POLARIS
METALS PTY LTD

CONSERVATION MANAGEMENT PLAN

JACKSON 5 LOW IMPACT DRILL PROGRAM

M77/1095

Yilgarn Region WA

Document History

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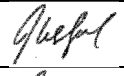
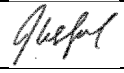
0	17/07/2013	Final for issue	KH	
1	24/09/2013	Revised for reissue	DTS	

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1. SUMMARY

This Conservation Management Plan (CMP) has been developed by Polaris Metals Pty Ltd (Polaris) in consultation with the Department of Environment and Conservation (DEC), Office of the Environment Protection Authority (OEPA) and Department of Mining and Petroleum (DMP). It provides a prescriptive management framework to mitigate the potential inherent and residual risks associated with the J5 drilling program.

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2. BACKGROUND INFORMATION

2.1. OWNERSHIP

Polaris is a developing iron ore producer with a vast pipeline of high quality development projects and exploration targets across Western Australia. Polaris, previously an ASX-listed iron ore explorer, was acquired by Mineral Resources Limited (MRL) in January 2010. It is now a wholly owned subsidiary of MRL.

Proponent details:

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2.2. PROJECT OBJECTIVES

The specifics of this program are detailed below as per the "Guidelines for conservation management plans relating to mineral exploration on lands managed by the Department of Environment and Conservation" (DMP 2011), Table 1. Further detail has also been provided in the text and the J5 Drilling Program - Proposed Disturbance (October 2012) Appendix A.

Table 1: CMP Details

No.	CMP requirement (CMP guidelines 4.3.1)	Detail	Section / page
1	Tenement number	M77/1095	
2	Date of grant	9/5/2011	
3	Holder (or letter of Authorisation)	Polaris Metals Pty Ltd	
4	Maps and aerial photographs showing the tenement and program area, existing roads and access tracks and any disturbances areas	**Appendix A**	Figure 1 Figure 2
5	Tenement conditions		**Appendix B**
6	DEC tenure affected	Gazetted Helena-Aurora Range Conservation Reserve No. 458470	Figure 4
7	Program type	RC and Diamond drilling	
8	Mineral/s being sought	Iron Ore (Fe)	
9	Land Disturbance	1.69 ha	
9	Grid spacing	25 - 50 m	**Appendix A**
10	Drilling is for infill or resource definition	Resource definition and Strike Extension	

No.	CMP requirement (CMP guidelines 4.3.1)	Detail	Section / page
11	Total bulk sample	N/A	
12	Tonnage disturbed	2145 t	
13	Indicative anticipated start date	1 September 2013	
14	Anticipated duration of program	1 year	
15	Proposed access into and within the conservation estate shown on the maps and/or aerial photographs		Figure 5
16	Off-road activities, detailing locations and equipment to be used (e.g. 4WD light vehicle, loaded and dozer)	Site Prep: Loader/Excavator/Dozer Drilling: Drill Rig, Water/Fuel Truck, Booster Truck, 3 x 4WD LV's	
17	Specifics of proposed clearing and earthworks (e.g. cut-and-fill drill pads, costeans, tracks, bulk sampling and sumps, including dimensions, locations and tonnages/volumes, and the type of machinery to be used		**Appendix A**
17	Practices to avoid and minimise impacts on the conservation values		**Section 5** **Section 6**
18	Type of drilling rig (e.g. RAB, RC, diamond, aircore)	RC and Diamond	**Section 4**
19	Drilling company (if known)	Unconfirmed	
20	General number, depth, spacing/location of drill holes with a view to clearly focus on the area, extent and nature of impacts rather than the simple statistics	50 RC and diamond holes to approximately 250 m max depth, spacing as close as 50 m x 20 m in some areas if required, disturbance 1.69 ha and 2145 t	
21	Depth to groundwater (relative to depth of drill holes	Estimated >70 m vertical	
22	Likely groundwater quality	Moderately Saline	
23	Surface disposal methods for groundwater	Sumps	
24	Camp management (such as fire, rubbish, water)	Aurora Camp	**Section 4.1**

2.3. LOCATION AND SITE LAYOUT

The J5 prospect lies at the eastern extremity of the Jackson Range; and is geographically separated from the main Helena and Aurora Range (HAR) to the east. The HAR represents the highest and largest example of Banded Ironstone Formations in the Eastern Goldfields (Newbey and Hnatiuk 1985). Tenement M77/1095 is located approximately 52 km NNE of Koolyanobbing and 100 km NNE of Southern Cross in the Shire of Yilgarn in Western Australia.

The project lies wholly within the gazetted Helena-Aurora Range Conservation Park No. 458470 (Figure 1 and Figure 2). This area has been set aside for its regional conservation values and is managed by the DEC under the Conservation and Lands Management Act 1984 (CALM Act).

2.4. HISTORY

Portman Iron Ore (Cliffs) undertook exploration and infill drilling at J5 in 2005 and 2006. This resulted in a disturbance area of approximately 4.5 ha. This drilling was completed prior to the Gazettal of the Helena - Aurora Range Conservation Park.

2.5. EXISTING FACILITIES

There are no existing facilities associated with the J5 (M77/1095) prospect.

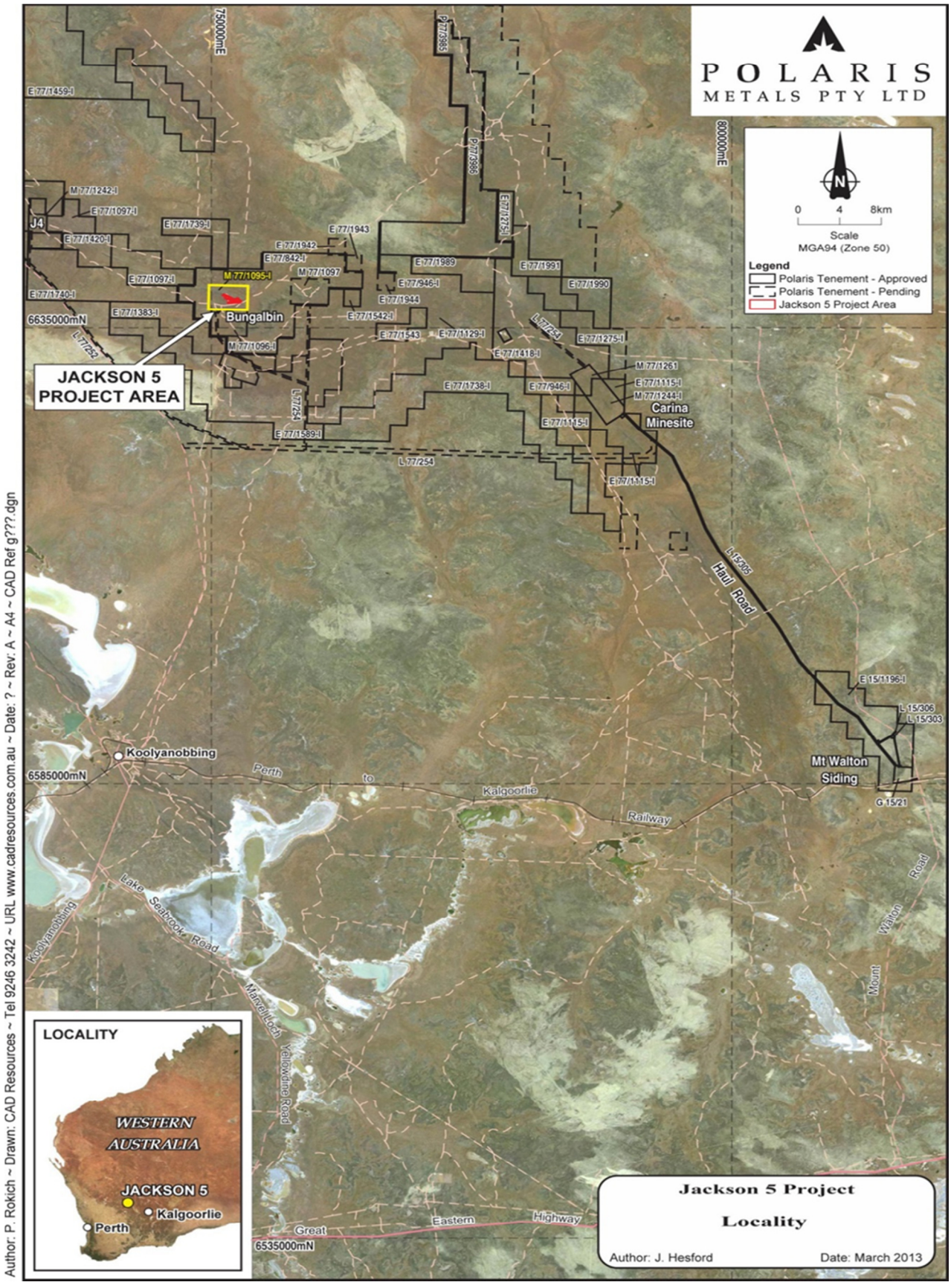

Figure 1: Project location

Figure 2: POW layout

3. EXISTING ENVIRONMENT

3.1. GEOLOGY

The Jackson area is situated near the centre of the Yilgarn Block, a stable Archaean craton consisting of belts of banded gneiss and layered sedimentary, volcanic and intrusive rocks, all of which are intruded by voluminous granitoids (Chin and Smith 1983). The Banded Iron Formation (BIF) characteristically contains banded dark grey to black iron rich bands alternating with red jasperlite, basalt, chert and other materials.

3.2. SOILS AND SOIL PROFILES

The J5 project area consists of gently undulating plains with occasional ranges of low hills lying on the Southern Cross Terrains of the Yilgarn Craton (Cowan et al. 2001). The area within tenement M77/1095 lies within both the Jackson and Bungalbin Systems, as defined by Beard (1972a, 1972b) which consists predominantly of red loam, sandy loams, clay loams and occasional calcareous soils. Soils on the upper slopes are mainly skeletal, becoming shallow on lower slopes (Newbey 1985). A summary of the geological units associated with tenement M77/1095 is set out in Table 2.

Table 2: Geology of the J5 prospect

Tenement	Geology Code	Description
M77/1095	Aiw	Archaean: banded iron formation, quartz-grunerite-magnetite rock
	Agv	Archaean: Variably textured, medium and coarse grained, seriate granite and adamellite; locally porphyritic
	Qa	Cainozoic Quaternary: Alluvium – silt sand and gravel in stream channels
	Qc	Cainozoic Quaternary: colluviums – silt, sand and gravel on slopes adjoining rock and laterite outcrop

3.3. HYDROLOGY

Ground water in the Coolgardie region (particularly the northern goldfields), is contained within unconfined alluvial, calcreate and sedimentary basin aquifers, paleochannels and fractured rock aquifers (Kalaitzis et al. 2002). Drainage is internal, with flat bottom paleodrainages discharging into chains of salt lakes in the region. Groundwater is estimated to occur at depths of 60 to 120 m with salinity levels varying from 1,500 to 34,000 mg/L TDS (Ecologia 2013).

3.4. CLIMATE

Beard (1990) described the climate of the Coolgardie Botanical District as arid non-seasonal to semi-arid Mediterranean, characterised by an arid climate with cool winters and hot, dry summers. Annual precipitation in the Coolgardie Botanical District ranges from 200 mm to 300 mm, with the bulk of the precipitation falling in the winter months, with sporadic summer cyclonic rainfall. Southern Cross, which is located to the southwest of the survey area, has an annual rainfall of 294 mm (Bureau of Meteorology 2013). Rainfall and temperature data for Southern Cross is illustrated in Figure 3.

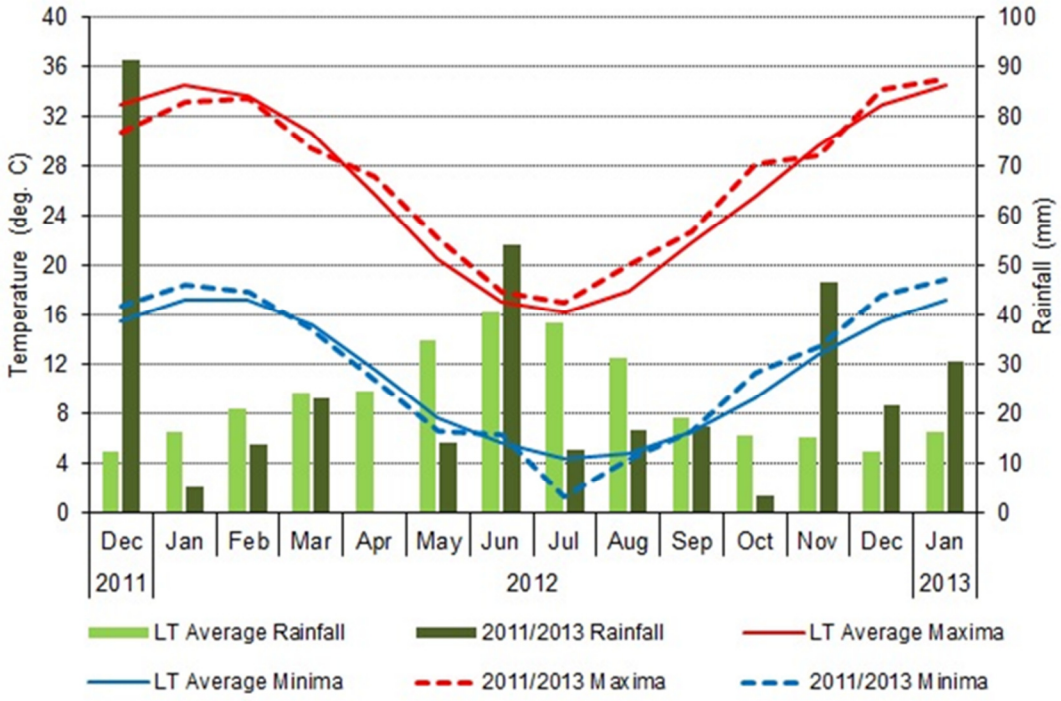

Figure 3: Monthly rainfall and temperature for Southern Cross[1]

[1] Long term average rainfall and temperature data, together with monthly rainfall and average maximum / minimum temperature data for the period December 2011 to January 2013 are shown.

3.5. FLORA

Mattiske Consulting Pty Ltd (Mattiske) was commissioned by Polaris to undertake a targeted botanical survey for threatened and priority flora within the J5 project area and two identified potential access corridor routes. High rainfall and commitments made to the DEC to avoid the use of access tracks in the Helena-Aurora Range Conservation Park in wet conditions resulted in two separate survey efforts.

The survey took place over two six day periods in December 2012 and February 2013. The survey was conducted using Guidance Statement 51 (EPA 2004). All botanists involved in the survey held valid Regulation 4 licence to take, issued under the *Wildlife Conservation Act 1950* to collect flora for scientific purposes in CALM lands and the Helena-Aurora Range Conservation Park.

The complete Mattiske botanical report is provided in Appendix C.

3.5.1. IBRA bioregion and Beard mapping

The Interim Biogeographic Regionalisation for Australia (IRBA) describes the J5 prospect area as (COO2) sub-region (Cowan et al. 2001). Tenement M77/1095 lies inside the Coolgardie Botanical District and intersects three of Beard's vegetation associations (Shepherd et al. 2002). These vegetation associations are:

- vegetation association 141 - medium woodland; York gum, salmon gum & gimlet
- vegetation association 520 - shrublands, Acacia quadrimarginea thickets
- vegetation association 538 - shrublands; Acacia brachystachya scrub

3.5.2. Threatened ecological communities

No threatened ecological communities, pursuant to Schedule 1 of the *Wildlife Conservation Act 1950* and as listed by the DEC (2013a), are currently listed in the Coolgardie botanical District. No threatened ecological communities, pursuant to the *Environment Protection and Biodiversity Conservation Act 1999*, and as listed by the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) (2013b), are currently listed in the Coolgardie Botanical District.

3.5.3. Priority ecological communities

There are 58 Priority Ecological Communities (PEC's) defined and listed in the Goldfields Region (DEC 2013b). The majority of tenement M77/1095 lies within the Helena and Aurora Range vegetation complex (banded ironstone formation), a Priority 1 ecological community, illustrated in Figure 4.

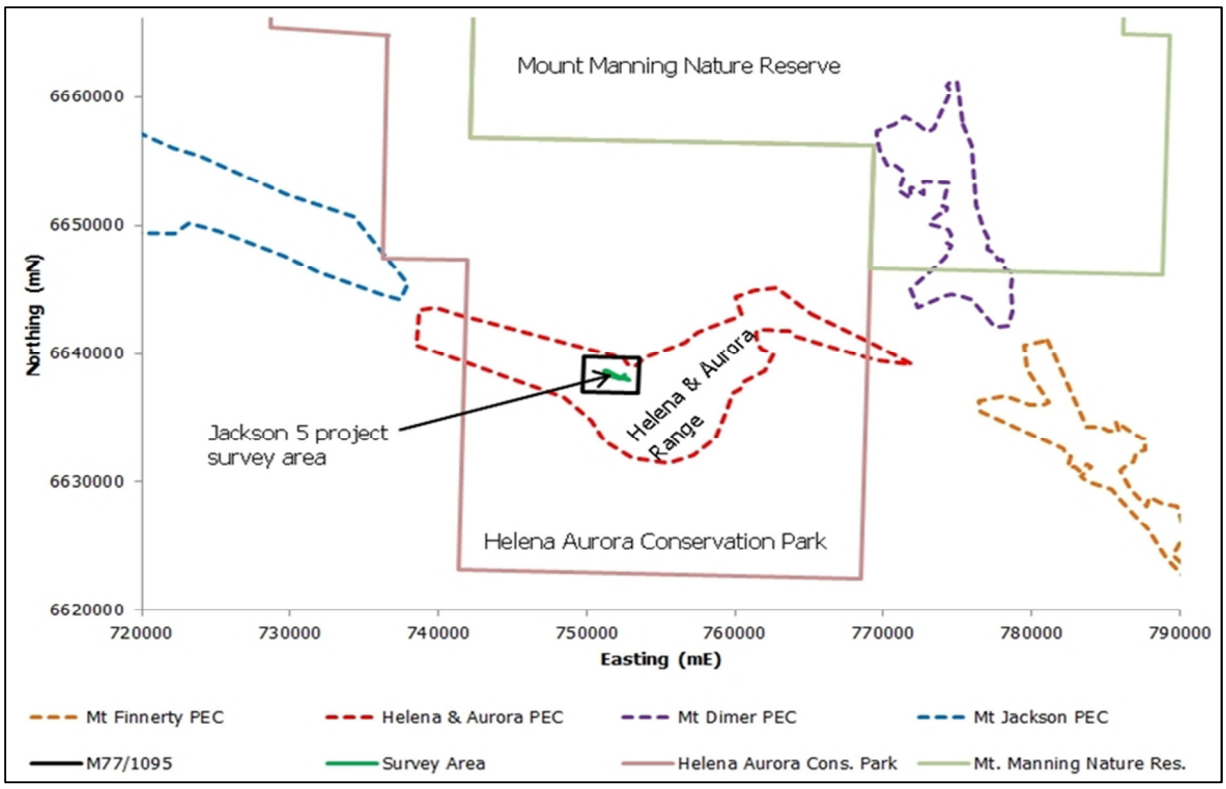

Figure 4: J5 in relation to PECs, nature reserves and conservation parks

3.5.4. Potential threatened and priority flora

A desktop survey using a 25 km buffer was completed for the J5 prospect. Two known threatened flora taxa and 35 known priority flora taxa were identified in the search. The 35 priority taxa are composed of eight priority 1, three priority 2, 20 priority 3 and four priority 4 taxa (DEC 2013c). Refer to Table 3 for full list of Threatened and Priority Flora potential occurring in the J5 prospect area.

Table 3: Threatened and priority flora potentially occurring in the J5 prospect area

Taxon / Common Name	Family	Conservation significance		Habitat	Potential to Occur in survey Area
		SCC	FCC		
Leucopogon spectabilis	Ericaceae	T	E	Shallow loams, banded ironstone, in crevices on exposed ridges	**Medium** Preferred soil types occur within survey area
Tetratheca aphylla subsp. aphylla	Elaeocarpaceae	T	VU	Red-brown loam, sandy loam, banded ironstone, in crevices on hills, outcrops, slopes, valleys & ridges	**Medium** Preferred soil types occur within survey area
Acacia adinophylla	Fabaceae	P1		Stony loam or sandy soils, clay, ironstone ridges, undulating plains	**Recorded** Preferred soil types occur within survey area Species has been recorded within survey area
Acacia sp. Bungalbin Hill (J.J. Alford 1119)	Fabaceae	P1		Silty sandy loam, banded ironstone, hill slopes, cliffs and ridges	**Medium** Preferred soil types occur within survey area
Baechea sp. Helena and Aurora Range (G.J. Keighery 4424)	Myrtaceae	P1		Deep yellow sand, flat plains	**Unlikely** Soil type does not occur in survey area
Chamelaucium sp. Koolyanobbing (V. Clarke 644)	Myrtaceae	P1		Yellow sand, sandplains	**Unlikely** Soil type does not occur in survey area
Gnephosis intonsa	Asteraceae	P1		Red-brown clay, stony saline loam	**Low** Soil types may not occur in survey area Species is an annual and may not be identifiable at the time of the year
Lepidosperma bungabin	Cyperaceae	P1		Red loams with banded ironstone rock and gravel,	**Medium** Preferred soil types occur within

Taxon / Common Name	Family	Conservation significance		Habitat	Potential to Occur in survey Area
		SCC	FCC		
				steep mid slopes	survey area
Persoonia leucopogon	Proteaceae	P1		Yellow sand, sandy clay	**Unlikely** Soil type does not occur in survey area
Philotheca deserti subsp. brevifolia	Rutaceae	P1		Red sandy clay	**Unlikely** Soil type does not occur in survey area
Goodenia jaurdiensis	Goodeniaceae	P2		Red clay loam with laterite of banded ironstone gravel or quartz gravel, low lying plains and lower slopes	**Low** Preferred soil types occur in survey area
Malleostemon sp. Adelong (G.J. Keighery 11825)	Myrtaceae	P2		Red sand	**Unlikely** Soil type does not occur in survey area
Phlegmatospermum eremaem	Brassicaceae	P2		Stony loam	**Low** Soil type may not occur in survey area Species is an annual and may not be identifiable at the time of the survey
Acacia cylindrica	Fabaceae	P3		Yellow/brown sand, gravelly soils, undulating plains, flats	**Unlikely** Soil type does not occur in survey area
Acaia formidabilis	Fabaceae	P3		Yellow, red-brown sand, undulating plains, hillsides	**Low** Soil types may occur in survey area
Astartea sp. Bungalbin Hill (K.R. Newbey 8989)	Myrtaceae	P3		Deep yellow sand, sandplains	**Unlikely** Soil type does not occur in survey area
Baeckea sp. Bungalbin Hill (B.J. Lepschi & L.A. Craven 4586)	Myrtaceae	P3		Yellow-brown sand, laterite, gravel, Moderately exposed flat sand plains	**Unlikely** Soil type does not occur in survey area
Banksia Lullfitzii	Proteaceae	P3		Yellow sand, sandplains	**Unlikely** Soil type does not occur in survey area
Bossiaea sp. Jackson Range (G. Cockertin & S. McNee LCS 13614)	Fabaceae	P3		Sandy loam, clay loams, decomposed granite breakaways	**Unlikely** Soil type does not occur in survey area

Taxon / Common Name	Family	Conservation significance		Habitat	Potential to Occur in survey Area
		SCC	FCC		
Calytrix creswellii	Myrtaceae	P3		Yellow sand, sometimes with lateritic gravel, sandplains	**Unlikely** Soil type does not occur in survey area
Dillwynia acerosa	Fabaceae	P3		Gravelly clay with laterite	**Unlikely** Soil type does not occur in survey area
Grevillea georgeana	Proteaceae	P3		Stony loam/clay, ironstone hilltops and slopes	**Medium** Preferred soil types occur within survey area
Hibbertia lepidocalyx subsp. tuberculata	Dilleniaceae	P3		Orange loam, ironstone gravel	**Recorded** Preferred soil types occur within survey area Species has been recorded within survey area
Homalocalyx grandiflorus	Myrtaceae	P3		Yellow sand, sandplains	**Unlikely** Soil type does not occur in survey area
Lepidosperma Ferricola	Cyperaceae	P3		Well drained stony loam, silty clay, banded ironstone, rocky ledges, scree slopes, crevices & ravines	**Medium** Preferred soil types occur within survey area
Mirbelia ferricola	Fabaceae	P3		Clay loams, banded ironstones, hillslopes and ridges	**Medium** Preferred soil types occur within survey area
Neurachne annularis	Poaceae	P3		Red-brown sandy loams, ironstone gravel, amoung rocks on tops, sides and based ironstone ranges	**Recorded** Preferred soil types occur within survey area Species has been recorded within survey area
Milichrus sp. Bungalbin Hill (F.H. & M.P. Mollemans 3069)	Ericaceae	P3		Yellow sand, yellow-brown loamy sand	**Unlikely** Soil type does not occur in survey area
Spartothamnella sp. Helena and Aurora Range (P.G. Armstrong 155-109	Lamiaceae	P3		Red/orange sandy loams, hillslopes and flats	**Medium** Preferred soil types occur within survey area
Stenanthemum newbeyi	Rhamnaceae	P3		Clayey sand, clay, loam, laterite or ironstone, hillslopes	**Recorded** Preferred soil types occur within survey area

Taxon / Common Name	Family	Conservation significance		Habitat	Potential to Occur in survey Area
		SCC	FCC		
					Species has been recorded within survey area
Stylidium choreanthum	Stylidiaceae	P3		White/yellow or red sands, plans	**Unlikely** Soil type does not occur in survey area
Styphelia sp. Bullfinch (M. Hislop 3574)	Ericaceae	P3		Clay loams, upper slopes, granitic/lateritic breakaways	**Medium** Preferred soil types and topography occur with survey area
Verticordia mitodes	Myrtaceae	P3		Yellow sand, sandplains	**Unlikely** Soil type does not occur in survey area
Banksia arborea	Proteaceae	P4		Stony loam, ironstone hills	**Recorded** preferred soil types occur within survey area species has been recorded within survey area
Eucalyptus formanii	Myrtaceae	P4		Red sand, ironstone slopes	**Low** Soil type potentially present in survey area
Grevillia erectiloba	Proteaceae	P4		Gravelly loam, lateritic ridges	**Recorded** Preferred soil types occur within survey area Species has been recorded within survey area
Sowerbaea multicaulis	Asparagaceae	P4		Yellow sand, sandplain	**Unlikely** Soil type does not occur in survey area

3.6. FAUNA

Ecologia Environment (Ecologia) commenced a two-phase Level 2 trapping survey for terrestrial and short-range endemic (SRE) fauna across the J5 prospect in 2012 (Ecologia 2013).

All survey methods were consistent with following guidelines:

- Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment
- Guidance Statement No. 20: Sampling of Short range endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia (EPA 2009)
- Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia (EPA 2004)

- Guidance Statement 54: Consideration of Subterranean Fauna in Groundwater and Caves during Environmental Impact Assessment in Western Australia (EPA 2003)
- Guidance Statements 54a: Guidance for the Assessment of Environmental Factors (EPA 2007)
- Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002)

Based on desktop assessment and the results of previous biological surveys in the surrounding region, seven mammal, 33 bird and two reptile species of conservation significance were identified as potentially occurring in the study area. An additional six species of conservation significant invertebrate species have previously been recorded in the Goldfields region. Based on habitat preferences and the representation of these in the study area, two of these species have the potential to occur. Information regarding conservation significant species is summarised in Table 4.

Table 4: Likelihood of occurrence of conservation significant fauna in J5 prospect area

Species	Conservation Significance			Habitat	Previous Records	Likelihood of Occurrence
	EPBC Act	WC Act	DEC			
Mammals						
Red-tailed Phascogale *Phascogale calura*	EN	S1	EN	Dense casuarina woodland with hollow-containing eucalypts	Within field guide's distribution (Menkhorst and Knight 2011) but no records within 100 km of the study area	**LOW** No previous records in the local region. No suitable habitat present in the study area
Western Quoll *Dasyurus geoffroii*	VU	S1	VU	Variety of wooded habitat; eucalypt forest, dry eucalypt woodland and mallee shrublands	Four recent and historical records (1969-2004) from the vicinity of Southern Cross and from approximately 90 km west of the study area (DEC 2013a). Historical record (secondary evidence) from within the study area (Dell *et al.* 1985)	**MEDIUM** Potential habitat present within the eucalypt woodland. Few previous records from within 100 km of study area
Numbat *Myrmecobius fasciatus*	VU	S1	VU	Eucalypt forests and woodlands, dominated by *Eucalyptus marginata, E. calophylla* and *E. wandoo*	One record (unknown date) from approximately 90 km south of the study area (DEC 2013a)	**LOW** Some potential habitat present within the eucalypt woodland. One previous record in the surrounding region

Species	Conservation Significance			Habitat	Previous Records	Likelihood of Occurrence
	EPBC Act	WC Act	DEC			
Greater Bilby *Macrotis lagotis*	VU	S1	VU	Variety of habitats on soft soil including spinifex hummock grassland, acacia shrubland, open woodland and cracking clays	Closest, most recent record (2003) from approximately 100 km to the south-west of the study area (DEC 2013a)	**MEDIUM** Suitable habitat exists in the form of sandplains in the south of the study area. Very few recent records within 100 km
Black-flanked Rock-wallaby *Petrogale lateralis lateralis*	VU	S1	VU	Scattered locations amongst rocky outcrops	Within field guide's distribution (Menkhorst and Knight 2011). No records within 100 km of the study area	**LOW** No previous records in the local region, little isolated suitable habitat present in the form of rocky ridges
Western Brush Wallaby *Macropus irma*			P4	Open forest or woodland, with low grasses and open shrubby thickets	Within field guide's distribution (Menkhorst and Knight 2011) but no records within 100 km of the study area	**LOW** No previous records in the local region, little isolated suitable habitat present in the form of eucalypt woodland
Birds						
Carnaby's Black-Cockatoo *Calyptorhynchus latirostris*	EN	S1	EN	Proteaceous woodland and scrub, eucalypt woodland and pine plantations	Historical record from within the study area (Dell *et al.* 1985). No recent record within 100 km of the study area (DEC 2013a)	**LOW** No recent records in the local region. Some potential habitat exists in the form of eucalypt woodland

Species	Conservation Significance			Habitat	Previous Records	Likelihood of Occurrence
	EPBC Act	WC Act	DEC			
Malleefowl *Leipoa ocellata*	VU	S1	VU	Dry inland scrub, mallee	Recorded from five previous surveys within 100 km of the study area (Bamford 2012, ecologia internal database; Biota 2011a; Dell *et al.* 1985; Ninox 2009). Seventeen additional record from the region (within 100 km) (DEC 2013a). Also, 41 records from rare fauna search return (DEC 2013a)	**RECORDED nearby** Species recorded from 4.5 km east of study area in November 2013. Suitable habitat present within sand plains
Slender-billed Thornbill *Acanthiza iredalei iredalei*	VU			Treeless or sparsely wooded flatlands, samphire and low melaleuca scrubs	Three records from Lake Barlee, approximately 95 km north of the study area (DEC 2013a). DSEWPaC suggests that some suitable habitat may exist in the vicinity of the study area (Protected Matter Search)	**LOW** No suitable habitat present within study area, no recent nearby records
Fork-tailed Swift *Apus pacificus*	M	S3		Nomadic, almost entirely aerial lifestyle over a variety of habitats; associated with storm fronts	Closest record from 92 km east of study area (DEC 2013a). Within species distribution (Simpson and Day 2010)	**MEDIUM** Species has been recorded in the region and species is not restricted to habitat types
Eastern Great Egret *Ardea modesta*	M	S3		Wide range of wetland habitats, including floodwaters, rivers, shallows of wetlands, intertidal mudflats	Study area within species' distribution (Simpson and Day 2010), no previous records within 100 km of the study area	**LOW** No suitable habitat exists within study area, no previous records

Species	Conservation Significance			Habitat	Previous Records	Likelihood of Occurrence
	EPBC Act	WC Act	DEC			
Oriental Plover *Charadrius veredus*	M	S3		Open plains, including samphire; bare rolling country; bare claypans; open ground near inland swamps	Study area within species' distribution (Simpson and Day 2010), no previous records within 100 km of the study area	**LOW** No suitable habitat exists within study area, no previous records
Oriental Pratincole *Glareola maldivarum*	M	S3		Plains, shallow wet and dry edges in open bare wetlands, tidal mudflats, beaches	Study area within species' distribution (Simpson and Day 2010), no previous records within 100 km of the study area	**LOW** No suitable habitat exists within study area, no previous records
Rainbow Bee-eater *Merops ornatus*	M	S3		Open country, most vegetation types, dunes, banks; prefer lightly wooded, preferably sandy, country near water	Recorded from five previous surveys within 100 km of the study area (Biota 2011a, ecologia internal database; Dell *et al.* 1985; Ninox 2009). Approximately 21 records within 50 km of the study area (DEC 2013a)	**RECORDED** Recorded throughout the study area
Peregrine Falcon *Falco peregrinus*		S4	Other	Widespread; coastal cliffs, riverine gorges and wooded watercourses	Recorded during three previous surveys within and surrounding the study area (Dell *et al.* 1985, ecologia internal database). Eight records within 100 km of the study area (DEC 2013a)	**RECORDED NEARBY** Recorded from J4 during the current survey
Major Mitchell's Cockatoo *Lophochroa leadbeateri*		S4	Other	Arid to semi-arid lightly wooded country near water and tall eucalypts	Seven records within 100 km of the study area (DEC 2013a) and recorded from two previous surveys in the local region (Ninox 2009, ecologia internal database)	**RECORDED** Recorded during this survey from the west of the J5 study area and previously recorded from surrounding areas

Species	Conservation Significance			Habitat	Previous Records	Likelihood of Occurrence
	EPBC Act	WC Act	DEC			
Masked Owl *Tyto novaehollandiae*			P3	Forest, woodland, caves, mature trees with hollows	The study area lies within species' distribution (Simpson and Day 2010), no previous records within 100 km of the study area.	**LOW** No previous records in the local region
Australian Bustard *Ardeotis australis*			P4	Open grasslands, chenopod flats and low heathland	Recorded during four previous surveys (Dell *et al.* 1985, ecologia internal database; Ninox 2009). Study area lies within species' distribution (Simpson and Day 2010), and one very recent record from the vicinity of the study area (DEC 2013a)	**Potentially recorded** Potential secondary evidence (tracks) recorded from the sandplain within the southern J5 study area. Suitable habitat present within study area
Bush Stone-curlew *Burhinus grallarius*			P4	Lightly wooded country next to daytime shelter of thickets or long grass	The study area lies within species' distribution (Simpson and Day 2010), no previous records within 100 km of the study area	**Potentially recorded** Potential secondary evidence (tracks) recorded from the sandplain within the southern J5 study area. Suitable habitat present within study area. No previous records from surrounding areas
Shy Heathwren (western) *Hylacola cauta whitlocki*			P4	Mallee woodland that has relatively dense shrub and heath understorey	Two recent records(2000) from the vicinity of the study area (DEC 2013a). Recorded during two previous surveys (Dell *et al.* 1985, ecologia internal database)	**MEDIUM** Several records in the local region, very little suitable habitat present within study area

Species	Conservation Significance			Habitat	Previous Records	Likelihood of Occurrence
	EPBC Act	WC Act	DEC			
Crested Bellbird (southern) *Oreoica gutturalis gutturalis*			P4	Variety of habitats: acacia scrubs, eucalypt, casuarina woodlands, saltbush and heath shrubland, *Triodia* grassland	Recorded from five previous surveys within 100km of the study area (Biota 2011a, ecologia internal database; Dell *et al.* 1985; Ninox 2009). Species recorded regularly throughout the study area and its vicinity (DEC 2013a)	**RECORDED** Species recorded throughout the study area during the survey
Reptiles						
Woma *Aspidites ramsayi*		S4	P1	Arid regions of central Australia; shelter in hollow logs or burrows	Six records from within 100 km of the study area with the majority from along Great Eastern Highway(unknown date, DEC 2013a). Study area within species' distribution(Wilson and Swan 2010)	**MEDIUM** Suitable habitat present in the form of eucalypt woodland and several previous records from the surrounding
Western Carpet Python *Morelia spilota imbricata*		S4	P4	Banksia woodland, eucalypt woodland, rocky outcrops	Three records within 100 km south of the study area (One historical record, date for remaining records unknown, DEC 2013a). Recorded from Carina North and Chamaeleon project area (Bamford 2012)	**MEDIUM** Suitable habitat present in the form of eucalypt woodland and rocky ridge. Some previous records from along Great Eastern Highway
Invertebrates						

Species	Conservation Significance			Habitat	Previous Records	Likelihood of Occurrence
	EPBC Act	WC Act	DEC			
Arid Bronze Azure Butterfly *Ogyris subterrestris petrina*	CR	S1	CR	Little known. Most likely associated with smooth barked eucalypt trees, such as Gimlet trees *Eucalyptus salubris* and the sugar ant *Camponotus terebrans*	Species known from two locations approximately 140 km west of the study area and 180 km east south-east of the study area (DEC 2013a)	**UNKNOWN** Very little is known about the species and its habitat preference
Tree-stem Trapdoor Spider *Aganippe castellum*			P4	Flood-prone depressions and flats which support myrtaceous shrub communities. In particular, areas supporting Broombush (*Melaleuca uncinata*) and Sheoaks (such as *Allocasuarina acutivalvis*) in sandy loam soils	Numerous records from Mount Jackson and from the J5 study area, outside the Impact Area (DEC 2013a)	**HIGH** Numerous records from within the study area and its surrounding. Suitable habitat present

3.6.1. Fauna habitat

Four fauna habitat types occur within the study area:

- Rocky ridge;
- Rocky plain and footslopes;
- Eucalypt woodland; and
- Drainage line.

Rocky plain and foot slopes cover 55 % of the J5 study area and are therefore the most common habitat type in this study area (Table 5). These habitat types represent a preliminary result and may be adjusted after the upcoming survey once ground truthing confirms the extent of habitat types present.

Table 5: Summary of fauna habitat

Fauna Habitat	Area inside J5 study area (Ha)	Percentage of J5 Study Area (%)
Rocky ridge	260.9	10.5
Rocky plain and footslope	1,368.9	55.0
Eucalypt woodland	717.6	28.8
Drainage line	142.3	5.7
Total	**2,489.7**	**100**

3.7. SOCIAL ENVIRONMENT

The Helena-Aurora Range Conservation Park is regularly used by recreational four wheel drive enthusiasts and campers. Consultation with relevant stakeholders undertaken by Polaris is provided in Table 6.

Table 6: Key consultation details

Stakeholder	Representative	Consultation	Date
AMEC	Justin Fromm	• Field visit	04/07/2012
DEC/DPaW	Norm Caporn Dan Coffey David Pickles Sandra Thomas	• Lead agency Meeting (DEC Kensington)	12/06/2012
		• Field visit	04/07/2012
	Dan Coffey Neil Gibson Nic Woolfrey Sandra Thomas Julie Futter	• Meeting held at DEC EMB office	15/03/2013
	Dan Coffey Julie Futter	• Submitted J5 CMP for review and comment	17/07/2013
	Dan Coffey Sandra Thomas Julie Futter	• Meeting held in DPaW EMB office • J4 interim compliance report submitted	13/8/2013
OEPA	Nyomi Bowers	• Email and phone communication	
	Mark Jefferies	• Lead agency Meeting (DEC Kensington)	12/06/2012
		• Field visit	04/07/2012
	Nyomi Bowers Mark Jefferies	• Meeting at OEPA office • Requested advice on strategy for referring J5 PoW.	25/07/2013
	Nyomi Bowers	• Submitted J5 CMP for review and comment	26/07/2013
	Nyomi Bowers Richard Sutherland	• Meeting held at OEPA office • J4 interim compliance report submitted Requested advice/comments on draft CMP submitted 26/07/2013 regarding suitability for referral to EPA	14/08/2013
DMP	Eugene Bouwhuis Tony White	• Lead agency Meeting (DEC Kensington)	12/06/2012
		• Field visit	04/07/2012
	Clare Grosser Dan Machin Eugene Bouwhuis Rosemarie De Bari	• Meeting held at DMP office • Copy of draft CMP provided • J4 interim compliance report submitted	13/8/2013
Conservation Commission	The Panel	• Preliminary J5 and Bungalbin East program description document submitted.	20/08/2012
Wildflower Society	Brian Moyle	• Meeting held at Polaris office	19/02/2013
		• Meeting held at Polaris office	06/8/2013
Wilderness Society	Peter Robertson	• Meeting held at WS office	16/8/2013
Shire of Yilgarn	Vivienne Piccoli Romolo Patroni	• Meeting held at Shire of Yilgarn office	09/9/2013

Note: Polaris invited AMEC, DEC, DMP and OEPA to a tour of Polaris' Yilgarn prospects (04/07/2012). The field visit allowed all government agencies a chance to see and discuss matters relating to J5 among others.

4. PROJECT DESCRIPTION

Further drilling is necessary to more accurately define the J5 resource. The drill program will be based on the historical Portman Iron Ore drilling, thus reducing additional disturbance.

The project will consist of up to 50 RC and 4 diamond drill holes on 46 pads. A total of 1.69 ha of native vegetation will be cleared and approximately 2145 t of material likely to be moved during cut and fill activities (Table 7). Pre-existing exploration tracks and pads from historical drill programs throughout the prospect area will be re-used in the program. A total of 13 additional access tracks and 18 new drill pads will be cleared. A further 28 existing pads may be expanded to varying degrees to allow access for modern equipment.

A Front end loader will be commissioned to construct the access tracks and pads, however in areas where cut/fill is required a D8/D9 Dozer and/or Excavator shall be mobilised where necessary which will also minimise impact. Pads will have a maximum footprint of 20 m x 15 m (often less in practice).

Table 7: Disturbance areas

Disturbance Type	Disturbance ID	Proposed Disturbance Area (ha)
Vegetation Clearing/ removal of topsoil	Access Tracks	Western Access – 0.34 Eastern Access – 0.14
	Pads	0.94
	Tracks	0.27
	Total:	**1.69**

4.1. SUPPORT FACILITIES

A regional exploration camp has been constructed on mining lease M77/580 to support Polaris's exploration activities within the Yilgarn, including:

- Chamaeleon
- Hunt Range
- J4
- J5
- Bungalbin East

Tenement M77/580 is located within the confines of the Helena-Aurora Conservation Park, however is excised from the Park (Figure 5). The Aurora camp has been built to eliminate the need to establish separate camp facilities for each exploration program, thus reducing disturbance in the area. Polaris will manage all, waste, fire risks and water as per the approved POW ID: 35397.

Existing public access tracks in the Helena-Aurora Conservation Park will be used to access the J5 tenement, therefore no upgrade of these tracks is required for this drill program. Traffic from exploration vehicles and the public may create some localised points where maintenance is required. Polaris, in consultation with the DEC, will conduct agreed maintenance works at its own expense.

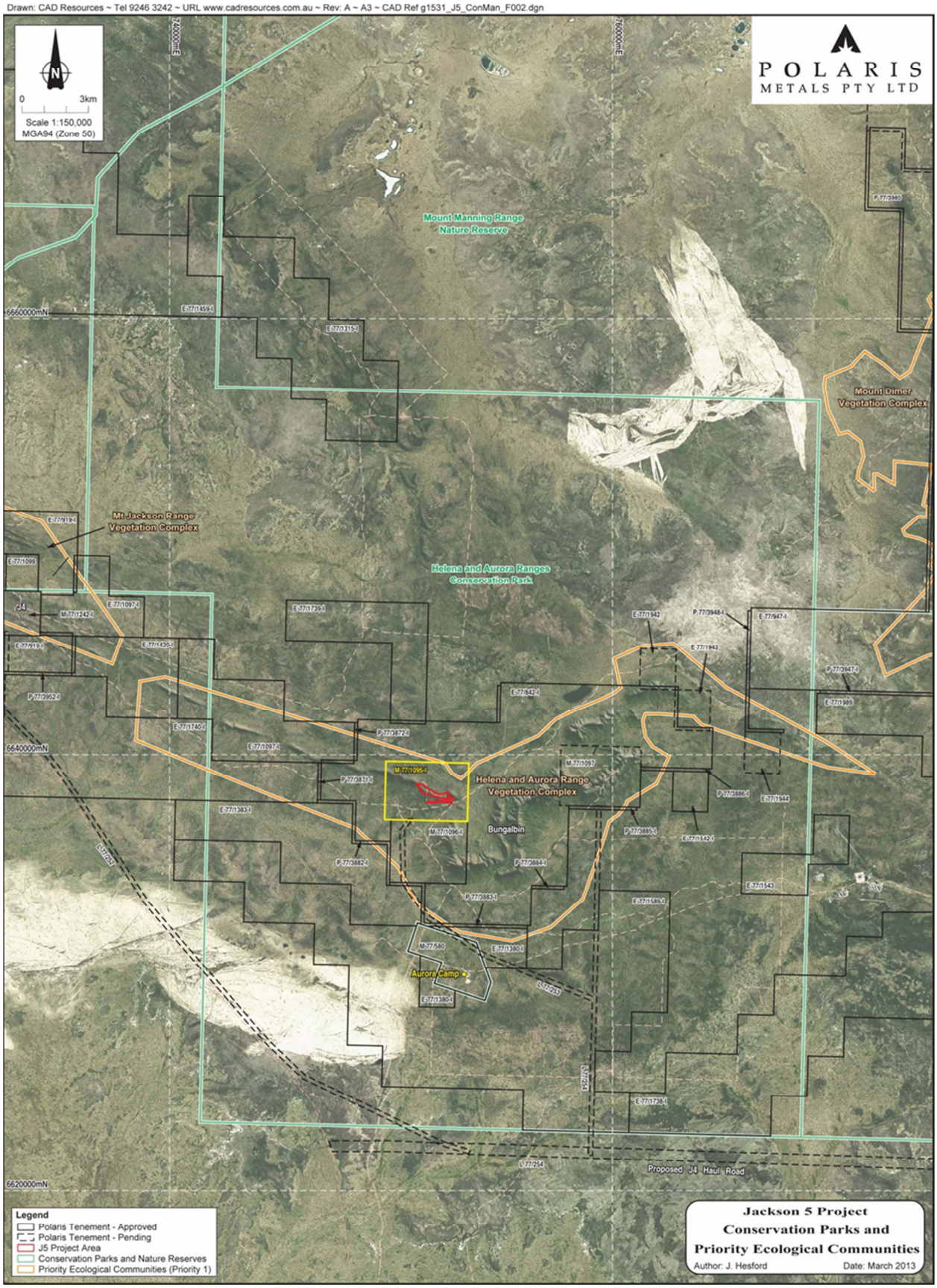

Figure 5: Regional exploration camp and J5 access

4.2. COMPLIANCE WITH LEGISLATION AND OTHER APPROVALS

No approvals have been sought by Polaris for J5 to date.

It is intended that this drill program will be approved by DMP via a Program of Work (POW), which will be accompanied by this CMP.

A Native Vegetation Clearing Permit (NVCP) is not required as clearing will be approved and managed via OEPA assessment pursuant to Part IV of the EP Act.

Compliance and approvals items are listed in Table 8. In consultation with the DMP and OEPA, this Conservation Management Plan will supplement both the drilling program of work and EPA referral document.

Table 8: Compliance and approvals

Agency	Type	Approved
DMP	Tenements: • M77/1095 – J5 tenement	9 May 2011
DMP	Purpose clearing permit	NA
DIA	Heritage surveys of tenement	Complete
EPA	Part IV referral	This document

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5. RISK ASSESSMENT

A risk assessment of the proposed drilling has been conducted by Polaris to define the associated inherent and residual risks to the environment. The results of the risk assessment are summarised in Table 9. The risk matrix for assessing likelihood and consequence is provided in Table 10.

Table 9: Summary of risk assessment

Before Management							**After Management**			
No.	**Conservation values (CMP s4.1)**	**Activity**	**Potential impacts**	**L**	**C**	**Inherent Risk**	**Management practices implemented to reduce risk**	**L**	**C**	**Residual risk**
1	Flora and Vegetation Refer to **Error! Reference source not found.** for priority flora list	• Clearing of native vegetation • Routine exploration drilling and support activities • Vehicle movement • Track/pad design and alignment • Rehabilitation	• Reduction of significant flora and vegetation • Reduced PEC composition • Secondary impacts on significant flora and vegetation communities from dust deposition, saline ground water exposure and vehicle movement • Lack of revegetation success • Removal of root stock	**a**	**2**	**High**	• Site Induction • EOP06 Clearing • EOP09 Site Disturbance Permit • EOP08 Rehabilitation • EOP10 Topsoil Management • EOP15 Vehicles and Driving • ENVF03 Site Disturbance Permit • ENVR04 Site Disturbance Register • ENVR05 Rehabilitation Register	**c**	**2**	**Moderate**
2	Soil and Landform	• Clearing of native vegetation • Routine exploration drilling and support activities • Track/pad design and alignment • Rehabilitation • Waste management • Chemical storage and disposal	• Increased erosion as a result of clearing and earth works (translocation of topsoil / sediment) • Drainage shadow causing vegetation loss in areas where vegetation is reliant on sheet flow • Lack of revegetation success • Positions of stockpiles altering natural drainage lines • Vehicle movement sin wet conditions • Insufficient re-instatement of surface contours • Over stripping topsoil and subsoil • Soil contamination from chemical spills and saline ground water • Aesthetic impact to conservation estate • Impact on local vegetation • Impact on rehabilitation success	**b**	**3**	**High**	• Site Induction • EOP03 Hydrocarbon and Chemical Management • EOP04 Waste Management • EOP06 Clearing • EOP08 Rehabilitation • EOP09 Site Disturbance Permit • EOP10 Topsoil Management • EOP15 Vehicles and Driving • ENVF03 Site Disturbance Permit • ENVR02 Hazardous Material Register • ENVR03 Spill Register • ENVR04 Site Disturbance Register • ENVR05 Rehabilitation Register	**c**	**3**	**Moderate**
3	Feral animals	• Routine exploration drilling and support activities • Vehicle movement • Waste management	• Introduction of feral fauna • Competition with and predation of native species • Human interaction with feral fauna	**b**	**3**	**High**	• Site Induction • EOP04 Waste Management • EOP07 Malleefowl Conservation • EOP15 Vehicle and Driving • ENVR01 Fauna Interaction Register	**d**	**3**	**Moderate**
4	Fire	• Routine exploration drilling and support activities • Vehicles movement • Waste management	• Loss of significant flora, vegetation and fauna habitat • Fauna death • Human impact • Loss of infrastructure • Aesthetic impact to conservation estate	**c**	**4**	**High**	• Site Induction • EOP03 Hydrocarbon and Chemical Management • EOP04 Waste Management • EOP05 Bushfire Management • EOP06 Clearing • EOP09 Site Disturbance Permit • EOP15 Vehicles and Driving • ENVF03 Site disturbance Permit • ENVR02 Hazardous Materials Register • Bush Fire Contingency and Emergency Response	**d**	**4**	**Moderate**
5	Heritage	• Clearing of native vegetation • Routine exploration drilling and support activities • Track/pad design and alignment	• Partial and or complete disturbance to heritage sites	**c**	**4**	**High**	• Heritage surveys • Site Induction • EOP01 Aboriginal Heritage • EOP05 Bushfire Management • EOP06 Clearing • EOP09 Site Disturbance Permit	**d**	**4**	**Moderate**

Before Management							After Management			
No.	**Conservation values (CMP s4.1)**	**Activity**	**Potential impacts**	**L**	**C**	**Inherent Risk**	**Management practices implemented to reduce risk**	**L**	**C**	**Residual risk**
							• EOP15 Vehicles and Driving • ENVF03 Site disturbance Permit • ENVR04 Site Disturbance Register			
6	Surface and groundwater	• Clearing of native vegetation • Routine exploration drilling and support activities • Waste management • Hydrocarbon storage	• Contamination of surface water • Contamination of groundwater • Altering natural surface drainage • Secondary impact to vegetation	**c**	**3**	**Moderate**	• EOP03 Hydrocarbon and Chemical Management • EOP06 Clearing • EOP08 Rehabilitation • EOP09 Site Disturbance Permit • EOP10 Topsoil Management • ENVF03 Site disturbance Permit • ENVR02 Hazardous Materials Register • ENVR03 Spill Register • ENVR04 Site disturbance Register • ENVR05 Rehabilitation Register	**d**	**3**	**Moderate**
7	Weeds	• Clearing of native vegetation • Routine exploration drilling and support activities • Vehicle movement	• Introduction of new weed species through vehicle and personnel movements • Spread of existing weed populations • Aesthetic impact to conservation estate	**c**	**2**	**Moderate**	• Site Induction • EOP06 Clearing • EOP08 Rehabilitation • EOP11 Weed Management • EOP15 Vehicle and Driving • ENVF04 Weed Hygiene Certificate • ENVR05 Rehabilitation Register	**d**	**2**	**Low**

Table 10: Risk matrix

Risk Matrix		Consequence				
		(1) Insignificant	**(2) Minor**	**(3) Moderate**	**(4) Major**	**(5) Catastrophic**
Likelihood	**(a) Almost Certain**	Moderate	High	Critical	Critical	Critical
	(b) Likely	Moderate	Moderate	High	Critical	Critical
	(c) Possible	Low	Moderate	Moderate	High	High
	(d) Unlikely	Low	Low	Moderate	Moderate	High
	(e) Rare	Low	Low	Low	Moderate	Moderate

6. POTENTIAL IMPACTS

6.1. NATIVE VEGETATION CLEARING AND EARTHWORKS

Approximately 1.69 ha of native vegetation will be cleared as part of the program of works. Earthworks will be strategically carried out to minimise disturbance to large vegetation and leave rootstock. Proposed pad and access track alignments are defined in Appendix A. Tracks will be of minimum size for safe access of the drilling equipment, with the proposed 675 m of Class 1 and Class 2 tracks averaging 3.5 m width and 6 m maximum impact where cut and fill is unavoidable.

Two options are proposed for access into the project area (see Figure 2). The longer of the two options is a 970 m access route from the western side of tenement M77/1095 will require clearing of up to 0.34 ha of vegetation. The shorter of the two access route options is a 410 m access route originating from the eastern side of Tenement M77/1095 will require the clearing of up to 0.14 ha of vegetation.

All cleared vegetation will be windrowed to one side of the drill pad and/or track in areas devoid of vegetation. Topsoil will largely be left intact and only striped where sumps are to be constructed. Topsoil will be stockpiled to one side of the sump and excavated subsoil placed on the alternate side. Sumps will be 3 m x 3 m x 1 m in area and sloped to allow fauna egress, constructed sumps will be within the cleared area of the pad and located down gradient from the drill rig to contain drilling fluids and intercepted saline ground. Diamond drilling requires two sumps per hole.

6.2. FLORA

6.2.1. Impact

Threatened:

No threatened flora has been recorded on J5.

Priority flora:

A total of six Priority flora was recorded during the survey. These are detailed in Table 11 with their recorded population numbers identified across the survey area.

Table 11: Priority flora species recorded

Species	Family	Total Population
Acacia adinophylla (P1)	Fabaceae	95
Hibbertia Lepidocalyx subsp. tuberculata (P3)	Dilleniaceae	1,331
Mirbelia ferricola (P3)	Fabaceae	164
Neurachne annularis (P3)	Poaceae	444,456
Stenanthemum newbeyi (P3)	Rhamnaceae	1,990
Banksia arborea (P4)	Proteacea	424

Only 3 % of the J5 project area will be cleared to accommodate the drilling program. An assessment of the Priority flora species defined within the proposed disturbance area was undertaken at both the local and regional level by Mattiske (2013) (Table 12). Overall, with the exception of Acacia adinophylla (P1), impacts to Priority flora are determined as being low. An estimated 28.42 % of the A. adinophylla (P1) of the local population will potentially be cleared along the western access corridor, however this equates to 2.62% of the known regional population. To reduce the percentage take Polaris proposes to use the eastern access corridor, or facilitate a carefully planned western corridor route. Using old tracks within the western corridor would also significantly reduce the impacts to A. adinophylla (P1).

Table 12: Impact on Priority flora

Taxon	Confirmed / likely occurrence in program area	Extent / abundance outside program area	Confirmed / likely impact
Acacia adinophylla (P1)	Confirmed. 95 individuals within J5 prospect survey area	1,032 individuals within defined area of COO2 bioregion	**Moderate - Low:** Eastern access corridor (410 m): 5 individuals Locally = 5.26 % Regionally = 0.48 % Western access corridor (970 m): 27 individuals Locally = 28.42 % Regionally = 2.62 %
Hibbertia lepidocalyx subsp. tuberculata (P3)	Confirmed. 1,331 individuals within J5 prospect survey area	2,189 individuals within defined area of COO2 bioregion	**Moderate - Low:** Proposed new drill pads and access tracks: 115 individuals Locally = 8.64 % Regionally = 5.25 % Existing old drill pads: 16 individuals Locally = 1.20 % Regionally = 0.73 % Existing old tracks: 13 individuals Locally = 0.98 % Regionally = 0.59 %
Mirbelia ferricola (P3)	Confirmed. 164 individuals within J5 prospect survey area	1,223 individuals within defined area of COO2 bioregion	**Low:** Proposed new drill pads and access tracks: 3 individuals Locally = 1.83 % Regionally = 0.24 %
Neurachne annularis (P3)	Confirmed. 444,456 individuals within J5 prospect survey area	865,970 individuals within defined area of COO2 bioregion	**Low:** Proposed new drill pads and access tracks: 13,365 individuals Locally = 3.00 % Regionally = 1.54 %

Taxon	Confirmed / likely occurrence in program area	Extent / abundance outside program area	Confirmed / likely impact
			Eastern access corridor (410 m): 580 individuals Locally = 0.13 % Regionally = 0.07 % Western access corridor (970 m): 580 individuals Locally = 0.13 % Regionally = 0.07 %
Stenanthemum newbeyi (P3)	Confirmed. 1,990 individuals within J5 prospect survey area	8,453 individuals within defined area of COO2 bioregion	**Moderate - Low:** Proposed new drill pads and access tracks: 50 individuals Locally = 2.51 % Regionally = 0.59 % Existing old drill pads: 49 individuals Locally = 2.46 % Regionally = 0.58 % Existing old tracks: 131 individuals Locally = 6.58 % Regionally = 1.55 % Western access corridor (970 m): 2 individuals Locally = 0.10 % Regionally = 0.02 %
Banksia arborea (P4)	Confirmed. 424 individuals within J5 prospect survey area	3,534 individuals within defined area of COO2 bioregion.	**Low:** Proposed new drill pads and access tracks: 4 individuals Locally = 0.94 % Regionally = 0.11 % Existing old drill pads: 5 individuals Locally = 1.18 % Regionally = 0.14 % Existing old tracks: 8 individuals Locally = 1.89 % Regionally = 0.23 %

6.2.2. Management

Polaris' aim is to minimise direct and residual impacts to native vegetation associated with exploration and related activities.

Flora and vegetation management during clearing shall include, but not be limited to:

- Demarcate priority flora and avoid where possible
- Provision of field identification guides defining significant flora species
- Marking out the extent of clearing and exclusion areas and conforming to approved clearing areas
- Follow-up of cleared areas against approved permit/s
- Follow-up of rehabilitation of cleared areas
- Reporting on non-compliances using clearing procedures
- Implementing contingency measures in the event of non-compliances or unexpected impacts to the environment
- Preventing the introduction of weeds

Clearing will be kept to the minimum required to undertake exploration. The key management measures that will be applied include:

- Using existing tracks and pads from previous exploration activities (Figure 2 & Figure 5; Appendix A)
- Internal application to clear with management signoff
- Progressive clearing utilising raised blade technique to avoid topsoil and root stock disturbance
- Avoid cut and fill clearing where possible through alignment of access tracks and placement of pads across strike where safety is not compromised
- Induction/training of personnel on the importance of minimising clearing
- Complying with the Site Disturbance Procedure and any permit conditions
- Supervision of clearing activities by an Environmental Advisor
- Minimising impact area for drill pads and associated working areas
- Minimising size (i.e. width and length) and number of access roads and prevent unnecessary clearing of new roads/access

Stock piling of topsoil and vegetation will be done so as not to disturb or smother adjacent vegetation. Cleared topsoil and vegetation will be stockpiled separately and away from naturally occurring drainage lines to minimise secondary impacts to vegetation.

Additionally, the status of any weeds on site will be monitored periodically during site environmental inspections and if found, will be treated immediately to prevent their spread. Identification of Listed weeds of any kind will be reported to DEC.

Vehicle hygiene practices will be implemented to minimise the opportunity for introduced taxa to become established in the area. Inter-site vehicle hygiene will be enforced ensuring that vehicles and machinery coming into the site will be inspected for weeds and thoroughly washed down off site at either Carina or Southern Cross if necessary. Vehicles mobilising intra-site that have not been thoroughly cleaned of soil and plant debris prior to arrival will be turned away.

6.3. FAUNA AND FAUNA HABITAT

6.3.1. Impact

Some localised terrestrial fauna impact from vegetation clearing activities may occur but is not anticipated to have significant impacts to fauna populations on a regional scale. The fauna present in the project area are mostly wide-ranging with no species unique to the project area (Ecologia 2012).

Few impacts are expected as a result of clearing fauna habitat due to extensive areas of similar habitat in the surrounding region. The species of conservation significance that

potentially occur in these habitat types associated with J5 are mobile and typically capable of moving into the surrounding areas. Therefore impacts to these fauna habitats, on a regional scale, are not anticipated to be significant.

6.3.2. Management

Polaris intends to management disturbance to fauna and fauna habitat as follows:

- Avoid unnecessary clearing beyond that required for the project including use of existing access tracks and pads
- Retain cleared vegetation and topsoil for use in rehabilitation
- Progressively rehabilitate areas when they are completed
- Induct all personnel on important fauna constraints and factors
- Reduce vehicle speed on roads and tracks
- Exclude firearms and pets from the project area
- Manage rubbish disposal to discourage scavenging by native and feral animals
- Routine site inspections so problems can be identified and remedied at an early stage
- Weed monitoring and management
- Create fauna egress in all open excavations

6.4. TOPSOIL AND SOIL PROFILES

An insignificant amount of topsoil stripping is proposed for the project, localised disturbance to the soil profile will occur in areas where sumps and cut/fill is required. Soil nutrient deterioration and seed viability is not seen to be an issue for the project due to the relatively short duration of the program.

6.5. HYDROCARBON MANAGEMENT

No hydrocarbons will be stored in the J5 project area, all refuelling and servicing of exploration vehicles and/or equipment will be conducted at the Aurora Camp. Spills from refuelling activities will be managed according to the spill procedure.

6.6. VISUAL AMENITY AND LANDSCAPE ALTERATION

Little to no landscape alternation is proposed for the J5 drill program. The additional 1.69 ha of clearing will pose little change to the already disturbed site keeping the visual amenity intact. Polaris' robust procedures and extensive planning will ensure the site is managed and rehabilitated to the satisfaction of all stakeholders.

6.7. POLARIS SUPPORTING DOCUMENTATION

Polaris' internal procedures and forms will be used to manage the risk to conservation values associated with exploration drilling at J5.

All procedures and forms have been created using industry best practices and are listed in Table 13.

In combination with the environmental procedures, a representative from Polaris' Environmental Department will be present during major milestones throughout the drilling program, their roll will be to:

- Implement the Conservation Management Plan (CMP). This involves internal collaboration with exploration and environmental personnel and external liaison with Regulatory Agencies.

- Act as an internal auditing function to measure performance against CMP.
- Assist the exploration geology team with environmental and rehabilitation tasks associated with drilling programs.
- Supervise clearing activities

Table 13: Polaris supporting procedures and forms/registers

Procedures	Forms/Registers
EOP01 Aboriginal Heritage	ENVF01 Training Records
EOP02 Fauna	ENVF02 Record of Document Review
EOP03 Hydrocarbon and Chemical Management	ENVF03 Site Disturbance Permit
EOP04 Waste Management	ENVF04 Weed Hygiene Certificate
EOP05 Bushfire Management	ENVF05 Document Distribution Register
EOP06 Clearing	ENVF08 Contractor Facilities Checklist
EOP07 Malleefowl Conservation	ENVF09 Camp, Landfill and WWTF (If applicable)
EOP08 Rehabilitation	ENVR01 Fauna Interaction Register
EOP09 Site Disturbance Permit	ENVR02 Hazardous Materials Register
EOP10 Topsoil Management	ENVR03 Spill Register
EOP11 Weed Management	ENVR04 Site Disturbance Register
EOP12 Dust Management	ENVR05 Rehabilitation Register
EOP15 Vehicles and Driving	

7. SOCIAL IMPACTS

7.1. DEPARTMENT OF INDIGENOUS AFFAIRS

A search was conducted using the Department of Indigenous Affairs (DIA) Aboriginal Heritage Inquiry System for M77/1095 (DIA 2013). Four sites are recorded inside M77/1095, the search results are provided in Appendix D. Only two of the four sites are located in the project area.

7.2. HERITAGE

An archaeological survey of the proposed drill program has been completed. The two significance sites identified in the DIA Aboriginal Heritage Inquiry System were confirmed on the ground. The identified water soaks have been delineated in the field and a 20m buffer placed around them. No disturbance to Heritage sites is anticipated for the J5 project.

7.3. LAND USE, COMMUNITY AND SOCIAL ENVIRONMENT

The impact from the J5 drilling program on the community and social environment is considered low, regionally, and manageable at a local level. Polaris will continue consultation with the relevant stakeholders prior to and during the operational stages of the drill program.

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8. REHABILITATION

Rehabilitation of historical and proposed disturbance will be undertaken at J5 to minimise the residual effects of the exploration program on the environment. Polaris will implement rehabilitation techniques consistent with DMP requirements, EPA Guidance Statement No 6. Rehabilitation of Terrestrial Ecosystems, and the Guideline for Mineral Exploration/Rehabilitation Activities (DMP 2007), including:

GENERAL:

- Progressive clearing utilising raised blade technique to avoid topsoil and root stock disturbance to enable natural regeneration of vegetation
- Utilise low impact, manoeuvrable excavator and front end loader for rehabilitation works
- Compacted surfaces will be ripped or scarified to reduce erosion, increase infiltration and provide a seed trap. They will also be seeded (where necessary) with suitable local native flora species
- Natural drainage lines will not be disturbed if possible
- Stockpiled vegetation will be distributed over the rehabilitation area
- Local provenance seed from the area collected by a reputable seed collector may be used to supplement natural rehabilitation where regeneration is insufficient
- Monitor the area after rehabilitation for weed infestation and control significant weed outbreaks
- Hydrocarbons, chemicals and spent spill kits will be removed from the site and disposed of appropriately
- Any in situ hydrocarbon contaminated soils will be removed or suitably remediated

DRILL HOLES:

- Survey and permanently mark each drill hole for future location
- PVC collars will be removed or cut 40 cm below the surface, capped and backfilled to surface. A concrete drill plug will be fitted. PVC wastes to be removed from site
- Backfilled holes will include mounds to facilitate water shedding away from the drill hole and cover with topsoil
- All remnant drill samples to be disposed of into open sumps prior to backfilling. Plastic sample bags and all other artificial debris and waste materials will be disposed of appropriately

DRILL PADS:

- Drill sumps and other temporary excavations back filled and rehabilitated
- Drill pads will be re-shaped to existing contours. Topsoil will be spread over the area and scarified
- Respread all cleared vegetation over disturbed areas
- Drill pads and access tracks will be re-profiled to conform with the natural topography

ACCESS TRACKS:

- Avoid long continuous rip lines along tracks, especially on slopes
- Reshape the surface profile to match existing contours where possible

- Entrances to access tracks will be blocked to discourage third party entry

SUMPS:

- Allow sumps to dry out
- Backfill with material excavated for the sump that has been stockpiled nearby
- Reshape the surface profile to match existing contours where possible
- Respread topsoil and scarify the area

CUT AND FILL:

- Cut and fill will be undertaken only when absolutely necessary
- Drill pads and access tracks will be re-profiled to conform with the natural topography
- Respread topsoil and scarify the area

8.1. RECORDING

An established Polaris internal exploration tracking system will be used to track the progress of the exploration program, from application to rehabilitation. A CMP file will be kept on site and will contain all completed copies of forms, procedures and checklists relating to the program. All Polaris personal and contractors will be inducted on the environmental and safety requirements specific to the project prior to commencing works at J5.

Clearing and post-clearing monitoring will include:

- An existing high resolution pre-disturbance aerial image of the site will be used as a baseline reference for clearing activities.
- Either an aerial/satellite image or a differential GPS survey will be taken at the end of clearing to capture any discrepancies between actual and proposed clearing.

8.2. REPORTING AND LIAISON

Polaris has a reporting requirement to report and liaise on the following;

- Notification to DEC-R 5 working days prior to entering DEC managed lands to commence preparation of and or conduct the exploration program
- Notification to DEC-R within 5 working days of completion of drilling
- Any deviation from the approved program should be discussed with and agreed to by DEC prior to being implemented
- Any non-compliances identified should be provided to DEC within 24 hours and identify the nature and measures put in place to ensure there is no re-occurrence. The mitigation measures should be discussed and agreed to by DEC
- Any sightings of threatened fauna
- Location data of any declared rare, priority and conservation significant flora species in addition to those already reported
- Program completion report – to be submitted to DEC within 12 months of the completion of drilling activities
- Polaris Metals point of contact for the exploration program including on-site contact numbers and radio frequencies
- DEC contacts
- Any communications with other individuals / groups (e.g. related to aboriginal heritage etc)

8.3. COMPLETION REPORT

There is a requirement for an AER to be submitted to DMP in April of each year.

There is a CMP requirement for a completion report to be compiled and submitted to both DMP and DEC on completion of activities and after rehabilitation. Rehabilitation is due to be completed 6 months after program completion. Auditing of rehabilitation is scheduled for 1 month after rehabilitation completion. Submission of the completion report is scheduled for 1 month after auditing.

The completion report for this program will be submitted to both DMP and DEC with the AER.

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APPENDICES

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Appendix A: Proposed Site Work (October 2012 – CD Attached)

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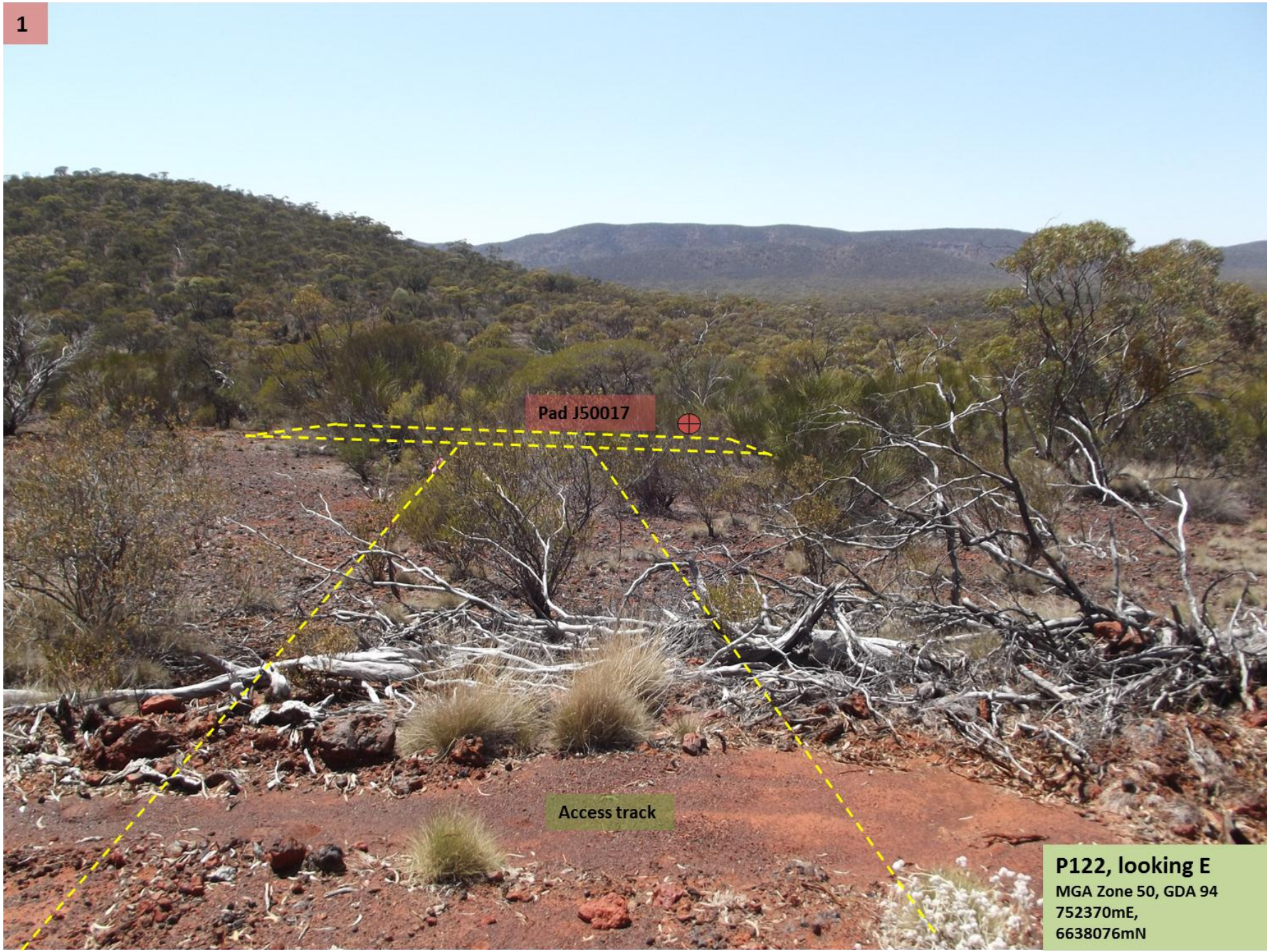
POLARIS
METALS PTY LTD

J5 DRILLING PROPOSED SITE WORK

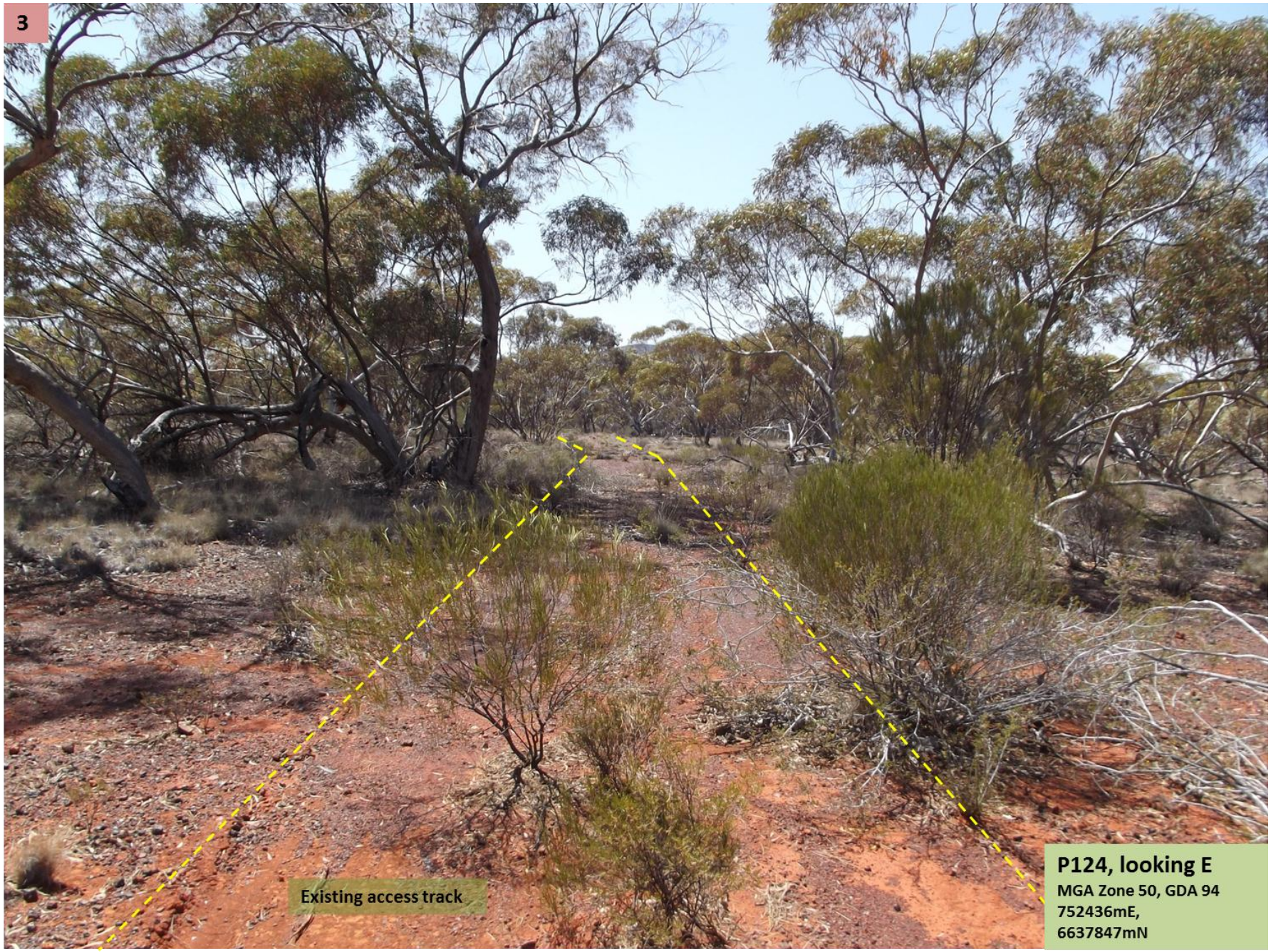
October 2012

Summary: Annotated photographs of proposed site work at J5.
Use in conjunction with plans: J5 Photo Locations; J5 Proposed Drilling

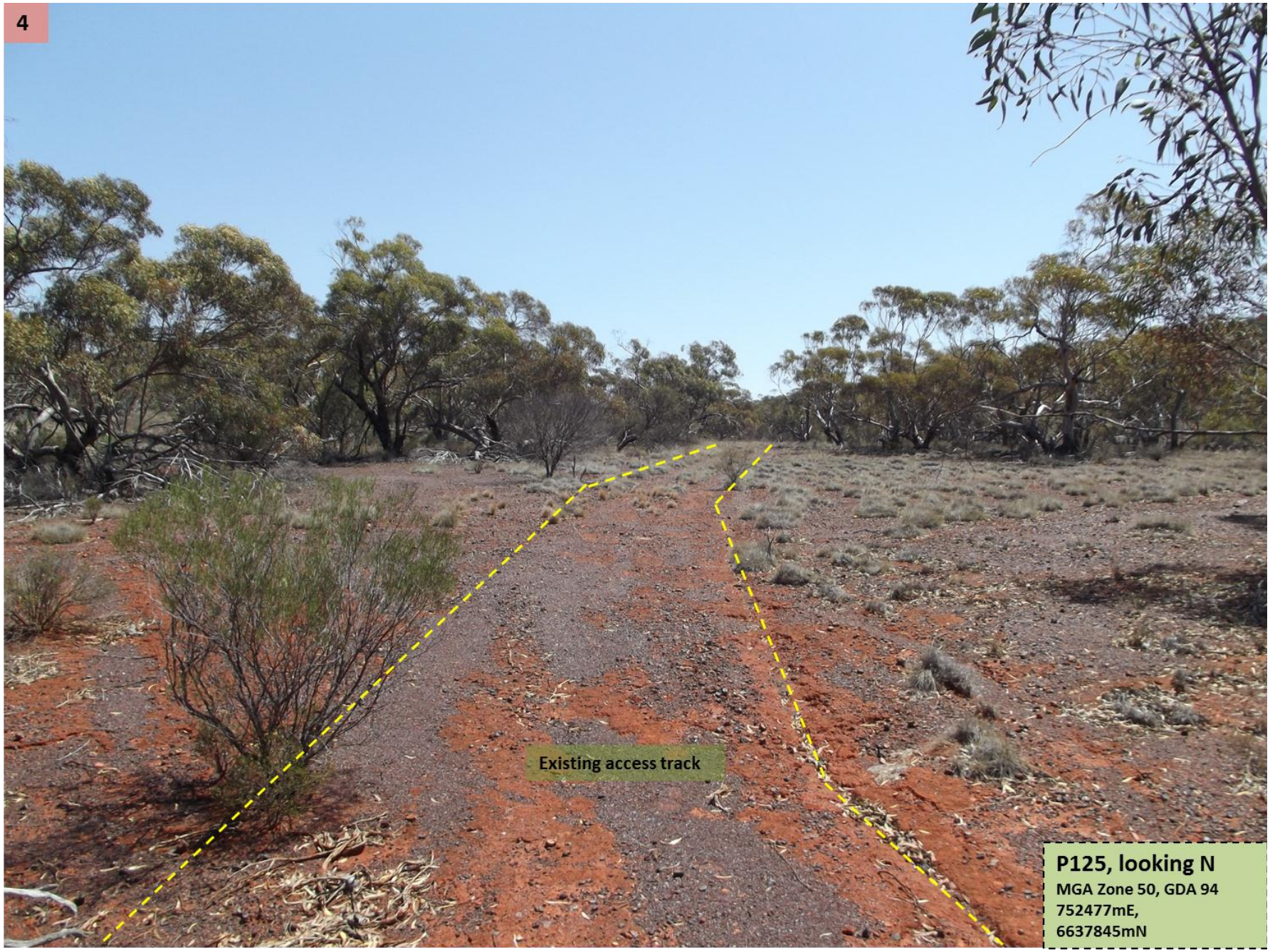


COMMENT: Proposed 60mx3.5m track from line 1 to peg J5017 (on line 0).

COMMENT: Existing east-west track on the south side of J5. Occasional minor maintenance required.

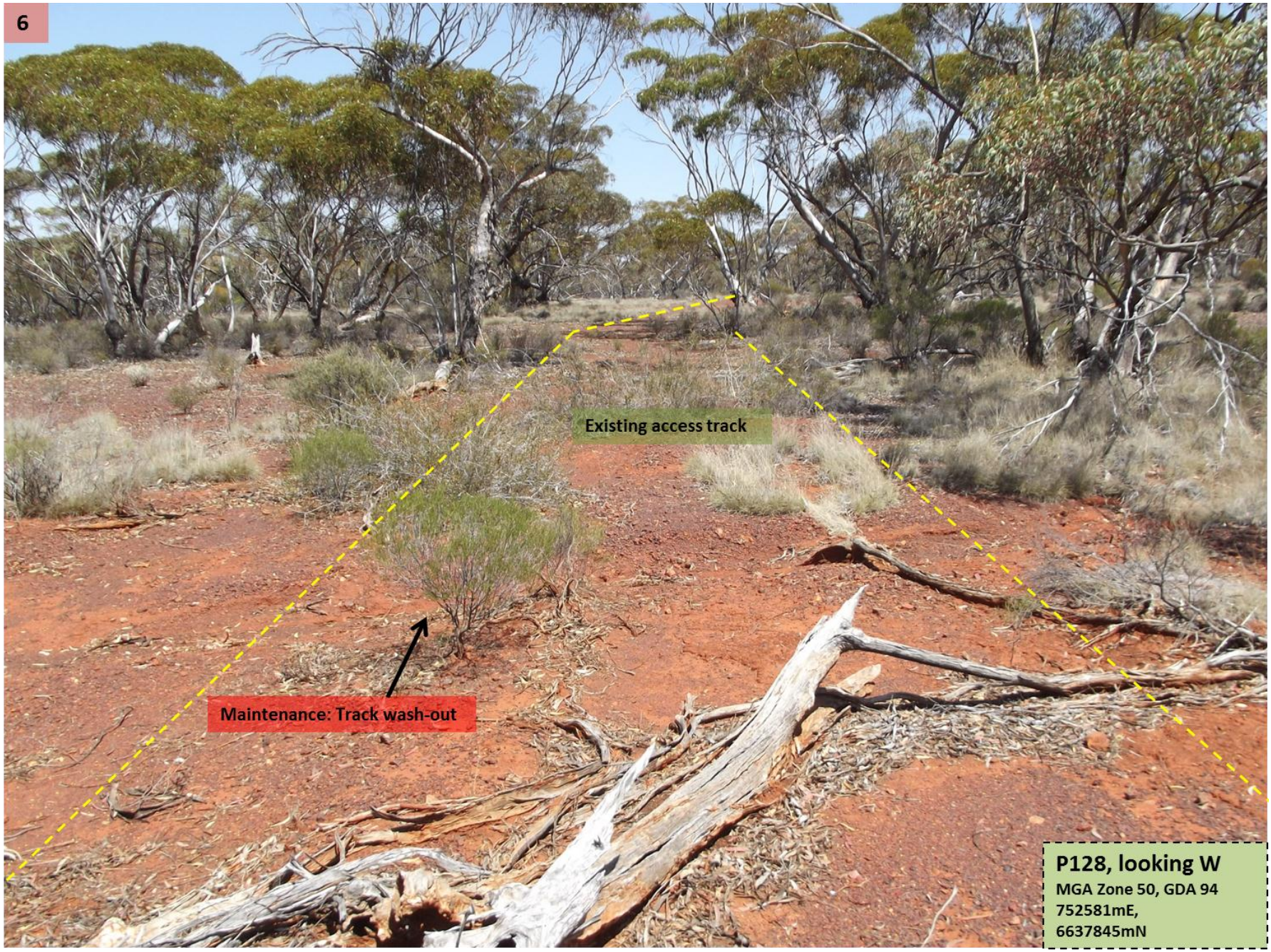


COMMENT: Existing east-west track on the south side of J5. Occasional minor maintenance required.



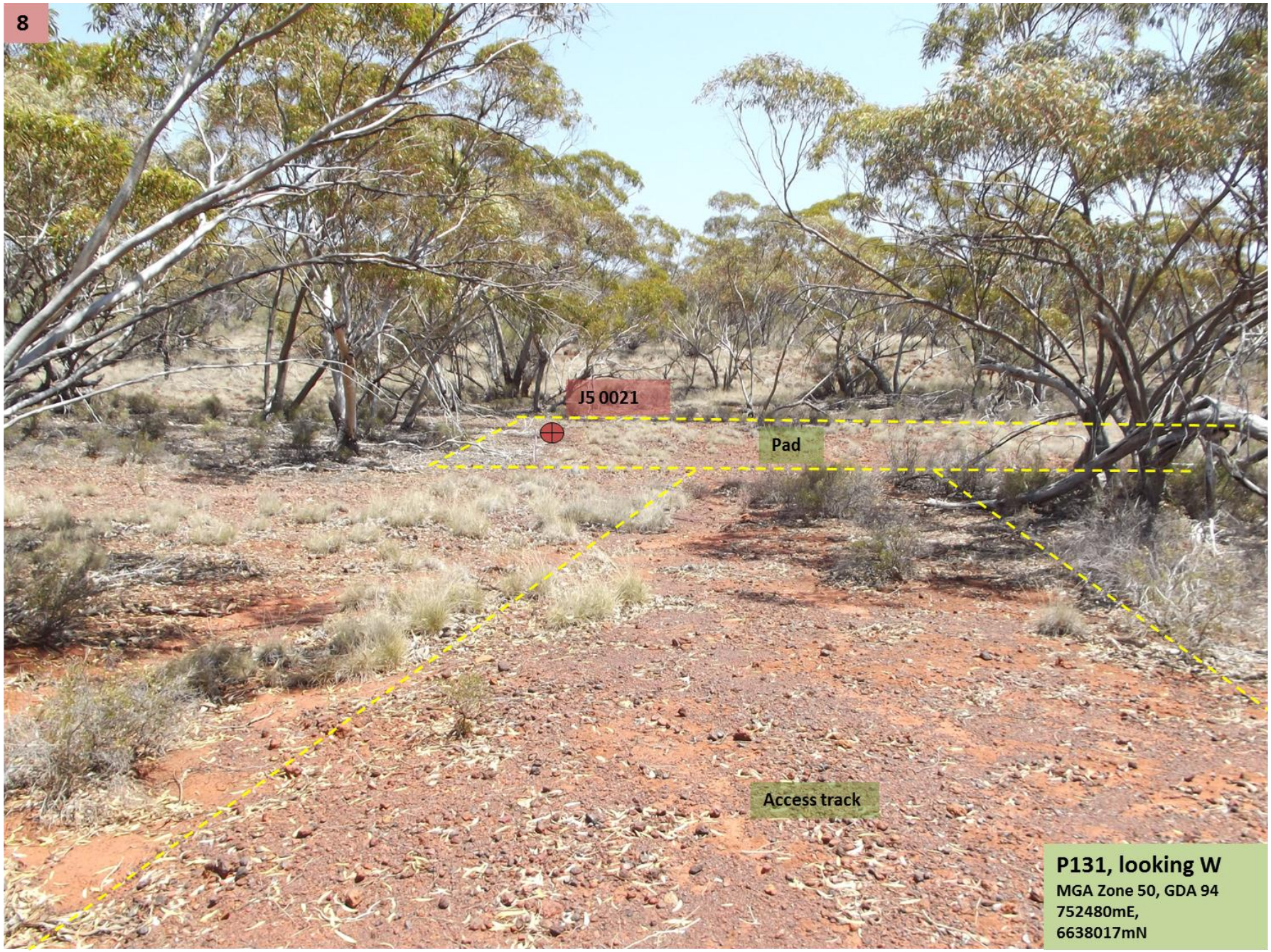
COMMENT: Existing track connecting to line -1.

COMMENT: Existing east-west track on the south side of J5, linking to Bungalbin-J4 track. Occasional minor maintenance required.

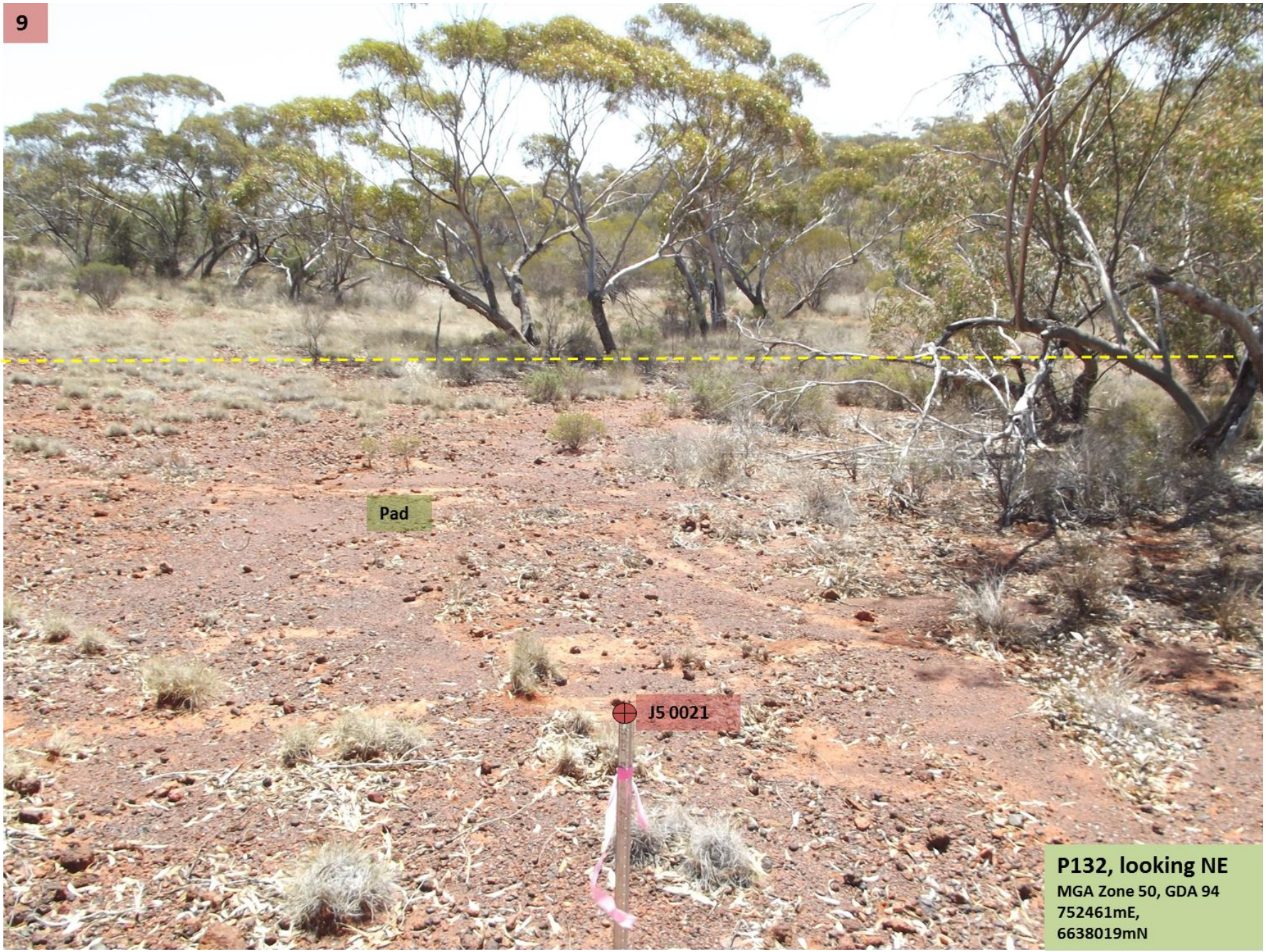


COMMENT: Existing east-west track on the south side of J5, with a washout gully (0.3mD x 1mW) requiring minor maintenance.

COMMENT: Peg (J5022) on existing track. Pad planned to be within standard pad dimensions (15m x20m) with minimal clearing required.



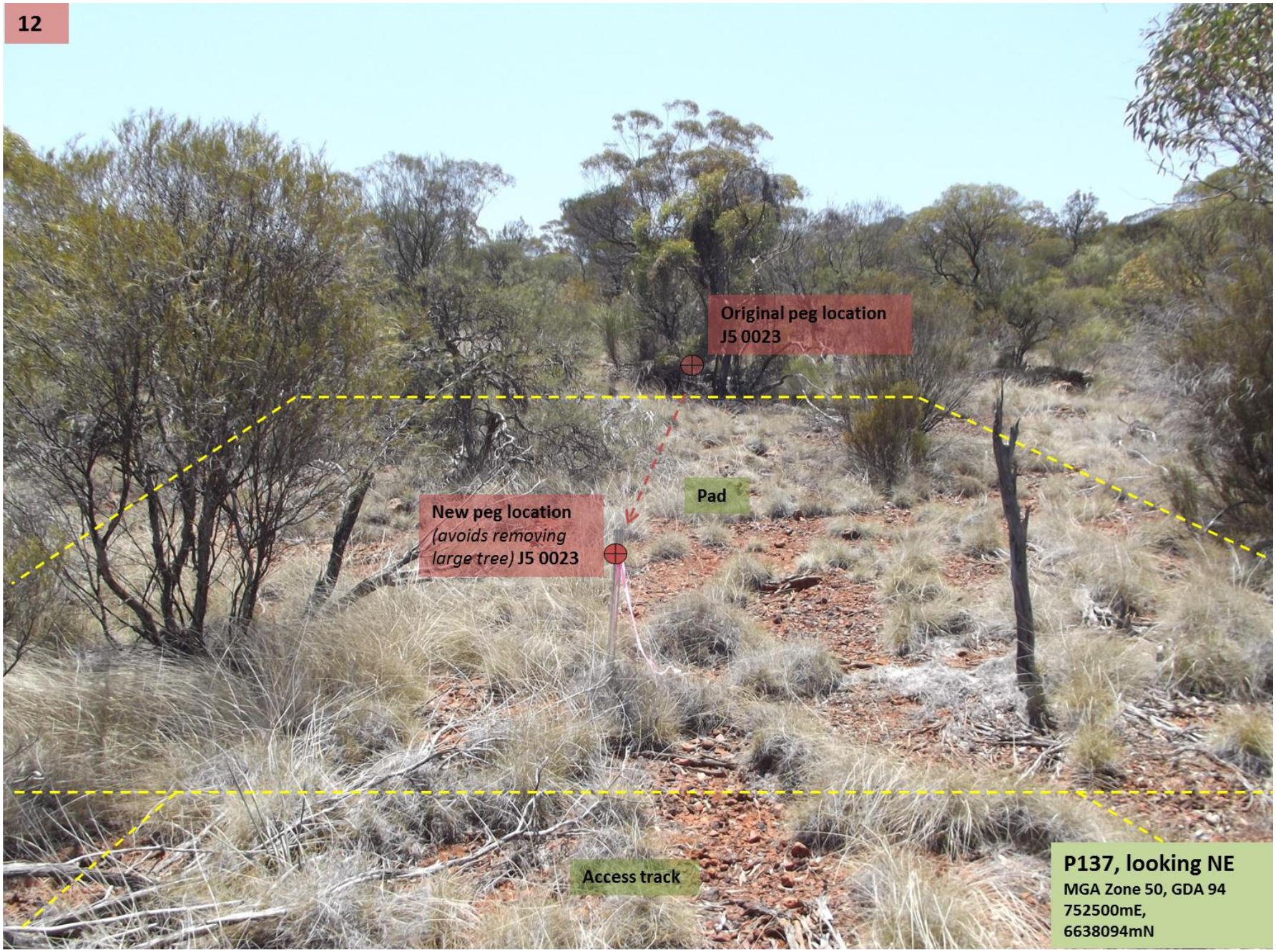
COMMENT: Proposed 25mx3.5m access track branches off existing track (to pad J5021).
Pad planned to be within standard pad dimensions (15m x20m) with minimal clearing required.



COMMENT: Pad (J50021) planned to be within standard pad dimensions (15m x20m) with minimal clearing required.

COMMENT: Proposed 50mx3.5m access track from line -1 to line 0. Minor clearing required.

COMMENT: Proposed 50mx3.5m access track from line -1 to line 0. Minor clearing required. Same track as in Photo 133.



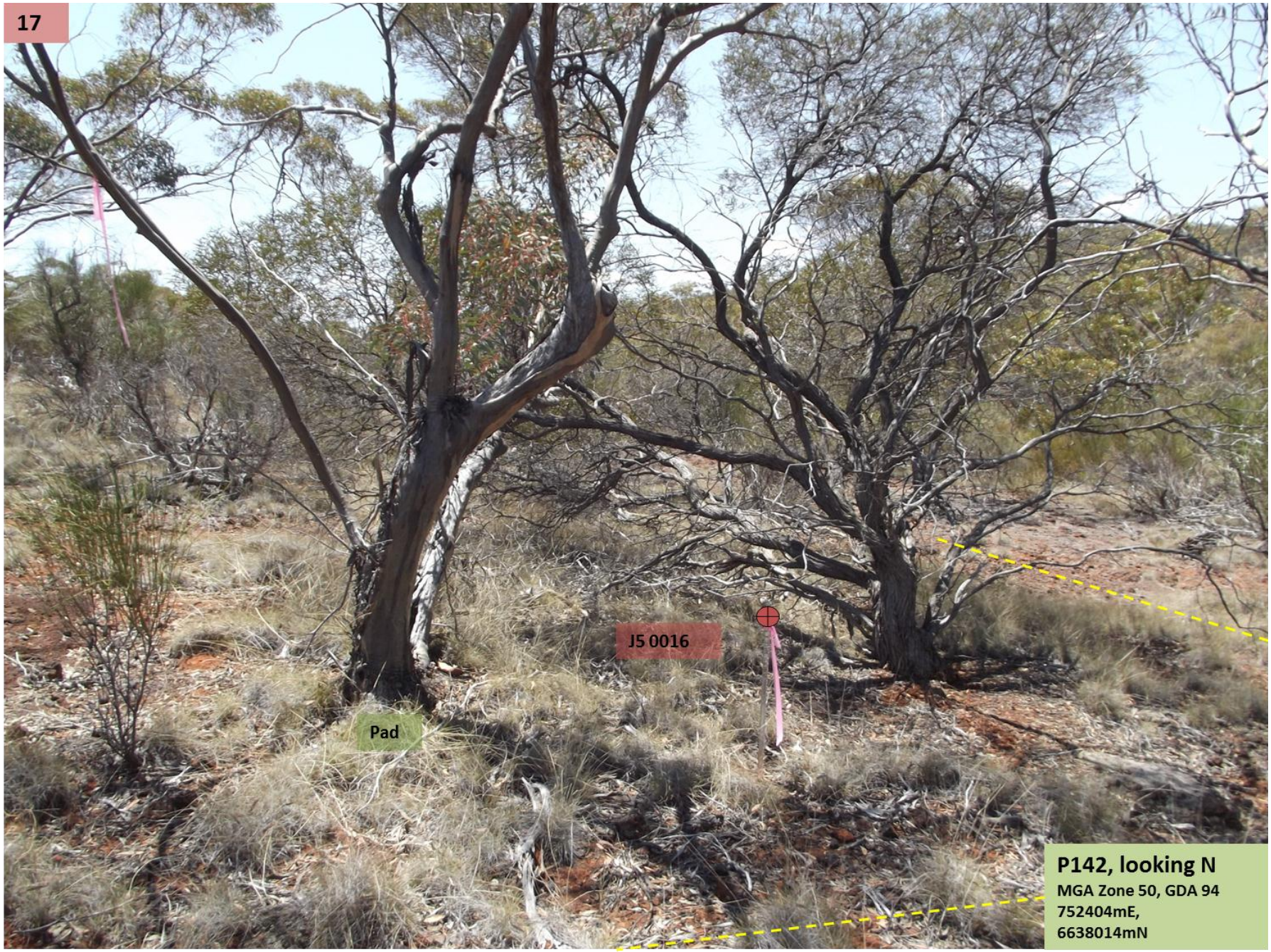
COMMENT: Peg (J50023) has been moved SSW 13m to avoid clearing a large tree (see figure). Pad planned to be within standard pad dimensions (15m x20m) with minor clearing required.

COMMENT: Angled pad (J50020) planned to be within standard pad dimensions (15m x20m) with minor clearing required.

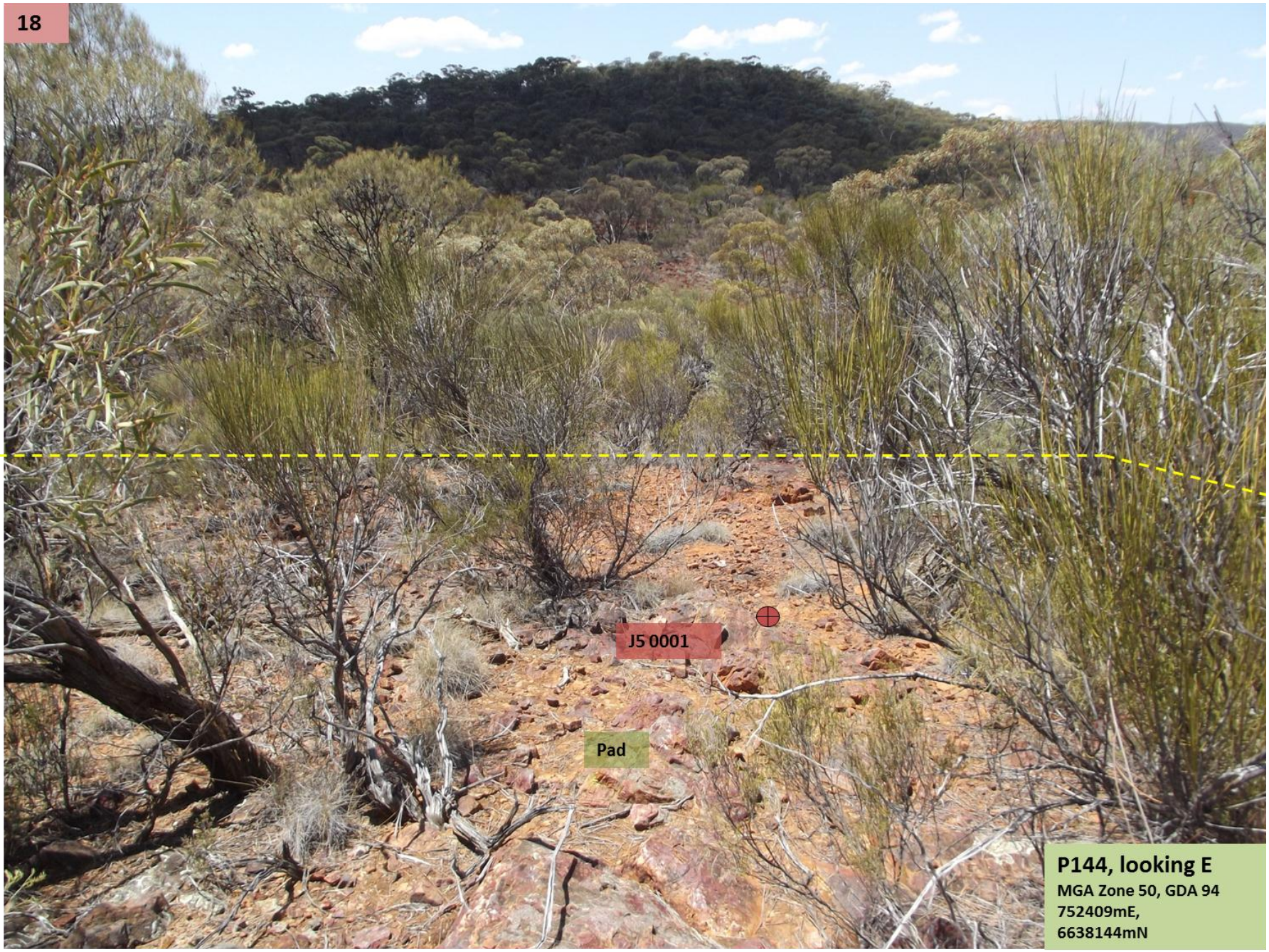
COMMENT: Pad (J50019) planned to be within standard pad dimensions (15m x20m) with minor benching. Minor clearing required. Estimated 270t impact.

COMMENT: Pad (J50018) planned to be within standard pad dimensions (15m x20m) with minor benching required. Minor clearing required. Estimated 270t impact.

COMMENT: Pad (J50017) planned to be within standard pad dimensions (15m x20m) with minor clearing required.

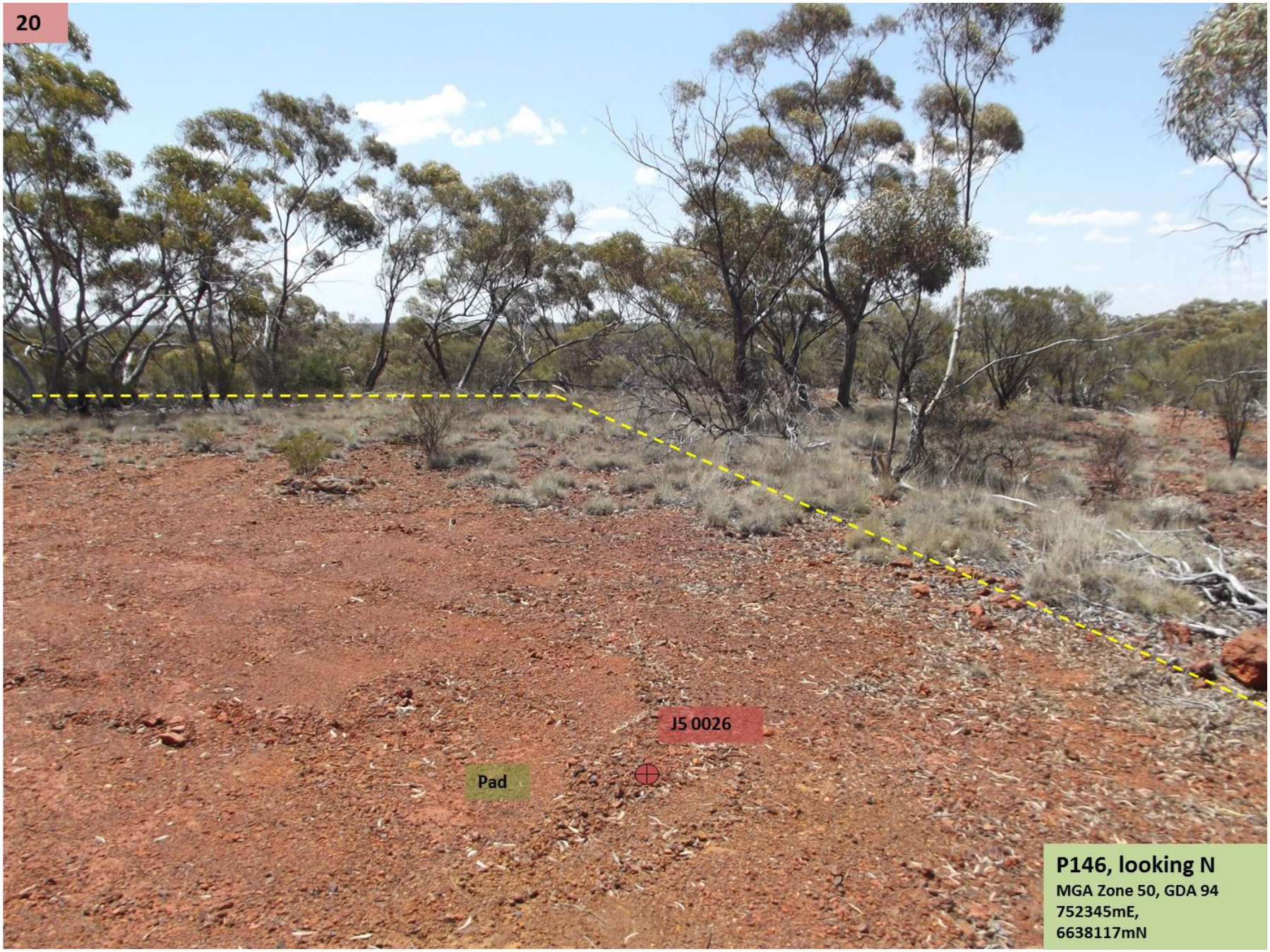


COMMENT: Pad (J50016) planned to be within standard pad dimensions (15m x20m) with minor clearing required. Proposed 35mx3.5m access track connecting J50017 and J50016 requires clearing.



COMMENT: Pad (J50001) planned to be within standard pad dimensions (15m x20m) with minor clearing required.

COMMENT: Proposed 40mx3.5m access track from J5RC0111 to J50001. Minimal vegetation clearing required.

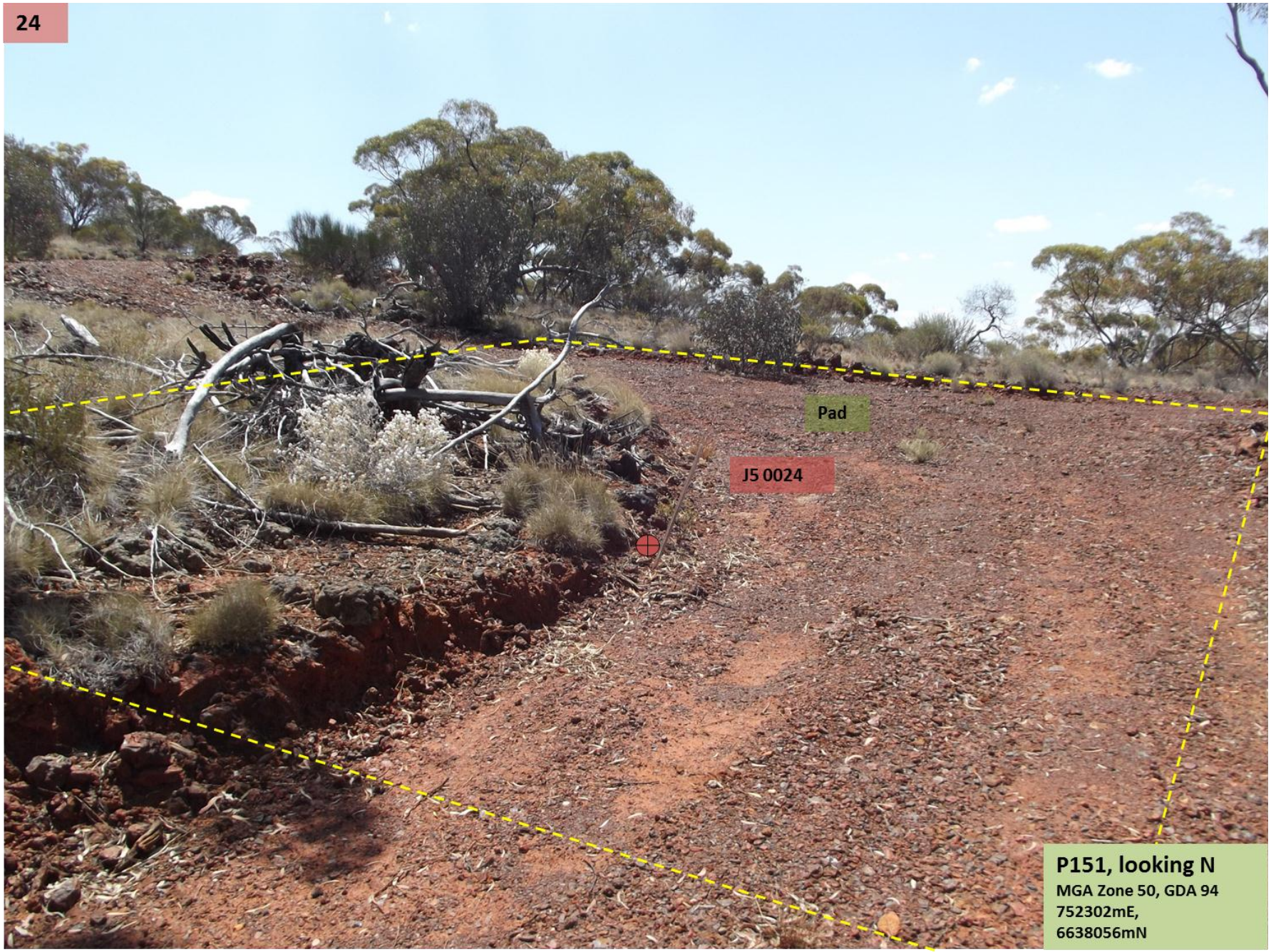


COMMENT: Twin hole (J50026) planned on existing pad. Pad to be expanded and minor clearing undertaken.

COMMENT: Hole (J50025) planned on existing track within standard pad dimensions (15m x20m) . Minor clearing and limb pruning required to the north of peg.

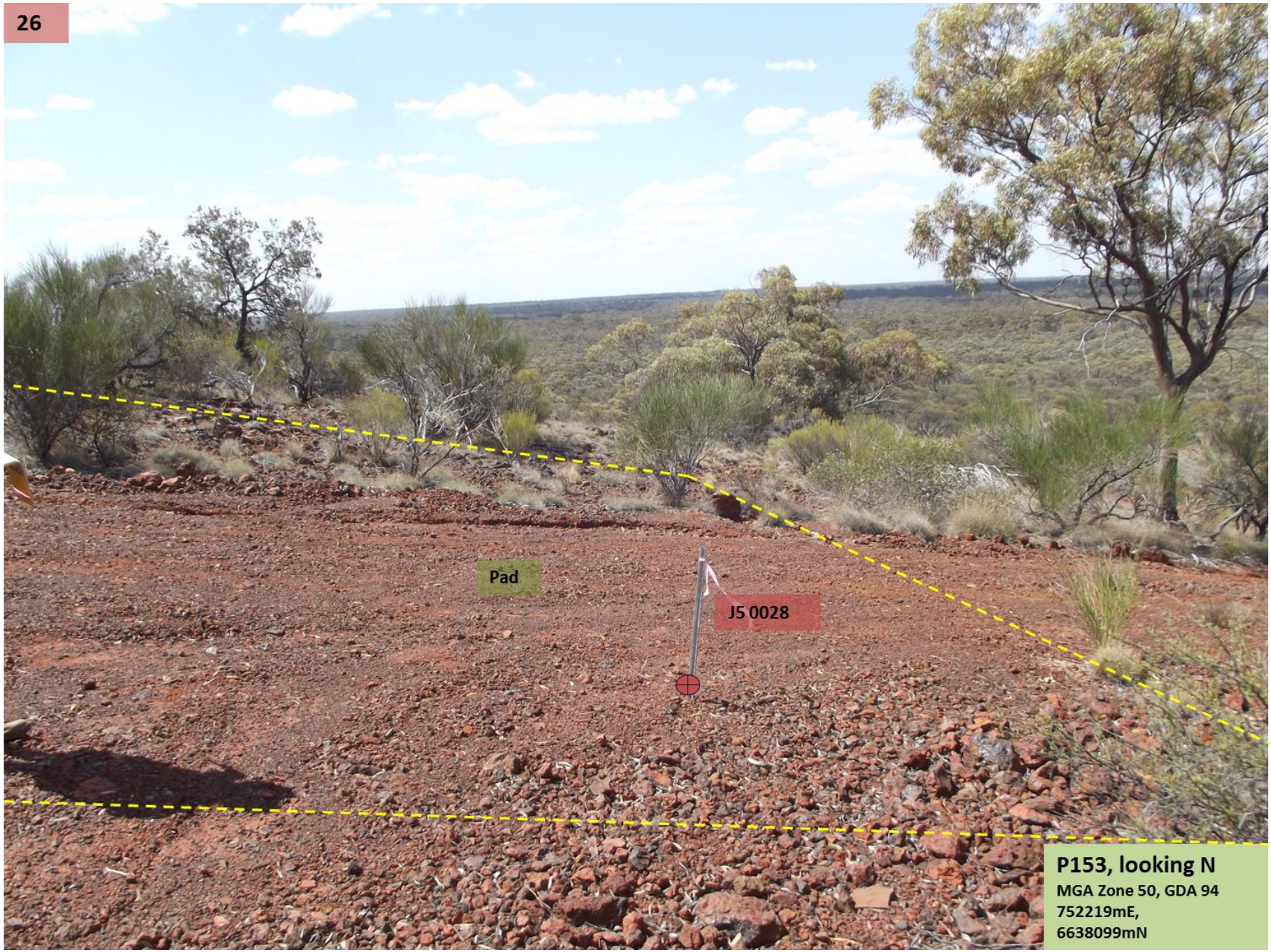
COMMENT: Proposed 20mx3.5m access track from pad (J50002) to existing track.

COMMENT: Pad (J50002) is planned to be within standard pad dimensions (15m x20m) with benching and minor clearing required. Estimated impact 270t.



COMMENT: Pad (J50024) is planned on the existing track to be within standard pad dimensions (15m x20m). The corner of the track intersection is to be widened.

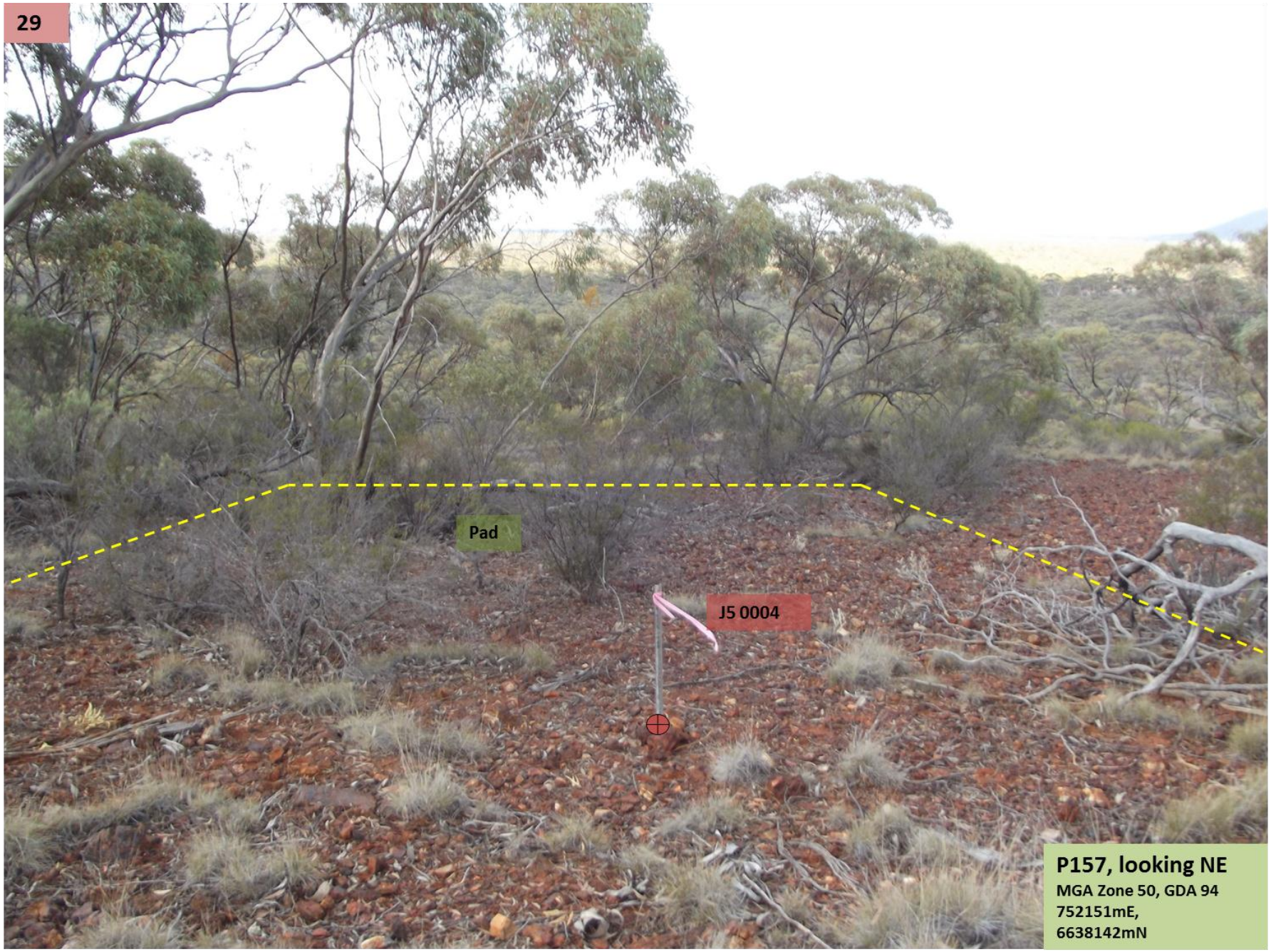
COMMENT: Pad (J50027) is planned on the existing track to be within standard pad dimensions (15m x20m), with benching into west slope. Estimated impact 240t.



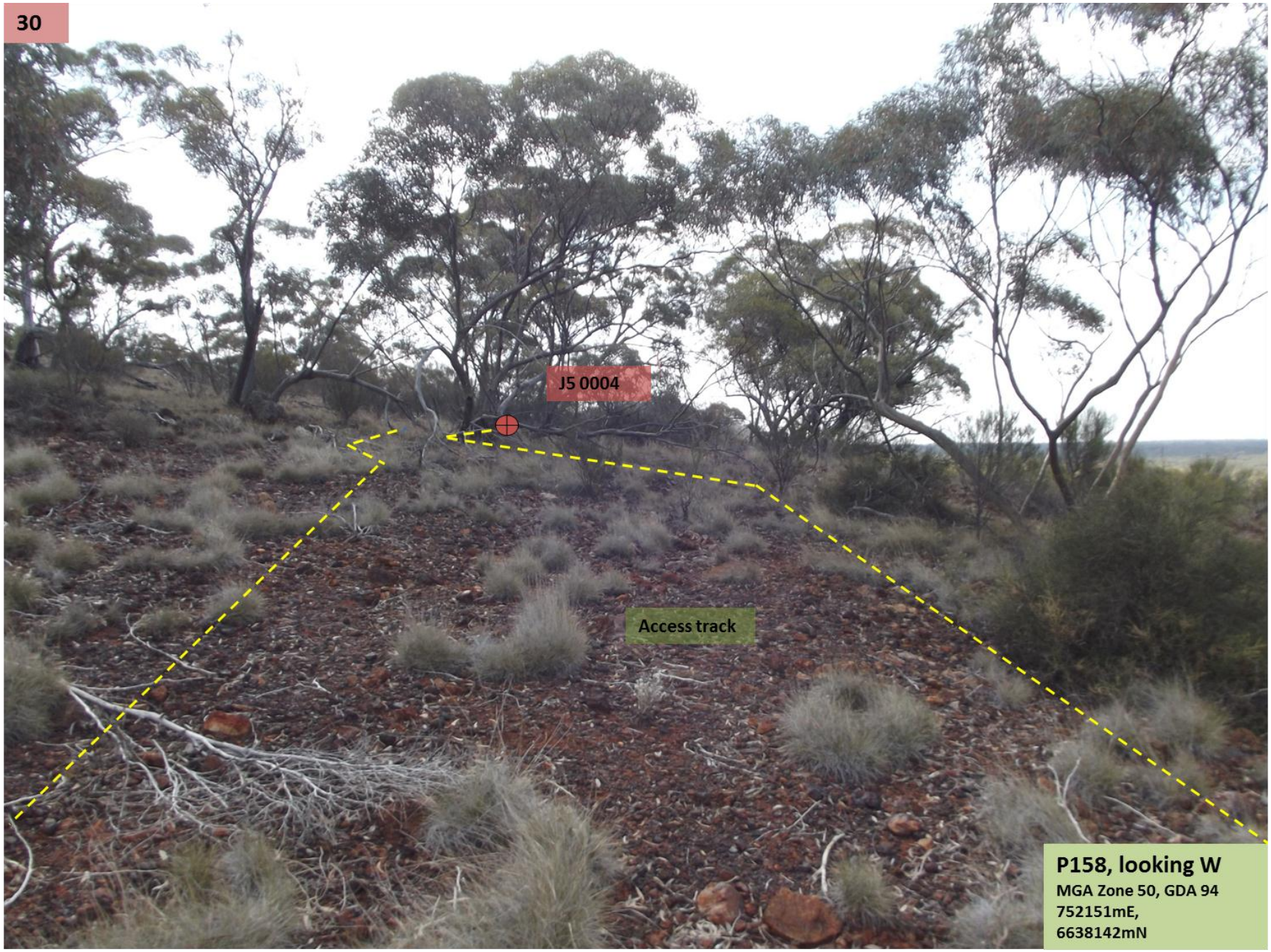
COMMENT: Pad (J50028) is planned on the existing track to be within standard pad dimensions (15m x20m). Minor benching, and clearing of vegetation to the north. Estimated impact 216t.

COMMENT: Pad (J50045) is planned on an existing pad to be within standard pad dimensions (15m x20m). Minor regrowth clearing required.

COMMENT: Pad (J50003) is planned on an existing pad and existing track to be within standard pad dimensions (15m x20m). No clearing required.



COMMENT: Pad (J50004) is planned to be within standard pad dimensions (15m x20m) with clearing required.

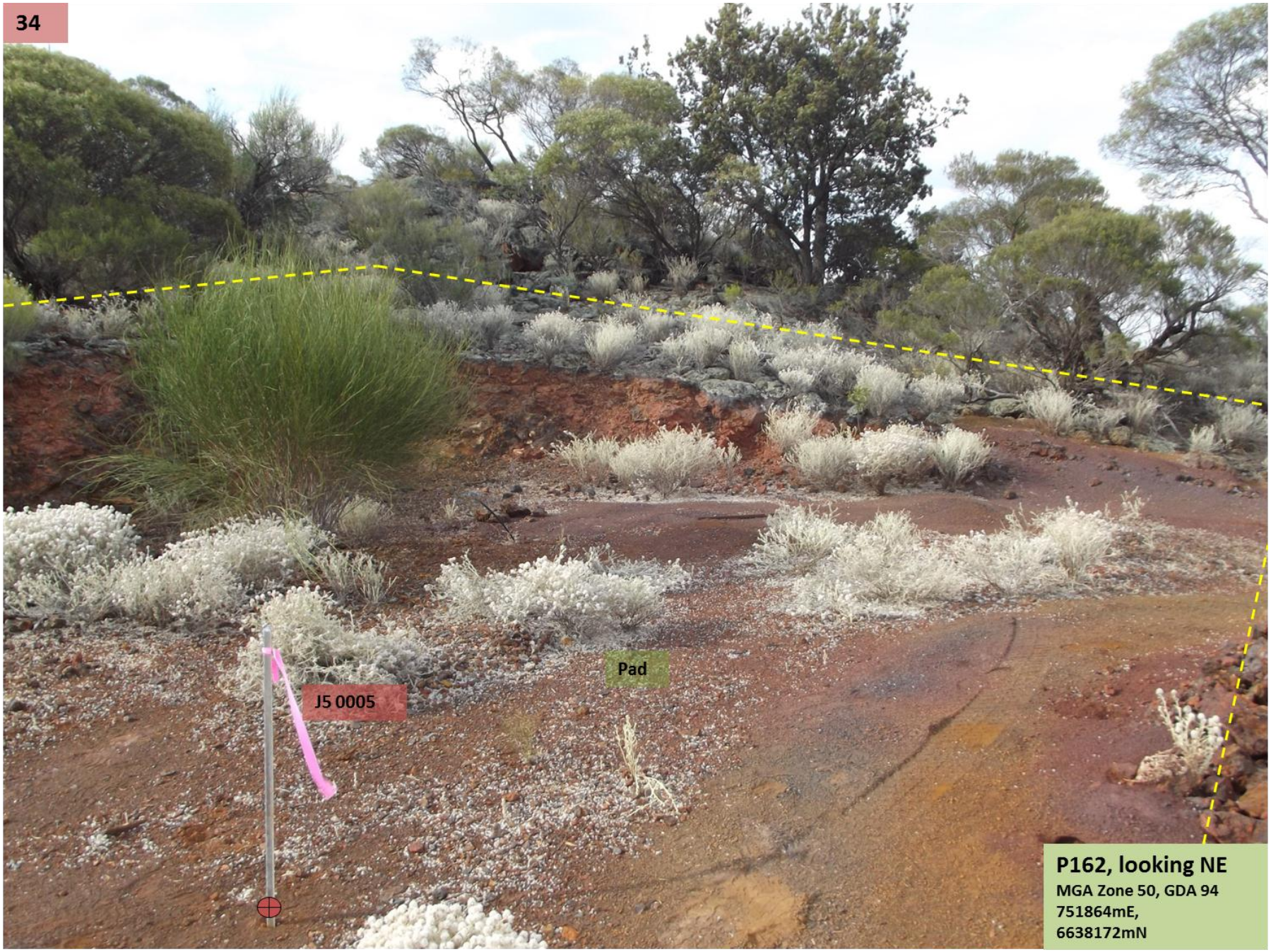


COMMENT: Proposed 20mx3.5m access track from J5RC097 to J50004. Minimal vegetation clearing (track avoids large trees).

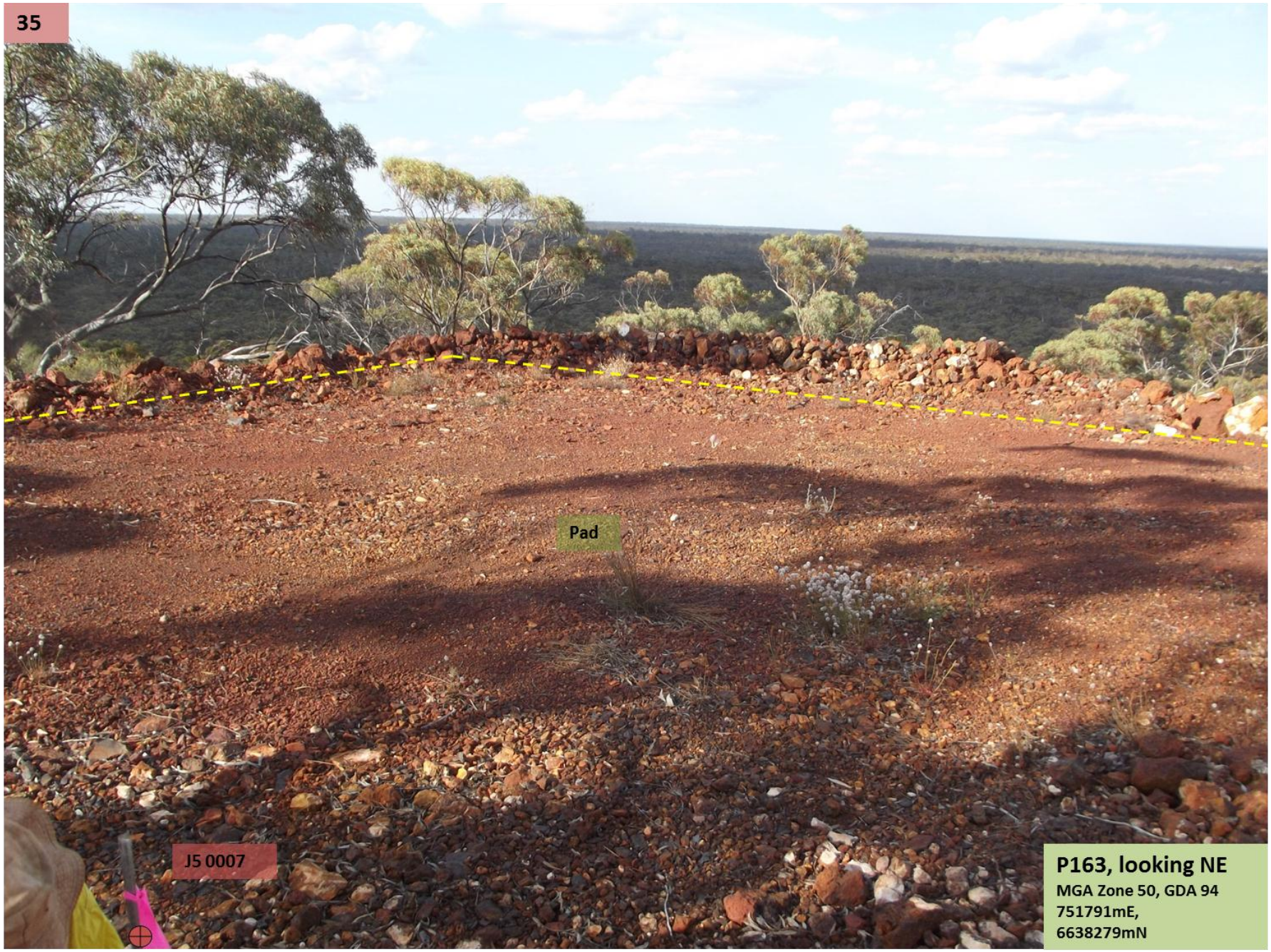
COMMENT: Planned hole (J50029) to be drilled on expanded existing pad (currently 10m x 10m, expanded to 12m x 10m). Pad to be expanded by cutting into the southern slope, estimated impact 294t.

COMMENT: Pad (J50006) planned to be within standard pad dimensions (15m x20m) with benching. Avoiding clearing large tree to west of pad. Estimated impact 360t.

COMMENT: Proposed 25mx3.5m access track from J50006 to J50029 with minimal vegetation clearing.



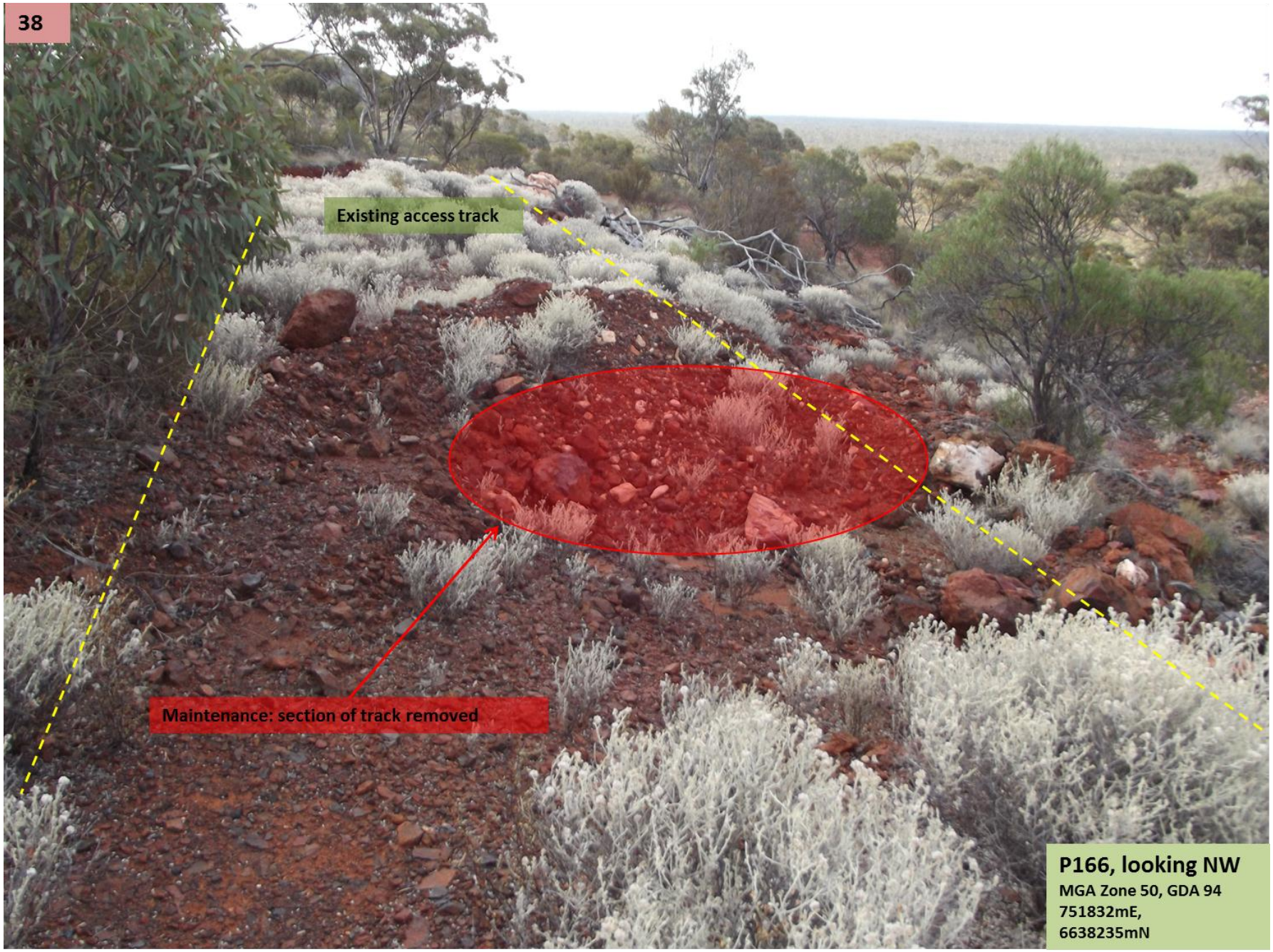
COMMENT: Planned hole (J50005) to be drilled on expanded existing pad (currently 12m x 7m). Pad to be expanded by cutting into the northern and western sides of existing pad. Estimated impact 148t.



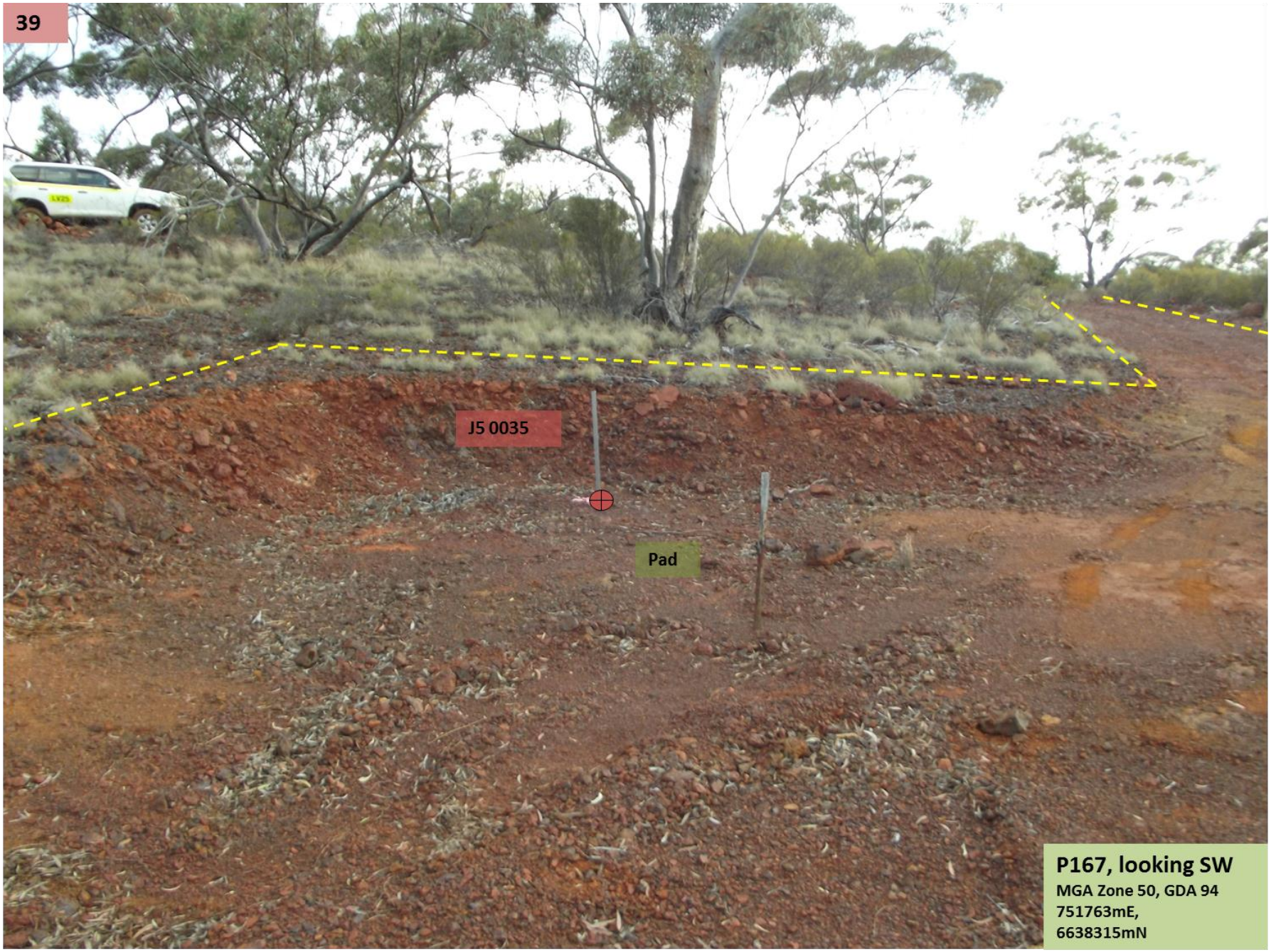
COMMENT: Existing pad (10m x 15m) in good condition for drilling (J50007). No clearing or excavation required.

COMMENT: Planned hole (J50031) is to be drilled on the expanded existing track (4m wide). Pad will be within standard pad dimensions (15m x20m). Minimal clearing of vegetation.

COMMENT: Planned hole (J50030) to be drilled on expanded existing pad (currently 7m x 6m). Pad to be expanded by cutting into the southern slope a few metres. Estimated impact 35t.



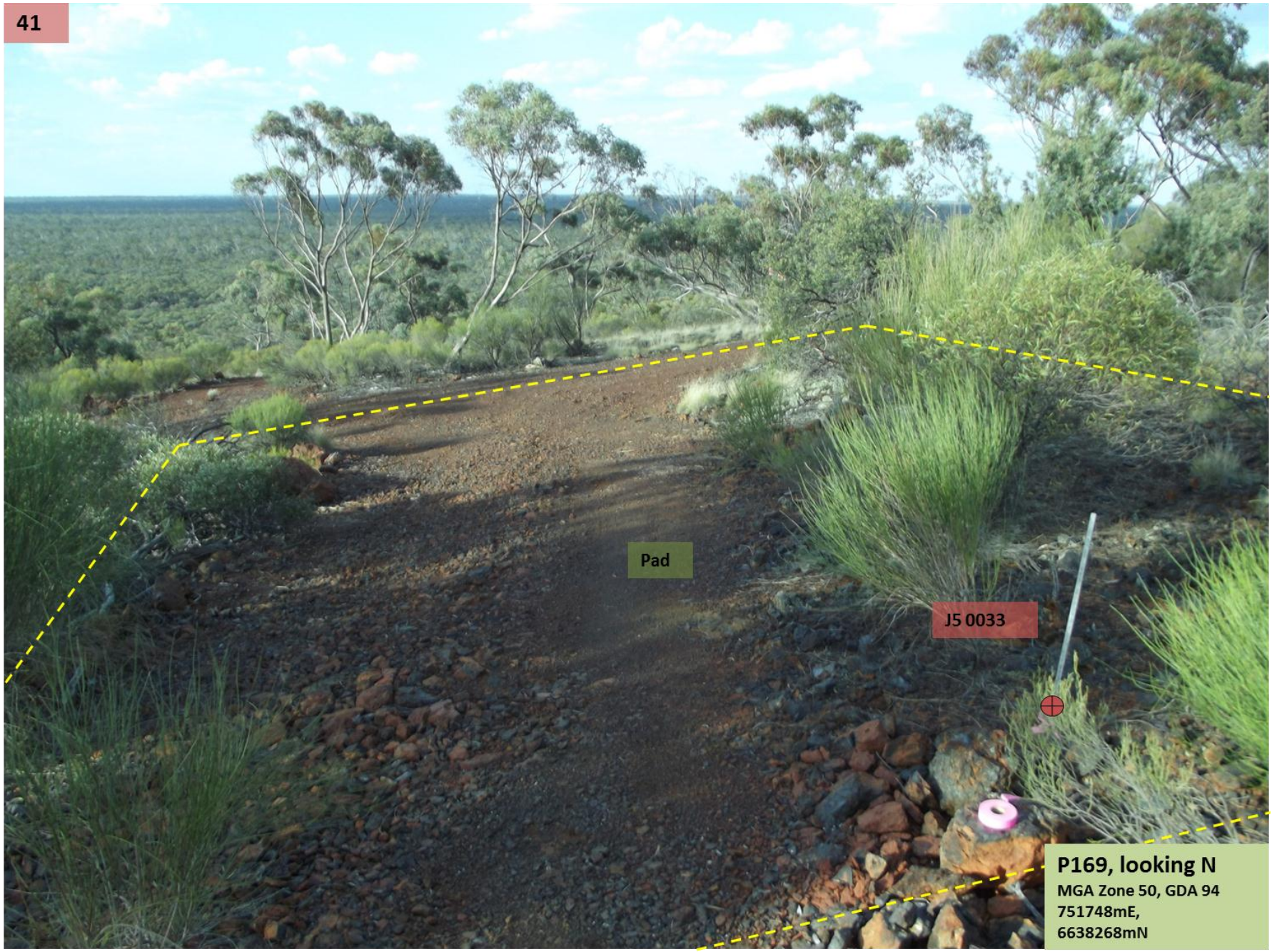
COMMENT: Existing track connecting J50030 with J50007, with large dig out in track. Section of track to be restored.



COMMENT: Planned hole (J50035) to be drilled on expanded existing pad (currently 8m x 9m). Pad to be expanded by building up the northern side. Estimated impact 112t.

40

COMMENT: Planned hole (J50034) is to be drilled on the expanded existing track (4m wide). Pad will be within standard pad dimensions (15m x20m). Minimal clearing of vegetation.



COMMENT: Planned hole (J50033) is to be drilled on the expanded existing track (4m wide). Pad will be within standard pad dimensions (15m x20m). Minimal clearing of vegetation.

COMMENT: Pad (J50044) is planned on an existing pad within standard pad dimensions (15m x20m). Clearing of regrowth required.

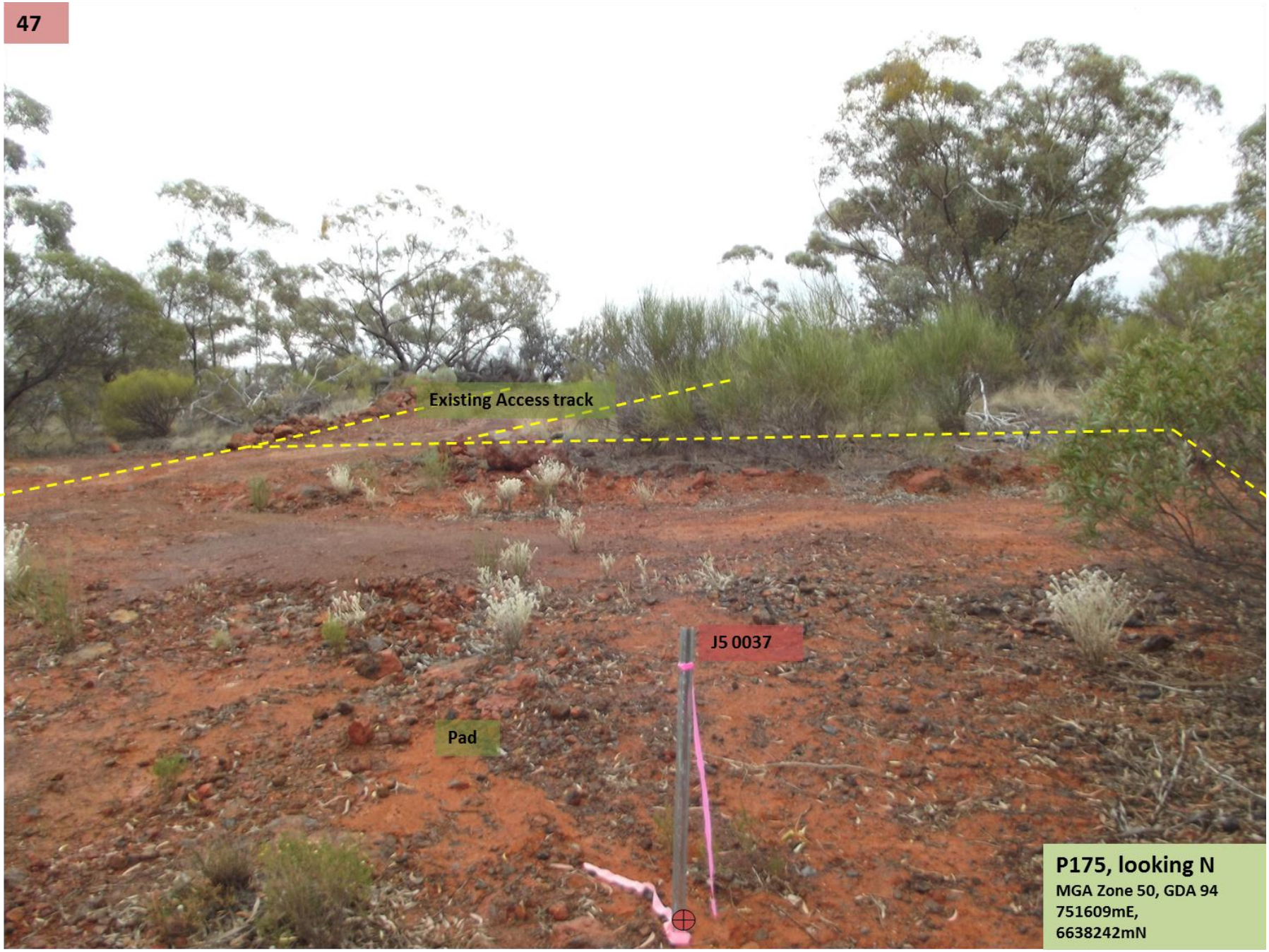
COMMENT: Planned hole (J50036) is to be drilled on the expanded existing track (4m wide). Pad will be within standard pad dimensions (15m x20m). Minimal clearing of vegetation.

COMMENT: Pad (J50008) is planned to be within standard pad dimensions (15m x20m) with benching. Minimal clearing required. Estimated impact 360t.

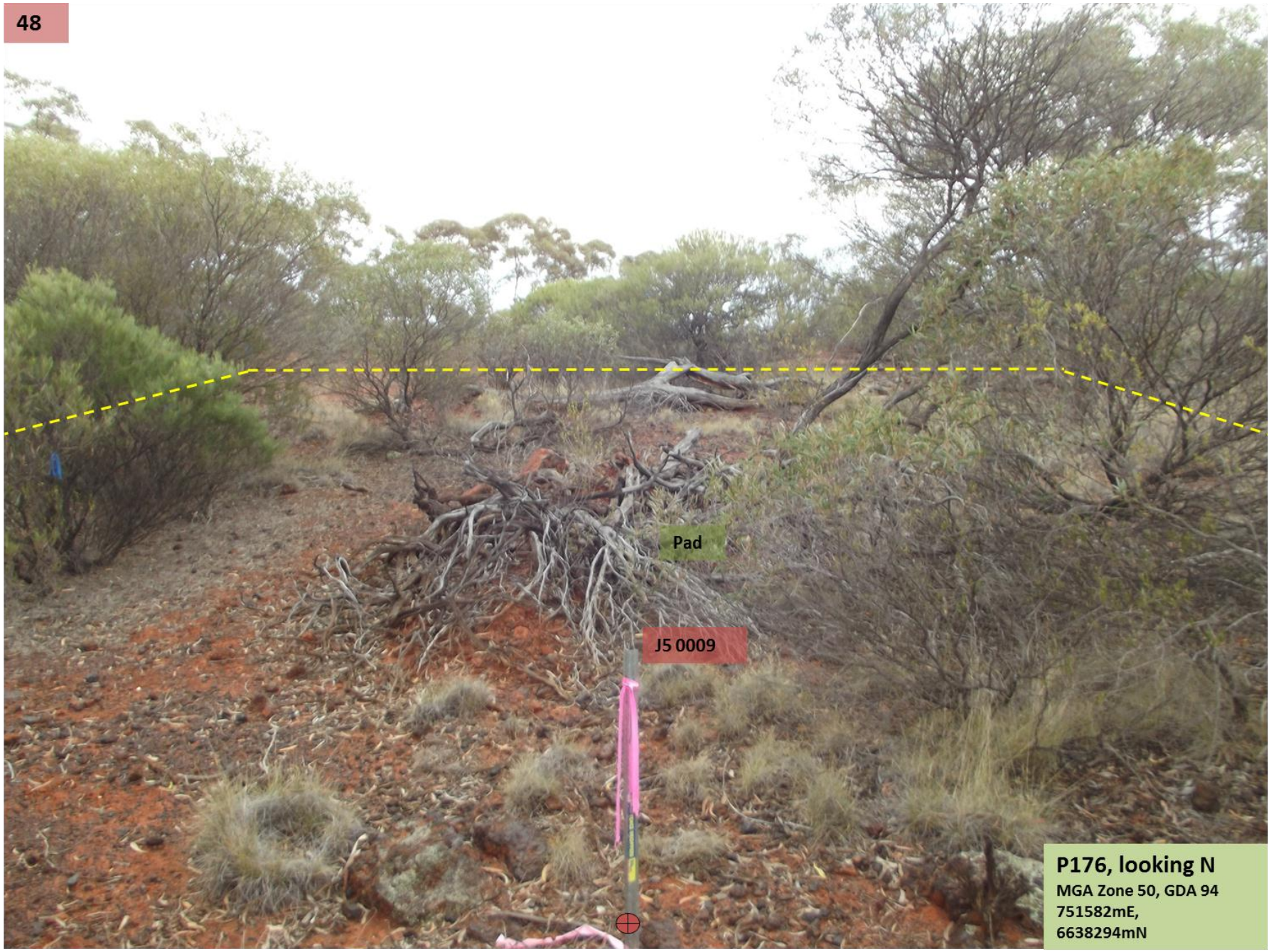
COMMENT: Proposed benched 50mx3.5m access track from J5RC070 to J50008 (50m x 6m impact). Minimal vegetation clearing (track avoids large trees and priority plants). Estimated impact 60t.

COMMENT: Planned hole (J50038) is to be drilled on the expanded existing track (4m wide). Pad will be within standard pad dimensions (15m x20m). Minimal clearing of vegetation.

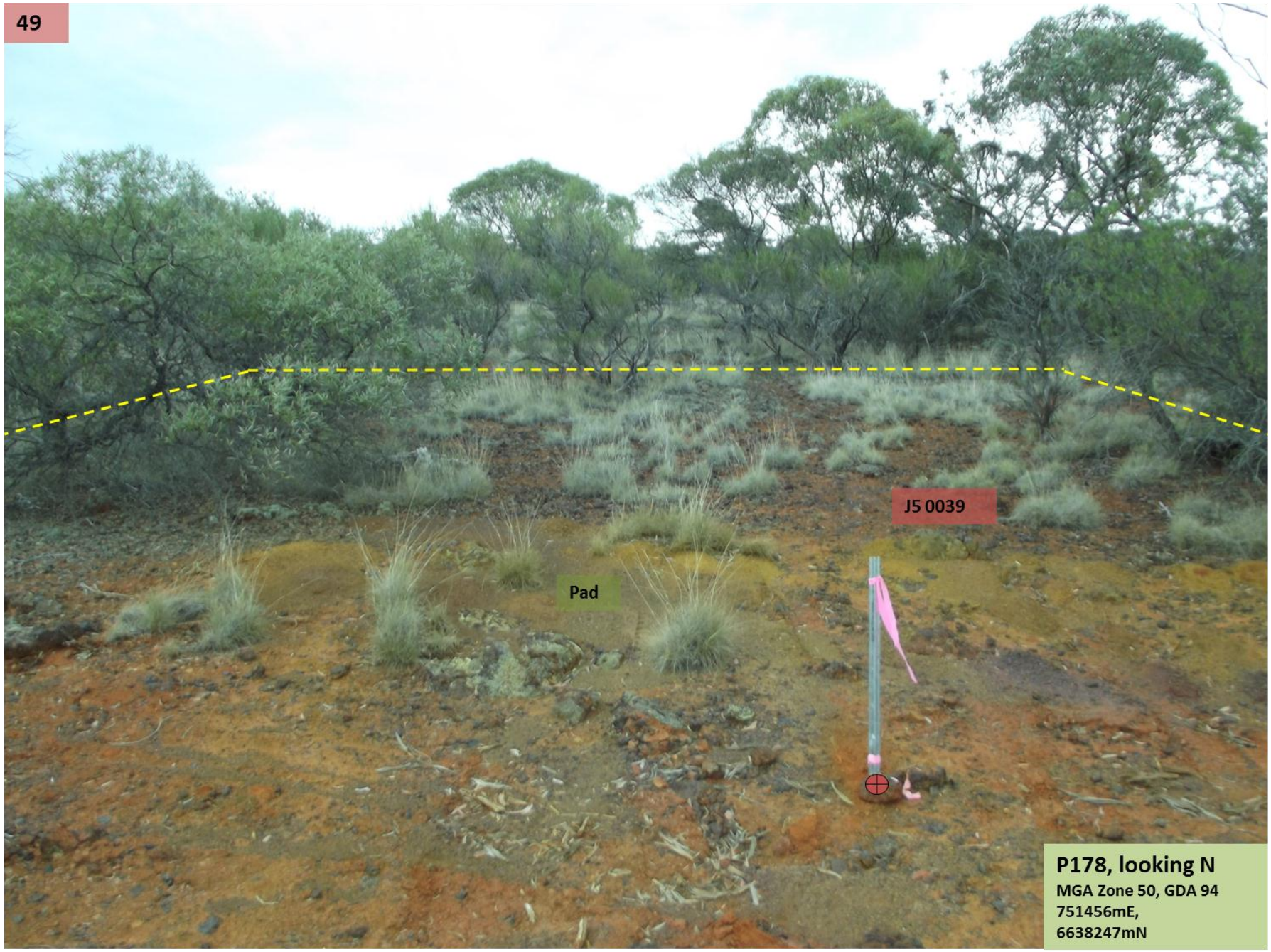
47



COMMENT: Planned hole (J50037) to be drilled on expanded existing pad (currently 8m x 10m). Pad to be expanded by using the existing access track and cutting into the northern side of existing pad.



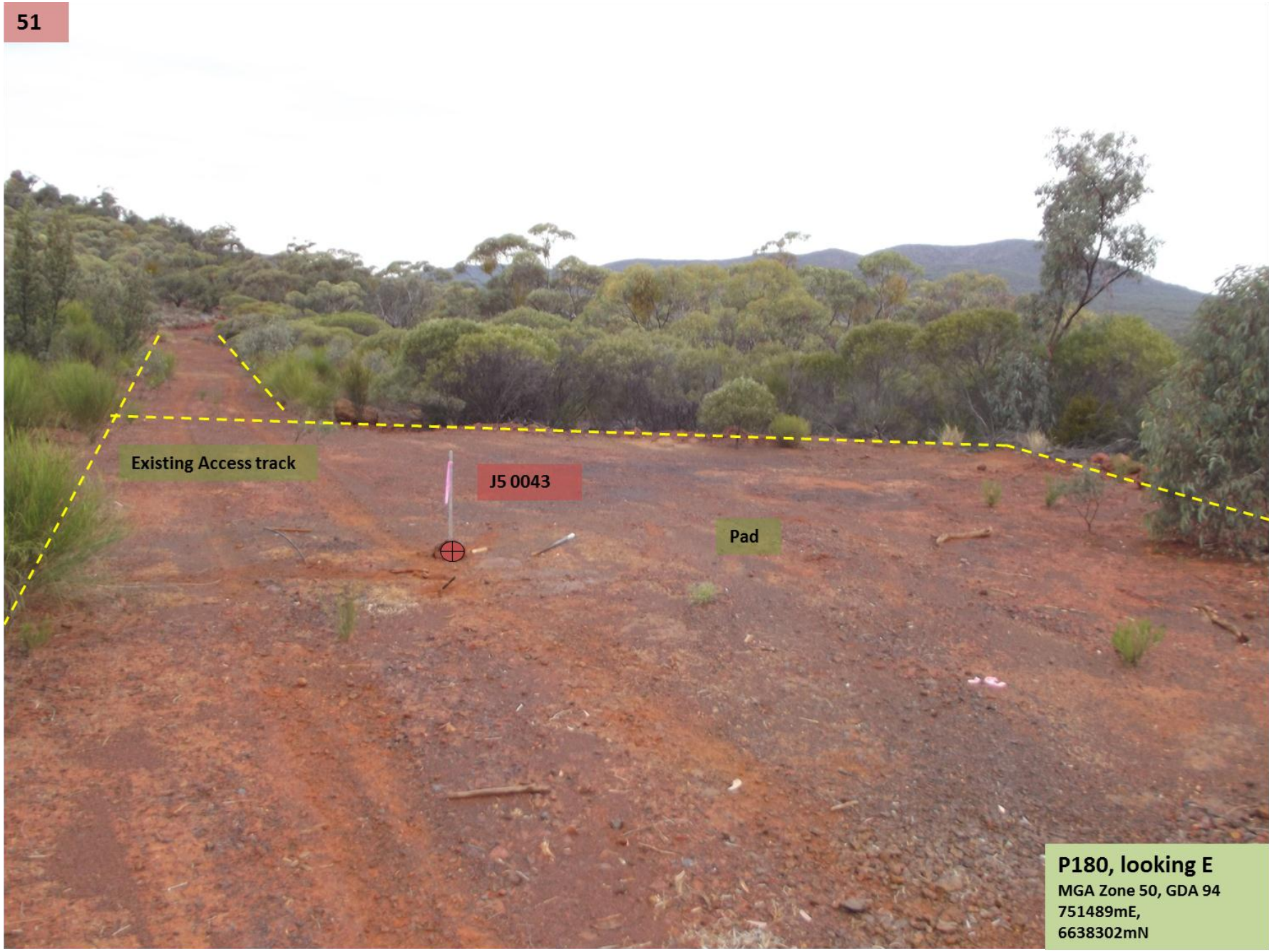
COMMENT: Pad (J50009) is planned to be within standard pad dimensions (15m x20m) including the adjacent existing access track. Minimal clearing required.



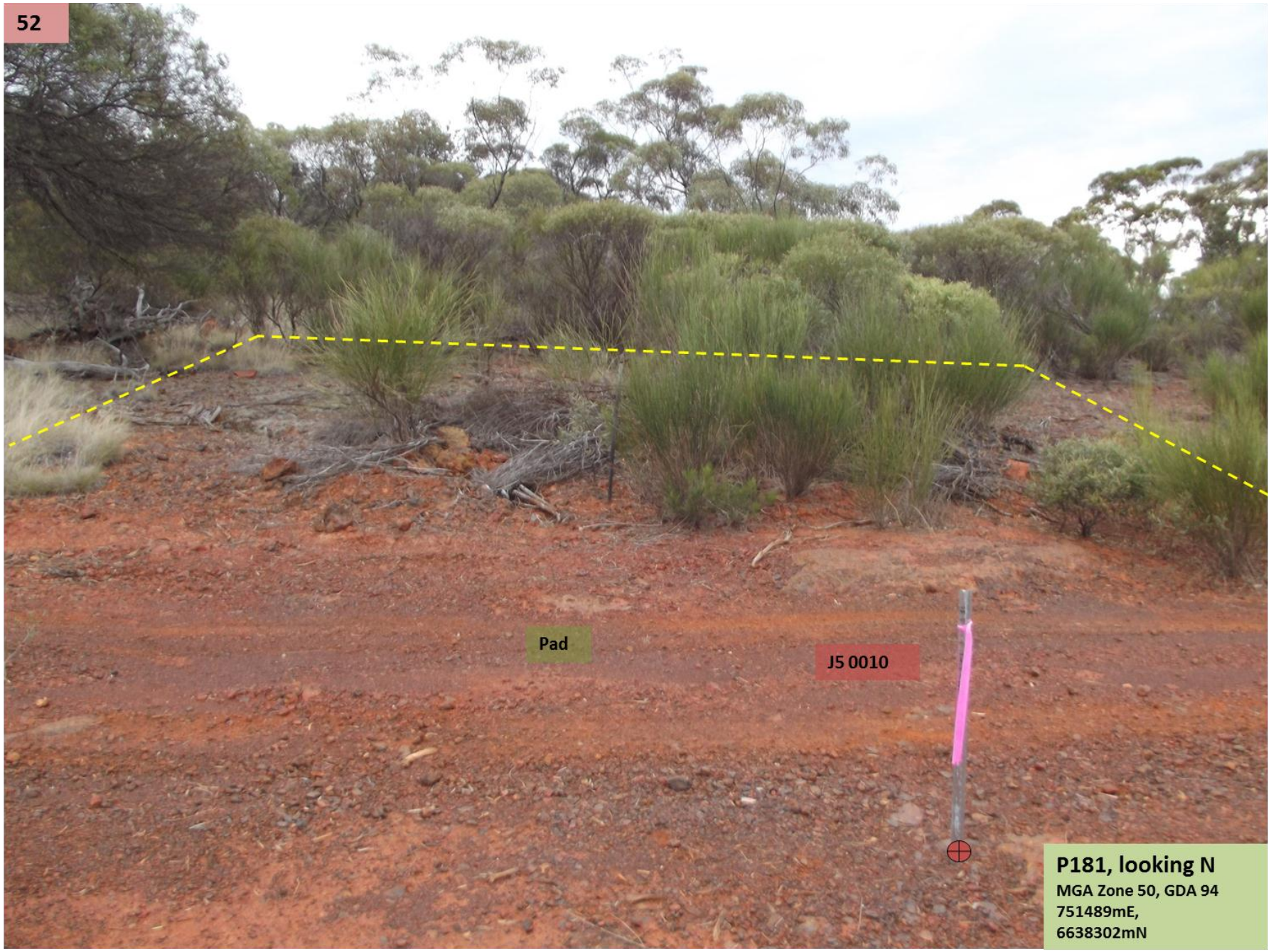
COMMENT: Planned hole (J50039) to be drilled on expanded existing pad, with pad benched and within the dimensions (15m x20m). Minimal clearing required. Estimated impact 200t.

COMMENT: Existing access track to J50039 requires widening .

51



COMMENT: Existing pad in good condition for drilling diamond twin (J50043). No clearing or excavation for pad required. Sumps needed, 2 at 3mx3mx1m within existing pad area.

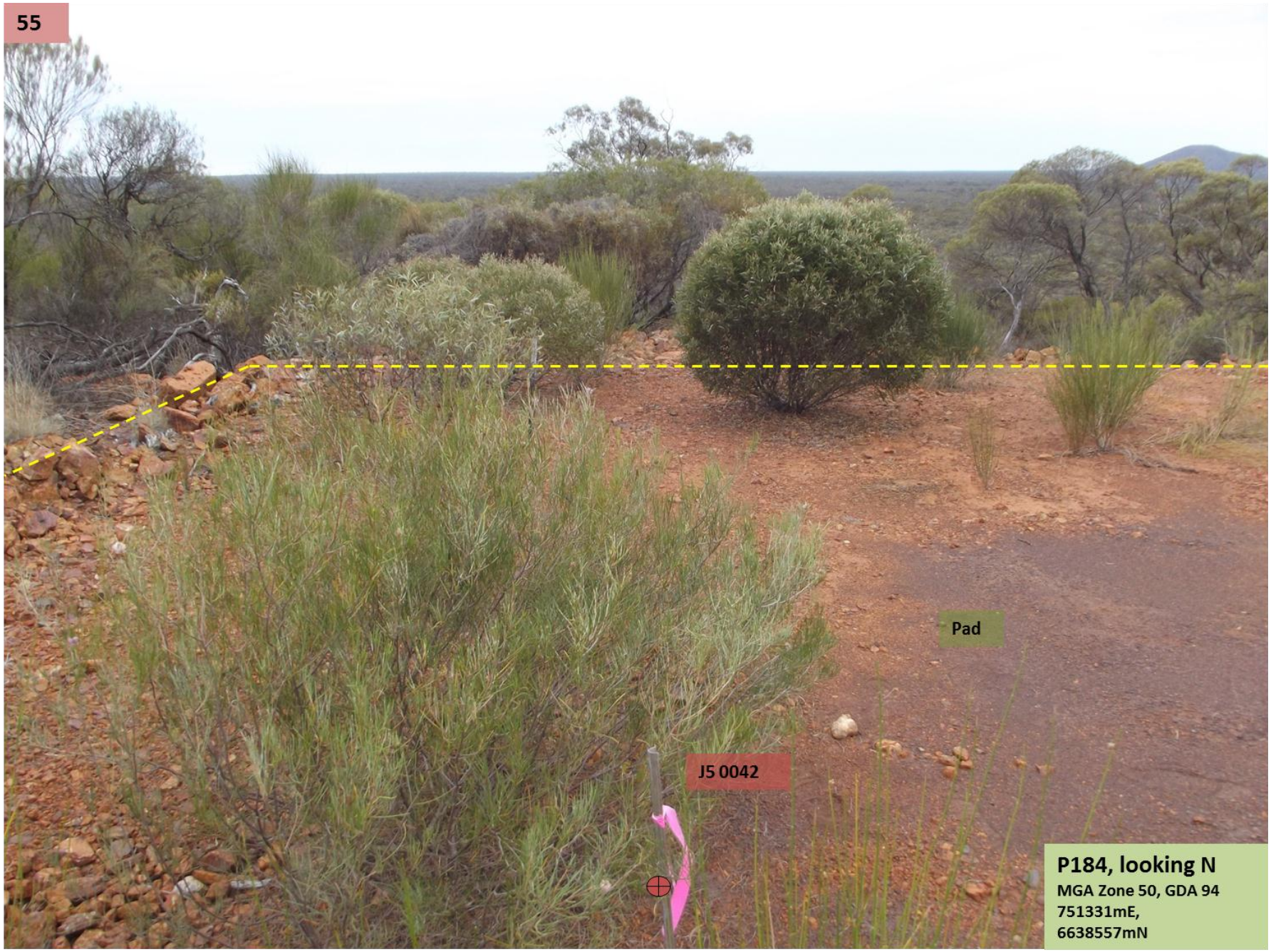


COMMENT: Planned hole (J50010) to be drilled on expanded existing pad, with pad benched and within the dimensions (15m x20m). Minimal clearing required. Estimated impact 225t.

COMMENT: Planned hole (J50040) to be drilled on expanded existing pad, with pad potentially benched and within the dimensions (15m x20m). Minimal clearing required. Estimated impact 234t.

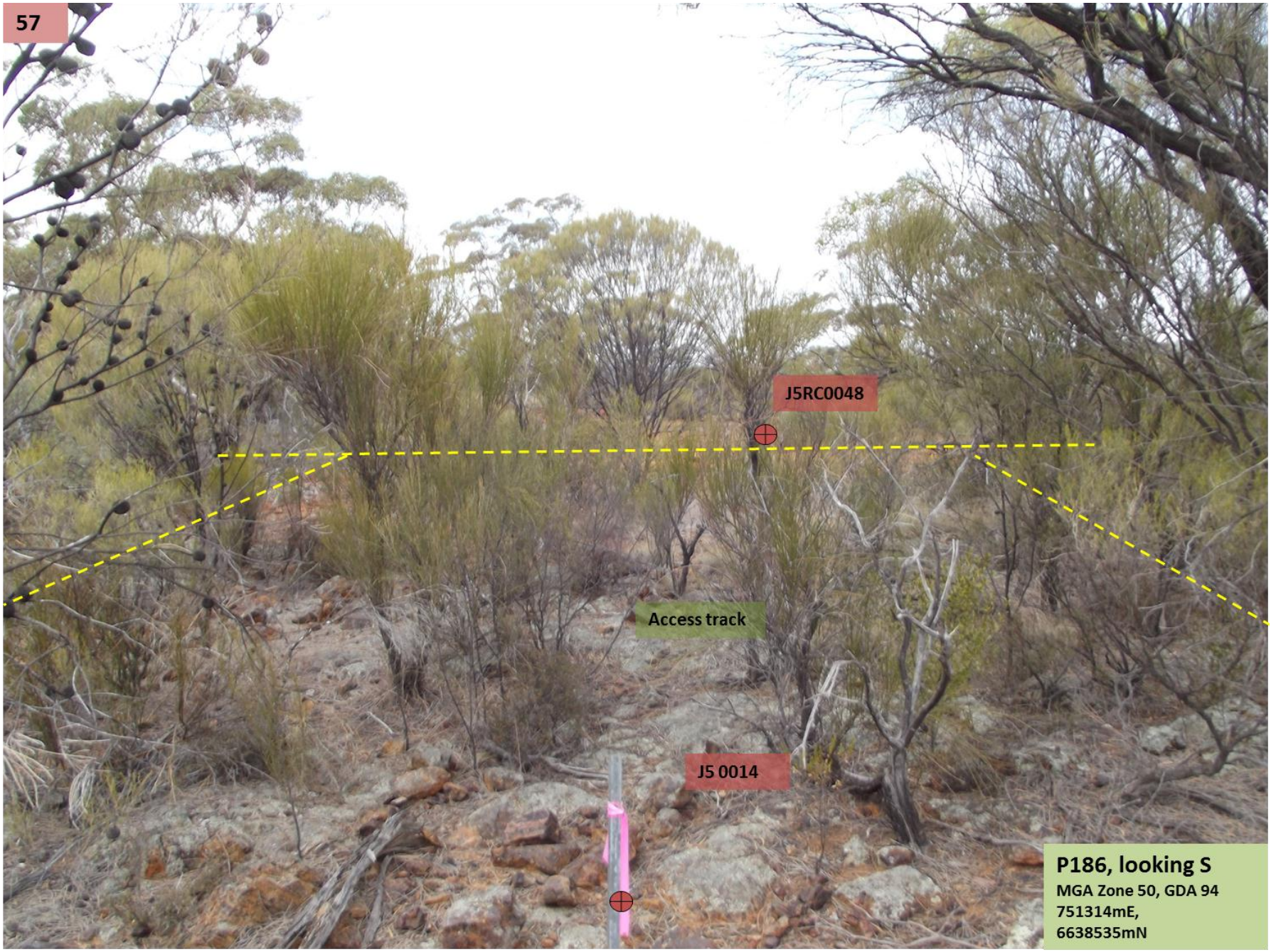
54

COMMENT: Planned hole (J50041) to be drilled on expanded existing track, with pad dimensions within (15m x20m). Minimal clearing required.



COMMENT: Existing pad in good condition for drilling (J50042). Minimal clearing of regrowth vegetation on pad required.

COMMENT: Pad (J50014) is planned to be within standard pad dimensions (15m x20m). Minor clearing required.



COMMENT: Proposed access track (12m x 3.5m) from J50014 to J5RC0048.

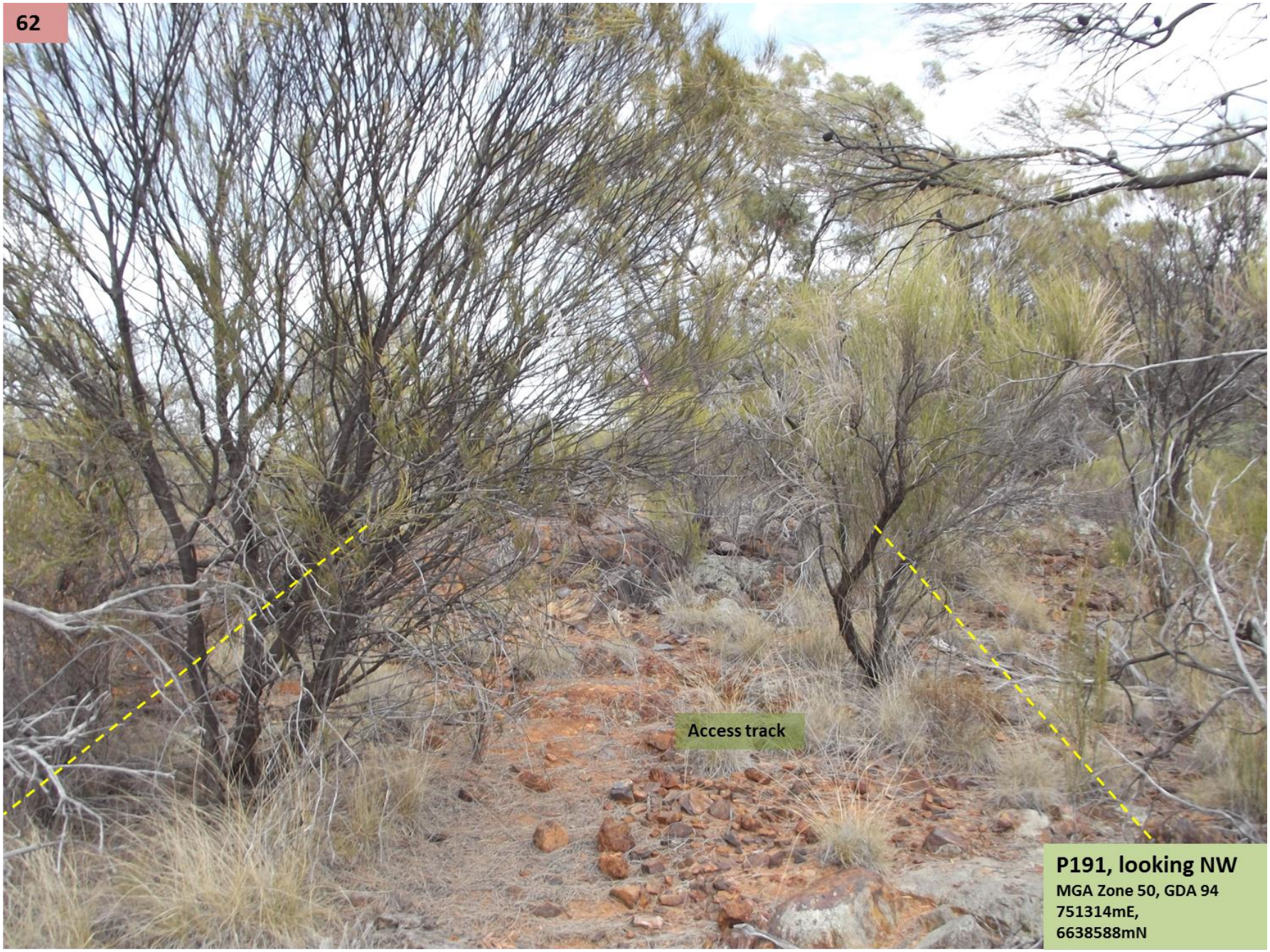
COMMENT: Pad (J50015) is planned to be within standard pad dimensions (15m x20m). Rocky outcrop requires ripping to flatten pad area. Minor clearing required.

59

COMMENT: Proposed 100mx3.5m access track from J50042 to J50015 along contours on the north slope of J5.

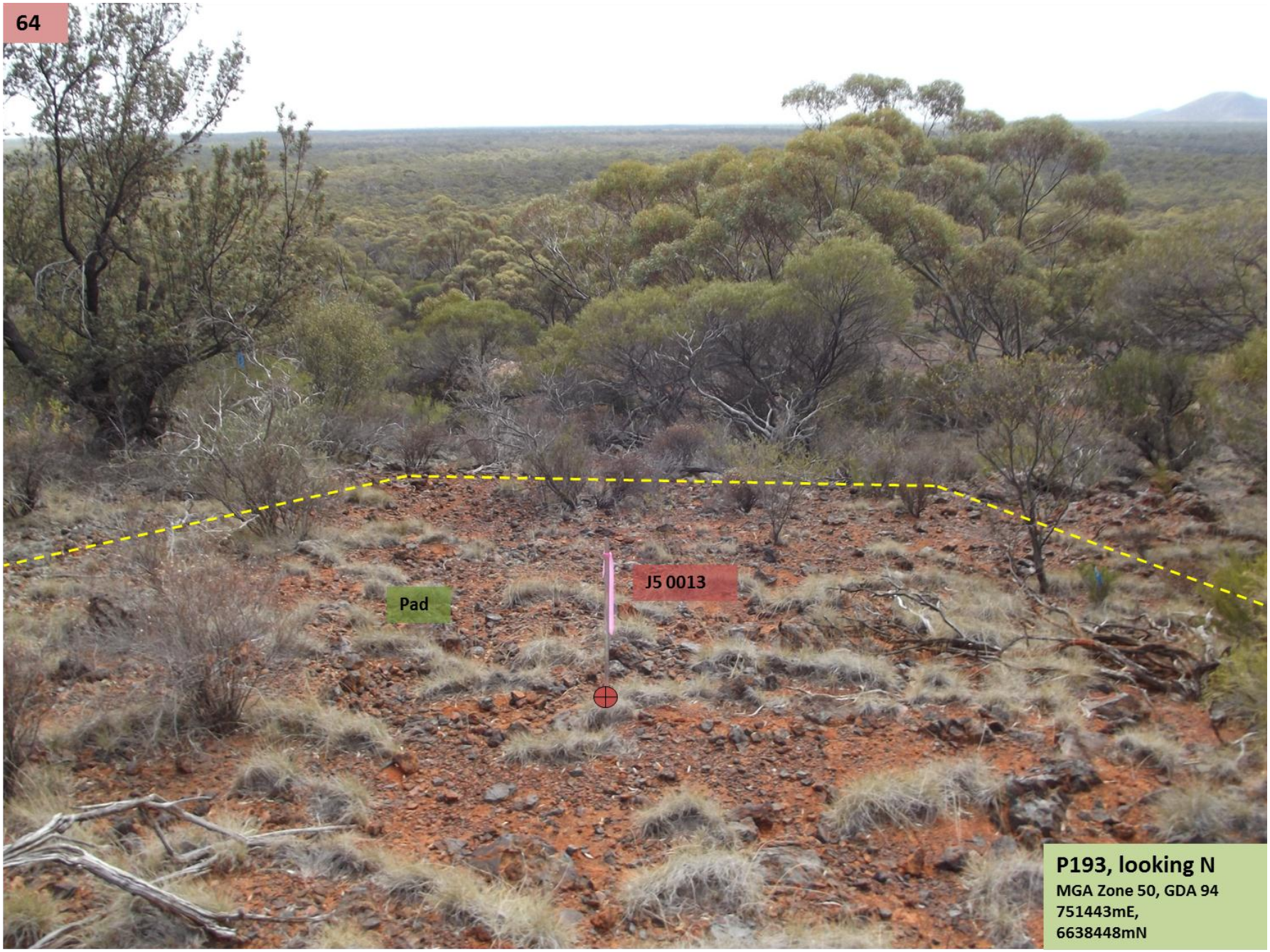
COMMENT: Proposed access track (3.5m wide) from J50042 to J50015 along contours on the north slope of J5. Same track as previous photo.

COMMENT: Proposed access track (3.5m wide) from J50042 to J50015 along contours on the north slope of J5. Same track as previous photos.



COMMENT: Proposed access track (3.5m wide) from J50042 to J50015 along contours on the north slope of J5. Same track as previous photos.

COMMENT: Proposed access track (100m x 3.5m wide) from J50042 to J50015 along contours on the north slope of J5. Same track as previous photos.



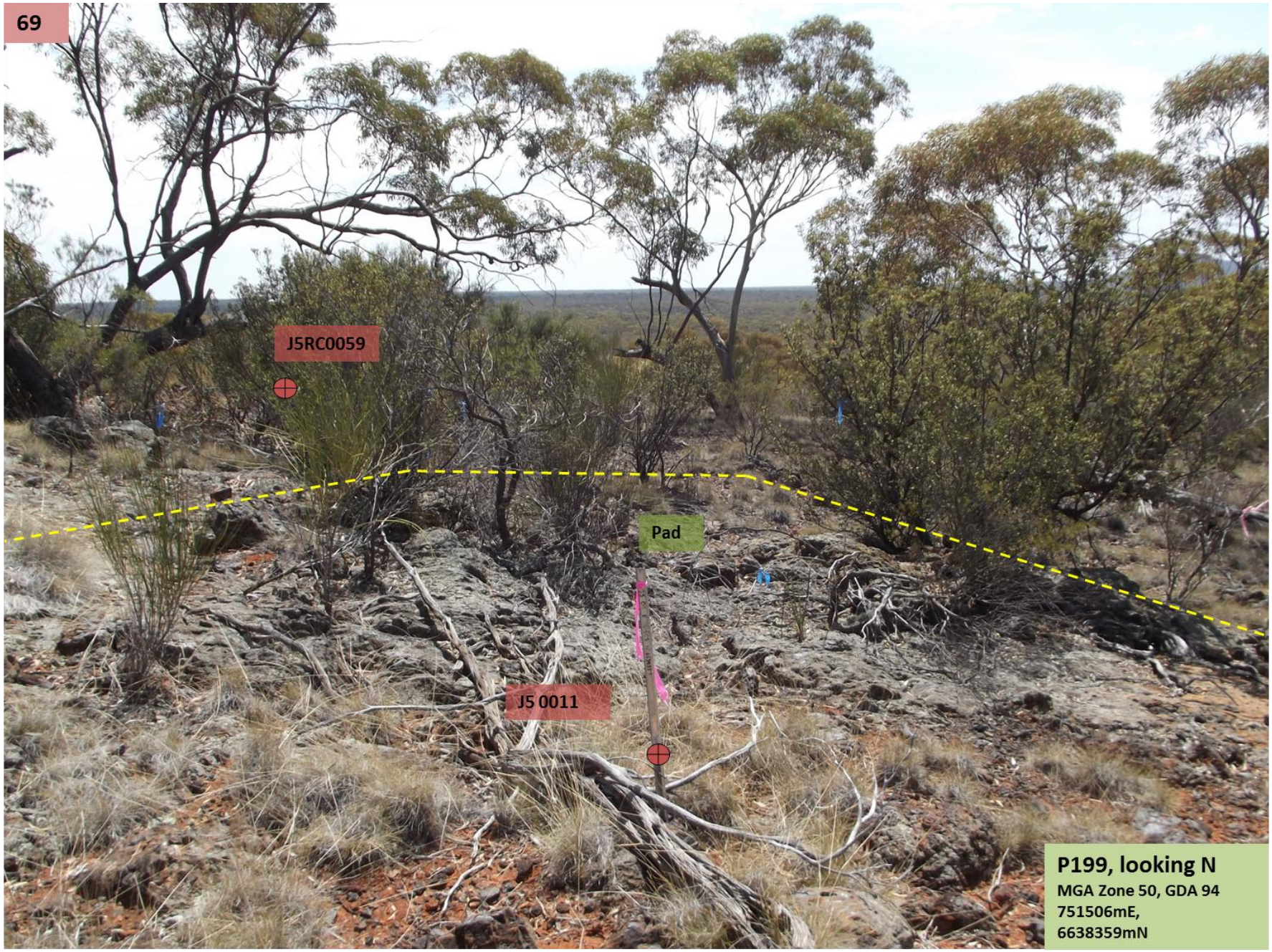
COMMENT: Pad (J50013) is planned to be within standard pad dimensions (15m x20m) with full benching and cut-down. Minimal clearing required (possible P4 impact to *Banksia arborea*). Estimated impact 360t.

COMMENT: Proposed access track (30m x 3.5m wide) from J50013 to J50058. Minimal vegetation clearing.

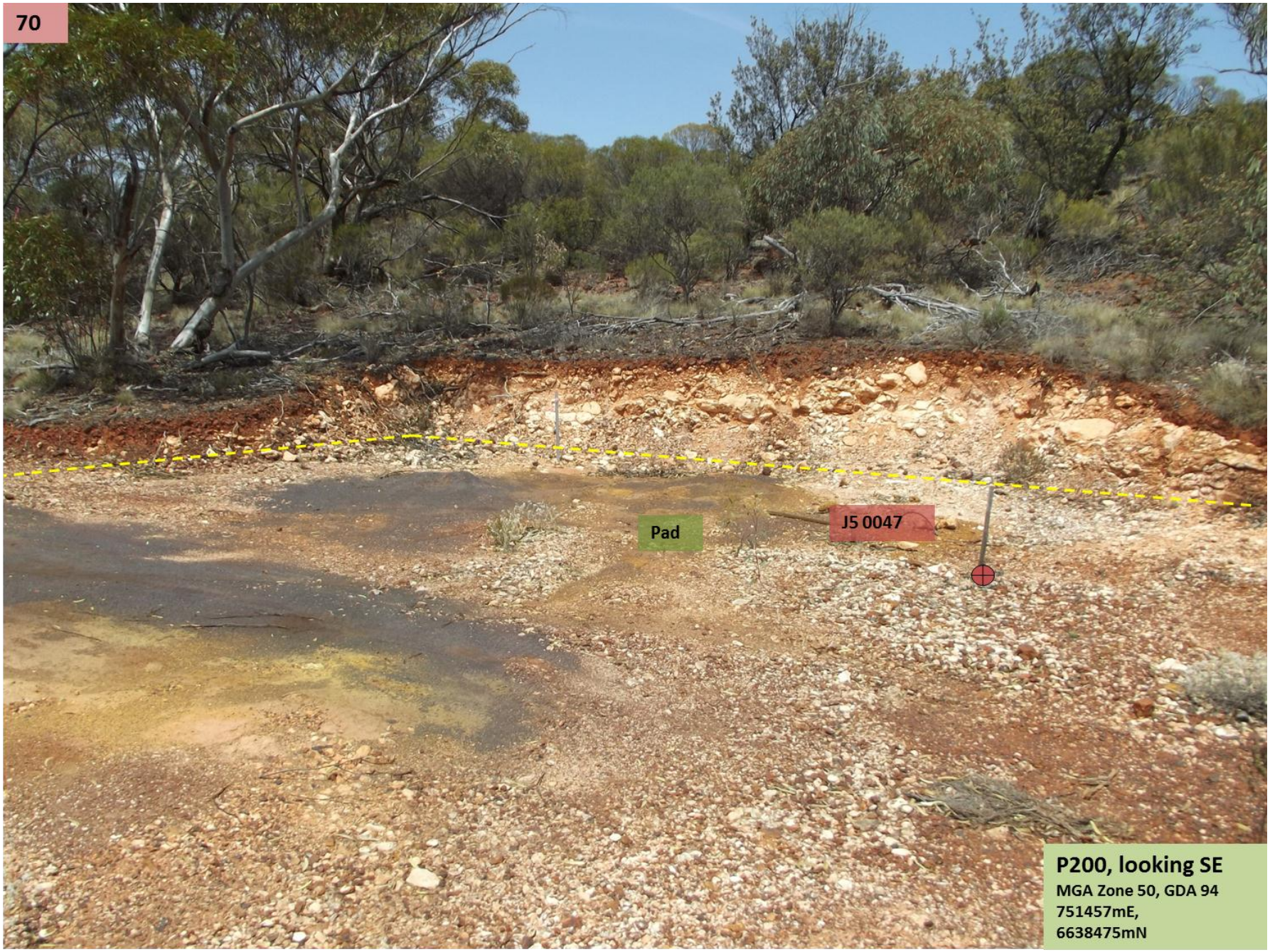
COMMENT: Proposed access track (30m x 3.5m wide) from J50058 to J50013. Minimal vegetation clearing. Same track as previous photo.

COMMENT: Pad (J50012) is planned to be within standard pad dimensions (15m x20m) with benching. Minimal clearing required.
Estimated impact 315t.

COMMENT: Proposed benched 35mx3.5m access track (35m x 6m impact) from J50012 to J50047. Minimal vegetation clearing. Estimated impact 30t.



COMMENT: Pad (J50011) is planned to be within standard pad dimensions (15m x20m). As it is located on outcrop the north side of proposed pad is to be built up. Minimal clearing required (avoid removing large tree on the western edge). Access to pad via J5RC0059.



COMMENT: Existing pad (14m x 11m) in good condition for drilling (J50047). No clearing for pad required.

Appendix B: Tenement Conditions

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Cond No	Version	Text	Compliance
1	1	Survey.	Yes
2	1	All surface holes drilled for the purpose of exploration are to be capped, filled or otherwise made safe immediately after completion.	Yes
3	1	All disturbances to the surface of the land made as a result of exploration, including costeans, drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the Environmental Officer, Department of Mines and Petroleum (DMP). Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the Environmental Officer, DMP.	Yes
4	1	All waste materials, rubbish, plastic sample bags, abandoned equipment and temporary buildings being removed from the mining tenement prior to or at the termination of exploration program.	Yes
5	1	Unless the written approval of the Environmental Officer, DMP is first obtained, the use of drilling rigs, scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface disturbance or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.	Yes
6	1	The lessee submitting a plan of proposed operations and measures to safeguard the environment to the Director, Environment, DMP for his assessment and written approval prior to commencing any developmental or productive mining or construction activity.	Yes
7	1	The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the documents titled: • "Ground Disturbance Approval Application" dated 1 September 2000 and signed by Mr Peter Collings, General Manager, Iron Ore Development for Portman Iron Ore Limited; • "Portman Limited Exploration Environmental Management Commitments" dated 27 October 2000 and signed by Mr Peter Collings, General Manager - Iron Ore Development and retained on Department of Mines and Petroleum File No. 6826/99; and • Facsimile dated 28 November 2000 from Fiona Martin for Garry Connell, Environmental Manager Koolyanobbing	Yes

		Expansion Project and retained on Department of Mines and Petroleum File No. 6826/99. • "Ground Disturbance Approval Application for Exploration Licence 77/842 dated 21 May 2001 and signed by Peter Collings" and retained on Department of Mines and Petroleum File No. 9274/01. Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail.	
8	2	The lessee submitting to the Executive Director, Environment Division, DMP, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programs for the next 12 months. This report to be submitted each year in: • April	Yes
9	1	A plan to be submitted to the Regional Environmental Officer at the completion of exploration program outlining measures to rehabilitate the project area to the satisfaction of the Regional Environmental Officer.	Yes
10	1	Constructed drill pads are to be rehabilitated at the completion of the exploration program, and the measures taken to prevent erosion.	Yes
11	1	Measures are to be taken to restrict the use of tracks for exploration. Designated access tracks are to be used to ensure minimal disturbance.	Yes
	1	**Consent to mine on DEC - Managed Lands Conservation of Flora and Fauna Reserve 48470 granted subject to the following conditions:**	Yes
12	1	Prior to lodgement of a Program of Work (POW), the lessee preparing a Conservation Management Plan (CMP) to address the conservation impacts of the proposed activities and submitting the CMP to the relevant Regional Manager of the Department of Environment and Conservation (DEC). This CMP shall be prepared pursuant to DEC-prepared "Guidelines for Conservation Management Plans Relating to Mineral Exploration on Lands Managed by the Department of Environment and Conservation" to meet the requirements of the Minister for Environment for acceptable impacts to conservation estate. A copy of the CMP and of DEC's decision on its acceptability under the guidelines is to accompany the lodgement of the POW application with the Department of Mines and Petroleum.	Yes
13	1	At least five working days prior to accessing the reserve or proposed reserve area, unless	Yes

		otherwise agreed with the relevant Regional Manager of the Department of the Environment and Conservation (DEC-R), the holder providing the DEC-R with an itinerary and program of the locations of operations on the lease area and informed at least five days in advance of any changes to that itinerary. All activities and movements shall comply with reasonable access and travel requirements of the DEC-R regarding seasonal/ground conditions	
14	1	The lessee submitting to the Director of Environment, Department of Mines and Petroleum (DMP), and to the relevant Regional Manager, Department of the Environment and Conservation (DEC-R) a project completion report outlining the project operations and rehabilitation work undertaken in the program. This report is to be submitted within six months of completion of the exploration activities.	Yes
15	1	All Mining Proposals submitted for the commencement, alteration or expansion of operations within the tenement boundary are to contain information that demonstrates the proponent has genuinely engaged with the Department of Environment and Conservation on the Mining Proposal. The level of engagement will be to the satisfaction of the Director Environment, Department of Mines and Petroleum.	Yes
16	1	Rights being reserved to persons authorised by the Chief Executive Officer of the Department of Environment and Conservation to enter the lease and carry out land management operations and other duties and exercise such powers as may be necessary or expedient for the administration of the Conservation and Land Management Act 1984 and Regulations, the Wildlife Conservation Act 1950 and Regulations, the Bush Fires Act 1954 and Regulations and the Emergency Management Act 2005 and Regulations.	Yes

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Appendix C: Flora Survey Report

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THREATENED AND PRIORITY FLORA SURVEY

JACKSON 5 PROSPECT

TENEMENT M77/1095

Prepared for

Polaris Metals Pty Ltd

Prepared by

Mattiske Consulting Pty Ltd

February 2013

PMN1301/010/13

Mattiske Consulting Pty Ltd

Disclaimer and Limitation

This report has been prepared on behalf of and for the exclusive use of Polaris Metals Pty Ltd, and is subject to and issued in accordance with the agreement between Polaris Metals Pty Ltd and Mattiske Consulting Pty Ltd. Mattiske Consulting Pty Ltd accepts no liability or responsibility whatsoever for it in respect of any use of or reliance upon this report by any third party.

This report is based on the scope of services defined by Polaris Metals Pty Ltd, budgetary and time constraints imposed by Polaris Metals Pty Ltd, the information supplied by Polaris Metals Pty Ltd (and its agents), and the method consistent with the preceding.

DOCUMENT HISTORY

Report	Version	Prepared By	Reviewed By	Submitted to Client	
				Date	Copies
Draft Report	V1	DA	MG	27/02/13	n/a
Draft Report	V2	DA	EMM	27/02/13	Email
Final Report	V3	NM/EMM	EMM	08/03/13	Email
Final Report	V4	DA	EMM	10/04/13	Email
Final Report with updated maps	V5	DA	EMM	16/04/13	Email

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B: Coordinates delineating the boundary of the Jackson 5 prospect survey area within Tenement M77/1095

C: Assessment of threatened and priority flora potentially present in the Jackson 5 prospect survey area

D: Locations and populations of *Acacia adinophylla* (P1) recorded within the Jackson 5 prospect survey area

E: Locations and populations of *Hibbertia lepidocalyx* subsp. *tuberculata* (P3) recorded within the Jackson 5 prospect survey area

F: Locations and populations of *Mirbelia ferricola* (P3) recorded within the Jackson 5 prospect survey area

G: Locations of *Neurachne annularis* (P3) survey quadrats within the Jackson 5 prospect survey area

H: Locations and populations of *Stenanthemum newbeyi* (P3) recorded within the Jackson 5 prospect survey area

I: Locations and populations of *Banksia arborea* (P4) recorded within the Jackson 5 prospect survey area

ABBREVIATIONS

DAFWA	Department of Agriculture and Food
DEC	Department of Environment and Conservation
DMP	Department of Mines and Petroleum
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
EPBC	Environment Protection and Biodiversity Conservation
IBRA	Interim Biogeographic Regionalisation for Australia
Mattiske	Mattiske Consulting Pty Ltd
PEC	Priority Ecological Community
Polaris	Polaris Metals Pty Ltd
TSSC	Threatened Species Scientific Committee
TEC	Threatened Ecological Community

1. SUMMARY

Mattiske Consulting Pty Ltd was commissioned in December 2012 by Polaris Metals Pty Ltd to undertake a search for the presence of threatened and priority flora within a 40.2 ha area of tenement M77/1095. The survey area, referred to in this report as the Jackson 5 prospect survey area, was located on an ironstone hill. The survey for threatened and priority flora took place over a six day period in December 2012 and February 2013. The Jackson 5 prospect survey area is located within both the Helena Aurora Conservation Park and the Helena and Aurora vegetation complex (P1) priority ecological community.

The survey area contained numerous tracks and old drill pads. The existing tracks are in good condition. Apart from using existing drill pads, Polaris Metals Pty Ltd proposes to construct up to 19 new drill pads, some of which will require short access track clearing. In addition one of two access corridor routes, located in the southern portion of the Jackson 5 prospect survey area, are proposed to be used to access the main drilling program area. In total, Polaris Metals Pty Ltd calculate that up to 1.20885 ha of the Jackson 5 prospect survey area would need to be cleared to accommodate new drill pad and track construction. This amounts to 3% of the Jackson 5 prospect survey area and 0.12% of tenement M77/1095.

The survey for threatened and priority flora within the Jackson 5 prospect survey area did not result in any threatened flora being recorded. Six priority flora taxa were recorded. The six priority flora taxa recorded were *Acacia adinophylla* (P1), *Hibbertia lepidocalyx* subsp. *tuberculata* (P3), *Mirbelia ferricola* (P3), *Neurachne annularis* (P3), *Stenanthemum newbeyi* (P3) and *Banksia arborea* (P4). An assessment of impacts of the proposed drilling program to the priority flora within the Jackson 5 prospect survey area has been made, at both the local and regional level. Overall, with the exception of *Acacia adinophylla* (P1), impacts to priority flora at the local level are low. At the local level, 28.42% of the *Acacia adinophylla* (P1) could be cleared if the western access corridor option is used. Whilst this is a significant portion of the local population, using the alternate eastern access corridor would avoid this level of removal of *Acacia adinophylla* (P1). Alternately, a carefully planned western corridor route, using some of the old tracks within the corridor would also significantly reduce the impacts to *Acacia adinophylla* (P1).

The main potential limitation was associated with the period at which the present survey was undertaken, and the associated likelihood of not detecting flora which is of conservation significance, particularly those which are annual species, or species which may not have previously been recorded in the area. However, given that a maximum of 3% of the Jackson 5 prospect survey area would need to be cleared to accommodate new drill pad and track construction, then the likelihood of any clearing activities having a major impact to such taxa could similarly be considered to be of a minimal level.

Given the small estimated percentage take of conservation significant flora, with the exception of *Acacia adinophylla* (P1) within the Jackson 5 prospect survey area, and the relatively small percentage of the Jackson 5 prospect survey area which would be need to be cleared to permit new drill pad and track construction, overall there would be a low level of impact to the vegetation of the area in terms of any clearing required for drilling activity.

2. INTRODUCTION

Polaris Metals Pty Ltd (Polaris) proposes to undertake a drilling program in tenement M77/1095 to evaluate the Jackson 5 iron ore deposit which consists of goethite haematite ores. Mattiske Consulting Pty Ltd (Mattiske) was commissioned in December 2012 by Polaris to undertake a search for threatened and priority flora within a defined area of mine tenement M77/1095. This defined area consisted of a 40.2 ha area of the tenement which encompasses a range of drill hole locations, together with a location for access track construction. These search areas are referred to in this report as the Jackson 5 prospect survey area.

2.1 Location and Scope of Proposal

Tenement M77/1095 is located approximately 52 km NNE of Koolyanobbing and 100 km NNE of Southern Cross in the Shire of Yilgarn in Western Australia (Figure 1). The scope of work specified by Polaris was to search for threatened and priority flora within three specific areas of tenement M77/1095. These three areas consisted of:

1. an approximately 35 ha area located on the upper slopes and ridges of a hill which contained proposed drill holes locations;
2. a 440 m access track alignment; and
3. a 980 m access track alignment.

The total area surveyed was 40.2 ha. Two proposed access track routes are incorporated into the narrow section of the survey area located to the south on the main hill (Figure 2). One access route originates at Mt Dimer Rd (eastern end of narrow corridor), whilst the other originates at an existing access track at the western end of the narrow corridor. The Jackson 5 prospect survey area contains numerous tracks and old drill pads from previous exploration drilling activities, principally those undertaken by Cliff's Natural Resources Inc. (formerly Portman Iron Ore Ltd).

2.2 Western Australia's Flora and Vegetation – A Legislative perspective

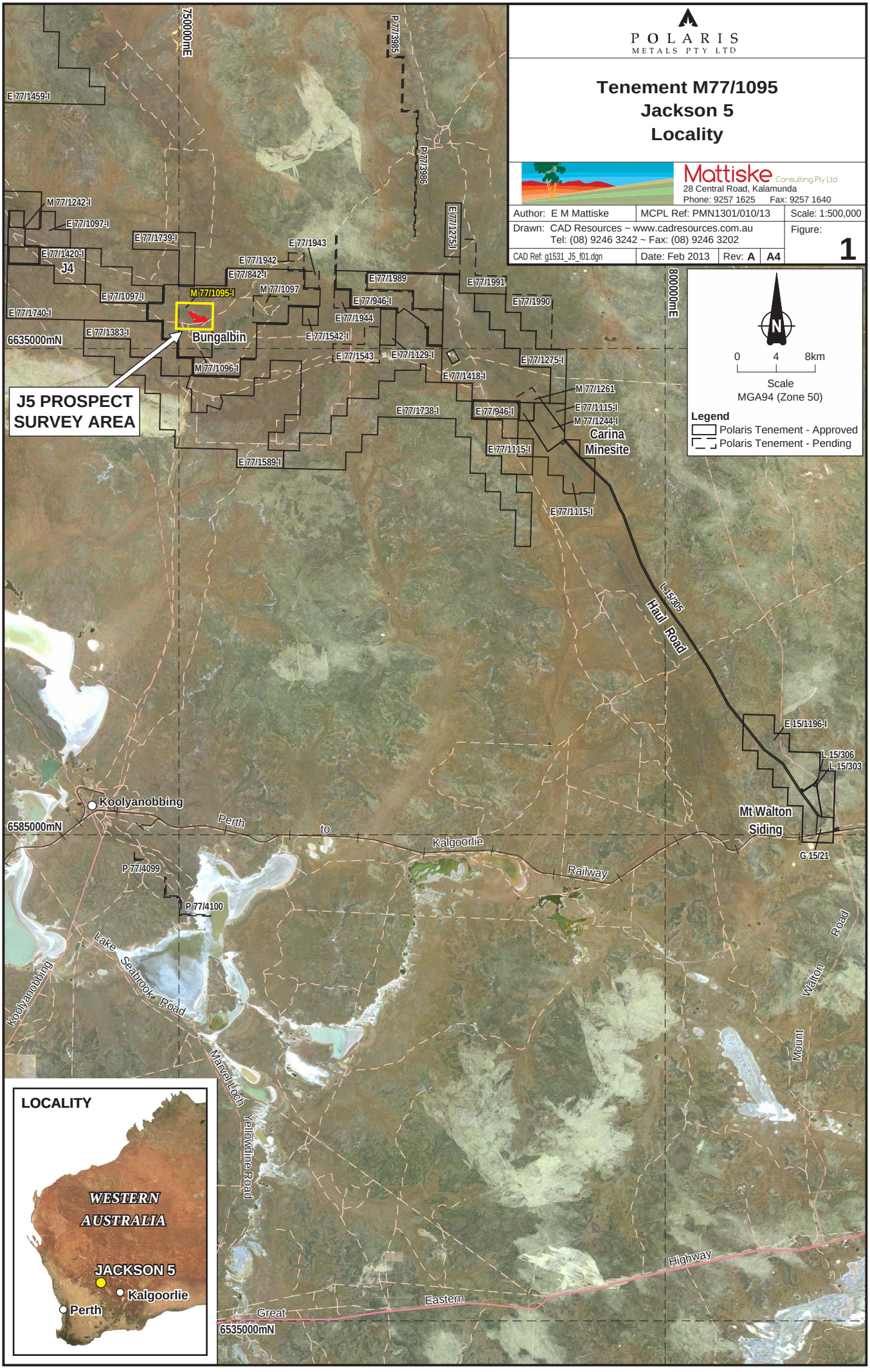
The legislative protection of flora and vegetation within Western Australia is principally governed by three Acts, namely:

- The *Wildlife Conservation Act 1950*;
- The *Environmental Protection Act 1986*; and
- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

These three acts provide for the protection of threatened flora, fauna (and fauna habitats) and ecological communities, while also addressing specific threats such as the clearing of native vegetation.

Where flora has been gazetted as threatened flora under the *Wildlife Conservation Act 1950*, it is an offence "to take" such flora without the written consent of the Minister. The *Wildlife Conservation Act 1950* states that "to take" flora includes to gather, pluck, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means. Under the *Environment Protection and Biodiversity Conservation Act 1999*, a person must not take an action that has or will have a significant impact on a listed threatened species without approval from the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities, unless those actions are not prohibited under the Act.

At the State level, ecological communities may be considered as threatened under the *Environmental Protection Act 1986* once they have been identified as such by the Western Australian Threatened Ecological Communities Scientific Advisory Committee. At the Commonwealth level, some Western Australian TECs are listed as threatened, under the *Environment Protection and Biodiversity Conservation Act 1999*. Under the *Environment Protection and Biodiversity Conservation Act 1999*, a person must not take an action that has or will have a significant impact on a listed threatened ecological community without approval from the Commonwealth Minister for the Sustainability, Environment, Water, Population and Communities, unless those actions are not prohibited under the Act.


POLARIS
METALS PTY LTD
Tenement M77/1095
Jackson 5
Locality
Mattiske Consulting Pty Ltd
28 Central Road, Kalamunda
Phone: 9257 1625 Fax: 9257 1640
Author: E M Mattiske
MCPL Ref: PMN1301/010/13
Scale: 1:500,000
Drawn: CAD Resources ~ www.cadresources.com.au
Tel: (08) 9246 3242 ~ Fax: (08) 9246 3202
Figure: 1
CAD Ref: g1531_J5_f01.dgn
Date: Feb 2013
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M 77/1242-I
E 77/1097-I
E 77/1739-I
E 77/1420-I
J4
E 77/1740-I
E 77/1383-I
M 77/1095-I
M 77/1097
E 77/842-I
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E 77/1543
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M 77/1096-I
E 77/946-I
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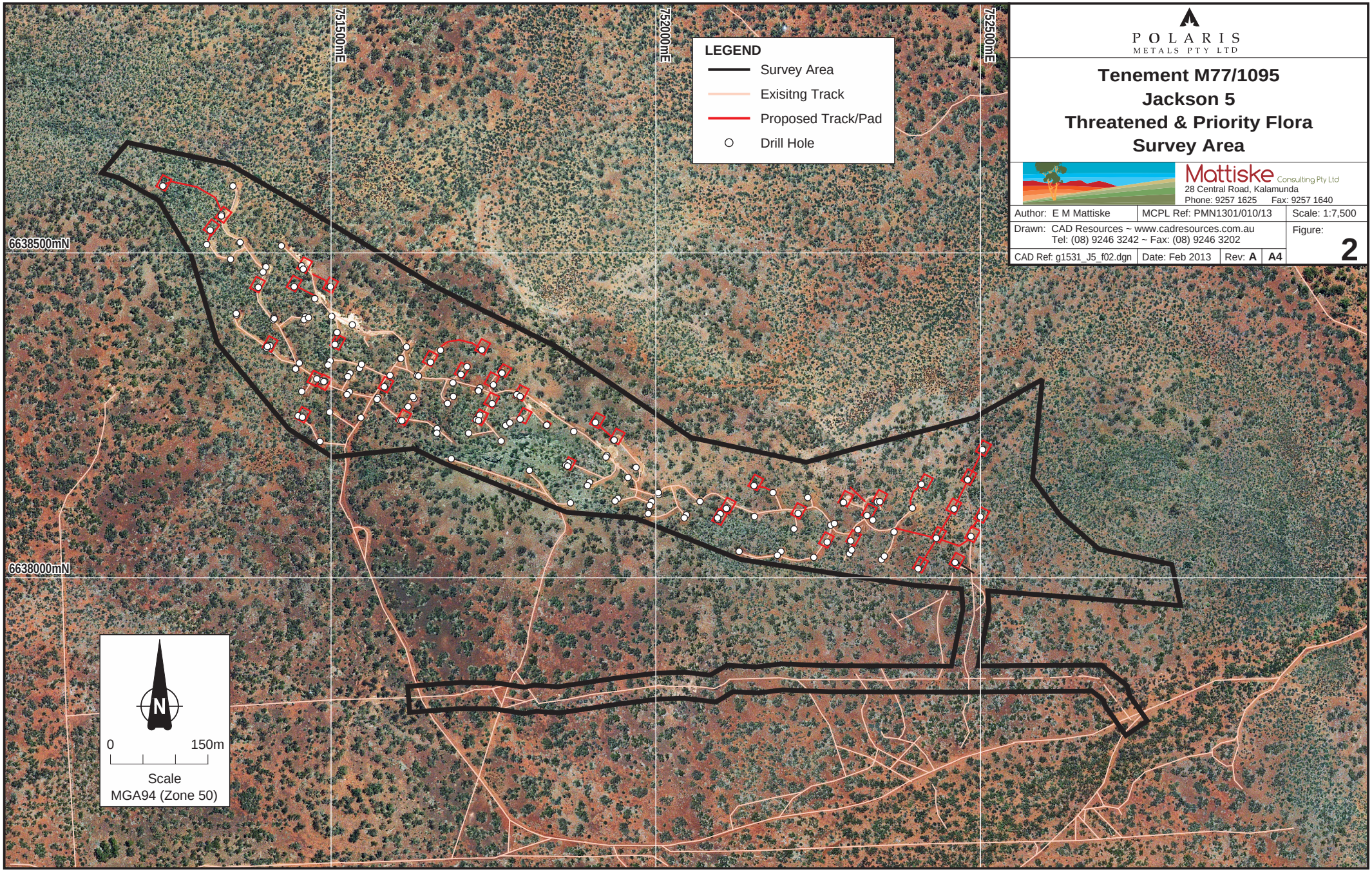
E 77/1275-I
E 77/1418-I
E 77/1738-I
E 77/946-I
M 77/1261
E 77/1115-I
M 77/1244-I
Carina
Minesite
E 77/1589-I
E 77/1115-I
E 77/1115-I
P 77/3985
P 77/3986
E 77/1275-I
Bungalbin
J5 PROSPECT
SURVEY AREA
0 4 8km
Scale
MGA94 (Zone 50)
Legend
Polaris Tenement - Approved
Polaris Tenement - Pending
L 15/305
Haul Road
E 15/1196-I
L 15/306
L 15/303
Mt Walton
Siding
G 15/21
Koolyanobbing
Perth
to
Kalgoorlie
Railway
P 77/4099
P 77/4100
Lake Seabrook Road
Koolyanobbing
Marvel Loch
Yellowdine Road
Walton Road
Mount
Great Eastern Highway
LOCALITY
WESTERN AUSTRALIA
JACKSON 5
Kalgoorlie
Perth



POLARIS METALS PTY LTD

Tenement M77/1095
Jackson 5
Threatened & Priority Flora
Survey Area

Mattiske Consulting Pty Ltd
28 Central Road, Kalamunda
Phone: 9257 1625 Fax: 9257 1640

Author: E M Mattiske	MCPL Ref: PMN1301/010/13	Scale: 1:7,500
Drawn: CAD Resources ~ www.cadresources.com.au Tel: (08) 9246 3242 ~ Fax: (08) 9246 3202		Figure: 2
CAD Ref: g1531_J5_f02.dgn	Date: Feb 2013	Rev: A A4

In addition to legislative protection, Department of Environment and Conservation categorises priority flora using five categories, P1 to P5, to denote the conservation priority status of such species, with P1 listed species being the most threatened, and P5 the least. A similar listing is applied to priority ecological communities. Both threatened and priority listings are regularly reviewed by the relevant agencies, and may have their status changed when more information on the species or community becomes available. Appendix A sets out definitions of both threatened and priority flora and ecological communities, as well as additional information on environmental protection legislation and how it is applied in Western Australia.

Under the *Environmental Protection Act 1986*, the clearing of native vegetation requires a permit to do so, from the Department of Environment and Conservation or the Department of Mines and Petroleum, unless that clearing is exempted under specific provisions listed in Schedule 6 of the Act, or are prescribed in the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. The *Environmental Protection Act 1986*, defines "native vegetation" as indigenous aquatic or terrestrial vegetation, and includes dead vegetation unless that dead vegetation is of a class declared by regulation to be excluded from this definition but does not include vegetation in a plantation.

Under the *Environmental Protection Act 1986*, Section 51A, "clearing" means the killing or destruction of, the removal of, the severing or ringbarking of trunks or stems of, or the doing of any other substantial damage to, some or all of the native vegetation in an area, and includes the draining or flooding of land, the burning of vegetation, the grazing of stock, or any other act or activity, that causes any of the aforementioned consequences or results. Appendix A sets out additional information relevant to the clearance of native vegetation as described under the *Environmental Protection Act 1986*.

Flora or vegetation may be locally or regionally significant in addition to statutory listings by the State or Federal Government. While not legislatively protected, these factors are taken into consideration during the assessment of mining proposals, clearing proposals and other proposed development; Guidance Statement 51 specifically states:

> "A broad consideration of the ecological processes that influence sites and their ecological functions is required; statutory lists of Declared Rare and Priority Flora are only a small subset of biodiversity. Proponents should ensure that flora and vegetation surveys provide sufficient information to address both biodiversity conservation and ecological function values within the context of the type of proposal being considered and the relevant EPA objectives for protection of the environment" (EPA 2004).

Appendix A describes what factors may lead to a species or community to be considered locally or regionally significant.

2.3 Declared Plant Species

Declared plant species are introduced taxa (weeds) that are considered to be particularly invasive, especially with respects to the agricultural environment. The *Agriculture and Related Resources Protection Act 1976*, Section 35, makes provision for classes of plants to be listed as declared in respect of parts of, or the entire State. According to the *Agriculture and Related Resources Protection Act 1976*, a declared plant is defined as a plant belonging to a class of plants declared under section 35 of the Act to be declared plants and includes any part of such a plant and/or the product of such a plant.

The *Agriculture and Related Resources Protection Act 1976* provides for declared plants to be assigned to specific categories, P1 to P5, which determines the form of control which applies to the declared plant. In Appendix A, Table A6 lists the categories of control codes for declared plants and the associated management requirements.

The current listing of declared plant species is available at the Department of Agriculture and Food (DAFWA) website (DAFWA 2013).

3. OBJECTIVES

The aim of this survey was to search for threatened and priority flora within a (Polaris) defined area within tenement M77/1095. Specifically the objectives included:

- Undertake a desktop search to evaluate the botanical values of the local and broader area associated with tenement M77/1095 to identify any matters of botanical or conservation significance;
- Search for threatened and priority flora species within a defined 40.2 ha area within tenement M77/1095, located on the upper slopes and ridges within the tenement, and which would be the locality for proposed exploration drill holes, and record the population and locations of any threatened and priority flora present;
- Search for threatened and priority flora species along a 440 m alignment for a proposed (previously disturbed) access route within tenement M77/1095 , and record the population and locations of any threatened and priority flora present;
- Search for threatened and priority flora species along a 980 m alignment for a proposed (previously disturbed) access route within tenement M77/1095 , and record the population and locations of any threatened and priority flora present;
- Review the conservation status of the vascular plant species recorded by reference to current literature and current listings by the Department of Environment and Conservation, the Department of Sustainability, Environment, Water, Population and Communities under the *Environment Protection and Biodiversity Conservation Act 1999,* and plant collections held at the Western Australian State Herbarium;
- Provide an evaluation of the impacts of the proposed drilling program to any threatened and priority flora located within the survey area, at both the local and regional level;
- Provide recommendations on the local and regional significance of any threatened or priority flora recorded or ecological communities present; and
- Prepare a report summarising the findings.

4. METHODS

The Jackson 5 prospect survey area consisted of a 40.2 ha area located on the lower slopes, upper slopes and ridges of a banded ironstone hill located within mine tenement M77/1095. The coordinates delineating the boundary of the Jackson 5 prospect survey area are set out in Appendix B. Within the Jackson 5 prospect survey area, in addition to existing old drill pads, 19 new drill pads are proposed to be constructed to accommodate new drill hole locations. The coordinates of the proposed new drill hole locations are set out in Table 1. Figure 3 illustrates the locations of the proposed new drill holes, together with proposed new access tracks which will be required in order to access the new drill holes. For the purposes of the field survey, drill pads were 15 m x 20 m in dimension, and new tracks to access drill holes were 3.5 m in width with some exceptions which are indicated in Table 1. In a number of cases new track construction will not be required because the dimensions of the proposed new drill pad will intersect an existing track.

Table 1: Locations of proposed new drill holes within the Jackson 5 prospect survey area of Tenement M77/1095

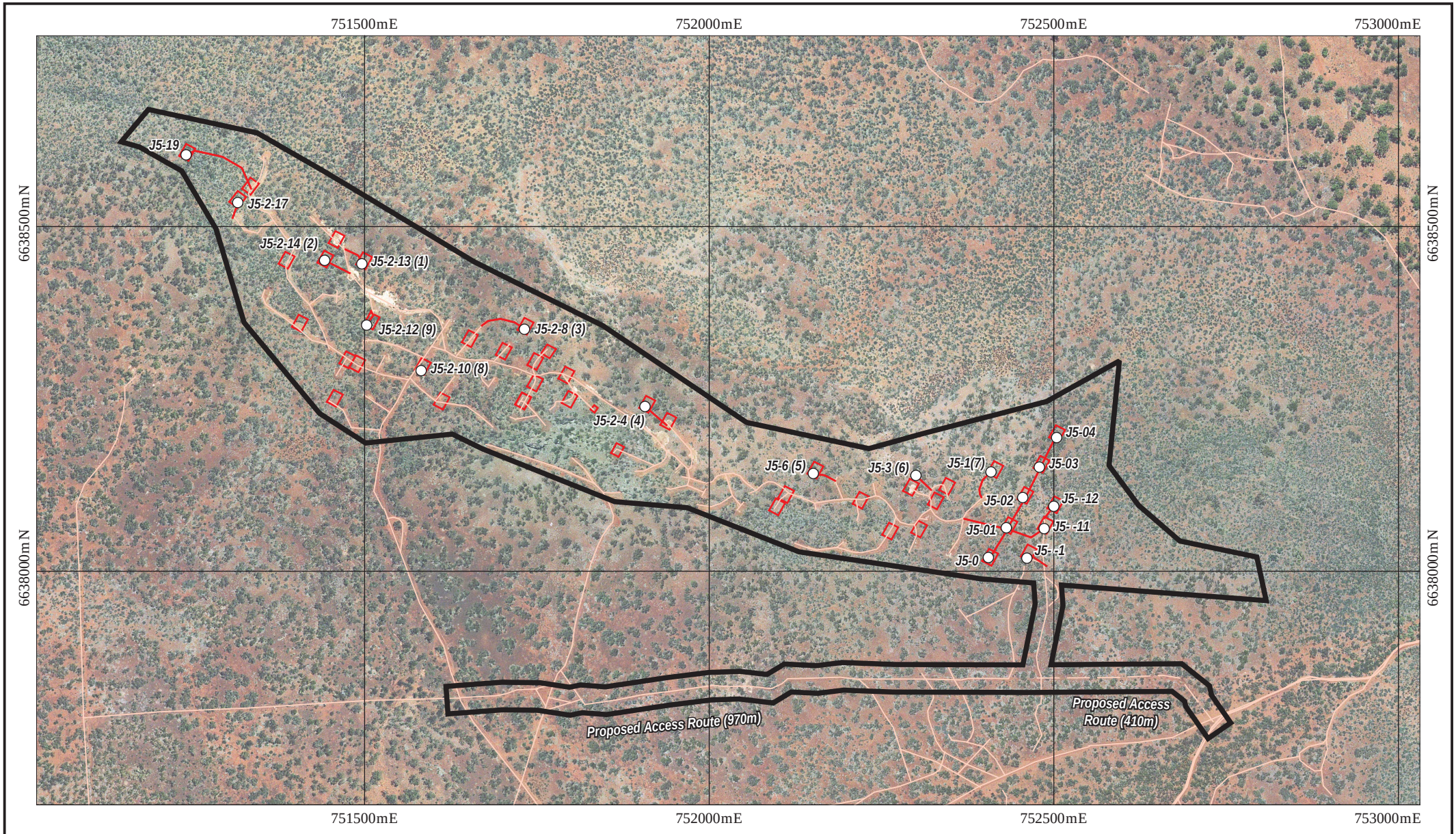
Drill pad searches were based on dimensions of 15 m x 20 m. Access tracks to drill pads were 3.5 m in width, with the exception of drill holes marked (*) which were 6 m in width.

Drill Hole	Location (GDA94_Zone50)	
	Easting (mE)	Northing (mN)
J5- -1	752461	6638019
J5- -11	752486	6638062
J5- -12	752500	6638094
J5-0	752405	6638020
J5-01	752431	6638063
J5-02	752455	6638107
J5-03	752479	6638151
J5-04	752504	6638194
J5-1(7)	752409	6638144
J5-19	751241	6638604
J5-2-10 (8)	751582	6638291
J5-2-12 (9)	751503	6638357
J5-2-13 (1)*	751496	6638446
J5-2-14 (2)*	751442	6638451
J5-2-4 (4)*	751907	6638239
J5-2-8 (3)*	751732	6638351
J5-3 (6)	752300	6638139
J5-6 (5)	752151	6638142
J5-2-17	751314	6638535

All coordinates for the boundary of the Jackson 5 prospect survey area, proposed new drill hole and track locations, were supplied by Polaris.

4.1 Desktop Assessment

A desktop assessment was conducted using the Department of Environment and Conservation (DEC 2007-, 2013g) and the Department of Sustainability, Environment, Water, Population and Communities databases (DSEWPAC 2013a, 2013b, 2013d) to identify the possible occurrence of threatened and priority flora, threatened and priority ecological communities, and other matters protected under the EPBC Act within the vicinity of tenement M77/1095. In addition, historical documentation and vegetation mapping of the region, as well as data recorded by Mattiske during previous surveys in the area, was reviewed.



Legend

- Survey Boundary
- Existing Tracks
- Proposed New Tracks
- Proposed Drill Holes

Client: POLARIS METALS NL

0 100m

Scale 1:7,500
MGA94 (Zone 50)

CAD Ref: g1531_J5_PS_F01.dgn

Date: Apr 2013 | Rev: C | A4

Mattiske Consulting Pty Ltd
28 Central Road, Kalamunda WA 6076 ~ Tel: 9257 1625 ~ Fax: 9257 1640
Author: E M Mattiske | MCPL Ref: PMN1301/010/13
Drawn: CAD Resources ~ www.cadresources.com.au
Tel: (08) 9246 3242 ~ Fax: (08) 9246 3202

Yilgarn Iron Ore Project - J5 Area

Jackson 5 Prospect Survey Area

Existing tracks, proposed new drill holes and tracks

Figure: 3

4.2 Field Survey

The search for threatened and priority flora within the Jackson 5 prospect survey area was undertaken by a team of four botanists from Mattiske Consulting Pty Ltd on the 10th and 11th of December 2012 and the 4th to 7th February 2013. The survey was conducted to the standards set out in Guidance Statement 51 (Environmental Protection Authority, 2004). All botanists held valid collection licences to collect flora for scientific purposes, issued under the *Wildlife Conservation Act 1950*. In addition, one botanist held a valid permit to take declared rare flora, issued under the *Wildlife Conservation Act 1950.* Mattiske Consulting Pty Ltd held valid Regulation 4 Permits to take flora for scientific purposes within CALM lands. The permits (No. 003682 – validity 11/09/12 to 31/12/12 and No. CE003855 – validity 25/01/13 to 30/04/13) were valid for the Mount Manning – Helena Aurora Ranges Conservation Park. The licensee was present during the surveys. Aerial photographic maps of the survey area were prepared and supplied by CAD Resources of Carine, Western Australia.

4.3 Survey Areas

The Jackson 5 prospect survey area consisted of a 40.2 ha area, the majority (approximately 35 ha) of which was the location of drill holes and tracks. A smaller section of the survey area, which was the southern portion of the survey area, was the location for two options for access routes into the main drill hole / track area. Whilst the threatened and priority survey methodology is similar, they are discussed separately in the following sections.

4.3.1 Drill Hole Area Survey

The Jackson 5 project survey area was traversed on foot by botanists spaced 40 m apart. Pre-defined search paths, together with the locations of the proposed new drill holes and access tracks, were stored on hand held GPS units. The pre-defined search paths were traversed in a zigzag pattern to ensure all flora within the survey area was checked. Coordination between adjacent botanists, either directly or with hand held 2-way radios, ensured that overlapping of search paths or double counting of any populations of threatened, priority or significant flora was avoided. With the exception of *Neurachne annularis* (P3), the following data was recorded when any threatened, priority or significant flora was located: GPS location, height (cm), number of plants and corresponding area of population, reproductive state, and plant condition. Any flora which could not be identified in the field was collected for subsequent identification, was treated as being potentially significant, and its location and population recorded.

The population of *Neurachne annularis* (P3) within the survey area was calculated by accurately sampling a subset of the population. This was achieved by accurately counting the number of *Neurachne annularis* (P3) plants present in 157 10 m x 10 m quadrats scattered across the entire survey area. The location of each *Neurachne annularis* (P3) survey quadrat was established prior to undertaking the field study to avoid any bias in quadrat site selection in the field. The *Neurachne annularis* (P3) survey quadrats were located every 60 m along the pre-defined search paths described in the preceding paragraph. Where a survey quadrat was found to either partially or wholly intersect an existing area of disturbance (existing track or drill pad) then the quadrat was moved to the immediate north of south such that it was relocated at least 10 m from the disturbance. The quadrats, which were not permanently pegged, were marked out with standard 50 m measuring tapes to ensure accuracy of quadrat dimensions. The sides of all quadrats were oriented in a north-south /east-west direction. Within each quadrat the number of *Neurachne annularis* (P3) tussocks which were either wholly within or which originated within the survey quadrat were recorded. The GPS coordinates of the north-west corner of each quadrat was recorded. A record was made of the average height (cm), reproductive state, and plant condition of *Neurachne annularis* (P3) in each quadrat. The methodology used to estimate the population of *Neurachne annularis* (P3) generally follows that of Elzinga *et al*. (1998).

4.3.2 Access Tracks to Drill Hole Area

The search for threatened and priority flora along both the 440 m and 980 m proposed access routes was achieved by botanists walking 20 m apart along the length of each access track alignment. Coordination between adjacent botanists, either directly or with hand held 2-way radios, ensured that overlapping of search paths or double counting of any populations of threatened, priority or significant

flora was avoided. The access corridor surveyed was 40 m wide. The planned access track width is 3.5 m. Consequently, a larger area was surveyed to enable adjustments to the final track route to be made. The following data was recorded when any threatened, priority or significant flora was located: GPS location, height (cm), number of plants and corresponding area of population, reproductive state, and plant condition. Any flora which could not be identified in the field was collected for subsequent identification, was treated as being potentially significant, and its location and population recorded.

All plant specimens collected during the field survey were dried and processed in accordance with the requirements of the Western Australian Herbarium. The plant species were identified through comparisons with pressed specimens housed at the Western Australian Herbarium. Where appropriate, plant taxonomists with specialist skills were consulted. Nomenclature of the species recorded generally follows that of Paczkowska & Chapman (2000).

4.4 Data Sources

Data was acquired from several sources to compile regional population figures for threatened and priority flora. These sources were:

- Current and past surveys undertaken by Mattiske in the region
- Records from the Department of Environment and Conservation
- Records form the Western Australian Herbarium
- Data acquired from Cliff's Natural Resources Inc. (formerly Portman Iron Ore Ltd)

Data from the DEC and the Western Australian Herbarium were acquired by CAD Resources of Carine, Western Australia, on behalf of Mattiske. Data was acquired from Cliff's Natural Resources Inc. under a data sharing agreement with Polaris Metals Pty Ltd. The data acquired from Cliff's Natural Resources Inc. comprised data from the following tenements: M77/1097, E77/1383-I, E77/842-I, P77/3885-I, P77/3884-I, P77/3886-I, M77/1242-I and M77/1095-I. All regional data used in this report was maintained by CAD Resources.

The regional data spans a geographical area defined from 704400 mE / 6699600 mN (north west corner) to 823000 mE / 6546600 mN (south east corner) – all coordinates are MGA94, zone 50. The area of coverage is 118.6 km by 153 km, representing an area of 18,146 km^2.

5. DESKTOP ASSESSMENT

The Jackson 5 prospect survey area is located 100 km NNE of the town of Southern Cross in the Shire of Yilgarn. The Jackson 5 prospect survey area is located within the Coolgardie Botanical District, as defined by Beard (1990). More recently, the vegetation of Western Australia has been assigned to bioregions and subregions under the Interim Biogeographical Regionalisation for Australia (IBRA), with the survey area lying within the Southern Cross (C002) sub-region of the Coolgardie Bioregion.

5.1 Climate

Beard (1990) described the climate of the Coolgardie Botanical District as arid non-seasonal to semi-arid Mediterranean, characterised by an arid climate with cool winters and hot, dry summers. Annual precipitation in the Coolgardie Botanical District ranges from 200 mm to 300 mm, with the bulk of the precipitation falling in the winter months, with sporadic summer cyclonic rainfall. Southern Cross, which is located to the southwest of the survey area, has an annual rainfall of 294 mm (Bureau of Meteorology 2013). Rainfall and temperature data for Southern Cross is illustrated in Figure 4.

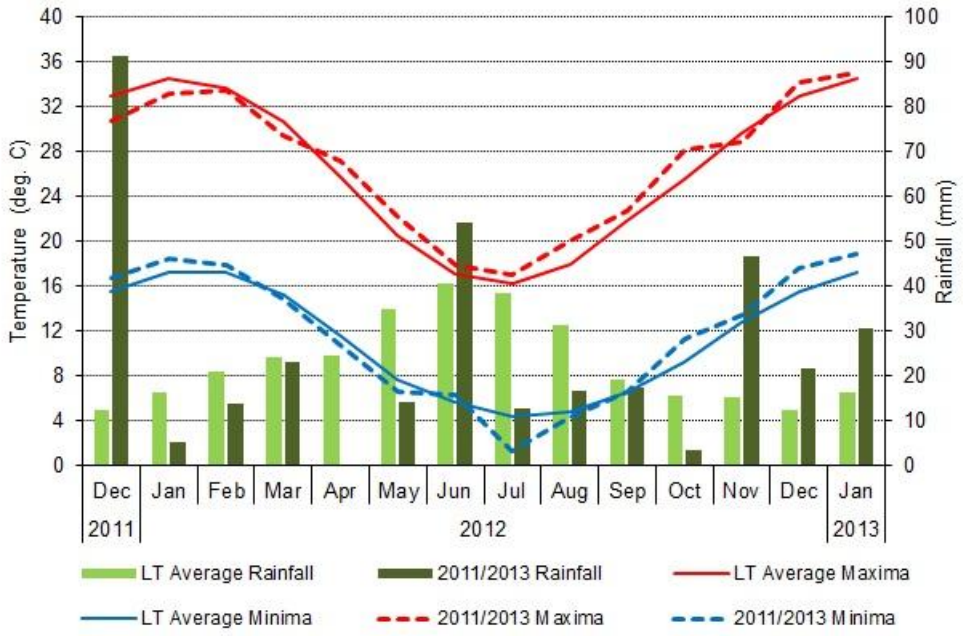


Figure 4: Monthly rainfall and temperature for Southern Cross
Long term average rainfall and temperature data, together with monthly rainfall and average maximum and minimum temperature data for the period December 2011 to January 2013 are shown.

5.2 Soils and Topography

The Jackson 5 project survey area and the associated tenement (M77/1095) is located within an area which consists of gently undulating plains with occasional ranges of low hills lying on the 'Southern Cross Terrains' of the Yilgarn Craton (Cowan *et al.* 2001). Beard (1972a, 1990) described the Coolgardie Botanical District as having major greenstone belts, which provide the hilly topography, together with banded ironstone ridges rising from the brown calcareous earth of the surrounding plains.

The Jackson 5 project survey area within tenement M77/1095 lies within both the Jackson and Bungalbin Systems, as defined by Beard (1972a, 1972b) which consists predominantly of red loams, sandy loams, clay loams and occasional calcareous soils. The hills of the Bungalbin System consist of greenstone / banded ironstone formations which rise from the generally flat surrounding terrain.

The Jackson 5 prospect survey area occurs within the Jackson area, as defined by Chin and Smith (1983). Chin and Smith (1983) mapped the geology of the Jackson area at a scale of 1: 250,000. A summary of the geological units associated with tenement M77/1095 is set out in Table 2. The Jackson area is situated near the centre of the Yilgarn Block, a stable Archaen craton consisting of belts of banded gneiss and layered sedimentary, volcanic and intrusive rocks, all of which are intruded by voluminous granitoids (Chin and Smith 1983). In all greenstone belts on Jackson, the banded iron formations (BIF) that have resisted erosion protrude as hills and prominent ranges composed of bands of iron rich rocks interspersed with basalt jaspilite, chert and other minerals at millimetre to centimetre scale (Chin and Smith 1983).

The banded iron formation in the Mt Jackson-Bungalbin area occurs at two stratigraphic levels separated by basalt. These two units, and thin banded iron formation within the basalt, characteristically contain banded dark grey to black iron-rich bands alternating with red jaspilite bands at centimetre scale. The red jaspilite is commonly boundinaged and disrupted due to mobilization of the iron rich bands (Chin and Smith 1983). The hills rise to 100 m above the surrounding plains and have stony slopes with bedrock exposures common of steep slopes and crests. Soils on the upper slopes are mainly skeletal, becoming shallow on lower slopes (Newbey 1985).

The Helena and Aurora Range, within which the Jackson 5 prospect survey area lies, represents the highest and largest example of hill (banded ironstone formation) in the Eastern Goldfields (Newbey and Hnatiuk 1985). This is a substantial range in the context of south west WA extending 20 km long, with a 600-700 m high central peaks extending from Bungalbin hill 10 km east.

Table 2: Geology of the Jackson 5 Prospect survey area
(geology codes and descriptions from Chin and Smith 1983)

Tenement	Geology Code	Description
M77/1095	Aiw	Archaean: banded iron formation, quartz-grunerite-magnetite rock
	Agv	Archaean: Variably textured, medium and coarse grained, seriate granite and adamellite; locally porphyritic
	Qa	Cainozoic Quaternary: Alluvium – silt sand and gravel in stream channels
	Qc	Cainozoic Quaternary: colluviums – silt, sand and gravel on slopes adjoining rock and laterite outcrop

5.3 IBRA Bioregion

The Interim Biogeographic Regionalisation for Australia (IBRA) delineated 85 bioregions across Australia, based on a range of biotic and abiotic factors, including climate, vegetation, fauna, geology and landform (Thackway and Cresswell 1995, Environment Australia 2000). IBRA Version 7 refined the 85 bioregions and 403 subregions described in IBRA6.1, by expanding the number of bioregions to 89 and sub-regions to 419. The subregions represent more localised and homogenous geomorphologic units in each bioregion. IBRA7 includes four new oceanic bioregions, and seven new sub-regions in the oceanic bioregions and six new subregions in South Australia (DSEWPC 2013c)

Cowan *et al*. (2001) described the Southern Cross (COO2) sub-region as physically comprising gently undulating uplands dissected by broad valleys with bands of low greenstone hills. The valleys have Quaternary duplex and gradational soils, and include chains of saline playa lakes. Floristically, the sub-region supports diverse *Eucalyptus* woodlands (*Eucalyptus salmonophloia, Eucalyptus salubris, Eucalyptus transcontinentalis, Eucalyptus longicornis*) rich in endemic eucalypts, occurring around these salt lakes, on the low greenstone hills, valley alluvial soils and broad plains of calcareous earths. The salt lake surfaces support dwarf shrublands of samphire. The granite basement outcrops at mid-levels in the landscape and supports swards of *Borya constricta*, with stands of *Acacia acuminata* and *Eucalyptus loxophleba*. Upper levels in the landscape are the eroded remnants of a lateritic duricrust yielding yellow sandplains, gravelly sandplains and laterite breakaways. Mallees (*Eucalyptus leptopoda*, *Eucalyptus platycorys* and *Eucalyptus scyphocalyx*) and scrub-heaths (*Allocasuarina corniculata, Callitris preissii, Melaleuca uncinata* and *Acacia beauverdiana*) occur on these uplands. The scrubs are rich in endemic *Acacia* species and Myrtaceae.

5.4 Historical Mapping by John Beard

Tenement M77/1095 lies within the Coolgardie Botanical District, as defined by Beard (1990). Beard (1972a, 1972b) mapped the vegetation of the Coolgardie Botanical District at a scale of 1:250,000. The dominant plant families within the Coolgardie Botanical District include Myrtaceae (myrtles such as Eucalypts and Melaleucas), Asteraceae (daisies), Chenopodiaceae (salt bushes) and Poaceae (grasses). The Coolgardie Botanical District is characterized by Eucalypt woodlands and covers 5 % of the State of Western Australia (Beard 1990). Tenement M77/1095 intersects two of Beard's vegetation systems – the Jackson and Bungalbin vegetation systems (Beard 1972a, 1972b). Beard (1969) defined a vegetation system as a particular series of plant communities recurring in a catenary sequence or mosaic pattern, linked to topographic, pedological, and/or geological features. A vegetation system is a sub-division of a botanical district.

The ranges of soil types present within the Jackson system support a variety of vegetation communities. The deeper red loams which predominate on the valley floors and flats support sclerophyll woodlands.

The main woodland type is the *Eucalyptus salmonophloia – Eucalyptus salubris* association. In addition to these principle eucalypts, *Eucalyptus longicornis*, *Eucalyptus gracilis*, *Eucalyptus corrugata* and *Eucalyptus oleosa* occur within the woodlands. Beard (1972a) described two understorey types which occur within these woodlands – a broombrush and a saltbush type. The broombrush understorey consists of shrubs such as *Acacia acuminata*, *Eremophila decipiens*, *Eremophila oppositifolia*, *Eremophila scoparia*, *Philotheca brucei*, *Melaleuca pauperiflora* and *Ptilotus obovatus*. The saltbush understorey is described by Beard (1972a) as containing *Atriplex nummularia*, *Atriplex hymenotheca*, *Templetonia* sp. and *Zygophyllum apiculatum*.

A second eucalypt association in the woodlands is the *Eucalyptus loxophleba* association where the loam soils are sandier. Other eucalypt species, such as *Eucalyptus oleosa*, *Eucalyptus transcontinentalis*, *Eucalyptus celastroides* and *Eucalyptus corrugata* occur casually in this woodland association. Common large shrubs found within the *Eucalyptus loxophleba* woodland include *Acacia acuminata*, *Acacia tetragonophylla*, *Alyxia buxifolia*, *Dodonaea viscosa*, *Eremophila drummondii*, *Eremophila ionantha*, *Exocarpos aphyllus*, and *Santalum acuminatum*. Common small shrubs include *Acacia andrewsii*, *Atriplex hymenotheca*, *Cryptandra minutifolia*, *Philotheca coccinea*, *Philotheca brucei*, *Grevillea acuaria*, *Olearia muelleri*, *Phebalium lepidotum*, *Prostanthera grylloana* and *Ptilotus obovatus*. Patches of *Acacia* scrub and of mallee (*Eucalyptus eremophila*, *Eucalyptus ewartiana*, *Eucalyptus oleosa* and *Eucalyptus sheathiana*) occur within both types of woodland (Beard 1972a).

Within the Jackson system, Beard (1972a) describes three lateritic soils systems that support *Acacia* thickets. These are:

1. an *Acacia neurophylla* association on very shallow soils;
2. an *Acacia-Casuarina-Melaleuca* association on moderate depth soils, which supports shrubs such as *Acacia burkittii*, *Acacia multispicata*, *Allocasuarina acutivalvis*, *Allocasuarina corniculata*, *Eucalyptus leptopoda, Eucalyptus oldfieldii, Grevillea paradoxa, Melaleuca uncinata, Baeckea* sp., *Grevillea acuaria, Phebalium canaliculatum* and *Thryptomene kochii*; and
3. an *Acacia resinimarginea* association on deep soils which has similar shrubs to the *Acacia-Casuarina-Melaleuca* association but with a definite understorey of ericoid shrubs. The grass, *Triodia irritans*, occurs in this association.

The Helena and Aurora Ranges lie within the Bungalbin vegetation system, as defined by Beard (1972). The Bungalbin vegetation system consists of the vegetation associated with the ironstone outcrops which constitute the ridges at Bungalbin, Mount Jackson, Koolyanobbing and elsewhere. These ridges are rocky, with little soil, except on the footslopes (Beard 1972b). Bungalbin Hill, at 680 m, is the highest point in the region. Beard (1972b) described the vegetation of the Bungalbin vegetation system as consisting of small trees such as *Brachychiton gregorii* and *Dryandra* (*Banksia*) *arborea* on rocky outcrops; medium shrubs such as *Acacia quadrimarginea, Acacia aneura, Acacia tetragonophylla, Casuarina acutivalvis* and *Santalum spicatum*; and small shrubs such as *Dodonaea larreoides, Enchylaena tomentosa, Eremophila clarkei, Eremophila oldfieldii, Eriostemon brucei* (*Philotheca brucei*), *Grevillea paradoxa, Kochia planifolia* (*Maireana planifolia*), *Pimelea thesioides (Pimelea spiculigera* var*. thesioides), Ptilotus obovatus, Olearia stuartii* and *Thryptomene appressa* (*Aluta appressa*). The footslopes at Mount Jackson is composed of woodland of *Eucalyptus ebbanoensis*, whilst at Koolyanobbing the footslopes consist of the *Eucalyptus salmonophloia – Eucalyptus salubris* association which is a common component of the Jackson vegetation system, where the red-brown clay-loam soils are deeper, and which typically surrounds the Bungalbin vegetation system (Beard 1972b).

5.5 Pre-European Vegetation

Tenement M77/1095, which contains the Jackson 5 prospect survey area, intersects three of Beard's vegetation associations (Shepherd *et al*. 2002; Figure 5). These vegetation associations are:

- vegetation association 141 - medium woodland; York gum, salmon gum & gimlet
- vegetation association 520 - shrublands, *Acacia quadrimarginea* thickets.
- vegetation association 538 - shrublands; *Acacia brachystachya* scrub

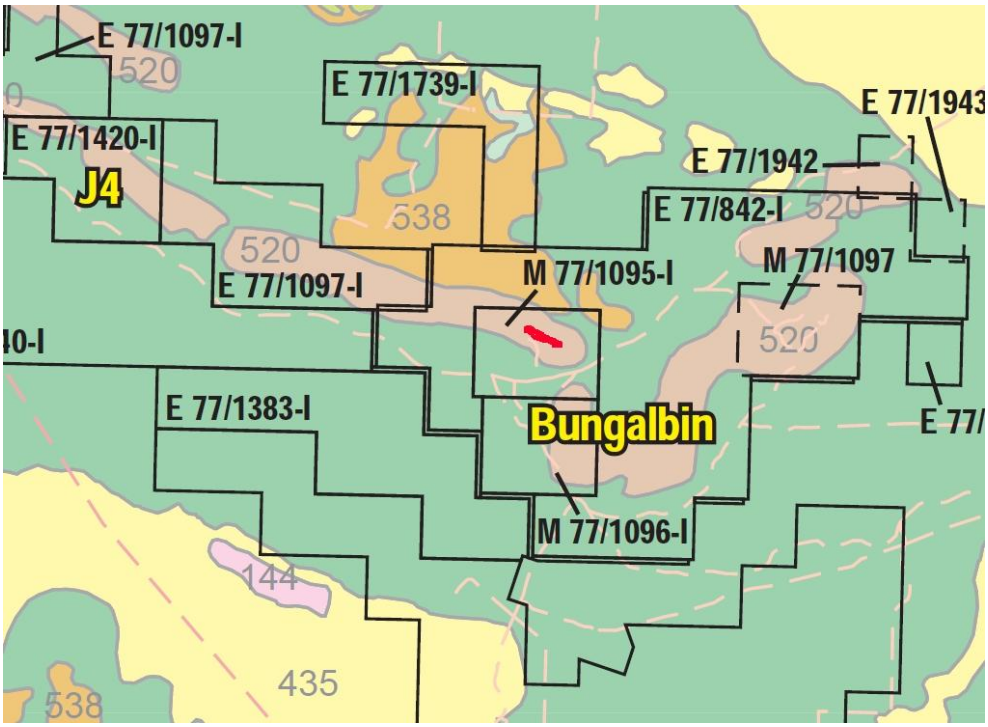


Figure 5: Beard's Jackson vegetation map with the location of the Jackson 5 prospect survey area and vegetation associations in the region
A portion of Beard's 1:250,000 Jackson vegetation map (Beard 1972b). The location of the Jackson 5 prospect survey area (red) consists of *Acacia* thickets on ironstone ridges (a_{14}Sc). The survey area is surrounded by *Eucalyptus salmonophloia* / *Eucalyptus salubris* sclerophyll woodland (e^{8}_{34}Mi).

The pre-European and current extent of the vegetation associations which intersect both tenement M77/1095 and the Jackson 5 prospect survey area are illustrated in Figure 6. The areas of each of the vegetation associations intersecting both tenement M77/1095 and the Jackson 5 Prospect survey area are set out in Table 3. It should be noted that the data (Government of Western Australia 2011) only reports on the status of reserves within the DEC managed estate.

Table 3: Extent of Beard vegetation associations intersecting tenement M77/1095, and the Jackson 5 prospect survey area

Data source: Government of Western Australia 2011.

	Statewide			Survey Area	
Vegetation Association	**Pre-European Extent (ha)**	**Current Extent (ha)**	**Percent Remaining**	**Area of Intersection**	**Proportion of Current Extent (%)**
Tenement M77/1095					
141.3	644,279.88	643,912.31	99.94	572.7641	0.089
520.0	23,184.91	22,979.42	93.11	397.7088	1.270
538.1	100,911.51	100,592.27	99.68	28.0990	0.028
Jackson 5 prospect survey area					
141.3	644,279.88	643,912.31	99.94	9.2217	0.0014
520.0	23,184.91	22,979.42	93.11	30.8371	0.1341

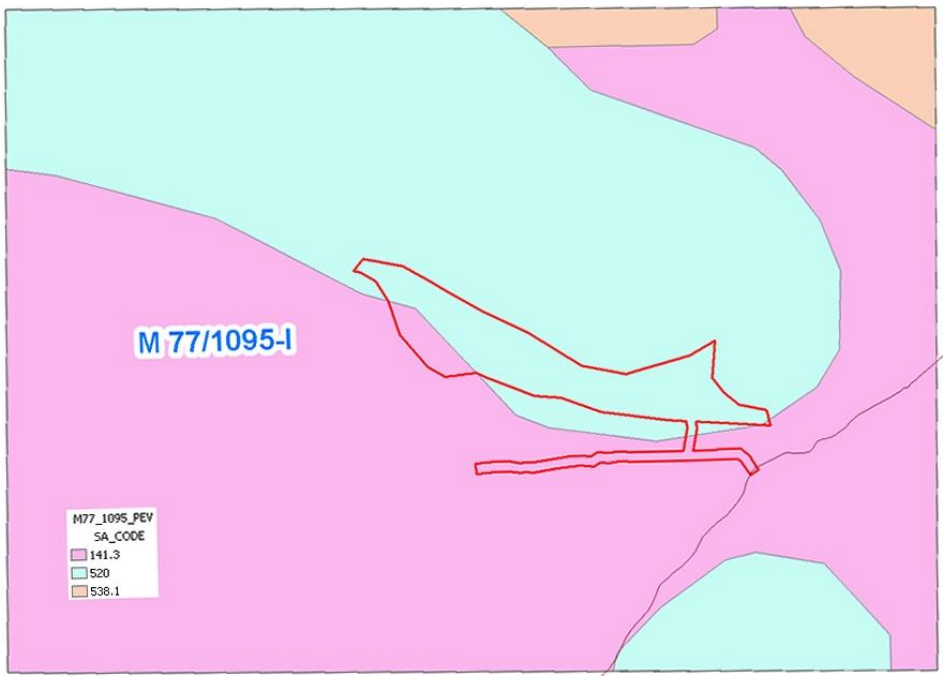


Figure 6: Beard's vegetation associations intersecting tenement M77/1095
The location of the Jackson 5 prospect survey area (red polygon) is shown within tenement M77/1095. Coordinates delineating the Jackson 5 prospect survey area were supplied by Polaris.

5.6 Biological Surveys of the Eastern Goldfields

In their biological survey of the Eastern Goldfields, Newbey and Hnatiuk (1985) noted that each banded iron formation hill had its own set of vegetation. The soils were red sands that were skeletal on steep slopes, shallow on erosional upper slopes, and deeper on colluvial lower slopes. Specifically, Newbey and Hnatiuk (1985) sampled the vegetation at the eastern end of the Helena Range, which is approximately coincident with the Jackson 5 project survey area, and described the vegetation as a *Melaleuca filifolia* tall shrubland. This shrubland included mallees of *Eucalyptus oleosa* and *Eucalyptus ebbanoensis*; tall shrubs of *Acacia* aff. aneura, *Calycopeplus paucifolius*, *Grevillea obliquistigma* and *G.* sp. (KRN 9646); low shrubs of *Baeckea elderiana*; and the annuals, *Bellida graminea*, *Helichrysum lindleyi*, *Millotia myosuroides* and *Myriocephalus gracilis*, growing on dark reddish-brown sandy loam soils associated with banded iron formation.

A review of the specific site survey data from Newbey and Hnatiuk (1985) reveals that the following taxa of conservation significance were recorded during the survey: *Banksia arborea* (P4) and *Grevillea georgeana* (P3) originally recorded as G. sp. (KRN 9646). Additionally, the data reveals the following taxa were recorded: *Leucopogon* sp. (KRN 6954), *Mirbelia* sp. (KRN 8949), and *Plectrachne* sp. (KRN 5925). A search of the Western Australia Herbarium database (DEC 2013g) reveals that *Mirbelia* sp. (KRN 8949) has been identified as *Mirbelia ferricola* (P3), and that *Plectrachne* sp. (KRN 5925) has been identified as *Neurachne annularis* (P3). No identification of the specimen *Leucopogon* sp. (KRN 6594) could be found. However, two Ericaceae of conservation significance occur in the vicinity, namely *Leucopogon spectabilis* (T) and *Pseudactinia* sp. Bungalbin Hill (F.H. & M.P. Mollemans 3069) (P3). Consequently, any Ericaceous species encountered should be treated as potentially being of conservation significance.

5.7 Flora and Vegetation of the Eastern Goldfield Ranges

The banded iron ranges of the Eastern Goldfields have been the subject of flora and vegetation surveys in the 1990's and 2000's. The survey work had been undertaken by the Department of Environment and Conservation, by Neil Gibson and others. These surveys focused on the following ranges:

- Helena and Aurora Range (Gibson *et al*. 1997)
- Bremer Range (Gibson and Lyons 1998a)
- Parker Range (Gibson and Lyons 1998b)
- Highclere Hills (Gibson and Lyons 2001a)
- Hunt, Yendilberin and Watt Hills (Gibson and Lyons 2001b)
- Mt Manning Range (Gibson 2004a)
- Middle and South Ironcap, Digger Rock and Hatter Hill (Gibson 2004b)

The Jackson 5 prospect survey area lies within the Helena and Aurora Range area which was surveyed by Gibson *et al*. (1997). In that survey, Gibson *et al*. reported a total of 324 taxa recorded from the 55 survey quadrats. A number of flora taxa of conservation significance were recorded during the survey, a number of which have been the subject of taxonomic and conservation status revision in the intervening years. When these revisions are taken into account, the taxa of conservation significance recorded during the survey were *Leucopogon spectabilis* (T), *Tetratheca aphylla* subsp. *aphylla* (T), *Acacia adinophylla* (P1), *Gnephosis intonsa* (P1), *Phlegmatospermum eremaeum* (P2), *Acacia cylindrica (*P3), *Grevillea georgeana* (P3), *Lepidosperma ferricola* (P3), *Neurachne annularis* (P3), *Stenanthemum newbeyi* (P3), *Banksia arborea* (P4), and *Grevillea erectiloba* (P4).

Six floristic community types were identified within the survey area. The distribution of these floristic communities correlated strongly with topographic position and slope. The community types identified were (Gibson *et al*. 1997):

Community types 1 & 2: *Acacia quadrimarginea*, *Grevillea zygoloba*, *Allocasuarina acutivalvis*, *Melaleuca nematophylla*, *Banksia arborea* and *Calycopeplus paucifolius* woodlands and shrublands on skeletal yellow or red soils of the ridge tops and upper slopes of the Helena and Aurora Range;

Community type 2: Woodlands dominated by *Eucalyptus ebbanoensis* and/or *E. corrugata* or *E. capillosa* subsp. *capillosa* on the small breakaways with *Alyxia buxifolia* and/or *Stenanthemum newbeyi* in understorey;

Community type 3: Open side slopes of the Helena and Aurora Range dominated or co-dominated by *Eucalyptus ebbanoensis* and/or *E. corrugata*, with an understorey dominated by *Neurachne annularis* (P3). Occasionally this community may be dominated by *Acacia* spp. rather than the eucalypt species;

Community type 4: Lower slopes and flats below the Helena and Aurora Range variously dominated by *Acacia aneura*, *A. resinimarginea* or *A. acuminata*, or occasionally by *Eucalyptus ebbanoensis* and/or *E. hypochlamydea* subsp. *hypochlamydea*. Where eucalypts dominate, the understorey includes taxa such as *Grevillea zygoloba* and *Eremophila clarkei*. Most constant understorey species is *Neurachne annularis* (P3), *Austrostipa elegantissima*, *Olearia pimeleoides* and *Dianella revoluta*. Almost complete lack of chenopod species;

Community type 5: Eucalypt woodlands on the flats below the range with a diverse chenopod understorey. This group is divided into two sub-groups: Type 5a - woodlands close to the change in slope where *Eucalyptus ebbanoensis* and *E. corrugata* form an overstorey over chenopods and *Neurachne annularis* (P3); and Type 5b - woodland with *Eucalyptus salmonophloia*, *E. salubris, E. longicornis, E. sheathiana* and *E. transcontinentalis* dominating at different sites; and

Community type 6: consisted of three heterogeneous species poor quadrats. This community type appears to have been delineated due to the sensitivity of the analysis to species richness.

Subsequent to the survey of the Helena and Aurora Ranges in the 1990's, the area has been designated as a priority ecological community, and is described by the DEC as Helena and Aurora Range vegetation complexes (banded ironstone formation), a priority 1 ecological community (DEC 2013f). Some of the above community types are likely to be encountered within the Jackson 5 prospect survey area.

5.8 Surveys by Mattiske Consulting Pty Ltd

Mattiske Consulting Pty Ltd has undertaken a number of surveys in the vicinity of the Jackson 5 prospect survey area between 2007 and 2012. The majority of these surveys have been targeted at flora associated with potential drill hole locations or potential exploration camp locations. A record of these surveys is set out in Table 4.

Table 4: Mattiske surveys in the vicinity of the Jackson 5 project survey area

Survey Type [Report Reference]	Survey Dates	Number of Days	Number of Person Days
Flora and vegetation of proposed drill hole sites in tenement E77/1097: Musca (25 drill holes) and J4 Extension (13 drill holes). [Mattiske 2007a]	28/08/2007 - 29/08/2007	2	4
Flora and vegetation of proposed drill hole sites in tenement E77/842: Bungalbin Eastern (61 drill holes). [Mattiske 2007b]	22/11/2007 – 22/11/2007	2	4
Flora and vegetation of proposed Bungalbin Camp Site. [Mattiske 2007c]	19/11/2007 & 22/11/2007	2	4
Flora and vegetation of proposed drill hole sites in tenement E77/842: Bungalbin Central Prospect (24 drill holes). [Mattiske 2008a]	6/03/2008	1	2
Flora and vegetation of proposed infill drill hole sites in tenement E77/842: Bungalbin Eastern (81 drill holes). [Mattiske 2008b]	5/02/2008 – 6/02/2008	2	8
Flora and vegetation of proposed infill drill hole sites in tenement E77/1097: J4 Prospect (111 drill holes). [Mattiske 2008c]	5/03/2008 – 6/03/2008	2	8
Flora and vegetation of proposed infill drill hole sites in tenement E77/1097: Musca Prospect (251 drill holes). [Mattiske 2008d]	7/02/2008	1	2
Flora and vegetation of proposed infill drill hole sites in tenement E77/842: J5 Prospect (48 drill holes). [Mattiske 2008e]	7/02/2008	1	4
Helena & Aurora Ranges: Declared Rare Flora and Priority Flora Population Study. [Mattiske 2010]	7/09/2010 – 9/09/2010 and 16/11/201 – 18/11/2010	6	24
Threatened and priority flora survey: proposed Bungalbin Central Exploration Camp. [Mattiske 2011]	18/10/2011	1	2
Threatened and priority flora survey: proposed drill hole locations in Tenement M77/1242 and E77/1097 – J4 Prospect.	29/05/2012 – 30/05/2012	2	4
Total survey effort		**22**	**66**

During the surveys undertaken by Mattiske between 2007 and 2012 a range of threatened and priority flora were recorded. These are set out in Table 5.

Table 5: Threatened and priority flora recorded by Mattiske between 2007 and 2012 in the vicinity of the Jackson 5 project survey area

Taxon	SCC	FCC	Prospect (s)
Leucopogon spectabilis	T	E	Bungalbin East
Tetratheca aphylla subsp. *aphylla*	T	V	Bungalbin Central, Bungalbin East
Acacia adinophylla	P1	-	Bungalbin East, J5
Acacia sp. Bungalbin Hill (J.J. Alford 1119)	P1	-	Bungalbin East
Lepidosperma bungalbin	P1	-	Bungalbin East
Austrostipa blackii	P3	-	Bungalbin East
Grevillea georgeana	P3	-	Bungalbin East
Hibbertia lepidocalyx subsp. tuberculata	P3	-	Bungalbin East
Mirbelia ferricola	P3	-	Bungalbin East
Neurachne annularis	P3	-	Bungalbin Central, Bungalbin East, J4, J5, Musca
Stenanthemum newbeyi	P3	-	Bungalbin Central, Bungalbin East, J5
Banksia arborea	P4	-	Bungalbin Central, Bungalbin East, J4, J5
Eucalyptus formanii	P4	-	Bungalbin East
Grevillea erectiloba	P4	-	Bungalbin Central, Bungalbin East

5.9 State Reserves

Tenement M77/1095, which contains the Jackson 5 prospect survey area, lies wholly within Crown Reserve 48470, the Helena Aurora Conservation Park (Figure 7). The Jackson 5 prospect survey area is located on a banded iron hill.

5.10 Threatened Ecological Communities

No threatened ecological communities, pursuant to Schedule 1 of the *Wildlife Conservation Act 1950* and as listed by the Department of Environment and Conservation (2013b), are currently listed in the Coolgardie Botanical District. No threatened ecological communities, pursuant to the *Environment Protection and Biodiversity Conservation Act 1999*, and as listed by the Department of Sustainability, Environment, Water, Population and Communities (2013b), are currently listed in the Coolgardie Botanical District.

5.11 Priority Ecological Communities

There are 58 priority ecological communities defined and listed in the Goldfields Region (DEC 2013f). These Priority Ecological Communities are generally not well defined and as detailed mapping has not been undertaken on J5 it is not possible to provide clear data on the degree of impacts on the Priority Ecological Community.

Currently, the majority of tenement M77/1095, which is the location of the Jackson 5 prospect survey area, lies within the Helena and Aurora Range vegetation complexes (banded ironstone formation), a priority 1 ecological community. The DEC has identified the main threat to this PEC as mining (DEC 2013f). The relative location of the Jackson 5 project survey area in relation to the Helena and Aurora Range vegetation complexes (banded ironstone formation) is illustrated in Figure 7.

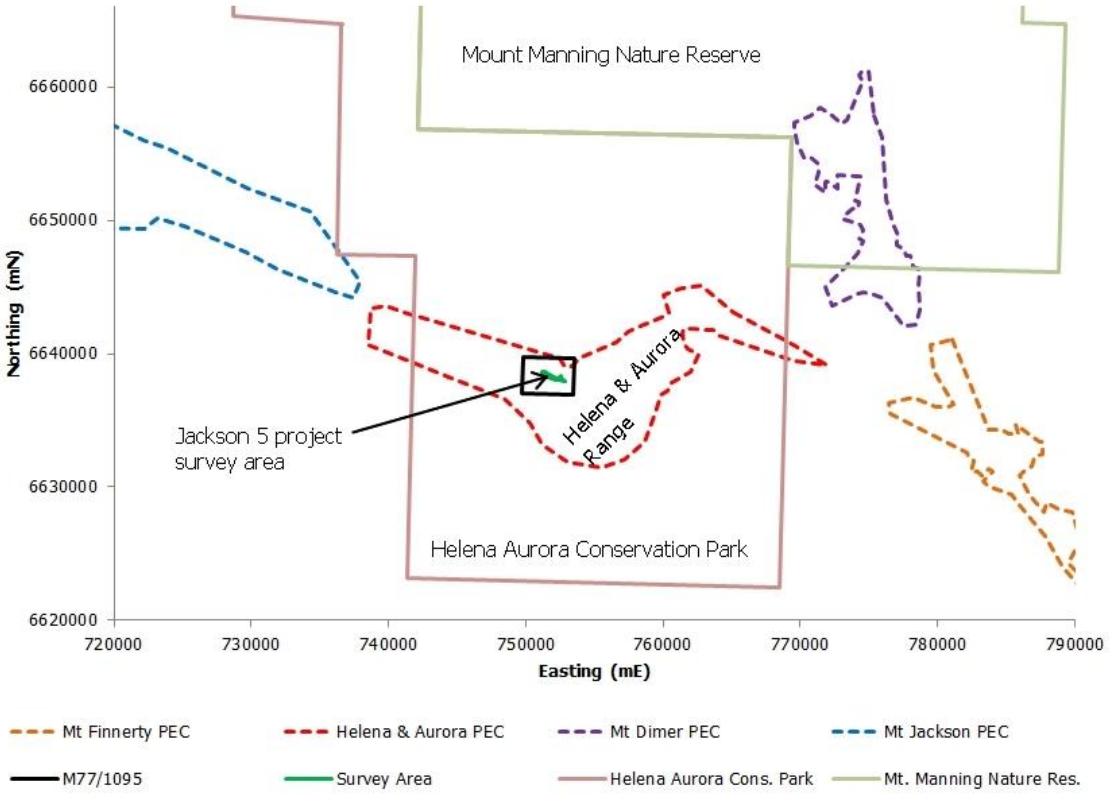


Figure 7: Location of the Jackson 5 prospect survey area in relation to priority ecological communities, nature reserves and conservation parks

Advice provided by the Department of Environment and Conservation (V. English pers. comm.) in relation to the Helena and Aurora Vegetation Complex (P1) is as follows: the Helena and Aurora Range vegetation complexes (banded ironstone formation) are made up of vegetation associations:

Helena Aurora 1: *Acacia quadrimarginea*, *Grevillea zygoloba*, *Allocasuarina acutivalvis*, *Melaleuca nematophylla*, *Banksia arborea* (P4) and *Calycopeplus paucifolius* woodlands and shrublands on skeletal yellow or red soils of the ridge tops and upper slopes of the Helena and Aurora Range (Gibson *et al*. 1997);

Helena Aurora 2: Woodlands dominated by *Eucalyptus ebbanoensis* and/or *E. corrugata* or *E. capillosa* subsp. *capillosa* on the small breakaways with *Alyxia buxifolia* and/or *Stenanthemum newbeyi* in understorey (Gibson *et al*. 1997);

Helena Aurora 3: Open side slopes of the Helena and Aurora Range dominated or co-dominated by *Eucalyptus ebbanoensis* and/or *E. corrugata*, with an understorey dominated by *Neurachne annularis* (P3). Occasionally this community may be dominated by *Acacia* spp. rather than the eucalypt species. (Gibson *et al*. 1997);

Helena Aurora 4: Lower slopes and flats below the Helena and Aurora Range variously dominated by *Acacia aneura*, *A. resinimarginea* or *A. acuminata*, or occasionally by *Eucalyptus ebbanoensis* and/or *E. hypochlamydea* subsp. *hypochlamydea*. Where eucalypts dominate, the understorey includes taxa such as *Grevillea zygoloba* and *Eremophila clarkei*. Most constant understorey species is *Neurachne annularis* (P3), *Austrostipa elegantissima*, *Olearia pimeleoides* and *Dianella revoluta*. Almost complete lack of chenopod species (Gibson *et al*. 1997);

Helena Aurora 5a: Woodlands close to the change in slope where Eucalyptus ebbanoensis and E. corrugata form an overstorey over chenopods and *Neurachne annularis* (P3) (Gibson *et al*. 1997); and

Helena Aurora 5b: Eucalypt woodland with *Eucalyptus salmonophloia*, *E. salubris, E. longicornis, E. sheathiana* and *E. transcontinentalis* dominating ad different sites (Gibson *et al*. 1997).

5.12 Potential Threatened and Priority Flora

The desktop assessment for threatened and priority flora was undertaken to enable an understanding of which listed flora taxa of conservation significance may potentially occur within the Jackson 5 prospect survey area. This assessment was initially based on the resources of NatureMap (DEC 2007-), the Western Australian Herbarium (DEC 2013g), and the Department of Sustainability, Environment, Water, Population and Communities (2013a, 2013b, 2013d). A 25km search radius about the central point of the Jackson 5 prospect survey area (751930 mE, 6638187 mN, MGA94 zone 50) was used to determine the presence of known threatened and priority taxa in the vicinity of the survey area. In addition to data which was accessed through NatureMap (DEC 2007-), data from previous surveys of the Jackson 5 area between 2007 and 2012, undertaken by Mattiske Consulting Pty Ltd (2007a, 2007b, 2007c, 2008a, 2008b, 2008c, 2008d, 2008e, 2010, 2011,2012), were incorporated into the desktop survey results to provide a more comprehensive list of threatened and priority taxa which may be encountered in the survey area. As the J5 area is wider than the immediate prospect area, these potential threatened and priority species are summarized to allow coverage of potential values in the specific J5 survey area.

On the basis of this desktop survey in the vicinity of the Jackson 5 prospect survey area there are two known threatened flora taxa and 35 known priority flora taxa. The 35 priority taxa are composed of eight priority 1, three priority 2, 20 priority 3 and four priority 4 taxa (DEC 2013g).

Two threatened flora taxa pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act 1950*, and as listed by the Department of Environment and Conservation (2013b) have been recorded within the 25 km buffer about the proposed Jackson 5 prospect survey area. These taxa are listed in Table 6. The Department of Sustainability, Environment, Water, Population and Communities (2013a) lists *Tetratheca aphylla* (the Bungalbin Tetratheca) as a vulnerable species. All subspecies of *Tetratheca aphylla* are considered vulnerable. The Department of Sustainability, Environment, Water, Population and Communities (2013a) lists *Leucopogon spectabils* (T) as endangered.

An assessment of the likelihood of recording either of the listed threatened taxa within the Jackson 5 prospect survey area, based on factors including known soil type, topography and distribution, is set out in Appendix C. Based on this assessment, whilst neither taxa have previously been recorded by Mattiske during a previous survey of the Jackson 5 area (MCPL 2008e) both threatened taxa have the potential to occur within the Jackson 5 project survey area because: (1) the soils and landforms which are their preferred habitat are known to occur within the survey area; and (2) both species are known to occur on the adjacent Aurora Range.

Table 6: Threatened flora recorded near the Jackson 5 prospect survey area
SCC = State Conservation Code (DEC); FCC = Federal Conservation Code (DSEWPC 2013a). Refer to Appendix A for definitions of threatened flora categories.

Species	Family	SCC	FCC
Leucopogon spectabilis	Ericaceae	T	E
Tetratheca aphylla subsp. *aphylla*	Elaeocarpaceae	T	V

The thirty-five priority flora species that have been recorded within the 25 km search buffer about the proposed Jackson 5 prospect survey area are listed in Table 7. Based on the desktop assessment, six taxa have a high likelihood of being recorded within the Jackson 5 project survey area. These taxa are: *Acacia adinophylla* (P1), *Hibbertia lepidocalyx* subsp. *tuberculata* (P3), *Neurachne annularis* (P3), *Stenanthemum newbeyi* (P3), *Banksia arborea* (P4) and *Grevillea erectiloba* (P4). In addition a further seven taxa have a medium likelihood of being recorded within the Jackson 5 prospect survey area. These taxa are: *Acacia* sp. Bungalbin Hill (J.J. Alford 1119) (P1), *Lepidosperma bungalbin* (P1), *Grevillea georgeana* (P3), *Lepidosperma ferricola* (P3), *Mirbelia ferricola* (P3), *Spartothamnella* sp. Helena & Aurora Range (P.G. Armstrong 155-109) (P3) and *Styphelia* sp. Bullfinch (M. Hislop 3574) (P3).

Table 7: Priority flora recorded in the vicinity of the Jackson 5 prospect survey area

SCC = State Conservation Code (DEC). Refer to Appendix A for definitions of conservation codes.

Species	Family	SCC
Acacia adinophylla	Fabaceae	P1
Acacia sp. Bungalbin Hill (J.J. Alford 1119)	Fabaceae	P1
Baeckea sp. Helena and Aurora Range (G.J. Keighery 4424)	Myrtaceae	P1
Chamelaucium sp. Koolyanobbing (V. Clarke 644)	Myrtaceae	P1
Gnephosis intonsa	Asteraceae	P1
Lepidosperma bungalbin	Cyperaceae	P1
Persoonia leucopogon	Proteaceae	P1
Philotheca deserti subsp. *brevifolia*	Rutaceae	P1
Goodenia jaurdiensis	Goodeniaceae	P2
Malleostemon sp. Adelong (G.J. Keighery 11825)	Myrtaceae	P2
Phlegmatospermum eremaeum	Brassicaceae	P2
Acacia cylindrical	Fabaceae	P3
Acacia formidabilis	Fabaceae	P3
Astartea sp. Bungalbin Hill (K.R. Newbey 8989)	Myrtaceae	P3
Baeckea sp. Bungalbin Hill (B.J. Lepschi & L.A. Craven 4586)	Myrtaceae	P3
Banksia lullfitzii	Proteaceae	P3
Bossiaea sp. Jackson Range (G. Cockerton & S. McNee LCS 13614)	Fabaceae	P3
Calytrix creswellii	Myrtaceae	P3
Dillwynia acerosa	Fabaceae	P3
Grevillea georgeana	Proteaceae	P3
Hibbertia lepidocalyx subsp. *tuberculata*	Dilleniaceae	P3
Homalocalyx grandiflorus	Myrtaceae	P3
Lepidosperma ferricola	Cyperaceae	P3
Mirbelia ferricola	Fabaceae	P3
Neurachne annularis	Poaceae	P3
Melichrus sp. Bungalbin Hill (F.H. & M.P. Mollemans 3069)	Ericaceae	P3
Spartothamnella sp. Helena & Aurora Range (P.G. Armstrong 155-109)	Lamiaceae	P3
Stenanthemum newbeyi	Rhamnaceae	P3
Stylidium choreanthum	Stylidiaceae	P3
Styphelia sp. Bullfinch (M. Hislop 3574)	Ericaceae	P3
Verticordia mitodes	Myrtaceae	P3
Banksia arborea	Proteaceae	P4
Eucalyptus formanii	Myrtaceae	P4
Grevillea erectiloba	Proteaceae	P4
Sowerbaea multicaulis	Asparagaceae	P4

6. FIELD SURVEY RESULTS

The J5 prospect survey area consisted of a 40.2 ha area located on a banded ironstone hill on the Helena Range. The entire Jackson 5 prospect survey area was searched at a high level of intensity over a period of six days in December 2012 and February 2013.

Within the Jackson 5 prospect survey area, the total area to be cleared for new track construction to access the 19 planned new drill holes is 2705.5 m^2 (0.27055 ha). The total area to be cleared for construction of new drill pads is 9383 m^2 (0.9383 ha). The total area to be cleared for both new track and drill pad construction would be 12,088.5 m^2 (1.20885 ha).

Two options are proposed for the construction of an access track through the corridor to the south of the main section of the survey area (Figure 8). The longer of the two options is a 980 m access route from the western side of tenement M77/1095. Based on a nominal track width of 3.5 m, this would require the clearing of up to 3,430 m^2 (0.3430 ha) of vegetation. The shorter of the two access route options is a 440 m access route originating from the eastern side of Tenement M77/1095. Based on a nominal track width of 3.5 m, this would require the clearing of up to 1,540 m^2 (0.1540 ha) of vegetation.

6.1 Survey Limitations and Constraints

The main limitation that appears to exist is the likelihood of additional annual and ephemeral taxa, which despite the recent higher rainfalls prior to the targeted search may not have been recorded due to the higher summer temperatures that may not favour the germination and maintenance of some of these taxa (Table 8). Consequently, although the targeted work for threatened and priority species (which were perennials) was not constrained there is some potential for additional new annual and ephemeral species to occur in the J5 prospect survey area. This latter constraint may affect the thoroughness of the survey, and the conclusions which have been formed.

Table 8: Potential flora and vegetation survey limitations for the survey area

Potential Survey Limitation	Impact on Survey
Sources of information and availability of contextual information (i.e. pre-existing background versus new material).	**Not a constraint:** Existing vegetation information of the area has historically been based on the vegetation surveys of John Beard. This, together with vegetation reviews by other authors, access to online information on flora collection in the region, and previous surveys undertaken by Mattiske Consulting Pty Ltd, there is adequate information on the vegetation of the survey area.
Scope (i.e. what life forms, etc., were sampled).	**Not a constraint:** The focus of the survey was a search for threatened and priority flora. All currently known threatened or priority flora expected to be encountered in the J5 prospect area are perennial species.
Proportion of flora collected and identified (based on sampling, timing and intensity).	**Potential Constraint:** Although the focus of the survey was to search for threatened and priority flora, which are recognized by the desktop assessment to be perennial species, there is still some likelihood of new annual and ephemeral species that would not have been covered in this targeted survey effort on the J5 prospect survey area. Consequently, there remains a potential constraint on the survey effort.
Completeness and further work which might be needed (i.e. was the relevant survey area fully surveyed).	**Not a constraint:** The J5 prospect survey area was covered fully, as this was a targeted assessment for threatened and priority species which are perennials.
Mapping reliability.	**Not a constraint:** Not a relevant factor for the present survey. Actual locations for the survey were available as a shape file stored on hand held GPS units.

Table 8: Potential flora and vegetation survey limitations for the survey area

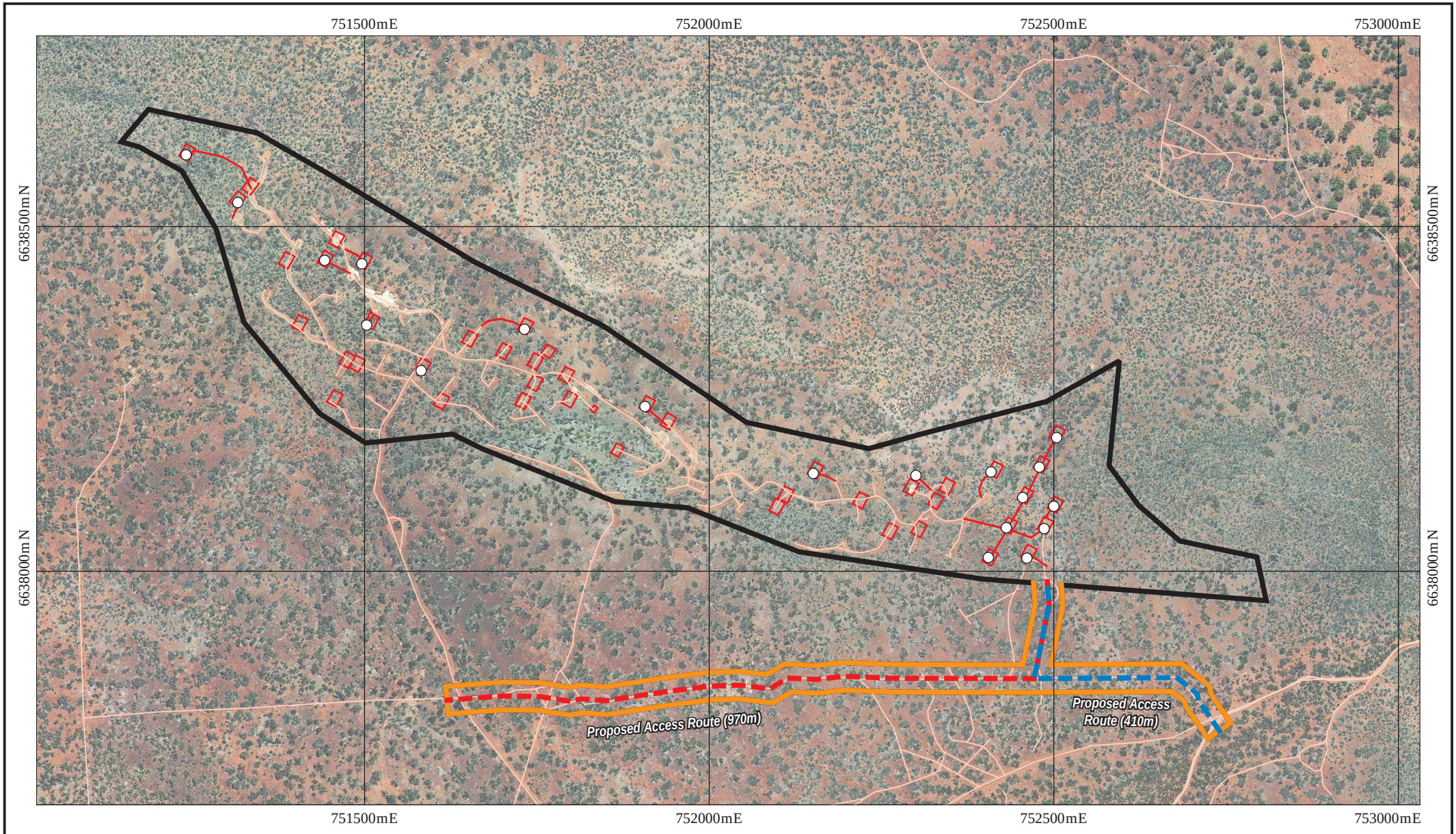
Potential Survey Limitation	Impact on Survey
Timing, weather, season, cycle.	**Potential Constraint:** The survey was carried out in December 2012 and February 2013 following favourable rainfalls. As the threatened and priority flora which are known to occur in the prospect area were perennial shrubs the timing, weather, season and cycle are not considered to be a constraint. However, due to the number of new taxa being uncovered within the Mt Manning – Helena-Aurora Range system (D. Coffey pers. comm.), the timing of the present survey may have constrained the coverage of annual or ephemeral species, which may be of conservation significance. This is notwithstanding the above average levels of rainfall in the region since November 2012. Annual species were either absent during the present survey, or were in such a poor state as to render accurate identification impossible.
Disturbances (fire flood, accidental human intervention, etc.).	**Not a constraint:** The survey area was located in a region which had not been subject to recent fires. Evidence of human disturbance, in the form of tracks, was present. However, the proportion of the survey area disturbed was low.
Intensity (in retrospect, was the intensity adequate).	**Not a constraint:** The search for threatened and priority flora was made on foot, in parallel paths covering the survey area, at a 20 m (access route) and 40 m (drill holes) spacing. The survey intensity is considered to have been thorough.
Resources (i.e. were there adequate resources to complete the survey to the required standard).	**Not a constraint:** Resources, in terms of time, equipment, support and personnel were adequate to undertake and complete the survey.
Access problems (i.e. ability to access survey area).	**Not a constraint:** The survey area was easily accessible from existing tracks in the tenement. There were no obstacles to surveying the designated area.
Experience levels (e.g. degree of expertise in plant identification to taxon level).	**Not a constraint:** The botanists who undertook the field work have undertaken previous surveys in the area and are familiar with the vegetation and flora of the area, particularly the threatened and priority flora.

6.2 Potential Impacts to Vegetation Associations in Survey Area

An assessment of the impacts to vegetation associations within tenement M77/1095 resulting from the clearing of tracks and drill pad areas, based on the following criteria (refer to Figure 8):

- Drill hole survey area (blue polygon in Figure 8): total area to be cleared = 1.20885 ha, based on 0.27055 ha for new tracks and 0.9383 ha for new drill pads (S. Risbey, Regional Manager, Polaris Metals Pty Ltd, pers. com.).
- Western access route (green polygon with black dashed line in Figure 8): 980 m length, 3.5 m track width. Total area = 0.3430 ha.
- Eastern access route (green polygon with solid red line in Figure 8): 440 m length, 3.5 m width. Total area = 0.1540 ha.

The impacts to the vegetation associations within tenement M77/1095 are detailed in Table 9.



Legend

- Survey Boundary
- Existing Tracks
- Proposed New Tracks
- Proposed Drill Holes
- Access Corridor
- Western Access Route
- Eastern Access Route

Client: POLARIS METALS NL

0 100m

Scale 1:7,500
MGA94 (Zone 50)

CAD Ref: g1531_J5_PS_F02.dgn
Date: Apr 2013 | Rev: C | A4

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Yilgarn Iron Ore Project - J5 Area

Jackson 5 Prospect Survey Area

Drill Hole and Access Route Survey Areas

Figure: **8**

Table 9: Risk assessment for impact on vegetation associations in the Jackson 5 prospect survey area of tenement M77/1095

Total size of area surveyed = 40.2 ha. The area to be cleared is based on the clearing of 1.20885 ha of native vegetation to accommodate new drill pads and tracks, as well as ground works deemed necessary on existing track and drill pads in order to make them serviceable for drilling operations, together with separate calculations for access corridor track options. Refer to Figures 6, 7 and 9.

Source of data on pre-European extent of vegetation associations is from Government of Western Australia (2011).

Vegetation Association	Description	Pre-European Extent in WA (ha)	Remaining Uncleared in WA (%)	Total in Crown reserves or managed by DEC (%)	Extent to be Disturbed by Program	Confirmed / Likely Impact
Drill pads and access tracks						
520	Shrublands, *Acacia quadrimarginea* thickets	23,184.91	93.11	46.34	1.20885 ha	Low • < 0.01% total extent in WA • < 1% total extent within tenement M77/1095
Western access option (980 m)						
141.3	Medium woodland; York gum, salmon gum & gimlet	644,279.88	99.94	15.60	0.3185 ha	Low • < 0.0001% total extent in WA • < 0.1% total extent within tenement M77/1095
520	Shrublands, *Acacia quadrimarginea* thickets	23,184.91	93.11	46.34	0.0245 ha	Low • < 0.001% total extent in WA • < 0.01% total extent within tenement M77/1095
Eastern access option (440 m)						
141.3	Medium woodland; York gum, salmon gum & gimlet	644,279.88	99.94	15.60	0.1295 ha	Low • < 0.0001% total extent in WA • < 0.1% total extent within tenement M77/1095
520	Shrublands, *Acacia quadrimarginea* thickets	23,184.91	93.11	46.34	0.0245 ha	Low • < 0.001% total extent in WA • < 0.01% total extent within tenement M77/1095

6.3 Threatened Flora

No threatened flora pursuant to Schedule 1 of the *Wildlife Conservation Act 1950* and as listed by the Department of Environment and Conservation (2013a) were recorded within the J5 prospect survey area. No threatened flora pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* and as listed by the Department of Sustainability, Environment, Water, Population and Communities (2013) were recorded within the J5 prospect survey area.

6.4 Priority Flora

A total of six priority flora taxa were recorded during the survey of the Jackson 5 prospect survey area. The taxa recorded were: *Acacia adinophylla* (P1), *Hibbertia lepidocalyx* subsp. *tuberculata* (P3), *Mirbelia ferricola* (P3), *Neurachne annularis* (P3), *Stenanthemum newbeyi* (P3) and *Banksia arborea* (P4). The total population of each taxon recorded within the Jackson 5 prospect survey area is set out in Table 10.

Table 10: Populations of priority flora taxa recorded within the Jackson 5 prospect survey area in December 2012 and January 2013
Total populations, with the exception of *Neurachne annularis* (P3), were determined by recording the number of individual plants of each species. The population of *Neurachne annularis* (P3) was calculated after accurately counting a subset of the population within the Jackson 5 prospect survey area.

Species	Family	Total Population
Acacia adinophylla (P1)	Fabaceae	95
Hibbertia lepidocalyx subsp. *tuberculata* (P3)	Dilleniaceae	1,331
Mirbelia ferricola (P3)	Fabaceae	164
Neurachne annularis (P3)	Poaceae	444,456
Stenanthemum newbeyi (P3)	Rhamnaceae	1,990
Banksia arborea (P4)	Proteaceae	424

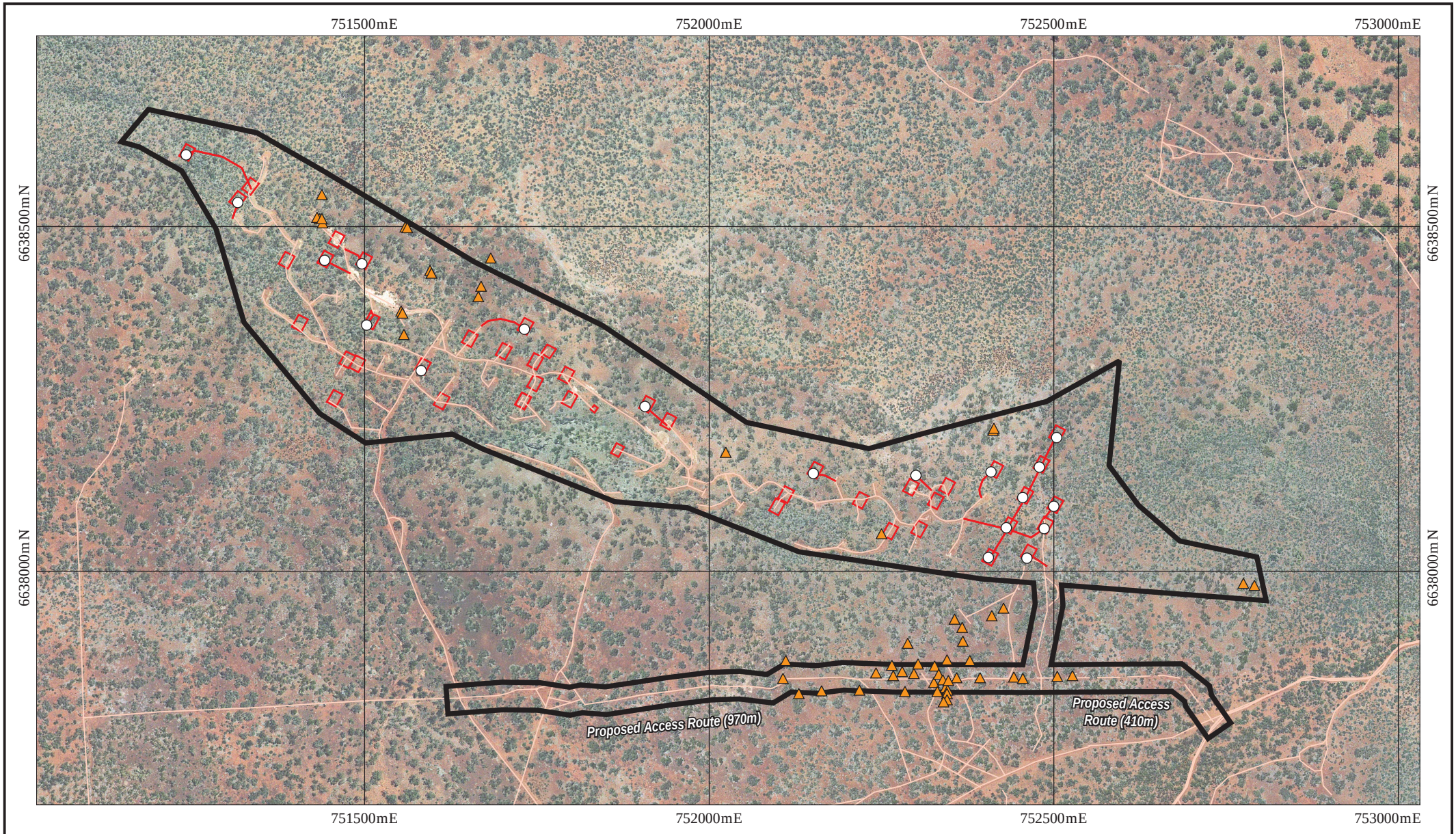
The distribution of all priority taxa recorded within the Jackson 5 prospect survey area are illustrated in Figures 9 through 15. The detailed results of each priority taxon recorded within the Jackson 5 prospect survey area are set out in sections 6.4.1 through 6.4.6.

6.4.1 *Acacia adinophylla* (P1)

A total of 95 individual plants of *Acacia adinophylla* (P1) were recorded within the Jackson 5 prospect survey area, Figure 9. *Acacia adinophylla* (P1) was primarily recorded on lower slopes and flats on gravelly clay loam soils. *Acacia adinophylla* (P1) occurred most densely in the southern portion of the survey area which is the site of the proposed western access corridor.

No *Acacia adinophylla* (P1) would be taken by clearing associated with new drill pads and their associated tracks. Up to 32 *Acacia adinophylla* (P1), which are currently growing on or on the edge of existing tracks, could be affected by vehicles accessing existing tracks within the Jackson 5 prospect survey area. The major area of impact would be associated in the southern portion of the survey area, and is associated with the population of *Acacia adinophylla* (P1) growing on the western access corridor.

The locations and populations of *Acacia adinophylla* (P1) recorded within the Jackson 5 prospect survey area are set out in Appendix D.



Legend

- Survey Boundary
- Existing Tracks
- Proposed New Tracks
- Proposed Drill Holes
- *Acacia adinophylla (P1)*

Client: POLARIS METALS NL

0 100m

Scale 1:7,500
MGA94 (Zone 50)

CAD Ref: g1531_J5_PS_F03.dgn

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Jackson 5 Prospect Survey Area

Distribution of *Acacia adinophylla* (P1)

Figure: **9**

6.4.2 *Hibbertia lepidocalyx* subsp. *tuberculata* (P3)

A total of 1,331 individual plants of *Hibbertia lepidocalyx* subsp. *tuberculata* (P3) were recorded within the Jackson 5 prospect survey area (Figure 10). *Hibbertia lepidocalyx* subsp. *tuberculata* (P3) was recorded on a range of topographical areas, from lower slopes to ridges, typically growing on gravelly or rocky soils. *Hibbertia lepidocalyx* subsp. *tuberculata* (P3) was not distributed evenly over the survey area, and was more common in the eastern half, and towards the western extremity of the Jackson 5 prospect survey area.

A total of 115 *Hibbertia lepidocalyx* subsp. *tuberculata* (P3) would be taken by clearing associated with new drill pads and their associated tracks. Sixteen *Hibbertia lepidocalyx* subsp. *tuberculata* (P3) would be taken by clearing associated with existing drill pads. Up to 139 *Hibbertia lepidocalyx* subsp. *tuberculata* (P3), which are currently growing on or on the edge of existing tracks, could be affected by vehicles accessing existing tracks within the Jackson 5 prospect survey area. No *Hibbertia lepidocalyx* subsp. *tuberculata* (P3) were recorded on the southern access corridor.

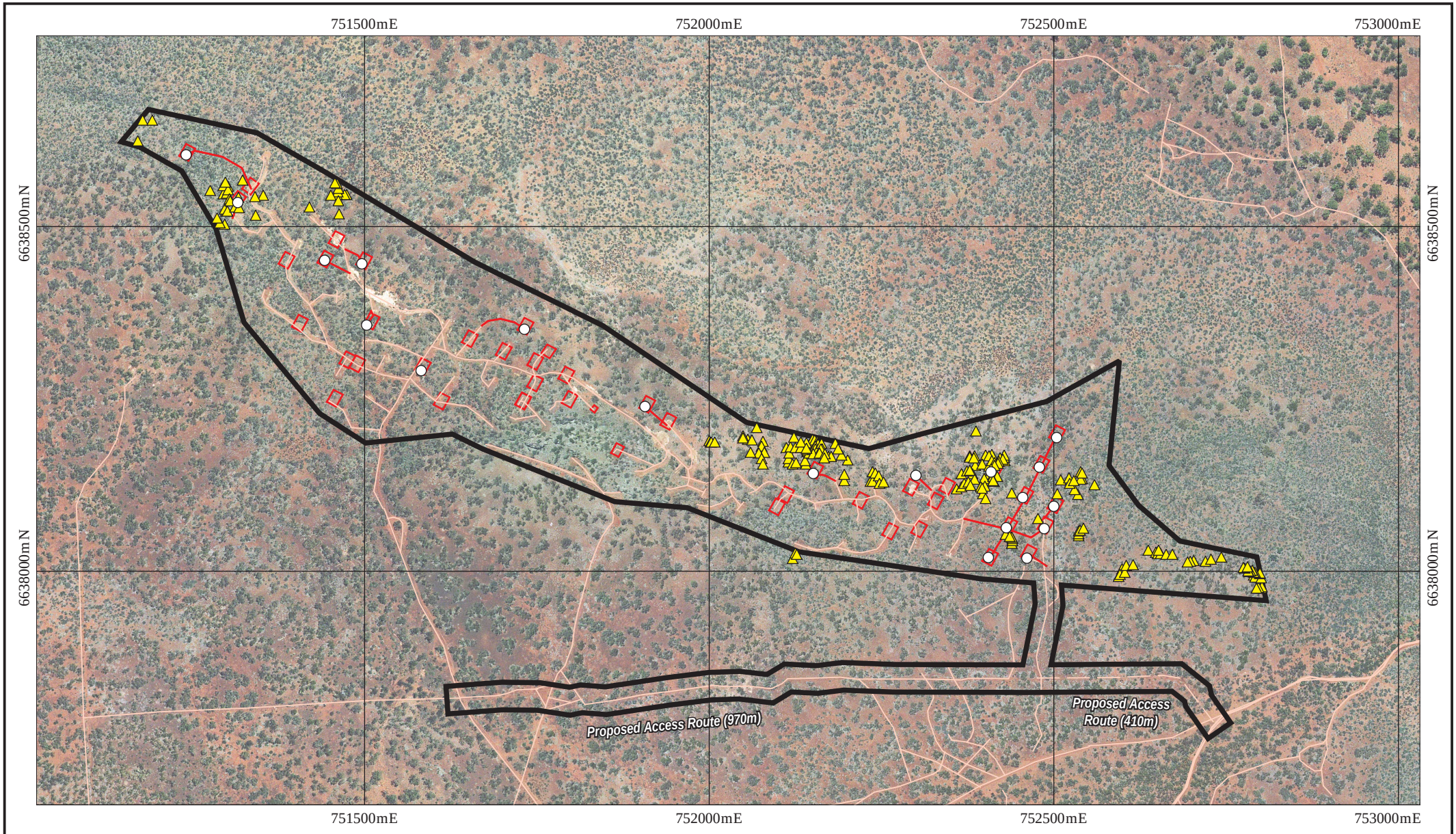
The locations and populations of *Hibbertia lepidocalyx* subsp. *tuberculata* (P3) recorded within the Jackson 5 prospect survey area are set out in Appendix E.

6.4.3 *Mirbelia ferricola* (P3)

A total of 164 individual plants of *Mirbelia ferricola* (P3) were recorded within the Jackson 5 prospect survey area (Figure 11). *Mirbelia ferricola* (P3) was recorded growing on ridges to lower slopes in positions where there was usually rock outcropping.

Three *Mirbelia ferricola* (P3) would be taken by clearing associated with new drill pads and their associated tracks. No *Mirbelia ferricola* (P3) were recorded growing on or on the edge of existing tracks. No *Mirbelia ferricola* (P3) were recorded on the southern access corridor.

The locations and populations of *Mirbelia ferricola* (P3) recorded within the Jackson 5 prospect survey area are set out in Appendix F.



Legend

- Survey Boundary
- Existing Tracks
- Proposed New Tracks
- Proposed Drill Holes
- *Hibbertia lepidocalyx subsp. tuberculata (P3)*

Client: POLARIS METALS NL

0 100m

Scale 1:7,500
MGA94 (Zone 50)

CAD Ref: g1531_J5_PS_F04.dgn
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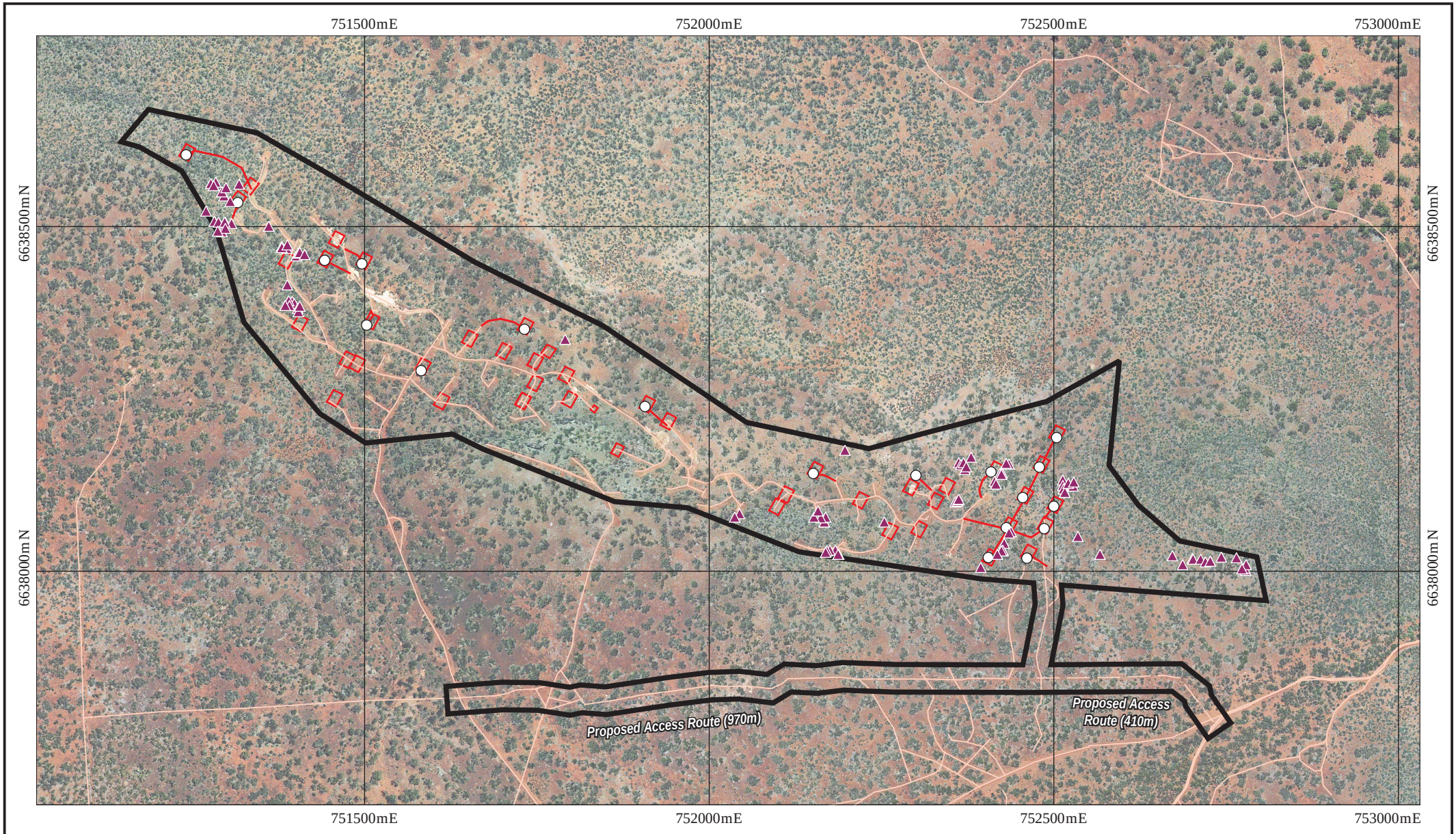
Jackson 5 Prospect Survey Area

Distribution of *Hibbertia lepidocalyx* subsp. *tuberculata* (P3)

Figure: **10**



Legend

- Survey Boundary
- Existing Tracks
- Proposed New Tracks
- Proposed Drill Holes
- *Mirbelia ferricola (P3)*

Client: POLARIS METALS NL

0 100m

Scale 1:7,500
MGA94 (Zone 50)

CAD Ref: g1531_J5_PS_F05.dgn
Date: Apr 2013 | Rev: C | A4

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Yilgarn Iron Ore Project - J5 Area

Jackson 5 Prospect Survey Area

Distribution of *Mirbelia ferricola* (P3)

Figure: **11**

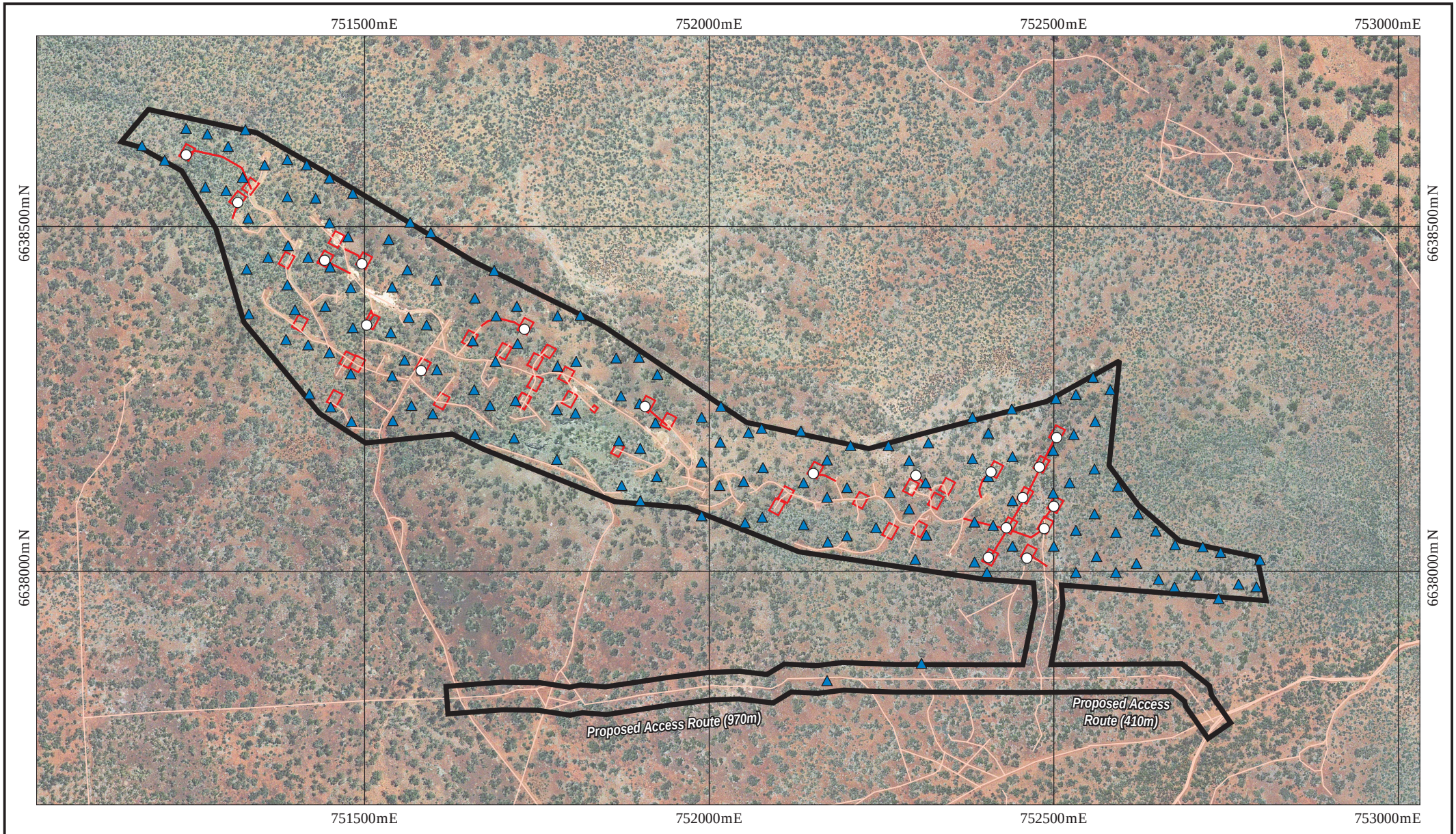
6.4.4 *Neurachne annularis* (P3)

The size of the Jackson 5 prospect survey area (40.2 ha) and the coverage of *Neurachne annularis* (P3) across the survey area made it impractical to count all plants. An estimate of the *Neurachne annularis* (P3) population within the survey area was made by accurately counting plants in 157 random 10 m x 10 m quadrats distributed over the survey area. This data was then used to derive an average density for *Neurachne annularis* (P3) and an estimate of the population present within the survey area. The locations of the *Neurachne annularis* (P3) survey quadrats within the Jackson 5 prospect survey are is illustrated in Figure 12, and set out in Appendix G.

Sequential sampling of *Neurachne annularis* (P3) was carried out to determine if a suitably large enough subset of the total population had been sampled in order to derive a total population estimate. Figure 13 illustrates the results of plotting the mean number of *Neurachne annularis* (P3) per quadrat, standard deviation and estimated total population of *Neurachne annularis* (P3) within the Jackson 5 prospect survey area, sequentially from 1st to 157th quadrat. Initially the analysis was made, based on the order in which the quadrats were surveyed. This was from the western to eastern sides of the survey area. However this produced a skewed result due to the stratified nature of the *Neurachne annularis* (P3) distribution within the survey area, with there being a general tendency for the more dense areas of *Neurachne annularis* (P3) to be located on lower slopes to the northern and eastern sections of the Jackson 5 prospect survey area. Consequently, the data was randomised to remove this inherent bias, which would otherwise produce an overestimate of the *Neurachne annularis* (P3) population. The plot illustrates that whilst the standard deviation has stabilised after sampling approximately 100 quadrats (equivalent to 2.48 % of the Jackson 5 prospect survey area), both the average number of *Neurachne annularis* (P3) per quadrat and the estimated total population of *Neurachne annularis* (P3) within the Jackson 5 prospect survey area do not stabilise until approximately 140 quadrats had been sampled. This is the equivalent of 3.48 % of the Jackson 5 prospect survey area.

Based on the subset of *Neurachne annularis* (P3) sampled, and an average 110.56 *Neurachne annularis* (P3) per quadrat, the total population of *Neurachne annularis* (P3) within the Jackson 5 prospect survey area was calculated to be 444,456 plants. The number of *Neurachne annularis* (P3) plants which would be impacted by the clearing of 1.20885 ha was calculated to be 13,365 plants or 3 % of the population within the Jackson 5 prospect survey area.

Additionally, 580 *Neurachne annularis* (P3) may potentially be cleared to accommodate either the western or eastern access routes located in the southern section of the Jackson 5 prospect survey area. *Neurachne annularis* (P3) occurs in the short (150 m) section of the survey area between the main section which is the location of the drill holes and tracks, and the southern east-west corridor. A 3.5 m wide track has been used as the basis for the calculation of clearing impacts.



Legend

- Survey Boundary
- Existing Tracks
- Proposed New Tracks
- Proposed Drill Holes
- *Neurachne annularis (P3)*

Client: POLARIS METALS NL

0 100m

Scale 1:7,500
MGA94 (Zone 50)

CAD Ref: g1531_J5_PS_F06.dgn

Date: Apr 2013 | Rev: C | A4

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Yilgarn Iron Ore Project - J5 Area

Jackson 5 Prospect Survey Area

Location of *Neurachne annularis* (P3) survey quadrats

Figure: **12**

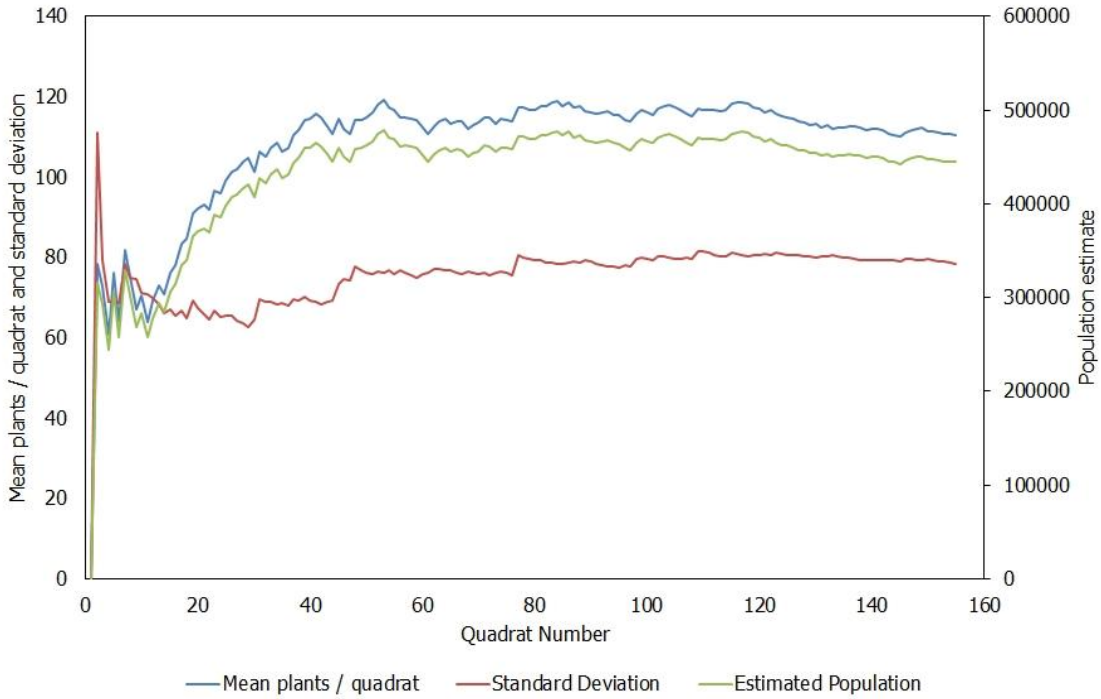


Figure 13: Sequential sampling of 10 m x 10 m quadrats for *Neurachne annularis* (P3) population estimate

6.4.5 *Stenanthemum newbeyi* (P3)

A total of 1,990 individual plants of *Stenanthemum newbeyi* (P3) were recorded within the Jackson 5 prospect survey area (Figure 14). *Stenanthemum newbeyi* (P3) was recorded from flats to ridges on gravelly clay loam soils. *Stenanthemum newbeyi* (P3) was widespread across the Jackson 5 prospect survey area, but tended to be more dense on the mid to upper slope areas.

Fifty *Stenanthemum newbeyi* (P3) would be taken by clearing associated with new drill pads and their associated tracks. Forty nine *Stenanthemum newbeyi* (P3) would be taken by clearing associated with existing drill pads. Up to 131 *Stenanthemum newbeyi* (P3), which are currently growing on or on the edge of existing tracks, could be affected by vehicles accessing existing tracks within the Jackson 5 prospect survey area. Two *Stenanthemum newbeyi* (P3) could be cleared along the western access corridor located in the southern section of the Jackson 5 prospect survey area

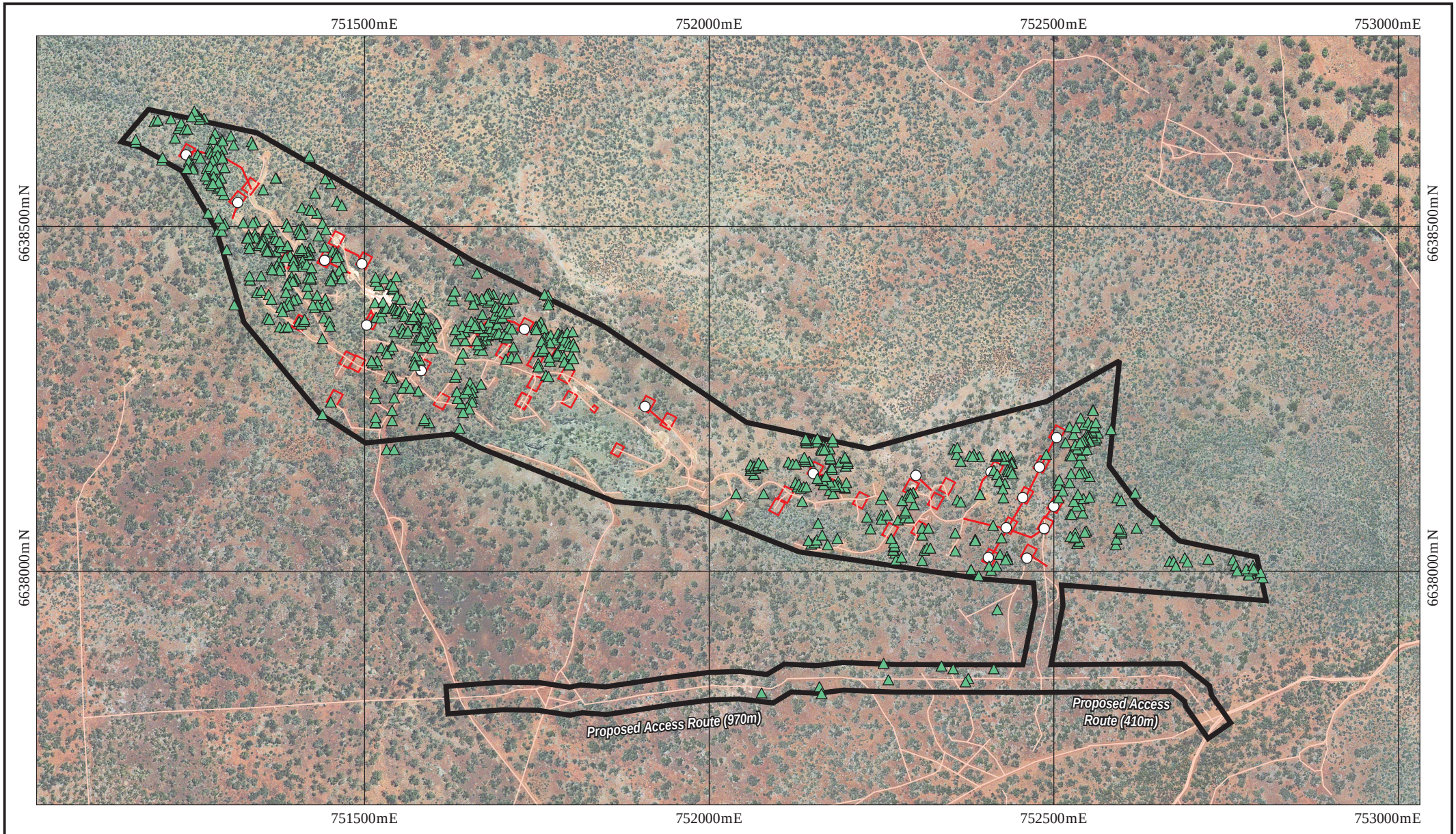
The locations and populations of *Stenanthemum newbeyi* (P3) recorded within the Jackson 5 prospect survey area are set out in Appendix H.

6.4.6 *Banksia arborea* (P4)

A total of 424 individual plants of *Banksia arborea* (P4) were recorded within the Jackson 5 prospect survey area (Figure 15). *Banksia arborea* (P4) was recorded on mid slopes to ridges in areas where massive ironstone rock outcropping occurred. *Banksia arborea* (P4) was most commonly recoded in the central portion of the Jackson 5 prospect survey area, on its southern side, where a breakaway area was located.

Four *Banksia arborea* (P4) would be taken by clearing associated with new drill pads and their associated tracks. Five *Banksia arborea* (P4) would be taken by clearing associated with existing drill pads. Up to eight *Banksia arborea* (P4), which are currently growing on or on the edge of existing tracks, could be affected by vehicles accessing existing tracks within the Jackson 5 prospect survey area.

The locations and populations of *Banksia arborea* (P4) recorded within the Jackson 5 prospect survey area are set out in Appendix I.



Legend

- Survey Boundary
- Existing Tracks
- Proposed New Tracks
- Proposed Drill Holes
- *Stenanthemum newbeyi (P3)*

Client: POLARIS METALS NL

0 100m

Scale 1:7,500
MGA94 (Zone 50)

CAD Ref: g1531_J5_PS_F07.dgn
Date: Apr 2013 | Rev: C | A4

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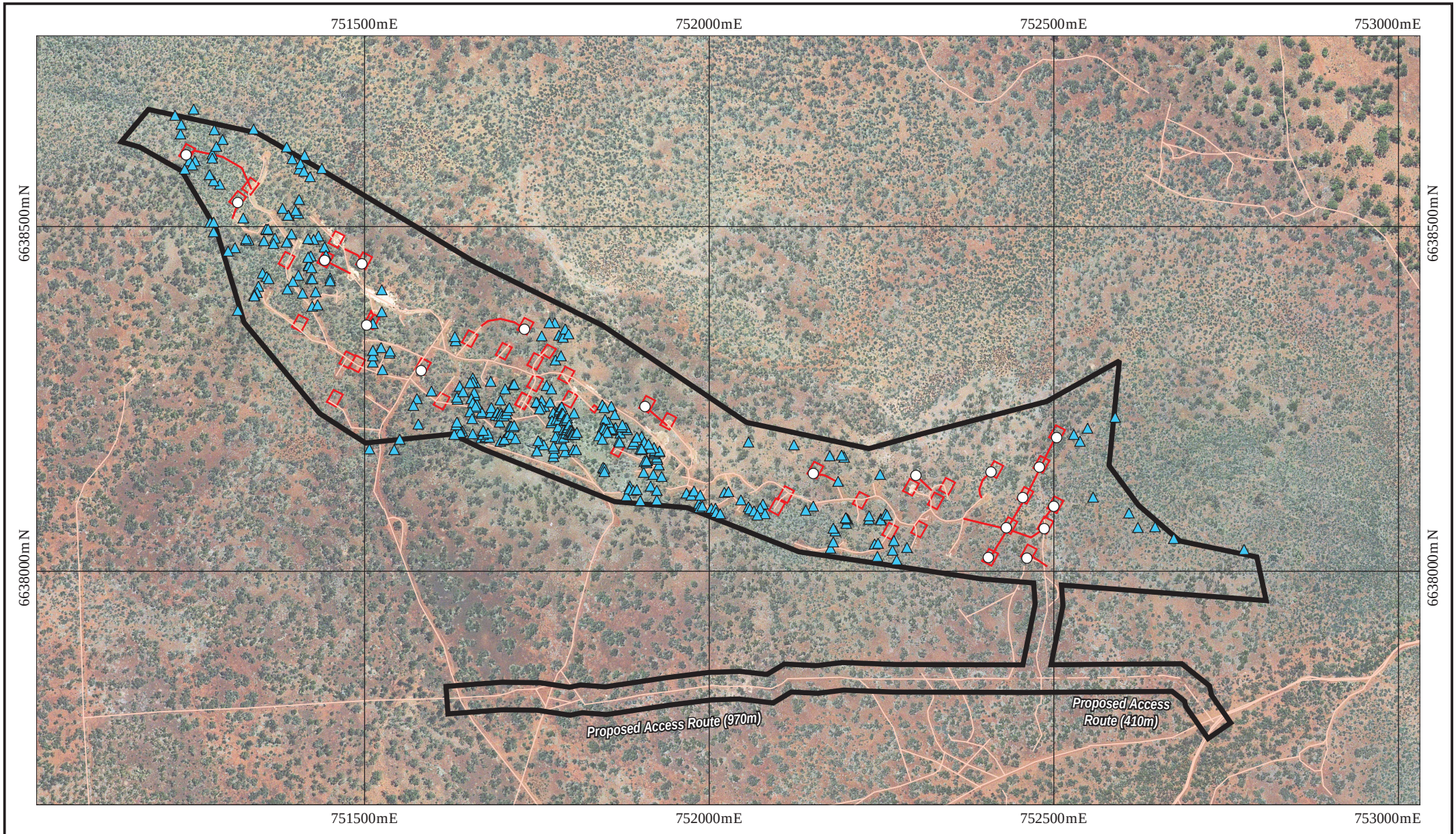
Yilgarn Iron Ore Project - J5 Area

Jackson 5 Prospect Survey Area

Distribution of *Stenanthemum newbeyi* (P3)

Figure: **14**



Legend

- Survey Boundary
- Existing Tracks
- Proposed New Tracks
- Proposed Drill Holes
- *Banksia arborea (P4)*

Client: POLARIS METALS NL

0 100m

Scale 1:7,500
MGA94 (Zone 50)

CAD Ref: g1531_J5_PS_F08.dgn

Date: Apr 2013 | Rev: C | A4

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Yilgarn Iron Ore Project - J5 Area

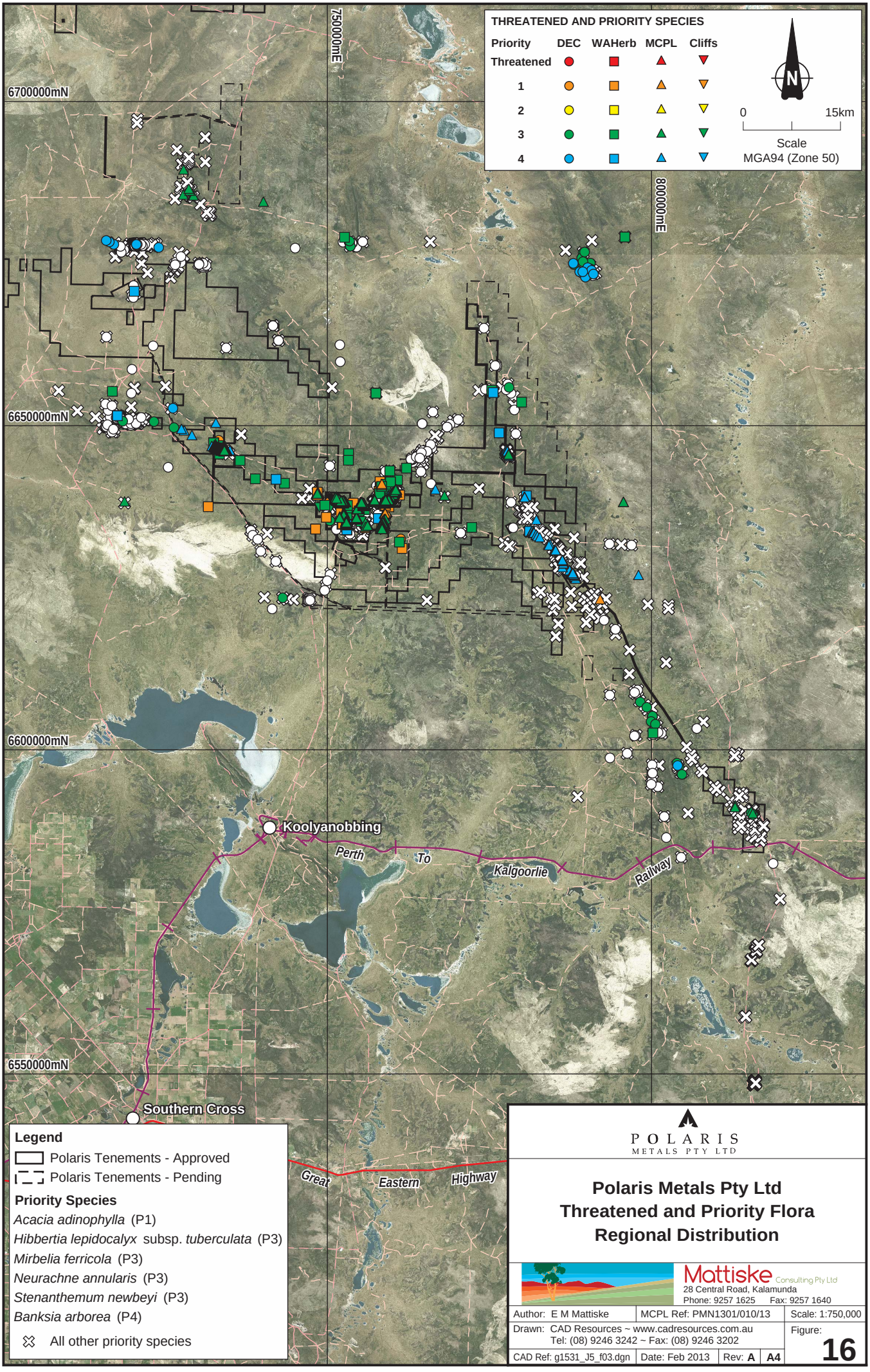
Jackson 5 Prospect Survey Area

Distribution of *Banksia arborea* (P4)

Figure: **15**

6.5 Impacts to Priority Flora

The impacts to priority flora growing within the Jackson 5 prospect survey area resulting from clearing of new drill pads and tracks are set out in Tables 11 to 16. The tables also indicate the potential impacts to priority flora growing on existing drill pads and tracks. Local impact figures were based on total population of each species recorded within the Jackson 5 prospect survey area. Regional population data has been compiled from several sources as specified in the methods section. The regional data spans a geographical area defined from 704400 mE / 6699600 mN (north west corner) to 823000 mE / 6546600 mN (south east corner) – all coordinates are MGA94, zone 50. The area of coverage is 118.6 km by 153 km, representing an area of 18,146 km^2. The distribution of threatened and priority flora, at the regional scale, is shown in Figure 16.



POLARIS METALS PTY LTD

Polaris Metals Pty Ltd
Threatened and Priority Flora
Regional Distribution

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CAD Ref: g1531_J5_f03.dgn	Date: Feb 2013	Rev: A A4

Table 11: Risk assessment for impact on *Acacia adinophylla* (P1) in the Jackson 5 prospect survey area of tenement M77/1095

Total size of area surveyed = 40.2 ha. Extent to be disturbed is based on the clearing of 1.2 ha of native vegetation to accommodate new drill pads and tracks, as well as ground works deemed necessary on existing track and drill pads in order to make them serviceable for drilling operations.

SCC = *Wildlife Conservation Act 1950* / DEC listing (State Conservation Code); FCC = *EPBC Act 1999* listing (Federal Conservation Code)

Taxon	SCC	FCC	Description	Soils, topography and vegetation	Flowering time	Likelihood of detection if present	Confirmed / likely occurrence in program area	Extent / abundance outside program area	Confirmed / likely impact
Acacia adinophylla	P1	n/a	prostrate or erect tangled shrub	stony loam or sandy soils , clay; ironstone ridges, undulating plains	Sep-Nov	High Readily observable due to characteristic growth form; dissimilar to other taxa in area	Confirmed. 95 individuals within Jackson 5 prospect survey area	1032 individuals within defined area of COO2 bioregion.	Moderate - Low: Taxon is a disturbance opportunist. Proposed new drill pads and access tracks: 0 individuals. Locally = 0 % Regionally = 0 % Existing old drill pads and tracks: 0 individuals Locally = 0 % Regionally = 0 % Eastern access corridor (440 m): 5 individuals Locally = 5.26 % Regionally = 0.48 % Western access corridor (980 m): 27 individuals Locally = 28.42 % Regionally = 2.62 %

Table 12: Risk assessment for impact on *Hibbertia lepidocalyx* subsp. *tuberculata* (P3) in the Jackson 5 prospect survey area of tenement M77/1095

Total size of area surveyed = 40.2 ha. Extent to be disturbed is based on the clearing of 1.2 ha of native vegetation to accommodate new drill pads and tracks, as well as ground works deemed necessary on existing track and drill pads in order to make them serviceable for drilling operations.

SCC = *Wildlife Conservation Act 1950* / DEC listing (State Conservation Code); FCC = *EPBC Act 1999* listing (Federal Conservation Code)

Taxon	SCC	FCC	Description	Soils, topography and vegetation	Flowering time	Likelihood of detection if present	Confirmed / likely occurrence in program area	Extent / abundance outside program area	Confirmed / likely impact
Hibbertia lepidocalyx subsp. *tuberculata*	P3	n/a	shrub to 50 cm	orange loam; ironstone gravel	Jul-Sep	High Jul-Sep, but generally good due to vegetative characteristics	Confirmed. 1,331 individuals within Jackson 5 prospect survey area	2,189 individuals within defined area of COO2 bioregion.	Moderate - Low: Proposed new drill pads and access tracks: 115 individuals Locally = 8.64 % Regionally = 5.25 % Existing old drill pads: 16 individuals Locally = 1.20 % Regionally = 0.73 % Existing old tracks: 13 individuals Locally = 0.98 % Regionally = 0.59 % Eastern access corridor (440 m): 0 individuals Locally = 0 % Regionally = 0 % Western access corridor (980 m): 0 individuals Locally = 0 % Regionally = 0 %

Table 13: Risk assessment for impact on *Mirbelia ferricola* (P3) in the Jackson 5 prospect survey area of tenement M77/1095

Total size of area surveyed = 40.2 ha. Extent to be disturbed is based on the clearing of 1.2 ha of native vegetation to accommodate new drill pads and tracks, as well as ground works deemed necessary on existing track and drill pads in order to make them serviceable for drilling operations.

SCC = *Wildlife Conservation Act 1950* / DEC listing (State Conservation Code); FCC = *EPBC Act 1999* listing (Federal Conservation Code)

Taxon	SCC	FCC	Description	Soils, topography and vegetation	Flowering time	Likelihood of detection if present	Confirmed / likely occurrence in program area	Extent / abundance outside program area	Confirmed / likely impact
Mirbelia ferricola	P3	n/a	shrub to 200 cm	clay-loams, banded ironstone; hillslopes and ridges	Sep-Nov	High Readily observable due to characteristic growth form; dissimilar to other taxa in area	Confirmed. 164 individuals within Jackson 5 prospect survey area	1,223 individuals within defined area of COO2 bioregion.	Low: Proposed new drill pads and access tracks: 3 individuals Locally = 1.83 % Regionally = 0.24 % Existing old drill pads and tracks: 0 individuals Locally = 0 % Regionally = 0 % Eastern access corridor (440 m): 0 individuals Locally = 0 % Regionally = 0 % Western access corridor (980 m): 0 individuals Locally = 0 % Regionally = 0 %

Table 14: Risk assessment for impact on *Neurachne annularis* (P3) in the Jackson 5 prospect survey area of tenement M77/1095

Total size of area surveyed = 40.2 ha. Extent to be disturbed is based on the clearing of 1.2 ha of native vegetation to accommodate new drill pads and tracks, as well as ground works deemed necessary on existing track and drill pads in order to make them serviceable for drilling operations.

SCC = *Wildlife Conservation Act 1950* / DEC listing (State Conservation Code); FCC = *EPBC Act 1999* listing (Federal Conservation Code)

Taxon	SCC	FCC	Description	Soils, topography and vegetation	Flowering time	Likelihood of detection if present	Confirmed / likely occurrence in program area	Extent / abundance outside program area	Confirmed / likely impact
Neurachne annularis	P3	n/a	tussock forming perennial grass to 75 cm high	red-brown sandy loams, ironstone gravel; among rocks on tops, sides and bases of banded ironstone ranges	Sep-Oct	High Readily observable due to characteristic growth form; dissimilar to other taxa in area	Confirmed. 444,456 individuals within Jackson 5 prospect survey area	865970 individuals within defined area of COO2 bioregion.	Low: Proposed new drill pads and access tracks: 13,365 individuals Locally = 3.00 % Regionally = 1.54 % Existing old drill pads and tracks: 0 individuals Locally = 0 % Regionally = 0 % Eastern access corridor (440 m): 580 individuals Locally = 0.13 % Regionally = 0.07 % Western access corridor (980 m): 580 individuals Locally = 0.13 % Regionally = 0.07 %

Table 15: Risk assessment for impact on *Stenanthemum newbeyi* (P3) in the Jackson 5 prospect survey area of tenement M77/1095

Total size of area surveyed = 40.2 ha. Extent to be disturbed is based on the clearing of 1.2 ha of native vegetation to accommodate new drill pads and tracks, as well as ground works deemed necessary on existing track and drill pads in order to make them serviceable for drilling operations.

SCC = *Wildlife Conservation Act 1950* / DEC listing (State Conservation Code); FCC = *EPBC Act 1999* listing (Federal Conservation Code)

Taxon	SCC	FCC	Description	Soils, topography and vegetation	Flowering time	Likelihood of detection if present	Confirmed / likely occurrence in program area	Extent / abundance outside program area	Confirmed / likely impact
Stenanthemum newbeyi	P3	n/a	shrub to 1.6 m high	clayey sand, clay, loam; laterite or ironstone; hillslopes	Aug-Sep or Dec-Jan	High Readily observable due to characteristic growth form	Confirmed. 1,990 individuals within Jackson 5 prospect survey area	8,453 individuals within defined area of COO2 bioregion.	Moderate - Low: Proposed new drill pads and access tracks: 50 individuals Locally = 2.51 % Regionally = 0.59 % Existing old drill pads: 49 individuals Locally = 2.46 % Regionally = 0.58 % Existing old tracks: 131 individuals Locally = 6.58 % Regionally = 1.55 % Eastern access corridor (440 m): 0 individuals Locally = 0 % Regionally = 0 % Western access corridor (980 m): 2 individuals Locally = 0.10 % Regionally = 0.02 %

Table 16: Risk assessment for impact on *Banksia arborea* (P4) in the Jackson 5 prospect survey area of tenement M77/1095

Total size of area surveyed = 40.2 ha. Extent to be disturbed is based on the clearing of 1.2 ha of native vegetation to accommodate new drill pads and tracks, as well as ground works deemed necessary on existing track and drill pads in order to make them serviceable for drilling operations.

SCC = *Wildlife Conservation Act 1950* / DEC listing (State Conservation Code); FCC = *EPBC Act 1999* listing (Federal Conservation Code)

Taxon	SCC	FCC	Description	Soils, topography and vegetation	Flowering time	Likelihood of detection if present	Confirmed / likely occurrence in program area	Extent / abundance outside program area	Confirmed / likely impact
Banksia arborea	P4	n/a	large shrub or tree to 8 m high	stony loam; ironstone hills	Mar-May or Sep-Oct	High Readily observable due to characteristic growth form; dissimilar to other taxa in area	Confirmed. 424 individuals within Jackson 5 prospect survey area	3,534 individuals within defined area of COO2 bioregion.	Low: Proposed new drill pads and access tracks: 4 individuals Locally = 0.94 % Regionally = 0.11 % Existing old drill pads: 5 individuals Locally = 1.18 % Regionally = 0.14 % Existing old tracks: 8 individuals Locally = 1.89 % Regionally = 0.23 % Eastern access corridor (440 m): 0 individuals Locally = 0 % Regionally = 0 % Western access corridor (980 m): 0 individuals Locally = 0 % Regionally =0x %

7. DISCUSSION

A survey for threatened and priority flora within a 40.2 ha area, located on a banded ironstone hill within tenement M77/1095, was undertaken in December 2012 and February 2013. The survey, the aim of which was to record the locations and populations of any threatened and priority flora within the survey area, referred to in this report as the Jackson 5 prospect survey area, took place over a six day period.

The Jackson 5 prospect survey area lies principally within vegetation association 520 - shrublands containing *Acacia quadrimarginea* thickets. A small portion of the Jackson 5 prospect survey area falls within vegetation association 141.3 - medium woodland; York gum, salmon gum & gimlet (Figure 6). An assessment of the impacts of the proposed drilling program on these vegetation associations (Table 8) demonstrates that there would be a low impact to both vegetation associations (<0.1% of its pre-European extent at the State level, and <1% at the local level). Given that greater than 99% of these vegetation associations remain intact within both the State and the Coolgardie IBRA region, the impact from the proposed drilling program would be minimal.

No threatened flora pursuant to Schedule 1 of the Wildlife Conservation Act 1950 and as listed by the Department of Environment and Conservation (2013a) were recorded within the Jackson 5 prospect survey area. No threatened flora pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* and as listed by the DSEWPC (2013) were recorded within the Jackson 5 prospect survey area.

A total of six priority flora taxa were recorded during the survey of the Jackson 5 prospect survey area. The taxa recorded were: *Acacia adinophylla* (P1), *Hibbertia lepidocalyx* subsp. *tuberculata* (P3), *Mirbelia ferricola* (P3), *Neurachne annularis* (P3), *Stenanthemum newbeyi* (P3) and *Banksia arborea* (P4). With the exception of *Neurachne annularis* (P3), all other taxa were individually recorded. The population of *Neurachne annularis* (P3) within the Jackson 5 prospect survey area was calculated, based on accurately sampling a subset of the population. The *Neurachne annularis* (P3) survey quadrats were distributed across the entire Jackson 5 prospect survey area. *Neurachne annularis* (P3) does not occur at an even density across the Jackson 5 prospect survey area. This is, in part, a reflection of the range of topographical, soil and landform elements which are present within the Jackson 5 prospect survey area. Field observations, supported by the initial analysis of the data highlighted this fact. Notwithstanding this situation, we consider that the population estimate arrived at is reasonable. The analysis of the data demonstrates stable calculated *Neurachne annularis* (P3) numbers per quadrat and a stable associated standard deviation in the data after approximately 3.5% of the Jackson 5 prospect survey area had been sampled. An alternative to the approach taken in this survey, which may produce a more accurate estimate, would require mapping of the *Neurachne annularis* (P3) within the Jackson 5 prospect survey area, to enable sub-populations to be sampled based on their topographic, soil or landform distribution. This however, would be considerably more time intensive, and was beyond the scope of the present survey. In the context of the relatively small area proposed to be cleared, we consider that the approach taken is adequate to address the needs of the survey.

An assessment of the impacts of the proposed drilling program to the populations of each priority taxon has been undertaken, and is presented in Tables 11 to 16. The results of the assessment demonstrates that the impacts at the local level from the proposed drilling program will be low for *Mirbelia ferricola* (P3), *Neurachne annularis* (P3) and *Banksia arborea* (P4). The potential impacts to populations of *Acacia adinophylla* (P1), *Hibbertia lepidocalyx* subsp. *tuberculata* (P3) and S*tenanthemum newbeyi* (P3) are rated as low to moderate as there is a potential to clear a greater proportion of the local populations of each of these taxa. *Acacia adinophylla* (P1) in particular, has the highest potential for significant impacts if the western access corridor route is used. This access option could potentially result in 28.42 % of the local population being cleared. However, whilst this figure is high, it must be stated that this figure assumes a track which passes along the midline of the proposed access corridor. Most of the *Acacia adinophylla* (P1) can be avoided by maximising use of the existing old track and making some minor deviations about the centre line. Alternatively, impacts to *Acacia adinophylla* (P1) are low if the eastern access corridor option is used. The impact tables for each species represent maximal impacts, with local impact figure being solely calculated based on the data recorded within the 40.2 ha Jackson 5 prospect survey area, which in itself represents only 3 % of the area of tenement M77/1095, within which it is situated. Tenement M77/1095 contains landforms, contiguous with the present area surveyed, which would support additional populations of the six recorded taxa (general field observations). In many cases, impacts can be reduced by making minor adjustments to proposed track alignments and drill pad areas.

At the regional level, the impacts to all six taxa are low. The regional data represent an 18,146 km^2 area within the COO2 sub-region. The regional data is a combination of DEC, WA Herbarium, Mattiske and Cliff's Natural Resources Inc. data. The area used for the regional data is effectively an area spanning the exploration and mining interests of Polaris and Cliff's Natural Resources Inc. in the Coolgardie region.

The J5 prospect survey area within tenement M77/1095 is located at the eastern end of the Helena Range, and is situated within both the Helena and Aurora vegetation complex (P1), and the Helena Aurora Conservation Park. The vegetation which comprises much of the upper slope and ridge area is consistent with the Helena and Aurora vegetation complex (P1) floristic community Helena Aurora 1: *Acacia quadrimarginea*, *Grevillea zygoloba*, *Allocasuarina acutivalvis*, *Melaleuca nematophylla*, *Banksia arborea* (P4) and *Calycopeplus paucifolius* woodlands and shrublands on skeletal yellow or red soils of the ridge tops and upper slopes of the Helena and Aurora Range. Refer to Section 5.11 of this report for a description of vegetation units which constitute the Helena and Aurora vegetation complex (P1). The current PEC listing does not have, nor does it imply, that the PEC has any form of legislative protection. Nonetheless, any exploration activities should be undertaken in a manner which will have minimal impacts to the area.

The main potential limitation, with respect to the present survey, is the timing of the survey which may have influenced the coverage of a range of annual and ephemeral species. Despite the higher rainfalls in the months preceding the assessment of the J5 prospect survey areas, the higher summer temperatures may have restricted coverage of some of the annual and ephemeral species. The optimal time for undertaking botanical surveys in the Coolgardie district is during the spring season. There are reasons for this, including maximising the opportunity to collect/identify annual or ephemeral species, and to enable collection of fertile specimens to maximise the ability to identify specimens accurately. This is particularly important where conservation significant flora species are concerned. The present survey was undertaken in December and February, and as such may have constrained the coverage of the flora. During the present survey, with the exception of *Stenanthemum newbeyi* (P3), no other flora, apart from *Ptilotus obovatus*, was in flower. The latter is not of conservation significance. Fertile specimens of *Grevillea erectiloba* (P4) would be useful to enable them to be more easily distinguished from the vegetatively similar *Grevillea zygoloba*, which is not a conservation listed species. However, in the case of these two taxa, there are sufficient vegetative differences to permit discrimination between the two. Numerous specimens of *Grevillea* were collected in the field and all were subsequently identified as *Grevillea zygoloba*.

There is the potential for some conservation listed flora in the area to have been missed due to the timing of the survey effort. The botanists who undertook the field work noted the presence of specimens of *Austrostipa* sp. at numerous locations within the Jackson 5 prospect survey area. The majority of these were in such poor condition as to render them unidentifiable at the species level. Some specimens with old flower heads were collected, and were subsequently identified as a common species (*Austrostipa platychaeta*). *Austrostipa platychaeta is not a priority species*. However, the priority grass *Austrostipa blackii* (P3) is known to occur in the region. Similarly, the priority daisy, *Gnephosis intonsa* (P3), which is an annual herb, would not have been detected during the present survey. This taxon has previously been reported from the Helena and Aurora Ranges by Gibson *et al*. (1997). A further concern regarding the timing of the survey is the potential for new or novel taxa to be recorded in the region. As indicated in recent surveys by the Mattiske Consulting team and by DEC (D. Coffey pers. comm.) that the discovery of new or novel taxa in the wider Helena and Aurora Range area is not uncommon. The timing of the present survey would make recording of such taxa, particularly if they were annual species, unlikely, and accurate identification without fertile material improbable.

8. CONCLUSIONS

Given the small estimated percentage take of conservation significant flora, with the exception of *Acacia adinophylla* (P1) within the Jackson 5 prospect survey area, and the relatively small percentage of the Jackson 5 prospect survey area which would be needed to be cleared to permit new drill pad and track construction, overall there would be a low level of impact to the vegetation of the area in terms of any clearing required for drilling activity. With respect to *Acacia adinophylla* (P1), which may be significantly impacted at the local level by clearing activities, either the use of the eastern access route option, or a western access route option which makes use of the existing, albeit overgrown old track, in such a way as to minimise the need to take any *Acacia adinophylla* (P1), will overcome this problem.

The main potential limitation related to the timing of the survey efforts, and the potential of not detecting flora that may be of conservation significance. However, given that a maximum of 3% of the Jackson 5 prospect survey area would need to be cleared to accommodate new drill pad and track construction, then the likelihood of any clearing activities having a major impact to such taxa could similarly be considered to be of a minimal level.

Given the sensitivity of the area, and the need to minimise impacts to conservation significant flora from any clearing activities, we would recommend that an appropriately qualified environmental officer from Polaris, preferably with botanical knowledge of the area, be present during clearing activities to supervise personnel involved in vegetation clearing.

9. PERSONNEL

The following Mattiske Consulting Pty Ltd personnel were involved in this project:

Name	Position	Project Involvement	Flora Collection Permit
Dr E.M. Mattiske	Managing Director & Principal Ecologist	Planning, Management & Reporting	
Ms B. Koch	Senior Botanist	Plant identification	
Mr D. Angus[1]	Botanist	Planning, fieldwork, plant identification, data interpretation and report preparation	SL009838 and 25-1213
Ms L. Cockram	Botanist	Fieldwork	SL009850
Mr A. Barrett	Botanist	Fieldwork	SL010111
Ms C. Reynolds	Botanist	Fieldwork	SL009860
Mr R. Dharmarajan	Botanist	Fieldwork	SL009845
Mr J. Freeman	Botanist	Fieldwork	SL010035
Mr B. Ellery	Botanist	Plant identification	

1. Regulation 4 Authority licensee.

10. REFERENCES

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APPENDIX A: LEGISLATIVE PROTECTION FOR WESTERN AUSTRALIA'S ENVIRONMENT

1. Western Australia's Flora – A Legislative perspective

Western Australia has a unique and diverse flora, and is recognised as one of the world's 34 biodiversity hotspots (Myers *et al*. 2000). In this context, Western Australia possesses a high degree of species richness and endemism. This is particularly pronounced in the south-west region of the state. There are currently over 10,000 plant species known to occur within Western Australia (DEC 2013a), and scientific knowledge of many of these species is limited.

The legislative protection of flora within Western Australia is principally governed by three Acts, namely:

- The *Wildlife Conservation Act 1950*;
- The Environmental Protection Act 1986; and
- Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

The unique flora of Western Australia is potentially under threat due to historical clearing practices associated with agricultural, mining and human habitation activities. As a consequence of these historical clearing practices a number of flora species have become threatened or have the potential to become threatened as their habitat is impacted by human activity. In addition, some areas of the State have been affected by past clearing practices such that entire ecological communities are under threat. The following sections describe these threatened and priority flora and ecological communities, and outline the legislative protection afforded to them.

Ecological communities that are deemed to be threatened are afforded protection under the *Environmental Protection Act 1986*. Listings of threatened species and communities are reviewed annually by the Western Australian Threatened Species Scientific Committee (TSSC), which is a body appointed by the Minister for the Environment and supported by the Department of Environment and Conservation.

The TSSC reviews threatened and specially protected flora (and fauna) listings on an annual basis. Recommendation for additions or deletions to the listings of specially protected flora (and fauna) is made to the Minister for the Environment by the TSSC, via the Director General of the Department of Environment and Conservation, and the WA Conservation Commission. Under Schedule 1 of the *Wildlife Conservation Act 1950*, the Minister for the Environment may declare that a class or description of flora to be threatened flora throughout the State, by notice published in the *Government Gazette* (DEC 2013b).

At the Commonwealth level, under the *Environment Protection and Biodiversity Conservation Act 1999*, a nomination process exists, to list a threatened species or ecological communities. Additions or deletions to the lists of threatened species and communities are made by the Minister for Sustainability, Environment, Water, Populations and Communities, on advice from the Federal Threatened Species Scientific Committee. *Environment Protection and Biodiversity Conservation Act 1999* lists of threatened flora and ecological communities are published on the Department of Sustainability, Environment, Water, Populations and Communities (DSEWPC) website (2013a, 2013b).

2. Threatened and Priority Flora

Flora within Western Australia that is considered to be under threat may be classed as either threatened flora or priority flora. At the Commonwealth level, under the *Environment Protection and Biodiversity Conservation Act 1999*, threatened species can be listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable, or conservation dependent, by the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities. Under the *Environment Protection and Biodiversity Conservation Act 1999*, a person must not take an action that has or will have a significant impact on a listed threatened species without approval from the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities, unless those actions are not prohibited under the Act. Table A1 sets out definitions of threatened flora under federal legislation.

The current *Environment Protection and Biodiversity Conservation Act 1999* list of threatened flora may be found on the Department of Sustainability, Environment, Water, Population and Communities (2013a) website.

Table A1: Federal Definition of Threatened Flora Species

Note: Adapted from the *EPBC Act 1999*

CODE	CATEGORY
Ex	**Extinct** Taxa which at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
ExW	**Extinct in the Wild** Taxa which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CE	**Critically Endangered** Taxa which at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
E	**Endangered** Taxa which is not critically endangered and it is facing a very high risk of extinction in the wild in the immediate or near future, as determined in accordance with the prescribed criteria.
V	**Vulnerable** Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent** Taxa which at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

At the State level, the *Wildlife Conservation Act 1950* provides for taxa of native flora (and fauna) to be specially protected because they are subject to identifiable threats. Protection of these taxa has been identified as being warranted because they may become extinct, are threatened, or are otherwise in need of special protection. Where flora has been gazetted as threatened flora under the *Wildlife Conservation Act 1950*, it is an offence "to take" such flora without the written consent of the Minister. The *Wildlife Conservation Act 1950* states that "to take" flora includes to gather, pluck, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means.

Priority flora constitute species which are considered to be under threat, but for which there is insufficient information available concerning their distribution and/or populations to make a proper evaluation of their conservation status. Such species are considered to potentially be under threat, but do not have legislative protection afforded under the *Wildlife Conservation Act 1950*.

The Department of Environment and Conservation categorises priority flora according to their conservation priority, using five categories, P1 to P5, to denote the conservation priority status of such species, with P1 listed species being the most threatened, and P5 the least. Priority flora species are regularly reviewed, and may have their priority status changed when more information on the species becomes available. Table A2 sets out definitions of both threatened and priority flora.

Table A2: State Definition of Threatened and Priority Flora Species

Note: Adapted from DEC (2013a)

CODE	CATEGORY
T	**Threatened Flora (Declared Rare Flora – Extant)** Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such (Schedule 1 under the WC Act). Threatened flora (Schedule 1) are further ranked by DEC according to their level of threat using IUCN Red List criteria: • **CR:** Critically Endangered – considered to be facing an extremely high risk of extinction in the wild; • **EN:** Endangered – considered to be facing a very high risk of extinction in the wild; or • **VU:** Vulnerable – considered to be facing a high risk of extinction in the wild.
P1	**Priority One – Poorly Known Species** Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
P2	**Priority Two – Poorly Known Species** Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
P3	**Priority Three – Poorly Known Species** Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
P4	**Priority Four – Rare Threatened and other species in need of monitoring** (i) **Rare** - Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. (ii) **Near Threatened** - Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (iii) Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5	**Priority Five – Conservation Dependent Species** Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxon becoming threatened within five years.

3. Threatened and Priority Ecological Communities

An ecological community is defined as a naturally occurring biological assemblage that occurs in a particular type of habitat composed of specific abiotic and biotic factors. Under the *Environment Protection and Biodiversity Conservation Act 1999*, a person must not take an action that has or will have a significant impact on a listed threatened ecological community without approval from the Commonwealth Minister for the Sustainability, Environment, Water, Population and Communities, unless those actions are not prohibited under the Act. A description of each of these categories of TECs is presented in Table A3. The current *Environment Protection and Biodiversity Conservation Act 1999* list of threatened ecological communities can be located on the Department of Sustainability, Environment, Water, Population and Communities (2013b) website.

Table A3: Federal Definition of Threatened Ecological Communities

Note: Adapted from DSEWPC (2013b)

CATEGORY	DEFINITION
Critically endangered	If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	If, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future.
Vulnerable	If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future.

At the State level, ecological communities may be considered as threatened once they have been identified as such by the Western Australian Threatened Ecological Communities Scientific Advisory Committee. A threatened ecological community is defined, under the *Environmental Protection Act 1986*, as an ecological community listed, designated or declared under a written law or a law of the Commonwealth as threatened, endangered or vulnerable. There are four State categories of threatened ecological communities, or TECs; a description of each of these categories of TECs is presented in Table A4. Some, but not all, Western Australian TECs are also listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*.

Ecological communities identified as threatened, but not listed as threatened ecological communities, can be classified as priority ecological communities (PECs). These communities are under threat, but there is insufficient information available concerning their distribution to make a proper evaluation of their conservation status.

The Department of Environment and Conservation categorises priority ecological communities according to their conservation priority, using five categories, P1 to P5, to denote the conservation priority status of such ecological communities; these categories are defined in Table A5. A list of current priority ecological communities can be viewed at the Department of Environment and Conservation (2013f) website.

Table A4: State Definition of Threatened Ecological Communities

Note: Adapted from DEC (2013d)

CODE	CATEGORY
PTD	**Presumed Totally Destroyed** An ecological community will be listed as Presumed Totally Destroyed if there are no recent records of the community being extant and either of the following applies: (i) records within the last 50 years have not been confirmed despite thorough searches or known likely habitats or; (ii) all occurrences recorded within the last 50 years have since been destroyed.
CE	**Critically Endangered** An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future, meeting any one of the following criteria: (iv) The estimated geographic range and distribution has been reduced by at least 90% and is either continuing to decline with total destruction imminent, or is unlikely to be substantially rehabilitated in the immediate future due to modification; (v) The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area; (vi) The ecological community is highly modified with potential of being rehabilitated in the immediate future.
E	**Endangered** An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. The ecological community must meet any one of the following criteria: (i) The estimated geographic range and distribution has been reduced by at least 70% and is either continuing to decline with total destruction imminent in the short term future, or is unlikely to be substantially rehabilitated in the short term future due to modification; (ii) The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area; (iii) The ecological community is highly modified with potential of being rehabilitated in the short term future.
V	**Vulnerable** An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing high risk of total destruction in the medium to long term future. The ecological community must meet any one of the following criteria: (i) The ecological community exists largely as modified occurrences that are likely to be able to be substantially restored or rehabilitated; (ii) The ecological community may already be modified and would be vulnerable to threatening process, and restricted in range or distribution; (iii) The ecological community may be widespread but has potential to move to a higher threat category due to existing or impending threatening processes.

Table A5: State Definition of Priority Ecological Communities

Note: Adapted from DEC (2013d)

CODE	CATEGORY
P1	**Poorly-known ecological communities** Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist.
P2	**Poorly-known ecological communities** Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, un-allocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation.
P3	**Poorly known ecological communities** (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing and inappropriate fire regimes.
P4	Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.
P5	**Conservation Dependent ecological communities** Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

4. Clearing of Native Vegetation

Under the *Environmental Protection Act 1986*, the clearing of native vegetation requires a permit to do so, from the Department of Environment and Conservation or the Department of Mines and Petroleum, unless that clearing is exempted under specific provisions listed in Schedule 6 of the Act, or are prescribed in the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Under the *Environmental Protection Act 1986*, "native vegetation" means indigenous aquatic or terrestrial vegetation, and includes dead vegetation unless that dead vegetation is of a class declared by regulation to be excluded from this definition but does not include vegetation in a plantation.

Under the *Environmental Protection Act 1986*, Section 51A, "clearing" means the killing or destruction of, the removal of, the severing or ringbarking of trunks or stems of, or the doing of any other substantial damage to, some or all of the native vegetation in an area, and includes the draining or flooding of land, the burning of vegetation, the grazing of stock, or any other act or activity, that causes any of the aforementioned consequences or results.

Under the *Environmental Protection Act 1986*, ten principles are set out, under which native vegetation should not be cleared. These principles state that native vegetation should not be cleared, if:

a. it comprises a high level of biological diversity;

b. it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia;

c. it includes, or is necessary for the continued existence of, threatened flora;

d. it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community;

e. it is significant as a remnant of native vegetation in an area that has been extensively cleared;

f. it is growing in, or in association with, an environment associated with a watercourse or wetland;

g. the clearing of the vegetation is likely to cause appreciable land degradation;

h. the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area;

i. the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water; or

j. the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

The *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*, under Regulation 5, sets out prescribed clearing actions that do not require a clearing permit.

Under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*, under Regulation 6 –"environmentally sensitive areas" are defined as "the area covered by vegetation within 50 m of threatened flora, to the extent to which the vegetation is continuous with the vegetation in which the threatened flora is located".

Under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* - Regulation 6 (environmentally sensitive areas), the area covered by a threatened ecological community, is similarly considered an environmentally sensitive area and therefore non-permitted, unless Ministerial approval is granted.

5. Local and Regional Significance

Flora or vegetation may be locally or regionally significant in addition to statutory listings by the State or Federal Government. While not legislatively protected, these factors are taken into consideration during the assessment of mining proposals, clearing proposals and other proposed development; Guidance Statement 51 specifically states:

"A broad consideration of the ecological processes that influence sites and their ecological functions is required; statutory lists of Declared Rare and Priority Flora are only a small subset of biodiversity. Proponents should ensure that flora and vegetation surveys provide sufficient information to address both biodiversity conservation and ecological function values within the context of the type of proposal being considered and the relevant EPA objectives for protection of the environment" (EPA 2004).

In regards to flora; species, subspecies, varieties, hybrids and ecotypes may be significant other than as threatened flora or priority flora, for a variety of reasons, including:

- a keystone role in a particular habitat for threatened species, or supporting large populations representing a significant proportion of the local regional population of a species;
- relic status
- anomalous features that indicate a potential new discovery;
- being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- the presence of restricted subspecies, varieties, or naturally occurring hybrids;
- local endemism/a restricted distribution; and
- being poorly reserved (EPA 2004).

Vegetation may be significant because the extent is below a threshold level and a range of other reasons, including:

- scarcity;
- unusual species;
- novel combinations of species;
- a role as a refuge;
- a role as a key habitat for threatened species or large populations representing a significant proportion of the local to regional total population of a species;
- being representative of the range of a unit (particularly, a good local and/or regional example of a unit in "prime" habitat, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range); and
- a restricted distribution (EPA 2004).

Vegetation communities are locally significant if they contain priority flora species or contain a range extension of a particular taxon outside of the normal distribution. They may also be locally significant if they are very restricted to one or two locations or occur as small isolated communities. In addition, vegetation communities that exhibit unusually high structural and species diversity are also locally significant. Vegetation communities are regionally significant where they are limited to specific landform types, are uncommon or restricted plant community types within the regional context, or support populations of threatened flora. Determining the significance of flora and vegetation may be applied at various scales, for example, a vegetation community may be nationally significant and governed by statutory protection as well as being locally and regionally significant.

6. Invasive Species and Declared Plants

The *Agriculture and Related Resources Protection Act 1976* provides for declared plants to be assigned to specific categories, P1 to P5, which determines the form of control which applies to the declared plant. These categories are briefly outlined in Table A6.

Table A6: Definition of Standard Control Codes for Declared Plant Species in Western Australia

Note: Adapted from DAF (2013)

CONTROL CODE REQUIREMENT	CONDITIONS
P1	Prohibits the movement of plants or their seeds within the State, including the movement of contaminated machinery and produce (livestock and fodder).
P2	Eradicate infestation to destroy and prevent propagation each year until no plants remain. The infested area must be managed in such a way that prevents the spread of seed or plant parts on or in livestock, fodder, grain, vehicles and/or machinery.
P3	The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery.
P4	Prevent the spread of infestation. The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery.
P5	Infestations on public land (or land under the control of a local government) must be controlled.

APPENDIX B: COORDINATES DELINEATING THE BOUNDARY OF THE JACKSON 5 PROSPECT SURVEY AREA WITHIN TENEMENT M77/1095.

Waypoint	Location (GDA94_Zone50)		Waypoint	Location (GDA94_Zone50)	
	Easting (mE)	Northing (mN)		Easting (mE)	Northing (mN)
1	752488	6638246	47	751944	6637806
2	752307	6638199	48	752002	6637813
3	752232	6638178	49	752043	6637815
4	752054	6638216	50	752093	6637809
5	751846	6638356	51	752119	6637825
6	751659	6638449	52	752157	6637823
7	751515	6638536	53	752195	6637827
8	751444	6638579	54	752267	6637825
9	751344	6638636	55	752437	6637824
10	751186	6638670	56	752461	6637824
11	751147	6638623	57	752672	6637826
12	751173	6638615	58	752690	6637811
13	751235	6638581	59	752691	6637804
14	751284	6638497	60	752724	6637757
15	751325	6638361	61	752757	6637780
16	751435	6638229	62	752729	6637820
17	751501	6638186	63	752726	6637834
18	751627	6638199	64	752686	6637866
19	751670	6638178	65	752496	6637864
20	751863	6638101	66	752513	6637950
21	751968	6638092	67	752511	6637980
22	752130	6638028	68	752808	6637957
23	752396	6637989	69	752795	6638021
24	752471	6637983	70	752683	6638044
25	752473	6637952	71	752623	6638096
26	752455	6637864	72	752580	6638153
27	752268	6637865	73	752595	6638305
28	752193	6637868	74	752489	6638246
29	752156	6637863	75	752488	6638246
30	752109	6637865			
31	752084	6637850			
32	752045	6637855			
33	751999	6637853			
34	751938	6637846			
35	751850	6637832			
36	751813	6637835			
37	751797	6637832			
38	751755	6637838			
39	751699	6637839			
40	751618	6637833			
41	751621	6637793			
42	751701	6637799			
43	751751	6637798			
44	751798	6637791			
45	751816	6637795			
46	751851	6637792			

Appendix C: Assessment of threatened and priority flora potentially present in the Jackson 5 prospect survey area

Refer to Appendix A for State (SCC) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AW – Avon Wheatbelt; COO – Coolgardie; ESP – Esperance Sandplains; HAM – Hampton; JF – Jarrah Forest; MAL – Mallee; MUR – Murchison; NUL – Nullabor; YAL - Yalgoo.

Taxon / Common Name	Family	SCC	FCC	Description & Habitat	Potential to Occur in Survey Area
Leucopogon spectabilis	Ericaceae	T	E	Habit: erect, sparse shrub to 1 m high Flowers: white Flowering period: not defined, but likely August-October Soils: shallow loams; banded ironstone; in crevices on exposed ridges IBRA Distribution: COO Florabase records: 13	medium preferred soils types occur within survey area
Tetratheca aphylla subsp. *aphylla*	Elaeocarpaceae	T	VU	Habit: caespitose shrub to 60 cm high Flowers: pink / mauve Flowering time: July-October Soils: red-brown loam, sandy loam, banded ironstone; in crevices on hills, outcrops, slopes, valleys & ridges IBRA Distribution: COO Florabase records: 16	medium preferred soils types occur within survey area
Acacia adinophylla	Fabaceae	P1		Habit: prostrate or erect tangled shrub Flowers: yellow Flowering period: September-November Soils: stony loam or sandy soils , clay; ironstone ridges, undulating plains IBRA Distribution: COO Florabase records: 25	high preferred soils types occur within survey area species has previously been recorded within survey area
Acacia sp. Bungalbin Hill (J.J. Alford 1119)	Fabaceae	P1		Habit: shrub (with strong camphor-like odour) Flowers: yellow Flowering period: September Soils: silty sandy loam; banded ironstone; hill slopes, cliffs and ridges IBRA Distribution: COO Florabase records: 5	medium preferred soils types occur within survey area

Appendix C: Assessment of threatened and priority flora potentially present in the Jackson 5 prospect survey area

Refer to Appendix A for State (SCC) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AW – Avon Wheatbelt; COO – Coolgardie; ESP – Esperance Sandplains; HAM – Hampton; JF – Jarrah Forest; MAL – Mallee; MUR – Murchison; NUL – Nullabor; YAL - Yalgoo.

Taxon / Common Name	Family	SCC	FCC	Description & Habitat	Potential to Occur in Survey Area
Baeckea sp. Helena and Aurora Range (G.J. Keighery 4424)	Myrtaceae	P1		Habit: erect, multi stemmed shrub to 1.2 m high Flowers: white Flowering period: December Soils: deep yellow sand; flat plains IBRA Distribution: COO Florabase records: 2	unlikely soil type does not occur in survey area
Chamelaucium sp. Koolyanobbing (V. Clarke 644)	Myrtaceae	P1		Habit: compact shrub to 30 cm high Flowers: green / red Flowering period: August-October Soils: yellow sand, sandplains IBRA Distribution: COO Florabase records: 9	unlikely soil type does not occur in survey area
Gnephosis intonsa	Asteraceae	P1		Habit: prostrate to ascending annual herb Flowers: yellow-brown Flowering period: September-October Soils: red-brown clay, stony saline loam IBRA Distribution: AW, COO, ESP, MAL, MUR Florabase records: 19	low soil type may not occur in survey area species is an annual and may not be identifiable at the time of the survey
Lepidosperma bungalbin	Cyperaceae	P1		Habit: tufted rhizomatous perennial herb (sedge) Flowers: brown Flowering period: July Soils: red loams with banded ironstone rock and gravel; steep mid slopes IBRA Distribution: COO Florabase records: 9	medium preferred soils types occur within survey area
Persoonia leucopogon	Proteaceae	P1		Habit: erect or decumbent shrub to 60 cm Flowers: yellow / green-yellow Flowering period: October-December Soils: yellow sand , sandy clay IBRA Distribution: AW, COO MUR Florabase records: 5	unlikely soil type does not occur in survey area

Appendix C: Assessment of threatened and priority flora potentially present in the Jackson 5 prospect survey area

Refer to Appendix A for State (SCC) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AW – Avon Wheatbelt; COO – Coolgardie; ESP – Esperance Sandplains; HAM – Hampton; JF – Jarrah Forest; MAL – Mallee; MUR – Murchison; NUL – Nullabor; YAL - Yalgoo.

Taxon / Common Name	Family	SCC	FCC	Description & Habitat	Potential to Occur in Survey Area
Philotheca deserti subsp. *brevifolia*	Rutaceae	P1		Habit: shrub to 1 m high Flowers: white Flowering period: September Soils: red sandy clay IBRA Distribution: COO, MUR Florabase records: 5	unlikely soil type does not occur in survey area
Goodenia jaurdiensis	Goodeniaceae	P2		Habit: perennial herb to 15 cm high Flowers: yellow Flowering period: September-October Soils: red clay loam with laterite of banded ironstone gravel or quartz gravel; low lying plains and lower slopes IBRA Distribution: COO Florabase records: 5	low preferred soils types occur within survey area
Malleostemon sp. Adelong (G.J. Keighery 11825)	Myrtaceae	P2		Habit: spreading shrub to 30 cm high Flowers: white Flowering period: October Soils: red sand IBRA Distribution: COO, MUR Florabase records: 4	unlikely soil type does not occur in survey area
Phlegmatospermum eremaeum	Brassicaceae	P2		Habit: prostrate annual herb Flowers: white-cream Flowering period: June or August-September Soils: stony loam IBRA Distribution: AW, COO, HAM, MAL, NUL Florabase records: 15	low soil type may not occur in survey area species is an annual and may not be identifiable at the time of the survey
Acacia cylindrica	Fabaceae	P3		Habit: shrub to 3 m high Flowers: yellow Flowering period: August-October Soils: yellow/brown sand, gravelly soils; undulating plains, flats IBRA Distribution: AW, COO Florabase records: 29	unlikely soil type does not occur in survey area

Appendix C: Assessment of threatened and priority flora potentially present in the Jackson 5 prospect survey area

Refer to Appendix A for State (SCC) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AW – Avon Wheatbelt; COO – Coolgardie; ESP – Esperance Sandplains; HAM – Hampton; JF – Jarrah Forest; MAL – Mallee; MUR – Murchison; NUL – Nullabor; YAL - Yalgoo.

Taxon / Common Name	Family	SCC	FCC	Description & Habitat	Potential to Occur in Survey Area
Acacia formidabilis	Fabaceae	P3		Habit: diffuse pungent shrub Flowers: yellow Flowering period: August-September Soils: yellow, red-brown sand; undulating plains, hillsides IBRA Distribution: AW, COO, YAL Florabase records: 14	low soil type may occur in survey area
Astartea sp. Bungalbin Hill (K.R. Newbey 8989)	Myrtaceae	P3		Habit: spreading shrub to 0.4 m high Flowers: white/pink Flowering period: September-December or March Soils: deep yellow sand; sandplains IBRA Distribution: COO Florabase records: 18	unlikely soil type does not occur in survey area
Baeckea sp. Bungalbin Hill (B.J. Lepschi & L.A. Craven 4586)	Myrtaceae	P3		Habit: spreading shrub Flowers: white Flowering period: November Soils: yellow-brown sand, laterite, gravel; moderately exposed flat sand plains IBRA Distribution: COO Florabase records: 20	unlikely soil type does not occur in survey area
Banksia lullfitzii	Proteaceae	P3		Habit: lignotuberous shrub to 2 m high Flowers: yellow/orange, orange/brown Flowering period: March-May Soils: yellow sand; sandplains IBRA Distribution: COO, ESP, MAL Florabase records: 20	unlikely soil type does not occur in survey area
Bossiaea sp. Jackson Range (G. Cockerton & S. McNee LCS 13614)	Fabaceae	P3		Habit: spinescent shrub to 1.7 m high Flowers: yellow-red Flowering period: potentially March-May (July) Soils: sandy loam, clay loams; decomposed granite breakaways, IBRA Distribution: AW, COO, YAL Florabase records: 17	unlikely soil type does not occur in survey area

Appendix C: Assessment of threatened and priority flora potentially present in the Jackson 5 prospect survey area

Refer to Appendix A for State (SCC) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AW – Avon Wheatbelt; COO – Coolgardie; ESP – Esperance Sandplains; HAM – Hampton; JF – Jarrah Forest; MAL – Mallee; MUR – Murchison; NUL – Nullabor; YAL - Yalgoo.

Taxon / Common Name	Family	SCC	FCC	Description & Habitat	Potential to Occur in Survey Area
Calytrix creswellii	Myrtaceae	P3		Habit: spreading shrub to 1 m high Flowers: white Flowering period: September-December Soils: yellow sand, sometimes with lateritic gravel; sandplains IBRA Distribution: COO, MUR Florabase records: 16	unlikely soil type does not occur in survey area
Dillwynia acerosa	Fabaceae	P3		Habit: shrub to 50 cm high Flowers: yellow/red Flowering period: September Soils: gravelly clay with laterite IBRA Distribution: COO, ESP, JF, MAL Florabase records: 44	unlikely soil type does not occur in survey area
Grevillea georgeana	Proteaceae	P3		Habit: erect to widely spreading shrub to 3 m high Flowers: red Flowering period: January or march or September-November Soils: stony loam/clay; ironstone hilltops and slopes IBRA Distribution: COO, MUR Florabase records: 46	medium preferred soils types occur within survey area
Hibbertia lepidocalyx subsp. *tuberculata*	Dilleniaceae	P3		Habit: shrub to 50 cm Flowers: yellow-orange Flowering period: July-September Soils: orange loam; ironstone gravel IBRA Distribution: COO Florabase records: 6	high preferred soils types occur within survey area species has previously been recorded within survey area
Homalocalyx grandiflorus	Myrtaceae	P3		Habit: spreading shrub to 2 m high Flowers: purple/red/pink Flowering period: October-December Soils: yellow sand; sandplains IBRA Distribution: COO, MUR Florabase records: 13	unlikely soil type does not occur in survey area

Appendix C: Assessment of threatened and priority flora potentially present in the Jackson 5 prospect survey area

Refer to Appendix A for State (SCC) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AW – Avon Wheatbelt; COO – Coolgardie; ESP – Esperance Sandplains; HAM – Hampton; JF – Jarrah Forest; MAL – Mallee; MUR – Murchison; NUL – Nullabor; YAL - Yalgoo.

Taxon / Common Name	Family	SCC	FCC	Description & Habitat	Potential to Occur in Survey Area
Lepidosperma ferricola	Cyperaceae	P3		Habit: tufted rhizomatous perennial herb (sedge) to 1 m high Flowers: unknown, but likely brown Flowering period: unconfirmed, but expected late autumn Soils: well drained stony loam, silty clay, banded ironstone; rocky ledges, scree slopes, crevices & ravines IBRA Distribution: COO Florabase records: 26	medium preferred soils types occur within survey area
Mirbelia ferricola	Fabaceae	P3		Habit: erect shrub to 2 m high Flowers: yellow Flowering period: September-November Soils: clay-loams, banded ironstone; hillslopes and ridges IBRA Distribution: AW, COO Florabase records: 24	medium preferred soils types occur within survey area
Neurachne annularis	Poaceae	P3		Habit: tussock forming perennial grass to 75 cm high Flowers: Flowering period: September-October Soils: red-brown sandy loams, ironstone gravel; amoung rocks on tops, sides and bases of banded ironstone ranges IBRA Distribution: COO Florabase records: 22	high preferred soils types occur within survey area species has been recorded within survey area
Melichrus sp. Bungalbin Hill (F.H. & M.P. Mollemans 3069)	Ericaceae	P3		Habit: shrub to 80 cm high Flowers: pink/red Flowering period: July or September-October Soils: yellow sand, yellow-brown loamy sand IBRA Distribution: AW, COO, MUR, YAL Florabase records: 23	unlikely soil type does not occur in survey area
Spartothamnella sp. Helena & Aurora Range (P.G. Armstrong 155-109)	Lamiaceae	P3		Habit: shrub to 70 cm high Flowers: white (red berries) Flowering period: March-April (likely) Soils: red/orange sandy loams; hillslopes and flats IBRA Distribution: AW, COO, MUR, YAL Florabase records: 24	medium preferred soils types occur within survey area species has been recorded adjacent to survey area

Appendix C: Assessment of threatened and priority flora potentially present in the Jackson 5 prospect survey area

Refer to Appendix A for State (SCC) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AW – Avon Wheatbelt; COO – Coolgardie; ESP – Esperance Sandplains; HAM – Hampton; JF – Jarrah Forest; MAL – Mallee; MUR – Murchison; NUL – Nullabor; YAL - Yalgoo.

Taxon / Common Name	Family	SCC	FCC	Description & Habitat	Potential to Occur in Survey Area
Stenanthemum newbeyi	Rhamnaceae	P3		Habit: shrub to 1.6 m high Flowers: yellow Flowering period: August-September or December-January Soils: clayey sand, clay, loam; laterite or ironstone; hillslopes IBRA Distribution: COO Florabase records: 32	high preferred soils types occur within survey area species has been recorded within survey area
Stylidium choreanthum	Stylidiaceae	P3		Habit: creeping perennial herb, up to 3 cm high and 30 cm wide Flowers: pink/white Flowering period: September-November Soils: white/yellow or red sands; plains IBRA Distribution: AW, COO Florabase records: 27	unlikely soil type does not occur in survey area
Styphelia sp. Bullfinch (M. Hislop 3574)	Ericaceae	P3		Habit: shrub to 50 cm Flowers: white/cream Flowering period: July Soils: clay loams; upper slopes, granitic/, lateritic breakaways IBRA Distribution: COO, YAL Florabase records: 13	medium preferred soils types and topography occur within survey area
Verticordia mitodes	Myrtaceae	P3		Habit: spreading shrub to 70 cm high Flowers: pink-purple Flowering period: October to December or January Soils: yellow sand; sandplains IBRA Distribution: AW, COO Florabase records: 22	unlikely soil type does not occur in survey area
Banksia arborea	Proteaceae	P4		Habit: large shrub or tree to 8 m high Flowers: yellow Flowering period: March-May or September-October Soils: stony loam; ironstone hills IBRA Distribution: COO, JF, MUR Florabase records: 42	high preferred soils types occur within survey area species has been recorded within survey area

Appendix C: Assessment of threatened and priority flora potentially present in the Jackson 5 prospect survey area

Refer to Appendix A for State (SCC) and Federal (FCC; EPBC Act) conservation code definitions. IBRA Distribution: AW – Avon Wheatbelt; COO – Coolgardie; ESP – Esperance Sandplains; HAM – Hampton; JF – Jarrah Forest; MAL – Mallee; MUR – Murchison; NUL – Nullabor; YAL - Yalgoo.

Taxon / Common Name	Family	SCC	FCC	Description & Habitat	Potential to Occur in Survey Area
Eucalyptus formanii	Myrtaceae	P4		Habit: tree (occasionally mallee) to 11 m high Flowers: white Flowering period: January-April Soils: red sand; ironstone slopes IBRA Distribution: COO, MUR, YAL Florabase records: 64	low soil type potentially present within survey area
Grevillea erectiloba	Proteaceae	P4		Habit: shrub to 3 m high Flowers: red Flowering period: September-November Soils: gravelly loam, lateritic ridges IBRA Distribution: COO, MUR Florabase records: 25	high preferred soils types occur within survey area species has been recorded within survey area
Sowerbaea multicaulis	Asparagaceae	P4		Habit: tufted perennial herb to 25 cm high Flowers: purple-violet Flowering period: October-December Soils: yellow sand; sandplain IBRA Distribution: COO, JF, MAL, MUR Florabase records: 20	unlikely soil type does not occur in survey area

APPENDIX D: LOCATIONS AND POPULATIONS OF *ACACIA ADINOPHYLLA* (P1) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751553	6638375	1		752024	6638170	1
751559	6638497	1		752775	6637980	1
751562	6638496	1		752791	6637977	1
751438	6638509	1		751431	6638511	2
751555	6638372	1		752303	6637863	2
751557	6638341	1		752410	6637933	2
752250	6638052	1		752367	6637916	2
751438	6638544	1		752218	6637825	2
752265	6637861	1		752333	6637848	2
752345	6637869	1		752455	6637842	2
752378	6637868	1		752345	6637820	3
752111	6637868	1		752346	6637825	3
752368	6637896	1		752107	6637842	3
752163	6637824	1		752359	6637843	3
752242	6637850	1		752339	6637840	3
752284	6637823	1		752347	6637839	3
752442	6637844	1		752393	6637843	4
752280	6637852	1		752527	6637846	4
752326	6637836	1		752427	6637944	7
752327	6637860	1		752288	6637893	7
752331	6637823	1				
752340	6637808	1				
752345	6637811	1				
752505	6637845	1				
752267	6637846	1				
752356	6637928	1				
752412	6638202	1				
752413	6638205	1				
752130	6637820	1				
752297	6637849	1				
751665	6638396	1				
751669	6638411	1				
751595	6638434	1				
751597	6638430	1				
751683	6638452	1				
751435	6638509	1				
751439	6638503	1				
752343	6637829	1				

APPENDIX E: LOCATIONS AND POPULATIONS OF *HIBBERTIA LEPIDOCALYX ssp. TUBERCULATA* (P3 RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
752234	6638128	1		752412	6638129	1
752237	6638128	1		752419	6638154	1
752522	6638133	1		752428	6638163	1
752663	6638022	1		752428	6638166	1
752003	6638185	1		752436	6638048	1
752008	6638185	1		752439	6638047	1
752121	6638016	1		752439	6638111	1
752127	6638022	1		752535	6638109	1
752359	6638117	1		752536	6638049	1
752366	6638120	1		752536	6638052	1
752505	6638110	1		752536	6638056	1
752115	6638156	1		752538	6638057	1
751297	6638501	1		752539	6638142	1
751301	6638520	1		752559	6638123	1
751302	6638551	1		752703	6638013	1
752049	6638191	1		752775	6638003	1
752049	6638194	1		752777	6638002	1
752139	6638158	1		752782	6637998	1
752413	6638128	1		752783	6637997	1
752418	6638135	1		752785	6637998	1
752430	6638051	1		752790	6637992	1
752530	6638116	1		752794	6637973	1
752539	6638131	1		752797	6637974	1
752541	6638132	1		752801	6637973	1
752637	6638028	1		752802	6637975	1
752648	6638025	1		752792	6637989	1
752694	6638011	1		752799	6637995	1
752145	6638169	1		752799	6637994	1
752406	6638165	1		752801	6637988	1
752439	6638038	1		751192	6638652	1
752060	6638170	1		751276	6638550	1
752069	6638206	1		751298	6638562	1
752164	6638175	1		751304	6638538	1
752196	6638138	1		751305	6638535	1
752378	6638163	1		751318	6638525	1
752386	6638151	1		751451	6638543	1
752394	6638120	1		751457	6638561	1
752409	6638146	1		751463	6638516	1

APPENDIX E: LOCATIONS AND POPULATIONS OF *HIBBERTIA LEPIDOCALYX ssp. TUBERCULATA* (P3 RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751474	6638544	1		751317	6638540	3
752720	6638012	2		751290	6638503	3
752743	6638018	2		752414	6638151	3
752000	6638187	2		752385	6638131	3
752510	6638130	2		752396	6638118	3
751286	6638510	2		752156	6638171	3
751302	6638556	2		752163	6638183	3
752412	6638138	2		752173	6638164	3
752651	6638023	2		752400	6638121	3
751460	6638560	2		752599	6638001	3
751295	6638557	2		752698	6638012	3
751297	6638523	2		752790	6637996	3
751299	6638520	2		751462	6638535	3
751323	6638565	2		752529	6638129	4
752543	6638060	2		752523	6638125	4
752168	6638168	2		752376	6638127	4
751420	6638526	2		752139	6638177	4
752142	6638171	2		751171	6638622	4
752162	6638175	2		751312	6638526	4
752426	6638160	2		751341	6638541	4
752429	6638158	2		751353	6638543	4
752440	6638045	2		751295	6638545	4
752541	6638140	2		752158	6638182	4
752596	6637993	2		752076	6638179	4
752652	6638028	2		752605	6638006	4
752140	6638153	2		752153	6638188	4
752143	6638172	2		752615	6638007	4
752167	6638162	2		752420	6638157	4
752422	6638162	2		752177	6638164	4
752440	6638042	2		752781	6638004	4
752603	6637996	2		752126	6638155	5
752788	6637999	2		752655	6638023	5
752792	6637996	2		752149	6638186	5
752672	6638022	3		752370	6638125	6
752477	6638074	3		751471	6638544	6
752125	6638024	3		752150	6638189	6
752412	6638135	3		752154	6638179	6
751178	6638652	3		752414	6638155	6

APPENDIX E: LOCATIONS AND POPULATIONS OF *HIBBERTIA LEPIDOCALYX ssp. TUBERCULATA* (P3 RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
752253	6638127	7		752158	6638184	13
752384	6638162	7		752594	6637990	14
751460	6638544	7		751461	6638548	14
752141	6638184	7		752183	6638183	14
752151	6638168	7		752187	6638175	14
752410	6638158	7		752118	6638178	15
752201	6638159	7		752150	6638175	15
752378	6638165	7		752247	6638125	16
752728	6638015	8		752366	6638139	16
752133	6638185	8		752405	6638135	16
751462	6638553	8		752112	6638177	17
751342	6638514	8		752399	6638132	17
752406	6638150	8		752142	6638174	18
752160	6638169	8		752056	6638189	18
752385	6638165	8		752387	6638201	18
752002	6638185	9		752143	6638176	19
752237	6638142	9		752382	6638139	19
751300	6638546	9		752401	6638166	21
752078	6638186	9		752115	6638161	23
752123	6638192	10		752078	6638153	23
752145	6638181	10		752125	6638177	29
752241	6638140	11		752062	6638188	32
752153	6638178	11		752076	6638161	36
752157	6638186	11		752116	6638169	42
752410	6638167	11		752072	6638169	43
752192	6638166	11		752133	6638177	63
752397	6638110	11		752080	6638170	68
752121	6638153	12				
752374	6638143	12				
752378	6638144	12				
752379	6638122	12				
752196	6638129	12				
752153	6638183	12				
752154	6638175	12				
752246	6638136	13				
752141	6638176	13				
752396	6638153	13				
752401	6638103	13				

APPENDIX F: LOCATIONS AND POPULATIONS OF *MIRBELIA FERRICOLA* (P3) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751401	6638455	1		751318	6638559	1
751404	6638459	1		751380	6638467	1
751406	6638382	1		751270	6638520	1
751791	6638334	1		751277	6638560	1
752360	6638099	1		751287	6638491	1
752362	6638101	1		751288	6638504	1
752362	6638102	1		751390	6638390	1
752369	6638155	1		751391	6638383	1
752371	6638145	1		751395	6638389	1
752373	6638149	1		752037	6638076	1
752380	6638163	1		752167	6638069	1
752516	6638112	1		752169	6638025	1
752672	6638020	1		752169	6638076	1
751413	6638457	1		752175	6638028	1
752567	6638022	1		752183	6638028	1
752720	6638011	1		752187	6638022	1
752743	6638018	1		752188	6638022	1
752773	6638001	1		752197	6638173	1
751385	6638383	1		752394	6638003	1
751282	6638505	1		752418	6638022	1
751293	6638548	1		752422	6638139	1
751298	6638504	1		752424	6638027	1
751361	6638498	1		752426	6638028	1
751380	6638469	1		752435	6638053	1
752414	6638128	1		752528	6638121	1
752426	6638027	1		752687	6638007	1
752428	6638038	1		752701	6638016	1
752438	6638055	1		752702	6638015	1
752535	6638048	1		752775	6638002	1
751297	6638504	1		752777	6638002	1
751298	6638495	1		752778	6637999	1
751305	6638534	1		752514	6638117	2
751307	6638502	1		752529	6638127	2
751388	6638413	1		751403	6638379	2
751388	6638471	1		751406	6638460	2
752152	6638076	1		752362	6638155	2
752424	6638138	1		752765	6638017	2
752425	6638140	1		751387	6638466	2

APPENDIX F: LOCATIONS AND POPULATIONS OF *MIRBELIA FERRICOLA* (P3) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751296	6638542	2				
751293	6638490	2				
751299	6638554	2				
752167	6638069	2				
752416	6638124	2				
752713	6638015	2				
752431	6638154	2				
752435	6638153	2				
751398	6638386	2				
752162	6638075	2				
752365	6638152	3				
752513	6638130	3				
752254	6638069	3				
752424	6638138	3				
752171	6638027	3				
752779	6638007	3				
752521	6638125	4				
752513	6638122	4				
752727	6638012	4				
752044	6638081	4				
752158	6638085	4				
751281	6638557	4				
752357	6638098	6				
751404	6638374	6				
751284	6638562	7				

APPENDIX G: LOCATIONS OF *NEURACHNE ANNULARIS* (P3) SURVEY QUADRATS WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Coordinates are the north-west corner of a 10 m x 10 m quadrat. The number of plants recorded within the quadrat is shown.

Location (GDA94, Zone 50)		Number of Plants		Location (GDA94, Zone 50)		Number of Plants
Easting (mE)	Northing (mN)			Easting (mE)	Northing (mN)	
752171	6637839	160		751483	6638351	3
752308	6637864	160		751480	6638284	45
751177	6638615	82		751481	6638215	37
751210	6638594	72		751535	6638479	7
751241	6638640	87		751540	6638410	96
751269	6638555	140		751538	6638344	88
751272	6638632	106		751540	6638281	86
751302	6638614	74		751541	6638216	84
751299	6638550	110		751558	6638304	87
751332	6638371	109		751564	6638366	154
751329	6638436	103		751562	6638435	126
751331	6638510	109		751566	6638504	45
751323	6638569	68		751596	6638489	61
751327	6638638	44		751604	6638420	149
751355	6638587	189		751590	6638355	314
751360	6638453	25		751605	6638290	3
751386	6638334	160		751599	6638226	116
751388	6638413	0		751568	6638238	75
751389	6638470	0		751660	6638394	41
751388	6638541	166		751657	6638332	120
751388	6638595	133		751659	6638261	56
751416	6638587	140		751660	6638196	0
751429	6638539	212		751682	6638238	0
751418	6638453	119		751690	6638302	68
751399	6638377	29		751691	6638368	29
751418	6638326	260		751688	6638434	0
751420	6638255	102		751721	6638382	153
751451	6638236	145		751719	6638245	0
751449	6638315	110		751722	6638328	3
751443	6638382	119		751717	6638191	0
751450	6638439	25		751780	6638368	52
751449	6638503	58		751780	6638295	189
751449	6638568	77		751779	6638232	0
751483	6638546	95		751779	6638160	0
751476	6638483	99		751806	6638227	0
751480	6638409	110		751807	6638302	158

APPENDIX G: LOCATIONS OF *NEURACHNE ANNULARIS* (P3) SURVEY QUADRATS WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Coordinates are the north-west corner of a 10 m x 10 m quadrat. The number of plants recorded within the quadrat is shown.

Location (GDA94, Zone 50)		Number of Plants		Location (GDA94, Zone 50)		Number of Plants
Easting (mE)	Northing (mN)			Easting (mE)	Northing (mN)	
751813	6638369	49		752299	6638015	147
751873	6638122	0		752290	6638088	220
751869	6638187	0		752290	6638158	165
751872	6638252	201		752318	6638184	197
751865	6638307	10		752314	6638126	186
751898	6638308	158		752315	6638050	123
751899	6638241	160		752382	6638221	106
751900	6638176	0		752382	6638161	69
751900	6638100	0		752385	6638069	85
751924	6638135	0		752385	6638011	157
751922	6638213	172		752403	6637996	78
751925	6638283	143		752412	6638064	221
751989	6638221	97		752405	6638135	29
751989	6638156	198		752405	6638198	201
751989	6638078	58		752439	6638233	124
752015	6638122	142		752440	6638164	215
752016	6638185	126		752440	6638100	98
752017	6638237	25		752440	6638034	16
752057	6638199	213		752503	6638248	24
752050	6638128	180		752499	6638173	6
752052	6638068	25		752499	6638111	143
752076	6638205	175		752500	6638034	189
752078	6638148	309		752532	6637996	92
752077	6638076	0		752532	6638057	97
752133	6638201	156		752523	6638126	25
752137	6638126	72		752529	6638196	155
752137	6638065	0		752532	6638254	19
752172	6638040	65		752557	6638279	170
752171	6638105	60		752560	6638215	140
752171	6638159	150		752559	6638146	120
752205	6638180	282		752559	6638081	179
752200	6638119	161		752562	6638019	207
752200	6638049	144		752590	6637996	205
752260	6638180	95		752590	6638054	260
752262	6638112	114		752593	6638121	225
752242	6638061	138		752582	6638261	235

APPENDIX G: LOCATIONS OF *NEURACHNE ANNULARIS* (P3) SURVEY QUADRATS WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Coordinates are the north-west corner of a 10 m x 10 m quadrat. The number of plants recorded within the quadrat is shown.

Location (GDA94, Zone 50)		Number of Plants		Location (GDA94, Zone 50)		Number of Plants
Easting (mE)	Northing (mN)			Easting (mE)	Northing (mN)	
752622	6638081	274				
752620	6638009	193				
752652	6637986	372				
752648	6638056	286				
752676	6638036	169				
752675	6637975	120				
752707	6637992	143				
752716	6638033	183				
752739	6637958	104				
752768	6637979	93				
752742	6638025	153				
752799	6638014	165				
752794	6637975	154				

APPENDIX H: LOCATIONS AND POPULATIONS OF *STENANTHEMUM NEWBEYI* (P3) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751419	6638522	1		751702	6638394	1
751423	6638521	1		751703	6638338	1
751805	6638323	1		751705	6638305	1
752130	6638124	1		751706	6638336	1
752135	6638099	1		751707	6638339	1
752137	6638120	1		751710	6638352	1
752141	6638120	1		751710	6638374	1
752234	6638059	1		751787	6638340	1
752250	6638073	1		751789	6638309	1
752252	6638108	1		751790	6638301	1
752258	6638079	1		751794	6638344	1
752360	6638177	1		751797	6638297	1
752365	6638157	1		751800	6638312	1
752382	6638164	1		751802	6638345	1
751417	6638411	1		752357	6638027	1
751422	6638423	1		751713	6638308	1
751539	6638277	1		752355	6638175	1
751540	6638231	1		752360	6638101	1
751540	6638407	1		752365	6638098	1
751542	6638408	1		752380	6638000	1
751542	6638411	1		752506	6638127	1
751543	6638249	1		752507	6638104	1
751543	6638345	1		752523	6638126	1
751544	6638380	1		752523	6638207	1
751547	6638397	1		752524	6638080	1
751555	6638372	1		752525	6638139	1
751556	6638343	1		752526	6638080	1
751558	6638367	1		752531	6638047	1
751561	6638343	1		752517	6638184	1
751566	6638364	1		752668	6638012	1
751568	6638363	1		752724	6638015	1
751571	6638367	1		752760	6638014	1
751691	6638341	1		752764	6638006	1
751692	6638356	1		752766	6637998	1
751692	6638380	1		751243	6638639	1
751693	6638356	1		751245	6638592	1
751696	6638375	1		751246	6638594	1
751700	6638366	1		751249	6638657	1

APPENDIX H: LOCATIONS AND POPULATIONS OF *STENANTHEMUM NEWBEYI* (P3) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751258	6638602	1		751230	6638640	1
751260	6638657	1		751233	6638644	1
751261	6638653	1		751234	6638648	1
751262	6638597	1		751239	6638638	1
751263	6638654	1		751272	6638572	1
751267	6638655	1		751273	6638517	1
751297	6638583	1		751276	6638585	1
751306	6638629	1		751276	6638606	1
751310	6638616	1		751276	6638611	1
751324	6638503	1		751279	6638603	1
751330	6638481	1		751280	6638562	1
751361	6638399	1		751280	6638624	1
751362	6638363	1		751281	6638570	1
751365	6638392	1		751283	6638581	1
751366	6638435	1		751283	6638603	1
751371	6638568	1		751285	6638567	1
751377	6638352	1		751286	6638613	1
751377	6638434	1		751287	6638491	1
751377	6638476	1		751287	6638553	1
751379	6638380	1		751288	6638510	1
751388	6638413	1		751290	6638555	1
751388	6638470	1		751292	6638568	1
751389	6638352	1		751293	6638550	1
751433	6638484	1		751296	6638544	1
751450	6638422	1		751329	6638481	1
751451	6638560	1		751333	6638426	1
751454	6638428	1		751347	6638470	1
751454	6638462	1		751351	6638473	1
751459	6638460	1		751353	6638551	1
751460	6638456	1		751356	6638468	1
752376	6637842	1		751358	6638464	1
752591	6638044	1		751359	6638365	1
751397	6638391	1		751363	6638461	1
751168	6638620	1		751366	6638491	1
751168	6638624	1		751370	6638482	1
751206	6638594	1		751372	6638461	1
751207	6638598	1		751372	6638568	1
751219	6638654	1		751375	6638435	1

APPENDIX H: LOCATIONS AND POPULATIONS OF *STENANTHEMUM NEWBEYI* (P3) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751378	6638440	1		751770	6638340	1
751387	6638502	1		752026	6638079	1
751389	6638469	1		752153	6638039	1
751389	6638497	1		752169	6638135	1
751410	6638448	1		752321	6638031	1
751416	6638443	1		752538	6638184	1
751421	6638456	1		752544	6638210	1
751515	6638256	1		751410	6638440	1
751516	6638213	1		751663	6638430	1
751518	6638297	1		751677	6638333	1
751524	6638322	1		752140	6638157	1
751532	6638174	1		752141	6638184	1
751533	6638313	1		752157	6638185	1
751536	6638319	1		752157	6638190	1
751540	6638216	1		752163	6638173	1
751541	6638279	1		752412	6638064	1
751541	6638280	1		752413	6638144	1
751627	6638397	1		752418	6638167	1
751629	6638390	1		752428	6638165	1
751631	6638279	1		752429	6638159	1
751633	6638283	1		752439	6638154	1
751638	6638205	1		752534	6638038	1
751639	6638305	1		752534	6638175	1
751643	6638314	1		752537	6638139	1
751651	6638351	1		752540	6638175	1
751653	6638271	1		752542	6638082	1
751655	6638360	1		752542	6638173	1
751663	6638332	1		752543	6638103	1
751678	6638400	1		752548	6638174	1
751689	6638360	1		752550	6638214	1
751749	6638348	1		752552	6638105	1
751752	6638316	1		752618	6638111	1
751758	6638317	1		752694	6638011	1
751758	6638317	1		751768	6638308	1
751760	6638321	1		751392	6638418	1
751760	6638350	1		751396	6638418	1
751767	6638384	1		751397	6638420	1
751769	6638329	1		751397	6638449	1

APPENDIX H: LOCATIONS AND POPULATIONS OF *STENANTHEMUM NEWBEYI* (P3) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751398	6638449	1		751670	6638393	1
751400	6638422	1		751671	6638318	1
751402	6638446	1		751671	6638370	1
751409	6638462	1		751673	6638345	1
751418	6638400	1		751677	6638397	1
751420	6638600	1		751679	6638339	1
751428	6638380	1		751679	6638388	1
751431	6638398	1		751680	6638346	1
751432	6638384	1		751681	6638346	1
751439	6638225	1		751681	6638401	1
751439	6638335	1		751682	6638347	1
751451	6638243	1		751685	6638347	1
751571	6638363	1		751687	6638399	1
751572	6638301	1		751689	6638366	1
751572	6638364	1		751689	6638369	1
751573	6638296	1		751756	6638359	1
751576	6638353	1		752039	6638110	1
751577	6638358	1		752060	6638144	1
751578	6638259	1		752061	6638150	1
751578	6638378	1		752065	6638138	1
751579	6638336	1		752067	6638147	1
751579	6638377	1		752072	6638155	1
751582	6638387	1		752144	6638042	1
751585	6638346	1		752158	6638067	1
751586	6638216	1		752162	6638175	1
751587	6638219	1		752164	6638050	1
751587	6638358	1		752165	6638130	1
751588	6638358	1		752168	6638178	1
751589	6638346	1		752176	6638161	1
751594	6638213	1		752177	6638145	1
751597	6638350	1		752177	6638149	1
751631	6638404	1		752177	6638160	1
751643	6638228	1		752178	6638145	1
751661	6638357	1		752180	6638185	1
751665	6638350	1		752182	6638123	1
751669	6638269	1		752183	6638121	1
751669	6638328	1		752186	6638045	1
751670	6638390	1		752189	6638120	1

APPENDIX H: LOCATIONS AND POPULATIONS OF *STENANTHEMUM NEWBEYI* (P3) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
752199	6638126	1		752541	6638140	1
752201	6638154	1		752545	6638054	1
752264	6638045	1		752545	6638141	1
752271	6638014	1		752557	6638231	1
752274	6638072	1		752557	6638232	1
752279	6638018	1		752559	6638207	1
752285	6638085	1		752561	6638213	1
752292	6638105	1		752592	6638104	1
752292	6638110	1		752598	6638053	1
752292	6638111	1		752648	6638071	1
752296	6638112	1		752690	6638017	1
752297	6638094	1		752779	6638001	1
752312	6638028	1		752782	6637998	1
752316	6638031	1		752783	6637992	1
752318	6638060	1		752783	6637993	1
752384	6638167	1		752786	6637994	1
752386	6638042	1		752789	6638006	1
752386	6638044	1		751391	6638420	1
752393	6638109	1		751404	6638493	1
752406	6638005	1		751410	6638494	1
752409	6637999	1		751406	6638489	1
752417	6638005	1		751408	6638486	1
752418	6638138	1		751410	6638498	1
752421	6638128	1		751421	6638467	1
752422	6638022	1		752354	6637856	1
752424	6638046	1		752372	6637837	1
752424	6638164	1		752163	6637820	1
752427	6638104	1		752180	6638110	1
752429	6638125	1		752079	6638110	1
752433	6638015	1		752260	6637840	1
752437	6638164	1		751250	6638587	1
752439	6638156	1		751383	6638382	1
752529	6638046	1		752413	6637856	1
752529	6638099	1		751283	6638595	1
752533	6638092	1		751293	6638601	1
752535	6638109	1		751293	6638624	1
752537	6638041	1		751294	6638500	1
752537	6638155	1		751297	6638502	1

APPENDIX H: LOCATIONS AND POPULATIONS OF *STENANTHEMUM NEWBEYI* (P3) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751333	6638473	1		752583	6638203	2
751336	6638621	1		751195	6638650	2
751769	6638302	1		751277	6638560	2
751781	6638317	1		751330	6638481	2
752253	6637864	1		751342	6638481	2
752393	6638109	1		751346	6638481	2
752594	6638060	1		751758	6638333	2
752598	6638058	1		751767	6638280	2
752785	6637999	1		751273	6638566	2
751200	6638652	1		751278	6638557	2
751714	6638349	2		751332	6638486	2
751542	6638406	2		751341	6638487	2
752128	6638120	2		751350	6638405	2
752249	6638102	2		751353	6638477	2
752357	6638053	2		751358	6638488	2
751553	6638392	2		751359	6638462	2
751716	6638323	2		751365	6638438	2
751785	6638340	2		751372	6638479	2
751397	6638440	2		751373	6638441	2
751563	6638346	2		751378	6638473	2
751703	6638342	2		751516	6638221	2
751708	6638341	2		751517	6638366	2
751781	6638343	2		751635	6638248	2
752489	6638167	2		752280	6638100	2
752508	6638130	2		752290	6638075	2
752524	6638048	2		751690	6638382	2
752526	6638165	2		751290	6638560	2
752250	6638079	2		751344	6638402	2
752677	6638005	2		751645	6638345	2
751251	6638584	2		751652	6638233	2
751378	6638469	2		751524	6638365	2
751380	6638467	2		751646	6638332	2
751388	6638413	2		751574	6638382	2
751454	6638426	2		751580	6638380	2
751384	6638351	2		752166	6638180	2
751386	6638402	2		752268	6638034	2
751463	6638454	2		752269	6638034	2
751653	6638397	2		752288	6638108	2

APPENDIX H: LOCATIONS AND POPULATIONS OF *STENANTHEMUM NEWBEYI* (P3) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
752531	6638053	2		752156	6638043	2
752546	6638185	2		752172	6638036	2
752562	6638191	2		752268	6638039	2
751441	6638365	2		752416	6638164	2
752140	6638187	2		752426	6638117	2
752144	6638184	2		752432	6638019	2
752152	6638187	2		752433	6638145	2
752531	6638181	2		752598	6638100	2
752552	6638135	2		751390	6638386	2
752564	6638198	2		751391	6638383	2
752556	6638194	2		751397	6638448	2
751575	6638333	2		751402	6638393	2
751577	6638356	2		751405	6638463	2
751636	6638449	2		751412	6638360	2
751665	6638326	2		751580	6638304	2
751669	6638354	2		752197	6638119	2
751681	6638359	2		751575	6638351	2
751685	6638341	2		752160	6637830	2
752071	6638149	2		752076	6637821	2
752175	6638127	2		752197	6638163	2
752187	6638122	2		751333	6638482	2
752197	6638118	2		751342	6638505	2
752198	6638161	2		751444	6638493	2
752201	6638157	2		751279	6638593	2
752378	6638165	2		751294	6638622	2
752543	6638185	2		752418	6637942	2
752598	6638055	2		752620	6638060	2
751752	6638294	2		752787	6637999	2
751752	6638299	2		752800	6637996	2
751392	6638456	2		752359	6638167	3
751405	6638360	2		752229	6638076	3
751413	6638363	2		751544	6638379	3
751420	6638598	2		751555	6638350	3
751574	6638310	2		751547	6638372	3
751577	6638366	2		751788	6638325	3
751657	6638264	2		751803	6638328	3
751667	6638328	2		751695	6638343	3
751671	6638333	2		752507	6638122	3

APPENDIX H: LOCATIONS AND POPULATIONS OF *STENANTHEMUM NEWBEYI* (P3) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751251	6638581	3		751586	6638350	3
751423	6638438	3		751684	6638350	3
751242	6638582	3		751748	6638351	3
751280	6638560	3		752061	6638147	3
751300	6638464	3		752139	6638160	3
751385	6638453	3		752175	6638175	3
751442	6638468	3		752430	6638014	3
751451	6638419	3		752547	6638056	3
751443	6638567	3		752558	6638206	3
751294	6638610	3		751418	6638457	3
751338	6638616	3		751582	6638337	3
751360	6638462	3		751584	6638355	3
751362	6638498	3		752167	6638174	3
751634	6638258	3		752418	6638166	3
751649	6638236	3		752540	6638166	3
751225	6638626	3		752558	6638189	3
751271	6638582	3		752555	6638199	3
751356	6638487	3		751450	6638353	3
751376	6638447	3		751394	6638425	3
751380	6638469	3		751410	6638460	3
751515	6638387	3		751590	6638343	3
751516	6638248	3		752309	6638060	3
751542	6638410	3		751419	6638461	3
751642	6638353	3		751294	6638597	3
751658	6638385	3		752133	6638118	4
751350	6638426	3		751418	6638423	4
751527	6638388	3		751557	6638374	4
751532	6638318	3		751558	6638374	4
751525	6638374	3		751797	6638297	4
752552	6638186	3		751791	6638333	4
752790	6638001	3		752513	6638114	4
751449	6638360	3		751253	6638665	4
752434	6638142	3		751338	6638503	4
752538	6638175	3		751463	6638433	4
752541	6638186	3		751467	6638422	4
752283	6638082	3		751431	6638517	4
752391	6637991	3		751354	6638480	4
751408	6638356	3		751360	6638465	4

APPENDIX H: LOCATIONS AND POPULATIONS OF *STENANTHEMUM NEWBEYI* (P3) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751586	6638350	3		751753	6638355	4
751684	6638350	3		751763	6638282	4
751748	6638351	3		751777	6638309	4
752061	6638147	3		751334	6638420	4
752139	6638160	3		751358	6638493	4
752175	6638175	3		751543	6638174	4
752430	6638014	3		751766	6638337	4
752547	6638056	3		752141	6638188	4
752558	6638206	3		752560	6638188	4
751418	6638457	3		752071	6638151	4
751582	6638337	3		752175	6638165	4
751584	6638355	3		752284	6638075	4
752167	6638174	3		751447	6638385	4
752418	6638166	3		752178	6638148	4
752540	6638166	3		752179	6638190	4
752558	6638189	3		752267	6638028	4
752555	6638199	3		752268	6638033	4
751450	6638353	3		752538	6638093	4
751394	6638425	3		752555	6638201	4
751410	6638460	3		752145	6638157	4
751590	6638343	3		752555	6638209	4
752309	6638060	3		751390	6638390	4
751419	6638461	3		751598	6638337	4
751294	6638597	3		752065	6638150	4
752133	6638118	4		752078	6638152	4
751418	6638423	4		752198	6638150	4
751557	6638374	4		752309	6638050	4
751558	6638374	4		751333	6638466	4
751797	6638297	4		751422	6638421	5
751791	6638333	4		751538	6638414	5
752513	6638114	4		751541	6638380	5
751253	6638665	4		751551	6638376	5
751338	6638503	4		751780	6638314	5
751463	6638433	4		752529	6638196	5
751467	6638422	4		752674	6638012	5
751431	6638517	4		751269	6638571	5
751354	6638480	4		751288	6638562	5
751360	6638465	4		751467	6638438	5

APPENDIX H: LOCATIONS AND POPULATIONS OF *STENANTHEMUM NEWBEYI* (P3) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751538	6638414	5		751540	6638325	6
751510	6638303	5		751662	6638393	6
751632	6638332	5		751425	6638384	6
751757	6638331	5		751640	6638342	6
751777	6638311	5		752549	6638193	6
751443	6638393	5		752270	6638024	6
751512	6638300	5		752550	6638190	6
751516	6638213	5		751409	6638466	6
751518	6638303	5		751599	6638321	6
751656	6638243	5		751660	6638359	6
751660	6638392	5		752187	6638128	6
751516	6638424	5		752309	6638013	6
752162	6638129	5		752803	6637988	6
751689	6638347	5		752121	6638153	7
752438	6638143	5		752125	6638126	7
752440	6638139	5		751704	6638372	7
752543	6638188	5		751696	6638364	7
752148	6638037	5		752532	6638206	7
752539	6638220	5		751529	6638422	7
751443	6638382	5		751656	6638257	7
752392	6638164	5		752549	6638198	7
752337	6637860	5		752157	6638132	7
752126	6638153	6		751414	6638462	7
752140	6638190	6		752060	6638152	7
751546	6638376	6		752175	6638115	7
751555	6638263	6		751566	6638263	8
751690	6638349	6		751716	6638394	8
751546	6638425	6		751787	6638337	8
751797	6638324	6		751776	6638333	8
752524	6638166	6		751293	6638491	8
751459	6638453	6		751360	6638493	8
751467	6638528	6		751645	6638256	8
751360	6638494	6		752436	6638150	8
751521	6638412	6		751681	6638351	8
751660	6638354	6		751589	6638365	8
751761	6638399	6		751597	6638342	8
751516	6638418	6		751666	6638319	8
751656	6638248	6		751676	6638350	8

APPENDIX H: LOCATIONS AND POPULATIONS OF *STENANTHEMUM NEWBEYI* (P3) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751409	6638525	8
751287	6638601	8
751541	6638324	9
751700	6638375	9
751532	6638379	9
751560	6638271	9
751796	6638330	9
751721	6638307	9
751311	6638384	9
751283	6638633	9
751761	6638337	9
751530	6638379	9
751640	6638241	9
751650	6638261	9
752166	6638123	9
751423	6638428	9
751749	6638353	9
751584	6638322	9
751604	6638357	9
752384	6638167	9
751381	6638374	10
752590	6638036	10
752164	6638175	10
751460	6638534	11
751632	6638348	11
751767	6638389	11
752428	6638165	11
751699	6638380	12
751257	6638660	12
751683	6638391	12
752190	6638156	12
752138	6638163	12
751803	6638306	13
751590	6638325	13
751439	6638502	15
751535	6638280	16
751706	6638392	18
751766	6638398	18
752115	6638156	20
751428	6638546	6

APPENDIX I: LOCATIONS AND POPULATIONS OF *BANKSIA ARBOREA* (P4) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751410	6638401	1		751710	6638235	1
751571	6638238	1		751711	6638208	1
751717	6638209	1		751713	6638196	1
751771	6638213	1		751715	6638268	1
751782	6638340	1		751716	6638207	1
751783	6638233	1		751717	6638269	1
751785	6638190	1		751719	6638190	1
751786	6638236	1		751772	6638216	1
751794	6638203	1		751778	6638218	1
751794	6638220	1		751781	6638207	1
751800	6638201	1		751783	6638230	1
751803	6638174	1		751783	6638232	1
751804	6638227	1		751785	6638226	1
752003	6638089	1		751785	6638310	1
752009	6638089	1		751786	6638227	1
752022	6638112	1		751787	6638223	1
752028	6638113	1		751787	6638227	1
752258	6638079	1		751787	6638340	1
751418	6638453	1		751788	6638226	1
751418	6638480	1		751788	6638337	1
751424	6638422	1		751789	6638192	1
751537	6638317	1		751789	6638203	1
751551	6638189	1		751790	6638216	1
751690	6638224	1		751790	6638218	1
751693	6638228	1		751791	6638349	1
751695	6638223	1		751792	6638198	1
751696	6638214	1		751792	6638203	1
751697	6638186	1		751793	6638217	1
751697	6638246	1		751795	6638206	1
751699	6638223	1		751796	6638342	1
751702	6638188	1		751797	6638210	1
751702	6638223	1		751798	6638196	1
751703	6638189	1		751800	6638196	1
751704	6638262	1		751800	6638202	1
751706	6638226	1		751802	6638196	1
751707	6638231	1		751805	6638196	1
751709	6638199	1		751807	6638174	1
751710	6638199	1		751808	6638199	1

APPENDIX I: LOCATIONS AND POPULATIONS OF *BANKSIA ARBOREA* (P4) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751967	6638111	1		751903	6638175	1
751978	6638114	1		751915	6638176	1
751985	6638094	1		751921	6638170	1
751986	6638090	1		751921	6638172	1
751987	6638108	1		751921	6638173	1
751990	6638092	1		751924	6638101	1
752010	6638083	1		751928	6638171	1
752016	6638081	1		751928	6638172	1
752123	6638181	1		752057	6638185	1
752232	6638073	1		752196	6638163	1
752232	6638078	1		751752	6638187	1
752240	6638037	1		751756	6638236	1
752244	6638019	1		751760	6638181	1
752245	6638038	1		751761	6638237	1
752248	6638138	1		751769	6638243	1
752249	6638072	1		751774	6638179	1
752256	6638081	1		751775	6638226	1
751782	6638218	1		751777	6638193	1
751798	6638202	1		751777	6638304	1
751669	6638191	1		751778	6638224	1
751675	6638192	1		751778	6638228	1
751920	6638177	1		751873	6638207	1
752192	6638166	1		751881	6638203	1
752609	6638082	1		751889	6638182	1
752622	6638061	1		751891	6638186	1
752589	6638221	1		751895	6638116	1
751848	6638235	1		751900	6638175	1
751871	6638198	1		751370	6638481	1
751845	6638239	1		751390	6638514	1
751854	6638214	1		751396	6638418	1
751858	6638204	1		751400	6638521	1
751858	6638237	1		751404	6638427	1
751860	6638203	1		751404	6638517	1
751863	6638225	1		751405	6638537	1
751864	6638206	1		751405	6638581	1
751866	6638202	1		751407	6638589	1
751900	6638100	1		751412	6638578	1
751902	6638174	1		751419	6638441	1

APPENDIX I: LOCATIONS AND POPULATIONS OF *BANKSIA ARBOREA* (P4) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751422	6638422	1		751768	6638358	1
751422	6638455	1		751776	6638358	1
751507	6638175	1		751915	6638121	1
751512	6638301	1		751925	6638160	1
751512	6638310	1		752059	6638088	1
751512	6638357	1		752074	6638089	1
751524	6638322	1		752078	6638095	1
751525	6638406	1		752151	6638092	1
751526	6638290	1		752175	6638165	1
751543	6638174	1		752198	6638075	1
751576	6638248	1		752198	6638075	1
751578	6638211	1		752199	6638075	1
751630	6638196	1		752268	6638042	1
751631	6638338	1		752538	6638186	1
751632	6638332	1		752549	6638205	1
751633	6638210	1		752647	6638062	1
751634	6638214	1		752776	6638029	1
751635	6638247	1		751536	6638314	1
751639	6638199	1		751638	6638266	1
751643	6638258	1		751387	6638613	1
751655	6638248	1		751750	6638172	1
751656	6638219	1		751756	6638184	1
751657	6638197	1		751757	6638245	1
751657	6638278	1		751775	6638169	1
751661	6638235	1		751789	6638180	1
751661	6638237	1		751791	6638171	1
751663	6638240	1		751902	6638175	1
751670	6638227	1		751847	6638205	1
751670	6638227	1		751749	6638243	1
751670	6638229	1		751751	6638242	1
751672	6638196	1		751754	6638233	1
751672	6638201	1		751764	6638267	1
751672	6638202	1		751771	6638262	1
751679	6638198	1		751774	6638164	1
751681	6638192	1		751775	6638176	1
751683	6638228	1		751779	6638195	1
751684	6638235	1		751870	6638185	1
751757	6638339	1		751874	6638210	1

APPENDIX I: LOCATIONS AND POPULATIONS OF *BANKSIA ARBOREA* (P4) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants		Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751879	6638206	1		752201	6638073	1
751885	6638121	1		752266	6638028	1
751890	6638115	1		752272	6638014	1
751895	6638192	1		752287	6638032	1
751395	6638596	1		752557	6638105	1
751413	6638601	1		751661	6638271	1
751419	6638441	1		752070	6638079	1
751419	6638443	1		751279	6638603	1
751597	6638259	1		751282	6638638	1
751657	6638272	1		751285	6638614	1
751840	6638194	1		751328	6638478	1
751845	6638189	1		751332	6638478	1
751846	6638148	1		751344	6638402	1
751847	6638147	1		751346	6638411	1
751847	6638206	1		751352	6638430	1
751848	6638142	1		751354	6638477	1
751848	6638147	1		751357	6638494	1
751849	6638218	1		751388	6638477	1
751851	6638203	1		751394	6638487	1
751852	6638199	1		751424	6638382	1
751869	6638187	1		751429	6638403	1
751902	6638193	1		751432	6638384	1
751905	6638141	1		751525	6638374	1
751906	6638157	1		751653	6638271	1
751906	6638185	1		751683	6638273	1
751909	6638155	1		751920	6638168	1
751912	6638182	1		752046	6638101	1
751919	6638138	1		751312	6638467	1
751924	6638115	1		751324	6638510	1
751924	6638163	1		751328	6638480	1
751931	6638135	1		751450	6638423	1
752057	6638091	1		751234	6638646	1
752065	6638085	1		751275	6638573	1
752140	6638086	1		751281	6638490	1
752180	6638040	1		751294	6638624	1
752180	6638060	1		751360	6638494	1
752183	6638056	1		751368	6638473	1
752199	6638067	1		751233	6638632	1

APPENDIX I: LOCATIONS AND POPULATIONS OF *BANKSIA ARBOREA* (P4) RECORDED WITHIN THE JACKSON 5 PROSPECT SURVEY AREA

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751239	6638581	1
751276	6638504	1
751340	6638399	1
751909	6638158	1
751381	6638524	1
751281	6638504	1
751419	6638441	1
752176	6638031	1
752187	6638128	1
751316	6638376	1
751442	6638468	1
751421	6638570	1
751438	6638582	1
751250	6638587	1
751252	6638668	1
751254	6638593	1
751281	6638564	1
751290	6638559	1
751339	6638639	1
751387	6638475	1
751388	6638407	1
752249	6638074	2
751713	6638208	2
751985	6638096	2
751974	6638108	2
752529	6638196	2
751698	6638227	2
752674	6638045	2
751860	6638204	2
751880	6638107	2
751910	6638158	2
751389	6638514	2
751358	6638493	2
751638	6638204	2
751642	6638201	2
751657	6638242	2
751512	6638318	2
751884	6638117	2

Location (GDA94, Zone 50) Easting (mE)	Northing (mN)	Number of Plants
751845	6638206	2
751927	6638152	2
751340	6638397	2
751358	6638425	2
751246	6638593	2
751225	6638659	2
751279	6638597	2
751433	6638484	2
751302	6638462	2
751444	6638456	2
751450	6638419	2
752081	6638081	2
751796	6638197	3
751653	6638229	3
751634	6638250	3
751774	6638228	3
751426	6638479	3
751361	6638422	3
751802	6638199	4
751660	6638253	4
751423	6638438	4
751659	6638257	5
751676	6638193	6

Appendix D: Aboriginal Heritage Search Results

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Search Criteria

Other Heritage Place IDs 18731, 20336, 29178, 29179

Disclaimer

Aboriginal sites exist that are not recorded on the Register of Aboriginal Sites, and some registered sites may no longer exist. Consultation with Aboriginal communities is on-going to identify additional sites. The AHA protects all Aboriginal sites in Western Australia whether or not they are registerd.

Copyright

Coordinate Accuracy

Accuracy is shown as a code in brackets following the site coordinates.

Reliable The spatial information recorded in the site file is deemed to be reliable, due to methods of capture.

Unreliable The spatial information recorded in the site file is deemed to be unreliable due to errors of spatial data capture and/or quality of spatial information recorded.

Status

Lodged	→	ACMC Decision Made
Information lodged, awaiting assessment		**Registered Site** Insufficient Information Stored Data

Spatial Accuracy

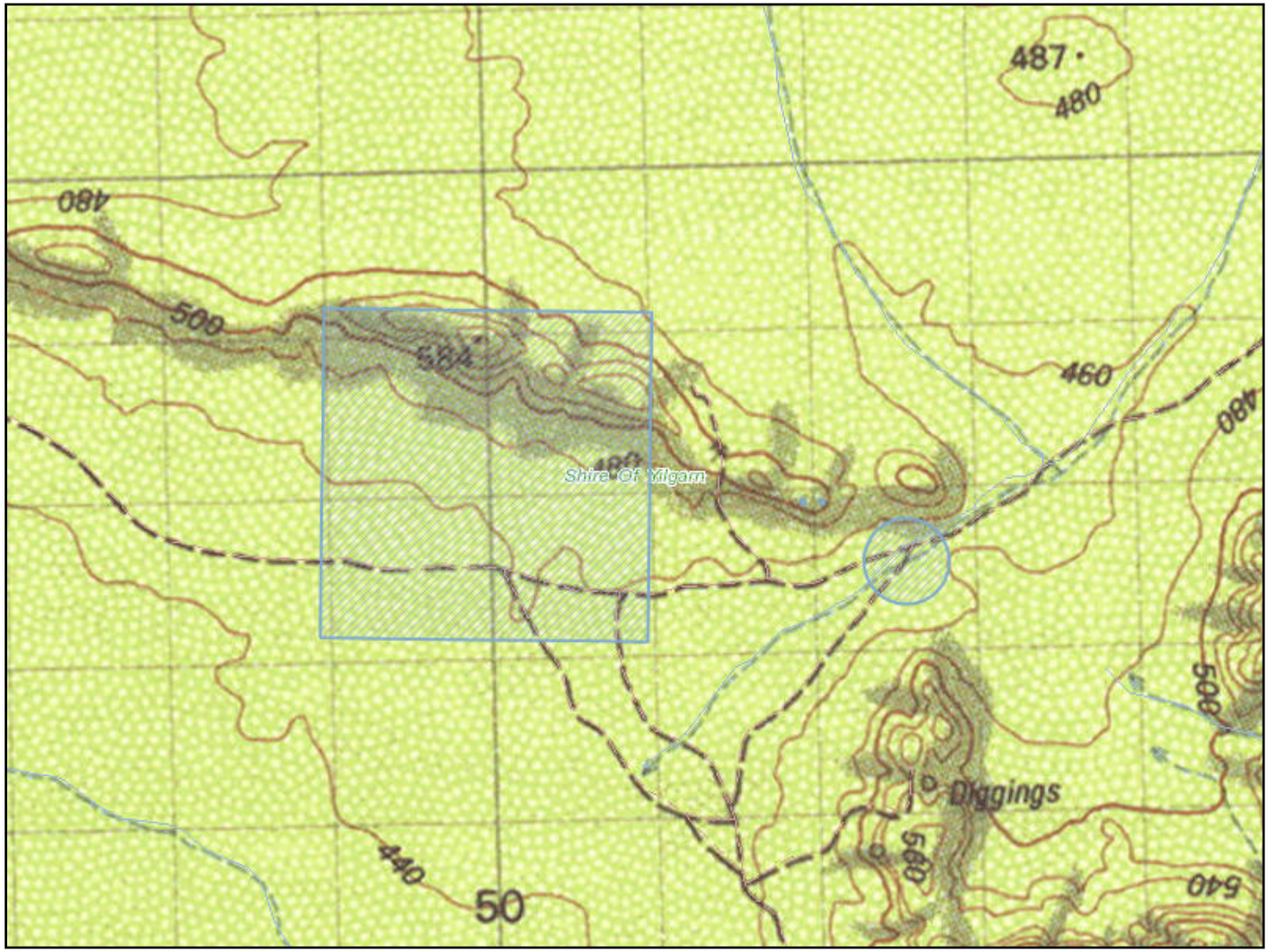
Index coordinates are indicative locations and may not necessarily represent the centre of the sites, especially for sites with an access code "closed" or "vulnerable". Map coordinates (Lat/Long) and (Easting/Northing) are based on the GDA 94 datum. The Easting/Northing map grid can be across one or more zones. The zone is indicated for each Easting on the map, i.e. '5000000:Z50' means Easting=5000000, Zone=50.

Sites Shown on Maps

Site boundaries may not appear on maps at low zoom levels.

List of Other Heritage Places with Map

ID	Status	Access	Restriction	Place Name	Type	Additional Info	Informants	Coordinates	Place No.
18731	Insufficient Information	Open	No Gender Restrictions	Helena/Aurora Ranges Engraving	Engraving		*Registered Informant names available from DAA	751699mE 6639166mN Zone 50 [Unreliable]	
20336	Lodged	Closed	Male Access Only	KY19	Mythological, Artefacts / Scatter	Camp, Water Source, [Other: ROCKHOLE]	*Registered Informant names available from DAA	Not available for closed Places	
29178	Lodged	Open	No Gender Restrictions	J5 Rockhole 1		Water Source	*Registered Informant names available from DAA	752189mE 6638075mN Zone 50 [Reliable]	
29179	Lodged	Open	No Gender Restrictions	J5 Rockhole 2		Water Source	*Registered Informant names available from DAA	752067mE 6638078mN Zone 50 [Reliable]	



Legend

Selected Heritage Places

- Other Heritage Places
- Aboriginal Community Occupied
- Aboriginal Community Unoccupied
- Town
- Search Area