



JWD Iron Ore Project

Works Approval Supporting Documentation

Category 12

Rev 0, December 2020

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Wiluna Fe Limited
JWD Iron Ore Project
Works Approval Supporting Documentation
Category 12

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Revision Status

Revision No.	Description	Prepared	Reviewed	Date
Rev 0	Submission to DWER	Margaret Dunlop Kate George	Jeremy Sinclair	10 December 2020

This document has been prepared based on assumptions as reported throughout and upon information and data supplied by others.



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1. PROJECT SUMMARY

1.1. Background

Wiluna Fe Limited (trading as Fe limited) under an iron ore mining rights agreement with Golden West Resources (GWR) is developing the John William Douth Open Pit (JWD), located in the Goldfields, approximately 40 kilometres (km) west of Wiluna and 700 km northeast of Perth (Attachment 2 - Figure 1).

The JWD Project forms part of the larger Wiluna West Iron Ore Project, which comprises eight iron ore deposits over two Banded Iron Formation (BIF) ridges (Ridges B and C as classified by GWR) (Attachment 2- Figure 2).

1.2. Project Description

The JWD Project (the Project) refers to a single iron ore deposit with a total run of mine (ROM) ore inventory of approximately 3.0 million tonnes.

Ore will be sourced from the JWD open pit using conventional drill and blast, load and haul methods and trucked to the run-of-mine (ROM) pad for crushing and screening with the final product hauled to Geraldton for export overseas.

The Project has a mine life comprised of three stages, identified according to the stages of pit development. The first stage covers a period of 6 months whereby the crushing and screening plant is envisaged to produce 350,000 tonnes of iron ore. Stage 2 produces an additional 1.1 million tonnes of iron ore, extending the operation to around March 2023. Stage 3 mines and processes an additional 1.55 million tonnes of iron ore, taking the operation through to around April 2025.

The project is comprised of:

- An open pit
- A permanent waste rock dump (WRD)
- Topsoil and vegetation stockpiles.
- Power supplied from diesel generators
- Associated mine infrastructure and utilities elements including stormwater management infrastructure (bunds and diversion drains), magazine, mine access roads.
- A Mobile Crushing & Screening Plant (design capacity of 2 million tonnes per annual period)

Existing infrastructure includes roads and camp.

Subject to the receipt of key approvals, construction is anticipated to commence in February 2021, with mining commencing in March 2021. The mobile crushing and screening plant refers to Stages 1 to 3 of the Project.

This supplementary information supports Wiluna Fe Limited's submission of the 'Application form: works approval / licence' as required by the Department of Water and Environmental Regulation (DWER) to assess the Project.

This Works Approval has been prepared as per the *Guidelines: Industry Regulation Guide to Licencing, Activities regulated under the Environmental Protection Act and the Environmental Protection Regulations 1987, June 2019* (Department of Water and Environmental Regulation 2019)

1.3. Objective

In support of this project, Wiluna Fe Limited seeks to construct and operate one prescribed premises, as defined under Schedule 1 of the Environmental Protection Regulations 1987, in accordance with Part V of the Environmental Protection Act 1986:

- Mobile crushing and screening plant (Category 12) – 2 Mtpa (maximum capacity not project production rate).

The project does not trigger the following:

- Category 6 (mine dewatering and discharge greater than 50,000 tonnes or more per annum), as the project is above water table.
- Category 52 as power supply will be less than 20 MW.
- Category 73 (Bulk storage of chemicals (hydrocarbons) – 1000 m³ in aggregate) as less than 1000 m³ in aggregate is planned to be stored on site.
- Category 85 - Sewage facility: premises –on which sewage is treated (excluding septic tanks); or from which treated sewage is discharged onto land or into waters (20 to 100 m³ per day) as less than 20 m³ per day will be produced.
- Category 64 – Class II landfill (20 tonnes or more per annum).

1.4. Ownership and Land Tenure

The premises is located within M53/1078-I, M53/1018-I and L53/146 which is 100% owned by GWR Group Limited. The Proponent is Wiluna Fe Pty Ltd, who are undertaking work for GWR Limited.

Table 1: Tenements part of the Prescribed Premises

Tenement	Owner	Date granted	Expiry date	Area
M 53/1078-I	GWR Group Limited	05/01/2006	29/01/2027	593.65 ha
M 53/1018-I	GWR Group Limited	30/01/2006	29/01/2027	597.0 ha
L 53/146	GWR Group Limited	10/08/2006	09/08/2027	51.80 ha

2. Proposed Activities

2.1. Key Infrastructure and Equipment

A mobile crushing and screening plant is proposed to process the 3.0 Million tonnes (Mt) of iron ore mined over stages 1,2 and 3 of the Project via conventional drill and blast and load and haul mining practises. The crushing and screening plant will be located adjacent to the run-of-mine (ROM) within the limits of the approved waste dump (Attachment 2 – Figure 1). The plant will provide primary, secondary and tertiary crushing and screening to produce a lump (31.5 – 6.3 mm) and a fines (<6.3 mm) product.

Key infrastructure and equipment are summarised in Table 2.

Table 2: Crushing and Screening Facility Details

Component	Overview
Scope, size and scale, including details as to frequency, production and design capacity	Crushing and screening plant, operating dayshift only, 7 days per week, with a design capacity and expected production rate of approximately 1 Million tonnes per annum (Mtpa).
Key infrastructure and equipment	<p>The crushing and screening plant will include the following key equipment:</p> <ul style="list-style-type: none"> • 1x Feeder and Grizzly. • 1x Jaw (primary) Crusher. • 2x (secondary plus tertiary) cone crushers. • 2x twin deck sizing screens. • 2x Radial Stackers. • Weightometers. • Metal detection units.
Unique or non-industry standard processes or operations	None.

Component	Overview
Emissions and emission discharge points*	<p>Potential emissions from the crushing and screening facility and associated discharge points are:</p> <ul style="list-style-type: none"> • Noise <ul style="list-style-type: none"> ○ Crushing and screening plant. ○ Associated vehicle movements and equipment and machinery operation (e.g., rock breaker and diesel generators) • Fugitive dust: <ul style="list-style-type: none"> ○ ROM stockpile (feeds the crushing and screening plant). ○ Crushing screening plant, specifically primary feed hopper, conveyor transfer points and stackers ○ Product stockpiles ○ Associated vehicle movements and equipment and machinery operation (e.g. rock breaker and diesel generators) • Contaminated stormwater from the ROM pad and associated sediment basins.

2.2. Crushing and Screening Facility

The crushing and screening of material is achieved with a mobile crushing and screening plant utilising three-stage crushing and screening via a combination of diesel/electric powered modular track mounted crushers, screens and portable conveyors. An indicative schematic of the crushing and screening plant layout is provided in Figure 3 and 4 respectively. The premises plan is located in Attachment 2 (Figure 1). The location of the crushing and screening plant in relation to minor drainage features and the 1 in100-year flood level is discussed in Attachment 7.

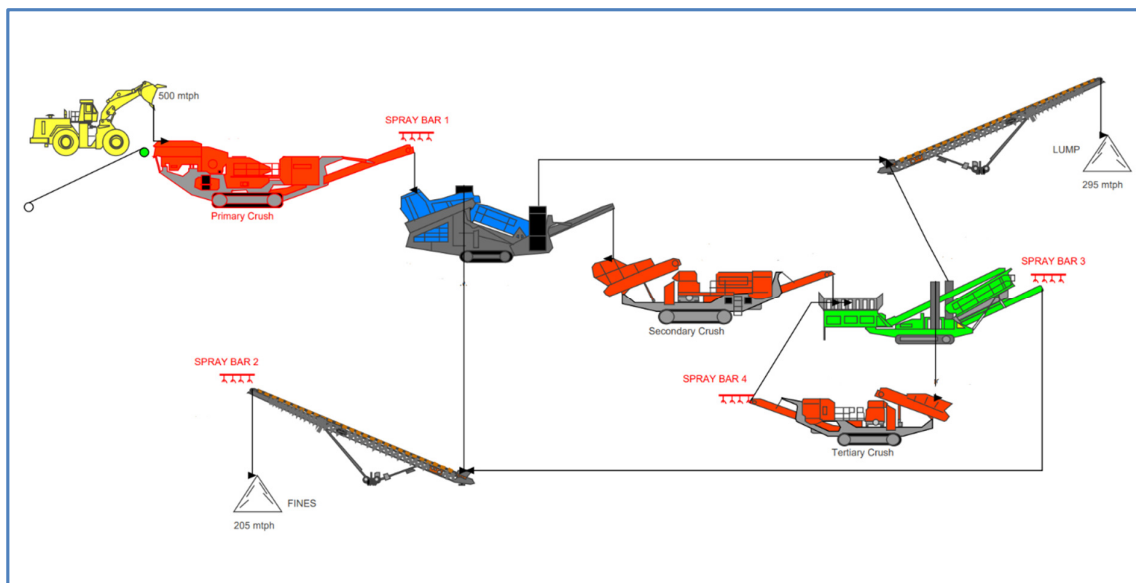


Figure 3 - Crushing and Screening Plant Flow Diagram

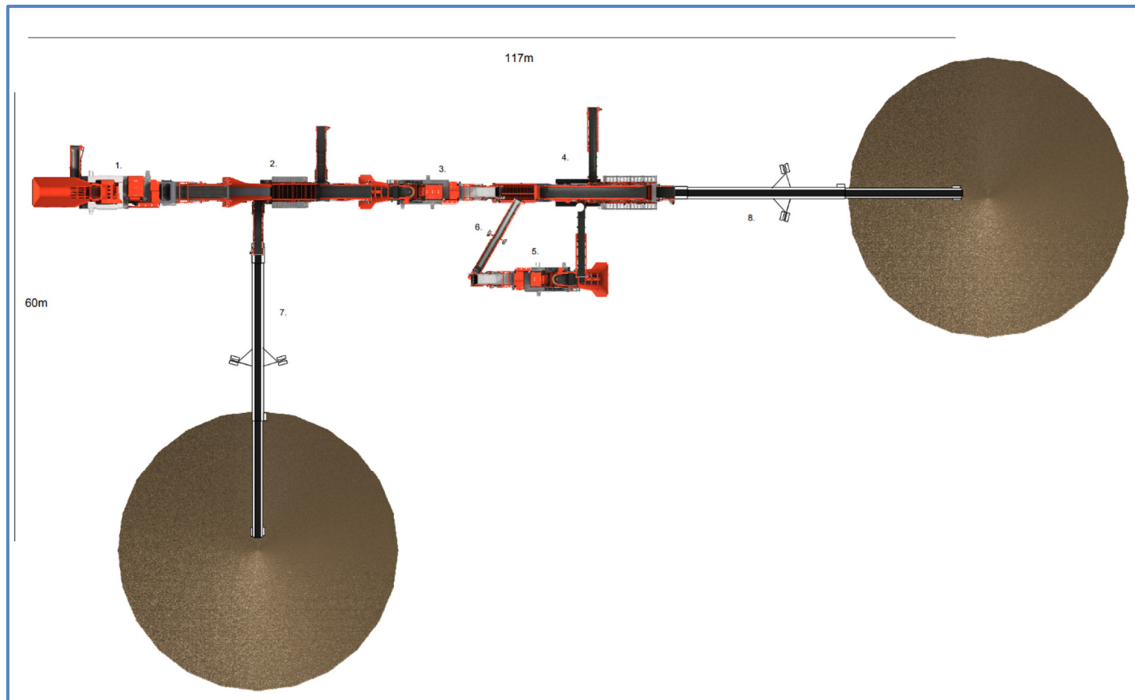


Figure 4 – Crusher Schematic

2.2.1. Site Preparation and Construction

Native vegetation and topsoil will be stripped within approved areas, with topsoil stockpiled in accordance with environmental requirements. Following removal of the topsoil and material unsuitable for construction purposes, the surface will be levelled and rolled accordingly to provide a stable pad for the crushing and screening modules. Any identified weak areas will be excavated and replaced with suitable granular material to provide stable ground. Material for this purpose will be sourced from within approved clearing boundaries. Limited structural work will be required to be performed on site, given the plant is a mobile crushing and screening plant made up of connected modules. Placement on site and connection and assembly will be completed by the crushing and screening contractor under the supervision of Wiluna Fe or GWR company representatives. The final stage of construction will involve installation of dust suppression reticulation, followed by erection of appropriate signage across the plant to ready it for the commissioning phase.

Pending the receipt of necessary approvals, key dates are as follows:

- Mobilisation/Placement & Assembly – Late January 2021 (Assembly duration – 1 week)
- Commissioning / Ramp up – February 2021
- Operation – March 2021.

2.3. Process

Ore mined from the open pits will be hauled via haul trucks to the ROM pad, where it will be stockpiled prior to processing. A front end loader (FEL) will feed the stockpiled ROM ore into the hopper of the

primary crusher, where it will proceed to undergo three crushing stages and two screening stages before the ore is fed onto the product stockyard (with an approximate total capacity inclusive of bulk-out stockpiles of 80,000t) via two radial stackers (one for lump product and one for fines product). The maximum capacity of the product stockpiles (below the radial stackers) will be approximately 30,000 tonnes for each product.

Oversize ore (too large for the primary crusher) will be separated into an oversize ore stockpile which will be periodically processed using a rock breaker before being fed into the crushing and screening plant.

The plant is expected to have an average throughput of 400 tonnes per hour. Instantaneous plant throughput rates may be up to 550 tonnes per hour. The plant is envisaged to be run on a day shift only basis with periodic 'shut downs' for planned preventative maintenance to be undertaken. The plant is expected to have approximately 2500 operating hours per annum based on an average throughput of 400 tonnes per hour.

The in-situ moisture content of the ore prior to processing is expected to range from 1 to 2%. A target moisture content of 5% for Fines and 3.5% for Lump during processing will be achieved by application of water spray bars, which will also limit dust emissions. Water sprays will be installed over the output of the primary jaw crusher, output of the Fines stacker, and the output of the second cone crusher (tertiary crush). In addition, a mobile water truck with a water cannon and/or spray bar will be utilised to manage dust emissions on the ROM pad, in and around the plant area and product stockpile areas.

The plant individual components are diesel over hydraulic.

The Project has no tailings or dewatering outputs. Emissions are discussed further in Section 4.

2.4. Diesel and Hydrocarbon Storage

Hydrocarbons and chemicals will as a minimum be located within bunded areas or on drip trays to contain any potential spills and where applicable within ISO containers within an iso bund.

Diesel fuel storage will be within a self-contained, double skinned storage tank. There will be two diesel storage facilities on site, 1 x 110kl diesel storage tank adjacent to the workshop within the Mining Contractors Work Area and 1 x 50kl diesel storage tank located at the existing Exploration Camp for the purpose of diesel power generation at the camp and a backup diesel supply.

Waste oil will be stored in a tank and removed from site for recycling by a licensed collection service. Oil filters and hydrocarbon-contaminated rags will be collected in approved receptacles and removed from site to an appropriate facility.

All chemicals and reagents classed as dangerous goods will be stored in accordance with the requirements of the *Dangerous Goods Safety Act 2004* and the *Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007*. Spill kits will be made available for use to contain hydrocarbon spills.

Hydrocarbon spills associated with the plant will be prevented by regular inspections. In the event of an inadvertent spill or leakage, spill kits and a bobcat/loader will be available to dispose of any material according to a hazardous materials and spills response procedure. Such material will be collected and disposed of to a licensed facility offsite.

2.5. Approval Status

Primary and secondary environmental approvals for the JWD Project have been sought. Relevant legislation and key environmental approvals required are listed below:

Environmental Protection Act 1986, Part V Clearing of Native Vegetation:

- On the 29 September 2010, GWR applied for a clearing permit (purpose permit) under Section 51E of the EP Act for the purpose of mining (CPS 4006/1), for the period 16 April 2011 to 16 April 2016
- CPS 4006/1 approved the clearing of up to 64 ha of native vegetation within the Project Footprint.
- The Clearing Permit was extended to 16 April 2026 under CPS 4006/2 on 14 April 2016.
- An application was lodged in April 2019 to expand the area of clearing permitted.
- On 4 July 2019, the Clearing Permit was extended as CPS 4006/3 to cover clearing of up to 102 ha of vegetation.

Mining Act 1978 (Mining Act)

- A Mining Proposal was submitted for the JWD project (L53/115, L53/146, M53/971, M53/972, M53/1018 and M53/1078) (REG ID 28191) and approved 11 April 2012
- An updated Mining Proposal was submitted to DMIRS on 29 July 2020. The Mining Proposal is currently being reviewed.

Rights in Water and Irrigation Act 1914 (RIWI Act)

- A licence to extract 150,000 kL/yr of groundwater for dust suppression was granted on 25 June 2019 and runs until 24 June 2019 (GWL 202977).

2.6. JWD Proponent

Wiluna Fe Pty Ltd is the occupier (the Licensee) for the land subject to the Works Approval. Attachment 1A includes permission for Wiluna Fe Pty Ltd to undertake work for GWR on the site. Licensee details are:

Wiluna Fe Pty Ltd
PO Box 1385 West Leederville WA 6901
<https://www.felimited.com.au/>
ACN 644 197 446

The Wiluna Fe Pty Ltd Contact for the Works Approval application is:

Jeremy Sinclair, Projects Director
+61 8 6181 9793

Fe Limited is a 100 percent subcompany of Wiluna Fe Pty Ltd.

2.7. Supporting Information and Attachments

Supporting information is provided in the following section of this document as per the attachment titles listed in the *DWER Application form: works approval, licence, renewal, amendment, or registration (v13, April 2020)*. Attachments required for this works approval application and provided in this document are list below:

ATTACHMENT 1

- Attachment 1A: Proof of occupier status
- Attachment 1B: ASIC company extract

ATTACHMENT 2

- Attachment 2: Premises map/s (Figure 1: Premises Map, Figure 2: Regional Overview)

ATTACHMENT 3

- Attachment 3A: Environmental Commissioning Plan

ATTACHMENT 5

- Attachment 5: Emissions and discharge

ATTACHMENT 6

- Attachment 6A: Other approvals and consultation documentation

ATTACHMENT 7

- Attachment 7: Siting and location

ATTACHMENT 8

- Attachment 8A: Targeted Counts of *Sida picklesiana* (P3) within the wider local populations on the Herbert Lukin Range (Wiluna).
- Attachment 8B: Malleefowl Targeted Survey

ATTACHMENT 9

- Attachment 9: Proposed Fee Calculations

2.8. Supporting Studies and Investigations

Baseline investigations that supported the environmental assessment are summarised in Table 3 and include investigations within the proposed JWD footprint and more regionally for the Wiluna West Iron Ore Project. Many of these investigations are discussed and referenced in Attachment 6, Attachment 7, and Attachment 8. All technical reports are available if required.

IBSA numbers are as follows.

Table 3: Summary of studies completed across the JWD Project area

Investigation/Study	Year	Reference
Terrestrial fauna		
A Vertebrate Fauna Survey of the Wiluna West Project Area, Western Australia.	2005	(Ninox Wildlife Consulting 2005)
A Vertebrate Fauna Survey of the Wiluna West Project Area #2, Western Australia.	2006	(Ninox Wildlife Consulting 2006)
A Vertebrate Fauna Survey of the Wiluna West Project Area #3, Western Australia.	2008	(Ninox Wildlife Consulting 2008)
Spring Fauna Assessment - C3, C4 and Bowerbird, Wiluna West Project.	2012	(Keith Lindbeck & Associates 2012)
Golden Monarch Project - Targeted Malleefowl Survey.	2019	(GWR Group Limited 2019)
Invertebrate fauna		
Golden West Resources Short Range Endemic Survey.	2007	(ATA Environmental 2007)
Wiluna West Subterranean Fauna Survey Report #1.	2007	(Subterranean Ecology 2007)
Pseudoscorpions and spiders (Arachnida) from Wiluna West, Western Australia.	2012	(Burger, M. A., Castalanelli, M.A. and Harvey, M. S. 2012)
Wiluna West Scorpion Identification Report	2012	(Volschenk 2012)
Hydrology and Hydrogeology		
Phase one Groundwater Exploration Programme, Railway Line North and Railway Line South – Joyner's Find Project.	2007	(KH Morgan and Associates 2007)
Preliminary Report, Groundwater Exploration Programme Areas C3, C4 and Bowerbird, Wiluna West Project.	2008	(KH Morgan and Associates 2008)
Wiluna West Hydrogeological Review – Water and Environment	2008	(Aquaterra 2008)
Water Analysis Report.	2009	(Bioscience 2009)
Hydrological Study: Wiluna West Iron Ore Project.	2013	(Pennington Scott 2013)
Golden Monarch Deposit – Hydrology and Surface-Water Assessment.	2019	(Rockwater 2019)
Flora and vegetation		
Flora and Vegetation of the Wiluna West Banded Ironstone Formations. Flora and Vegetation of the Wiluna West Banded Ironstone Formations.	2006	(Botanica Consulting 2006)
Wiluna West Targeted Flora Survey, 18-20 November 2009.	2009	(Keith Lindbeck & Associates 2009)
Herbert Lukin Ridge & Surrounds Vegetation Survey	2010	(Recon Environmental 2010)
Targeted Priority Flora survey – C3, C4 and Bowerbird.	2012	(Native Vegetation Solutions 2012)
Targeted Counts of <i>Sida picklesiana</i> (P3) within the Wider Local Populations on the Herbert Lukin Range (Wiluna).	2018	(Native Vegetation Solutions 2018)

Investigation/Study	Year	Reference
Aboriginal Culture and Heritage		
Report on the results of an Archaeological Survey of the Unit B and Unit C, Wiluna, northern Goldfields, Western Australia for Golden West Resources	2006	(Brown, V and Ryan, I 2006)
Report on the results of an Archaeological Survey and Site Recording of the proposed Bowerbird and Joyners Find mine sites and the Bowerbird Haul Road, Eastern Goldfields, Western Australia.	2006	(Harrison, R, Brown, V. and Morse, K. 2006)
Management Plans and Procedures (based on above investigations)		
John William Douth Open Pit Environmental Management Plan – Operation Phase		(Keith Lindbeck and Associates 2010)
Relevant IBSA Numbers		
IBSA-2020-0167		
IBSA-2020-0160		
IBSA-2020-0159		
IBSA-2020-0169		
IBSA-2020-0170		
IBSA-2020-0165		
IBSA-2020-0168		
IBSA-2020-0164		
IBSA-2020-0166		

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- Native Vegetation Solutions (2018) Targeted Counts of *Sida picklesiana* (P3) within the Wider Local Populations on the Herbert Lukin Range (Wiluna).
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Attachment 1A: Proof of Occupier Status

27/11/2020

Attention: Chief Executive Officer

Department of Water and Environmental Regulation

Locked Bag 10

Joondalup DC WA 6919

RE: Occupier of the JWD project via Iron Ore Rights Agreement

This letter confirms that Wiluna Fe Pty Ltd is the occupier of the JWD project with regards to the Works Approval and subsequent licensing submitted to the Department of Water and Environmental Regulation pursuant to Environmental Protection Act 1986 (WA).

For those tenements marked in the table below these are iron ore right tenements required for the JWD Project. By way of an assignment of iron ore rights dated 14 September 2020 between GWR and Wiluna Fe Pty Ltd (Iron Ore Rights Agreement), Wiluna Fe Pty Ltd was appointed manager of the JWD Project to develop the JWD project and has authority to apply for and carry out the Works Approval and subsequent licencing in relation to these tenements.

Tenement	Registered Holder	Wiluna Fe Pty Ltd (1)
M53/1078	GWR GROUP LIMITED	Yes
M53/971	GWR GROUP LIMITED	Yes
M53/1018	GWR GROUP LIMITED	Yes
L53/146	GWR GROUP LIMITED	Yes
L53/115	GWR GROUP LIMITED	Yes
M53/972	GWR GROUP LIMITED	Yes

Note 1 - Authorised for Works approval and licence

Please contact me if you require further information.



Yours sincerely

Adrian Costello

General Manager - GWR GROUP LIMITED

MINING TENEMENT DETAILS REPORT

DISCLAIMER: This is not the official Register referred to in Reg. 84C of the Mining Regulations 1981.

MINING LEASE 53/1078

Tenement Summary

Identifier : M 53/1078-I	District : WILUNA
Current Area : 745.65000 HA	Status : Live
Mark Out : 28/01/2006 09:30:59	Received : 02/02/2006 08:30:00
Term Granted : 21 Years	Lodging Office : MEEKATHARRA
Commence : 01/02/2007	Expiry : 31/01/2028
Purpose :	Death :

OWNERSHIP DETAILS

Current Holders

Name and Address	Shares
GWR GROUP LIMITED PO BOX 517, WEST PERTH, WA, 6872	80
JINDALEE RESOURCES LIMITED AUSTWIDE MINING TITLE MANAGEMENT PTY LTD, C/- AUSTWIDE MINING TITLE MANAGEMENT PTY LTD, PO BOX 1434, WANGARA, WA, 6947, xxxxxxxx@austwidemining.com.au, xxxxxxxx400	20
Total Shares:	100

Holder Changes

Dealing	Status Date	From (Shares)	To (Shares)
Transfer 293391	Registered 18/06/2008 14:10:00	JINDALEE RESOURCES LIMITED (100)	GOLDEN WEST RESOURCES LTD (60)
Transfer 300931	Registered 02/10/2008 13:05:00	JINDALEE RESOURCES LIMITED (40)	GOLDEN WEST RESOURCES LTD (20)
A to A (Name) 437153	Recorded 12/12/2013 13:50:00	GOLDEN WEST RESOURCES LTD (80)	GWR GROUP LIMITED (80)

Applicants on Receival

Name and Address	Shares
JINDALEE RESOURCES LIMITED C/- HETHERINGTON EXPLORATION & MINING TITLE SERVICES PTY LTD, PO BOX 8249 PERTH BUSINESS CENTRE, PERTH, WA, 6849	100
Total Shares:	100

DESCRIPTION DETAILS

Description

Block Type :	Effective From :
Locality : JOYNERS FIND	

MINING TENEMENT DETAILS REPORT

DISCLAIMER: This is not the official Register referred to in Reg. 84C of the Mining Regulations 1981.

MISCELLANEOUS LICENCE 53/146

Tenement Summary

Identifier : L 53/146	District : WILUNA
Current Area : 51.80000 HA	Status : Live
Mark Out : 08/07/2005 15:05:00	Received : 14/07/2005 08:30:00
Term Granted : 21 Years	Lodging Office : MEEKATHARRA
Commence : 10/08/2006	Expiry : 09/08/2027
Purpose : Road Pipeline	Death :

OWNERSHIP DETAILS

Current Holders

Name and Address	Shares
GWR GROUP LIMITED PO BOX 517, WEST PERTH, WA, 6872	100
Total Shares:	100

Holder Changes

Dealing	Status Date	From (Shares)	To (Shares)
A to A (Name) 437153	Recorded 12/12/2013 13:50:00	GOLDEN WEST RESOURCES LTD (100)	GWR GROUP LIMITED (100)

Applicants on Receival

Name and Address	Shares
GOLDEN WEST RESOURCES LTD PO BOX 260, OSBORNE PARK, WA, 6917	100
Total Shares:	100

DESCRIPTION DETAILS

Description

Block Type :	Effective From :
Locality : JOYNERS FIND	
Datum : Datum situated at GDA94 Zone 50 7032770N 793500E	
Boundary :	
Thence 7032770N 793710E	
Thence 7032850N 794310E	
Thence 7032510N 794770E	
Thence 7031990N 795990E	
Thence 7031990N 796090E	
Thence 7031790N 796090E	
Thence 7031790N 795990E	
Thence 7032310N 794770E	
Thence 7032650N 794310E	
Thence 7032570N 793710E	

Attachment 1B: ASIC
Company Extract



ASIC

Australian Securities & Investments Commission

27 November 2020

PO Box 4000
Gippsland Mail Centre VIC 3841
DX 84416 Traralgon

CATHERINE JULIE GRANT-EDWARDS
UNIT 3
32 HARROGATE STREET
WEST LEEDERVILLE WA 6007

Dear Sir/Madam,

Company Statement

FOR WILUNA FE PTY LTD
ACN 644 197 446

As requested, enclosed is a statement showing the details of your company as recorded by ASIC.

You can notify ASIC of changes online at www.asic.gov.au/changes.

Yours faithfully,

Rosanne Bell
Senior Executive Leader
Registry

For more help or information

Web www.asic.gov.au
Ask a question? www.asic.gov.au/question
Telephone 1300 300 630

Inquire 1300 300 630

Issue date 27 Nov 20

Company Statement

ACN 644 197 446
FOR WILUNA FE PTY LTD

**NEXT REVIEW DATE: 09 September
21**

Company Statement

1 Registered office
UNIT 3 32 HARROGATE STREET WEST LEEDERVILLE WA 6007

2 Principal place of business
UNIT 3 32 HARROGATE STREET WEST LEEDERVILLE WA 6007

3 Ultimate holding company
FE LIMITED
ACN 112 731 638

4 Officeholders

Name: ANTONY WILLIAM PAUL SAGE
Born: GLOUCESTER UNITED KINGDOM
Date of birth: 26/06/1960
Address: 14 BANOOL CRESCENT CITY BEACH WA 6015
Office(s) held: DIRECTOR, APPOINTED 25/11/2020

Name: MARK DAVID HANCOCK
Born: PERTH WA
Date of birth: 17/12/1968
Address: 21 ALVER ROAD DOUBLEVIEW WA 6018
Office(s) held: DIRECTOR, APPOINTED 09/09/2020

Name: CATHERINE JULIE GRANT-EDWARDS
Born: PERTH WA
Date of birth: 25/05/1981
Address: 52 HAMPSHIRE STREET EAST VICTORIA PARK WA 6101
Office(s) held: SECRETARY, APPOINTED 09/09/2020

5 Company share structure

Share class	Shares description	Number issued	Total amount paid on these shares	Total amount unpaid on these shares
ORD	ORDINARY	100	\$1.00	\$0.00

These details continue on the next page

Company statement continued

6 Members

Name: FE LIMITED ACN 112 731 638

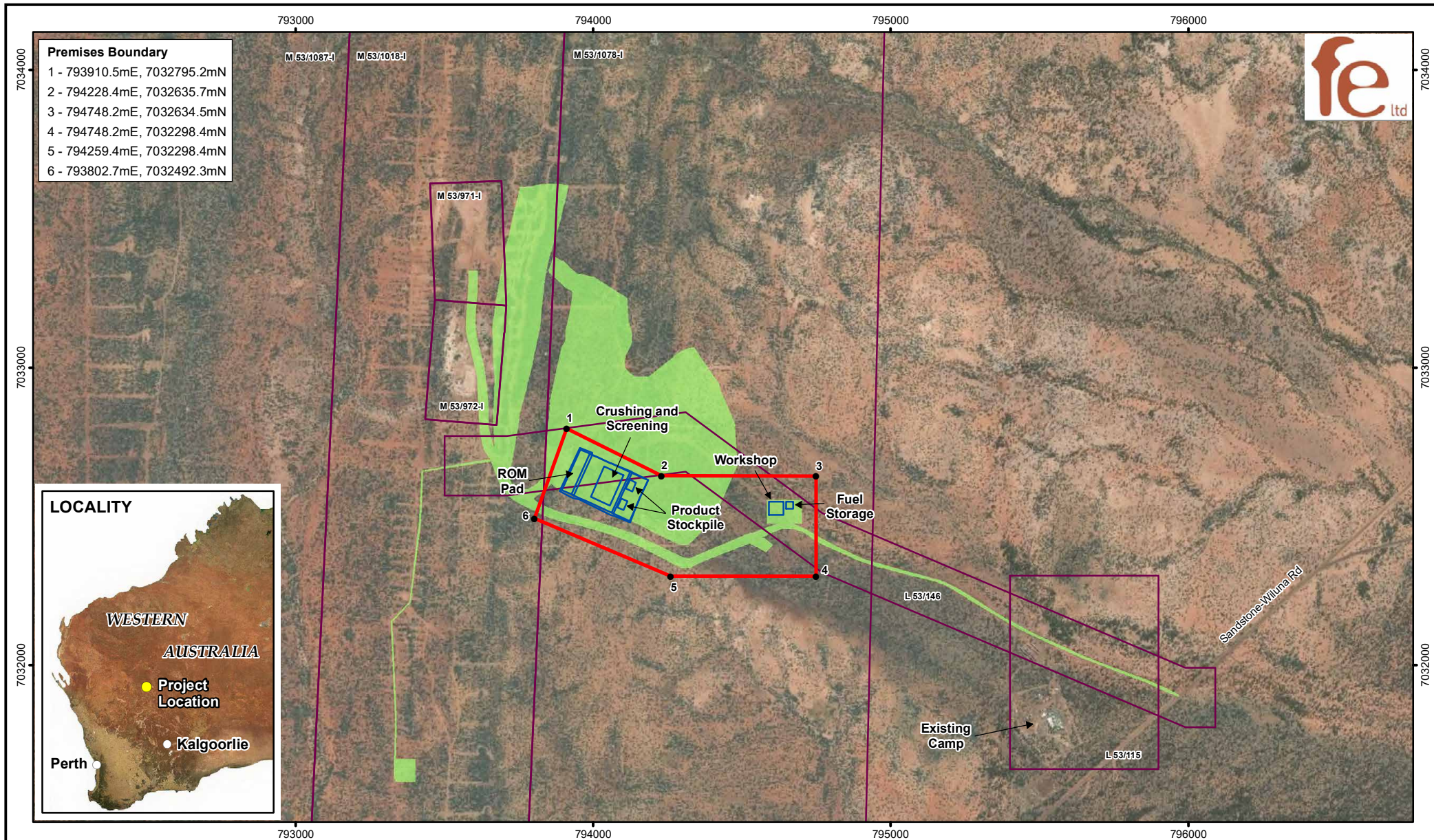
Address: UNIT 3 32 HARROGATE STREET WEST LEEDERVILLE WA 6007

Share Class	Total number held	Fully paid	Beneficially held
ORD	100	Yes	Yes

End of company statement

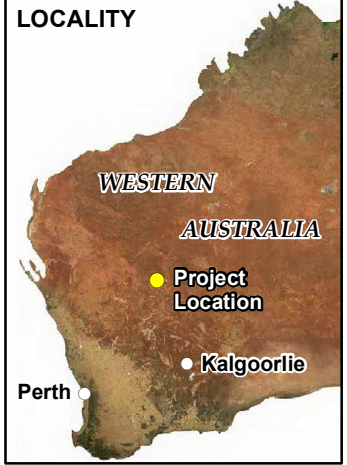
This concludes the information to which the company must respond (if incorrect) under s346C of the *Corporations Act 2001*.

Attachment 2: Premises Maps



Premises Boundary

- 1 - 793910.5mE, 7032795.2mN
- 2 - 794228.4mE, 7032635.7mN
- 3 - 794748.2mE, 7032634.5mN
- 4 - 794748.2mE, 7032298.4mN
- 5 - 794259.4mE, 7032298.4mN
- 6 - 793802.7mE, 7032492.3mN



- Legend**
- Premises Boundary
 - Proposed Infrastructure
 - Tenements
 - Approved Infrastructure



0 200 400m

Scale: 1:17,500
MGA94 (Zone 50)

CAD Ref: a2797_F001

Date: December 2020 Rev: A A4



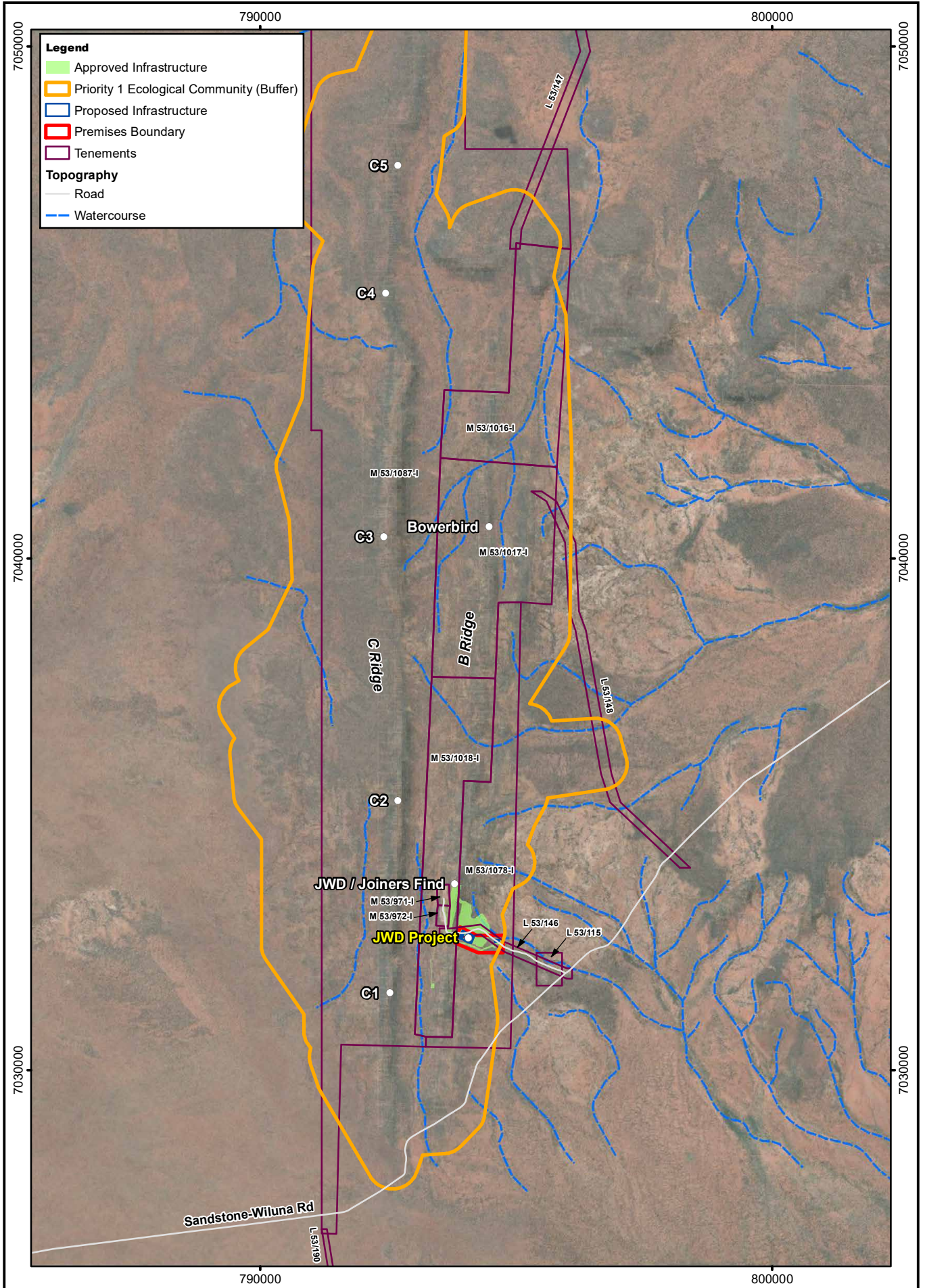
Author: M. Dunlop

Drawn: CAD Resources ~ www.cadresources.com.au

Tel: (08) 9246 3242 ~ Fax (08) 9246 3202

Figure 1
Premises map

Imagery: ESRI, Maxar (Feb 2019)



Imagery: ESRI, Maxar (Feb 2019)

N

0 0.75 1.5 km

Scale: 1:100,000
MGA94 (Zone 50)

CAD Ref: a2797_F004
Date: December 2020

Rev: A | A4

Rapallo

Author: M. Dunlop

Drawn: CAD Resources ~ www.cadresources.com.au
Tel: (08) 9246 3242 ~ Fax (08) 9246 3202

Figure 2
Regional Overview
JWD Project and Wiluna West Project

Attachment 3A: Environmental Commissioning Plan

1. Background

A mobile crushing and screening plant is proposed to process the 3.0 Million tonnes (Mt) of iron ore mined over stages 1 to 3 of the Project via conventional drill and blast and load and haul mining practises. The crushing and screening plant will be located adjacent to the run-of-mine (ROM) within the limits of the approved waste dump. The plant will provide primary, secondary and tertiary crushing and screening to produce a Lump (31.5 – 6.3 mm) and a Fines (<6.3 mm) product.

The mobilisation and placement of the crushing and screening facility is currently planned for February 2021, following which validation and commissioning will be undertaken in accordance with plant supplier specifications in late February 2021, ahead of operational commencement in March 2021.

2. Commissioning Process

Post mobilisation, placement, and connection of the plant modules, a commissioning process will be followed:

The commissioning process for the mobile crushing plant will have the following phases:

- First stage involves progressively testing and commissioning all elements of the system
- The second stage involves dry commissioning where the plant components are run up without material flowing through the plant. During dry commissioning, in addition to each module be tested for functionality, etc. dust suppression sprays will also be tested for functionality.
- The final stage of commissioning will see the introduction of ore to the circuit, starting at a low feed rate and gradually increased. As the rate is increased, adjustments will be made to fine tune the plant with respect to productivity, spillage, dust generation and generally developing an ‘on the ground’ understanding of the material processing characteristics for the specific plant.

Ore commissioning of each component will not begin until pre-commissioning and dry commissioning tests have been passed (Table 4). During ore commissioning, material feeds to the processing plant will be gradually increased until they reach the steady-state design volumes.

Table 4: Crushing plant design and commissioning requirements

Infrastructure	Requirements
Design and Construction	
Crushing/Screening Plant	First stage – All Elements Second stage - Dry commissioning Third stage - Fine Tuning
Commissioning Operations Management Measures	
Crushing/Screening Plant	Water will be added to the process to achieve 3-6% moisture Dust suppression sprinklers and sprays will be installed at the ROM feed hopper and transfer points to control levels of fugitive dust and will be operational.

Infrastructure	Requirements
	Water trucks will be available and used around the plant and on the ROM and roads as required to minimise fugitive dust emissions.
Product stockpile	Dust suppression sprinkler and sprays to control levels of fugitive dust. Maximum moisture levels of the final product will be controlled to maintain operational efficiency from road haulage vehicles and adjusted for seasonal conditions

Commissioning will be completed within 2 weeks of mobilising the crushing and screening plant to site. Once pre and dry commissioning are complete and all required documentation has been provided to Wiluna Fe, the Project will be considered to have reached practical completion.

Ore commissioning will be complete when:

- All loops have been tuned and the plant can run in a stable and reliable manner
- Bunds are clean and there is no ongoing spillage that requires constant attention.
- No excessive dust generation observed from the crushing/screening plant.

The facility will be handed over the Wiluna Fe operations team following successful ore commissioning. Once the process is stabilised, throughput will be progressively increased until nameplate capacity is achieved, and product quality requirements are met.

3. Expected Emissions and Discharges

3.1. Expected Emissions to Air

Commissioning has the potential to impact on air quality through the generation of particulates and greenhouse gas emissions via:

- Land clearing, vegetation and topsoil removal
- Construction and earthwork activities
- Wind erosion from the ROM pad, ore and topsoil stockpiles
- Ore crushing and material transfer during ore processing
- Material handling and transport activities
- Vehicle movements on unsealed roads
- Engine exhausts from construction equipment, mining equipment and light vehicle
- The use of diesel fuel for power generation
- Transport of materials and equipment to the JWD Project and removal of packaging wastes.

Given the reasonably remote location of the Project from sensitive receptors except priority flora (Attachment 7- Figure 5) the proposed mitigation and management measures are sufficient to achieve a low risk of significant impact to air quality.

3.2. Expected Noise Emissions

Potential sources of noise emissions during commissioning may include:

- Construction and earthworks activities
- Operational activities including heavy vehicles, generators, conveyors and ore processing equipment
- Emissions during operations and maintenance activities
- Warning alarms on the crusher and reversing sirens on mobile machinery and equipment.
- Transport of equipment and supplies to and from the project area.

Given the reasonably remote location of the project, the proposed mitigation and management measures are sufficient to achieve a low risk of significant impact due to noise emissions.

3.3. Expected Discharges to Land and Water

Sources of discharge to land and surface water during commissioning may potentially originate from:

- Deposition of windblown ore to land.
- Hydrocarbon spills or leaks from vehicle and equipment use or maintenance activities.
- Spillage, leakage and seepage of hydrocarbons and chemicals used and stored onsite.

Management measures to mitigate any potential impacts to land and surface water are discussed in Section 4.3.

3.4. Expected Discharges to Groundwater

Sources of discharge to groundwater during commissioning may potentially originate from:

- Hydrocarbon spills or leaks from vehicle and equipment use or maintenance activities.
- Spillage, leakage and seepage of hydrocarbons and chemicals used and stored onsite.

Management measures to prevent impacts to groundwater are discussed in Section 4.3.

4. MANAGEMENT OF EMISSIONS AND DISCHARGES

4.1. Emissions to Air

Project design has considered exposure to particulates, greenhouse gas emissions and odour emissions in order to minimise adverse impacts. Wiluna Fe will implement control measures during commissioning of the project to ensure compliance with occupational health and environmental standards. The following management measures will be implemented during the commissioning phases of the Project:

- Dust will be visually monitored on a daily basis when the plant is operational.
- Dust will be managed by watering unsealed roads with a water cart and with fixed sprays during construction and operations.
- Sprays will be fitted to the tipping area of the crusher to ensure ore remains moist during tipping and crushing activities.
- A dust collector will be installed and operated on the crusher discharge conveyor.

4.2. Noise Emissions

Project design has considered exposure to noise in order to minimise adverse impacts. The following management measures will be implemented during the commissioning phases of the project:

- All plant equipment will be maintained to ensure they are operating efficiently and are not unduly noisy.
- Noise limits will be in accordance with the *Environmental Protection (Noise) Regulations 1997*.

4.3. Discharges to Land and Water

The following measures will be implemented to manage potential discharges to land and surface water during commissioning:

- Hydrocarbon wastes will be segregated from other wastes and collected for offsite disposal by a licensed contractor
- Hydrocarbon-contaminated wastes (e.g. oil filters, rags, containers) will be kept in demarcated, dedicated containers for offsite disposal by a licensed contractor.
- All hydrocarbons and chemicals will be located within bunded areas or on drip trays to contain any potential spills. Bulk fuel storage will be within a self-contained, double-skinned storage tank. Storage areas will be bunded with a containment capacity equivalent to 110% of the capacity of any tank or 25% of the total capacity of an interlinked system.
- Hydrocarbons and chemicals will as a minimum be located within bunded areas or on drip trays to contain any potential spills and where applicable within ISO containers within an iso bund.
- Waste oil will be stored in a tank and removed from site for recycling by a licensed collection service. Oil filters and hydrocarbon-contaminated rags will be collected in approved receptacles and removed from site to an appropriate facility.
- Regular inspection of bunded areas to ensure capacity is maintained.
- Washdown effluents will report to oil/water interceptor/separator for separation prior to reuse or discharge.
- Spillages will be cleaned up and disposed of as per appropriate SDS, relevant environmental and safety guidelines and the site's environmental procedure.
- All chemical and reagents classed as dangerous goods will be stored in accordance with the requirements of the *Dangerous Goods Safety Act 2004* and the *Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007*. Spill kits will be made available for use to contain hydrocarbon spills. Any release which is likely to cause pollution or environmental harm will be reported to the DWER in accordance with Section 72 of the *Environmental Protection Act 1986*.

4.4. Discharges to Groundwater

The following measures will be implemented to manage potential discharges to land and surface water during commissioning:

- Hydrocarbon wastes will be segregated from other wastes and collected for offsite disposal by a licensed contractor
- Hydrocarbon-contaminated wastes (e.g. oil filters, rags, containers) will be kept in demarcated, dedicated containers for offsite disposal by a licensed contractor.
- Spills and leaks will be contained and managed promptly where these occur.

4.5. Environmental Targets and Limits

Wiluna Fe will target the minimal generation of dust and developed a target for commissioning and time limited operations (Table 5).

Table 5: Commissioning limits/targets

Infrastructure	Commissioning/Time limited operations Targets
Crushing/screening plant	Target - No excessive dust generation observed from the crushing/screening plant
	Target - No release of stormwater captured in the plant area to the surrounding vegetation.

4.6. Contingencies

If excessive dust generation or release of stormwater outside of the plant area (i.e. to surrounding vegetation) is observed in the crushing/screening plant, the source will be investigated, and remedial actions implemented as required.

5. MONITORING

A monitoring plan for the commissioning phase of the JWD is provided in Table 6

Photographic records will be taken during all stages of construction to show evidence of compliance.

Table 6: Commissioning Monitoring Plan

Aspect	Frequency / Format
Crushing/Screening Plant	
Ore input volumes	Daily record
Discharge waste rock volume	Daily record

6. MANAGEMENT OF ACCIDENTS AND MALFUNCTIONS

Contingencies for the commissioning phase of the Crushing Plant are summarised in Table 7. Wiluna Fe will maintain a register of exceptions, incidents and corrective actions during commissioning.

Table 7: Contingency Plan

Infrastructure	Contingency	Action
Crushing/Screening Plant	Spill or leak of mine water or product.	Shut down, identify fault and repair.
	Spill or leak of mill lubricants	Shut down, recover spill, identify fault and repair. Dispose of contaminated absorbents.
	Dust suppression or collection systems not working properly	Identify fault and repair.
	Excessive ore dust from stockpiling or crushing	Shut down crusher and identify cause
	Plant noise exceeds workplace standards outside of designated hearing protection zones	Investigate cause and remedy.

7. REPORTING

Written advice will be provided to DWER for the following:

- Commencement of commissioning (seven days prior to start).
- Suspension of commissioning (seven days after suspension).
- Completion of commissioning (seven days after completion).

As per the DWER Industry Licensing Guidelines (Department of Water and Environmental Regulation 2019), Wiluna Fe will provide the following reports to DWER after construction is complete:

- Environmental Commissioning Report.

Upon completion of commissioning activities, a Commissioning Report will be submitted to the DWER as soon as possible after completion of the commissioning program (in accordance with the Works Approval conditions – when issued).

All incidents will be recorded and investigated under an internal incident reporting system in place at the Project. Reporting of incidents other than minor incidents shall follow the requirements set out in s72 of the *Environmental Protection Act 1986*.

8. RESPONSIBILITIES

Commissioning plan responsibilities are outlined in Table 8.

Table 8: Commissioning plan responsibilities

Role	Responsibility
Registered Manager	<p>Accountable for ensuring the requirements of the plan are met and that adequate resources are made available to implement the plan.</p> <p>Implement this Plan and ensure that all photographic records, information, monitoring and studies required for the Environmental Commissioning Report are collected to allow for submission to DWER upon completion of construction.</p>
Environmental Advisor (or delegate)	<p>Work with the above personnel to ensure the data is being collected and Environmental Commissioning Reports are being compiled.</p> <p>Compile and review Environmental Commissioning Report against this plan and Works Approval Conditions</p> <p>Submit to DWER</p>
Project Director	<p>Overall oversight of implementation of the Environmental Commissioning Plan by Project personnel and contractors.</p>
All personnel, contractors, and visitors	<p>Participate in awareness training prior to commencing duties</p>

Attachment 5A. Other Approvals

Table 9: List of other Approvals for the JWD Project

Requirement	Regulator	Approval Reference	Approval Date
Mining Act 1978	Department of Mines, Industry Relation and Safety	REGISTRATION ID: 28191 John William Douth Open Pit	11/04/2012
Environmental Protection Act 1986	Department of Mines, Industry Relation and Safety	CLEARING PERMIT 4006/3 John William Douth Open Pit	04/07/2019
Rights in Water and Irrigation Act 1914	Department of Water and Environmental Regulation	GROUNDWATER LICENCE GWL 202977	24/06/2019
Mining Act 1978 and Mining	Department of Mines, Industry Relation and Safety	GWR has an approved Mining Proposal -Mine Closure Plan (Reg ID 55179) for larger scale development at C4, Bowerbird and C3 deposits incorporating JWD.	29/07/2020
Mines Safety & Inspection Act 1994	Department of Mines, Industry Relation and Safety	A Project Management Plan will be submitted to the DMIRS in accordance with this Act and Regulations. All operations will occur in accordance with the Act and Regulations.	

Attachment 5B. Consultation Documentation

Table 10: Stakeholder Engagement Register

Date	Stakeholder*	Description of Consultation	Stakeholder comments/issues	Proponent response and/or resolution
14/02/06	DEC Dr Neil Gibson GWR representatives	Site Visit	Site visit to show DEC the Wiluna West site.	As a result of this site meeting, a quadrat-based sampling methodology was obtained by Jim's Seeds, Weeds and Trees from Dr. Gibson.
23/05/07	DEC GWR representatives	Project briefing in Kalgoorlie	Overview of the Project provided.	N/A
6/11/08	DEC David Pickles Sandra Thomas GWR representative	Project briefing	Briefing outlined the results of the biophysical surveys undertaken to date at the Project. DEC raised concern over adequacy of 2006 SRE survey (based on timing of survey). Further work suggested.	Subsequent survey work has been undertaken by GWR.
April and August 2010	DEC Western Australian Herbarium GWR representatives	Meeting	Consultation with the DEC regarding the flora species <i>Sida picklesiana</i> (formerly <i>Sida</i> sp. Wiluna). The species was first recorded by the DEC in the 2006 quadrat survey and later given a Priority 1 rating. Discussions were undertaken with the Curator and staff of the WA Herbarium regarding two undetermined specimens showing superficial similarities to this species (considered a new taxon at this time).	Further survey work undertaken by KLA (in conjunction with the WA Herbarium) which recorded additional populations of the species extending up to 200km from the GWR Project (This species has subsequently been downgraded to a Priority 3 species).
2010	Central Desert Land Council Representing Tarlpa NTC	Correspondence	Provide copy of Mining proposal with conceptual MCP.	No concerns or issues.
2010	Wiluna Shire council members GWR representatives	Meeting	Presentation on the Wiluna West project and JWD.	No concerns or issues.
Ongoing from 2010	Tarlpa Native Title Claimants	Triennial Meetings	Regular briefings with the NT relationship committee.	No concerns or issues.
Ongoing from 2010	Lupton family (Lake Way Pastoralist sub-leasee)	Informal discussions about project	Periodical Informal discussion giving updates on projects.	No concerns or issues.
2010	DMP Janine Cameron	Meeting	Provided overview of JWD Project before submission.	Comments provided and acted on.
27/01/12 & 30/01/12	DMP Ryan Mincham GWR representatives	Consultation	Advice from the NVB, DMP (Ryan Mincham) sought regarding the requirement for an Autumn fauna survey.	

Date	Stakeholder*	Description of Consultation	Stakeholder comments/issues	Proponent response and/or resolution
20/02/12	EPA Dr Paul Vogel Mr Mark Jefferies GWR Craig Ferrier Mick Wilson Paul Leidich KLA Keith Lindbeck	Meeting - GWR met with the OEPA to discuss the Wiluna West Project	The Chairman and Mark Jefferies raised the following points: 1. Metalliferous drainage at neutral pH – looking at AMD was correct but must include neutral drainage for such elements as selenium, etc. 2. Ensure that the studies investigate the cumulative impacts and compare to the regional environment. 3. Contact DEC to ensure they are happy with the lack of autumn fauna surveys (as with the DMP). 4. Contact DEC to obtain comment on the impact of the project on the PEC. 5. Contact DoW to discuss availability of groundwater for the project and potential impact on other users. 6. Discuss clearing permit requirements with DMP 7. Discuss implications of export through the Port of Esperance with the DoT.	All agencies were met with and issues addressed in the subsequent submissions.
21/02/12 and 9/03/12	DEC • David Pickles • Sandra Thomas	Correspondence (letter and email)	Correspondence with David Pickles (letter), DEC seeking advice on the requirement for autumn fauna survey at the project (as three Spring fauna surveys have been undertaken previously). Email correspondence received from Sandra Thomas, EMB, DEC advising that: “Based on the available information, an Autumn fauna survey does not appear to be required.”	
20/06/12	DoW • Yolanda Brookes • Chris O’Boy • James MacIntosh • Tina Taraborrelli GWR representatives	Meeting	GWR presented a summary of the Project, hydrogeological investigations and the proposed water supply and dewatering strategy. The strategy for water licensing was presented. The DoW was supportive of the proposed approach noting that all key DoW requirements had been addressed.	N/A
28/08/12	DEC • Sandra Thomas • Val English • Julie Futter • Daniel Coffey GWR representatives • Craig Ferrier • Mick Wilson KLA Keith Lindbeck	Meeting	GWR provided an update on the Project and advice sought from the DEC on the impact of the Project on the Wiluna West PEC. DEC outlined the information they require (vegetation and flora data) to enable them to make their assessment on the impact of the Project.	GWR provided the required information to the DEC.
20/02/13 21/02/13 10/04/13 10/07/13	Mid-West Road Safety Committee Mt Magnet Shire Meekatharra Shire Cue Shire Menzies Shire Yalgoo Shire	Meeting	JWD Project and proposed road transport objectives.	Ongoing discussions.

Date	Stakeholder*	Description of Consultation	Stakeholder comments/issues	Proponent response and/or resolution
26/02/14				
9/04/13 31/10/13 28/11/13 29/01/14 6/02/14 19/02/14 7/03/14	Sandstone Shire MRD GWR representatives	Meeting	JWD Project and proposed road transport objectives.	Ongoing Discussions.
21/11/13 27/11/13 28/01/14 5/02/14 18/02/14	Wiluna Shire GWR representatives	Meeting	Presentation of project and discussions on road transport.	Comments provided and acted on.
18/02/14	Sandstone Shire GWR representatives	Public meeting	JWD Project and proposed transport objectives.	Comments provided and acted on.
2014	Central Desert Land Council	Correspondence	Provide copy of Mining MCP for any feedback.	No concerns or issues.
6/03/14	Native Title Claimants	Annual General Meeting	Annual Function for all claimants.	No concerns or issues.
7/04/14	Pastoralist Jim Quadrio Alan Bloor GWR representatives	Exploration Activities	Exploration objectives.	Consent to program.
September 2014	Toro Energy (Pastoralist owner for Lake Way Station)	Correspondence	Provided synopsis of Mine Closure Plan.	No concerns or issues.
2015	Central Desert Land Council	Meeting	Presented WWIOP Mining Proposal for review.	No concerns or issues.
2018 and 2019	Wiluna Shire • Councillors • CEO	Ongoing meetings and discussions	Status of Golden Monarch project and use of Shire Roads	Ongoing discussions and no issues

Date	Stakeholder*	Description of Consultation	Stakeholder comments/issues	Proponent response and/or resolution
	• Executive Manager Technical			
5/07/18	Wiluna Native Title holders	TMPAC Board Meeting	Provided project update, which specifically included the proposed open pit at Golden Monarch	No concerns or issues
8/08/18 27/08/18	DMIRS Ryan Mincham	Phone call/Email	Advice sought regarding definition of 'Fauna specialist' as stated in CPS 4006/2 as GWR has and intends to utilise the Aboriginal Martu women to undertake targeted Malleefowl assessments at the Project. Ryan spoke to Lesley Polomka about this scenario and they both agreed that the Aboriginal Martu women would be suitably qualified to undertake this work. Ryan has provided some further advice in relation to the process for seeking approval as per the conditions on CPS 4006/2.	GWR submitted a letter requesting approval for the Aboriginal Martu women to complete the survey (former and future) with the CPS 4006/3 application.
19/08/2018	Wiluna Native Title holders	Survey	Ethnographic survey over proposed C4 Haul road	Compliant with Cultural Heritage Management Plan
January 2019	Bill (Manager) for Lupton family	Informal Meeting	Advised that we were seeking to commence mining at Golden Monarch	No concerns or issues
27/02/19	Wiluna Native Title holders	Wiluna Native Title holders	Provided project update, which specifically included the proposed open pit at Golden Monarch	No concerns or issues
25/03/19	DBCA David Pickles	Phone call	CLA contacted David to advise him of GWR's intention to start mining at Golden Monarch, update on recent Sida survey findings and to seek advice on the source of Boodie record (Bettongia. lesueur.graii) which shows in the DBCA threatened fauna search at Wiluna West.	Confirmed source of record and advised that DBCA is only aware of their occurrence at Matuwa (>200km north) where they were re-introduced. David advised he is relocating to the Karratha DBCA office within the next fortnight.
10/4/19 – 12/4/19	Wiluna Native Title holders	Survey	Heritage survey over portion of proposed Golden Monarch footprint and Eagle – Emu deposits	Compliant with Cultural Heritage Management Plan
6/05/19	Toro Energy (owner of Lake Way Station) Greg Shirliff	Email	Advised that we were intending to commence mining at Golden Monarch and wished to convene meeting.	Acknowledged receipt and awaiting response
22/05/19	Wiluna Shire President CEO GWR representatives	Meeting	Meeting, advised of Wiluna West project status and intention to commence mining at Golden Monarch	No issues raised.
27/06/19	DMIRS Maree Doyle Rob Irwin GWR Mick Wilson	Email correspondence and Meeting	DMIRS requested further information in relation to the Golden Monarch MP (Reg ID 80069) including: Interaction between Golden Monarch and JWD pits Design of Golden Monarch WRD if JWD does not proceed and confirmation of waste characteristics Clarification of areas where existing disturbance>approved disturbance. GWR arranged a meeting to discuss these items.	GWR clarified that the waste from the two deposits is similar. GWR committed to complete a detailed Golden Monarch WRD design and requested a further meeting to confirm the suitability of the design. Clarification of disturbance areas will be provided to DMIRS.

Date	Stakeholder*	Description of Consultation	Stakeholder comments/issues	Proponent response and/or resolution
9/07/19	DMIRS Maree Doyle Rob Irwin GWR Mick Wilson	Meeting	GWR presented the design of the Golden Monarch WRD to DMIRS. DMIRS provided advice in relation to back sloping the top surface of the WRD and other suggestions for inclusion in the MCP. The differences in existing and approved 'disturbance' were briefly discussed and DMIRS requested an outline of events relating to this to assess.	Golden Monarch MP and Mine Closure Plan will be updated with this design information and resubmitted. GWR will provide an outline of the disturbance on L53/115 (under separate cover) for DMIRS review.
19/08/19	Wiluna Native Title holders	Survey	Ethnographic survey over proposed C4 Haul road	Compliant with Cultural Heritage Management Plan
6/09/19	Wiluna Shire Councillors Wiluna Executives General public GWR representatives	Council Meeting	Presented update on Wiluna West project including intention to start mining at Golden Monarch	No Issues
12-16 September 2019	Wiluna Native Title holders	Survey	Archaeological survey over C4 deposit and haul road C4, C3, Bowerbird, Eagle, Emu and Golden Monarch	Compliant with Cultural Heritage Management Plan
November 2019 to May 2020	Engagement with Wiluna Shire management, CEO, Works Manager and Shire President	Meetings, email and formal agreement	Establishment and finalising a Road Access Agreement	Finalised May 2020
14/11/19	DMIRS – Maree Doyle CLA – Belinda Clark	Phone	DMIRS queried timing of submission of Eagle and Emu MP as DMIRS are advising proponents that MP's produced in accordance with DMP (2006) guidelines will only be accepted until February 2020.	Submission delayed – this MP drafted in accordance with DMIRS (2020) guidance.

Date	Stakeholder*	Description of Consultation	Stakeholder comments/issues	Proponent response and/or resolution
20/11/19	DMIRS Maree Doyle Richard Smetana GWR Mick Wilson Adrian Costello CLA Keith Lindbeck Belinda Clark	Meeting	Meeting held for GWR to provide overview of Eagle-Emu deposits and ascertain the most efficient approval pathway for clearing permit (and MP). DMIRS advised that Jan De Lange is the most appropriate contact for geotechnical advice.	DMIRS advice was incorporated into the MP.
10/12/19	DMIRS Maree Doyle	Email	Email request for clarification regarding inclusion of Bowerbird infrastructure in the Eagle- Emu MP. DMIRS preliminary advice is that "inclusion of the Bowerbird infrastructure in the MP would provide greater flexibility with land use (given the overlaps) or shifts in location/construction of proposed infrastructure (provided the alterations do not trigger the need for re-submission of an MP) once development commences, mine closure planning, compliance and reporting purposes".	GWR have considered this advice in preparation of this MP. As there are no immediate plans to develop Bowerbird pit, it has been left out of this MP.
25/02/2020	Youno Downs Station Marilyn Bernhardt	Phone	Project update	Very supportive
25/02/2020	Toro Energy (owner of Lake Way Station) Greg Shirliff	Email	Request to catch up regarding project status	No response
12/03/2020	Wiluna Shire DCEO EA GWR Mick Wilson	Meeting	Provided update on Wiluna West project including JWD, Golden Monarch, Eagle, Emu and C4	No issues
27/03/2020	Youno Downs Station Colin Bernhardt	Site Visit	Site visit Golden Monarch, Eagle, Emu, C4 and C4 haul road	Highly supportive
April 2020	DMIRS Maree Doyle	Phone	DMIRS contacted to advise of the two MP's currently being prepared for submission at the Project: 1/ Eagle-Emu – DMIRS advised this submission has been delayed 2/ proposed 18.6 km haul road from the C4 deposit - DMIRS advised that a smaller scale operation at C4 is now considered viable and the proposed haul road will enable transport of iron ore to either the Geraldton or Esperance Port. DMIRS queried if the haul road was <10 ha disturbance (i.e. to use small-scale MP). CLA advised that these MP's would be submitted around the same time, with C4 haul road MP expected to be submitted first. Advice was sought on the best strategy for submitting an MCP to support the MP's given the MP/MCP's would be assessed by DMIRS' at the same time.	DMIRS acknowledged that a MCP is required to be submitted with each MP. It was recommended that the C4 haul road MCP be submitted separately (rather than a joint MCP).

Date	Stakeholder*	Description of Consultation	Stakeholder comments/issues	Proponent response and/or resolution
05/05/2020	Toro Energy (owner of Lake Way Station) Greg Shirliff	Phone	Talked about project status and agreed that Mick Wilson (GWR Executive Director) would send an email describing current project status	Email describing current project status and approvals, in particular JWD, Golden Monarch, Eagle, Emu, C4 and proposed C4 haul road was provided to Toro on 6/5/20. GWR has not receive a response to date.
26/06/2020	DMIRS Marius Hanecomp Don Russell	Phone	Initial introduction on GWR's C4 Project and PMP requirements.	No Issues – reinforced requirements on PMP and follow template
08/07/2020	DMIRS Marius Hanecomp Don Russell Adrian Costello	Phone	Discussion on PMP structure and particular reference to Rosslyn Hill use and ensuring clear area of responsibility. Discussion on Haulage options and mid-point stockpile requirements.. Updated timeframes on submission and use of SRS.	No Issues – appreciated discussion and update
27/07/2020	Paroo Station Jim Ford Mick Wilson (GWR)	Meeting	Northern end of proposed C4 haul road is adjacent to Paroo Station boundary. GWR outlined its plans	No issues and GWR agreed to keep them informed of their activities.

Attachment 6

Environmental Impacts and Risk Assessment

9. Environmental Impacts and Risk Assessment

A risk assessment for the Prescribed Premises activities was completed in accordance with the DWER Guidance Statement: Risk Assessments (Department of Water and Environmental Regulation 2017). The risk assessment process identified the following:

- The sources of pollution and where available, quantification of emissions
- The pathway which pollution follows from the source to the receptor
- The environmental and health receptors
- The potential Impacts on the receptors from this source of pollution
- The project specific controls and mitigation measures which will be applied at the JWD
- The likelihood, consequence and overall risk rating associated with this factor
- The requirement for monitoring.

Likelihood and consequence categories were derived from the DWER Guidance Statement (DER 2017), to generate a risk rating (Table 11).

Table 11: Risk rating matrix (Source: DWER 2017)

		Consequence				
		Slight	Minor	Moderate	Major	Severe
Likelihood	Almost certain	Medium	High	High	Extreme	Extreme
	Likely	Medium	Medium	High	High	Extreme
	Possible	Low	Medium	Medium	High	Extreme
	Unlikely	Low	Medium	Medium	Medium	High
	Rare	Low	Low	Medium	Medium	High

Risks and associated control measures are presented in Table 12 with further description provided in the preceding sub-sections.

There are no residences or communities in close proximity to the Project area. The nearest pastoral residence is Ullalla station located 25 km to the southwest of the project area.

Possible key receptors are limited to:

- Flora and vegetation surrounding the project infrastructure.
- Native fauna that inhabit the adjoining habitat
- Groundwater and surface water

Table 12 and Table 13 outlines the sources of emissions and discharges associated with the proposed activities and provides control measures to mitigate any associated risks.

Table 12. Risk Assessment for Emissions and Discharges associated with the Prescribed Premises.

REF	Emissions Source/Event	Type and Source	Pathway	Receptor	Potential Impact	Controls	Consequence on Receptor	Likelihood of Consequence	Level of Risk	Monitoring Required under Works Approval and/or License
Emissions to Air – PM₁₀ and NO_x										
	Emissions to Air – Emissions of NO _x	NO _x emissions due to burning of diesel fuel for motor vehicles and generators for rock crusher and pumps.	Direct emissions to air – wind dispersion	Vegetation (including Priority species) Site amenity	Reduced amenity on site Decline in vegetation health Impacts limited to site	Engine maintenance to ensure efficient running and optimum fuel consumption. Energy efficiency through turning off equipment when not in use.	Slight	Possible	Low	No – Monitoring and reporting under National Pollution Inventory and NGERs.
	Emissions to Air – Increase in PM ₁₀	Ore and waste loading and unloading on surface	Direct emissions to air – wind dispersion	Vegetation (including Priority species) Site amenity	Reduced amenity on site Decline in vegetation health Impacts limited to site	Water application if required.	Slight	Possible	Low	Yes – Visual Monitoring
	Emissions to Air - Increase in PM ₁₀	Crushing and conveying				Sprays (as required) Dust collection systems. Maximum moisture levels of the final product will be controlled to maintain operational efficiency from road haulage vehicles.	Minor	Possible	Medium	Yes – Visual Monitoring
	Emissions to Air – Increase in PM ₁₀	Truck movements along unsealed roads				Watering of road surface.	Slight	Possible	Low	Yes – Visual Monitoring
	Noise emissions - crushing	Noise from crusher	Direct emissions to air	Fauna behaviour Site amenity	Reduced amenity on site Decline in habitat quality Impacts limited to site.	All mining operations to comply with the <i>Environmental Protection (Noise) Regulations 1997</i> Equipment and machinery design will specify compliance with Australian Standard noise limits. Apply best available technology to minimise noise emissions from construction.	Slight	Possible	Low	No
Emissions to Land and Water										
	Emissions to Land and Water - Spillage of hydrocarbons	Hydrocarbons from leaks and spills during refuelling and operations	Spillage to soil, surrounding vegetation and ephemeral drainages Seepage into groundwater Workshop and washdown facility.	Vegetation Fauna Groundwater Surface water Soils.	Contamination of surface water and groundwater Death or degradation of vegetation Contamination of soils Degradation of fauna habitat.	Storage of hydrocarbons in bunded areas or self-bunded tanks Vehicle maintenance in designated areas Provision of spill kits around hydrocarbon storage areas Treatment of hydrocarbon contaminated water Remediation of contaminated soil Flood protection installed around operational areas.	Minor	Possible	Medium	Yes Audit of compliance – Construction in accordance with design Regular inspections of integrity of hardstands and bunds.

Table 13: Sources of emissions and discharges during construction and commissioning

Ref	Source of emission or discharge	Emission or discharge type	Volume and frequency	Proposed controls
Emissions to air				
1.	Vehicle movements on unsealed access roads during construction/commissioning	Noise	Temporary during construction/commissioning	<ul style="list-style-type: none"> All mining operations to comply with the Environmental Protection (Noise) Regulations 1997 Equipment and machinery design will specify compliance with Australian Standard noise limits Apply best available technology to minimise noise emissions from construction
2.		Dust	Temporary during construction/commissioning	<ul style="list-style-type: none"> Adhere to Dust Management Procedures to reduce dust emissions on nearby vegetation and fauna habitats Vehicle traffic will be confined to defined roads and tracks Active haul roads and access tracks are watered for dust suppression Vehicle speeds will be restricted on all access and haul roads.
3.	Earthworks, construction of new buildings, plant and infrastructure	Noise	Temporary during construction/commissioning	<ul style="list-style-type: none"> All mining operations to comply with the Environmental Protection (Noise) Regulations 1997 Equipment and machinery design will specify compliance with Australian Standard noise limits Apply best available technology to minimise noise emissions from construction.
4.		Dust	Temporary during construction/commissioning	<ul style="list-style-type: none"> Adhere to Environmental Procedures to reduce dust emissions on nearby vegetation and fauna habitats All areas under construction to be watered for dust suppression as required.
5.	Crushing Plant	Noise	Commissioning	<ul style="list-style-type: none"> All mining operations to comply with the Environmental Protection (Noise) Regulations 1997 Equipment and machinery design will specify compliance with Australian Standard noise limits Apply best available technology to minimise noise emissions from construction.
6.		Dust	Commissioning	<ul style="list-style-type: none"> Adhere to Environmental Procedures to reduce dust emissions on nearby vegetation and fauna habitats.
Emissions to land and water				
7.	Storage and use of hydrocarbons	Spills and breach of containment		<ul style="list-style-type: none"> Adhere to Environmental Procedures for Dangerous Goods and Hazardous Substances and Spill Management.

Ref	Source of emission or discharge	Emission or discharge type	Volume and frequency	Proposed controls
				<ul style="list-style-type: none"> • All hydrocarbon storage areas will be designed and constructed in accordance with Australian Standards AS1940 and AS1692 • All hydrocarbons will be stored in bunded areas or containers with bunding. Containment and handling will be managed in accordance with the Australian Standard 1940-2004, 'The Storage and Handling of Flammable and Combustible Liquids' • The bunded areas will incorporate a collection sump to recover spillage • Fuel bowsers and fuel delivery inlets will be located on HDPE-lined pads and/or drip trays to contain any drips and spills • All substances will be permitted, stored, handled and disposed of in accordance with relevant licence conditions and requirements, and based on relevant regulations, guidelines and standards • Vehicles and machinery will be serviced within designated workshop areas • Movement of materials will be confined to defined roads and tracks and vehicle speeds will be restricted on all access and haul roads • Spill kits will be fully stocked, located in strategic locations and personnel will be trained in their use • Designated bins and drums will be provided to dispose of hydrocarbon materials which will be transported off site for disposal at a licensed facility • Any treated hydrocarbon contaminated water with a TPH concentration <15 mg/L, may be used onsite for dust suppression. If TPH >15 mg/L, it will be recirculated through the system for further treatment or contained in a storage tank for removal off-site remediation of contaminated soil • Stormwater diverted around and away from the crushing and screening plan and workshop infrastructure areas by bunding and if necessary diversion drains.
8.	Storage and use of chemicals	Spills and breach of containment		<ul style="list-style-type: none"> • All chemicals will be stored in appropriately bunded facilities. • The bunded areas will incorporate a collection sump to recover spillage • Level indicators to detect leaks, based on drops in level.
9.	Infrastructure drainage	Stormwater runoff	Construction and operation	<ul style="list-style-type: none"> • Installation of sediment control structures at locations where high sediment loads are anticipated

Ref	Source of emission or discharge	Emission or discharge type	Volume and frequency	Proposed controls
				<ul style="list-style-type: none"> Stormwater diverted around and away from the crusher and workshop infrastructure areas by bunding and diversion drains where necessary.
10.	Workshop and wash down facility	Hydrocarbons - spills, leaks and breach of containment		<ul style="list-style-type: none"> Washdown bay located on an impervious pad, constructed so that it drains to a clean water recovery system Sediment from wash down pad will collect in a sump. Contaminated soil shall be stockpiled for removal offsite by a licenced controlled waste contractor Hydrocarbon contaminated water will be directed to an oily-water separator system. Treated TPH concentration <15 mg/L, may be used onsite for dust suppression. If TPH >15 mg/L, it will be recirculated through the system for further treatment or contained in a storage tank for removal off-site Spill kits will be located at all hydrocarbon storage facilities and service trucks and be clearly identified.

10. Monitoring and Reporting

The main factors and infrastructure requiring monitoring comprise:

- Dust during construction and operations
- Hydrocarbon and chemical storage facilities.

Monitoring for these factors and infrastructure is discussed below in Table 14.

Table 14: Monitoring Requirements

Factor or Infrastructure	Monitoring Requirement
Dust	<p>Conduct regular visual inspections of project areas to ensure dust generation from exposed areas is not excessive. This is especially relevant during periods of strong winds and high temperatures</p> <p>Sensitive vegetation (including significant flora) adjacent to cleared areas shall be inspected regularly for dust impacts and remediation action shall be taken, as necessary.</p>
Hydrocarbon and Chemical Storage Facilities	<p>Hydrocarbon and chemical storage facilities will be inspected daily to ensure compliance with storage requirements contained in Australian Standard 1940-2004.</p>

Monitoring results will be reported in the Annual Environmental Report submitted to DWER. Compliance with licence conditions will be reported in the Annual Audit of Compliance Report submitted to DWER.

Attachment 7. Siting and Location

11. Summary of Key Receptors

Table 15: Summary of specific ecosystems and biological components discussed in the following section.

Specified Ecosystems	Distance from the Premises
Ramsar Sites	None identified within 100km
DBCA Managed Lands and Water	There are no conservation reserves or DBCA managed lands proximal to the project area. The closest nature reserve is Wanjarri NR 85km to the south-east. Mooloogool Station (DBCA managed) is 52 km north west.
Ecological Communities (TECS and PECS)	The project is within the Wiluna West vegetation complexes (BIF) Priority 1 Ecological Community (PEC)
Biological Component	Distance from the Premises
Threatened/Priority Flora	No threatened flora. Priority flora occurs on the project area and is approved to be cleared via NVCP (Figure 5, Attachment 7).
Threatened/Priority Fauna	Malleefowl (vulnerable – BC Act and EPBC Act) and Brush-tailed Mulgara (Priority 4 DBCA) have been recorded regionally. JWD project area does not contain appropriate habitats (Attachment 8B).
Hydrography WA (250K Surface water polygons)	Some minor non-perennial drainage lines Lake Way drainage system = 30km to the east Lake Mason is 95km south southwest No rivers, lakes, pools or significant surface water bodies or groundwater dependent ecosystems within the project area.
Contaminated Sites	None recorded in DWER database

12. Landscape

12.1. Geology

The Wiluna West project extends 45 km in strike over the Joyner's Greenstone Belt, near the northern margin of the Yilgarn Craton. The Joyner's Greenstone Belt is a narrow (5 km to 10 km) north-south striking greenstone belt comprising prominent ridges (in the central and eastern portion) of Banded Iron Formations (BIF) intercalated with mafic and ultramafic schists with minor chert and clastic sediment horizons.

High grade hematite mineralisation occurs within three main BIF ridges (Units A, B and C) with grade occurrences of up to 69% Fe. Iron mineralisation occurs within BIFs surrounded by inter-bedded mafic and ultramafic schist units. Unit B and Unit C have been partially drill tested by GWR for hematite mineralisation. The two main ridges show distinctive mineralisation styles with B ridge showing a much lower proportion of remnant bedding and generally a significantly higher portion of haematite especially in the top 20 m. Mineralisation of the B ridge is also much more continuous

along strike occurring semi-continuously for over 15 km. The mineralisation on the C ridge typically occurs in a series of pods of up to 20 Mt separated by poorly or un-mineralised BIF. The JWD deposit represents part of Unit B.

12.2. Landforms

The project is located within the Murchison Region and is characterised by undulating hills, with occasional ranges of low hills and extensive sand plains in the eastern half. The principal soil type is shallow earthy loam overlying red-brown hardpan, shallow stony loams on hills and red earthy sands on sand plains (Beard 1990).

The land systems in which the JWD project area occurs are the Gabanintha and Sherwood land systems (Figure 6 – Attachment 7).

12.2.1. Gabanintha Land System

This land system comprises Whitestone (with some greenstone) hill ranges and it forms higher tracts in most of the hill belts. It is composed of parallel ridges, with rocky crests formed by haematitic jaspilite and with stony slopes eroded on schist (Mabbutt & Fanning 1987).

The soils are generally outcrops with adjacent stony soils and shallow reddish earths and sands. The vegetation is predominantly open mulga (*Acacia aneura*) with sparse shrubs and grasses (Mabbutt & Fanning 1987).

This land system encompasses the majority of the JWD area (~80%).

12.2.2. Sherwood Land System

Comprising the south eastern part of the waste dump area, this land system consists of plains on shallow stony soils and alluvial plains formed by moderate dissection of weathered granitic rock.

This system is dominated by shallow stony soils on hardpan or rock with mulga and soft spinifex (Mabbutt & Fanning 1987).

12.3. IBRA Regions

The Interim Biogeographic Regionalisation for Australia (IBRA) divides the Australian continent into 89 bioregions and 419 subregions. The proposed clearing area is located within the Murchison bioregion and the Eastern Murchison (MUR1) subregion of the IBRA (Thackway & Cresswell 1995).

The East Murchison subregion lies on the Yilgarn Craton's "Eastern Goldfields" and "Southern Cross" Terrains.

The East Murchison bioregion is characterised by Mulga Woodlands often rich in ephemerals, hummock grasslands, saltbush shrublands and *Halosarcia* shrubland (Cowan 2001). The area is characterised by internal drainage and salt lake systems associated with Paleodrainage systems.

12.4. Soil-Landscape Zone

The project is located within the Salinaland Plains soil-landscape zone of the Murchison Province (Tille 2006).

This zone which encompasses 132,450 km², including sandplains (with hardpan wash plains and some mesas, stony plains and salt lakes) on granitic rocks (and some greenstone) of the Yilgarn Craton and comprises red sandy earths, red deep sands, red shallow loams and red loamy earths with some red-brown hardpan shallow loams; salt lake soils and red shallow sandy duplexes.

12.5. Land Systems

The Wiluna-Meekatharra area, covering 25,000 square miles, has been mapped and described in 48 land systems, based on recurring patterns of topography, soils and vegetation (Mabbut et al., 1963).

The prescribed premise is located on two Land Systems listed below (Mabbut et al., 1963):

- Gabanintha – Whitestone hill ranges, rocky ridges and stony lower slopes, shallow red earths and texture contrast soils on slopes, very open mulga with sparse shrubs and grasses.
- Sherwood - Breakaways, kaolinised footslopes and extensive gently sloping plains on granite supporting mulga shrublands and minor halophytic shrublands.

13. Hydrology

13.1. Surface Water

The region is characterised by undulating areas of sandplain and granite outcrop with northerly trending ridges controlled by the strike of the greenstone belts, and by low-lying broad alluviated valleys containing playa lakes (Aquaterra 2008).

The drainage system of the Wiluna West area comprises two large south-easterly trending palaeodrainages. The Carey and Raeside Palaeodrainages extend from a regional divide in the west of the area and drain towards the Eucla Basin. These palaeodrainages have low gradients and frequently contain small to very large playa lakes, such as Lake Way. The playa lakes are normally dry, floored by mud or salt crystals, and are commonly fringed by sand and gypsum dunes that prevent the flow of surface runoff between the lakes. These lakes occasionally become inundated during intense rainfall events and during rare cyclonic events (Aquaterra 2008).

The Lake Way drainage system lies approximately 35 km to the east of the project area, whilst Lake Mason is approximately 95 km south-southeast of the Project.

The Project area is not located within a Surface Water Proclamation Area.

13.1.1. Project surface hydrogeology

Rockwater (2019) completed a surface water assessment of the JWD Project area.

The JWD Project area contains broad and ill-defined ephemeral watercourses and drainage lines. These drainage lines only flow following heavy rainfall. Drainage lines direct surface water flows south and east towards Lake Way, South East of Wiluna. There are two catchments A and B (Figure 7 – Attachment 7) (Rockwater 2019).

Assessment of the flood flows from these catchments identified:

- Catchment A – 1 in 100 year flood levels and extent would not impact the planned pits or ROM
- Catchment B – 1 in 100 year flood levels are not expected to impact the planned infrastructure (Rockwater 2019)

The 1 in100-year flood level for the crusher area is at 563.5 mAHD. The crusher will be located between 585 and 592.5 mAHD, over 20mAHD above the flood level.

13.2. Groundwater

13.3. Regional Hydrogeology

The main aquifer in the Wiluna West area is the mineralised BIF, which forms a ‘strip aquifer’ of two parallel sub-vertical zones of enhanced permeability compared to surrounding mafic and ultramafic schists. The aquifer exhibits horizontal and vertical anisotropy.

In addition to the BIF aquifer, several paleochannels and paleo-tributary channels lie in the vicinity of the Project area, including Lake Way, Ward Well and Carey channels. These are located outside the proposed JWD development area.

13.4. Project Hydrogeology

The Project area is located in the Meekatharra subarea of the East Murchison groundwater area. The project is not within a Public Drinking Water Source Area.

Groundwater recharge in the project area is likely to be significant but episodic, and mostly as a result of storm events. Recharge will likely be by direct infiltration through exposed outcrop, with secondary infiltration through the base of the local creek systems during runoff events.

Groundwater occurs in the secondary fracture porosity developed in the saprolite profile or within the primary porosity of the regional Cenozoic alluvial and calcrete aquifers. Bore yields from the BIF tend to be highly variable with the highest yielding bores between 200 to 1,500 kL/day.

13.4.1. JWD Groundwater Exploration Bores

Groundwater levels recorded in the exploration holes over all deposits at Wiluna West Project area shows that the regional groundwater flow direction is in a general easterly direction toward Lake Way, although there may be some localized variations around the B and C ridges.

GWR has undertaken mineral exploration drilling over the JWD project area. Groundwater levels were measured in a selection of the drill holes within the proposed JWD area and range from 30 m to 60 m below ground level (Clark Lindbeck & Associates 2019). Groundwater levels will be at least 10 to 15 metres below the floor of the proposed pit.

13.4.2. Groundwater Quality

A groundwater production bore is located at the existing camp (795538E 7032130N) and is used for all water requirements (excluding drilling).

The water from this bore slightly acidic. The low calcium and moderate magnesium levels make the sample “soft” water and scale does not develop in pipes. Concentrations of all measured trace metals are very low, with only zinc at a detectable level (Table 16) (Bioscience 2009).

Table 16 Ground water chemistry of the production bore located at the camp

Element	Water Bore
Nitrate N (mg/L)	2.90
Ammonia N (mg/L)	0.04
Phosphate P (mg/L)	0.10
Potassium (mg/L)	3.9
Calcium (mg/L)	14.5
Magnesium (mg/L)	18.1
Sodium (mg/L)	87.8
Chloride (mg/L)	110

Element	Water Bore
Carbonate (mg/L)	25
Sulphate (mg/L)	56
Iron (mg/L)	<0.01
Manganese (mg/L)	<0.01
Copper (mg/L)	<0.01
Zinc (mg/L)	0.04
Electrical Conductivity (dS.m ⁻¹)	0.74
pH	6.38
Total Dissolved Solids* (mg/L)	456

14. Materials Characterisation

14.1. Soils

This project area contains non-saline alluvial soils and hardpan to the south and Whitestone BIR outcrops with adjacent skeletal stony soils and shallow reddish earthy sands in the north.

GWR collected seven topsoil samples from the proposed pit and waste dump footprint to assess the suitability of the topsoil to provide successful rehabilitation. The results of the analyses indicated that the soils were non-saline to slightly saline with a pH ranging from 5.0 to 7.3 (slightly acidic to neutral). Given the sandy nature of the topsoil, no sodicity or dispersivity testing was undertaken.

14.2. Waste Rock Characterisation

GWR completed testwork on various metallurgical core samples to characterise the waste and low grade materials expected to be exposed to oxidation. Waste rock samples were targeted as these contain the highest sulphur levels and would have the highest propensity to generate acidic runoff. Waste material with sulphur content below 0.3% is regarded as non-acid forming due to the sulphur level being too low to result in acid generation.

A total of 1,100 samples have been taken along the proposed pit area. The highest sulphur level recorded was 0.166% which only occurred in one sample. All remaining samples recorded sulphur levels between 0.01 and 0.1%. The waste produced from the JWD project is considered non-acid producing (S<0.3%) (Table 17).

Table 17: Waste characterisation samples

Proposed Test pit area				
Sulphur values	average (%)	min (%)	max (%)	number of samples
Schist	0.008	0.001	0.086	1017
BIF	0.013	0.001	0.166	83

No Potentially Acid Forming (PAF) rock is anticipated to be mined during the proposed mining operation.

15. Vegetation and flora

15.1. Regional

The Project area is located within the Austin Botanical District in the Eremaean Province and lies within the East Murchison IBRA sub-region which covers an area of 211,350 ha (Beard 1990).

Vegetation throughout this area is Mulga woodlands often rich in ephemerals, hummock grasslands, saltbush shrublands and *Halosarcia* shrublands.

The Project area is located within Vegetation Association 202 (Shrublands, mulga and *Acacia quadramarinea* shrub) (Beard 1975).

Table 18 presents the current extent of each vegetation system association in relation to its pre-European extent, and the percentage is protected for conservation.

The vegetation group has been subject to very limited clearing (less than 1 %) since European settlement. Approximately 23% of the vegetation system association is protected for conservation.

Table 18: Vegetation Groups Intersecting the JWD area (Department of Biodiversity Conservation and Attractions 2018)

Vegetation Group	Description	Current Extent (ha)	Percentage of Pre-European Extent Remaining	Percentage of Current Extent Protected for Conservation
202	Shrublands, mulga and <i>Acacia quadramarinea</i> shrub	448,343	99.96%	22.92%

15.2. Vegetation surveys

Findings from vegetation and flora surveys at the broader JWD area include:

- Flora
 - A total of 279 native taxa from 120 genera and 41 families have been recorded in the broader JWD area
 - No Threatened taxa, listed under the State Biodiversity Conservation Act 2016 (BC Act) and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), have been identified at the Project
 - Four Priority flora have been recorded in proximity to the proposed mining area: *Sida picklesiana* (P3), *Homalocalyx echinulatus* (P3), *Olearia mucronata* (P3) and *Ptilotus luteolus* (P3) (Attachment 7- Figure 5). Two additional species, *Calytrix uncinata* and *Baeckea* sp Melita Station, identified in previous assessments as Priority flora, have since been delisted
 - Two of these species are anticipated to be impacted, *Sida picklesiana* and *Homalocalyx echinulatus*. Approximately 20% of the known *S. picklesiana* population locally will be impacted (within an 8 km radius), with <18.89% of the known population impacted regionally
 - No species listed as Declared Pests were recorded.
- Vegetation
 - The Recon Environmental (Recon Environmental 2010) survey covered an area of 12,647 ha and identified 29 vegetation communities within the wider Project area
 - No listed Threatened Ecological Communities (TECs) listed under the EPBC Act or BC Act were recorded

- The condition of the vegetation in the area is Pristine to Excellent (Keighery 1994) through to degraded.

15.3. *Sida picklesiana*

A targeted threatened flora survey of the broader Project Area was undertaken by Native Vegetation Solutions in August 2018. The focus was to quantify the impact on *S. picklesiana* as it was known to occur in the area (from previous survey work).

The survey involved assessment of the number of *S. picklesiana* within the disturbance footprint, and, within an 8 km radius (Attachment 8A - Native Vegetation Solutions 2018).

The estimate of the regional population size of *Sida picklesiana* (P3) is very conservative as this species has not been intensely regionally surveyed. The current regional distribution of known populations of *Sida picklesiana* (P3) is approximately 160 km north, 70 km south, 67 km east and 180 km west of the proposed Project area.

The clearing of native vegetation for the project is covered by an existing Native Vegetation Clearing Permit. Clearing of *S. picklesiana* will be limited within the project area with extensive populations remaining (Attachment 7 - Figure 5).

15.4. Ecological Communities:

The proposed mining area is located within the Wiluna West vegetation complexes (BIF) which is listed as a Priority 1 Ecological Community (PEC) by DBCA due to its vegetation complexes. The Wiluna West PEC boundary (with buffer) covers an estimated area of 10,670 ha.

GWR and Wiluna Fe Ltd are cognisant that the PEC boundaries are indicative only and are provided for information purposes and subject to alteration by the DBCA. Notwithstanding this, the Project area represents a small percentage (~1%) of PEC area.

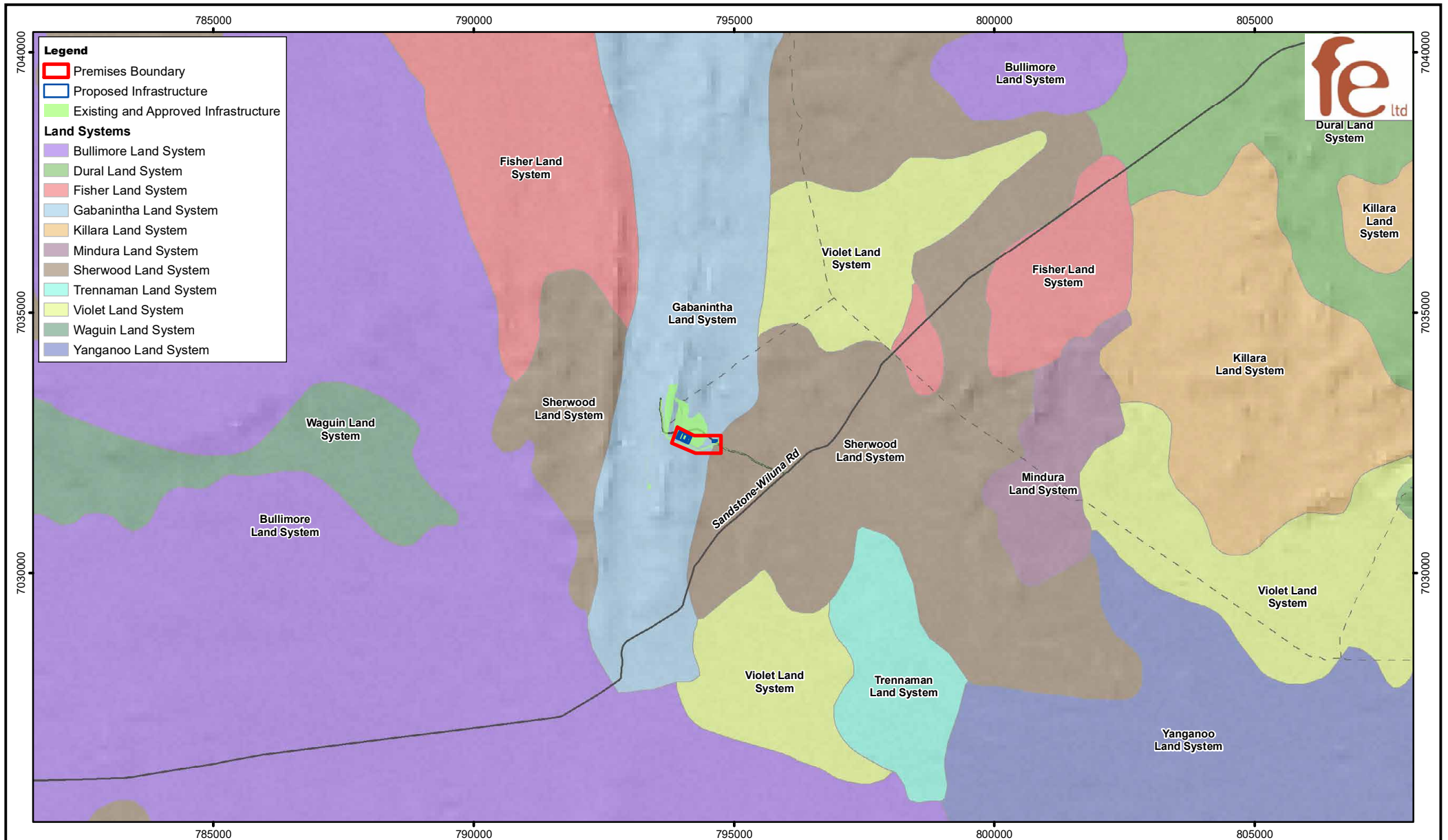
In addition to the Wiluna West PEC, two additional PEC's were revealed from the DBCA TEC database as having the potential to occur in the project area:

- "Millbillillie: Bubble calcrete groundwater assemblage type on Carey palaeodrainage on Millbillillie Station" PEC (P1)
- "Bubble Well calcrete groundwater calcrete assemblage type on Carey palaeodrainage on Millbillillie Station" PEC (P1).

These communities are related to subterranean fauna communities and these palaeodrainages are not known to occur in the Project area.

15.5. Wetlands and Groundwater Dependence

- There are no Nationally Important Wetlands or RAMSAR wetlands located within 100 km of the JWD area (Department of the Environment and Energy 2020)
- No groundwater dependent taxa were identified during the surveys.



Imagery: ESRI, Maxar (Feb 2019)

N

0 1 2km

Scale: 1:100,000
MGA94 (Zone 50)

CAD Ref: a2797_F003

Date: December 2020 Rev: A A4

Rapallo

Author: M. Dunlop

Drawn: CAD Resources ~ www.cadresources.com.au

Tel: (08) 9246 3242 ~ Fax (08) 9246 3202

Figure 6
Land Systems of the JWD area

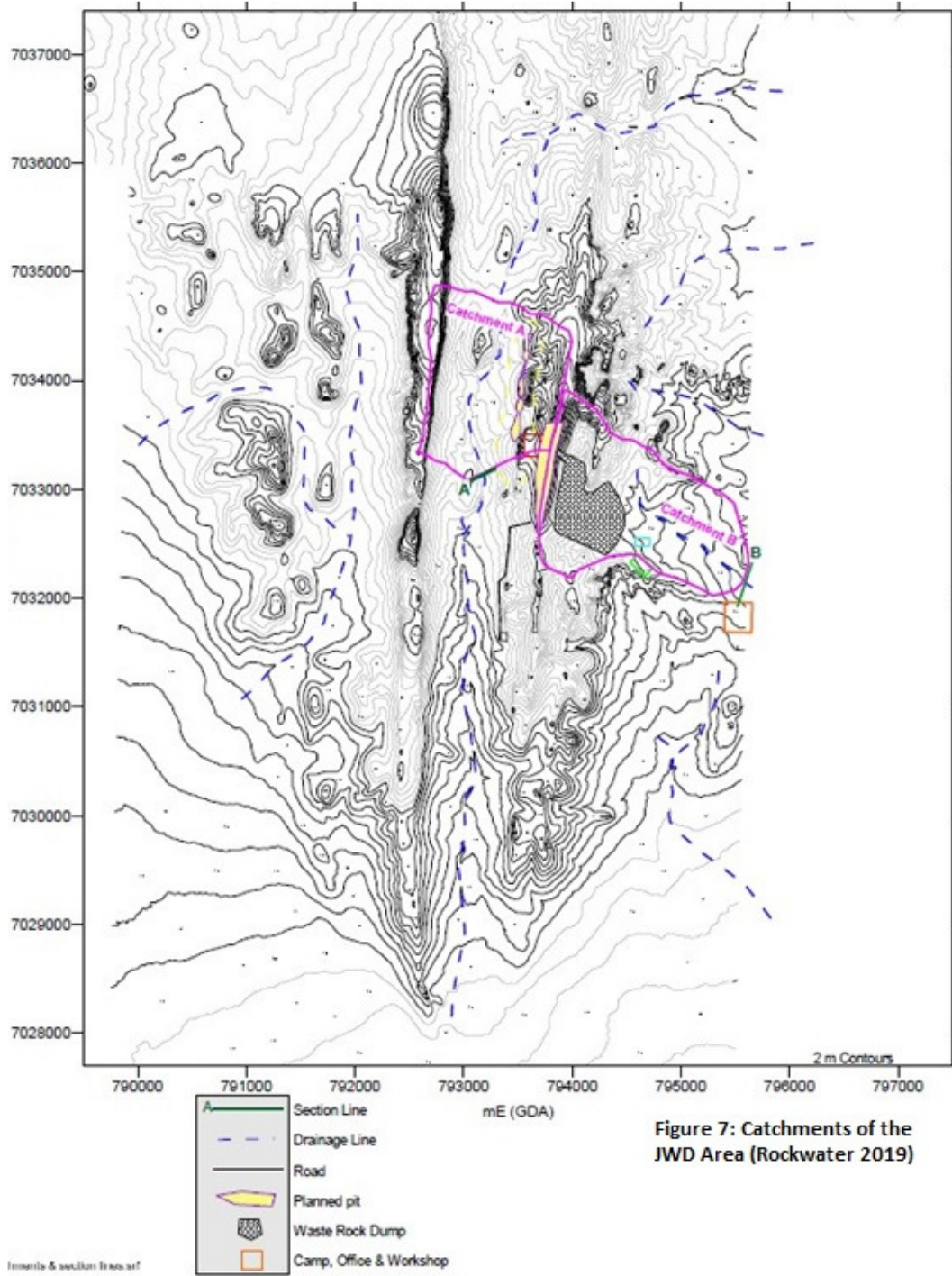


Figure 7: Catchments of the JWD Area (Rockwater 2019)

16. Terrestrial fauna

16.1. JWD area

A total of 71 bird, 27 mammal, two frog and 40 reptile species were recorded at the project during the Level 2 surveys (Ninox Wildlife Consulting, (2005) (2006) (2008) (Keith Lindbeck & Associates 2012)). Four fauna species of conservation significance have been recorded during survey work in the broader JWD Project area to date:

- Malleefowl (*Leipoa ocellata*)
- Brush-tailed Mulgara (*Dasyercus blythii*)
- Long-tailed Dunnart (*Sminthopsis longicaudata*)
- Peregrine Falcon (*Falco peregrinus*).

The Ninox surveys also recorded secondary signs of the Boodie/Burrowing Bettong (*Bettongia lesuergraii*). This inland species is presumed extinct on the mainland and preferred sandy or loamy soils (often calcareous) that were deep enough to construct its burrow.

Neither Long-tailed Dunnart nor Peregrine Falcon are restricted to the JWD Project and the habitats are unlikely to support Brush-tailed Mulgara.

16.2. Targeted Malleefowl Surveys

Malleefowl were first recorded at Wiluna West on the C ridge in 2006 (Ninox Wildlife Consulting 2006). In addition to records during the Ninox surveys, four targeted Malleefowl searches have been undertaken.

To date a total of 78 Malleefowl mounds have been located at the overall Wiluna West project through targeted surveys which includes:

- 6 active mounds (only two mounds located within or in close proximity to the disturbance footprint were assessed in 2014)
- 4 inactive mounds
- 68 near-extinct to extinct mounds. Only 15 of these mounds were reassessed in 2014 (due to their location within or in close proximity to the Project disturbance footprint).

An assessment of the occurrence of Malleefowl mounds with vegetation communities recorded at site shows that they prefer the MSET (Mulga Shrubland over *Eremophila forrestii* and *Triodia* on lateritic soils) and ASET (Acacia shrubland over *Eremophila* and *Triodia*) vegetation communities as defined by Recon Environmental (2010).

No Malleefowl mounds have ever been recorded in the proposed mining area at JWD. The mining area is not considered to be suitable for Malleefowl as the area does not contain vegetation suitable for Malleefowl. The vegetation in the proposed mining area was considered to be unsuitable as the habitat was either too rocky, too open and / or there was a lack of suitable leaf litter. The Targeted Malleefowl report is located in Attachment 8B.

16.3. Short Range Endemics (SREs)

Two short-range endemics invertebrate surveys have been undertaken at the Project, comprising habitat located in the proposed clearing area and which are summarised below.

16.3.1. SRE Survey (2006)

No SRE were recorded during the survey (ATA Environmental 2007). Ten spiders from the families *Lycosidae*, *Miturgidae*, *Gnaphosidae*, *Zodariidae*, *Ctenizidae* and *Sparassidae* were collected during the survey. The spider species recorded are common and widespread and do not have conservation significance.

A juvenile *Conothele* species, a mygalomorph spider was recorded during the survey on Ridge C (approximately one kilometre west of C4) (Keith Lindbeck & Associates 2012). As mature males are required for species identification, the conservation significance of this species cannot be determined. Notwithstanding this, this species has a scattered occurrence throughout favoured habitat (unlike other species which aggregate in large numbers in pockets of habitat).

16.3.2. SRE Survey (2011)

The Level 2 Spring fauna survey conducted in November 2011 included a targeted SRE survey (Appendix 6). Invertebrate groups targeted during the survey were those considered most likely to potentially contain SRE taxa including:

- *Mygalomorphae* (trapdoor spiders)
- *Diplopoda* (millipedes)
- *Pseudoscorpionida* (pseudoscorpions)
- *Pulmonata* (land snails).

A total of 24 invertebrates comprising three spiders, eight pseudoscorpions and 13 scorpions were collected during this survey and vouchered at the Western Australian Museum. Two specimens were collected from soil samples and the remainder from pitfall traps and visual searches (Keith Lindbeck & Associates 2012).

The spiders recorded were either juvenile or female and therefore could not be identified to species, as best taxonomic features in their identification are found within the genitalia of males.

Three genera of pseudoscorpions were collected (Family: *Olpiidae*). Of these, *Indolpium* spp. are not likely to represent SREs, whereas the endemism of both *Autrohorus* spp. and *Beierolpium* `sp. 8/3` require systematic revision to determine their degree of endemism (Burger, M. A., Castalanelli, M.A. and Harvey, M. S. 2012).

Thirteen scorpions were recorded, and none were identified as SREs ((Volschenk 2012).

While taxonomic changes/updates are likely to have occurred since the previous SRE work completed, the habitat supporting these potential SRE is not restricted to the clearing area and is well represented on the B and C ridges which are approximately 20km in length.

16.4. Subterranean Fauna

Regional surveys for stygofauna and troglofauna were undertaken by Subterranean Ecology in May and July 2007. For stygofauna, the survey effort involved 35 sample events spread across 19 sites while troglofauna sampling involved 57 traps deployed in 29 drill holes in the Bowerbird, C3 and C4 deposits.

The following summary is taken from Subterranean Ecology (2007):

“Stygofauna was detected at three (16 %) of the 19 sites sampled and comprised representatives of two common groundwater taxa known in the Yilgarn, namely Bathynellacea, and Oligochaeta. The two species of stygofauna identified were found only within the colluvium aquifer to the north of the main haematite ridges identified as potential mining sites. No stygofauna was detected within the Haematite/BIF areas.

Troglofauna was collected from 83% (24 of the 29) holes sampled. A total of 493 specimens comprising 12 morpho-species were collected. The invertebrate specimens comprised 12 taxa belonging to Acarina (3 morpho-species), Collembola (2), and Lepidoptera (2). None of the taxa collected showed any obvious troglomorphisms and are not considered likely to be obligate subterranean species (troglobites) that may be short range endemics (SRE’s) whose habitat and distribution is directly dependent on the subsurface habitat of the BIF.”

Additional sampling for stygofauna was undertaken in 2012 during long term pump test at the production bores at Bowerbird and C4 and consisted of 14 samples. The Bowerbird bore yielded one stygofauna species, *Cypridopsis* sp, which is widespread throughout the Pilbara and Yilgarn.

These samples were largely focused on the Bowerbird, C3 and C4 deposits where active mine dewatering will occur. JWD is above water table and will not impact subterranean fauna.

17. Heritage

17.1. Aboriginal Heritage

Several archaeological and ethnographic surveys have been completed over the Wiluna West Iron Ore Project including the JWD project area. In the JWD project area, there is one archaeology site (24647) and one ethnographic site (24581) registered by the DIA. The archaeology site (24647) is a rock shelter and is recorded as SR (stored data) on the register. The ethnographic site (24581) is recorded as P (permanent register) and has a buffer area that covers majority of B ridge.

The Cultural Heritage Management Plan (CHMP) dictates the status of the sites across the Wiluna West Iron Ore Project and clearing constraints are mapped in Attachment 7- Figure 5. All works will be undertaken in accordance with the CHMP.

Site induction programs include sections on Aboriginal heritage awareness to aid in identification and preservation of any possible heritage sites, and all employees and contractors will be made aware of the location of known sites (where appropriate), in order to avoid disturbance to these sites.

GWR and Wiluna Fe will continue ongoing consultation with Traditional landowners.

17.2. European Heritage

No sites of European heritage significance will be impacted by the Project, thus no management action is required.

Attachment 8A.

Sida picklesiana

Targeted Survey Report

**Keith Lindbeck and Associates
Environmental Management Consultants**

ABN 36 150 274 469



**GOLDEN WEST RESOURCES
LIMITED**

***Sida* sp. Wiluna (A. Markey and S. Dillon
4126) P1
REGIONAL FLORA SURVEY**

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September 2010

EXECUTIVE SUMMARY

Golden West Resources Ltd (GWR) proposes to mine iron ore from its Wiluna West project located approximately 35 km south-west of Wiluna in the Murchison region of Western Australia.

A 2007 Department of Environment and Conservation (DEC) survey of the project area collected a putative new species of *Sida* which was given the phrase name *Sida* sp. Wiluna (A. Markey and S. Dillon 4126). Due to the lack of knowledge of this particular taxon it was given a Priority 1 Conservation Code.

Due to the presence of this new taxon in the area they propose to mine, GWR commissioned Keith Lindbeck and Associates (KLA) to conduct a regional survey to determine its distribution and abundance, and whether it was restricted to the project or was more widespread.

KLA, in conjunction with the Western Australian Herbarium conducted four searches, starting with the location of an undetermined WA Herbarium specimen on Doolgunna Station, located approximately 140 km north of Meekatharra. Flowering and fruiting material was collected from the Doolgunna specimen and it was determined to be *Sida* sp. Wiluna (A. Markey and S. Dillon 4126). Flowering and fruiting material was also collected from Joyners Find, and these collections represented the first of this material allowing a taxonomic description to be written which would lead to the taxon receiving a name.

Overall, 30 new populations of the taxon in the region were identified, totaling thousands of plants. These are scattered from 140 km north Meekatharra to south of the Wiluna West project, giving the taxon a distribution covering hundreds of kilometers. Combined with locations of the taxon recorded by KLA during surveys of drill lines, and previous work by the DEC and Recon Environmental, over 150 locations of the taxon are now known.

These locations occur on three different types of substrate: Banded Ironstone, sandy loam and hardpan with a mantle of ironstone and/or quartz gravels and decaying sandstone.

The taxon *Sida* sp. Wiluna (A. Markey and S. Dillon 4126) is shown to have a larger range than initially encountered and to be relatively common within it. It is suggested that the Conservation Code be reviewed.

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1.0 INTRODUCTION

1.1 BACKGROUND

Golden West Resources (GWR) proposes to mine iron ore at its Wiluna West project, located approximately 35 km south-west of Wiluna.

As part of its Yilgarn Banded Ironstone Formation Regional survey, the Department of Environment and Conservation (DEC) carried out a flora survey of the project, including Joyners Find, an area GWR proposes to mine in the near future. As a result of this survey, a new taxon was identified to occur on the banded ironstone (BIF). This new species, phrase named *Sida* sp. Wiluna (A. Markey and S. Dillon 4126) was given a conservation rating of Priority 1 to reflect the lack of knowledge of its abundance and distribution.

The Priority 1 ranking is defined as and given to:

Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size or being on lands under immediate threat, e.g. road verges, urban areas, active mineral leases etc., or the plants are under threat e.g. from disease, grazing by feral animals etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

Foreseeing that the presence of a poorly known Priority 1 species may impact upon the development of the proposed mining operation, GWR commissioned Keith Lindbeck and Associates (KLA) to conduct a regionally-based survey to determine if the new species was as uncommon as thought.

1.2 PURPOSE AND SCOPE

The objective of this report is to document the results of the targeted surveys carried out in search of *Sida* sp. Wiluna (A. Markey and S. Dillon 4126).

The scope of the searches was to examine suitable habitat throughout the region to determine if the new taxon was confined to Joyners Find or if it has a more wider distribution in the region.

2.0 *Sida* sp. Wiluna (A. Markey and S. Dillon 4126)

2.1 BRIEF DESCRIPTION AND CHARACTERS

(By A. Markey, DEC)

Sida sp Wiluna (A. Markey & S. Dillon 4126) is a densely branched (“twiggy”), rounded shrub c. 1.0 m in height.

The leaves are distinctly discolorous, with dark green adaxial surface and white-golden abaxial leaf surfaces. Older leaves can become brown-red in colour on their adaxial surfaces. The abaxial leaf surface is densely stellate-hairy, and shorter stellate hairs cover the adaxial surface. Leaf apices are distinctly truncate and blunt or emarginate, with a small, blunt leaftip mucro associated with the midrib extending beyond the leaf apex by c. 0.5 mm. Leaves are linear-elliptic and the leaf lamina margins are entire.

Sida sp. Wiluna (A. Markey & S. Dillon 4126) has a robust, densely-branched, shrubby growth form which resembles that of *Sida calyxhymeniana* and *Sida ectogama*. Therefore, *Sida* sp. Wiluna (A. Markey & S. Dillon 4126) could be easily confused with the latter two taxa based on similarities in growth form and leaf morphology.

Plates 1 and 2 show the general morphology of the shrub and detail of the flowers and leaves. The major features used in field identification of the taxon are the entire leaf margins (i.e. not toothed or lobed) and blunt or emarginate leaf apex (referring to the notched tip) if no flowers or fruit are present.



Plate 1 - Detail of the *Sida* sp. Wiluna (A. Markey and S. Dillon 4126) leaf and flower



Plate 2 - General morphology of the shrub, to the right of the image

Sida sp. Wiluna (A. Markey and S. Dillon 4126) was first collected by the DEC at Joyners Find in 2006. In their report (Markey and Dillon, 2009) it is stated that a search of the collections in the WA HERBARIUM found a match with two other collections which similarly could not be identified to species level.

2.2 HABITAT

Sida sp. Wiluna (A. Markey and S. Dillon 4126) was originally recorded on banded ironstone in the Joyners Find area (Markey and Dillon 2009). Further work by Recon Environmental in the Wiluna West project area (Read 2009) recorded the taxon from plains below the banded ironstone ridges. These plains are sandy loam soils and hardpan with a mantle of quartz and ironstone gravels. Plates 3 and 4 show the two originally known habitats of the *Sida*.



Plate 3 - *Sida* sp. Wiluna (A. Markey and S. Dillon 4126) on ironstone gravel



Plate 4 - *Sida* sp. Wiluna (A. Markey and S. Dillon 4126) on banded ironstone

DRAFT

3.0 METHODS

3.1 PRE-FIELD PREPARATION

Initially, after discussion with the Curator and staff of the Western Australian Herbarium (WA Herbarium), two undetermined specimens showing superficial similarities to the new taxon were examined and details of their locations recorded. A diagnostic checklist of features suitable to identify the new taxon was produced by A. Markey, one of the botanists that initially collected the *Sida*. This checklist is reproduced as Appendix A.

The two indeterminate specimens (*Sida* sp. (DJ Edinger 5375) and *Sida* sp. (AA Mitchell 4149)) had been identified by WA Herbarium botanists as showing characters similar to the new taxon. These specimens were collected from Doolgunna Station approximately 140 km north of Meekatharra, and near the Reedys Gold Mine approximately 40 km north of Cue, respectively. These specimens were also examined by KLA staff, and the databased collection points and habitat descriptions were noted as reference points for inclusion in the regional search.

Aerial photography around the recorded locations of these specimens was examined and suitable habitat selected for targeted investigation, based on known habitat preferences of the new taxon. Locations for searches were also chosen from aerial photography around Wiluna West and on the Wiluna North Road.

3.2 FIELD WORK

Four field trips were undertaken:

1. 12-14 April 2010, Martin Henson (KLA) and Rob Davis (DEC);
This first trip focussed on the location of *Sida* sp. (DJ Edinger 5375), collected on Doolgunna Station. Joyner's Find was also targeted to collect material for lodgement with the WA Herbarium.
2. 28 April-1 May 2010, Martin Henson and Dr Vi Saffer (KLA);
This trip revisited the populations on Joyner's Find and Doolgunna Station and recollected flowering and fruiting material at the request of the WA Herbarium. Further populations were also searched for and recorded along the Wiluna North Road and on Ned's Creek Station, and searches were undertaken on GWR tenements between A Ridge and B Ridge.
3. 3-7 August 2010, Martin Henson and Rob Davis;
A major aim of this field trip was to search for the location of *Sida* sp. (AA Mitchell 4149), and to collect adequate material to determine whether it was *Sida* sp. Wiluna (A. Markey and S. Dillon 4126). This location would then become the focus for another field trip if it was warranted.
The population on Doolgunna Station was to be revisited at the request of the WA Herbarium, and further searching carried out in the area.
4. 16-20 August 2010, Martin Henson and Cath Krens (Anders Environmental).
The location of the *Sida* sp. (AA Mitchell 4149) near Cue was to be used as a starting point for further searching in the area, and suitable habitat between Cue and GWR was located and examined.
After discussion with the site Environmental Officers, the Magellan minesite north of Wiluna West was visited and searches conducted for the *Sida* and suitable habitat in that area. Aerial photography had shown potential similarities and continuation of habitat.

4.0 RESULTS

4.1 FIELD SEARCH RESULTS

Field trips are briefly discussed below and population numbers and locations are presented in Table 1. Populations are numbered in Table 1 for reference in text (in brackets), for reasons of scale numbers could not be added to Figures.

Figure 1 shows the locations and results of the searches conducted to the north of Wiluna (1, 2 and 3 below), and Figure 2 shows populations and results at Wiluna West including all records from previous KLA, DEC and Recon Environmental searches and should be viewed in conjunction with the following information.

1. The location of *Sida* sp. (DJ Edinger 5375) was found on the boundary of Doolgunna and Ned's Creek Stations and it was decided that it matched *Sida* sp. Wiluna (A. Markey and S. Dillon 4126). Flowering and fruiting material was collected and pressed and the extent of the population was searched and counted. A population of over 200 individuals was estimated (28), occurring on ironstone gravels. Flowering and fruiting material was also collected from Joyner's Find populations of the *Sida*.
2. Further material from both the Joyner's Find and Doolgunna Station populations was collected at the request of the WA Herbarium. The Doolgunna Station population (28) was investigated further and followed for approximately eight kilometres to the south. The population was found to occur in mulga intergroves and on quartz and ironstone gravels and numbered over 875 individuals. Populations were also recorded on Ned's Creek Station on Wiluna North Road, and further south on the same road. A further six populations were recorded (26, 27, 29, 30, 31, 32) with an estimated 1200 individuals (including 28). Collections were made from these populations but were desiccated due to lack of rainfall (many individuals appeared almost dead) and did not press well leading to their being unsuitable for lodgement with the WA Herbarium.
3. While driving to GWR from Perth, the route was planned to allow a search to be made for *Sida* sp. (AA Mitchell 4149), approximately 40 km north of Cue near the Reedy's gold mine close to Tuckenarra. Following the success of prior searches to the north of GWR and Wiluna, a transect was then driven along the Wiluna North Road from Wiluna to the Great Northern Highway, stopping to inspect suitable habitat and sightings of *Sida* from the vehicle. Several new populations of *Sida* sp. Wiluna (A. Markey and S. Dillon 4126) were recorded along this transect. Access tracks off the main road were also investigated. The populations previously discovered on Ned's Creek (26) was found to be more extensive than originally recorded, extending approximately 4 km to the north, the Doolgunna population (28) on the boundary with Ned's Creek Station was found to extend 2 km to the north. Populations were also recorded along the Wiluna North Road almost to its intersection with the Great Northern Highway approximately 40 km south of Kumarina. A total of twelve new populations (13-22, 24, 25) were recorded. Population (23) is the expansion of the original Ned's Creek discovery. Approximately 1210 individuals were recorded in these populations. All these populations occurred on quartz and ironstone gravels, usually in conjunction with *Acacia* shrubland or scrub.

4. The fourth field trip extended directly to GWR via the Paynes Find-Sandstone Road and the Sandstone-Meekatharra and Ullalla Roads, stopping to investigate sightings of *Sida* in suitable habitat on the way north of Sandstone. All sightings were identified as *Sida ectogama*.

A trip was conducted towards Cue, travelling through Jouno Station to Gidgee and Gabanintha and the Sandstone-Meekatharra Road. Habitat suitable for the targeted *Sida* were traversed and *Sida* species identified in suitable habitat were examined along the way, however all *Sida* encountered was identified as *S. ectogama*.

The location of the AA Mitchell *Sida* in WA Herbarium records was visited but did not match the given habitat description of a breakaway scree slope. The location when found proved to be a hardpan plain with *Acacia* open shrubland. It is suggested that, as the original collection was made in 1995, an error has occurred in conversion of the GPS point to the newer GDA94 datum.

No *Sida* sp. Wiluna (A. Markey and S. Dillon 4126) was recorded at Magellan Metals, as habitat appeared to be unsuitable.

Populations of the *Sida* sp. Wiluna (A. Markey and S. Dillon 4126) were recorded south of Joyners Find on BIF and gravelly slopes (1-9). Attention was turned then to eastern side of Wiluna West ridges and here the targeted *Sida* was recorded in a new habitat, on decaying sandstone mesas in the plains. These are populations 10-13. The discovery of the taxon here further indicates its lack of habitat specificity.

In total, 11 new populations were recorded, ranging in size from over 500 plants to 20+ and containing an estimated 1900 individuals.

Figure 2 shows these populations and all other records of *Sida* sp. Wiluna at Joyners Find in the Wiluna West area. This includes all records in Appendix B; those from KLA searches, drill line inspections, Recon Environmental and DEC work in the area.

Table 1 - Results of Regional Searches for *Sida* sp. Wiluna (A. Markey and S. Dillon 4126)

Area	Pop No.	Date	Location (GDA94)	No.
Joyners Find	1	18/08/2010	26.79889, 119.95277	500+
Joyners Find	2	19/08/2010	26.80132, 119.95289	50+
Joyners Find	3	19/08/2010	26.80304, 119.95385	20+
Joyners Find	4	19/08/2010	26.80327, 119.95276	250+
Joyners Find	5	19/08/2010	26.80391, 119.95829	300+
Joyners Find	6	19/08/2010	26.80782, 119.95807	500+
Joyners Find	7	19/08/2010	26.80756, 119.95653	70+
East of Wiluna West Ridges	8	19/08/2010	26.72977, 119.97649	37
East of Wiluna West Ridges	9	19/08/2010	26.73585, 119.97721	100+
East of Wiluna West ridges	10	19/08/2010	26.74471, 119.97808	50+
Wiluna North Road	11	4/08/2010	25.43641, 119.47770	50+
Wiluna North Road	12	4/08/2010	25.42682, 119.44701	20+
Wiluna North Road	13	4/08/2010	25.44036, 119.50687	10+
Wiluna North Road	14	4/08/2010	25.62138, 119.73632	20+
Wiluna North Road	15	4/08/2010	25.74546, 119.90857	20+
Wiluna North Road	16	4/08/2010	25.77935, 119.96432	50+
Wiluna North Road	17	4/08/2010	25.79827, 119.99472	10+

Ned's Creek Station	18	4/08/2010	25.66868, 119.51247	200+
Ned's Creek Station	19	5/08/2010	25.59375, 119.52746	200+
Doolgunna Station	20	5/08/2010	25.59342, 119.52626	200+
Ned's Creek Station	21	4/08/2010	25.53751, 119.63966	400+
Wiluna North Road	22	5/08/2010	25.44050, 119.50672	30+
Wiluna North Road	23	5/08/2010	25.71783, 119.86264	
Wiluna North Road	24	29/04/2010	25.53781, 119.64026	30+
Wiluna North Road	25	29/04/2010	25.78.27, 119.96508	5
Doolgunna Station	26	29/04/2010	25.61097, 119.52609	875+
Wiluna North Road	27	29/04/2010	25.74289, 119.97868	4
East of Wiluna West Ridges	28	30/04/2010	26.79275, 119.96538	205+
East of Wiluna West Ridges	29	30/04/2010	26.74100, 119.96596	240+
East of Wiluna West Ridges	30	30/04/2010	26.87659, 119.96639	24

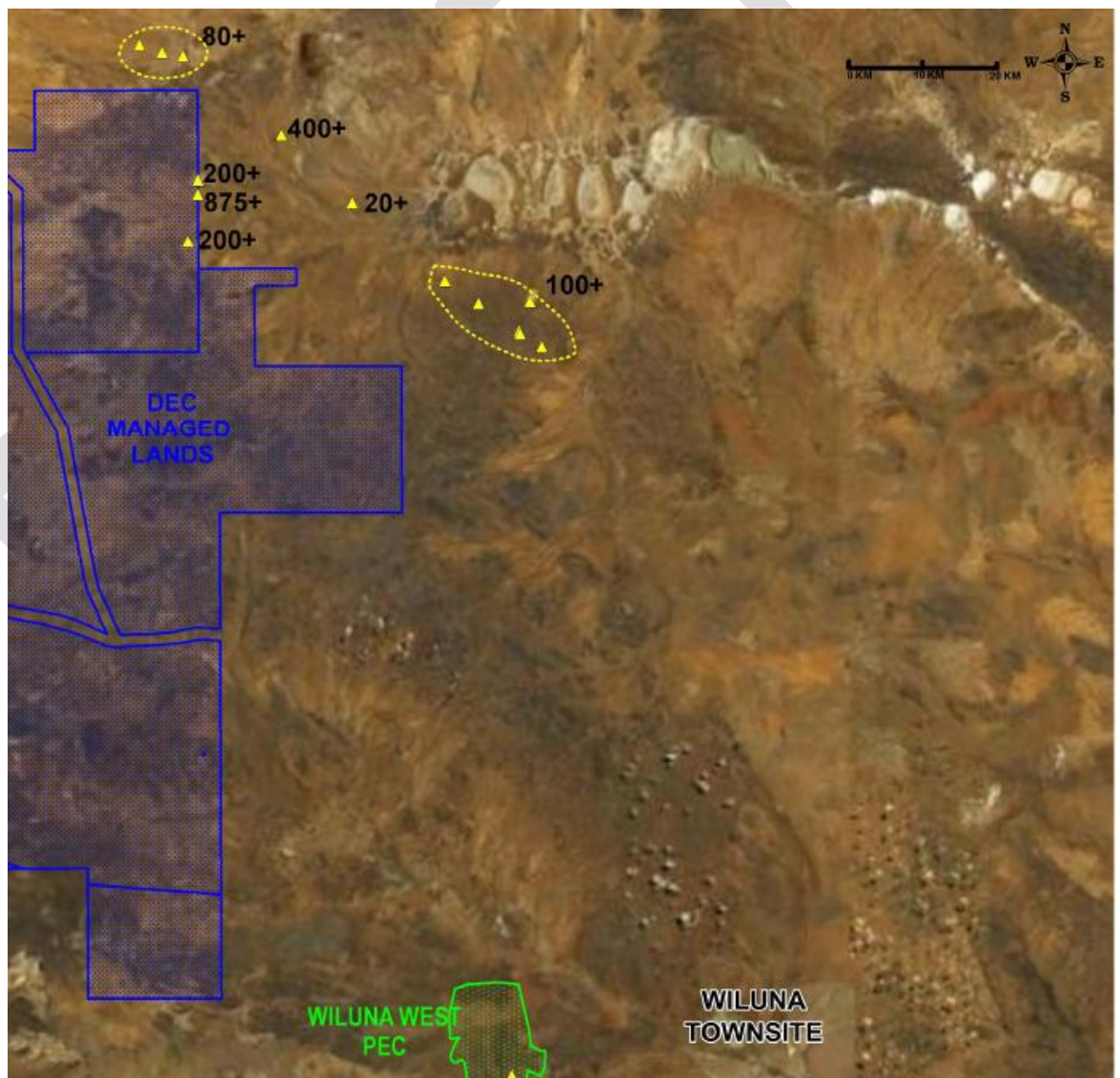


Figure 1 - Populations of *Sida* sp. Wiluna (A. Markey and S. Dillon 4126) to north of Wiluna in relation to Wiluna West

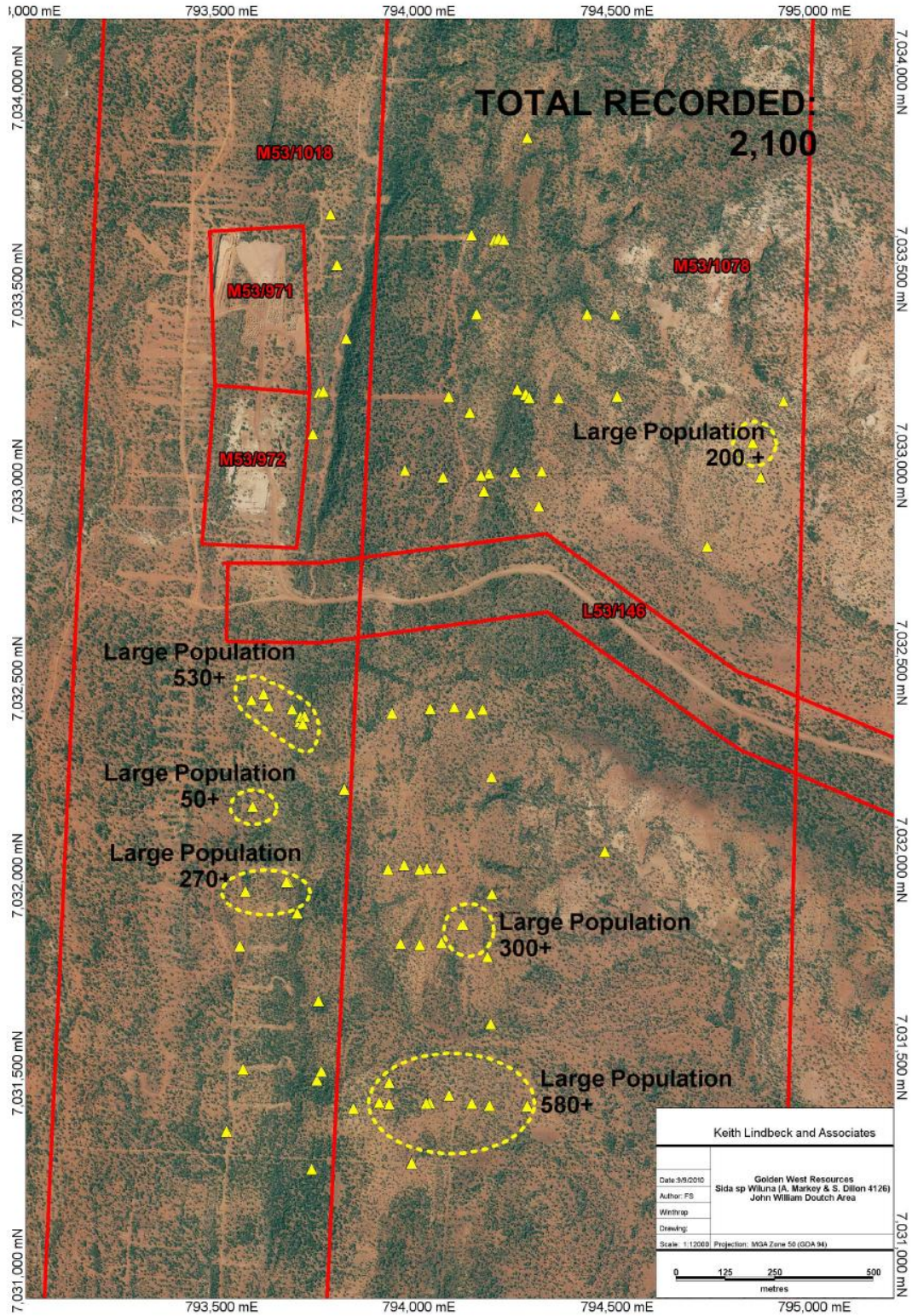


Figure 2 - Population locations and estimated numbers of *Sida* sp. Wiluna (A. Markey and Dillon 4126) at Joyners Find

4.2 SUMMARY OF POPULATIONS RECORDED

JWD Populations

This *Sida* species has been extensively surveyed within the proposed JWD mine footprint area and has been collected on BIF outcropping, midslopes and in the swales between the ridges. Regional *Sida* surveys and various targeted Priority searches (completed by KLA and Recon Environmental) have recorded over 2,100 individuals within this JWD area. The JWD area supports large populations ranging from 20+ to 500 or more individuals (Figure 2).

Approximately 35 plants are located within the proposed JWD mine disturbance footprint.

Wiluna West Sida Populations

The surveys undertaken at the Wiluna West area to date have recorded over 2,550 *Sida* species from 35 populations. Initially, *Sida* was only recorded in SIMS-B and SIMS-M habitat but the distribution of this species has expanded off the main ridges and also now identified as occurring in the OALS, AXSI, BRXS, and infrequently in the SIMS-C and LOMS habitats. These habitats are frequent over the GWR's tenements.

Regional Sida Populations

The Regional *Sida* survey identified over 1,350 individuals from 15 populations (Figure 1). These large populations of *Sida* were recorded 130 km north of the Wiluna West area and on a variety of habitats including BIF, sandy loam and hardpan with ironstone or quartz gravels, intergroves of banded mulga, lateritic gravel and sandstone. This taxon is not restricted to BIF habitat and was found to occur in a variety of vegetation types.

The largest single population of *Sida* was recorded at Doolgunna Station (140 km north of the JWD area). Over 875 individuals were recorded in this area and the population extends along the boundary of Doolgunna Station and the neighbouring Ned's Creek Station. Doolgunna Station is owned by the DEC and is a conservation estate (Figure 1).

The regional *Sida* survey has identified that this taxon is relatively widespread in the Murchison region. KLA have compiled a list of over 4,500 individuals represented in 150 populations in a variety of habitats.

5.0 DISCUSSION

As Table 1 shows and this report presents, *Sida* sp. Wiluna (A. Markey and S. Dillon 4126) is now known from a number of populations and from three widespread and different habitats over an area approximately 200 km long.

Habitats that the *Sida* are known to occur on are;

- Banded Ironstone Formation,
- Ironstone and quartz gravels,
- Sandstone.

The majority of the populations found have been on open plains with ironstone and/or quartz gravels, and records of this taxon on these different substrates show that it is not a habitat specialist as may have been deduced from its original recording by DEC on BIF. It is therefore reasonable to assume that its distribution is greater than originally thought as these three habitat types are widespread and common throughout the Murchison.

The population records presented here have been collected mostly by following existing tracks and roads in the region. This limited form of searching has yielded significant results for the amount of time expended, which is perhaps an indication of the distribution and abundance of this taxon.

Currently the known populations are loosely grouped at the north and south ends of the transects covered during these searches, which have centered on Wiluna West and the Wiluna North Road.

The gap between the known northern and southern extents of this taxon has only been partly searched, along the Wiluna North Road. Mooloogool Station, a DEC reserve adjoining Doolgunna Station to the south, and lies largely to the west of the Wiluna North Road, has not been examined and may yield further populations if searched. No populations have been recorded to the west of Joyners Find, and limited searching has been conducted to the east although this has been successful to date.

Currently KLA has 158 records of populations of this taxon (Appendix B), with the number of individuals approaching 5000. It is possible that, given further searching, some of these may prove to belong to the same population, and that there may be overlap between collections by different collectors, so the figure of 158 may not represent the number of discrete populations. Nevertheless, this figure shows that it is widespread and at least locally common.

Thirty-four of the recorded populations of the *Sida*, those noted by Recon Environmental, were not defined by a count of individuals as this was outside the scope of that work. Therefore, once these recordings are investigated and defined, the total of individuals is expected to be higher.

The drill line surveys conducted by KLA recorded, in many cases, a single individual. These records are of individuals that were recorded in the impact area of the drill line and needed to be avoided. Given the distance between the drill lines it is considered likely that in some cases the *Sida* occurs between them and the records in Appendix B show only parts of a number of populations of greater size, rather than populations in their own right.

The exact number of individual in these populations is not known but is estimated at over 4500. The largest population known so far (875+ individuals) is protected on a DEC

Reserve (Doolgunna Station). This population covers an area of approximately eight kilometres north to south and hundreds of metres across.

Despite the variables that are still undefined (exact distribution, exact number of individuals or populations), these searches have shown that this taxon is relatively widespread in the Murchison region. Given the current state of knowledge of this taxon it is suggested that the Conservation Code of Priority 1 be reviewed.

DRAFT

6.0 REFERENCES

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**APPENDIX A
DIAGNOSTIC CHECKLIST FOR *SIDA* SP. WILUNA (A.
MARKEY AND S.DILLON 4126)**

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The best times to survey for *Sida* are those when the plant has flowering and fruiting material available. I would assume that this would follow good winter rainfall. If fertile material is unable to be collected, I would have some confidence that an experienced observer could determine *Sida* sp. Wiluna (Markey & Dillon 4126) from sterile material. But my preferences are for fruiting and flowering material to be certain and confident in identification.

Sida species in wider Wiluna region

Sida calyxhymeniana

Sida cardiophylla

Sida ectogama

Sida fibulifera

Sida intricata

Sida platycalyx

Sida petrophila

Sida sp. dark green fruits (S. van Leeuwen 2260)

Sida sp. Excedentifolia (J.L. Egan 1925)

Sida sp. Golden calyces glabrous (H.N. Foote 32)

Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)

Sida sp. tiny glabrous fruit (A.A. Mitchell PRP1152)

Sida sp. verrucose glands (F.H. Mollemans 2423)

Species recorded on Herbert Lukin Ridge

Sida ectogama

Sida sp. dark green fruits (S. van Leeuwen 2260)

Sida sp. Excedentifolia (J.L. Egan 1925)

Sida sp. Golden calyces glabrous (H.N. Foote 32)

Sida sp. verrucose glands (F.H. Mollemans 2423)

Sida sp. Wiluna (A. Markey & S. Dillon 4126)

A number of species of *Sida* can be discounted as being mistaken for *Sida* sp Wiluna (A. Markey & S. Dillon 4126), because they are low, scrambling shrubs with very different morphologies. These are: *Sida cardiophylla*, *Sida fibulifera*, *Sida intricata*, *Sida platycalyx*, *Sida* sp. Excedentifolia (J.L. Egan 1925), *Sida* sp. Golden calyces glabrous (H.N. Foote 32), *Sida* sp. tiny glabrous fruit (A.A. Mitchell PRP1152) and *Sida* sp. verrucose glands (F.H. Mollemans 2423)

This leaves *Sida calyxhymeniana*, *Sida ectogama*, *Sida petrophila*, *Sida* sp. dark green fruits (S. van Leeuwen 2260) and *Sida* sp. spiciform panicles (E. Leyland s.n. 14/8/90) as being similar to (in some respects) and possibly confused with *Sida* sp. Wiluna (A. Markey & S. Dillon 4126)

Brief description and characters

Sida sp Wiluna (A. Markey & S. Dillon 4126) is a densely branched ("twiggy"), rounded shrub c. 1.0 m in height.

The leaves are distinctly discolourous, with dark green adaxial surface and white-golden abaxial leaf surfaces. Older leaves can become brown-red in colour on their adaxial surfaces. The abaxial leaf surface is densely stellate-hairy, and shorter stellate hairs cover the adaxial surface. Leaf apices are distinctly truncate and blunt or emarginate, with a small, blunt leaf tip mucro associated with the midrib extending beyond the leaf apex by c. 0.5 mm. Leaves are linear-elliptic and the leaf lamina margins are entire.

Sida sp. Wiluna has a robust, densely-branched, shrubby growth form which resembles that of *Sida calyxhymeniana* and *Sida ectogama*. Therefore, *Sida* sp. Wiluna (Markey & Dillon 4126) could be easily confused with the latter two taxa based on similarities in growth form and leaf morphology.

Sida calyxhymenia has a distinctive indumentum of white and dark green stellate hairs on the leaves, stems and (notably) calyx. Such dark green stellate hairs are absent in *Sida* sp. Wiluna (Markey & Dillon 4126), which only has white and golden stellate hairs. The leaf margins are variable – from entire to serrulate or crenulated, and the leaves are often much larger (longer) than *Sida* sp. Wiluna (Markey & Dillon 4126).

Sida ectogama co-occurs with *Sida* sp. Wiluna (A. Markey & S. Dillon 4126), and is a widespread species through the midwest region of Western Australia. *Sida* sp. Wiluna (A. Markey & S. Dillon 4126) is distinguished from *Sida ectogama* by having truncate leaf apices and entire leaf margins. The leaf margins of *Sida ectogama* are consistently crenulate and the leaf apices more acute and lacking a small (< 0.05 mm) blunt mucro which can be often found at the leaf tips of *Sida* sp. Wiluna (A. Markey & S. Dillon 4126). The leaves of *Sida ectogama* tend to be more elliptic and broader than *Sida* (A. Markey & S. Dillon 4126).

The flowers of *Sida ectogama* are relatively larger (10 - 15 mm) than *Sida* sp. Wiluna and very different in morphology. The flowers of *Sida ectogama* are distinctly and obviously bisexual. On the male flowers, the staminal column is characteristically short and the staminal filaments very long and greatly exerted. In the female flowers, the staminal column is long, but the style arms are very long and exerted. The flowers of *Sida ectogama* are larger, and the margins of the corolla lobes notably ciliate and emarginate.

Sida sp. dark green fruit (S. van Leeuwen 2260) is a low, often sprawling and spreading shrub, with narrowly oblong, discolourous leaves. This taxon differs from *Sida* sp. Wiluna in more lax branching habit, and differences in leaf shape and indumentum. The leaves of *Sida* sp. dark green fruit (S. van Leeuwen 2260) are linear – narrowly linear and vary in length. They have been described as truncate by Barker (2007), but not as truncate-emarginate as those in *Sida* sp. Wiluna (Markey & Dillon 4126) and what I have seen may be more described as acute.

Sida petrophila has dark green stellate hairs, like *Sida calyxhymeniana*. *Sida petrophila* doesn't form twiggy, robust shrubs like *Sida* sp. Wiluna (Markey & Dillon 4126). *Sida petrophila* has a characteristic presence of green stellate hairs and a lax, few-branched habit. The leaves are linear and usually (minutely) crenulate-serrulate. *Sida* sp. spiciform panicles (E. Leyland s.n. 14/8/90) has leaves similar to those of *Sida petrophila*, but lacking the green stellate hairs.

Species	shrub height (m)/description	leaf width (mm)	Leaf length (mm) / shape	Leaf colour
<i>Sida</i> sp. Wiluna	Twiggy, compact shrub to 1-(1.5)	(3) 4 – 8 (9)	13 – 20 Linear – narrowly oblong - elliptic	Distinctly discolorous
<i>Sida ectogama</i>	Twiggy, compact shrub to 1 - 2	5 - 8	10 – 15 Elliptic	Discolorous
<i>Sida calyxhymeniana</i>	Twiggy, dense bush – sparse twiggy erect shrub – 0.5 – 1.0	6 - 15	20 – 55 Linear - narrowly oblong	Concolorous
<i>Sida petrophila</i>	Sparse erect twiggy subshrub 0.5 – 1.0	8 – 20	15 – 40 Linear	Concolorous
<i>Sida</i> sp dark green fruits (S. van Leeuwen 2260)	Sprawling, low subshrub 0.2 - 0.5	(3) 4 – 6	35 – 50 Narrowly oblong – linear	Distinctly discolorous

All values taken from a small sample of herbarium specimens at PERTH – so values are not from exhaustive survey but quick assessment of variation.

Species	Stellate hair colour	Leaf Indumentum	Leaf margin	Leaf apex
<i>Sida</i> sp. Wiluna	White/gold	Dense, flattened hairs on adaxial surface	Entire	Truncate, emarginate
<i>Sida ectogama</i>	White/gold	Dense, short hairs on adaxial surface	Crenulate	Acute - truncate
<i>Sida calyxhymeniana</i>	White and dark green	Scurfy stellate hairy on both surface	Crenulate or serrulate	Acute
<i>Sida petrophila</i>	White and dark green	Scurfy stellate hairy on both surface	Crenulate - crenate	Acute
<i>Sida</i> sp dark green fruits (S. van Leeuwen 2260)	white	Glands on adaxial surface, dense-sparsely stellate hairy	Crenulate – serrulate or entire	Acute

APPENDIX B
***Sida* sp. Wiluna (A Markey and S. Dillon 4126) records**

Date	Collectors	Coll No.	Name	Location (GDA94)	Soil	Landform	Notes
18/08/2010	M Henson & C Krens	MHCK103	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79889, 119.95277	Sandy loam with quartz and ironstone gravels	S facing slope	Pop of 500+ in Acacia open scrub
19/08/2010	M Henson & C Krens	MHCK106	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.80132, 119.95289	Sandy loam with quartz and ironstone gravels	S facing slope	Pop of 50+ in Acacia open scrub
19/08/2010	M Henson & C Krens	MHCK107	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.80304, 119.95385	Sandy loam with quartz and ironstone gravels	S facing slope	Pop of 20+ around DEC site WILU039
19/08/2010	M Henson & C Krens	MHCK108	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.80327, 119.95276	Sandy loam with quartz and ironstone gravels and patches of BIF	S facing slope	Pop of 250+ in Acacia open scrub/tall woodland and on bare BIF
19/08/2010	M Henson & C Krens	MHCK109	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.80391, 119.95829	Sandy loam with quartz and ironstone gravels and patches of BIF	Ridge	Pop of 300+ in Acacia open scrub/tall woodland and on bare BIF
19/08/2010	M Henson & C Krens	MHCK110	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.80464, 119.95894	Sandy loam with quartz and ironstone gravels and patches of BIF	Ridge	part of MHCK109 population
19/08/2010	M Henson & C Krens	MHCK111	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.80782, 119.95807	Sandy loam with ironstone gravel	Crest and S facing slope	Pop of 500+ in Acacia shrubland
19/08/2010	M Henson & C Krens	MHCK113	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.80756, 119.95653	Clay loam with BIF outcrop and ironstone gravel	Ridge	Pop of 70+ in mulga shrubland
19/08/2010	M Henson & C Krens	MHCK114	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.72977, 119.97649	Sandstone mesa, in sand and rock, possibly slightly saline	Crest and slope	Pop of 37, stunted
19/08/2010	M Henson & C Krens	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.73585, 119.97721	Sandstone mesa, in sand and rock, possibly slightly saline	Crest and slope	100+
19/08/2010	M Henson & C Krens	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.74471, 119.97808	Sandstone mesa, in sand and rock, possibly slightly saline	Crest and slope	50+
4/08/2010	R Davis and M Henson	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	25.43641, 119.47770	Sandy loam with quartz and ironstone gravels	Stoney plain	50+
4/08/2010	R Davis and M Henson	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	25.42682, 119.44701	Sandy loam with quartz and ironstone gravels	Stoney plain	20+
4/08/2010	R Davis and M Henson	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	25.44036, 119.50687	Sandy loam with quartz and ironstone gravels	Stoney plain	10+
4/08/2010	R Davis and M Henson	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	25.62138, 119.73632	Sandy loam with quartz and ironstone gravels	Stoney plain	20+
4/08/2010	R Davis and M Henson	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	25.74546, 119.90857	Sandy loam with quartz and ironstone gravels	Stoney plain	20+
4/08/2010	R Davis and M Henson	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	25.77935, 119.96432	Sandy loam with ironstone gravels	Stoney plain	50+
4/08/2010	R Davis and M Henson	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	25.79827, 119.99472	Sandy loam with ironstone gravels	Stoney plain	10+
4/08/2010	R Davis and M Henson	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	25.66868, 119.51247	Sandy loam with quartz and ironstone gravels	Stoney plain	200+
5/08/2010	R Davis and M Henson	RD11486	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	25.59375, 119.52746	Sandy loam with quartz and ironstone gravels	Stoney plain	200+
5/08/2010	R Davis and M Henson	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	25.59342, 119.52626	Sandy loam with quartz and ironstone gravels	Stoney plain	200+ between here and Coppermine Road
4/08/2010	R Davis and M Henson	RD11476, RD11477	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	25.53751, 119.63966	Sandy loam with quartz and ironstone gravels	Stoney plain	400+ over 60ha
5/08/2010	R Davis and M Henson	RD11480	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	25.44050, 119.50672	Sandy loam with quartz and ironstone gravels	Stoney plain	30+
5/08/2010	R Davis and M Henson	RD11481	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	25.71783, 119.86264	Sandy loam with quartz and ironstone gravels	Stoney plain	
29/04/2010	M Henson and V Saffer	No coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	25.53781, 119.64026	Sandy loam with ironstone gravel	Stoney plain	30+
29/04/2010	M Henson and V Saffer	No coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	25.78.27, 119.96508	Sandy loam with ironstone gravel	Stoney plain	5
29/04/2010	M Henson and V Saffer	No coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	25.61097, 119.52609	Sandy loam with ironstone gravel	Stoney plain	875+
29/04/2010	M Henson and V Saffer	No coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	25.74289, 119.97868	Sandy loam with ironstone gravel	Stoney plain	4
30/04/2010	M Henson and V Saffer	No coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79275, 119.96538	Sandy loam with ironstone gravel	Stoney plain	205+
30/04/2010	M Henson and V Saffer	No coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.74100, 119.96596	Sandy loam with ironstone gravel	Stoney plain	240+
30/04/2010	M Henson and V Saffer	No coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.87659, 119.96639	Sandy loam with ironstone gravel	Stoney plain	24
ND	Recon Environmental	JFH13	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.80958, 119.95461			pnd (population not defined)
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.80939, 119.95715			pnd
ND	Recon Environmental	JFH11	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.80876, 119.95242			pnd
ND	Recon Environmental	JFH07	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.80574, 119.95469			pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.80734, 119.95480			pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.80217, 119.96186			pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.80089, 119.95521			pnd
ND	Recon Environmental	JFH03	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.80051, 119.95893			pnd

ND	Recon Environmental	JFH104	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79513, 119.96429		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79431, 119.95998		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79399, 119.95857		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79352, 119.96561		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79176, 119.96614		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.78772, 119.95453		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.78077, 119.93510		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.77749, 119.93264		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.77417, 119.93794		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.77404, 119.93883		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.77405, 119.93806		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.77389, 119.93841		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.77372, 119.93011		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.77425, 119.96499		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.74410, 119.96227		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.74103, 119.96679		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.72461, 119.96776		pnd
ND	Recon Environmental	JFH121	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.71492, 119.98179		pnd
ND	Recon Environmental	JFH120	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.71355, 119.98196		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.78586, 119.93395		pnd
ND	Recon Environmental	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.72456, 119.97058		pnd
ND	Recon Environmental	JFH123	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.69635, 119.95370		pnd
ND	Recon Environmental	JFH127	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.78586, 119.95946		pnd
ND	Recon Environmental	JFH126	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79220, 119.95816		pnd
ND	Recon Environmental	JFH122	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.71415, 119.98080		pnd
ND	Recon Environmental	JFH137	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.86330, 119.94262		pnd
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79277, 119.9542		12
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.7918, 119.95433		1
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79177, 119.95444		8
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.78812, 119.95809		1
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.78821, 119.95867		2
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.78817, 119.95879		2
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.7882, 119.95893		2
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.78985, 119.9618		1
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.78987, 119.96108		1
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.78992, 119.95828		3
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79182, 119.95763		1
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79162, 119.95935		1
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79172, 119.95957		1
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.7918, 119.95966		1
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79179, 119.96041		2
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79172, 119.9619		1

ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79351, 119.96002		1
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79353, 119.95935		1
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79358, 119.9586		1
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79363, 119.95848		1
ND	KLA	No Coll	Sida sp. Wiluna (A. Markey and S. Dillon 4126)	26.79369, 119.95754		1
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Attachment 8B. Targeted Malleefowl survey



GWR GROUP LIMITED

GOLDEN MONARCH PROJECT- **TARGETED MALLEEFOWL SURVEY**



April 2019

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1.0 INTRODUCTION

1.1 BACKGROUND

GWR Group Limited (GWR) proposes to develop the Golden Monarch gold deposit at their Wiluna West Project which is located approximately 35 km southwest of the town of Wiluna (Figure 1). The Project comprises eight iron ore deposits over the two Banded Iron Formation (BIF) ridges (Ridges B and C as classified by GWR). Gold deposits are known to occur in the swales between the BIF ridges, with Golden Monarch located in between the B and C ridges (Figure 2).

Previous fauna surveys completed at the Wiluna West Project has identified the occurrence of Malleefowl (*Leipoa ocellata*) (Ninox 2006; KLA 2012). The Malleefowl (*Leipoa ocellata*) is classified as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* and Vulnerable under the State's *Biodiversity Conservation Act 2016*.

GWR's current clearing permits (CPS 4006/2 and CPS 6726/1) contain conditions requiring completion of targeted Malleefowl surveys prior to any clearing activities. Although no Malleefowl mounds have been recorded in proximity to the Golden Monarch Project area, GWR engaged the Indigenous Martu Women from Wiluna to undertake a targeted Malleefowl survey of the proposed Golden Monarch Project area.

1.2 OBJECTIVES

The objective of this targeted Malleefowl survey was to assess the occurrence of Malleefowl in the proposed Golden Monarch Project area, specifically to:

- assess the suitability of habitat for Malleefowl use;
- identify any nesting mounds – size, age and evidence of recent use; and
- identify secondary signs of Malleefowl or direct sightings i.e. tracks, recently moulted feathers and scats.

1.3 MALLEEFOWL

1.3.1 Description of the Species

Malleefowl (*Leipoa ocellata*) (Gould, 1840) are large ground dwelling birds belonging to the Megapodiidae family. This species belongs to a small group of mound builders where the mound is used as an external heat source to incubate their eggs (Clark 1964). The Malleefowl is a long-lived sedentary species with an average lifespan of roughly 15 years. Reaching approximately 60cm in height and 1.5 - 2kg in weight, they are roughly the size of a small turkey (Benshemesh 2005). They have a unique appearance with a distinctly barred upper body of grey, white, black, buff and pale chestnut feathers, with a crest extending from the front of the crown to the nape which is raised when the bird is alarmed (DEE 2018; Pizzey and Knight 1999) (Figure 3).

1.3.2 General Ecology

The Malleefowl is a species which occupies semi-arid to arid regions of Western Australia, inhabiting dense shrublands and thickets of Mallee (*Eucalyptus spp.*), Boree (*Melaleuca lanceolata*), Bowgada (*Acacia linophylla*), or areas which form dense leaf litter (Johnstone and Storr 1998). Malleefowl prefer habitat that is long unburnt for breeding and shelter. However Malleefowl will feed in recently burnt areas (Benshemesh 1992, Marchant and Higgins 1993).

The Malleefowl builds mounds that utilise heat from the sun and composting vegetation to incubate their eggs. Most heat is generated from the fermentation of vegetative

material used to create the mound, along with solar energy used later in the season as the leaf litter dries out (Johnstone and Storr, 1998). The size of Malleefowl mounds vary. However, an average mound spans 5 m in diameter and can be up to 1 m high (DEC 2010) (Figure 4).

Malleefowl are usually solitary and occupy a home range of between 0.5 and 4.6 km (Benshemesh 1992). Established monogamous breeding pairs usually inhabit a similar area throughout the year and come together for breeding. While both sexes build the mound, once the female has laid the eggs, the male usually maintains the mound on his own. Birds generally breed annually (Marchant and Higgins 1993) with the breeding season lasting 11 months. Following mound preparation, eggs are laid from mid-August to late January and hatchlings appear from November and January (Johnstone and Storr 1998). The precocial chicks are independent from hatching having no contact with either their parents or siblings (van der Waag 2007). While fifty to eighty-five percent of eggs hatch (Firth 1959), generally more than 80% of chicks die within the first few weeks of life from predation and 'metabolic stress' (Priddel and Wheeler 1994).

Malleefowl feed opportunistically and will often feed on whatever food sources are abundant in the area (van der Waag 2007). Their omnivorous diet can consist of seeds, native herbs, flower buds, fruits and foliage of different plant species, as well as invertebrates. This species will drink water and can easily survive during summer when surface water is unavailable (DBCA 2018).

1.3.3 Distribution

Originally, Malleefowl were widespread and common across the southern arid and semiarid zone, however the species has now become patchily distributed due to the effects of habitat clearing and fox predation (Johnstone and Storr 1998). Unlike other megapods that prefer damp forest, the Malleefowl does not inhabit the higher rainfall area of the Swan Coastal Plain and south coast of Western Australia (Figure 5).

1.3.4 Conservation Status

The Malleefowl is protected under Federal and State legislation - it is classified as Vulnerable: "Taxa facing a high risk of extinction in the wild in the medium-term future" under the Federal *Environmental Protection and Biodiversity Conservation (EPBC) Act 1999* and is listed as Vulnerable "species considered to be facing a high risk of extinction in the wild in the medium term future" under the Western Australian *Biodiversity Conservation Act 2016*.

The Malleefowl is also listed as Vulnerable on the 2019 IUCN Red List of Threatened Species.



Figure 1: Location of Wiluna West Project (regional)

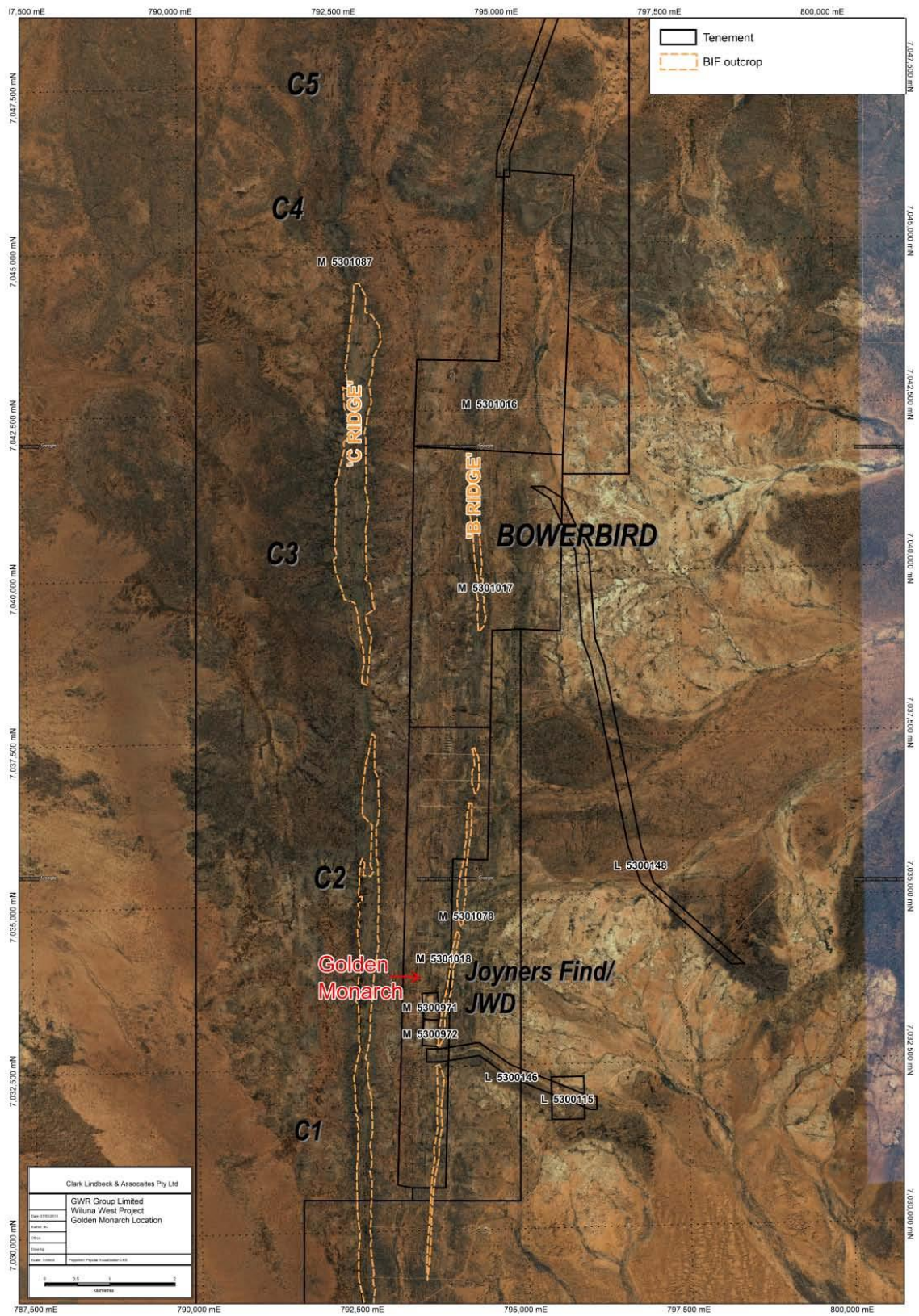


Figure 2: Location of the Golden Monarch Deposit at Wiluna West



Figure 3: Adult Malleefowl (*Leipoa ocellata*)



Figure 4: Malleefowl Mound (South-west WA)
(source: Jiri Lochman/Lochman Transparencies)

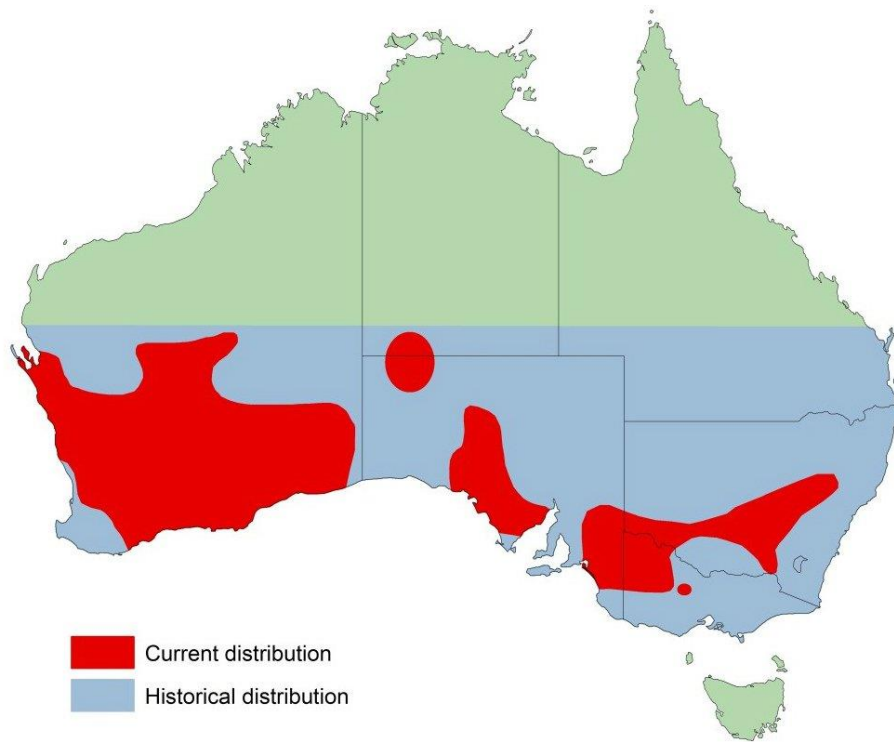


Figure 5: Distribution of Malleefowl

2.0 PROJECT CONTEXT

2.1 REGIONAL VEGETATION

The Interim Biogeographic Regionalisation for Australia (IBRA) divides the Australian continent into 89 bioregions and 419 subregions (DEE, 2017). The project is located within the Murchison Region and is characterised by undulating hills, with occasional ranges of low hills and extensive sand plains in the eastern half. The principal soil type is shallow earthy loam overlying red-brown hardpan, shallow stony loams on hills and red earthy sands on sand plains (Beard, 1990).

The Wiluna West Project Area is located within the Austin Botanical District in the Eremaean Province and lies within the East Murchison IBRA sub-region which covers an area of 211,350 ha (Beard, 1990). Vegetation throughout this area is Mulga woodlands often rich in ephemerals, hummock grasslands, saltbush shrublands and *Halosarcia* shrublands.

The Golden Monarch project area is located within Beard (1979) vegetation group, Shrublands; mulga and *Acacia quadrimarginea* scrub (Vegetation association 202).

2.2 PROJECT VEGETATION

A number of vegetation and flora surveys have been undertaken at the Wiluna West Project between 2005 and 2018. These include:

- Vegetation & flora survey undertaken on M53/1016 and L53/148 – Jims Seeds, Weeds & Trees (now Botanica Consulting), September 2005.
- Vegetation and flora survey of the haul road from the project site to the Northern Goldfields Highway – Jims Seeds, Weeds & Trees (now Botanica Consulting), December 2006.
- Vegetation & flora survey of 92 20m x 20m quadrats on Units A, B & C – Botanica Consulting, July 2006.
- Vegetation & flora survey of 50 20m x 20m quadrats on Units A, B & C – DEC, August 2006. Survey focused more on ridges and uplands in the area than the plains between the ridges.
- Vegetation and flora survey of the Bowerbird project and related haul road – Botanica Consulting, March-April 2007.
- Flora and Vegetation Survey of Four Proposed Gravel Pits (no longer to be utilised) – on M53/1087 and at intersection of L53/148 and Ullala Road - Botanica Consulting, April 2007.
- Flora survey and mapping of vegetation on Ridges A, B & C – Botanica Consulting, 24 February- 1 March 2008.
- Vegetation survey of Wiluna West Project (including mapping native vegetation communities of project area -12,647 ha) – Recon Environmental, March-June 2009.
- Targeted regional searches for *Sida picklesiana* (formerly *Sida* sp. Wiluna (A Markey and S Dillon 4126)) - Keith Lindbeck & Associates (in conjunction with WA Herbarium), August 2010.
- Variety of targeted Priority flora surveys for proposed exploration within E53/1114, E53/1116, E53/1173, M53/1016, M53/1017, M53/1018, M53/1078) – Botanica Consulting, Keith Lindbeck & Associates, Recon Environmental 2007 to 2011.

- Targeted Priority flora survey of the three deposits that will be mined in the first 10 years of operations (Bowerbird, C3 and C4) - Native Vegetation Solutions, November 2011.
- Targeted Priority flora survey of the proposed Golden Monarch disturbance footprint – Native Vegetation Solutions, August 2018.

Recon (2010) identified 29 vegetation communities within the entire Wiluna West Project area (Table 1, Figure 6). These vegetation communities on the BIF were grouped into six main types following Markey and Dillon's (2009) descriptions of the communities (based on floristic composition) at the project (Table 1).

Previous assessments of the occurrence of active and inactive Malleefowl mounds with vegetation communities recorded at the Wiluna West Project suggest that preferred habitat are the MSET (Mulga Shrubland over *Eremophila forrestii* and *Triodia* on lateritic soils) and ASET (Acacia shrubland over *Eremophila* and *Triodia*) vegetation communities as defined by Recon (2009).

Table 1: Vegetation units identified at the project

Vegetation Unit (Recon 2010)		Vegetation Unit Description (Recon 2010)	Vegetation Unit Description (DBCAs - Markey & Dillon 2009)
SIMS-B	Stony Ironstone Mulga Shrublands on rocky slopes and crests, frequently on BIF	SIMS-B can be described as an <i>Acacia aneura</i> var. <i>microcarpa</i> shrubland with <i>Grevillea berryana</i> occurring on rocky outcrops usually on banded iron formation (BIF).	TYPE 1: found on crests and steeper upper slopes; described as a sparse open tall shrubland of <i>Acacia aneura</i> cf. var. <i>microcarpa</i> , <i>Grevillea berryana</i> and less commonly, <i>Acacia quadrimarginea</i> over <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Prostanthera campbellii</i> , above <i>Ptilotus obovatus</i> , <i>Sida</i> sp. Golden calyces glabrous, <i>Sida</i> sp. <i>Excedentifolia</i> , <i>Ptilotus schwartzii</i> , <i>Cheilanthes brownii</i> , with <i>Eriachne helmsii</i> , <i>E. mucronata</i> , and <i>Monachather paradoxus</i> .
ASET*	Acacia shrubland over Eremophila and Triodia	ASET is a mixed Acacia shrubland generally comprised of <i>Acacia aneura</i> over mid to low shrubs including <i>Eremophila punctata</i> , <i>E. latrobei</i> , <i>E. forrestii</i> , over <i>Triodia melvillei</i> .	TYPE 2: located on flat summit surfaces on ridge tops, and on the undulating pediments and valley floors off the main ridges. It encompasses mosaics of <i>Acacia</i> over <i>Triodia</i> grasslands or low myrtaceous- <i>Eremophila</i> shrublands, with isolated mallees of <i>Eucalyptus kingsmillii</i> subsp. <i>kingsmillii</i> .
LOMS	Low Open Myrtaceae Shrubland	LOMS is a low open shrubland, usually dominated by <i>Aluta maisonneuvei</i> subsp. <i>auriculata</i> , and tending to have very sharp boundaries with the surrounding Acacia shrublands.	
SIMS-C	Stony Ironstone Mulga Shrublands on rocky slopes and crests	SIMS-C is a commonly occurring upland habitat associated with ironstone or laterite; dominated by <i>Acacia aneura</i> var. <i>microcarpa</i> .	TYPE 3: usually found on pediments, lower slopes and slightly low outcrops of weathered BIF and other metasediments, quartz and ultramafic lithologies, usually obscured by colluvium. It consists of <i>Acacia aneura</i> , and less frequently <i>Acacia balsamea</i> and <i>A. cuthbertsonii</i> subsp. <i>cuthbertsonii</i> tall open shrublands over shrubs including <i>Scaevola spinescens</i> , <i>Senna artemisioides</i> subsp. <i>helmsii</i> , <i>Eremophila flabellata</i> , and scattered <i>Maireana convexa</i> , <i>M. georgei</i> , and <i>Ptilotus obovatus</i> .
UAET	Undulating lateritic slopes of Acacia over low Eremophila and Triodia	Low shrubland occurring on undulating lateritic low hills dominated by <i>Eremophila jucunda</i> subsp. <i>jucunda</i> and <i>Triodia melvillei</i> with scattered tall shrubs of <i>Acacia aneura</i> .	
SUAE	Stony undulating slopes of Acacia <i>rhodophloia</i> over Eremophila and low shrubs	Shrubland dominated by <i>Acacia rhodophloia</i> frequently over <i>Eremophila jucunda</i> subsp. <i>jucunda</i> with <i>E. latrobei</i> subsp. <i>latrobei</i> and <i>E. punctata</i> , and also <i>Aluta maisonneuvei</i> subsp. <i>auriculata</i>	
SAEC	Stony Acacia <i>rhodophloia</i> and <i>Eremophila congesta</i> (P1) Shrubland occurring on crests	It is a shrubland dominated by <i>Acacia rhodophloia</i> over <i>Eremophila congesta</i> (P1) with <i>E. latrobei</i> subsp. <i>latrobei</i> and <i>E. punctata</i> , and on occasion <i>Triodia melvillei</i> only occurring on the crests of hills	
OALS	Open Acacia Shrubland on ironstone or laterite over low scattered shrubs	OALS is a varying habitat generally dominated by <i>Acacia quadrimarginea</i> and/or <i>A. balsamea</i> (P4) and frequently occurs on lateritic low rises; low outcrops of weathered BIF; rough quartz slopes; and upper breakaway surfaces.	
OALS-S	Open Acacia Shrubland on ironstone or laterite over low scattered shrubs – southern C Ridge	Generally dominated by <i>Acacia quadrimarginea</i> with <i>Acacia aneura</i> over <i>Scaevola spinescens</i> , <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Ptilotus obovatus</i> and <i>E. flabellata</i>	
AXSI	Acacia Mixed Shrubland on Stony Ironstone Slopes	Generally dominated by <i>A. balsamea</i> (P4) with <i>Acacia cuthbertsonii</i> subsp. <i>cuthbertsonii</i> and <i>A. aneura</i> above <i>Scaevola spinescens</i> , <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Ptilotus obovatus</i> and <i>Senna artemisioides</i> subsp. <i>helmsii</i>	
SXSS	Scattered Mixed Shrubland on Low Stony Rises	SXSS is an open, scattered shrubland dominated by <i>Acacia</i> species occurring on stony ironstone.	
SAES	Stony Acacia Eremophila Shrubland	An open <i>Acacia aneura</i> shrubland on stony red earth over scattered <i>Eremophila</i> spp., <i>Sida ectogama</i> , <i>Ptilotus obovatus</i> , and <i>P. schwartzii</i>	
DRAS	Drainage Tract Acacia Shrubland	Scattered to close tall shrubland, sometimes woodland with understorey development inversely related to upper storey cover	
USCS	Upland Small Chenopod Species Shrubland	Open <i>Acacia aneura</i> shrubland on stony red earth over scattered <i>Ptilotus obovatus</i> , <i>Maireana</i> spp., <i>Sclerolaena</i> spp., and <i>Tecticornia</i> spp.	
SIME	Stony Ironstone Mulga with <i>Eremophila forrestii</i> Shrubland	Commonly occurring mulga shrubland dominated by <i>Acacia aneura</i> var. <i>microcarpa</i> , above <i>Eremophila forrestii</i> often with <i>E. punctata</i> , <i>E. flabellata</i> and <i>E. jucunda</i> subsp. <i>jucunda</i>	TYPE 4: consists of a tall open shrubland of <i>Acacia aneura</i> and <i>A. tetragonophylla</i> , occasionally with isolated emergent trees of <i>Acacia pruinocarpa</i> , over a mosaic of shrubland and chenopods.
SMEC	Stony Slopes Mulga <i>Eremophila congesta</i> (P1) Shrubland	Occurs along the lower slopes of hills in the north and east of the survey area and is dominated by <i>Acacia aneura</i> var. <i>microcarpa</i> above <i>Eremophila congesta</i> (P1), often with emergent <i>Acacia pruinocarpa</i>	
MSET*	Mulga Shrubland over <i>Eremophila forrestii</i> and Triodia	MSET occurs on the lateritic soils, it is dominated by <i>Acacia aneura</i> var. <i>microcarpa</i> , above <i>Eremophila forrestii</i> often with <i>E. jucunda</i> subsp. <i>jucunda</i> over <i>Triodia melvillei</i>	
SIMS-M	Stony Ironstone Mid-slope Mulga Shrubland	A mid-slope habitat associated with iron rich outcrops dominated by <i>Acacia aneura</i> var. <i>microcarpa</i> , with scattered <i>A. pruinocarpa</i>	TYPE 5: found on lower slopes, pediments and valley flats. It is a tall <i>Acacia aneura</i> shrubland often with a canopy of <i>A. pruinocarpa</i> over <i>Eremophila forrestii</i> , <i>E. latrobei</i> , <i>Senna</i> spp., <i>Eremophila flabellata</i> , <i>Rhagodia eremaea</i> , <i>Sida ectogama</i> , <i>Ptilotus obovatus</i> , with <i>P. schwartzii</i> , <i>Sida</i> sp. <i>Excedentifolia</i> and <i>Monachather paradoxa</i> .
BCLS	Breakaway Footslope Chenopod Low Shrubland	Generally comprised of a low scattered shrubland generally dominated by chenopod species	TYPE 6: generally located mid-slope, associated with massive haematite-enriched outcrops; it can be summarized as consisting of <i>Acacia aneura</i> cf. var. <i>microcarpa</i> and occasionally <i>A. pruinocarpa</i> over <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Dodonaea petiolaris</i> , <i>Eremophila flabellata</i> , <i>Sida</i> sp. Wiluna, (Markey and Dillon 4126) [<i>Sida picklesiana</i> (ms) (Markey et al. 2011) and less frequently <i>Ptilotus rotundifolius</i> , <i>Eremophila jucunda</i> subsp. <i>jucunda</i> , <i>Harnieria kempeana</i> subsp. <i>muelleri</i> .
			NS

Vegetation Unit (Recon 2010)		Vegetation Unit Description (Recon 2010)	Vegetation Unit Description (DBCA- Markey & Dillon 2009)
BRXS	Breakaway Mixed Shrublands	Generally a scattered <i>Acacia</i> spp. shrubland above <i>Eremophila</i> spp., <i>Ptilotus obovatus</i> , with <i>Scaevola spinescens</i> , and often with emergent <i>Eucalyptus carnei</i> near the footslope edges of the breakaway scarp	NS
CBKW	Creek Bank Woodland or Shrubland	Creek beds are characteristically between 20 and 50m wide and up to 4m deep, incised into hardpan. The vegetation fringing the creeklines often consists of a moderately close mulga woodland or tall shrubland	NS
MUWA	Mulga Wanderrie Grassy Shrubland	MUWA is generally a scattered mulga shrubland over wanderrie grasses	NS
HPMD	Hardpan Plain Mulga Woodland - Drainage	Mulga woodland with a poorly developed low and mid shrub strata occupying the lowest part of the landscape	NS
HPMS	Hardpan Plain Mulga Shrubland	Usually a scattered to moderately close tall mulga shrubland with a well-developed low and mid shrub strata	NS
MUBW	Hardpan Plain Mulga & Bowgada Shrubland	Scattered to moderately close tall shrubland (<i>Acacia 113 ramulosa</i>), but it is occasionally dominated by mid shrub (<i>Acacia 113 ramulosa</i> , with <i>Eremophila forrestii</i>) or tree strata	NS
GRMU	Hardpan Plain Mulga Grove	Mulga groves are often moderately close to closed tall shrublands, or less frequently low woodlands	NS
SAMA	Sandplain Mallee Spinifex Hummock Grasslands	SAMA occurs on deep red sandy soils and consists of <i>Triodia</i> grasslands interspersed with mallee	NS
SAMU	Sandplain Mulga Spinifex Hummock Grassland	SAMU occurs as a scattered tall mulga shrubland over a hummock grass (<i>Triodia</i>) stratum	NS
SASP	Sandplain Spinifex Hummock Grassland	SASP consists of a <i>Triodia</i> grassland, where the hummock grass layer generally dominates in terms of projected foliar cover and biomass	NS

NS – community not surveyed by the DBCA

*Preferred Malleefowl habitat

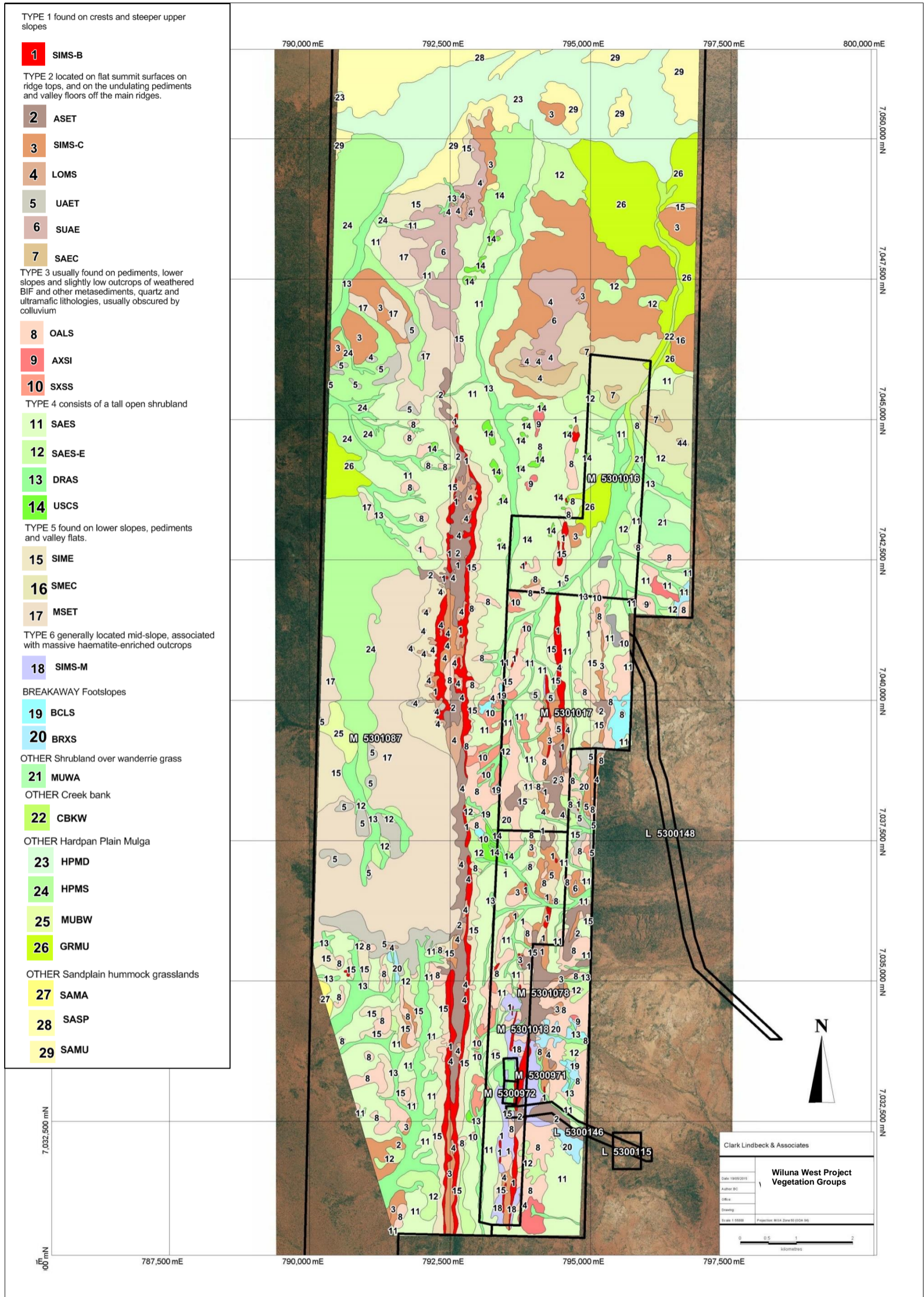


Figure 6: Vegetation communities at the Wiluna West Project

2.3 PROJECT FAUNA

Four Level 2 fauna surveys have been undertaken at the wider Wiluna West area to date. These surveys were completed on the:

- 31 October – 9 November 2005 - M53/1016 and L53/148 (Ninox Wildlife Consulting, 2005).
- 15 – 24 September 2006 – B ridge from Joyners Find deposit to Bowerbird deposit (Ninox Wildlife Consulting, 2006).
- 23 - 31 October 2007 – ‘C’ Ridge (Ninox Wildlife Consulting, 2008).
- 9 – 18 November 2011 – Bowerbird, C3 and C4 deposit areas (KLA, 2012).

Evidence of Malleefowl were first recorded at the project (on the C ridge) in 2006 (Ninox Wildlife Consulting, 2007). As well as records collected during the fauna surveys, numerous targeted searches have been undertaken which include:

- Targeted search along the C ridge, Traditional owners and GWR exploration staff in May 2008 - recorded one active mound, numerous old inactive mounds and tracks at various locations along C ridge.
- Audit of known Malleefowl mounds in the C3, C4 and Bowerbird areas, as part of the KLA 2011 Level 2 survey (November 2011). This recorded one active mound and 22 inactive mounds.
- Targeted search along the B and C ridges at grid spacings of 100m, was undertaken by Traditional owners (Martu) with GWR exploration staff, in 2012 – three active mounds, 54 inactive (near extinct-extinct) mounds were recorded.
- A reassessment survey of Malleefowl mounds that have been identified in previous surveys (in particular those located in the proposed BB, C3 and C4 mine footprint) was undertaken by AES in March 2014. A total of 24 Malleefowl mounds were assessed:
 - Two active mounds surveyed.
 - Four mounds were surveyed as inactive.
 - 15 mounds were described as either extinct or near-extinct; and
 - One mound was unable to be located or it has been misidentified (i.e. not a Malleefowl mound).

To date a total of 78 Malleefowl mounds have been located at the wider Wiluna West project through targeted surveys which includes (Figure 7):

- Six active mounds;
- Four inactive mounds; and
- 68 near-extinct to extinct mounds.

As can be seen in Figure 7, the active mounds are all located west of the C ridge and none are located within the Golden Monarch disturbance footprint.

DBCA shows a record within the proposed search area which relates to an opportunistic siting of Malleefowl track during the 2006 Ninox survey. Ninox (2006) states: “*fresh footprints were noted just west of the current survey area*”. GWR understand this record relates to the C ridge.

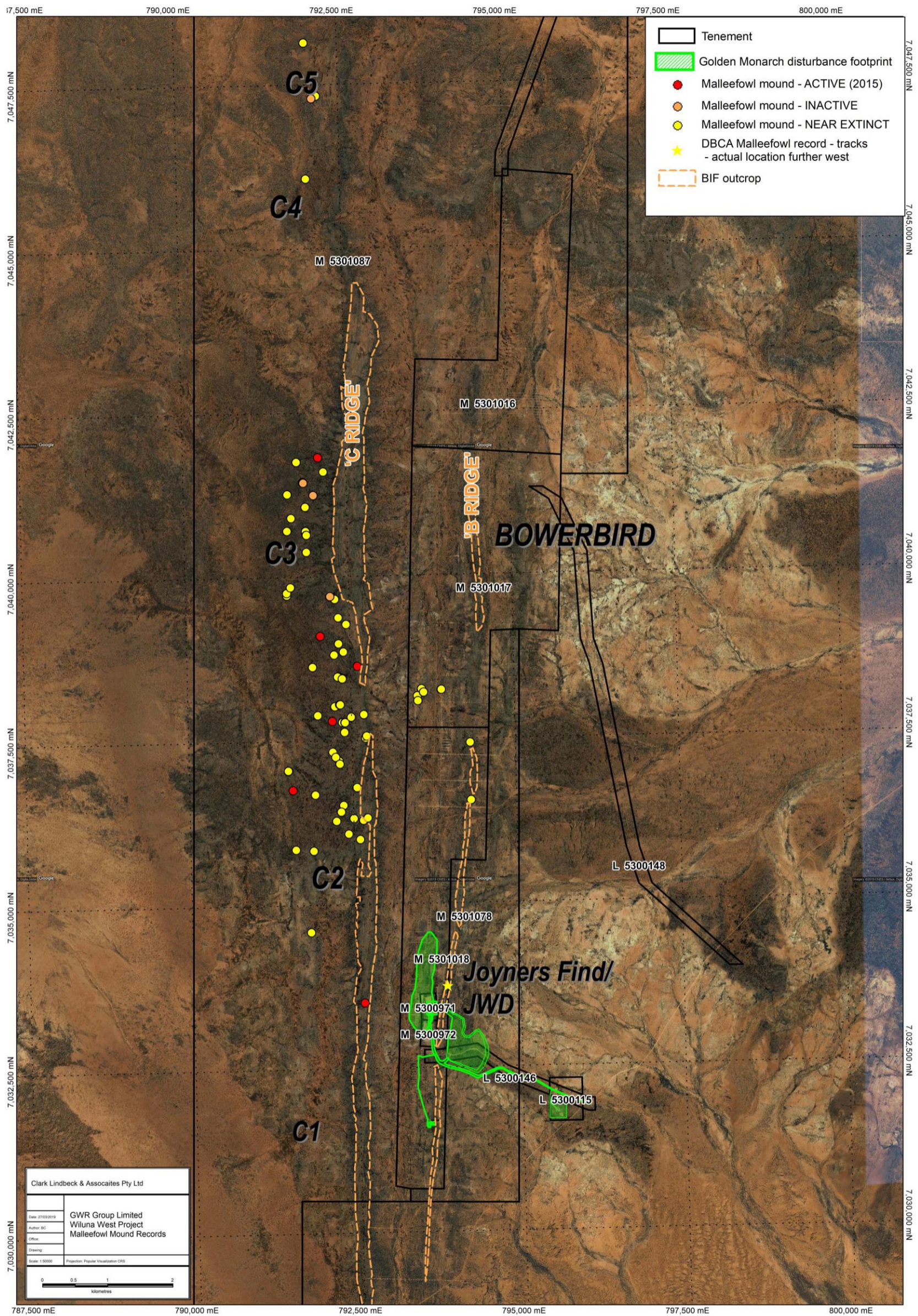


Figure 7: Locations of Malleefowl mounds at the Project in relation to the Golden Monarch disturbance footprint

3.0 SURVEY METHODOLOGY

3.1 SITE SURVEY

A Level 2 targeted Malleefowl survey was completed on the 8th July, 30th July and the 4th August 2018. The survey area focused on proposed disturbance Golden Monarch disturbance (Figure 8).

The survey was carried out with reference to:

- Commonwealth of Australia (2010). *Survey Guidelines for Australia's threatened birds*.
- Environmental Protection Authority (2016). *Technical Guidance: Terrestrial Fauna Surveys*.
- EPA (2016b). *Technical Guidance: Sampling methods for Terrestrial Vertebrate Fauna*.

A line survey approach was adopted that ensured all parts of the area were surveyed. Between six and eight surveyors accompanied by a GWR representative with a GPS walked in east-west parallel lines, as topography permitted, across all uncleared areas of vegetation to:

- assess the suitability of habitat for Malleefowl use;
- identify any nesting mounds – size, age and evidence of recent use; and
- identify secondary signs of Malleefowl or direct sightings i.e. tracks, recently moulted feathers and scats.

The distance between lines was dictated by the density of the vegetation and topography, with personnel spaced either side of the centre line at spacings of less than 20 m.

Figure 8 shows the centreline traverses of the survey area which were at 85-100 m spacings. The surveyors were spaced either side of this centreline providing comprehensive coverage of the survey area.

3.2 PERSONNEL AND REPORTING

The field work was undertaken by the Martu Women (Traditional Owners) in conjunction with GWR.

The following personnel were involved in the survey:

- Mick Wilson (GWR)
- Martu (Traditional Owners)*
- Milesha Yappo
 - Miranda Long
 - Rebeca Anderson
 - Rita Cutter
 - Selena Richards
 - Lina Long
 - Shoronne Elliott.

Rita Cutter, Lina Long and Selena Richards are senior Martu Women and are highly knowledgeable in respect to native fauna. Lina Long and Rita Cutter are members of the highly respected Birriliburu Rangers Program and lead a number of land management activities in the Birriliburu Indigenous Protected Area (IPA), including reinstating traditional fire patterns, threatened species monitoring and baseline fauna surveys. They have more than 40 years of experience in this area, in particular with identification of threatened fauna.

This survey report was prepared by GWR in conjunction with Clark Lindbeck & Associates Pty Ltd.

3.3 LIMITATIONS

The survey was planned and designed to inspect all areas of uncleared vegetation within the footprint of disturbance for the Golden Monarch disturbance footprint. Notwithstanding this, Table 2 lists the potential limitations of the survey.

Table 2: Limitations and constraints associated with the targeted assessment

Variable	Potential Impact on Survey	Details
Access problems	Not a constraint	The survey was conducted via 4WD and on foot. Numerous tracks were located within the survey area, providing ease of access.
Competency/ Experience	Not a constraint	The Martu Elders that conducted the survey are regarded as suitably qualified and experienced with >40 years' experience. Clark Lindbeck & Associates Pty Ltd employs qualified environmental scientists and has more than 28 years of experience in the environmental consulting industry. They assisted GWR in preparation of this report.
Timing of survey, weather & season	Not a constraint	Fieldwork was conducted in July - August 2018. Identification of mounds and tracks is not season dependent.
Area disturbance	Not a constraint	Disturbance in the area was a result of historic mining activity, exploration and access tracks and did not limit the survey.
Survey Effort/ Extent	Not a constraint	Survey intensity was appropriate for the size/significance of the area with a maximum 25 m line spacing for the targeted assessment.
Availability of contextual information at a regional and local scale	Not a constraint	Results of DBCA searches and previous fauna assessments at the Project were reviewed to provide context on the local environment and the region.
Data Analysis	Not a constraint	N/A
Completeness	Not a constraint	GWR considers the spacing of the survey adequate for the assessment.

3.4 LICENCE AND PERMITS

No licences or permits were required for the targeted Malleefowl survey and report.

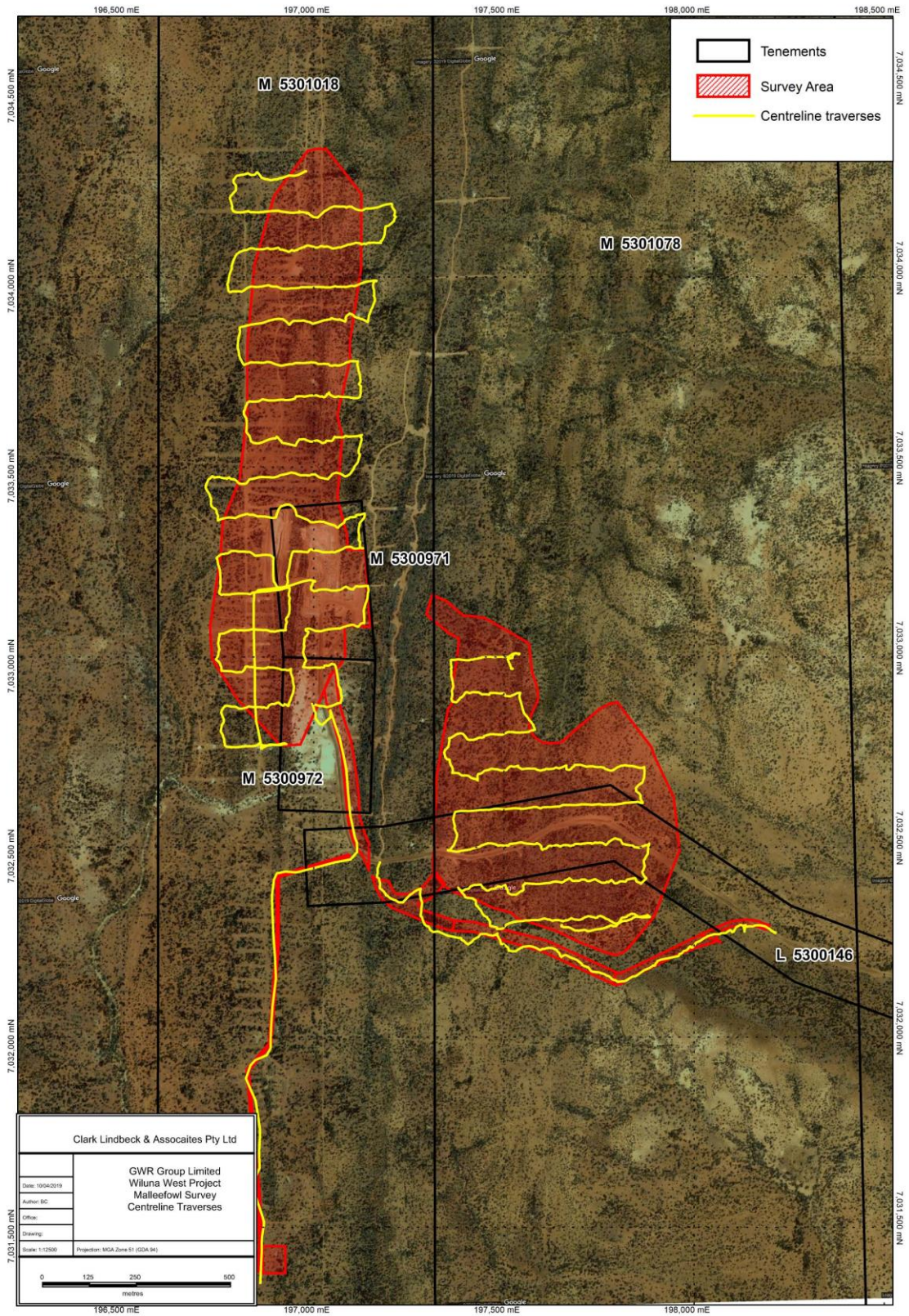


Figure 8: Line traverses walked during targeted survey

4.0 SURVEY RESULTS

4.1 MALLEEFOWL HABITAT

Malleefowl favour dense shrublands and areas that contain sufficient leaf litter for mound building.

Following assessment of the area, the senior Martu Women were strongly of the opinion that the habitat within the survey area was not suitable for Malleefowl as it was either:

- disturbed, and
- either too rocky and/or too open
- there was a lack of suitable leaf litter.

4.2 EVIDENCE OF MALLEEFOWL

No active, inactive or historic Malleefowl mounds or evidence of their recent presence (tracks, scats) was recorded during the targeted survey.

This is consistent with previous survey results and the preferred Malleefowl vegetation groups previously mapped which were not present within the proposed footprint.

5.0 DISCUSSION

Although there was no evidence of Malleefowl recorded within the Golden Monarch disturbance footprint, GWR is cognisant they may venture into the area to forage. Therefore, GWR will implement the following management measures to prevent impacts to this species:

- ensuring no clearing outside the proposed footprint,
- clearing boundaries will be well marked and all clearing activities supervised;
- erect signage to alert drivers of potential presence of Malleefowl;
- continue to monitor all known mounds frequently;
- maintain management that reduces risk of fire;
- ensure that all personnel attend inductions prior to commencing work onsite and that these inductions include information about the Malleefowl, its legal status, ecology and habitat requirements;
- encourage all personnel to report any signs of Malleefowl; and
- all vehicles are to remain on designated tracks and speed restrictions appropriate to operational areas.

6.0 REFERENCES

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Attachment 9. Proposed Fee Calculation

Table 19: Estimated Cost of Works

Detail	Cost (\$)
Crusher and Screen Mobilisation and Establishment	\$100,000
ROM Pad, Plant Site, Product Stockpile Pad	\$271,545
Dozer Work and Roller	\$28,000
Logistics	\$83,256
TOTAL	\$482,801

Table 20: Proposed Works Approval and Licencing Fees

Detail	Cost (\$)
Works Approval Fee	
More than \$450,000 but no more than \$500,000	4669.0
Licence Fee	
Part 1 Total Premise Component (Category 12))	12,180
Part 2 Waste Component – No emissions	0
Part 3 Waste Discharges Component – No emissions	0
TOTAL PROPOSED FEE	\$16,849

Works Approval Fee -

Industry Licensing System

**Application Page 3 of 5
Works Approval Fees**

Fee start date: 06/01/2021

Fees calculator

If you are applying for a works approval you must provide the following details in accordance with the Environmental Protection Regulations 1987. Guidance on calculating works approval fees is available on the DWER website.

Fees relate to the cost of the works, including all capital costs (inclusive of GST) associated with the construction and establishment of the works proposed under the works approval application. This includes, for example, costs associated with earth works, hard stands, drainage, plant hire, equipment, processing plant, relocation of equipment and labour hire.

Costs exclude:

land purchase costs

Premises Component(s)

Category	Capacity Range	Fee
12 - Screening, etc. of material	More than 500 000 but not more than 5 000 000 tonnes per year	N/A
<input type="text" value="Selection required"/>	<input type="text" value="Select capacity range"/>	<input type="button" value="Add"/>
Total Premises Component(s)		N/A

Premises construction cost

Total cost	Rate
More than \$450,000 but not more than \$500,000	115

Total Fee

Total Works Approval Fee	\$4669.00
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Licence Fee

**Application Page 3 of 5
Licence Fees**

Fee start date: 06/01/2021

Fees calculator

If you are applying for a licence or submitting your annual licence fee information you must provide the following details in accordance with the Environmental Protection Regulations 1987. Guidance on calculating licence fees is available on the DWER website.

All supporting information, workings, calculations and assumptions made in the fee calculations should be attached on Application Page 4. DWER officers may reject fee applications or request resubmissions if information is missing or incomplete, for example, if some of the prescribed waste components have not been appropriately considered. It is the applicant's or licensee's responsibility to ensure that their fee application is appropriate and complete. Rejected applications and resubmission requests could delay your application and may incur penalty fees.

Premises Component

Select the prescribed premises category undertaken

Premises Component(s)

Category	Capacity Range	Fee
12 - Screening, etc. of material	More than 500 000 but not more than 5 000 000 tonnes per year	\$12180.00
<input type="text" value="Selection required"/>	<input type="text" value="Select capacity range"/>	<input type="button" value="Add"/>
Total Premises Component(s)		\$12180.00

Part 2 Waste

Waste Type	Amount	Fee
004 - No Emissions Incur a Fee	Not applicable	
Total Waste Component(s):		\$0.00

Part 3 Waste Discharges to Air:

Waste Type	Location / Qualifier	Units	Discharge	Fee
001 - No Emissions Incur a Fee	Not applicable	N/A	0	
Total Air Component(s):				\$0.00

Discharges to Water:

Waste Type	Location / Qualifier	Units	Discharge	Fee
003 - No Emissions Incur a Fee	Not applicable	N/A	0	
Total Water Component(s):				\$0.00

Discharges to Land:

Waste Type	Location / Qualifier	Units	Discharge	Fee
002 - No Emissions Incur a Fee	Not applicable	N/A	0	
Total Land Component(s):				\$0.00

Total Fee

Total Licence Fee	\$12180.00
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