-0005) during clearing activities for the Project. Stockpiles will be placed at various locations within the Proposed Permit Area alongside construction areas (outside the road corridor) to minimise the overall disturbance width. This Application includes an allowance for stockpile areas of up to 0.25 ha per tenement within the Proposed Permit Area. These allowances are also summarised per tenement in Table 3-1.

Topsoil and subsoils (if required) will be stockpiled separately to ensure the integrity of the topsoils is maintained for future rehabilitation requirements. Stockpiles will be stored at a maximum height of 2 m for topsoil and 4 m for subsoil to ensure their stability. All stockpiles will be sign-posted and locations recorded by site survey as part of MinRes's environmental management system (EMS) for use in future closure and rehabilitation.

3.1.4 Turkey's Nest and Groundwater Bore

Water for the Project's Road construction and ongoing dust suppression is proposed to be sourced from groundwater from the Iron Valley Mine as well as the existing bore located on L47/626. Groundwater is abstracted under existing 5C groundwater licences, 182884(4) and GWL 179365(9) respectively. This Application has allowed for the construction of two turkey's nests, each up to 0.5 ha in surface area, to store abstracted groundwater within the Proposed Permit Area. One turkey's nest has been allocated within the northern section within tenement L47/951 and one in the southern section within tenement L47/954.

Water sourced from the existing bore and turkey's nest located in L47/626 under approved MP 39123, will require the installation of a new above ground pipeline and underground road-crossing beneath the existing Phil's Creek Haul Road. Any above ground pipelines would be laid within existing access tracks and road

corridors and will not require any additional clearing. The management of this water, including potential impacts from leaks or spills will still be managed separately under the existing approvals. Alternatively, MinRes may install a new groundwater bore within L47/951 adjacent to the new turkey's nest, requiring up to 0.05 ha disturbance area for a drill pad. Clearing allocation for both these scenarios has been included in this Application. Approvals for drilling, construction and abstraction will be obtained as required at a later date.

3.1.5 Laydown Area

During construction activities, temporary equipment laydown areas will be required to store construction equipment and materials. When working on the northern sections of the haul road, laydown areas may also require portable site offices and ablutions. These laydowns will be located within the Proposed Permit Area, and where possible, be located within existing disturbed or degraded areas to minimise the overall disturbance footprint. An allowance of up to 0.5 ha within tenements L47/950, L47/951 and L47/952 has been included for laydown areas in this Application. These allowances are also summarised per tenement in Table 3-1.

3.2 METHOD OF VEGETATION DISTURBANCE

Vegetation will be cleared using mechanical methods as per the MinRes Land Clearing Procedure (MRL-EN-PRO-0004) and Site Disturbance Permit Procedure (MRL-EN-PRO-0005), with any topsoil and vegetation removed prior to clearing of subsoils whenever possible. A soil assessment has been conducted at the Proposed Permit Area (refer to Section 4.6.2) with expected topsoil depths varying between 0.15 – 0.43 m below ground level (mBGL). This information will allow selective removal of topsoils within the Proposed Permit Area. All salvaged topsoil and vegetation scrub will be stockpiled separately within the Proposed Permit Area for later use in rehabilitation, or direct reapplication if suitable areas are available at the time.

3.3 REHABILITATION AND MAINTENANCE

Rehabilitation of the haul road and related activities (i.e. borrow pits, turkey's nests, groundwater bores, laydown areas) will be conducted in accordance with the MCP developed for the Project, submitted to DMIRS for assessment concurrently with this application.

The outcome of the soil assessment conducted for the Project (refer to Section 4.6.2), identified that all topsoil and subsoils are considered suitable for use in rehabilitation and revegetation of native species similar to the surrounding areas.

Rehabilitation will typically involve:

- At the completion of construction, removal of all equipment and temporary infrastructure (i.e., site offices, ablutions, laydown areas);
- At closure of the haul road, removal of drainage structures and any other remaining infrastructure;
- Assess the presence and extent of any potential hydrocarbon (or other) contamination within the Proposed Permit Area. Where required, excavate contaminated soils, and transport to hydrocarbon bioremediation areas at Phil's Creek Mine or other approved facilities;
- Recontouring of disturbed areas to blend in with local topography and prevent erosion;
- Rip or scarify compacted surfaces; and
- Spread stockpiled topsoil and vegetation over recontoured areas to facilitate natural revegetation.

3.4 INDICATIVE TIMELINE

Clearing activities are proposed to commence upon grant of this NVCP and DMIRS approvals (MP/MCP) and continue for approximately four months, concluding in early 2023.

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

4. RELEVANT ENVIRONMENTAL CHARACTERISTICS

4.1 CLIMATE

The Permit Application Area is located within the Pilbara Region, characterised by an arid tropical environment which experiences very hot, wet summers and mild, dry winters with low and variable rainfall. Climatic conditions are predominately influenced by tropical cyclones experienced over the summer months (DPIRD, 2021).

The closest Bureau of Meteorology (BoM) weather station to the Project is located at Newman Airport (ID 007176) located approximately 100 km to the south-west of the Permit Application Area.

Based on the available data collected from the Newman Airport BoM weather station, average temperatures recorded during the summer months (December to March) can be up to 35C°, with the hottest days occurring between October and March. During the winter months (June to August) rarely drop below 10C° and average around 20C° during the day (BOM, 2022). A summary of the mean average temperatures recorded at the BoM station is shown in Figure 4-1 below.

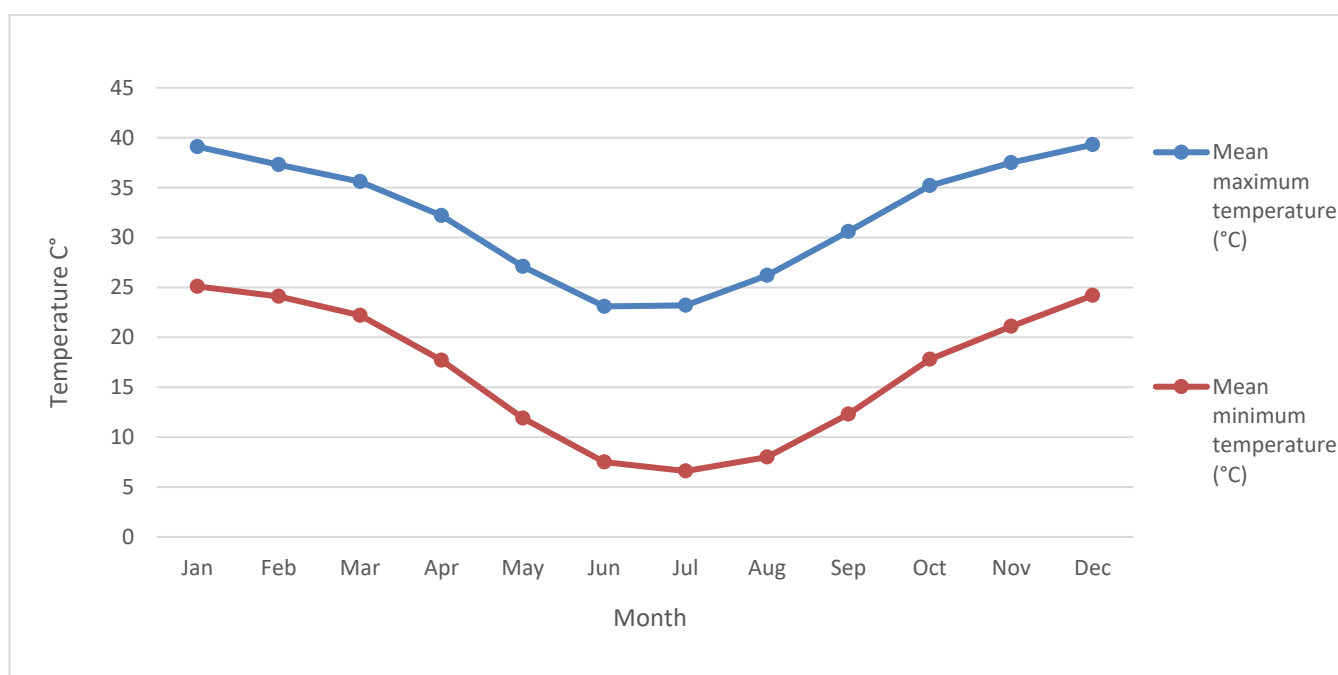


FIGURE 4-1: MEAN ANNUAL TEMPERATURE FOR NEWMAN AIRPORT STATION (ID (007176) (1996-2022)

The majority of rainfall in the Pilbara region occurs between January to March and is mostly due to the seasonal tropical cyclone systems typical for that time of year. Tropical cyclones can contribute to 25-34% of the total annual rainfall in the region (DPIRD, 2021). They typically penetrate from the north, producing sporadic and drenching thunderstorms. Rainfall in the western Pilbara is also influenced by southern mid-latitude drivers, such as frontal systems, during autumn and winter (DPIRD, 2021).

Average annual rainfall recorded since 1971 from the Newman Airport BoM Station is 321.5 mm. February has the highest mean monthly rainfall on record of 72.3 mm and September has the lowest mean monthly rainfall of 3.5 mm (BOM, 2022). A summary of the annual average rainfall collected from the Newman Airport BoM Station between 1971 and 2022 is shown in Figure 4-2 below.

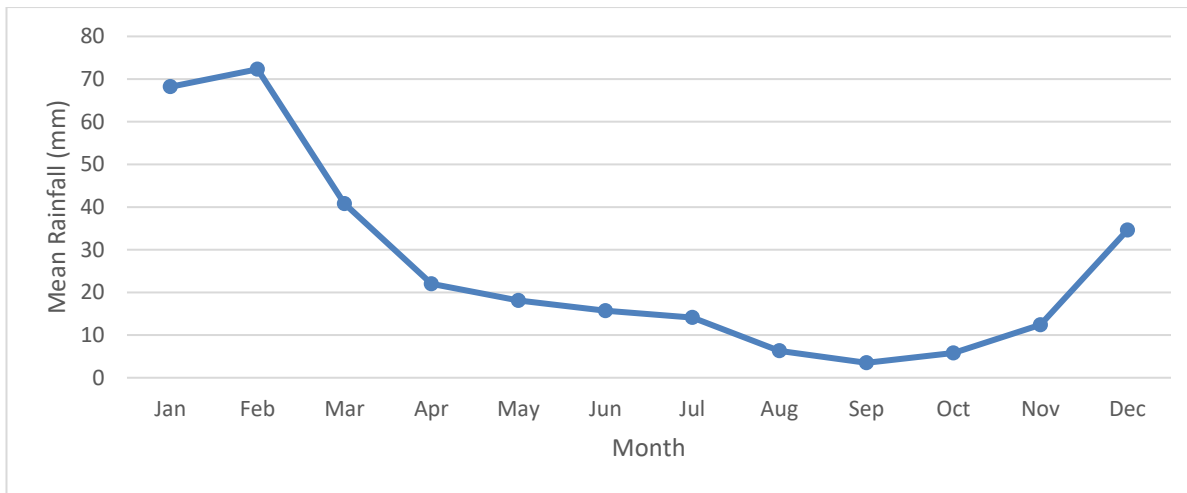


FIGURE 4-2: MEAN RAINFALL (MM) NEWMAN AERO (007176) RECORDED BETWEEN 1971-2022

The hot, dry and sunny conditions in the Pilbara lead to very high evaporative demand (DPIRD, 2021). Evaporation rates are not recorded at Newman Airport BoM Station. Rates for the Central Pilbara region are estimated to be between 2,000 mm and 3,500 mm per year, being ten times higher than average annual rainfall (Gardiner, 2003). These conditions result in a typically arid landscape, except for areas located in proximity to river systems and shallow groundwater resources.

The Newman Airport BoM station annually records wind speed and wind direction for 9 am and 3 pm since 1994. Annual wind speed averages at 9am is 17.4 km/hour and 17.5 km/hour at 3pm, with the strongest winds recorded in the morning of up to 135 km/hour (BOM, 2022).

4.2 REGIONAL SETTING

Under the Interim Biogeographic Regionalisation for Australia (IBRA) land classification system, the Proposal lies in the Pilbara biogeographic region. The Pilbara bioregion has been separated into four subregions; the Hamersley, Fortescue Plains, Chichester and Roebourne sub-regions. The Proposed Permit Area overlies both the Fortescue Plains and the Hamersley sub-regions, as shown on Table 2-1.

4.3 LAND USE

The Proposed Permit Area is located in the Pilbara region of WA, within the Shire of East Pilbara. The dominant land uses typical of the region is for grazing and native pastures (Kendrick, 2001b). The area is also surrounded by mineral exploration and mining projects.

The Proposed Permit Area is located within a portion of the Marillana Pastoral Lease (Pastoral Lease 3114/984) that is used predominately for grazing. Access agreements are already in place with station owners and MinRes are continuously in consultation regarding their current and proposed activities in the region. Further details about consultation with the pastoral lease holders is provided in Section 5.

4.4 GEOLOGY

4.4.1 Regional Geology

The Proposed Permit Area is located within the southern section of the Pilbara Craton. Regionally, the fresh basement rocks are typically overlain by weathered basement rocks which occur as lateritic and basal gravel and/or conglomerate deposits. These weathered deposits underlie early Tertiary Channel Iron Deposits (CID), which are the dominant economic-grade iron deposits in the region. The CID is typically overlain by younger alluvial and colluvial gravels and sediments (PMI, 2013).

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

The structural geology of the region is dominated by the Yandicoogina Syncline, an east-south-east trending syncline, which plunges shallowly to the east near the Project Area. The outer flanks of the syncline are comprised of early Proterozoic basement rocks. The core of the syncline formed the meandering river channels in which the Marillana CID deposit was formed and is the location of the present day Marillana Creek (PMI, 2013).

4.4.2 Local Geology

The geology in the vicinity of the Project comprises Proterozoic basement rocks of the Brockman Iron Formation and the Weeli Wolli Formation, which are overlain by a Cainozoic sedimentary cover of Tertiary alluvial sediments and the Marillana CID deposit. The basal sediments comprise BIF, chert and shale from the Weeli Wolli Formation, overlain by younger conglomerate and clay, with goethite and chert fragments (PMI, 2013).

4.4.3 Waste Rock

No mining is proposed under this Application and therefore no mine waste will be generated.

To minimise the overall disturbance requirements, the proposed haul road will be constructed from existing mine waste material sourced from MinRes's nearby Iron Valley Project. The estimated volume of waste rock material required from the Iron Valley Mine waste rock stockpiles for this Application's Road construction, is approximately 70,000m³ (RGS, 2022b). To support the use of the material for this application, comprehensive geochemical analysis and waste characterisation was undertaken to assess its suitability for road construction purposes.

RGS conducted a sampling and geotechnical test program to characterise representative samples of waste rock likely to be used for the road construction outlined within this Application. A range of laboratory tests were performed on representative samples to assess the degree of risk from the presence of reactive sulfides, the risk of acid generation, salinity, and neutral mine drainage (NMD) as well as the presence of naturally occurring radioactive materials, and asbestiform fibrous minerals in accordance with the relevant WA mine planning and mine closure guidelines (RGS 2022b).

Physical characterisation of the composite waste rock samples reported a variety of dark reddish-brown colours with sample textures cited as loamy sand through to clayey sand materials by the laboratory. The particle size distribution test result indicate that the waste rock materials sampled are mainly comprised of sand and gravel. Dispersive characteristics of the waste rock materials were reported as being relatively low and in conjunction with topsoils, would support rehabilitation efforts at mine closure (RGS 2022b).

The geochemical test results indicated the material generally had a low risk of acid mine drainage (AMD) (including both neutral and saline drainage) being generated from waste rock materials. The waste rock materials are naturally slightly alkaline and may potentially generate slightly alkaline surface water runoff or groundwater. Further, waste rock materials had low concentrations of some metal/metalloids and whilst the potential for seepage into surrounding waters was low (RGS 2022b).

Testing also confirmed a low risk of radioactive materials or fibrous (asbestiform) minerals being present within waste rock.

Overall, it was concluded that waste rock materials are unlikely to be sodic or dispersive and considered suitable for use as road construction material and act as a suitable medium for site revegetation and rehabilitation activities associated with this Application.

A full copy of this geotechnical report is provided as Appendix 1 in Attachment A.

The MinRes civil engineering team also conducted tests to ensure that the waste material could be used as select fill for haul road construction purposes. These tests included: grading, plasticity, modified density and 4 days-soaked California Bearing Ratio (CBR) tests.

4.5 HYDROLOGY

The Proposal is located in proximity to the Fortescue Marsh, an important wetland as part of Fortescue River system, and is considered the largest ephemeral wetland in the Pilbara region. Weeli Wolli Creek is located within the Proposed Permit Area and has a catchment area of almost 5,000km², terminating at the Fortescue Marsh approximately 30 km to the north (AQ2, 2021). Weeli Wolli Creek is the second largest contributor to Fortescue Marsh, with an estimated contribution of 11% of Fortescue Marsh's total surface water inflows (PMI, 2013). The streams that feed into Weeli Wolli Creek include Marillana Creek, Yandicoogina Creek and Pebble Mouse Creek (AQ2, 2021), as shown on Figure 4-3.

The Proposed Permit Area runs in north-south orientation to the east of the Hamersley Range and follows Weeli Wolli Creek floodplain. The southern section of the Proposed Permit Area crosses the creek's main channel, with the creek then continuing north to the west. The creek does not intersect with the northern portion of the haul road or the tie-in areas within the Proposed Permit Area. The Proposed Permit Area also intersects several other minor drainage lines and travels across an alluvial fan associated with Weeli Wolli Creek. Overflow from the main drainage path into the other secondary flow paths likely occurs during flow events of different magnitude, but based on other drainage lines in the Pilbara, is expected to start to occur following rainfall events with an average recurrence interval between 20% and 5% (AQ2, 2021).

There is one railway crossing downstream of the Proposed Permit Area with a significant embankment elevation to the north of the haul road (AQ2, 2021).

Locally, a number of catchments flow from the Hamersley Range in the west. To the east of Weeli Wolli Creek, smaller catchments and channels cross the Proposed Permit Area as they drain to the north and east across the alluvial fan with predominantly sheet flow behaviour (AQ2, 2021).

The intercepted catchments are relatively steep within the Hamersley Range, becoming flatter as the drainage lines discharge out of the range and form alluvial fans, where drainage lines frequently become poorly defined without a discernible preferential flow path. The Proposed Permit Area crosses the main Weeli Wolli Creek alluvial fan for the majority of its length (AQ2, 2021).

The defined catchment areas draining towards the Proposed Permit Area are summarised in Table 4-1. To the north of these catchments, the proposed haul road alignment runs downslope, parallel to the surface water flow direction (AQ2, 2021). The location of these catchments in relation to the Proposed Permit Area are shown on Figure 4-3. A full copy of this hydrology report is provided as Appendix 2 in Attachment A.

TABLE 4-1: ESTIMATED PHIL'S CREEK HAUL ROAD CATCHMENT AREAS (AQ2, 2021)

CATCHMENT	CATCHMENT AREA (KM ²)	HAUL ROAD ALIGNMENT CROSSING COMMENT
A	0.9	Small catchment flowing from Hamersley Range that may discharge alongside Proposal area.
B	9.4	Larger catchment flowing from Hamersley Range that may discharge alongside Proposal area.
C+D	1.6	Two small catchments flowing north directing sheetflow across the proposed Proposal area.
E+F	1.3	Two small catchments flowing north directing sheetflow across the proposed Proposal area.
Weeli Wolli Creek	Approx. 4,000	Weeli Wolli Creek catchment to haul road crossing, approximately 3.5km downstream of Waterloo Bore Gauging Station.

4.5.1 Flooding Potential

Surface water modelling was conducted by AQ2 (2021) using catchment and contour data, as well as proposed haul road design parameters to determine the behaviour of the surface water within the Proposed Permit Area. This model also includes the existing railway embankment close to the northern boundary where it crosses the surface water channel. The cuts in the embankment have been made to allow water to drain out (AQ2, 2021).

The results of the surface water modelling indicate that surface water inflows from Weeli Wolli Creek during a large event, defined as a 1% Annual Exceedance Probability event (1% AEP), will spread widely over the flat alluvial fan where the proposed haul road alignment crosses (AQ2, 2021).

Based on the outcomes of the surface water modelling, the Project has the potential to increase runoff at culvert discharge locations. This has the potential to impact on surrounding vegetation relying on sheet flow surface water. However, there is limited distance between the proposed haul road sections and the next drainage line downstream, limiting significant impacts to vegetation. Further, sheet flow in the local area is already influenced by the existing Phil's Creek Haul Road and the existing rail alignment with no known significant impacts as a result (AQ2, 2021).

The concentration of increased runoff at culvert discharge locations does have the potential to cause higher stream velocities, resulting in the potential erosion of downstream areas. Inadequate drainage provisions may also lead to the disruption of water flow downstream if runoff is trapped behind a raised haul road embankment, limiting the water discharge downstream (AQ2, 2021).

Management of these factors will be considered in the final haul road design and are considered unlikely to significantly impact on the natural hydrology of the local area, or on the condition of vegetation in surrounding downstream locations.

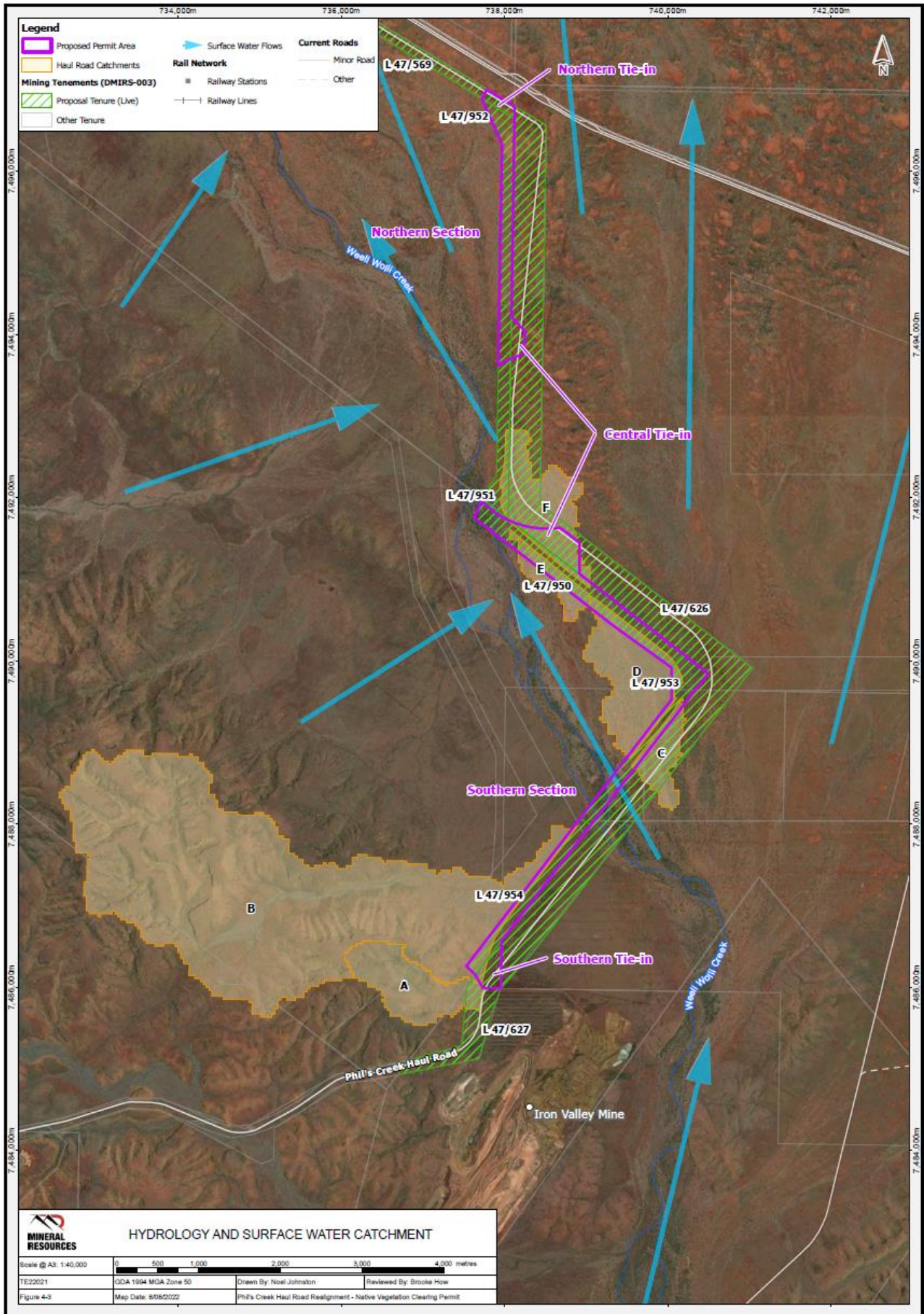


FIGURE 4-3: HYDROLOGY AND SURFACE WATER CATCHMENTS

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

4.6 LAND SYSTEMS AND SOILS

4.6.1 Land Systems

The land systems of the Pilbara region are classified according to similarities in landform, soil, vegetation, geology and geomorphology, as mapped by the Department of Agriculture and Food (DAFWA). The Proposed Permit Area traverses five land systems (RGS, 2022a) of which are summarised in Table 4-2 and shown on Figure 4-4.

TABLE 4-2: LAND SYSTEM ASSOCIATIONS

LAND SYSTEM	DESCRIPTION	MAPPED EXTENT		
		TOTAL MAPPED EXTENT (HA)	OCCURRING WITHIN DE (HA)	(%) OF TOTAL MAPPED AREA OCCURRING WITHIN DE
Boolgeeda	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands and mulga shrublands	999,853	44.10	<0.01%
Urandy	Stony plains, alluvial plains and drainage lines supporting shrubby soft spinifex grasslands	132,542	35.10	0.03%
Fortescue	Alluvial plains and floodplains supporting patchy grassy woodlands, shrublands and tussock grasslands	50,330	17.60	0.03%
River	Active floodplains and major rivers supporting grassy Eucalyptus spp. woodlands, tussock grasslands and soft spinifex grasslands	595,308	101.70	0.02%
Fan	Washplains and gilgai plains supporting groved mulga tall shrublands and minor tussock grasslands.	148,028	44.40	0.03%

The dominant land system of the Proposed Permit Area is the river land system, which comprises nearly half of the Proposed Permit Area and encompasses the main creek bed of the Weeli Wolli creek and surrounding floodplains. The northern part of the Proposed Permit Area is defined by the Fortescue and Fan land systems, which comprise alluvial plains and flood plains, respectively.

The southern section of the haul road traverses the Boolgeeda land system, which comprises stony lower slopes of the Hamersley range further to the south. This land system occurs extensively in the Hamersley (PIL03) IBRA region which borders the Proposed Permit Area. A small section at the south-western end of the Proposed Permit Area intersects the Newman land system, defined by rugged mountains and plateaux, however, these landforms do not occur in the Proposed Permit Area. Review of aerial photography shows the area intersects the base of a hill rising to the west (RGS, 2022a).

Less than 0.03% of these land systems occur within the Proposed Permit Area.

4.6.2 Soil Characteristics

Soil mapping units (SMUs) were determined for the Proposed Permit Area based on field observations by RGS (2022a). Four SMUs were identified and are summarised below. The distribution of each of the SMUs in relation to the Proposed Permit Area are shown in Figure 4-5.

- **SMU 1 (Red Duplex)** predominately comprises a red loam overlying a dense light clay and are found in the north of the Proposal area. The soil is red throughout the profile with an alkaline pH. The emplacement of loam over clay suggests these soils may have been deposited by the movement of, or flood events associated with the Weeli Wolli Creek. The topsoils present are

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

approximately 0.15 m deep with subsoils approximately 1.65 m thick. This soil is generally fertile with high to moderately low plant available water capacity and generally supports tussocky grass, hakea, eucalypt species and potentially acacias.

- **SMU 2 (Red Loamy Earth)** comprises dense red loams and is found in the central Proposal area. It is characterised by red topsoil overlying potentially calcareous, hard setting, alkaline subsoil. The soil is common in the Pilbara region but is rarely the dominant soil type observed. The topsoils present are approximately 0.3 m deep with subsoils approximately 1.2 m thick. Similarly, to SMU 1, this soil is generally fertile with good plant water availability and generally supports spinifex, casuarina, wild sage and potentially acacias.
- **SMU 3 (Red Loamy Gravel Earth)** consisting of red, alkaline loams with sub-rounded to rounded river rocks through the profile and are found in the north of the Proposal area adjacent to SMU 1. The topsoils present are approximately 0.38 m deep with subsoils approximately 1.18 m thick. The loam generally holds good levels of plant available water, is fertile and generally supports tussocky grass, casuarina, hakea, eucalyptus, and potentially eucalyptus.
- **SMU 4 (Rocky Sand/Loam)** comprises of red loams and sands with coarser fragments up to 200 mm in size through the profile and are found in the central and southern Proposal areas. The soils are red with a neutral to alkaline pH. Loamy topsoils may overlie calcareous subsoils and may be firm to hard setting. Sandy topsoils may also be hard setting, occasionally with saline subsoil, a stony mantle, and/or stones throughout the profile. The topsoils present are approximately 0.43 m deep with subsoils approximately 0.8 m thick. The fertility of the SMU 4 soils ranges from moderately low to fertile, sand dominated soils are prone to wind erosion in exposed positions and may hold water relatively poorly, while loam dominated soils have better plant available water capacity, but may be prone to surface compaction, crusting, or hard setting. This SMU generally supports triodia, eucalyptus, hakea, and potentially acacias.

In summary, all SMUs showed very similar properties and are neutral to alkaline, low in salts and potentially dispersive and may be prone to erosion on steeper slopes. However, these soils are considered suitable for relatively flat haul roads, such as this Proposal (RGS, 2022a). Whilst topsoils were generally poor in nutrient levels and organic matter, they do naturally support some native species and therefore are likely to facilitate revegetation of similar vegetation. To maintain the limited biological and nutritional components of the soils, topsoil stockpile heights should be limited to 2 m or less, where possible. Subsoils within SMU 1 and 2 have the potential to generate dust during excavation due to their high silt and clay content and therefore consideration of dust management will be required in these areas (RGS, 2022a).

A full copy of this soils assessment is provided as Appendix 3 in Attachment A.

4.6.3 Land Degradation Summary

The location of the Proposed Permit Area has been subject to land degradation from cattle for over 100 years, impacts from disturbance included cattle grazing, trampling and scats, weeds, and frequent burning. Based on the flora and vegetation surveys conducted over the Project, approximately 1.04 ha of land within the Purpose Permit Area was identified as being completely degraded. The majority (>80%) of the surveyed area was ranked as being in poor condition. A full summary of the vegetation condition within the Proposed Permit Area is included in Section 4.7.

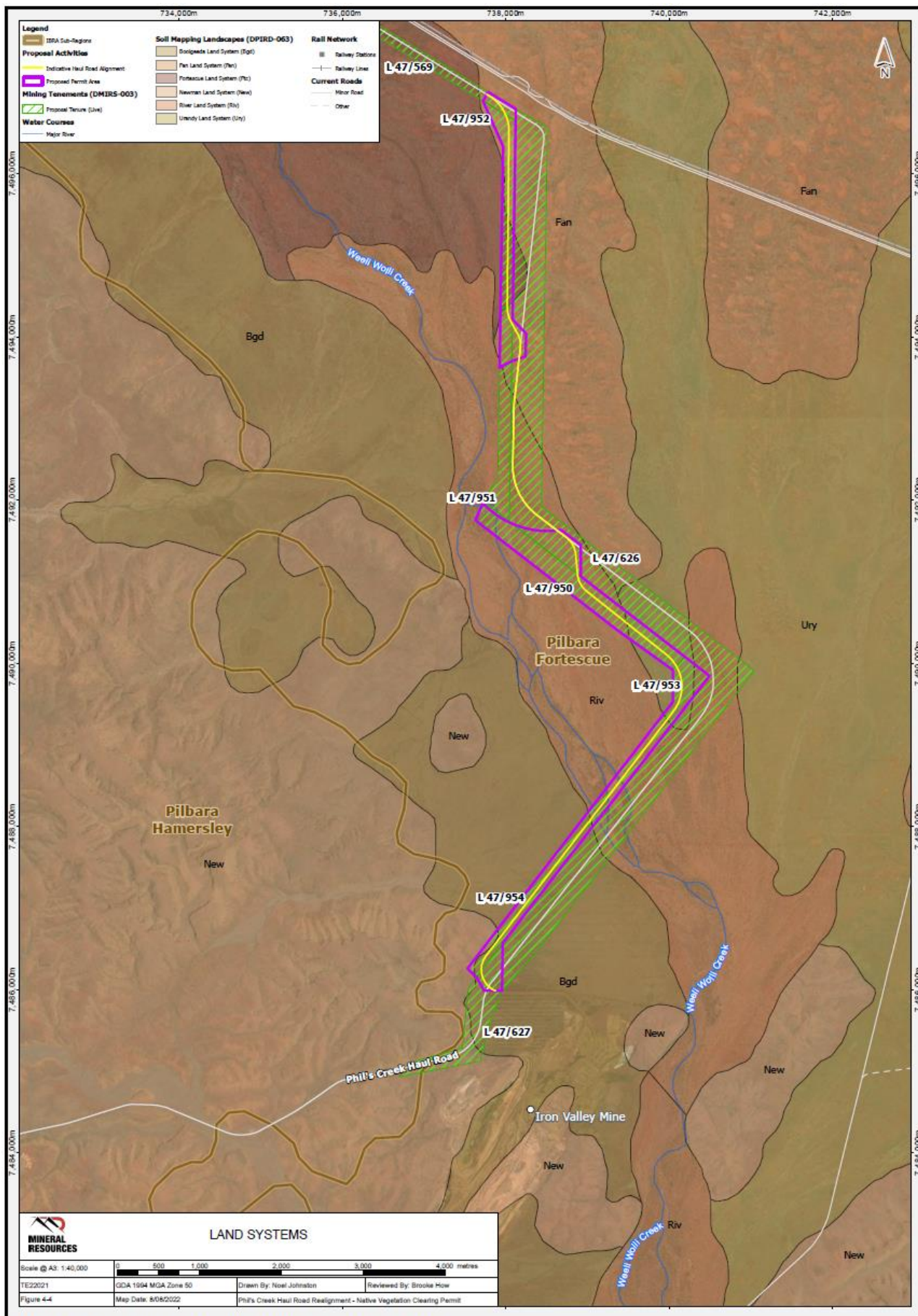


FIGURE 4-4: LAND SYSTEMS

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

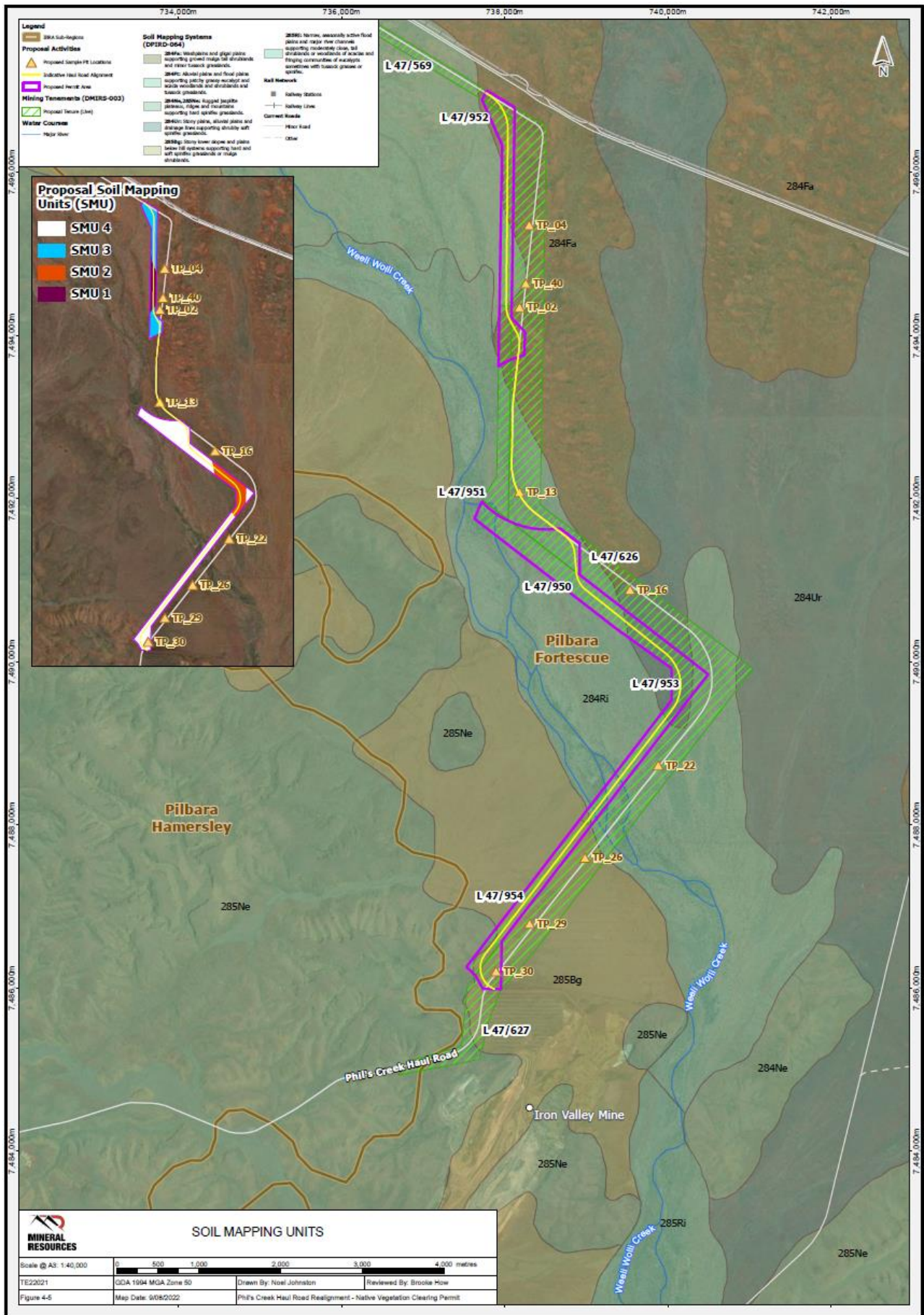


FIGURE 4-5: SOIL MAPPING UNITS

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

4.7 FLORA AND VEGETATION

Rapallo (2021a) conducted a desktop assessment, as well as a single-phase detailed survey and targeted conservation significant survey in May and June 2021, respectively. The survey area covered both the northern and southern portions of the haul road within the Proposed Permit Area. The overall survey corridor was approximately 12.7 km long and between 150 to 400 m wide and covered approximately 237 ha in total. The survey did include the central portion of the original realignment route, however, this central portion has been excised from this Application.

To characterise the flora and fauna values of the central 'tie-in' areas, Rapallo (2022c) also conducted a desktop assessment to extrapolate the vegetation mapping over these central tie-in areas utilising available drone images, aerial photography and LiDAR imagery with existing vegetation mapping conducted in the northern, central and southern sections of the haul road alignment from the detailed survey (Rapallo 2021a). Based on the small size of the assessment area, the quality of drone images and the timing of the detailed survey, the extrapolated vegetation was mapped with high confidence. This assessment was conducted over the two tie in areas, with the northern central tie-in being approximately 10 ha and the southern central tie-in being 27 ha.

The northern and southern tie-in areas, located in tenements L47/569 and L47/627 are outside the extent of these 2021 and 2022 Rapallo biological surveys. The northern tie-in area was covered in a 2012 flora and vegetation survey also conducted by Rapallo (2012a) over portions of the existing Phil's Creek Haul Road. Where relevant to the Proposed Permit Area, information is provided in the following sections. The southern tie-in area was outside the boundary of the 2012 survey. It should be noted that these two tie-in areas are small, and the overall disturbance proposed within them is minimal (3.79 and 3.69 ha, respectively). Based on the high-level of knowledge of existing flora and vegetation in the adjacent surveyed areas, the biological values within these small tie-in areas are likely to be represented by those mapped, as summarised in the following sections.

Information from all available surveys has been used to characterise the flora and vegetation values of the Proposed Permit Area and is summarised in the following sections. Copies of these reports are provided as Appendices 4 and 7 in Attachment A.

4.7.1 Pre-European Vegetation

Mapping of pre-European broad vegetation within WA was completed on a broad scale (1:1,000,000) by Beard (1976). These vegetation types were later re-assessed by Shepherd *et al.* (2002), resulting in 819 vegetation associations within WA (Shepherd, 2002).

The Proposed Permit Area falls within Vegetation Association 29, Fortescue Valley. This area is characterised by low open to sparse woodland of mulga (*Acacia aneura*) and associated species. Approximately 877,889 ha Fortescue Valley has been mapped within Australia, with 99.98% of the vegetation association consider to be remaining undisturbed. Given the Project only proposes to impact on 70 ha, and it has over 99% of its original extent remaining, it would be considered 'least concern' (DER, 2014a).

4.7.2 Conservation Significant Flora

A desktop assessment was completed in 2021 (Rapallo 2021a) combining all conservation significant flora taxa recorded within 50 km of the Phil's Creek Haul Road alignment. This data was sourced from the DBCA Threatened and Priority Flora database (TPFL), Western Australian Herbarium (WAH), NatureMap (NM) and historical flora and vegetation survey reports (Rapallo, 2021a) and considers flora species listed under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Biodiversity Conservation Act 2016* (BC Act).

The desktop study identified 75 conservation significant flora taxa recorded from within 70 kilometres of the survey area. A preliminary assessment was completed to estimate the likelihood of occurrence for these taxa within the survey area prior to the survey. This assessment compared habitat requirements for

each of these taxa, as available from either FloraBase or embedded within the DBCA and WAH data, with the vegetation communities present in the survey area. Desktop results are summarised in Table 4-3.

TABLE 4-3: SUMMARY OF DESKTOP RESULTS FOR CONSERVATION SIGNIFICANT TAXA

LIKELIHOOD RANKING	CONSERVATION STATUS					TOTAL TAXA
	T	P1	P2	P3	P4	
Likely to occur		1		3	2	6
May potentially occur	1	8	11	18	3	41
Unlikely to occur		6	3	16	2	27
Highly unlikely to occur			1			1
TOTAL	1	15	15	37	7	75

The outcome of the desktop assessment was used to inform a targeted conservation significant flora survey of the northern and southern sections of the haul road, as part of the Proposed Permit Area. During this targeted survey, no Threatened or Priority flora listed under the BC Act or EPBC Acts were observed within the Proposed Permit Area. In addition, no species of local or regional significance were recorded in the Proposed Permit Area (Rapallo 2022a; 2022b).

Further, whilst the desktop assessment conducted over the central tie-in areas did not involve a ground-truthing component, based on the high confidence in the vegetation mapping extrapolated from available data, and the lack of any flora of conservation significance identified within the detailed survey area, it is considered unlikely that the tie-in areas comprise any species of conservation significance (Rapallo 2022b).

4.7.3 Introduced Flora

A desktop study completed by Rapallo (2021a) identified twenty weed species occurring within the region. No Weeds of National Significance (WONS) were identified.

The detailed survey (Rapallo 2021a) recorded seven Introduced flora taxa (excluding the four tie-in sections). The most frequently occurring weeds were *Cenchrus ciliaris* (buffel grass) and *Cenchrus setiger* (birdwood grass). None of the species recorded were WONS and are not listed as declared pests, prohibited, or requiring a permit under the *Biosecurity and Agriculture Management Act 2007*. Further, none of the species have been identified as 'Priority Alerts' for the Pilbara region by the Department of Biodiversity, Conservation and Attractions (DBCA).

Table 4-4 below summarises the locations of the introduced species recorded within the survey area (Rapallo 2021a).

TABLE 4-4: WEEDS RECORDED WITHIN THE PROPOSAL AREA (RAPALLO 2021a)

TAXON	WAOL STATUS	LOCATIONS RECORDED PER VEGETATION TYPE						
		A1	A2	A3	B1	B2	C	D
<i>Aerva javanica</i>	Permitted s11	2			3	1		
<i>Vachellia farnesiana</i>	Permitted s11	1						
<i>Malvastrum americanum</i>	Permitted s11	1			1	1		
<i>Cenchrus ciliaris</i>	Permitted s11	1	8		4	1	7	4
<i>Cenchrus setiger</i>	Permitted s11	17	6	1	4	2	5	1
<i>Portulaca oleracea</i>	Permitted s11	4		1	1			
<i>Solanum lasiophyllum</i>	Permitted s11	6	2		2	2	3	3

4.7.4 Conservation Significant Vegetation

A search of the DBCA's Threatened and Priority Ecological Communities (TEC-PEC) database did not yield any known Threatened Ecological Communities (TEC) or Priority Ecological Communities (PEC) within the Proposed Permit Area. Six PECs were identified within 50 km of Proposal (Rapallo 2021a), including:

- Fortescue Marsh Land System (Priority 1)
- Vegetation of sand dunes of the Hamersley Range/Fortescue Valley (Priority 3)
- Freshwater claypans downstream of the Fortescue Marsh - Goodiadarrie Hills on Mulga Downs Station (Priority 1)
- Narbung Land System (Priority 3)
- Weeli Wolli Spring Community (Priority 1)
- Four plant assemblages of the Wona Land System (Priority 1).

Based on the desktop assessment by Rapallo (2021a), the closest PEC to the Proposed Permit Area is the Vegetation of sand dunes of the Hamersley Range/Fortescue Valley PEC, listed as a Priority 3. The closest known occurrence of this PEC is within 600 m of the Proposed Permit Area, however no sand dunes were identified within the survey area (Rapallo 2021a).

All other PECs recorded within the region were also not considered to be present within the Proposed Permit Area based on an assessment of the local absence of the PEC's defining landform or flora characteristics (Rapallo 2021a).

The Proposed Permit Area does not occur within 5 km of any other known Environmentally Sensitive Areas (ESAs) as listed under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. The closest ESA to the Proposed Permit Area is the Karijini National Park located approximately 80 km to the west (Figure 1-1).

Local significance was also considered by Rapallo during the detailed survey (2021a). The Proposed Permit Area falls within the Fortescue Valley 29 vegetation system-association, which still has close to 100% of its original extent remaining and would be considered 'least concern' (Rapallo 2021a). Further, no vegetation recorded within the survey area was considered to provide refugia for flora taxa (for example, vegetation associated with gorges or seepage areas), or otherwise providing an important function required to maintain ecological integrity of a significant ecosystem (as defined by EPA 2016a). Therefore, no vegetation types recorded within the Proposed Permit Area are of local significance.

4.7.5 Vegetation

Seven vegetation types were mapped within the Proposed Permit Area. The vegetation types present within the Proposed Permit Area, including their description, associated landform, mapped extent and likely disturbance footprints are provided below in Table 4-5 and locations shown in Figure 4-6.

TABLE 4-5: VEGETATION TYPES (RAPALLO 2021a)

UNIT ID	UNIT DESCRIPTION	MAPPED SURVEY EXTENT (HA)			PROPOSED DISTURBANCE (HA) (%)
		NORTHERN AND SOUTHERN HAUL ROAD SECTIONS	CENTRAL TIE-IN SECTIONS	COMBINED TOTAL	
A1	Mixed acacia woodland with <i>Corymbia hamersleyana</i> over <i>Cenchrus</i> grassland	97	24	121	29.43 (24%)
A2	Mixed acacia woodland with <i>Corymbia hamersleyana</i> over <i>Cenchrus</i> / <i>Triodia</i> grassland	15	1.5	16.5	2.25 (14%)
A3	Sparse mixed shrubland over isolated tussock grasses	4	0	4	1.43 (36%)
B1	Major drainage channel with <i>Eucalyptus victrix</i> and <i>E. Camaldulensis</i> over <i>Cenchrus</i> grassland	21	0	21	3.16 (15%)
B2	Floodplain with <i>Eucalyptus victrix</i> and mixed acacias over <i>Cenchrus</i> grassland	11	0	11	0 (0%)
C	Mixed acacia woodland with <i>Corymbia hamersleyana</i> over <i>Triodia pungens</i> hummock grassland.	54	8.5	62.5	12.81 (20%)
D	<i>Eucalyptus gamophylla</i> over <i>Acacia adoxa</i> and <i>Grevillea wickhamii</i> over <i>Triodia basedownii</i> or <i>T. vanleeuwenii</i> hummock grassland.	35	0	35	16.00 (45%)
X	Cleared Road	0	3	3	1.93 (64%)

Rapallo (2021a) describes the vegetation across the northern part of the detailed survey area to be defined by the Weeli Wolli Creek and associated flood plains. The Weeli Wolli Creek was mapped as major drainage (vegetation type B1) defined by *Eucalyptus victrix* and *E. camaldulensis* woodland over mixed acacias. The floodplains directly flanking the major drainage (type B2) contained *Eucalyptus victrix*, while floodplains and undulating plains were defined by low open woodland of mixed acacias with *Corymbia hamersleyana* (types A1 and A2). A small part of the survey area was very open, comprising sparse shrubland only (type A3). Being surrounded by type A1, and lacking further replicates within the survey area, type A2 was a very open and degraded version of type A1 (Rapallo 2021a). The understorey of the major drainage and floodplain vegetation types was dominated largely by the invasive introduced grasses *Cenchrus ciliaris* (buffel grass) and *Cenchrus setiger* (birdwood grass) which has modified the original understorey (Rapallo 2021a).

The central part of the detailed survey area, where it traversed the Urandy land system, contained undulating sandy or loamy plains dominated by soft spinifex (*Triodia pungens*) plains with an open acacia woodland overstorey. Vegetation type A2 flanked this vegetation type and was similar to type A1 but with

a mixed understorey of *Cenchrus* tussock grasses and soft spinifex of roughly equal dominance across this vegetation type (Rapallo 2021a).

The southern part of the detailed survey area entered the Boolgeeda land system, which is the second most dominant land system underlying the survey area. Within the Boolgeeda land system, the landform changed to stony plain, and the spinifex species changed from a dominance of *Triodia pungens* to a dominance of *Triodia basedowii* and *Triodia vanleeuwenii*. The overstorey on these stony plains was defined by *Acacia adoxa* and *Grevillea wickhamii* (Rapallo 2021a).

The vegetation of the northern central tie-in area was assessed as vegetation type A1 with the haul road and turkey's nest mapped as cleared. The vegetation of the southern central tie-in area was assessed as vegetation types A1, A2, and C, with some cleared areas including the haul road.

The northern tie-in area was characterised in the 2012 survey (Rapallo 2012a) as vegetation unit G, described as 'sparse open tall shrubland or open low woodland with scattered *Corymbia hamersleyana*, dominated by *Acacia distans*., *A. paraneura*, *A. sclerosperma* subsp. *Sclerosperma*, *A. synchronicia*, *Eremophila longifolia*, over mixed shrubs such as *Acacia citrinoviridis*, over **Cenchrus ciliaris* and *Triodia lanigera* hummock grasses. This northern tie-in area borders the A1 vegetation unit described by Rapallo in 2021(a) (refer to Figure 4-6) and based on the A1 description provided in Table 4-5, is considered to be a similar complex to Unit G.

4.7.6 Vegetation Condition

Vegetation condition across the survey area varied from Very Good to Completed Degraded, with the majority of the quadrats surveyed ranked as Poor (Rapallo 2021a).

Some sections of the survey area were noted to be affected by fire however this was considered a minor disturbance. The main disturbances to the survey area were reported to be weeds and cattle (through grazing and erosion). Dust associated with the presence of the adjacent existing Phil's Creek Haul Road was also noted, however would not represent a significant impact to the condition of native vegetation. Other disturbances included clearing, minor tracks, and rubbish (Rapallo 2021a).

Within the central tie-in areas, various disturbances were visible, including cattle grazing, which had reduced the tussock grasses to small clumps, evidence of small-scale fires, soil erosion from cattle, and a film of red-brown dust covering the vegetation. Vegetation condition of the northern central tie-in area was rated as poor while the southern central tie-in area was rated as good (Rapallo 2022c).

4.7.7 Groundwater Dependent Vegetation

The Weeli Wolli Creek will likely intersect the Purpose Permit Area in two places within the southern section of the haul road alignment and the majority of the Purpose Permit Area is within the creek's alluvial fan. These locations can be seen on Figure 4-3. These water crossings comprises vegetation type B2 and spreads out to north west of the nearby Marillana project area. The vegetation that was mapped by ecologia (2009) confirms the vegetation is typical of community B1 and the trees and tall shrubs are probably phreatophytic, utilising groundwater at some point during the year (Rapallo, 2021a).

Vegetation type B1 which contained species of eucalypt and acacia woodland, *Eucalyptus camaldulensis*, *Eucalyptus victrix*, and *Atalaya hemiglauca*, and vegetation type A1 and A2 within the Proposed Permit Area that contain *Eucalyptus victrix* and *Atalaya hemiglauca*, were found to be elective phreatophytes (Rapallo, 2021a). Vegetation type A1 and B2 within the Proposed Permit Area, which occurred on floodplains, also contained *Eucalyptus victrix* and *Atalaya hemiglauca*.

The survey area is mostly defined by the Weeli Wolli Creek and associated floodplains and this is reflected by the common occurrence of *Atalaya hemiglauca* throughout the majority of vegetation types.

There was no obligate phreatophytes found in the survey area. No vegetation types within the Purpose Permit Area are groundwater dependent that will be significantly impacted by the clearing activities within this Application.

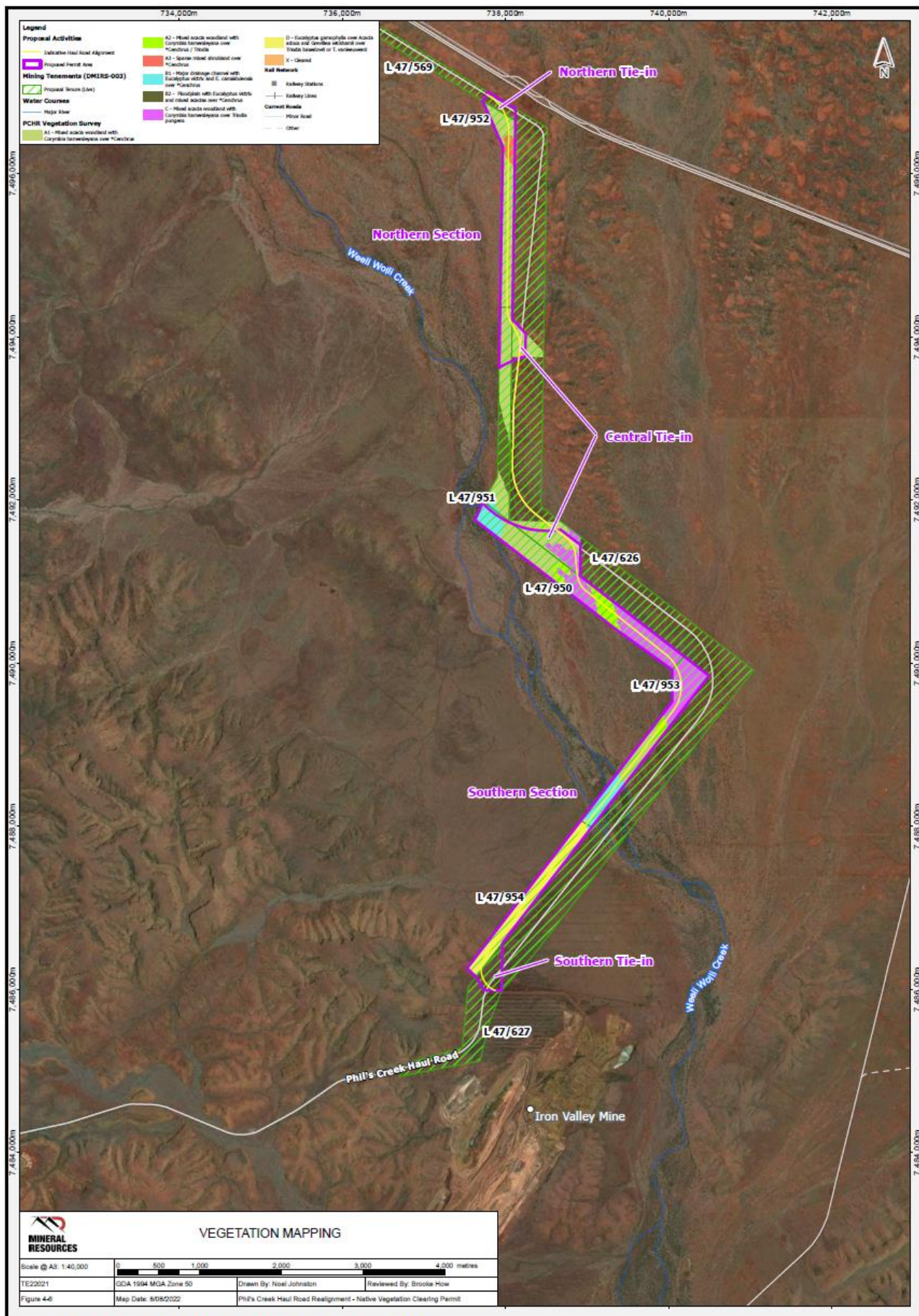


FIGURE 4-6: VEGETATION MAPPING

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

4.8 FAUNA

Rapallo (2022a) conducted a two-phase targeted conservation significant survey of the Proposed Permit Area in April and June 2021. The survey area covered both the northern and southern portions of the haul road as part of the Proposed Permit Area. The overall corridor surveyed was approximately 12.7 km long and between 150 to 400 m wide, covers approximately 237 ha in total. The survey methods aligned with a reconnaissance fauna survey as defined in EPA (2020) and included deployment of camera traps, ultrasonic (microbat) and acoustic (night parrot) SM4 recorders systematic searching for signs of bilby and mulgara, nocturnal searching (spotlighting), foraging, opportunistic records and habitat mapping (Rapallo, 2022a).

To characterise the fauna values of the central 'tie-in' areas, Rapallo (2022c) also conducted a desktop assessment to extrapolate the fauna habitats mapping over these tie-in areas utilising available drone images, aerial photography and LiDAR imagery with existing vegetation mapping conducted in the northern, central and southern sections of the haul road alignment from the detailed vegetation survey (Rapallo 2022c). Based on the small size of the assessment area, the quality of drone images and the timing of the detailed survey, the extrapolated habitat mapping was completed with high confidence. This assessment was conducted over the two tie in areas, with the northern central tie-in being approximately 10 ha and the southern central tie-in being 27 ha.

The northern and southern tie-in areas, located in tenements L47/569 and L47/627 respectively are outside the extent of these biological surveys. The northern tie-in was covered in a 2012 vertebrate fauna survey conducted by Rapallo (2012b) over portions of the existing Phil's Creek Haul Road. Where relevant to this Proposed Permit Area, information is provided in the following sections. The southern tie-in was outside the boundary of this 2012 survey. It should be noted that these two tie-in areas are small, and the overall disturbance proposed within them is minimal (3.79 and 3.69 ha, respectively). Based on the high-level of knowledge of existing fauna, habitats and land systems in the adjacent surveyed areas, the biological values within these small tie-in areas are likely to be represented by those in the mapped areas, summarised in the following sections.

Information from all available surveys has been used to characterise the fauna values of the Proposed Permit Area and the results are summarised in the following sections. The location of survey areas is shown on Figure 4-7. Copies of these reports are provided as Appendices 5 and 7 in Attachment A.

4.8.1 Fauna Habitat

Six broad fauna habitats were identified in the Proposed Permit Area, including acacia woodland, floodplain, loamy spinifex plain, major drainage, minor drainage, and stony plain (Rapallo 2022a). The habitats recorded and their mapped extent, are summarised below in Table 4-6.

TABLE 4-6: FAUNA HABITATS WITHIN PROPOSED PERMIT AREA (RAPALLO 2022A)

HABITAT NAME	MAPPED SURVEY EXTENT (HA)			PROPOSED DISTURBANCE (HA) (%)
	NORTHERN AND SOUTHERN HAUL ROAD SECTIONS	CENTRAL TIE-IN SECTIONS	COMBINED TOTAL	
Acacia woodland	116	24	121	31.60 (26%)
Floodplain	11	0	11	0.00 (0%)
Loamy spinifex plain	54	8.5	62.5	11.56 (18%)
Major drainage	19	0	19	2.85 (15%)
Minor drainage	8	0	8	2.52 (31%)
Stony spinifex plain	28	0	28	13.79 (49%)
Cleared Areas	0	3	3	0.00 (0%)

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

The major drainage habitat was assessed by Rapallo (2022a) as having a high significance due to its widespread availability of microhabitats, such as fallen timber, large trees and tree hollows to provide foraging and dispersal opportunities for conservation significant fauna. This habitat only comprises a small proportion of the Proposed Permit Area (~7%) and MinRes will avoid clearing or disturbance within this habitat, wherever possible. This habitat is relatively common throughout the Pilbara and therefore due to the minor potential disturbance to this area (~15% of the surveyed mapped extent of the habitat), the activities within this Application are not considered to significantly impact on the habitat (Rapallo 2022a).

The other five broad habitats were classified as having moderate significance and were shown to extend well outside the surveyed area (Rapallo 2022a). Further, the habitats described by the 2012 fauna survey (Rapallo 2012b) that includes the northern tie-in section, also confirmed that the habitats were all typical of the Pilbara bio-region.

No fauna habitats were identified as being significant to any conservation significant fauna (Rapallo 2022a) due to the habitat's broad scale regional representation within the Pilbara bio-region.

4.8.2 Conservation Significant Fauna

A desktop assessment was conducted combining all conservation significant fauna taxa recorded within 50 km of the Phil's Creek Haul Road alignment. This data was sourced from the DBCA Threatened and Priority Fauna database, NatureMap (NM), DAWE Protect Matters search tool, Birdlife Australia online database and historical fauna survey reports within and surround the Proposed Permit Area and considers fauna species listed under the EPBC Act and the BC Act.

The desktop assessment reported 32 fauna species within 50 km of the survey area. Based on a review of available information:

- only two priority species were known to occur: the northern quoll (*Dasyurus hallucatus*) and ghost bat (*Macroderma gigas*);
- 19 species were considered highly likely to possible to occur; and
- 11 were considered unlikely to highly unlikely to occur

within the surveyed area (Rapallo 2022a).

Based on the outcomes of this desktop assessment, Rapallo identified 10 species as having the potential to occur in the survey area,

which were specifically targeted during the survey. These species were:

- Pilbara olive python (*Liasis olivaceus barroni*) – Vulnerable
- Western pebble-mound mouse (*Pseudomys chapmani*) – Priority 4
- Brush-tailed mulgara (*Dasyercus blythi*) – Priority 4
- Bilby (*Macrotis lagotis*) – Vulnerable
- Peregrine falcon (*Falco peregrinus*) – Other specially protected fauna
- Grey falcon (*Falco hypoleucos*) – Vulnerable
- Northern quoll (*Dasyurus hallucatus*) – Vulnerable
- Ghost bat (*Macroderma gigas*) – Vulnerable
- Pilbara leaf-nosed bat (*Rhinonictis aurantia* Pilbara) – Vulnerable and
- Night parrot (*Pezoporus occidentalis*) – Critically Endangered.

During the detailed fauna surveys conducted in the Proposed Permit Area, two conservation significant fauna were recorded, the northern quoll (*Dasyurus hallucatus*) through scat identification, and ghost bat (*Macroderma gigas*) through an ultrasonic SM4 recording (Rapallo 2022a). The 2012 fauna survey also recorded the Rainbow Bee-eater (*Merops ornatus*) within the northern tie-in section and the Northern Quoll

in the vicinity, but outside the Proposed Permit Area (Rapallo 2012b). No other potential conservation significant fauna species identified in the desktop assessment were recorded during the detailed survey.

The full list of species and their conservation status can be found the detailed survey report provided as Appendix 5 in Attachment 1.

4.8.2.1 Northern Quoll

The northern quoll is moderately common through part of the Pilbara (within 150 km of the coast) usually present where suitable rocky habitat is present, providing denning habitat and safety from predators and fire. The Northern quoll is both arboreal and terrestrial, inhabiting ironstone and sandstone ridges, scree slopes, granite boulders and outcrops, drainage lines and riverine habitats. Habitat usually includes rocky areas or structurally diverse woodland or forest used for shelter, with surrounding vegetated habitats used for foraging and dispersal. Rocky habitats tend to support higher densities, as they offer protection from predators and are generally more productive in terms of availability of resources. Other microhabitat features important to the species include rock cover, proximity to permanent water and time-since last fire. Dens occur in a wide range of situations including rock overhangs, tree hollows, hollow logs, termite mounds, goanna burrows and human dwellings/infrastructure, where individuals usually den alone (Rapallo, 2022a).

The northern quoll was confirmed to occur in the Proposed Permit Area through the hair analysis from scats likely to have come from a quoll that was foraging or dispersing in the area. The scat was collected in the loamy spinifex plain habitat that does not align with shelter (denning) habitat for the species (Rapallo, 2022a). Clearing activities associated with this Application have the potential to cause temporary displacement of local quolls in their preferred foraging habitat but it will not impact the local population and will not remove any significant amount of critical habitat for this species.

4.8.2.2 Ghost Bat

The ghost bat has widespread but patchy distribution across northern Australia. The availability of suitable roost caves is critical for the species' persistence and survival. The ghost bat will often forage more broadly across habitats, utilising drainage lines and other habitats where prey species are likely to be most abundant (Rapallo, 2022a).

The ghost bat was recorded within the Proposed Permit Area from a single call recorded at the Weeli Wollie Creek. Analysis conducted by Bat Call WA confirms that the call timing was consistent with a foraging individual and that this result is consistent with the known population and dispersal of ghost bats in the region. Further, the Proposed Permit Area does not contain any critical habitat for the species, such as landforms that could provide roost caves (Rapallo 2022a). Clearing activities associated with this Application have the potential to cause a minor reduction in their preferred foraging habitat of local ghost bats however it will not impact the local population or remove any significant amount of critical habitat for this species.

4.8.2.3 Rainbow Bee-eater

The 2012 survey (Rapallo 2012b) recorded the Rainbow Bee-eater (*Merops ornatus*), listed as Migratory under the EPBC Act, with one record collected from within the northern tie-in area. Whilst some suitable habitat for the Rainbow Bee-eater occurred within the surveyed area, the species is considered to be highly mobile and therefore was at a low risk of the being impacted on an individual or population level, based on the implementation of the haul road. Whilst this species wasn't recorded in the 2021 survey (Rapallo 2022a) due to its migratory nature, it may still occasionally occupy the Proposal area. However, it is still considered unlikely to be impacted by the development and operation of the Proposal.

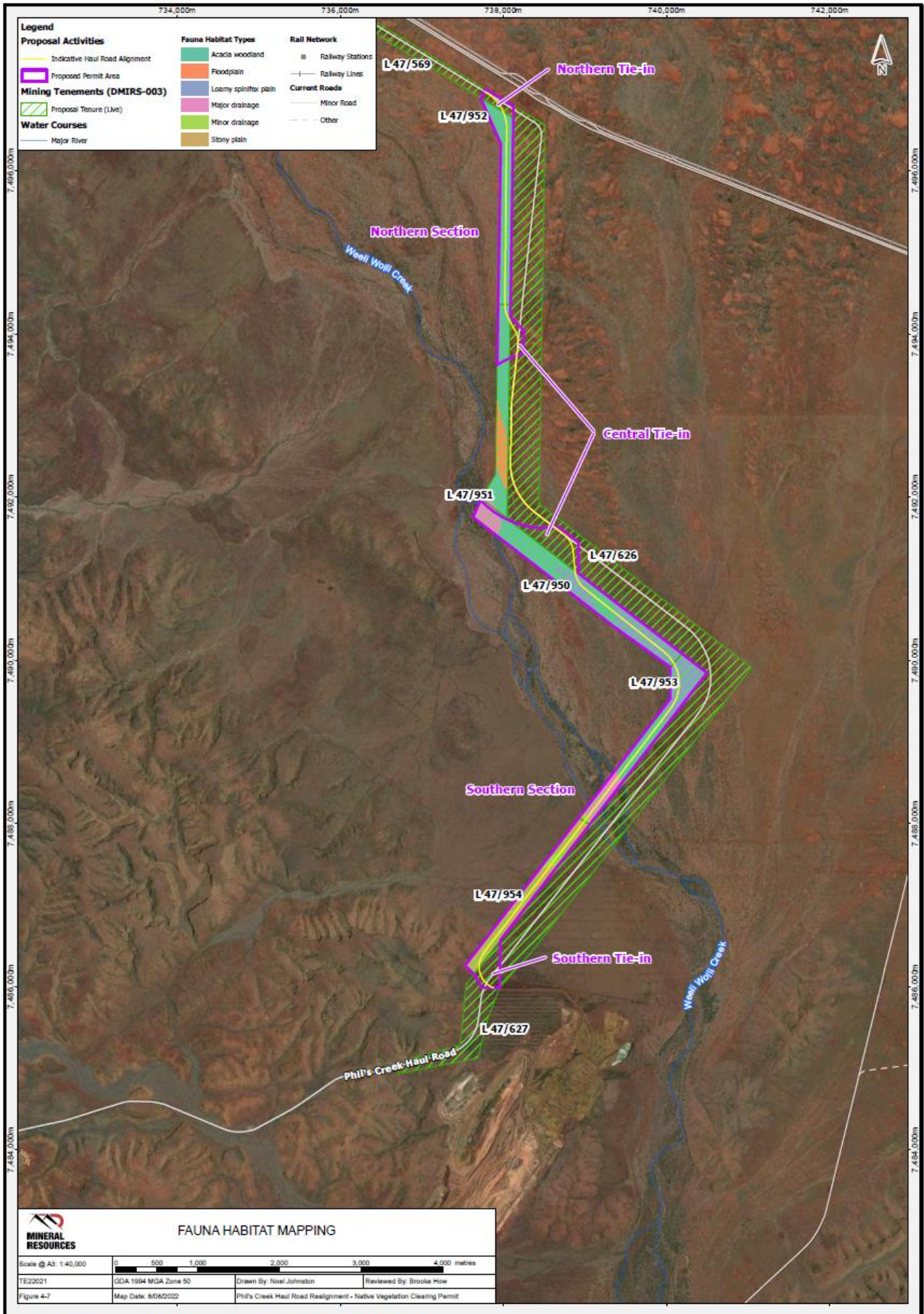


FIGURE 4-7: FAUNA HABITAT MAPPING

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

4.8.3 Short Range Endemics

A targeted short-range endemic invertebrate (SRE) survey was conducted within the Proposed Permit Area in April and June 2021 (Rapallo 2022b). The SRE survey area covered both the northern and southern portions of the haul road as part of the Proposed Permit Area. The overall corridor surveyed was approximately 12.7 km long and between 150 to 400 m wide, covers approximately 237 ha in total (Rapallo 2022b) as shown on Figure 4-8.

Broad fauna habitat mapping was completed as part of a targeted conservation significant fauna survey over the same survey area utilising land systems and dominant vegetation types (refer to Section 4.8) (Rapallo 2022b). Twelve wet pitfall traps were deployed to target each of the broad habitat types. Other survey activities included leaf litter sifting and foraging (Rapallo 2022b).

Laboratory sorting of the wet pitfall traps yielded 199 specimens targeting invertebrate groups known to contain SRE taxa. The specimens were sent for morphological identifications and produced 77 potential SRE specimens which were then sent for DNA sequencing. DNA sequencing then identified 18 potential SRE species.

All six broad habitat types (refer to Section 4.8) were found to support potential SRE taxa, as shown on Figure 4-8. Of the potential 18 SRE species identified through DNA, five have regional matches with specimens collected elsewhere and outside the survey area.

The remaining 13 are currently only known from within the surveyed area. Eight species were only recorded within the survey area but were found across multiple sites and habitats. Five taxa were only captured from a single site and habitat. The survey sites where the single collections were recorded are located within the acacia woodland, major drainage and stony spinifex plain fauna habitats. All these fauna habitats are known to occur extensively outside the survey area and the Proposed Permit Area in all directions. Further, due to the linear nature of haul roads, the clearing required under this Application will not create discrete islands of these habitats and it is therefore considered unlikely to significantly impact on any SRE species or habitats (Rapallo 2022b).

A full copy of this report is provided as Appendix 6 in Attachment A.

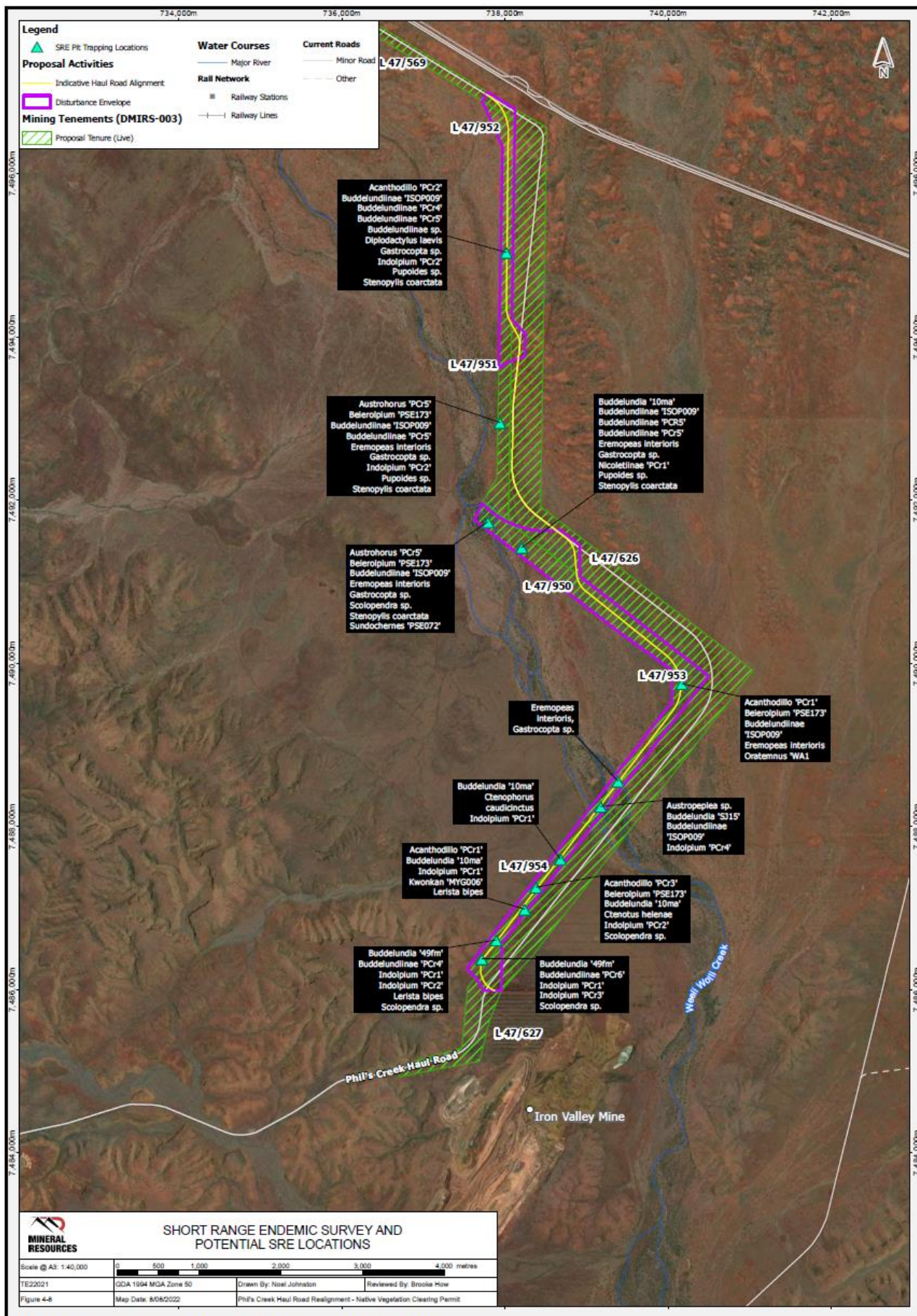


FIGURE 4-8: SHORT RANGE ENDEMIC SURVEY AND POTENTIAL SRE LOCATIONS

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

5. STAKEHOLDER CONSULTATION

MinRes recognises the value of building positive relationships with key stakeholders and the communities in which we are active. We seek to build sustainable partnerships with business partners, governments, non-government organisations, host communities and other stakeholders to support mutually beneficial outcomes. MinRes strives to engage early, openly, honestly and regularly with the communities impacted by our operations and consider their views in our decision-making with respect to key planning, operational and closure aspects.

MinRes is committed to continued engagement with stakeholders through all development phases of projects and operations, a Stakeholder Engagement Plan is maintained which outlines all communications and requirements with relevant stakeholders.

Outcomes of these activities are recorded in a Stakeholder Consultation Register, which is a live document that interconnects with the Stakeholder Engagement Plan. This plan encompasses all MinRes activities associated with this Project, including:

- Phil's Creek Mine
- Iron Valley Mine
- Existing Phil's Creek Haul Road.

MinRes intend to include engagement activities specific to this Application in this Stakeholder Engagement Plan.

Key stakeholders associated with this Application include the following:

Local and State Government:

- Shire of East Pilbara
- DBCA
- DMIRS
- Department of Water and Environmental Regulation (DWER)
- Department of Planning, Lands and Heritage (DPLH)
- Environmental Protection Authority (EPA) WA
- Main Roads WA (MRWA).

Non-Government Stakeholders

- Nyiyaparli Native Title Group
- Marillana Pastoral Lease holder
- Wildflower Society of WA
- Conservation Council of WA.

6. AVOIDANCE AND MITIGATION MEASURES

MinRes has applied the mitigation hierarchy (avoid, minimise and rehabilitate) to reduce the potential impacts to flora and vegetation. Areas of land clearing will be progressively rehabilitated to agreed post mining land use outcomes which will be documented in the Project's MCP (ENV-TS-RP-0397) which has been submitted to DMIRS concurrently with this Application.

The objectives of environmental management for this Application are:

- To identify all likely environmental impacts arising from the clearing activities and to determine significant impacts requiring the implementation of special management procedures
- To develop and declare the environmental management commitments necessary to minimise, control, ameliorate and rehabilitate significant impacts.

A Mining Proposal (ENV-TS-RP-0396) has been prepared to support the approval of the Project by DMIRS under the Mining Act. Management measures from this MP will be implemented for clearing activities described within this Application.

Table 6-1 addresses requirements under Section 5.6 of the Clearing Permit Application. Additional mitigation measures are also included in Table 7-1 in Section 7.

TABLE 6-1: SITE SELECTION – AVOIDANCE AND MITIGATION

DMIRS QUESTIONNAIRE	MINRES SITE SELECTION
Why did you select this location and amount of clearing?	<p>The Proposed Permit Area was selected to duplicate the existing Phil's Creek Haul Road as close as possible to the original alignment and proximity to the mine sites that it services (Phil's Creek Mine and Iron Valley Mine). This area was chosen as it is already heavily disturbed and degraded in parts, comprises no significant environmental features (species, communities, habitats etc) and has relatively flat topography, which is ideal for the safe construction and operation of a haul road.</p> <p>The amount of clearing proposed in this Application includes the minimum disturbance required to construct a road alignment. When locating the final alignment, existing roads, disturbed areas and degraded areas will be favoured over clearing vegetation in good to excellent condition wherever possible.</p>
What alternatives to clearing – e.g. engineering solutions – did you consider	<p>The Proposed Permit Area was selected due to its proximity to already established infrastructure, such as the existing Phil's Creek Haul Road and turkeys nest (important for dust suppression).</p> <p>A significant reduction in the proposed clearing was achieved by proposing the use of the Iron Valley Mine's waste rock material as the road construction base, in place of utilising local borrow pits. It should be noted that an allowance for borrow pits has been included in this Application in the event that additional material is required and would be limited to a maximum of 1.5 - 3 ha per tenement.</p>
What changes, if any, did you make to the location or amount of clearing to reduce the impacts of the clearing?	<p>Initial road construction material was to be sourced from local borrow pits within the Proposed Permit Area. This requirement was significantly reduced, if not eliminated, through the use of waste rock material for road construction, sourced from the nearby Iron Valley Mine.</p>

7. TEN CLEARING PRINCIPLES

The proposed vegetation clearing has been assessed against the ten clearing principles described within A Guide to the Assessment of Applications to Clear Native Vegetation (DER, 2014a) under Part V Division 2 of the EP Act (WA). The results of flora, vegetation and fauna surveys described in Section 4 have been used in the assessment of the ten clearing principles, summarised in Table 7-1 below.

TABLE 7-1: ASSESSMENT OF PROPOSED VEGETATION CLEARING AGAINST THE TEN CLEARING PRINCIPLES, AVIODANCE AND MITGATION MEASURES

RELEVANT INFORMATION	ASSESSMENT OF POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	ASSESSMENT OF VARIANCE WITH CLEARING PRINCIPLE
A. NATIVE VEGETATION SHOULD NOT BE CLEARED IF IT COMPRISES A HIGH LEVEL OF BIOLOGICAL DIVERSITY			
<p>The Purpose Permit Area does not lie within any ESAs, TEC's or PEC's that are considered to represent a high level of biodiversity. Vegetation surveyed within the Purpose Permit Area has not been described as highly diverse. All vegetation types extend well beyond the boundaries of the Purpose Permit Area and are known to be well represented within the region.</p>	<p>The clearing proposed within this Application will require the removal (up to 70 ha) of native vegetation which will result in minor loss of native vegetation within the Purpose Permit Area. This results in less than 26% loss of the mapped extent (2021a) of known vegetation types.</p> <p>Given the minimal clearing required for the application and vegetation within the Proposed Permit Area does not represent a high level of biodiversity, this Application is not considered to impact on the overall biodiversity of the vegetation within the Permit Area.</p>	<ul style="list-style-type: none"> All clearing activities will be managed in accordance with the MinRes Land Clearing Procedure (MRL-EN-PRO-0004) and the Site Disturbance Permit System (ENV-EN-PRO-0005). Final haul road alignment will be designed to minimise clearing of native vegetation as much as practicable (i.e. utilise previously cleared or degraded areas, wherever possible). Clearing boundaries will be flagged/demarcated in the field and spotters used when clearing in close proximity to the boundary of the Proposed Permit Area to ensure clearing remains within approved areas. Cleared areas are to be rehabilitated if not required during operation of the haul road (i.e. borrow pits, lay down areas). 	<p>The proposed vegetation clearing is not expected to be at variance with Clearing Principle A.</p>
B. NATIVE VEGETATION SHOULD NOT BE CLEARED IF IT COMPRISES THE WHOLE, OR PART OF, OR IS NECESSARY FOR THE MAINTENANCE OF, A SIGNIFICANT HABITAT FOR FAUNA INDIGENOUS TO WA			
<p>Six broad habitats were described in the Proposed Permit Area. No habitats were identified as being significant to any conservation significant fauna known to occur within the Proposed Permit Area. One of the habitats, the 'major drainage' habitat was described as having a high significance due to its widespread availability of microhabitats, such as fallen timber, large trees and tree hollows to provide foraging and dispersal opportunities. Some species listed under the EPBC Act may utilise this habitat.</p> <p>The other five fauna habitats were classified as having moderate significance and were also shown to extend well outside the surveyed area.</p>	<p>This Application proposes to clear up to 15% of the total surveyed area of the 'major drainage' habitat. The habitat is known to extend well beyond the boundaries of the Proposed Permit Area and is considered relatively common through the Pilbara. The portion of this habitat within the Proposed Permit Area is not considered to be critical to the survival of any species, however it may cause temporary displacement of individuals during construction activities. Given there is extensive similar habitat available in the surrounding region, this habitat is not considered to be significantly impacted by the clearing activities proposed in this Application.</p> <p>All fauna habitats observed are broadly distributed throughout the Pilbara and are not considered crucial for the presence or survival of any Threatened or Priority fauna listed under the BC Act or the EPBC Act.</p>	<ul style="list-style-type: none"> All clearing activities will be managed in accordance with the MinRes Land Clearing Procedure (MRL-EN-PRO-0004) and the Site Disturbance Permit System (ENV-EN-PRO-0005). The final haul road alignment will be designed to minimise clearing of native vegetation as much as practicable (i.e. utilise previously cleared or degraded areas, wherever possible). All clearing activities (including supporting activities such as borrow pits, laydown areas) shall minimise impacts to the 'major drainage' habitat as much as practicable. Fauna refuges such as large trees and tree hollows, will be pushed to the side of cleared areas and retained where practicable. These can provide ongoing refuge for fauna during construction and operation and help re-establish habitat during rehabilitation. Cleared areas are to be rehabilitated if not required during operation of the haul road (i.e. borrow pits, ay down areas). 	<p>The proposed vegetation clearing is not expected to be at variance with Clearing Principle B.</p>
C. NATIVE VEGETATION SHOULD NOT BE CLEARED IF IT INCLUDES, OR IS NECESSARY FOR THE CONTINUED EXISTENCE OF, RARE FLORA			
<p>No Threatened flora or Priority flora species have been recorded within the Proposed Permit Area.</p>	<p>No Threatened or Priority flora will be impacted by the clearing activities within this Application.</p>	<ul style="list-style-type: none"> All clearing activities will be managed in accordance with the MinRes Land Clearing Procedure (MRL-EN-PRO-0004) and the Site Disturbance Permit System (ENV-EN-PRO-0005). Maintain a Flora Register for the Proposed Permit Area. 	<p>The proposed vegetation clearing is not expected to be at variance with Clearing Principle C.</p>

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

RELEVANT INFORMATION	ASSESSMENT OF POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	ASSESSMENT OF VARIANCE WITH CLEARING PRINCIPLE
D. NATIVE VEGETATION SHOULD NOT BE CLEARED IF IT COMPRISES THE WHOLE OR PART OF, OR IS NECESSARY FOR THE MAINTENANCE OF, A THREATENED ECOLOGICAL COMMUNITY			
No TECs have been recorded within the Proposed Permit Area.	No impacts to TECs will be impacted by the clearing activities within this Application.	<ul style="list-style-type: none"> All clearing activities will be managed in accordance with the MinRes Land Clearing Procedure (MRL-EN-PRO-0004) and the Site Disturbance Permit System (ENV-EN-PRO-0005). 	The proposed vegetation clearing is not expected to be at variance with Clearing Principle D.
E. NATIVE VEGETATION SHOULD NOT BE CLEARED IF IT IS SIGNIFICANT AS A REMNANT OF NATIVE VEGETATION IN AN AREA THAT HAS BEEN EXTENSIVELY CLEARED			
The Proposed Permit Area lies within the Fortescue Valley 29 vegetation system-association. This vegetation association has over 99% of its original extent remaining and it is considered of 'least concern' to impacts posed by clearing.	The clearing activities proposed within this Application will impact less than 1% of the entire Fortescue Valley 29 vegetation system-association. With more than 99% remaining undisturbed, this Application is considered to have negligible impact on the remnant vegetation of the area.	<ul style="list-style-type: none"> All clearing activities will be managed in accordance with the MinRes Land Clearing Procedure (MRL-EN-PRO-0004) and the Site Disturbance Permit System (ENV-EN-PRO-0005). Final haul road alignment will be designed to minimise clearing of native vegetation as much as practicable (i.e. utilise previously cleared or degraded areas, where possible). Cleared areas are to be rehabilitated if not required during operation of the haul road (i.e. borrow pits, lay down areas). 	The proposed vegetation clearing is not expected to be at variance with Clearing Principle E.
F. NATIVE VEGETATION SHOULD NOT BE CLEARED IF IT IS GROWING IN, OR IN ASSOCIATION WITH, AN ENVIRONMENT ASSOCIATED WITH A WATERCOURSE OR WETLAND			
<p>No Ramsar Wetlands, nationally Important Wetlands or DBCA managed waters occur within the Proposed Permit Area.</p> <p>The Proposed Permit Area falls within the Weeli Wolli Creek catchment that typically drains towards the north-west. The Proposed Permit Area crosses the Weeli Wolli Creek in two locations, with the remaining areas predominately within the creeks wider alluvial fan. Overflow from the creek lines only flow into secondary drainage lines within the alluvial fan following significant rainfall events.</p> <p>Flood modelling has been conducted for this Project, with consideration of the existing topography and drainage lines and the proposed road design elements, such as drainage infrastructure at creek crossings. It was concluded that due to the flat topography of the Proposed Permit Area, the proposed haul road will operate as a floodway and have minimal impact on the local flooding regime of the Weeli Wolli Creek.</p>	<p>The clearing activities proposed within this Application may result in temporary impacts to the natural flow regime and water quality within the Weeli Wolli Creek. These impacts are only expected to occur during construction activities (less than a four-month period).</p> <p>Through implementation of the proposed mitigation measures, including designing suitable drainage infrastructure at creek crossings, the any potential impacts to the creek are considered to be short-term and the ongoing natural hydrological regime of the Weeli Wolli Creek and its catchment area are unlikely to be significantly impacted.</p>	<ul style="list-style-type: none"> All clearing activities will be managed in accordance with the MinRes Land Clearing Procedure (MRL-EN-PRO-0004) and the Site Disturbance Permit System (ENV-EN-PRO-0005). Implement Surface Water Management Procedure (MRL-EN-PRO-0003). Flood modelling will be used to inform final road design to minimise potential for significant alterations in hydrological flow (i.e. culverts and drains). Clearing, movement and disturbance around creek lines and pooled water will be limited where possible to minimise disruption to the natural hydrological regimes. Avoid clearing activities and road constructions earthworks during periods of short-duration and high-intensity rainfall (i.e. cyclones) to minimise short-term impacts to water quality and sheet flow. During road construction, consider additional temporary stabilisation measures if necessary to prevent significant erosion of cleared areas (i.e. during forecasted heavy rainfall events). Install erosion control measures around vegetation and topsoil stockpiles, to prevent the loss and erosion of stockpiled material, and potential sedimentation of drainage lines. Conduct regular site inspections during construction, and following high-intensity, short-duration rainfall events during operation and apply adaptive erosion or water management controls, if required (i.e. maintenance or repairs to road construction or surface water infrastructure). Cleared areas are to be rehabilitated if not required during operation of the haul road (i.e. borrow pits, ay down areas). 	The proposed vegetation clearing is not expected to be at variance with Clearing Principle F.

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

RELEVANT INFORMATION	ASSESSMENT OF POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	ASSESSMENT OF VARIANCE WITH CLEARING PRINCIPLE
G. NATIVE VEGETATION SHOULD NOT BE CLEARED IF THE CLEARING OF THE VEGETATION IS LIKELY TO CAUSE APPRECIABLE LAND DEGRADATION			
<p>The majority of the Proposed Permit Area was observed to be degraded with a significant portion classified as being in poor condition. Contributing factors to this assessment was based on the presence of weeds, cattle disturbance, previous fire damage and presence of historical clearing of tracks. The Proposed Permit Area is located within an existing cattle pastoral lease and seven weed species have already been recorded within the Proposed Permit Area.</p> <p>The area adjacent to the Proposed Permit Area remains mostly uncleared with the exception of the existing Phil's Creek Haul Road located to the east.</p>	<p>The Proposed Permit Area is surrounded by large amounts of continuous areas of undisturbed native vegetation.</p> <p>Given the extent of remaining vegetation in the area, the amount of clearing proposed within this Application (<70 ha) is not expected to significantly impact on groundwater levels underlying the area or result in increased salinity of surrounding soils.</p> <p>Based on the outcomes of the flood modelling conducted for the Project, the natural flow regime of the Weeli Wolli Creek is not expected to be impacted by the Application.</p> <p>Whilst minor, local soil erosion may occur during clearing and construction activities, the local topography is not steep and significant gulying would not be expected. Drainage mechanisms such as culverts will be installed, where necessary, to minimise erosion across drainage lines. Further, the use of erosion prevention controls around stockpiled materials and progressive rehabilitation of cleared lands further reduces this risk.</p> <p>Through the implementation of proposed mitigation measures, and the retention of natural flow regimes, the potential for significant erosion or sedimentation of the Weeli Wolli Creek is unlikely.</p>	<p><i>Proposed measures are as per Principle F.</i></p>	<p>The proposed vegetation clearing is not expected to be at variance with Clearing Principle G.</p>
H. NATIVE VEGETATION SHOULD NOT BE CLEARED IF THE CLEARING OF THE VEGETATION IS LIKELY TO HAVE AN IMPACT ON THE ENVIRONMENTAL VALUES OF ANY ADJACENT OR NEARBY CONSERVATION AREA			
<p>The Proposed Permit Area is not located within any known conservation areas, Conservation or National Parks and Reserves, Ramsar Wetlands, Nationally Important Wetlands or other DBCA managed waters or land.</p> <p>The closest conservation areas are the Fortescue Marsh, located approximately 30 km to the north, and Karajini National Park, located approximately 80 km to the west of the Proposed Permit Area.</p>	<p>Given the distance of the Proposed Permit Area to the nearest conservation areas, the clearing activities within this Application are not considered to impact on the environmental values of any conservation or environmentally significant areas.</p>	<ul style="list-style-type: none"> All clearing activities will be managed in accordance with the MinRes Land Clearing Procedure (MRL-EN-PRO-0004) and the Site Disturbance Permit System (ENV-EN-PRO-0005). Cleared areas are to be rehabilitated if not required during operation of the haul road (i.e. borrow pits, lay down areas). 	<p>The proposed vegetation clearing is not expected to be at variance with Clearing Principle H.</p>
I. NATIVE VEGETATION SHOULD NOT BE CLEARED IF THE CLEARING IS LIKELY TO CAUSE DETERIORATION IN THE QUALITY OF SURFACE OR UNDERGROUND WATER			
<p>The Proposed Permit Area falls within the Weeli Wolli Creek catchment that typically drains towards the north-west. The Proposed Permit Area crosses the Weeli Wolli Creek in two locations, with the remaining areas predominately within the creeks wider alluvial fan. This creek is part of the larger Fortescue River system. The creek is not a permanent water source. The area typically flows following heavy rainfall events. Overflow from the creek lines only reach secondary drainage lines within the alluvial fan following significant rainfall events.</p> <p>Based on information inferred from the nearby Iron Valley Mine, groundwater below the Proposed Permit Area is expected to be at least 26 to 43 metres below ground level. There is low hydraulic</p>	<p>The clearing activities proposed within this Application may result in temporary impacts to the natural flow regime and create minor levels of soil erosion which may adversely impact on the water quality within the Weeli Wolli Creek. These impacts are only expected to occur during construction activities (less than a four month period).</p> <p>Through implementation of the proposed mitigation measures, including designing suitable drainage infrastructure at creek crossings, erosion control measures around stockpiled material and avoiding clearing during heavy rainfall events, any potential impacts to the creek are considered to be short-term water quality within the Weeli Wolli Creek and its catchment area are unlikely to be significantly impacted.</p> <p>Other potential impacts to surface quality may result from minor hydrocarbon spills, which may occur as a result of leaks from vehicles and machinery</p>	<ul style="list-style-type: none"> <i>Refer to Proposed measures as per Principle F.</i> All waste to be removed from the Proposed Permit Area and disposed off site. Minor volumes of hydrocarbons and chemicals required for the construction activities to be temporarily stored in suitably bunded laydown areas in accordance with relevant Australian Standards. Any bulk storage shall be stored offsite (i.e. Iron Valley Mine or Phil's Creek Mine). All laydown areas to be located more than 50 m from existing creek and drainage lines. No refuelling, maintenance or washing of vehicles to occur within the Proposed Permit Area. 	<p>The proposed vegetation clearing is not expected to be at variance with Clearing Principle I.</p>

Printed copies of this document are not controlled. Please ensure that this is the latest available version before use.

RELEVANT INFORMATION	ASSESSMENT OF POTENTIAL IMPACTS	PROPOSED MITIGATION MEASURES	ASSESSMENT OF VARIANCE WITH CLEARING PRINCIPLE
<p>conductivity expected between surface water flows and below ground aquifers in the local area.</p>	<p>during clearing or construction activities or due to storage of minor volumes within laydown areas. Any potential contamination observed will be removed and remediated from the Proposed Permit Area to prevent any significant impacts to the water quality of the Weeli Wolli Creek and its catchment.</p> <p>In regard to groundwater quality, the clearing proposed under this Application is for the purposes of a haul road construction on the grounds surface and does not require any below-ground activities. Due to the depth of groundwater expected below the site, the surface activities proposed within this Application are not considered to impact on groundwater.</p> <p>Any groundwater abstracted for use in road construction and dust suppression for the activities within this Application is managed separately under the existing groundwater licences issued to MinRes and regulated by the DWER.</p>	<ul style="list-style-type: none"> All equipment, vehicles and machinery to be regularly inspected and serviced (offsite) to reduce potential for accidental leaks and spills. Spill response equipment to be available of all equipment and machinery, and within all laydown areas within the Proposed Permit Area. All spills to be managed in accordance with the Chemical Management Procedure (MRL-HS-PRO-0009), including containment, removal and disposal offsite. Training in the handling of hydrocarbons, chemicals and waste management, as well as emergency spill response to be undertaken by all employees during site inductions. Implement a surface water and groundwater monitoring program to identify any significant reduction in water quality as a result of activities conducted within this Application. Groundwater abstracted for use in road construction and clearing activities will be managed separately by MinRes, in accordance with their existing 5C Licences. 	
<p>J. NATIVE VEGETATION SHOULD NOT BE CLEARED IF THE CLEARING IS LIKELY TO CAUSE, OR EXACERBATE, THE INCIDENCE OR INTENSITY OF FLOODING</p>			
<p>The climate of the region is semi-arid, characterised by hot summers and cool winters. The average rainfall is approximately 321 millimetres per year, with the majority of rainfall received during the summer months as a result of tropical cycles. Flooding of the Weeli Wolli Creek into secondary drainage lines and the wider alluvial fan is common during these short, intense seasonal rainfall events.</p> <p>The local topography is relatively flat, gradually declining towards the north-west, following the sheetflow of the Weeli Wolli Creek catchment within and surrounding the Proposed Permit Area.</p> <p>Flood modelling has been conducted for this Project, with consideration of the existing topography and drainage lines and the proposed road design elements, such as drainage infrastructure at creek crossings. It was concluded that due to the flat topography of the Proposed Permit Area, the proposed haul road will operate as a floodway and have minimal impact on the local flooding regime of the Weeli Wolli Creek.</p>	<p>The clearing proposed within this Application, together with the road design informed by site-specific flood modelling data, will not result in the damming or retention of surface water within or surrounding the Proposed Permit Area.</p> <p>There may be minor changes to localised surface drainage through the clearing of vegetation, particularly during construction activities, however, there is not expected to be any significant or long-term impacts to the natural flooding regime of the Weeli Wolli Creek and its catchment area.</p> <p>The clearing proposed within this Application may cause localised, short-term disturbance but will not exacerbate the incidence or intensity of flooding.</p>	<p><i>Proposed measures are as per Principle F.</i></p>	<p>The proposed vegetation clearing is not expected to be at variance with Clearing Principle J.</p>

8. SUMMARY AND CONCLUSIONS

Vegetation clearing detailed within this Application is required for the realignment of MinRes's current haulage route (Phil's Creek Haul Road) to utilise two newly constructed sections of the haul road.

This Clearing Permit Application seeks approval for clearing of up to 70 ha of native vegetation within a 246 ha Proposed Permit Area.

The assessment against the ten clearing principles described within *A Guide to the Assessment of Applications to Clear Native Vegetation* (DER, 2014) under Part V Division 2 of the EP Act was based on information derived from all relevant desktop information and detailed surveys conducted over the Proposed Permit Area. The recent flora & vegetation surveys (Rapallo 2021a; 2022c), and terrestrial fauna & SRE assessments (Rapallo 2022a; 2022c and 2022b) were all used for vegetation and habitat mapping, disturbance calculations and assessments of risks to the relevant environmental factors.

All vegetation described within the Proposed Permit Area is well represented on a regional scale and the small area of proposed clearing (<70 ha) is unlikely to have any significant impact on the environmental values of the region. There are no TECs, PECs, Threatened or Priority flora, or any habitat critical to the survival of any Threatened or Priority fauna recorded within the Proposed Permit Area. The activities proposed within this Application are not considered to impact on any conservation significant flora or fauna.

The activities proposed within this Application form an integral part of MinRes's developments in the vicinity of the Proposal Permit Area. Through the implementation of the management strategies to minimise the impact of land clearing, the proposed clearing requested in this Application is not expected to be at variance with any of the ten clearing principles (Table 7-1).

9. REFERENCES

- AQ2, 2021. *Phil's Creek Haul Road-Surface Water Assessment, Version 25 Agosto*, s.l.: s.n.
- Beard, J., 1976. *Vegetation Survey of Western Australia, Pilbara 1:1 000 000. Map and Explanatory Notes to Sheet 7*, Perth: University of Western Australia Press.
- BOM, 2022. *Bureau of Meteorology*. [Online] Available at: <http://www.bom.gov.au/climate/dwo/IDCJDW6061.latest.shtml> [Accessed 19/05/2022 May 2022].
- DER, 2014a. *A guide to the Assessment of Applications to Clear Native Vegetation*, s.l.: Department of Environment Regulation.
- DPIRD, 2021. *Agriculture and Food. Climate in the Pilbara region of Western Australia*, s.l.: s.n.
- Gardiner, S., 2003. *Impacts of Mining and Mine Closure on Water Quality and the Nature of Shallow Aquifer, Yandi Iron Ore Mine*, s.l.: s.n.
- Kendrick, P., 2001b. *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002; Pilbara 3 (PIL3 - Hamersley subregion)*, s.l.: The Department of Conservation and Land Management.
- PMI, 2013. *Mining Proposal for the Phil's Creek Haul Road (Reg ID 39123)*, s.l.: Process Minerals International.
- Rapallo, 2012a. *Level 2 Flora and Vegetation Survey of Phil' Creek Haul Road for Process Minerals International*.
- Rapallo, 2012b. *Level 1 Phil's Creek Vertebrate Fauna Survey for Process Minerals International*.
- Rapallo, 2021a. *J021225 – Detailed and targeted flora survey of the Phil's Creek haul road realignment, Version 22 December 2021*.
- Rapallo, 2022a. *J021054-B – Targeted conservation significant vertebrate fauna survey and habitat assessment of the Phil's Creek Haul Road realignment, Version 14 February 2022*.
- Rapallo, 2022b. *J021054 – Taxonomy results of short-range endemic invertebrates collected from the Phil's Creek Haul Road realignment, Version 12 January 2022*.
- Rapallo, 2022c. *J021716 – Extrapolation of Phil's Creek Haul Road realignment vegetation and habitat mapping, Version 24 March 2022*.
- RGS, 2022a. *Technical Report-Soils Assessment-Phil's Creek Haul Road*, Issued 01 January 2022
- RGS, 2022b. *Technical Report - Phil's Creek Haul Road Geochemical Assessment*. Issued 29 January 2022
- Shepherd, D. B. G. a. H., 2002. *Native vegetation in Western Australia: Extent, type, and status. Resource Management Technical Report 249.*, South Perth, Western Australia: Department of Agriculture.

LIST OF APPENDICES

APPENDIX 1: GEOCHEMICAL ASSESSMENT (RGS 2022B)

APPENDIX 2: SURFACE WATER ASSESSMENT (AQ2 2021)

APPENDIX 3: SOILS ASSESSMENT (RGS 2022A)

APPENDIX 4: DETAILED AND TARGETED FLORA SURVEY REPORT (RAPALLO 2021A)

APPENDIX 5: MEMORANDUM – TARGETED CONSERVATION SIGNIFICANT VERTEBRATE FAUNA SURVEY AND HABITAT ASSESSMENT (RAPALLO 2021B)

APPENDIX 6: TAXONOMY RESULTS OF SHORT-RANGE ENDEMIC INVERTEBRATES (RAPALLO 2022A)

APPENDIX 7: MEMORANDUM – REVIEW OF EXISTING SURVEY COVERAGE (RAPALLO 2022B)