



## CLEARING PERMIT

*Granted under section 51E of the Environmental Protection Act 1986*

<b>Purpose Permit number:</b>	CPS 9123/1
<b>Permit Holder:</b>	Hamersley Iron Pty Ltd
<b>Duration of Permit:</b>	15 April 2021 to 15 April 2028

The Permit Holder is authorised to clear native vegetation subject to the following conditions of this Permit.

### **PART I – CLEARING AUTHORISED**

#### **1. Purpose for which clearing may be done**

- Clearing for the purpose of a borefield including bores, pipelines, powerlines, access tracks and other infrastructure; and
- Clearing for the purpose of construction of a pipeline and associated laydown areas, storage areas, offices, parking areas, surge tanks, chlorination units, pump stations, and booster stations.

#### **2. Land on which clearing is to be done**

Lot 8 on Plan 241372	Mount Sheila
Lot 9 on Plan 47815	Mount Sheila
Lot 32 on Plan 55948	Mount Sheila
Lot 106 on Plan 243222	Mount Sheila
Lot 107 on Plan 243223	Mount Sheila
Lot 331 on Plan 74355	Mount Sheila
Lot 556 on Plan 70685	Mount Sheila
Lot 556 on Plan 404911	Mount Sheila
Lot 557 on Plan 70685	Mount Sheila
Unallocated Crown Land (PIN 714253)	Mount Sheila
Unallocated Crown Land (PIN 1014954)	Mount Sheila
Unallocated Crown Land (PIN 1014967)	Mount Sheila
Unallocated Crown Land (PIN 1014974)	Mount Sheila
Eungella Place Road Reserve (PIN 11432512)	Tom Price
Jabbarup Place Road Reserve (PIN 11432490)	Tom Price
Kanberra Drive Road Reserve (PIN 11432488)	Tom Price
Killawarra Drive Road Reserve (PIN 11432489)	Tom Price
Lot 9 on Plan 47815	Tom Price
Lot 20 on Plan 47816	Tom Price
Lot 26 on Plan 241873	Tom Price
Lot 35 on Plan 93088	Tom Price
Lot 36 on Plan 51845	Tom Price
Lot 271 on Plan 15093 (Crown Reserve 39874)	Tom Price
Lot 272 on Plan 15093 (Crown Reserve 39874)	Tom Price
Lot 277 on Plan 15091 (Crown Reserve 39907)	Tom Price
Lot 500 on Plan 406730 (Crown Reserve 40797)	Tom Price
Lot 520 on Plan 69942	Tom Price
Lot 522 on Plan 69942	Tom Price
Lot 1236 on Plan 15091	Tom Price
Lot 3000 on Plan 44791	Tom Price

Tarwonga Circuit Road Reserve (PIN 11432484)	Tom Price
Unallocated Crown Land (PIN 11994537)	Tom Price
Warrina Place Road Reserve (PIN 11432487)	Tom Price
Yanagin Place Road Reserve (PIN 11432486)	Tom Price

### 3. Clearing authorised

- (a) The Permit Holder must not clear more than 150 hectares of native vegetation within the area cross-hatched yellow in Figure 1 (Areas A to D) of attached Schedule 1.
- (b) This Permit authorises the Permit Holder to clear native vegetation for activities to the extent that the Permit Holder has the right to access land under the *Water Agencies (Powers) Act 1984* or any other written law.

### 4. Period during which clearing is authorised

The Permit Holder must not clear any native vegetation after 15 April 2023.

### 5. Application

This Permit allows the Permit Holder to authorise persons, including employees, contractors and agents of the Permit Holder, to clear native vegetation for the purposes of this Permit subject to compliance with the conditions of this Permit and approval from the Permit Holder.

## PART II –MANAGEMENT CONDITIONS

### 6. Avoid, minimise and reduce the impacts and extent of clearing

In determining the amount of native vegetation to be cleared authorised under this Permit, the Permit Holder must have regard to the following principles, set out in order of preference:

- (a) avoid the clearing of native vegetation;
- (b) minimise the amount of native vegetation to be cleared; and
- (c) reduce the impact of clearing on any environmental value.

### 7. Weed control

- (a) When undertaking any clearing authorised under this Permit, the Permit Holder must take the following steps to minimise the risk of the introduction and spread of *weeds*:
  - (i) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
  - (ii) ensure that no *weed*-affected soil, *mulch*, *fill* or other material is brought into the area to be cleared; and
  - (iii) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.
- (b) At least once in each 12-month period for the term of this Permit, the Permit Holder must remove or kill any *weeds* growing within areas cleared under this Permit.

### 8. Watercourses

- (a) Where practicable the Permit Holder shall avoid clearing *riparian vegetation*.
- (b) Where a *watercourse* is to be impacted by clearing, the Permit Holder shall maintain the existing surface flow of that *watercourse*.

### 9. Retain vegetative material and topsoil, and rehabilitation

- (a) The Permit Holder must retain the vegetative material and topsoil removed by clearing authorised under this Permit and stockpile the vegetative material and topsoil in an area that has already been cleared.
- (b) The Permit Holder must within 6 months of undertaking the clearing authorised under this Permit, *revegetate* and *rehabilitate* the areas that are no longer required for the purpose for which they were cleared under this Permit by:
  - (i) re-shaping the surface of the land so that it is consistent with the surrounding 5 metres of uncleared land;

- (ii) ripping the ground to remove soil compaction; and
- (iii) laying the vegetative material and topsoil retained under condition 9(a) on the cleared area.
- (c) The Permit Holder must within 24 months of laying the vegetative material and topsoil on the cleared area in accordance with condition 9(b) of this permit:
  - (i) engage an *environmental specialist* to determine the species composition, structure and density of the vegetation of area *revegetated* and *rehabilitated*; and
  - (ii) engage an *environmental specialist* to make a determination as to whether the composition, structure and density determined under condition 9(c)(i) of this permit will, without further *revegetation*, result in a similar species composition, structure and density to that of pre-clearing vegetation types in that area.
- (d) if the determination made by the *environmental specialist* under condition 9(c)(ii) is that the species composition, structure, and density determined under condition 9(c)(i) will not, without further *revegetation*, result in a similar species composition, structure and density to that of pre-clearing vegetation types in that area, the permit holder must *revegetate* the area by deliberately *planting* and/or *direct seeding* native vegetation seeds that will result in a similar species composition, structure, and density of native vegetation to pre-clearing vegetation types in that area.
- (e) where additional *planting* or *direct seeding* of native vegetation is undertaken in accordance with condition 9(d), the Permit Holder must repeat the activities required by condition 9(c) and 9(d) within 12 months of undertaking the additional *planting* or *direct seeding* of native vegetation.
- (f) Where a determination is made by an *environmental specialist* under condition 9(c)(ii) that the composition, structure and density within areas *revegetated* and *rehabilitated* will result in a similar species composition, structure and density to that of pre-clearing vegetation types in that area, that determination shall be submitted to the *CEO* within three months of the determination being made by the *environmental specialist*.
- (g) During the next *optimal time* occurring after receiving notice from the *CEO*:
  - (i) stating that the *CEO* disagrees with the determination submitted under condition 9(f); and
  - (ii) specifying the required further *planting* of *local provenance* propagating material and/or *direct seeding* of *local provenance* seeds that in the *CEO's* reasonable opinion are necessary to ensure that the native vegetation will result in a similar species composition, structure and density to that of pre-clearing vegetation types in that area, the permit holder must carry out the further *planting* and/or *direct seeding* specified in the notice.

### **PART III - RECORD KEEPING AND REPORTING**

#### **10. Records that must be kept**

The permit holder must maintain records relating to the listed relevant matters in accordance with the specifications detailed in Table 1.

**Table 1: Records that must be kept**

No.	Relevant matter	Specifications
1.	In relation to the authorised clearing activities generally	<ul style="list-style-type: none"> <li>(a) the species composition, structure, and density of the cleared area;</li> <li>(b) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings;</li> <li>(c) the date that the area was cleared;</li> <li>(d) the size of the area cleared (in hectares);</li> <li>(e) actions taken to avoid, minimise, and reduce the impacts and extent of clearing in accordance with condition 6;</li> <li>(f) actions taken to minimise the risk of the introduction and spread of <i>weeds</i> in accordance with condition 7.</li> </ul>

No.	Relevant matter	Specifications
		<p>(g) actions taken to avoid the clearing of <i>Priority flora</i> taxa;</p> <p>(h) the name, location and number of each <i>Priority flora</i> taxon impacted using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings.</p>
2.	In relation to the revegetation and rehabilitation of areas pursuant to condition 9 of this Permit:	<p>(a) the location of any areas <i>revegetated</i> and <i>rehabilitated</i>, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees;</p> <p>(b) a description of the <i>revegetation</i> and <i>rehabilitation</i> activities undertaken;</p> <p>(c) the date that the area was <i>revegetated</i> and <i>rehabilitated</i>;</p> <p>(d) the size of the area <i>revegetated</i> and <i>rehabilitated</i> (in hectares).</p> <p>(e) a copy of the <i>environmental specialist's</i> report detailing the species composition, structure and density of the area <i>revegetated</i> and <i>rehabilitated</i> including the methodology used in determining those values.</p>

## 11. Reporting

- (a) The Permit Holder must provide to the *CEO* on or before 30 June of each year, a written report:
- (i) of records required under condition 10 of this Permit; and
  - (ii) concerning activities done by the Permit Holder under this Permit between 1 January and 31 December of the preceding year.
- (b) If no clearing authorised under this Permit was undertaken between 1 January and 31 December of the preceding year, a written report confirming that no clearing under this permit has been carried out must be provided to the *CEO* on or before 30 June of each year.
- (c) Prior to 30 September 2028, the Permit Holder must provide to the *CEO* a written report of records required under condition 10 of this Permit where these records have not already been provided under condition 12(a) of this Permit.

## DEFINITIONS

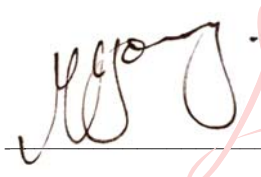
In this permit, the terms in Table 2 have the meanings defined.

**Table 2: Definitions**

Term	Definition
CEO	Chief Executive Officer of the <i>department</i> responsible for the administration of the clearing provisions under the <i>Environmental Protection Act 1986</i> .
clearing	has the meaning given under section 3(1) of the EP Act
condition	a condition to which this clearing permit is subject under section 51H of the EP Act
direct seeding	means a method of re-establishing vegetation through establishment of a seed bed and the introduction of seeds of the desired plant species



Term	Definition
department	means the <i>department</i> established under section 35 of the <i>Public Sector Management Act 1994</i> (WA) and designated as responsible for the administration of the EP Act, which includes Part V Division 3
environmental specialist	means a person who holds a tertiary qualification in environmental science or equivalent, and has experience relevant to the type of environmental advice that an <i>environmental specialist</i> is required to provide under this Permit, or who is approved by the <i>CEO</i> as a suitable <i>environmental specialist</i>
EP Act	<i>Environmental Protection Act 1986</i> (WA)
fill	means material used to increase the ground level, or to fill a depression
local provenance	means native vegetation seeds and propagating material from natural sources within 100 kilometres and the same Interim Biogeographic Regionalisation for Australia (IBRA) subregion of the area cleared
mulch	means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation
native vegetation	has the meaning given under section 3(1) and section 51A of the EP Act
optimal time	means the period from November to December for undertaking <i>direct seeding</i> . No <i>planting</i> without irrigation
planting	means the re-establishment of vegetation by creating soil conditions and planting seedlings of the desired species
Priority flora	means those plant taxa described as Priority flora classes 1, 2, 3, or 4 in the Department of Biodiversity, Conservation and Attractions Threatened and Priority Flora List for Western Australia (as amended from time to time)
rehabilitate/ed/ion	means actively managing an area containing native vegetation in order to improve the ecological function of that area
revegetate/ed/ion	means the re-establishment of a cover of <i>local provenance</i> native vegetation in an area using methods such as natural regeneration, <i>direct seeding</i> and/or <i>planting</i> , so that the species composition, structure and density is similar to pre-clearing vegetation types in that area
riparian vegetation	has the meaning given to it in Regulation 3 of the <i>Environmental Protection (Clearing of Native Vegetation) Regulations 2004</i>
watercourse	has the meaning given to it in section 3 of the <i>Rights in Water and Irrigation Act 1914</i> ; wetland/s means an area of seasonally, intermittently or permanently waterlogged or inundated land, whether natural or otherwise, and includes a lake, swamp, marsh, spring, dampland, tidal flat or estuary
weeds	means any plant – <ul style="list-style-type: none"> <li>(a) that is a declared pest under section 22 of the <i>Biosecurity and Agriculture Management Act 2007</i>; or</li> <li>(b) published in a Department of Biodiversity, Conservation and Attractions species-led ecological impact and invasiveness ranking summary, regardless of ranking; or</li> <li>(c) not indigenous to the area concerned</li> </ul>

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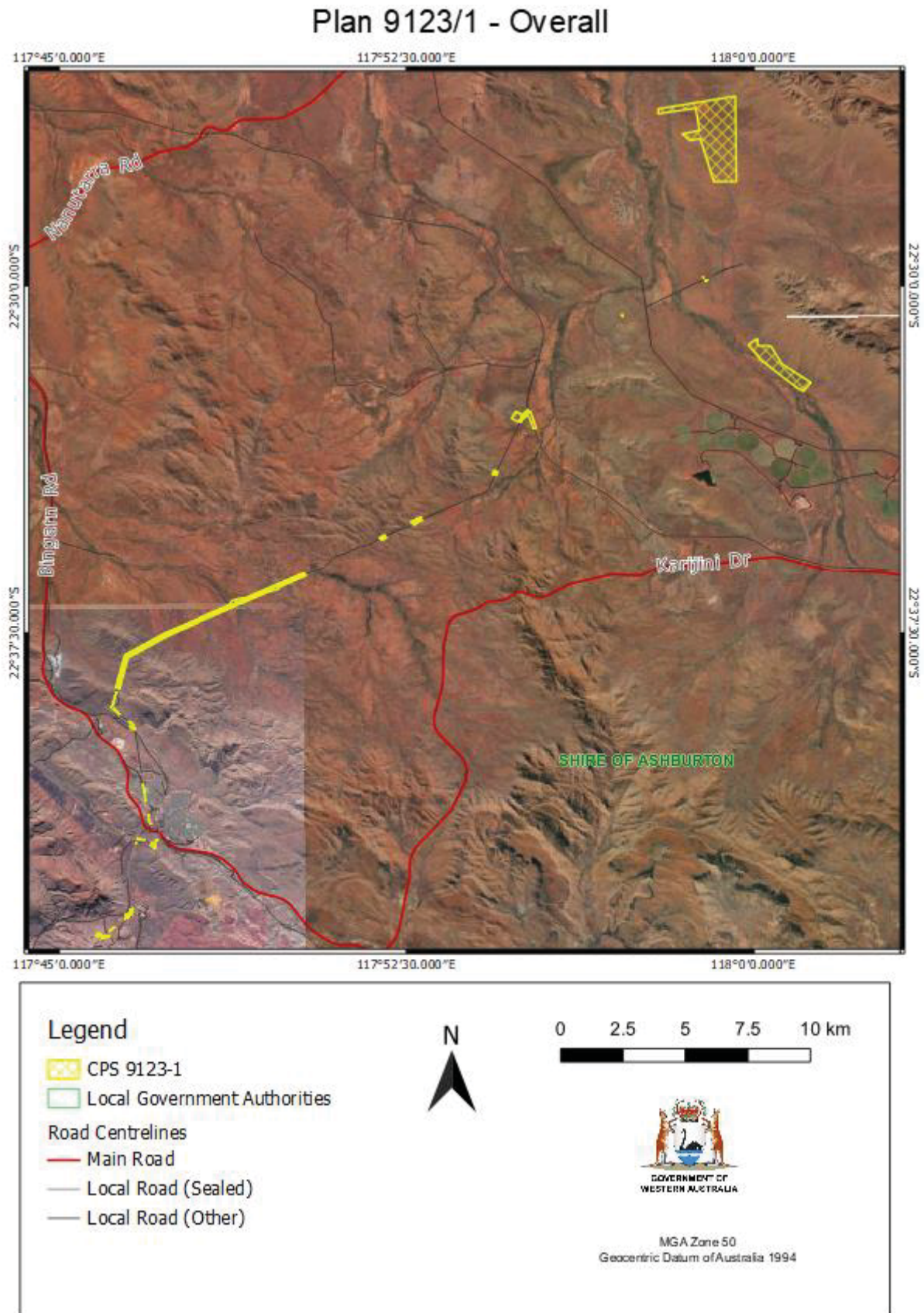
MIKE YOUNG  
A/MANAGER  
NATIVE VEGETATION REGULATION

Officer delegated under Section 20  
of the *Environmental Protection Act 1986*

23 March 2021

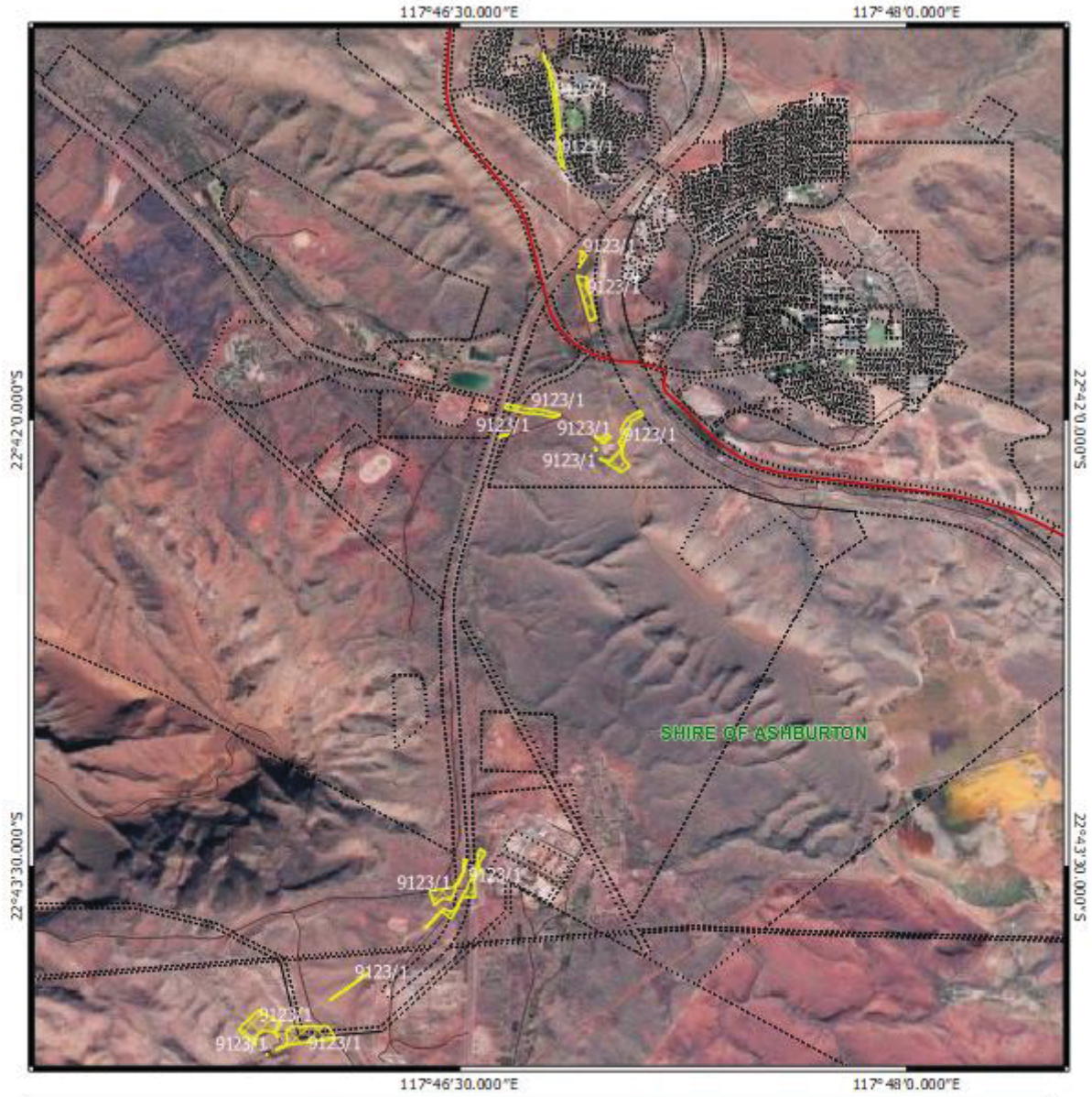
# Schedule 1



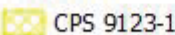
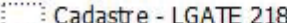

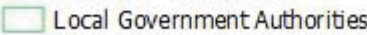



Figure 1: Map of the boundaries of the areas within which clearing may occur, Areas A to D)





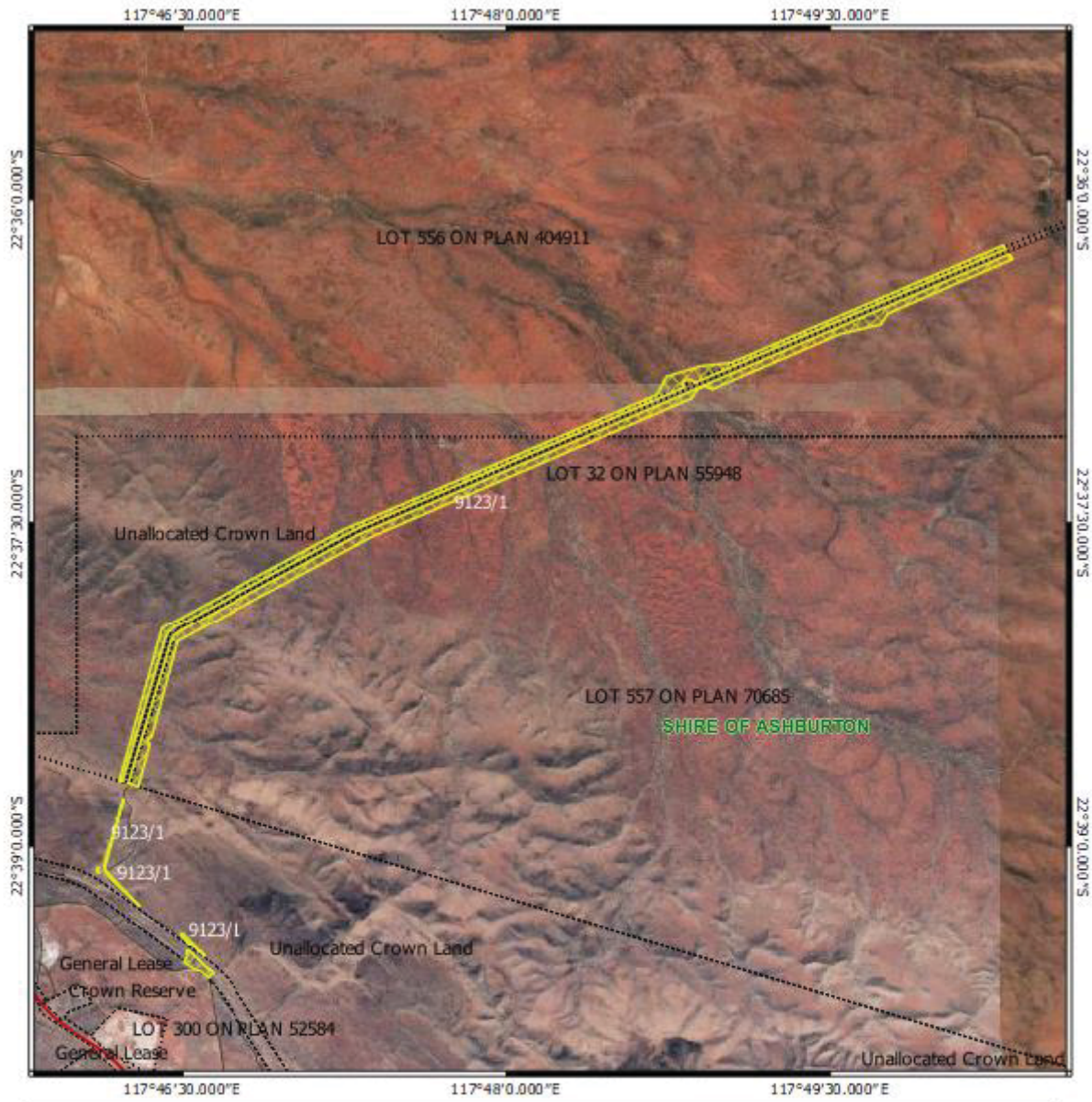
# Plan 9123/1 - Area A



<b>Legend</b>			
	CPS 9123-1		
	Cadastre - LGATE 218	 <p>GOVERNMENT OF WESTERN AUSTRALIA</p>	
	Local Government Authorities		
Road Centrelines			
	Main Road	<p>MGA Zone 50 Geocentric Datum of Australia 1994</p>	
	Local Road (Sealed)		
	Local Road (Other)		



# Plan 9123/1 - Area B



**Legend**

- CPS 9123-1
- Cadastre - LGATE 218
- Local Government Authorities
- Road Centrelines
- Main Road
- Local Road (Other)

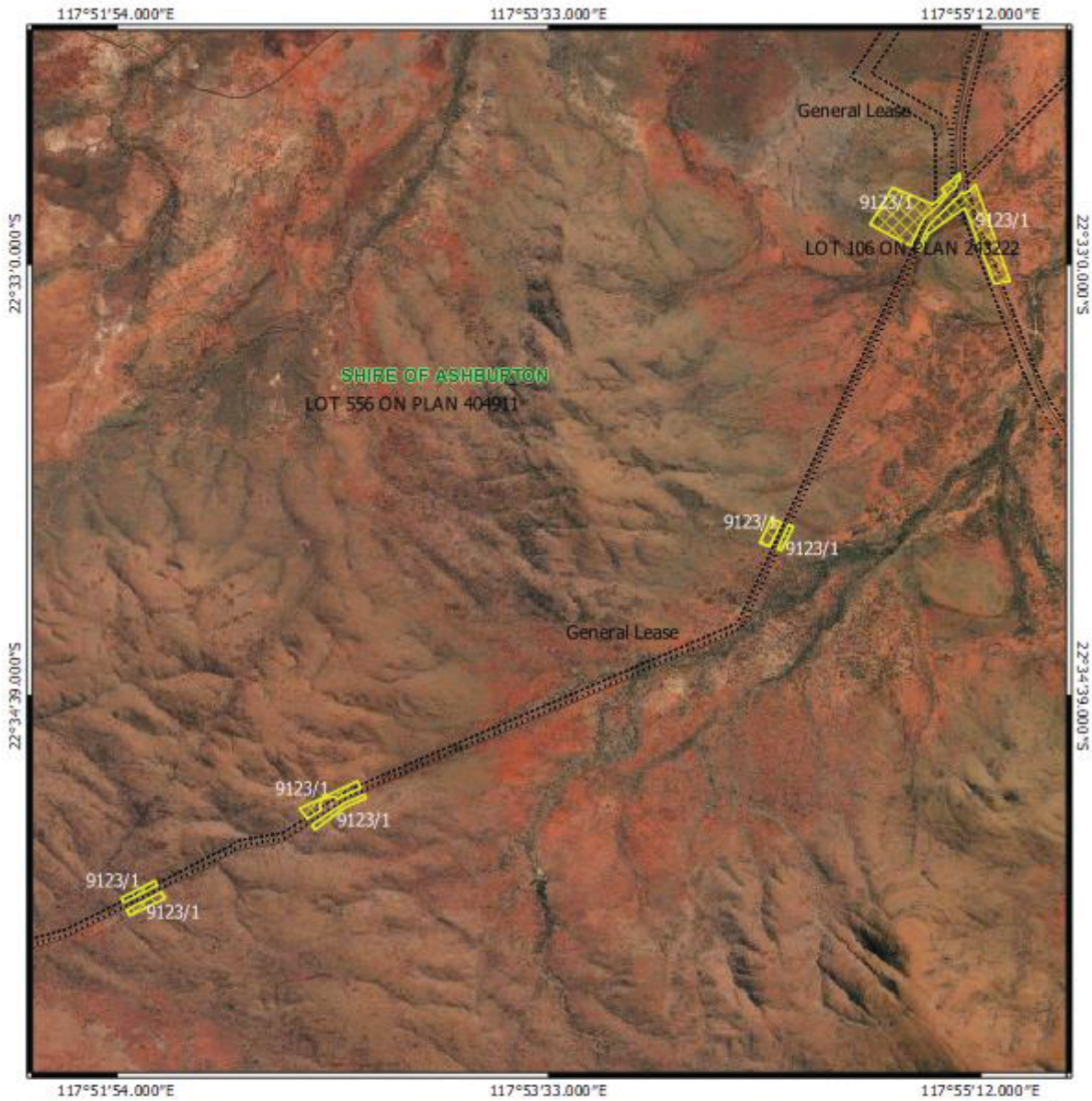
N

0 0.5 1 1.5 2 2.5 km




GOVERNMENT OF  
WESTERN AUSTRALIA


MGA Zone 50  
Geocentric Datum of Australia 1994


# Plan 9123/1 - Area C




**Legend**

-  CPS 9123-1
-  Cadastre - LGATE 218
-  Local Government Authorities
- Road Centrelines
- Local Road (Other)





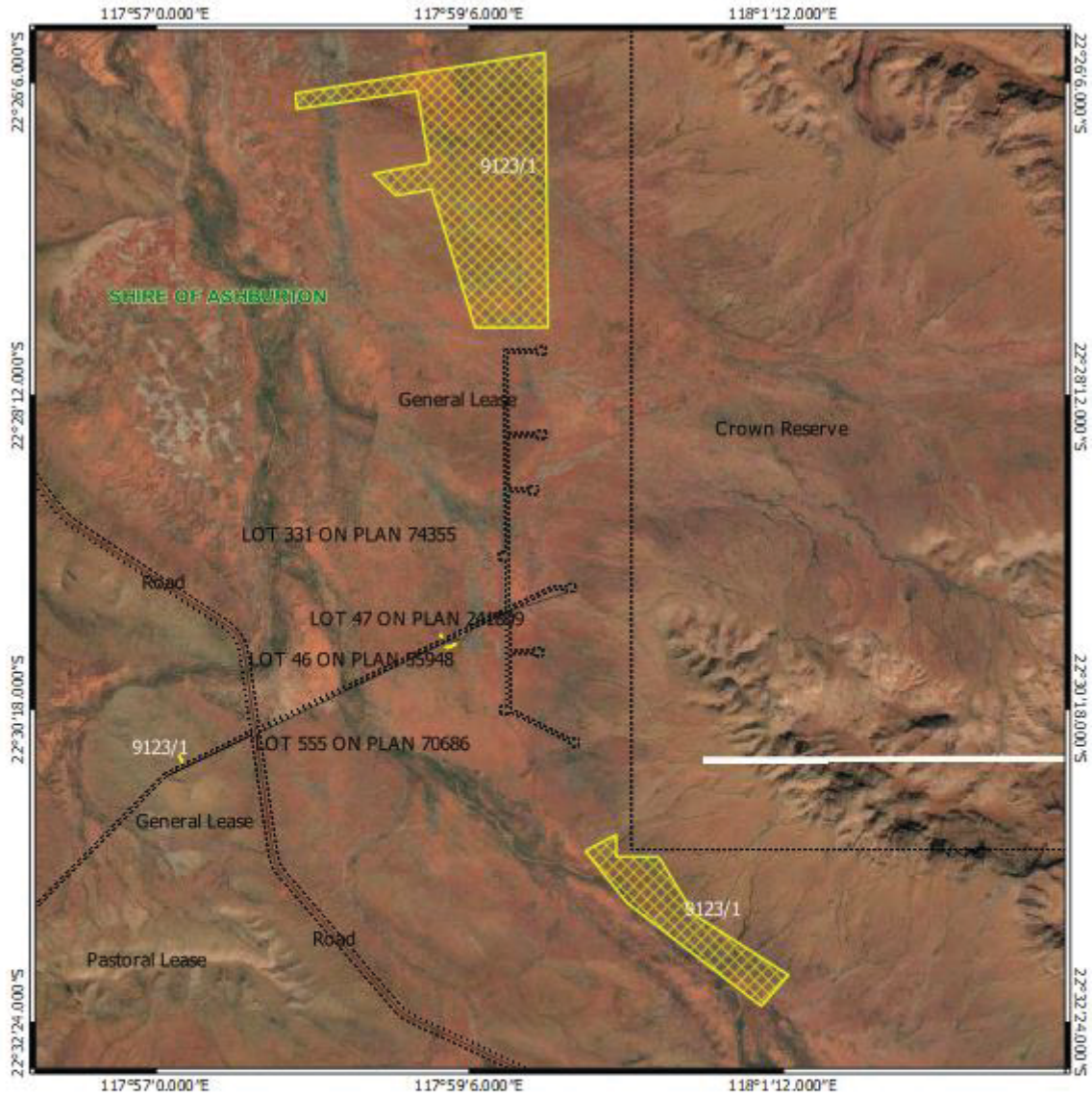


GOVERNMENT OF  
WESTERN AUSTRALIA

MGA Zone 50  
Geocentric Datum of Australia 1994



# Plan 9123/1 - Area D



**Legend**

- CPS 9123-1
- Cadastre - LGATE 218
- Local Government Authorities
- Road Centrelines
- Local Road (Other)

N

0 1 2 3 4 km

GOVERNMENT OF WESTERN AUSTRALIA

MGA Zone 50  
Geocentric Datum of Australia 1994



# Clearing Permit Decision Report

## 1. Application details and outcome

### 1.1. Permit application details

<b>Permit number:</b>	CPS 9123/1	
<b>Permit type:</b>	Purpose permit	
<b>Applicant name:</b>	Hamersley Iron Pty Ltd	
<b>Application received:</b>	25 November 2020	
<b>Application area:</b>	150 hectares of native vegetation	
<b>Purpose of clearing:</b>	Borefield including bores, pipelines, powerlines, access tracks and other infrastructure.	
<b>Method of clearing:</b>	Mechanical removal	
<b>Properties:</b>	Lot 8 on Plan 241372	Mount Sheila
	Lot 9 on Plan 47815	Mount Sheila
	Lot 32 on Plan 55948	Mount Sheila
	Lot 106 on Plan 243222	Mount Sheila
	Lot 107 on Plan 243223	Mount Sheila
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	Warrina Place Road Reserve (PIN 11432487)	Tom Price
	Yanagin Place Road Reserve (PIN 11432486)	Tom Price
<b>Location (LGA area):</b>	Shire of Ashburton	
<b>Localities:</b>	Mount Sheila, Tom Price	

## 1.2. Description of clearing activities

Hamersley Iron Pty Ltd (Hamersley Iron) (the applicant) has identified the need to replace a number of production and monitoring bores at the Southern Fortescue Borefield. The applicant is also duplicating the Southern Fortescue Pipeline from a filter plant at Marandoo booster station to the Tom Price town tanks to the south.

An existing amended clearing permit (CPS 4919/4), granted in April 2019, authorises the applicant to clear up to 90 hectares for the purpose of a borefield, pipeline, and associated access and infrastructure (Figure 2).

Clearing for a number of bores, pipelines and other infrastructure components associated with the Southern Fortescue Borefield has been approved via native vegetation clearing permits which have since been surrendered. These areas were not included in the amendment CPS 4919/4 (Figure 2). Some of these bores are required to be replaced to sustain water supply from the Southern Fortescue Borefield.

The applicant has applied for a new clearing permit (CPS 9123/1) to allow upgrade works for the Southern Fortescue Pipeline to proceed in areas of the Southern Fortescue Borefield not covered by the existing CPS 4919/4 application clearing area. Clearing is proposed to occur in the northern and southern portions of the Southern Fortescue Borefield, to allow borefield works, and along sections of the existing CPS 4919/4 boundary, to allow widening of the clearing boundary to the full extent of the easement for pipeline works (Hamersley Iron 2020a) (Figure 1).

Infrastructure required comprises a borefield that includes bores, pipelines, powerlines, and access tracks, and a pipeline that includes laydown areas, storage areas, offices, parking areas, surge tanks, chlorination units, pumping stations and booster stations. Works proposed include earthworks, top soil removal, revegetation of temporary disturbances, creation of access tracks, installation of new pipeline and associated assets, removal of the existing pipe for offsite disposal, fire breaks for asset protection, laydown areas, office areas and electrical upgrades (Hamersley Iron 2020a).

The application is for a Purpose Permit (CPS 9123/1) with an application area of approximately 707 hectares, within which the applicant has applied to clear up to 150 hectares of native vegetation (Hamersley Iron 2020a).

## 1.3. Decision on application and key considerations

<b>Decision:</b>	Granted
<b>Decision date:</b>	23 March 2021
<b>Decision area:</b>	150 hectares of native vegetation within the application area depicted in Section 1.5, below.

## 1.4. Reasons for decision

This clearing permit application was submitted, accepted, assessed and determined in accordance with sections 51E and 51O of the *Environmental Protection Act 1986* (EP Act). The Department of Water and Environmental Regulation (DWER) advertised the application for public comment for 21 days and no submissions were received.

In making this decision, the Delegated Officer had regard for the site characteristics (Appendix B), relevant datasets (Appendix F2), the findings of flora, vegetation and fauna surveys (Appendix A), the clearing principles set out in Schedule 5 of the EP Act (Appendix C), proposed avoidance and minimisation measures (Section 3.1), relevant planning instruments and any other matters considered relevant to the assessment (Section 3.3).

The assessment identified that the proposed clearing:

- will result in the loss of native vegetation that may support Priority flora taxa and riparian vegetation; and
- may potentially introduce and spread of weeds into adjacent vegetation, which could impact on the quality of the adjacent vegetation and its habitat values.

After considering the available information, as well as the applicant's minimisation and mitigation measures (Section 3.1), the Delegated Officer determined that the applicant has demonstrated suitable avoidance and minimisation measures and that the proposed clearing can be minimised and managed such that it will be unlikely to lead to an unacceptable risk to environmental values.

The Delegated Officer determined to grant a clearing permit subject to conditions to:

- Avoid and minimise clearing of drainage line vegetation types by restricting clearing to the formation of access tracks and pipelines only.
- Implement weed management strategies.
- Revegetate all cleared areas upon the conclusion of the purpose of the proposed clearing.



1.5. Site map

### Context Map

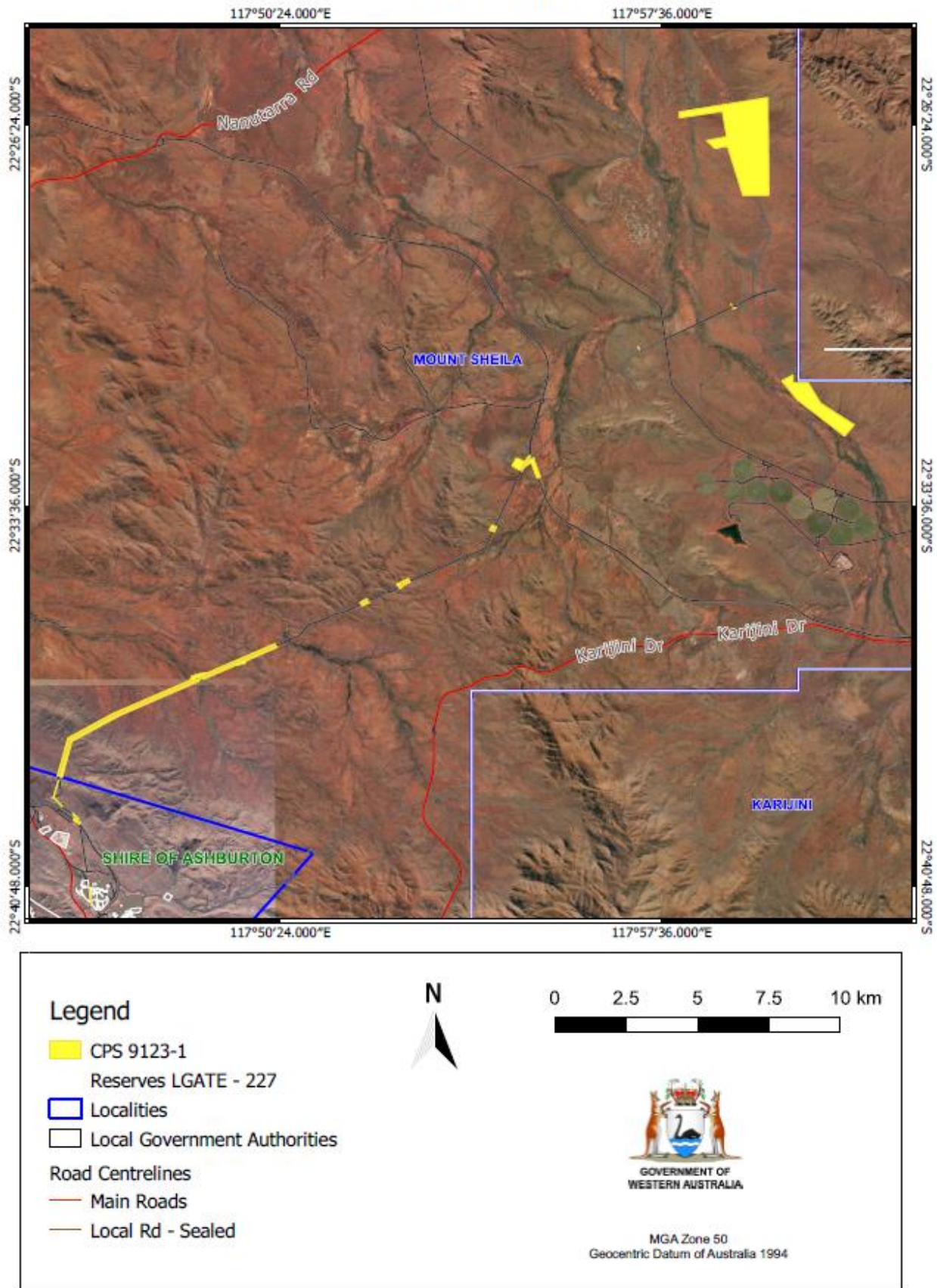


Figure 1. Map of the application area. The areas in yellow indicate the areas within which clearing can occur under the granted clearing permit.

## 2. Legislative context

The clearing of native vegetation in Western Australia is regulated under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (Clearing Regulations).

In addition to the matters considered in accordance with section 51O of the EP Act (see Section 1.3), the Delegated Officer has also had regard to the objects and principles under section 4A of the EP Act, particularly:

- the precautionary principle;
- the principle of intergenerational equity; and
- the principle of the conservation of biological diversity and ecological integrity.

Other legislation of relevance for this assessment include:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Biodiversity Conservation Act 2016* (BC Act);
- *Rights in Water and Irrigation Act 1914* (RIWI Act);
- *Land Administration Act 1997* (LAA); and
- *Mining Act 1978* (the Mining Act).

The key guidance documents which inform this assessment are:

- *A guide to the assessment of applications to clear native vegetation* (DER December 2014);
- *Procedure: Native vegetation clearing permits* (DWER October 2019);
- Technical guidance – *Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016a); and
- Technical guidance – *Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020).

## 3. Detailed assessment of application

### 3.1. Avoidance and mitigation measures

Evidence was submitted by the applicant demonstrating the recognition and avoidance of key habitat features and species locations within the application area (Hamersley Iron 2020a; Hamersley Iron 2020b), as summarised below.

Vegetation, flora, and fauna surveys have been undertaken over the application area, with an assessment undertaken to evaluate potential impacts of proposed clearing (Hamersley Iron 2020b) (Appendix A) (Appendix E).

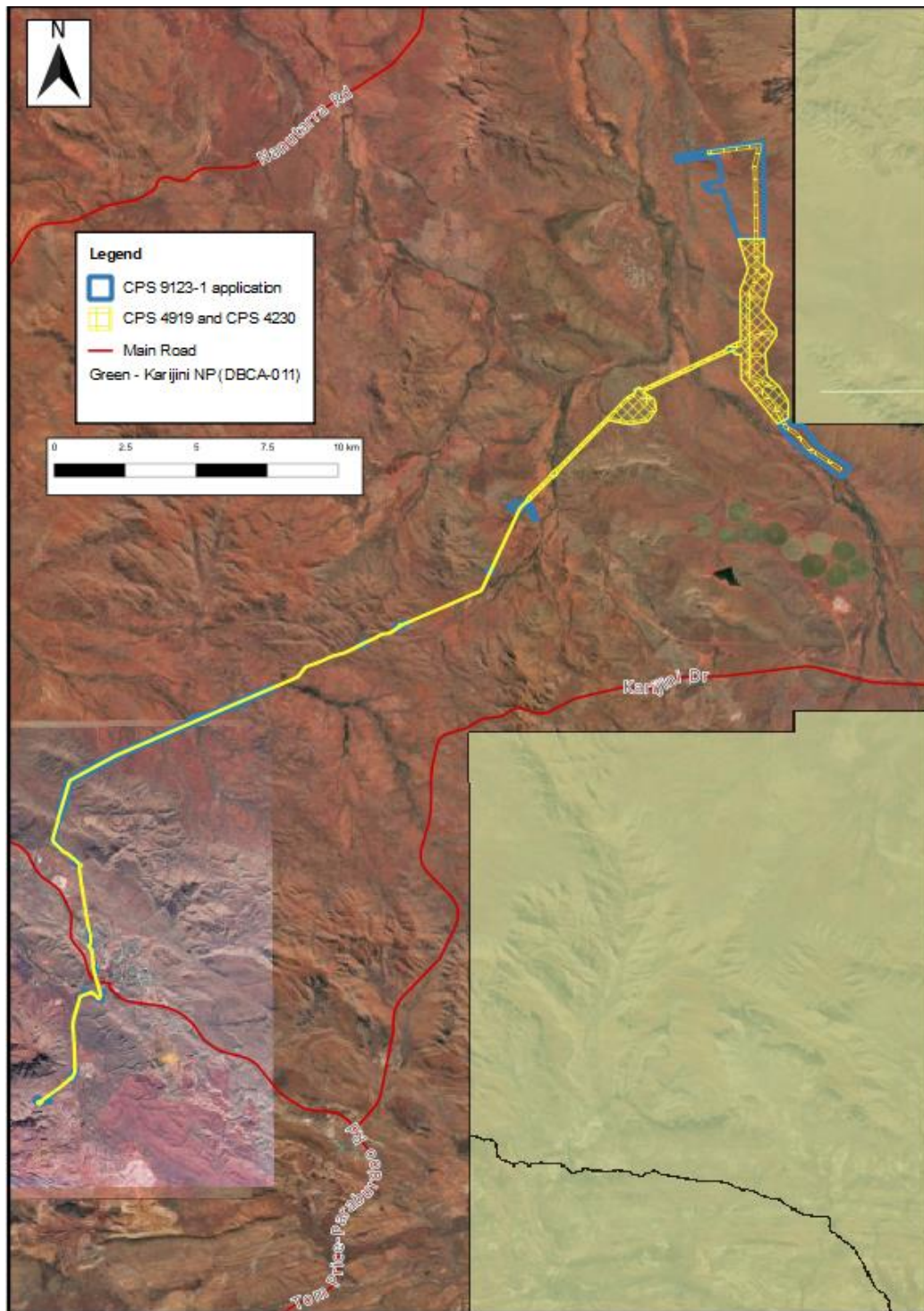
Proposed clearing will be planned and undertaken so as to minimise clearing and avoid areas of elevated environmental significance. Locations of areas and species of elevated conservation significance (including Mulga communities, Priority Flora and Priority Fauna species) identified during surveys are recorded in the Hamersley Iron's internal Geographic Information System (GIS) allowing such areas and species to be avoided wherever possible.

Areas previously cleared or disturbed for existing infrastructure will be preferenced (Figure 2) and existing maintenance tracks utilised wherever feasible, to minimise the area of clearing required. Where new access tracks are needed for planned upgrade works to occur clearing will be undertaken with a dozer using the 'raised blade' clearing technique. Blade down clearing may be required, however, in areas of steep or rough terrain in order to provide a safe working environment (Hamersley Iron 2020a).

Hamersley Iron Pty Ltd operates under the Rio Tinto Iron Ore Group Health, Safety, Environment and Communities (HSEC) Management System. Proposed clearing will be undertaken by the applicant in accordance with the HSEC Management System.

All areas cleared will be revegetated apart from the required operational infrastructure consisting of pipelines, bores, and associated access tracks and structures (section 1.2) (Hamersley Iron 2020a).





**Figure 2. Map of the application area showing the current CPS 9123/1 application area (blue) and relevant previous clearing permits authorised (yellow)**

### **3.2. Assessment of environmental impacts**

In assessing the application in accordance with section 51O of the EP Act, the Delegated Officer has examined the application and site characteristics (Appendix B) and considered whether the clearing poses a risk to environmental values. The assessment against the Clearing Principles is contained in Appendix C.

This assessment identified that the clearing may pose a risk to the environmental values of Priority flora and fauna, riparian vegetation, conservation areas, and surface and groundwater, and that these required further consideration. The detailed consideration and assessment of the clearing impacts against the specific environmental values is provided below. Where the assessment found that the clearing presents an unacceptable risk to environmental



values, conditions aimed at controlling and/or ameliorating the impacts have been imposed under sections 51H and 51I of the EP Act. These are also identified below.

### **3.2.1. Environmental value: biological values (biological diversity) – Clearing Principle (a)**

**Assessment:** The Hamersley sub-region (PIL3) of the Pilbara Bioregion of Thackway and Cresswell (1995) is a recognised Biodiversity hotspot (TSSC 2003). Special features of the Hamersley sub-region include rare features such as gorges, centres of endemism including calcrete deposits, refugia, and the *Themeda* grasslands Threatened Ecological Community (Kendrick 2003). Examples of high biodiversity include hummock grassland reptile and small mammal communities (Kendrick 2003).

The application area consists of six regional vegetation associations (Shepherd *et al.* 2001), 21 vegetation units (Hamersley Iron 2020b), eight Land Systems (van Vreeswyk, *et al.* 2004), and nine major geological units (Martin *et al.* 2014).

Much of the application area has had disturbance related to the construction of the Southern Fortescue Borefield and consequent upgrades since at least 2012, and over the previous years several flora and vegetation surveys have been undertaken over the area, including Biota (2008), Mattiske (2008), Pilbara Flora (2011), Rio Tinto (2011) and Rio Tinto (2018), as well as fauna surveys including Biota (2009), Biota (2011), Pilbara Flora (2011), and Rio Tinto (2018). Numerous flora and fauna surveys have also been conducted in the surrounding areas.

Current databases and past survey results were analysed and reviewed by the applicant, particularly in regard to conservation significant vegetation, flora, fauna and habitats, with a reconnaissance survey undertaken in areas where existing information was absent. The reconnaissance survey was conducted in April and May 2019 with combined results and updated species accounts presented in Hamersley Iron (2020b). A total of 92 taxa from 59 genera representing 25 families were recorded during the reconnaissance survey (Hamersley Iron 2020b).

Twenty vegetation units have been described and mapped over the application area. Full descriptions are provided in Appendix B1. Seven vegetation units are associated with the hills and breakaways landform, nine with plains and four with drainage lines. In terms of area, floodplains and plains vegetation units comprise over 80 per cent of the application area.

None of the vegetation units occurring represent significant ecological communities such as Threatened Ecological Communities (TECs) listed under the EP Act or EPBC Act, or Priority Ecological Communities (PECs) listed by the Department of Biodiversity, Conservation and Attractions (DBCA) (Appendix B2).

Kendrick (2003) identified valley floor Mulga communities within the Hamersley sub-region as an 'Ecosystem at Risk'. That is, should they be subject to ongoing threatening processes, they may qualify for listing as either a PEC or TEC. DBCA (2018) advised that the applicant should avoid clearing Mulga communities in Good to Excellent condition (Trudgen 1991), minimise the clearing of all other Mulga communities, and manage indirect impacts to Mulga communities such as changes to surface hydrology.

Mulga communities occur extensively throughout the Pilbara, including in the vicinity of the Southern Fortescue Borefield. Vegetation units containing Mulga comprise approximately 30 per cent of the application area, with the structural formations described ranging from scattered low trees to open woodland and open forest (Appendix B). Due to the predominance of Mulga communities some disturbance to them will be unavoidable, however, the applicant's avoidance and minimisation measures (section 3.1), including the designation of Vegetation Units corresponding with valley floor Mulga communities, as described by Kendrick (2003), as areas of elevated conservation significance, will allow such areas to be avoided wherever possible. The maintenance of existing surface water flows will also minimise any indirect impacts to Mulga communities due to changes to surface hydrology, particularly downstream impacts.

One Priority 3 flora taxon and one Priority 4 flora taxon have previously been recorded in the application area, and four Priority flora taxa were considered 'Likely' to occur over the application area by Hamersley Iron (2020b).

#### ***Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (P3)**

*Themeda* sp. Hamersley Station is a tall perennial tussock grass growing to approximately 1.8 metres high associated with the Vulnerable *Themeda* grasslands on cracking clays (Hamersley Station, Pilbara) TEC, located approximately 20.5 kilometres to the west of the application area where it occurs in large numbers. However, it has also been recorded on creek lines outside of the mapped TEC areas. The closest database record is located approximately 2.9 kilometres north of the application area (Appendix B2b), however, Rio Tinto have recorded 14 individuals across two locations within the north-east section of the application area (Hamersley Iron 2020b) (Appendix E2). The taxon occurs across most of the southern portion of the Pilbara bioregion over approximately 550 kilometres, from Karratha to the east of Newman including east of Karijini National Park, Millstream and Nullagine.

#### ***Lepidium catapycnon* (P4)**

*Lepidium catapycnon* is an open, woody perennial to 0.3 metres high that typically grows on skeletal soils on hillsides. A total of seven individuals from four records comprising a single population have been recorded in the southern section of the application area (Hamersley Iron 2020b) (Appendix E2). The species is a disturbance opportunist and road-grading and track construction appears to increase the number of individuals (DAWE 2017). The species is a short-lived pioneer with what is believed to be a long-lived soil seed-bank and germination triggered by disturbances (DAWE 2017). Thirty-nine records are contained within Florabase (WAH 1998-) with the taxa located within central and southern parts of Pilbara bioregion over a range of approximately 300 kilometres, including within Karijini National Park, with plant numbers ranging from a few individuals to several hundred (Brown *et al.* 1998).

#### ***Vittadinia* sp. Coondewanna Flats (S. van Leeuwen 4684) (P1)**

*Vittadinia* sp. Coondewanna Flats is an erect branched herb or sub-shrub that occurs on dark reddish-brown clay loams, clays, cracking clays, sandy clay, and loam and in association with gilgais and low open woodland, most commonly with Mulga (*Acacia aneura*). It has been recorded from plains and broad drainage lines. The closest database record is located approximately 18.9 km south-east of the application area (Rio Tinto 2018), however, Rio Tinto have subsequently recorded the taxon within 50 metres of the application area in the central portion (Hamersley Iron 2020b) (Appendix E2). Twenty-five records of *Vittadinia* sp. Coondewanna are contained within Florabase (WAH 1998-) with the taxon located within the south-eastern section of Pilbara bioregion over a range of approximately 400 kilometres. *Vittadinia* sp. Coondewanna has been recorded as scattered occurrences in very low numbers across similar habitat in the broader region. *Vittadinia* sp. Coondewanna has not been recorded within the application area during flora and vegetation surveys and, if present, would likely occur in low, and scattered numbers (Rio Tinto 2018).

#### ***Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)**

*Rhagodia* sp. Hamersley is an erect spindly shrub, which generally occurs on cracking clays and is often associated with Mulga (*Acacia aneura*), which has been recorded within one kilometre of the application area in the central portion (Hamersley Iron 2020b) (Appendix E2). It differs from the more common *Rhagodia eremaea* by its narrow, less odorous leaves. There are 67 records of *Rhagodia* sp. Hamersley listed within FloraBase (WAH 1998-) over a range of approximately 460 kilometres of the south-eastern portion of the Pilbara bioregion and also encroaching into the Gascoyne bioregion.

#### ***Rostellularia adscendens* var. *latifolia* (P3)**

*Rostellularia adscendens* var. *latifolia* is a herb to 10 centimetres in height, which occurs over most of the southern and eastern portions of Pilbara bioregion and has been recorded within 150 metres of the application area in the central and north-eastern sections (Hamersley Iron 2020b) (Appendix E2). Thirty-nine records appear in Florabase (WAH 1998-) and it has a known distribution extending over 400 kilometres from approximately 50 kilometres north-west of Newman to midway between Pannawonica and Tom Price, with additional records extending up to 300 kilometres north-east to midway between Telfer and Marble Bar and including within Karijini National Park. The taxon occurs in a variety of soil types near creeks, gullies, floodplains, as well as protected areas near watercourses, shaded rocky ridges, gullies and gorges.

#### ***Goodenia nuda* (P4)**

*Goodenia nuda* is a herb to 50 centimetres in height, with yellow flowers, which occurs on a variety of soil types in drainage lines, floodplains and alluvial plains in seasonally-inundated clay soils and drainage lines, often with Mulga (*Acacia aneura*). It has been recorded within 500 metres of the application area in the southern section (Appendix B2). *Goodenia nuda* has a range of approximately 900 kilometres. Over 105 records appear in Florabase (WAH 1998-) throughout the Pilbara bioregion and extending south into the Gascoyne bioregion and the Little Sandy Desert. It has been recorded within Karijini National Park, 200 kilometres south-east of Newman, Port Hedland and south of Onslow. An isolated record also occurs to the east of the Karlamilyi (Rudall River) National Park.

Several flora and vegetation surveys have been undertaken over the application area and in the surrounding areas (Appendix E). No Threatened flora have been recorded within the application area, nor were any additional Priority flora taxa identified by the survey undertaken in Autumn 2019 and presented in Hamersley Iron (2020b).

Much of the application area has been previously disturbed due to the construction of the Southern Fortescue Borefield and consequent upgrades. The long and linear areas within the application area have been disturbed by previous clearing activity required for borefield and pipeline infrastructure.

The Priority flora taxa that are known from or are likely to occur in the application area have been recorded elsewhere in the local area and in the Pilbara region more broadly. Given this, and given the extensive areas of native vegetation in similar or better condition surrounding the application area, it is considered unlikely that the application area represents an area of particularly high biodiversity at a local or regional scale, that the proposed clearing would significantly impact Priority flora populations, or that the proposed clearing would result in a change in the conservation status of Priority flora. The risk posed by the proposed clearing to biodiversity values is therefore considered low.

Given this, a management approach of avoiding the clearing of Priority flora taxa in the first instance, and minimising the clearing of Priority flora where it is unavoidable, is considered appropriate (DBCA 2021). The applicant has committed to the avoidance of key habitat features. As outlined in Section 3.1, the applicant will preference clearing to areas previously cleared for existing infrastructure, use the 'raised blade' clearing technique wherever possible, and avoid clearing of areas of elevated conservation significance as far as practicable.

Current and previous surveys over the application area (Biota 2008; Mattiske 2008; Pilbara Flora 2011; Rio Tinto 2011; Rio Tinto 2018; Hamersley Iron 2020b) have recorded a combined total of 25 introduced (weed) species within, and in the vicinity of, the application area (Hamersley Iron 2020b). Any disturbance associated with the proposed clearing could facilitate the introduction or exacerbate the spread of weed species into adjacent native vegetation. To minimise the risk of introduction and spread of weeds to or from the application area, strict weed hygiene protocols should be implemented during clearing of vegetation and subsequent earthworks.

**Conclusion:** Based on the above assessment, and the avoidance and mitigation measures provided by the applicant (Section 3.1), the Delegated Officer has determined that the proposed clearing requires management conditions in relation to this environmental value.

**Conditions:** To address the above impacts, the following management measures will be required as conditions on the clearing permit:

- Implementation of weed management strategies.
- Revegetation of all cleared areas upon conclusion of the purpose of the proposed clearing.
- Maintenance of existing surface water flows.

### **3.2.2. Environmental value: Biological values (fauna) – Clearing Principle (b)**

**Assessment:** Five broad fauna habitat types have been recorded over the application area; Creekline, Minor Drainage Line, Stony Plain, Mulga Plain, and Stony Hills/Slopes. Over half the application area consists of Mulga Plains with creeklines constituting less than two per cent of the application area.

None of the fauna habitats were deemed by Hamersley Iron (2020b) to hold any elevated conservation significance. However, riverine habitats (creeklines and drainage lines) in arid zones generally record greater species richness and abundances than other habitats (Doughty *et al.* 2011). Although they can be affected by frequent burning, their linear configuration and more mesic characteristics facilitate dual roles as both fire refuge, and routes for immigration and emigration (Burbidge *et al.* 2010; Doughty *et al.* 2011; McKenzie and Bullen 2009). All habitats within the study area have the potential to support a range of conservation-listed fauna species.

Twenty-seven fauna species of conservation significance have been recorded within 50 kilometres of the application area, comprising 12 birds, nine mammals, and six reptiles. Nine of the twelve birds identified are migratory waders and shorebirds unlikely to occur over the habitats of the application area.

A likelihood of occurrence table in respect to significant fauna undertaken by Hamersley Iron (2020b) is provided in Appendix E3. The Western Pebble-mound Mouse (*Pseudomys chapmani*) (P4) is considered likely to occur. Hamersley Iron (2020b) also considered that the Pilbara Olive Python (*Liasis olivaceus* subsp. *barroni*) (VU), Lined Soil-crevice Skink (*Notoscincus butleri*) (P4) and Long-tailed Dunnart (*Sminthopsis longicaudata*) (P4) have been assessed as potentially occurring (Appendix E). Considering the records within the local area and the Stony Hills and Slopes habitat present, the Northern Quoll (*Dasyurus hallucatus*) (EN) may also occur.

Over 175 records of the Northern Quoll (EN) have been made within 50 kilometres of the application area, the closest being within 12 kilometres from 2016. Preferred habitat is rocky escarpments, open forest and woodland, and riverine habitats where the Northern Quoll utilises tree hollows as den sites (Woinarski *et al.* 2014). However, rocky habitats with breakaways, rock crevices and caves support higher densities of Northern Quolls (Dunlop *et al.* 2014). No preferred habitat or denning habitat is likely to be present, however, males range broadly and the species may disperse through Stony Hills and Slopes habitat intermittently. Therefore, although the species may be present on occasion, the application area is not considered to represent significant habitat for the Northern Quoll and the proposed clearing is considered unlikely to significantly impact the species.

The Olive Python subspecies *Liasis olivaceus barroni* (VU) is a Pilbara endemic with a distribution that coincides with the Pilbara bioregion. This species typically shelters in logs, flood debris, caves, tree hollows and thick vegetation close to water and rock outcrops (Burbidge 2004). It is typically associated with gorges, gullies and riparian zones. Thirty-seven records of the Pilbara Olive Python are located within 50 kilometres of the application area with the closest within 150 metres at the south-western end close to Tom Price from 1999. While there are some rocky habitats within the application area associated with the Stony Hills and Slopes habitat, none are associated with permanent water sources. Therefore, although the species may be present on occasion, the application area is not considered to represent significant habitat for the Pilbara Olive Python and the proposed clearing is considered unlikely to significantly impact the species.

The Lined Soil-crevice Skink *Notoscincus butleri* (P4) is endemic to Western Australia. The holotype was collected in 1979, 30 km south southwest of Dampier, and it is thought to occur in arid, rocky near-coastal Pilbara regions (Wilson and Swan 2017). This species is associated with spinifex-dominated areas near creek and river margins and it has been collected from two sites within 50 kilometres of the application area, the closest record being from within four kilometres in 1995. No large creek or river systems occur over the application area, however, due to the lack of information available and the presence of spinifex-dominated areas and drainage lines it is considered that the species may potentially occur.

The Long-tailed Dunnart (*Sminthopsis longicaudata*) (P4) occurs across the Gibson Desert, Pilbara and Murchison with a patchy distribution restricted to rocky scree and plateau areas, generally with little vegetation or in areas of spinifex hummock grassland, shrubs and open woodland (Van Dyke and Strahan 2008). Minor occurrences of Stony Hills and Slopes habitat occurs over the application area. It is considered that the species may potentially occur in the application area.

The Western Pebble-mound Mouse (*Pseudomys chapmani*) (P4) is endemic to the Pilbara region of Western Australia (Menkhorst and Knight 2001). The species occurs on skeletal soils containing an abundance of small pebbles, and it creates its own microhabitat by constructing a distinctive mound of pebbles around its burrows (Anstee and Armstrong 2001). The Western Pebble-mound Mouse inhabits rocky hummock grassland areas, sometimes with little or no soil in which to burrow, but with plentiful supply of suitably-sized pebbles. Mounds are often located on the spurs and lower slopes of ridges where weathering produces an abundant supply of pebbles of the preferred size Ford and Johnson (2007). In the application area, this aligns with the Stony Plains and Stony Hills and Slopes habitat types. One hundred and eighty records have been made within 50 kilometres of the application area, the closest being within 1.6 kilometres; habitat is present within the application area and the species is considered likely to occur.

The Lined Soil-crevice Skink, Long-tailed Dunnart and Western Pebble-mound mouse have been recorded elsewhere in the local area and in the Pilbara region more broadly. Given this, the linear nature of the proposed clearing and the extensive areas of similar habitat surrounding the application area, it is considered unlikely that the proposed clearing would significantly impact these species or that the proposed clearing would result in any changes to their conservation statuses. The risk posed to these species by the proposed clearing is therefore considered low.

No species of Threatened or Priority listed fauna have been recorded within the application area. No significant riverine, or gorge and gully habitat occurs within the application area and proposed clearing is linear in nature with previously cleared areas used for borefield infrastructure already present over much of the area. As outlined in Section 3, the applicant will preference clearing to areas previously cleared for existing infrastructure, use 'raised blade' clearing wherever possible, and avoid clearing of areas of elevated conservation significance as far as practicable. Whilst some of the significant fauna species identified may disperse through the application area, or utilise the area for foraging at peak times following significant rainfall, it is unlikely proposed clearing will impact populations at either the local or bioregional scale. DBCA (2021) advises that any potential taking of Threatened species would require authorisation under s40 of the *Biodiversity Conservation Act 2016* (BC Act).

Current and previous surveys over the application area (Biota 2008; Matiske 2008; Pilbara Flora 2011; Rio Tinto 2011; Rio Tinto 2018; Hamersley Iron 2020b) have recorded a combined 25 introduced (weed) species within, and in the vicinity of, the application area (Hamersley Iron 2020b). Any disturbance could exacerbate the introduction or spread of weed species into adjacent native vegetation.

**Conclusion:** Based on the above assessment, and the avoidance and mitigation measures provided by the applicant (Section 3.1), the Delegated Officer has determined that the proposed clearing requires management conditions in relation to this environmental value.

**Conditions:** To address the above impacts, the following management measures will be required as conditions on the clearing permit:

- Implementation of weed management strategies.
- Revegetation of all cleared areas upon conclusion of the purpose of the proposed clearing.
- Maintenance of existing surface water flows.

### **3.2.3. Environmental value: Conservation areas – Clearing Principle (h)**

The application area is not located within any gazetted conservation reserves. However, the closest north-eastern section of the application area is located within 100 metres of Karijini National Park (Karijini) (Figure 3), and immediately adjacent to (but not within) an Environmentally Sensitive Area (ESA) associated with the National Park. This north-eastern section is also located within Unallocated Crown Land which is former leasehold (ex Hamersley Station) that is proposed for conservation.

Due to the proximity of Karijini to proposed clearing, direct or indirect impacts, such as dust, noise, erosion, or any increase in distribution and abundance of weeds, may impinge on the National Park's environmental, cultural and recreation values.

The landscape of the area in the vicinity of Karijini consists of the Boolgeeda Land System of stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or Mulga shrublands (van Vreeswyk *et al.* 2004). Vegetation in this Land System is generally not prone to degradation and the system is not susceptible to erosion (van Vreeswyk *et al.* 2004).

The area in the vicinity of Karijini consists of vegetation units predominantly of the Plains units (P3, P6, P7, and P8) (Hamersley Iron 2020b), described generally as plains of tall *Acacia* shrubland or woodland over *Triodia* (spinifex) hummock grassland, or hummock grassland without an overstorey, with some areas of scattered Mulga (*Acacia aneura*) low trees (Appendix E). Mapped fauna habitat (Hamersley Iron 2020b) is described as plains of Mulga Plains or Stony Plains. No Hills and Breakaways habitat occurs in the vicinity of Karijini. Small areas of minor drainage line vegetation occurs, that is, Unit D4 consisting of tall open scrub of *Acacia* and *Gossypium* over *Triodia*. Drainage is directed from Karijini toward the application area.

Current and previous surveys over the application area (Biota 2008; Matiske 2008; Pilbara Flora 2011; Rio Tinto 2011; Rio Tinto 2018; Hamersley Iron 2020b) have recorded a combined 25 introduced (weed) species within, and in the vicinity of, the application area (Hamersley Iron 2020b). Any disturbance could exacerbate the introduction or spread of weed species into adjacent vegetation.

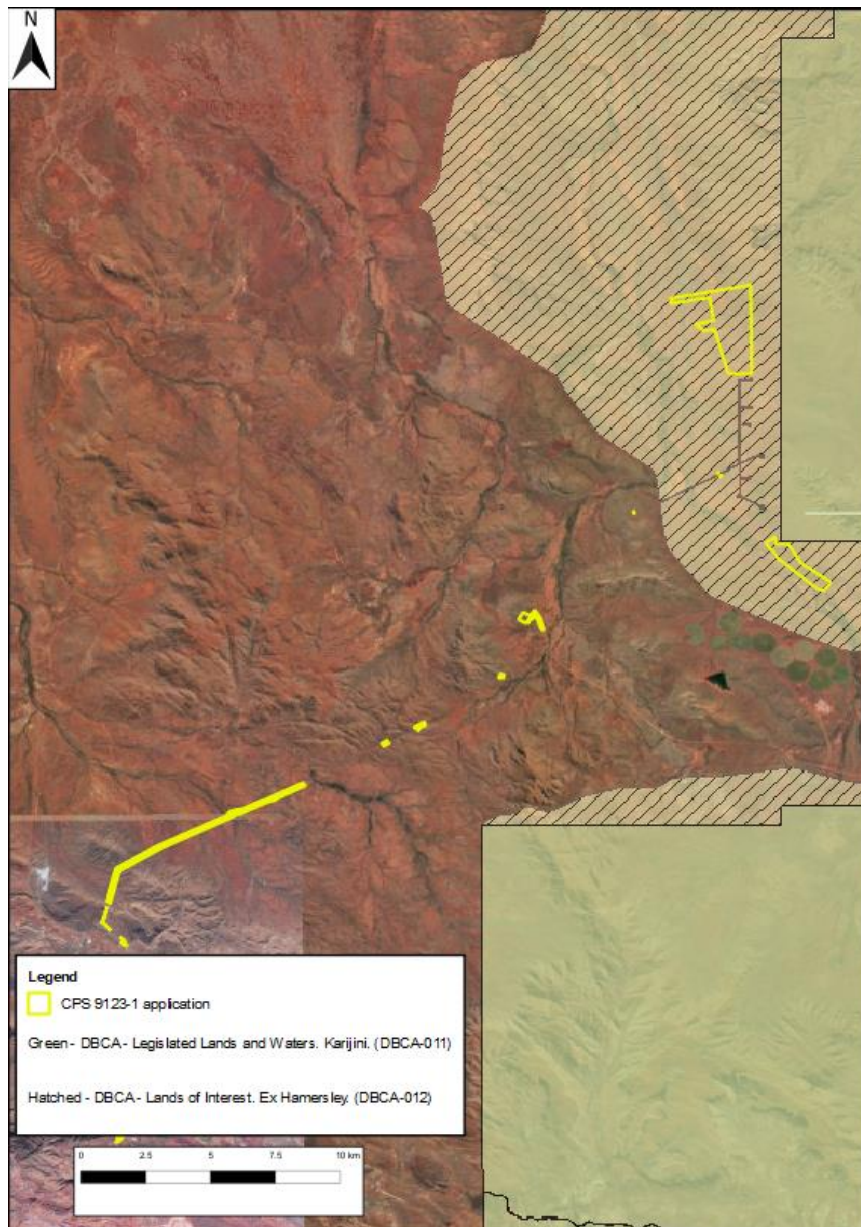
Potential impacts such as erosion and the introduction or spread of weed species affecting Karijini are mitigated somewhat due to the relatively level topography of the area, with any minor drainage potentially dispersing propagules away from the National Park. Dust and noise are unlikely to impact park users in this isolated location and the applicant's standard controls are likely to mitigate any impacts to vegetation.

Conclusion: Based on the above assessment, and the avoidance and mitigation measures provided by the applicant (Section 3.1), the Delegated Officer has determined that the proposed clearing is considered requires management conditions in relation to this environmental value.

Conditions: To address the above impacts, the following management measures will be required as conditions on the clearing permit:

- Implementation of weed management strategies.
- Revegetation of all cleared areas upon conclusion of the purpose of the proposed clearing.
- Maintenance of existing surface water flows.





**Figure 3. Conservation lands of interest in the vicinity of the application area**

### **3.2.4. Environmental value: Riparian vegetation and water courses – Clearing Principle (f)**

Assessment: The application area is located within the Hardey River, Caves Creek, and Southern Fortescue River catchments, and lies between Barnett Creek to the west, Joffre Creek to the east, and just south of the Fortescue River South tributary. A tributary of Barnett Creek dissects the application area as do several minor drainage lines. These flow lines are not considered to be significant watercourses and no major rivers intersect the application area.

Approximately 36 hectares of the application area, or 5.2 per cent of the area, has been mapped as four separate vegetation units described as ‘drainage line’ vegetation by Hamersley Iron (2020b), including 10 hectares mapped as ‘creekline’ fauna habitat (Vegetation Unit D1) (Appendix B). All drainage lines are non-perennial and most are minor. The area of Vegetation Unit D1 represents the largest watercourse and is associated with a tributary of Barnett Creek. This area is already impacted by an existing access road and the proposed clearing is considered unlikely to significantly worsen any existing impacts or introduce new, significant impacts to associated riparian vegetation. Notwithstanding, the proposed clearing includes vegetation which is growing in association with a watercourse and, as such, the proposal is at variance to Principle (f). A condition requiring the flow of surface water be maintained is considered adequate to minimise further disturbance to riparian ecosystems.

Current and previous surveys over the application area (Biota 2008; Matiske 2008; Pilbara Flora 2011; Rio Tinto 2011; Rio Tinto 2018) have recorded a combined 25 introduced (weed) species within, and in the vicinity of, the application area (Hamersley Iron 2020b). Any disturbance could exacerbate the introduction or spread of weed species into adjacent drainage line vegetation.



**Conclusion:** Based on the above assessment, and the avoidance and mitigation measures provided by the applicant (Section 3.1), the Delegated Officer has determined that the proposed clearing requires management conditions in relation to this environmental value.

**Conditions:** To address the above impacts, the following management measures will be required as conditions on the clearing permit:

- Implementation of weed management strategies.
- Revegetation of all cleared areas upon conclusion of the purpose of the proposed clearing.
- Maintenance of existing surface water flows.

### **3.2.5. Environmental value: Surface water and groundwater – Clearing Principle (i)**

The application area is located within the Southern Fortescue and Marandoo Water Reserve, a public drinking water source area for Tom Price gazetted under the *Country Areas Water Supply Act, 1947*.

The Southern Fortescue Borefield, where clearing is proposed, is managed for Priority 1 source protection. This groundwater source is considered semi-confined, with only a semi-confining layer of impermeable rock or soil present between the water source and the land uses above it. Contaminants can infiltrate this water source from inappropriate land uses. To help protect the water source from contamination 500 metre wellhead protection zones (WHPZs) have been established around all production bores (DWER 2021).

The north-eastern portion of the proposed clearing intersects the wellhead protection zones of the Southern Fortescue Borefield (Figure 4). Clearing is not typically supported in these protection zones, however, given the nature of this application, this may be unavoidable (DWER 2021).

Advice was received from the North West region of DWER in regard to water quality, co-ordinated with the Water Source Protection team (DWER 2021). DWER (2021) advised that clearing should be minimised within the wellhead protection zones, and that all other activities associated with the clearing such as infrastructure laydown, refuelling, and topsoil storage, are not to occur within the wellhead protection zones to ensure contamination risk is minimised.

The applicant should also adhere to DWER's Water Quality Protection Guidelines and Water Quality Protection Notes during clearing activities, in particular for the storage and disposal of hydrocarbons, chemicals and potentially hazardous substances. These notes and guidelines provide recommendations on best practice measures to protect water resources, and to reduce risks to Tom Price's drinking water sourced from the Southern Fortescue Water Reserve. These documents are available from the DWER website and include:

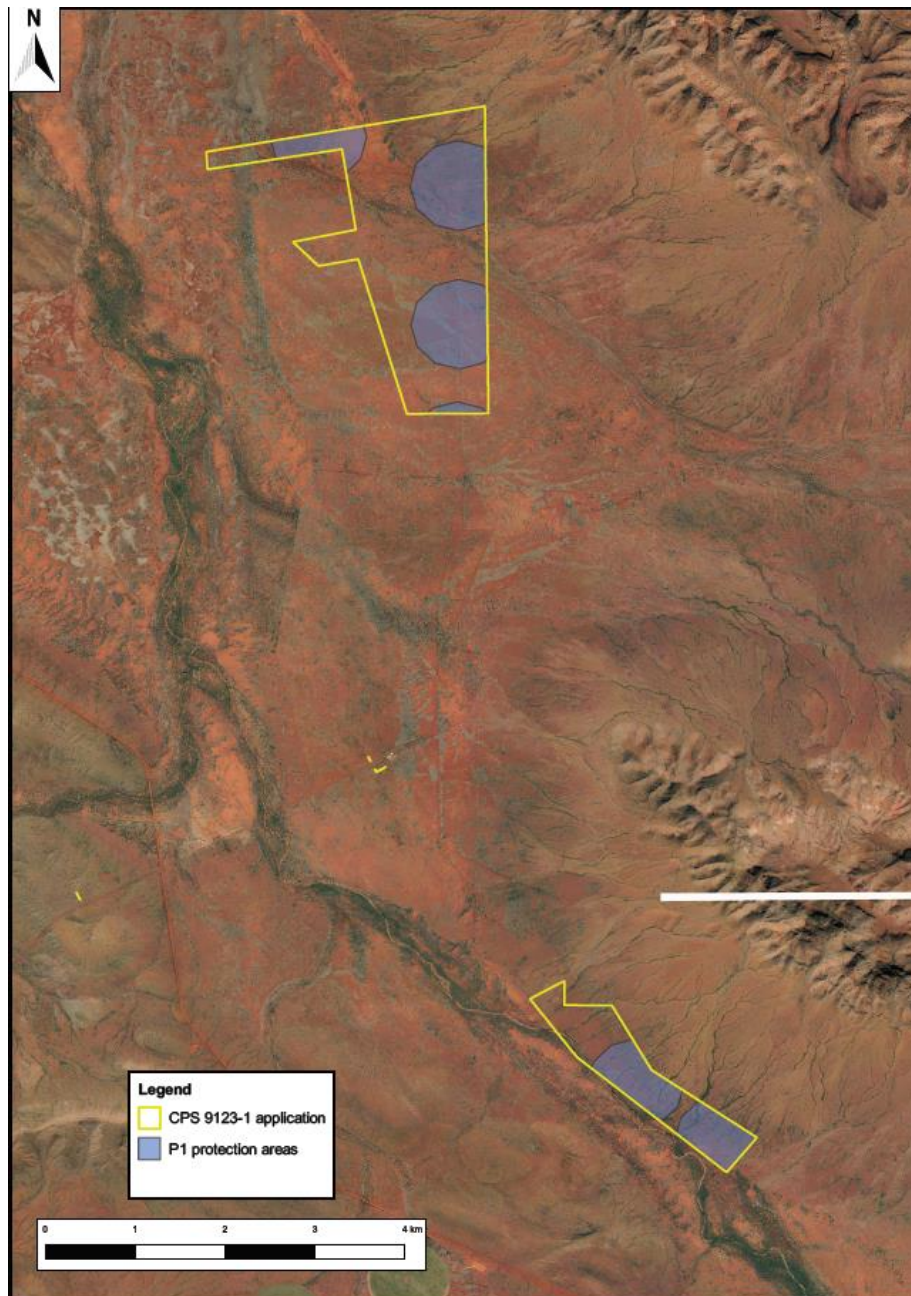
- WQPN 10: Contaminant spills – emergency response.
- WQPN 44: Roads near sensitive water resources.
- WQPN 56: Tanks for fuel and chemical storage near sensitive water resources.
- WQPN 83: Infrastructure corridors near sensitive water resources.
- WQPN 84: Rehabilitation of disturbed land in PDWSAs.

The application area is located within the proclaimed Pilbara Groundwater and Surface Water Areas and are subject to licensing requirements under the *Rights in Water and Irrigation Act 1914*. If the applicant needs to use groundwater or surface water for exploration or other purposes, they will need to apply for a 5C licence to take water and a 26D licence to construct any new water supply bores. Disturbance to the bed or banks of a water course in association with the taking or diverting of water may require a section 17 permit.

**Conclusion:** Proposed clearing may cause an increase in sediment levels in surface water runoff. However, this increase is likely to be temporary and restricted to periods of works. The proposed clearing is considered unlikely to have a significant impact on the quality or quantity of identified surface or groundwater resources, provided clearing activities are undertaken in conformance with the applicant's environmental management commitments, the above advice (section 3.2.5), and DWER's water quality protection notes and guidelines DWER (2021). With these standard management measures in place the Delegated Officer has determined that the proposed clearing is unlikely to cause deterioration in the quality of surface or underground water.

**Conditions:** To address the above impacts, the following management measure will be required as a condition on the clearing permit:

- Maintenance of existing surface water flows.



**Figure 4. Wellhead protection zones in the vicinity of the application area**

### 3.2.6. Environmental value: Land degradation – Clearing Principle (g)

Assessment: Three Land Systems as described by van Vreeswyk, *et al.* (2004) comprise over 70 per cent of the application area; the Boolgeeda, Paraburdoo and Marandoo (Appendix B). These Land Systems are not prone to degradation or susceptible to erosion, apart from drainage zones (unit 5) within the Paraburdoo Land System which are moderately susceptible (van Vreeswyk, *et al.* 2004).

Landforms and soils over the application area are varied and diverse. Rainfall in the region is highly variable and often results from heavy downpours from cyclonic events and localised thunderstorms (van Vreeswyk *et al.* 2004).

Due to the presence of hills and breakaways landforms covering approximately 68 hectares (or 9.7 per cent of the application area) and drainage systems covering approximately 36 hectares (or 5.2 per cent of the application area), the construction of access tracks over the steeper sections of the application area has the potential to cause localised land degradation via water erosion.

Existing maintenance tracks will be utilised as much as possible to minimise the clearing required. However, new access tracks are required for the upgrade works to occur. Clearing will be undertaken with a bulldozer using a 'raised blade' clearing technique wherever possible, however, blade down clearing may be required in some areas to provide a safe working environment. The appropriate placement of new access tracks coupled with the installation of table

drains can ameliorate impacts. Areas not required for pipeline, bore and access infrastructure will be revegetated immediately post-construction (Hamersley Iron 2020a).

Localised erosion may occur from the creation of tracks in any of the Land Systems over the application area but particularly over the ironstone crests Newman and Platform Land Systems that constitute a minor portion of the proposed clearing area. Clearing is not expected to result in an increased risk of nutrient export, changes to pH, water-logging, acidification, or increased salinity. It is not anticipated that the removal of vegetation will contribute significantly to increased amounts of wind or water erosion in adjacent areas.

Current and previous surveys over the application area (Biota 2008; Mattiske 2008; Pilbara Flora 2011; Rio Tinto 2011; Rio Tinto 2018; Hamersley Iron 2020b) have recorded a combined 25 introduced (weed) species within, and in the vicinity of, the application area (Hamersley Iron 2020b). Any disturbance could exacerbate the introduction or spread of weed species into adjacent native vegetation. Strict weed hygiene protocols should be implemented during clearing of vegetation and subsequent earthworks to minimise the introduction and spread of weeds to or from the application area.

**Conclusion:** Based on the above assessment, and the avoidance and mitigation measures provided by the applicant (Section 3.1), the Delegated Officer has determined that the proposed clearing requires management conditions in relation to this environmental value.

**Conditions:** To address the above impacts, the following management measures will be required as conditions on the clearing permit:

- The implementation of weed management strategies.
- Revegetation of all cleared areas upon conclusion of the purpose of the proposed clearing.

### **3.3. Relevant planning instruments and other matters**

Properties intersecting the application area are presented in section 1.1. Hamersley Iron has provided the relevant authorisation to access these properties via Tenements, Mineral Leases and General Leases obtained under the *Mining Act 1978* (the Mining Act), and Leases and Easements obtained under the *Land Administration Act 1997* (LAA).

The application area is located within the proclaimed Pilbara Groundwater and Surface Water Areas that are subject to licensing requirements under the *Rights in Water and Irrigation Act 1914* (RIWI Act). The application area is also located within the Southern Fortescue and Marandoo Water Reserve that is a Public Drinking Water Source Area (PDWSA) for Tom Price gazetted under the *Country Areas Water Supply Act, 1947*. Rio Tinto Limited (through its subsidiary Hamersley Iron Pty Ltd) is the licensed water service provider for the town, and Rio Tinto Limited (through its subsidiary Pilbara Iron Company (Services) Pty Ltd) holds the necessary water licences and permits under the RIWI Act (DWER 2018).

Advice was received from the North West region of DWER in regard to water quality that was co-ordinated with the Water Source Protection Team (DWER 2021) (section 3.2.5). No issues preventing the issuing of a clearing permit have been identified. Necessary approvals from DWER under the RIWI Act may be required prior to undertaking the proposed clearing (section 3.2.5).

The Shire of Ashburton (the Shire) provided comment on the CPS 9123/1 application and requests that adequate dust mitigation be implemented by the applicant during clearing operations. The Shire also requests that Hamersley Iron liaise with the Shire's Infrastructure Services Department regarding the transportation of equipment required to undertake the clearing on the Shire's road network and any works within a Shire public reserve (Shire of Ashburton 2020).

Advice was sought from the Department of Biodiversity, Conservation and Attractions (DBCA) in regard to both the related (previous) application CPS 4919/1 (DBCA 2018) and the current application CPS 9123/1 (DBCA 2021) (sections 3.2.1 to 3.2.3).

The application area is located within the registered area of interest of the Eastern Guruma People (Determination reference WCD2007/001) including Eastern Guruma (Area B) (Determination reference WCD2012/002), with the Wintawari Guruma Aboriginal Corporation the Registered Native Title Bodies Corporate (RNTBC). The Muntulgura Guruma People also have registered area of interest. Indigenous Land Use Agreements (ILUAs) have been registered including the Hamersley Iron Pty Ltd - Eastern Guruma ILUA (WI2001/001) and the Pilbara Iron - Eastern Guruma Body Corporate ILUA (WI2007/001). Under section 24MD and section 24LA of the *Native Title Act 1993* (Cth), DWER provided the Eastern Guruma People and the Muntulgura Guruma People, and the Wintawari Guruma Aboriginal Corporation RNTBC an opportunity to comment on this clearing permit application. No comments were received.

A large number of Aboriginal Heritage places and Sites of Significance occur over the application area including; Weelamurra Wuntu (Willamarranha, Wilumarra and Wirlumarra) (Place ID 38183), Donkeyman Pool Tom Price (Place ID 11311), Spinifex Pigeon Falls (Place ID 11310), Narraminju-Caves Creek (Place ID 37670), Robert Bednarik Cave (Place ID 11300), Hamersley (Place ID 11186) and the lodged site; Mine Site Habitation Cave (Place ID 11295). Many more Aboriginal Heritage Sites are located in the local area. It is the Permit Holder's responsibility to comply with the *Aboriginal Heritage Act 1972* and ensure that no Aboriginal Sites of Significance are damaged through the clearing process.

The applicant has advised that heritage surveys will be conducted over the application area prior to any works commencing. Hamersley Iron is aware of its requirements under the *Aboriginal Heritage Act 1972 (WA)* and will ensure that surveys are completed, sites are avoided or appropriate approvals are obtained prior to undertaking any ground disturbing activities.

Hamersley Iron operates under the Rio Tinto Iron Ore Group Health, Safety, Environment and Communities (HSEC) Management System. The HSEC Management System describes Hamersley Iron's approach to health, safety, environment and social risk management and provides context and direction for continuous improvement. Proposed clearing will be undertaken in accordance with this HSEC Management System.

The Delegated Officer noted the purpose of the proposed clearing, to improve water supply to mining operations and to Tom Price.

## Appendix A – Information provided by applicant

Summary	Reference
Supporting Information for clearing permit application CPS 9123/1 including a justification and description of clearing activities, avoidance and minimisation actions, and a commitment to the revegetation of all areas not required for the pipeline, bores, and associated operational footprint.	Hamersley Iron (2020a)
Additional supporting information for clearing permit application CPS 9123/1 that included a flora, vegetation and fauna habitat assessment that summarised and updated previous biological survey information obtained over the application area, including; Biota (2008), Matiske (2008), Pilbara Flora (2011), Rio Tinto (2011), and Rio Tinto (2018), with a reconnaissance survey undertaken where existing information was absent. The reconnaissance survey was conducted in April and May 2019 with combined results and updated species accounts presented in Hamersley Iron (2020b).	Hamersley Iron (2020b)

## Appendix B – Site characteristics

The information provided below describes the key characteristics of the area proposed to be cleared and is based on the best information available to DWER at the time of this assessment. This information was used to inform the assessment of the clearing against the Clearing Principles, contained in Appendix C.

### 1. Site characteristics

Site characteristic	Details																																				
Local context	The application area is located within the Shire of Ashburton, north-west of the town of Tom Price and extending for approximately 33 kilometres. The application area is located within the Hamersley sub-region (PIL3) of the Pilbara Bioregion of Thackway and Cresswell (1995) described as a “mountainous area of Proterozoic sedimentary ranges and plateaux, dissected by gorges of basalt, shale and dolerite (Kendrick 2003).																																				
Regional Vegetation	<p>Six regional vegetation associations considered within the regional mapping of Shepherd <i>et al.</i> (2001) have been mapped over the application area:</p> <table border="1"> <thead> <tr> <th>Veg Assn.</th> <th>Description</th> <th>Extent in application area (ha)</th> <th>Percentage of application area (%)</th> </tr> </thead> <tbody> <tr> <td>18</td> <td>Low woodland; mulga (<i>Acacia aneura</i>).</td> <td>404</td> <td>57.0 %</td> </tr> <tr> <td>29</td> <td>Sparse low woodland; mulga, discontinuous in scattered groups.</td> <td>156</td> <td>22.1 %</td> </tr> <tr> <td>82</td> <td>Hummock grasslands, low tree steppe; snappy gum over <i>Triodia wiseana</i>.</td> <td>5</td> <td>0.7 %</td> </tr> <tr> <td>157</td> <td>Hummock grasslands, grass steppe; hard spinifex, <i>Triodia wiseana</i></td> <td>16</td> <td>2.3 %</td> </tr> <tr> <td>175</td> <td>Short bunch grassland — savanna/grass plain (Pilbara).</td> <td>61</td> <td>8.6 %</td> </tr> <tr> <td>567</td> <td>Hummock grasslands. shrub steppe; mulga and kanji over soft spinifex and <i>Triodia basedowi</i>.</td> <td>66</td> <td>9.4 %</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Totals:</b></td> <td><b>707.4</b></td> <td><b>100 %</b></td> </tr> </tbody> </table>	Veg Assn.	Description	Extent in application area (ha)	Percentage of application area (%)	18	Low woodland; mulga ( <i>Acacia aneura</i> ).	404	57.0 %	29	Sparse low woodland; mulga, discontinuous in scattered groups.	156	22.1 %	82	Hummock grasslands, low tree steppe; snappy gum over <i>Triodia wiseana</i> .	5	0.7 %	157	Hummock grasslands, grass steppe; hard spinifex, <i>Triodia wiseana</i>	16	2.3 %	175	Short bunch grassland — savanna/grass plain (Pilbara).	61	8.6 %	567	Hummock grasslands. shrub steppe; mulga and kanji over soft spinifex and <i>Triodia basedowi</i> .	66	9.4 %	<b>Totals:</b>		<b>707.4</b>	<b>100 %</b>				
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Vegetation Units	<p>Twenty vegetation units were identified across three major landforms over the application area (Hamersley Iron 2020b). A summary is provided in the table below, with full descriptions in the tables following (Hamersley Iron 2020b). The majority of the application area consists of the floodplains and plains landform.</p> <table border="1"> <thead> <tr> <th>Vegetation Prefix</th> <th>Landform Description</th> <th colspan="2">No. of vegetation units</th> <th>Combined Area (ha)</th> <th>Percentage of application area</th> </tr> </thead> <tbody> <tr> <td>H</td> <td>Hills and breakaways</td> <td>7</td> <td>(H1 to H7)</td> <td>68.2</td> <td>9.7 %</td> </tr> <tr> <td>P</td> <td>Floodplains and plains</td> <td>9</td> <td>(P1 to P9)</td> <td>576.3</td> <td>81.5 %</td> </tr> <tr> <td>D</td> <td>Drainage lines</td> <td>4</td> <td>(D1 to D4)</td> <td>36.2</td> <td>5.2 %</td> </tr> <tr> <td>CD</td> <td>Previously cleared</td> <td>1</td> <td>CD (1)</td> <td>26.8</td> <td>3.8 %</td> </tr> <tr> <td colspan="4" style="text-align: center;"><b>TOTAL</b></td> <td><b>707.4</b></td> <td><b>100 %</b></td> </tr> </tbody> </table>	Vegetation Prefix	Landform Description	No. of vegetation units		Combined Area (ha)	Percentage of application area	H	Hills and breakaways	7	(H1 to H7)	68.2	9.7 %	P	Floodplains and plains	9	(P1 to P9)	576.3	81.5 %	D	Drainage lines	4	(D1 to D4)	36.2	5.2 %	CD	Previously cleared	1	CD (1)	26.8	3.8 %	<b>TOTAL</b>				<b>707.4</b>	<b>100 %</b>
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**Site characteristic**

**Details**

Unit	Source (Report and Unit code)	Vegetation description	Extent (ha) within study area	Proportion (%) within study area
<b>Vegetation of hills and breakaways</b>				
H1	Mattiske (2008), B2	Low Open Woodland of <i>Acacia aneura</i> var. <i>aneura</i> , <i>Corymbia hamersleyana</i> and <i>Acacia pruinocarpa</i> over <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Eremophila galeata</i> , <i>Themeda triandra</i> , <i>Triodia wiseana</i> , <i>Aristida</i> spp. and annual species	35.3	5.0
H2	Mattiske (2008), S1	Hummock Grassland of <i>Triodia pungens</i> and <i>Triodia wiseana</i> with emergent <i>Eucalyptus gamophylla</i> , <i>Eucalyptus leucophloia</i> , <i>Acacia aneura</i> var. <i>aneura</i> , <i>Acacia pruinocarpa</i> , <i>Acacia ancistrocarpa</i> , <i>Acacia bivenosa</i> , <i>Senna</i> spp. and a range of annual species	4.8	0.7
H3	Mattiske (2008), S2	Hummock Grassland of <i>Triodia wiseana</i> , <i>Triodia angusta</i> , <i>Triodia pungens</i> with emergent <i>Eucalyptus leucophloia</i> and <i>Eucalyptus gamophylla</i> over <i>Eremophila</i> spp., <i>Acacia bivenosa</i> and a range of annual species	1.6	0.2
H4	Mattiske (2008), S3	Hummock Grassland of <i>Triodia wiseana</i> with emergent <i>Eucalyptus leucophloia</i> , <i>Corymbia deserticola</i> subsp. <i>deserticola</i> over <i>Acacia bivenosa</i> , <i>Themeda triandra</i> , <i>Solanum lasiophyllum</i> and mixed <i>Senna</i> and <i>Ptilotus</i> species	10.3	1.5
H5	Mattiske (2008), S5	Hummock Grassland of <i>Triodia wiseana</i> with emergent <i>Acacia inaequilatera</i> , <i>Eucalyptus leucophloia</i> , <i>Acacia bivenosa</i> and mixed <i>Senna glutinosa</i> subsp. <i>glutinosa</i> and <i>Senna glutinosa</i> subsp. <i>pruinosa</i> and <i>Ptilotus</i> species	10.7	1.5
H6	Pilbara Flora (2011), 2	Low woodland of <i>Eucalyptus leucophloia</i> , <i>Acacia aptaneura</i> and <i>Acacia citrinoviridis</i> over mixed grassland	0.6	0.1
H7	Pilbara Flora (2011), 3	Low open woodland of <i>Eucalyptus leucophloia</i> over high shrubland of <i>Acacia</i> species over hummock grassland of <i>Triodia wiseana</i>	4.9	0.7
			<b>Total</b>	<b>68,2</b>
				<b>9,7</b>

Unit	Source (Report and Unit code)	Vegetation description	Extent (ha) within study area	Proportion (%) within study area
<b>Vegetation of floodplains and plains</b>				
P1	Mattiske (2008), M1	Low Woodland to Low Open Forest of <i>Acacia aneura</i> var. <i>aneura</i> , <i>Acacia pruinocarpa</i> , <i>Grevillea berryana</i> over <i>Eremophila galeata</i> , <i>Acacia tetragonophylla</i> , <i>Eremophila forrestii</i> over <i>Triodia pungens</i> and a range of annual species	25.9	3.7
P2	Mattiske (2008), M3	Low Open Woodland of <i>Acacia aneura</i> var. <i>aneura</i> , <i>Acacia pruinocarpa</i> over <i>Acacia tetragonophylla</i> , <i>Eremophila forrestii</i> over <i>Triodia pungens</i> and a range of annual species	15.5	2.2
P3	Rio Tinto (2018) P4	Tall open shrubland of <i>Acacia ancistrocarpa</i> , <i>Acacia pruinocarpa</i> , <i>A. aptaneura</i> and <i>A. atkinsiana</i> over open hummock grassland of <i>Triodia melvillei</i> .	85.2	12
P4	Rio Tinto (2018) P6	Low open woodland of <i>Acacia aptaneura</i> , <i>Acacia pruinocarpa</i> and <i>Corymbia deserticola</i> subsp. <i>deserticola</i> over scattered tall shrubs of <i>Acacia ancistrocarpa</i> over hummock grassland of <i>Triodia melvillei</i> .	12.1	1.7
P5	Biota (2008) 1a.	<i>Acacia aneura</i> woodland on broad flat alluvial and colluvial areas.	6,8	1,0
P6	Biota (2008) 1b.	Open grassland, Only occurs as a mosaic with P5 within the current study area.	228.2	32.2
P7	Biota (2008) 1c.	<i>Triodia melvillei</i> hummock grassland.	55,0	7,8
P8	Biota (2008) 4c.	<i>Acacia aneura</i> scattered low trees over open grassland.	146.9	20.8
P9	Pilbara Flora (2011), 10	Open forest of <i>Acacia aptaneura</i> over very open mixed hummock grassland (rehabilitation).	0.8	0.1
			<b>Total</b>	<b>576,4</b>
				<b>81,5</b>

Site characteristic		Details		
Unit	Source (Report and Unit code)	Vegetation description	Extent (ha)	Proportion (%) within study area
<b>Vegetation of drainage lines</b>				
D1	Mattiske (2008), C2	Low Woodland of <i>Eucalyptus xerothermica</i> and <i>Corymbia hamersleyana</i> over <i>Acacia maitlandii</i> , <i>Acacia bivenosa</i> , <i>Petalostylis labicheoides</i> , <i>Rulingia luteiflora</i> over <i>Themeda triandra</i> and <i>Triodia pungens</i> .	10.1	1.4
D2	Mattiske (2008), C3	Tall Shrubland of <i>Acacia bivenosa</i> , <i>Acacia ancistrocarpa</i> , <i>Acacia maitlandii</i> , <i>Acacia monticola</i> with occasional emergent <i>Corymbia deserticola</i> subsp. <i>deserticola</i> and <i>Eucalyptus leucophloia</i> over <i>Gompholobium polyzygum</i> , <i>Rulingia luteiflora</i> and <i>Triodia pungens</i> .	4.0	0.6
D3	Current Survey, CL1	Woodland of <i>Eucalyptus victrix</i> and <i>Acacia citrinoviridis</i> over closed grassland of * <i>Cenchrus ciliaris</i> and * <i>C. setiger</i> ,	14,5	2.1
D4	Current Survey, MD1	Tall open scrub of <i>Acacia atkinsiana</i> , <i>Acacia monticola</i> and <i>Gossypium robinsonii</i> over open shrubland of <i>Acacia pruinocarpa</i> and <i>Acacia bivenosa</i> over open tussock grassland of <i>Themeda triandra</i> over very open hummock grassland of <i>Triodia melvillei</i> .	7,6	1.1
			<b>Total</b>	<b>36.2</b>
CD	Mattiske (2008) Pilbara Flora (2011), CL/HD/R	Previously cleared areas (e.g. tracks)		
			<b>Total</b>	<b>26,8</b>
			<b>Grand Total</b>	<b>707,5</b>
				<b>100,0</b>

<b>Vegetation condition</b>	Vegetation of the application area as assessed by Hamersley Iron (2020b) ranged from Very Good to Excellent (Trudgen 1988) (Appendix D). The majority of the application area consisted of vegetation in Very Good condition (Appendix E4).		
	<b>Vegetation Condition</b>	<b>Combined Area (ha)</b>	<b>Percentage of application area</b>
	Completely Degraded	26.8	3.9 %
	Poor	17.5	2.5 %
	Good	29.4	4.2 %
	Very good	633.7	89.6 %
		<b>707.4</b>	<b>100 %</b>

<b>Fauna habitats</b>	Five broad habitat types were described over the application area as assessed by Hamersley Iron (2020b).		
	<b>Description</b>	<b>Area (ha)</b>	<b>Area (%)</b>
	Creekline	16.0	2.0 %
	Minor Drainage Line	45.9	5.6 %
	Stony Plain	140.2	17.2 %
	Mulga Plain	454.1	55.6 %
	Stony Hills and Slopes	134.6	16.5 %
	Disturbed areas	25.4	3.1 %

Site characteristic	Details		
Land Systems	Eight Land Systems (van Vreeswyk, <i>et al</i> 2004) occur over the application area:		
	Land System subsystem	Description	Percentage of application area
	Boolgeeda	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands. Vegetation is generally not prone to degradation and the system is not susceptible to erosion.	34 %
	Paraburdoo	Basalt derived stony gilgai plains and stony plains supporting snakewood and mulga shrublands with spinifex, chenopods and tussock grasses. Stony drainage floors and gilgai plains developed from basalt; snakewood with stony chenopod pastures in poor to fair condition. Much of the system is inherently resistant to erosion except for drainage zones (unit 5) which are moderately susceptible.	19 %
	Marandoo	Basalt hills and restricted stony plains supporting grassy mulga shrublands. (Soil erosion: nil 100%).	18 %
	Newman	Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands.	8 %
	Rocklea	Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex (and occasionally soft spinifex) grasslands.	7 %
	Platform	Dissected slopes and raised plains supporting hard spinifex grasslands.	6 %
	McKay	Hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands.	5 %
Jurrawarrina	Hardpan plains and alluvial tracts supporting mulga shrublands with tussock and spinifex grasses.	3 %	

Site characteristic	Details																				
<b>Geology and soils</b>	<p>The application area is comprised of nine major geological units based on scale map sheet series (Martin <i>et al.</i> 2014).</p> <table border="1" data-bbox="368 344 1353 887"> <thead> <tr> <th data-bbox="368 344 464 389">Code</th> <th data-bbox="464 344 1353 389">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="368 389 464 434">Czc</td> <td data-bbox="464 389 1353 434">Eluvium. Residual deposits of boulders and cobbled in clay gilgais</td> </tr> <tr> <td data-bbox="368 434 464 495">Czd</td> <td data-bbox="464 434 1353 495">Hematite - Hematite deposits, including canga, mostly residual on marra mamba iron formation and brockman iron formation. Contains Iron Ore</td> </tr> <tr> <td data-bbox="368 495 464 577">Ahm</td> <td data-bbox="464 495 1353 577">Marra mamba iron – Chert, ferruginous chert and banded iron with minor shale; jaspilite with pronounced ‘pinch and swell’ structures, small occurrences of manganese</td> </tr> <tr> <td data-bbox="368 577 464 638">Qa</td> <td data-bbox="464 577 1353 638">Quaternary alluvium - Alluvium - unconsolidated silt, sand, aeolian sand, red loamy sand in drifts and fixed shelf dunes and gravel</td> </tr> <tr> <td data-bbox="368 638 464 683">Afd</td> <td data-bbox="464 638 1353 683">Dolerite, metadolerite, and amphibolite dykes</td> </tr> <tr> <td data-bbox="368 683 464 743">AHd</td> <td data-bbox="464 683 1353 743">Wittenoom formation. Thin to medium-bedded grey crystalline dolomite, intercalations of chert, dolomitic shale</td> </tr> <tr> <td data-bbox="368 743 464 788">AFub</td> <td data-bbox="464 743 1353 788">Bunjinah-Metabasaltic breccia, pelite and minor chert</td> </tr> <tr> <td data-bbox="368 788 464 833">AFi</td> <td data-bbox="464 788 1353 833">Jeerinah-Pillowed and massive metabasaltic breccia</td> </tr> <tr> <td data-bbox="368 833 464 887">Qw</td> <td data-bbox="464 833 1353 887">Cainozoic colluvium - Cainozoic-alluvium and colluvium - red brown sandy and clayey soil.</td> </tr> </tbody> </table>	Code	Description	Czc	Eluvium. Residual deposits of boulders and cobbled in clay gilgais	Czd	Hematite - Hematite deposits, including canga, mostly residual on marra mamba iron formation and brockman iron formation. Contains Iron Ore	Ahm	Marra mamba iron – Chert, ferruginous chert and banded iron with minor shale; jaspilite with pronounced ‘pinch and swell’ structures, small occurrences of manganese	Qa	Quaternary alluvium - Alluvium - unconsolidated silt, sand, aeolian sand, red loamy sand in drifts and fixed shelf dunes and gravel	Afd	Dolerite, metadolerite, and amphibolite dykes	AHd	Wittenoom formation. Thin to medium-bedded grey crystalline dolomite, intercalations of chert, dolomitic shale	AFub	Bunjinah-Metabasaltic breccia, pelite and minor chert	AFi	Jeerinah-Pillowed and massive metabasaltic breccia	Qw	Cainozoic colluvium - Cainozoic-alluvium and colluvium - red brown sandy and clayey soil.
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<b>Landforms and land degradation risk</b>	<p>Landforms and soils over the application area are varied and diverse. Three Land Systems comprise over 70 per cent of the application area: the Boolgeeda, Paraburdoo and Marandoo. These Land Systems are not prone to degradation or susceptible to erosion apart from drainage zones (unit 5) within the Paraburdoo Land System which are moderately susceptible.</p>																				
<b>Waterbodies</b>	<p>The application area lies within the Hardey River, Caves Creek and Southern Fortescue River catchments, and between Barnett Creek (to the west) and Joffre Creek (to the east), and just south of the Fortescue River South tributary. No major rivers intersect the study area, however, the application area intersects Barnett Creek and two other unnamed major creek lines. Several other small un-named minor ephemeral drainage lines also occur over the application area.</p>																				
<b>Conservation areas</b>	<p>The closest north-eastern section of the application area is within 100 metres of Karijini National Park. This north-eastern section is also located within Unallocated Crown Land which is former leasehold (ex Hamersley Station) that is proposed for conservation.</p>																				
<b>Climate</b>	<p>The climate of the Pilbara is semi-desert tropical with the region experiencing two distinct seasons; a hot summer from October to April, and a mild winter from May to September with the majority of rainfall received during the hot summer months (Sudemeyer 2016). The annual rainfall for the closest town of Wittenoom is approximately 462 millimetres (BOM 2020).</p>																				

## 2. Ecosystem, flora, and fauna analysis

Consideration was given to the site characteristics set out above, relevant datasets (Appendix F), and biological survey information including Hamersley Iron (2020b) referencing Biota (2008), Mattiske (2008), Pilbara Flora (2011), Rio Tinto (2011), and Rio Tinto (2018).

The following conservation significant ecological communities, flora taxa, and fauna species have been identified within 50 kilometres of the application area, and their likelihood of occurrence assessed. Surveys were adequate to assess likelihood of occurrence.

## 2(a) Ecological Communities (see Appendix E6)

Common ID	Common name	Status (WA)	Hectares within 50 km (ha)	Approx. Closest occurrence (km)
Themeda grasslands	Themeda grasslands on cracking clays (Hamersley Station, Pilbara)	Vulnerable	4,535	20.5 km
Brockman Iron cracking clay communities	Brockman Iron cracking clay communities of the Hamersley Range	Priority 1	11,779	1.5 km
Coolibah - Lignum Flats, sub type 3	Coolibah - Lignum Flats: sub type 3. Coolibah woodland over lignum over silky browntop (Mt Bruce flats)	Priority 1	84.3	22.5 km

## 2(b) Significant Flora (see Appendix E2)

A total of 92 taxa from 59 genera representing 25 families were recorded during the survey of Hamersley Iron (2020b). No species of Threatened flora were recorded or were expected to occur over the application area.

A likelihood of occurrence table in respect to significant flora undertaken by Hamersley Iron (2020b) is provided in Appendix E2.

One Priority 3 taxa and one Priority 4 taxa have previously been recorded over the application area.

Status	Taxa
P3	<i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431)
P4	<i>Lepidum catapycnon</i> .

Four Priority taxa were considered 'Likely' to occur over the application area.

Status	Taxa
P1	<i>Vittadinia</i> sp. Coondewanna Flats (S. van Leeuwen 4684)
P3	<i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794)
P3	<i>Rostellularia adscendens</i> var. <i>latifolia</i>
P4	<i>Goodenia nuda</i>

Three Priority taxa 'Possibly' occur over the application area. Minimal areas of soil type and habitat are present, and no records have been made from within the application area.

Status	Taxa
P2	<i>Pentalepis trichodesmoides</i> subsp. <i>hispida</i>
P3	<i>Aristida jerichoensis</i> var. <i>subspinulifera</i>
P3	<i>Olearia mucronata</i>

Significant flora taxa recorded within 50 kilometres of the application area.

Taxon	Status	No Records	Closest (km)
<i>Barbula ehrenbergii</i>	P1	2	19.4
<i>Bothriochloa decipiens</i> var. <i>cloncurrrens</i>	P1	1	0.6
<i>Calotis squamigera</i>	P1	2	7.4
<i>Eucalyptus lucens</i>	P1	3	1.1
<i>Goodenia pedicellata</i>	P1	9	21.3

Taxon	Status	No Records	Closest (km)
<i>Helichrysum oligochaetum</i>	P1	2	34.7
<i>Hibiscus</i> sp. Mt Brockman (E. Thoma ET 1354)	P1	8	21.8
<i>Josephinia</i> sp. Woodstock (A.A. Mitchell PRP 989)	P1	1	45.3
<i>Tetradlea butcheriana</i>	P1	6	39.2
<i>Triodia</i> sp. Karijini (S. van Leeuwen 4111)	P1	1	34.3
<i>Triodia</i> sp. Silvergrass (P.-L. de Kock BES 00808)	P1	2	47.0
<i>Vittadinia</i> sp. Coondewanna Flats (S. van Leeuwen 4684)	P1	3	23.8
<i>Adiantum capillus-veneris</i>	P2	6	18.6
<i>Aristida lazaridis</i>	P2	1	45.8
<i>Cladium procerum</i>	P2	2	41.2
<i>Dicladanthera glabra</i>	P2	12	32.2
<i>Eremophila pusilliflora</i>	P2	1	42.1
<i>Euphorbia inappendiculata</i> var. <i>inappendiculata</i>	P2	1	6.0
<i>Euphorbia inappendiculata</i> var. <i>queenslandica</i>	P2	7	16.4
<i>Gompholobium karijini</i>	P2	24	19.1
<i>Hibiscus</i> sp. Gurinbiddy Range (M.E. Trudgen MET 15708)	P2	1	47.5
<i>Indigofera ixocarpa</i>	P2	31	0.1
<i>Isotropis parviflora</i>	P2	1	32.3
<i>Oxalis</i> sp. Pilbara (M.E. Trudgen 12725)	P2	1	41.9
<i>Pentalepis trichodesmoides</i> subsp. <i>hispida</i>	P2	5	0.9
<i>Scaevola</i> sp. Hamersley Range basalts (S. van Leeuwen 3675)	P2	13	3.2
<i>Teucrium pilbaranum</i>	P2	10	23.0
<i>Acacia daweana</i>	P3	17	8.4
<i>Acacia effusa</i>	P3	22	8.4
<i>Acacia subtiliformis</i>	P3	1	44.2
<i>Amaranthus centralis</i>	P3	1	21.9
<i>Aristida jerichoensis</i> var. <i>subspinulifera</i>	P3	5	15.6
<i>Astrebla lappacea</i>	P3	12	11.6
<i>Dampiera anonyma</i>	P3	46	1.3
<i>Dolichocarpa</i> sp. Hamersley Station (A.A. Mitchell PRP 1479)	P3	5	16.0
<i>Eragrostis surreyana</i>	P3	1	34.6
<i>Eremophila coacta</i>	P3	4	47.9
<i>Eremophila magnifica</i> subsp. <i>velutina</i>	P3	14	11.6
<i>Eucalyptus rowleyi</i>	P3	1	14.8
<i>Euphorbia australis</i> var. <i>glabra</i>	P3	12	18.2
<i>Euphorbia stevenii</i>	P3	1	5.4
<i>Fimbristylis sieberiana</i>	P3	5	19.0
<i>Geijera salicifolia</i>	P3	7	2.0
<i>Glycine falcata</i>	P3	4	4.4
<i>Goodenia lyrata</i>	P3	1	23.9
<i>Goodenia</i> sp. East Pilbara (A.A. Mitchell PRP 727)	P3	8	17.0
<i>Grevillea saxicola</i>	P3	10	0.1
<i>Gymnanthera cunninghamii</i>	P3	2	16.2
<i>Indigofera gilesii</i>	P3	1	29.3



Taxon	Status	No Records	Closest (km)
<i>Indigofera</i> sp. Bungaroo Creek (S. van Leeuwen 4301)	P3	4	20.9
<i>Iotasperma sessilifolium</i>	P3	8	12.4
<i>Olearia mucronata</i>	P3	11	0.9
<i>Pilbara trudgenii</i>	P3	1	48.8
<i>Ptilotus subspinescens</i>	P3	23	15.1
<i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794)	P3	6	19.0
<i>Rostellularia adscendens</i> var. <i>latifolia</i>	P3	10	0.1
<i>Sida</i> sp. Barlee Range (S. van Leeuwen 1642)	P3	19	0.4
<i>Sida</i> sp. Hamersley Range (K. Newbey 10692)	P3	10	2.0
<i>Solanum albostellatum</i>	P3	1	21.0
<i>Solanum kentrocaule</i>	P3	6	0.1
<i>Solanum</i> sp. Red Hill (S. van Leeuwen et al. PBS 5415)	P3	3	8.0
<i>Stackhousia clementii</i>	P3	2	27.7
<i>Stylidium weeliwolli</i>	P3	1	5.5
<i>Swainsona thompsoniana</i>	P3	9	6.0
<i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431)	P3	19	2.9
<i>Triodia basitricha</i>	P3	10	4.4
<i>Triodia pisoliticola</i>	P3	1	17.3
<i>Xanthoparmelia nashii</i>	P3	2	31.2
<i>Acacia bromilowiana</i>	P4	14	1.8
<i>Eremophila magnifica</i> subsp. <i>magnifica</i>	P4	28	0.1
<i>Goodenia nuda</i>	P4	14	0.5
<i>Lepidium catapycnon</i>	P4	23	0.8
<i>Ptilotus mollis</i>	P4	5	10.0
<i>Ptilotus trichocephalus</i>	P4	5	6.0
<i>Rhynchosia bungarensis</i>	P4	6	25.3

## 2(c) Significant Fauna (see Appendix E3)

Five broad fauna habitat types were recorded over the application area.

Description	Significant micro-habitats	Area (ha)	Area (%)
Creekline	Tree hollows	16.0	2.0 %
Minor Drainage Line	Leaf litter	45.9	5.6 %
Stony Plain	Leaf litter	140.2	17.2 %
Mulga Plain	Leaf litter	454.1	55.6 %
Stony Hills and Slopes	Rock out crops	134.6	16.5 %
Disturbed areas		25.4	3.1 %

None of the fauna habitats were deemed by Hamersley Iron (2020b) to hold any elevated conservation significance. However, all habitats within the study area have the potential to support a range of conservation-listed fauna species.

Twenty seven fauna species of conservation significance have been recorded within 50 kilometres of the application area. A likelihood of occurrence table in respect to significant flora undertaken by Hamersley Iron (2020b) is provided in Appendix E3.

Five fauna species were considered as likely to, or to potentially occur, over the application area

Common name	Scientific name	Status	Likelihood
Northern Quoll	<i>Dasyurus hallucatus</i>	EN	Potential
Pilbara Olive Python	<i>Liasis olivaceus subsp. barroni</i>	VU	Potential
Western pebble-mound mouse	<i>Pseudomys chapmani</i>	P4	Likely
Lined Soil-crevice Skink	<i>Notoscincus butleri</i>	P4	Potential
Long-tailed Dunnart	<i>Sminthopsis longicaudata</i>	P4	Potential

Significant fauna species recorded within 50 kilometres of the application area.

Common Name	Scientific name	Status	No. Records	Closest Record (km)
<b>Bird</b>				
Grey Falcon	<i>Falco hypoleucos</i>	VU	2	20.4
Peregrine Falcon	<i>Falco peregrinus</i>	OS	18	8.8
Striated Grasswren (Sandplain)	<i>Amytornis striatus striatus</i>	P4	8	0.1
Common Sandpiper	<i>Actitis hypoleucos</i>	MI	4	0.1
Fork-tailed Swift	<i>Apus pacificus</i>	MI	9	27.3
Long-toed Stint	<i>Calidris subminuta</i>	MI	4	0.1
Oriental Plover	<i>Charadrius veredus</i>	MI	2	45.7
Swinhoe's Snipe	<i>Gallinago megala</i>	MI	1	31.7
Osprey	<i>Pandion cristatus</i>	MI	1	49.6
Glossy Ibis	<i>Plegadis falcinellus</i>	MI	4	0.1
Little Tern	<i>Sternula albifrons</i>	MI	2	41.3
Wood Sandpiper	<i>Tringa glareola</i>	MI	6	0.1
<b>Mammal</b>				
Long-Tailed Hopping-Mouse	<i>Notomys longicaudatus</i>	EX	1	21.0
		EN	179	12.0
Ghost Bat	<i>Macroderma gigas</i>	VU	26	17.8
Bilby	<i>Macrotis lagotis</i>	VU	2	16.1
Pilbara Leaf-nosed Bat	<i>Rhinonictes aurantia (Pilbara)</i>	VU	63	9.4
Spectacled Hare-Wallaby (Mainland)	<i>Lagorchestes conspicillatus leichardti</i>	P4	1	34.8
Lakeland Downs Mouse	<i>Leggadina lakedownensis</i>	P4	67	1.6
Western Pebble-Mound Mouse	<i>Pseudomys chapmani</i>	P4	180	1.6
Long-tailed Dunnart	<i>Sminthopsis longicaudata</i>	P4	10	3.3
<b>Reptile</b>				
Pilbara Olive Python	<i>Liasis olivaceus barroni</i>	VU	37	0.1
Gane's Blind Snake (Pilbara)	<i>Anilius ganei</i>	P1	5	16.3
Pin-striped Fine snout Ctenotus	<i>Ctenotus nigrilineatus</i>	P1	2	6.2
Spotted Ctenotus (Northeast)	<i>Ctenotus uber johnstonei</i>	P2	4	44.7
Pilbara Barking Gecko	<i>Underwoodisaurus seorsus</i>	P2	10	25.7
Lined Soil-Crevice Skink (Dampier)	<i>Notoscincus butleri</i>	P4	5	3.8
<b>Fish</b>				
Fortescue Grunter	<i>Leiopotherapon aheneus</i>	P4	12	19.2

### 3. Vegetation extent

Six regional vegetation associations considered within the regional mapping of Shepherd *et al.* (2001) have been mapped over the application area. Regional extents of these vegetation associations are provided below:

Vegetation association description	Veg. Assn.	Pre-European extent (ha)	Current extent (ha)	Current extent (%)	Current Extent in All DBCA-Managed Land	% Current Extent in All DBCA-Managed Land (proportion of Current Extent)
Low woodland; mulga ( <i>Acacia aneura</i> ).	18	19,890,667	19,842,830	99.76	1,317,179	6.6
Sparse low woodland; mulga, discontinuous in scattered groups.	29	7,903,991	7,898,973	99.94	496,368	6.3
Hummock grasslands, low tree steppe; snappy gum over <i>Triodia wiseana</i> .	82	2,565,901	2,553,206	99.51	295,378	11.6
Hummock grasslands, grass steppe; hard spinifex, <i>Triodia wiseana</i>	157	502,648	499,303	99.33	91,078	18.2
Short bunch grassland — savanna/grass plain (Pilbara).	175	525,953	524,484	99.72	40,278	7.7
Hummock grasslands. shrub steppe; mulga and kanji over soft spinifex and <i>Triodia basedowi</i> .	567	777,507	774,896	99.66	197,318	25.5

#### Remnant vegetation within 50 kilometres of the application area

	Hectares (ha)	Remaining %
Remnant vegetation remaining	865,240	99.2 %

## Appendix C – Assessment against the Clearing Principles

Assessment against the Clearing Principles	Variance level	Is further consideration required?
<b>Environmental value: biological values</b>		
<p><u>Principle (a):</u> “Native vegetation should not be cleared if it comprises a high level of biodiversity.”</p> <p><u>Assessment:</u> The application area consists of six regional vegetation associations (Shepherd <i>et al.</i> 2001), 21 vegetation units (Hamersley Iron 2020b), eight Land Systems (van Vreeswyk, <i>et al.</i> 2004), and nine major geological units (Martin <i>et al.</i> 2014).</p> <p>One Priority 3 flora taxa and one Priority 4 flora taxa have previously been recorded over the application area, and four Priority flora taxa were considered 'Likely' to occur over the application area by Hamersley Iron (2020b).</p>	Not likely to be at variance	Yes. Further consideration provided in section 3.2.1
<p><u>Principle (b):</u> “Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna.”</p> <p><u>Assessment:</u> Five broad fauna habitat types were recorded over the application area and The Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>) (P4) is considered likely to occur. Hamersley Iron (2020b) also considered that the Pilbara Olive Python (<i>Liasis olivaceus</i> subsp. <i>barroni</i>) (VU), Lined Soil-crevice Skink (<i>Notoscincus butleri</i>) (P4) and Long-tailed Dunnart (<i>Sminthopsis longicaudata</i>) (P4) have been assessed as potentially occurring. Considering the records within the local area and the Stony Hills and Slopes habitat present the Northern Quoll (<i>Dasyurus hallucatus</i>) (EN) may also occur.</p>	Not likely to be at variance	Yes. Further consideration provided in section 3.2.2
<p><u>Principle (c):</u> “Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora.”</p> <p><u>Assessment:</u> Three Threatened flora species occur within the Pilbara bioregion: <i>Aluta quadrata</i> (EN), <i>Pityrodia</i> sp. Marble Bar (G. Woodman &amp; D. Coultas GWDC Opp 4) (EN) and <i>Thryptomene wittweri</i> (VU). None of these species has been recorded within 50 kilometres of the application area and no Threatened flora taxa were identified by Hamersley Iron (2020b). The application area is unlikely to include, or be necessary for, the continued existence of, Threatened flora.</p>	Not at variance	Further consideration not required
<p><u>Principle (d):</u> “Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.”</p> <p><u>Assessment:</u> The Vulnerable Threatened Ecological Community (TEC); Themeda grasslands on cracking clays (Hamersley Station, Pilbara) endorsed by the Western Australian Minister for Environment has been mapped approximately 20.5 kilometres north-west of the application area. No other TECs have been recorded within 50 kilometres of the application area. The application area does not contain species assemblages analogous to any TEC's (Hamersley Iron 2020b) and the application area is unlikely to comprise the whole or a part of, or be necessary for, the maintenance of a Threatened Ecological Community.</p>	Not at variance	Further consideration not required.

Assessment against the Clearing Principles	Variance level	Is further consideration required?
<b>Environmental values: significant remnant vegetation and conservation areas</b>		
<p><u>Principle (e):</u> <i>“Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.”</i></p> <p><u>Assessment:</u> The national objectives and targets for biodiversity conservation in Australia has a target to prevent clearance of ecological communities with an extent below 30 per cent of that present pre the year 1750, below which species loss appears to accelerate exponentially at an ecosystem level (Commonwealth of Australia 2001). The application area consists of six regional vegetation associations (Shepherd <i>et al.</i> 2001) (Appendix B1). All of these six vegetation associations retain over 99% of their original pre-European cover (Appendix B3). Within a 50 kilometre radius of the application area over 99 per cent of native vegetation is retained. Vegetation in the proposed clearing area is not considered to be part of a significant ecological linkage in the local area. The application area is not significant as a remnant of native vegetation in an area that has been extensively cleared.</p>	Not at variance	Further consideration not required.
<p><u>Principle (h):</u> <i>“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.”</i></p> <p><u>Assessment:</u> The application area is not within any gazetted conservation reserves. However, the closest north-eastern section of the application area is located within 100 metres of Karijini National Park. This north-eastern section is also located within Unallocated Crown Land which is former leasehold (ex Hamersley Station) that is proposed for conservation.</p>	May be at variance	Yes. Further consideration provided in section 3.2.3
<b>Environmental values: land and water resources</b>		
<p><u>Principle (f):</u> <i>“Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.”</i></p> <p><u>Assessment:</u> Over 36 hectares of the application area (or 5.2%) has been mapped as Drainage line vegetation by Hamersley Iron (2020b). The application area, therefore, is likely to support native vegetation growing in, or in association with, an environment associated with a watercourse.</p>	Is at variance	Yes. Further consideration provided in section 3.2.4
<p><u>Principle (g):</u> <i>“Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.”</i></p> <p><u>Assessment:</u> Landforms and soils over the application area are varied and diverse. Due to the presence of hills and breakaways landforms covering approximately 68 hectares (or 9.7 per cent of the application area) and drainage systems covering approximately 36 hectares (or 5.2 per cent of the application area) (Hamersley Iron 2020b) localised erosion can potentially occur from the creation of tracks.</p>	Not likely to be at variance	Yes. Further consideration provided in section 3.2.6
<p><u>Principle (i):</u> <i>“Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.”</i></p> <p><u>Assessment:</u> The application area is located within the proclaimed Pilbara groundwater and surface water areas and are subject to licensing requirements under the <i>Rights in Water and Irrigation Act 1914</i>. The application area is also located within the Southern Fortescue and Marandoo Water Reserve, a public drinking water source area for Tom Price (gazetted</p>	Not likely to be at variance	Yes. Further consideration provided in section 3.2.5

Assessment against the Clearing Principles	Variance level	Is further consideration required?
<p>under the <i>Country Areas Water Supply Act, 1947</i>. The Southern Fortescue Borefield, where clearing is proposed, is managed for Priority 1 source protection, with 500 metre wellhead protection zones (WHPZs) established around all production bores, to help protect the source from contamination. A portion of the proposed clearing activities falls within the WHPZs of the Southern Fortescue Borefield.</p>		
<p><u>Principle (j)</u>: <i>“Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.”</i></p> <p><u>Assessment</u>: The climate is semi-arid to semi-tropical with a summer rainfall season and a relatively dry winter. Rainfall is generally low and highly variable, typically resulting from cyclone events and localised thunderstorms (van Vreeswyk <i>et al.</i>, 2004), with the annual rainfall for the closest town of Tom Price, immediately to the south of the application area being approximately 398.5 millimetres (BOM 2021). No mapped floodplain areas intersect the application area and no large rivers dissect the application area. Whilst temporary localised flooding can occur following heavy rainfall events, the proposed clearing is not likely to increase the incidence or intensity of natural flooding events.</p>	<p>Not likely to be at variance</p>	<p>Further consideration not required.</p>



## Appendix D – Vegetation condition rating scale

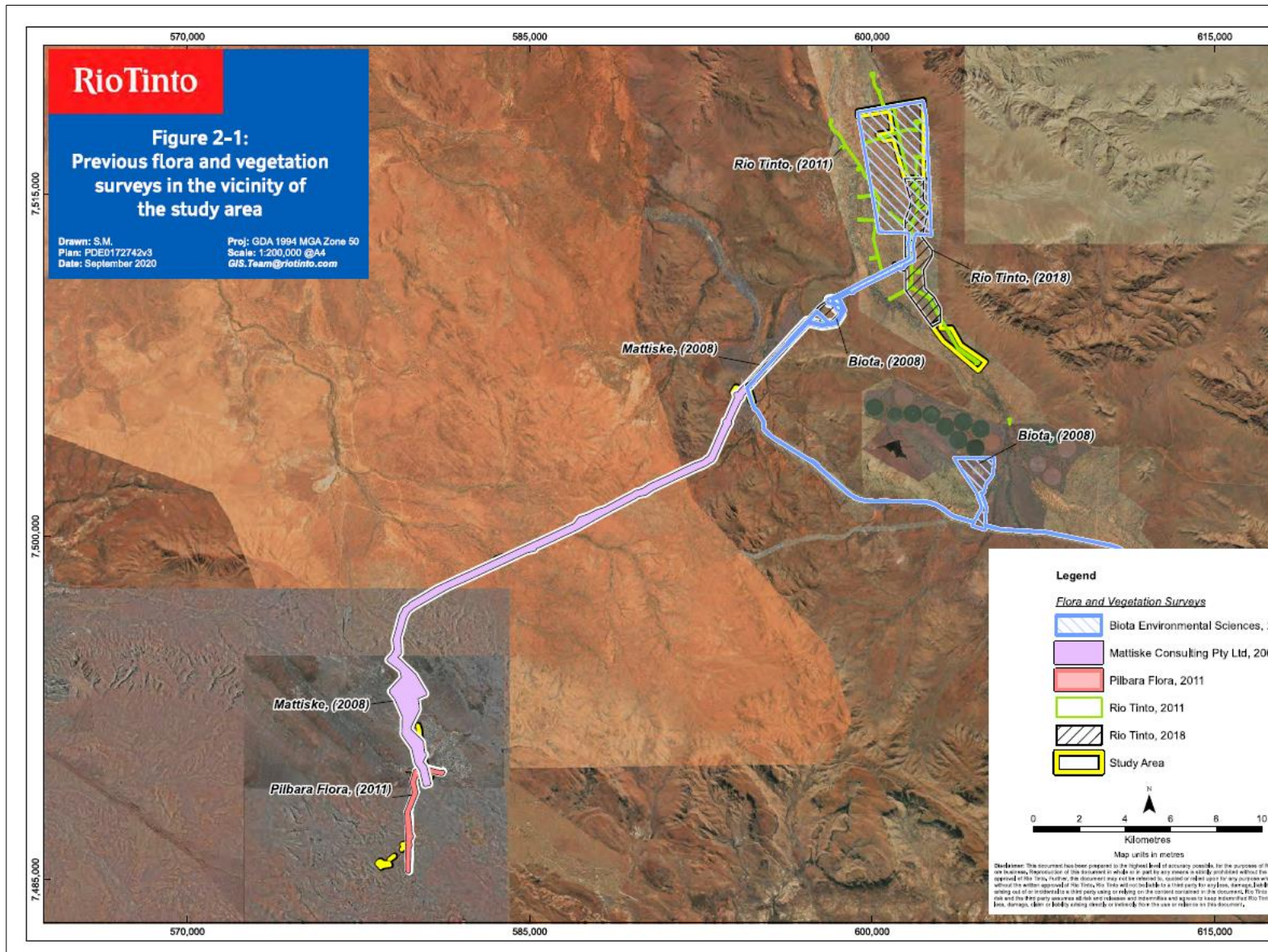
Vegetation condition is a rating given to a defined area of vegetation to categorise and rank disturbance related to human activities. The rating refers to the degree of change in the vegetation structure, density and species present in relation to undisturbed vegetation of the same type. The degree of disturbance impacts upon the vegetation's ability to regenerate. Disturbance at a site can be a cumulative effect from a number of interacting disturbance types.

### Measuring vegetation condition for the Eremaean and Northern Botanical Provinces (Trudgen, 1991)

Condition	Description
Excellent	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Very good	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
Good	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Very poor	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
Completely degraded	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

**Appendix E – Biological survey information excerpts**

**(1) Flora and vegetation surveys undertaken in the vicinity of the application area (Hamersley Iron 2020b)**



(2) Significant flora likelihood analysis (Hamersley Iron 2020b)

**Table 3-4:** Conservation listed flora species returned by database searches, including pre-field likelihood of occurrence assessment and potential presence via habitat preference and proximity of previous recordings

Species	Status	Database		Nearest known locality from study area	Habitat and discussion (pre-field)	Likelihood of occurrence
		NM	RT			
<i>Acacia bromilowiana</i>	P4	X	X	2.4 km	Grows in skeletal stony loam typically high in the landscape. The Hamersley Range populations occur on steep slopes, ridge tops and breakaways (often in gullies and sheltered places) that comprises a substrate of banded ironstone or massive basalts.	Unlikely
<i>Acacia dawsoniana</i>	P3	x		10 km	Low spreading shrub. Recorded from rocky red skeletal loam in spinifex on lower scree slopes and bajada outwash fans of banded rocky ironstone ranges and ridges (Rio Tinto & DPaW 2014).	Unlikely
<i>Acacia effusa</i>	P3	x		13.4 km	Low spreading shrub. Recorded from rocky red loam with surface strew of rocks in spinifex on low scree slopes of low rocky ranges or on bajada alluvial plain at the base of large banded ironstone mountains and ranges (Rio Tinto & DPaW 2014).	Unlikely
<i>Astrebia lappacea</i>	P3	X	X	12 km	Recorded as occurring mainly on gilgais, depressions on cracking clays soils and crabholed plains.	Unlikely
<i>Amaranthus centralis</i>	P3		X	8 km	Recorded as growing in red sand in ephemeral watercourses, sandy to clayey loam on river banks and edges of permanent pools in eucalypt lined channels or Acacia shrubland.	Unlikely
<i>Aristida jerichoensis</i> var. <i>subspinulifera</i>	P3		X	3 km	Recorded from hardpan plains with deep soil with open Acacia woodland over Triodia and other grasses	Possible
<i>Astrebia lappacea</i>	P3		x	3.4 km	Tufted perennial grass. Recorded as occurring mainly on gilgais, depressions on cracking clay soils and crab holed plains (Rio Tinto & DPaW 2014).	Unlikely
<i>Bothriochloa decipiens</i> var. <i>cloncurrrensensis</i>	P1	X	X	>1 km	Associated with floodplains, clays and seasonally wet grasslands.	Unlikely
<i>Calotis squamigera</i>	P1	X	X	7.5 km	In the Pilbara, it is only known from a poorly defined flow line on a plain with pebbly red/brown loam. Elsewhere in central Australia, it is common in grassland and sclerophyll forest.	Unlikely

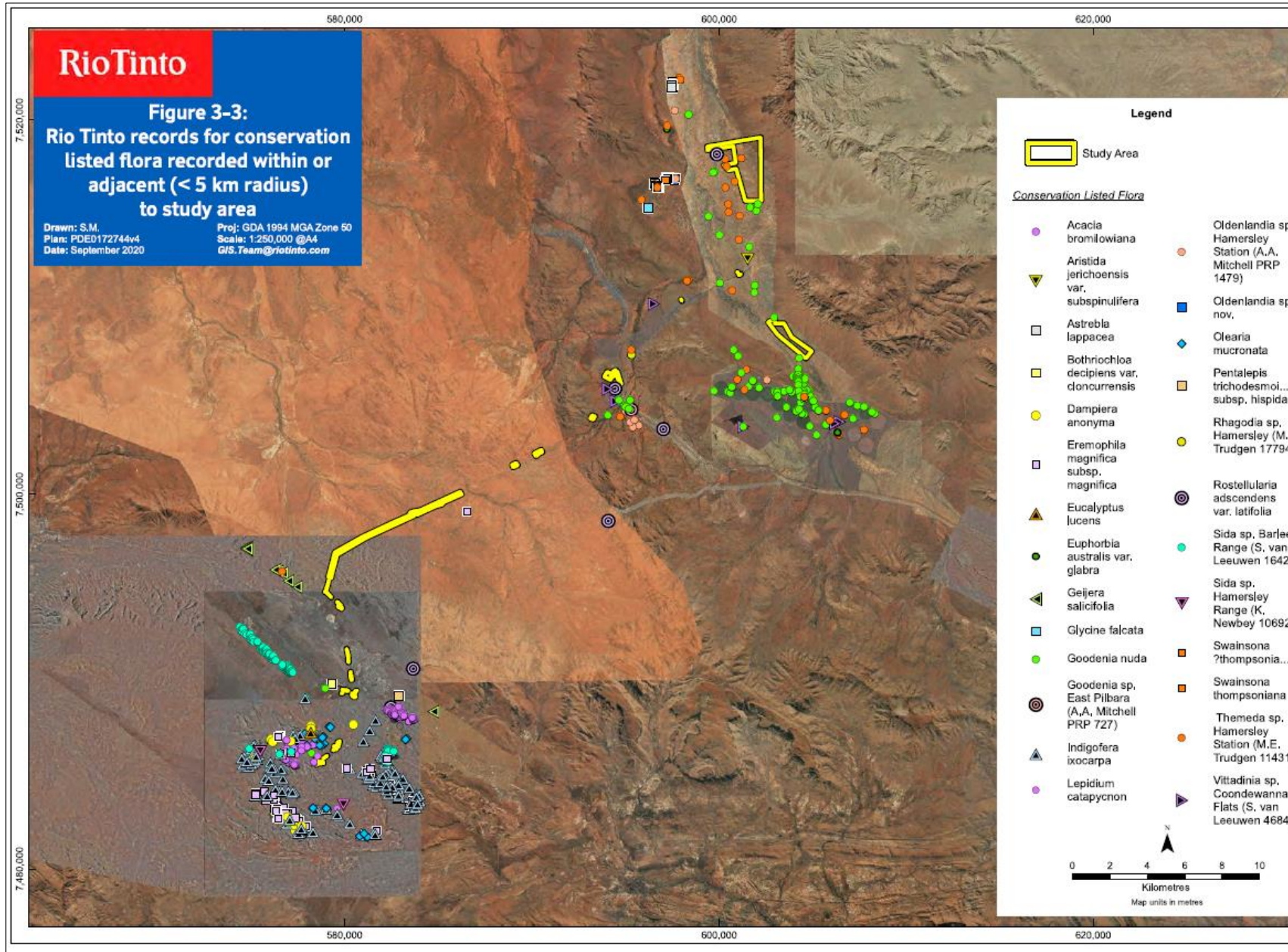
Species	Status	Database		Nearest known locality from study area	Habitat and discussion (pre-field)	Likelihood of occurrence
		NM	RT			
<i>Dampiera anonyma</i>	P3	X	X	1,5 km	Recorded from hummock grassland on hill slopes and summits above 1000 m in skeletal red brown soil over massive banded ironstone,	Unlikely
<i>Eremophila magnifica</i> subsp. <i>magnifica</i>	P4	X	X	<1km	Recorded from rocky-red brown loams on hill slopes and along ephemeral drainage lines,	Unlikely
<i>Eremophila magnifica</i> subsp. <i>velutina</i>	P3		X	13 km	Recorded as common and growing in rocky red-brown loams in amongst <i>Triodia</i> and <i>Acacia</i> species on hill slopes and along ephemeral drainage lines	Unlikely
<i>Eucalyptus lucens</i>	P1	X	X	1 km	Occupies higher altitude shallow soils on quartzite but also occurs on ironstone in the Pilbara,	Unlikely
<i>Euphorbia australis</i> var. <i>glabra</i>	P3		X	2,3 km	Recorded from heavy cracking clays,	Unlikely
<i>Euphorbia inappendiculata</i> var. <i>inappendiculata</i>	P2	x		5 km	A prostrate, much-branched diffuse herb. In the Pilbara it is recorded from hummock grassland of <i>Triodia apectia</i> over very open grassland of * <i>Cenchrus ciliaris</i> on red loamy depressions interspersed with quartzite on plain (Rio Tinto & DPaW 2014).	Unlikely
<i>Geijera salicifolia</i>	P3	X	X	2 km	Recorded from scree slopes and gorges in the Pilbara,	Unlikely
<i>Glycine falcata</i>	P3	X	X	10 km	Recorded as growing on stony loam or cracking clays, typically in grassland in low-lying areas,	Unlikely
<i>Goodenia nuda</i>	P4	X	X	1,5 km	Mostly recorded from seasonally inundated clay soils and drainage lines, often in mulga.	Likely
<i>Goodenia pedicellata</i>	P1		X	17 km	Shows a strong association with calcrete soils,	Unlikely
<i>Goodenia</i> sp, East Pilbara (A.A, Mitchell PRP 727)	P3		X	1,6 km	Shows a strong association with calcrete soils,	Unlikely
<i>Grevillea saxicola</i>	P3	X	X	<1 km	Grows in orange-brown to red-brown loam soils on the upper scree/breakaway slopes and crests often associated with banded iron formation outcropping.	Unlikely
<i>Gymnanthera cunninghamii</i>	P3		X	16 km	Recorded as growing in the surrounding areas of permanent or semi-permanent water courses in sandy soils.	Unlikely

Species	Status	Database		Nearest known locality from study area	Habitat and discussion (pre-field)	Likelihood of occurrence
		NM	RT			
<i>Hibiscus</i> sp. Mt Brockman (E. Thoma ET 1354)			X	5 km	Grows in sheltered or rocky drainage lines below associated cliff-lines or rocky ridges,	Unlikely
<i>Hibiscus</i> sp. Gurinbidy Range (M.E. Trudgen MET 15708)	P2	X		3 km	Grows in sheltered or rocky drainage lines below associated cliff-lines or rocky ridges,	Unlikely
<i>Indigofera ixocarpa</i>	P2	X	X	<1 km	Recorded growing on hills and drainage lines, usually skeletal soils over massive ironstones but also on granite,	Unlikely
<i>Indigofera</i> sp. Bungaroo Creek (S. van Leeuwen 4301)	P3		X	14 km	Recorded as growing in coarse alluvium in high energy creek lines or along steep slopes in skeletal soils overlaying coarse breccias from the Brockman ironstone formation.	Unlikely
<i>Isoetes sessilifolium</i>	P3	X	X	18 km	Recorded from gilgai, cracking clays and crabhole country in periodically flooded areas.	Unlikely
<i>Lepidium catapycnon</i>	P4	X	X	Previously Recorded	Occurs on skeletal soils in open woodland in unusually hilly areas, more frequent on south facing slopes. It appears to be extirpated by <i>Tridolia</i> sp. As the vegetation matures, re-appearing after fires.	Previously Recorded
<i>Oldenlandia</i> sp. Hamersley Station (A.A. Mitchell PRP 1479)	P3	X	X	8 km	Occurs on cracking clays.	Unlikely
<i>Olearia mucronata</i>	P3	X	X	1.5 km	Recorded from mesic areas amongst ironstone boulders and along creek lines sometimes locally abundant on the margins of dry creek lines.	Possible
<i>Pentalepis trichodesmoides</i> subsp. <i>hispida</i>	P2	X	X	< 1km	Often found in <i>Tridolia</i> hummock grassland and on summits and slopes of low hills and basaltic soils.	Possible
<i>Pentalepis trichodesmoides</i> subsp. <i>incana</i>	P1	X		13 km	Found in in <i>Tridolia</i> grassland and <i>Eucalyptus</i> woodland on skeletal soils on volcanic rock types.	Unlikely
<i>Ptilotus mollis</i>	P4	X	X	9 km	Recorded from steep rocky sites, usually in full sun on massive ironstone formations,	Unlikely
<i>Ptilotus subspinescens</i>	P3		X	15 km	Recorded from hummock grassland between mesas of ironstone, mainly on rocky and scree slopes.	Unlikely



Species	Status	Database		Nearest known locality from study area	Habitat and discussion (pre-field)	Likelihood of occurrence
		NM	RT			
<i>Rhagodia</i> sp, Hamersley (M. Trudgen 17794)	P3		X	<1 km	Recorded from mulga on cracking clays.	Likely
<i>Rostellularia adscendens</i> var. <i>latifolia</i>	P3	X	X	<1 km	Recorded from protected areas near watercourses, or along shaded rocky ridges, often in dry gullies and gorges,	Likely
<i>Scaevola</i> sp, Hamersley Range basalts (S. van Leeuwen 3675)	P2	X	X	2 km	Known to be very habitat specific, occurring on slopes and hilltops on skeletal brown soils over mostly basaltic volcanic rock,	Unlikely
<i>Sida</i> sp, Barlee Range (S. van Leeuwen 1642)	P3	X	X	<1 km	Recorded as growing in skeletal soils in rocky areas especially scree slopes and rock piles in full sun to afternoon shade or in small chines and gullies,	Unlikely
<i>Sida</i> sp, Hamersley Range (K. Newbey 10692)	P3	X	X	3 km	Recorded as being associated with rocky outcrops and breakaways also sometimes found in flat areas between hills in shrubby grassland,	Unlikely
<i>Solanum kentrocaule</i>	P3	X	X	13 km	Occurs on hillsides and mountaintops or occasionally creek-beds, in skeletal red-brown soil over ironstone or on basalt scree,	Unlikely
<i>Solanum</i> sp, Red Hill (S. van Leeuwen et al. PBS 5415)	P3		x	7,4 km	Low spreading shrub, Recorded from footslopes of shale hills or ironstone hills and gorges (Western Australian Herbarium 1998-).	Unlikely
<i>Stylidium weeliwoffi</i>	P3	X	X	5 km	Rosetted annual herb growing on gritty sandy soil along watercourses and at the edges of permanent pools or in gorges, Unlikely to occur within study area due to lack of suitable habitat	Unlikely
<i>Swainsona thompsoniana</i>	P3	X	X	18 km	Occurs on clay soils, usually in association with tussock grasses. Unlikely to occur within study area due to lack of suitable habitat.	Unlikely
<i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431)	P3	X	X	Previously recorded	Recorded from drainage lines, clays flats, crabhole flats and dark, self-mulching clays (Rio Tinto & DP&W 2014).	Previously recorded
<i>Triodia basitricha</i>	P3	X		4.5 km	Plants often grow on crests and nearby slopes of rocky hills.	Possible
<i>Vittadinia</i> sp, Coondewanna Flats (S. van Leeuwen 4684)	P1		X	50 m	Recorded from clay-loams, clays cracking clays and gilgai usually in association with low open woodland and frequently with mulga	Likely

NM – NatureMap; RT – Rio Tinto Priority Flora Database.



(3) Significant fauna likelihood analysis (Hamersley Iron 2020b)

**Table 3-7: Conservation listed fauna species returned by database searches, including pre-field likelihood of occurrence assessment and potential presence via habitat preference and proximity of previous recordings**

Species	Common name	BC Act	EPBC Act	NM	RT	EPBC	Distance to nearest record	Habitat and discussion	Likelihood of occurrence
<i>Leggadina lakedownensis</i>	Northern Short-tailed Mouse, Lakeland Downs Mouse	P4	-	X	-	-	3 km	Found in a variety of habitats including spinifex and tussock grasslands, samphire and sedgelands, Acacia shrublands, woodlands and stony ranges across much of tropical Australia. In the Pilbara, the species has been recorded from coastal and inland localities and appears to prefer cracking clay habitats, although has been recorded in rocky habitat. As there are no cracking clays within the study area, it is unlikely there is suitable habitat for this species.	Unlikely
<i>Sminthopsis longicaudata</i>	Long-tailed Dunnart	P4	-	X		-	2.5 km	Exposed rock and stony soils with hummock grasses and shrubs. Flat-topped hills, lateritic plateaus, sandstone ranges and breakaways. Sparse mulga over spinifex.	Potential
<i>Dasyurus hallucatus</i>	Northern Quoll	EN	EN			X	> 20 km	In the Pilbara region, the species tends to prefer the Rocklea, Macroy and Robe land systems and occurs within gorges, breakaways and major drainage lines with large Eucalyptus trees. This species has been recorded twice within 50 m and 190 m east of the study area, from breakaway habitats. This habitat continues into the study area, hence it is considered likely the Northern Quoll would utilise habitat found within the study area.	Unlikely
<i>Macrotis lagotis</i>	Greater Bilby	VU	VU	x	X		15 km	Remaining populations of the Greater Bilby occupy three major vegetation types, namely: open tussock grassland on uplands and hills, mulga woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas.	Unlikely
<i>Macroderma gigas</i>	Ghost bat	VU	VU	-	X	X	5 km	This species is known to occur in the Hamersley Range and wider Pilbara region. It roosts in natural caves, adits and mines, as well as granite rockpiles in the eastern Pilbara (Armstrong and Anstee 2000). This species has been recorded from calls surrounding the study area and may utilise habitat for foraging within the study area.	Unlikely

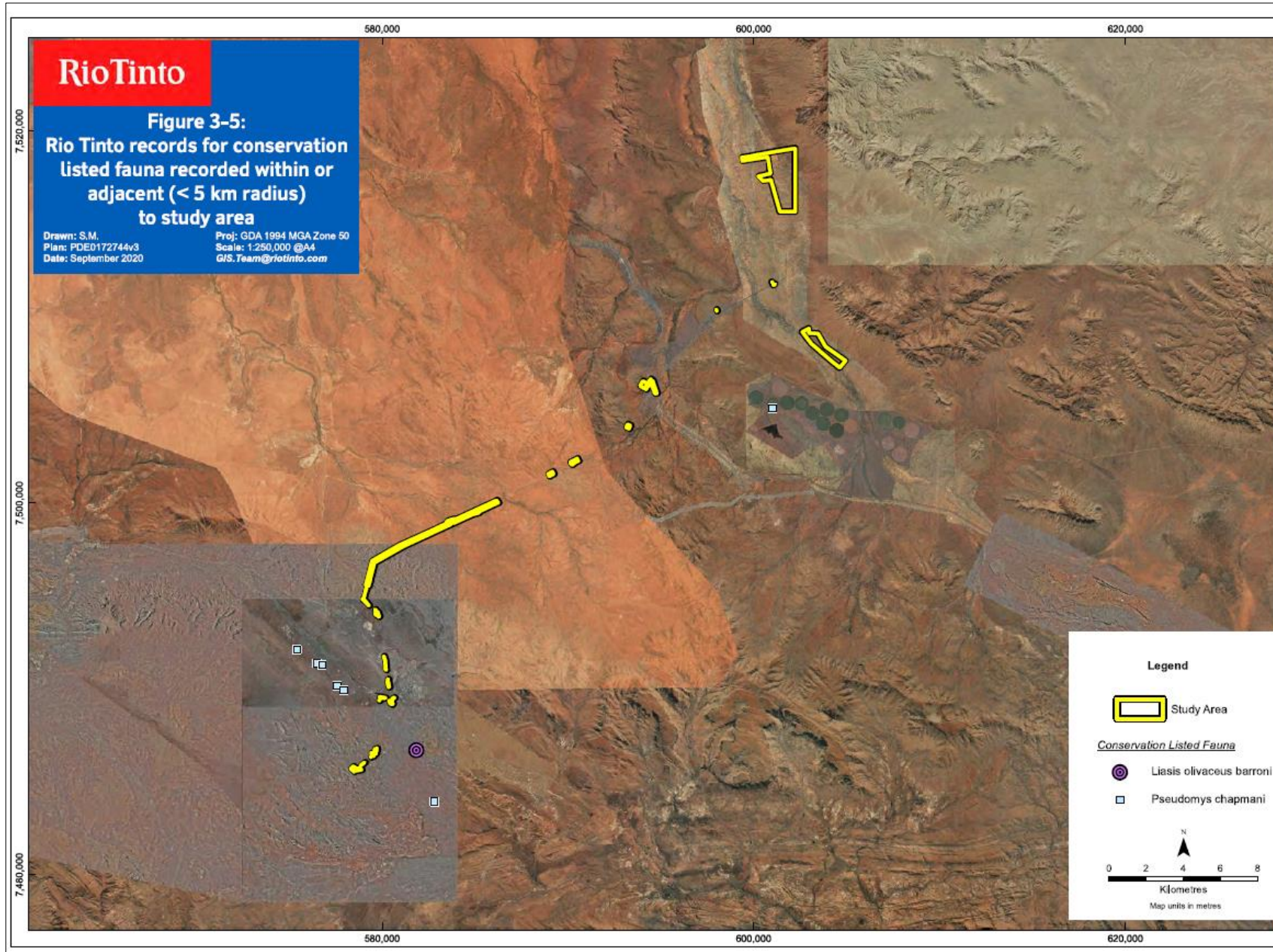
Species	Common name	BC Act	EPBC Act	NM	RT	EPBC	Distance to nearest record	Habitat and discussion	Likelihood of occurrence
<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	P4	-	X	X	-	6 km	The Western pebble-mound mouse is endemic to the Pilbara region of Western Australia and occurs west to the McKay Range and south to the Collier Range (Menkhorst and Knight 2001). The species is patchily distributed on gentle colluvial slopes of rocky, hummock grassland with little or no soil and sparse shrub layer. A small amount of habitat is present in the study area and an inactive mound was recorded in the wider area during the 2015 surveys.	Likely
<i>Rhinonicteris aurantia</i> (Pilbara form)	Pilbara Leaf-nosed Bat	VU	VU	X	X	X	9 km	This species inhabits abandoned mine shafts, granite rock pile terrain of the east Pilbara and caves formed in gorges that dissect sedimentary geology in the west Pilbara (van Dyck and Strahan 2008). This species is more influenced by the availability of suitable roost caves than by habitat type and high humidity is particularly important to this species (Churchill 1998).	Unlikely
<i>Liasis olivaceus</i> subsp. <i>barroni</i>	Pilbara Olive Python	VU	VU	X	X	X	<1 km	Regarded as a Pilbara endemic, the Pilbara olive python has a known distribution that coincides roughly with the Pilbara bioregion (Environment Australia 2012). This species typically shelters in logs, flood debris, caves, tree hollows and thick vegetation close to water and rock outcrops (Burbidge 2004).	Potential
<i>Notoscincus butleri</i>	Lined Soil-crevice Skink (Dampier)	P4	-	X	X	-	4.5 km	Found in spinifex dominated areas near creek and river margins. Suitable habitat is located within the study area.	Potential
<i>Amytornis striatus</i> subsp. <i>striatus</i>	Striated Grasswren (inland)	P4	-	X	-	-	<1 km	Occurs in spinifex country with sparsely scattered trees, on sand dunes or stocky ranges. The study area lies outside the known range of the <i>A. striatus</i> subsp. <i>striatus</i> with the nearby NatureMap record likely to be erroneous.	Unlikely
<i>Malurus leucopterus</i> subsp. <i>leucopterus</i>	Dirk Hartog black and white fairy-wren	VU	VU	X	-	-	< 1 km	The White-winged Fairy-wren (Dirk Hartog Island) occurs at a single location, Dirk Hartog Island, in Western Australia (Schodde & Mason 1999).	Unlikely
<i>Plegadis falcinellus</i>	Glossy Ibis	MI	MI	X			< 1km	Migratory wader bird, therefore unlikely to land as no permanent water in study area.	Unlikely

Species	Common name	BC Act	EPBC Act	NM	RT	EPBC	Distance to nearest record	Habitat and discussion	Likelihood of occurrence
<i>Calidris ferruginea</i>	Curlew Sandpiper	CR & MI	CR & MI	-	-	X	> 200 km	Small, slim sandpiper which occurs on intertidal mudflats and around non-tidal swamps, lakes and lagoons near the coast and ponds in saltworks and sewage farms. No suitable habitat for this species occurs in the study area.	Unlikely
<i>Pezoporus occidentalis</i>	Night Parrot	CR	EN	-	-	X	> 100 km	This species inhabits treeless or sparsely wooded spinifex near water. This cryptic species is unlikely to occur in the study area.	Unlikely
<i>Rostratula australis</i>	Australian Painted-snipe, Australian Painted Snipe	EN	EN	-	-	X	> 150 km	This species frequents shallow, freshwater wetlands with a thick cover of low vegetation (DEH 2003). No suitable habitat for this species occurs in the study area.	Unlikely
<i>Apus pacificus</i>	Fork-tailed Swift	MI	MI	-	-	X	45 km	The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. Unlikely to be dependent on habitat in the study area.	Unlikely
<i>Hirundo rustica</i>	Barn Swallow	MI	MI	-	-	X	> 200 km	The Barn Swallow usually occurs in northern Australia, on Cocos-Keeling Island, Christmas Island (Stokes et al. 1984; Stokes 1988), Ashmore Reef (Higgins et al. 2006), and patchily along the north coast of the mainland from the Pilbara region, Western Australia, to Fraser Island in Queensland. The species has been recorded irregularly further south in Western Australia, in areas such as Derby and Carnarvon, and in South Australia near Koolunga, Roxby Downs, Nantawarra and south of Innamincka (Higgins et al. 2006).	Unlikely
<i>Actitis hypoleucos</i>	Common Sandpiper	MI	MI	X	X	X	<1km	Migratory wader bird, therefore unlikely to land as no permanent water in study area.	Unlikely
<i>Motacilla cinerea</i>	Grey Wagtail	MI	MI	-	-	X	140 km	This species inhabits fast-flowing mountain streams and rivers with riffles and exposed rocks or shoals, often in forested areas. It is also found in more lowland watercourses, even canals, where there are artificial waterfalls, weirs, millraces or lock gates. Outside of the breeding season it occupies a wider variety of habitats, including farmyards, sewage farms, forest tracks, tea estates and even town centres (Tyler 2016).	Unlikely



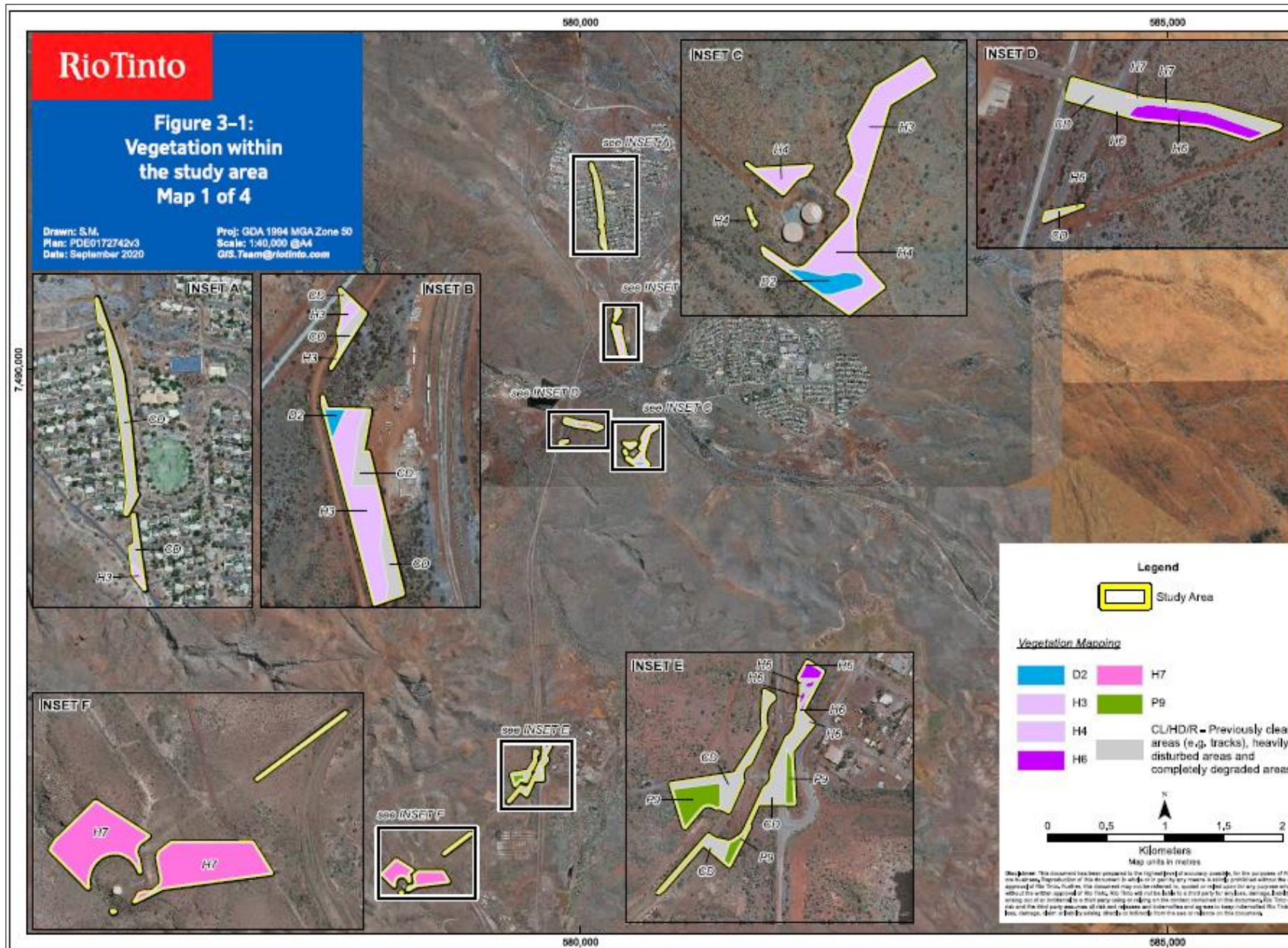
Species	Common name	BC Act	EPBC Act	NM	RT	EPBC	Distance to nearest record	Habitat and discussion	Likelihood of occurrence
<i>Motacilla flava</i>	Yellow Wagtail	MI	MI	-	-	X	>500 km	This species occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra. In the north of its range it is also found in large forest clearings.	Unlikely
<i>Calidris subminuta</i>	Long-toed Stint	MI	MI	X	-	-	< 1 km	Migratory wader bird, therefore unlikely to land as no permanent water in study area.	Unlikely
<i>Calidris melanotos</i>	Pectoral Sandpiper	MI	MI	-	-	X	> 200 km	Migratory wader bird, therefore unlikely to land as no permanent water in study area.	Unlikely
<i>Falco peregrinus</i>	Peregrine Falcon	OS	-	X	-	-	10 km	Occupies a variety of habitats, with nesting typically occurring on ledges, cliff faces or shallow tree hollows. Unlikely to be dependent on habitat in the study area.	Unlikely
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	MI	MI	-	-	X	55 km	Migratory wader bird, therefore unlikely to land as no permanent water in study area.	Unlikely
<i>Charadrius veredus</i>	Oriental Plover	MI	MI	-	-	X	45 km	Migratory wader bird, therefore unlikely to land as no permanent water in study area.	Unlikely
<i>Tringa glareola</i>	Wood Sandpiper	MI	MI	X	X	-	< 1 km	Migratory wader bird, therefore unlikely to land as no permanent water in study area.	Unlikely

**NM** – NatureMap; **RT** –Rio Tinto Priority Fauna Database; **EPBC** – EPBC Act Protected Matters Search Tool.

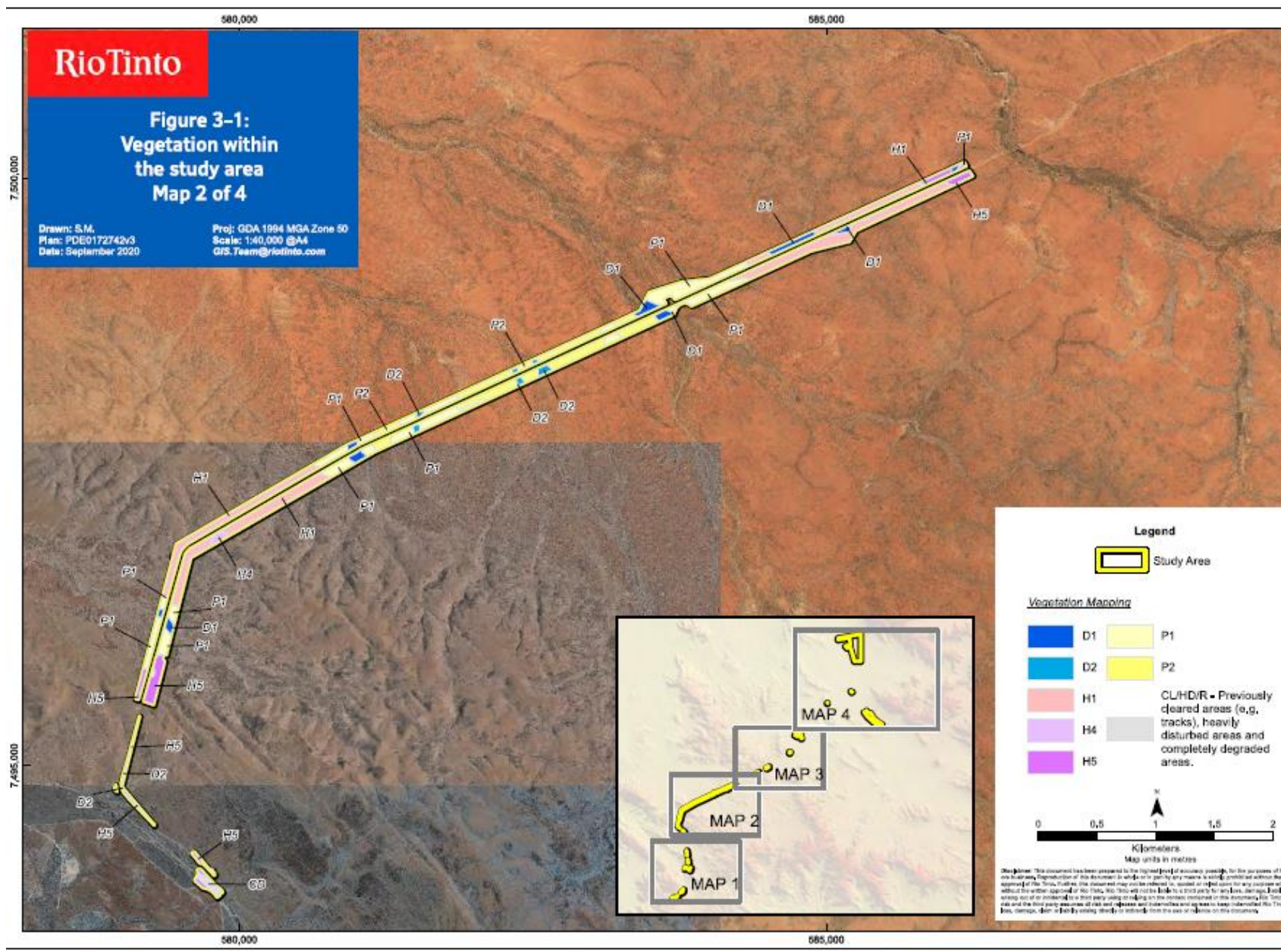




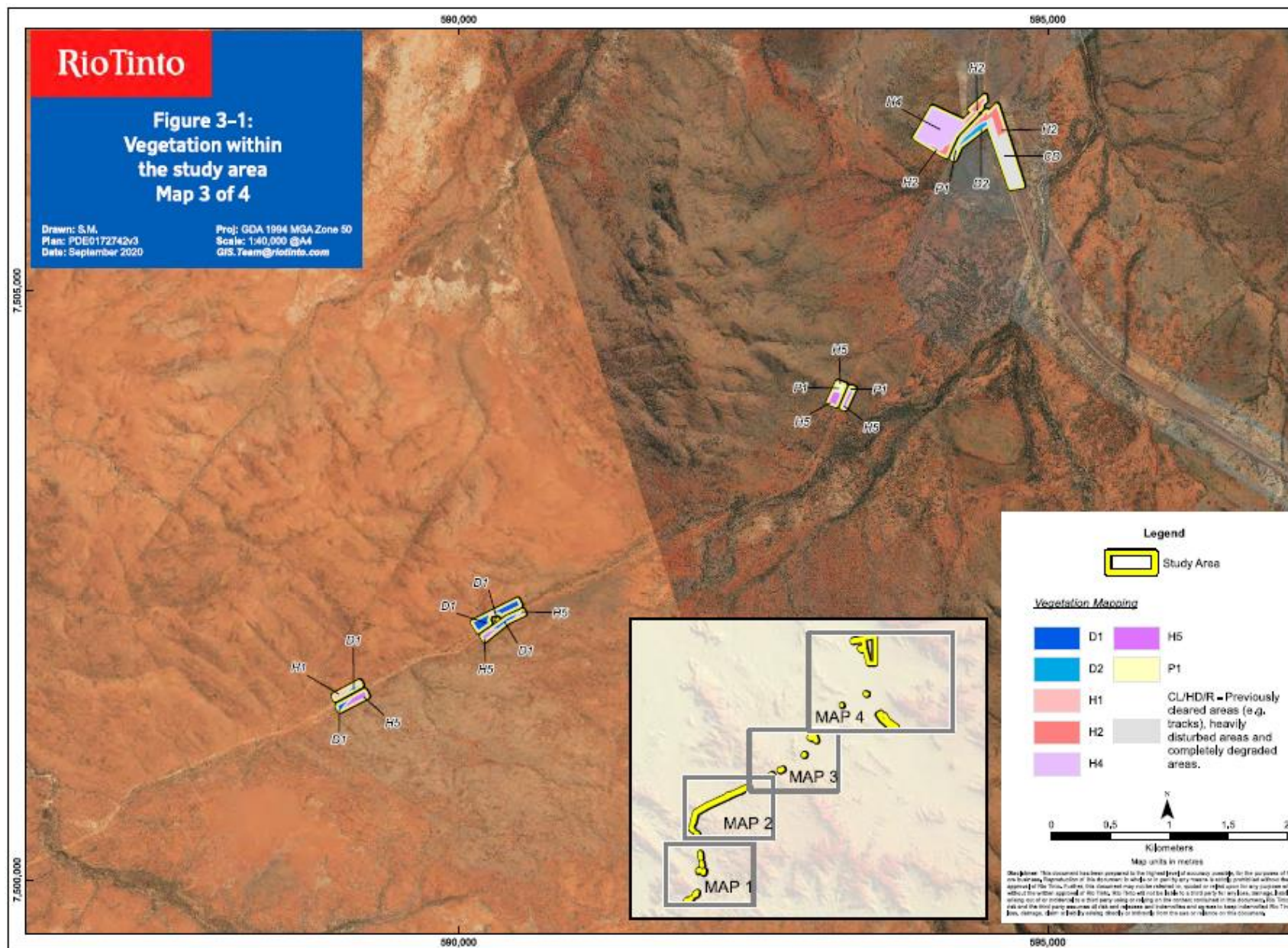
(4) Vegetation units of the application area (Hamersley Iron 2020b)



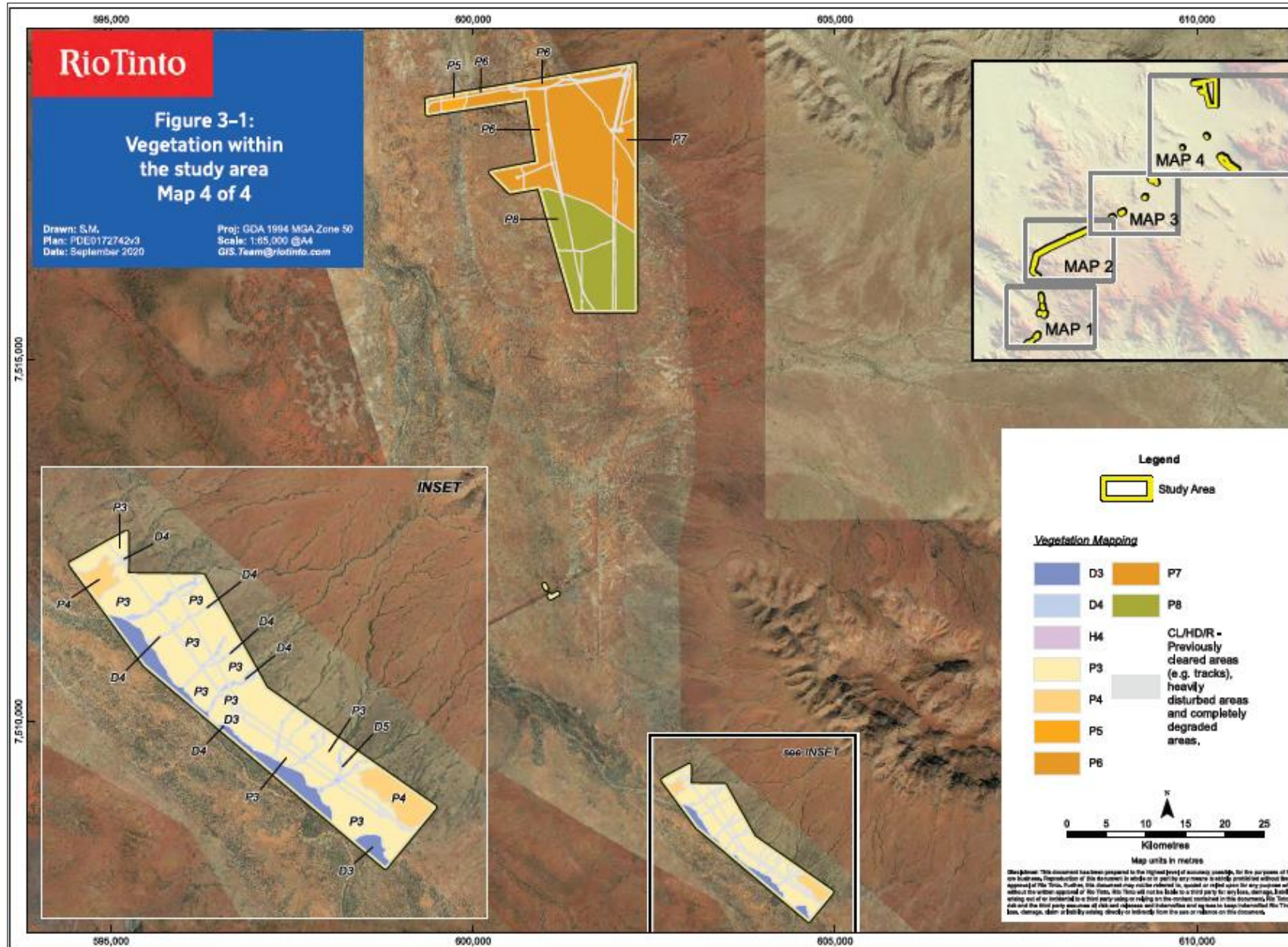






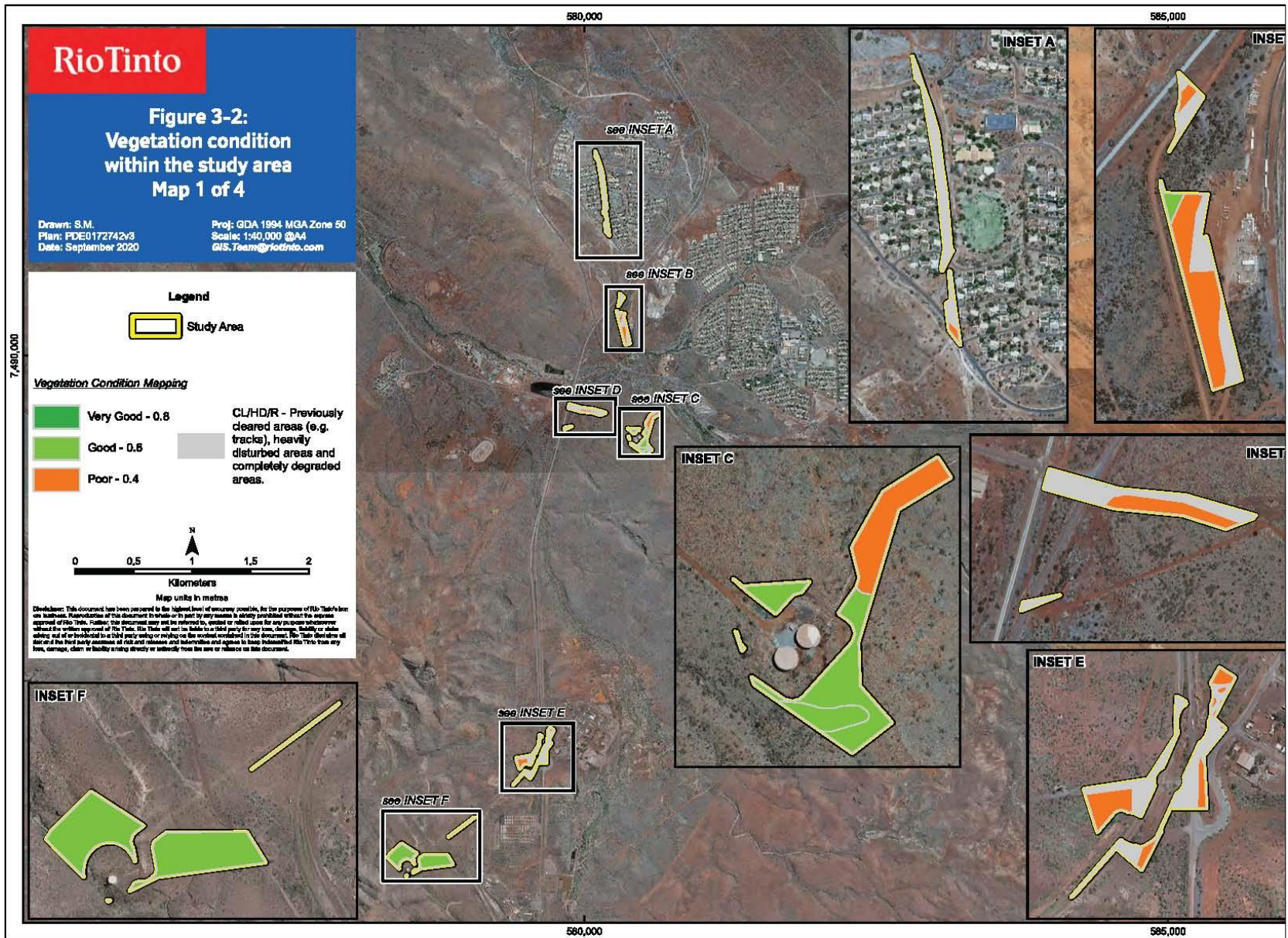








(5) Vegetation condition of the application area (Hamersley Iron 2020b)





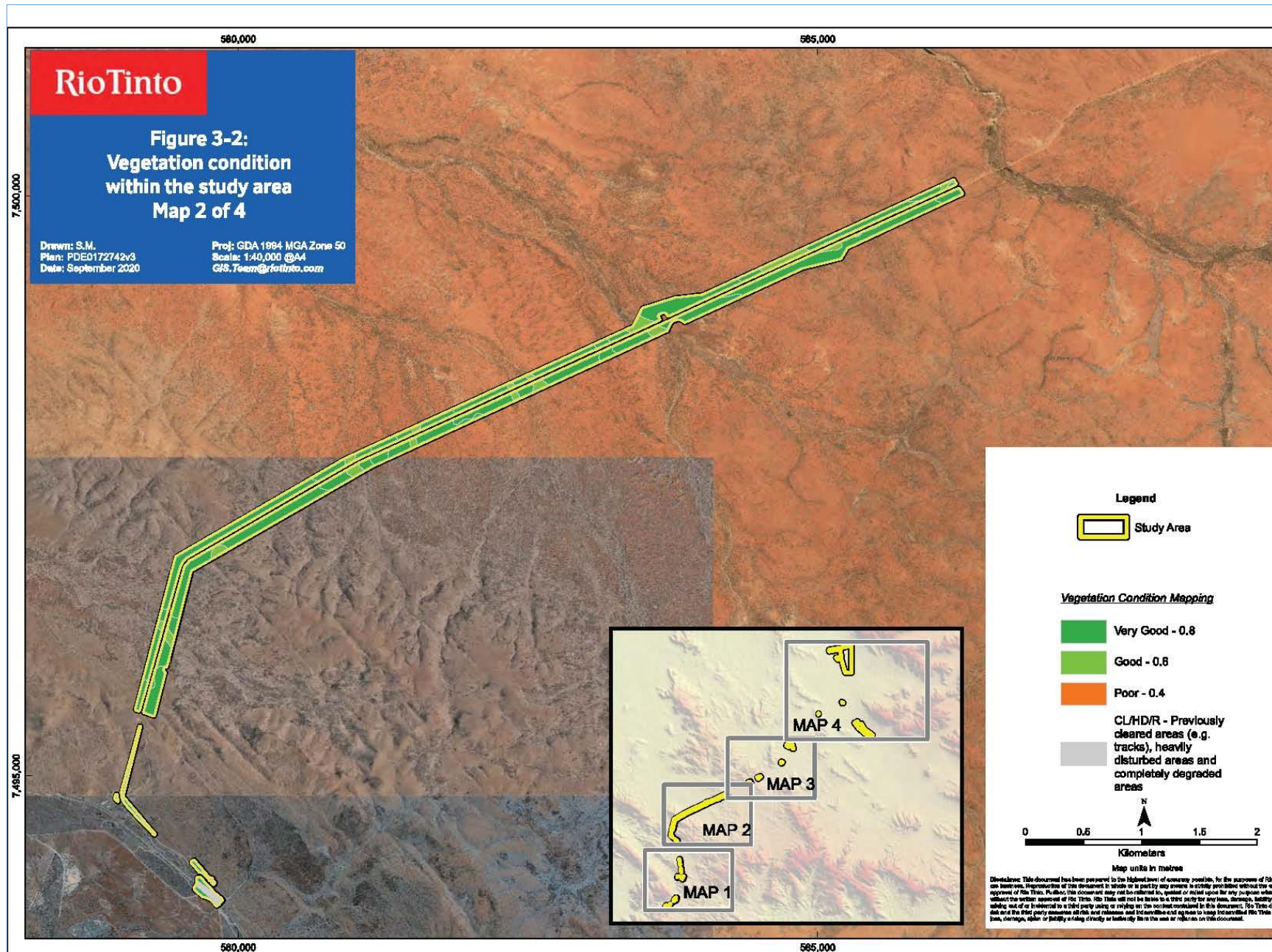
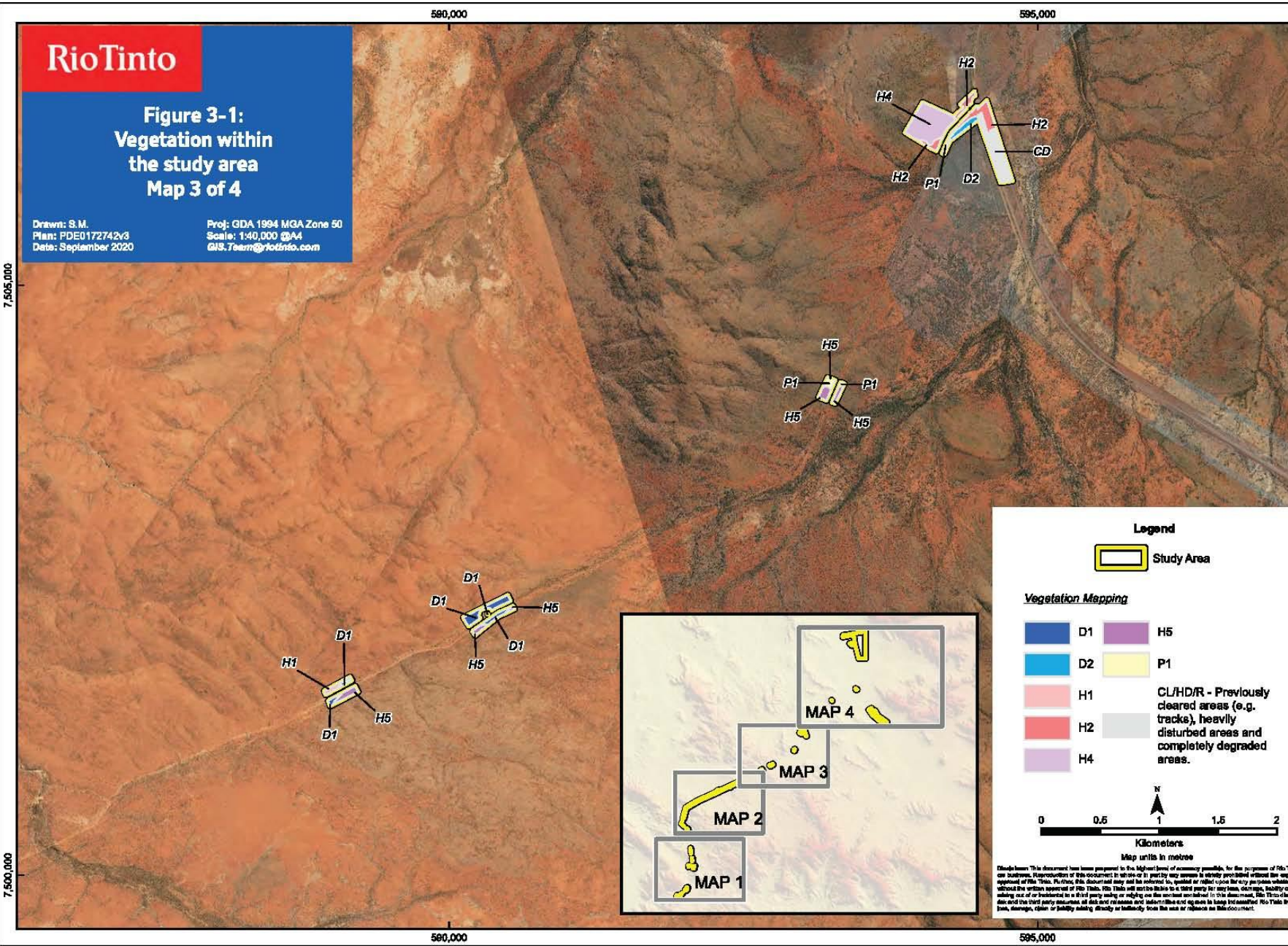




Figure 3-1:  
Vegetation within  
the study area  
Map 3 of 4

Drawn: S.M. Proj: GDA 1994 MGA Zone 50  
Plan: PDE0172742v3 Scale: 1:40,000 @A4  
Date: September 2020 GIS.Team@riotinto.com



**Legend**

Study Area

**Vegetation Mapping**

D1	H5	CL/HD/R - Previously cleared areas (e.g. tracks), heavily disturbed areas and completely degraded areas.
D2	P1	
H1		
H2		
H4		

0 0.5 1 1.5 2  
Kilometers  
Map units in metres

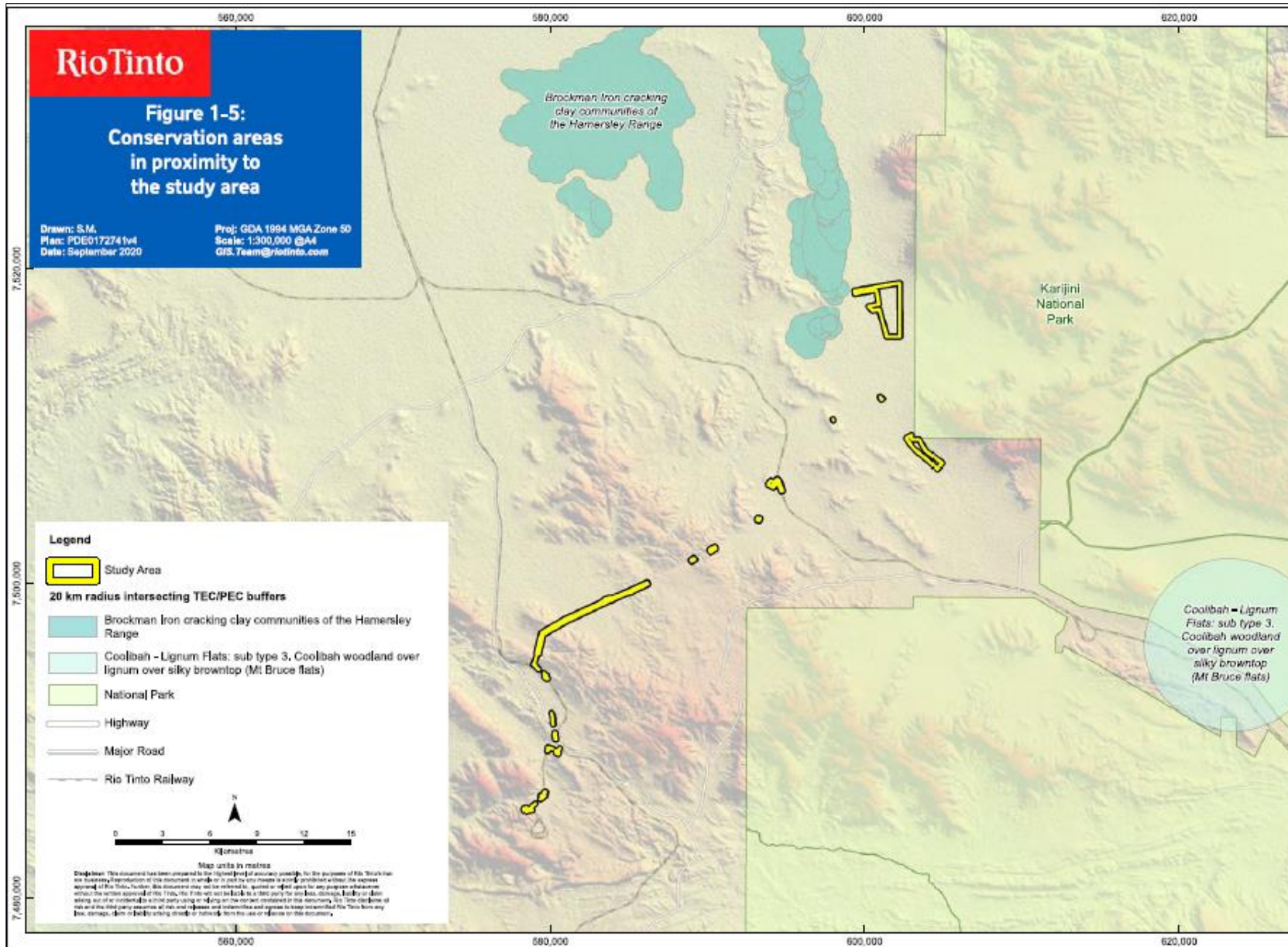
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(6) Conservation areas and TECs and PECs (Hamersley Iron 2020b)



## Appendix F – References and databases

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## 2. GIS datasets

Publicly available GIS Databases used (sourced from [www.data.wa.gov.au](http://www.data.wa.gov.au)):

- Aboriginal Heritage Places (DPLH-001)
- Cadastre Address (LGATE-002)
- Contours (DPIRD-073)
- DBCA – Lands of Interest (DBCA-012)
- DBCA Legislated Lands and Waters (DBCA-011)
- Directory of Important Wetlands in Australia – Western Australia (DBCA-045)
- Environmentally Sensitive Areas (DWER-046)
- Flood Risk (DPIRD-007)
- Groundwater Salinity Statewide (DWER-026)
- IBRA Vegetation Statistics
- Local Planning Scheme – Zones and Reserves (DPLH-071)
- Regional Parks (DBCA-026)
- Soil and Landscape Mapping – Best Available

Restricted GIS Databases used:

- ICMS (Incident Complaints Management System) – Points and Polygons
- Threatened Flora (TPFL)
- Threatened Flora (WAHerb)
- Threatened Fauna
- Threatened Ecological Communities and Priority Ecological Communities
- Threatened Ecological Communities and Priority Ecological Communities (Buffers)