Bunbury Outer Ring Road

Southern Section

Ministerial Statement 1191

Compliance Assessment Report

2023 - 2024

Main Roads WA

Revision 0

28-Aug-24

South West Gateway Alliance

Delivering the Bunbury Outer Ring Road

Document control record

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Document control						
Report title		BORR (South) Ministerial Statement 1191 | Compliance Assessment Report 2023-2024				
Client		Main Roads WA				
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
A	30-May-24	SWGA Draft	D.P	A.G.		A.M.
B	19-Jul-24	SWGA Review	A.G.	E.R.		A.M.
C	19-Aug-24	Main Roads Review	E.R	Main Roads		M.S.
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Current revision		**0**				

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1 Introduction

1.1 Background

The Commissioner of Main Roads Western Australia (MRWA) has been granted conditional approval for the construction and operation of the Bunbury Outer Ring Road Southern Section (the Proposal) under Part IV Division 2 (section 45) of the *Environmental Protection Act 1986* by the Minster for Environment. The Proposal is subject to the implementation conditions of Ministerial Statement 1191 (MS 1191) which was issued on 31 May 2022 (Minister for Environment, 2022).

1.2 Purpose and scope

This Compliance Assessment Report (CAR) addresses the compliance of the Bunbury Outer Ring Road (BORR) Southern Section (the Proposal) with conditions set out in Ministerial Statement 1191 (MS 1191).

Condition 12-6 of MS 1191 requires an annual compliance assessment report to be submitted to the Chief Executive Officer (CEO) of the Department of Water and Environmental Regulation (DWER).

MS 1191: Condition 12-6

The proponent shall submit to the CEO the first Compliance Assessment Report fifteen (15) months from the date of issue of this Statement addressing the twelve (12) month period from the date of issue of this Statement and then annually from the date of submission of the first Compliance Assessment Report, or as otherwise agreed in writing by the CEO. The Compliance Assessment Report shall:

(1) be endorsed by the proponent's Chief Executive Officer or a person delegated to sign on the Chief Executive Officer's behalf;

(2) include a statement as to whether the proponent has complied with the conditions;

(3) identify all potential non-compliances and describe corrective and preventative actions taken;

(4) be made publicly available in accordance with the approved Compliance Assessment Plan; and

(5) indicate any proposed changes to the Compliance Assessment Plan required by condition 12-1.

This CAR incorporates a 12-month audit period from 31 May 2023 to 30 May 2024. This is the second CAR to be submitted under Ministerial Statement 1191.

This CAR has been produced in accordance with condition M12.6 and has been endorsed by the Commissioner for Main Roads' delegate (Appendix A).

1.3 Proposal overview

The Proposal includes the construction and operation of 10.5 kilometres of the BORR Southern Section, located about 200 km south of Perth. The 200 hectare development envelope occurs mainly within the Shire of Capel (including the localities of Gelorup, North Boyanup and Statham) and a small component within the City of Bunbury. The location and physical extent of the Proposal are summarised in Table 1 and Figure 1.

Table 1. Location and authorised extent of physical and operational elements.

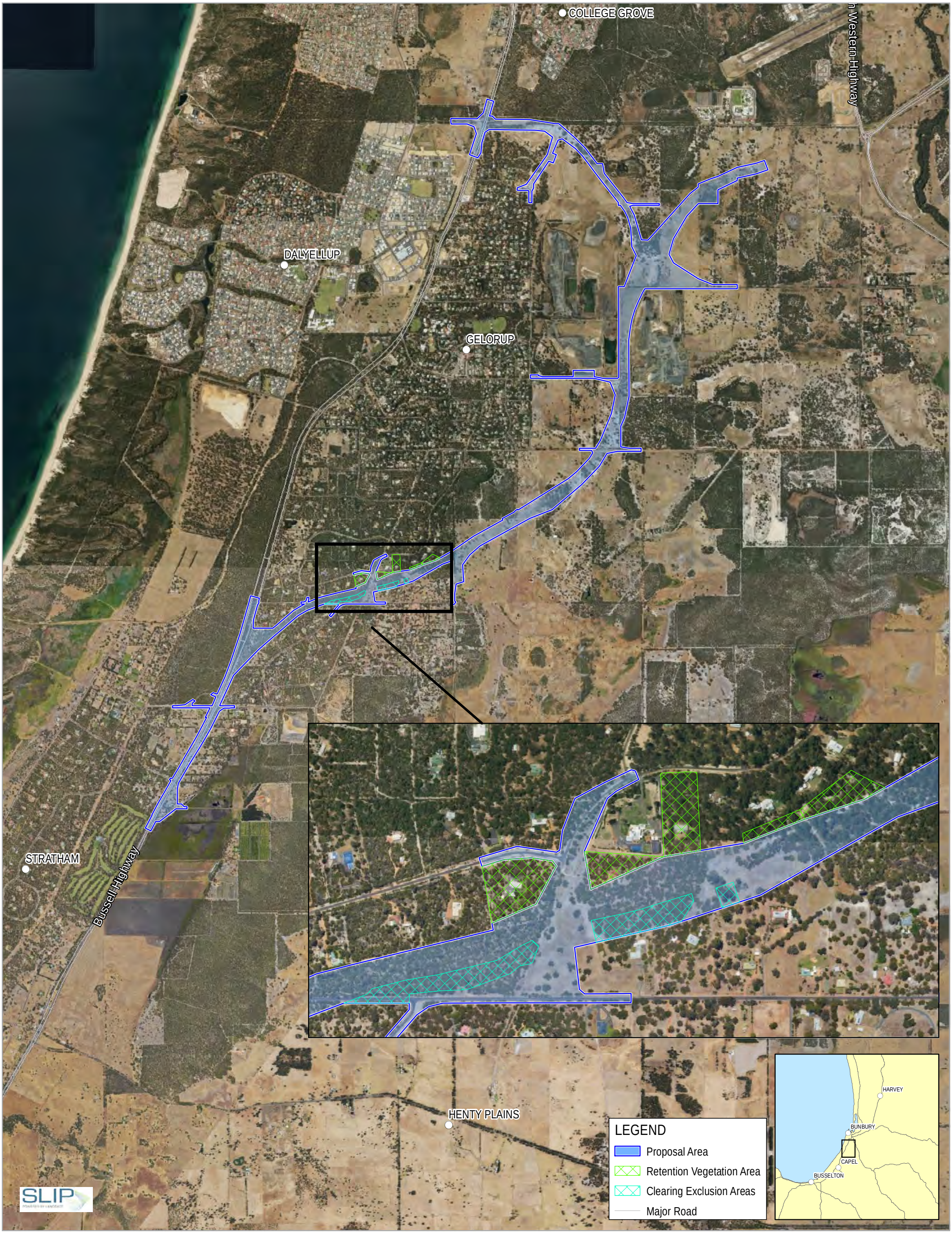
Element	Location	Authorised Extent
Freeway standard dual carriageway, grade separated interchanges and vehicle bridges, regional distributor roads, local road modifications, drainage structures, and other infrastructure, including but not limited to, noise walls, screen walls, fauna-crossings and land-bridges, possum rope-bridges, pedestrian underpass/overpass, principle shared path, lighting, fencing, signage, and safety barriers.	Located within the Development Envelope as shown in Figure 1.	Clearing and disturbance of no more than 71.5 ha of native vegetation within the 200 ha Development Envelope.

1.4 Proponent details

The proponent for the Proposal is Main Roads Western Australia (Main Roads).

Main Roads awarded a contract to South West Gateway Alliance (SWGA) to design and construct the Bunbury Outer Ring Road.

Figure 1. Proposal location.



Paper Size ISO A3

0 250 500 750 1,000

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

N

Australian Government

BUILDING OUR FUTURE

mainroads WESTERN AUSTRALIA

BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

Main Roads Western Australia
Bunbury Outer Ring Road Southern Section

Proposal Area

FIGURE 1

2 Summary of Proposal's Implementation Status

2.1 Clearing during the reporting period

Construction of the Proposal (BORR Southern Section) commenced on 1 August 2022.

Clearing of 18.47 hectares (ha) of native vegetation has occurred during the reporting period (Table 2; Figure 2a).

Clearing of key environmental aspects as identified in MS 1191 are all within the associated specified limits.

Table 2. Clearing metrics during the reporting period.

Environmental Aspect	Area / quantity specified in Ministerial Statement 1191	Area / quantity cleared during 2022 - 2023 reporting period	Area / quantity cleared during this 2023 – 2024 reporting period	Total area / quantity cleared
Native vegetation	71.5 ha (within a 200 ha development envelope)	29.72 ha	18.47 ha	48.19 ha
Conservation Category Wetlands	0.2 ha	0 ha	0.11 ha	0.11 ha
Resource Enhancement Wetlands	1.4 ha	0.52 ha	0 ha	0.52 ha
Vegetation representative of the Banksia Woodlands of the Swan Coastal Plain Priority Ecological Community (PEC) (Banksia Woodlands)	23.4 ha	11.49 ha	6.16 ha	17.65 ha
Vegetation representative of the Tuart *(Eucalyptus gomphocephala)* woodlands and forests of the Swan Coastal Plain PEC (Tuart Woodlands)	4.4 ha	2.06 ha	1.42 ha	3.48 ha
Vegetation representative of the Southern Swan Coastal Plain *Eucalyptus gomphocephala – Agonis flexuosa* Woodlands PEC (Tuart-Peppermint Woodlands), overlapping the Tuart Woodlands PEC	4.5 ha	2.15 ha	1.42 ha	3.58 ha
Western Ringtail Possum habitat	60.9 ha	24.39 ha	17.94 ha	42.32 ha
Brush-tailed Phascogale habitat	39.2 ha	18.09 ha	11.72 ha	29.80 ha
Black-stripe Minnow habitat (potential)	5.5 ha	2.16 ha	0.25 ha	2.41 ha
Black Cockatoo habitat	60.9 ha	24.39 ha	17.94 ha	42.32 ha
	no more than 1088 trees with a diameter at breast height of > 500 mm	397 trees	305 trees	702 trees
	no more than 11 trees with suitable nest hollows	3 trees	0 trees	3 trees

Figure 2a. **Ground disturbance and clearing extents during the reporting period.**

Centenary Road

BUSSELL HWY

Sleaford Drive

Lillydale Road

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W A

PERTH

KALGOORLIE

Map Area

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Proposal approval boundary (MS1191)

Ground disturbance and clearing extents 2022 - 2023

Ground disturbance and clearing extents 2023 - 2024

N

0 400

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents Map 1 of 4

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:8,2500 @ A3

Hasties Road

Ducane Road

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N

0 400

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents Map 2 of 4

Biota Environmental Sciences

Author: Biota | Drawn: P Sawers | Job No.: 1855 | Date: 20 Aug 2024 | Revised: | Projection: MGA Z50 (GDA94) | Scale: 1:7,500 @ A3

BUSSELL HWY

Yalinda Drive

Eucalypt Drive

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Jilley Road

Brockway Drive

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Ground disturbance and clearing extents 2023 - 2024

N

0 400

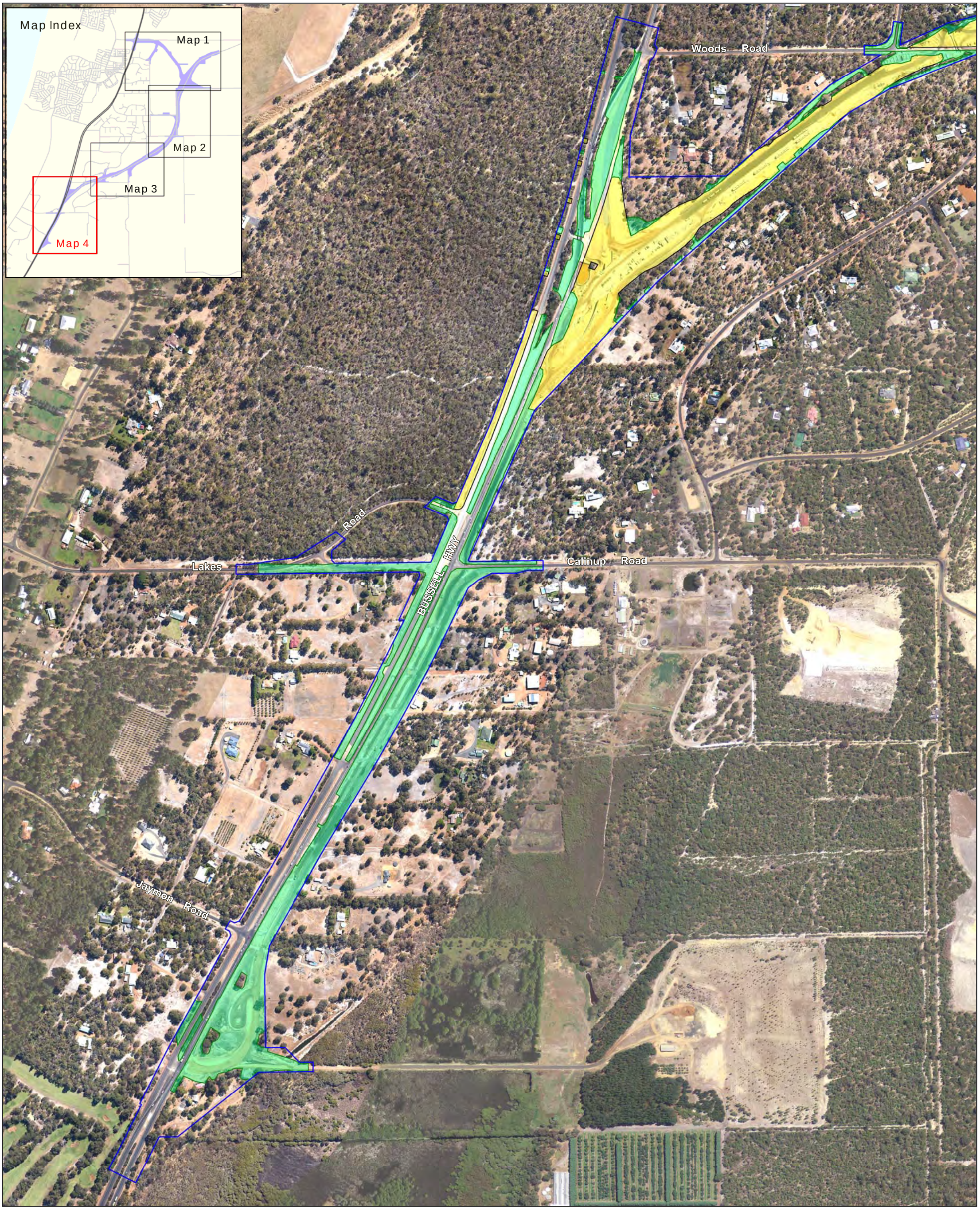
meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents Map 3 of 4

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,250 @ A3



Location Map

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents 2022 - 2023
- Ground disturbance and clearing extents 2023 - 2024

N

0 400

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents Map 4 of 4

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,000 @ A3

2.2 Clearing staging during the reporting period

Clearing was conducted across 17 separate clearing stages during the reporting period (Table 3; Figure 2b).

Table 3. Clearing staging during the reporting period.

Clearing staging during the reporting period				
Clearing stage	**Category**	**Patch**	**Commencement**	**Completion**
Centenary - Lilydale	1/2/3	1,2,3	10 May '23	14 Jul '23
Yalinda – Eucalypt	2/3	-	14 Jun '23	20 Jun '23
Bussell Hwy South (Tamra)	3	-	15 Jun '23	23 Jun '23
Yalinda – Five Mile	1	7	20 Jun '23	12 Jul '23
Bussell Hwy South (Calinup)	3	-	26 Jun '23	10 Jul '23
Bussell Hwy South (Median)	1	8	11 Jul '23	26 Jul '23
Five Mile - Jilley	1	7	13 Jul '23	24 Jul '23
Jilley	1	7	25 Jul '23	25 Jul '23
Banksia Hill	1	6	27 Jul '23	11 Aug '23
Bussell - Yalinda	1	8	27 Jul '23	25 Aug '23
Bussell Hwy (Patch 9)	1	9	14 Aug '23	30 Aug '23
Bussell-Centenary	2	-	10 Oct '23	17 Oct '23
Ducane – Jilley	2/3	-	30 Oct '23	9 Nov '23
Hasties - Sleaford	2/3	-	6 Nov '23	15 Nov '23
Bussell - Hasties	1/2/3	2,4	6 Mar '24	*
Woods - Bussell	1/3	8,9	16 Apr '24	*
Woods - Ducane	1/2/3	6,7	23 Apr '24	*

* Denotes clearing completed after the 31 May 2023 to 30 May 2024 reporting period.

3 Compliance Reporting

3.1 Background

This Compliance Assessment Report (CAR) has been prepared in accordance with the Office of the Environmental Protection Authority (OEPA) *Post Assessment Guideline No. 3 – Post Assessment Guideline for Preparing a Compliance Assessment Report (PAG 3)* (OEPA, 2012b) to address conditions 12-3 and 12-6 of MS 1191, which state:

MS 1191: Condition 12-3

After receiving notice in writing from the CEO that the Compliance Assessment Plan satisfies the requirements of condition 12-2 the proponent shall assess compliance with conditions in accordance with the Compliance Assessment Plan required by condition 12-1.

MS 1191: Condition 12-6

The proponent shall submit to the CEO the first Compliance Assessment Report fifteen (15) months from the date of issue of this Statement addressing the twelve (12) month period from the date of issue of this Statement and then annually from the date of submission of the first Compliance Assessment Report, or as otherwise agreed in writing by the CEO. The Compliance Assessment Report shall:

(1) be endorsed by the proponent's Chief Executive Officer or a person delegated to sign on the Chief Executive Officer's behalf;

(2) include a statement as to whether the proponent has complied with the conditions;

(3) identify all potential non-compliances and describe corrective and preventative actions taken;

(4) be made publicly available in accordance with the approved Compliance Assessment Plan; and

(5) indicate any proposed changes to the Compliance Assessment Plan required by condition 12-1.

Condition 12-1 of MS 1191 referenced above states:

MS 1191: Condition 12-1

The proponent shall prepare and maintain a Compliance Assessment Plan which is submitted to the CEO at least six (6) months prior to the first Compliance Assessment Report required by condition 12-6, or prior to implementation of the proposal, whichever is sooner.

3.2 Objective

This CAR has been developed to align with the structure indicated in the approved Compliance Assessment Plan (CAP; SWGA 2022), which was prepared in accordance with the requirements of condition 12-2 and the Office of the Environmental Protection Authority (OEPA) *Post Assessment Guideline for Preparing a Compliance Assessment Plan, Post Assessment Guideline No. 2* (OEPA, 2012a).

The proposed table of contents from the CAP is presented in Table 4. The table includes reference to sections in the CAR that correspond to the required content.

This CAR includes:

- Statement of compliance prepared in accordance with the OEPA *Post Assessment Form for a Statement of Compliance and endorsed by the proponent's Managing Director or a person delegated to sign on the Managing Director's behalf* (Appendix A).
- Ministerial Statement audit table in accordance with Appendix 1 of the CAP (Appendix B).
- Subsidiary management plan audit tables (Appendix C, D, E, F)
- Evidence (related to potential non-compliances/non-conformances only (Appendix G).
- Summary table of evidence (Appendix H).
- Relevant survey reports and/or monitoring and management plans prepared to demonstrate compliance (Appendix I-L).

Table 4. Table of contents for Compliance Assessment Reporting as outlined in the CAP.

Heading	Description	Section
Introduction	Brief about the Proposal, including: • Proposal background • Proposal approvals • Proponent details	Section 1
Summary of proposal's implementation status	Summary of the current implementation status of the Proposal, specifically milestones/achievements within the audit period	Section 2
Statement of compliance	Statement of whether the proponent has complied with the conditions, prepared in accordance with the OEPA *Post Assessment Form* for a Statement of Compliance and endorsed by the proponent's Managing Director or a person delegated to sign on the Managing Director's behalf	Appendix A
Details of declared compliance status	Endorsed by Main Roads Managing Director or a person delegated to sign on the Managing Director's behalf	Appendix A
Non-compliances and corrective actions, if any	Identify all non-compliances and corrective actions	Appendix A, G
MS 1191 audit table	Ministerial Statement audit table in accordance with Appendix 1 of the CAP	Appendix B
MS 1191 CFMP audit table	Construction Fauna Management Plan audit table	Appendix C
MS 1191 HFMP audit table	Habitat Fragmentation Management Plan audit table	Appendix D
MS 1191 AMP audit table	Amenity Management Plan audit table	Appendix E
MS 1191 OMP audit table	Offset Management Plan audit table	Appendix F
Summary table of supporting evidence demonstrating compliance	Supporting/ verifying information/ documentation	Appendix H
Detailed reporting for monitoring and management plans	Relevant management plans, reports and/or monitoring prepared to ensure and demonstrate compliance	Appendices I-L

3.3 Reporting Period

This CAR addresses a compliance period of 31 May 2023 to 30 May 2024 and will be submitted to the CEO of the DWER by 31 August 2024. Subsequent CARs will address the compliance period from 31 May to 30 May with each report submitted to the CEO of the DWER by the annual date of 31 August following the conclusion of the compliance period.

4 Compliance Assessment

4.1 Assessment approach

The audit to determine the status and evidence of compliance was completed by SWGA, external specialist consultants and Main Roads.

The Proposal has been subject to routine external inspections and audits during the reporting period to review compliance against MS 1191 including, independent daily site inspection / audits during clearing within clearing category 1 areas (Preston Consulting).

4.2 Criteria

Criteria were based on the MS 1191 conditions of approval. The audit table in Appendix B presents all the approval conditions and the performance of the Proposal to these conditions for the reporting period. The audit table contains each condition separated into audit elements for auditing purposes (i.e., the audit criteria) and includes the following headings:

- Audit Code: Ministerial Statement reference number.
- Subject: The environmental subject/issue.
- Requirement: Wording of the relevant implementation condition, procedure, or commitment.
- How: The way the proponent intends to achieve the requirement.
- Evidence: Information or data collected to verify compliance, i.e., report/letter/site inspection requirements.
- Phase: Proposal phase.
- Timeframe: Specific timing and/or location.
- Status: Notes about the fulfilment of compliance.
- Further Information: Additional details and supporting information to verify compliance status.

The ‘Status’ field of the audit tables in Appendix B, Appendix C and Appendix D describes the implementation of the action and compliance with the condition, procedure or commitment. Although the CEO of DWER makes the final determination of compliance, it is necessary to update this field each audit period, as the Proposal progresses. DWER has prepared updated guidance related to the preparation of compliance audits, including generic expressions that are used to identify the status of each item as defined in Appendix B.

4.3 Compliance with conditions

A Statement of Compliance in relation to the conditions of MS 1191 for the period addressed in the CAR has been included in Appendix A.

Compliance with the conditions of MS 1191 for the Proposal has been assessed and reported using the Audit Table in Appendix B.

4.4 Subsidiary plans

Conditions of MS1191 require the implementation of a number of subsidiary plans (Table 5), referenced in the Audit Table (Appendix B).

Table 5. Subsidiary plans to be implemented in accordance with MS1191 conditions.

Condition	Plan Implementation
3.5	Phytophthora Dieback Management Plan
5.2	Construction Fauna Management Plan (CFMP)
6.3	Habitat Fauna Management Plan (HFMP)
7.2	Traffic Noise Management Plan
8.3	Amenity Management Plan
9.4	Offset Management Plan
12.1	Compliance Assessment Plan (CAP)

Compliance with the requirement to implement specific Environmental Management Plans required in accordance with Conditions 5, 6, 8 and 9 of MS 1191 has been assessed and reported using the Audit Tables in Appendices C, D, E and F.

4.5 Retention of Compliance Statements

All Compliance Assessment Reports will be retained by Main Roads in accordance with relevant record keeping legislation including the:

- *State Records Act, 2000.*
- *Evidence Act, 1906.*
- *Electronic Transactions Act, 2011.*
- *Freedom of Information Act, 1992.*

Main Roads will retain CARs (including all associated compliance assessments) and evidence used to verify compliance for the life of the proposal and then for a minimum of seven years after the end of the life of the proposal. Main Roads will continue to implement the proposal until the CEO has determined all conditions of MS1191 have been satisfactorily met.

CARs will be retained on Main Roads' Electronic Document and Records Management System that Main Roads is required to maintain and operate in accordance with its obligations under the *State Records Act, 2000.*

4.6 Public Availability of Compliance Reports

In line with Condition 13-1 and the *Post Assessment Guideline 4: Making Information Publicly Available* (OEPA 2012d), compliance assessment reports will be made publicly available by publishing them on the Main Roads Western Australia website. This will occur within 14 days of the report being submitted to the CEO.

4.7 Department Compliance Review

In 2023, DWER initiated a review of Main Roads' compliance with MS 1191. It is understood that the review is ongoing and has not been finalised.

5 References

Minister for Environment. 2022. Ministerial Statement 1191 – Bunbury Outer Ring Road Southern Section, May 2022 https://www.epa.wa.gov.au/sites/default/files/1MINSTAT/Statement%201191_0.pdf

OEPA. 2012a. Post Assessment Guideline for Preparing a Compliance Assessment Plan, Post Assessment Guideline No. 2. August. Office of the Environmental Protection Authority. Perth, Western Australia.

OEPA. 2012b. Post Assessment Guideline for Preparing an Audit Table, Post Assessment Guideline No. 1. August. Office of the Environmental Protection Authority. Perth, Western Australia.

OEPA. 2012c. Post Assessment Guideline for Preparing a Compliance Assessment Report, Post Assessment Guideline No. 3. August. Office of the Environmental Protection Authority. Perth, Western Australia.

OEPA. 2012d. Post Assessment Guideline for Making Information Publicly Available, Post Assessment Guideline No. 4. August. Office of the Environmental Protection Authority. Perth, Western Australia.

SWGA, 2022. Compliance Assessment Plan, South West Gateway Alliance, Perth Western Australia.

6 Figures

Figure 2b. Clearing stages during the reporting period.

Bussell - Centenary

Centenary Road

Centenary Road

Patch 1

Patch 2

Patch 3

Centenary - Lillydale

Sleaford Drive

Bussell - Hasties

BUSSELL HWY

Hasties - Sleaford

Patch 4

Lillydale Road

Bussell - Hasties

Hasties Road

Patch 5

Ducane Road

Marchetti Road

Patch 6

Banksia Hill

Ducane - Jilley

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KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary

Ground disturbance and clearing areas (up to 31 May 2024)

Clearing Categories

Cat 1

Cat 2

Cat 3

N

0 400

meters

BORR South Clearing Areas End of May 2024 Map 1

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2023	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:12,000 @ A3

Woods - Ducane

Ducane - Jilley

Five Mile - Jilley

Yalinda - Eucalypt

Eucalypt Drive

Yalinda Drive

Patch 7

Five Mile Rk

Jilley

Bussell - Yalinda

Yalinda - Five Mile

BUSSELL HWY

Woods Road

Patch 8a

Patch 8b

Bussell Hwy South (Median)

Jilley Road

Woods - Bussell

Tamra Close

Calinup Road

Bussell Hwy South (Tamra)

Bussell Hwy South (Calinup)

Jaymon Road

Patch 9

Bussell Hwy (Patch 9)

Location Map

LEGEND

Proposal approval boundary

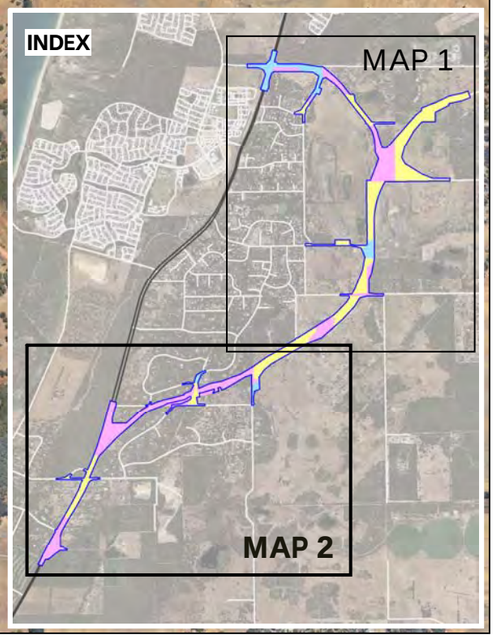
Ground disturbance & clearing areas (up to 31 May 2024)

Clearing Categories

Cat 1

Cat 2

Cat 3



N

0 500

meters

Author: Biota | Drawn: P Sawers | Job No.: 1855

Date: 16 Aug 2024 | Revised:

Projection: MGA Z50 (GDA94) | Scale: 1:12,000 @ A3

BORR South Clearing Areas End of May 2024 Map 2

Biota Environmental Sciences

Figure 3. Ground disturbance and clearing extents during the reporting period in relation to native vegetation and potential Black-stripe minnow habitat.

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Lillydale Road

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Ground disturbance and clearing extents 2023 - 2024

Potential Black-stripe minnow habitat

Native vegetation

N

0 400

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Black-stripe Minnow Habitat and Native Vegetation - Map 1

Biota Environmental Sciences

Author: Biota | Drawn: P Sawers | Job No.: 1855 | Date: 21 Aug 2024 | Revised: | Projection: MGA Z50 (GDA94) | Scale: 1:8,2500 @ A3

Lillydale Road

Hasties Road

Ducane Road

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Ground disturbance and clearing extents 2023 - 2024

Black-stripe minnow habitat

Native vegetation

N

0 400

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Black-stripe Minnow Habitat and Native Vegetation - Map 2

Biota Environmental Sciences

Author: Biota | Drawn: P Sawers | Job No.: 1855 | Date: 21 Aug 2024 | Revised: | Projection: MGA Z50 (GDA94) | Scale: 1:7,500 @ A3

BUSSELL HWY

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- Black-stripe minnow habitat
- Potential Black-stripe minnow habitat
- Native vegetation

N

0 400

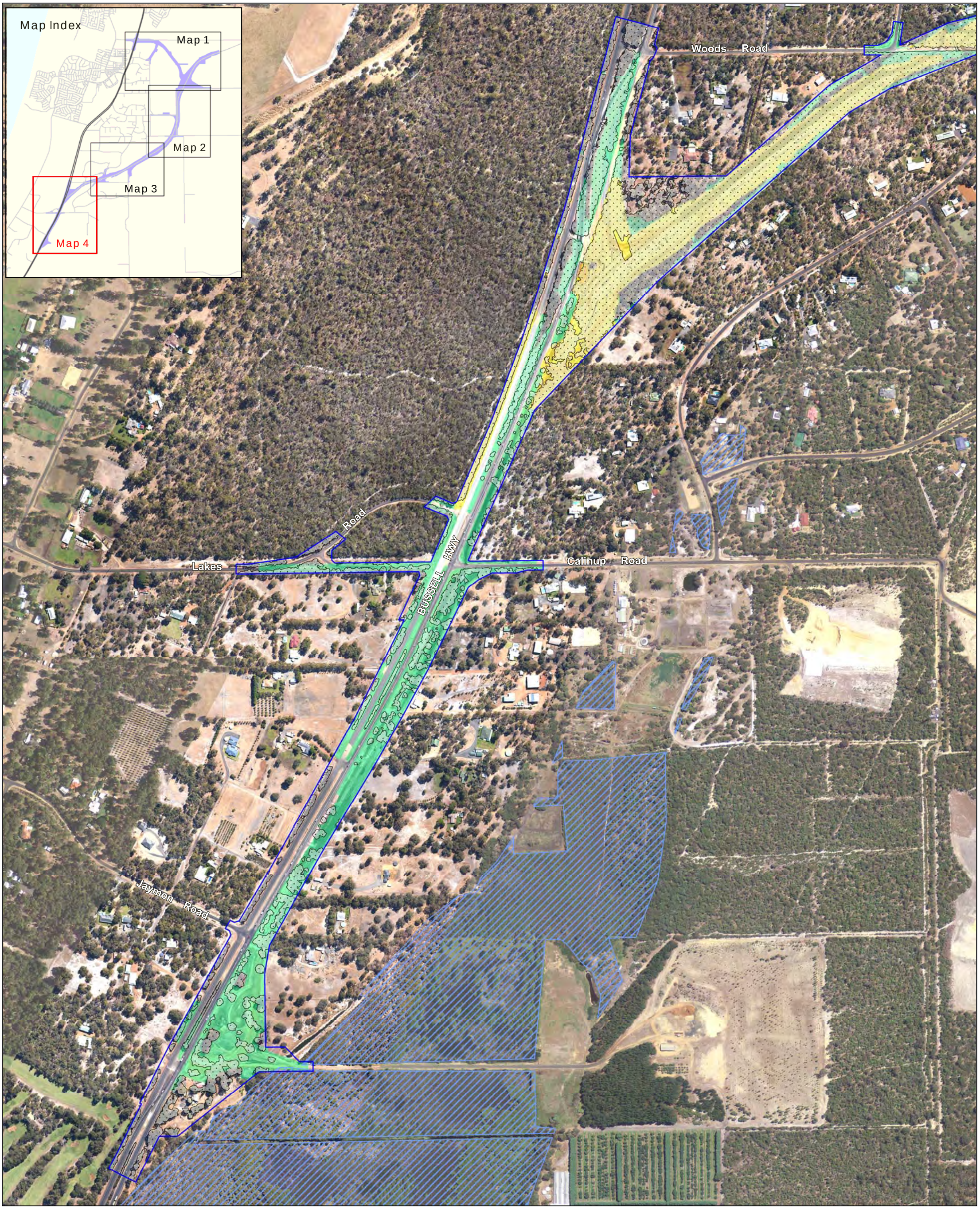
meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Black-stripe Minnow Habitat and Native Vegetation - Map 3

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 21 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,250 @ A3



Location Map

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- Ground disturbance and clearing extents 2023 - 2024
- Potential Black-stripe minnow habitat
- Native vegetation

N

0 400

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Black-stripe Minnow Habitat and Native Vegetation - Map 4

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 21 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,000 @ A3

Figure 4a. Ground disturbance and clearing extents during the reporting period in relation to Western ringtail possum habitat and South-western brush-tailed phascogale habitat.

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Sleaford Drive

Centenary Road

Lillydale Road

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Ground disturbance and clearing extents 2023 - 2024

Western Ringtail Possum habitat

Brush-tailed Phscogale habitat

N

0 400

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Western Ringtail Possum Habitat and South-western Brush-tailed Phascogale Habitat - Map 1

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:8,2500 @ A3

Hasties Road

Ducane Road

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N

0 400

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Western Ringtail Possum Habitat and South-western Brush-tailed Phascogale Habitat Map 2

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,500 @ A3

BUSSELL HWY

Yalinda Drive

Eucalypt Drive

Woods Road

Jilley Road

Brockway Drive

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

PERTH

KALGOORLIE

Map Area

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents 2022 - 2023
- Ground disturbance and clearing extents 2023 - 2024
- Western Ringtail Possum habitat
- Brush-tailed Phascogale habitat

N

0 400

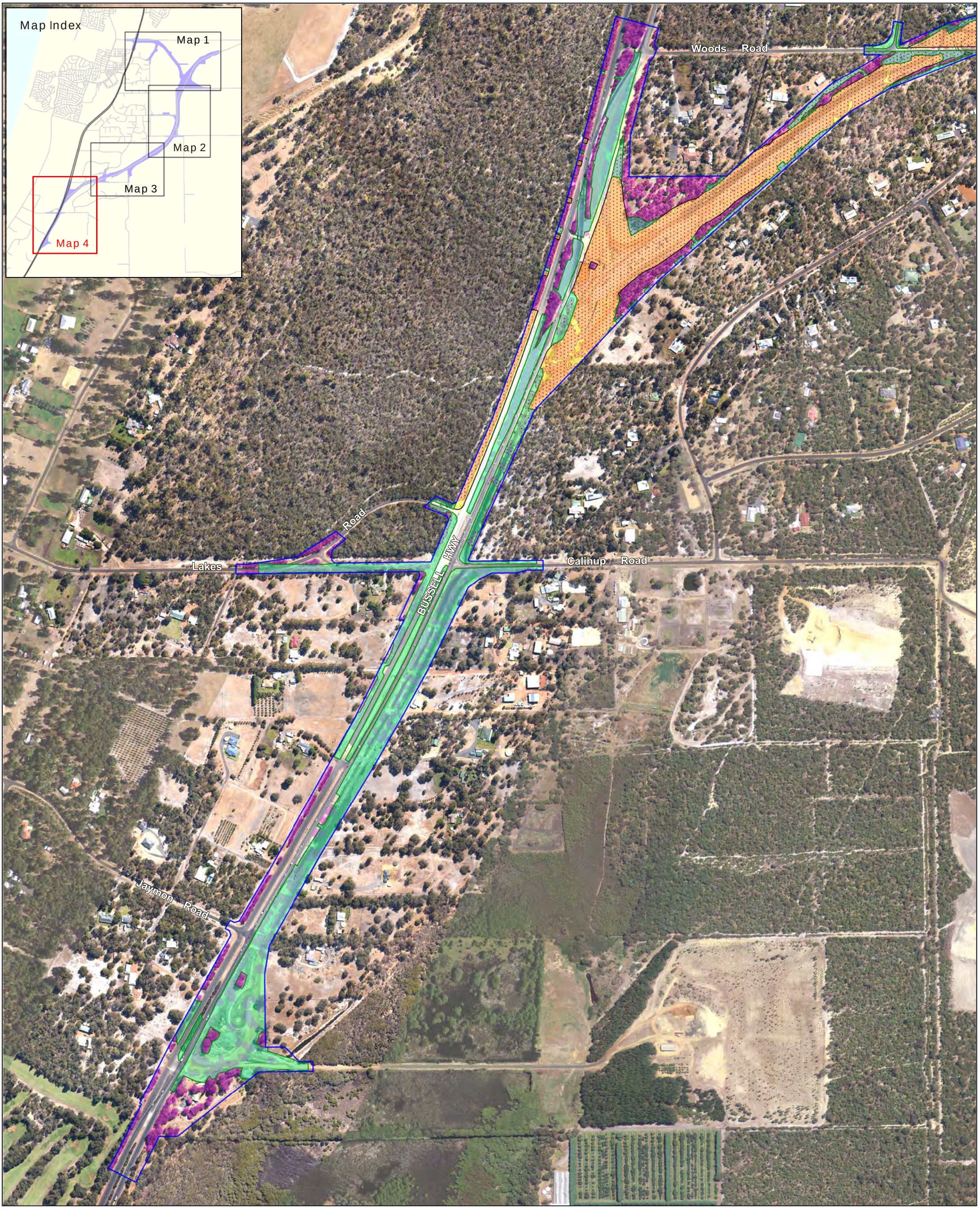
meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Western Ringtail Possum Habitat and South-western Brush-tailed Phascogale Habitat - Map 3

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,250 @ A3



Location Map

KARRATHA
W A
KALGOORLIE
PERTH
Map Area

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents 2022 - 2023
- Ground disturbance and clearing extents 2023 - 2024
- Western Ringtail Possum habitat
- Brush-tailed Phascogale habitat

N

0 400

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Western Ringtail Possum Habitat and South-western Brush-tailed Phascogale Habitat Map 4

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,000 @ A3

Figure 4b. Ground disturbance and clearing extents during the reporting period in relation to Black cockatoo habitat and habitat trees.

See Enlargement

Centenary Road

BUSSELL HWY

Sleaford Drive

Lillydale Road

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Map 1

Map 2

Map 3

Map 4

ENLARGEMENT

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents 2022 - 2023
- Ground disturbance and clearing extents 2023 - 2024
- Black cockatoo habitat

BC Tree Habitat Hollow Assessment 2024

- Potentially suitable
- Unlikely suitable
- Not suitable
- Tree suitable DBH - no hollows

N

0 400

metres

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Black Cockatoo Habitats - Map 1

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:8,2500 @ A3

N

0 300

metres

Hasties Road

Ducane Road

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents 2022 - 2023

Ground disturbance and clearing extents 2023 - 2024

Black cockatoo habitat

BC Tree Habitat Hollow Assessment 2024

Potentially suitable

Unlikely suitable

Not suitable

Tree suitable DBH - no hollows

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Black Cockatoo Habitat Map 2

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA2094)	Scale: 1:7,500 @ A3

BUSSELL HWY

Yalinda Drive

Eucalypt Drive

Woods Road

Jilley Road

Brockway Drive

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Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

- Environmental Boundary (MS 1191)
- Ground disturbance and clearing extents 2022 - 2023
- Ground disturbance and clearing extents 2023 - 2024
- Black cockatoo habitat

BC Tree Habitat Hollow Assessment 2024

- Potentially suitable
- Unlikely suitable
- Not suitable
- Tree suitable DBH - no hollows

N

0 400

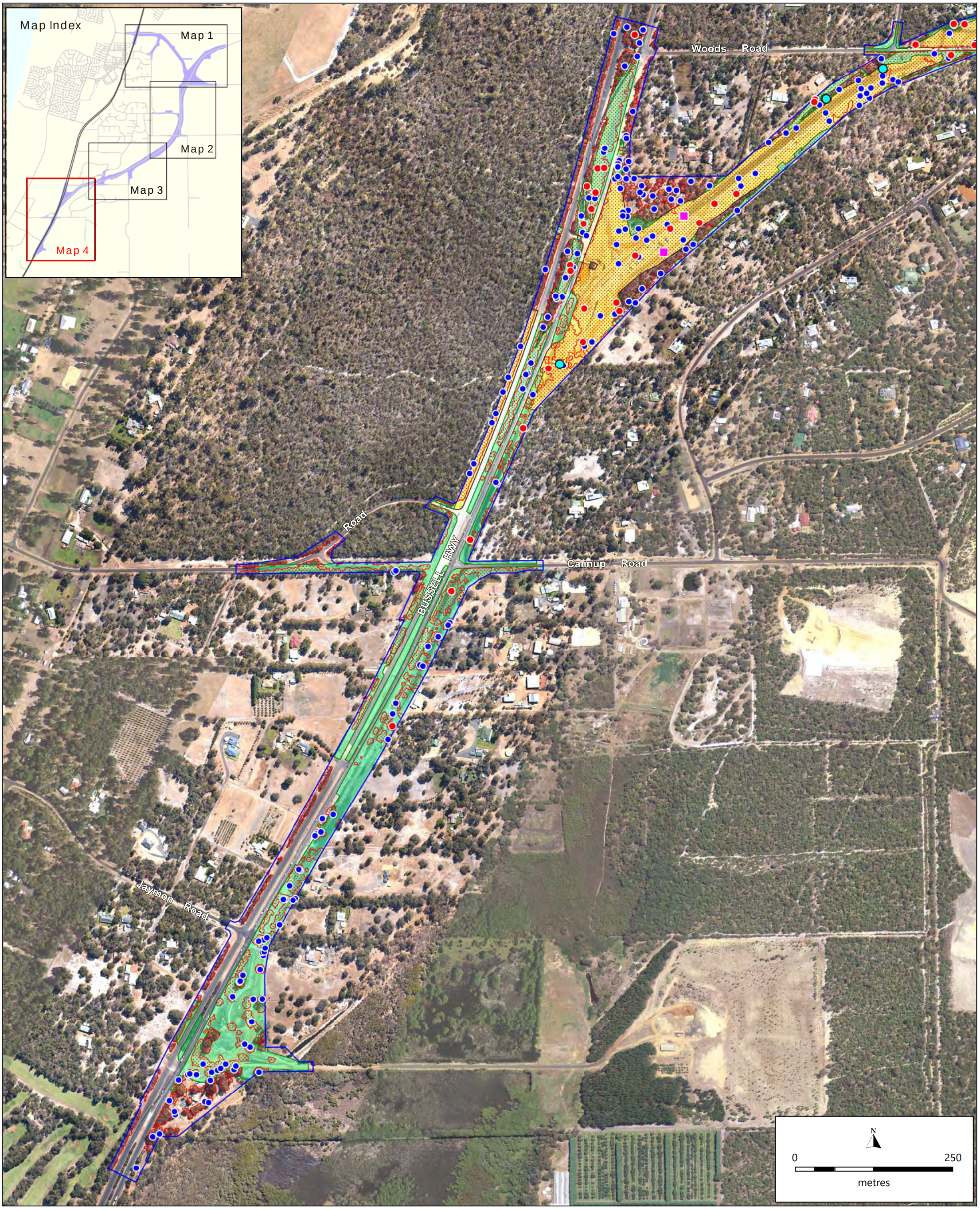
meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Realtion to Black Cockatoo Habitat - Map 3

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,250 @ A3



Location Map

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents 2022 - 2023
- Ground disturbance and clearing extents 2023 - 2024
- Black cockatoo habitat

BC Tree Habitat Hollow Assessment 2024

- Potentially suitable
- Unlikely suitable
- Not suitable
- Trees suitable DBH - no hollows

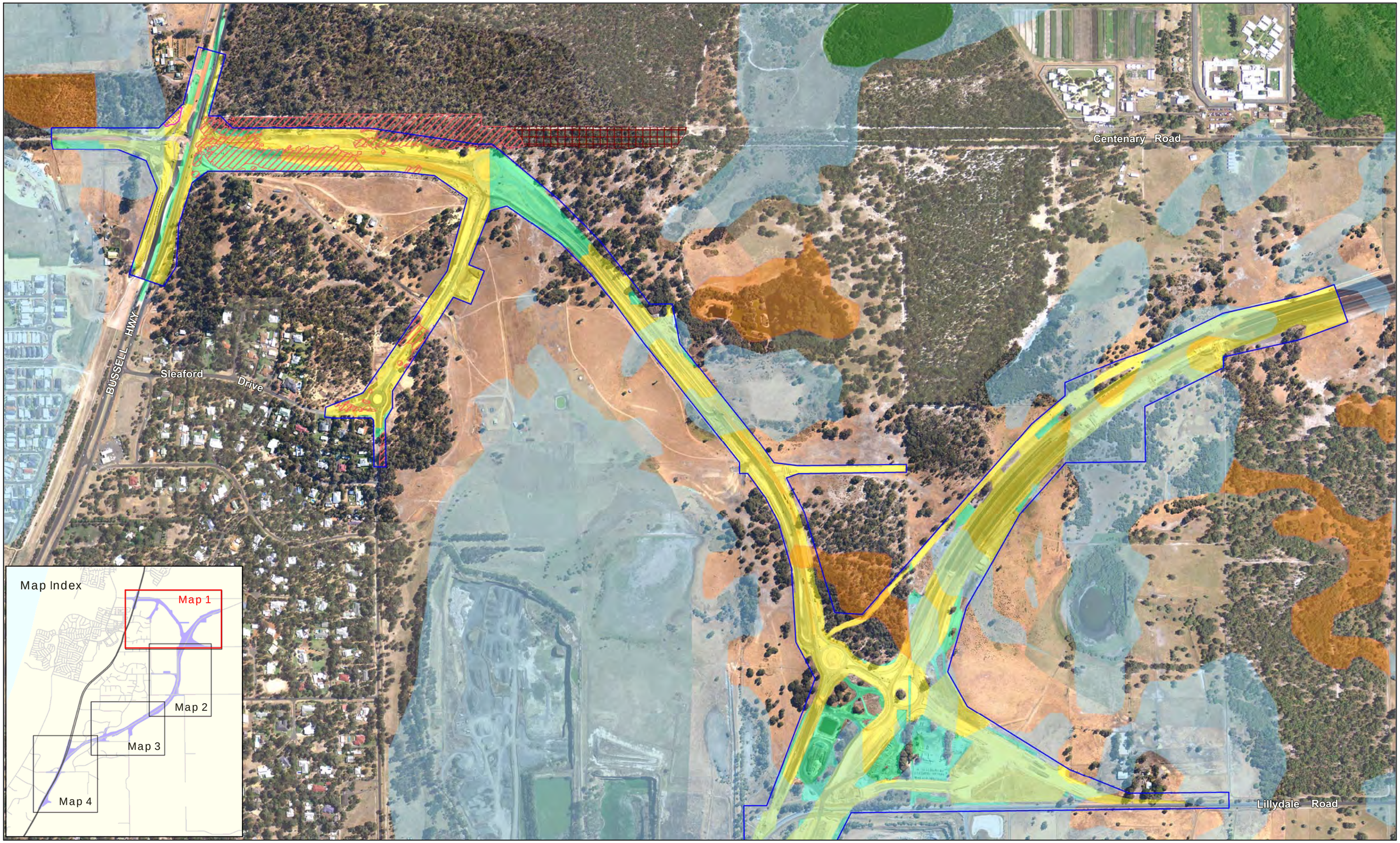
BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Black Cockatoo Habitat Map 4

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,000 @ A3

Figure 5. Ground disturbance and clearing extents during the reporting period in relation to Threatened and Priority Ecological Communities and inland waters (wetlands).



Location Map

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents 2022 - 2023
- Ground disturbance and clearing extents 2023 - 2024

TEC PEC

- Banksia Woodland TEC/PEC
- Tuart Woodland TEC/PEC
- Tuart-Peppermint Woodland PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Conservation Category Wetlands
- Multiple Use Wetlands
- Resource Enhancement Wetlands

N

0 300

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to TEC PEC and Geomorphic Wetlands - Map 1

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 22 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:8,2500 @ A3

N

0 400

meters

Lillydale Road

Hasties Road

Ducane Road

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents 2022 - 2023

Ground disturbance and clearing extents 2023 - 2024

BORR South Imagery March 2024

TEC PEC

Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

Conservation Category Wetlands

Resource Enhancement Wetlands

Multiple Use Wetlands

Ground Disturbance and Clearing Extents in Relation to TEC PEC and Geomorphic Wetlands Map 2

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 22 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,500 @ A3

BUSSELL HWY

Yalinda Drive

Eucalypt Drive

Woods Road

Jilley Road

Brockway Drive

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

PERTH

KALGOORLIE

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents 2022 - 2023

Ground disturbance and clearing extents 2023 - 2024

TEC PEC

Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

Conservation Category Wetlands

Multiple Use Wetlands

N

0 300

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to TEC PEC and Geomorphic Wetlands - Map 3

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 22 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,250 @ A3

Map Index

Map 1

Map 2

Map 3

Map 4

Woods Road

Road

Lakes

BUSSELL HWY

Calinup Road

Jaymon Road

N

0 300

meters

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents 2022 - 2023

Ground disturbance and clearing extents 2023 - 2024

BORR South Imagery March 2024

TEC PEC

Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

Conservation Category Wetlands

Multiple Use Wetlands

Ground Disturbance and Clearing Extents in Relation to TEC PEC and Geomorphic Wetlands Map 4

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 22 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,000 @ A3

7 Appendices

Appendix	Title
Appendix A	MS 1191 Statement of Compliance
Appendix B	MS 1191 Audit Table
Appendix C	MS 1191 Construction Fauna Management Plan Audit Table
Appendix D	MS 1191 Habitat Fragmentation Management Plan Audit Table
Appendix E	MS 1191 Amenity Management Plan Audit Table
Appendix F	MS 1191 Offset Management Plan Audit Table
Appendix G	Evidence (related to potential non-compliance/non-conformance only)
Appendix H	Summary table of evidence
Appendix I	M2-4 Environmental Performance Report – Inland waters
Appendix J	M3-4 Environmental Performance Report – Flora and vegetation (PEC)
Appendix K	M4-7 Environmental Performance Report – Black Cockatoos
Appendix L	M5-3 Environmental Performance Report – Construction Fauna Management Plan

Appendix A

Statement of Compliance

Statement of Compliance

1 Proposal and Proponent Details

Proposal Title	*Bunbury Outer Ring Road (Southern Section)*
Statement Number	*1191*
Proponent Name	*Main Roads Western Australia*
Proponent's Australian Company Number (where relevant)	50 860 676 021

2 Statement of Compliance Details

Reporting Period	*31/05/23* to *30/05/24*

Implementation phase(s) during reporting period (please tick ✓ relevant phase(s))							
Pre-construction		Construction	✓	Operation		Decommissioning	

Audit Table for Statement addressed in this Statement of Compliance is provided at Attachment:	B
An audit table for the Statement addressed in this Statement of Compliance must be provided with this Statement of Compliance. The audit table must be prepared and maintained in accordance with the Office of the Environmental Protection Authority's (OEPA) *Post Assessment Guideline for Preparing an Audit Table*, as amended from time to time. The 'Status Column' of the audit table must accurately describe the compliance status of each implementation condition and/or procedure for the reporting period of this Statement of Compliance. The terms that may be used by the proponent in the 'Status Column' of the audit table are limited to the Compliance Status Terms listed and defined in The CAP.	

Were all implementation conditions and/or procedures of the Statement complied with within the reporting period? (please tick ✓ the appropriate box)			
No (please proceed to Section 3)		Yes (please proceed to Section 4)	✓

Each page (including Attachment 2) must be initialed by the person who signs Section 4 of this Statement of Compliance. INITIALS: MS

3 Details of Non-compliance(s) and/or Potential Non-compliance(s)

The information required Section 3 must be provided for each non-compliance or potential non-compliance identified during the reporting period covered by this Statement of Compliance.

Non-compliance/potential non-compliance

Which implementation condition or procedure was non-compliant or potentially non-compliant?
Was the implementation condition or procedure non-compliant or potentially non-compliant?
On what date(s) did the non-compliance or potential non-compliance occur (if applicable)?

Was this non-compliance or potential non-compliance reported to the General Manager, OEPA?	
☐ Yes ☐ Reported to OEPA verbally Date _____ ☐ Reported to OEPA in writing Date _____	☐ No

What are the details of the non-compliance or potential non-compliance and where relevant, the extent of and impacts associated with the non-compliance or potential non-compliance?
What is the precise location where the non-compliance or potential non-compliance occurred (if applicable)? (please provide this information as a map or GIS co-ordinates)
What was the cause(s) of the non-compliance or potential non-compliance?
What remedial and/or corrective action(s), if any, were taken or are proposed to be taken in response to the non-compliance or potential non-compliance?
What measures, if any, were in place to prevent the non-compliance or potential non-compliance before it occurred? What, if any, amendments have been made to those measures to prevent re-occurrence?
Please provide information/documentation collected and recorded in relation to this implementation condition or procedure: • in the reporting period addressed in this Statement of Compliance; and • as outlined in the approved Compliance Assessment Plan for the Statement addressed in this Statement of Compliance. (the above inform action may be provided as an attachment to this Statement of Compliance)

Proponent Declaration

I, Martine Scheltema - Director *(full name and position title)* declare that I am authorised on behalf of the Commissioner of Main Roads Western Australia (being the person responsible for the proposal) to submit this form and that the information contained in this form is true and not misleading.

Signature: Martine Scheltema Date: 30.08.24

Please note that:

- it is an offence under section 112 of the *Environmental Protection Act 1986* for a person to give or cause to be given information that to his knowledge is false or misleading in a material particular; and
- the Chief Executive Officer of the DWER has powers under section 47(2) of the Environmental Protection Act 1986 to require reports and information about implementation of the proposal to which the statement relates and compliance with the implementation conditions.

4 Submission of Statement of Compliance

One hard copy and one electronic copy (preferably PDF on CD or thumb drive) of the Statement of Compliance are required to be submitted to the Chief Executive Officer, DWER, marked to the attention of Manager, Compliance (Ministerial Statements).

Please note, the DWER has adopted a procedure of providing written acknowledgment of receipt of all Statements of Compliance submitted by the proponent, however, the DWER does not approve Statements of Compliance.

5 Contact Information

Queries regarding Statements of Compliance, or other issues of compliance relevant to a Statement may be directed to Compliance (Ministerial Statements), DWER:

Manager, Compliance (Ministerial Statements)

Department of Water and Environmental Regulation

Postal Address: Locked Bag 33
Cloisters Square
PERTH WA 6850

Phone: (08) 6364 7000

Email: compliance@dwer.wa.gov.au

6 Post Assessment Guidelines and Forms

Post assessment documents can be found at www.epa.wa.gov.au

ATTACHMENT 1

Table 1 Compliance Status Terms

Compliance Status Terms	Abbrev	Definition	Notes
Compliant	C	Implementation of the proposal has been carried out in accordance with the requirements of the audit element.	This term applies to audit elements with: • ongoing requirements that have been met during the reporting period; and • requirements with a finite period of application that have been met during the reporting period, but whose status has not yet been classified as 'completed'.
Completed	CLD	A requirement with a finite period of application has been satisfactorily completed.	This term may only be used where: • audit elements have a finite period of application (e.g. construction activities, development of a document); • the action has been satisfactorily completed; and • the Office of the Environmental Protection Authority (OEPA) has provided written acceptance of 'completed' status for the audit element.
Not required at this stage	NR	The requirements of the audit element were not triggered during the reporting period.	This should be consistent with the 'Phase' column of the audit table.
Potentially Non-compliant	PNC	Possible or likely failure to meet the requirements of the audit element.	This term may apply where during the reporting period the proponent has identified a potential non-compliance and has not yet finalized its investigations to determine whether non-compliance has occurred.
Non-compliant	NC	Implementation of the proposal has not been carried out in accordance with the requirements of the audit element.	This term applies where the requirements of the audit element are not "complete" have not been met during the reporting period.

Compliance Status Terms	Abbrev	Definition	Notes
In Process	IP	Where an audit element requires a management or monitoring plan be submitted to the OEPA or another government agency for approval, that submission has been made and no further information or changes have been requested by the OEPA or the other government agency and assessment by the OEPA or other government agency for approval is still pending.	**The term 'In Process' may not be used for any purpose other than that stated in the Definition Column.** The term 'In Process' may not be used to describe the compliance status of an implementation condition and/or procedure that requires implementation throughout the life of the project (e.g. implementation of a management plan).

Appendix B

MS 1191 Audit Table

MS 1191 Audit Table

Note:

- Phases that apply in this table = Pre-Construction, Construction, Operation, Decommissioning, Overall (several phases).
- This audit table is a summary and timetable of conditions and commitments applying to this Proposal. Refer to the Minister's Statement for full detail/precise wording of individual elements.
- Code prefixes: M = Minister's condition, P = Proponent's commitment.
- Acronyms list: CEO = Chief Executive Officer of OEPA; DEC = Department of Environment Regulation; DPAW = Department of Parks and Wildlife; DIA = Department of Indigenous Affairs; DMP = Department of Mining and Petroleum; DWER = Department of Water and Environmental Regulation; EPA = Environmental Protection Authority; DoH = Department of Health; DoW = Department of Water, Minister for Env = Minister for the Environment; OEPA = Office of the Environmental Protection Authority.
- Compliance Status: C = Compliant, CLD = Completed, NA = Not Audited, NC = Non – compliant, NR = Not Required at this stage. Please note the terms VR = Verification Required and IP = In Process are only for OEPA use.

Audit Table for Ministerial Statement 1191

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
1191:M1.1	Limitations and extent of proposal	When implementing the proposal, the proponent shall ensure the proposal does not exceed the following extents: Clearing and disturbance of no more than 71.5 ha of native vegetation within a 200 ha development envelope.	Implement Proposal in accordance with limitations and extents.	Annual Compliance Assessment Report (CAR)	Overall	Ongoing	C	Clearing and disturbance of 18.47 ha of native vegetation has occurred during the reporting period. Clearing and disturbance of a total of 48.19 ha of native vegetation has occurred since clearing for the Proposal commenced (and at the end of this reporting period); and is well below the 71.5 ha permitted. Refer to Table 3 and Figure 2 of this CAR.
1191:M2.1	Inland Waters	The proponent shall implement the proposal to achieve the following environmental outcomes: (1) clear no more than: (a) 0.2 ha of Conservation Category Wetlands; and (b) 1.4 ha of Resource Enhancement Wetlands.	Implement Conditions M2-2 and M2-3. Implement Proposal and clearing in accordance with limitations and extents of Condition M2-1(1).	Annual CAR	Overall	Ongoing	C	Clearing and disturbance of 0.11 ha of Conservation Category Wetland has occurred during the reporting period. Clearing and disturbance of a total of 0.11 ha of Conservation Category Wetland has occurred since clearing for the Proposal commenced (and at the end of this reporting period); and does not exceed the 0.2 ha permitted. Clearing and disturbance has not occurred within areas classified as Resource Enhancement Wetland during the reporting period. Clearing and disturbance of a total of 0.52 ha of Conservation Category Wetland has occurred since clearing for the Proposal commenced (and at the end of this reporting period); and does not exceed the 1.4 ha permitted. Refer to Table 3 and Figure 5 of this CAR.
		(2) no project attributable impacts to the hydrological regime and water quality of the following values when compared to preconstruction baseline conditions: (a) Five Mile Brook (incorporating Multiple Use Wetland UFI-1163 and Conservation Category Wetland UFI-931); (b) Conservation Category Wetland (UFI-14478); (c) Resource Enhancement Wetlands (UFI-1117 and UFI-15493) and; (d) black-stripe minnow (*Galaxiella nigrostriata*) habitats defined and mapped in the proponent's Action Management Plan Conservation Significant Fauna (Revision 2 August 2021) that are within or adjoins the development envelope, except for the black-stripe minnow habitats permitted to be cleared in condition 4-1(1)(e).				C	There have been no project attributable impacts to the hydrological regime and water quality of the following values when compared to preconstruction baseline conditions: (a) Five Mile Brook (incorporating Multiple Use Wetland UFI-1163 and Conservation Category Wetland UFI-931); (b) Conservation Category Wetland (UFI-14478); (c) Resource Enhancement Wetlands (UFI-1117 and UFI-15493) and; (d) Black-stripe minnow (*Galaxiella nigrostriata*) habitats Refer to Appendix I: M2.4 Environmental Performance Report – Inland Waters.
1191:M2.2	Inland Waters	Prior to ground-disturbing activities, the proponent shall undertake monitoring of the hydrological regimes of the values listed in condition 2-1(2) and submit a report to the CEO about the preconstruction baseline conditions and predicted post-development hydrological regime.	Prepare Hydrological Regime Report.	Baseline Hydrological Regime Report	Pre-construction	Prior to ground-disturbing activities	CLD	The Baseline Hydrological Regime Report was submitted to DWER on the 18 July 2022, prior to ground-disturbing activities. Refer to M2-2, Baseline Hydrological Regime Report.

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
1191:M2.3	Inland Waters	The proponent shall continue to undertake monitoring of hydrological regime and water quality during and post-construction until the CEO is satisfied that the proponent has demonstrated the outcomes in condition 2-1(2) have been met.	Monitoring of hydrological regimes and water quality.	Annual Hydrological Regime Report Annual CAR	Overall	During construction, and until the CEO is satisfied that the proponent has demonstrated the outcomes in Condition M2-1(2) have been met	C	Monitoring of hydrological regimes and water quality has been conducted during the reporting period. Refer to Appendix I: M2.4 Environmental Performance Report – Inland Waters.
1191:M2.4	Inland Waters	The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall: (1) outline the monitoring that was undertaken during the implementation of the proposal; (2) outline the results of the monitoring undertaken to report whether that the environmental outcomes specified in condition 2-1(2) were achieved; (3) report whether that the outcomes in condition 2-1(2) were achieved; and (4) outline any management actions undertaken during the implementation of the proposal to meet the outcomes in condition 2-1(2).	Prepare an annual Environmental Performance Report (EPR) in relation to Inland Waters.	EPR as part of Annual CAR	Overall	By 31 August 2023 and annually thereafter	C	Refer to Appendix I: M2.4 Environmental Performance Report – Inland Waters.
1191:M2.5	Inland Waters	The proponent shall not construct bridge footings, drainage structures and abutments within the area depicted in Figure 5.	The Proposal shall be designed and constructed in accordance with Condition M2-5.	Annual CAR	Overall	Ongoing	C	No construction of bridge footings, drainage structures and abutments has occurred within the area depicted in Figure 5.
1191:M3.1	Flora and Vegetation	The proponent shall implement the proposal to achieve the following environmental outcomes: (1) clear no more than: (a) 23.4 ha of vegetation representative of the Banksia Woodlands of the Swan Coastal Plain Priority Ecological Community (PEC) (*Banksia Woodlands*); (b) 4.4 ha of vegetation representative of the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain PEC (Tuart Woodlands); and (c) 4.5 ha of vegetation representative of the Southern Swan Coastal Plain *Eucalyptus gomphocephala – Agonis flexuosa* Woodlands PEC (Tuart-Peppermint Woodlands), overlapping the Tuart Woodlands PEC.	Implement Proposal and clearing in accordance with limitations and extents of Condition M3-1(1). Implement Conditions M3-2 and M3-3 with regard to Baseline and Annual PEC Reports. Implement Condition M3-5.	Annual CAR Baseline and Annual PEC Reports Design, survey, and GIS files	Overall	Until the CEO is satisfied that the proponent has demonstrated the outcomes in Condition M3-1(2) have been met	C	Clearing and disturbance has included: (a) 6.16 ha of vegetation representative of the Banksia Woodlands of the Swan Coastal Plain Priority Ecological Community (PEC) (*Banksia Woodlands*) during the reporting period. Clearing and disturbance of a total of 17.65 ha has occurred since clearing for the Proposal commenced (and at the end of this reporting period); and does not exceed the 23.4 ha permitted. (b) 1.42 ha of vegetation representative of the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain PEC (Tuart Woodlands) during the reporting period. Clearing and disturbance of a total of 3.48 ha has occurred since clearing for the Proposal commenced (and at the end of this reporting period); and does not exceed the 4.4 ha permitted. (c) 1.42 ha of vegetation representative of the Southern Swan Coastal Plain *Eucalyptus gomphocephala – Agonis flexuosa* Woodlands PEC (Tuart-Peppermint Woodlands), overlapping the Tuart Woodlands PEC during the reporting period. Clearing and disturbance of a total of 3.58 ha has occurred since clearing for the Proposal commenced (and at the end of this reporting period); and does not exceed the 4.5 ha permitted. Refer to Table 2 and Figure 5 of this CAR.
		(2) ensure there are no project attributable indirect impacts, when compared to preconstruction baseline conditions, to Banksia Woodlands, Tuart Woodlands, and Tuart-Peppermint Woodlands within twenty (20) metres outside the development envelope (defined in Figure 2a and Figure 2b) and within the clearing exclusion areas (defined in Figure 1).					C	There have been no project attributable indirect impacts, when compared to preconstruction baseline conditions, to Banksia Woodlands, Tuart Woodlands, and Tuart-Peppermint Woodlands. Refer to Appendix J, M3.4 Environmental Performance Report – Flora and Vegetation (PEC).

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
1191:M3.2	Flora and Vegetation	Prior to ground-disturbing activities, the proponent shall undertake monitoring of the values listed in condition 3-1(2) and submit a report about the preconstruction baseline conditions to the CEO.	Prepare and submit Baseline PEC / TEC Report.	Baseline PEC / TEC Report	Pre-construction	Prior to ground-disturbing activities	CLD	The Baseline PEC / TEC Report was submitted to DWER on the 18 July 2022, prior to ground-disturbing activities. Refer to M3.2, Baseline PEC / TEC Report.
1191:M3.3	Flora and Vegetation	The proponent shall continue to undertake monitoring during and postconstruction until the CEO is satisfied that the proponent has demonstrated the outcomes in condition 3-1(2) has been met.	Annual PEC / TEC Report.	Annual PEC Report Annual CAR	Overall	Until the CEO is satisfied that the proponent has demonstrated the outcomes in condition 3-1(2) has been met	C	Refer to Appendix J, M3.4 Environmental Performance Report – Flora and Vegetation (PEC).
1191:M3.4	Flora and Vegetation	The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall: (1) outline the monitoring that was undertaken during the implementation of the proposal; (2) outline the results of the monitoring undertaken to report whether that the environmental outcomes specified in condition 3-1(2) were achieved; (3) report whether that the outcomes in conditions 3-1(1) and 3-1(2) were achieved; and (4) outline any management actions undertaken during the implementation of the proposal to meet the outcomes in conditions 3-1(1) and 3-1(2).	Prepare an annual Environmental Performance Report (EPR) in relation to Flora and Vegetation.	EPR as part of Annual CAR	Overall	By 31 August 2023 and annually thereafter	C	Refer to Appendix J, M3.4 Environmental Performance Report – Flora and Vegetation (PEC).
1191:M3.5	Flora and Vegetation	The proponent shall undertake the following actions within the development envelope during construction and for five (5) years post-construction: (1) implement hygiene protocols consistent with the Management of *Phytophthora cinnamomi* for Biodiversity Conservation in Australia, Part 2 National Best Practice Guidelines as amended or replaced from time to time; and (2) undertake weed control and management to prevent the introduction or spread of environmental weeds.	Implement Dieback Management Plan. Implement weed control and management.	Dieback Management Plan Annual CAR	Overall	During construction and for 5 years post-construction	C	Refer to M3-5, SWGA Phytophthora Dieback Management Plan (SWGA-30-134-20-PLN-0001-0). Refer to M3-5, Phytophthora Dieback Re-Assessment Reports. Refer to M0, SWGA Construction Environmental Management Plan (SWGA-00-134-20-MPL-0002-0). Refer to M3-5, SWGA Topsoil and Mulch Management Plan (SWGA-30-134-20-PLN-0002-0).
1191:M4.1	Terrestrial Fauna (Construction)	The proponent shall implement the proposal to achieve the following environmental outcomes: (1) clear no more than: (a) 60.9 ha of habitat for western ringtail possum; (b) 60.9 ha of black cockatoo foraging and breeding habitat; (c) 1088 black cockatoo potential nesting trees, and 11 trees with suitable hollows; (d) 39.2 ha of habitat for south-western brush-tailed phascogale; and (e) 5.5 ha of habitat for black-stripe minnow.	Implement Proposal and clearing in accordance with limitations and extents of Condition M4-1(1).	Annual CAR Design, survey, and GIS files	Overall	During implementation of the proposal	C	Clearing and disturbance has included: (a) 17.94 ha of habitat for western ringtail possum during the reporting period. Clearing and disturbance of a total of 42.32 ha has occurred since clearing for the Proposal commenced (and at the end of this reporting period); and does not exceed the 60.9 ha permitted. (b) 17.94 ha of black cockatoo foraging and breeding habitat during the reporting period. Clearing and disturbance of a total of 42.32 ha has occurred since clearing for the Proposal commenced (and at the end of this reporting period); and does not exceed the 60.9 ha permitted. (c) 305 black cockatoo potential nesting trees during the reporting period. Clearing of a total of 702 trees has occurred since clearing for the Proposal commenced (and at the end of this reporting period); and does not exceed the 1088 trees permitted. No trees with potentially suitable hollows for Black cockatoo nesting were cleared during the reporting period. Clearing of a total of three (3) trees has occurred since clearing for the Proposal commenced (and at the end of this reporting period); and does not exceed the 11 trees permitted.

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								(d) 11.72 ha of habitat for south-western brush-tailed phascogale during the reporting period. Clearing and disturbance of a total of 29.80 ha has occurred since clearing for the Proposal commenced (and at the end of this reporting period); and does not exceed the 39.2 ha permitted. (e) 0.25 ha of potential habitat for black-stripe minnow during the reporting period. Clearing and disturbance of a total of 2.41 ha has occurred since clearing for the Proposal commenced (and at the end of this reporting period); and does not exceed the 5.5 ha permitted. Refer to Table 2 and Figures 4a and 4b of this CAR.
1191:M4.2	Terrestrial Fauna (Construction)	Prior to ground-disturbing activities the proponent shall undertake the following actions: (1) within seven (7) days prior to clearing, using a qualified and licensed terrestrial fauna spotter with experience in surveying for black cockatoos, inspect all potential nesting trees hollows within the development envelope to determine if any hollows are being used for nesting by black cockatoos; (2) if any hollows are in use by black cockatoos, the proponent shall not disturb or clear the nesting tree, or vegetation within a ten (10) metre radius of the nesting tree, until after the cockatoos have naturally completed nesting (young have fledged and dispersed) and an appropriately qualified terrestrial fauna spotter has verified that the hollow(s) are no longer being used by black cockatoos; and	Undertake Black cockatoo surveys in accordance with Condition M4-2(1) within 7 days prior to clearing. Implement pre-clearing protocols of Conditions M4-2(1) and M4-2(2).	Survey Report Annual CAR	Pre-construction & Construction	Prior to ground-disturbing activities for each stage of clearing	C	Pre-clearing survey reports in relation to Black cockatoos have been prepared for each clearing stage (refer to CAR, Table 3 for clearing stages). Refer to M4-2, Black cockatoo pre-clearing survey reports.
		(3) within seven (7) days prior to clearing (or if staged, prior to each stage) implement pre-clearance protocols to minimise impacts to terrestrial fauna.					C	Refer to Appendix C: Construction Fauna Management Plan (CFMP) Audit Table including in relation to 'sensitive clearing protocols'.
1191:M4.3	Terrestrial Fauna (Construction)	During the construction of the proposal the proponent shall: (1) ensure the presence of appropriately qualified fauna spotters during clearing activities;	Engage appropriately qualified fauna spotters during clearing activities. Implement Condition M4-3(2) and M4-3(3).	Annual CAR	Construction	During the construction of the proposal	C	At least one appropriately qualified fauna spotter(s) (depending on habitat category) was present during clearing activities. Refer to M0 Independent Daily Inspection Reports. Fauna spotter accreditation: Regulation 28: Fauna Taking (Relocation) Licence. Licence Number: FR28000318-4b Licence Number: FR28000016-10b Section 40: Authorisation to Take or Disturb Threatened Species. Amendment Number: TFA – 2020-0013f Authorisation Number: TFA 2020-0013-3
		(2) not clear or cause any project attributable indirect impacts to the clearing exclusion areas as defined in Figure 1; and					C	No clearing or project attributable indirect impacts have occurred to vegetation within the clearing exclusion areas. Refer to Appendix J, M3.4 Environmental Performance Report – Flora and Vegetation (PEC).
		(3) ensure foraging species for black cockatoos are not planted within ten (10) metres of the road.					NR	There has been no revegetation during this reporting period.
1191:M4.4	Terrestrial Fauna (Construction)	The proponent must install one artificial black cockatoo nesting hollow for each suitable hollow that cannot be avoided in the 11 trees with suitable hollows identified in condition 4-1(1)(c).	Install artificial black cockatoo nesting hollows.	Annual CAR	Overall	Prior to commencement of the next black cockatoo breeding season following clearing.	C	No trees with potentially suitable hollows for Black cockatoo nesting were cleared during the reporting period. Clearing of a total of three (3) trees has occurred since clearing for the Proposal commenced (and at the end of this reporting period). The installation of three (3) nesting hollows was reported in the 2022-2023 CAR. Three (3) artificial nesting hollows were installed in June 2023 in accordance with Condition 4.4.

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
								Refer to M4.4-4.6 Report: Installation of Four Artificial Nest Hollows, Ducane Reserve WA (Australian Black Cockatoo Specialists, June 2023).
1191:M4.5	Terrestrial Fauna (Construction)	Each artificial black cockatoo nesting hollow required by condition 4-4 must be installed prior to commencement of the next black cockatoo breeding season following clearing.	Install artificial black cockatoo nesting hollows required under Condition M4-4 prior to commencement of the next black cockatoo breeding season following clearing.	Annual CAR	Overall	Prior to commencement of the next black cockatoo breeding season following clearing.	C	Clearing of a total of three (3) trees has occurred since clearing for the Proposal commenced (and at the end of this reporting period). Three (3) artificial nesting hollows were installed in June 2023 in consultation with DBCA, prior to the following breeding season in Spring. Refer to M4.4-4.6 Report: Installation of Artificial Nest Hollows, Ducane Reserve WA (Australian Black Cockatoo Specialists, June 2023).
1191:M4.6	Terrestrial Fauna (Construction)	The artificial black cockatoo nest hollow(s) required by condition 4-4 of must: (1) be installed at the locations identified by DBCA within property locations as set out and described in Table 1 of condition 9-2. (2) be designed and placed in accordance with the specifications details in How to design and place artificial hollows for Carnaby's cockatoo (DPAW Fauna Notes 2015), or any subsequent DBCA revision of this guideline; and (3) be monitored and maintained in accordance with the specifications detailed in How to monitor and maintain artificial hollows for Carnaby's cockatoo (DPAW Fauna Notes 2015), or any subsequent DBCA revision of this guideline, for a period of at least ten (10) years.	Design and install artificial black cockatoo nesting hollow required under Condition M4-4 in consultation with DBCA and according the DBCA guidelines. Monitor artificial nesting hollows for a period of 10 years.	Correspondence from DBCA Annual CAR & EPR	Overall	Prior to commencement of the next black cockatoo breeding season following clearing and monitored and maintained for at least 10 years	C	The installation of nesting hollows was reported in the 2022-2023 CAR. Three (3) artificial nesting hollows were installed in June 2023. All hollows were installed in accordance with DBCA's Fauna Note on Artificial Hollows for Black Cockatoos (2023). The three artificial hollows were inspected in March 2024. No signs of prospecting or nesting by Black Cockatoos were recorded. Monitoring of the three artificial hollows will continue for at least 10 years. Refer to M4.4-4.6 Report: Installation of Artificial Nest Hollows, Ducane Reserve WA (Australian Black Cockatoo Specialists, June 2023). Refer to Appendix K, M4.7 Environmental Performance Report – Black Cockatoos.
1191:M4.7	Terrestrial Fauna (Construction)	The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, for a period of at least ten (10) years, that shall: (1) outline the monitoring and maintenance that was undertaken in accordance with the specifications detailed in How to monitor and maintain artificial hollows for Carnaby's cockatoo (DPAW Fauna Notes 2015), or any subsequent DBCA revision of this guideline; and (2) outline the results of the monitoring and maintenance undertaken.	Prepare an annual Environmental Performance Report (EPR) in relation to Condition M4-7.	EPR as part of Annual CAR	Overall	Annually for at least 10 years	C	Three (3) artificial nesting hollows have been required to be installed to date. The three artificial hollows were inspected in March 2024. No signs of prospecting or nesting by Black Cockatoos were recorded. Refer to M4.4-4.6 Report: Installation of Artificial Nest Hollows, Ducane Reserve WA (Australian Black Cockatoo Specialists, June 2023). Refer to Appendix K, M4.7 Environmental Performance Report – Black Cockatoos.
1191:M5.1	Construction Fauna Management Plan	The proponent shall implement the proposal to achieve the following environmental objective: (1) during construction, minimise and manage project attributable adverse impacts to conservation significant terrestrial fauna including western ringtail possum and south-western brush-tailed phascogale.	Implement Construction Fauna Management (CFM) Plan	Annual CAR CFM Plan	Construction	During construction	C	The CFMP has been implemented to reduce the risk of project attributable adverse impacts to conservation significant terrestrial fauna. Refer to Appendix C: Construction Fauna Management Plan Audit Table, for management actions and outcomes.
1191:M5.2	Construction Fauna Management Plan	The proponent shall prepare a Construction Fauna Management Plan and submit to the CEO prior to ground-disturbing activities.	Prepare CFM Plan.	CFM Plan Annual CAR	Pre-construction	Prior to ground-disturbing activities	CLD	Letter of approval for Construction Fauna Management Plan received from DWER on 22 July 2022 (DWER Ref: DWERVT10554). A copy of the CFMP is available on the Main Roads website. Refer to M5-2, Construction Fauna Management Plan.
		This Plan shall: (1) specify the passive relocation management actions to be implemented prior to and during clearing;					C	Refer to Section 2.1 of the CFMP.
		(2) define the low-risk clearing timeframe for western ringtail possum applicable to Category 1 Clearing Areas and append supplementary survey evidence to justify the chosen timeframe;					C	Refer to Table 1-5 of the CFMP.

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
		(3) specify monitoring that: (a) includes a baseline survey to be undertaken within thirty (30) days prior to clearing (or if staged, prior to each clearing stage) to confirm presence/absence and number of western ringtail possum and south-western brush-tailed phascogale individuals within the development envelope and at receival sites. The baseline survey shall be prepared and undertaken on advice of DBCA during the preparation of the Construction Fauna Management Plan; (b) records whether threatened or priority fauna is encountered during clearing, and reports to the CEO and DBCA within thirty (30) days after clearing (or each clearing stage) on the number of individuals relocated in accordance with any requirements of the lawful authority obtained under the *Biodiversity Conservation Act 2016*; (c) evaluates the suitability, adequacy, and effectiveness of passive relocation management actions at reducing impacts to western ringtail possum individuals displaced by clearing from Category 1 Clearing Areas defined in Figure 3; (d) evaluates impacts to residential western ringtail possum individuals at receival sites; and (e) uses monitoring methods including, but not limited to, radio telemetry with robust sample sizes (the minimum number of tagged animals to be determined in consultation with DBCA).					C	Refer to Table 2-1 and Section 2.3 in the CFMP.
		(4) identify and spatially define the study area(s) and reference sites proposed for monitoring and evaluation and provide rationale for the location of the sites;					C	Refer to Figures 7 – 9 in the CFMP.
		(5) specify management actions; management targets; monitoring locations, methodologies, indicators, and timing; and actions and investigations in the event of a failure to meet a management target to demonstrate that the objective in condition 5-1 will be met; and					C	Refer to Tables 2-1, 2-2, and 2-3 of the CFMP for management actions, management targets and monitoring locations.
		(6) be prepared in consultation with the DBCA and in accordance with any requirements of a lawful authority obtained under the *Biodiversity Conservation Act 2016*.					C	Refer to Section 4 of the CFMP.
1191:M5.3	Construction Fauna Management Plan	The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall: (1) outline the monitoring that was undertaken during the implementation of the Construction Fauna Management Plan required in condition 5-2; (2) outline the results of the monitoring undertaken to report whether that the environmental objective specified in condition 5-1(1) was achieved; (3) report whether that the objective in condition 5-1(1) was achieved; and (4) outline any management actions undertaken during the implementation of the Construction Fauna Management Plan required in condition 5-2 to meet the objective in condition 5-1(1).	Prepare an annual Environmental Performance Report (EPR) in relation to Construction Fauna Management (Condition M5-3).	EPR as part of Annual CAR	Overall	By 31 August 2023 and annually thereafter	C	Refer to Appendix L, M5.3 Environmental Performance Report - CFMP.
1191:M5.4	Construction Fauna Management Plan	The proponent shall not commence ground-disturbing activities until the CEO has confirmed in writing that the Construction Fauna Management Plan satisfies the requirements of condition 5-2.	Prepare and submit CFM Plan. Approval of CFM Plan by CEO.	Correspondence from CEO Annual CAR	Pre-construction	Prior to ground-disturbing activities	CLD	Letter of approval for CFMP (Rev1A; July 2022) received from DWER on 22 July 2022 (DWER Ref: DWERVT10554).

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
								A copy of the CFMP is available on the Main Roads website. Refer M5-4, Construction Fauna Management Plan – Approval.
1191:M5.5	Construction Fauna Management Plan	The proponent shall implement the latest revision of the Construction Fauna Management Plan approved by the CEO.	Implement latest version of CFM Plan. Undertake baseline fauna survey for WRP and BPh within 30 days prior to clearing. Record and report priority fauna encountered during clearing. Monitoring including radio-telemetry surveys.	Annual CAR CFM Plan Pre-clearing fauna survey reports Priority fauna records and reports Monitoring surveys Correspondence with CEO	Overall	Until the CEO has confirmed that the proponent has demonstrated that the requirements of the Construction Fauna Management Plan have been achieved	C	Refer to Appendix C, Construction Fauna Management Plan (CFMP) Audit Table. Refer to Appendix L, M5.3 Environmental Performance Report - CFMP. Refer to M5-5, Baseline pre-clearing terrestrial fauna surveys. Refer to M5-5, Fauna records during clearing.
1191:M5.6	Construction Fauna Management Plan	The proponent: (1) may review and submit proposed amendments to the Construction Fauna Management Plan; or (2) shall review and submit proposed amendments to the Construction Fauna Management Plan when directed by the CEO.	CFM Plan reviewed as required.	CFM Plan	Overall	As required or when directed by the CEO	NR	Not required at this stage.
1191:M5.7	Construction Fauna Management Plan	The proponent shall continue to implement the Construction Fauna Management Plan as approved by the CEO in writing, until the CEO has confirmed by written notice that the proponent has demonstrated that the requirements of the Construction Fauna Management Plan have been achieved.	Implement CFM Plan.	CFM Plan Annual CAR Correspondence from CEO	Overall	Until the CEO has confirmed that the proponent has demonstrated that the requirements of the Construction Fauna Management Plan have been achieved	C	Refer to Appendix C, Construction Fauna Management Plan (CFMP) Audit Table.
1191:M6.1	Habitat Fragmentation Management Plan	The proponent shall ensure the implementation of the proposal achieves the following environmental objectives: (1) minimise the impacts of habitat fragmentation that are attributable to the proposal on western ringtail possum; and (2) minimise the impacts from predation that are exacerbated by the proposal on western ringtail possum.	Implement Habitat Fragmentation Management (HFM) Plan in accordance with Condition M6-3.	Annual CAR HFM Plan	Overall	Ongoing	C	Refer to Appendix D Habitat Fragmentation Management Plan (HFMP) Audit Table.
1191:M6.2	Habitat Fragmentation Management Plan	The proponent shall ensure the implementation of the proposal achieves the following environmental outcome: (1) abundance and persistence of the western ringtail possum in the receival sites returns to pre-disturbance levels within a maximum of fifteen (15) years from the commencement of construction.	Implement HFM Plan.	Annual CAR HFM Plan	Overall	Within a maximum of 15 years from the commencement of construction	C	Refer to Appendix D, Habitat Fragmentation Management Plan (HFMP) Audit Table. Refer to Appendix L, M5.3 Environmental Performance Report - CFMP.
1191:M6.3	Habitat Fragmentation Management Plan	The proponent shall prepare a Habitat Fragmentation Management Plan and submit to the CEO prior to ground-disturbing activities.	Prepare and submit HFM Plan, including consultation with DBCA.	HFM Plan Consultation with DBCA	Pre-construction	Prior to ground-disturbing activities	CLD	Habitat Fragmentation Management Plan (HFMP) submitted to CEO on 22 July 2022. A copy of the HFMP is available on the Main Roads website. Refer to M6-3, Habitat Fragmentation Management Plan.
		This Plan shall: (1) when implemented, substantiate, and ensure that conditions 6-1 and 6-2 are being met;					C	The approved HFMP has been developed to achieve the objectives of Conditions 6.1 and 6.2 and the ongoing monitoring will demonstrate these objectives have been met. Refer to Appendix D, Habitat Fragmentation Management Plan (HFMP) Audit Table Refer to Appendix L, M5.3 Environmental Performance Report – CFMP.

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
		Fauna crossings, land-bridges and fragmentation (2) specify the locations, dimensions and designs of fauna crossings to reconnect terrestrial fauna habitats, including tree-canopy connections to fauna crossings for western ringtail possum (and brush-tailed phascogale);					C	Refer to Section 2.3 of the HFMP.
		(3) specify the locations and designs of a minimum of two (2) fauna land bridges, which are to be: (a) a minimum width of five (5) metres at the Yalinda Drive traffic bridge; and (b) between five (5) and ten (10) metres at the dedicated fauna land bridge east of Yalinda Drive (to be determined in consultation with DBCA);					C	Refer to Section 2.3.2 of the HFMP.
		(4) specify the revegetation and maintenance requirements of the fauna land bridges to maximise utilisation by western ringtail possums and ensure revegetation is self-sustaining or otherwise managed to ensure its ongoing survival;					C	Refer to Section 2.3.2.2 and 2.3.2.3 of the HFMP.
		(5) specify monitoring methodologies to evaluate the effectiveness and utilisation of fauna crossings and fauna land bridges by western ringtail possum against the objectives in condition 6-1 which must include, but not be limited to, monitoring of DNA scat analysis and camera-monitoring;					C	Refer to Section 2.3.3 of the HFMP.
		(6) specify monitoring methodologies to evaluate the project attributable effects of fragmentation on the demographics and genetics of the local western ringtail possum population and the effectiveness of minimisation measures to demonstrate whether the objective in condition 6-1(1) and outcome in condition 6-2 will be met; Predator control;					C	Refer to Section 2.3.3 of the HFMP.
		(7) specify actions to undertake targeted predator control to reduce predation impacts to conservation significant fauna, to be implemented: (a) one (1) month prior to clearing; (b) during construction of the proposal; and (c) at entrances/exits to fauna crossings and fauna land bridges for a minimum of five (5) years post-construction, subject to the five (5) yearly review required by condition 6-3(12); Abundance and persistence of western ringtail possum;					C	Refer to Section 2.4 of the HFMP.
		(8) specify monitoring methodologies to evaluate the abundance and persistence of the western ringtail possum at the receival sites to demonstrate whether the outcome in condition 6-2 will be met; Protection and enhancement of adjacent habitat;					C	Refer to Table 2.4 of the HFMP.
		(9) demonstrate how the habitat within the clearing exclusion areas (excluding the 'Grey Giant' Heritage Place No. 26059 site) and vegetation retention areas (defined in Figure 4) in Gelorup will be maximised for benefits to western ringtail possums and, where relevant, include provisions to establish revegetation of degraded areas;					C	Refer to Section 2.6.1 of the HFMP.
		(10) include provisions to monitor revegetation required by condition 6-3(9), and undertake maintenance and remedial measures as required to demonstrate it is self-sustaining and habitat is maximised for benefits to western ringtail possums;					C	Refer to Sections 2.6.1 and 2.6.2 of the HFMP.

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
		(11) outline the long-term management and protection mechanism of the clearing exclusion areas and the vegetation retention areas as defined in Figure 4; General plan provisions;					C	Refer to Section 2.6.2 of HFMP.
		(12) be implemented for a minimum of fifteen (15) years post-construction, or otherwise agreed to by the CEO and on advice of DBCA following review of effectiveness every five (5) years;					NR	Review not yet required, refer to Section 3.3 for details on the HFMP review schedule.
		(13) specify management actions; management targets; monitoring locations, methodologies, indicators, and timing; and contingency actions and investigations in the event of a failure to meet a management target to demonstrate that the objectives in condition 6-1 and outcome in condition 6-2 will be met; and					C	Refer to Table 2-1, 2-2, and 2-3 of the HFMP.
		(14) be prepared in consultation with DBCA and in accordance with any requirements of a lawful authority obtained under the *Biodiversity Conservation Act 2016*.					C	Refer to Section 4 of the HFMP.
1191:M6.4	Habitat Fragmentation Management Plan	The proponent shall include a report of a peer review carried out by an independent person or independent persons with suitable technical experience to review the Draft Habitat Fragmentation Management Plan, required under condition 6-3, to report on the adequacy of that content to achieving the objectives and outcome specified in conditions 6-1 and 6-2.	Engage an independent person to undertake peer review. Submit peer review of HFM Plan to CEO.	Peer review of HFM Plan Correspondence with CEO	Pre-construction	Prior to ground-disturbing activities	CLD	A Peer Review of the HFMP was completed on 8 June 2022, prior to ground disturbance. Refer to Appendix C of the HFMP for the Peer Review Report.
1191:M6.5	Habitat Fragmentation Management Plan	The proponent shall submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, following the review of effectiveness every five (5) years, required by condition 6-3(12), that shall: (1) outline the monitoring that was undertaken during the implementation of the Habitat Fragmentation Management Plan required in condition 6-3; (2) outline the results of the monitoring undertaken to report whether that the environmental objectives and outcome specified in conditions 6-1 and 6-2 was achieved; (3) report whether that the objectives and outcome specified in conditions 6-1 and 6-2 was achieved; and (4) outline any management actions undertaken during the implementation of the Habitat Fragmentation Management Plan required in condition 6-3 to meet the objectives and outcome specified in conditions 6-1 and 6-2.	Prepare an Environmental Performance Report (EPR) in relation to the HFM Plan.	EPR as part of Annual CAR	Overall	Every 5 years	NR	EPR in relation to the HFMP due in 2027.
1191:M6.6	Habitat Fragmentation Management Plan	The proponent shall include a report of a peer review carried out by an independent person or independent persons with suitable technical experience to review the Environmental Performance Reports, required under condition 6-5, with the report and to report on the adequacy of that content to achieving the objectives and outcome specified in conditions 6-1 and 6-2.	Peer review of EPR required under Condition M6-5.	Peer review and report	Overall	Every 5 years	NR	Peer Review of EPR in relation to the HFMP due in 2027.
1191:M6.7	Habitat Fragmentation Management Plan	The proponent shall not commence ground-disturbing activities until the CEO has confirmed in writing that the Habitat Fragmentation Management Plan satisfies the requirements of condition 6-3.	Prior to ground-disturbing activities, confirmation from CEO that HFM Plan satisfies Condition M6-3.	HFM Plan Correspondence from CEO	Pre-construction	Prior to ground-disturbing activities	CLD	Letter of approval for HFMP (Rev1A; July 2022) was received from DWER on 22 July 2022 (DWER Ref: DWERVT10552). Refer to M6-7, Habitat Fragmentation Management Plan – Approval.
1191:M6.8	Habitat Fragmentation Management Plan	The proponent shall implement the latest revision of the Habitat Fragmentation Management Plan approved by the CEO.	Implement latest version of HFM Plan.	HFM Plan Annual CAR	Overall	When HFM Plan has been updated	C	Refer to Appendix D, Habitat Fragmentation Management Plan (HFMP) Audit Table.

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
1191:M6.9	Habitat Fragmentation Management Plan	The proponent: (1) may review and submit proposed amendments to the Habitat Fragmentation Management Plan; or (2) shall review and submit proposed amendments to Habitat Fragmentation Management Plan when directed by the CEO.	Review HFM Plan as required.	HFM Plan Correspondence from CEO	Overall	As required or when directed by the CEO	NR	
1191:M6.10	Habitat Fragmentation Management Plan	The proponent shall continue to implement the Habitat Fragmentation Management Plan as approved by the CEO in writing, until the CEO has confirmed by written notice that the proponent has demonstrated that the environmental objectives and outcomes detailed in conditions 6-1 and 6-2 of the Habitat Fragmentation Management Plan have been achieved.	Implement HFM Plan.	Annual CAR HFM Plan Correspondence from CEO	Overall	Until the CEO has confirmed that the proponent has demonstrated that the objectives and outcomes in conditions 6-1 and 6-2 of the Habitat Fragmentation Management Plan have been achieved	C	Refer to Appendix D, Habitat Fragmentation Management Plan (HFMP) Audit Table.
1191:M7.1	Social Surroundings (Noise)	The proponent shall implement the proposal to meet the following environmental objective: (1) minimise operational noise impacts on existing noise sensitive receptors, as far as practicable.	Implement Conditions M7-2 to M7-7	Annual CAR TNM Plan	Overall	Ongoing	NR	
1191:M7.2	Social Surroundings (Noise)	At least six (6) months prior to the operation of the proposal and in order to meet the requirements of condition 7-1, the proponent shall prepare a Traffic Noise Management Plan to include: (1) outdoor noise management targets; (2) indoor noise management targets to apply to noise sensitive receptors where the construction of noise walls is not feasible or practicable; (3) the noise management actions to ensure the noise management targets are met during the operation of the proposal; (4) where noise walls will be constructed, the location, height, and timing of construction of the walls; (5) where acoustic treatment of houses will be implemented, the standard of treatments, timing, and evidence of consultation with affected stakeholders; (6) road design measures to minimise noise emissions where relevant and appropriate, including low noise road surfaces and selection of appropriate bridge expansion joints; (7) post-construction noise monitoring to demonstrate that noise management actions meet the relevant outdoor noise management targets; and (8) contingency actions in the event relevant noise management targets are not met.	Prepare Traffic Noise Management (TNM) Plan.	Annual CAR TNM Plan	Construction	At least 6 months prior to the operation of the proposal	NR	Construction is not complete and will not be completed within 6 months of this reporting period.
1191:M7.3	Social Surroundings (Noise)	The Traffic Noise Management Plan shall be approved by notice in writing from the CEO prior to the commencement of operation.	Submission of TNM Plan.	Correspondence confirming approval of TNM Plan Annual CAR TNM Plan	Construction	Prior to the commencement of operation	NR	
1191:M7.4	Social Surroundings (Noise)	The proponent: (1) may review and revise the Traffic Noise Management Plan; or (2) shall review and revise the Traffic Noise Management Plan when directed by the CEO by notice in writing.	TNM Plan will be reviewed annually and revised if required or as directed by the CEO.	Annual CAR TNM Plan	Overall	As required or when directed by the CEO	NR	
1191:M7.5	Social Surroundings (Noise)	The proponent shall implement the approved Traffic Noise Management Plan, or the most recent version, which the CEO has confirmed by notice in writing satisfies the requirements of condition 7-2.	Implement TNM Plan.	Annual CAR TNM Plan	Overall	Until the CEO has confirmed that the proponent has demonstrated that	NR	

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
						the objective in condition 7-1 is being and will continue to be met		
1191:M7.6	Social Surroundings (Noise)	The proponent shall continue to implement the Traffic Noise Management Plan, or any subsequently approved revisions until the CEO has confirmed by notice in writing that the proponent has demonstrated that the objective in condition 7-1 is being and will continue to be met.	Implement Traffic Noise Management Plan.	Annual CAR TNM Plan	Overall	Until the CEO has confirmed that the proponent has demonstrated that the objective in condition 7-1 is being and will continue to be met	NR	
1191:M7.7	Social Surroundings (Noise)	In the event of failure to implement management actions detailed in the approved Traffic Noise Management Plan, the proponent shall meet the requirements of condition 12-6 (Compliance Reporting) and shall immediately implement management actions to meet the requirements of condition 7-1.	Traffic Noise Corrective Actions Report. Revised Traffic Noise Management Plan.	Annual CAR Traffic Noise Corrective Actions Report	Overall	Immediately implement management actions	NR	
1191:M8.1	Social Surroundings (Amenity Management Plan)	The proponent shall demonstrate that the proposal is designed and constructed in order to meet the following environmental objective: (1) minimise the impacts to social connectivity and visual amenity.	Implement Amenity Management (AM) Plan in accordance with Condition M8.	AM Plan	Overall	Ongoing	C	Refer to Appendix E, Amenity Management Plan (AMP) Audit Table.
1191:M8.2	Social Surroundings (Amenity Management Plan)	The proponent shall demonstrate that the proposal is implemented to meet the following environmental outcome: (1) ensure no project attributable direct or indirect impacts to significant trees.	Implement Amenity Management (AM) Plan in accordance with Condition M8. Conduct surveys and monitoring of significant trees.	Annual CAR AM Plan Significant Tree Survey Reports	Overall	Ongoing	C	No significant trees have been impacted. Refer to Appendix J, M3-4 Environmental Performance Report – Flora and Vegetation (PEC)
1191:M8.3	Social Surroundings (Amenity Management Plan)	The proponent shall prepare an Amenity Management Plan and submit to the CEO within twelve (12) months of the issue of the statement. The Plan shall include, but not be limited to: (1) outcomes of consultation undertaken with the local community and relevant stakeholders regarding: (a) the specifications and locations of amenity infrastructure such as screen-walls, noise-walls, vegetative screening, landscaping, revegetation, pedestrian overpasses/underpasses, walking trails, foot/cycle paths, and any other relevant infrastructure; (2) a map of the amenity infrastructure to be constructed/installed; (3) the roles and responsibilities for on-going maintenance of the amenity infrastructure; and (4) information to demonstrate how the objective in condition 8-1 and outcome in condition 8-2 will be achieved by the Amenity Management Plan.	Prepare AM Plan.	AM Plan Annual CAR	Overall	By 31 May 2023	CLD	The Bunbury Outer Ring Road (Southern Section) Amenity Management Plan (Main Roads WA Reference: D23#500728) was submitted to the CEO on 30 May 2023. The Bunbury Outer Ring Road (Southern Section) Amenity Management Plan (Rev 2 Oct 2023) was approved on 25 October 2023 (App-0398). Refer to M8-3, Amenity Management Plan.
1191:M8.4	Social Surroundings (Amenity Management Plan)	After submitting the Amenity Management Plan and receiving approval by notice in writing from the CEO the proponent shall implement the Amenity Management Plan.	Implement AM Plan.	Annual CAR Correspondence with CEO	Overall	After receiving approval by the CEO	C	The Bunbury Outer Ring Road (Southern Section) Amenity Management Plan (Rev 2 Oct 2023) was approved on 25 October 2023 (App-0398). Refer to M8-4, Amenity Management Plan – Approval. Refer to Appendix E, Amenity Management Plan (AMP) Audit Table.
1191:M8.5	Social Surroundings (Amenity Management Plan)	Following construction, the proponent shall prepare and submit a report to demonstrate that the requirements of the Amenity Management Plan have been implemented and the objective of condition 8-1 and outcome of condition 8-2 has been achieved.	Prepare and submit a report on AM Plan implementation.	Report (Condition M8-5) Correspondence with CEO	Operation	Following construction	NR	
1191:M9.1	Offsets	The proponent shall implement offset measures to counterbalance the significant residual impacts to the following environmental values: (1) 60.9 ha of habitat for western ringtail possum;	Implement Conditions M9-2 to M9-14.	Annual CAR	Overall	Ongoing	C	Refer to Appendix F, Offset Management Plan (OMP) Audit Table.

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
		(2) 60.9 ha of black cockatoo foraging and breeding habitat; (3) 39.2 ha of habitat for south-western brush-tailed phascogale; (4) 23.4 ha of Banksia Woodlands of the Swan Coastal Plain PEC (Banksia Woodlands); (5) 4.4 ha of Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain PEC (Tuart Woodlands); and (6) 4.5 ha of Southern Swan Coastal Plain *Eucalyptus gomphocephala – Agonis flexuosa* Woodlands PEC (Tuart-Peppermint Woodlands), overlapping the Tuart Woodlands PEC.						
1191:M9.2	Offsets	To meet the requirement of condition 9-1 the proponent shall undertake offset measures to the extents and at the locations as set out and described in Table 1.	Implement offset measures in accordance with Table 1 and the BORR Southern Section Offset Management (OM) Plan.	Annual CAR	Overall	Ongoing	C	Refer to Appendix F, Offset Management Plan (OMP) Audit Table.
1191:M9.3	Offsets	Within twelve months of the commencement of ground-disturbing activities, the proponent shall revise the existing Bunbury Outer Ring Road (BORR) Southern Section Offset Management Plan to the requirements of the CEO, and to meet the following objectives: (1) counterbalance the significant residual impacts listed in condition 9-1; (2) improve connectivity of western ringtail possum habitats; (3) ensure a net-gain in western ringtail possum populations in secure conservation tenure within fifteen (15) years from the commencement of construction; and (4) demonstrate a strategic conservation benefit for the western ringtail possum species.	Revise OM Plan and submit to CEO.	OM Plan Annual CAR	Overall	Within twelve months of the commencement of ground-disturbing activities	C	The Offset Management Plan (Rev A,10 Jun 2022) was submitted to DWER on 10 Jun 2022. The Offset Management Plan (Rev C, Nov 2022) was submitted to DWER on 23 Dec 2022. The Offset Management Plan (Rev 1, Feb 2024) was submitted to DWER, and approved on 11 March 2024. Refer to M9-3, Offset Management Plan.
1191:M9.4	Offsets	The BORR Southern Section Offset Management Plan shall: (1) demonstrate that the objectives in condition 9-3 will be met; (2) describe how the offset measures will be implemented consistent with condition 9-2; (3) be prepared in consultation with DBCA, the Shire of Capel and the Shire of Dardanup; (4) consistent with condition 9-2, spatially identify the areas (Proposed Offset Conservation Areas) of: (a) acquired lands offset areas to receive on-ground management and/or revegetation offset measures; (b) DBCA lands to receive on-ground management and revegetation offset measures. (5) demonstrate how the environmental values within the Proposed Offset Conservation Areas will be maintained and improved in order to counterbalance the significant residual impact to the environmental values in condition 9-1 through application of the principles of the WA Environmental Offsets Policy and completion of the WA Offsets Template, as described in the WA Environmental Offsets Guidelines, and the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy Assessment Guide, or any subsequent revisions of these documents; (6) for the land acquisition offsets identified in condition 9-2:	Prepare OM Plan.	OM Plan Annual CAR	Overall	Within twelve months of the commencement of ground-disturbing activities	C	The Offset Management Plan (Rev 1 Feb 2024) was approved by DWER on 11 March 2024. Refer to Appendix F, Offset Management Plan (OMP) Audit Table.

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
		(a) demonstrate that the Proposed Offset Conservation Areas contain the minimum extents of the environmental values identified in condition 9-2; (b) identify how the Proposed Offset Conservation Areas will be protected, being either the sites are ceded to the Crown for the purpose of management for conservation, or the sites are managed under other suitable mechanism for the purpose of conservation as agreed by the CEO by notice in writing; (c) specify the quantum of works associated with establishing the Proposed Offset Conservation Areas, including a contribution for maintaining the offset for at least twenty (20) years after completion of purchase or approval of the offset management plan where relevant; and (d) identify the relevant management body for the on-going management of the Proposed Offset Conservation Areas, including its role, and the role of the proponent, and confirmation in writing that the relevant management body accepts responsibility for its role. (7) For revegetation and/or on-ground management offsets identified in condition 9-2: (a) state the completion criteria for revegetation and/or on-ground management for each offset site, which will demonstrate attainment of the 'future quality with offset' score in Schedule 3. For revegetation offsets relating to western ringtail possum environmental values, this shall include, but not be limited to: (i) western ringtail possum target densities; (ii) completion criteria to measure (at a minimum) ringtail possum abundance/distribution, habitat structure and vegetation condition; and (iii) adaptive management to inform successful habitat revegetation for western ringtail possum. (b) demonstrate the consistency of the targets with the objectives of any relevant guidance, including but not limited to, recovery plans or area management plans; (c) detail the on-ground management actions, with associated timeframes for implementation and completion, to achieve the targets identified in condition 9-4(7)(a); and (d) detail the monitoring, reporting and evaluation mechanisms for the targets and actions identified under conditions 9-4(7)(a) and 9-4(7)(c). (8) for the predator control program within the Ludlow Tuart State Forest/Tuart Forest National Park (consistent with the proponent's Offset Strategy Revision 3 August 2021): (a) state the targets to be achieved by the predator control program which will result in a tangible improvement to the environmental values being offset; (b) demonstrate the consistency of the targets with the objectives of any relevant guidance,						

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
		including but not limited to, recovery plans or area management plans; (c) detail the on-ground management actions, with associated timeframes for implementation and completion to achieve the targets identified in condition 9-4(8)(a), and how the implementation of the predator control program will facilitate the achievement of the objectives in conditions 9-3(3) and 9-3(4); and (d) detail the monitoring, reporting and evaluation mechanisms for the targets and actions, including but not limited to, a review of the program's effectiveness to demonstrate that the objective of conditions 9-3(3) and 9-3(4) will be met. (9) for the establishment of a Wildlife Carer's Peppermint Orchard: (a) identify the location of the Wildlife Carer's Peppermint Orchard and state the completion criteria for this offset measure in accordance with DBCA requirements; and (b) detail the monitoring, reporting and evaluation mechanisms to demonstrate the completion criteria identified under condition 9-4(9)(a) will be met.						
1191:M9.5	Offsets	The proponent: (1) may review and revise the BORR Southern Section Offset Management Plan; or (2) shall review and revise the BORR Southern Section Offset Management Plan as and when directed by the CEO by a notice in writing.	OM Plan will be reviewed annually and revised if required or as directed by the CEO.	Revised OM Plan Annual CAR	Overall	As required or when directed by the CEO	NR	The Offset Management Plan annual internal review was conducted in association with updates and revisions to the Management Plan associated with preparation of Revision 1 (Feb 2024).
1191:M9.6	Offsets	The CEO shall confirm in writing that the BORR Southern Section Offset Management Plan satisfies the requirements of conditions 9-3 and 9-4[1].	Develop and submit OM Plan.	Correspondence from CEO	Pre-construction	Within twelve months of the commencement of ground-disturbing activities	C	The Offset Management Plan (Rev 1 Feb 2024) was submitted to DWER and approved on 11 March 2024 (APP-0000381). Refer to M9-6, Offset Management Plan – Approval.
1191:M9.7	Offsets	The proponent shall implement the latest revision of the BORR Southern Section Offset Management Plan approved by the CEO.	Implement latest version of OM Plan.	Annual CAR OM Plan	Overall	Until the CEO has confirmed that the proponent has demonstrated that the objectives in condition 9-3 are being met.	C	Refer to Appendix F, Offset Management Plan (OMP) Audit Table.
1191:M9.8	Offsets	The proponent shall continue to implement the BORR Southern Section Offset Management Plan until the CEO has confirmed by notice in writing that the proponent has demonstrated that the objectives in condition 9-3 are being met.	Implement OM Plan.	Annual CAR Correspondence from CEO	Overall	Until the CEO has confirmed that the proponent has demonstrated that the objectives in condition 9-3 are being met	C	Refer to Appendix F, Offset Management Plan (OMP) Audit Table.
1191:M9.9	Offsets	When a notification to the CEO occurs in accordance with condition 12-5, the proponent shall provide a report to the CEO within sixty (60) days if the actions, objectives, or targets in the BORR Southern Section Offset Management Plan are unable to be met and provide details and timing of contingency actions to be undertaken, to the satisfaction of the CEO.	Prepare and submit a report to CEO.	Report (Condition M9-9) Correspondence from CEO	Overall	Within 60 days if the actions, objectives, or targets in the BORR Southern Section Offset Management Plan are unable to be met	NR	
1191:M9.10	Offsets	The proponent shall report to the CEO on the outcomes of the contingency actions as required by condition 9-9 within sixty (60) days of completion.	Prepare and submit a report to CEO.	Report (Condition M9-10)	Overall	Within 60 days of completion of the	NR	

[1] This condition has been amended as part of the s45C signed 22 June 2022.

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
						contingency actions		
1191:M9.11	Offsets	The proponent shall continue to implement contingency actions as required by condition 9-9 until the CEO has confirmed by notice in writing that the proponent has demonstrated that the objectives in condition 9-3 are being met.	Implement contingency actions required under Condition M9-9.	Correspondence from CEO	Overall	Until the CEO has confirmed that the proponent has demonstrated that the objectives in condition 9-3 are being met	NR	
1191:M9.12	Offsets	If, after receiving the Environmental Performance Report required by condition 6-5 the CEO determines that the proposal has not met the environmental outcome in condition 6-2 and has resulted in an additional significant residual impact to western ringtail possum, and after notifying the proponent in writing, the proponent must undertake an additional offset to counterbalance the significant residual impact from the additional impact to western ringtail possum in habitats adjoining the development envelope.	Implement additional offsets and revise OM Plan.	Correspondence with CEO OM Plan Annual CAR	Overall	Upon the request of the CEO	NR	
1191:M9.13	Offsets	Within twelve (12) months of receiving notice in writing from the CEO that an additional offset is required under condition 9-12, the proponent shall update the BORR Southern Section Offset Management Plan required by condition 9- 3 to include additional offsets to counterbalance the significant residual impacts to western ringtail possums.	Update OM Plan to include additional offsets requirements and submit to CEO.	Updated OM Plan Annual CAR Correspondence from CEO	Overall	Within 12 months of receiving notice from the CEO that an additional offset is required under condition 9-12	NR	
1191:M9.14	Offsets	The proponent shall implement the latest version of the BORR Southern Section Offset Management Plan, which the CEO has confirmed in writing satisfies the requirements of condition 9-4.	Implement latest version of OM Plan.	OM Plan Annual CAR Correspondence from CEO	Overall	As required when OM Plan is updated	C	The Offset Management Plan (Rev 1 Feb 2024) was submitted to DWER and approved on 11 March 2024 (APP-0000381). Refer to Appendix F, Offset Management Plan (OMP) Audit Table.
1191:M10.1	Contact Details	The proponent shall notify the CEO of any change of its name, physical address, or postal address for the serving of notices or other correspondence within twenty-eight (28) days of such change. Where the proponent is a corporation or an association of persons, whether incorporated or not, the postal address is that of the principal place of business or of the principal office in the State.	Submit written notification to the CEO of changes to contact details.	Written notification to CEO	Overall	Within 28 days of a change of name, physical address, or postal address.	NR	No changes occurred within this reporting period.
1191:M11.1	Time Limit for Proposal Implementation	The proponent shall not commence implementation of the proposal after five (5) years from the date of this Statement, and any commencement, prior to this date, must be substantial.	Implement the proposal and Condition M11-2.	Written notification to CEO	Overall	By 31 May 2027	CLD	This CAR is also considered to be written confirmation that the proponent has substantially commenced construction.
1191:M11.2	Time Limit for Proposal Implementation	Any commencement of implementation of the proposal, on or before five (5) years from the date of this Statement, must be demonstrated as substantial by providing the CEO with written evidence, on or before the expiration of five (5) years from the date of this Statement.	Submit written notification to the CEO.	Written notification to CEO	Overall	By 31 May 2027	CLD	This CAR is also considered to be written confirmation that the proponent has substantially commenced construction.
1191:M12.1	Compliance Reporting	The proponent shall prepare and maintain a Compliance Assessment Plan which is submitted to the CEO at least six (6) months prior to the first Compliance Assessment Report required by condition 12-6, or prior to implementation of the proposal, whichever is sooner.	Prepare a Compliance Assessment Plan and submit to the CEO for approval.	Compliance Assessment Plan (CAP) CEO approval of CAP	Overall	By 28 February 2023 or prior to implementation	CLD	The Compliance Assessment Plan (CAP) was submitted to the CEO on 20 July 2022 and approved on 21 July 2022. A copy of the CAP is available on the Main Roads website. Refer to M12-1, Compliance Assessment Plan.
1191:M12.2	Compliance Reporting	The Compliance Assessment Plan shall indicate: (1) the frequency of compliance reporting; (2) the approach and timing of compliance assessments; (3) the retention of compliance assessments; (4) the method of reporting of potential non-compliances and corrective actions taken; (5) the table of contents of Compliance Assessment Reports; and (6) public availability of Compliance Assessment Reports.	Prepare and submit to the CEO a CAP addressing all requirements.	CAP CEO approval of CAP	Overall	By 28 February 2023 or prior to implementation	CLD	Refer to the CAP.

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
1191:M12.3	Compliance Reporting	After receiving notice in writing from the CEO that the Compliance Assessment Plan satisfies the requirements of condition 12-2 the proponent shall assess compliance with conditions in accordance with the Compliance Assessment Plan required by condition 12-1.	Undertake compliance assessments in accordance with the approved CAP.	Annual CAR	Overall	Ongoing	C	The CAP was approved by the CEO on 21 July 2022 (WERVT10374). Refer to M12-3, M12-1 Compliance Assessment Plan – Approval.
1191:M12.4	Compliance Reporting	The proponent shall retain reports of all compliance assessments described in the Compliance Assessment Plan required by condition 12-1 and shall make those reports available when requested by the CEO.	Prepare and retain annual compliance assessment reports in accordance with the approved CAP. Make CARs available to CEO on request.	Annual CAR	Overall	Ongoing	C	This CAR. Annual compliance assessment reports developed in accordance with the CAP are available on the Main Roads website.
1191:M12.5	Compliance Reporting	The proponent shall advise the CEO of any potential non-compliance within seven (7) days of that non-compliance being known.	Written correspondence to CEO within 7 days of any potential non-compliance.	Annual CAR Correspondence to CEO advising of potential non-compliances.	Overall	Within 7 days of that non-compliance being known	C	No non-compliances have been identified during this reporting period.
1191:M12.6	Compliance Reporting	The proponent shall submit to the CEO the first Compliance Assessment Report fifteen (15) months from the date of issue of this Statement addressing the twelve (12) month period from the date of issue of this Statement and then annually from the date of submission of the first Compliance Assessment Report, or as otherwise agreed in writing by the CEO. The Compliance Assessment Report shall: (1) be endorsed by the proponent's Chief Executive Officer or a person delegated to sign on the Chief Executive Officer's behalf; (2) include a statement as to whether the proponent has complied with the conditions; (3) identify all potential non-compliances and describe corrective and preventative actions taken; (4) be made publicly available in accordance with the approved Compliance Assessment Plan; and (5) indicate any proposed changes to the Compliance Assessment Plan required by condition 12-1.	Submit Annual CAR.	Annual CAR Transmittal documentation of CAR.	Overall	By 31 August 2023 and annually thereafter	C	This is the second Compliance Assessment Report for MS1191.
1191:M13.1	Public Availability of Data	Subject to condition 13-2, within a reasonable time period approved by the CEO of the issue of this Statement and for the remainder of the life of the proposal, the proponent shall make publicly available, in a manner approved by the CEO, all validated environmental data (including sampling design, sampling methodologies, empirical data and derived information products (maps), management plans and reports relevant to the assessment of this proposal and implementation of this Statement.	Publish on Main Roads Western Australia website or provide reports as directed by the CEO.	Transmittal documentation of request for data Website link	Overall	Ongoing	C	This CAR will be published on the Main Roads Western Australia website within 14 days of the report being submitted to the CEO. Other approved management plans and/or reports are available on the Main Roads website.
1191:M13.2	Public Availability of Data	If any data referred to in condition 13-1 contains particulars of: (1) a secret formula or process; or (2) confidential commercially sensitive information; the proponent may submit a request for approval from the CEO to not make these data publicly available. In making such a request the proponent shall provide the CEO with an explanation and reasons why the data should not be made publicly available.	Provide the CEO with an explanation and reasons why data should not be made publicly available.	Correspondence with CEO, request for confidentially, if applicable	Overall	Ongoing	NA	

Appendix C

MS 1191 Construction Fauna Management Plan Audit Table

Audit Table for *Construction Fauna Management Plan* (CFMP) - Requirements to be implemented in accordance with Condition 5 of Ministerial Statement 1191.

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Compliance status
WRP and BTP Management Actions and Performance Targets **Pre construction** Section 2.1 Table 2-1	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*) • South-western brush tailed Phascogale (BTP, *Phasogale tapoatafa*)	• Prior to clearing, the final road design shall be assessed against the proposed clearing area to ensure the required clearing area is no more than the approved area.	Avoid direct impacts to WRP and BTP individuals Minimise indirect impacts on adjacent receival habitat Preclude use of refuge sites within the Development Envelope prior to construction Reduce predator population within the Development Envelope and adjacent habitat	The road design is within the specified clearing limits for the Proposal. Refer this CAR, Table 2 and Figures 2-5.	Compliant
		• At least six (6) weeks prior to clearing, install artificial dreys, artificial watering points and protective natural structures (such as felled trees) in receival sites outside the development envelope, exclusion areas and other areas where appropriate (refer to Section 1.4.1.1.3). • At least six (6) weeks prior to clearing, install arboreal ropes where practical to provide connections from habitat inside the development envelope to receival sites outside the development envelope to minimise the need for WRP to go to ground (refer to Section 1.4.1.1.3).		In consultation with WRP expert Barbara Jones, and Biota Environmental Sciences, SWGA have installed: • artificial dreys and watering points a minimum of six weeks prior the commencement of Category 1 clearing stages during the reporting period. • arboreal ropes where appropriate to provide connections from habitat inside the development envelope to receival sites outside the development envelope. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• Within thirty (30) days prior to clearing (or if staged, prior to each clearing stage) survey for WRP and BTP shall be undertaken to confirm presence / absence and number individuals within the development envelope and at receival sites (refer to Section 2.3.2).		Fauna surveys for WRP and BTP have been conducted within the 30 days prior to clearing activities commencing within clearing stages during the reporting period. Refer to M5-5 Terrestrial Fauna Surveys Refer to Appendix L: M5.3 Environmental Performance Report - CFMP.	Compliant
		• Deploy soft-jaw traps within the Development Envelope during the 30-day period prior to the clearing based on field observations (refer to Section 1.4.1.1.2).		Experienced specialists consultants have been engaged to undertake predator control within and adjoining the Development Envelope. This includes the deployment of soft-jaw traps during the 30-day period prior to clearing. Refer to M6-8 Predator Control Progressive Report.	Compliant
		• Vacant dreys suitable for WRP or BTP shall be removed, and hollows blocked prior to clearing were deemed appropriate and safe.		All clearing of native vegetation has involved specialist fauna consultants with specific experience in relation to WRP / BTP. A component of their daily activities on site is inspection of hollows and the removal of vacant dreys prior to clearing. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• Prior to clearing, control of WONS, declared plants and aggressive environmental weeds recognised as threats to WRP habitat will be undertaken within the Development Envelope.		SWGA have engaged suitably qualified contractors to undertake weed control throughout the Proposal area. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• All WRP and BTP habitat that is to be retained within the Development Envelope shall be delineated prior to site works to ensure it is conserved.		All WRP and BTP habitat that is to be retained is pegged and flagged accordingly to ensure it is conserved. SWGA has a detailed ground disturbance and clearing protocol outlined in the *SWGA Construction Environmental Management Plan* and reflected in the and *SWGA Ground Disturbance and Clearing Permit.* Refer to M0 SWGA Construction Environmental Management Plan. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• Clearing of vegetation shall be confined to daylight hours. • Movement / disturbance of recently cleared vegetation (within 24 hours and prior to downsize / chipping) shall be confined to daylight hours.		SWGA commence clearing one hour after sunrise and complete clearing one hour before sunset as per the Geoscience Australia astronomical definitions. All movement / disturbance of cleared vegetation is checked by fauna spotters and confined to daylight hours (as per the requirements above). Refer to M0 Independent Daily Inspection Reports.	Compliant
		• Cleared vegetation shall be chipped immediately (i.e., not stockpiled) or transported at least 100 m from WRP and BTP habitat before further processing.		The clearing process implemented across the Proposal includes the down-sizing and mulching (chipping) of cleared vegetation on the same day that it is cleared. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• All buildings requiring demolition for the Proposal shall be inspected for WRP and BTP twice a day for two days prior to demolition works. • Where WRP or BTP are observed, or suspected, to be in any building to be demolished attempts shall be made to capture the animal prior to the demolition works commencing. • A licensed fauna-spotter shall be on-site at all times during the demolition of buildings suspected or observed to house WRP or BTP. • Machinery operators shall maintain radio communication with their spotter. • Any pest animal baits used in buildings to be demolished shall be in bait stations and disposed of prior to demolition.		All demolition activities have included the pre-demolition inspections and risk assessment, conducted by specialist fauna consultants. No WRP or BTP have been recorded prior to or during demolition activities. All pest animal baiting has involved the use of appropriate bait stations.	Compliant

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Compliance status
During clearing Section 2.1 Table 2.1	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*) • South-western brush tailed Phascogale (BTP, *Phasogale tapoatafa*)	**Sensitive Clearing Protocols** • Patches of WRP habitat to be cleared will be delineated prior to clearing.	Avoid direct impacts to WRP and BTP. Minimise indirect impacts on adjacent receival habitat. Avoid indirect impacts to WRP in adjacent habitat. Restore and maintain connectivity between known WRP and BTP habitat areas. Reduce predator population within the Development Envelope and adjacent habitat.	SWGA has a detailed ground disturbance and clearing protocol outlined in the *SWGA Construction Environmental Management Plan* and reflected in the *SWGA Ground Disturbance and Clearing Permit.* This includes demarcation of clearing and exclusion areas prior to clearing utilising licenced surveyors. Prior to clearing, the clearing areas are subject to walk-through inspections involving representatives from all major relevant disciplines (environment, engineering, construction, survey, machine operators, fauna spotters, Aboriginal heritage monitors, independent quality certifiers, client). Refer to M0 SWGA Construction Environmental Management Plan. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• Clearing timeframes for Category 1, 2 and 3 Habitat Clearing Categories (Table 1-5) shall be followed.		All clearing works are completed within the clearing timeframes defined in the CFMP. Category 1 clearing is undertaken between the period of March 1st and August 30th. During the reporting period, the category 1 clearing dates are listed below. 2023: May 31/05/2023 – August 30/08/2023 2024: April 03/04/2024 – May 30/05/2024.	Compliant
		• Spotlighting of potential WRP and BTP habitat shall be undertaken by a suitably experienced person for two nights within the seven (7) days prior to clearing. Trees containing WRP will be tagged and checked during pre-clearing fauna searches.		Suitably experienced persons have been engaged to undertake the pre-clearing, clearing and post clearing assessments. All engaged consultants are recognised zoologists or ecologists with prior experience in assessment and management of WRP / BTP during construction activities. Lead personnel have over 20 years' experience in this regard. All clearing of native vegetation including potential WRP and BTP habitat has included pre-clearing nocturnal surveys for 2 nights within 7 days prior to clearing utilising specialised fauna consultants with specific experience in relation to WRP / BTP surveys. Trees with the potential to contain WRP / BTP are tagged and checked during pre-clearing fauna searches. Refer to M5-5 Terrestrial Fauna Surveys Refer to M0 Independent Daily Inspection Reports.	Compliant
		• Pre-clearing fauna searches shall be conducted immediately prior to (i.e., on the day of) and during clearing operations and will include hollows, dreys, ground debris, dense ground-level vegetation, fallen timber and logs.		All clearing of native vegetation has involved specialised fauna consultants with specific experience in relation to WRP / BTP, and management during clearing activities. Pre-clearing fauna searches have been conducted immediately prior to and during clearing operations. Vacant dreys / vacant tree hollows suitable for WPR or BTP, have been removed prior to clearing where appropriate. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• Clearing shall be conducted congruent with the habitat clearing categories as detailed in Table 1-5 and shown in Figure 2. • Habitat clearing is to be staged, commencing from existing cleared edges / roads, and progressing towards habitat that will be retained to direct WRP and BTP towards these areas as per the proposed clearing staging (Figure 2).		Clearing has been congruent with the habitat clearing categories and staging. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• Where western ringtail possums (WRP) are observed during clearing operations, the tree containing the animal shall be left for up to two consecutive nights to allow for the animal to vacate or move into an artificial drey (installed within or near trees known to contain possums prior to clearing), while clearing continues in adjacent vegetation. If the tree continues to be occupied after two consecutive nights, the animal will be safely coerced / relocated to a safe area outside of the clearing footprint by the authorised fauna spotter(s). Where possums have been identified as likely to occur (i.e., observed hollow), trees shall be 'bumped gently" with a machine prior to felling. The machinery operator and fauna spotter(s) will wait and observe the tree for a period of time to allow fauna to move off on its own accord into the surrounding vegetation. If the animal remains in the tree, the tree shall be felled slowly and controlled onto vegetation, as directed by the fauna spotter(s). The 'soft felling' of habitat trees will provide a 'cushion' for the vegetation being felled, minimising the risk of injury to the animal and allow any WRP the opportunity to safely vacate.		All clearing of native vegetation has involved specialised fauna consultants with specific experience in relation to WRP / BTP, and management during clearing activities. When observed during clearing operations, trees containing WRP or BTP have been left for up to two consecutive nights at the discretion of specialist fauna spotters. Trees observed to support WRP after two consecutive nights have been treated in accordance with the sensitive clearing protocols, and on advice by specialised fauna spotters with specific experience in relation to management of WRP. Refer to M5-5 Terrestrial Fauna Surveys Refer to M0 Independent Daily Inspection Reports.	Compliant

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Compliance status
		• Artificial dreys may be installed within or near trees known to contain WRP prior to clearing, as WRP appear to preferentially move into artificial dreys. Entrances of inhabited dreys will be safely blocked, and both the drey and WRP will be securely relocated into nearby receival site habitat, as has been successfully implemented in other local clearing projects (Dr. Mike Bamford, pers. comm.). Alternatively, where practical, the hollow may be cut from the tree with the WRP in situ, and relocated to nearby receival habitat, as has been successfully implemented in other local clearing projects (Dr. Mike Bamford, pers. comm.). • In situations where connections to adjacent receiving habitat have been reduced by ongoing clearing or potentially cause stress or take of the animal, a licensed fauna spotter may coerce / move the animal to a safe area outside of the clearing footprint. Where practical, WRP will be encouraged to move along the branches of one tree to the next, into receival site habitat. Experience shows that WRP will also step onto a net and allow themselves to be carried on the net to trees in receival habitat (Dr. Mike Bamford, pers. comm.).		All clearing of native vegetation has involved specialised fauna consultants with specific experience in relation to WRP / BTP, and management during clearing activities. Hollows containing WRP or BTP may be safely removed from a tree and relocated to adjacent receival habitat if appropriate for the circumstances. Fauna spotters present on site during clearing may coerce or relocate WRPs, where practicable, to adjacent habitat outside the clearing boundary where appropriate. Refer to M0 Independent Daily Inspection Reports.	Compliant
		• Felled trees with hollows shall be checked immediately for fauna after felling (by fauna spotter) and prior to further processing. If it is not possible to fully inspect the hollow, the tree will be left on the ground overnight to allow time for any undetected fauna to vacate. • Vacant dreys within felled trees will be destroyed immediately to prevent animals re-entering them.		All clearing of native vegetation has involved specialised fauna consultants with specific experience in relation to WRP/BTP being present on site during the clearing activities. A component of their daily activities on site is an inspection of trees and vegetation immediately on felling to inspect for fauna. If it is not possible to fully inspect the trees, hollows, or vegetation, these are left as a minimum overnight to allow time for any undetected fauna to vacate. Vacant dreys within felled trees are immediately dismantled to prevent animals re-entering them. Refer also to M0 Independent Daily Inspection Reports.	Compliant
		• A post-clearing survey shall be undertaken (by fauna spotter) immediately following each day's clearing operations and the following morning to identify the presence of any injured animals.		All clearing of native vegetation has involved specialised fauna spotters with specific experience in relation to WRP/BTP being present on site during the clearing activities. A component of their daily activities on site is a post-clearing inspection to review cleared areas, and to identify any potential injured animals. Refer also to M0 Independent Daily Inspection Reports.	Compliant
		Terrestrial Fauna Handling • Fauna handling shall only be conducted by licensed fauna spotters.		SWGA have engaged highly experienced and licensed personnel to undertake the pre-clearing, clearing and post clearing assessments. All engaged consultants are recognised zoologists or ecologists with prior experience in assessment and management of WRP during construction activities (SW Environmental personnel each have around 20 years' experience in this regard). Refer also to CAR Audit Table M4-3(1) Fauna spotter accreditation.	Compliant
		• Any WRP and BTP showing signs of injury or illness shall be caught, bagged, and taken to an experienced wildlife veterinarian. • If an injured WRP or BTP has not already been captured, then the appointed fauna-spotter must attempt to capture the animal for the purposes of veterinary assessment and treatment. • All treatment of injured fauna shall be undertaken by a veterinarian.		SWGA has access to a number of experienced wildlife veterinarians and wildlife carers should they be required.	Compliant
		• Where clearing operations abut existing roads, in addition to standard traffic management measures, visual message boards shall be installed to warn drivers of the potential for fauna to cross the road during clearing operations.		Vehicle Message Boards have been installed to notify drivers of the potential for fauna to cross the road, for clearing works abutting roads. Refer to M0 Independent Daily Inspection Reports.	Compliant
During construction Section 2.1 Table 2.1	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*) • South-western brush tailed Phascogale (BTP, *Phasogale tapoatafa*)	• Road construction activities (i.e., activities undertaken after clearing has been completed) adjacent to WRP habitat will only be undertaken during daylight hours where practicable.	Avoid direct impacts to WRP and BTP. Minimise indirect impacts on adjacent receival habitat. Avoid indirect impacts to WRP in adjacent habitat. Restore and maintain connectivity between known WRP and BTP habitat areas. Reduce predator population within the Development Envelope and adjacent habitat.	Normal construction hours are 7am – 5pm, Monday to Friday (excluding Public Holidays). Out of hours work is restricted and regulated. It should be noted that clearing works commence at least one hour after sunrise and are completed at least one hour before sunset as per the Geoscience Australia astronomical definitions.	Compliant
		• Post-clearing, possum exclusion fencing (temporary and permanent) shall be installed adjacent at known habitat areas to exclude WRP and BTP moving onto the road (Figure 6). The fencing will be 1.5 m high and be constructed to prevent possums being able to climb over or dig under it. Possum exclusion fencing shall take account of and complement noise and screen walls in excluding fauna from moving onto the road.		The Proposal design reports and drawings include the requirements for installation of fauna fencing in accordance with CFMP, with installation ongoing within the Proposal area.	Compliant
		• Deploy soft-jaw traps bi-monthly within the Development Envelope during construction based on the outcomes of site assessments.		Experienced specialists consultants have been engaged to undertake predator control within and adjoining the Development Envelope. This includes bi-monthly deployment of soft-jaw traps during construction.	Compliant

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Compliance status
				Refer to M6-8 Predator Control Progressive Reports.	

		Loss of ecological connectivity
		• Construct two fauna bridges at Yalinda Drive and 350 meters to the east, at least 5 meters in width.
		• Install permanent possum rope bridges / underpasses at key location(s) to enable fauna including WRP to move between retained habitat areas, see Figure 6.
		• Install tree-canopy connections to all crossing structures.
		• The size and design of all movement devices will be based on MRWA Design of Fauna Underpasses (MRWA, 2010), topography at the site, expert advice (Barbara Jones, pers. comm.), information from relevant studies and reports (QDMR, 2000; Harper, M., Mccarthy, M. & van der Ree, R., 2008) and in line with the concept designs.
		• Underpass dimensions will be based on the fauna recorded or expected to occur in the vicinity.
		• The final underpass designs will incorporate the following features known to encourage use by fauna and reduce the risk of predation:
		  • Connection to nearby habitat via overhead rope hawsers and poles (minimum 2.5 m high) (Plate 1);
		  • Objects for fauna to shelter on, under or in (furniture) will be locally sourced and will include sand, mulch, logs, and rocks;
		  • Revegetation using fast growing species at underpass entrances to provide cover for animals approaching, entering, and leaving the underpasses;
		  • Natural flooring such as sand or gravel;
		  • Possum fencing to direct fauna towards the underpass entrance; and
		  • Dual-use underpasses will have a concrete substrate and will not contain furniture (furniture would be washed away by drainage flows).
		• The Proposal Area boundary will be fenced according to the detailed design to restrict pedestrian and vehicular access to retained WRP habitat.
				Construction of Fauna connectivity structures (e.g., Fauna underpasses and bridges) commenced during this reporting period. These structures are being built as per the Proposal design reports and drawings.	Compliant

Post construction		• Deploy soft-jaw traps bi-annually at fauna crossing structure access and egress points (once in each of the spring and autumn seasons) for five years post-construction based on the outcomes of site assessments.	Minimise predation at crossing structures.	Not required at this stage.	Not required at this stage
SMART Performance Standards for WRP and BTP Section 2.1.2. Table 2-2	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*) • South-western brush tailed Phascogale (BTP, *Phasogale tapoatafa*)	• No WRP injuries or mortalities as a consequence of construction activity. • No WRP or BTP injuries or mortalities as a consequence of construction activity.	Avoid direct impacts to WRP and BTP individuals. Preclude use of refuge sites within the Development Envelope prior to construction.	No Project attributable injuries or mortalities to WRP and BTP individuals occurred during this reporting period.	Compliant
		• Not more than 60.9 ha of WRP and 39.2 ha of BTP habitat cleared.	Minimise indirect impacts on adjacent receival habitat Reduce clearing of WRP and BTP habitat to the extent practicable in final design.	Refer this CAR (Table 2 and Figure 4) for clearing or WRP and BTP habitat during the reporting period. Clearing and disturbance has included: 17.94 ha of habitat for WRP during the reporting period. Clearing and disturbance of a total of 42.32 ha has occurred since clearing for the Proposal commenced (and at the end of this reporting period); and does not exceed the 60.9 ha permitted. 11.72 ha of habitat for BTP during the reporting period. Clearing and disturbance of a total of 29.80 ha has occurred since clearing for the Proposal commenced (and at the end of this reporting period); and does not exceed the 39.2 ha permitted.	Compliant
Post construction	• Western Ringtail Possum (WRP,	• WRP abundance trends at monitored receival sites commensurate with (i.e., not greater than 5 % different to) those at reference sites.	Minimise indirect impacts on WRP in adjacent receival habitat.	Not required at this stage.	Not required at this stage

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Compliance status
Section 2.1.2. Table 2-2	*Pseudocheirus occidentalis*) • South-western brush tailed Phascogale (BTP, *Phasogale tapoatafa*)	• Quality / condition of WRP and BTP monitored receival sites adjacent to the Development Envelope is maintained at baseline or any change is commensurate with (i.e., not greater than 5% different to) that at reference site habitat. • WONS, Declared weeds and / or environmental weeds recognised as threats to WRP within the Development Envelope are below baseline survey levels.	Maintain condition rating in adjacent WRP and BTP receival habitat.	Not required at this stage.	Not required at this stage
		• Installation of engineered movement structures as per specification.	Restore and maintain connectivity between known WRP and BTP habitat areas.	Not required at this stage.	Not required at this stage
		• Monitor and implement predator management at crossings to ensure observation do not increase by 25%.	Minimise predation at crossing structures.	Not required at this stage.	Not required at this stage
WRP Monitoring Program Section 2.3.7. Table 2-3	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*) • South-western brush tailed Phascogale (BTP, *Phasogale tapoatafa*)	• Injury or death of WRP recorded by Fauna spotters (with lawful authority) and reported to Manager Environment within 24 hours of incident occurring. • Main Roads to consult with DBCA of the WRP injury or mortality occurring.	Avoid direct impacts to WRP individuals.	No Project attributable injuries or mortalities to WRP and BTP individuals occurred during this reporting period.	Compliant
		• Relocation of WRP recorded by Fauna spotters (with lawful authority) and reported to DBCA / DWER within thirty (30) days after clearing (for each clearing stage).		Records of whether threatened or priority fauna (WRP / BTP) are encountered during clearing, are reported to the CEO and DBCA within thirty (30) days after clearing (or each clearing stage), including the number of individuals relocated in accordance with any requirements of the lawful authority obtained under the *Biodiversity Conservation Act 2016*. Refer to M5-5 Fauna records during clearing.	Compliant
		• Area of WRP habitat cleared reported to Manager Environment monthly.	Reduce clearing of WRP habitat to the extent practicable in final design Minimise indirect impacts on adjacent receival habitat.	Area of WRP habitat cleared is reported to the Manager Environment daily during Category 1 clearing and reported monthly. This CAR details the total WRP habitat cleared during the reporting period (and to date) (Table 2, Figure 4a).	Compliant

		• Report annually as part of Environmental Performance Report against performance measures and contribution of measures to achievement of the environmental objectives. The EPR or response summary will include:
		  • Bi-monthly surveys - WRP presence / absence, abundance, and distribution (within DE and at receival habitat and reference sites) monitored by a continuation and expansion of the bi-monthly strip sampling surveys that have been conducted within the Development Envelope, receival sites and reference sites since October 2019.
		  • WRP monitoring - telemetry study (including GPS collars), and mark-resight study.
		  • Habitat monitoring – WRP habitat (within the Development Envelope and at receival sites) monitored via assessment of 3D aerial imagery.
			Restore and maintain connectivity between known WRP habitat areas.
			Minimise indirect impacts on WRP in adjacent receival habitat.
			Maintain condition rating in adjacent WRP receival site habitat.
				This CAR.
				Refer to Appendix L: M5.3 Environmental Performance Report - CFMP.
					Compliant

Site Induction Training Program Section 2.4.3. Table 2-5		• Awareness of Main Roads Environmental Policy. • Identification of the environmental values in the Development Envelope. • Identification of key environmental risks associated with the Proposal, and the identification of management requirements to control such risks. • Roles and responsibilities of all personnel in the protection and management of the environment, including identification of key personnel that have specific roles or responsibilities. • Awareness of importance of compliance with the environmental requirements (including penalties for non-conformance with the environmental requirements). • Pegging of the area of works, and other pegging types (for example, trees to be retained). • Clearing of native vegetation and management of topsoil. • Hygiene procedures for Phytophthora Dieback and weed management. • Appropriate disposal of wastes. • Environmental incidents, including the requirements for management and reporting. • The environmental benefits of improved personal performance.	Site induction training program.	All personnel on the Project are required to complete an online and face to face induction. The induction addresses the details listed. Refer to M0 SWGA Construction Environmental Management Plan.	Compliant

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Compliance status
Environmental Audit Schedule **Pre construction** Section 3.1. Table 3-1		• Review of construction procedures to ensure CFMP management / monitoring actions are incorporated within works procedures.	Prior to construction.	A pre-commencement audit was completed in July 2022 (Preston Consulting), prior to the commencement of construction works associated with the Proposal.	Completed
Environmental Audit Schedule **Construction** Section 3.1. Table 3-1		• Inspections by site environmental personnel during the clearing of Habitat Category 1 areas. • Inspections by site environmental personnel to identify compliance with CFMP. • Independent audit for assessment of compliance with CFMP.	Daily. Periodic (generally weekly). Once during construction.	Independent auditors are on site daily during clearing within Category 1 areas, including specific review of compliance against the CFMP. Refer to M0 Independent Daily Inspection Reports. SWGA environmental personnel are on site daily during clearing of Category 1 areas. Daily inspections include identifying compliance with the CFMP. Between June-August 2023, an independent audit was conducted on the implementation of the CFMP.	Compliant
Environmental Audit Schedule **Post construction** Section 3.1. Table 3-1		• Independent audit for assessment of compliance with CFMP.	Once during 3 year post construction period.	Not required at this stage.	Not required at this stage
CFMP Review Schedule **Construction**		• CFMP will be reviewed and updated, as necessary with adaptive management measures following completion of year 1 clearing.	Prior to recommencing of Category 1 Habitat in 2023.	The CFMP is subject to ongoing review (with the most recent undertaken in April 2024). No updates have been required to date. Previously, the CFMP was reviewed in February 2023.	Completed
CFMP Review Schedule **Construction and Post Construction**		• Review CFMP management and monitoring actions. • Review of opportunities for an improvement in environmental performance. • Revise CFMP (if appropriate) and seek DWER approval of revised CFMP.	Annually (once during construction). Once every three years post construction for nine (9) years.	An annual review (once during construction) was completed in February 2023.	Compliant

Appendix D

MS 1191 Habitat Fragmentation Management Plan Audit Table

Audit Table for *Habitat Fragmentation Management Plan* (HFMP) - Requirements to be implemented in accordance with Condition 6 of Ministerial Statement 1191.

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Compliance status
WRP Management Actions and Performance Targets **Prior to construction** Section 2.1 Table 2-1	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*)	• Undertake pre-construction baseline 3D aerial surveys of habitat condition in Development Envelope, receival sites and reference sites to assess if pre-construction condition rating in adjacent WRP receival habitat is maintained post construction.	• Maintain pre-construction condition rating in adjacent WRP receival habitat (Section 2.6) through pre and post construction condition monitoring.	A baseline aerial surveys of habitat condition within and adjacent to the Proposal area was completed in July 2022. Further aerial surveys have been undertaken in February 2023, September 2023 and March 2024. Refer to Appendix L, M5.3 Environmental Performance Report - CFMP.	Compliant
During construction Section 2.1 Table 2-1		• Construct two fauna bridges at Yalinda Drive and 350 meters to the east, both at least 5 meters in width.	• No significant reduction in adjacent receival habitat condition (CFMP and Section 2.6) due to indirect impacts associated with the Proposal detected through pre and post construction condition monitoring. • Restore connectivity between known WRP habitat areas (Section 2.3), through installing crossing structures and subsequent utilisation monitoring. • Ensure revegetation is planted to the design criteria specified in Section 2.3.2.1 and 2.3.2.2.	These are incorporated in the Proposals design and construction of the fauna bridges commenced during this reporting period.	Compliant
		• Install permanent possum rope bridges / underpasses at key location(s) (section 2.3) to enable WRP to move between retained habitat areas (Figure 3). Install tree-canopy connections to all crossing structures. The size and design of all movement devices will be based on MRWA Design of Fauna Underpasses (MRWA, 2010), topography at the site, expert advice (Barbara Jones, pers. comm.), information from relevant studies and reports (QDMR, 2000; Harper, M., Mccarthy, M. & van der Ree, R., 2008) and in line with the concept designs (Figure 5). Underpass dimensions will be based on the WRP fauna recorded or expected to occur in the vicinity (Figure 5 HFMP).		This is incorporated in the Proposal design, however, not yet constructed.	Not required at this stage

		• The final underpass designs will incorporate the following features known to encourage use by WRP and reduce the risk of WRP predation:
		  • Connection to nearby habitat via overhead rope hawsers and poles (minimum 2.5 m high)
		  • Objects for WRP to shelter on, under or in (furniture) will be locally sourced and will include sand, mulch, logs, and rocks
		  • Revegetation using fast growing species at underpass access and egress points to provide cover for WRP approaching, entering, and leaving the underpasses
		  • Natural flooring such as sand or gravel
		  • Possum fencing to direct fauna towards the underpass entrance
		  • Dual-use underpasses will have a concrete substrate and will not contain furniture (furniture would be washed away by drainage flows).
				This is incorporated in the Proposals design and construction of the fauna underpasses commenced during this reporting period.	Compliant

		• Install possum fence adjacent to known habitat areas to limit WRP access to the Development Envelope, see Figure 3 (HFMP). • The possum fence will be 1.5 m high and constructed to prevent WRP being able to climb over or dig under it, see Figure 4 (HFMP).		The Proposal design reports, and drawings include the requirements for installation of fauna fencing (to 1.5m high) in accordance with the HFMP. The construction of possum fencing adjacent to known habitat areas commenced during this reporting period.	Compliant

		• Undertake targeted revegetation:
		  • at fauna crossing structure access and egress points (adjacent to the Development Envelope) to make utilisation of the structures attractive and effective for WRP
		  • on fauna land bridge decks
		  • in degraded portions of vegetation retention areas and clearing exclusion areas.
				No revegetation has been undertaken during the reporting period.
				Construction of the fauna structures (crossing structures and land bridges) commenced during this reporting period, however, has not yet been completed. Revegetation associated with these fauna crossing structures will commence following their construction.
					Not required at this stage

		• Deploy soft-jaw traps, or other appropriate approach or technique, within the Development Envelope during construction (refer to Section 2.4.2).	• Reduce predator population within the Development Envelope and adjacent habitat compared to baseline survey results.	Specialist consultants have been engaged to undertake predator control within and adjoining the Proposal area. Soft-jaw traps are the primary approach to predator (fox) control. Implementation of the feral and invasive animal management occurs prior to, during, and post-clearing. Refer to M6-8 Predator Control Progressive Report.	Compliant
Post construction Section 2.1 Table 2-1	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*)	• Install design features at WRP crossing structure locations (adjacent to the Development Envelope) to ensure access to water is maintained and to encourage utilisation of the structures. • Ongoing 3D aerial surveys of habitat condition in Development Envelope, receival sites and reference sites.	• Maintain connectivity between known WRP habitat areas (Section 2.3) through installing crossing structures and demonstrating WRP usage though structure utilisation monitoring.	The Proposal is in the construction phase. This management action will be implemented post-construction. Aerial surveys of habitat condition within and adjacent to the Proposal area have been completed in July 2022 (prior to construction), February 2023, September 2023 and March 2024 and are ongoing. Refer also to Appendix L, M5.3 Environmental Performance Report - CFMP.	Not required at this stage

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Compliance status
		• Supplement revegetation at fauna crossing structure access and egress points (adjacent to the Development Envelope) where required to achieve completion criteria (Table 2-7).	• Revegetation to meet completion criteria specified in Table 2-7.	The Proposal is in the construction phase. This management action will be implemented post-construction. Construction of the fauna structures (crossing structures and land bridges) commenced during this reporting period, however, has not yet been completed. Revegetation associated with these fauna crossing structures will commence following their construction.	Not required at this stage
		• Deploy soft-jaw traps, or other appropriate approach or technique, bi-annually at fauna crossing structure access and egress points (once in each of the spring and autumn seasons) for the period of EPBC Act/EP Act approvals or as otherwise agreed by the Minister/CEO (refer to Section 2.4.2).	• Reduce predator population within the Development Envelope and adjacent habitat.	The Proposal is in the construction phase. Fauna crossing structures construction has commenced during this reporting period. This management action relates to the post-construction phase.	Not required at this stage
		• Motion sensor IR cameras will be installed on fauna crossing structures to assist with determining crossing structure efficacy.	• Cameras will be deployed for a minimum of four weeks annually for a minimum of fifteen (15) years postconstruction.	The Proposal is in the construction phase. Fauna crossing structures construction has commenced during this reporting period. Motion sensor IR cameras will be implemented post-construction.	Not required at this stage
SMART Performance Standards for WRP Management Objectives Section 2.1.3 Table 2-3		• No reduction in receival site vegetation condition against pre-construction habitat survey results (Section 2.3.3.2), or any trends in condition change are consistent with changes to reference site habitat condition over the same period.	• Maintain or improve condition rating in adjacent WRP receival habitat.	Refer to Appendix L, M5.3 Environmental Performance Report - CFMP. Refer to Appendix J, M3-4 Environmental Performance Report – Flora and Vegetation.	Compliant
		• WRP abundance and persistence trends at receival sites returns to pre-disturbance levels within 15 years from commencement of the action.	• Minimise or avoid indirect impacts on WRP in adjacent receival habitat.	Specialist consultants have undertaken bi-monthly WRP surveys within and adjoining the Proposal area since 2019 to identify trends in WRP abundance within and adjoining the Proposal area and at reference sites. Refer to Appendix L, M5-3 Environmental Performance Report – CFMP.	Compliant
		• Restore and maintain connectivity between known WRP habitat areas.	• Structures utilised within 5 years of construction	Connectivity will be maintained and restored through the installation of fauna bridges, crossings, and underpasses. The Proposal is in the construction phase. This management action will be implemented post-construction.	Not required at this stage
		• As detailed in Table 2-7 for the fauna land bridges and forecourt areas and fauna crossing structure access and egress points and Table 2-10 for vegetation retention and clearing exclusion areas.	Ensure revegetation meets design criteria. • Ensure revegetation achieves success criteria.	The Proposal is in the construction phase. No revegetation has occurred. This management action will be implemented upon the commencement of the revegetation.	Not required at this stage
SMART Performance Standards for HFMP Outcomes Section 2.1.3 Table 2-4	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*)	• WRP abundance at monitored receival sites return to pre-disturbance levels.	• Abundance and persistence of the western ringtail possum in the receival sites returns to pre-disturbance levels within fifteen (15) years from the commencement of construction.	Longer-term management requirement. Refer to Appendix L, M5-3 Environmental Performance Report - CFMP.	Not required at this stage
Land-bridge Revegetation Monitoring Section 2.3.2.3. Table 2-7	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*)	• Installation of logs and timber (furniture), minimum 2 per ha, to provide cover for ground fauna. • Weed cover within revegetation area less than 20 % by area. • No weed occurrence is to extend more than 50 % of the bridge deck width. • Bare ground cover within revegetation area no more than 10 % by area. • Plant density equivalent to at least 20 stems per 25 m2. • Native vegetation cover 80 % by area across all strata. • Evidence of juvenile native plant recruitment. • Native vegetation cover 80 % by area across all strata and • Evidence of juvenile native plant recruitment. • A minimum of 50 % of the range of species planted present.	• Presence of fauna furniture. • Weed cover by area based on quadrats. • Bare ground cover by area based on quadrats. • Plant density. • Native vegetation cover by area based on quadrats. • Natural recruitment of native species. • Presence/absence of pests. • Diversity of species present.	The Proposal is in the construction phase. Construction of the fauna crossing structures commenced during this reporting period, however, have not yet been completed. These management action will be implemented following completion of construction of the fauna structures.	Not required at this stage
WRP Habitat Fragmentation Monitoring Section 2.3.3. Table 2-8	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*)	• Habitat monitoring – WRP habitat (within the Development Envelope and at receival sites) monitored via assessment of 3D aerial imagery.	• Maintain condition rating in adjacent WRP receival site habitat.	Refer to Appendix L, M5-3 Environmental Performance Report – CFMP. Refer to Appendix J, M3.4 Environmental Performance Report – Flora and Vegetation.	Compliant

		• WRP monitoring –
		  • Telemetry study (including GPS collars), and
		  • Mark-resight study.
			• Minimise indirect impacts on WRP in adjacent receival habitat.	Refer to Appendix L, M5-3 Environmental Performance Report – CFMP.	Compliant

Management Plan Reference No.	Species	Management Action	Performance Target	Comments / Evidence	Compliance status
		• Genetic relatedness study – genetic analyses of the population and relational dynamics (degree of relatedness) of WRP within the Development Envelope and receival sites.	• Abundance and persistence of the western ringtail possum in the receival sites returns to pre-disturbance levels within fifteen (15) years from the commencement of construction.	Refer to Appendix L, M5-3 Environmental Performance Report – CFMP.	Compliant
		• Bi-monthly surveys - WRP presence / absence, abundance, and distribution (within DE and at receival habitat and reference sites) monitored by a continuation and expansion of the bi-monthly strip sampling surveys that have been conducted within the Development Envelope, receival sites and reference sites since October 2019.		Refer to Appendix L, M5-3 Environmental Performance Report – CFMP.	Compliant
		• Conduct visual assessment of constructed / in construction WRP movement structures to confirm these are as per detailed design and provision of as constructed plans. • Possum fencing intact and effective. Conduct inspections of fencing for damage and effective function. • WRP recorded or filmed using rope bridge or underpass. • WRP presence / absence (at structures).	• Restore and maintain connectivity between known WRP habitat areas.	The Proposal is still in the construction phase. Construction of the fauna crossing structures commenced during this reporting period. Visual checks of the structures during construction have been completed, and is ongoing, with construction as per the detailed design. Other management action will be implemented post-construction.	Compliant
		• Revegetation to design specification. • Revegetation success, see Section 2.6.3.	• Ensure revegetation meets design criteria. • Ensure revegetation achieves success criteria.	The Proposal is still in the construction phase. No revegetation has yet occurred. This management action will be implemented upon the commencement of revegetation.	Not required at this stage
WRP Predator Control Monitoring Aspects Section 2.4.3 Table 2-9	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*)	• Predator control efficacy, based on feral predator presence within the Development Envelope and receival sites. • Predator control implementation schedule and field records	• Reduce predator population within the DE and adjacent habitat. • Minimise predation at crossing structures.	Experienced specialists consultants have been engaged to undertake predator control within and adjoining the Development Envelope. Refer to M6-8 Predator Control Progressive Reports.	Compliant
Reporting Requirements Section 2.7.1 Table 2-11	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*)	• Implementation of HFMP.	• Annually (as part of annual compliance reporting).	The HFMP has been implemented during the reporting period. Refer to this CAR.	Compliant
		• Non-compliance with HFMP or Environmental incident.	• Report - As soon as reasonably practicable but not more than seven business days after becoming aware of the incident or non-compliance (DWER).	No non compliances with the HFMP have been recorded during this reporting period.	Compliant
HFMP Review Construction and Post construction Section 3.3 Table 3-2	• Western Ringtail Possum (WRP, *Pseudocheirus occidentalis*)	• Review of HFMP management and monitoring actions. • Review of opportunities for an improvement in environmental performance	• Annually (Once during construction)	The HFMP is subject to ongoing review (with the most recent undertaken in April 2024). No updates have been required to date. Previously, the HFMP was reviewed in February 2023.	Compliant
		• Revise HFMP (if appropriate) and seek approval of EPA for revised HFMP	• Once every three years post construction for at least nine (9) years*.	Not required at this stage.	Not required at this stage
HFMP Review Post construction Section 3.3 Table 3-2		• Peer review of EPR	• Every five years post construction for 15 years.	Not required at this stage.	Not required at this stage

Appendix E

MS 1191 Amenity Management Plan Audit Table

Audit Table for *Amenity Management Plan* (AMP) - Requirements to be implemented in accordance with Condition 8 of Ministerial Statement 1191.

Management Plan Reference No.	Management Target	Management Action	Monitoring / Timing	Comments / Evidence	Compliance status
Table 4: Social Connectivity	Improve pedestrian connectivity within Gelorup	• Construct pedestrian underpasses at Five Mile Brook (Figure 2, Appendix A) and Yalinda Bridge. Indicative designs of proposed pedestrian underpasses are shown in Appendix B (Landscape Drawings: SWGA-32-980-00-DRG-0102 and 0103).	• Compliance with as constructed drawings	Not commenced during this reporting period.	Not required at this stage.
	Improve connectivity between Gelorup and Stratham.	• Construct pedestrian crossing across Bussell Highway to Jaymon Road linking Gelorup to Stratham. Indicative design of proposed pedestrian crossing is shown in Appendix B (General Arrangement Drawings: SWGA-32-310-00-DRG-0108).		Not commenced during this reporting period.	Not required at this stage.
	Improve pedestrian and cyclist connectivity through the Proposal Area.	• The proposed PSPs to be constructed as part of the Proposal will provide a link from Bussell Highway at Gelorup to South Western Highway at Picton via Centenary Road, Bunbury Outer Ring Road and Willinge Drive. Construct the following connectivity features: - Principal Shared Path (PSP) (3.0 m) on the northern side of BORR, from its intersection with the South Western Highway to the Lillydale Road intersection (Appendix B – General Arrangement Drawings: SWGA-31-310-00-DRG-0101 to 0106) - PSP (3.0 m) on southern side of Lillydale Road, from its intersection with BORR connecting to a Shared Path (2.5 m) on the western side of Bussell Highway (Appendix B – General Arrangement Drawings: SWGA-31-310-00-DRG-0106, 0122, 0123, 0124, 0125 and 0141) - Shared Path (2.5 m) on western side of Jules Road North from BORR to Sleaford Drive intersection (Appendix B – General Arrangement Drawings: SWGA-31-310-00-DRG-0124 and 0131) - Walking Trail (2.0 m) connecting Yalinda Drive (north of BORR), under the Five Mile Brook Bridge, to Jilley Road (south of BORR) (Appendix A – Figure 3 and Appendix B – Landscape Drawings: SWGA-32-980-00-DRG-0101 to 102 and SWGA-32-310-00-DRG-1011) - Shared Path (2.5 m) from the northern to the southern side of BORR from along Yalinda Drive from Cokelup Road across the Yalinda Drive Bridge to Woods Road (Appendix B – Landscape Drawings: SWGA-32-980-00-DRG-0103).		Construction of the proposed PSPs commenced during this reporting period. Construction is as per Proposal design reports and drawings.	Compliant.
	Improve movement on local roads.	• Undertake works on Shire of Capel roads (e.g., Yalinda Drive, Jilley Road, Jules Road and Hasties Road) to provide improved connectivity for local shire roads within Gelorup. • Construct shared paths, cycling and walking paths, drainage, off road carparking on local roads. • Indicative designs of proposed upgraded to local road network are shown in Appendix B (General Arrangement Drawings: SWGA-31-310-00-DRG-0106 to 113, 0121, 0124, 0131).		Construction commenced on Shire of Capel Roads (as per Proposal design reports and drawings) during this reporting period. These roads are still in the construction phase.	Compliant.
	Improve social connectivity by reducing the amount of heavy vehicles using local roads within Gelorup.	• Close Hasties Road to remove thoroughfare for heavy vehicles from Holcim from Jules Road. Indicative designs of proposed upgrades to local road network are shown in Appendix B (General Arrangement Drawings: SWGA-31-310-00-DRG-0151).		Not applicable at this stage.	Not required at this stage.
Table 4: Visual Amenity	Minimise visual amenity impacts on local residents.	• Construction noise and screening walls as per SWGA project designs and locations shown in Figure 4 (Appendix A), including the following: - Noise walls will be constructed of painted concrete panels and steel posts and meet the requirements of SPP 5.4 (WAPC, 2009). - Where appropriate, generally where the height of walls is proposed to be above 2.5 – 3.8 m, high density acrylic / perspex may be used in the top section of the wall to reduce visual impacts and to assist light transfer to adjacent residences. - Construction additional screen walls to further improve noise and visual amenity along the Gelorup corridor. - Noise walls will be extended along the road verge as screen walls. This will be in areas where gaps existed due to predicted levels being below mitigation trigger levels, except where the road is in a large cutting, between Five Mile Brook bridge and Yalinda	• Compliance with As Constructed drawings • Post Construction noise monitoring	Construction of the noise and screen walls commenced during this reporting period. Construction is as per project design reports and drawings.	Compliant.

Management Plan Reference No.	Management Target	Management Action	Monitoring / Timing	Comments / Evidence	Compliance status
		Drive bridge, and therefore sunk well below existing ground levels. - Continuation of screen walls between the noise walls will also reduce visual impacts by providing additional screening of road traffic.			
	Where possible, retain native vegetation.	• Retain native vegetation wherever possible, in addition to the Retention Vegetation Areas and Vegetated Exclusion Areas included in Figure 4 of MS 1191, for passive recreation and link to walk trails. Proposed areas to be retained, such as around Five Mile Brook, are shown in Figure 2 and Figure 3 (Appendix A).	• Compliance with As Constructed drawings	Refer to Figure 3 of this CAR.	Compliant.
	Minimise visual impacts of the view of the road and street lighting	• Installation and maintenance of vegetation screening and landscape planting to mitigate visual impacts of the view of the road and street lighting. The ULDF (BORR IPT, 2020a) includes a range of measures to mitigate visual and landscape impacts during detailed design such as: - Feature planting and feature planting mixes to interchanges - Screen planting of native shrubs and trees to edges interfacing residential land uses - Median planting, where appropriate, of native shrubs and groundcovers to tie into the character of the wider road journey. - Riparian planting to rivers: drainage / swale planting to basins and swales. The proposed locations of vegetation screening and landscape planting area shown in Appendix B (Landscape Drawings: SWGA-32-980-00-DRG-0000).		No revegetation has been completed during this reporting period.	Compliant.
	Minimise privacy intrusion and reduce headlight glare impacts.	• Screen walls are included in the Proposal at various locations for the purposes of providing visual privacy to nearby residences and protection from headlight glare. A headlight glare study was undertaken to assess potential glare issues on nearby residences. Visual mitigation recommendations were provided to the design team and headlight screen walls incorporated into the Proposal design. • Proposed planting includes native screening vegetation to the Proposal Area boundary between the new road and viewer, therefore over time, this would screen views of the road from areas without screen walls. The proposed locations for noise and screen walls from Jilley Road to Bussell Highway are shown in Figure 4 (Appendix A).		Construction of screen walls commenced during this reporting period. Construction is as per project design reports and drawings. No screen planting has been completed during this reporting period.	Compliant.
Table 4: Significant Trees	No direct or indirect impact to the Giant Tuart (‘Grey Giant’) or culturally modified tree attributable to the Proposal.	• <u>Giant Tuart:</u> Establish a “Construction Exclusion Zone” around the Giant Tuart for the project duration, as per Site Exclusion Area in General Arrangement Drawings: SWGA-32-310-00-DRG-0102 for the Giant Tuart (Appendix B). - Avoidance areas within the Permit area must be demarcated prior to commencement of clearing. This includes flagging, fencing and/or sign posting of sites adjacent to construction areas for avoidance. - Exclusion zones shall be demarcated so that a line of sight can be seen between demarcation pegs. - Ground disturbance (direct or indirect) shall not occur within designated exclusion zones. • <u>Culturally modified tree:</u> The culturally modified tree (noting that this is dead), is located in Boyanup, occurs outside the Proposal Area. This tree has intentionally been avoided during the Proposal design development phase and is not expected to be directly or indirectly impacted by the Proposal. For the purpose of protecting culturally significant information, this location has not been mapped in the AMP. The culturally modified tree is located in private property outside the direct management of Main Roads.	• Monthly visual inspections, throughout the construction of the project, of exclusion areas to monitor that there has been no disturbance within these areas.	A “Construction Exclusion Zone” has been established around the Giant Tuart for the project duration. The culturally modified tree remains *in situ* outside the Proposal Area.	Compliant.
Table 5 Construction	Environmental audit and monitoring schedule	• Periodic inspections by site environmental personnel to identify compliance with the AMP	• Periodic (generally monthly)	Routine site inspections are completed by SWGA environmental personnel to identify compliance with various EMPs. Compliance against this AMP is included during these inspections.	Compliant.
		• Audit for assessment of compliance with the AMP	• Annually	AMP was approved in October 2023. An audit for assessment of compliance with the AMP is due in October 2024.	Not required at this stage.

Management Plan Reference No.	Management Target	Management Action	Monitoring / Timing	Comments / Evidence	Compliance status
Table 5 Post Construction		• Audit for assessment of compliance with the AMP	• Annually (once per calendar year for up to 3 years).	Not applicable at this stage.	Not required at this stage.
Table 5 Operation		• At completion of soft landscaping works SWGA shall ensure the following completion criteria are met prior to handover to Main Roads WA: - Non irrigated areas: A minimum of 50% projected foliage cover (excluding any weeds) over any treated area of 100 m2, with no bare soil areas > 2 m2. - All irrigated planting areas: – A minimum of 70% projected foliage cover (excluding any weeds) over any treated area of 100 m2, with no bare soil areas > 0.5 m2. - All non-irrigated areas of grass: – A minimum 70% grass foliage cover (excluding any weeds) over any treated area of 100 m2, with no bare soil areas > 1 m2. Following completion of construction maintenance period the site will be handed over from SWGA to Main Roads WA and will be subject to on-going operational monitoring through standard network surveillance and maintenance.	• As required during SWGA maintenance period. • Ongoing following handover to Main Roads WA.	Not applicable at this stage.	Not required at this stage.

Appendix F

MS 1191 Offset Management Plan Audit Table

Audit Table for *Offset Management Plan* (OMP) - Requirements to be implemented in accordance with Condition 9 of Ministerial Statement 1191.

Management Plan Reference No.	Aspect	Management Action	Requirement	Comments / Evidence	Compliance status
Offset Site #1 **Management actions and Time frames** Ducane Area Lots 153, 267 and 268 Queelup Road Gelorup' offset (Ducane Offset Site). Section 3.4.4 Table 3-5	• Vehicle access	• Install gates and other barriers such as boulders, steel roadside barriers to restrict unauthorised vehicle access.	Installation late 2023 Ongoing twice-yearly inspections commencing late 2023	The installation of gates and other barriers commenced during this reporting period. Further installation and routine maintenance is ongoing.	Compliant
	• Artificial hollows	• Install artificial nesting hollows.	Installation winter 2023 Ongoing annual inspections commencing winter 2023	Initial installation of artificial nesting hollows has been completed. Refer to Appendix K, M4.7 EPR Black Cockatoo Artificial Hollows.	Compliant
	• Weed control	• Conduct baseline weed survey.	Commencing spring 2023	The weed baseline survey was undertaken during October 2023.	Compliant
		• Ongoing weed control program (WONS and Declared weeds) with a particular focus around wetland areas.	Twice-yearly in spring and autumn or as required for years 1 and 2, annually thereafter up to 20 years. Commencing 2024	Weed control is scheduled for optimum control times; including spring 2024, and is ongoing.	Compliant
	• Pest control	• Kangaroo control using shooting.	Twice-yearly at six-month intervals for years 1-5 with additional culling if required, annually thereafter based on site observations of grazing impact. Commencing spring 2024.	Not applicable at this stage.	Not applicable
		• Fox control using 1080 baiting.	Conduct annually in late winter to autumn based on site observation of fox presence. Commencing late winter 2024.	Baiting planned to commence in spring 2024; this will be ongoing.	Compliant
		• Rabbit control using Rabbit Haemorrhagic Disease Virus (RHDV) and Pindone.	Conduct annually in spring to autumn based on site observation of rabbit presence. Commencing spring 2024	Expert predator control contractors have been engaged to undertake rabbit control (rabbit baiting); rabbit baiting was undertaken in July 2024; and is ongoing.	Compliant
		• Feral cat control using trapping.	Conduct annually in spring to autumn based on site observation of cat presence. Commencing autumn 2024	Feral cat control using traps commenced during this reporting period, and is ongoing.	Compliant
	• Fire management	• Maintain 3 m wide firebreak around the offset area boundary.	Ongoing annual inspections and maintenance.	Three metre wide firebreaks around the offset boundaries were established in 2020. Maintenance works were conducted on the firebreaks in November 2023.	Compliant
	• Rubbish removal	• Rubbish will be removed from the site opportunistically to improve vegetation condition and limit the attraction of pest animals.	Rubbish removed from the site opportunistically	Rubbish has been opportunistically removed from site; and is ongoing.	Compliant
Offset Site #1 **Monitoring Program** **Ducane Area** Lots 153, 267 and 268 Queelup Road Gelorup' offset (Ducane Offset Site). Section 3.4.5 Table 3-6	• Presence and condition of fencing	• Visual inspection of fence.	Report annually as part of annual compliance reporting commencing spring 2023	Visual inspections of fencing commenced in Spring 2023 and have been conducted routinely; and is ongoing.	Compliant
	Condition of firebreaks	• Visual inspection of firebreaks (Annually commencing 2021)	Report annually as part of annual compliance reporting commencing spring 2021	Visual inspections of firebreaks are undertaken annually and are included in the Main Roads annual firebreak program.	Compliant
	• Fox, feral cat and rabbit control	• Field survey for visual evidence of fox, feral cat or rabbit presence (Annually in autumn commencing 2024)	Conduct annually in autumn commencing 2024	Expert predator control contractors have been engaged to conduct fox, feral cats and rabbit surveys. These field surveys were undertaken in July 2024; and are ongoing.	Compliant
	• WRP Density/observations	• Nocturnal field survey (including in Reference Sites).	Every three years in October/ November commencing in 2023/2024 (baseline)	WRP nocturnal baseline field survey was undertaken in December 2023.	Compliant
	• Black cockatoo habitat	• Field survey of black cockatoo foraging and potential nesting habitat and artificial hollows	Every two years in spring commencing 2023/24 (baseline) 2024 for artificial hollows	Black cockatoo baseline field survey is in progress; and will be ongoing. Refer to Appendix K, M4.7 EPR Black Cockatoo Artificial Hollows.	Compliant
	• Condition of vegetation assessed against EPA (2016)	• Field survey.	Annually in spring commencing 2023 (baseline).	A baseline flora and vegetation monitoring survey was undertaken in October 2023. Ongoing flora and vegetation field surveys will be conducted annually in spring.	Compliant

Management Plan Reference No.	Aspect	Management Action	Requirement	Comments / Evidence	Compliance status
	• WONS and Declared weed species distribution and diversity	• Presence and distribution (location) of WONS and Declared weed species present.	Annually in spring for five years, commencing 2023 then every two years thereafter.	Field survey for WONS and declared weed species was included in the flora and vegetation monitoring survey undertaken in October 2023.	Compliant
	• Vegetation cover and structure	• Drone footage (3D imagery).	Three-yearly in autumn or spring commencing 2023 (baseline)	Baseline 3D aerial imagery of the offset site was captured as part of the BORR South corridor in 2023 and re-captured in March 2024. Further 3D aerial imagery capture is scheduled for 2026.	Compliant
Offset Site #2 **Management actions and time frames** 29 Queelup Road Gelorup' offset (Lot 29 Offset Area) Section 4.4.4 Table 4-5	• Fencing	• Install boundary fence to rural fence specifications.	Installation 2023 Ongoing quarterly inspections commencing 2023	Boundary fencing has been installed as per the rural fencing specifications.	Compliant
	• Artificial hollows	• Install artificial nesting hollows.	Installation 2024 Ongoing annual inspections commencing 2024	Inspection / nesting survey of three (3) artificial nesting hollows (AFH) installed in June 2023 was conducted on 7 March 2024. Annual inspection / nesting survey for 2025 is planned for October during spring. Refer to Appendix K, M4.7 EPR Black Cockatoo Artificial Hollows.	Compliant
	• Weed control	• Conduct baseline weed survey.	Spring 2023 commencing 2024	Weed baseline survey has been undertaken.	Completed
		• Ongoing weed control program (WONS and Declared weeds) with a particular focus in the area of the south eastern boundary.	Twice-yearly in spring and autumn or as required for years 1 and 2 Annually thereafter based on site observations commencing 2024	A weed control program is in progress; and ongoing.	Compliant
	• Pest control	• Fox control using 1080 baiting.	Annually in late winter to autumn based on site observation of fox presence commencing autumn 2024	A fox control baiting program is in progress, and ongoing.	Compliant
		• Rabbit control using RHDV and Pindone.	Annually in spring to autumn based on site observation of rabbit presence commencing autumn 2024	Expert predator control contractors have been engaged to undertake rabbit control (surveillance (identifying presence and or absence of rabbits) and rabbit baiting). Rabbit control was undertaken in July 2024; and is ongoing.	Compliant
	• Fire management	• Establish and maintain 3 m wide firebreak around the offset area boundary.	Autumn 2023 commencing autumn 2023, maintenance ongoing	Three metre wide firebreak has been established around the offset area boundary. Maintenance and monitoring are incorporated in the Main Roads annual firebreak program; and will be ongoing.	Compliant
Offset Site #2 **Monitoring Program** Lot 29 Queelup Road Offset Area Table 4-6 Section 4.4.5	• Fencing	• Visual inspections of fence.	Annually commencing spring 2023	Opportunistic visual inspections of fencing have been undertaken during the reporting period; and will be ongoing.	Compliant
	• Firebreaks	• Condition of fire breaks.	Annually commencing spring 2023	Visual monitoring of firebreaks have been undertaken during the reporting period (included in the Main Roads annual firebreak program); and will be ongoing.	Compliant
	• Fox and rabbit control	• Field survey for visual evidence of fox or rabbit presence.		Expert predator control contractors have been engaged to complete the Fox, and rabbit field surveys annually. Field surveys are in progress; and will be ongoing.	Compliant
	WRP • Distribution / observations	• Nocturnal field survey.	Every three years in October / November commencing in 2023/2024	The nocturnal field survey for WRP was conducted during the reporting period in November 2023; and will be ongoing.	Compliant
	WRP density • Number of WRP / ha			WRP density was included with the nocturnal field survey conducted in November 2023 during the reporting period.	Compliant
	Black cockatoo habitat/quality	• Field survey of black cockatoo foraging and potential nesting habitat and artificial hollows.	Every two years in spring commencing 2023 (baseline), 2023 for artificial hollows	A black cockatoo habitat field survey was completed in November 2023, the next habitat field survey will be conducted in spring 2025. Inspection of Lot 29 Queelup to assess suitability to install artificial hollows was completed on 7 March 2024.	Compliant
	Vegetation • Condition of vegetation assessed against EPA (2016)	• Vegetation field Survey.	Annually in spring commencing 2023 (baseline)	A baseline flora survey was completed in spring 2023; and will be ongoing.	Compliant
	WONS and Declared weed species distribution and diversity	• Field survey (meander with opportunistic recording).	Twice-yearly for two years (commencing 2023) (baseline), Annually thereafter	Field survey for WONS and declared weed species was included in the 2023 baseline survey; and will be ongoing.	Compliant

Management Plan Reference No.	Aspect	Management Action	Requirement	Comments / Evidence	Compliance status
	• Presence and distribution (location) of WONS and Declared weed species present				
	• Cover and structure of vegetation	• Drone footage (3D imagery).	Three-yearly in autumn or spring commencing 2023 (baseline)	Baseline 3D aerial imagery was captured as part of the BORR South corridor in 2023. Further 3D aerial imagery capture is scheduled for 2026.	Compliant
Offset Site #3 **Management actions and timeframes** Lot 301 Marchetti Road Gelorup (now Yalinda Drive) 16' offset (Lot 301 Offset Area) Section 5.4.4 Table 5-5	• Fencing	• Replace existing rural boundary.	Installation autumn 2022 Ongoing quarterly inspections commencing autumn 2022.	Visual inspections are undertaken. Maintenance of the existing rural boundary is planned for late 2024; and will be ongoing.	Compliant
	• Artificial hollows	• Install artificial nesting hollows.	Installation autumn 2024 Ongoing annual inspections commencing autumn 2024	Not required at this stage.	Not required at this stage
	• Signage	• Install signage to exclude dog- walking from this offset area.	Installation Q1/Q2 2024, signage to remain in place for 20 years from the date of approval Q1/Q2 2024	Signage installation is in progress.	Compliant
	• Weed control	• Conduct baseline weed survey.	Spring 2023 commencing spring 2023.	Weed baseline survey was undertaken in November 2023.	Compliant
		• Ongoing weed control program (WONS and Declared weeds) with a particular focus around Five Mile Brook.	Twice-yearly in spring and autumn or as required for years 1 and 2. Annually thereafter based on site observations	Weed control for WONS and declared weeds is in progress; and ongoing.	Compliant
	• Pest control	• Fox control using 1080 baiting.	Annually in late winter to autumn based on site observation of fox presence.	Fox control baiting program is in progress, and ongoing.	Compliant
		• Rabbit control using RHDV and Pindone.	Annually in spring to autumn based on site observation of rabbit presence commencing autumn 2024	Expert predator control contractors have been engaged to undertake rabbit control, including surveillance (identifying presence and or absence of rabbits) and rabbit baiting. Rabbit baiting was undertaken in July 2024; and is ongoing.	Compliant
	• Fire management	• Establish and maintain 3 m wide firebreak around the offset area boundary.	Autumn 2023 commencing autumn 2024	Three metre wide firebreak is established around the offset area boundary. Maintenance and annual monitoring is incorporated into the Main Roads annual firebreak program.	Compliant
Offset Site #3 **Monitoring Program** Lot 301 Marchetti Road (now Yalinda) Gelorup16' offset (Lot 301 Offset Area) Table 5-6 Section 5.4.5	• Fencing	• Visual inspection of fence.	Annually commencing 2023	Opportunistic visual inspections of fencing have been conducted throughout the reporting period; and is ongoing.	Compliant
	• Firebreaks	• Inspection of the firebreaks.		Visual monitoring of firebreaks have been undertaken during the reporting period (included in the Main Roads annual firebreak program); and is ongoing.	Compliant
	• Fox and rabbit control	• Field survey for visual evidence of fox or rabbit presence.	Annually commencing 2024	Expert predator control contractors have been engaged to complete field surveys fox and rabbit presence. Field survey was undertaken in July 2024.	Compliant
	• WRP distribution	• Nocturnal field survey.	Every three years in October / November commencing in 2023/2024.	Nocturnal field survey (Biota) for WRP is in progress.	Compliant
	• WRP density			WRP density and distribution (Biota) review is in progress.	Compliant
	• Black cockatoo habitat/quality	• Field survey of black cockatoo foraging and potential nesting habitat and artificial hollows.	Every two years in spring commencing 2023, 2024 for artificial hollows	Black cockatoo habitat field survey was completed in 2023, the next habitat field survey will be conducted in spring 2025. Inspection of Lot 301 Yalinda to assess suitability to install artificial hollows was completed on 7 of March 2024.	Compliant
	• Condition of vegetation assessed against EPA (2016)	• Field survey.	Annually in spring commencing 2023 (baseline)	Vegetation field survey was undertaken in November 2023; and is ongoing.	Compliant
	• Presence and distribution (location) of WONS and Declared weed species present	• Field survey (meander with opportunistic recording).	Twice-yearly for two years commencing 2023 (baseline). Annually thereafter	A baseline field survey was undertaken in November 2023; and is ongoing.	Compliant
	• Vegetation cover and structure	• Drone footage (3D imagery).	Every three years in autumn or spring commencing 2023 (baseline)	Baseline 3D aerial imagery was captured as part of the BORR South corridor in 2023. Further 3D aerial imagery is scheduled for 2026.	Compliant

Management Plan Reference No.	Aspect	Management Action	Requirement	Comments / Evidence	Compliance status
Offset Site #4 **Management actions and timeframes** Lot 104 (North) Willinge Drive, Davenport Section 6.4.4 Table 6-5	• Clearing / stockpiling stumps	• Clearing of regrowth bluegums as required, vegetative material to be mulched.	Commencing autumn 2023 or prior	The clearing of regrowth bluegums has been completed and the vegetation mulched.	Completed
	• Fencing	• Survey fence location to obtain accurate calculation of Offset Area • Removal of dilapidated fence • Installation of new fence (fauna fence specification) (noting that seasonal inundation limits site access, fence can be installed during summer only).	Commencing autumn 2023 or prior	The installation of fauna fencing has been competed as per the design specifications.	Completed
	• Earthworks / drainage	• Installation of constructed wetlands / nutrient basins • Contouring the revegetation area to reduce areas of standing water • Installation of maintenance access / fire tracks • Rip / furrowing of unvegetated areas in preparation for planting.	Commencing summer 2022 / 2023 or prior	Earthworks and drainage works are being undertaken; in progress.	Compliant
	• Weed control	• Baseline weed survey.	Baseline weed survey to be conducted spring 2023	Preliminary weed control commenced 2015 / 2016. Baseline weed survey was conducted during spring of 2023.	Completed
	• Weed control	• Initial herbicide application prior to planting including treatment of woody weeds (Blue gums) • Revegetation areas treated with pre-emergent herbicide where required prior to planting • Ongoing management of WONS and Declared weeds	Estimated two treatments in Years 1-3 post rehabilitation Annually thereafter as required based on site observations	Preliminary weed control commenced 2015 / 2016. The management of WONS and declared weed species is ongoing.	Compliant
	• Pest animal control	• Rabbit baiting using a combination of RHDV and Pindone.	Commencing autumn 2023 or prior Rabbit baiting conducted annually from spring through to late autumn as required based on site observations	Expert predator control contractors have been engaged to undertake rabbit control, including routine surveillance (identifying presence and or absence of rabbits) and rabbit baiting. Rabbit baiting was undertaken in July 2024; and is ongoing.	Compliant
		• Fox baiting using 1080 (sodium fluoroacetate).	Commencing autumn 2023 or prior Fox baiting conducted annually during late winter through to autumn as required based on site observations	Fox baiting was undertaken in October 2023 during this reporting period; and is ongoing.	Compliant
	• Remediation / rubbish removal	• Dieldrin assessment – testing is due November 2021, remediate if required. • Disposal of tyres / waste.	Completed	Dieldrin testing was completed during 2023. Waste disposal has been undertaken as required.	Completed
		• Rubbish removal, opportunistically and as required.	Ongoing, opportunistically	Opportunistic waste disposal has been undertaken; and is ongoing.	Compliant
	• Firebreak maintenance	• Maintenance of fire breaks to remove flammable material.	Annually and opportunistically	Firebreak maintenance is included in the Main Roads annual firebreak program.	Compliant
	• Rehabilitation	Seed Collection / Propagation. • Seed collections to be ordered annually as required • Seedling propagation / cuttings taken annually as required Revegetation – Commencing 2022 • Site is to be fully planted (no direct seeding) • Rip / mound, plant out in 2022 and annually thereafter as required	Seed collection and propagation commencing 2023. The remaining tasks will commence within 12 months of the completion of construction. Revegetation works are expected to continue for five years	Seed collection is ordered in advance as part of rehabilitation scheduling. Seedling propagation is not required at this stage. However, forward planning of seed propagation and cuttings required annually for revegetation are planned as per the rehabilitation schedule. Rip / mound, plant out occurred in 2022 and 2023, this will continue annually for the next 5 years.	Compliant
Offset Site #4 **Monitoring Program** Lot 104 (North) Willinge Drive, Davenport Section 6.4.5 Table 6-6	• Presence and condition of fencing	• Visual inspection of fence.	Annually commencing spring 2023	Opportunistic visual inspections of fencing have been conducted routinely throughout the reporting period; and is ongoing.	Compliant
	• Condition of firebreaks	• Visual inspection of firebreaks.	Annually commencing spring 2023	Visual inspections of the firebreaks are undertaken as part of the Main Roads annual firebreak program.	Compliant
	• Fox and rabbit control	• Field survey for visual evidence of fox or rabbit presence.	Annually in autumn commencing 2023	Expert predator control contractors have been engaged to complete fox, and rabbit field surveys annually. These surveys are in progress; and ongoing.	Compliant
	• WRP observations/number	• Nocturnal field survey.	Baseline assessment in 2023/2024 then every three years in October / November commencing 2030 (six years post-rehabilitation).	Nocturnal field survey and density / distribution (Biota) of WRP has been completed.	Compliant
	• Condition of vegetation assessed against EPA (2016)	• Field survey (meander).	Baseline assessment 2023 then annually in spring from 2028 onwards (five years post-rehabilitation)	Survey of vegetation condition is in progress; and ongoing.	Compliant

Management Plan Reference No.	Aspect	Management Action	Requirement	Comments / Evidence	Compliance status
	• WONS and Declared weed species distribution and diversity	• Field survey (meander with opportunistic recording).	Annually for five years commencing 2023, every two years thereafter	Field survey for WONS and declared weeds is in progress; and ongoing.	Compliant
	• Cover and structure of native vegetation.	• Drone footage (3D imagery).	Every three years in autumn or spring commencing 2023 (baseline)	Baseline 3D aerial imagery of the offset site was captured in March 2024. Further 3D aerial imagery is scheduled for 2026.	Compliant
Offset Site #5 **Management actions & timeframes** Ludlow State Forest / Tuart Forest National Park' offset (Ludlow Offset Area). Section 7.4.4.2 Table 7-6**C**	• Weed Control Site 2	• Post revegetation – ongoing weed control targeting Arum lily, Bridal creeper and other WONS and Declared weeds as required.	Up to two treatments annually in late winter/early spring and summer/autumn in years 1-3 post revegetation and annually thereafter	Not required at this stage	Not required at this stage
	• Weed Control Site 4	• Post revegetation – ongoing weed control targeting Arum lily, Bridal creeper and other WONS and Declared weeds as required.	Up to two treatments annually in late winter/early spring and summer/autumn in years 1-3 post revegetation and annually thereafter	Not required at this stage.	Not required at this stage
	• Weed Control Site 12	• Herbicide application targeting Arum lily, Bridal creeper WONS and Declared weeds as required.	Up to two treatments annually in late winter/early spring and summer/autumn in years 1-3 post revegetation and annually thereafter	Herbicide control of WONS and declared species commenced in 2023; and is ongoing.	Compliant
	• Pest Control Site 2	• Pest animal control.	Rabbit baiting ongoing annually as required based on site observations. Fox baiting not currently required (requirement monitored annually) Cat trapping to commence spring 2025 and continue annually as required based on site observations	Expert predator control contractors have been engaged to undertake rabbit control including surveillance (identifying presence and or absence of rabbits) and rabbit baiting. Rabbit baiting was undertaken in July 2024; and is ongoing.	Compliant
	• Pest Control Site 4			Not required at this stage.	Not required at this stage
	• Pest Control Site 12	• Pest animal control.	Rabbit baiting to commence spring 2025 and continue annually as required based on site observations Fox baiting to commence in spring 2025 and continue annually or biannually. as required based on site observations Cat trapping to commence spring 2025 and continue annually as required based on site observations	Not required at this stage.	Not required at this stage
	• Fencing Site 2	• Ongoing maintenance of existing fence as required.	Fence installed in 2017	Visual fencing inspections have been implemented encompassing fencing maintenance as required; this will be ongoing.	Compliant
	• Fencing Site 4		Fence installed in 2021		Compliant
	• Fencing Site 12	• Construction of revegetation area fences to fauna fence specification • Fauna gates to be installed • Fence locations surveyed to obtain accurate calculation of Offset Area • Ensure fence position maintains fire and fauna access.	Fence to be installed 2024	The installation of new revegetation fauna fencing is in progress as per the design specifications.	Compliant
	• Rubbish Removal, all sites	• Rubbish removal as required.	Q1 2024 and ongoing.	Rubbish removal has been undertaken; this will be ongoing as required.	Compliant
	• Revegetation - seed collection / propagation Sites 2, 4, 12	• Order seed collections • Order seedlings • Seedling propagation.	Sites 2 and 4 - seedlings for infill planting ordered annually as required based on monitoring results to enable achievement of completion criteria Site 12 - Seed and seedlings to be ordered in 2024	Seed collection and ordering of seedlings is carried out as per rehabilitation scheduling; and is ongoing.	Compliant
	• Revegetation - site preparation Site 12	• Rip and furrow-line throughout open areas, hand-augur in amongst existing vegetation in preparation for planting.	Site preparation works to commence in 2025	Not required at this stage.	Not required at this stage
	• Revegetation – planting and seeding Sites 2 and 4	• Infill planting as required.	Infill planting will be undertaken annually as required	Infill planting is undertaken annually; this is in progress.	Compliant

Management Plan Reference No.	Aspect	Management Action	Requirement	Comments / Evidence	Compliance status
	• Revegetation – planting and seeding Site 12	• Direct seedling of areas with low weed burden. • Rip / furrow planting with seedlings. • Targeted planting required for areas of remnant vegetation. • Infill planting as required.	Planting to commence in winter 2025 and be completed in winter 2029 (5-year revegetation program) Post-2029, infill planting will be undertaken annually as required	Not required at this stage.	Not required at this stage
	• Rehabilitation completion, all sites	• Rehabilitation meets completion criteria (excluding WRP density criteria, which will be completed within 15 years of revegetation commencing).	10 years from commencement of rehabilitation	Not required at this stage.	Not required at this stage
Offset Site #5 **Management actions & timeframes** Ludlow State Forest / Tuart Forest National Park' offset (Ludlow Offset Area). Section 7.4.5 Table 7-7	• Presence and condition of fencing	• Visual inspection of fence.	Annually commencing spring 2024	Annual visual inspections of fencing are undertaken; and ongoing.	Not required at this stage
	• Condition of firebreaks	• Visual inspection of firebreaks.	Annually commencing spring 2023	Visual inspections of the firebreaks are undertaken, this is included in the Main Roads annual firebreak program.	Compliant
	• Fox, feral cat and rabbit control	• Field survey for visual evidence of fox, feral cat, or rabbit presence.	Annually in autumn commencing 2024 (baseline)	Expert predator control contractors have been engaged to complete the fox, cat and rabbit field surveys annually. These surveys are in progress; and ongoing.	Compliant
	• WRP Distribution	• Nocturnal field survey.	Baseline assessment in 2023/2024 then every three years in October/ November commencing 2030 (six years post-commencement of rehabilitation)	Western ring tail possum baseline spotlighting surveys were undertaken during the reporting period in November 2023 and April 2024. WRP distribution surveys were conducted during the reporting period on 27 November 2023 and 5 December 2023.	Compliant
	• WRP Density				Compliant
	Black cockatoo • Presence and/or foraging evidence	• Field survey.	Annually in spring commencing 2028	Not required at this stage.	Not required at this stage
	• Number of species per 100m2	• Field survey using 10 x 10 m floristic quadrats.	Annually in spring commencing year 2023 (baseline)	Baseline field survey reports for site 1, site 2, Site 4, site 7, and site 12 are in progress (SWR Offset Rehabilitation Monitoring, Spring 2023).	Compliant
	• Native foliage cover			Baseline report for sites 1, 2, 4, 7, and site 12 are in progress (SWR Offset Rehabilitation Monitoring Spring 2023).	Compliant
	• Condition of vegetation assessed against EPA (2016)	• Field survey.		Baseline reports for sites 1, 2, 4, 7, and site 12 are in progress (SWR Offset Rehabilitation Monitoring Spring 2023).	Compliant
	• (Presence and distribution (location) of WONS and Declared weed species present)	• Field survey (meander with opportunistic recording).	Annually in spring for five years commencing 2023, every two years thereafter	Field surveys for sites 1, 2, 4, 7, and site 12 are in progress (SWR Offset Rehabilitation Monitoring Spring 2023).	Compliant
	• Vegetation cover and structure	• Drone footage (3D imagery).	Every three years in autumn or spring commencing 2023 (baseline)	Baseline 3D aerial imagery of the offset site was captured in February 2023 Further 3D aerial imagery is scheduled for 2026.	Compliant
Offset Site #6 **Monitoring program** Ludlow Peppermint Orchard Section 8.4.5 Table 8-5	• Presence and condition of fencing	• Visual inspection of fence.	Annually commencing 2022	Visual inspections of fencing have been conducted; and ongoing.	Compliant
	• Condition of Firebreaks	• Visual inspection of firebreaks.	Annually commencing 2022	Visual inspections of the firebreaks are undertaken, and included in the Main Roads annual firebreak program.	Compliant
	• Orchard development, plant height	• Field survey identifying plant height in Peppermint orchard is greater that 2m at two years.	Annually commencing spring, 2021	Planned for Q4 2024.	Compliant
	• Orchard development, plant health and flowering	• Field survey.	Annually commencing spring 2024	Planned for Q4 2024	Compliant
	• Orchard development, orchid area, size of Peppermint orchard	• Size of Peppermint orchard – Orchard area is less than one hectare in any monitoring period.	Annually commencing spring, 2021	Planned for Q4 2024.	Complaint
Offset Site #7 **Monitoring Program** Supplementation	• Fox bait uptake	• Visual inspection, camera detection rates, monitor number of baits take	Monthly commencing winter 2023 (baseline) for years 1-5 Then three-monthly for years 6-8[25]	Year one baseline remote camera monitoring program; twenty remote cameras continuously monitoring bait uptake and detection of feral animals was undertaken during the reporting period (July 2023 – June 2024). Data for this monitoring is currently being analysed.	Compliant

Management Plan Reference No.	Aspect	Management Action	Requirement	Comments / Evidence	Compliance status
of DBCA's TFNP fox baiting program Section 9.1.3 Table 9-3	• Fox relative abundance/trends	• Camera detection rates and trapping / shooting results, monitor fox relative abundance.	Annual report will be submitted to DWER as part of the CAR	Additional fox baiting was carried out during the reporting period within the wetlands fringe zones monthly from October 2023 to May 2024. No shooting occurred during the reporting period. Planning is underway to develop shooting plans commencing during the next reporting period.	Compliant
Offset Site # 8 **Management actions and timeframes** Lot 27 Tredrea Place, Myalup Section 10.4.4 Table 10-5	• Fencing	• Replace existing rural boundary.	Installation 2023/2024 Ongoing annual inspections and maintenance commencing 2024	The replacement of the existing rural boundary has been completed.	Compliant
	• Weed Control	• Conduct baseline weed survey.	Commencing spring 2023	Baseline weed survey has been completed.	Compliant
		• Ongoing weed control program (WONS and Declared weeds).	Commenced 2018 Twice-yearly in spring and autumn or as required for years 1 and 2. Annually thereafter based on site observations	Not required at this stage.	Not required at this stage
	• Pest Control	• Fox control using 1080 baiting.	Annually in late winter to autumn based on site observation of fox presence. commencing after fence installed	Fox baiting was completed during 2024; and is ongoing	Compliant
		• Rabbit control using RHDV and Pindone.	Annually in spring to autumn based on site observation of rabbit presence. commencing after fence installed	Expert predator control contractors have been engaged to undertake rabbit control, including surveillance (identifying presence and or absence of rabbits) and rabbit baiting. Rabbit baiting was undertaken in July 2024; and is ongoing.	Compliant
	• Targeted revegetation	• In bare / Completely degraded / Degraded areas 25m^2.	2025 and 2026. Ongoing annual inspections commencing winter 2025	Not required at this stage.	Not required at this stage
	• Firebreak	• Maintain 3 m wide firebreak around the offset area boundary	Ongoing annual inspections and maintenance	Three metre wide firebreak has been established around the offset site boundary. This is included in the Main Roads annual firebreak program.	Compliant
Offset Site # 8 **Management actions and timeframes** Lot 27 Tredrea Place, Myalup Section 10.4.5 Table 10-6	• Presence and condition of fencing	• Visual inspection of fence.	Annually commencing 2023	Opportunistic visual inspections of fencing have been completed annually; and is ongoing.	Compliant
	• Condition of firebreaks	• Visual inspection of firebreaks.	Annually commencing 2023	Visual inspections of the firebreaks are undertaken, this is included in the Main Roads annual firebreak program.	Compliant
	• Condition of vegetation assessed against EPA (2016)	• Field survey.	Annually in spring commencing year 2023 (baseline).	The baseline flora condition field survey was completed in 2023.	Compliant
	• Presence and distribution (location) of WONS and Declared weed species present	• Field survey (meander with opportunistic recording).	Twice-yearly for two years commencing year 2023. Annually thereafter.	A field survey for the presence and distribution of WONS and declared weeds was completed during 2023; and is ongoing.	Compliant
	• Fox and rabbit control, evidence of recent (<2 months old) fox or rabbit presence	• Field survey for visual evidence of fox or rabbit presence.	Annually in autumn commencing 2024	Expert predator control contractors have been engaged to complete rabbit field surveys annually. These are in progress; and ongoing.	Compliant

Appendix G

Evidence (related to potential non-compliance/ non-conformance only)

None for Reporting Period

Appendix H
Evidence Summary Table

Cond.	Evidence Reference	Description
M1-1	Ground disturbance and clearing (Figures and shapefiles)	Figures and shapefiles in relation to ground disturbance and clearing during the reporting period (31 May 2023 to 31 May 2024) for specified environmental aspects / values
M2-1 (2)	M2-2 Baseline Hydrological Regime Report M2-4 Environmental Performance Report	MS1191 M2-2 Baseline Hydrological Regime Report MS1191 M2-4 Environmental Performance Report
M2-2	M2-2 Baseline Hydrological Regime Report	MS1191 M2-2 Baseline Hydrological Regime Report
M2-3, 2-4	M2-4 Environmental Performance Report	MS1191 M2-4 Environmental Performance Report
M2-5	Attachment 2 to Statement 1191	MS1191 S45C(5) amendment to Condition 2-5
M3-1 (2)	M3-2 Baseline PEC / TEC Report M3-4 Environmental Performance Report	MS1191 M3-2 Baseline PEC / TEC Report MS1191 M3-4 Environmental Performance Report
M3-2	M3-2 Baseline PEC / TEC Report	MS1191 M3-2 Baseline PEC / TEC Report
M3-3, 3-4	M3-4 Environmental Performance Report	MS1191 M3-4 Environmental Performance Report
M3-5(1)	M3-5 Phytophthora Dieback Management	MS1191 M3-5 Phytophthora Dieback Management Plan MS1191 M3-5 Phytophthora Dieback Re-Assessment Reports
M3-5(2)	M3-5 Weed Control and Management	MS1191 M3-5 Weed Control and Management
M4-2	M4-2 Black cockatoo pre-clearing surveys	MS1191 M4-2 Black cockatoo pre-clearing survey Reports
M4-3(1)	M4-3 Fauna spotters	MS1191 M4-3 Fauna spotter accreditation
M4-3(2)	M3-4 Environmental Performance Report M5-3 Environmental Performance Report	MS1191 M3-4 Environmental Performance Report MS1191 M5-3 Environmental Performance Report
M4-4 - 4-6	M4-4_4-6 Black cockatoo artificial hollows	MS1191 M4-4_4-6 Black cockatoo artificial hollows Report
M4-7	M4-7 Environmental Performance Report	MS1191 M4-7 Environmental Performance Report
M5-2	M5-2 Construction Fauna Management Plan	MS1191 M5-2 Construction Fauna Management Plan
M5-3	M5-3 Environmental Performance Report	MS1191 M5-3 Environmental Performance Report
M5-4	M5-4 Construction Fauna Management Plan - Approval	MS1191 M5-4 Construction Fauna Management Plan – Approval
M5-5	M5-5 Terrestrial fauna surveys	MS1191 M5-5 Baseline pre-clearing terrestrial fauna surveys
M5-5	M5-5 Fauna records during clearing	MS1191 M5-5 Fauna records during clearing
M6-3	M6-3 Habitat Fragmentation Management Plan	MS1191 M6-3 Habitat Fragmentation Management Plan
M6-7	M6-7 Habitat Fragmentation Management Plan - Approval	MS1191 M6-7 Habitat Fragmentation Management Plan - Approval
M6-8	M6-8 Predator Control Progressive Report	MS1191 M6-8 Predator Control Progressive Reports
M8-3	M8-3 Amenity Management Plan	MS1191 M8-3 Amenity Management Plan
M8-4	M8-4 Amenity Management Plan - Approval	MS1191 M8-4 Amenity Management Plan - Approval
M9-3	M9-3 Offset Management Plan	MS1191 M9-3 Offset Management Plan
M9-6	M9-6 Offset Management Plan - Approval	MS1191 M9-6 Offset Management Plan - Approval
M12-1	M12-1 Compliance Assessment Plan	MS1191 M12-1 Compliance Assessment Plan
M12-3	M12-1 Compliance Assessment Plan	MS1191 M12-1 Compliance Assessment Plan - Approval

Cond.	Evidence Reference	Description
M0 Multiple	M0 SWGA CEMP	SWGA Construction Environmental Management Plan
M0 Multiple	M0 Independent Daily Inspection Reports	Independent Daily Audit - Inspection Reports (Preston)

Appendix I

M2.4 Environmental Performance Report – Inland Waters

Bunbury Outer Ring Road

Southern Section

Ministerial Statement 1191: M2-4

Environmental Performance Report

Inland Waters (2023 - 2024)

Main Roads WA

Revision 0

28-Aug-24

South West Gateway Alliance

Delivering the Bunbury Outer Ring Road

Document control record

Document prepared by:

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Document control						
Report title		Ministerial Statement 1191 | M2-4 Environmental Performance Report – Inland Waters				
Client		Main Roads WA				
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
A	19-July-24	SWGA Review	A.G.	E.R.		A.H.
B	27-Jul-24	SWGA Review	A.G.	E.R.		A.H.
C	19-Aug-24	Main Roads Review	E.R	Main Roads		A.H.
0	28-Aug-24	Issued	E.R.	Main Roads		M.S.
Current revision		**0**				

Contents

Report

Annual Groundwater Report (AECOM and SWGA, 2024)

Report

Annual Aquatic Fauna and Surface Water Report (SLR Consulting, 2024)

Figures

Tables

1 Introduction

1.1 Background

The Commissioner of Main Roads Western Australia (MRWA) has been granted conditional approval for the Bunbury Outer Ring Road (BORR) Southern Section (the Proposal) under Part IV Division 2 (section 45) of the *Environmental Protection Act 1986* by the Minster for Environment. The Proposal is subject to the implementation conditions of Ministerial Statement 1191 (MS 1191) which was issued on 31 May 2022 (Minister for Environment, 2022).

In their Report and Recommendations in relation to the Proposal (EPA Report 1714, October 2021), the EPA noted that in relation to Inland Waters, there was the potential for direct and indirect impacts to hydrological regimes and water quality in adjacent Conservation Category Wetlands (CCWs), Resource Enhancement Wetlands (REWs), the Five Mile Brook and black stripe minnow habitats.

To address these impacts, under Condition 2 of MS1191, the EPA required pre-disturbance monitoring of hydrological regimes and baseline conditions, and monitoring of these elements during and post-construction, with reporting requirements, to meet the objective that there be no project-attributable impacts to the hydrological regime and water quality of CCW and REW wetlands, Five Mile Brook or black-stripe minnow habitat.

Ministerial Statement 1191, therefore, includes the following conditions in relation to Inland Waters:

Condition 2-1(2)

> *No project attributable impacts to the hydrological regime and water quality of the following values when compared to preconstruction baseline conditions:*
>
> *(a) Five Mile Brook (incorporating MU Wetland UFI-1163 and CC Category Wetland UFI-931),*
>
> *(b) CC Category Wetland (UFI-14478),*
>
> *(c) RE Wetlands (UFI-1117 and UFI-15493), and*
>
> *(d) black-stripe minnow (Galaxiella nigrostriata) habitats defined and mapped in the proponent's Action Management Plan CC Significant Fauna (Revision 2 August 2021) that are within or adjoins the development envelope, except for the black-stripe minnow habitats permitted to be cleared in condition 4-1(1)(e).*

Condition 2-2

> *Prior to ground-disturbing activities, the proponent shall undertake monitoring of the hydrological regimes of the values listed in condition 2-1(2) and submit a report to the CEO about the preconstruction baseline conditions and predicted post-development hydrological regime.*

Condition 2-3

> *The proponent shall continue to undertake monitoring of hydrological regime and water quality during and post-construction until the CEO is satisfied that the proponent has demonstrated the outcomes in condition 2-1(2) have been met.*

2 Environmental Performance Report

2.1 Purpose and scope

This Environmental Performance Report (EPR) addresses the compliance of the Bunbury Outer Ring Road (BORR) Southern Section (the Proposal) with Condition 2-4 set out in MS 1191.

Condition 2-4 of MS 1191 requires an annual Environmental Performance Report (EPR) to be submitted to the Chief Executive Officer (CEO) of the EPA as part of the Compliance Assessment Report (CAR).

> **MS 1191: Condition 2-4**
>
> *The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:*
>
> > *(1) outline the monitoring that was undertaken during the implementation of the proposal;*
> >
> > *(2) outline the results of the monitoring undertaken to report whether that the environmental outcomes specified in condition 2-1(2) were achieved;*
> >
> > *(3) report whether that the outcomes in condition 2-1(2) were achieved; and*
> >
> > *(4) outline any management actions undertaken during the implementation of the proposal to meet the outcomes in condition 2-1(2).*

This EPR has been prepared to address Conditions 2-1(2), 2-3 and 2-4 of MS 1191 during the reporting period.

This EPR incorporates a 12-month audit period from 31 May 2023 to 31 May 2024. This is the second EPR associated with Condition 2-4 to be submitted under MS 1191.

Two reports have been prepared reviewing hydrological regime and water quality:

- Annual Groundwater Report (prepared by AECOM - Attachment 1).
- Annual Aquatic Fauna and Surface Water Report (prepared by SLR Consulting - Attachment 2).

2.2 Clearing metrics in relation to Inland Waters during the reporting period

Construction of the Proposal commenced on 1 August 2022.

Clearing and disturbance of Inland Waters during the reporting period is summarised in Table 1 and Figure 1.

Table 1. Ground disturbance and clearing in relation to Inland Waters during the reporting period (May 2023 –24).

Environmental Aspect	Area / quantity specified in Ministerial Statement 1191	Area / quantity cleared during the 2022 – 2023 reporting period	Area / quantity cleared during this 2023 – 2024 reporting period	Total area / quantity cleared
Conservation Category Wetlands	0.2 ha	0 ha	0.11 ha	0.11 ha
Resource Enhancement Wetlands	1.4 ha	0.52 ha	0 ha	0.52 ha
Black-stripe minnow habitat (potential)	5.5ha	2.16 ha	0.25 ha	2.41 ha

2.3 Key References and Reports

A number of key references and reports have informed the preparation of this report:

Appeals Convenor (2022). Appeals Convenor's Report to the Minister for Environment: Appeals objecting to Report and Recommendations of EPA Report 1714 – Bunbury Outer Ring Road Southern Section. Appeal 045/21, April 2022. Office of the Appeals Convenor, Perth, Western Australia.

Bunbury Outer Ring Road Integrated Planning Study BORR IPT (2019). Wetland Study (BORR-02-RP-EN-007, Jan 2019).

Bunbury Outer Ring Road Integrated Planning Study BORR IPT (2020). Groundwater and Surface Water Quality Monitoring 2019-20 (BORR-00-RP-EN-005 Rev 1, August 2020).

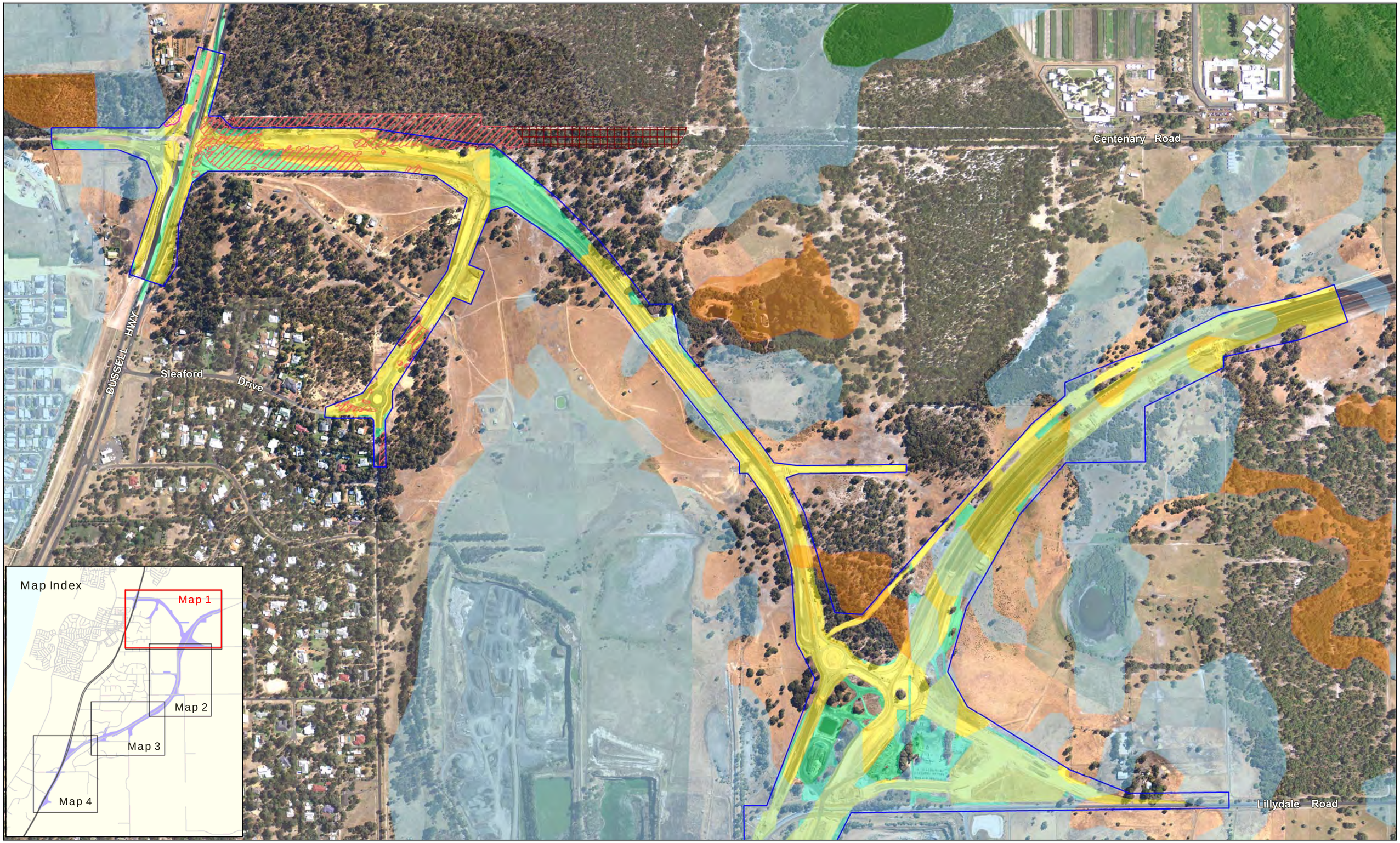
Environmental Protection Authority (2021). Bunbury Outer Ring Road Southern Section, Commissioner for Main Roads Western Australia. Report 1714, October 2021. Environmental Protection Authority, Perth, Western Australia.

South West Gateway Alliance (2021). Bunbury Outer Ring Road Determination of Design Groundwater Levels (SWGA-00-270-00-REP-0001, September 2021).

Southwest Gateway Alliance (2022). Bunbury Outer Ring Road (Southern Section) Baseline Hydrological Regime Report. (SWGA-00-134-00-REP-0006, July 2022).

WRM (2021) Bunbury Outer Ring Road Southern Section: Targeted Conservation Significant Aquatic Fauna Monitoring 2021. Unpublished report by Wetland Research and Management to SWGA. December 2021.

Figure 1. Ground disturbance and clearing extents during the reporting period in relation to inland waters (wetlands).



Location Map

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents 2022 - 2023
- Ground disturbance and clearing extents 2023 - 2024

TEC PEC

- Banksia Woodland TEC/PEC
- Tuart Woodland TEC/PEC
- Tuart-Peppermint Woodland PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Conservation Category Wetlands
- Multiple Use Wetlands
- Resource Enhancement Wetlands

N

0 300

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to TEC PEC and Geomorphic Wetlands - Map 1

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 22 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:8,2500 @ A3

N

0 400

meters

Lillydale Road

Hasties Road

Ducane Road

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents 2022 - 2023

Ground disturbance and clearing extents 2023 - 2024

BORR South Imagery March 2024

TEC PEC

Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

Conservation Category Wetlands

Resource Enhancement Wetlands

Multiple Use Wetlands

Ground Disturbance and Clearing Extents in Relation to TEC PEC and Geomorphic Wetlands Map 2

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 22 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,500 @ A3

BUSSELL HWY

Yalinda Drive

Eucalypt Drive

Woods Road

Jilley Road

Brockway Drive

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

PERTH

KALGOORLIE

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents 2022 - 2023

Ground disturbance and clearing extents 2023 - 2024

TEC PEC

Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

Conservation Category Wetlands

Multiple Use Wetlands

N

0 300

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to TEC PEC and Geomorphic Wetlands - Map 3

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 22 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,250 @ A3

Map Index

Map 1

Map 2

Map 3

Map 4

Woods Road

Road

Lakes

BUSSELL HWY

Calinup Road

Jaymon Road

N

0 300

meters

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents 2022 - 2023

Ground disturbance and clearing extents 2023 - 2024

BORR South Imagery March 2024

TEC PEC

Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

Conservation Category Wetlands

Multiple Use Wetlands

Ground Disturbance and Clearing Extents in Relation to TEC PEC and Geomorphic Wetlands Map 4

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 22 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,000 @ A3

Figure 2. Ground disturbance and clearing extents during the reporting period in relation to potential Black-stripe minnow habitat.

BUSSELL HWY

Sleaford Drive

Centenary Road

Lillydale Road

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

PERTH

KALGOORLIE

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents 2022 - 2023

Ground disturbance and clearing extents 2023 - 2024

Potential Black-stripe minnow habitat

Native vegetation

N

0 400

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Black-stripe Minnow Habitat and Native Vegetation - Map 1

Biota Environmental Sciences

Author: Biota | Drawn: P Sawers | Job No.: 1855 | Date: 21 Aug 2024 | Revised: | Projection: MGA Z50 (GDA94) | Scale: 1:8,2500 @ A3

Lillydale Road

Hasties Road

Ducane Road

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents 2022 - 2023

Ground disturbance and clearing extents 2023 - 2024

Black-stripe minnow habitat

Native vegetation

N

0 400

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Black-stripe Minnow Habitat and Native Vegetation - Map 2

Biota Environmental Sciences

Author: Biota | Drawn: P Sawers | Job No.: 1855 | Date: 21 Aug 2024 | Revised: | Projection: MGA Z50 (GDA94) | Scale: 1:7,500 @ A3

BUSSELL HWY

Yalinda Drive

Eucalypt Drive

Woods Road

Jilley Road

Brockway Drive

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents 2022 - 2023
- Ground disturbance and clearing extents 2023 - 2024
- Black-stripe minnow habitat
- Potential Black-stripe minnow habitat
- Native vegetation

N

0 400

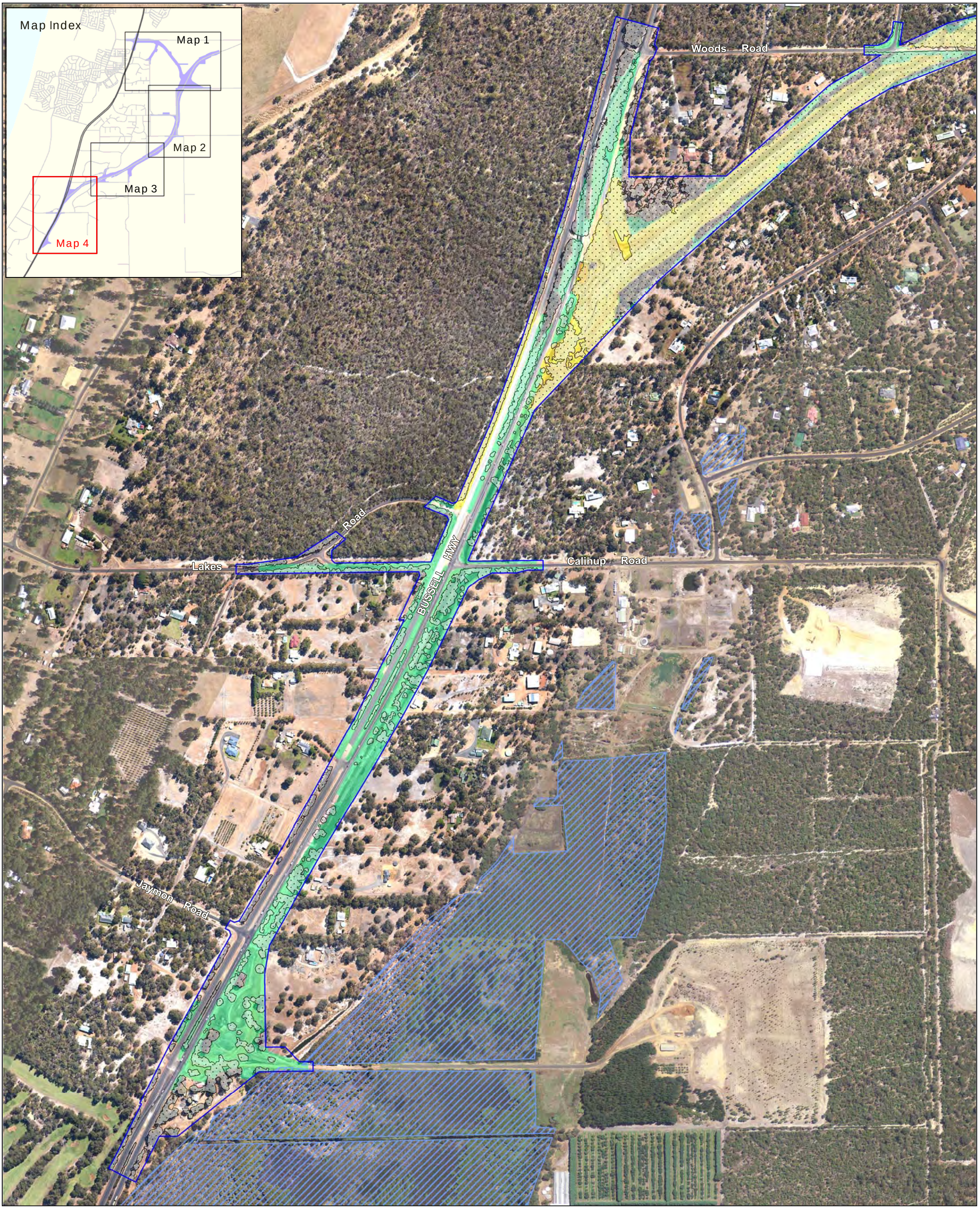
meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Black-stripe Minnow Habitat and Native Vegetation - Map 3

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 21 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,250 @ A3



Location Map

KARRATHA
W A
KALGOORLIE
PERTH
Map Area

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents 2022 - 2023
- Ground disturbance and clearing extents 2023 - 2024
- Potential Black-stripe minnow habitat
- Native vegetation

N

0 400

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Black-stripe Minnow Habitat and Native Vegetation - Map 4

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 21 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,000 @ A3

Report

Annual Groundwater Report (AECOM and SWGA, 2024)

Bunbury Outer Ring Road

Southern Section

Ministerial Statement 1191

Annual Groundwater and Hydrological Regime Report

2023 - 2024

Main Roads WA

Revision 0

28-Aug-24

South West Gateway Alliance

Delivering the Bunbury Outer Ring Road

Document control record

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Document control						
Report title		BORR Southern Section - Annual Groundwater Report and Hydrological Review (2023-24)				
Client		Main Roads WA				
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
A	30-Jul-24	SWGA Review	SA / GB	RW		AM
B	14-Aug-24	SWGA Review	GB	ES / AG		AM
C	19-Aug-24	Main Roads Review	GB	Main Roads		MS
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Current revision		**0**				

Contents

Figures

Tables

1 Executive Summary

As a regulatory condition (Conditions 2-1(2) and Condition 2-3) of Ministerial Statement 1191 for the Bunbury Outer Ring Road (Southern section), Main Roads is required to complete an annual review to assess the hydrological regime and water quality when compared to preconstruction baseline conditions of:

- Five Mile Brook (incorporating Multiple Use Wetland UFI-1163 and Conservation Category Wetland (UFI-931).
- Conservation Category Wetland (UFI-14478).
- Resource Enhancement Wetlands (UFI-1117 and UFI-15493).
- Black-stripe minnow *(Galaxiella nigrostriata)* habitat.

This monitoring review assesses compliance with the relevant Ministerial Statement conditions and summarises the groundwater and surface water monitoring data for the reporting period from June 2023 to May 2024 in context with local baseline conditions.

Targeted groundwater and surface water levels and quality have been monitoring since 2019, prior to construction commencement and continued through 2024. In context to construction related activities, key findings from monitoring during the 2023 to 2024 monitoring assessment include:

- Low rainfall has resulted in limited surface water ponding in the southern areas that are known to form Black-Stripe Minnow habitat areas.
- Shallow water table levels continue to respond to rainfall recharge events or lack thereof.
- Groundwater levels linked to geomorphic wetlands and TEC/PEC areas follow trends within or slightly lower than the historic ranges that are consistent with regional trends.
- The smaller average seasonal groundwater level fluctuations in 2023-2024 are attributed to the low seasonal rainfall and resulting recharge to the Superficial Aquifer.
- Outside the local influences of the Gelorup quarry facility (BORR_MW11), groundwater salinity remained fresh to slightly brackish.
- No surface water quality was collected due to the monitoring location (SW10) being dry during the reporting period.
- No Hydrocarbons were detected in groundwater during the 2023-2024 period.

Groundwater monitoring was completed in accordance with the outlined monitoring program, however several recommendations to replace monitoring sites decommissioned as part of construction activities have been provided.

Based on the review, groundwater monitoring remains within historical ranges and no changes compared with baseline data as presented in the *Bunbury Outer Ring Road - Groundwater and Surface Water Monitoring Report (2019-2020)* (BORR IPT, 2020) and the *Bunbury Outer Ring Road (Southern Section) Baseline Hydrological Regime Report* (SWGA, 2022) are attributed to the project.

It is concluded that Main Roads WA (MRWA) was compliant with Condition 2-1(2) and Condition 2-3 of Ministerial Statement 1191 during the reporting period.

2 Introduction

2.1 Project Background

Main Roads is currently constructing a 27-kilometre highway, the Bunbury Outer Ring Road (BORR), that links Forrest Highway to Bussell Highway. The Project includes 19 kilometres (km) of dual carriageway connecting the Forrest Highway at Kingston, to the South-Western Highway, south of Centenary Road in the Shire of Capel (Figure 1).

The Project area is located approximately 170 km south of Perth and occurs within the City of Bunbury and Shires of Capel, Dardanup and Harvey. The majority of the land within the Project area is zoned rural (cleared agricultural land), with remaining land zoned as a mix of railways, urban, urban deferred, regional open space and industrial. The alignment predominately comprises cleared rural land with some areas of remnant vegetation, predominately associated with road reserves and drainage lines.

Construction commenced on 24 February 2022 and is planned to continue until 2025.

2.2 Purpose and Scope

The Commissioner of Main Roads was granted conditional approval for the Bunbury Outer Ring Road Southern Section (the Proposal) under Part IV Division 2 (section 45) of the *Environmental Protection Act 1986* by the Minster for Environment. The Project is subject to the implementation conditions of Ministerial Statement 1191 (MS 1191) which was issued on 31 May 2022 (Minister for Environment, 2022).

Conditions 2-1(2) and Condition 2-2 of MS1191 requires that:

> *No project attributable impacts to the hydrological regime and water quality of the following values when compared to preconstruction baseline conditions:*
>
> *(a) Five Mile Brook (incorporating MU Wetland UFI-1163 and CC Wetland (UFI-931),*
>
> *(b) CC Wetland (UFI-14478),*
>
> *(c) RE Wetlands (UFI-1117 and UFI-15493), and*
>
> *(d) black-stripe minnow (*Galaxiella nigrostriata*) habitats defined and mapped in the proponent's Action Management Plan CC Significant Fauna (Revision 2 August 2021) that are within or adjoins the development envelope, except for the black-stripe minnow habitats permitted to be cleared in condition 4-1(1)(e).*

This monitoring review assesses the compliance with the above conditions and summarises the groundwater and surface water monitoring data for the reporting period from June 2023 to May 2024 in context with local baseline conditions. Locations of geomorphic wetlands, Threatened and Priority Ecological Communities (TECs/PECs), and groundwater monitoring bores are shown on (Figure 1).

The objective of this report is to assess the impact (if any) on the hydrological regime and water quality of the identified geomorphic wetlands and TECs/PECs, as a result of construction related activities of the BORR Southern Section. To achieve this, ongoing groundwater level and quality monitoring data is compared with baseline data as presented in the *Bunbury Outer Ring Road - Groundwater and Surface Water Monitoring Report (2019-2020)* (BORR IPT, 2020) and the *Bunbury Outer Ring Road (Southern Section) Baseline Hydrological Regime Report* (SWGA, 2022).

Ocean Dr
Washington Av
Winthrop Av
Oriel Ct
Somerville Dr
Hawker Dr
Crampton Av
Nalbarra Dr
Brand Av
Dudley Dr
Mosedale Av
Parade Rd
15493
BORR_MW46
Centenary Rd
South Western Hwy
Bunbury Outer Ring Rd
BORR_MW13
Atkins Rd
Ferndale Av
Lewana App
Bussell Hwy
Sleaford Dr
Dobbie Cr
Crystal Bend
Murtin Rd
Maynard Pde
Dalyellup Blvd
Paragon Loop
Kambany App
Tiffany Ctr
BORR_MW12
1117
Norton Prom
Loretta Av
Gelorup Quarry
BORR_PB13
Lillydale Rd
Jules Rd
Frances Rd
Wake Dr
Roselea Ct
Hawkins Dr
Allenville Rd
BORR_MW11
Hasties Rd
Coachwood Way
BORR_MR_MW05
Brookview Av
Crowd Rd
Queelup Rd
Hampstead St
Ducane Rd
Whistler Rd
BORR_MW10
Watkins Rd
Marchetti Rd
Silvereye Rd
Yallinda Dr
931
Gelorup Rise
BORR_MW09
Eucalypt Dr
BORR_PB11
BORR_MB11s
BORR_MB11d
BORR_MW08a
Ken Bell Rd
BORR_MW07
Woods Rd
Marri Pl
Manea Dr
Hair Pl
1163
Jilley Rd
Skippings Rd
Galinup Rd
Dugite Rd

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Legend

- Ministerial Boundary 1191 (STH SWGA)
- TECPEC South
- Black-Stripe Minnow Wetland Habitat
- Potential Black Stripe Habitat
- Rivers
- Surface Water Sampling Point

Groundwater Boreholes

- Production Bore
- Monitoring Bores
- Monitoring Bore Decommissioned

South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

A3 scale: 1:25,000

0 500 1,000 Metres

Date: 30/07/2024 25_01_001_GW_Monitoring

Coordinate System: GDA 1994 Perth Coastal Grid 1994PCG94

BORR Annual Groundwater Review to 31 May 2024

Groundwater Monitoring Locations: Page 1

Lawson Rd
Norton Prom
Loretta Av
Blaxland Rd
Tiffany Ctr
Gelorup Qua
Maidment Pde
Gutmann Pwy
Wentworth Dr
McMillan Dr
Frances Rd
Katinka St
Killerby Dr
Chisholm Rd
Wake Dr
Jules Rd
Hawkins Dr
Dalyellup Bvd
Hornibrook Rd
Hasties Rd
Harewoods Rd
Coachwood Way
Brookview Av
Crowd Rd
Hampstead St
Ducane Rd
Whistler Rd
BORR_MW10
Watkins Rd
Marchetti Rd
931
Yalinda Dr
Gelorup Rise
BORR_MW09
Eucalypt Dr
BORR_PB11
BORR_MB11s
BORR_MB11d
BORR_MW08a
Banksia Rd
BORR_MW07
Woods Rd
Brockway Dr
Marri Pl
BORR_PB14
BORR_MB14s
BORR_MB14d
BORR_BH27.1
Manea Dr
Quambi Dr
Bussell Hwy
1163
Lakes Rd
BORR_MW06
Calinup Rd
Jaymon Rd
Mininup Rd
Dugite Rd
BORR_MW05
14478
Jilley Rd
Ramsay Rd
BORR_MW04
Murnane Cr
Kent Rd
Stratham Cl
Fishermans Rd
Bourne Loop
Boyanup Rd West

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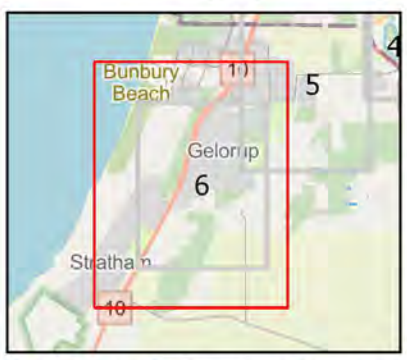
Legend

- Ministerial Boundary 1191 (STH SWGA)
- TECPEC South
- Black-Stripe Minnow Wetland Habitat
- Potential Black Stripe Habitat
- Rivers
- Surface Water Sampling Point

Groundwater Boreholes

- Production Bore
- Monitoring Bores
- Monitoring Bore Decommissioned



South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

A3 scale: 1:25,000

0 500 1,000 Metres

Date: 30/07/2024 25_01_001_GW_Monitoring

Coordinate System: GDA 1994 Perth Coastal Grid 1994PCG94

BORR Annual Groundwater Review to 31 May 2024

Groundwater Monitoring Locations: Page 2

3 Site Characteristics

3.1 Climate

The Project area falls within the Swan Coastal Plain, which is typically described as a warm Mediterranean climate, dominated by a hot, dry summer and a mild, wet winter. Table 1 presents Bunbury (ID 009965) monthly rainfall data in context with the project (BOM, 2024).

In context to the assessment of environmental change, rainfall predominantly occurs during winter months. Historical (1995 to 2022) average annual rainfall recorded at the Bunbury meteorological station is about 632 mm/yr. During baseline monitoring, rainfall water reported below averaging in all periods prior to construction commencing in 2022. During the current reporting period, annual rainfall (551mm) was well below both the historical (632 mm for the 2018 to 2024 average) and in the previous two years (about 720 mm) (Table 2). This low rainfall resulted in there being no surface water observed in Five Mile Brook during monitoring rounds.

Table 1 Bunbury Monthly Rainfall Data (BOM Station 009965)

Month	1995-2021	Reporting Period						2018 to 2024 Average
		2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	
	Pre-Construction Historical Average	Baseline			Construction Period			
	mm							
Jun	135.7	178	*182*	*152.2*	***101.0***	***110.4***	*167.4*	148.5
Jul	145.5	165.2	***94.6***	***129.0***	*199.8*	*226.2*	*168.6*	163.9
Aug	118.2	146.2	***91.8***	***65.6***	***108.2***	*132.8*	*126.8*	**111.9**
Sep	79.7	**29.2**	***30.0***	*88.2*	*95.2*	***70.2***	***72.4***	**64.2**
Oct	36.4	37.6	*53.2*	*NR*	*123.4*	***30.6***	***11.8***	51.3
Nov	21.4	**3.0**	***15.4***	*NR*	***12.6***	***18.0***	***2.6***	**10.3**
Dec	15.8	**5.8**	***0.2***	***5.0***	***10.6***	***0.0***	***1.0***	**3.8**
Jan	10.4	*NR*	***1.2***	***0.2***	***0.0***	***0.6***	***0.0***	**0.4**
Feb	8.4	*NR*	*12.4*	*54.6*	***2.8***	***0.0***	***0.0***	**14.0**
Mar	19.7	*21.2*	*35.2*	*36.4*	***8.6***	***15.8***	***0.4***	**19.6**
Apr	41.1	***16.2***	***23.6***	*74.0*	*61.6*	*112.4*	***0.0***	48.0
May	97.2	***34.8***	*114.4*	*147.8*	*111.0*	***37.0***	*177.4*	103.7
Total	**632.3**	**602.4**	**539.6**	**605.2**	723.8	717.0	**551.0**	635.8

Note: **Bolded** totals are below the 1995-2021 pre-construction historical average.

3.2 Topography

Topography ranges from 5 to 39 m above the Australian Height Datum (AHD) with the more elevated areas associated with the Spearwood sands and Bassendean sands and the least elevated areas associated with drainage lines (5 to 10 m AHD) (GoWA, 2020).

3.3 Groundwater

The Project area occurs within the Bunbury Groundwater Area, which is proclaimed under the Rights in Water and Irrigation Act 1914 (RIWI Act), and therefore has numerous licenced and unlicenced private and commercial bores.

In context to the project, the primary groundwater units underlying the Southern Section of the BORR alignment are:

- The Superficial Aquifer: a thin (0 to 40 m thick) surficial, predominantly unconfined layer that is recharged by direct infiltration of rainfall. This forms a key aquifer for local private groundwater abstraction.

- The Leederville Aquifer: a confined formation ranging from 15 to 300 m below ground level (m bgl), which is recharged by downward seepage from the overlying Superficial aquifer and direct infiltration in outcrop areas. This forms an aquifer for local private and commercial abstraction.
- The Yarragadee Aquifer: a confined aquifer (within the Project area) underlying the Leederville Aquifer and ranging from 600 m to 1,200 m thick. The Yarragadee Aquifer is recharged by direct infiltration of rainfall where unconfined, and elsewhere through limited seepage from the overlying Leederville Aquifer (Department of Water, 2009). This forms a key aquifer for local private and project related abstraction (PB11 and PB14).

A total of nineteen (19) groundwater wells were installed in the Southern Section in 2018 for the targeted groundwater and Acid Sulfate Soil (ASS) investigations (BORR IPT, 2020). Water level data was initially monitoring using both telemetered and non-telemetered loggers.

Groundwater typically flows in a westerly direction towards the Indian Ocean (BORR IPT, 2020). Depth to groundwater in the Southern Section is generally driven by topography with the lower-lying areas having groundwater that are shallow, with seasonal variability of up to 2 m, ranging between groundwater that is close to or at the surface, to between 5 m and 17 m bgl (BORR IPT, 2020). In more elevated areas linked to the costal sand ridgeline, the depth to groundwater can be over 18 m bgl.

Groundwater salinity in the Superficial Aquifer is generally fresh to marginally brackish (<500 to <2,000 mg/L Total Dissolved Solids (TDS)). There is, however, likely to be some localised variation because of poor drainage and subsequent shallow perched water tables leading to evapoconcentration of salts during the summer months.

The underlying Leederville and Yarragadee Aquifers are generally fresh, particularly so for the upper sandier parts. Deeper in the aquifer, salinities can increase somewhat, reported to be up to the region of 800 mg/L TDS (Commander, 1984).

3.4 Surface Water

3.4.1 Watercourses

Five Mile Brook is the most northern waterway in the Geographe Catchment, and the key waterway within the Southern Section. The catchment supports an agricultural industry dominated by beef grazing. Rural lifestyle lots and urban residential areas associated with the southern extension of Dalyellup Estate are key land uses in the lower reaches of the catchment.

Five Mile Brook typically flows only in the winter months, discharging to Geographe Bay at Minninup Beach. The waterway is modified into an artificial drain for several kilometres before reaching the bay. In the summer months the mouth of the creek closes over due to lack of flow. When the flow intensifies in the winter months the drain fills, the sandbar breaks and water flows into Geographe Bay. Since 2000, the mean annual flow for Five Mile Creek is 5 GL/year of a total of 203 GL/year for the waterways of the Geographe catchment (DWER, 2023).

Five Mile Brook generally has poor water quality, likely resulting from a combination of soils which do not retain nutrients and intensive land uses within the catchment (DWER, 2023). The nutrient loads in Five Mile Brook are driven by intensive agricultural land-uses, with a high proportion of beef grazing in the catchment. Due to the seasonal nature of this waterway, there are limited data on which to assess water quality. The available data show phosphorus and nitrogen concentrations to be above water quality targets (DWER, 2023).

3.4.2 Wetlands

3.4.2.1 Wetlands of International Significance

No Ramsar wetlands (Ramsar Sites (DBCA-010)) are located within 10 km of the Southern Section of the Project area. The Ramsar listed Peel-Yalgorup System is located approximately 20 km to the north of the project alignment and the Vasse-Wonnerup System is located approximately 19 km to the south-west of the project alignment (GoWA, 2020).

3.4.2.2 Geomorphic Wetlands

Wetlands on the Swan Coastal Plain have been classified using a geomorphic-hydrologic approach to wetland classification (Hill, Semeniuk, Semeniuk, & del Marco, 1996; Semeniuk & Semeniuk, 1995). Wetlands have also been evaluated and assigned an appropriate management category which provides guidance on the nature of wetland management and protection that the wetland should be afforded. These include Conservation Category Wetlands (CCW), Multiple Use Wetlands (MUW) and Resource Enhancement Wetlands (REW).

The identified wetland areas within the southern sections of the project include:

- *MUW UFI-1163 – a multiple use wetland (sumpland basin) forming semi-permanent pools within Five Mile Brook south of the proposed alignment.*
- *CCW UFI-931 – a conservation category wetland (sumpland basin) forming semi-permanent pools within Five Mile Brook north of the proposed alignment.*
- *CCW UFI-14478 - a conservation category wetland (sumpland basin) forming a low-lying basin south of the alignment on Bussell Highway.*
- *REW UFI-1117 - a resource enhanced sumpland basin formed in a low-lying basin near Lilydale Road and partially within the alignment.*
- *REW UFI-15493 - a resource enhanced dampland formed in a low-lying basin west of the alignment near Bussell Highway.*

3.4.1 Black-stripe Minnow Habitat

The Black Striped Minnow is endemic to south-western Australia and is now rare throughout its distribution. Black-Stripe Minnow have been confirmed within the Five Mile Brook, located within the Southern Section of the Project (WRM 2021). Figure 1 presents the potential habitats in the Southern Section.

Typical habitat conditions include tannin-stained water bodies with large areas of intact riparian vegetation. Importantly, given the high mobility of the species, it is possible that colonisation/recolonisation would occur after a large rainfall event if the wetlands become connected.

3.5 Construction Related Activities

Construction activities commenced in the southern section in August 2022 and have continued throughout the 2023 to 2024 reporting period. Activities undertaken during this time that may pose risks to the hydrological regime include:

- Vegetation clearing resulting in erosion and changes in sediment load.
- Excavations and bridge construction in the Five Mile Brook areas.
- Addition of fill material modifying drainage and surface water ponding areas.
- Lowering of the water table due to groundwater abstraction for water supply (PB11, PB13 and PB14).

4 Monitoring Program

Monitoring commitments to assess the potential impacts of the project are summarised below in Table 2. Monitoring locations are presented on Figure 1 and align with *Galaxiella nigrostriata* habitat monitoring sites. In addition, project related water supply bores (PB11, PB13 and PB14) have been included to provide context to environmental receptors. Details of monitoring bore construction are presented in Appendix A.

Groundwater and surface water levels from monitoring sites have been used to compare against pre-construction baseline and trends in reference monitoring wells as presented in the *Bunbury Outer Ring Road - Groundwater and Surface Water Monitoring Report (2019-2020)* (BORR IPT, 2020) and the *Bunbury Outer Ring Road (Southern Section) Baseline Hydrological Regime Report* (SWGA, 2022).

4.1 Project Related Water Supply Monitoring

Water supply production bores PB11, PB13 and PB14, were installed in the southern section of the alignment to provide construction water. To minimise local impacts on other users and potential environmental receptors, production bores were designed to draw groundwater from deeper zones up to 80m depth, from within the Yarragadee Formation.

Due to the proximity to several private groundwater users in the Gelorup region, as recommended by the Department of Water and Environmental Regulation (DWER email correspondence 10 November 2022), an integrated monitoring programme of both PB11 and PB14 was initiated to record the rate of discharge and how the local aquifer responds. Monitoring provides information of the longer-term aquifer response to pumping in this area, whether changes during bore operations are within expected ranges, and allow efficient response to groundwater related issues as local construction and water use ramps up.

Groundwater level data loggers are installed in monitoring bores adjacent to each pumping bore that target both the Superficial Aquifer (shallow) and Yarragadee Aquifer (deep). Production bore will be operated under the same cyclic abstraction of 16 hr/day for 5 days per week.

Locations are provided on **Figure 1.**

4.2 Applied Guidelines

Water quality for physio-chemical parameters and nutrients have been compared against ANZECC/ARMCANZ (2000) freshwater guideline values for the protection of slightly/moderately disturbed wetland ecosystems in the southwest of Western Australia as these are the most recent locally specific guidelines. Results have also been compared to historical data from the pre-development monitoring program (BORR IPT 2020, SGWA 2021).

Table 2 Monitoring Requirements

Monitoring Location[1]	Locality	Environmental Value[2]		Monitoring Requirements	Comments
GROUNDWATER					
BH27.1 (9 m)[3]	West of Five Mile Brook	Black Striped Minnow (Galaxiella nigrostriata) habitat	-	Monthly Water level data logging – telemetry and manual Quarterly • Field parameters: pH, temperature, conductivity, redox, total oxygen - Laboratory analysis: - **Inorganics:** pH, EC, TDS - **Acidity and Alkalinity**: Carbonate as CaCO3, Bicarbonate as CaCO3, Hydroxide as CaCO3, Total Alkalinity, Acidity - **Major Ions:** Calcium, Magnesium, Potassium, Sodium, Chloride, Sulphate, Cations, Anions, Ionic Balance, Sulfide - **Nutrients:** Ammonium, ammonia, Nitrogen (oxidised), Total Nitrogen, Reactive Phosphorus, Kjeldahl Nitrogen, Total Phosphorus - **Metals:** Aluminium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Nickel, Selenium, Zinc - **BTEXN:** Benzene, Toluene, Ethylbenzene, Xylene, Naphthalene - **TRH:** Total Recoverable Hydrocarbons	*Impacted by construction*
MB14s (14.55 m) and MB14d (60.5 m)					Replacement for BH27.1 and water table drawdown from abstraction (PB14)
BORR_MW46 (6 m)			RE Wetland UFI-15493		
BORR_MW04 (13 m)	South of Five Mile Brook		CC Wetland UFI-14478		
BORR_MW05 (8 m)			CC Wetland UFI-14478		
BORR_MW06 (8 m)			-		
BORR_MW07 (10.50 m)			-		*Limited saturated thickness to collect water sample*
BORR_MW08a (6.0 m)			MU Wetland UFI-1163 (5-mile Brook)		*Blocked with tree roots – cleared each round*
BORR MR_MW05 (5 m)[3]			-		*Impacted by construction*
BORR_MW09 (5.5 m)	Preston River to Five Mile Brook		CC Wetland UFI-931		*Impacted by construction*
BORR_MW10 (4 m)			CC Wetland UFI-931		
BORR_MW11 (4.0 m)			-		
BORR_MW12 (4.5 m)[3]			RE Wetland UFI-1117		*Landholder access restrictions. Impacted by construction Nov 23.*
MB11s (15.15 m) and MB11d (60 m)			MU Wetland UFI-1163 (5-mile Brook)		Replacement for BORR_MW9 and water table drawdown from abstraction (PB11)
SURFACE WATER					
Surface Water 10 (SW10)	Five Mile Brook	Black Striped Minnow (Galaxiella nigrostriata) habitat	MU Wetland UFI-1163 (5-mile Brook)	Quarterly • Field parameters: pH, temperature, electrical conductivity (EC), redox, total oxygen, turbidity - Laboratory analysis: In addition to the above - **Inorganics:** TSS - **Pesticides:** Organophosphates, Glyphosate	*Dry during reporting period*

[1] *Bore ID and Depth (m bgl)*
[2] *MU – Multiple Use; CC – Conservation Category; RE - Resource Enhanced*
[3] *– Impacted or no access available*

5 Methodology

Fieldwork was undertaken as described in Table 3.

Table 3 Field work methodology and demonstration of compliance

Activity/Item	Details
Groundwater Bore - Gauging	All monitoring bores were gauged using an interface probe to determine the depth to groundwater prior to the commencement of sampling. Groundwater gauging recorded information is presented in Appendix B
Groundwater Bore - Sampling Method	All bores were sampled using low-flow technique (peristaltic pump). Ex-situ measurements of water quality parameters were taken on site using a multi-parameter instrument (YSI Pro DSS) fitted with a flow-through-cell. The parameters included pH, dissolved oxygen (DO), redox potential, temperature, and electrical conductivity (EC). Field parameters are presented in Appendix E
Surface Water - Sampling Method	The YSI Pro DSS was used to take in-situ measurements of water quality parameters, including the parameters taken at groundwater bores and water turbidity. Where water level permitted, the measurements were profiled at different depths. Field parameters are presented in Appendix E
Sample Analysis	Primary samples were analysed by ALS, a NATA accredited laboratory, using standard methods. Laboratory QA/QC measures included duplicate and rinsate samples. Duplicate samples were taken at one groundwater bore and one surface water location each round, and rinsates were taken at a frequency of one per day of sampling.
Field Documentation	All field records were logged on standardised field forms and included the date and time, location, field personnel, quality assurance / quality control (QA/QC) sample information and details of the sampling observations, provided in Appendix E.
Sample Preparation, Preservation and Transportation	Sampling was undertaken in accordance with AS/NZS 5667.1:1998. Samples were placed in laboratory-supplied bottles containing appropriate preservatives. Samples for dissolved metals were not field filtered. Samples were labelled in accordance with the monitoring location, field personnel and date, placed in eskies chilled with ice and forwarded to the laboratory under standard chain of custody (COC) procedures. Copies of the laboratory documentation are presented in Appendix D.
Decontamination Procedure	Decontamination of all non-disposable equipment was completed between sample locations. Disposable equipment such as bladders and gloves were replaced between each location.

6 Monitoring Results

6.1 Groundwater Levels

As per Table 2, eight groundwater monitoring bore locations and one surface water location have formed the Southern Section groundwater level monitoring program for the past 12 months. Due to ongoing construction activities commencing in late 2022, monitoring bores BORR_MW09, MR_MW05 and BH27.1 have been impacted by construction. In addition, access has been limited to BORR_MW12 due to landowner restrictions, and was impacted by construction in November 2023.

Groundwater level monitoring of MB11s and MB14s, in relation to water supply abstraction from production bores, PB11 (5-Mile Brook) and PB14 (Bussell Hwy), provided additional data to replace bores destroyed during construction.

The groundwater levels and water quality in available bores were monitored over a 12-month period June 2023 to May 2024 as per Table 2.

Groundwater levels from current and historical monitoring are presented in tabular and graphical formats Appendix B. Where available, each hydrograph presents data logger and manual groundwater levels alongside Bunbury monthly rainfall totals, bore screened interval and design groundwater levels (predicted historical maximum). To provide some context to baseline conditions, hydrographs include data from August 2018 to May 2024.

Importantly, in context with local changes to the groundwater environment, the past year has experienced below average rainfall (Table 1) compared to baseline conditions (1995 to 2021) and the recent construction period (2022 to 2023).

To assess groundwater related observations, the Southern Section has been divided into four discrete topographic zones incorporating:

- Eastern Topographic Flats – lower elevations linked to Palusplain and shallow sediments overlaying Bunbury Basalt: *Areas of potential Black-stripe Minnow habitat*
- Five Mile Brook area: *Areas of known Black-stripe Minnow habitat*
- Residential Ridgeline – elevated residential areas linked to the coastal dunes and limestone ridgeline
- West of ridgeline – western flank of the ridgeline and towards the ocean: *Areas of potential Black-stripe Minnow habitat*

Shallow groundwater level observations for the 2023-2024 reporting period include:

Eastern Agricultural Flats: CC Wetland UFI-931 and RE Wetland UFI-1117 – outside influence of the Gelorup quarry (BORR_MW9, BORR_MW10, and MR_MW05):

- The pre-construction (baseline) depth to groundwater ranged between 1.78 m bgl (winter high) and 3.21 m bgl (summer low) with influences from local drainage features and links to the depth of the underlying Bunbury Basalt.
- The 2023-2024 seasonal depth to groundwater ranged between 1.61 m bgl (winter high) and 2.22 m bgl (summer low).
- Groundwater elevation ranges between 12.70 m AHD (BORR_MW09) and 17.01 m AHD (BORR_MW10) with groundwater flow gradients generally towards the west or local drainages.
- A lower seasonal variability of 0.61 m when compared with a baseline of up to 1.43 m.
- Abstraction from PB11 (Yarragadee Aquifer) reported no measurable response in the water table superficial aquifer as measured in MB11s.

Quarry influence (BORR_MW11):

- A seasonal low groundwater level of 3.86 m bgl with level rising to 0.66 m bgl following winter rainfall is similar to pre-construction baseline conditions (2018-2021) that had a summer low of 3.98 m bgl rising to a winter high of 0.58m bgl.

- The local groundwater level had a seasonal range of 3.1 m compared to baseline conditions of 3.4 m with fluctuations likely linked to levels in the adjacent quarry lake.

Five Mile Brook: MU Wetland UFI-1163 (BORR_MW08a):

- The depth to groundwater for the 2023-2024 period, ranging between 3.54 m bgl (winter high) and 4.77 m bgl (summer low), was below the pre-construction baseline of 1.84 m bgl to 4.24 m bgl, likely a result of the low rainfall and recharge to the Superficial Aquifer.
- A consistent smaller seasonal variation of 1.23 m compared with baseline value of 2.40 m – a likely direct correlation with annual rainfall and subsequent recharge.
- Observed local surface water inundation (near this bore) following winter rain and drainage towards Five Mile Brook.

Residential Ridgeline (BORR_MW07):

- The groundwater level in monitoring bore BORR_MW07 ranged between 9.83 m bgl (winter) and 10.74 m bgl (summer) in the 2023-2024 review period. This compares with the baseline levels of between 9.89 m bgl and 10.29 m bgl respectively.
- A muted seasonal variation in the groundwater level of between 0.91m (2023-2024 reporting period) and 0.41 m (baseline) was observed – attributed to the lower rainfall and recharge to the Superficial Aquifer.
- The topographic high ridgeline with underlying limestone and well drained sand stratigraphy and therefore not forming suitable habitat for the Black Striped Minnow.
- This area forms a widespread residential area with private landowners reliant on groundwater use and therefore likely impacting on groundwater levels and quality throughout the year peaking during the summer dry season.

West of Ridgeline: RE Wetland UFI-15493 and CC Wetland UFI-14478 (BORR_MW04, BORR_MW05, BORR_MW06, BORR_MW46, BH27.1):

- Depth to groundwater ranged between 3.35 m bgl (winter high) and 4.41 m bgl (summer low) compared to baseline conditions of between 4.77 m bgl (winter) and 5.46 m bgl (summer) with seasonal high levels driven by local drainage features.
- Groundwater elevation ranges between 1.67 mAHD and 6.05 m AHD with groundwater flow gradients generally towards the west.
- A seasonal variability of up to 0.61 m compared with a baseline of up to 0.69m.
- Abstraction from PB14 (Yarragadee Aquifer) reported no measurable response in the water table superficial aquifer as measured in MB14s.

Groundwater levels measured during the 2023-2024 reporting period reported some correlation with the lower rainfall measured, resulting in lower recharge and seasonal high groundwater levels.

6.2 Water Quality

As per Table 2, a total of eight groundwater monitoring bore locations and one surface water location forms the groundwater and surface water related water quality monitoring program for the BORR Southern Section. A number of monitoring program related aspects include:

- Monitoring bores MR_MW05 and BH27.1 have been decommissioned due to construction activities.
- BORR_MW07 has had restricted sampling since February 2022 due to the bore depth having limited saturated thickness restricting sample collection using the peristaltic sampling pump.
- BORR_MW8a has been subject to consistent tree root blockage. This bore was cleared in July 2023.
- BORR_MW12 has historically had limited access due to landowner restrictions.
- Samples from BORR_MW11 and MR_MW05 had elevated groundwater concentrations as a likely consequence of the adjacent quarry pit lakes forming a local hydraulic sink and therefore not likely representative of a project related change.

Groundwater quality data from available bores in the reporting period (2023-2024) are presented with baseline and historical data (2018-2021) in tabular and graphical formats in Appendix B. The time plots present analyte concentrations in context with Bunbury monthly rainfall totals.

To assess the water quality characteristics and potential change as a result of project construction related activities on the Black-striped minnow habitat, it is important to highlight and assess in context with local landuse changes. The Project area is in an area that has been extensively cleared and fertilised for grazing. In 2012, the DoW reported that waterways in the Leschenault Catchment regularly exceed ANZECC and ARMCANZ guidelines. The results presented herein are of a similar order of magnitude to the historical results presented by the DoW (2012). As a result, exceedances of the ANZECC and ARMCANZ guidelines are not linked to Project-related activities.

6.2.1 Surface Water Quality

Surface water quality was not measured for this reporting period due to the monitoring location (SW10) being dry during all monitoring events. Surface water monitoring is detailed separately within the *Annual Aquatic Fauna and Surface Water Report* (SLR Consulting, 2024).

6.2.2 Groundwater Quality

Where available, groundwater samples were collected quarterly in August and November 2023, and February and May 2024. Table 4 presents a summary of groundwater quality results including pre-construction baseline with the current 2023-2024 reporting period.

Dissolved metals in groundwater are filtered prior to analysis to remove the particulate matter. In comparison, total metals are performed on surface water samples. To allow comparison with groundwater results, guideline “dissolved” values have been assumed and presented in tabular format highlighting exceedances in Appendix C.

Table 4 Groundwater Quality – Laboratory Summary Results

Parameter	ANZECC and AARMCANZ (2000) Freshwater Guidelines[1]	Maximum during 2023/24[1]	2023/24 Exceedances	Pre-construction maximum	Pre-construction Exceedances
Copper	0.0014	0.012 (BORR_MW46)	BORR_MW04, BORR_MW11	0.052	BORR_MW04, BORR_MW05, BORR_MW06, BORR_MW08a, BORR_MW09, BORR_MW10, BORR_MW11, BORR_MW46, MR_MW05
Zinc	0.008	0.137 (BORR_MW46)	BORR_MW05, BORR_MW08a, BORR_MW11, BORR_MW46	0.404	BORR_MW05
Nitrogen	1.5	7.9 (BORR_MW08a)	BORR_MW06, BORR_MW08a, BORR_MW11, BORR_MW46	6.3	MR_MW05, BORR_MW05, BORR_MW06, BORR_MW08a, BORR_MW09, BORR_MW11
Phosphorus	0.06	2.81 (BORR_MW46)	BORR_MW05, BORR_MW06, BORR_MW08a, BORR_MW11, BORR_MW46	1.22	MR_MW05, BORR_MW04, BORR_MW05, BORR_MW06, BORR_MW08a, BORR_MW10, BORR_MW11, BORR_MW46

[1] Dissolved Metals guideline values assumed to allow assessment in context to groundwater

6.2.2.1 Physicochemical Parameters

Based on the four discrete topographic zones groundwater quality observations for the 2023-2024 reporting period (Appendix C) included:

Eastern Agricultural Flats: CC Wetland UFI-931 and RE Wetland UFI-1117 – outside influence of the Gelorup quarry (BORR_MW9, BORR_MW10): Lower elevations linked to Palusplain and shallow sediments overlaying Bunbury Basalt: *Areas of potential Black-stripe Minnow habitat*

- The pH range in 2023-2024 of between 6.0 and 7.6 is similar to that of the pre-construction historical pH range of between 6.6 and 7.7.
- The groundwater salinity (measured as electrical conductivity (EC)) ranged between 98 and 1,140 µS/cm, slightly higher than the pre-construction range of between 168 and 779 µS/cm, possibly caused by the low rainfall and aquifer recharge during the 2023-2024 reporting period.
- Bicarbonate and alkalinity concentrations remained within historical ranges.

Quarry influence (BORR_MW11):

- The pH range in 2023-2024 of 6.3 to 7.0 was slightly lower than the pre-construction historical pH range (7.2 and 7.9).
- Pre-construction groundwater electrical conductivity ranged up to 24,600 µS/cm. During the reporting period, salinity ranged between 306 and 1,090 µS/cm, possibly caused by the nearby quarry pit lakes.
- Prior to construction, bicarbonate 258 to 1,860 mg/L) concentrations were also high. During the 2023-2024 period bicarbonate ranged between 33 and 125 mg/L.

Five Mile Brook: MU Wetland UFI-1163 (BORR_MW08a): Five Mile Brook area: *Areas of known Black Striped Minnow habitat*

- The pH range in 2023-2024 of between 6.0 and 7.6 is similar to that of the pre-construction historical pH range of between 6.6 and 7.7.
- Groundwater electrical conductivity ranged between 98 and 1,140 µS/cm, slightly lower and higher than the pre-construction range of between 168 and 779 µS/cm, possibly caused by the low rainfall recharge and very low rainfall during the 2023-2024 period.
- Bicarbonate and alkalinity concentrations remained within historical ranges.

West of Ridgeline: RE Wetland UFI-15493 and CC Wetland UFI-14478 (BORR_MW04, BORR_MW05, BORR_MW06, BORR_MW46): western flank of the ridgeline and towards the ocean: *Areas of potential Black Striped Minnow habitat*

- The pre-construction pH range was reported between 3.2 and 7.6. The acidic values in BORR_MW46 have since reverted to neutral ranges.
- The pH range between 6.0 and 7.6 is similar to that of the pre-construction historical pH range outside the impact from BORR_MW46 of between 6.7 and 7.7.
- Groundwater electrical conductivity ranged between 306 and 5,470 µS/cm, slightly higher than the pre-construction range of between 216 and 4,280 µS/cm, possibly caused by the low rainfall and recharge during the 2023-2024 period.
- Bicarbonate and alkalinity concentrations remained within historical ranges.

6.2.2.2 Total Metals

Except for copper, and zinc, outside BORR_MW46, there were no exceedances of guidelines recorded during 2023-2024 reporting period for any tested metals (Table 4). These observations were also exhibited during pre-construction baseline sampling and therefore indicate likely no change in water quality as a result of the Project activities.

Exceedances are presented in Appendix C.

6.2.2.3 Nutrients

Concentrations of phosphorus (0.0 to 2.81 mg/L) were above the guidelines (0.06 mg/L) for the reporting period and, for BORR_MW46, slightly higher than the historic range (up to 1.22 mg/L) (**Appendix C**). The variability in concentration levels can likely be attributed to the variability is seasonal rainfall that results in first flush and inundation of widespread low-lying fertilised agricultural land.

A change in peak total nitrogen concentrations between a baseline maximum of 6.3 mg/L and the recent reporting period of 9.2 mg/L reported during the highly variably rainfall period (**Appendix C**).

6.2.2.4 Organic Chemicals

Petroleum hydrocarbons, benzene, toluene, ethylbenzene, xylenes, organophosphorus and organochlorine pesticides, and glyphosate were not detected either pre-construction or during the 2023-2024 reporting period.

6.2.2.5 Groundwater Quality Summary

In context with the identified topographic zones, the following observations are apparent:

Eastern Agricultural Flats (BORR_MW9, BORR_MW10) is aligned with CC Wetland UFI-931 and RE Wetland UFI-1117 and located outside influence of the Gelorup quarry. The Superficial Aquifer in this area is at lower elevations linked to palusplain and shallow sediments overlying Bunbury Basalt and has been linked with areas of potential Black-stripe minnow habitat. Groundwater quality measured during the 2023-2024 period generally suggests concentrations were slightly higher than the pre-construction ranges, possibly caused by the low rainfall recharge and very low rainfall during the 2023-2024 period. These changes are not attributed to the project.

Quarry influence (BORR_MW11) salinity for the reporting period ranged between 306 and 1,090 µS/cm, well below the maximum pre-construction of 24,600 µS/cm. This is possibly caused by the influence of the nearby quarry pit lakes that may be forming hydraulic sinks resulting in localised evapo-concentration of salt.

Five Mile Brook (BORR_MW08a) is aligned with MU Wetland UFI-1163 and an area known as Black Striped Minnow habitat. During the 2023-2024 reporting period, most analytes remain within long-term ranges, however, some minor deviations have been observed as a result of the very low recent rainfall and limited localised recharge.

Residential Ridgeline (BORR_MW07) observations have been recently driven by groundwater levels in BORR_MW07 close to the base of the constructed bore. Due to the limited available saturation, no water quality samples could be collected during the 2023-24 monitoring period. It is however noted that this area is dominated as a topographic high ridgeline and therefore not within a suitable habitat for the Black Striped Minnow.

West of Ridgeline (BORR_MW4, BORR_MW05, BORR_MW06, and BORR_MW46) is associated with RE Wetland UFI-15493 and CC Wetland UFI-14478 on the western flank of the ridgeline and towards the ocean. This includes a potential Black Striped Minnow habitat area. The acidic values measured at BORR_MW46 in 2020 have reverted to neutral ranges. Outside BORR_MW46, groundwater quality characteristics remain within historical ranges with some minor fluctuations possibly caused by the low rainfall recharge and very low rainfall during the 2023-2024 period.

7 Quality Assurance/Quality Control

Laboratory QA/QC checks indicate results were within acceptable levels with all differences between the primary and duplicate within acceptable limits, except for phosphorus. This is considered to be acceptable as both primary and duplicate results are close to laboratory limit of reporting (LOR) and are low in concentrations (**Appendix C**).

Lab QA/QC was acceptable with all parameters within acceptable ranges except for:

- The laboratory measurements of pH were outside holding times on 18 Aug 2023, 29 Nov 2023, 22 Feb 2024, and 16 May 2024. However. the laboratory pH results were similar to the field pH results suggesting little had changed during sample handling and transportation.
- 22 Feb 2024 – The matrix spike for nitrate (NOx) not determined due to high background levels and low frequency of total metals control samples. This is considered to be acceptable as results are similar to other events and all other total metals parameters, including relative percentage difference for field duplicates are acceptable.

In summary, the laboratory data is considered suitable for assessing water quality trends.

8 Monitoring Compliance

This monitoring review assesses the compliance with the Conditions 2-1(2) and Condition 2-3 of MS1191 and outlined in Section 2.2 and summarises the groundwater and surface water monitoring data for the 12-month reporting period from June 2023 to May 2024 in context with local baseline conditions. Monitoring compliance has been shaded and coded in accordance with Table 5.

Table 5 Summary of Monitoring Compliance Abbreviations

Abbreviation	Compliance Status	Comments
C	Compliant	More than 80% completed
PNC	Potentially non-compliant	60 to 80% completed
NC	Non-compliant	Less than 60% completed
D	Monitoring Bore Decommissioned/ Impacted	
NA	Monitoring location dry or no landowner access permitted	

Compliance of the scheduled monitoring for 2023-2024 reporting period is summarised in **Table 6**.

Table 6 Compliance of Monitoring in the Project Southern Section 2023-2024

Bore ID	2023-2024 Monitoring Bore Data Compliance								
	Monthly Static Water Level (m bgl; mAHD)	Quarterly Field TDS (mg/L)	Quarterly Field EC (mg/L)	Quarterly Field pH	Quarterly Laboratory Analysis				Notes
					Aug-23	Nov-23	Feb-24	May-24	
Groundwater									
BORR_MW04	C	C	C	C	C	C	C	C	
BORR_MW05	C	C	C	C	C	C	C	C	
BORR_MW06	C	C	C	C	C	C	C	C	
BORR_MW07	C	C	C	C	C	C	C	C	Bore too deep to sample
BORR_MW08a	C	C	C	C	C	C	C	C	Bore blocked by plant roots in June 2023
BORR_MW09	D	D	D	D	C	D	D	D	Bore impacted by construction September 2023
MB11s and MB11d	C	NC	NC	NC	NC	NC	NC	NC	Replacement for BORR_MW09 water level monitoring
BORR_MW10	C	C	C	C	C	C	C	C	
BORR_MW11	C	NA	NA	NA	C	NA	NA	C	Dry (Mar, Apr, May)
BORR_MW12	NA	NA	NA	NA	NA	D	D	D	Bore impacted by construction
BORR_MW46	C	C	C	C	C	C	C	C	
MR_MW05	D	D	D	D	D	D	D	D	Bore impacted by construction
BH27.1	D	D	D	D	D	D	D	D	Bore impacted by construction
MB14s and MB14d	C	NC	NC	NC	NC	NC	NC	NC	Replacement for BH27.1 water level monitoring
Surface Water									
SW10	-	NA	NA	NA	NA	NA	NA	NA	Sampled when inundated. Dry for 2023-2024 reporting period

9 Recommendations

Due to several monitoring bores now been decommissioned and impacted as part of construction activities, several locations may warrant replacements being installed at the following sites:

- **BORR_MW09** – Replaced with monitoring bores MB11s (water table aquifer) and MB11d (Yarragadee Aquifer) for project abstraction drawdown context.
- **BH27.1** – Replaced with shallow monitoring bore MB14s (water table aquifer) and MB14d (Yarragadee Aquifer) for project abstraction drawdown context.
- **BORR_MW12** – limited long-term monitoring due to historic landowner access restrictions and impacted by construction in November 2023.
- **BORR_MR_MW05** – decommissioned as part of construction activities. This bore has historically had results with elevated salinity that are inconsistent with regional trends and was likely impacted by the adjacent Gelorup quarry. Recommended to remove this location from the program.

10 Conclusions

Targeted groundwater and surface water levels and quality have been monitoring since 2019, prior to construction commencement and continued through 2024. In context to construction related activities, key findings from monitoring during the 2023 to 2024 monitoring assessment include:

- Low rainfall has resulted in limited surface water ponding in the southern areas that are known to form Black Striped Minnow habitat areas.
- Shallow water table levels continue to respond to rainfall recharge events or lack thereof.
- Groundwater levels linked to all geomorphic wetlands and TEC/PEC areas follow trends within or slightly lower than the historic ranges that are consistent with regional trends.
- The smaller average seasonal groundwater level fluctuations in 2023-2024 are attributed to the low seasonal rainfall and resulting recharge to the Superficial Aquifer.
- Outside the local influences of the Gelorup quarry facility (BORR_MW11), groundwater salinity remained fresh to slightly brackish.
- No measurable groundwater level drawdown in the superficial water table was evident from project related water supply abstraction bores.
- No surface water quality was collected due to the monitoring location (SW10) being dry during the reporting period.
- No Hydrocarbons were detected in groundwater during the 2023-2024 period.

Groundwater monitoring was completed in accordance with the outlined monitoring program, however several recommendations to replace monitoring sites decommissioned as part of construction activities have been provided. Newly included monitoring bores MB11s and MB14s will have additional water quality data included in future monitoring events.

Based on the review, groundwater monitoring remains within historical ranges and no changes compared with baseline data as presented in the *Bunbury Outer Ring Road - Groundwater and Surface Water Monitoring Report (2019-2020)* (BORR IPT, 2020) and the *Bunbury Outer Ring Road (Southern Section) Baseline Hydrological Regime Report* (SWGA, 2022) are attributed to the project.

It is concluded that Main Roads WA (MRWA) is compliant with Conditions 2-1(2), 2-3 and 2-4 of Ministerial Statement 1191 during the reporting period.

11 References

Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.*

Australian Government 2019, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality,* available from: https://www.waterquality.gov.au/anz-guidelines.

Australian Government Initiative (AIG). 2000. Nickel in freshwater and marine water. Retrieved from Australian Government Initiative: Nickel in freshwater and marine water (waterquality.gov.au). Accessed on 11 July 2024.

Australian Government Initiative (AIG). 2000. Zinc in freshwater and marine water. Retrieved from Australian Government Initiative: Zinc in freshwater (waterquality.gov.au). Accessed on 11 July 2024.

Bunbury Outer Ring Road Integrated Planning Study (BORR IPT) 2020 *Groundwater and Surface Water Quality Monitoring 2019-20.*

BoM, 2024. Climate Statistics for Australian Locations - Bunbury. Retrieved from Bureau of Meteorology: http://www.bom.gov.au/climate/averages/tables/cw_009965.shtml. Accessed on 11 July 2024.

Commander, D. (1984). The Bunbury shallow drilling groundwater investigation: Western Australia. Geological Survey Professional Papers for 1982, 32-52.

DWER, 2023. Geographe Waterways. https://rgw.dwer.wa.gov.au/geographe-waterways/five-mile-brook/

Department of Water. (2009). Bunbury and South West Coastal Groundwater Areas subarea reference sheets. Perth: Government of Western Australia.

Department of Water 2012, *Leschenault Estuary Water Quality Improvement Plan*, Department of Water, Western Australia.

Government of Western Australia (GoWA). 2020. data.wa.gov.au. Retrieved from https://data.wa.gov.au/. Accessed on 11 July 2024

Hill, A. L., Semeniuk, C. A., Semeniuk, V., & del Marco, A., 1996. Wetlands of the Swan Coastal Plain, Volume 2: Wetland Mapping, Classification and Evaluation. Perth: Prepared for the Water and Rivers Commission and the Department of Environmental Protection, Western Australia.

Semeniuk, C.A., & Semeniuk, V., 1995. A Geomorphic Approach to Global Classification for Inland Wetlands. Vegetation, 118, 103-124.

Southwest Gateway Alliance (SWGA) 2021, *Bunbury Outer Ring Road, Southern Section Baseline Hydrological Regime Report,* unpublished report to Environmental Protection Authority, August 2021.

Appendix A
Bore Summary Details

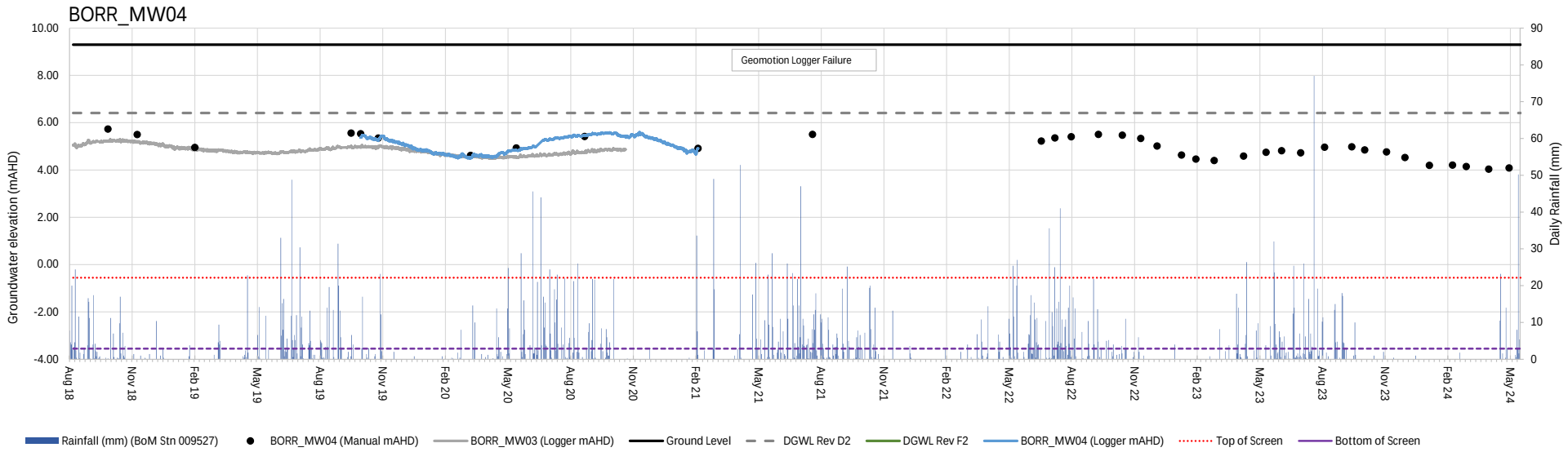
App A - Monitoring Bore Construction Details

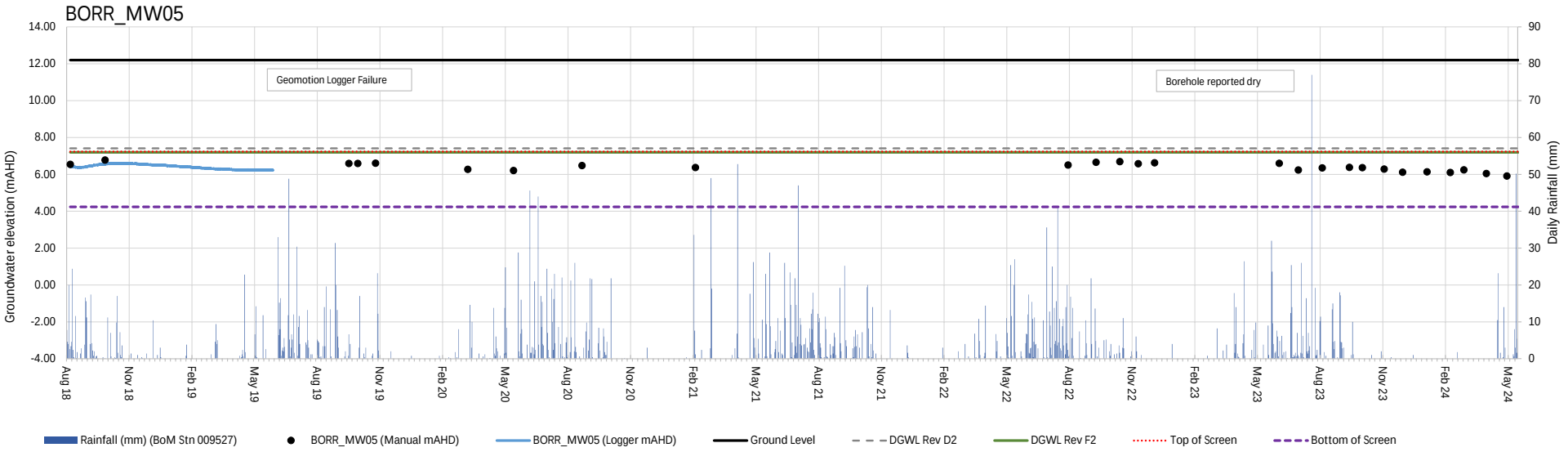
Bore_ID	River Locality	Location				Ground level (m AHD)	Top of Collar (m AHD)	Depth Drilled	Casing Details	Screened Interval		Seasonal Low GWL (m bgl)	Seasonal Low GWL (m AHD)	DGWL (m AHD)	Comments
		Easting (PCG94)	Northing (PCG94)	Easting (MGA94, Z50)	Northing (MGA94, Z50)					From (m bgl)	To (m bgl)				
Groundwater															
BORR_MW04	South of Five Mile Brook	30,098	96,440	370,118	6,297,058	9.30	9.45	13	Nominal 50mm ID uPVC class 9 Casing	10	13	4.68	4.62	NA	-
BORR_MW05	South of Five Mile Brook	30,660	97,684	370,681	6,298,315	12.20	12.24	8		5	8	6	6.2	7.2	-
BORR_MW06	South of Five Mile Brook	31,097	98,436	371,109	6,299,072	11.60	11.62	8		5	8	5.76	5.84	6.92	-
BORR_MW07	South of Five Mile Brook	32,079	99,497	372,079	6,300,144	15.60	15.62	10.5		7.5	10.5	10.12	5.48	6.25	-
BORR_MW08a	South of Five Mile Brook	33,592	99,726	373,589	6,300,390	15.97	15.95	6		3	6	3.33	12.64	14.53	-
BORR_MW09	Preston Rv to Five Mile Brook	34,250	100,342	374,240	6,301,013	16.40	16.45	5.5		2.5	5.5	4.91	11.49	14.62	Decommissioned
BORR_MW10	Preston Rv to Five Mile Brook	34,870	101,074	374,851	6,301,752	19.30	19.35	4.4		0.5	4.4	2.27	17.03	18.97	-
BORR_MW11	Preston Rv to Five Mile Brook	35,310	101,916	375,282	6,302,599	20.80	20.80	4.4		0.5	4.4	3.89	16.91	20.8	-
BORR_MW12	Preston Rv to Five Mile Brook	35,899	103,498	375,853	6,304,187	19.60	19.63	4.5		1.5	4.5	3.46	16.14	18.96	Decommissioned
BORR_MW46	Five Mile Brook - West	33,939	104,427	373,883	6,305,094	7.10	7.03	6		3	6	4.74	2.36	4.07	-
MR_MW05	South of Five Mile Brook	35,337	101,506	375,313	6,302,189	20.54	20.63	-		-	-	-	-	19.64	Decommissioned
BH27.1	Five Mile Brook - West	31,413	98,949	371,426	6,299,584	12.30	12.30	9		6	9	-	-	6.74	Decommissioned
MB11s	South of Five Mile Brook	33,627	99,849	374,128	6,302,416	16.35	16.24	15.15		13.15	15.15	NA	NA	NA	Replacement for BORR_MW9
MB11d								60		42	60				
MB14s	Preston Rv to Five Mile Brook	31,552	99,007	371,558	6,299,648	14.83	14.85	14.55		7.55	14.55	NA	NA	NA	Replacement for BH27.1
MB14d								60.5		42.5	60.5				
Surface Water															
SW10	Five Mile Brook	33,341	99,834	373,337	6,300,496		NA	NA	NA	NA	NA	NA	NA	NA	Surface Water Sampling Location

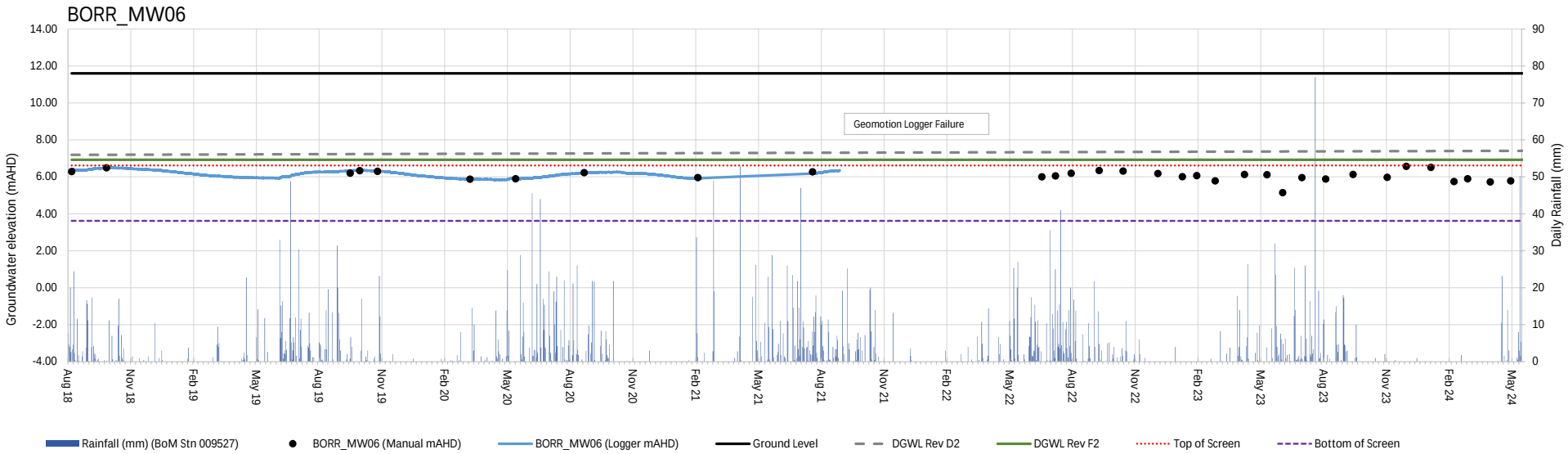
Appendix B
Groundwater Level Data

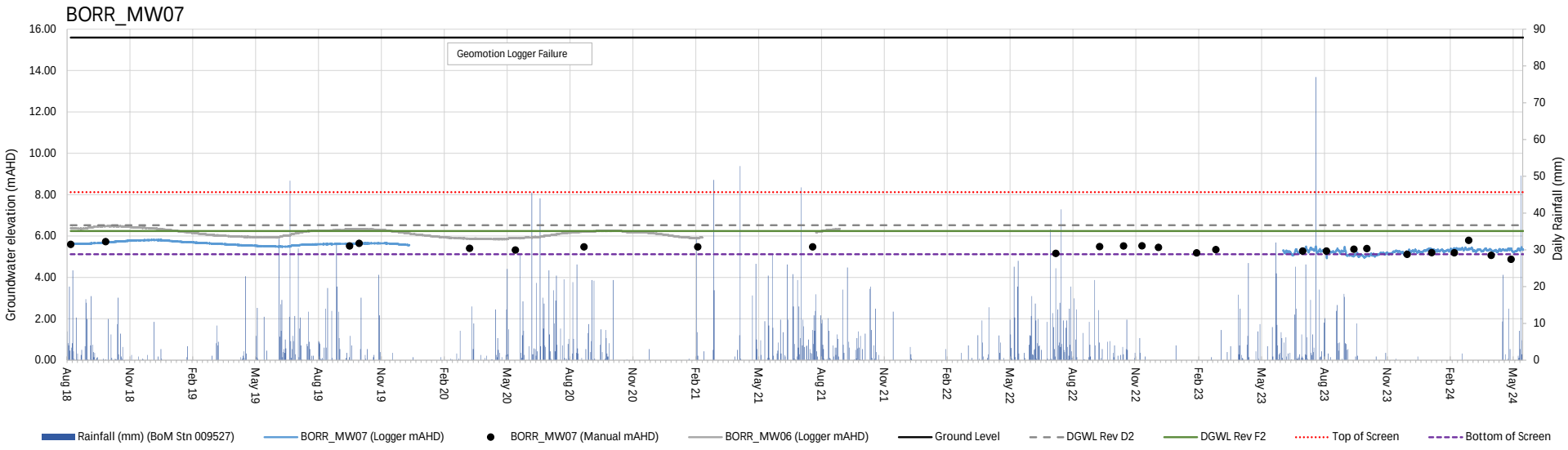
Bore ID	BORR_MW04		BORR_MW05		BORR_MW06		BORR_MW07		BORR_MW08a		BORR_MW09		BORR_MW10		BORR_MW11		BORR_MW12		BORR_MW46		MR_MW05		BH27.1	
Logger Type	#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A	
Easting	370117.70		370680.70		371109.40		372079.40		373588.50		374240.40		374851.40		375281.80		375852.60		373882.60		375313.50		371426.00	
Northing	6297058.10		6298314.70		6299071.60		6300143.90		6300390.20		6301013.40		6301751.80		6302599.20		6304187.10		6305094.10		6302185.30		6299584.00	
Ref Point AHD	9.45		12.24		11.62		15.62		15.95		16.45		19.35		20.80		19.63		7.03		20.51		12.13	
Ground AHD	9.30		12.20		11.60		15.60		15.97		16.40		19.30		20.80		19.60		7.10		20.50			
Date	BORR_MW04 (mbrp)	BORR_MW04 (Manual mAHD)	BORR_MW05 (mbrp)	BORR_MW05 (Manual mAHD)	BORR_MW06 (mbrp)	BORR_MW06 (Manual mAHD)	BORR_MW07 (mbrp)	BORR_MW07 (Manual mAHD)	BORR_MW08a (mbrp)	BORR_MW08a (Manual mAHD)	BORR_MW09 (mbrp)	BORR_MW09 (Manual mAHD)	BORR_MW10 (mbrp)	BORR_MW10 (Manual mAHD)	BORR_MW11 (mbrp)	BORR_MW11 (Manual mAHD)	BORR_MW12 (mbrp)	BORR_MW12 (Manual mAHD)	BORR_MW46 (mbrp)	BORR_MW46 (Manual mAHD)	MR_MW05 (mbrp)	MR_MW05 (Manual mAHD)	BH27.1 (mbrp)	BH27.1 (Manual mAHD)
26/7/2018			5.74	6.50	5.40	6.22	10.04	5.58			3.19	13.26	1.09	18.26	0.58	20.22								
6/8/2018			5.70	6.54	5.33	6.29	10.02	5.60			2.97	13.48	0.97	18.38	0.60	20.20								
7/8/2018																					2.44	18.07		
21/9/2018									1.84	14.11														
25/9/2018																	1.09	18.54						
26/9/2018	3.71	5.74	5.46	6.78	5.12	6.50	9.89	5.73			2.27	14.18	0.97	18.38	0.62	20.18								
8/11/2018	3.95	5.51							2.29	13.67														
1/2/2019	4.49	4.96																						
14/2/2019																					2.10	18.41		
7/8/2019																			3.69	3.34				
18/9/2019	3.88	5.57			5.41	6.21	10.10	5.52	2.07	13.88	3.14	13.31	1.38	17.98			1.50	18.13						
19/9/2019			5.65	6.59											1.39	19.41			3.56	3.47				
2/10/2019	3.91	5.54	5.65	6.59	5.28	6.34	9.97	5.65	2.33	13.62	3.13	13.32	1.39	17.96	1.18	19.62			3.47	3.56	2.20	18.31		
23/10/2019											3.16	13.29	1.46	17.89	1.47	19.33	1.65	17.98						
24/10/2019																				3.51				
28/10/2019	4.10	5.36	5.64	6.61	5.31	6.31			2.72	13.23											2.23	18.28		
12/3/2020	4.83	4.62	5.97	6.27	5.74	5.88	10.21	5.41	3.96	11.99	4.08	12.37	2.27	17.08	3.98	16.82	2.35	17.28	4.48	2.55				
18/5/2020	4.52	4.93	6.03	6.21	5.72	5.91	10.29	5.33	4.24	11.71									4.57	2.46				
21/5/2020											4.47	11.98	2.27	17.09			2.40	17.23			2.89	17.62		
24/8/2020															1.00	19.80			3.70	3.33	2.50	18.01		
25/8/2020																								
26/8/2020	4.03	5.42	5.76	6.48	5.38	6.24	10.14	5.48	1.94	14.01	3.81	12.64	1.37	17.98										
9/2/2021	4.53	4.92	5.87	6.37	5.65	5.97	10.12	5.48	3.58	12.37	3.96	12.49			1.28	19.52			4.19	2.84			6.13	6.00
27/7/2021	3.94	5.51			5.34	6.28	10.20	5.48	1.87	14.08	3.60	12.85	1.19		0.82				3.52		2.28		6.08	6.05
28/6/2022	4.22	5.23			5.61	6.01					4.07	12.38	1.76	17.59	1.32	19.48					2.42	18.09		
18/7/2022	4.09	5.36			5.56	6.06	10.46	5.16	3.86	12.09	3.91	12.54	1.61	17.74	1.26	19.54			3.88	3.15	2.32	18.19	6.17	5.96
10/8/2022			5.73	6.51	5.42	6.20			1.78	14.17			1.02	18.33					3.36	3.67	2.27	18.24	6.24	5.89
11/8/2022	4.04	5.41													0.64	20.16								
11/9/2022											3.35	13.10												
20/9/2022	3.94	5.51	5.58	6.66	5.27	6.35	10.13	5.49	1.84	14.11			1.05	18.30	0.67	20.13			3.07	3.96	0.99	19.52	6.33	5.80
25/10/2022	3.97	5.48	5.55	6.69	5.30	6.32	10.10	5.52	2.18	13.77	2.77	13.68	1.26	18.09	1.08	19.72			3.18	3.85	2.33	18.18	6.39	5.74
21/11/2022	4.11	5.34	5.66	6.58			10.09	5.53	2.54	13.41									3.35	3.68				
15/12/2022	4.43	5.02	5.61	6.63	5.43	6.19	10.17	5.45	2.82	13.13	3.00	13.45	1.58	17.77	1.38	19.42					1.84	18.67	6.36	5.77
20/1/2023	4.81	4.64			5.61	6.01			3.22	12.73			2.06	17.29	1.81	18.99					2.49	18.02		
8/2/2023																					2.71	17.80		
9/2/2023							10.43	5.19	3.49	12.46	3.43	13.02	2.71	16.64	3.58	17.22								
10/2/2023	4.98	4.47			5.55	6.07																		
9/3/2023	5.05	4.40			5.83	5.79	10.27	5.35	3.64	12.31	3.68	12.77			3.74	17.06					2.45	18.06	6.02	6.11
21/4/2023	4.85	4.60			5.48	6.14					4.00	12.45	2.23	17.12										
24/5/2023	4.70	4.75			5.50	6.12									3.39	17.41								
25/5/2023											4.34	12.11	2.15	17.20					3.26	3.77				
16/6/2023	4.63	4.82	5.64	6.60	6.47	5.15					4.23	12.22	2.01	17.34	1.43	19.37			3.16	3.88				
14/7/2023	4.72	4.73	6.00	6.24	5.65	5.97	10.35	5.27	4.05	11.90	4.26	12.19	1.07	18.28	1.11	19.69			3.92	3.11				
17/8/2023													1.40	17.95	0.66	20.14	1.08	18.55	3.67	3.36				
18/8/2023	4.48	4.97	5.89	6.35	5.73	5.89	10.35	5.27	3.69	12.26	3.75	12.70												
27/9/2023	4.46	4.99	5.86	6.38	5.48	6.14	10.26	5.36	3.55	12.40			1.45	17.90	0.76	20.04			3.54	3.49				
16/10/2023	4.60	4.86	5.88	6.36			10.22	5.40	3.54	12.41			1.55	17.81	0.92	19.88			3.57	3.47				
16/11/2023					5.64	5.99			3.74	12.21			1.75	17.61	1.35	19.45								
17/11/2023	4.68	4.77	5.95	6.29															4.27	2.76				
14/12/2023	4.92	4.53	6.12	6.12	5.04	6.58	10.50	5.12	4.03	11.92			2.05	17.30	1.60	19.20			4.52	2.51				
19/1/2024	5.10	4.20	6.06	6.14	5.10	6.52	10.40	5.20	4.13	11.82			2.12	17.23	3.71	17.09			4.75	2.28				
21/2/2024							10.43	5.19	4.30	11.65			2.27	17.08	3.86	16.94			5.02	2.01				
22/2/2024	5.24	4.21	6.14	6.11	5.87	5.76																		
13/3/2024	5.30	4.15	5.99	6.25	5.72	5.90	9.83	5.79	4.24	11.71			2.17	17.19					4.98	2.05				
15/4/2024	5.41	4.04	6.20	6.05	5.89	5.74	10.55	5.07	4.52	11.43			2.39	16.96					5.28	1.75				
14/5/2024							10.74	4.88																
15/5/2024	5.36	4.09	6.33	5.91	5.83	5.79			4.77	11.18			2.34	17.01					5.36	1.67				
7/6/2024	4.96	4.49	6.08	6.16	5.69	5.93	10.49	5.13	4.51	11.44			1.98	17.37	0.64	20.16			5.15	1.88				

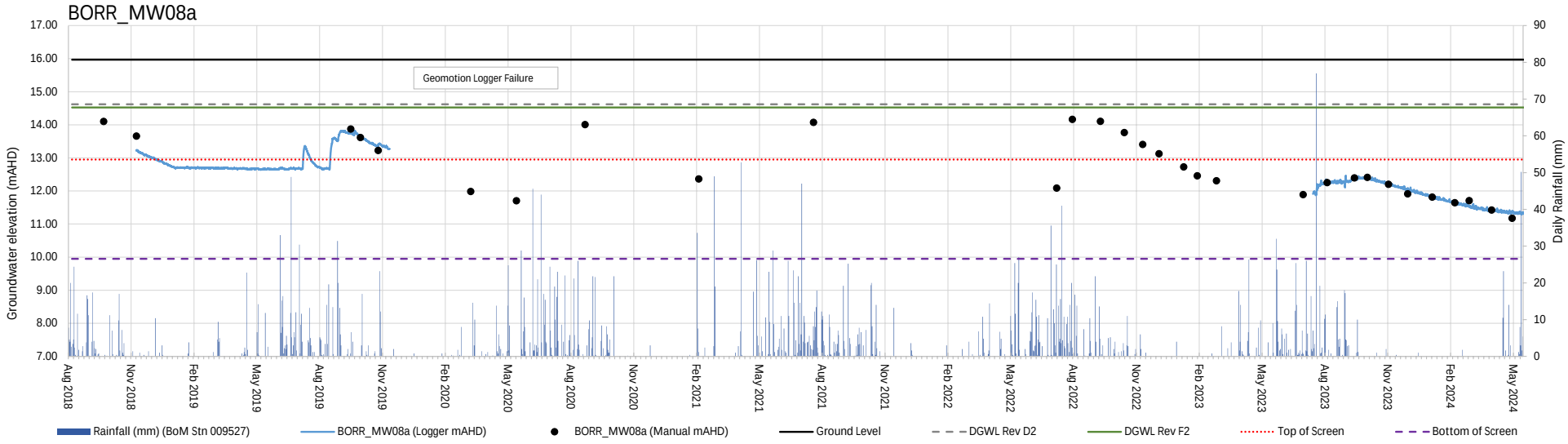
Dry
Destroyed as part of construction activities
No landowner assess

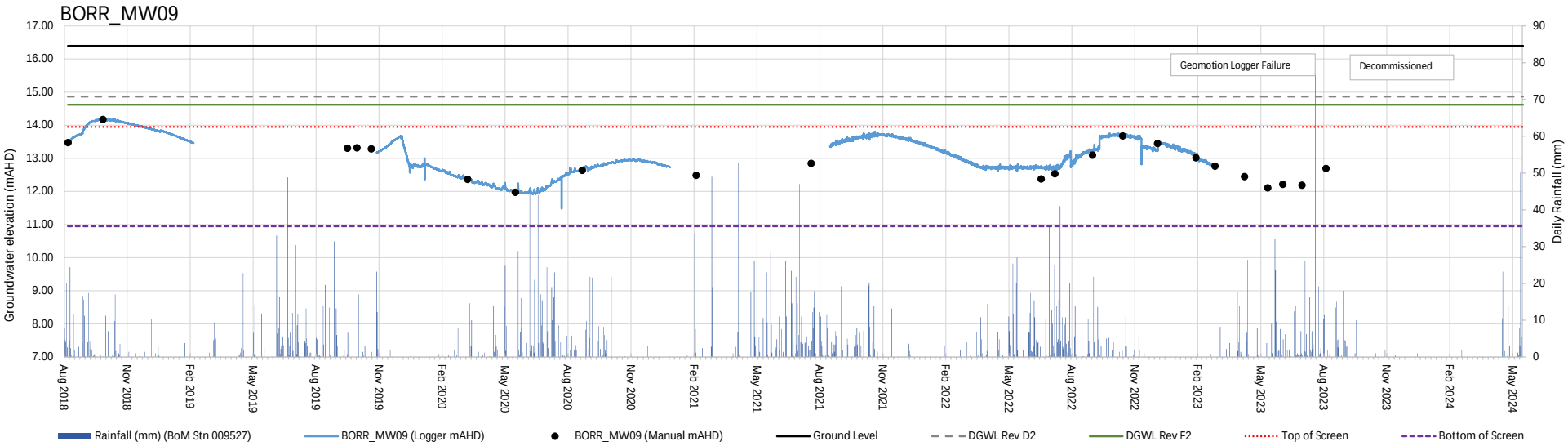

BORR_MW04
Geomotion Logger Failure
Groundwater elevation (mAHD)
Daily Rainfall (mm)
Rainfall (mm) (BoM Stn 009527)
BORR_MW04 (Manual mAHD)
BORR_MW03 (Logger mAHD)
Ground Level
DGWL Rev D2
DGWL Rev F2
BORR_MW04 (Logger mAHD)
Top of Screen
Bottom of Screen

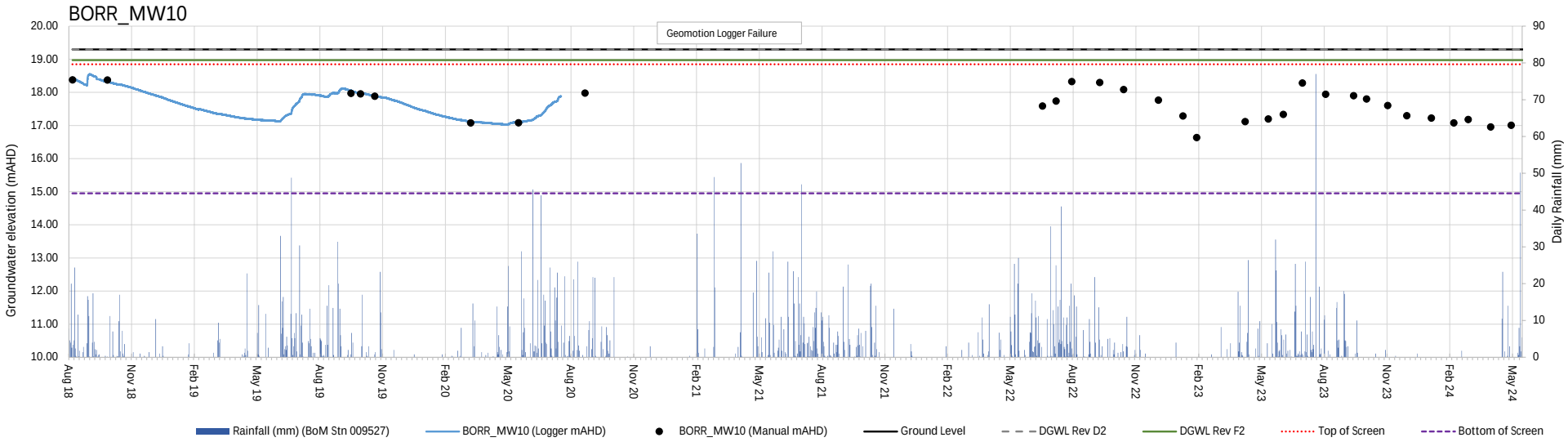

BORR_MW05
Geomotion Logger Failure
Borehole reported dry
Groundwater elevation (mAHD)
Daily Rainfall (mm)
Rainfall (mm) (BoM Stn 009527)
BORR_MW05 (Manual mAHD)
BORR_MW05 (Logger mAHD)
Ground Level
DGWL Rev D2
DGWL Rev F2
Top of Screen
Bottom of Screen

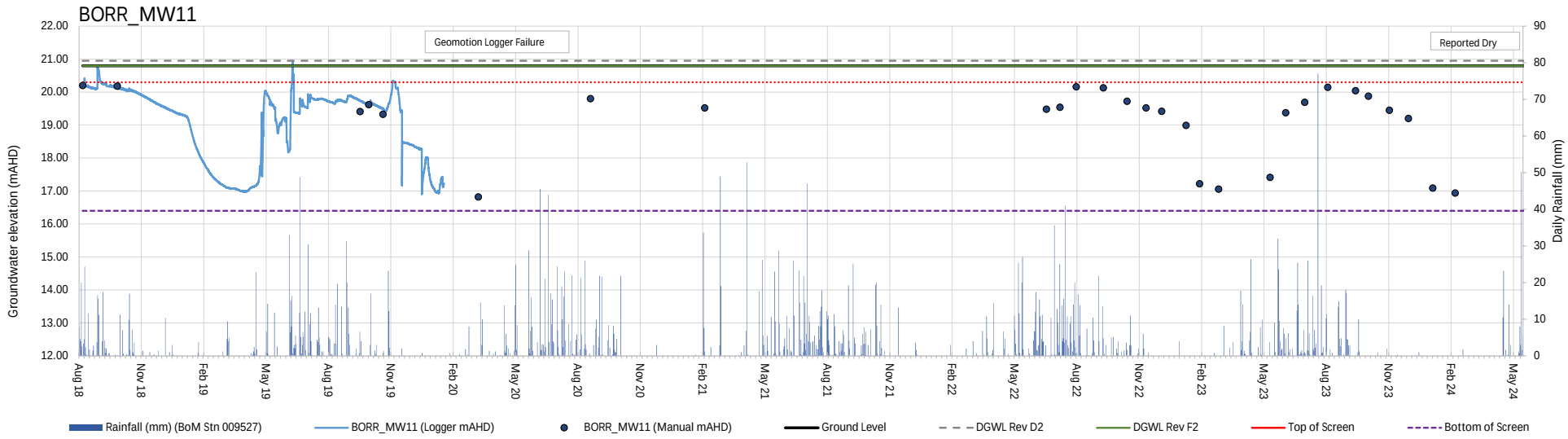

BORR_MW06
Geomotion Logger Failure
Groundwater elevation (mAHD)
Daily Rainfall (mm)
Rainfall (mm) (BoM Stn 009527)
BORR_MW06 (Manual mAHD)
BORR_MW06 (Logger mAHD)
Ground Level
DGWL Rev D2
DGWL Rev F2
Top of Screen
Bottom of Screen

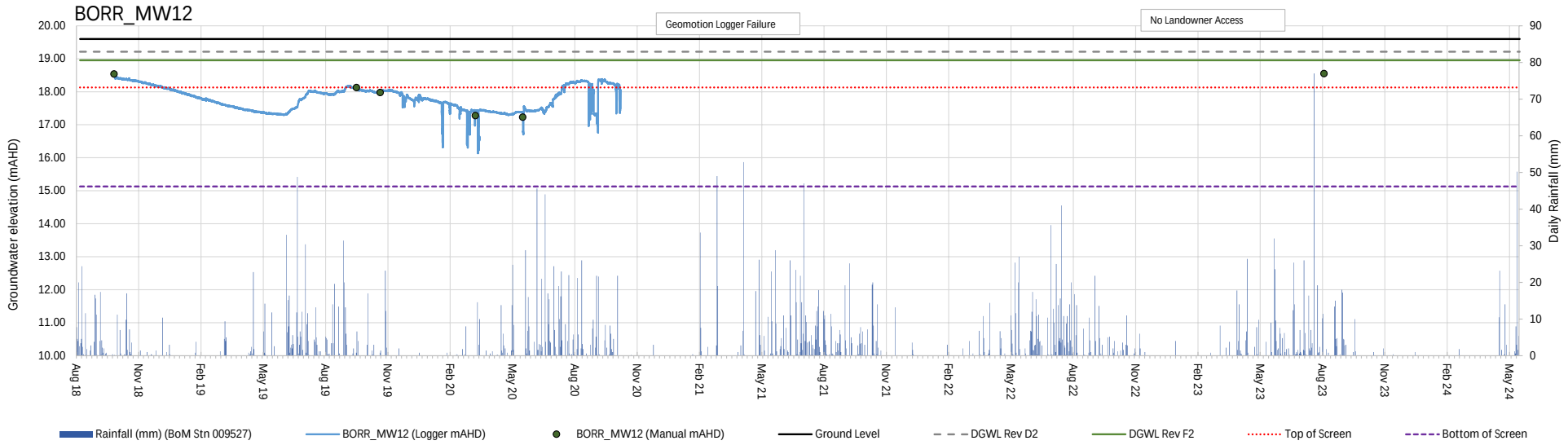

BORR_MW07
Geomotion Logger Failure
Groundwater elevation (mAHD)
Daily Rainfall (mm)
Rainfall (mm) (BoM Stn 009527)
BORR_MW07 (Logger mAHD)
BORR_MW07 (Manual mAHD)
BORR_MW06 (Logger mAHD)
Ground Level
DGWL Rev D2
DGWL Rev F2
Top of Screen
Bottom of Screen

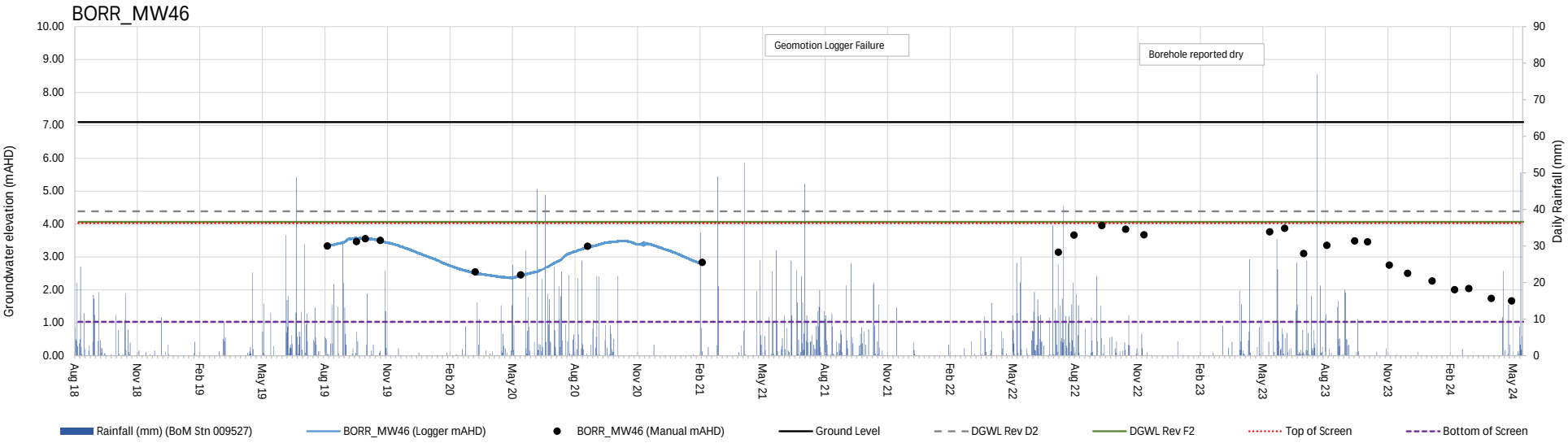

BORR_MW08a
Geomotion Logger Failure
Groundwater elevation (mAHD)
Daily Rainfall (mm)
Rainfall (mm) (BoM Stn 009527)
BORR_MW08a (Logger mAHD)
BORR_MW08a (Manual mAHD)
Ground Level
DGWL Rev D2
DGWL Rev F2
Top of Screen
Bottom of Screen

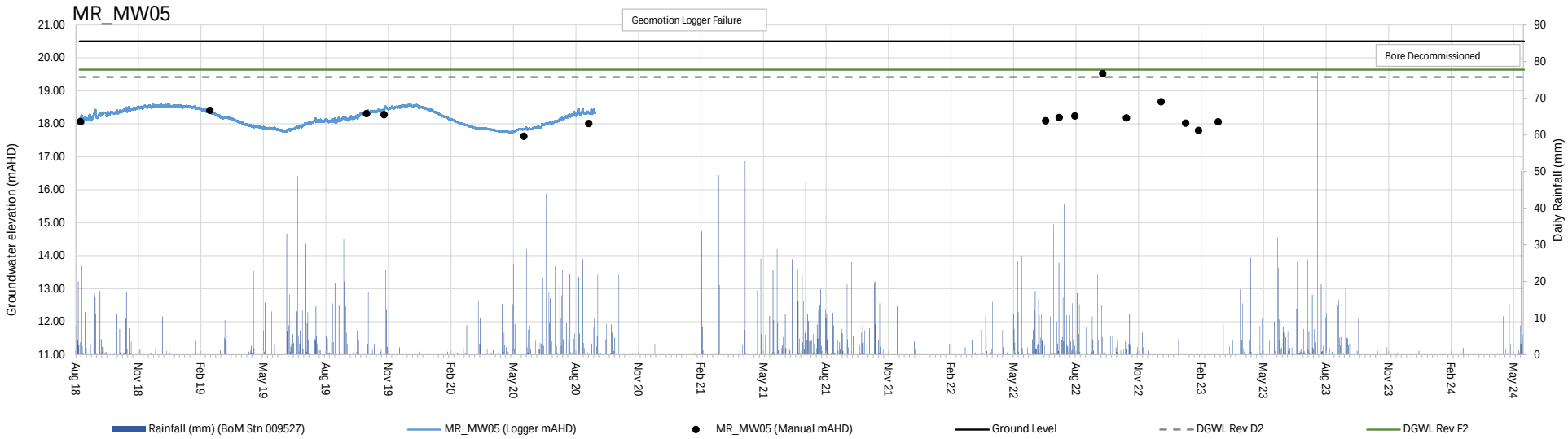

BORR_MW09
Geomotion Logger Failure
Decommissioned
Groundwater elevation (mAHD)
Daily Rainfall (mm)
Rainfall (mm) (BoM Stn 009527)
BORR_MW09 (Logger mAHD)
BORR_MW09 (Manual mAHD)
Ground Level
DGWL Rev D2
DGWL Rev F2
Top of Screen
Bottom of Screen

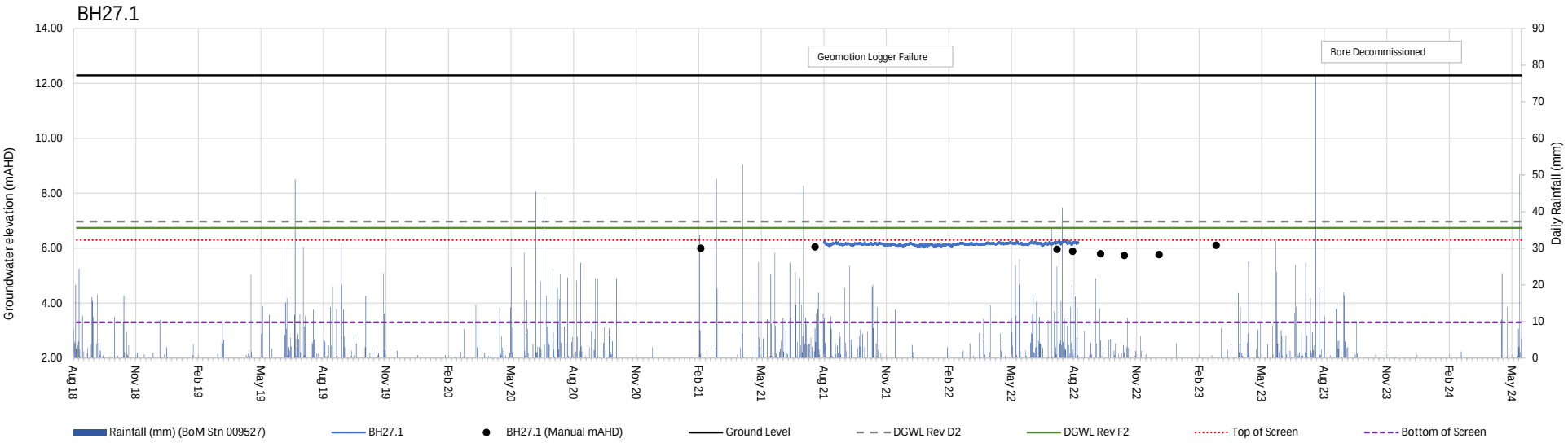

BORR_MW10
Geomotion Logger Failure
Groundwater elevation (mAHD)
Daily Rainfall (mm)
Rainfall (mm) (BoM Stn 009527)
BORR_MW10 (Logger mAHD)
BORR_MW10 (Manual mAHD)
Ground Level
DGWL Rev D2
DGWL Rev F2
Top of Screen
Bottom of Screen

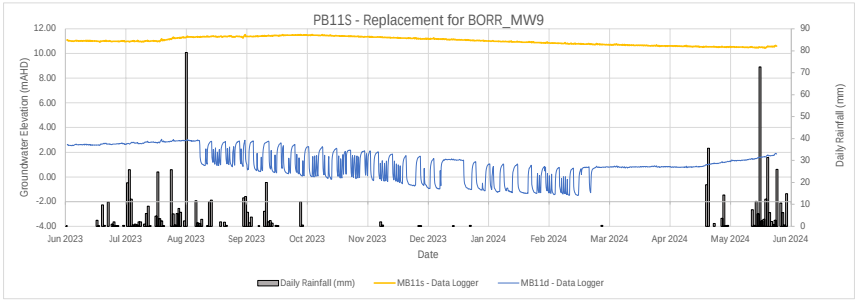

BORR_MW11
Geomotion Logger Failure
Reported Dry
Groundwater elevation (mAHD)
Daily Rainfall (mm)
Rainfall (mm) (BoM Stn 009527)
BORR_MW11 (Logger mAHD)
BORR_MW11 (Manual mAHD)
Ground Level
DGWL Rev D2
DGWL Rev F2
Top of Screen
Bottom of Screen

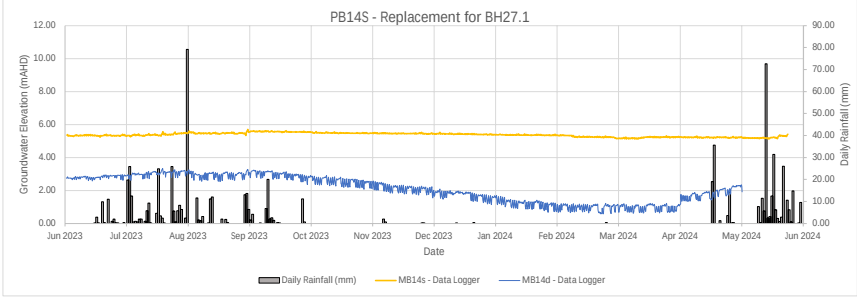

BORR_MW12
Geomotion Logger Failure
No Landowner Access
Groundwater elevation (mAHD)
Daily Rainfall (mm)
Rainfall (mm) (BoM Stn 009527)
BORR_MW12 (Logger mAHD)
BORR_MW12 (Manual mAHD)
Ground Level
DGWL Rev D2
DGWL Rev F2
Top of Screen
Bottom of Screen


BORR_MW46
Geomotion Logger Failure
Borehole reported dry
Groundwater elevation (mAHD)
Daily Rainfall (mm)
Rainfall (mm) (BoM Stn 009527)
BORR_MW46 (Logger mAHD)
BORR_MW46 (Manual mAHD)
Ground Level
DGWL Rev D2
DGWL Rev F2
Top of Screen
Bottom of Screen


MR_MW05
Geomotion Logger Failure
Bore Decommissioned
Groundwater elevation (mAHD)
Daily Rainfall (mm)
Rainfall (mm) (BoM Stn 009527)
MR_MW05 (Logger mAHD)
MR_MW05 (Manual mAHD)
Ground Level
DGWL Rev D2
DGWL Rev F2


BH27.1
Geomotion Logger Failure
Bore Decommissioned
Groundwater elevation (mAHD)
Daily Rainfall (mm)
Rainfall (mm) (BoM Stn 009527)
BH27.1
BH27.1 (Manual mAHD)
Ground Level
DGWL Rev D2
DGWL Rev F2
Top of Screen
Bottom of Screen


PB11S - Replacement for BORR_MW9
Groundwater Elevation (mAHD)
Daily Rainfall (mm)
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
90
80
70
60
50
40
30
20
10
0
Jun 2023
Jul 2023
Aug 2023
Sep 2023
Oct 2023
Nov 2023
Dec 2023
Jan 2024
Feb 2024
Mar 2024
Apr 2024
May 2024
Jun 2024
Date
Daily Rainfall (mm)
MB11s - Data Logger
MB11d - Data Logger


PB14S - Replacement for BH27.1
Groundwater Elevation (mAHD)
Daily Rainfall (mm)
12.00
10.00
8.00
6.00
4.00
2.00
0.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Jun 2023
Jul 2023
Aug 2023
Sep 2023
Oct 2023
Nov 2023
Dec 2023
Jan 2024
Feb 2024
Mar 2024
Apr 2024
May 2024
Jun 2024
Date
Daily Rainfall (mm)
MB14s - Data Logger
MB14d - Data Logger

Appendix C

Groundwater Quality Data

App C Water Quality Results

		Field Parameters						Inorganics				Acidity and Alkalinity					Major Ions																
Parameter	Date	pH	EC	Dissolved Oxygen	Redox	Temperature	TDS	pH	Conductivity	Total Dissolved Solids (TDS)	Total Suspended Solids	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaO3	Hydroxide as alkalinity	Total Alkalinity as CaCO3	Acidity as CaCO3	Total Calcium	Dissolved Calcium	Total Magnesium	Dissolved Magnesium	Total Potassium	Dissolved Potassium	Total Sodium	Dissolved Sodium	Total Chloride	Total Sulphate	Cation Total	Anion Total	Ionic Balance	Dissolved Sulfide	Ammonium as N	ammonia as N	Nitrite + Nitrate as N
Units		pH Units	uS/cm	mg/L		°C	mg/L	pH Units	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L		mg/L		mg/L		mg/L		mg/L	mg/L	meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L
ANZECC and AARMCANZ (2000) Freshwater 95% Guidelines		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-															0.9	0.9	0.15
BORR MW04	21/08/2019			8.9		22.5		7.29	3160	2080		0.5	253	0.5	253																		
BORR MW04	18/09/2019							7.61	2890	1720		0.5	246	0.5	246																		
BORR MW04	28/10/2019							7.19	3940	2410		0.5	301	0.5	301																		
BORR MW04	20/11/2019							7.26	4080	2430		0.5	310	0.5	310																		
BORR MW04	20/01/2020							7.04	4080	2450		0.5	281	0.5	281																		
BORR MW04	18/02/2020							7.2	4280	2850		0.5	282	0.5	282																		
BORR MW04	18/03/2020							7.4	3850	2420		0.5	250	0.5	250																		
BORR MW04	21/04/2020							7.33	4260	2670		0.5	260	0.5	260																		
BORR MW04	18/05/2020							7.46	3750	2310		0.5	236	0.5	236																		
BORR MW04	16/06/2020							7.28	3630	2190		0.5	256	0.5	256																		
BORR MW04	27/07/2020							7.62	3680	2120		0.5	270	0.5	270																		
BORR MW04	10/08/2022							7.25	3790			0.5	268	0.5	268	48000																	0.005
BORR MW04	21/11/2022							7.51	4870			0.5	330	0.5	330	55000																	0.02
BORR MW04	9/02/2023							7.25	5000			0.5	308	0.5	308	71000																	0.005
BORR MW04	26/05/2023							7.26	5180			0.5	328	0.5	328	90000																	0.06
BORR MW04	17/08/2023	6.49	5055	0.35	-24.1	18.7		7.11	5210			0.5	308	0.5	308	55000																	0.005
BORR MW04	17/11/2023	6.52	5219	0.12	22.5	18.9		7.58	5100			0.5	306	0.5	306	70000																	0.005
BORR MW04	22/02/2024	6.45	3947	0.24	-30.3	19.6		7.23	5470	3180		0.5	304	0.5	304	81000	181		82		4		701		1270		46.4	49.1	2.86	346		0.28	0.005
BORR MW04	15/05/2024	6.52	4961	3.6	-171.9	18.5		7.47	5180	3120		0.5	305	0.5	305	97000		222		83		6		753	1300	321	50.8	49.4	1.36	0.05	0.24	0.25	0.005
BORR MW05	21/08/2019			9		22.6		6.73	938	666		0.5	370	0.5	68																		
BORR MW05	19/09/2019							7.12	1030	576		0.5	68	0.5	73																		
BORR MW05	28/10/2019							6.8	1160	683		0.5	73	0.5	79																		
BORR MW05	20/11/2019							7.08	1140	722		0.5	79	0.5	86																		
BORR MW05	20/01/2020							6.97	1140	654		0.5	86	0.5	80																		
BORR MW05	18/02/2020							6.97	1200	742		0.5	80	0.5	76																		
BORR MW05	18/03/2020							7.09	1230	744		0.5	76	0.5	72																		
BORR MW05	21/04/2020							7.06	1210	788		0.5	72	0.5	79																		
BORR MW05	18/05/2020							7.13	1140	686		0.5	79	0.5	66																		
BORR MW05	16/06/2020							7.11	1050	614		0.5	66	0.5	156																		
BORR MW05	23/07/2020							7.19	454	392		0.5	156	0.5	45																		
BORR MW05	10/08/2022							6.34	659			0.5	45	0.5	45	30000																	0.005
BORR MW05	21/11/2022							7.04	1360			0.5	45	0.5	45	20000																	0.005
BORR MW05 (dry)	9/02/2023														-																		
BORR MW05 (dry)	25/05/2023														-																		
BORR MW05	18/08/2023	6.41	1435	0.26	-121	20.4		6.82	1220			0.5	50	0.5	50	24000																	0.005
BORR MW05	17/11/2023	6.25	2460	0.2	-32	22.1		6.96	2340			0.5	42	0.5	42	36000																	0.005
BORR MW05	22/02/2024	6.18	2628	1.23	-80.3	22.5		6.78	3110	2300		0.5	50	0.5	50	24000	150		112		12		346		475	<0.1	32.1	34.6	3.89	973		0.22	0.005
BORR MW05	15/05/2024	6.28	1983	0.14	-181.4	21.1		7.11	2250	1340		0.5	51	0.5	51	30000		95		63		11		251	331	530	21.1	21.4	0.62	0.5	0.09	0.09	0.03
BORR MW06	21/08/2019			10		24.9		6.96	438	302		0.5	49	0.5	49																	0.05	
BORR MW06	18/09/2019							7.08	384	273		0.5	48	0.5	48																		
BORR MW06	28/10/2019							6.76	690	492		0.5	71	0.5	71																		
BORR MW06	20/11/2019							6.74	605	466		0.5	56	0.5	56																		
BORR MW06	20/01/2020							6.88	370	260		0.5	47	0.5	47																		
BORR MW06	18/02/2020							7.03	546	440		0.5	68	0.5	68																		
BORR MW06	18/03/2020							7.15	629	432		0.5	60	0.5	60																		
BORR MW06	21/04/2020							7.09	721	479		0.5	58	0.5	58																		
BORR MW06	18/05/2020							7.11	779	532		0.5	59	0.5	59																		
BORR MW06	16/06/2020							7.2	702	499		0.5	74	0.5	74																		
BORR MW06	27/07/2020							7.21	555	390		0.5	42	0.5	42																		
BORR MW06	10/08/2022							6.68	356			0.5	42	0.5	42	20000																	0.06
BORR MW06	21/11/2022							7.03	330			0.5	37	0.5	37	19000																	0.05
BORR MW06	9/02/2023							7.62	1080			0.5	144	0.5	144	10000																	0.005
BORR MW06	26/05/2023							7.24	770			0.5	94	0.5	94	26000																	0.005
BORR MW06	18/08/2023	6.16	377	0.32	-47.3	20		6.55	343			0.5	41	0.5	41	34000																	0.09
BORR MW06	16/11/2023	7.21	965	0.06	-50.4	20.7		7.56	887			0.5	102	0.5	102	20000																	0.005
BORR MW06	22/02/2024	7.28	1010	0.03	-161.4	22		6.6	771	464		0.5	39	0.5	39	36000	36		9		15		106		153	0.2	7.53	7.01	3.58	92	-	0.44	0.005
BORR MW06	15/05/2024	5.86	1108	0.09	168.3	21.8		6	1140	753		0.5	7	0.5	7	44000		107		12		13		94	154	290	10.7	10.5	1.06	0.05	0.15	0.15	0.005
BORR MW08a	22/08/2019							6.1	578	474		0.5	40	0.5	40																	0.025	
BORR MW08a	18/09/2019							6.61	507	368		0.5	46	0.5	46																		
BORR MW08a	28/10/2019							6.19	534	584		0.5	48	0.5	48																		
BORR MW08a	21/11/2019							6.36	550	411		0.5	48	0.5	48																		
BORR MW08a	19/12/2019							6.8	607	418		0.5	58	0.5	58																		
BORR MW08a	20/01/2020							6.31	575	366		0.5	44	0.5	44																		
BORR MW08a	18/02/2020							6.52	510	416		0.5	53	0.5	53																		
BORR MW08a	19/03/2020							6.49	498	370		0.5	52	0.5	52																		
BORR MW08a	21/04/2020							6.69	529	393		0.5	51	0.5	51																		
BORR MW08a	18/05/2020							6.7	557	368		0.5	49	0.5	49																		
BORR MW08a	16/06/2020							6.52	566	385		0.5	55	0.5	55																		
BORR MW08a (blocked)	10/08/2022											-			-																		
BORR MW08a	21/11/2022							6.69	692			0.5	61	0.5	61	52000																	0.005
BORR MW08a	9/02/2023							6.75	659			0.5	71	0.5	71	41000																	0.005
BORR MW08a (blocked)	25/05/2023											-			-																		
BORR MW08a	18/08/2023	5.92	733	0.17	-73.3	18.7		6.3	727			0.5	49	0.5	49	61000																	0.005
BORR MW08a	16/11/2023	6.06	771	0.04	-14.5	19.7		6.98	732			0.5	68	0.5	68	42000																	0.005
BORR MW08a	21/02/2024	5.98	562	0.13	-44.8	21.5		6.24	741	763		0.5	81	0.5	81	60000	19		14		14		83		188	0.5	6.22	6.92	5.35	5		0.57	0.005
BORR MW08a	15/05/2024	5.96	758	0.52	-151.1	20.8		6.86	776	504		0.5	80	0.5	80	71000		27		18		16		94	204	10	7.33	7.35	0.18	0.05	0.51	0.51	0.005
BORR MW09	22/08/2019			8.7		23.3		6.59	430	280		0.5	11	0.5	11																	0.025	
BORR MW09	18/09/2019							6.63	393	258		0.5	10	0.5	10																		
BORR MW09	23/10/2019							6.8	271	164		0.5	11	0.5	11																		
BORR MW09	21/11/2019							6.62	192	116		0.5	11	0.5	11																		
BORR MW09	19/12/2019							6.82	215	138		0.5	10	0.5	10																		
BORR MW09	21/01/2020							6.68	210	93		0.5	12	0.5	12																		
BORR MW09	18/02/2020							6.71	168	94		0.5	10	0.5	10																		
BORR MW09	19/03/2020							6.7	171	114		0.5	11	0.5	11																		
BORR MW09	21/04/2020							6.82	196	127		0.5	13	0.5	13																		
BORR MW09	21/05/2020							6.71	247	152		0.5	12	0.5	12																		
BORR MW09	16/06/2020							6.68	257	154		0.5	14	0.5	14																		
BORR MW09	27/07/2020							6.64	599	446		0.5	9	0.5	9																		
BORR MW09	10/08/2022							6.72	98			0.5	17	0.5	17	12000																	0.52
BORR MW09	21/11/2022							6.82	223			0.5	12	0.5	12	17000																	4.92
BORR MW09	9/02/2023							6.65	153			0.5	12	0.5	12	10000																	0.61
BORR MW09	25/05/2023							6.71	221			0.5	13	0.5	13	25000																	
BORR MW09	18/08/2023	5.93	135	5.51	-20.3	18.2		6.47	135			0.5	16	0.5	16	21000																	1.24
BORR MW09 (destroyed)	17/11/2023														-																		
BORR MW10	22/08/2019							6.49	516	382		0.5	28	0.5	28																	0.025	
BORR MW10	18/09/2019							6.81	414	264		0.5	39	0.5	39																		
BORR MW10	23/10/2019							6.49	392	262		0.5	22	0.5	22																		
BORR MW10	21/11/2019							6.38	411	266		0.5	21	0.5	21																		
BORR MW10	19/12/2019							6.54	465	288		0.5	21	0.5	21																		
BORR MW10	21/01/2020							6.19	457	273		0.5	16	0.5	16																		
BORR MW10	18/02/2020							6.4	466	334		0.5	21	0.5	21																		
BORR MW10	19/03/2020							6.44	553	380		0.5	24	0.5	24																		
BORR MW10	21/04/2020							6.48	598	409		0.5	23	0.5	23																		
BORR MW10	21/05/2020							6.51	623	424		0.5	27	0.5	27																		
BORR MW10	16/06/2020							6.51	585	366		0.5	28	0.5	28																		
BORR MW10	23/07/2020							6.54	504	336		0.5	27	0.5	27																		
BORR MW10	10/08/2022							7.63	234			0.5	76	0.5	76	6000																	0.005
BORR MW10	21/11/2022							6.81	383			0.5	35	0.5	35	36000																	0.005
BORR MW10 (dry)	9/02/2023											-	-	-	-	-																	
BORR MW10	25/05/2023							6.43	496			0.5	21	0.5	21	54000																	0.005
BORR MW10	17/08/2023	5.86	415	0.57	-13.6	16.6		6.5	421			0.5	38	0.5	38	30000																	0.06
BORR MW10	16/11/2023	5.81	730	0.01	21.3	19.2		6.64	429			0.5	19	0.5	19	37000																	0.005
BORR MW10	21/02/2024	5.62	491	0.26	-12.6	23.1		6.29	546	341		0.5	22	0.5	22	39000	12		13		6		57		123	0.05	4.41	5.01	6.41	53		0.34	0.005
BORR MW10	15/05/2024	5.64	510	0.14	-138	22.1		6.6	504	292		0.5	20	0.5	20	42000		14		14		6		55	109	45	4.4	4.41	0.16	0.05	0.16	0.16	0.01
BORR MW11	21/08/2019			10.2		24.8		7.74	4150	2490		0.5	535	0.5	535																		
BORR MW11	19/09/2019							7.23	2300	1570		0.5	258	0.5	258																		
BORR MW11	23/10/2019							7.76	12900	7430		0.5	1400	0.5	1400																		
BORR MW11	20/11/2019							7.67	19600	12700		0.5	1860	0.5	1860																		
BORR MW11	19/12/2019							7.93	24600	15000		0.5	1840	0.5	1840																		
BORR MW11	16/06/2020							7.87	12600	7520		0.5	656	0.5	656																		
BORR MW11	27/07/2020							7.79	1940	1380		0.5	275	0.5	275																		
BORR MW11	10/08/2022							6.61	1700			0.5	67	0.5	67	37000																	0.03
BORR MW11	23/11/2022							7.72	16400			0.5	1530	0.5	1530	97000																	0.005
BORR MW11 (dry)	9/02/2023																																
BORR MW11 (dry)	25/05/2023																																
BORR MW11	17/08/2023	6.19	1710	1.06	-18.7	16.9		6.66	1150	748		0.5	90	0.5	90	48000																	0.02
BORR MW11 (dry)	17/11/2023																																
BORR MW11 (dry)	22/02/2024																																
BORR MW11 (dry)	15/05/2024																																
BORR MW46	21/08/2019			10.1		24.7		6.78	216	234		0.5	91	0.5	91																	0.025	
BORR MW46	19/09/2019							5.77	541	445		0.5	7	0.5	7																		
BORR MW46	24/10/2019							5.97	474	405		0.5	8	0.5	8																		
BORR MW46	20/11/2019							6.07	377	312		0.5	17	0.5	17																		
BORR MW46	19/12/2019							6.28	408	316		0.5	14	0.5	14																		
BORR MW46	21/01/2020							5.78	397	284		0.5	7	0.5	7																		
BORR MW46	18/02/2020							5.3	376	298		0.5	3	0.5	3																		
BORR MW46	18/03/2020							4.54	444	296		0.5	0.5	0.5	0.5																		
BORR MW46	23/04/2020							3.24	652	386		0.5	0.5	0.5	0.5																		
BORR MW46	18/05/2020							3.72	468	302		0.5	0.5	0.5	0.5																		
BORR MW46	16/06/2020							3.53	547	296		0.5	0.5	0.5	0.5																		
BORR MW46	23/07/2020							6.55	319	244		0.5	43	0.5	43																		
BORR MW46	10/08/2022							7.04	362			0.5	90	0.5	90	28000																	2.04
BORR MW46	21/11/2022							6.95	306			0.5	98	0.5	98	80000																	0.005
BORR MW46 (dry)	9/02/2023																																
BORR MW46 (dry)	25/05/2023																																
BORR MW46	18/08/2023	6.31	422	2.37	-17.9	19.5		6.9	420	273		0.5	125	0.5	125	41000																	4.52
BORR MW46	17/11/2023	5.77	1118	0.26	43.7	19.6		6.71	1090	709		0.5	33	0.5	33	35000																	0.005
BORR MW46	22/02/2024	5.74	546	0.34	-131.1	22.4		6.34	637	474		0.5	53	0.5	53	100000	19		8		6		67		153	1.2	6.01	5.87	1.14	24	25	1.23	0.005
BORR MW46	15/05/2024	6.11	946	2.02	-166.4	17.3		6.65	971	578		0.5	38	0.5	38	53000		52		10		10		114	212	123	8.63	9.3	3.72	0.8	1.13	1.13	0.01
MR MW05	22/08/2019			10.2		22.9		6.43	22600	13900		0.5	130	0.5	130																		
MR MW05	19/09/2019			11.1		22.6		6.47	22200	14300		0.5	125	0.5	125																		
MR MW05	28/10/2019							6.29	19900	15300		0.5	129	0.5	129																		
MR MW05	21/11/2019							6.25	21400	14800		0.5	125	0.5	125																		
MR MW05	19/12/2019							6.39	22200	13600		0.5	125	0.5	125																		
MR MW05	21/01/2020							6.16	23100	14900		0.5	102	0.5	102																		
MR MW05	18/02/2020							6.34	23600	17400		0.5	122	0.5	122																		
MR MW05	19/03/2020							6.2	22300	16600		0.5	81	0.5	81																		
MR MW05	23/04/2020							6.81	23500	15600		0.5	71	0.5	71																		
MR MW05	21/05/2020							6.34	22500	16500		0.5	59	0.5	59																		
MR MW05	16/06/2020							6.41	23200	14200		0.5	74	0.5	74																		
MR MW05	27/07/2020							6.51	22100	15600		0.5	55	0.5	55																		
MR MW05	10/08/2022							6.22	23100			0.5	98	0.5	98	157000																	0.005
MR MW05	22/11/2022							6.41	23100			0.5	128	0.5	128	151000																	0.005
MR MW05	9/02/2023							6.5	25200			0.5	155	0.5	155	178000																	0.005
MR MW05 (destroyed)	25/05/2023																																
SW10 - 5 Mile Creek	22/08/2019							7.57	1160	769		0.5	79	0.5	79	9		45		28		35		130		38	11.1	10.5	2.94	0.05	0.005	0.005	0.005
SW10 - 5 Mile Creek	18/09/2019							7.55	748	550		0.5	65	0.5	65	9		30		17		17		92		14	7.33	7.4	0.46	0.05	0.005	0.005	0.005
SW10 - 5 Mile Creek	23/07/2020							7.33	974	736		0.5	50	0.5	50	4		36		24		32		119		61	9.77	10.2	2.01	0.05	0.08	0.08	0.01
SW10 - 5 Mile Creek (dry)	10/08/2022																																
SW10 - 5 Mile Creek (dry)	21/11/2022																																
SW10 - 5 Mile Creek (dry)	9/02/2023																																
SW10 - 5 Mile Creek (dry)	25/05/2023																																
SW10 - 5 Mile Creek (dry)	17/08/2023																																
SW10 - 5 Mile Creek (dry)	16/11/2023																																
SW10 - 5 Mile Creek (dry)	21/02/2024																																
SW10 - 5 Mile Creek (dry)	15/05/2024																																

GROUNDWATER		Field Parameters						Inorganics				Acidity and Alkalinity					Major Ions																
Parameter	Date	pH	EC	Dissolved Oxygen	Redox	Temperature	TDS	pH	Conductivity	Total Dissolved Solids (TDS)	Total Suspended Solids	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaO3	Hydroxide as alkalinity	Total Alkalinity as CaCO3	Acidity as CaCO3	Total Calcium	Dissolved Calcium	Total Magnesium	Dissolved Magnesium	Total Potassium	Dissolved Potassium	Total Sodium	Dissolved Sodium	Total Chloride	Total Sulphate	Cation Total	Anion Total	Ionic Balance	Dissolved Sulfide	Ammonium as N	ammonia as N	Nitrite + Nitrate as N
Preconstruction	MAX	0	0	11.1	0	24.9	0	7.93	24600	17400	0	0.5	1860	0.5	1860	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0
	MIN	0	0	8.7	0	22.5	0	3.24	168	93	0	0.5	0.5	0.5	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.025	0
2023/24	MAX	7.28	5219	5.51	168.3	23.1	0	7.72	25200	3180	0	0.5	1530	0.5	1530	178000	181	222	112	83	15	16	701	753	1300	530	50.8	49.4	6.41	973	25	1.23	4.92
	MIN	5.62	135	0.01	-181.4	16.6	0	6	98	273	0	0.5	7	0.5	7	6000	12	14	8	10	4	6	57	55	109	0.05	4.4	4.41	0.16	0.05	0.09	0.09	0.005
Eastern Agricultural Flats BORR_MW09, BORR_MW10	MAX	0	0	8.7	0	23.3	0	6.82	623	446	0	0.5	39	0.5	39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.025	0
	MIN	0	0	8.7	0	23.3	0	6.19	168	93	0	0.5	9	0.5	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.025	0
	MAX	5.93	730	5.51	21.3	23.1	0	7.63	546	341	0	0.5	76	0.5	76	54000	12	14	13	14	6	6	57	55	123	45	4.41	5.01	6.41	53	0.16	0.34	4.92
	MIN	5.62	135	0.01	-138	16.6	0	6.29	98	292	0	0.5	12	0.5	12	6000	12	14	13	14	6	6	57	55	109	0.05	4.4	4.41	0.16	0.05	0.16	0.16	0.005
West of Ridgeline BORR_MW04, BORR_MW05, BORR_MW06, BORR_MW46	MAX	0	0	10.1	0	24.9	0	7.62	4280	2850	0	0.5	370	0.5	310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.05	0
	MIN	0	0	8.9	0	22.5	0	3.24	216	234	0	0.5	0.5	0.5	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.025	0
	MAX	7.28	5219	3.6	168.3	22.5	0	7.62	5470	3180	0	0.5	330	0.5	330	100000	181	222	112	83	15	13	701	753	1300	530	50.8	49.4	3.89	973	25	1.23	4.52
	MIN	5.74	377	0.03	-181.4	17.3	0	6	306	273	0	0.5	7	0.5	7	10000	19	52	8	10	4	6	67	94	153	0.2	6.01	5.87	0.62	0.05	0.09	0.09	0.005
Quarry influence BORR_MW11	MAX	0	0	10.2	0	24.8	0	7.93	24600	15000	0	0.5	1860	0.5	1860	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIN	0	0	10.2	0	24.8	0	7.23	1940	1380	0	0.5	258	0.5	258	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MAX	6.31	1118	2.37	43.7	22.4	0	7.04	1090	709	0	0.5	125	0.5	125	100000	19	52	8	10	6	10	67	114	212	123	8.63	9.3	3.72	24	25	1.23	4.52
	MIN	5.74	422	0.26	-166.4	17.3	0	6.34	306	273	0	0.5	33	0.5	33	28000	19	52	8	10	6	10	67	114	153	1.2	6.01	5.87	1.14	0.8	1.13	1.13	0.005
Five Mile Brook BORR_MW8a	MAX	0	0	0	0	0	0	6.8	607	584	0	0.5	58	0.5	58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.025	0
	MIN	0	0	0	0	0	0	6.1	498	366	0	0.5	40	0.5	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.025	0
	MAX	6.06	771	0.52	-14.5	21.5	0	6.98	776	763	0	0.5	81	0.5	81	71000	19	27	14	18	14	16	83	94	204	10	7.33	7.35	5.35	5	0.51	0.57	0.005
	MIN	5.92	562	0.04	-151.1	18.7	0	6.24	659	504	0	0.5	49	0.5	49	41000	19	27	14	18	14	16	83	94	188	0.5	6.22	6.92	0.18	0.05	0.51	0.51	0.005

SURFACE WATER		Field Parameters						Inorganics				Acidity and Alkalinity					Major Ions																
Parameter	Date	pH	EC	Dissolved Oxygen	Redox	Temperature	TDS	pH	Conductivity	Total Dissolved Solids (TDS)	Total Suspended Solids	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaO3	Hydroxide as alkalinity	Total Alkalinity as CaCO3	Acidity as CaCO3	Total Calcium	Dissolved Calcium	Total Magnesium	Dissolved Magnesium	Total Potassium	Dissolved Potassium	Total Sodium	Dissolved Sodium	Total Chloride	Total Sulphate	Cation Total	Anion Total	Ionic Balance	Dissolved Sulfide	Ammonium as N	ammonia as N	Nitrite + Nitrate as N
Five Mile Brook SW10	MAX	0	0	0	0	0	0	7.57	1160	769	0	0.5	79	0.5	79	9	0	45	0	28	0	35	0	130	0	61	11.1	10.5	2.94	0.05	0.08	0.08	0.01
	MIN	0	0	0	0	0	0	7.33	748	550	0	0.5	50	0.5	50	4	0	30	0	17	0	17	0	92	0	14	7.33	7.4	0.46	0.05	0.005	0.005	0.005
	MAX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

App C Water Quality Results

		Nutrients				Metals																			BTEXN					Total Recoverable Hydrocarbons								
Parameter	Date	Total Nitrogen	Reactive Phosphorus (Kjeldahl)	Total Kjeldahl Nitrogen	Total Phosphorus	Total Aluminium	Dissolved Aluminium	Total Cadmium	Dissolved Cadmium	Total Chromium	Dissolved Chromium	Dissolved Cobalt	Total Copper	Dissolved Copper	Total Iron	Dissolved Iron	Total Lead	Disolved Lead	Dissolved Manganese	Total Nickel	Dissolved Nickel	Dissolved Selenium	Total Zinc	Dissolved Zinc	Benzene	Toluene	Ethlybenzene	Xylene	Total Napthalene	C6-C10 fraction	C6-C10 fraction (minus BTEX)(F1)	>C10-C16 (minus Naphthalene)(F2)	>C10-C16 fraction	>C16-C34 fraction	>C34-C40 fraction	>C10-C40 fraction (sum)	Azinphos Methyl	Bromophos-ethyl
Units		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ANZECC and AARMCANZ (2000) Freshwater 95% Guidelines		1.5			0.06	0.055		0.0002		0.001			0.0014				0.0034		1.9	0.011		0.011	0.008		950				16								0.02	
BORR MW04	21/08/2019	0.4			0.29			0.00005					0.0005				0.0005			0.0005			0.007															
BORR MW04	18/09/2019	4.5			0.52			0.00005					0.008				0.0005			0.01			0.047															
BORR MW04	28/10/2019	0.4			0.08			0.00005					0.01				0.0005			0.009			0.066															
BORR MW04	20/11/2019	0.4			0.12			0.00005					0.012				0.0005			0.014			0.095															
BORR MW04	20/01/2020	0.4			0.11			0.00005					0.01				0.0005			0.011			0.078															
BORR MW04	18/02/2020	0.3			0.06			0.00005					0.012				0.0005			0.014			0.053															
BORR MW04	18/03/2020	0.4			0.1			0.00005					0.008				0.0005			0.003			0.036															
BORR MW04	21/04/2020	0.5			0.03			0.00005					0.002				0.0005			0.001			0.017															
BORR MW04	18/05/2020	0.3			0.08			0.00005					0.0005				0.0005			0.0005			0.005															
BORR MW04	16/06/2020	0.2			0.06			0.00005					0.013				0.0005			0.007			0.052															
BORR MW04	27/07/2020	0.3			0.11			0.00005					0.01				0.0005			0.002			0.012															
BORR MW04	10/08/2022	0.4		0.4	0.07			0.00005	0.00005	0.00005	0.00005		0.004	0.002			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW04	21/11/2022	0.6		0.6	0.04			0.00005	0.00005	0.00005	0.00005		0.0005	0.0005			0.0005	0.0005		0.0005	0.001		0.0025	0.0025														
BORR MW04	9/02/2023	0.6		0.6	0.05			0.00005	0.00005	0.00005	0.00005		0.0005	0.0005			0.0005	0.0005		0.001	0.0005		0.0025	0.0025														
BORR MW04	26/05/2023	0.5		0.4	0.02			0.00005	0.00005	0.00005	0.00005		0.0005	0.0005			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW04	17/08/2023	0.6		0.6	0.06			0.00005	0.00005	0.00005	0.00005		0.011	0.002			0.0005	0.0005		0.001	0.0005		0.006	0.0025														
BORR MW04	17/11/2023	0.4		0.4	0.01			0.00005	0.00005	0.00005	0.00005		0.0005	0.0005			0.0005	0.0005		0.001	0.0005		0.0025	0.0025														
BORR MW04	22/02/2024	0.4	0.025	0.4	0.02	0.01	0.005		0.00005		0.00005	0.001		0.0005	10.6	6.17		0.0005	0.177		0.0005	0.005		0.0025	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25
BORR MW04	15/05/2024	0.5	0.025	0.5	0.05	0.51	0.005		0.00005		0.00005	0.001		0.0005	16.1	3.14		0.0005	0.178		0.001	0.005		0.0025	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25
BORR MW05	21/08/2019	1.7	0.01	0.28	0.12			0.00005		10			0.004		0.025		0.0005			0.005		86	0.068															
BORR MW05	19/09/2019	1.1			0.03			0.00005					0.012				0.0005			0.015			0.046															
BORR MW05	28/10/2019	1.6			0.09			0.00005					0.008				0.001			0.013			0.115															
BORR MW05	20/11/2019	1.1			0.02			0.00005					0.011				0.001			0.014			0.072															
BORR MW05	20/01/2020	1.1			0.04			0.00005					0.01				0.001			0.013			0.01															
BORR MW05	18/02/2020	1.1			0.05			0.00005					0.01				0.0005			0.009			0.033															
BORR MW05	18/03/2020	1.3			0.04			0.00005					0.008				0.0005			0.003			0.041															
BORR MW05	21/04/2020	1.4			0.005			0.00005					0.005				0.0005			0.001			0.007															
BORR MW05	18/05/2020	1.1			0.08			0.00005					0.005				0.001			0.002			0.035															
BORR MW05	16/06/2020	0.9			0.06			0.00005					0.006				0.0005			0.002			0.017															
BORR MW05	23/07/2020	0.9			0.09			0.00005					0.003				0.0005			0.0005			0.0025															
BORR MW05	10/08/2022	9.2		9.2	0.99				0.00005									0.0005			0.005																	
BORR MW05	21/11/2022	0.4		0.4	0.02			0.00005	0.00005	0.00005	0.00005		0.0005	0.0005			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW05 (dry)	9/02/2023																																					
BORR MW05 (dry)	25/05/2023																																					
BORR MW05	18/08/2023	0.7		0.7	0.06			0.00005	0.00005	0.006	0.00005		0.005	0.0005			0.002	0.0005		0.002	0.0005		0.01	0.008														
BORR MW05	17/11/2023	1.5		1.5	0.1			0.00005	0.00005	0.013	0.00005		0.01	0.0005			0.004	0.0005		0.004	0.002		0.026	0.025														
BORR MW05	22/02/2024	0.9	0.01	0.9	0.04	1.95	0.005		0.00005		0.00005	0.00005		0.0005	3.72	1.79		0.0005	0.039		0.0005	0.005		0.005	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25
BORR MW05	15/05/2024	0.5	0.01	0.5	0.02	0.02	0.005		0.00005		0.00005	0.00005		0.0005	1.48	1.34		0.0005	0.018		0.0005	0.005		0.0025	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25
BORR MW06	21/08/2019	1.3	0.02		0.06			0.00005		5			0.025		0.52		0.002			0.014		5	0.126															
BORR MW06	18/09/2019	1.7			0.03			0.00005					0.009				0.003			0.008			0.061															
BORR MW06	28/10/2019	2.3			0.12			0.00005					0.001				0.0005			0.001			0.01															
BORR MW06	20/11/2019	1.7			0.06			0.00005					0.011				0.002			0.018			0.073															
BORR MW06	20/01/2020	1.1			0.04			0.00005					0.006				0.001			0.003			0.04															
BORR MW06	18/02/2020	0.8			0.07			0.00005					0.007				0.0005			0.013			0.12															
BORR MW06	18/03/2020	1			0.05			0.00005					0.005				0.0005			0.002			0.03															
BORR MW06	21/04/2020	1			0.32			0.00005					0.002				0.0005			0.0005			0.009															
BORR MW06	18/05/2020	1.5			0.05			0.00005					0.007				0.001			0.011			0.095															
BORR MW06	16/06/2020	1.4			0.07			0.00005					0.018				0.0005			0.008			0.047															
BORR MW06	27/07/2020	0.9			0.08			0.00005					0.011				0.0005			0.004			0.011															
BORR MW06	10/08/2022	0.5		0.4	0.06			0.00005	0.00005	0.003	0.00005		0.0005	0.0005			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW06	21/11/2022	0.4		0.4	0.04			0.00005	0.00005	0.001	0.00005		0.0005	0.0005			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW06	9/02/2023	1.6		1.6	0.06			0.00005	0.00005	0.00005	0.00005		0.0005	0.0005			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW06	26/05/2023	1.5		1.5	0.07			0.00005	0.00005	0.002	0.00005		0.016	0.0005			0.0005	0.0005		0.0005	0.0005		0.013	0.0025														
BORR MW06	18/08/2023	0.7		0.6	0.02			0.00005	0.00005	0.00005	0.00005		0.002	0.0005			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW06	16/11/2023	1.1		1.1	0.02			0.00005	0.00005	0.00005	0.00005		0.001	0.0005			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW06	22/02/2024	2	0.01	2	0.08	0.4	0.08		0.00005		0.00005	0.00005		0.0005	6.87	2.66		0.0005	0.109		0.0005	0.005		0.0025	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25
BORR MW06	15/05/2024	1.2	0.01	1.2	0.03	0.23	0.07		0.00005		0.00005	0.018		0.0005	15.8	9.74		0.0005	0.109		0.028	0.005		0.0025	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25
BORR MW08a	22/08/2019	1.8	0.05		0.82			0.00005					0.012		0.025		0.0005			0.015		8	0.075															
BORR MW08a	18/09/2019	1.4			0.58			0.00005					0.007				0.0005			0.005			0.074															
BORR MW08a	28/10/2019	2.9			1.01			0.00005					0.011				0.0005			0.012			0.083															
BORR MW08a	21/11/2019	1.6			0.67			0.00005					0.009				0.001			0.018			0.085															
BORR MW08a	19/12/2019	1.9			1.06			0.00005					0.01				0.002			0.016			0.097															
BORR MW08a	20/01/2020	1.3			0.59			0.00005					0.007				0.0005			0.004			0.042															
BORR MW08a	18/02/2020	1.8			0.86			0.00005					0.005				0.0005			0.005			0.033															
BORR MW08a	19/03/2020	2.4			1.22			0.00005					0.005				0.0005			0.003			0.038															
BORR MW08a	21/04/2020	2			0.96			0.00005					0.001				0.0005			0.001			0.054															
BORR MW08a	18/05/2020	1.6			0.83			0.00005					0.0005				0.0005			0.0005			0.0025															
BORR MW08a	16/06/2020	1.9			0.85			0.00005					0.014				0.0005			0.007			0.046															
BORR MW08a (blocked)	10/08/2022																																					
BORR MW08a	21/11/2022	2		2	0.59			0.00005	0.00005	0.001	0.00005		0.0005	0.0005			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW08a	9/02/2023	2.3		2.3	0.76			0.00005	0.00005	0.002	0.00005		0.0005	0.0005			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW08a (blocked)	25/05/2023																																					
BORR MW08a	18/08/2023	1.9		1.9	0.56			0.00005	0.00005	0.011	0.001		0.003	0.0005			0.004	0.0005		0.002	0.0005		0.01	0.0025														
BORR MW08a	16/11/2023	2.4		2.4	0.64			0.00005	0.00005	0.015	0.00005		0.02	0.0005			0.027	0.0005		0.007	0.0005		0.131	0.0025														
BORR MW08a	21/02/2024	7.9	0.42	7.9	1.88	41	0.56		0.00005		0.002	0.00005		0.001	8.8	0.9		0.001	0.08		0.002	0.005		0.05	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25
BORR MW08a	15/05/2024	3.2	0.47	3.2	0.65	3.31	0.22		0.00005		0.00005	0.00005		0.0005	1.72	0.8		0.0005	0.087		0.0005	0.005		0.0025	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25
BORR MW09	22/08/2019	0.9	0.04		0.01			0.00005		2.5			0.028		0.025		0.0005			0.015		5	0.118															
BORR MW09	18/09/2019	1.2			0.005			0.00005					0.014				0.0005			0.008			0.12															
BORR MW09	23/10/2019	3.2			0.005			0.00005					0.011				0.0005			0.009			0.055															
BORR MW09	21/11/2019	2.9			0.005			0.00005					0.02				0.001			0.017			0.042															
BORR MW09	19/12/2019	1.3			0.005			0.00005					0.014				0.001			0.014			0.06															
BORR MW09	21/01/2020	0.8			0.005			0.00005					0.014				0.001			0.006			0.047															
BORR MW09	18/02/2020	0.6			0.01			0.00005					0.012				0.0005			0.01			0.045															
BORR MW09	19/03/2020	0.4			0.02			0.00005					0.011				0.0005			0.003			0.039															
BORR MW09	21/04/2020	0.2			0.03			0.00005					0.003				0.0005			0.0005			0.027															
BORR MW09	21/05/2020	0.1			0.005			0.00005					0.005				0.0005			0.004			0.027															
BORR MW09	16/06/2020	0.05			0.02			0.00005					0.024				0.0005			0.006			0.053															
BORR MW09	27/07/2020	1.4			0.02			0.00005					0.0005				0.0005			0.0005			0.0025															
BORR MW09	10/08/2022	0.6		0.1	0.01			0.00005	0.00005	0.002	0.00005		0.006	0.002			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW09	21/11/2022	5.5		0.6	0.01			0.00005	0.00005	0.00005	0.00005		0.008	0.006			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW09	9/02/2023	0.8		0.2	0.02			0.00005	0.00005	0.00005	0.00005		0.006	0.003			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW09	25/05/2023	0.7		0.2	0.02			0.00005	0.00005	0.00005	0.00005		0.001	0.0005			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW09	18/08/2023	1.4		0.2	0.02			0.00005	0.00005	0.00005	0.00005		0.003	0.0005			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW09 (destroyed)	17/11/2023																																					
BORR MW10	22/08/2019	1.2	0.03		0.06			0.00005		0.5			0.011		0.025		0.0005			0.016		3	0.066															
BORR MW10	18/09/2019	0.9			0.005			0.00005					0.011				0.0005			0.009			0.053															
BORR MW10	23/10/2019	0.8			0.005			0.00005					0.008				0.0005			0.007			0.074															
BORR MW10	21/11/2019	0.8			0.005			0.00005					0.013				0.0005			0.012			0.055															
BORR MW10	19/12/2019	0.6			0.005			0.00005					0.009				0.0005			0.01			0.055															
BORR MW10	21/01/2020	0.6			0.005			0.00005					0.012				0.0005			0.013			0.073															
BORR MW10	18/02/2020	0.8			0.02			0.00005					0.0005				0.0005			0.0005			0.0025															
BORR MW10	19/03/2020	1.1			0.02			0.00005					0.009				0.0005			0.003			0.05															
BORR MW10	21/04/2020	1.2			0.07			0.00005					0.006				0.0005			0.002			0.017															
BORR MW10	21/05/2020	0.9			0.005			0.00005					0.007				0.0005			0.003			0.05															
BORR MW10	16/06/2020	0.8			0.02			0.00005					0.023				0.0005			0.006			0.046															
BORR MW10	23/07/2020	1.2			0.02			0.00005					0.0005				0.0005			0.0005			0.0025															
BORR MW10	10/08/2022	0.3		0.3	0.07			0.00005	0.00005	0.007	0.00005		0.001	0.0005			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW10	21/11/2022	0.5		0.5	0.01			0.00005	0.00005	0.00005	0.001		0.0005	0.0005			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW10 (dry)	9/02/2023	-																																				
BORR MW10	25/05/2023	0.7		0.7	0.05			0.00005	0.00005	0.002	0.002		0.0005	0.0005			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW10	17/08/2023	0.7		0.6	0.005			0.00005	0.00005	0.002	0.001		0.0005	0.0005			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW10	16/11/2023	0.6		0.6	0.005			0.00005	0.00005	0.002	0.001		0.0005	0.0005			0.0005	0.0005		0.0005	0.0005		0.0025	0.0025														
BORR MW10	21/02/2024	1.3	0.01	1.3	0.04	1.18	0.06		0.00005		0.001	0.00005		0.0005	4.52	1.43		0.0005	0.014		0.0005	0.005		0.012	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25
BORR MW10	15/05/2024	0.8	0.01	0.8	0.01	0.28	0.06		0.00005		0.001	0.00005		0.0005	2.36	1.62		0.0005	0.009		0.0005	0.005		0.0025	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25
BORR MW11	21/08/2019	2.3	0.02		0.76			0.00005		5			0.025		0.025		0.0005			0.02			0.099															
BORR MW11	19/09/2019	1.5			0.28			0.00005					0.009				0.0005			0.008			0.039															
BORR MW11	23/10/2019	4.2			0.33			0.00005					0.01				0.001			0.017			0.09															
BORR MW11	20/11/2019	6.3			0.15			0.00005					0.024				0.002			0.041			0.077															
BORR MW11	19/12/2019	6.2			0.17			0.00005					0.01				0.0025			0.018			0.404															
BORR MW11	16/06/2020	3			0.13			0.00005					0.03				0.0005			0.013			0.07															
BORR MW11	27/07/2020	1.4			0.21			0.00005					0.031				0.0005			0.004			0.011															
BORR MW11	10/08/2022	0.6		0.6	0.05			0.00005	0.00005	0.005	0.00005		0.007	0.006			0.0005	0.0005		0.003	0.002		0.005	0.0025														
BORR MW11	23/11/2022	6.5		6.5	0.3			0.00005	0.00005	0.03	0.004		0.026	0.008			0.004	0.0005		0.019	0.015		0.034	0.0025														
BORR MW11 (dry)	9/02/2023																																					
BORR MW11 (dry)	25/05/2023																																					
BORR MW11	17/08/2023	2.1		2.1	0.24			0.00005	0.00005	0.022	0.00005		0.027	0.012			0.003	0.0005		0.006	0.002		0.018	0.0025														
BORR MW11 (dry)	17/11/2023																																					
BORR MW11 (dry)	22/02/2024																																					
BORR MW11 (dry)	15/05/2024																																					
BORR MW46	21/08/2019	0.5	0.01		0.01			0.00005		5			0.041		0.025		0.002			0.012		11	0.104															
BORR MW46	19/09/2019	0.6			0.01			0.00005					0.017				0.001			0.012			0.07															
BORR MW46	24/10/2019	0.6			0.01			0.00005					0.012				0.0005			0.012			0.115															
BORR MW46	20/11/2019	0.8			0.02			0.00005					0.016				0.001			0.015			0.07															
BORR MW46	19/12/2019	1.4			0.005			0.00005					0.016				0.0005			0.012			0.062															
BORR MW46	21/01/2020	0.3			0.005			0.00005					0.012				0.0005			0.012			0.033															
BORR MW46	18/02/2020	0.3			0.03			0.00005					0.014				0.0005			0.012			0.047															
BORR MW46	18/03/2020	0.6			0.02			0.00005					0.01				0.0005			0.006			0.061															
BORR MW46	23/04/2020	0.8			0.02			0.00005					0.011				0.0005			0.004			0.038															
BORR MW46	18/05/2020	0.4			0.05			0.00005					0.008				0.0005			0.007			0.028															
BORR MW46	16/06/2020	0.4			0.05			0.00005					0.033				0.001			0.012			0.064															
BORR MW46	23/07/2020	0.6			0.05			0.00005					0.009				0.0005			0.003			0.0025															
BORR MW46	10/08/2022	2.5		0.5	0.02			0.00005	0.00005	0.003	0.00005		0.009	0.001			0.00005	0.00005		0.001	0.00005		0.0025	0.0025														
BORR MW46	21/11/2022	0.6		0.6	0.07			0.00005	0.00005	0.001	0.00005		0.003	0.00005			0.00005	0.00005		0.00005	0.00005		0.0025	0.0025														
BORR MW46 (dry)	9/02/2023																																					
BORR MW46 (dry)	25/05/2023																																					
BORR MW46	18/08/2023	5.5		1	0.02			0.00005	0.00005	0.002	0.00005		0.002	0.00005			0.00005	0.00005		0.00005	0.00005		0.0025	0.0025														
BORR MW46	17/11/2023	1.9		1.9	2.81			0.00005	0.00005	0.008	0.001		0.009	0.002			0.009	0.00005		0.004	0.00005		0.137	0.093														
BORR MW46	22/02/2024	2.9	0.01	2.9	0.26	0.6	0.08		0.00005		0.002	0.00005		0.00005	30.6	24.9		0.00005	0.159		0.00005	0.005		0.0025	0.5	1	1	1	2.5	10	10	50	50	300	50	300	50	0.25
BORR MW46	15/05/2024	2.2	0.09	2.2	0.21	0.46	0.04		0.00005		0.003	0.002		0.00005	16.8	8.39		0.00005	0.396		0.00005	0.005		0.008	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25
MR MW05	22/08/2019	2	0.06	0.025	0.09			0.0001		2.5			0.013		0.025		0.002			0.014		13	0.119															
MR MW05	19/09/2019	1.3	0.01		0.09			0.00025		5			0.008		0.025		0.0025			0.009		12	0.052															
MR MW05	28/10/2019	1.1			0.12			0.00025					0.0025				0.0025			0.007			0.068															
MR MW05	21/11/2019	0.9			0.08			0.00005					0.004				0.0005			0.006			0.031															
MR MW05	19/12/2019	2			0.08			0.00025					0.0025				0.0025			0.014			0.069															
MR MW05	21/01/2020	0.8			0.07			0.00005					0.006				0.00005			0.016			0.057															
MR MW05	18/02/2020	1.5			0.15			0.00025					0.0025				0.0005			0.008			0.053															
MR MW05	19/03/2020	1.1			0.1			0.00025					0.0025				0.0025			0.00025			0.03															
MR MW05	23/04/2020	0.9			0.07			0.00005					0.008				0.0005			0.007			0.057															
MR MW05	21/05/2020	0.4			0.08			0.00025					0.008				0.0025			0.007			0.043															
MR MW05	16/06/2020	0.4			0.07			0.00005					0.027				0.001			0.01			0.072															
MR MW05	27/07/2020	0.5			0.06			0.00005					0.052				0.0005			0.039			0.042															
MR MW05	10/08/2022	0.5		0.5	0.05			0.0001	0.0001	0.007	0.0001		0.006	0.001			0.001	0.001		0.001	0.001		0.011	0.005														
MR MW05	22/11/2022	0.6		0.6	0.05			0.00005	0.00005	0.009	0.003		0.002	0.00005			0.00005	0.00005		0.002	0.001		0.0025	0.0025														
MR MW05	9/02/2023	0.8		0.8	0.07			0.00005	0.00005	0.01	0.003		0.003	0.00005			0.00005	0.00005		0.002	0.001		0.007	0.0025														
MR MW05 (destroyed)	25/05/2023																																					
SW10 - 5 Mile Creek	22/08/2019	3.3	0.5	3.3	0.51	0.08	0.09		0.0002		0.00005	0.00005		0.026	0.97	0.91		0.002	0.012		0.016	0.005		0.113	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.01	0.05
SW10 - 5 Mile Creek	18/09/2019	3.3	0.65	3.3	0.67	0.1	0.12		0.00005		0.00005	0.00005		0.015	1.05	1.07		0.00005	0.011		0.011	0.005		0.105	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.01	0.05
SW10 - 5 Mile Creek	23/07/2020	5	0.64	5	1.09	0.14	0.1		0.00005		0.00005	0.00005		0.002	2.52	1.43		0.00005	0.015		0.003	0.005		0.01	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.01	0.05
SW10 - 5 Mile Creek (dry)	10/08/2022																																					
SW10 - 5 Mile Creek (dry)	21/11/2022																																					
SW10 - 5 Mile Creek (dry)	9/02/2023																																					
SW10 - 5 Mile Creek (dry)	25/05/2023																																					
SW10 - 5 Mile Creek (dry)	17/08/2023																																					
SW10 - 5 Mile Creek (dry)	16/11/2023																																					
SW10 - 5 Mile Creek (dry)	21/02/2024																																					
SW10 - 5 Mile Creek (dry)	15/05/2024																																					

GROUNDWATER		Nutrients				Metals																			BTEXN					Total Recoverable Hydrocarbons								
Parameter	Date	Total Nitrogen	Reactive Phosphorus (Kjeldahl)	Total Kjeldahl Nitrogen	Total Phosphorus	Total Aluminium	Dissolved Aluminium	Total Cadmium	Dissolved Cadmium	Total Chromium	Dissolved Chromium	Dissolved Cobalt	Total Copper	Dissolved Copper	Total Iron	Dissolved Iron	Total Lead	Disolved Lead	Dissolved Manganese	Total Nickel	Dissolved Nickel	Dissolved Selenium	Total Zinc	Dissolved Zinc	Benzene	Toluene	Ethlybenzene	Xylene	Total Napthalene	C6-C10 fraction	C6-C10 fraction (minus BTEX)(F1)	>C10-C16 (minus Naphthalene)(F2)	>C10-C16 fraction	>C16-C34 fraction	>C34-C40 fraction	>C10-C40 fraction (sum)	Azinphos Methyl	Bromophos-ethyl
Preconstruction	MAX	6.3	0.06	0.28	1.22	0	0	0.00025	0	10	0	0	0.052	0	0.52	0	0.003	0	0	0.041	0	86	0.404	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIN	0.05	0.01	0.025	0.005	0	0	0.00005	0	0.5	0	0	0.0005	0	0.025	0	0.00005	0	0	0.00025	0	3	0.0025	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2023/24	MAX	9.2	0.47	9.2	2.81	41	0.56	0.0001	0.0001	0.03	0.004	0.018	0.027	0.012	30.6	24.9	0.027	0.001	0.396	0.019	0.028	0.005	0.137	0.093	0.5	1	1	1	2.5	10	10	50	50	300	50	300	50	0.25
	MIN	0.3	0.01	0.1	0.005	0.01	0.005	0.00005	0.00005	0.00005	0.00005	0.00005	0.0005	0.00005	1.48	0.8	0.00005	0.00005	0.009	0.00005	0.00005	0.005	0.0025	0.0025	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25
Eastern Agricultural Flats BORR_MW09, BORR_MW10	MAX	3.2	0.04	0	0.07	0	0	0.00005	0	2.5	0	0	0.028	0	0.025	0	0.001	0	0	0.017	0	5	0.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIN	0.05	0.03	0	0.005	0	0	0.00005	0	0.5	0	0	0.0005	0	0.025	0	0.0005	0	0	0.0005	0	3	0.0025	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MAX	5.5	0.01	1.3	0.07	1.18	0.06	0.00005	0.00005	0.007	0.002	0.00005	0.008	0.006	4.52	1.62	0.0005	0.0005	0.014	0.0005	0.0005	0.005	0.0025	0.012	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25
	MIN	0.3	0.01	0.1	0.005	0.28	0.06	0.00005	0.00005	0.00005	0.00005	0.00005	0.0005	0.0005	2.36	1.43	0.0005	0.0005	0.009	0.0005	0.0005	0.005	0.0025	0.0025	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25
West of Ridgeline BORR_MW04, BORR_MW05, BORR_MW06, BORR_MW46	MAX	4.5	0.02	0.28	0.52	0	0	0.00005	0	10	0	0	0.041	0	0.52	0	0.003	0	0	0.018	0	86	0.126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIN	0.2	0.01	0.28	0.005	0	0	0.00005	0	5	0	0	0.0005	0	0.025	0	0.0005	0	0	0.0005	0	5	0.0025	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MAX	9.2	0.09	9.2	2.81	1.95	0.08	0.00005	0.00005	0.013	0.003	0.018	0.016	0.002	30.6	24.9	0.009	0.0005	0.396	0.004	0.028	0.005	0.137	0.093	0.5	1	1	1	2.5	10	10	50	50	300	50	300	50	0.25
	MIN	0.4	0.01	0.4	0.01	0.01	0.005	0.00005	0.00005	0.00005	0.00005	0.00005	0.0005	0.00005	1.48	1.34	0.00005	0.00005	0.018	0.00005	0.00005	0.005	0.0025	0.0025	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25
Quarry influence BORR_MW11	MAX	6.3	0.02	0	0.76	0	0	0.00005	0	5	0	0	0.031	0	0.025	0	0.0025	0	0	0.041	0	0	0.404	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIN	1.4	0.02	0	0.13	0	0	0.00005	0	5	0	0	0.009	0	0.025	0	0.0005	0	0	0.004	0	0	0.011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MAX	5.5	0.09	2.9	2.81	0.6	0.08	0.00005	0.00005	0.008	0.003	0.002	0.009	0.002	30.6	24.9	0.009	0.00005	0.396	0.004	0.00005	0.005	0.137	0.093	0.5	1	1	1	2.5	10	10	50	50	300	50	300	50	0.25
	MIN	0.6	0.01	0.5	0.02	0.46	0.04	0.00005	0.00005	0.001	0.00005	0.00005	0.002	0.00005	16.8	8.39	0.00005	0.00005	0.159	0.00005	0.00005	0.005	0.0025	0.0025	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25
Five Mile Brook BORR_MW8a	MAX	2.9	0.05	0	1.22	0	0	0.00005	0	0	0	0	0.014	0	0.025	0	0.002	0	0	0.018	0	8	0.097	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIN	1.3	0.05	0	0.58	0	0	0.00005	0	0	0	0	0.0005	0	0.025	0	0.0005	0	0	0.0005	0	8	0.0025	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MAX	7.9	0.47	7.9	1.88	41	0.56	0.00005	0.00005	0.015	0.002	0.00005	0.02	0.001	8.8	0.9	0.027	0.001	0.087	0.007	0.002	0.005	0.131	0.05	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25
	MIN	1.9	0.42	1.9	0.56	3.31	0.22	0.00005	0.00005	0.001	0.00005	0.00005	0.0005	0.0005	1.72	0.8	0.0005	0.0005	0.08	0.0005	0.0005	0.005	0.0025	0.0025	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.25	0.25

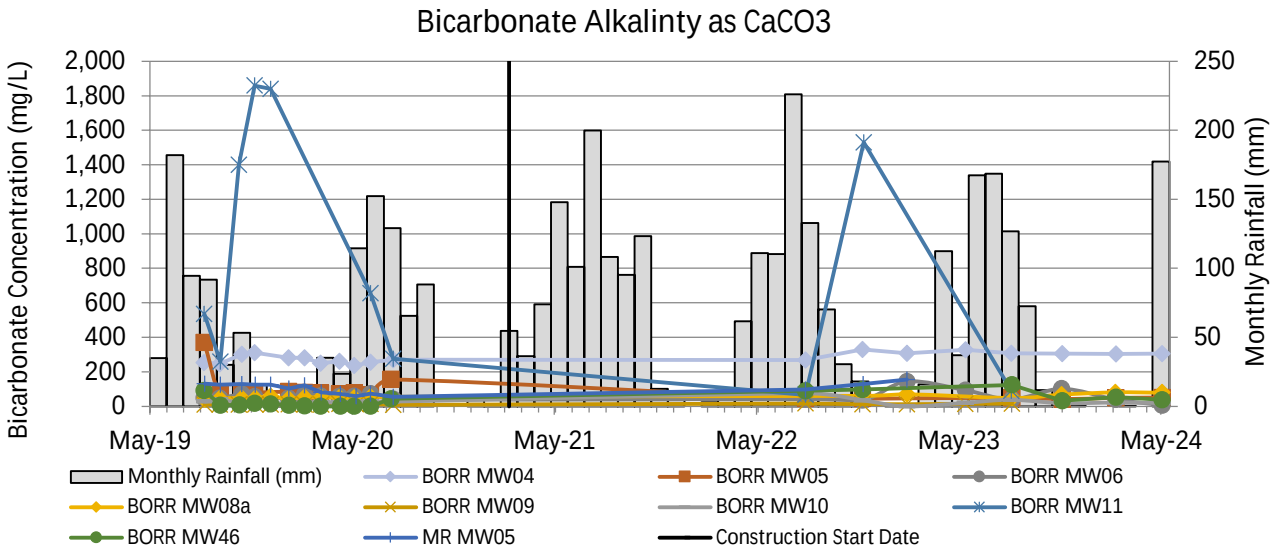
SURFACE WATER		Nutrients				Metals																			BTEXN					Total Recoverable Hydrocarbons								
Parameter	Date	Total Nitrogen	Reactive Phosphorus (Kjeldahl)	Total Kjeldahl Nitrogen	Total Phosphorus	Total Aluminium	Dissolved Aluminium	Total Cadmium	Dissolved Cadmium	Total Chromium	Dissolved Chromium	Dissolved Cobalt	Total Copper	Dissolved Copper	Total Iron	Dissolved Iron	Total Lead	Disolved Lead	Dissolved Manganese	Total Nickel	Dissolved Nickel	Dissolved Selenium	Total Zinc	Dissolved Zinc	Benzene	Toluene	Ethlybenzene	Xylene	Total Napthalene	C6-C10 fraction	C6-C10 fraction (minus BTEX)(F1)	>C10-C16 (minus Naphthalene)(F2)	>C10-C16 fraction	>C16-C34 fraction	>C34-C40 fraction	>C10-C40 fraction (sum)	Azinphos Methyl	Bromophos-ethyl
Five Mile Brook SW10	MAX	5	0.65	5	1.09	0.14	0.12	0	0.0002	0	0.00005	0.00005	0	0.026	2.52	1.43	0	0.002	0.015	0	0.016	0.005	0	0.113	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.01	0.05
	MIN	3.3	0.5	3.3	0.51	0.08	0.09	0	0.00005	0	0.00005	0.00005	0	0.002	0.97	0.91	0	0.00005	0.011	0	0.003	0.005	0	0.01	0.5	1	1	1	2.5	10	10	50	50	50	50	50	0.01	0.05
	MAX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

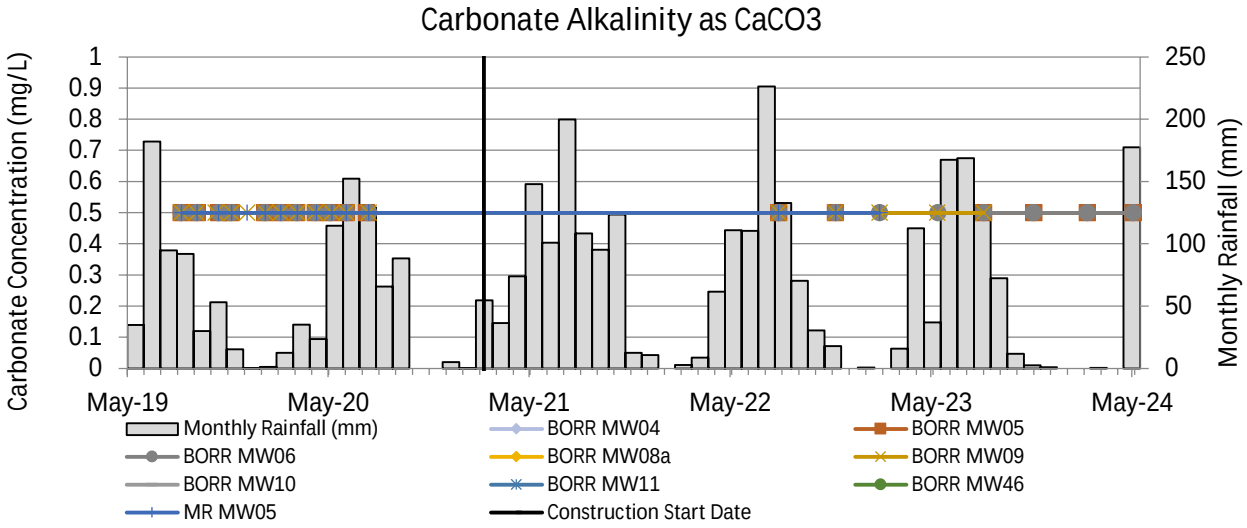
App C Water Quality Results

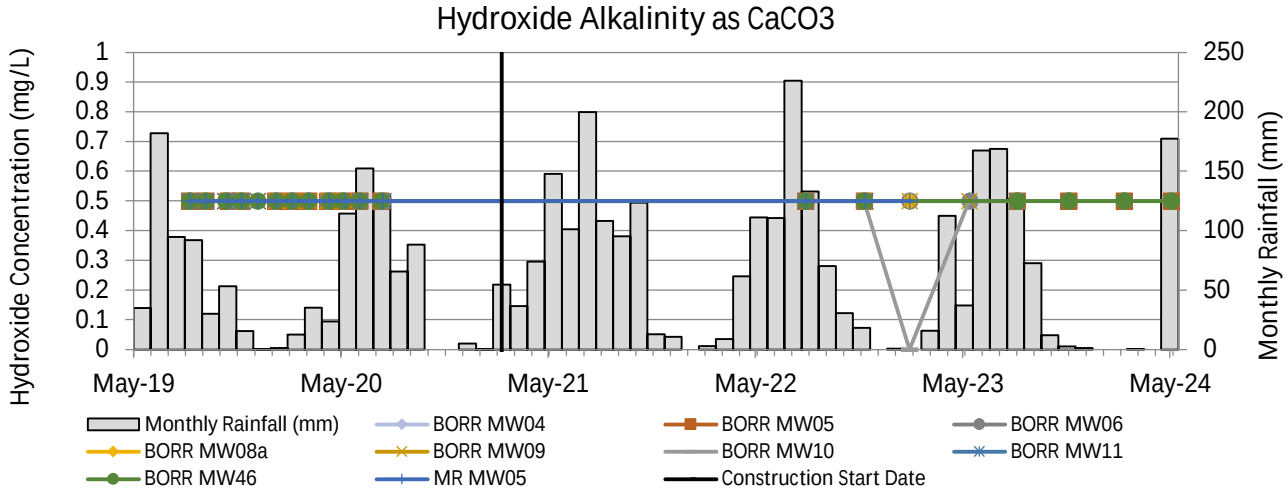
Pesticides																				
Parameter	Date	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenamiphos	Fenthion	Malathion	Monocrotophos	Parathion	Parathion-methyl	Pirimiphos-ethyl	Prothiofos	Glyphosate
Units		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ANZECC and ARMCANZ (2000) Freshwater 95% Guidelines				0.01			0.01		0.15				0.05		0.004				1200
BORR MW04	21/08/2019																		
BORR MW04	18/09/2019																		
BORR MW04	28/10/2019																		
BORR MW04	20/11/2019																		
BORR MW04	20/01/2020																		
BORR MW04	18/02/2020																		
BORR MW04	18/03/2020																		
BORR MW04	21/04/2020																		
BORR MW04	18/05/2020																		
BORR MW04	16/06/2020																		
BORR MW04	27/07/2020																		
BORR MW04	10/08/2022																		
BORR MW04	21/11/2022																		
BORR MW04	9/02/2023																		
BORR MW04	9/05/2023																		
BORR MW04	17/08/2023																		
BORR MW04	17/11/2023																		
BORR MW04	22/02/2024	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
BORR MW04	15/05/2024	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
BORR MW05	21/08/2019																		
BORR MW05	19/09/2019																		
BORR MW05	28/10/2019																		
BORR MW05	20/11/2019																		
BORR MW05	20/01/2020																		
BORR MW05	18/02/2020																		
BORR MW05	18/03/2020																		
BORR MW05	21/04/2020																		
BORR MW05	18/05/2020																		
BORR MW05	16/06/2020																		
BORR MW05	23/07/2020																		
BORR MW05	10/08/2022																		
BORR MW05	21/11/2022																		
BORR MW05 (dry)	9/02/2023																		
BORR MW05 (dry)	9/05/2023																		
BORR MW05	18/08/2023																		
BORR MW05	17/11/2023																		
BORR MW05	22/02/2024	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
BORR MW05	15/05/2024	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
BORR MW06	21/08/2019																		
BORR MW06	18/09/2019																		
BORR MW06	28/10/2019																		
BORR MW06	20/11/2019																		
BORR MW06	20/01/2020																		
BORR MW06	18/02/2020																		
BORR MW06	18/03/2020																		
BORR MW06	21/04/2020																		
BORR MW06	18/05/2020																		
BORR MW06	16/06/2020																		
BORR MW06	27/07/2020																		
BORR MW06	10/08/2022																		
BORR MW06	21/11/2022																		
BORR MW06	9/02/2023																		
BORR MW06	9/05/2023																		
BORR MW06	18/08/2023																		
BORR MW06	16/11/2023																		
BORR MW06	22/02/2024	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
BORR MW06	15/05/2024	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
BORR MW08a	22/08/2019																		
BORR MW08a	18/09/2019																		
BORR MW08a	28/10/2019																		
BORR MW08a	21/11/2019																		
BORR MW08a	18/12/2019																		
BORR MW08a	20/01/2020																		
BORR MW08a	18/02/2020																		
BORR MW08a	18/03/2020																		
BORR MW08a	21/04/2020																		
BORR MW08a	18/05/2020																		
BORR MW08a	16/06/2020																		
BORR MW08a (blocked)	10/08/2022																		
BORR MW08a	21/11/2022																		
BORR MW08a	9/02/2023																		
BORR MW08a (blocked)	25/05/2023																		
BORR MW08a	18/08/2023																		
BORR MW08a	16/11/2023																		
BORR MW08a	21/02/2024	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
BORR MW08a	15/05/2024	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
BORR MW09	22/08/2019																		
BORR MW09	18/09/2019																		
BORR MW09	23/10/2019																		
BORR MW09	21/11/2019																		
BORR MW09	19/12/2019																		
BORR MW09	21/01/2020																		
BORR MW09	18/02/2020																		
BORR MW09	18/03/2020																		
BORR MW09	21/04/2020																		
BORR MW09	21/05/2020																		
BORR MW09	16/06/2020																		
BORR MW09	27/07/2020																		
BORR MW09	10/08/2022																		
BORR MW09	21/11/2022																		
BORR MW09	9/02/2023																		
BORR MW09	25/05/2023																		
BORR MW09	18/08/2023																		
BORR MW09 (destroyed)	17/11/2023																		
BORR MW10	22/08/2019																		
BORR MW10	18/09/2019																		
BORR MW10	23/10/2019																		
BORR MW10	21/11/2019																		
BORR MW10	19/12/2019																		
BORR MW10	21/01/2020																		
BORR MW10	18/02/2020																		
BORR MW10	18/03/2020																		
BORR MW10	21/04/2020																		
BORR MW10	21/05/2020																		
BORR MW10	16/06/2020																		
BORR MW10	23/07/2020																		
BORR MW10	10/08/2022																		
BORR MW10	21/11/2022																		
BORR MW10 (dry)	9/02/2023																		
BORR MW10	25/05/2023																		
BORR MW10	17/08/2023																		
BORR MW10	17/11/2023																		
BORR MW10	21/02/2024	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
BORR MW10	15/05/2024	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
BORR MW11	21/08/2019																		
BORR MW11	19/09/2019																		
BORR MW11	23/10/2019																		
BORR MW11	20/11/2019																		
BORR MW11	19/12/2019																		
BORR MW11	16/06/2020																		
BORR MW11	27/07/2020																		
BORR MW11	10/08/2022																		
BORR MW11	21/11/2022																		
BORR MW11 (dry)	9/02/2023																		
BORR MW11 (dry)	9/05/2023																		
BORR MW11	17/08/2023																		
BORR MW11 (dry)	17/11/2023																		
BORR MW11 (dry)	22/02/2024																		
BORR MW11 (dry)	15/05/2024																		
BORR MW46	21/08/2019																		
BORR MW46	18/09/2019																		
BORR MW46	24/10/2019																		
BORR MW46	20/11/2019																		
BORR MW46	19/12/2019																		
BORR MW46	21/01/2020																		
BORR MW46	18/02/2020																		
BORR MW46	18/03/2020																		
BORR MW46	23/04/2020																		
BORR MW46	18/05/2020																		
BORR MW46	16/06/2020																		
BORR MW46	23/07/2020																		
BORR MW46	10/08/2022																		
BORR MW46	21/11/2022																		
BORR MW46 (dry)	9/02/2023																		
BORR MW46 (dry)	9/05/2023																		
BORR MW46	18/08/2023																		
BORR MW46	17/11/2023																		
BORR MW46	22/02/2024	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
BORR MW46	15/05/2024	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
MR MW05	22/08/2019																		
MR MW05	18/09/2019																		
MR MW05	28/10/2019																		
MR MW05	21/11/2019																		
MR MW05	19/12/2019																		
MR MW05	21/01/2020																		
MR MW05	18/02/2020																		
MR MW05	18/03/2020																		
MR MW05	21/04/2020																		
MR MW05	21/05/2020																		
MR MW05	16/06/2020																		
MR MW05	27/07/2020																		
MR MW05	10/08/2022																		
MR MW05	22/11/2022																		
MR MW05	9/02/2023																		
MR MW05 (destroyed)	25/05/2023																		
SW10 - 5 Mile Creek	22/08/2019	0.01	0.01	0.01	0.1	0.01	0.005	0.01	0.01	0.01	0.005	0.025	0.01	0.01	0.1	0.005	0.005	0.05	5
SW10 - 5 Mile Creek	18/09/2019	0.01	0.01	0.01	0.1	0.01	0.005	0.01	0.01	0.01	0.005	0.025	0.01	0.01	0.1	0.005	0.005	0.05	5
SW10 - 5 Mile Creek	23/07/2020	0.01	0.01	0.01	0.1	0.01	0.005	0.01	0.01	0.01	0.005	0.025	0.01	0.01	0.1	0.005	0.005	0.05	5
SW10 - 5 Mile Creek (dry)	10/08/2022																		
SW10 - 5 Mile Creek (dry)	21/11/2022																		
SW10 - 5 Mile Creek (dry)	9/02/2023																		
SW10 - 5 Mile Creek (dry)	25/05/2023																		
SW10 - 5 Mile Creek (dry)	17/08/2023																		
SW10 - 5 Mile Creek (dry)	16/11/2023																		
SW10 - 5 Mile Creek (dry)	21/02/2024																		
SW10 - 5 Mile Creek (dry)	15/05/2024																		

GROUNDWATER		Pesticides																	
Parameter	Date	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenamiphos	Fenthion	Malathion	Monocrotophos	Parathion	Parathion-methyl	Pirimiphos-ethyl	Prothiofos	Glyphosate
Preconstruction	MAX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2023/24	MAX	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
	MIN	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
Eastern Agricultural Flats BORR_MW06, BORR_MW10	MAX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MAX	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
	MIN	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
West of Ridgeline BORR_MW04, BORR_MW05, BORR_MW06, BORR_MW46	MAX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MAX	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
	MIN	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
Quarry influence BORR_MW11	MAX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MAX	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
	MIN	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
Five Mile Brook BORR_MW08a	MAX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MAX	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5
	MIN	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	1	1	0.25	0.25	5

SURFACE WATER		Pesticides																	
Parameter	Date	Carbophenothion	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Ethion	Fenamiphos	Fenthion	Malathion	Monocrotophos	Parathion	Parathion-methyl	Pirimiphos-ethyl	Prothiofos	Glyphosate
Five Mile Brook SW10	MAX	0.01	0.01	0.01	0.1	0.01	0.005	0.01	0.01	0.01	0.005	0.025	0.01	0.01	0.1	0.005	0.005	0.05	5
	MIN	0.01	0.01	0.01	0.1	0.01	0.005	0.01	0.01	0.01	0.005	0.025	0.01	0.01	0.1	0.005	0.005	0.05	5
	MAX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0







PROJECT ID	60644386
CREATED BY	SA
APPROVED BY	GRB
LAST MODIFIED	29/07/2024

South West Gateway Alliance
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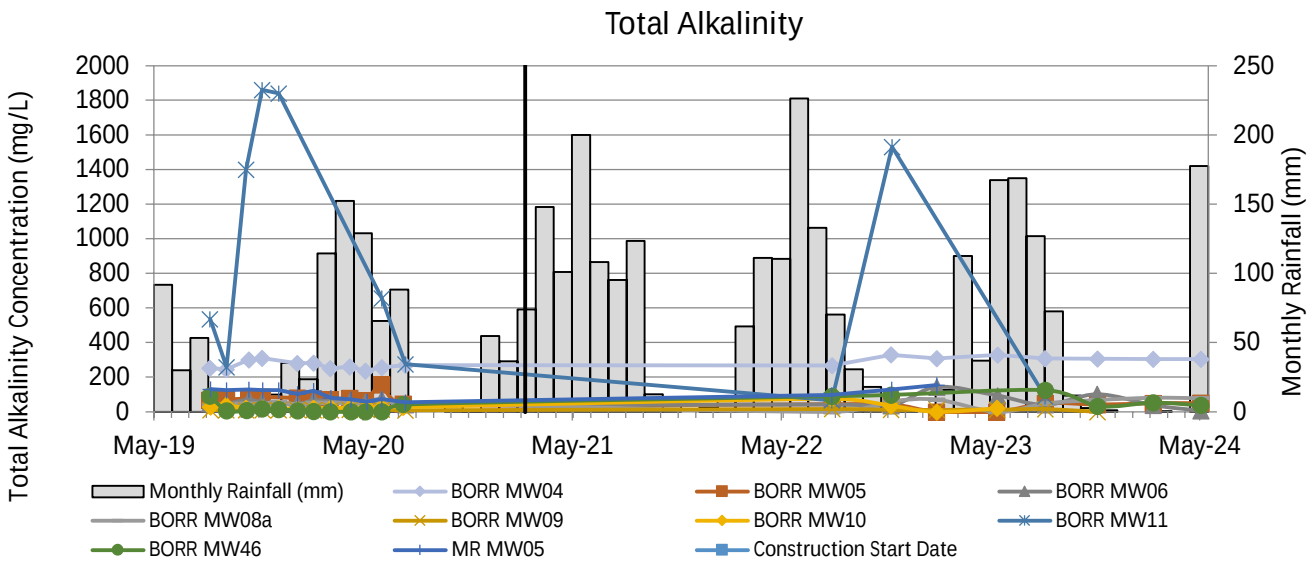
Southern Section
Groundwater Monitoring Review - to May 2024

CONCENTRATION OF BICARBONATE ALKALINITY, CARBONATE ALKALIITY AND HYDROXIDE ALKALINITY

Figure
5



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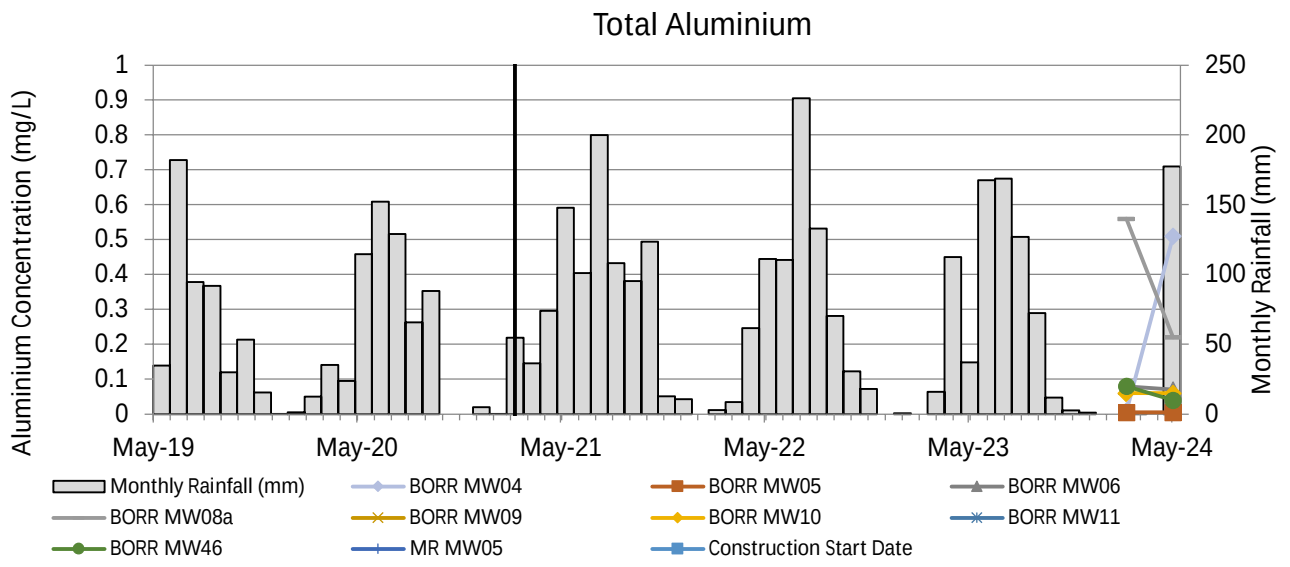
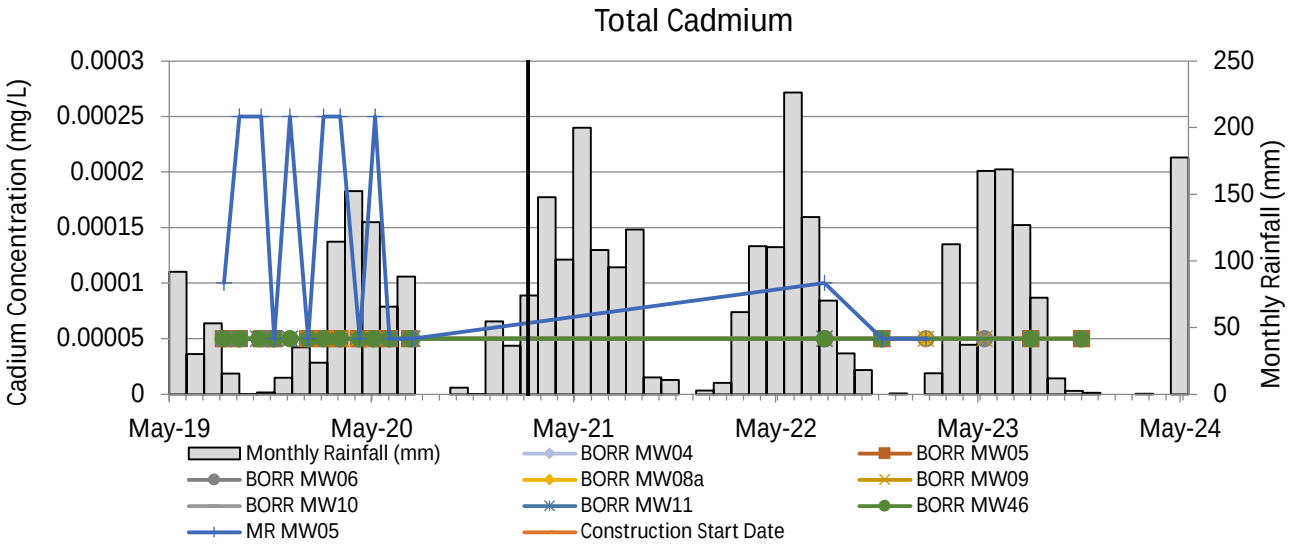
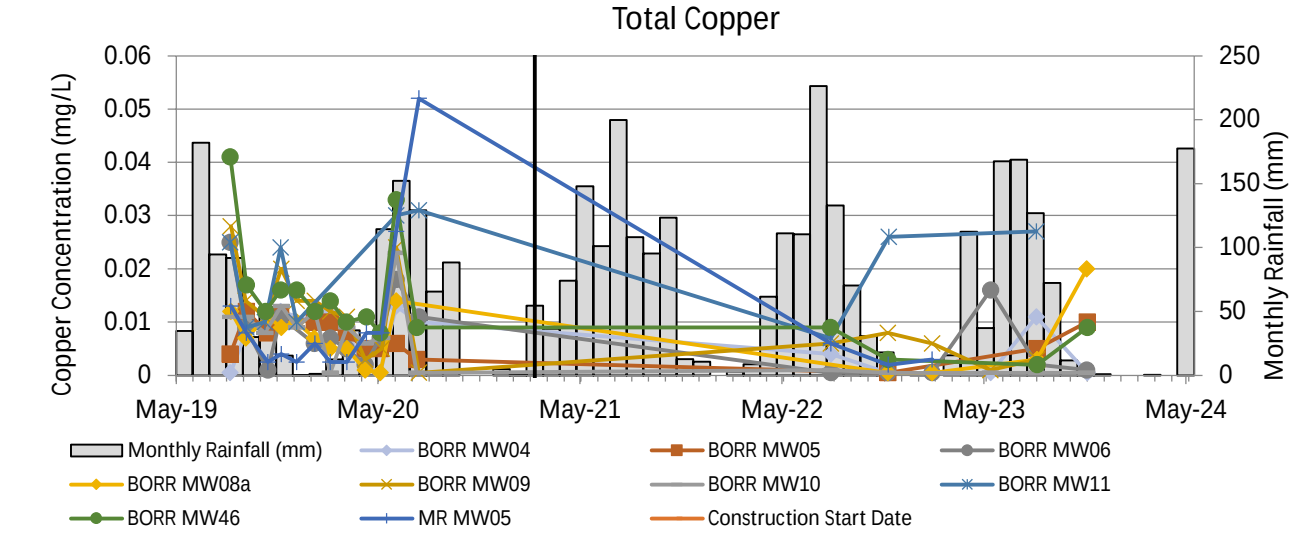
CONCENTRATION OF TOTAL ALKALINITY

Figure
6

A4 size







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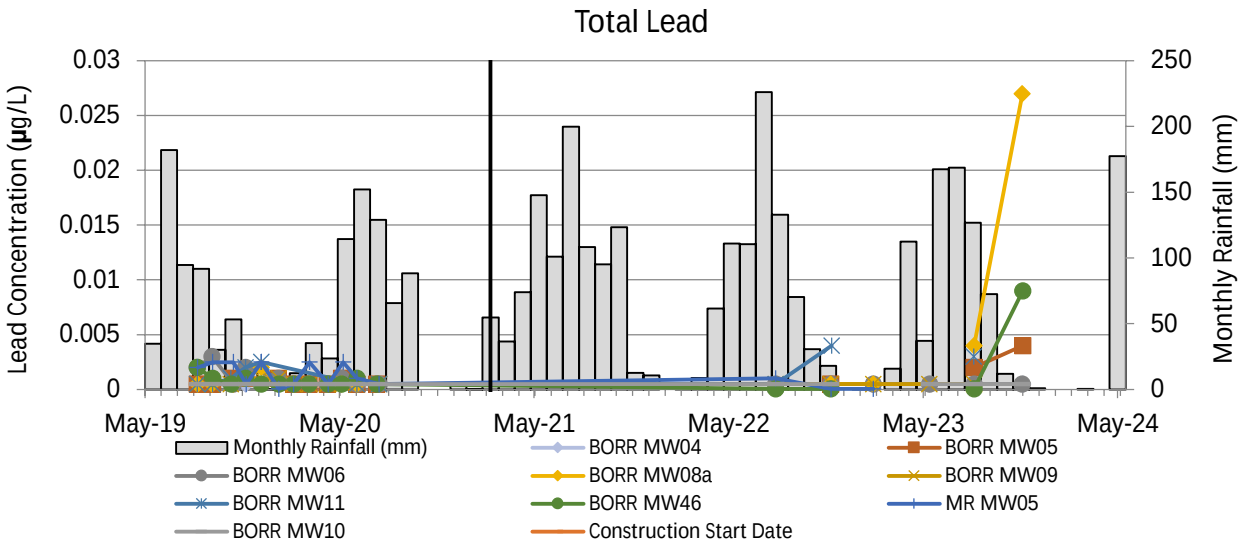
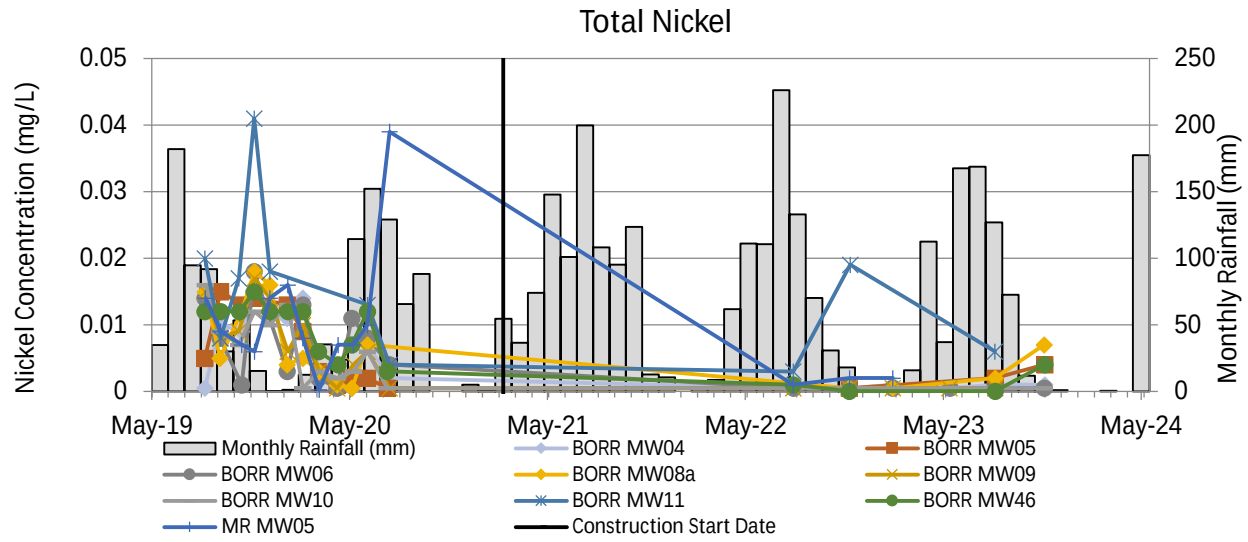
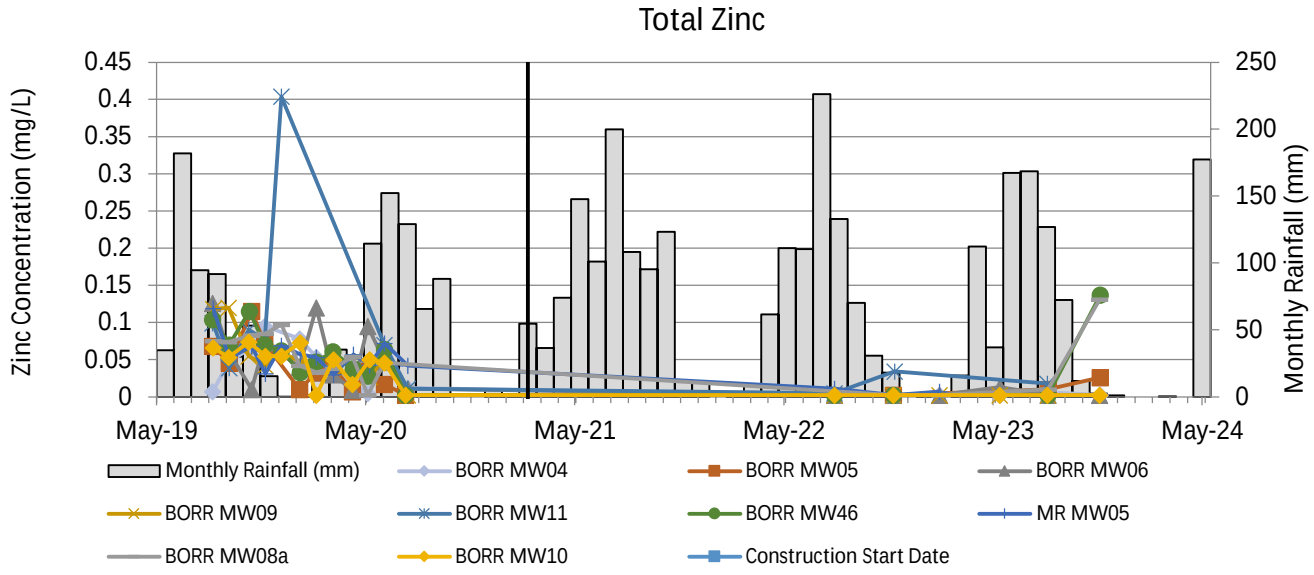
Groundwater Monitoring Review - to May 2024

CONCENTRATION OF ARSENIC, CADMIUM AND COPPER

Figure
7







PROJECT ID	60644386
CREATED BY	SA
APPROVED BY	GRB
LAST MODIFIED	29/07/2024

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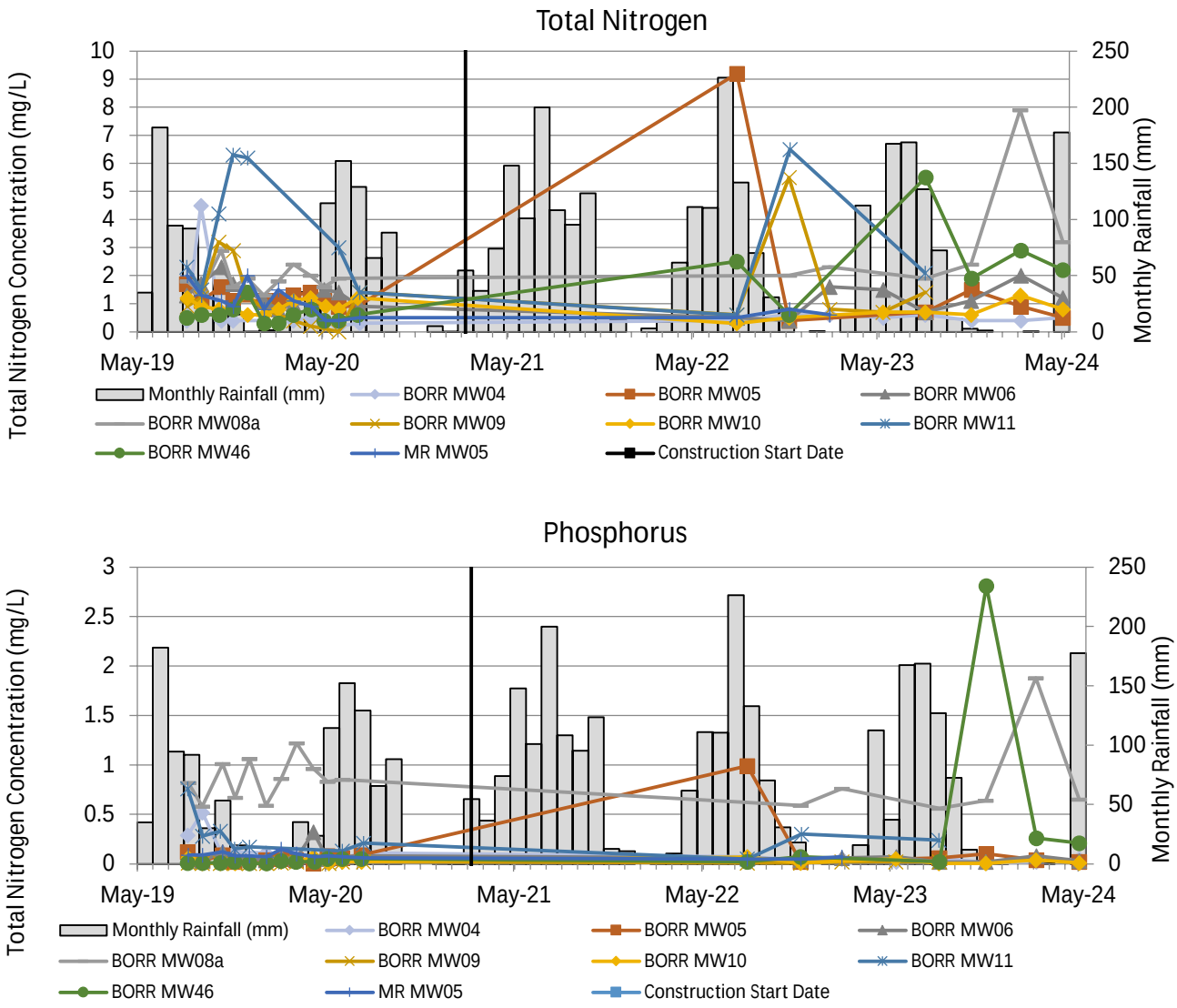
Southern Section Groundwater Monitoring Review - to May 2024

CONCENTRATION OF LEAD AND ZINC

Figure 8



PROJECT ID	60644386
CREATED BY	SA
APPROVED BY	GRB
LAST MODIFIED	29/07/2024

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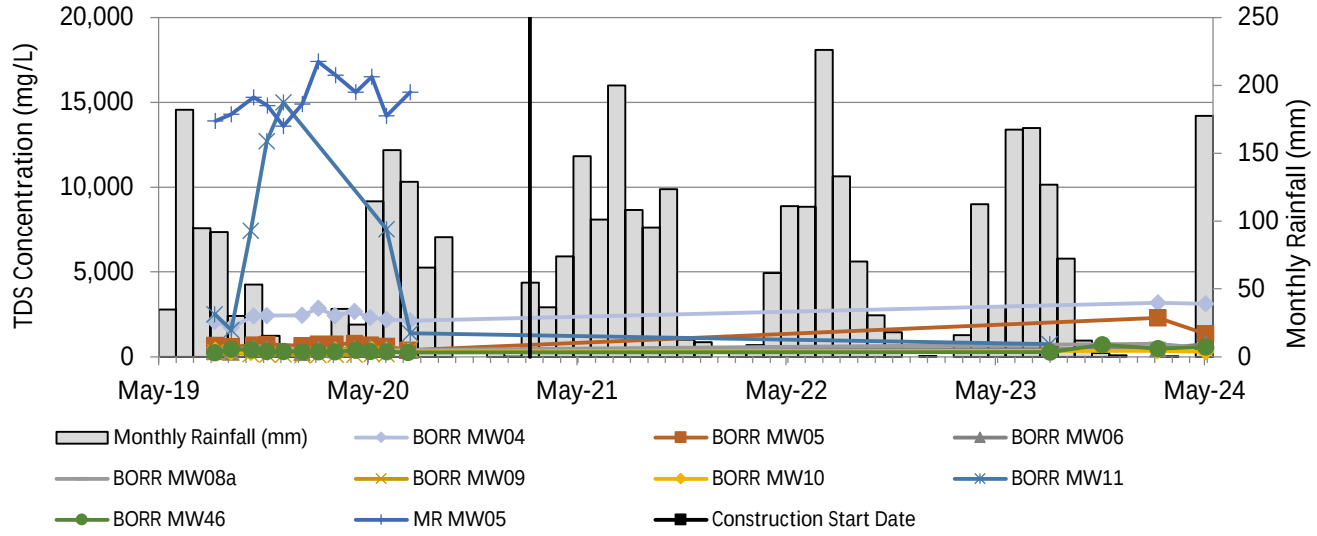
Southern Section
Groundwater Monitoring Review - to May 2024

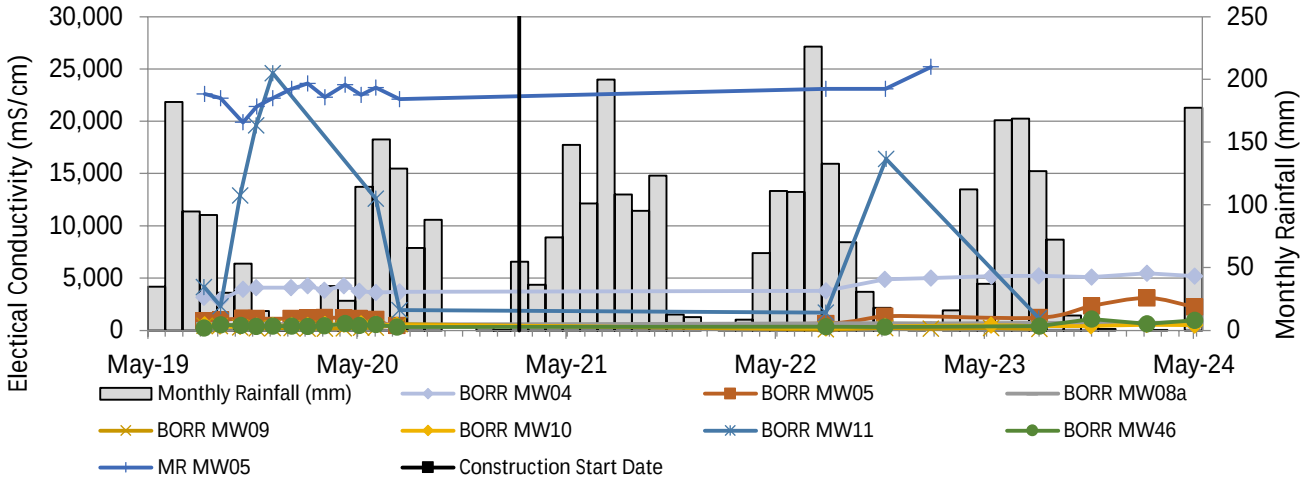
CONCENTRATION OF TOTAL NITROGEN AND PHOSPHORUS

Figure
9

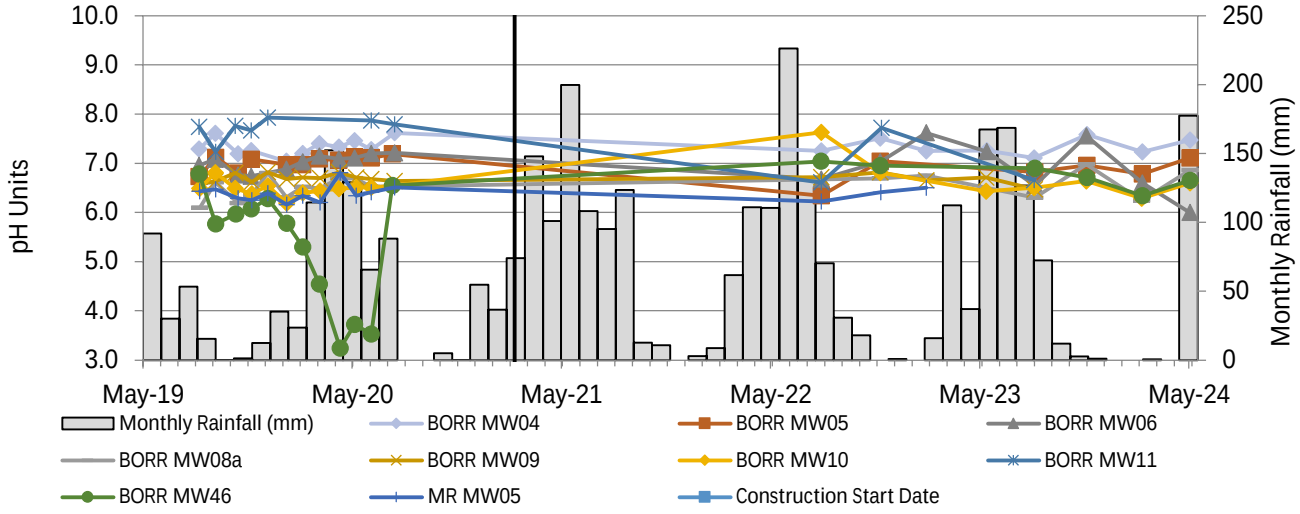
Total Dissolved Solids



Electical Conductivity



pH



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LAST MODIFIED	29/07/2024

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Southern Section Groundwater Monitoring Review - to May 2024

CONCENTRATION OF TDS, EC and pH

Figure 10

Appendix D
Laboratory Certificates

CERTIFICATE OF ANALYSIS

Work Order	: **EP2311299**	Page	: 1 of 15
Client	: **AECOM AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: SOPHIE JOHNSTONE	Contact	: Customer Services EP
Address	: 10 HOD WAY MALAGA WA, AUSTRALIA 6090	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: 0478 926 928	Telephone	: +61-8-9406 1301
Project	: BORR quarterly monitoring	Date Samples Received	: 18-Aug-2023 17:30
Order number	: BORR Quarterly monitoring	Date Analysis Commenced	: 22-Aug-2023
C-O-C number	: 55725	Issue Date	: 31-Aug-2023 13:37
Sampler	: SOPHIE JOHNSTONE		
Site	: Bunbury outer ring road		
Quote number	: EP/675/21_V2		
No. of samples received	: 23		
No. of samples analysed	: 23		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EG035: Poor matrix spike recovery was obtained for Hg due to possible matrix interference. Confirmed by re-analysis.
- EK061G (TKN)/EK067G (Total Phosphorus): Results for sample #20 and 23 confirmed by re-analysis.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW31	PB13	PB14	MW25	MW25b
				Sampling date / time	14-Aug-2023 16:34	16-Aug-2023 10:39	16-Aug-2023 11:11	16-Aug-2023 12:30	16-Aug-2023 12:52
Compound	CAS Number	LOR	Unit		EP2311299-001	EP2311299-002	EP2311299-003	EP2311299-004	EP2311299-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**5.13**	**6.90**	**7.06**	**6.19**	**6.48**
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**362**	**761**	**1250**	**4160**	**1980**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**2**	**82**	**148**	**64**	**29**
Total Alkalinity as CaCO3	----	1	mg/L		**2**	**82**	**148**	**64**	**29**
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		**41**	**30**	**30**	**136**	**26**
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	**0.001**	**0.003**	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	**0.001**	<0.001	**0.003**
Nickel	7440-02-0	0.001	mg/L		<0.001	**0.008**	**0.006**	**0.008**	**0.002**
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	**0.012**	**0.045**	**0.010**	**0.020**
Iron	7439-89-6	0.05	mg/L		**----**	**4.08**	<0.05	**----**	**----**
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	**0.007**	**0.007**	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	**0.002**	**0.008**	**0.002**
Copper	7440-50-8	0.001	mg/L		<0.001	**0.032**	**0.021**	**0.017**	**0.010**
Nickel	7440-02-0	0.001	mg/L		<0.001	**0.024**	**0.009**	**0.010**	**0.002**
Lead	7439-92-1	0.001	mg/L		<0.001	**0.001**	**0.005**	**0.002**	**0.001**
Zinc	7440-66-6	0.005	mg/L		<0.005	**0.032**	**0.089**	**0.024**	**0.022**
Iron	7439-89-6	0.05	mg/L		**----**	**11.4**	**6.43**	**----**	**----**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW31	PB13	PB14	MW25	MW25b
				Sampling date / time	14-Aug-2023 16:34	16-Aug-2023 10:39	16-Aug-2023 11:11	16-Aug-2023 12:30	16-Aug-2023 12:52
Compound	CAS Number	LOR	Unit		EP2311299-001	EP2311299-002	EP2311299-003	EP2311299-004	EP2311299-005
					Result	Result	Result	Result	Result
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser - Continued									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.81**	<0.01	<0.01	<0.01	**0.30**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**1.7**	**0.1**	**0.1**	**0.6**	**0.7**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**2.5**	**0.1**	**0.1**	**0.6**	**1.0**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.02**	**0.40**	**0.12**	**0.11**	**0.12**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	WQA01	NC4	MW22	MW22b	MW17
			Sampling date / time	16-Aug-2023 12:58	16-Aug-2023 14:35	16-Aug-2023 14:26	16-Aug-2023 14:28	17-Aug-2023 09:07
Compound	CAS Number	LOR	Unit	EP2311299-006	EP2311299-007	EP2311299-008	EP2311299-009	EP2311299-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.50**	----	**5.73**	**6.87**	**7.06**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**1960**	----	**11200**	**469**	**152**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**29**	----	**14**	**38**	**47**
Total Alkalinity as CaCO3	----	1	mg/L	**29**	----	**14**	**38**	**47**
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**23**	----	**87**	**14**	**11**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	----	**0.003**	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	----	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	**0.003**	----	<0.001	**0.001**	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.002**	----	**0.064**	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	----	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	**0.018**	----	**0.030**	**0.006**	<0.005
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	**0.004**	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.002**	**0.002**	<0.001	**0.008**	<0.001
Copper	7440-50-8	0.001	mg/L	**0.009**	**0.004**	**0.002**	**0.016**	**0.004**
Nickel	7440-02-0	0.001	mg/L	**0.002**	**0.002**	**0.054**	**0.004**	<0.001
Lead	7439-92-1	0.001	mg/L	**0.001**	**0.001**	<0.001	**0.007**	<0.001
Zinc	7440-66-6	0.005	mg/L	**0.021**	**0.009**	**0.028**	**0.024**	<0.005
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.30**	----	**0.14**	**1.51**	**1.90**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	WQA01	NC4	MW22	MW22b	MW17
				Sampling date / time	16-Aug-2023 12:58	16-Aug-2023 14:35	16-Aug-2023 14:26	16-Aug-2023 14:28	17-Aug-2023 09:07
Compound	CAS Number	LOR	Unit		EP2311299-006	EP2311299-007	EP2311299-008	EP2311299-009	EP2311299-010
					Result	Result	Result	Result	Result
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.6**	**----**	**0.3**	**1.5**	**0.6**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**0.9**	**----**	**0.4**	**3.0**	**2.5**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.10**	**----**	<0.01	**0.26**	**0.05**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	MW15	MW13	MW11	MW10	MW46
			Sampling date / time	17-Aug-2023 09:32	17-Aug-2023 09:33	17-Aug-2023 12:05	17-Aug-2023 14:21	17-Aug-2023 11:06
Compound	CAS Number	LOR	Unit	EP2311299-011	EP2311299-012	EP2311299-013	EP2311299-014	EP2311299-015
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.17**	**7.01**	**6.66**	**6.50**	**6.90**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**462**	**758**	**1150**	**421**	**420**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**41**	**251**	**90**	**38**	**125**
Total Alkalinity as CaCO3	----	1	mg/L	**41**	**251**	**90**	**38**	**125**
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**63**	**64**	**48**	**30**	**41**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.001**	<0.001	<0.001	**0.001**	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	**0.012**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.001**	**0.002**	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.002**	<0.001	**0.004**	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.003**	**0.001**	**0.022**	**0.002**	**0.002**
Copper	7440-50-8	0.001	mg/L	**0.002**	<0.001	**0.027**	<0.001	**0.002**
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.001**	**0.006**	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	**0.003**	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	**0.018**	<0.005	<0.005
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.02**	**0.01**	**0.02**	**0.06**	**4.52**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	MW15	MW13	MW11	MW10	MW46
			Sampling date / time	17-Aug-2023 09:32	17-Aug-2023 09:33	17-Aug-2023 12:05	17-Aug-2023 14:21	17-Aug-2023 11:06
Compound	CAS Number	LOR	Unit	EP2311299-011	EP2311299-012	EP2311299-013	EP2311299-014	EP2311299-015
				Result	Result	Result	Result	Result
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**3.3**	**1.4**	**2.1**	**0.6**	**1.0**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**3.3**	**1.4**	**2.1**	**0.7**	**5.5**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.11**	**0.11**	**0.24**	<0.01	**0.02**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	MW08a	PB11	MW12	MW09	MW06
			Sampling date / time	18-Aug-2023 09:21	17-Aug-2023 11:08	17-Aug-2023 13:17	18-Aug-2023 08:18	18-Aug-2023 11:03
Compound	CAS Number	LOR	Unit	EP2311299-016	EP2311299-017	EP2311299-018	EP2311299-019	EP2311299-020
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.30**	**6.31**	**6.49**	**6.47**	**6.55**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**727**	**330**	**447**	**135**	**343**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**49**	**26**	**22**	**16**	**41**
Total Alkalinity as CaCO3	----	1	mg/L	**49**	**26**	**22**	**16**	**41**
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**61**	**32**	**16**	**21**	**34**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.004**	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.001**	**0.005**	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	**0.001**	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.001**	**0.001**	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	**0.028**	**0.040**	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	**----**	**5.47**	**----**	**----**	**----**
EG020T: Total Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	**0.006**	**0.005**	**0.004**	<0.001	**0.001**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.011**	**0.022**	**0.007**	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	**0.003**	**0.004**	**0.011**	**0.003**	**0.002**
Nickel	7440-02-0	0.001	mg/L	**0.002**	**0.024**	**0.002**	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	**0.004**	**0.009**	**0.002**	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	**0.010**	**0.076**	**0.049**	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L	**----**	**13.1**	**----**	**----**	**----**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW08a	PB11	MW12	MW09	MW06
				Sampling date / time	18-Aug-2023 09:21	17-Aug-2023 11:08	17-Aug-2023 13:17	18-Aug-2023 08:18	18-Aug-2023 11:03
Compound	CAS Number	LOR	Unit		EP2311299-016	EP2311299-017	EP2311299-018	EP2311299-019	EP2311299-020
					Result	Result	Result	Result	Result
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser - Continued									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	<0.01	**1.01**	**1.24**	**0.09**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**1.9**	**0.5**	**0.7**	**0.2**	**0.6**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**1.9**	**0.5**	**1.7**	**1.4**	**0.7**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.56**	**0.08**	**0.08**	**0.02**	**0.02**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW05	MW04	WQA02	----	----
				Sampling date / time	18-Aug-2023 12:31	07-Aug-2023 15:23	18-Aug-2023 11:04	----	----
Compound	CAS Number	LOR	Unit		EP2311299-021	EP2311299-022	EP2311299-023	--------	--------
					Result	Result	Result	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**6.82**	**7.11**	**6.69**	**----**	**----**
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**1220**	**5210**	**345**	**----**	**----**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	**----**	**----**
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	**----**	**----**
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**50**	**308**	**40**	**----**	**----**
Total Alkalinity as CaCO3	----	1	mg/L		**50**	**308**	**40**	**----**	**----**
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		**24**	**55**	**25**	**----**	**----**
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	**----**	**----**
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	**----**	**----**
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	**----**	**----**
Copper	7440-50-8	0.001	mg/L		<0.001	**0.002**	<0.001	**----**	**----**
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	**----**	**----**
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	**----**	**----**
Zinc	7440-66-6	0.005	mg/L		**0.008**	<0.005	**0.005**	**----**	**----**
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	**0.008**	**0.003**	**----**	**----**
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	**0.0001**	**----**	**----**
Chromium	7440-47-3	0.001	mg/L		**0.006**	<0.001	**0.002**	**----**	**----**
Copper	7440-50-8	0.001	mg/L		**0.005**	**0.011**	**0.003**	**----**	**----**
Nickel	7440-02-0	0.001	mg/L		**0.002**	**0.001**	**0.001**	**----**	**----**
Lead	7439-92-1	0.001	mg/L		**0.002**	<0.001	<0.001	**----**	**----**
Zinc	7440-66-6	0.005	mg/L		**0.010**	**0.006**	**0.006**	**----**	**----**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	**----**	**----**
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	**----**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	<0.01	**0.04**	**----**	**----**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW05	MW04	WQA02	----	----
				Sampling date / time	18-Aug-2023 12:31	07-Aug-2023 15:23	18-Aug-2023 11:04	----	----
Compound	CAS Number	LOR	Unit		EP2311299-021	EP2311299-022	EP2311299-023	--------	--------
					Result	Result	Result	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.7**	**0.6**	**1.1**	**----**	**----**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**0.7**	**0.6**	**1.1**	**----**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.06**	**0.06**	**0.04**	**----**	**----**

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	NC4	----	----	----	----
				Sampling date / time	16-Aug-2023 14:35	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2311299-007	--------	--------	--------	--------
					Result	----	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**7.26**	----	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**447**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**31**	----	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**52**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		**52**	----	----	----	----
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		**6**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	----	----	----	----
Copper	7440-50-8	0.001	mg/L		**0.003**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L		**0.001**	----	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	----	----	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.17**	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**2.3**	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**2.5**	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.26**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L		<50	----	----	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	NC4	----	----	----	----
				Sampling date / time	16-Aug-2023 14:35	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2311299-007	--------	--------	--------	--------
					Result	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons - Continued									
C15 - C28 Fraction	----	100	µg/L		<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L		<50	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	----	----	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	----	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	----	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	----	----	----	----
Toluene	108-88-3	2	µg/L		<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	----	----	----	----
^ Total Xylenes	----	2	µg/L		<2	----	----	----	----
^ Sum of BTEX	----	1	µg/L		<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	----	----	----	----
EP204: Glyphosate and AMPA									
Glyphosate	1071-83-6	10	µg/L		<10	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**104**	----	----	----	----
Toluene-D8	2037-26-5	2	%		**97.9**	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		**98.6**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: SURFACE WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP204: Glyphosate and AMPA

CERTIFICATE OF ANALYSIS

Work Order	: **EP2316233**	Page	: 1 of 13
Client	: **AECOM AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: SOPHIE JOHNSTONE	Contact	: Danae Hambly
Address	: LEVEL 2 181 ADELAIDE TERRACE PERTH WA, AUSTRALIA	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: 0478 926 928	Telephone	: +61-8-9406 1301
Project	: BORR - quarterly monitoring	Date Samples Received	: 17-Nov-2023 17:50
Order number	: 60644386	Date Analysis Commenced	: 21-Nov-2023
C-O-C number	: 59878	Issue Date	: 29-Nov-2023 23:47
Sampler	: SOPHIE JOHNSTONE		
Site	: Bunbury outer ring road		
Quote number	: EP/675/21_V3		
No. of samples received	: 19		
No. of samples analysed	: 19		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EK059G (NOx): LOR for sample EP2316233-002 raised due to possible sample matrix interference.
- EK061G (Total Kjeldahl Nitrogen as N)/EK067G (Total Phosphorus as P): Results of sample #3 and 4 have been confirmed by re-analysis from the same extract. Note sample #4 sulfuric acid preserved bottle contains more sediments than #3 which might contribute to results disparity, scrutinise results accordingly.
- EA010P: #3 and 4 electrical conductivity confirmed by re-preparation and re-analysis.
- EA005P (pH)/ED037P (Alkalinity): Results for sample #9 and 10 confirmed by re-preparation and re-analysis.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW31	MW27	MW25	WQA01	MW22
				Sampling date / time	09-Nov-2023 12:00	15-Nov-2023 09:46	15-Nov-2023 10:28	15-Nov-2023 10:28	15-Nov-2023 12:23
Compound	CAS Number	LOR	Unit		EP2316233-001	EP2316233-002	EP2316233-003	EP2316233-004	EP2316233-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		4.87	5.79	6.87	6.79	5.98
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		245	139	2250	2510	12100
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		<1	7	88	81	10
Total Alkalinity as CaCO3	----	1	mg/L		<1	7	88	81	10
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		45	51	60	56	97
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.04	<0.02	0.60	0.60	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		0.9	1.6	2.3	3.7	0.2
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		0.9	1.6	2.9	4.3	0.2
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.01	0.05	0.27	0.42	<0.01

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW22b	MW15	MW13	MW10	MW08a
				Sampling date / time	15-Nov-2023 12:04	15-Nov-2023 14:09	16-Nov-2023 09:10	16-Nov-2023 16:46	16-Nov-2023 13:05
Compound	CAS Number	LOR	Unit		EP2316233-006	EP2316233-007	EP2316233-008	EP2316233-011	EP2316233-012
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**7.29**	**6.62**	**7.37**	**6.64**	**6.98**
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**1380**	**496**	**622**	**429**	**732**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**72**	**26**	**220**	**19**	**68**
Total Alkalinity as CaCO3	----	1	mg/L		**72**	**26**	**220**	**19**	**68**
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		**22**	**53**	**75**	**37**	**42**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.02**	<0.01	<0.01	<0.01	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.4**	**1.6**	**1.3**	**0.6**	**2.4**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**0.4**	**1.6**	**1.3**	**0.6**	**2.4**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.01**	**0.02**	**0.09**	<0.01	**0.64**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	MW06	MW05	MW04	MW46	----
			Sampling date / time	16-Nov-2023 15:38	17-Nov-2023 10:20	17-Nov-2023 09:48	17-Nov-2023 09:03	----
Compound	CAS Number	LOR	Unit	EP2316233-013	EP2316233-014	EP2316233-015	EP2316233-016	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.56**	**6.96**	**7.58**	**6.71**	**----**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**887**	**2340**	**5100**	**1090**	**----**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	**----**
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	**----**
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**102**	**42**	**306**	**33**	**----**
Total Alkalinity as CaCO3	----	1	mg/L	**102**	**42**	**306**	**33**	**----**
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**20**	**36**	**70**	**35**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	**----**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**1.1**	**1.5**	**0.4**	**1.9**	**----**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**1.1**	**1.5**	**0.4**	**1.9**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.02**	**0.10**	**0.01**	**2.81**	**----**

Analytical Results

Sub-Matrix: RINSATE (Matrix: WATER)				Sample ID	MW31	MW27	MW25	WQA01	MW22
				Sampling date / time	09-Nov-2023 12:00	15-Nov-2023 09:46	15-Nov-2023 10:28	15-Nov-2023 10:28	15-Nov-2023 12:23
Compound	CAS Number	LOR	Unit		EP2316233-001	EP2316233-002	EP2316233-003	EP2316233-004	EP2316233-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.002**
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	**0.002**	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	**0.003**	**0.002**	<0.001
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	**0.007**	**0.007**	**0.067**
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	**0.042**	**0.037**	**0.032**
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	**0.002**	**0.002**	**0.004**
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	**0.0001**
Chromium	7440-47-3	0.001	mg/L		<0.001	**0.004**	**0.003**	**0.003**	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	**0.020**	**0.020**	<0.001
Nickel	7440-02-0	0.001	mg/L		<0.001	**0.002**	**0.008**	**0.008**	**0.065**
Lead	7439-92-1	0.001	mg/L		<0.001	**0.002**	**0.002**	**0.002**	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	**0.056**	**0.056**	**0.031**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: RINSATE (Matrix: WATER)				Sample ID	MW22b	MW15	MW13	WQA02	NC4
				Sampling date / time	15-Nov-2023 12:04	15-Nov-2023 14:09	16-Nov-2023 09:10	09-Nov-2023 12:02	16-Nov-2023 16:43
Compound	CAS Number	LOR	Unit		EP2316233-006	EP2316233-007	EP2316233-008	EP2316233-009	EP2316233-010
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	**0.003**	**0.004**
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	**0.001**	<0.001	**0.001**
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	**0.015**
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	**0.001**	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		**0.002**	<0.001	<0.001	**0.003**	**0.004**
Nickel	7440-02-0	0.001	mg/L		**0.002**	<0.001	**0.002**	**0.002**	**0.002**
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	**0.016**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: RINSATE (Matrix: WATER)				Sample ID	MW10	MW08a	MW06	MW05	MW04
				Sampling date / time	16-Nov-2023 16:46	16-Nov-2023 13:05	16-Nov-2023 15:38	17-Nov-2023 10:20	17-Nov-2023 09:48
Compound	CAS Number	LOR	Unit		EP2316233-011	EP2316233-012	EP2316233-013	EP2316233-014	EP2316233-015
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		**0.001**	**0.001**	**0.001**	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	**0.002**	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	**0.025**	<0.005
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		**0.002**	**0.007**	**0.002**	**0.002**	**0.003**
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		**0.002**	**0.015**	<0.001	**0.013**	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	**0.020**	**0.001**	**0.010**	<0.001
Nickel	7440-02-0	0.001	mg/L		<0.001	**0.007**	<0.001	**0.004**	**0.001**
Lead	7439-92-1	0.001	mg/L		<0.001	**0.027**	<0.001	**0.004**	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	**0.131**	<0.005	**0.026**	<0.005
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: RINSATE (Matrix: WATER)				Sample ID	MW46	WQA03	WQA04	WQA05	----
				Sampling date / time	17-Nov-2023 09:03	15-Nov-2023 16:21	16-Nov-2023 16:27	17-Nov-2023 10:27	----
Compound	CAS Number	LOR	Unit		EP2316233-016	EP2316233-017	EP2316233-018	EP2316233-019	--------
					Result	Result	Result	Result	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		----	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		----	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		----	<1	<1	<1	----
Total Alkalinity as CaCO3	----	1	mg/L		----	<1	<1	<1	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		----	<0.01	<0.01	<0.01	----
Arsenic	7440-38-2	0.001	mg/L		**0.002**	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L		**0.002**	<0.001	<0.001	<0.001	----
Cobalt	7440-48-4	0.001	mg/L		----	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Zinc	7440-66-6	0.005	mg/L		**0.093**	----	----	----	----
Manganese	7439-96-5	0.001	mg/L		----	<0.001	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L		----	<0.01	<0.01	<0.01	----
Iron	7439-89-6	0.05	mg/L		----	<0.05	<0.05	<0.05	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		----	<0.01	<0.01	<0.01	----
Arsenic	7440-38-2	0.001	mg/L		**0.003**	----	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	----	----	----	----
Chromium	7440-47-3	0.001	mg/L		**0.008**	----	----	----	----
Copper	7440-50-8	0.001	mg/L		**0.009**	----	----	----	----
Nickel	7440-02-0	0.001	mg/L		**0.004**	----	----	----	----
Lead	7439-92-1	0.001	mg/L		**0.009**	----	----	----	----
Zinc	7440-66-6	0.005	mg/L		**0.137**	----	----	----	----
Iron	7439-89-6	0.05	mg/L		----	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: RINSATE (Matrix: WATER)				Sample ID	MW46	WQA03	WQA04	WQA05	----
				Sampling date / time	17-Nov-2023 09:03	15-Nov-2023 16:21	16-Nov-2023 16:27	17-Nov-2023 10:27	----
Compound	CAS Number	LOR	Unit		EP2316233-016	EP2316233-017	EP2316233-018	EP2316233-019	--------
					Result	Result	Result	Result	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		----	<0.01	<0.01	<0.01	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		----	<0.1	<0.1	<0.1	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ **Total Nitrogen as N**	----	0.1	mg/L		----	<0.1	<0.1	<0.1	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		----	<0.01	<0.01	<0.01	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Sample ID	WQA02	NC4	----	----	----
			Sampling date / time	09-Nov-2023 12:02	16-Nov-2023 16:43	----	----	----
Compound	CAS Number	LOR	Unit	EP2316233-009	EP2316233-010	--------	--------	--------
				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.35**	**7.26**	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**3310**	**3280**	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**18**	**14**	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**24**	**66**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**24**	**66**	----	----	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**22**	**7**	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.22**	**0.21**	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**5.9**	**4.8**	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**6.1**	**5.0**	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.15**	**0.15**	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	**150**	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	**70**	**60**	----	----	----
^ C10 - C36 Fraction (sum)	----	50	µg/L	**220**	**60**	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	----	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	WQA02	NC4	----	----	----
				Sampling date / time	09-Nov-2023 12:02	16-Nov-2023 16:43	----	----	----
Compound	CAS Number	LOR	Unit		EP2316233-009	EP2316233-010	--------	--------	--------
					Result	Result	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L		**220**	**150**	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		**220**	**150**	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	----	----	----
Toluene	108-88-3	2	µg/L		<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	----	----	----
^ **Total Xylenes**	----	2	µg/L		<2	<2	----	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	<5	----	----	----
EP204: Glyphosate and AMPA									
Glyphosate	1071-83-6	10	µg/L		**99**	**96**	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**127**	**134**	----	----	----
Toluene-D8	2037-26-5	2	%		**96.2**	**94.8**	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		**86.8**	**93.0**	----	----	----

Surrogate Control Limits

Sub-Matrix: SURFACE WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP204: Glyphosate and AMPA

CERTIFICATE OF ANALYSIS

Work Order	: **EP2402322**	Page	: 1 of 26
Client	: **AECOM AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: SOPHIE JOHNSTONE	Contact	: Danae Hambly
Address	: LEVEL 2 181 ADELAIDE TERRACE PERTH WA, AUSTRALIA	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: 0478 926 928	Telephone	: +61-8-9406 1301
Project	: BORR - quarterly monitoring	Date Samples Received	: 22-Feb-2024 16:15
Order number	: 60644386	Date Analysis Commenced	: 22-Feb-2024
C-O-C number	: 63677	Issue Date	: 06-Mar-2024 17:56
Sampler	: SOPHIE JOHNSTONE		
Site	: BORR feb 2024		
Quote number	: EP/675/21_V4		
No. of samples received	: 21		
No. of samples analysed	: 21		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- EK071G (Reactive Phosphorus): LOR for sample EP2402322-014 raised due to possible sample matrix interference.
- ED041G (Sulfate Turbidimetric): LOR for sample EP2402322-001, -002, -006 and -011 raised due to possible sample matrix interference.
- EP068: High LCS recovery deemed acceptable as all associated analyte results are less than LOR.
- EG020: LCS recoveries for Cd, Fe fall outside ALS Dynamic Control Limit. However, they are within the acceptance criteria based on ALS DQO. No further action is required.
- EG020T: Al, Fe, Zn results for samples EP2402322-003, -004, -008 and -009 have been confirmed by re-digestion and re-analysis.
- EG020: It is recognised that various total metal concentrations are less than dissolved for various samples. However, the difference is within experimental variation of the methods.
- TDS by method EA-015 may bias high for sample #2 and #11 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EK055G-NH4: In the absence of available field data (pH and temperature), ammonium was calculated using the lab standard values. Please scrutinise accordingly. NATA accreditation does not cover this service.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW31	MW27	MW25	WQA01	MW22
				Sampling date / time	11-Feb-2024 14:08	14-Feb-2024 14:10	20-Feb-2024 11:45	20-Feb-2024 11:43	20-Feb-2024 13:31
Compound	CAS Number	LOR	Unit		EP2402322-001	EP2402322-002	EP2402322-003	EP2402322-004	EP2402322-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		5.51	6.37	6.41	6.45	5.84
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		706	162	3300	3220	12700
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		433	224	1890	1830	8140
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		5	30	63	65	12
Total Alkalinity as CaCO3	----	1	mg/L		5	30	63	65	12
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		64	49	95	90	111
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		<2	<20	60	61	399
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		222	27	900	890	3800
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.58	11.5	0.23	0.92	0.20
Iron	7439-89-6	0.05	mg/L		5.50	9.71	0.21	4.06	21.6
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		1.56	0.84	4.49	4.93	0.15
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		1.56	0.84	4.48	4.92	0.15
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.01	<0.01	0.70	0.76	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		3.4	3.8	7.4	7.4	0.2
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW31	MW27	MW25	WQA01	MW22
				Sampling date / time	11-Feb-2024 14:08	14-Feb-2024 14:10	20-Feb-2024 11:45	20-Feb-2024 11:43	20-Feb-2024 13:31
Compound	CAS Number	LOR	Unit		EP2402322-001	EP2402322-002	EP2402322-003	EP2402322-004	EP2402322-005
					Result	Result	Result	Result	Result
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser - Continued									
^ Total Nitrogen as N	----	0.1	mg/L		**3.4**	**3.8**	**8.1**	**8.2**	**0.2**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.12**	**0.17**	**0.71**	**0.73**	<0.01
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EK085M: Sulfide as S2-									
Sulfide as S2-	18496-25-8	0.1	mg/L		**0.8**	<0.1	<0.1	<0.1	<0.1
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**6.36**	**1.36**	**27.9**	**27.7**	**116**
ø Total Cations	----	0.01	meq/L		**5.79**	**----**	**----**	**22.9**	**----**
ø Total Cations	----	0.01	meq/L		**----**	**1.48**	**23.6**	**----**	**115**
ø Ionic Balance	----	0.01	%		**4.69**	**----**	**----**	**9.52**	**----**
ø Ionic Balance	----	0.01	%		**----**	**4.05**	**8.44**	**----**	**0.29**
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	919-86-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Monocrotophos	6923-22-4	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
Dimethoate	60-51-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	333-41-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	298-00-0	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
Malathion	121-75-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	55-38-9	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	2921-88-2	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	56-38-2	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
Pirimphos-ethyl	23505-41-1	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	470-90-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW31	MW27	MW25	WQA01	MW22
				Sampling date / time	11-Feb-2024 14:08	14-Feb-2024 14:10	20-Feb-2024 11:45	20-Feb-2024 11:43	20-Feb-2024 13:31
Compound	CAS Number	LOR	Unit		EP2402322-001	EP2402322-002	EP2402322-003	EP2402322-004	EP2402322-005
					Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued									
Bromophos-ethyl	4824-78-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Fenamiphos	22224-92-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	34643-46-4	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	563-12-2	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	786-19-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	86-50-0	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW31	MW27	MW25	WQA01	MW22
				Sampling date / time	11-Feb-2024 14:08	14-Feb-2024 14:10	20-Feb-2024 11:45	20-Feb-2024 11:43	20-Feb-2024 13:31
Compound	CAS Number	LOR	Unit		EP2402322-001	EP2402322-002	EP2402322-003	EP2402322-004	EP2402322-005
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP204: Glyphosate and AMPA									
Glyphosate	1071-83-6	10	µg/L		<10	<10	<10	<10	<10
AMPA	1066-51-9	10	µg/L		<10	<10	<10	<10	<10
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.5	%		**80.5**	**66.1**	**66.2**	**76.6**	**67.8**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.5	%		**96.6**	**75.1**	**75.4**	**84.7**	**73.5**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**119**	**111**	**122**	**120**	**117**
Toluene-D8	2037-26-5	2	%		**95.9**	**97.0**	**99.7**	**97.7**	**99.6**
4-Bromofluorobenzene	460-00-4	2	%		**105**	**103**	**107**	**104**	**108**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW15	MW13	MW10	MW08a	MW06
				Sampling date / time	21-Feb-2024 08:42	21-Feb-2024 08:15	21-Feb-2024 15:51	21-Feb-2024 11:23	22-Feb-2024 08:38
Compound	CAS Number	LOR	Unit		EP2402322-006	EP2402322-007	EP2402322-010	EP2402322-011	EP2402322-012
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		6.35	7.09	6.29	6.24	6.60
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		782	774	546	741	771
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		455	514	341	763	464
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		37	276	22	81	39
Total Alkalinity as CaCO3	----	1	mg/L		37	276	22	81	39
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		61	88	39	60	36
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		<5	55	53	<10	92
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		226	52	123	188	153
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.25	0.18	1.18	41.0	0.40
Iron	7439-89-6	0.05	mg/L		5.24	8.61	4.52	8.80	6.87
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		2.84	1.64	0.34	0.57	0.44
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		2.84	1.63	0.34	0.57	0.44
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	0.02	<0.01	<0.01	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		3.2	3.6	1.3	7.9	2.0
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW15	MW13	MW10	MW08a	MW06
				Sampling date / time	21-Feb-2024 08:42	21-Feb-2024 08:15	21-Feb-2024 15:51	21-Feb-2024 11:23	22-Feb-2024 08:38
Compound	CAS Number	LOR	Unit		EP2402322-006	EP2402322-007	EP2402322-010	EP2402322-011	EP2402322-012
					Result	Result	Result	Result	Result
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser - Continued									
^ Total Nitrogen as N	----	0.1	mg/L		**3.2**	**3.6**	**1.3**	**7.9**	**2.0**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.05**	**0.52**	**0.04**	**1.88**	**0.08**
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	**0.20**	<0.01	**0.42**	<0.01
EK085M: Sulfide as S2-									
Sulfide as S2-	18496-25-8	0.1	mg/L		**0.3**	**0.7**	<0.1	<0.1	**0.2**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**7.11**	**8.13**	**5.01**	**6.92**	**7.01**
ø Total Cations	----	0.01	meq/L		**5.94**	**----**	**4.41**	**6.22**	**----**
ø Total Cations	----	0.01	meq/L		**----**	**7.39**	**----**	**----**	**7.53**
ø Ionic Balance	----	0.01	%		**9.00**	**----**	**6.41**	**5.35**	**----**
ø Ionic Balance	----	0.01	%		**----**	**4.72**	**----**	**----**	**3.58**
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	919-86-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Monocrotophos	6923-22-4	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
Dimethoate	60-51-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	333-41-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	298-00-0	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
Malathion	121-75-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	55-38-9	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	2921-88-2	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	56-38-2	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
Pirimphos-ethyl	23505-41-1	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	470-90-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW15	MW13	MW10	MW08a	MW06
				Sampling date / time	21-Feb-2024 08:42	21-Feb-2024 08:15	21-Feb-2024 15:51	21-Feb-2024 11:23	22-Feb-2024 08:38
Compound	CAS Number	LOR	Unit		EP2402322-006	EP2402322-007	EP2402322-010	EP2402322-011	EP2402322-012
					Result	Result	Result	Result	Result
EP068B: Organophosphorus Pesticides (OP) - Continued									
Bromophos-ethyl	4824-78-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Fenamiphos	22224-92-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	34643-46-4	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	563-12-2	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	786-19-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	86-50-0	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	**110**	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	**110**	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW15	MW13	MW10	MW08a	MW06
				Sampling date / time	21-Feb-2024 08:42	21-Feb-2024 08:15	21-Feb-2024 15:51	21-Feb-2024 11:23	22-Feb-2024 08:38
Compound	CAS Number	LOR	Unit		EP2402322-006	EP2402322-007	EP2402322-010	EP2402322-011	EP2402322-012
					Result	Result	Result	Result	Result
EP080: BTEXN - Continued									
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP204: Glyphosate and AMPA									
Glyphosate	1071-83-6	10	µg/L		<10	<10	<10	<10	<10
AMPA	1066-51-9	10	µg/L		<10	<10	<10	<10	<10
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.5	%		**66.3**	**65.7**	**55.2**	**67.0**	**56.0**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.5	%		**76.7**	**76.9**	**63.1**	**45.3**	**63.8**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**118**	**113**	**114**	**113**	**113**
Toluene-D8	2037-26-5	2	%		**99.0**	**93.4**	**95.8**	**95.3**	**95.5**
4-Bromofluorobenzene	460-00-4	2	%		**105**	**100**	**106**	**104**	**105**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW05	MW04	WQA03	MW46	----
				Sampling date / time	22-Feb-2024 09:40	22-Feb-2024 09:10	22-Feb-2024 08:35	21-Feb-2024 09:24	----
Compound	CAS Number	LOR	Unit		EP2402322-013	EP2402322-014	EP2402322-015	EP2402322-016	--------
					Result	Result	Result	Result	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		6.78	7.23	6.62	6.34	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		3110	5470	715	637	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		2300	3180	467	474	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		50	304	39	53	----
Total Alkalinity as CaCO3	----	1	mg/L		50	304	39	53	----
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		24	81	30	100	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		973	346	96	24	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		475	1270	144	153	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		1.95	0.01	0.38	0.60	----
Iron	7439-89-6	0.05	mg/L		3.72	10.6	6.75	30.6	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.22	0.28	0.43	1.23	----
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		0.22	0.28	0.43	1.23	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	<0.01	0.03	<0.01	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		0.9	0.4	2.0	2.9	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW05	MW04	WQA03	MW46	----
				Sampling date / time	22-Feb-2024 09:40	22-Feb-2024 09:10	22-Feb-2024 08:35	21-Feb-2024 09:24	----
Compound	CAS Number	LOR	Unit		EP2402322-013	EP2402322-014	EP2402322-015	EP2402322-016	--------
					Result	Result	Result	Result	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser - Continued									
^ Total Nitrogen as N	----	0.1	mg/L		**0.9**	**0.4**	**2.0**	**2.9**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.04**	**0.02**	**0.08**	**0.26**	**----**
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.05	<0.01	**0.01**	**----**
EK085M: Sulfide as S2-									
Sulfide as S2-	18496-25-8	0.1	mg/L		<0.1	<0.1	**0.2**	**1.2**	**----**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**34.6**	**49.1**	**6.84**	**5.87**	**----**
ø Total Cations	----	0.01	meq/L		**----**	**----**	**----**	**6.01**	**----**
ø Total Cations	----	0.01	meq/L		**32.1**	**46.4**	**7.53**	**----**	**----**
ø Ionic Balance	----	0.01	%		**----**	**----**	**----**	**1.14**	**----**
ø Ionic Balance	----	0.01	%		**3.89**	**2.86**	**4.81**	**----**	**----**
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	**----**
Demeton-S-methyl	919-86-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	**----**
Monocrotophos	6923-22-4	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	**----**
Dimethoate	60-51-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	**----**
Diazinon	333-41-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	**----**
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	**----**
Parathion-methyl	298-00-0	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	**----**
Malathion	121-75-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	**----**
Fenthion	55-38-9	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	**----**
Chlorpyrifos	2921-88-2	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	**----**
Parathion	56-38-2	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	**----**
Pirimphos-ethyl	23505-41-1	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	**----**
Chlorfenvinphos	470-90-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	**----**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW05	MW04	WQA03	MW46	----
				Sampling date / time	22-Feb-2024 09:40	22-Feb-2024 09:10	22-Feb-2024 08:35	21-Feb-2024 09:24	----
Compound	CAS Number	LOR	Unit		EP2402322-013	EP2402322-014	EP2402322-015	EP2402322-016	--------
					Result	Result	Result	Result	----
EP068B: Organophosphorus Pesticides (OP) - Continued									
Bromophos-ethyl	4824-78-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Fenamiphos	22224-92-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Prothiofos	34643-46-4	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Ethion	563-12-2	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Carbophenothion	786-19-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Azinphos Methyl	86-50-0	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	----
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	----
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	**110**	----
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	**210**	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	**320**	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	----
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	----
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	**300**	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	**300**	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	----
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW05	MW04	WQA03	MW46	----
				Sampling date / time	22-Feb-2024 09:40	22-Feb-2024 09:10	22-Feb-2024 08:35	21-Feb-2024 09:24	----
Compound	CAS Number	LOR	Unit		EP2402322-013	EP2402322-014	EP2402322-015	EP2402322-016	--------
					Result	Result	Result	Result	----
EP080: BTEXN - Continued									
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	----
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	----
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	----
EP204: Glyphosate and AMPA									
Glyphosate	1071-83-6	10	µg/L		<10	<10	<10	<10	----
AMPA	1066-51-9	10	µg/L		<10	<10	<10	<10	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.5	%		**62.1**	**58.7**	**58.9**	**63.8**	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.5	%		**63.6**	**55.4**	**65.2**	**69.6**	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**108**	**110**	**110**	**107**	----
Toluene-D8	2037-26-5	2	%		**94.3**	**95.0**	**96.3**	**95.9**	----
4-Bromofluorobenzene	460-00-4	2	%		**95.0**	**94.2**	**95.9**	**103**	----

Analytical Results

Sub-Matrix: **RINSATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	MW31	MW27	MW25	WQA01	MW22
				Sampling date / time	11-Feb-2024 14:08	14-Feb-2024 14:10	20-Feb-2024 11:45	20-Feb-2024 11:43	20-Feb-2024 13:31
					EP2402322-001	EP2402322-002	EP2402322-003	EP2402322-004	EP2402322-005
					Result	Result	Result	Result	Result
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**8**	**2**	**22**	**20**	**90**
Magnesium	7439-95-4	1	mg/L		**18**	**5**	**60**	**43**	**328**
Sodium	7440-23-5	1	mg/L		**78**	**21**	**398**	**409**	**1920**
Potassium	7440-09-7	1	mg/L		**8**	**2**	**8**	**4**	**3**
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.31**	**0.82**	<0.01	<0.01	**0.02**
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.005**
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	**0.002**	<0.001	<0.001	<0.001
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	**0.021**	**0.020**	**0.164**
Copper	7440-50-8	0.001	mg/L		<0.001	**0.001**	**0.002**	**0.002**	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.024**	**0.008**	**0.278**	**0.282**	**0.450**
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	**0.010**	**0.011**	**0.077**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		**0.008**	<0.005	**0.025**	**0.026**	**0.042**
Iron	7439-89-6	0.05	mg/L		**3.14**	**2.03**	**1.49**	**1.52**	**19.4**

Analytical Results

Sub-Matrix: **RINSATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	MW15	MW13	NC4	WQA02	MW10
				Sampling date / time	21-Feb-2024 08:42	21-Feb-2024 08:15	19-Feb-2024 15:43	20-Feb-2024 14:05	21-Feb-2024 15:51
					EP2402322-006	EP2402322-007	EP2402322-008	EP2402322-009	EP2402322-010
					Result	Result	Result	Result	Result
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**10**	**6**	----	----	**12**
Magnesium	7439-95-4	1	mg/L		**10**	**10**	----	----	**13**
Sodium	7440-23-5	1	mg/L		**92**	**143**	----	----	**57**
Potassium	7440-09-7	1	mg/L		**10**	**2**	----	----	**6**
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.12**	**0.02**	----	----	**0.06**
Arsenic	7440-38-2	0.001	mg/L		<0.001	**0.002**	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	**0.001**
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	----	----	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	**0.002**	**0.004**	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.004**	**0.008**	----	----	**0.014**
Nickel	7440-02-0	0.001	mg/L		<0.001	**0.002**	**0.002**	**0.003**	<0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	----	----	<0.01
Zinc	7440-66-6	0.005	mg/L		**0.007**	**0.012**	**0.048**	**0.032**	**0.012**
Iron	7439-89-6	0.05	mg/L		**2.69**	**3.78**	----	----	**1.43**
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		----	----	<0.0001	<0.0001	----

Analytical Results

Sub-Matrix: **RINSATE** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	MW08a	MW06	MW05	MW04	WQA03
				Sampling date / time	21-Feb-2024 11:23	22-Feb-2024 08:38	22-Feb-2024 09:40	22-Feb-2024 09:10	22-Feb-2024 08:35
					EP2402322-011	EP2402322-012	EP2402322-013	EP2402322-014	EP2402322-015
					Result	Result	Result	Result	Result
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**19**	**36**	**150**	**181**	**36**
Magnesium	7439-95-4	1	mg/L		**14**	**9**	**112**	**82**	**9**
Sodium	7440-23-5	1	mg/L		**83**	**106**	**346**	**701**	**106**
Potassium	7440-09-7	1	mg/L		**14**	**15**	**12**	**4**	**15**
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.56**	**0.08**	<0.01	<0.01	**0.08**
Arsenic	7440-38-2	0.001	mg/L		**0.007**	**0.001**	<0.001	**0.001**	**0.001**
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		**0.002**	<0.001	<0.001	<0.001	<0.001
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	**0.001**	<0.001
Copper	7440-50-8	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.080**	**0.109**	**0.039**	**0.177**	**0.112**
Nickel	7440-02-0	0.001	mg/L		**0.002**	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		**0.050**	<0.005	**0.005**	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L		**0.90**	**2.66**	**1.79**	**6.17**	**2.95**

Analytical Results

Sub-Matrix: RINSATE (Matrix: WATER)				Sample ID	MW46	WQA04	WQA05	WQA06	----
				Sampling date / time	21-Feb-2024 09:24	20-Feb-2024 16:11	21-Feb-2024 16:13	22-Feb-2024 10:19	----
Compound	CAS Number	LOR	Unit		EP2402322-016	EP2402322-017	EP2402322-018	EP2402322-019	--------
					Result	Result	Result	Result	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**19**	<1	<1	<1	----
Magnesium	7439-95-4	1	mg/L		**8**	<1	<1	<1	----
Sodium	7440-23-5	1	mg/L		**67**	<1	<1	<1	----
Potassium	7440-09-7	1	mg/L		**6**	<1	<1	<1	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.08**	<0.01	<0.01	<0.01	----
Arsenic	7440-38-2	0.001	mg/L		**0.003**	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L		**0.002**	<0.001	<0.001	<0.001	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Manganese	7439-96-5	0.001	mg/L		**0.159**	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	----
Iron	7439-89-6	0.05	mg/L		**24.9**	<0.05	<0.05	<0.05	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		----	<0.01	<0.01	<0.01	----
Iron	7439-89-6	0.05	mg/L		----	<0.05	<0.05	<0.05	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		----	<0.01	<0.01	<0.01	----
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		----	<0.01	<0.01	<0.01	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		----	<0.01	<0.01	<0.01	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									

Analytical Results

Sub-Matrix: RINSATE (Matrix: WATER)				Sample ID	MW46	WQA04	WQA05	WQA06	----
				Sampling date / time	21-Feb-2024 09:24	20-Feb-2024 16:11	21-Feb-2024 16:13	22-Feb-2024 10:19	----
Compound	CAS Number	LOR	Unit		EP2402322-016	EP2402322-017	EP2402322-018	EP2402322-019	--------
					Result	Result	Result	Result	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		----	<0.1	<0.1	<0.1	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		----	<0.1	<0.1	<0.1	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		----	<0.01	<0.01	<0.01	----
EK085M: Sulfide as S2-									
Sulfide as S2-	18496-25-8	0.1	mg/L		----	<0.1	<0.1	<0.1	----
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.5	µg/L		----	<0.5	<0.5	<0.5	----
Demeton-S-methyl	919-86-8	0.5	µg/L		----	<0.5	<0.5	<0.5	----
Monocrotophos	6923-22-4	2.0	µg/L		----	<2.0	<2.0	<2.0	----
Dimethoate	60-51-5	0.5	µg/L		----	<0.5	<0.5	<0.5	----
Diazinon	333-41-5	0.5	µg/L		----	<0.5	<0.5	<0.5	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L		----	<0.5	<0.5	<0.5	----
Parathion-methyl	298-00-0	2.0	µg/L		----	<2.0	<2.0	<2.0	----
Malathion	121-75-5	0.5	µg/L		----	<0.5	<0.5	<0.5	----
Fenthion	55-38-9	0.5	µg/L		----	<0.5	<0.5	<0.5	----
Chlorpyrifos	2921-88-2	0.5	µg/L		----	<0.5	<0.5	<0.5	----
Parathion	56-38-2	2.0	µg/L		----	<2.0	<2.0	<2.0	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L		----	<0.5	<0.5	<0.5	----
Chlorfenvinphos	470-90-6	0.5	µg/L		----	<0.5	<0.5	<0.5	----
Bromophos-ethyl	4824-78-6	0.5	µg/L		----	<0.5	<0.5	<0.5	----
Fenamiphos	22224-92-6	0.5	µg/L		----	<0.5	<0.5	<0.5	----
Prothiofos	34643-46-4	0.5	µg/L		----	<0.5	<0.5	<0.5	----
Ethion	563-12-2	0.5	µg/L		----	<0.5	<0.5	<0.5	----
Carbophenothion	786-19-6	0.5	µg/L		----	<0.5	<0.5	<0.5	----
Azinphos Methyl	86-50-0	0.5	µg/L		----	<0.5	<0.5	<0.5	----

Analytical Results

Sub-Matrix: RINSATE (Matrix: WATER)				Sample ID	MW46	WQA04	WQA05	WQA06	----
				Sampling date / time	21-Feb-2024 09:24	20-Feb-2024 16:11	21-Feb-2024 16:13	22-Feb-2024 10:19	----
Compound	CAS Number	LOR	Unit		EP2402322-016	EP2402322-017	EP2402322-018	EP2402322-019	--------
					Result	Result	Result	Result	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		----	<20	<20	<20	----
C10 - C14 Fraction	----	50	µg/L		----	<50	<50	<50	----
C15 - C28 Fraction	----	100	µg/L		----	<100	<100	<100	----
C29 - C36 Fraction	----	50	µg/L		----	<50	<50	<50	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		----	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		----	<20	<20	<20	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		----	<20	<20	<20	----
>C10 - C16 Fraction	----	100	µg/L		----	<100	<100	<100	----
>C16 - C34 Fraction	----	100	µg/L		----	<100	<100	<100	----
>C34 - C40 Fraction	----	100	µg/L		----	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		----	<100	<100	<100	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		----	<100	<100	<100	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		----	<1	<1	<1	----
Toluene	108-88-3	2	µg/L		----	<2	<2	<2	----
Ethylbenzene	100-41-4	2	µg/L		----	<2	<2	<2	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		----	<2	<2	<2	----
ortho-Xylene	95-47-6	2	µg/L		----	<2	<2	<2	----
^ Total Xylenes	----	2	µg/L		----	<2	<2	<2	----
^ Sum of BTEX	----	1	µg/L		----	<1	<1	<1	----
Naphthalene	91-20-3	5	µg/L		----	<5	<5	<5	----
EP204: Glyphosate and AMPA									
Glyphosate	1071-83-6	10	µg/L		----	<10	<10	<10	----
AMPA	1066-51-9	10	µg/L		----	<10	<10	<10	----
EP068S: Organochlorine Pesticide Surrogate									

Analytical Results

Sub-Matrix: RINSATE (Matrix: WATER)				Sample ID	MW46	WQA04	WQA05	WQA06	----
				Sampling date / time	21-Feb-2024 09:24	20-Feb-2024 16:11	21-Feb-2024 16:13	22-Feb-2024 10:19	----
Compound	CAS Number	LOR	Unit		EP2402322-016	EP2402322-017	EP2402322-018	EP2402322-019	--------
					Result	Result	Result	Result	----
EP068S: Organochlorine Pesticide Surrogate - Continued									
Dibromo-DDE	21655-73-2	0.5	%		----	65.8	70.1	59.3	----
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.5	%		----	61.2	57.6	45.1	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		----	110	110	110	----
Toluene-D8	2037-26-5	2	%		----	94.3	96.4	95.4	----
4-Bromofluorobenzene	460-00-4	2	%		----	98.2	104	101	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	NC4	WQA02	----	----	----
				Sampling date / time	19-Feb-2024 15:43	20-Feb-2024 14:05	----	----	----
Compound	CAS Number	LOR	Unit		EP2402322-008	EP2402322-009	--------	--------	--------
					Result	Result	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**7.67**	**7.74**	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**3860**	**3860**	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**6**	**8**	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**116**	**117**	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		**116**	**117**	----	----	----
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		**8**	**7**	----	----	----
EG020T: Total Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L		**0.002**	**0.005**	----	----	----
Nickel	7440-02-0	0.001	mg/L		**0.002**	**0.003**	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L		**0.019**	**0.054**	----	----	----
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	<0.01	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**2.4**	**3.3**	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**2.4**	**3.3**	----	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	NC4	WQA02	----	----	----
				Sampling date / time	19-Feb-2024 15:43	20-Feb-2024 14:05	----	----	----
Compound	CAS Number	LOR	Unit		EP2402322-008	EP2402322-009	--------	--------	--------
					Result	Result	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.24**	**0.24**	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	----	----	----
C10 - C14 Fraction	----	50	µg/L		<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L		<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L		<50	<50	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	----	----	----
>C10 - C16 Fraction	----	100	µg/L		<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L		<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	----	----	----
Toluene	108-88-3	2	µg/L		<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	----	----	----
^ **Total Xylenes**	----	2	µg/L		<2	<2	----	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	<5	----	----	----
EP204: Glyphosate and AMPA									
Glyphosate	1071-83-6	10	µg/L		<10	<10	----	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	NC4	WQA02	----	----	----
				Sampling date / time	19-Feb-2024 15:43	20-Feb-2024 14:05	----	----	----
Compound	CAS Number	LOR	Unit		EP2402322-008	EP2402322-009	--------	--------	--------
					Result	Result	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**106**	**109**	**----**	**----**	**----**
Toluene-D8	2037-26-5	2	%		**94.9**	**89.5**	**----**	**----**	**----**
4-Bromofluorobenzene	460-00-4	2	%		**100**	**98.8**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	TBW 1555	TBW 1559	----	----	----
				Sampling date / time	11-Feb-2024 00:00	11-Feb-2024 00:00	----	----	----
Compound	CAS Number	LOR	Unit		EP2402322-020	EP2402322-021	--------	--------	--------
					Result	Result	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	----	----	----
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	----	----	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	----	----	----
Toluene	108-88-3	2	µg/L		<2	<2	----	----	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	----	----	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	----	----	----
^ **Total Xylenes**	----	2	µg/L		<2	<2	----	----	----
^ **Sum of BTEX**	----	1	µg/L		<1	<1	----	----	----
Naphthalene	91-20-3	5	µg/L		<5	<5	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**110**	**113**	----	----	----
Toluene-D8	2037-26-5	2	%		**94.0**	**94.0**	----	----	----
4-Bromofluorobenzene	460-00-4	2	%		**101**	**103**	----	----	----

Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	50	146
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	27	153
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125

Sub-Matrix: RINSATE		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	50	146
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	27	153
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125

Sub-Matrix: SURFACE WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP204: Glyphosate and AMPA

CERTIFICATE OF ANALYSIS

Work Order	: **EP2406596**	Page	: 1 of 18
Client	: **AECOM AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: SOPHIE JOHNSTONE	Contact	: Natalie Duncan
Address	: LEVEL 2 181 ADELAIDE TERRACE PERTH WA, AUSTRALIA	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: 0478 926 928	Telephone	: +61-8-9406 1301
Project	: BORR - quarterly monitoring	Date Samples Received	: 16-May-2024 16:30
Order number	: 60644386	Date Analysis Commenced	: 16-May-2024
C-O-C number	: 67086	Issue Date	: 30-May-2024 22:48
Sampler	: SOPHIE JOHNSTONE		
Site	: Bunbury		
Quote number	: EP/675/21_V4		
No. of samples received	: 14		
No. of samples analysed	: 14		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Nancy Wang	2IC Organic Chemist	Perth Organics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP068: Where reported, Total Chlordane (sum) is the sum of the reported concentrations of cis-Chlordane and trans-Chlordane at or above the LOR.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- EK071G (Reactive Phosphorus as P): LOR raised for sample 6 due to possible sample matrix interference.
  ED041G (Turbidimetric Sulphate): LOR raised for samples 1, 3, 4 and 13 due to possible sample matrix interference.
- ED093: LCS recovery for K falls outside ALS Dynamic Control Limit. However, it is within the acceptance criteria based on ALS DQO. No further action is required.
- EG020A-F: Al, Mn and Fe results for EP2406596 -008 and 009 have been confirmed by re-preparation and re-analysis.
- EG020-F: Fe results for EP2406596 -011 and 012 have been confirmed by re-preparation and re-analysis.
- TDS by method EA-015 may bias high for sample #3 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic Balance out of acceptable limits for sample #3 due to analytes not quantified in this report.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - ammonia as N, calcium, magnesium, potassium and sodium for sample #13.
- EK055G-NH4: In the absence of available field data (pH and temperature), ammonium was calculated using the lab standard values. Please scrutinise accordingly. NATA accreditation does not cover this service.
- EP068: High LCS recovery deemed acceptable as all associated target analytes are less than LOR.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW31	MW25	MW27	MW08a	MW46
				Sampling date / time	06-May-2024 14:05	14-May-2024 11:13	14-May-2024 13:30	14-May-2024 15:33	15-May-2024 08:03
Compound	CAS Number	LOR	Unit		EP2406596-001	EP2406596-002	EP2406596-003	EP2406596-004	EP2406596-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		5.79	6.56	6.48	6.86	6.65
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		905	3950	163	776	971
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		460	2010	188	504	578
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		6	52	25	80	38
Total Alkalinity as CaCO3	----	1	mg/L		6	52	25	80	38
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		80	105	60	71	53
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		<5	62	<20	<20	123
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		282	1110	29	204	212
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		12	24	2	27	52
Magnesium	7439-95-4	1	mg/L		23	68	6	18	10
Sodium	7440-23-5	1	mg/L		104	605	22	94	114
Potassium	7440-09-7	1	mg/L		12	5	2	16	10
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.36	<0.01	1.03	0.22	0.04
Arsenic	7440-38-2	0.001	mg/L		<0.001	0.001	<0.001	0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	0.002	<0.001	0.003
Cobalt	7440-48-4	0.001	mg/L		<0.001	0.030	<0.001	<0.001	0.002

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW31	MW25	MW27	MW08a	MW46
				Sampling date / time	06-May-2024 14:05	14-May-2024 11:13	14-May-2024 13:30	14-May-2024 15:33	15-May-2024 08:03
Compound	CAS Number	LOR	Unit		EP2406596-001	EP2406596-002	EP2406596-003	EP2406596-004	EP2406596-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.031**	**0.504**	**0.007**	**0.087**	**0.396**
Nickel	7440-02-0	0.001	mg/L		<0.001	**0.011**	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		<0.005	**0.011**	**0.020**	<0.005	**0.008**
Iron	7439-89-6	0.05	mg/L		**6.81**	**8.06**	**2.77**	**0.80**	**8.39**
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.40**	**1.23**	**3.00**	**3.31**	**0.46**
Iron	7439-89-6	0.05	mg/L		**7.26**	**11.2**	**4.41**	**1.72**	**16.8**
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**1.73**	**0.37**	**0.81**	**0.51**	**1.13**
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		**1.73**	**0.37**	**0.81**	**0.51**	**1.13**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	**0.03**	<0.01	<0.01	**0.01**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**2.2**	**0.9**	**2.0**	**3.2**	**2.2**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**2.2**	**0.9**	**2.0**	**3.2**	**2.2**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.01**	**0.10**	**0.03**	**0.65**	**0.21**
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	<0.01	**0.47**	**0.09**
EK085M: Sulfide as S2-									
Sulfide as S2-	18496-25-8	0.1	mg/L		**0.6**	<0.1	**0.2**	<0.1	**0.8**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**8.07**	**33.6**	**1.32**	**7.35**	**9.30**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW31	MW25	MW27	MW08a	MW46
				Sampling date / time	06-May-2024 14:05	14-May-2024 11:13	14-May-2024 13:30	14-May-2024 15:33	15-May-2024 08:03
Compound	CAS Number	LOR	Unit		EP2406596-001	EP2406596-002	EP2406596-003	EP2406596-004	EP2406596-005
					Result	Result	Result	Result	Result
EN055: Ionic Balance - Continued									
ø Total Cations	----	0.01	meq/L		**7.32**	**33.2**	**1.60**	**7.33**	**8.63**
ø Ionic Balance	----	0.01	%		**4.89**	**0.60**	**9.73**	**0.18**	**3.72**
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	919-86-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Monocrotophos	6923-22-4	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
Dimethoate	60-51-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	333-41-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	298-00-0	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
Malathion	121-75-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	55-38-9	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	2921-88-2	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	56-38-2	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
Pirimphos-ethyl	23505-41-1	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	470-90-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	4824-78-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Fenamiphos	22224-92-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	34643-46-4	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	563-12-2	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	786-19-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	86-50-0	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW31	MW25	MW27	MW08a	MW46
				Sampling date / time	06-May-2024 14:05	14-May-2024 11:13	14-May-2024 13:30	14-May-2024 15:33	15-May-2024 08:03
Compound	CAS Number	LOR	Unit		EP2406596-001	EP2406596-002	EP2406596-003	EP2406596-004	EP2406596-005
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	<100
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ Total Xylenes	----	2	µg/L		<2	<2	<2	<2	<2
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP204: Glyphosate and AMPA									
Glyphosate	1071-83-6	10	µg/L		<10	<10	<10	<10	<10
AMPA	1066-51-9	10	µg/L		<10	<10	<10	<10	<10
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.5	%		**64.5**	**71.2**	**59.6**	**92.5**	**72.8**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.5	%		**53.3**	**57.4**	**57.0**	**90.1**	**73.0**
EP080S: TPH(V)/BTEX Surrogates									

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW31	MW25	MW27	MW08a	MW46
				Sampling date / time	06-May-2024 14:05	14-May-2024 11:13	14-May-2024 13:30	14-May-2024 15:33	15-May-2024 08:03
Compound	CAS Number	LOR	Unit		EP2406596-001	EP2406596-002	EP2406596-003	EP2406596-004	EP2406596-005
					Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates - Continued									
1.2-Dichloroethane-D4	17060-07-0	2	%		**102**	**101**	**102**	**104**	**104**
Toluene-D8	2037-26-5	2	%		**97.0**	**94.8**	**95.1**	**96.4**	**96.1**
4-Bromofluorobenzene	460-00-4	2	%		**107**	**107**	**105**	**104**	**103**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW04	MW05	MW06	WQA1	MW10
				Sampling date / time	15-May-2024 09:45	15-May-2024 10:18	15-May-2024 11:02	15-May-2024 11:04	15-May-2024 15:12
Compound	CAS Number	LOR	Unit		EP2406596-006	EP2406596-007	EP2406596-008	EP2406596-009	EP2406596-010
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.47	7.11	6.00	6.15	6.60
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		5180	2250	1140	1130	504
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		3120	1340	753	746	292
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		305	51	7	9	20
Total Alkalinity as CaCO3	----	1	mg/L		305	51	7	9	20
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		97	30	44	45	42
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		321	530	290	296	45
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		1300	331	154	157	109
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		222	95	107	105	14
Magnesium	7439-95-4	1	mg/L		83	63	12	11	14
Sodium	7440-23-5	1	mg/L		753	251	94	96	55
Potassium	7440-09-7	1	mg/L		6	11	13	13	6
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	0.07	0.11	0.06
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	0.001
Cobalt	7440-48-4	0.001	mg/L		0.001	<0.001	0.018	0.020	<0.001

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW04	MW05	MW06	WQA1	MW10
				Sampling date / time	15-May-2024 09:45	15-May-2024 10:18	15-May-2024 11:02	15-May-2024 11:04	15-May-2024 15:12
Compound	CAS Number	LOR	Unit		EP2406596-006	EP2406596-007	EP2406596-008	EP2406596-009	EP2406596-010
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.178**	**0.018**	**0.109**	**0.075**	**0.009**
Nickel	7440-02-0	0.001	mg/L		**0.001**	<0.001	**0.028**	**0.032**	<0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Iron	7439-89-6	0.05	mg/L		**3.14**	**1.34**	**9.74**	**11.8**	**1.62**
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.51**	**0.02**	**0.23**	**0.21**	**0.28**
Iron	7439-89-6	0.05	mg/L		**16.1**	**1.48**	**15.8**	**15.0**	**2.36**
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.25**	**0.09**	**0.15**	**0.18**	**0.16**
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		**0.24**	**0.09**	**0.15**	**0.18**	**0.16**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	**0.03**	<0.01	**0.01**	**0.01**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.5**	**0.5**	**1.2**	**1.1**	**0.8**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**0.5**	**0.5**	**1.2**	**1.1**	**0.8**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.05**	**0.02**	**0.03**	**0.02**	**0.01**
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.05	**0.01**	<0.01	**0.01**	<0.01
EK085M: Sulfide as S2-									
Sulfide as S2-	18496-25-8	0.1	mg/L		<0.1	**0.5**	<0.1	**0.2**	<0.1
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**49.4**	**21.4**	**10.5**	**10.8**	**4.41**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW04	MW05	MW06	WQA1	MW10
				Sampling date / time	15-May-2024 09:45	15-May-2024 10:18	15-May-2024 11:02	15-May-2024 11:04	15-May-2024 15:12
Compound	CAS Number	LOR	Unit		EP2406596-006	EP2406596-007	EP2406596-008	EP2406596-009	EP2406596-010
					Result	Result	Result	Result	Result
EN055: Ionic Balance - Continued									
ø Total Cations	----	0.01	meq/L		**50.8**	**21.1**	**10.7**	**10.6**	**4.40**
ø Ionic Balance	----	0.01	%		**1.36**	**0.62**	**1.06**	**0.55**	**0.16**
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Demeton-S-methyl	919-86-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Monocrotophos	6923-22-4	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
Dimethoate	60-51-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	333-41-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Parathion-methyl	298-00-0	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
Malathion	121-75-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	55-38-9	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	2921-88-2	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	56-38-2	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	<2.0
Pirimphos-ethyl	23505-41-1	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Chlorfenvinphos	470-90-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Bromophos-ethyl	4824-78-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Fenamiphos	22224-92-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	34643-46-4	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	563-12-2	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Carbophenothion	786-19-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
Azinphos Methyl	86-50-0	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	<0.5
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	<50

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW04	MW05	MW06	WQA1	MW10
				Sampling date / time	15-May-2024 09:45	15-May-2024 10:18	15-May-2024 11:02	15-May-2024 11:04	15-May-2024 15:12
Compound	CAS Number	LOR	Unit		EP2406596-006	EP2406596-007	EP2406596-008	EP2406596-009	EP2406596-010
					Result	Result	Result	Result	Result
EP080/071: Total Petroleum Hydrocarbons - Continued									
^ **C10 - C36 Fraction (sum)**	----	50	µg/L		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	<20
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	<20
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L		<100	<100	<100	<100	<100
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L		<100	<100	<100	<100	<100
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	<2
^ **Total Xylenes**	----	2	µg/L		<2	<2	<2	<2	<2
^ **Sum of BTEX**	----	1	µg/L		<1	<1	<1	<1	<1
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	<5
EP204: Glyphosate and AMPA									
Glyphosate	1071-83-6	10	µg/L		<10	<10	<10	<10	<10
AMPA	1066-51-9	10	µg/L		<10	<10	<10	<10	<10
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.5	%		**60.8**	**68.3**	**58.5**	**91.3**	**62.9**
EP068T: Organophosphorus Pesticide Surrogate									
DEF	78-48-8	0.5	%		**52.0**	**58.9**	**54.4**	**91.0**	**57.1**
EP080S: TPH(V)/BTEX Surrogates									

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW04	MW05	MW06	WQA1	MW10
				Sampling date / time	15-May-2024 09:45	15-May-2024 10:18	15-May-2024 11:02	15-May-2024 11:04	15-May-2024 15:12
Compound	CAS Number	LOR	Unit		EP2406596-006	EP2406596-007	EP2406596-008	EP2406596-009	EP2406596-010
					Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates - Continued									
1.2-Dichloroethane-D4	17060-07-0	2	%		**101**	**102**	**96.6**	**98.7**	**97.7**
Toluene-D8	2037-26-5	2	%		**96.8**	**97.8**	**96.3**	**95.0**	**94.0**
4-Bromofluorobenzene	460-00-4	2	%		**106**	**105**	**105**	**103**	**102**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW13	WQA2	MW15	NC4	----
				Sampling date / time	15-May-2024 16:18	15-May-2024 16:41	15-May-2024 17:14	[15-May-2024]	----
Compound	CAS Number	LOR	Unit		EP2406596-011	EP2406596-012	EP2406596-013	EP2406596-014	--------
					Result	Result	Result	Result	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.64	7.73	6.63	7.66	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		886	898	1080	1870	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		568	567	597	1040	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		280	279	56	111	----
Total Alkalinity as CaCO3	----	1	mg/L		280	279	56	111	----
ED038A: Acidity									
Acidity as CaCO3	----	1	mg/L		55	44	84	13	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		70	70	<5	56	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		51	53	307	501	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		13	13	15	43	----
Magnesium	7439-95-4	1	mg/L		19	23	17	47	----
Sodium	7440-23-5	1	mg/L		152	150	133	226	----
Potassium	7440-09-7	1	mg/L		2	2	22	15	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		<0.01	<0.01	0.26	0.06	----
Arsenic	7440-38-2	0.001	mg/L		0.002	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	0.001	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	<0.001	0.002	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW13	WQA2	MW15	NC4	----
				Sampling date / time	15-May-2024 16:18	15-May-2024 16:41	15-May-2024 17:14	[15-May-2024]	----
Compound	CAS Number	LOR	Unit		EP2406596-011	EP2406596-012	EP2406596-013	EP2406596-014	--------
					Result	Result	Result	Result	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Copper	7440-50-8	0.001	mg/L		**0.002**	**0.001**	<0.001	**0.003**	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Manganese	7439-96-5	0.001	mg/L		**0.006**	**0.007**	**0.006**	**0.685**	----
Nickel	7440-02-0	0.001	mg/L		**0.003**	**0.003**	<0.001	**0.003**	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Zinc	7440-66-6	0.005	mg/L		**0.006**	<0.005	<0.005	**0.314**	----
Iron	7439-89-6	0.05	mg/L		**3.33**	**2.34**	**4.56**	**0.06**	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**1.29**	**1.16**	**0.85**	**5.18**	----
Iron	7439-89-6	0.05	mg/L		**13.0**	**12.4**	**7.54**	**6.52**	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.66**	**0.55**	**7.00**	**0.47**	----
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		**0.64**	**0.53**	**6.98**	**0.46**	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**8.67**	**9.51**	<0.01	**0.06**	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**2.6**	**2.4**	**8.2**	**2.4**	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**11.3**	**11.9**	**8.2**	**2.5**	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.05**	**0.04**	**0.04**	**0.18**	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
EK085M: Sulfide as S2-									
Sulfide as S2-	18496-25-8	0.1	mg/L		<0.1	<0.1	**0.1**	<0.1	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**8.49**	**8.53**	**9.78**	**17.5**	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW13	WQA2	MW15	NC4	----
				Sampling date / time	15-May-2024 16:18	15-May-2024 16:41	15-May-2024 17:14	[15-May-2024]	----
Compound	CAS Number	LOR	Unit		EP2406596-011	EP2406596-012	EP2406596-013	EP2406596-014	--------
					Result	Result	Result	Result	----
EN055: Ionic Balance - Continued									
ø Total Cations	----	0.01	meq/L		----	----	9.00	----	----
ø Total Cations	----	0.01	meq/L		8.88	9.12	----	16.2	----
ø Ionic Balance	----	0.01	%		----	----	4.18	----	----
ø Ionic Balance	----	0.01	%		2.22	3.35	----	3.82	----
EP068B: Organophosphorus Pesticides (OP)									
Dichlorvos	62-73-7	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Demeton-S-methyl	919-86-8	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Monocrotophos	6923-22-4	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	----
Dimethoate	60-51-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Diazinon	333-41-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Chlorpyrifos-methyl	5598-13-0	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Parathion-methyl	298-00-0	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	----
Malathion	121-75-5	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Fenthion	55-38-9	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Chlorpyrifos	2921-88-2	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Parathion	56-38-2	2.0	µg/L		<2.0	<2.0	<2.0	<2.0	----
Pirimphos-ethyl	23505-41-1	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Chlorfenvinphos	470-90-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Bromophos-ethyl	4824-78-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Fenamiphos	22224-92-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Prothiofos	34643-46-4	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Ethion	563-12-2	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Carbophenothion	786-19-6	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
Azinphos Methyl	86-50-0	0.5	µg/L		<0.5	<0.5	<0.5	<0.5	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	<20	<20	<20	----
C10 - C14 Fraction	----	50	µg/L		<50	<50	<50	<50	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW13	WQA2	MW15	NC4	----
				Sampling date / time	15-May-2024 16:18	15-May-2024 16:41	15-May-2024 17:14	[15-May-2024]	----
Compound	CAS Number	LOR	Unit		EP2406596-011	EP2406596-012	EP2406596-013	EP2406596-014	--------
					Result	Result	Result	Result	----
EP080/071: Total Petroleum Hydrocarbons - Continued									
C15 - C28 Fraction	----	100	µg/L		<100	<100	<100	<100	----
C29 - C36 Fraction	----	50	µg/L		<50	<50	<50	<50	----
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	<50	<50	<50	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	<20	<20	<20	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	<20	<20	<20	----
>C10 - C16 Fraction	----	100	µg/L		<100	<100	<100	<100	----
>C16 - C34 Fraction	----	100	µg/L		<100	<100	<100	<100	----
>C34 - C40 Fraction	----	100	µg/L		<100	<100	<100	<100	----
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	<100	<100	<100	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	<100	<100	<100	----
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	<1	<1	<1	----
Toluene	108-88-3	2	µg/L		<2	<2	<2	<2	----
Ethylbenzene	100-41-4	2	µg/L		<2	<2	<2	<2	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	<2	<2	<2	----
ortho-Xylene	95-47-6	2	µg/L		<2	<2	<2	<2	----
^ Total Xylenes	----	2	µg/L		<2	<2	<2	<2	----
^ Sum of BTEX	----	1	µg/L		<1	<1	<1	<1	----
Naphthalene	91-20-3	5	µg/L		<5	<5	<5	<5	----
EP204: Glyphosate and AMPA									
Glyphosate	1071-83-6	10	µg/L		<10	<10	<10	<10	----
AMPA	1066-51-9	10	µg/L		<10	<10	<10	<10	----
EP068S: Organochlorine Pesticide Surrogate									
Dibromo-DDE	21655-73-2	0.5	%		**59.1**	**65.2**	**52.2**	**81.3**	----
EP068T: Organophosphorus Pesticide Surrogate									

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	MW13	WQA2	MW15	NC4	----
				Sampling date / time	15-May-2024 16:18	15-May-2024 16:41	15-May-2024 17:14	[15-May-2024]	----
Compound	CAS Number	LOR	Unit		EP2406596-011	EP2406596-012	EP2406596-013	EP2406596-014	--------
					Result	Result	Result	Result	----
EP068T: Organophosphorus Pesticide Surrogate - Continued									
DEF	78-48-8	0.5	%		**55.8**	**61.7**	**44.7**	**88.0**	**----**
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	2	%		**97.5**	**102**	**94.9**	**99.3**	**----**
Toluene-D8	2037-26-5	2	%		**97.3**	**96.9**	**96.7**	**95.7**	**----**
4-Bromofluorobenzene	460-00-4	2	%		**106**	**110**	**107**	**103**	**----**

Surrogate Control Limits

Sub-Matrix: **GROUNDWATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP068S: Organochlorine Pesticide Surrogate			
Dibromo-DDE	21655-73-2	50	146
EP068T: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	27	153
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP204: Glyphosate and AMPA

Appendix E
Field Sheets

FQM - NAPL and Groundwater Level Gauging Record

Project Name:	BORR	**Project Location:**	Bunbury	**PM Name:**	C. Brophy
Project Number:	606 44386	**Client:**	SWGA	**Fieldwork Staff Name:**	Sophie J. & Szalina M.

Confirm NAPL and groundwater levels by repeat measurements. All columns must be completed. If NAPL is not present in a well write 'ND' (Not Detected) in the relevant column.

Field Data

Well ID	Date (dd/mm/yy)	Time (24hr:mm)	PID Reading (ppm)	Depth to LNAPL (mBTOC)	Depth to Groundwater (mBTOC)	LNAPL Thickness (m)	Depth to DNAPL (mBTOC)	Total Well Depth (mBTOC)	DNAPL Thickness (m)	Comments (well condition, odour, NAPL colour and viscosity)
MW31	16.06.23	10 AM	-	~~3.114~~	3.279					
MW25	16.06.23	10:20	-	-	8.634					
MW25B	"	10:20	-	-	2.596					
MW22	"	10:40	-	-	3.097					
MW 22B	"	10:45	-	-	0.45					
MW 17	"	11:05	-	-	3.407					
MW 15		11:17	-	-	1.758					
MW13		11:27	-	-	0.75					
MW11		11:46	-	-	1.427					
MW10		12:03	-	-	~~0.00~~ 1.961					
MW09		12:11	-	-	4.183					
MW08A		12:20	-	-						roots lodged in well
~~MW08B~~										
MW11B		13:35			12.289			60.50		
MW11S		13:40	-	-	05.152			15.80		
MW07		14:05	-	-	9.071					logger installed
MW06		15:20	-	-	6.450					
MW05		15:25	-	-	5.601					
MW04		15:31	-	-	4.48					
MW46		15:48	-	-	3.225					

Measurement Equipment				**Notes/Comments**
Make & Model:		**Supplier:**		(PID) - photo ionisation detector; (ppm) - parts per million; (LNAPL) - light non-aqueous phase liquids; (DNAPL) - dense light non-aqueous phase liquid; (mBTOC) - metres below top of casing
Serial No.:		**Calibration Report Provided?**	N/A	

Approval and Distribution

Fieldwork Staff Signature Date

Project Manager Signature Date

Distribution: Project Central File

AECOM

FQM - NAPL and Groundwater Level Gauging Record

Project Name:		Project Location:		PM Name:	
Project Number:		Client:		Fieldwork Staff Name:	

Confirm NAPL and groundwater levels by repeat measurements. All columns must be completed. If NAPL is not present in a well write 'ND' (Not Detected) in the relevant column.

Field Data

Well ID	Date (dd/mm/yy)	Time (24hr:mm)	PID Reading (ppm)	Depth to LNAPL (mBTOC)	Depth to Groundwater (mBTOC)	LNAPL Thickness (m)	Depth to DNAPL (mBTOC)	Total Well Depth (mBTOC)	DNAPL Thickness (m)	Comments (well condition, odour, NAPL colour and viscosity)
BH-1916-1	18/06/23	12:45			18.953			15.80		0.68m standup
BH-1P15		12:54			5.914					0.74m standup
BH-1905-02		12:57			5.540					0.67m standup
BH-1905-01		13:00			4.835					0.65m standup
BH-1907-05		14:30			8.361			16.01		0.66m standup
BH-1907-06		14:32			NM			2.15		damaged
MW14S		14:44			9.512			14.55		0.58m standup
MW14D	↓	14:45			12.214			60.50		0.603m standup

Measurement Equipment

Make & Model:		Supplier:	
Serial No.:		Calibration Report Provided?	

Notes/Comments

(PID) - photo ionisation detector; (ppm) - parts per million; (LNAPL) - light non-aqueous phase liquids; (DNAPL) - dense light non-aqueous phase liquid; (mBTOC) - metres below top of casing

Approval and Distribution

Fieldwork Staff Signature Date

Project Manager Signature Date

Distribution: Project Central File

ANZ

FQM - NAPL and Groundwater Level Gauging Record

AECOM

Q4AN(EV)-414-FM1

Project Name:	~~Kings Park~~ BORR	Project Location:	~~Moora~~ Bunbury	PM Name:	~~D. Oulton~~ C. Brophy
Project Number:	60644586	Client:	~~AMPOL~~ SWCA	Fieldwork Staff Name:	S Johnstone / S Maass

Confirm NAPL and groundwater levels by repeat measurements. All columns must be completed. If NAPL is not present in a well write 'ND' (Not Detected) in the relevant column.

Field Data

Well ID	Date (dd/mm/yy)	Time (24hr mm)	PID Reading (ppm)	Depth to LNAPL (mBTOC)	Depth to Groundwater (mBTOC)	LNAPL Thickness (m)	Depth to DNAPL (mBTOC)	Total Well Depth (mBTOC)	DNAPL Thickness (m)	Comments (well condition, odour, NAPL colour and viscosity)
MW31	14/07/23	8:30			3.140					
MW29										Cannot access - paddock flooded
MW28										Destroyed by construction
MW25		8:48			8.119					
MW25b		8:50			-					DRY - moist at Bottom
MW22		9:10			2.718					
MW22B		9:14			0.431					
MW17		9:28			3.325					
MW15		9:36			1.587					
MW13		9:42			0.545					ants in well.
MW16		9:58			3.992					NO lid or ; cap - ; cap added
MW11		10:30			1.109					Roots, a lot (Blocked at 3.23, cleared 4.28)
MW10		11:12			1.816					
MW09		11:27			4.208					
MW08a		11:55			4.074					
MW07		11:40			10.327					Blocked 3.230 Cleared to 5.530
MW05		12:18			5.961					Blocked at 10.20/Cleared 11.8
MW06		12:27			4.57					5.66 Blocked / Cleared 7.4
MW04		12:37			5.634					
BH27										Destroyed by construction

Measurement Equipment

Make & Model:	Water Level Meter	Supplier:	CSI environmental
Serial No.:	001-01862	Calibration Report Provided?	N/A

Notes/Comments

(PID) - photo ionisation detector; (ppm) - parts per million; (LNAPL) - light non-aqueous phase liquids; (DNAPL) - dense light non-aqueous phase liquid; (mBTOC) - metres below top of casing

Searched for MW12 - destroyed by construction

Approval and Distribution

Fieldwork Staff Signature — Date: 14/07/23

Project Manager Signature — Date

Distribution: Project Central File

GK Environmental EQUIPMENT

Calibration Report

Multi-Parameter Water Quality Instrument

Customer:
Contact:

Manufacturer: YSI
Instrument: Professional Plus with Quatro cable
Serial #: 22B104437
Cable length: 1m (22B100428)

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
Condition		✓	Good, clean
pH millivolts for pH7 calibration range 0 mV ± 50 mV		✓	
pH 4 mV range + 165 to + 180 from 7 buffer mV value		✓	172.10 mV
pH slope		✓	55 to 60 mV/pH, ideal 59mV 58.4
Response time < 90 seconds		✓	
Calibrated and conforms to manufacturer's specifications		✓	
ORP			
Condition		✓	Good, clean
Response time < 90 seconds		✓	
within ± 80mv of reference Zobell Reading		✓	
Calibrated and conforms to manufacturer's specifications		✓	variance range ± 20mV 12 mV
Conductivity			
Condition		✓	Good, clean
Temperature		✓	°C
Conductivity cell constant 5.0 ± 1.0 in GLP file		✓	
Clean sensor reads less than 3 uS/cm in dry air		✓	
Calibrated and conforms to manufacturer's specifications		✓	µs/cm
Dissolved Oxygen			
Condition		✓	Good, clean
DO sensor in use		✓	polarographic
1.25 mil PE membrane (yellow membrane):		✓	
DO Sensor Value		✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
Calibrated and conforms to manufacturer's specifications		✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:

						Instrument Readings		
Parameter	**Standards**	**Reference**	**Calibration Point**	**Span**	**Units**	**Before**	**After**	**Units**
Temperature (22B100315)	Check Temp NATA	Room Temp	16	0.1	°C	NA	16.1	°C
pH (22B)	pH 7.00	392512	7.01	-27.80	mV	7.01	7.01	pH
pH (22B)	pH 4.00	394799	4.00	144.30	mV	3.95	4.00	pH
Conductivity (22B100315)	2764 µs/cm at 25°C	23/0402	2764	GLP	5.01	2756	2764	µs/cm
ORP (22A)	Zobell A & B	23/2404	249	249	mV	231.8	236.1	mV
Zero DO (22B100173)	NaSO3 in distilled water	10175	0.0	NA	NA	-0.1	0.0	%
100% DO (22B100173)	100% Air Saturation	Air	100.0	4.9	uA	100.8	100.0	%

Calibrated by: Gaurav Kanwar

Calibration Date: 07-Aug-23
Next Due: 03-Feb-24

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ANZ

FQM - NAPL and Groundwater Level Gauging Record

Q4AN(EV)-414-FM1

Project Name:	BORR CME	**Project Location:**	Bunbury	**PM Name:**	C. Brophy
Project Number:	60644386	**Client:**	SWCA	**Fieldwork Staff Name:**	SJ/SM

Confirm NAPL and groundwater levels by repeat measurements. All columns must be completed. If NAPL is not present in a well write 'ND' (Not Detected) in the relevant column.

Field Data

Well ID	Date (dd/mm/yy)	Time (24hr:mm)	PID Reading (ppm)	Depth to LNAPL (mBTOC)	Depth to Groundwater (mBTOC)	LNAPL Thickness (m)	Depth to DNAPL (mBTOC)	Total Well Depth (mBTOC)	DNAPL Thickness (m)	Comments (well condition, odour, NAPL colour and viscosity)
BH1905-2	16/08/23	15:48	—		5.812	—				Data logger info downloaded
MW07	15/08/23	8:45	—		10.256	—				Data logger info downloaded
MW15	↓	9:38	—		4.856	—				↓
MW11d		9:40	—		11.937	—				
MW45			—		09.316	—				
MW14d			—		11.977	—				

Measurement Equipment				Notes/Comments
Make & Model:	water level meter	**Supplier:**	Kasa environmental	(PID) - photo ionisation detector; (ppm) - parts per million; (LNAPL) - light non-aqueous phase liquids; (DNAPL) - dense light non-aqueous phase liquid; (mBTOC) - metres below top of casing
Serial No.:	01-601869	**Calibration Report Provided?**	N/A	

Approval and Distribution

Fieldwork Staff Signature — Date

Project Manager Signature — Date

Distribution: Project Central File

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ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

BORK

Project Name:	Picton GME	Project Number:	60644386	PM Name:	C. Brophy	Bore ID:	NC4
Client:	AMPOL SWCRT	Project Location:	1 Wimbridge Rd Picton BORK	Fieldwork Staff:	SJ/CB/SM	Sample Date:	16/08/23
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level:	Bore Radius (mm):	Chem Kit Serial No.: 22810447	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc):	Screen Interval (m):	Chem Kit Model: 451 Pro	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
2:45				9.26	449.9	6.86	80.1	14.7	mild turbid, odourless, mild turbidity
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
	All	2	x 40 mL Vial (H_2SO_4)	1	x 100 mL Amber	1	x 250 mL Plastic		
				1	x 100mL green glass	2	x60mL metals		
						1	x60mL purple		

Approval and Distribution

Fieldwork Staff Signature _____ Date _____ Checker Name and Signature _____ Date _____

Project Manager Signature _____ Date _____ **Distribution:** Project Central File

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FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW46
Project Name:	Picton GME	Project Number:	60709631	PM Name:	~~Russ Haley~~	Sample Date:	17/08/23
Client:	AMPOL	Project Location:	1 Wimbridge Rd Picton	Fieldwork Staff:	SJ/CS	Well Development or Well Sampling Event? (circle)	Well Sampling Event (circled)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 17/08/23	Bore Radius (mm):	Chem Kit Serial No.:	✓ Decontaminated	✓ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 3.743	Screen Interval (m):	Chem Kit Model: YSI Pro	✓ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	✓ Disposable	Bailer / Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up): Allen	(The correction to apply is probe dependent)	Other (specify)	✓ Peristaltic Pump / Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): key	Parameter method: Downhole		Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	✓ Retrieved				2 Parameters

Calculated bore volume (L): | Includes/ excludes bore annulus (circle) | # purge volumes removed: | Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (%)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
11:02	0.5	3.743	30	5.64	426	6.49	-22.7	19.3	Clear, colour & odour (ess)
11:04	1.0	↓	↓	4.00	417	6.33	-19.5	19.4	↓
11:06	1.5			3.53	416	6.29	-17.2	19.5	
11:08	2.0			3.06	419	6.27	-15.6	19.5	
11:10	2.5			3.03	420	6.27	-15.8	19.5	
11:12	3.0			2.36	422	6.32	-16.7	19.5	
11:14	3.5			2.37	422	6.32	-17.9	19.5	
STABILISED									Stabilised
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected			QA/QC Information	Field Comments
Field Filtered:	Unfiltered: ✓	x 40 mL Vial (HCl)	x 60 mL Ferrous	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
		x 40 mL Vial (H_2SO_4)	x 100 mL Amber	1 x 250 mL Plastic		Tubing replaced
				2 x 60mL metals		many dead ants in tubes
				1 x 60mL purple		

Approval and Distribution

Fieldwork Staff Signature | Date | Checker Name and Signature | Date

Project Manager Signature | Date | Distribution: Project Central File

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ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

Project Name:	BORE Doubleview GME	Project Number:	60644586	PM Name:	D Oulton C. Brophy	Bore ID:	MW31
Client:	ANZ SNCA	Project Location:	365 Scarborough Beach Rd	Fieldwork Staff:	S. Johnstone S. Maas	Sample Date:	16108/12
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 16108123	Bore Radius (mm):	Chem Kit Serial No.: 22B10437	☐ Decontaminated	☐ Low Flow Pump rate: 30/.	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 2.661	Screen Interval (m):	Chem Kit Model: YSI Pro	☐ Dedicated	Intake depth: 2.8m	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Allen	☐ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or (mg/L))	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
8:36	0.5	2.661	30	4.85	401	5.13	-5.8	15.7	Slight sulphur odour, mild turbidity, light brown colour
8:38	1.0	↓	↓	4.41	370	4.81	-5.5	16.5	↓
8:40	1.5			3.89	371	4.82	-6.9	16.7	
8:42	2.0			2.71	365	4.81	-10.1	16.8	
8:44	2.5			1.25	359	4.77	-18.1	16.8	
8:46	3.0			0.73	358	4.77	-19.9	16.8	
8:48	3.5			0.77	359	4.77	-21.4	16.8	
				Sample Taken					
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
All			x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		
						2	x 60ml metals		
						1	x 60mL purple		

Approval and Distribution

Fieldwork Staff Signature	16/08/23 Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

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FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

Project Name:	~~Stratton~~ BORE CME	**Project Number:**	~~60662477~~ 60649386	**PM Name:**	~~Kieron Kenny~~ C.Bracey	**Bore ID:**	MW25
Client:	~~AMPOL~~ SWCA	**Project Location:**	~~Stratton~~ BORE	**Fieldwork Staff:**	S. Johnstone / S.Mac	**Sample Date:**	16/08/23
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 16/08/23	Bore Radius (mm):	Chem Kit Serial No.: 22810447	☑ Decontaminated	☑ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 6.783	Screen Interval (m):	Chem Kit Model: 451 PRO	☑ Dedicated	Intake depth: 7.1	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☑ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Allen	☐ Retrieved				9 Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
12:30	0.5	6.783	30	2.40	4010	5.75	-35.1	17.9	clear, colourless, odourless
12:32	1.0	↓	↓	1.07	4083	5.81	-60.7	18.2	↓
12:34	1.5			0.65	4091	5.82	-69.7	18.5	
12:36	2.0			0.45	4096	5.81	-71.3	18.8	
12:38	2.5			0.35	4093	5.81	-71.3	18.8	
12:40	3.0			0.32	4091	5.81	-70.7	18.8	
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
/	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		
						2	x 60mL metals		
						1	x 60mL purge		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
~~Fieldwork Staff~~	16/08/23		
Project Manager Signature	**Date**	**Distribution:** Project Central File	

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FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW25b
Project Name:	~~Stratton~~ BORR GME	Project Number:	~~60668477~~ 60644386	PM Name:	~~Kieran Kenny~~ C.Brophy	Sample Date:	16/08/23
Client:	~~AMPOL~~ SWQA	Project Location:	~~Stratton~~ BORR	Fieldwork Staff:	S. Johnstone / S. Maas	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 16/08/23	Bore Radius (mm):	Chem Kit Serial No.: 22B104457	N Decontaminated	N Low Flow Pump rate: 30	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 0.721	Screen Interval (m):	Chem Kit Model: YSI Pro	N Dedicated	Intake depth: 1.5	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	Y Disposable	Y Bailer Y Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	Y Other (specify)	N Peristaltic Pump Y Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Allen	Parameter method: Y Downhole		Y Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Key	N Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
12:50	0.5	0.940	30	2.58	2737	5.96	-50.3	15.9	Clear, colourless, odourless
12:52	1.0	0.964		3.01	2601	5.97	-41.5	15.7	
12:54	1.5	1.087		3.05	2569	5.97	-32.7	15.1	
12:56	2.0	1.116		3.06	2369	5.95	-26.5	15.9	
12:58	2.5	1.276		3.15	2300	5.94	-23.6	15.8	
13:00	3.0	1.354		3.08	2323	5.94	-24.1	15.8	
				Stabilised					
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	WQA01-Dup	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	2	x 250 mL Plastic		
						4	x60mL metals		
						2	x60mL purple		

Approval and Distribution

Fieldwork Staff Signature	16/08/23 Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

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ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW22
Project Name:	~~Stratton~~ BORK CME	Project Number:	~~60682477~~ 60644386	PM Name:	~~Kieron Kenny~~ C Brophy	Sample Date:	16/08/23
Client:	~~AMPOL~~ BP SWCA	Project Location:	~~Stratton~~ BORK	Fieldwork Staff:	S. Johnstone S. MAASS	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 16/08/23	Bore Radius (mm):	Chem Kit Serial No.: 12810443?	☑ Decontaminated	☑ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 2.515	Screen Interval (m):	Chem Kit Model: 451 pro	☑ Dedicated	Intake depth: 5m	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☑ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	(Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up): Allen	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): key	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☑ Retrieved				2 Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/min)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
13:46	0.5	2.515	30	2.00	11593	4.61	-12.2	19.3	clear, colourless, odourless
13:48	1.0	↓	↓	0.54	11438	4.96	-16.3	19.6	↓
13:50	1.5			0.31	11406	4.98	-16.9	19.6	
13:52	2.0			0.25	11262	5.01	-17.3	19.6	
13:54	2.5			0.24	11134	5.01	-17.5	19.6	
13:56	3.0			0.22	11156	5.01	-17.9	19.6	
				Stabilised					
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected					QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	☑	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
☑	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		
						2	x60mL metals		
						1	x60ml purple		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
☑	16/08/23		
Project Manager Signature	**Date**	**Distribution:** Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

BORR

Project Name:	Picton GME	**Project Number:**	~~60709631~~ 60644350	**PM Name:**	~~Rose Haley~~ G. Brophy	**Bore ID:**	MW22b
Client:	AMPOL SWQA	**Project Location:**	1 Wimbridge Rd Picton Bunbury	**Fieldwork Staff:**	SJ/CS SM	**Sample Date:**	16/08/23
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 16/08/23	Bore Radius (mm):	Chem Kit Serial No.: 22B104437	☒ Decontaminated	☒ Low Flow Pump rate: 30	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 0.341	Screen Interval (m):	Chem Kit Model: YSI Pro	☒ Dedicated	Intake depth: 1.5m	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☒ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Allen	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Key	☒ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
14:08	0.5	0.341	30	1.15	3186	6.26	-13.7	16.1	light brown, mild turbidity,
14:10	1.0	0.375	↓	0.84	1733	6.35	-13.0	15.5	odourless
14:12	1.5	0.4189		0.77	567	6.39	-10.3	14.9	↓
14:14	2.0	0.456		1.05	482	6.30	-9.3	14.8	
14:16	2.5	0.512		1.02	479	6.30	-9.0	14.8	
14:18	3.0	0.59		1.01	476	6.29	-8.7	14.8	
					Stabilised				
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	✓	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		
						2	x 60 mL metals		
						1	x 60mL purge		

Approval and Distribution

Fieldwork Staff Signature	16/08/23 Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	~~Picton~~ BORR GME	**Project Number:**	~~60700631~~ 60644386	**PM Name:**	~~Rose Haley~~ O. Brophy	**Bore ID:**	MW17
Client:	~~AMPOL~~ SWQA	**Project Location:**	~~Wombiddie Rd Picton~~ Bunbury	**Fieldwork Staff:**	~~SJ/CS~~ SM	**Sample Date:**	17/08/23
						Well Development or Well Sampling Event? (circle)	Well Sampling Event (circled)

General Bore Information

Date of GW Level: 17/08/23	Bore Radius (mm):		
Depth to GW (m-pvc): 2.907	Screen Interval (m):		
Bore Depth (m-pvc):	Casing Radius (mm):		
Depth to Product (m-pvc):	Cover Type (gatic/stick up): Allen		
Product Thickness (m):	Bore Locked (YES/NO): Key		
	Key Type (if applicable):		

Parameter Info.

Chem Kit Serial No.: 22B104437
Chem Kit Model: YSI PRO
Corrected Redox: Y / N (N circled)
(The correction to apply is probe dependent)
Parameter method: Downhole / Retrieved (ticked)

Decontamination

- Decontaminated (ticked)
- Dedicated
- Disposable
- Other (specify)

Sampling Method

- Low Flow (ticked) Pump rate: 30%
- Intake depth: 3.5m
- Bailer
- Hydrasleeve
- Peristaltic Pump (ticked)
- Waterra
- Other (specify)

Hydrasleeve Info.

Hydrasleeve Size:
Hydrasleeve Type:
Sampling Depth (m-pvc):
Hydrasleeve Install time:
Sampling Start Time:

Monitoring sequence followed (number in order):

1 Gauging
Hydrasleeve in
Hydrasleeve out
2 Parameters

Calculated bore volume (L): | Includes/ excludes bore annulus (circle) | # purge volumes removed: | Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (%)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
9:06	0.5	2.907	30	2.97	171	6.94	-24.5	17.0	Clear, colourless, organic odour
9:08	1.0	↓	↓	2.87	161	6.81	-25.1	17.8	↓
9:10	1.5			2.79	161	6.79	-26.6	17.9	
9:12	2.0			2.67	158	6.77	-27.6	18.0	
9:14	2.5			2.62	156	6.77	-27.4	18.0	Slight sediment (roots)
9:16	3.0			2.65	155	6.77	-27.7	18.0	
Sample Taken									
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:

Field Filtered: —
Unfiltered: All

Bottles Collected

	x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)
	x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic
				2	x 60mL metals
				1	x 60mL purple

QA/QC Information

—

Field Comments

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Evidence of roots

Approval and Distribution

Fieldwork Staff Signature	Date: 17/08/23	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

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ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

BORE

Project Name:	~~Piston~~ GME	**Project Number:**	~~60709681~~ 60644386	**PM Name:**	~~Rose Nay~~ C. Brophy	**Bore ID:**	MW15
Client:	~~AMPOL~~ SWCA	**Project Location:**	1 ~~Wimbridge Rd Piston~~ BUNBURY	**Fieldwork Staff:**	SJ/~~GS~~ SM	**Sample Date:**	17/08/23
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 17/08/23	Bore Radius (mm):	Chem Kit Serial No.: 22B104457	☑ Decontaminated	☑ Low Flow Pump rate: 30%	Hydrasleeve Size:	**Monitoring sequence followed (number in order):**
Depth to GW (m-pvc): 1.137	Screen Interval (m):	Chem Kit Model: YSI Pro	☒ Dedicated	Intake depth: 2.5m	Hydrasleeve Type:	
~~Bore Depth (m-pvc):~~	Casing Radius (mm):	**Corrected Redox:** Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up): Allen key	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): (Y)	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☒ Retrieved				2 Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or (mg/L))	E.C. (mS/cm or (µS/cm))	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
9:34	0.5	1.137	30	1.73	391	5.86	-24.7	16.7	light brown, slight turbidity, slight organic odour
9:36	1.0	↓	↓	0.26	381	5.68	-21.6	17.0	
9:38	1.5			0.20	390	5.66	-21.1	17.0	
9:40	2.0			0.17	404	5.67	-21.4	16.9	
9:42	2.5			0.17	417	5.67	-22.9	16.9	
9:44	3.0			0.17	432	5.67	-24.3	17.0	↓
					STABILISED				
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	**Unfiltered:**		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	✓	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		
						2	x60mL metals		
						1	x60mL plastic Purple		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
✓	17/08/23		

Project Manager Signature	Date	Distribution: Project Central File

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FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

Project Name:	~~Stratton~~ BORE CME	**Project Number:**	~~60682477~~ 60644386	**PM Name:**	~~Kieron Kenny~~ C. Brophy	**Bore ID:**	MW13
Client:	~~AMPOL~~ SMEA	**Project Location:**	~~Stratton~~ Bunbury	**Fieldwork Staff:**	S. Johnstone / S. Maass	**Sample Date:**	17/08/23
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 17/08/23	Bore Radius (mm):	Chem Kit Serial No.: 21X04437	☒ Decontaminated	☒ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 0.07	Screen Interval (m):	Chem Kit Model: YSI Pro	☒ Dedicated	Intake depth: 1.5m	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	**Corrected Redox:** Y / (N)	☒ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	(Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☒ Retrieved				2 Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
10:04	0.5	0.22	30	1.86	672	6.62	-64.3	16.3	Sulphur odour, clear, light brown
10:06	1.0	0.33		0.12	668	6.54	-60.9	16.3	
10:08	1.5	0.41		0.05	697	6.47	-54.7	16.4	
10:10	2.0	0.36		0.05	719	6.44	-50.5	16.5	
10:12	2.5	0.48		0.18	742	6.44	-48.1	16.5	
10:14	3.0	0.37		0.20	755	6.44	-45.3	16.5	
10:16	3.5	0.41		0.21	752	6.44	-44.9	16.5	
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	**Unfiltered:**		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		
						2	x60mL metals		
						1	x60mL purple		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
✓	17/08/23		

Project Manager Signature	Date	Distribution: Project Central File

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FQM - Groundwater Sampling and Purging Record

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Q4AN(EV)-405-FM1

Project Name:	~~Picton~~ BORR GME	Project Number:	~~60709637~~ 60644386	PM Name:	~~Rose Haley~~ C. Brophy	Bore ID:	MW12
Client:	~~AMPOL~~ SWQA	Project Location:	~~Wimbridge Rd Picton~~ Bunbury	Fieldwork Staff:	SJ/~~CS~~ SM	Sample Date:	17/08/23
						Well Development or Well Sampling Event? (circle)	

General Bore Information

Date of GW Level: 17/08/23	Bore Radius (mm):		
Depth to GW (m-pvc): 1.048	Screen Interval (m):		
Bore Depth (m-pvc):	Casing Radius (mm):		
Depth to Product (m-pvc):	Cover Type (gatic/stick-up): Allen		
Product Thickness (m):	Bore Locked (YES/NO): keys		
	Key Type (if applicable):		
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Parameter Info.

Chem Kit Serial No.: 22B104437

Chem Kit Model: YSI PRO

Corrected Redox: Y / (N)

(The correction to apply is probe dependent)

Parameter method: Downhole / ✓ Retrieved

Decontamination

- ✓ Decontaminated
- ✓ Dedicated
- ✓ Disposable
- Other (specify)

Sampling Method

- ✓ Low Flow Pump rate: 30%
  - Intake depth: 1.7m
- Bailer
- Hydrasleeve
- ✓ Peristaltic Pump
- Waterra
- Other (specify)

Hydrasleeve Info.

Hydrasleeve Size:

Hydrasleeve Type:

Sampling Depth (m-pvc):

Hydrasleeve Install time:

Sampling Start Time:

Monitoring sequence followed (number in order):

- 1 Gauging
- Hydrasleeve in
- Hydrasleeve out
- 2 Parameters

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate %	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
13:20	0.5	1.048	30	3.20	564	6.42	-21.9	18.0	colourless & odourless, clear
13:22	1.0	↓	↓	1.49	543	6.04	-18.6	17.8	↓
13:24	1.5	↓	↓	1.14	516	5.97	-17.5	17.8	↓
13:26	2.0	↓	↓	1.11	510	5.96	-17.3	17.9	↓
13:28	2.5	↓	↓	1.01	488	5.95	-17.5	17.8	↓
13:30	3.0	↓	↓	0.94	471	5.95	-17.5	17.8	↓
13:32	3.5	↓	↓	1.02	469	5.93	-16.5	17.8	↓
Stabilised									
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:

Field Filtered: —

Unfiltered: All

Bottles Collected

	x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)
	x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic
				2	x 60mL metals
				1	x 60mL plastic purple

QA/QC Information

—

Field Comments

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
[signature]	17/08/23		
Project Manager Signature	**Date**	**Distribution:** Project Central File	

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FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	Bore Picton GME	Project Number:	60644380	PM Name:	Rose Haley A Brophy	Bore ID:	MW11
Client:	AMPOL SWCA	Project Location:	Winnejup Rd, Picton Bunbury	Fieldwork Staff:	SJ/GS SM	Sample Date:	17/08/23
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 17/08/23	Bore Radius (mm):	Chem Kit Serial No.: 28104437	☐ Decontaminated	☑ Low Flow Pump rate: 30L/min	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 0.657	Screen Interval (m):	Chem Kit Model: 451 Pro	☐ Dedicated	Intake depth: 2.5m	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up): Allen	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Key	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				2 Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/min)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
12:04	0.5	0.657	30	1.89	3410	6.50	-22.5	17.3	light brown, slight turbidity, odourless
12:06	1.0	↓	↓	1.31	1912	6.23	-18.3	17.1	↓
12:08	1.5			1.31	1846	6.20	-18.0	17.0	
12:10	2.0			1.05	1751	6.19	-18.0	16.9	
12:12	2.5			1.05	1700	6.19	-18.2	16.9	
12:14	3.0			1.06	1710	6.19	-18.7	16.9	
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Stabilised

Analytes Sampled for:		Bottles Collected					QA/QC Information	Field Comments
Field Filtered: ✓	Unfiltered: All	x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	✓	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		
					2	x60mL metals		
					1	x60mL purple		

Approval and Distribution

Fieldwork Staff Signature ✓	Date 17/08/23	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

AECOM

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

Project Name:	~~Malaga~~ BORA CME	Project Number:	~~6065797~~ 60644386	PM Name:	~~M.Dunlop~~ C.Brophy	Bore ID:	MW10
Client:	~~DPA~~ SWOA	Project Location:	~~Malaga~~ Bunbury	Fieldwork Staff:	S.Johnstone / S.Magill	Sample Date:	17/08/23
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 17/08/23	Bore Radius (mm):	Chem Kit Serial No.: 22B10443	N Decontaminated	N Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 1.354	Screen Interval (m):	Chem Kit Model: 151 Pro	N Dedicated	Intake depth: 1.7m	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	Y Disposable	Bailer / Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up): Alloy	(The correction to apply is probe dependent)	Other (specify)	N Peristaltic Pump / Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Key	Parameter method: N Downhole		Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	Y Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
14:26	0.5	1.354	30%	0.92	406	5.88	-18.3	16.5	clear, colourless, odourless
14:28	1.0			0.79	405	5.79	-12.7	16.5	
14:30	1.5			0.76	4007	5.78	-10.3	16.6	
14:32	2.0			0.67	418	5.78	-10.6	16.7	
14:34	2.5			0.62	415	5.82	-12.0	16.6	
14:36	3.0			0.59	417	5.84	-13.0	16.6	
14:38	3.5			0.57	415	5.86	-13.6	16.6	
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Stabilised

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	✓	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		
						2	x60mL metals		
						1	x60mL purge		

Approval and Distribution

Fieldwork Staff Signature — Date: 11/08/23 — Checker Name and Signature — Date

Project Manager Signature — Date — Distribution: Project Central File

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FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	~~Doubleview~~ BORR GME	Project Number:	60644380	PM Name:	R.Putnam C.Brophy	Bore ID:	MW09
Client:	AMPOL SWCA	Project Location:	365 ~~Scarborough Beach~~ Rd	Fieldwork Staff:	S. Johnstone IS Haass	Sample Date:	18/08/23
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info. Bonpm	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 18/08/23	Bore Radius (mm):	Chem Kit Serial No.: 2180437	☑ Decontaminated	☑ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 3.704	Screen Interval (m):	Chem Kit Model: 451 Pro	☑ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☑ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up): Allen	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Key	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☑ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
8:20	0.5	3.704	30	5.88	156	6.06	-18.1	16.9	clear, colourless, odourless
8:22	1.0	↓	↓	5.66	142	5.95	-17.8	17.9	↓
8:24	1.5			5.70	138	5.94	-19.0	18.2	
8:26	2.0			5.53	137	5.94	-19.5	18.2	
8:28	2.5			5.49	135	5.93	-20.0	18.2	
8:30	3.0			5.51	135	5.93	-20.3	18.2	
				Stabilised					
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	✓	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		
						2	x60mL metals		
						1	x60ml poly		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
✓	18/08/23		

Project Manager Signature | Date

Distribution: Project Central File

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FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	~~Picton~~ GME	**Project Number:**	~~60709091~~ 60649356	**PM Name:**	~~Rose Haley~~ C Brown	**Bore ID:**	MW08a
Client:	AMPOL SWCA	**Project Location:**	~~1 Wimbridge Rd~~ Picton Bunbury	**Fieldwork Staff:**	SJ/CS SM	**Sample Date:**	15/08/23
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 18.08.23	Bore Radius (mm):	Chem Kit Serial No.: 22B1044927	☐ Decontaminated	☑ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 3.713	Screen Interval (m):	Chem Kit Model: YSI Pro	☑ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	**Corrected Redox:** Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Allen	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Key	☑ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
09:26	0.5	3.713	30%	1.66	707	5.88	-53.6	17.7	clear, light brown, slight sulphur odour
09:28	1.0	↓	↓	0.52	731	6.03	-68.6	18.5	↓
09:30	1.5			0.48	734	5.99	-72.6	18.6	
09:32	2.0			0.27	732	5.95	-73.7	18.6	
09:34	2.5			0.23	733	5.95	-73.8	18.7	
09:36	3.0			0.18	734	5.93	-73.7	18.7	
09:38	3.5			0.17	733	5.92	-73.3	18.7	
				STABILISED					
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		Data logger downloaded
						2	x 60mL metals		
						1	x 60mL purple		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
~~Project Manager Signature~~	~~Date~~	**Distribution:** Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	~~Doubleview~~ BORR GME	Project Number:	60644386	PM Name:	~~D Oulton~~ G. Bracey	Bore ID:	MW06
Client:	AMPOL SWCA	Project Location:	~~365 Scarborough Beach Rd~~	Fieldwork Staff:	S. Johnstone I.S. Marsh	Sample Date:	18/08/23
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 18/08/23	Bore Radius (mm):	Chem Kit Serial No.: 751 PW0	☒ Decontaminated	☐ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 5.708	Screen Interval (m):	Chem Kit Model: 22P104437	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☒ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (flat/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Allen	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): key	☒ Retrieved				2 Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
11:26	0.5	05.708	30%	0.41	762	7.13	-51.4	20.0	Sulfur, yellow light
11:28	1.0			0.33	722	7.04	-53.8	20.1	
11:30	1.5			0.32	606	6.81	-52.7	20.1	
11:32	2.0			0.33	492	6.48	-50.6	20.2	
11:34	2.5			0.34	416	6.32	-48.6	20.1	
11:36	3.0			0.33	392	6.22	-47.4	20.1	
11:38	3.5			0.31	383	6.18	-47.3	20.1	
11:40	4.0	05.556		0.32	377	6.16	-47.3	20.0	
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Stabilised

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	WQA02 - Dup	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	2	x 250 mL Plastic		
						4	x60mL metals		
						2	x60mL purge		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
	18/08/23		

Project Manager Signature	Date	Distribution: Project Central File

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FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	Picton GME	Project Number:	60709631 60644386	PM Name:	Rose Haley CBrophy	Bore ID:	MW05
Client:	AMPOL SWCA	Project Location:	1 Wimbridge Rd Picton	Fieldwork Staff:	SJ/CS AS SM	Sample Date:	18/08/23
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 18/8/23	Bore Radius (mm):	Chem Kit Serial No.: 22004437	☒ Decontaminated	☒ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 5.846	Screen Interval (m):	Chem Kit Model: YSI Pro	☒ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☒ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Allen	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Key	☒ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
12:32	0.5	5.846	30	0.15	675	6.44	-191	20.2	Grey, highly turbid, strong Sulphur odour
12:34	1.0	↓	↓	0.25	1503	6.45	-152	20.4	
12:36	1.5			0.24	1448	6.42	-132	20.5	light grey, mild turbidity, Sulphur odour
12:38	2.0			0.25	1431	6.41	-123	20.4	
12:40	2.5			0.27	1432	6.41	-124	20.4	
12:42	3.0			0.26	1435	6.41	-121	20.4	↓
									Sample Taken
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	✓	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		
						2	x 60mL metals		
						1	x 60mL purge		

Approval and Distribution

Fieldwork Staff Signature ____ Date 18/08/23 ____ Checker Name and Signature ____ Date ____

Project Manager Signature ____ Date ____ **Distribution:** Project Central File

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FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

Project Name:	~~Moora~~ BORN	Project Number:	60644386	PM Name:	~~Dr Orton~~ C. Brophy	Bore ID:	MW04
Client:	AMPOL ~~SWC-A~~	Project Location:	~~Moore~~ Bunbury	Fieldwork Staff:	S.Johnstone S.Maass	Sample Date:	18/08/23
						Well Development or Well Sampling Event? (circle)	

Standing Water Information

Date of GW Level:	18/08/23
Depth to GW (m-pvc):	4.329
Bore Depth (m-pvc):	
Depth to Product (m-pvc):	
Product Thickness (m):	
Calculated bore volume (L):	

Bore Information

Bore Radius (mm):	
Screen Interval (m):	
Casing Radius (mm):	
Cover Type (gatic/stick up):	
Bore Locked (YES/NO):	Allen
Key Type (if applicable):	key
Includes/ excludes bore annulus (circle)	

Parameter(s)

Chem Kit Serial No.:	22B103347
Chem Kit Model:	451 Rio
Corrected Redox: Y / (N)	
(The correction to apply is probe dependent)	
Parameter method:	☐ Downhole ☑ Retrieved

Decontamination

☑	Decontaminated
☑	Dedicated
☑	Disposable
☐	Other (specify)

Sampling Method

☑	Low Flow Pump rate: 300 mL/min
	Intake depth:
☐	Bailer ☐ Hydrasleeve
☑	Peristaltic Pump ☐ Waterra
☐	Other (specify)
# purge volumes removed:	
Total purged volume (L):	

Hydrasleeve Info

Hydrasleeve Size:	
Hydrasleeve Type:	
Sampling Depth (m-pvc):	
Hydrasleeve Install time:	
Sampling Start Time:	

Monitoring sequence followed (number in order):

1	Gauging
	Hydrasleeve in
	Hydrasleeve out
2	Parameters

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/min)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
12:08	0.5	4.329	30	1.30	4946	6.47	-29.4	17.9	light brown clear, [illegible], odourless
12:10	1.0	↓	↓	0.44	5030	6.48	-24.7	18.6	
12:12	1.5			0.42	5036	6.49	-24.5	18.6	
12:14	2.0			0.37	5051	6.49	-23.5	18.7	
12:16	2.5			0.32	5060	6.49	-23.0	18.7	
12:18	3.0			0.35	5055	6.49	-24.1	18.7	
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Sample Token

Analytes Sampled for:

Field Filtered:	Unfiltered:
✓	All

Bottles Collected

	x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)
	x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic
				2	x 60mL metals
				1	x 60mL Purple

QA/QC Information

Field Comments

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Approval and Distribution

Fieldwork Staff Signature	18/08/23 Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

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FQM - NAPL and Groundwater Level Gauging Record

AECOM

Q4AN(EV)-414-FM1

Project Name:	~~60709631~~ BORR	**Project Location:**	Picton Bunbury	**PM Name:**	Rose Haley CB
Project Number:	60644386	**Client:**	Ampol MRWA	**Fieldwork Staff Name:**	MRWA SJ

Confirm NAPL and groundwater levels by repeat measurements. All columns must be completed. If NAPL is not present in a well write 'ND' (Not Detected) in the relevant column.

Field Data

Well ID	Date (dd/mm/yy)	Time (24hr:mm)	PID Reading (ppm)	Depth to LNAPL (mBTOC)	Depth to Groundwater (mBTOC)	LNAPL Thickness (m)	Depth to DNAPL (mBTOC)	Total Well Depth (mBTOC)	DNAPL Thickness (m)	Comments (well condition, odour, NAPL colour and viscosity)
MW31		9:35			2.673					
MW27		10:00			1.956					
MW25		10:20			6.186					
MW25D		10:22			0.865					
MW22		10:41			1.951					
MW22b		10:43			0.367					
MW17		10:57								well destroyed by construction
MW15		11:02			1.190					
MW13		11:09			0.365					
MW46		11:28			3.607					
MW11		11:40			0.758					
MW10		11:55			1.396					
MW09		12:20								Destroyed by construction
MW08a		13:02			3.569					
MW07		12:30			10.237					
MW11d		13:08			14.101					
MW11S		13:10			4.744					
BH1905-02		13:20			4.860					
MB14d		13:58			12.046					
MB14S		14:00			9.307					

Measurement Equipment

Make & Model:		**Supplier:**	
Serial No.:		**Calibration Report Provided?**	

Notes/Comments

(PID) - photo ionisation detector; (ppm) - parts per million; (LNAPL) - light non-aqueous phase liquids; (DNAPL) - dense light non-aqueous phase liquid; (mBTOC) - metres below top of casing

Approval and Distribution

Fieldwork Staff Signature Date

Project Manager Signature Date

Distribution: Project Central File

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FQM - NAPL and Groundwater Level Gauging Record

AECOM

Q4AN(EV)-414-FM1

Project Name:	60709631	**Project Location:**	Picton	**PM Name:**	Rose Haley
Project Number:		**Client:**	Ampol	**Fieldwork Staff Name:**	MN & SJ

Confirm NAPL and groundwater levels by repeat measurements. All columns must be completed. If NAPL is not present in a well write 'ND' (Not Detected) in the relevant column.

Field Data

Well ID	Date (dd/mm/yy)	Time (24hr:mm)	PID Reading (ppm)	Depth to LNAPL (mBTOC)	Depth to Groundwater (mBTOC)	LNAPL Thickness (m)	Depth to DNAPL (mBTOC)	Total Well Depth (mBTOC)	DNAPL Thickness (m)	Comments (well condition, odour, NAPL colour and viscosity)
MW06		14:46			5.460					
MW05		13:40			5.820					
MW04		13:34			4.312					

Measurement Equipment

Make & Model:		**Supplier:**	
Serial No.:		**Calibration Report Provided?**	

Notes/Comments

(PID) - photo ionisation detector; (ppm) - parts per million; (LNAPL) - light non-aqueous phase liquids; (DNAPL) - dense light non-aqueous phase liquid; (mBTOC) - metres below top of casing

Approval and Distribution

Fieldwork Staff Signature Date

Project Manager Signature Date

Distribution: Project Central File

ANZ

FQM - NAPL and Groundwater Level Gauging Record

AECOM

QA ANZ(EV)-414-FM1

MW06 16/10/23 -> All road access tracks closed

Project Name:	BORR	Project Location:	Bunbury	PM Name:	C Brophy
Project Number:	60644526	Client:	SWGA - MRWA	Fieldwork Staff Name:	SM

Confirm NAPL and groundwater levels by repeat measurements. All columns must be completed. If NAPL is not present in a well write 'ND' (Not Detected) in the relevant column.

Field Data

Well ID	Date (dd/mm/yy)	Time (24hr hh:mm)	PID Reading (ppm)	Depth to LNAPL (mBTOC)	Depth to Groundwater (mBTOC)	LNAPL Thickness (m)	Depth to DNAPL (mBTOC)	Total Well Depth (mBTOC)	DNAPL Thickness (m)	Comments (well condition, odour, NAPL colour and viscosity)
MW31	16/10/23	7 57			2.792					
MW27		8 25			2 040					code is 2021 to get into gate
MW25		8:56			6.434					Ants in well
MW25D		8 58			1.405					
MW22B		9:26			0.341					right
MW22		9 28			1.942					
MW15		9 48			1.327					
MW13		9 55			0.597					
MW46		10 15			3.035					
MW11		10 40			0.923					
MW10		11 02			1.495					
MW08?T		11 15			10.204					Datalogger downloaded
MW08a		11 30			03-556					↓
MW11d		11 42			14.038					↓
MW11S		11 45			3.667					↓
BH1905.02		12:00			5.031					↓
MW14S		12:38			9.321					↓
MW14d		12:40			12.265					↓
MW04		12:54			4.445					
MW05		13 05			5.836					

Measurement Equipment

Make & Model:	QED, MP30	Supplier:	GK environmental
Serial No.:	1672	Calibration Report Provided?	N/A

Notes/Comments

(PID) - photo ionisation detector; (ppm) - parts per million; (LNAPL) - light non-aqueous phase liquids; (DNAPL) - dense light non-aqueous phase liquid; (mBTOC) - metres below top of casing

Approval and Distribution

[signature] Fieldwork Staff Signature — Date: 16/10/23

Project Manager Signature — Date

Distribution: Project Central File

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FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

						Bore ID:	NC4
Project Name:	BORR CMF	Project Number:	60644386	PM Name:	C.B	Sample Date:	15/11/23
Client:	SWC-A	Project Location:	Bunbury	Fieldwork Staff:	S.J A.B	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level:	Bore Radius (mm):	Chem Kit Serial No: 20110401	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc):	Screen interval (m):	Chem Kit Model: TSI PRO	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
12:45	5L			8.20	3410	7.85	40.7	23.9	light brown, mild turbidity, odourless
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Samples Sampled for:		Bottles Collected			QA/QC Information	Field Commets
Field Filtered:	Unfiltered:	x 40 mL Vial (HCl)	x 60 mL Ferrous	x 60 mL metals (HNO_3)	WQA02-0-P	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
/	All	x 40 mL Vial (H_2SO_4)	x 100 mL Amber	x 250 mL Plastic		

Approval and Distribution

Fieldwork Staff Signature _____ Date _____ Checker Name and Signature _____ Date _____

Project Manager Signature _____ Date _____ **Distribution:** Project Central File

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

BORR quarterley

Project Name:	Bailey's Marine GME	**Project Number:**	60717653 60644386	**PM Name:**	D/Q C.B	**Bore ID:**	MW04
Client:	AMPOL SWCA	**Project Location:**	Swan River Boat Shed Bunbury	**Fieldwork Staff:**	S.J / A.B	**Sample Date:**	17/11/23
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info:	
Date of GW Level: 17/11/23	Bore Radius (mm):	Chem Kit Serial No.: 20k104050	☒ Decontaminated	☒ Low Flow Pump rate: 30	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 4.531	Screen Interval (m):	Chem Kit Model: YSI Pro	☒ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	**Corrected Redox:** Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Allen	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): yes	☒ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
9:50	0.5	4.571	30	2.64	5043	6.44	42.6	19.0	light brown, clear, odourless
9:52	1.0	↓	↓	0.56	5134	6.47	35.6	18.8	↓
9:54	1.5			0.24	5180	6.50	29.4	18.8	
9:56	2.0			0.16	5200	6.51	26.6	18.8	
9:58	2.5			0.15	5211	6.51	23.9	18.9	
10:00	3.0			0.12	5219	6.52	22.5	18.9	
				Stabilised					
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic	✓	
						1	YSI Pump		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
✓			
Project Manager Signature	**Date**	**Distribution:** Project Central File	

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FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	Bailey's Marine GME	Project Number:	60717653	PM Name:	D.O	Bore ID:	MW05
Client:	AMPOL	Project Location:	Swan River Boat Shed	Fieldwork Staff:	S.J	Sample Date:	17/11/23
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 17/11/23	Bore Radius (mm):	Chem Kit Serial No.: 20K1046070	☒ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 5.911	Screen Interval (m):	Chem Kit Model: YSI Pro	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☒ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): allen	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): key	☒ Retrieved				2 Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
10:16	0.5	5.911	30	1.75	2482	6.25	-26.8	22.8	light brown, roots, organic odour
10:18	1.0	↓	↓	0.33	2480	6.24	-31.8	22.5	
10:20	1.5			0.22	2463	6.24	-33.0	22.0	
10:22	2.0			0.23	2460	6.23	-32.5	22.0	
10:24	2.5			0.18	2460	6.23	-32.5	22.0	
10:26	30			0.20	2460	6.23	-32.0	22.1	
				Stabilised					↓
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic	✓	Needs to be cleared of wood.
						1	x60mL purple		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
✓	17/11/23		
Project Manager Signature	**Date**	**Distribution:** Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

BORR

Project Name:	Moora GME	Project Number:	~~60700663~~ 60644386	PM Name:	~~AA~~ C.B	Bore ID:	MW06
Client:	AMPOL SWCD	Project Location:	Moora Binbury	Fieldwork Staff:	S.J / A.B	Sample Date:	16/11/23

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info:	Decontamination	Sampling Method	Hydrasleeve Info:	
Date of GW Level: 16/11/23	Bore Radius (mm):	Chem Kit Serial No.: 20M104050	N Decontaminated	N Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 5.615	Screen Interval (m):	Chem Kit Model: YSI Pro	N Dedicated	Intake depth:	Hydrasleeve Type:	1 Gauging
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	Disposable	Bailer / Hydrasleeve	Sampling Depth (m-pvc):	Hydrasleeve in
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	Other (specify)	N Peristaltic Pump / Waterra	Hydrasleeve Install Time:	Hydrasleeve out
Product Thickness (m):	Bore Locked (YES/NO): Allen	Parameter method: Downhole		Other (specify)	Sampling Start Time:	2 Parameters
	Key Type (if applicable): Key	N Retrieved				
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (%)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
16:34	0.5	5.615	30	1.28	891	6.96	-3.1	21.3	light brown, clear, odourless
16:36	1.0			0.14	958	7.20	-37.3	20.9	
16:38	1.5			0.07	956	7.22	-45.0	20.8	
16:40	2.0			0.06	965	7.21	-47.3	20.7	
16:42	2.5			0.06	965	7.20	-48.3	20.7	
16:44	3.0			0.06	965	7.21	-50.4	20.7	
					Stabilised				
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information
Field Filtered:	Unfiltered:	x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		
	All	x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		
					1	x 500mL purple		

Field Comments

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

MW07 - 10.502
MW14s - 9.382
MW14d - 12.784

Approval and Distribution

Fieldwork Staff Signature	16/11/23 Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

BORR

Project Name:	Moora GME	Project Number:	60709653 60644386	PM Name:	D.A C.B	Bore ID:	MW080
Client:	AMPOL SWCA	Project Location:	Moora B.orum.	Fieldwork Staff:	S.J I.A.B	Sample Date:	16/11/23

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 16/11/23	Bore Radius (mm):	Chem Kit Serial No.: 20K104035	☒ Decontaminated	☒ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 3.762	Screen Interval (m):	Chem Kit Model: YSI Pro	☒ Dedicated	Intake depth:	Hydrasleeve Type:	1 Gauging
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Hydrasleeve in
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve out
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	2 Parameters
	Key Type (if applicable):	☒ Retrieved				
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (%)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
13:04	0.5	3.762	30	0.37	793	6.07	-7.7	20.0	light brown, slight sulphur odour, clear
13:06	1.0			0.15	789	6.09	-12.3	19.8	
13:08	1.5			0.11	787	6.09	-13.8	19.7	
13:10	2.0			0.04	777	6.08	-14.9	19.7	
13:12	2.5			0.04	771	6.06	-14.5	19.7	
13:14	3.0			0.04	771	6.06	-14.5	19.7	
					Stable, Stop				
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information
Field Filtered:	Unfiltered:	x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		✓
✓	All	x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		
					1	x60mL purple		

Field Comments

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Data logger downloaded.

MW11 01 - 14.443

MW11 S - 4.866

Approval and Distribution

Fieldwork Staff Signature — Date: 16/11/23

Project Manager Signature — Date

Checker Name and Signature — Date

Distribution: Project Central File

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	BORN Moora GME	Project Number:	60709658 60644386	PM Name:	DG C.B	Bore ID:	MW10
Client:	AMPOL SWCA	Project Location:	Moora Bunbury	Fieldwork Staff:	S.J I.A.B	Sample Date:	16/11/23

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info	Decontamination	Sampling Method	Hydrasleeve Info	
Date of GW Level: 16/11/23	Bore Radius (mm):	Chem Kit Serial No.: 10k104050	☒ Decontaminated	☒ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 1.695	Screen Interval (m):	Chem Kit Model: 451P2	☒ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Allen	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): ully	☒ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (%)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
10:06	0.5	1.695	30	0.66	801	5.81	29.7	19.6	light brown, clear, odourless
10:08	1.0	↓	↓	0.11	792	5.83	27.3	19.1	↓
10:10	1.5			0.05	759	5.83	26.5	19.1	
10:12	2.0			0.01	744	5.81	25.5	19.1	
10:14	2.5			0.01	758	5.81	23.3	19.1	
10:16	3.0			0.01	730	5.81	21.2	19.2	
									Stabilised.
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected				QA/QC Information
Field Filtered:	Unfiltered:	x 40 mL Vial (HCl)		x 60 mL Ferrous	2 x 60 mL metals (HNO_3)	
/	All	x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1 x 250 mL Plastic	
					1 x 60mL purple	

Field Comments

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Approval and Distribution

Fieldwork Staff Signature — Date: 16/11/23

Checker Name and Signature — Date

Project Manager Signature — Date

Distribution: Project Central File

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	~~Moora~~ BORA GME	Project Number:	~~60709653~~ 60644386	PM Name:	~~P.O~~ C.B	Bore ID:	MW13
Client:	~~AMPOL~~ SWCA	Project Location:	~~Moora~~ Bindoon	Fieldwork Staff:	~~S.J~~ IA.B	Sample Date:	16/11/23
						Well Development or **Well Sampling Event** (circle)	

General Bore Information

Date of GW Level: 16/11/23	Bore Radius (mm):		
Depth to GW (m-pvc): 0.891	Screen Interval (m):		
Bore Depth (m-pvc):	Casing Radius (mm):		
Depth to Product (m-pvc):	Cover Type (**gatic**/stick up):		
Product Thickness (m):	Bore Locked (YES/**NO**):		
	Key Type (if applicable):		
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)		

Parameter Info.

- Chem Kit Serial No.: 20K104010
- Chem Kit Model: YSI Pro
- Corrected Redox: Y / **N**
- (The correction to apply is probe dependent)
- Parameter method: ☐ Downhole ☑ Retrieved
- # purge volumes removed:

Decontamination

- ☑ Decontaminated
- ☐ Dedicated
- ☐ Disposable
- ☐ Other (specify)

Sampling Method

- ☑ Low Flow Pump rate: 30%
- Intake depth:
- ☐ Bailer ☐ Hydrasleeve
- ☐ Peristaltic Pump ☐ Waterra
- ☐ Other (specify)
- Total purged volume (L):

Hydrasleeve Info.

- Hydrasleeve Size:
- Hydrasleeve Type:
- Sampling Depth (m-pvc):
- Hydrasleeve Install time:
- Sampling Start Time:

Monitoring sequence followed (number in order):

- 1 Gauging
- Hydrasleeve in
- Hydrasleeve out
- 2 Parameters

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (%)	DO (ppm or **mg/L**)	E.C. (mS/cm or **µS/cm**)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
9:10	0.5	0.991	30	1.43	701	6.39	-23.1	19.7	
9:12	1.0	1.053	↓	0.12	686	6.30	-50.5	19.7	light brown, organic odour, slight sediment
9:14	1.5	1.065	↓	0.07	676	6.29	-66.9	19.7	↓
9:16	2.0	1.074	↓	0.07	676	6.30	-69.5	19.8	↓
9:18	2.5	↓	↓	0.03	673	6.30	-70.8	19.8	↓
9:20	3.0	↓	↓	0.03	673	6.30	-69.8	19.8	↓
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Stabilised

Analytes Sampled for:

- Field Filtered: —
- Unfiltered: All

Bottles Collected

	x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)
	x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic
				1	x60mL purge

QA/QC Information

—

Field Comments

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

MW11 - 1.35m

Approval and Distribution

[signature] Fieldwork Staff Signature	16/11/23 Date	Checker Name and Signature	Date
Project Manager Signature	Date		

Distribution: Project Central File

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	Boorn Moora GME	Project Number:	60644382	PM Name:	D.Quinn C.B	Bore ID:	MW15
Client:	AMPOL SWCA	Project Location:	Moora Bunbury	Fieldwork Staff:	S.Johnstone I.A.B	Sample Date:	15/11/23
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 15/11/23	Bore Radius (mm):	Chem Kit Serial No.: 151Pm	☒ Decontaminated	☒ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 1.525	Screen Interval (m):	Chem Kit Model: 20N104050	☒ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Allen	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): key	☒ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
11:56	0.5	1.532	30	1.62	750	5.89	15.8	21.7	clear, colourless, odourless
11:58	1.0	↓	↓	0.15	680	5.80	16.8	21.1	
14:00	1.5			6.11	655	5.75	14.3	21.1	
14:02	2.0			0.02	626	5.73	13.5	21.2	
14:04	2.5			0.05	595	5.71	14.2	21.2	
14:06	3.0			0.04	592	5.71	14.3	21.2	
				Stabilised.					
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		Ants in well
						1	x 60mL purple		

Approval and Distribution

Fieldwork Staff Signature — Date: 15/11/23 — Checker Name and Signature — Date

Project Manager Signature — Date — Distribution: Project Central File

FQM - Groundwater Sampling and Purging Record

						Bore ID:	MW22
Project Name:	BORR CME	Project Number:	60644382	PM Name:	C.B	Sample Date:	15/11/23
Client:	SWCA	Project Location:	Bunbury	Fieldwork Staff:	S.J/A.B	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level: 15/11/23	Bore Radius (mm):	Chem Kit Serial No.: 20410400	☒ Decontaminated	☒ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 2.559	Screen Interval (m):	Chem Kit Model: 451 Pro	☐ Dedicated	Intake depth:	Hydrasleeve Type:	1 Gauging
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☒ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Hydrasleeve in
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve out
Product Thickness (m):	Bore Locked (YES/NO): Allen	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	2 Parameters
	Key Type (if applicable): Key	☒ Retrieved				
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (%)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
12:14	0.5	2.559	30	5.83	108	4.38	30.9	21.0	clear, colourless, odourless
12:16	1.0	↓	↓	0.64	12208	4.96	16.2	20.8	↓
12:18	1.5			0.30	12168	5.04	14.5	20.8	
12:20	2.0			0.18	12357	5.05	14.6	21.2	
12:22	2.5			0.21	12317	5.05	14.7	21.0	
12:24	3.0			0.23	12312	5.05	14.9	21.0	
					Stabilised				
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

s Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)	✓	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		
						1	x60mL purple		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
✓	15/11/23		
Project Manager Signature	**Date**	**Distribution:** Project Central File	

AECOM

ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW225
Project Name:	Boral GME	Project Number:	60644386	PM Name:	C.B	Sample Date:	15/11/23
Client:	SWCA	Project Location:	Bunbury	Fieldwork Staff:	S.J / A.B	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level: 15/10/23	Bore Radius (mm):	Chem Kit Serial No.: 20x10405C	☒ Decontaminated	☒ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 0.73	Screen Interval (m):	Chem Kit Model: YSI Pro	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Allen	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Key	☐ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
11:56	0.5	0.85	30	1.02	1658	6.54	-62.5	21.3	clear, colourless, odourless
11:58	1.0	0.891		0.26	1619	6.52	-51.1	21.1	
12:00	1.5	0.961		0.52	1568	6.50	-46.7	21.4	
12:02	2.0	1.03		0.37	1522	6.50	-39.2	20.9	
12:04	2.5	1.051		0.30	1498	6.50	-31.2	20.9	
12:06	3.0	1.131		0.32	1497	6.50	-31.9	20.9	
					Stabilised				
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected					QA/QC Information	Field Comments
Field Filtered:	Unfiltered:	x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All	x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		
					1	x60mL purge		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
	15/11/23		
Project Manager Signature	**Date**	**Distribution:** Project Central File	

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FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	Boorn CMC	**Project Number:**	60644386	**PM Name:**	G.B	**Bore ID:**	MW05
Client:	SWCA	**Project Location:**	Bunbury	**Fieldwork Staff:**	S.J / A.B	**Sample Date:**	15/11/23
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level: 15/11/23	Bore Radius (mm):	Chem Kit Serial No.: DW04050	☒ Decontaminated	☒ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 7.101	Screen Interval (m):	Chem Kit Model: 151 Pro	☒ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☒ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Allen	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Key	☒ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (%)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
10:36	0.5	7.253	30	1.87	1309	6.31	-48.9	20.1	Clear, colourless, odourless (roots in water)
10:38	1.0	7.261	↓	1.56	1316	6.33	-50.3	19.8	↓
10:40	1.5	7.280		1.34	1352	6.32	-51.2	19.8	
10:42	2.0	7.300		1.19	1420	6.29	-50.4	19.8	
10:44	2.5	↓		1.18	1413	6.29	-48.7	19.8	
10:46	3.0			1.17	1417	6.29	-47.3	19.8	
					STABILISED				
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Samples Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	**Unfiltered:**		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)	WQA01 - Duplicate	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		Ants in well
						1	x 60mL plastic		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
✓	15/11/23		
Project Manager Signature	**Date**	**Distribution:** Project Central File	

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FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

Project Name:	~~Alcoa~~ BORR GME	Project Number:	60644386	PM Name:	D.Ogilvie C.B	Bore ID:	MW27
Client:	AMPOL SNCA	Project Location:	~~Alcoa~~ Bunbury	Fieldwork Staff:	S.Johnstone J.A.B	Sample Date:	15/11/23
						Well Development or Well Sampling Event? (circle)	

Groundwater Level Information

Date of GW Level:	15/11/23
Depth to GW (m-pvc):	2.120
Bore Depth (m-pvc):	
Depth to Product (m-pvc):	
Product Thickness (m):	
Calculated bore volume (L):	

Bore Information

Bore Radius (mm):	
Screen Interval (m):	
Casing Radius (mm):	
Cover Type (gatic/stick up):	
Bore Locked (YES/NO):	Allen
Key Type (if applicable):	Key
Includes/ excludes bore annulus (circle)	

Parameter Information

Chem Kit Serial No.:	20410405D
Chem Kit Model:	YSI Pro
Corrected Redox:	Y / N
(The correction to apply is probe dependent)	
Parameter method:	☐ Downhole ☑ Retrieved

Purge Equipment

- ☑ Decontaminated
- ☐ Dedicated
- ☐ Disposable
- ☐ Other (specify)

Sampling Method

- ☐ Low Flow Pump rate:
  Intake depth:
- ☐ Bailer ☐ Hydrasleeve
- ☑ Peristaltic Pump ☐ Waterra
- ☐ Other (specify)

Hydrasleeve Info

Hydrasleeve Size:	
Hydrasleeve Type:	
Sampling Depth (m-pvc):	
Hydrasleeve Install time:	
Sampling Start Time:	

Monitoring sequence followed (number in order):

1 Gauging
Hydrasleeve in
Hydrasleeve out
2 Parameters

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/min)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
9:48	0.5	2.123	30	0.19	377	5.69	-46.3	19.3	Dark brown, clear
9:50	1.0	↓	↓	0.10	251	5.39	-37.3	19.1	
9:52	1.5			0.06	197	5.21	-29.0	19.0	light brown, clear, odourless
9:54	2.0			0.02	184	5.21	-27.9	19.0	
9:56	2.5			0.01	177	5.20	-25.2	19.0	
9:58	3.0	↓	↓	0.01	174	5.20	-24.7	19.0	↓
				Stabilised					
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:

Field Filtered:	Unfiltered:
/	All

Bottles Collected

	x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)
	x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic
				1	x bore purge

QA/QC Information

/

Field Comments

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Approval and Distribution

Fieldwork Staff Signature	15/11/23 Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

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FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

Project Name:	~~Doubleview~~ 3088 GME	Project Number:	60644386	PM Name:	~~D. Oulton~~ C.B	Bore ID:	MW31
Client:	~~AMPOL~~ SWC-A	Project Location:	~~365 Scarborough Beach Rd~~	Fieldwork Staff:	S. Johnstone / A.B	Sample Date:	15/11/23

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 15/11/23	Bore Radius (mm):	Chem Kit Serial No.: 451 PRO	☒ Decontaminated	☒ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 2.9~~8665~~	Screen Interval (m):	Chem Kit Model: 10K104050	☒ Dedicated	Intake depth:	Hydrasleeve Type:	
~~Bore Depth (m-pvc):~~	Casing Radius (mm):	**Corrected Redox:** Y / (N)	☒ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Allen	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): key	☒ Retrieved				2 Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
9:08	0.5	2.965	30	0.75	305	4.99	57.0	19.4	light brown, clear, odourless
9:10	1.0	↓	↓	0.25	289	4.99	33.9	19.3	↓
9:12	1.5			0.15	282	4.98	20.2	19.3	
9:14	2.0			0.12	277	4.97	16.5	19.4	
9:16	2.5			0.13	274	4.97	15.0	19.4	
9:18	3.0			0.13	275	4.97	14.0	19.3	
				Stabilised					
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic	✓	
						1	x 60mL purple		

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
✓	15/11/23		
Project Manager Signature	**Date**	**Distribution:** Project Central File	

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FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	Moora GME	Project Number:	60709653 60644380	PM Name:	Dan C.B	Bore ID:	MW46
Client:	AMPOL SWCA	Project Location:	Moora Bunbury	Fieldwork Staff:	S.J / A.B	Sample Date:	17/11/23

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info	Decontamination	Sampling Method	Hydrasleeve Info	
Date of GW Level: 17/11/23	Bore Radius (mm):	Chem Kit Serial No.: 90410405D	☒ Decontaminated	☒ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 4.394	Screen Interval (m):	Chem Kit Model: YSI Pro	☒ Dedicated	Intake depth: 5m	Hydrasleeve Type:	1 Gauging
Bore Depth (m-pvc): 5.86	Casing Radius (mm):	Corrected Redox: Y / (N)	☒ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Hydrasleeve in
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve out
Product Thickness (m):	Bore Locked (YES/NO): Allen	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	2 Parameters
	Key Type (if applicable): key	☒ Retrieved				
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/min)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
9:00	0.5	4.360	30	1.28	1110	5.87	50.9	19.7	light brown, clear, odourless
9:02	1.0	↓	↓	0.56	1117	5.79	49.3	19.5	↓
9:04	1.5			0.32	1113	5.75	46.7	19.6	
9:06	2.0			0.25	1119	5.75	45.3	19.6	
9:08	2.5			0.27	1119	5.77	44.1	19.6	
9:10	3.0			0.26	1118	5.77	43.1	19.6	
									Stabilised
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	Unfiltered:	x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)			Bore volume calculation, bore condition, fate of tubing, redox correction etc.
	All	x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic			
					1	x 1mL purple			

Approval and Distribution

Fieldwork Staff Signature	17/11/23 Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

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FQM - NAPL and Groundwater Level Gauging Record

Q4AN(EV)-414-FM1

Project Name:	Bunbury Outer Ring Road	Project Location:	Bunbury	PM Name:	G Brophy
Project Number:	60644386	Client:	South West Gateway Alliance	Fieldwork Staff Name:	S J I S A

Confirm NAPL and groundwater levels by repeat measurements. All columns must be completed. If NAPL is not present in a well write 'ND' (Not Detected) in the relevant column.

Field Data

Well ID	Date (dd/mm/yy)	Time (24hr:mm)	PID Reading (ppm)	Depth to LNAPL (mBTOC)	Depth to Groundwater (mBTOC)	LNAPL Thickness (m)	Depth to DNAPL (mBTOC)	Total Well Depth (mBTOC)	DNAPL Thickness (m)	Comments (well condition, odour, NAPL colour and viscosity)
MW31	14/12/23	8 52			3 155					
MW27		9 12			2 410					
MW25		9 30			7.800					
MW25b		9 51			dry					
MW22		9 53			3 720					
MW22b		9 52			1.530					
MW15		10 10			1 910					
MW13		10 16			1 143					
MW16		10 38			4 592					
MW11		10 58			1607					
MW10		11:06			2.001					
MW07		11 20			10 483					
MW08a		11:25			405					
MW11S		11:34			5 06					
MW11d		11:36			5 48					
MW06		12 10			5 821					
MW04		12:32			4 769					
MW05		12:36			6.08					
MW14S		13:05			9.408					
MW14D	↓	13:07			13.018					

Measurement Equipment

Make & Model:	Geotech IP	Supplier:	Aivmet
Serial No.:	5803	Calibration Report Provided?	N/A

Notes/Comments

(PID) - photo ionisation detector; (ppm) - parts per million; (LNAPL) - light non-aqueous phase liquids; (DNAPL) - dense light non-aqueous phase liquid; (mBTOC) - metres below top of casing

Approval and Distribution

14/12/23

Fieldwork Staff Signature — Date

Project Manager Signature — Date

Distribution: Project Central File

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FQM - NAPL and Groundwater Level Gauging Record

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Q4AN(EV)-414-FM1

Project Name:	BOAR	Project Location:	Bunbury	PM Name:	AB
Project Number:	60644936	Client:	SNCA	Fieldwork Staff Name:	MR & SJ

Confirm NAPL and groundwater levels by repeat measurements. All columns must be completed. If NAPL is not present in a well write 'ND' (Not Detected) in the relevant column.

Well ID	Date (dd/mm/yy)	Time (24hr:mm)	PID Reading (ppm)	Depth to LNAPL (mBTOC)	Depth to Groundwater (mBTOC)	LNAPL Thickness (m)	Depth to DNAPL (mBTOC)	Total Well Depth (mBTOC)	DNAPL Thickness (m)	Comments (well condition, odour, NAPL colour and viscosity)
					Field Data					
MW31	9/01/24	8:14			3.375					
MW27		8:30			2.392					
MW25		8:53			8.08					
MW25b		8:54			dry					
MW22		9:11			3.382					
MW22b		9:12			dry					
MW15		9:30			2.037					
MW13		9:40			1.121					
MW46		10:42			4.823					
MW11		10:55			3.711					
MW10		11:05			2.071					
MW07		11:20			10.398					evd of roots
MW08a		11:40			4.152					
MW11d		11:45			16.084					
MW11S		11:50			5.255					
MW09		12:20			5.101					
MW06		12:15			5.082					
MW05		12:40			6.062					Roots @ 6.00 - cleared to 8m
MW14S		13:25			9.475					
MW14d		13:30			13.545					

Measurement Equipment			
Make & Model:		Supplier:	
Serial No.:		Calibration Report Provided?	

Notes/Comments

(PID) - photo ionisation detector; (ppm) - parts per million; (LNAPL) - light non-aqueous phase liquids; (DNAPL) - dense light non-aqueous phase liquid; (mBTOC) - metres below top of casing

Approval and Distribution

Fieldwork Staff Signature _____ Date _____

Project Manager Signature _____ Date _____

Distribution: Project Central File

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FQM - Sample QAQC Tracking Sheet

Q4AN(EV)-011-FM1

Project Name:	ORR Quarterly Monitorin	**Project Number:**	60644386
Project Location:	Bunbury Outer Ring Road	**Client:**	SWGA
PM Name:	GB	**Fieldwork Staff:**	SJ/HRG

QAQC Information

QAQC ID	Primary Sample ID	Sample Type	Batch Number
WQA01	MW25	Duplicate	
WQA02	NC4	Duplicate	
WQA03	MW06	Duplicate	
WQA04	—	Rinsate	
WQA05	—	Rinsate	
WQA06	—	Rinsate	

QA\QC Project Requirements

QAQC	Required		Frequency		Method Used
Field Duplicates	☑ Yes	☐ No	☐ 1 in 10	☐ 1 in 20	
Field Triplicates	☐ Yes	☑ No	☐ 1 in 10	☐ 1 in 20	
Rinsate Blanks	☑ Yes	☐ No	☐ 1 per matrix/equipment/day		
Field Blanks	☐ Yes	☑ No	☐ 1 per day		
Trip Blanks	☐ Yes	☑ No	☐ 1 per ice chest		
Trip Spikes	☐ Yes	☐ No	☐ 1 per ice chest		

Approval and Distribution

Fieldwork Staff Signature _____ Date _____

Project Manager Signature _____ Date _____

Distribution: Project Central File

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FQM - Groundwater Sampling and Purging Record

Project Name:	BORR Quarterly Monitoring	**Project Number:**	60644386	**PM Name:**	GB	**Bore ID:**	
Client:	SWGA	**Project Location:**	Bunbury Outer Ring Road	**Fieldwork Staff:**	SJ/HRG	**Sample Date:**	21/02/24

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 21/02/24	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	**Monitoring sequence followed (number in order):**
Depth to GW (m-pvc):	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	**Corrected Redox:** Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	**Unfiltered:**		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
			x 40 mL Vial (H_2SO_4)		x 100 mL Amber		x 250 mL Plastic		MB14D = 13.836m DTW
									MB14S = 9.517m DTW

Approval and Distribution

N. Ryan	21/02/24		
Fieldwork Staff Signature	**Date**	**Checker Name and Signature**	**Date**
Project Manager Signature	**Date**	**Distribution:** Project Central File	

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FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

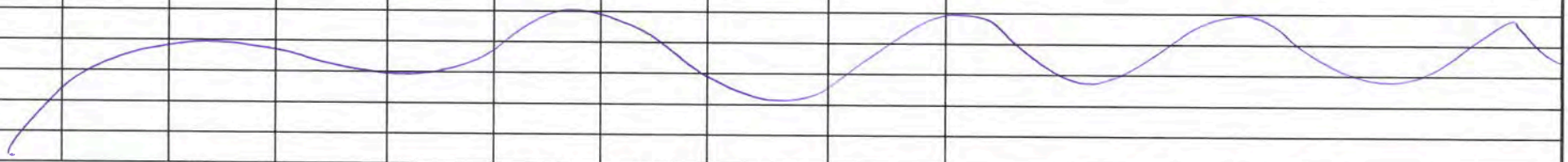
Project Name:	BORR Quarterly Monitoring	**Project Number:**	60644386	**PM Name:**	GB	**Bore ID:**	MW4
Client:	SWGA	**Project Location:**	Bunbury Outer Ring Road	**Fieldwork Staff:**	SJ/HRG	**Sample Date:**	22/02/24

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 22/02/24	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☑ Low Flow Pump rate: 30	Hydrasleeve Size:	**Monitoring sequence followed (number in order):**
Depth to GW (m-pvc): 5.099	Screen Interval (m):	Chem Kit Model:	☑ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	**Corrected Redox:** Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
9:32	0.5	5.282	30	0.76	3944	6.40	-23.5	19.8	clear, colourless, odourless
9:34	1.0	5.282		0.29	3948	6.42	-27.9	19.6	
9:36	1.5	5.282		0.19	3949	6.43	-29.5	19.6	
9:38	2.0			0.18	3951	6.45	-30.2	19.6	
9:40	2.5			0.20	3945	6.45	-30.5	19.6	
9:42	3.0			0.24	3947	6.45	-30.3	19.6	
			← STABILISED →						
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)



Analytes Sampled for:		Bottles Collected			QA/QC Information
Field Filtered:	**Unfiltered:**	x 40 mL Vial (HCl)	x 60 mL Ferrous	x 60 mL metals (HNO_3)	
	All	x 40 mL Vial (H_2SO_4)	x 100 mL Amber	x 250 mL Plastic	

Field Commets

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Approval and Distribution

Fieldwork Staff Signature	**Date**	**Checker Name and Signature**	**Date**
Project Manager Signature	**Date**	**Distribution:** Project Central File	

FQM - Groundwater Sampling and Purging Record

Project Name:	BORR Quarterly Monitoring	**Project Number:**	60644386	**PM Name:**	GB	**Bore ID:**	MW05
Client:	SWGA	**Project Location:**	Bunbury Outer Ring Road	**Fieldwork Staff:**	SJ/HRG	**Sample Date:**	22/02/24
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 22/02/24	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☑ Low Flow Pump rate: 30	Hydrasleeve Size:	**Monitoring sequence followed (number in order):**
Depth to GW (m-pvc): 6.095	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	**Corrected Redox:** Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
10:23	0.5	6.279	30	1.70	2568	6.28	-86.9	23.3	Clear, colourless, odourless
10:25	1.0	↓	↓	1.58	2575	6.21	-81.9	22.7	↓
10:27	1.5	↓	↓	1.46	2592	6.20	-79.6	22.5	↓
10:29	2.0	↓	↓	1.37	2624	6.19	-79.0	22.5	↓
10:31	2.5	↓	↓	1.30	2630	6.17	-79.2	22.7	↓
10:33	3.0	↓	↓	1.23	2628	6.18	-80.3	22.5	↓
		←	STABILISED		→				
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	**Unfiltered:**		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
	All		x 40 mL Vial (H_2SO_4)		x 100 mL Amber		x 250 mL Plastic		Roots, high turbidity during initial pump attempt. Tubing was too deep

Approval and Distribution

T.O. Ryan	22/02/24		
Fieldwork Staff Signature	**Date**	**Checker Name and Signature**	**Date**
Project Manager Signature	**Date**	**Distribution:** Project Central File	

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FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

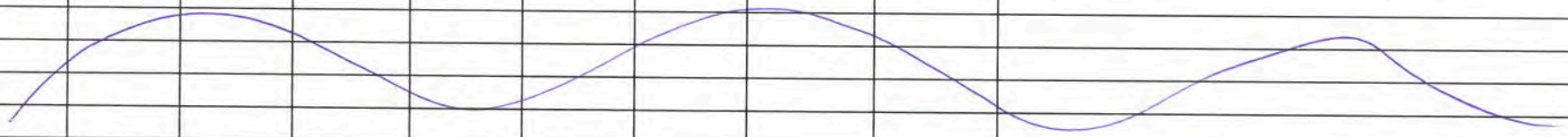
Project Name:	BORR Quarterly Monitoring	**Project Number:**	60644386	**PM Name:**	GB	**Bore ID:**	MW6
Client:	SWGA	**Project Location:**	Bunbury Outer Ring Road	**Fieldwork Staff:**	SJ/HRG	**Sample Date:**	22/02/24

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 22/02/24	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☑ Low Flow Pump rate: 30	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 5.845	Screen Interval (m):	Chem Kit Model:	☑ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	**Corrected Redox:** Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☑ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Allen	☐ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
8:57	0.5	5.856	30	0.50	980	7.20	-138.5	21.5	Clear, odourless, colourless
8:59	1.0	5.856	↓	0.08	1021	7.34	-160.9	21.8	Suspended sediment
9:01	1.5	5.856	↓	0.04	1026	7.35	-155.2	21.9	
9:03	2.0	↓	↓	0.02	1026	7.32	-166.8	22.0	
9:05	2.5	↓	↓	0.02	1021	7.30	-164.8	21.9	
9:07	3.0	↓	↓	0.03	1010	7.28	-161.4	22.0	
			← STABILISED →						
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)



Analytes Sampled for:		Bottles Collected			QA/QC Information	Field Commets
Field Filtered:	**Unfiltered:**	x 40 mL Vial (HCl)	x 60 mL Ferrous	x 60 mL metals (HNO_3)	WQA03	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
	All	x 40 mL Vial (H_2SO_4)	x 100 mL Amber	x 250 mL Plastic		

Approval and Distribution

T.K. Fieldwork Staff Signature	22/02/24 Date	Checker Name and Signature	Date
Project Manager Signature	Date	**Distribution:** Project Central File	

AECOM

FQM - Groundwater Sampling and Purging Record

Project Name:	BORR Quarterly Monitoring	**Project Number:**	60644386	**PM Name:**	GB	**Bore ID:**	MW7
Client:	SWGA	**Project Location:**	Bunbury Outer Ring Road	**Fieldwork Staff:**	SJ/HRG	**Sample Date:**	21/02/24

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 21/02/24	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 10.407	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	**Corrected Redox:** Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	**Unfiltered:**		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
			x 40 mL Vial (H_2SO_4)		x 100 mL Amber		x 250 mL Plastic		MW 7 = 10.407m DTW

Approval and Distribution

M. K.	21/02/24		
Fieldwork Staff Signature	**Date**	**Checker Name and Signature**	**Date**
Project Manager Signature	**Date**	**Distribution:** Project Central File	

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FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	BORR Quarterly Monitoring	**Project Number:**	60644386	**PM Name:**	GB	**Bore ID:**	MW 8A
Client:	SWGA	**Project Location:**	Bunbury Outer Ring Road	**Fieldwork Staff:**	SJ/HRG	**Sample Date:**	21/02/24
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 21/02/24	Bore Radius (mm): 150	Chem Kit Serial No.:	☒ Decontaminated	☒ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 4.320	Screen Interval (m): 3	Chem Kit Model:	☒ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm): 50	**Corrected Redox:** Y / (N)	☒ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up): Allen	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): key	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☒ Retrieved				2 Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
11:42	0.5	4.302	30	0.64	559	6.04	-1.0	21.4	Brown, turbid, odourless
11:44	1.0	4.328	↓	0.15	559	5.95	-24.0	21.3	↓
11:46	1.5	4.329	↓	0.13	559	5.96	-29.4	21.3	↓
11:48	2.0	4.329	↓	0.10	559	5.97	-35.8	21.4	↓
11:50	2.5	4.329	↓	0.11	559	5.98	-41.3	21.4	↓
11:52	3.0	4.329	↓	0.13	562	5.98	-44.8	21.5	↓
	←	STABILISED		→					
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	**Unfiltered:**		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All	2	x 40 mL Vial (H_2SO_4)	1	x 100 mL Amber	1	x 250 mL Plastic		Roots at 4m
		1	x 100mL orgs	1	x 125mL acetate				Cleared
		1	x 60mL nutrient						MB110 = 14.653m DTW
									MB115 = 5.425m DTW

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
16. Ryn	21/02/24		
Project Manager Signature	**Date**	**Distribution:** Project Central File	

FQM - Groundwater Sampling and Purging Record

						Bore ID:	MW10
Project Name:	BORR Quarterly Monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	21/02/24
Client:	SWGA	Project Location:	Bunbury Outer Ring Road	Fieldwork Staff:	SJ/HRG	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 21/02/24	Bore Radius (mm): 150	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 2.219	Screen Interval (m): 3	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm): 50	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up): Allen	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): keys	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
10:43	0.5	2.223	30	0.81	654	5.70	2.8	23.0	Clear, colourless, odourless
10:45	1.0	2.223		0.43	660	5.68	-4.6	22.9	
10:47	1.5	2.223		0.29	637	5.67	-4.1	22.9	
10:49	2.0			0.26	571	5.65	-3.3	23.0	
10:51	2.5			0.25	519	5.64	-6.6	23.0	
10:53	3.0			0.26	491	5.62	-12.6	23.1	
		← STABILISED →							
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All	2	x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x ~~250~~ 500 mL Plastic		
		1	x100mL orgs	1	x125mL acetate				
		1	x60mL nutrients						

Approval and Distribution

Fieldwork Staff Signature: JH-Ky	Date: 21/02/24	Checker Name and Signature:	Date:
Project Manager Signature:	Date:	Distribution: Project Central File	

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FQM - Groundwater Sampling and Purging Record

Project Name:	BORR Quarterly Monitoring	Project Number:	60644386	PM Name:	GB	Bore ID:	MW46
Client:	SWGA	Project Location:	Bunbury Outer Ring Road	Fieldwork Staff:	SJ/HRG	Sample Date:	21/02/24

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve info.	
Date of GW Level: 21/02/24	Bore Radius (mm): 150	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 5.088	Screen Interval (m): 3	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm): 50	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up): Allen	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): key	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/...)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
9:46	0.5	5.105	30	0.94	560	5.79	-103.5	22.6	Clear, colourless, slight sulfur odour
9:48	1.0	5.105	↓	0.39	542	5.74	-113.7	22.3	↓
9:50	1.5	5.110	↓	0.32	541	5.75	-121.0	22.2	↓
9:52	2.0	5.110	↓	0.36	542	5.76	-126.3	22.1	↓
9:54	2.5	↓	↓	0.32	543	5.75	-130.1	22.2	↓
9:56	3.0	↓	↓	0.34	546	5.74	-131.1	22.4	↓
		← STABILISED →							
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected					QA/QC Information
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2 x 60 mL metals (HNO_3)	
✓	All	2	x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1 x 250 mL Plastic	
		1	x100mL orgs	1	x125mL acetate		
		1	x60mL nutrients				

Field Commets

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Approval and Distribution

Fieldwork Staff Signature: JR	Date: 21/02/24	Checker Name and Signature:	Date:
Project Manager Signature:	Date:	Distribution: Project Central File	

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FQM - Groundwater Sampling and Purging Record

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Q4AN(EV)-405-FM1

						Bore ID:	MW15
Project Name:	BORR Quarterly Monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	21/02/24
Client:	SWGA	Project Location:	Bunbury Outer Ring Road	Fieldwork Staff:	SJ/HRG	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 21/02/24	Bore Radius (mm): 150	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 2.149	Screen Interval (m): 3	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	1 Gauging
Bore Depth (m-pvc):	Casing Radius (mm): 50	Corrected Redox: Y / (N)	☒ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Hydrasleeve in
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install Time:	Hydrasleeve out
Product Thickness (m):	Bore Locked (YES/NO): ALIEN	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	2 Parameters
	Key Type (if applicable): key	☐ Retrieved				
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
9:03	0.5	2.159	30	0.75	690	5.57	-39.1	23.9	Roots. light brown, organic odour, clear
9:05	1.0	2.159		0.20	704	5.57	-59.2	23.9	
9:07	1.5			0.20	703	5.58	-68.0	23.9	
9:09	2.0			0.19	702	5.58	-70.5	23.9	
9:11	2.5			0.22	700	5.58	-72.9	23.9	
9:13	3.0			0.21	696	5.58	-76.5	23.9	
			← STABILISED →						
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All	2	x 40 mL Vial (H_2SO_4)		x 100 mL Amber	1	x 250 mL Plastic		
		1	x100mL orgs						
		1	x60mL nutrients						

Approval and Distribution

M. Ry	21/02/24		
Fieldwork Staff Signature	Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

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FQM - Groundwater Sampling and Purging Record

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Q4AN(EV)-405-FM1

Project Name:	BORR Quarterly Monitoring	**Project Number:**	60644386	**PM Name:**	GB	**Bore ID:**	MW13
Client:	SWGA	**Project Location:**	Bunbury Outer Ring Road	**Fieldwork Staff:**	SJ/HRG	**Sample Date:**	21/02/24

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 21/2/24	Bore Radius (mm): 150	Chem Kit Serial No.:	☒ Decontaminated	☐ Low Flow Pump rate: 30%	Hydrasleeve Size:	**Monitoring sequence followed (number in order):**
Depth to GW (m-pvc): 1.386	Screen Interval (m): 3	Chem Kit Model:	☒ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm): 50	**Corrected Redox:** Y / (N)	☒ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Allen	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): key	☒ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L/)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
8:32	0.5	1.436	30	0.63	738	6.47	-144.7	24.9	Clear, colourless, odourless
8:34	1.0	1.456	30	1.76	663	6.31	-103.4	24.2	
8:36	1.5	1.465	↓	1.75	655	6.26	-90.2	24.1	
8:38	2.0	1.473	↓	1.79	653	6.24	-85.5	24.2	
8:40	2.5	1.475	↓	1.69	653	6.24	-86.5	24.2	
8:42	3.0	1.479	↓	1.56	652	6.22	-91.0	24.3	
			← STABILISED →						
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	**Unfiltered:**		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc
✓	All	2	x 40 mL Vial (H_2SO_4)	1	x 100 mL Amber	1	x 250 (300) mL Plastic		
		1	x 100mL orgs	1	x 125mL acetate				
		1	x 60mL nutrients						

Approval and Distribution

JB.RT	21/02/24		
Fieldwork Staff Signature	**Date**	**Checker Name and Signature**	**Date**
Project Manager Signature	**Date**	**Distribution:** Project Central File	

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FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW22
Project Name:	BORR Quarterly Monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	20/02/24
Client:	SWGA	Project Location:	Bunbury Outer Ring Road	Fieldwork Staff:	SJ/HRG	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 20/02/24	Bore Radius (mm): 150	Chem Kit Serial No.:	☐ Decontaminated	☒ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 3.652	Screen Interval (m): 3	Chem Kit Model: ProQuatro	☒ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm): 50	Corrected Redox: Y / (N)	☒ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Allen	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Key	☐ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
13:51	0.5	3.835	30	2.72	10733	4.95	113.0	24.1	Clear, colourless, odourless
13:53	1.0	3.866	30	0.37	10824	5.28	84.3	24.5	
13:55	1.5	3.893	30	0.31	11054	5.30	63.8	25.2	
13:57	2.0	3.911	30	0.19	11077	5.31	53.9	25.1	
13:59	2.5	3.927	30	0.22	11060	5.31	44.2	25.1	
14:01	3.0	3.935	30	0.22	11088	5.30	36.0	24.9	
		←	STABILISED		→				
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All	2	x 40 mL Vial (H_2SO_4)	1	x 100 mL Amber	1	x ~~250~~ 500 mL Plastic		MW22b - moist at bottom ~5cm
		1	x100mL orgs	1	x125mL Acetate				
		1	x60mL nutrients						

Approval and Distribution

Fieldwork Staff Signature: [signature]	Date: 20/02/24	Checker Name and Signature:	Date:
Project Manager Signature:	Date:	Distribution: Project Central File	

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FQM - Groundwater Sampling and Purging Record

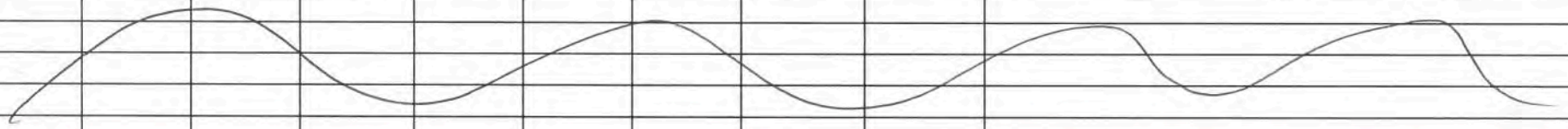
Q4AN(EV)-405-FM1

						Bore ID:	MW25
Project Name:	BORR Quarterly Monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	20/02/24
Client:	SWGA	Project Location:	Bunbury Outer Ring Road	Fieldwork Staff:	SJ/HRG	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 20/02/24	Bore Radius (mm): 150	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 8.407	Screen Interval (m): 3	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm): 50	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Allen	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Key	☐ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (↑↓)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
12:03	0.5	8.568	30	0.70	915	6.54	28.5	22.9	Clear, colourless, odourless
12:05	1.0	8.620	↓	0.31	797	6.65	24.8	21.9	
12:07	1.5	8.653	↓	0.31	781	6.68	25.1	21.7	
12:09	2.0	8.685	↓	0.20	777	6.69	24.6	21.7	
12:11	2.5	8.708	↓	0.18	774	6.67	23.8	21.4	
12:13	3.0	8.725	↓	0.14	774	6.69	21.4	21.5	
		←	STABILISED		→				
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)



Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)	INQA01	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All	2	x 40 mL Vial (H_2SO_4)	1	x 100 mL Amber	1	x 250 mL Plastic		
		1	x100mL orgs	1	x125mL acetate				
		1	x60mL nutrients						

Approval and Distribution

Fieldwork Staff Signature: [signature]	Date: 20/02/24	Checker Name and Signature:	Date:
Project Manager Signature:	Date:	Distribution: Project Central File	

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FQM - Groundwater Sampling and Purging Record

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Q4AN(EV)-405-FM1

						Bore ID:	MW27
Project Name:	BORR Quarterly Monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	20/02/24
Client:	SWGA	Project Location:	Bunbury Outer Ring Road	Fieldwork Staff:	SJ/HRG	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 20/02/24	Bore Radius (mm): 150	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 2.513	Screen Interval (m): 3	Chem Kit Model:	☒ Dedicated	Intake depth: 30/.	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm): 50	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up): Allen	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): keys	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate (L)	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
11:09	0.5	2.523	30	0.39	191.6	5.67	-105.9	25.6	Roots, organic odour
11:11	1.0	2.523	30	0.18	175.2	5.67	-111.0	24.9	Brown, mild turbidity, rootlets
11:13	1.5	2.523	30	0.17	160.1	5.62	-111.8	24.6	
11:15	2.0	↓	30	0.12	155.8	5.61	-113.0	24.4	↓
11:17	2.5	↓	30	0.10	152.7	5.59	-115.4	24.5	
11:19	3.0	↓	30	0.11	150.6	5.60	-117.7	24.4	
		←	STABILISED		→				
Acceptable Parameter Range:			± 10%	± 3%		± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
✓	All	2	x 40 mL Vial (H_2SO_4)	1	x 100 mL Amber	1	x ~~250~~ 200 mL Plastic		Roots until 2.2m
		1	x100mL orgs	1	x125mL acetone				Cleared to 4.0m
		1	x60mL nutrients						

Approval and Distribution

Fieldwork Staff Signature	Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

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FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW31
Project Name:	BORR Quarterly Monitoring	Project Number:	60644386	PM Name:	GB	Sample Date:	20102124
Client:	SWGA	Project Location:	Bunbury Outer Ring Road	Fieldwork Staff:	SJ/HRG	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 20102124	Bore Radius (mm): 150	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate: 30%	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 3.525	Screen Interval (m): 3	Chem Kit Model:	☒ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm): 50	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	1 Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Allen	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): key	☒ Retrieved				2 Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
10:15	0.5	3.545	30	0.73	595	5.14	160.8	23.6	Clear, colourless, odourless
10:17	1.0	3.545	30	0.37	569	5.08	159.8	23.3	
10:19	1.5	3.545	30	0.28	561	5.16	158.0	23.0	
10:21	2.0	↓	30	0.26	561	5.17	154.6	23.0	
10:23	2.5	↓	30	0.26	568	5.18	154.6	22.9	
10:25	3.0	↓	30	0.26	571	5.18	156.6	22.7	
		←	STABILISED		→				
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous	2	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
	All	2	x 40 mL Vial (H_2SO_4)	1	x 100 mL Amber	1	x 250 mL Plastic		
		1	x100mL orgs	1	x125mL acetate				
		1	x60mL nutrient						

Approval and Distribution

16.Ry Fieldwork Staff Signature	20/02/24 Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

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FQM - Groundwater Sampling and Purging Record

Project Name:	BORR Quarterly Monitoring	Project Number:	60644386	PM Name:	GB	Bore ID:	NC4
Client:	SWGA	Project Location:	Bunbury Outer Ring Road	Fieldwork Staff:	SJ/HRG	Sample Date:	20/02/24
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level:	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc):	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
14:25				8.08	3794	7.87	68.6	27.4	Odourless, brown, mild turbidity
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Commets
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	WQA02	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
			x 40 mL Vial (H_2SO_4)		x 100 mL Amber		x 250 mL Plastic		TDS = 2354

Approval and Distribution

Fieldwork Staff Signature	Date: 20/02/24	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

ANZ

FQM - NAPL and Groundwater Level Gauging Record

AECOM

Q4AN(EV)-414-FM1

Project Name:	BORR monthly monitoring	Project Location:	Bunbury	PM Name:	G.Brophy
Project Number:	60644386	Client:	SWGA	Fieldwork Staff Name:	SJ/SM

Confirm NAPL and groundwater levels by repeat measurements. All columns must be completed. If NAPL is not present in a well write 'ND' (Not Detected) in the relevant column.

Field Data

Well ID	Date (dd/mm/yy)	Time (24hr:mm)	PID Reading (ppm)	Depth to LNAPL (mBTOC)	Depth to Groundwater (mBTOC)	LNAPL Thickness (m)	Depth to DNAPL (mBTOC)	Total Well Depth (mBTOC)	DNAPL Thickness (m)	Comments (well condition, odour, NAPL colour and viscosity)
MW31	13/03/24	8:35	-	-	3.435	-	-	-	-	
MW27	13/03/24	8:55	-	-	2.445	-	-	-	-	
MW25		9:10	-	-	8.417	-	-	-	-	
MW25D		9:15	-	-	dry	-	-	-	-	
MW22		9:40	-	-	3.631	-	-	-	-	
MW22b		9:45	-	-	dry	-	-	-	-	
MW15		10:00	-	-	1.920	-	-	-	-	
MW13		10:10	-	-	1.322	-	-	-	-	
MW46		10:35	-	-	5.054	-	-	-	-	
MW11		11:40	-	-	dry	-	-	-	-	
MW10		11:50	-	-	2.45	-	-	-	-	
MW08a		12:10	-	-	4.256	-	-	-	-	
MW11S		12:25	-	-	5.054	-	-	-	-	
MB11d		12:20	-	-	13.941	-	-	-	-	
MW07		12:35	-	-	9.806	-	-	-	-	
MW06		12:45	-	-	5.698	-	-	-	-	
MB14S		13:45	-	-	9.192	-	-	-	-	Trouble downloading logger
MB14d		13:40	-	-	13.424	-	-	-	-	
MW05		14:20	-	-	5.952	-	-	-	-	
MW04		14:10	-	-	5.146	-	-	-	-	

Measurement Equipment			
Make & Model:	Solinist	Supplier:	Airmet
Serial No.:	485326	Calibration Report Provided?	yes

Notes/Comments

(PID) - photo ionisation detector; (ppm) - parts per million; (LNAPL) - light non-aqueous phase liquids; (DNAPL) - dense light non-aqueous phase liquid; (mBTOC) - metres below top of casing

Approval and Distribution

Fieldwork Staff Signature — Date: 13/03/24

Project Manager Signature — Date

Distribution: Project Central File

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FQM - NAPL and Groundwater Level Gauging Record

AECOM

Q4ANZEV)-414-FM1

Project Name:	BORR monthly monitoring	Project Location:	Bunbury	PM Name:	G Brophy
Project Number:	60644386	Client:	SWGA	Fieldwork Staff Name:	SJ/SM

Confirm NAPL and groundwater levels by repeat measurements. All columns must be completed. If NAPL is not present in a well write 'ND' (Not Detected) in the relevant column.

Field Data

Well ID	Date (dd/mm/yy)	Time (24hr mm)	PID Reading (ppm)	Depth to LNAPL (mBTOC)	Depth to Groundwater (mBTOC)	LNAPL Thickness (m)	Depth to DNAPL (mBTOC)	Total Well Depth (mBTOC)	DNAPL Thickness (m)	Comments (well condition, odour, NAPL colour and viscosity)
MW31	9:06	5/04/24			3.736					
MW25	9:25				3.727					
MW25b	9:26				dry					
MW22	10 04									Destroyed / decommed
MW22b	10 04									
MW15	10 26				2.344					
MW3	10:36				1.5858					
MW46	10 50				5 354					
MW11	11:10				dry					
MW10	11:25				2.347					
MW08a	12:05				4 542					Roots at 2.2m, cleared to 3.6m
MW07	11:40				10.530					Roots at 4.3m, cleared to 5.2m
MB11S	12:10				5.645					
MB11d	12 25				14 270					
MW06	12:45				5 865					
MW05	1:02				6.155					
MW04	12:50				5.260					Roots at 5.9m, cleared to 6.5m
MB14S	13.40				10 480					
MB14d	13:42			13.68	10.480					
MW27	14:45	✓			2.665					

Measurement Equipment

Make & Model:	Solinst	Supplier:	Hirmet
Serial No.:	485365	Calibration Report Provided?	Yes

Notes/Comments

(PID) - photo ionisation detector; (ppm) - parts per million; (LNAPL) - light non-aqueous phase liquids; (DNAPL) - dense light non-aqueous phase liquid; (mBTOC) - metres below top of casing

Approval and Distribution

Fieldwork Staff Signature — Date

Project Manager Signature — Date

Distribution: Project Central File

ANZ

FQM - Groundwater Sampling and Purging Record

Project Name:	Orica Pippingarra GME	**Project Number:**	~~60718833~~	**PM Name:**	C.M	**Bore ID:**	MW04
Client:	~~Orica~~ BoKR	**Project Location:**	~~Pippingarra Rd~~	**Fieldwork Staff:**	~~S.J~~ SB/SA	**Sample Date:**	15/5/24
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level:	Bore Radius (mm):	Chem Kit Serial No.: 13D10015	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 5.21	Screen Interval (m):	Chem Kit Model: YSI Pro Plus	☒ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc): 13.3	Casing Radius (mm):	**Corrected Redox:** Y / ~~N~~	☒ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Yes	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Allen	☒ Retrieved				Parameters

Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:	Total purged volume (L):

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
948		5.20		3.84	4840	6.52	-162.7	18.3	
950		5.18		3.91	4907	6.51	-164.4	18.4	Clear,
952		5.15		3.72	4960	6.53	-166.7	18.4	Not turbid
954		5.1		3.52	4966	6.51	-168.9	18.5	Odourless
956				3.53	4964	6.52	-170.9	18.5	
958				3.60	4961	6.52	-171.9	18.5	
				Stabilized					
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	**Unfiltered:**		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
	All	2	x 40 mL Vial (H_2SO_4)	2	x 100 mL Amber		x 250 mL Plastic		
		2	x 60ml HDPE	1	x 500 ml	2	x 60 ml H_2SO_4		

Approval and Distribution

Fieldwork Staff Signature	15/5/24 Date	Checker Name and Signature	15/05/24 Date
Project Manager Signature	Date	**Distribution:** Project Central File	

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FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	~~Orica Pippingarra GME~~	Project Number:	~~60718835~~	PM Name:	~~G.M~~	Bore ID:	MW05
Client:	~~Orica~~ BORR	Project Location:	~~Pippingarra Rd~~	Fieldwork Staff:	~~S.J~~ SS/SA	Sample Date:	15/~~5~~/24
						Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 15/5/24	Bore Radius (mm):	Chem Kit Serial No..	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 6.29	Screen Interval (m):	Chem Kit Model:	☒ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Y	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☒ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
1014		6.29		0.79	1806	6.4	-180.9	20.8	Clear
1016		6.27		0.29	1865	6.35	-182.8	21	Non turbid
1018		6.26		0.21	1920	6.31	-181.3	21	No smell
1020		6.25		0.18	1948	6.3	-181.6	21	
1022		6.2		0.15	1962	6.29	-181.5	21	
1024		6.2		0.14	1983	6.28	-181.4	21.1	
			Stabilized						
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected			QA/QC Information	Field Commets
Field Filtered:	Unfiltered:	x 40 mL Vial (HCl)	x 60 mL Ferrous	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
	All	2 x 40 mL Vial (H_2SO_4)	2 x 100 mL Amber	x 250 mL Plastic		
		2 x 80ml HDPE	1 x 500ml	2 x 60ml H_2SO_4		

Approval and Distribution

Fieldwork Staff Signature	15/5 Date	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	~~Ampol Canning Vale EoS~~	**Project Number:**	~~60730711~~	**PM Name:**	Dion Oulton	**Bore ID:**	MW06
Client:	~~Ampol~~ Bore	**Project Location:**	~~Canning Vale~~ Bunbury	**Fieldwork Staff:**	~~SJ & HR-G~~ SB/SA	**Sample Date:**	15/5/2024

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 15/5/24	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 2.5.81	Screen Interval (m):	Chem Kit Model:	☒ Dedicated	Intake depth:	Hydrasleeve Type:	Gauging
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Hydrasleeve in
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve out
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☒ Downhole		☐ Other (specify)	Sampling Start Time:	Parameters
	Key Type (if applicable):	☐ Retrieved				
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
1054				0.31	1195	7.25	-161.1	21.5	
1056				0.29	1182	7.21	-160.5	21.4	
1058				0.19	1195	7.29	-166.2	21.6	Odourless
1100				0.08	1181	7.28	-168.4	21.5	Slightly yellow
1102				0.09	1173	7.1	-168.5	21.7	
1104				0.08	1127	5.93	-167.8	21.7	
1106				0.08	1110	5.87	-168.2	21.8	
1108				0.09	1108	5.86	-168.5	21.8	
				Stabilized					
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	Duplicate WQA1	Bore volume calculation, bore condition, fate of tubing, redox correction etc.
	All	2	x 40 mL Vial (H_2SO_4)	2	x 100 mL Amber		x 250 mL Plastic		
		2	x 60 ml HDPE	1	x 500 mL	2	x 60 ml H_2SO_4		

Approval and Distribution

Fieldwork Staff Signature	Date: 15/5/24	Checker Name and Signature	Date
Project Manager Signature	Date	Distribution: Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	Moora GME	**Project Number:**	~~60709633~~	**PM Name:**	D.O	**Bore ID:**	MW07
Client:	~~AMPOL~~ BORR	**Project Location:**	~~Moora~~	**Fieldwork Staff:**	~~G.J~~ SB/SA	**Sample Date:**	14/5/2024

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 14/4/24	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	**Monitoring sequence followed (number in order):**
Depth to GW (m-pvc): 10.72	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	**Corrected Redox:** Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected			QA/QC Information	Field Comments
Field Filtered:	**Unfiltered:**	x 40 mL Vial (HCl)	x 60 mL Ferrous	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
		~~2~~ x 40 mL Vial (H_2SO_4)	~~2~~ x 100 mL Amber	x 250 mL Plastic		
		~~2 x 40mL HDPE~~	~~1 x 500mL~~	~~2 x 60mL HDPE~~		

Approval and Distribution

Fieldwork Staff Signature — Date: 15/05/24

Checker Name and Signature — Date

Project Manager Signature — Date

Distribution: Project Central File

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FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	~~Ampol~~ Canning Vale EoS	**Project Number:**	~~60730711~~	**PM Name:**	Dion Oulton	**Bore ID:**	MW08a
Client:	~~Ampol~~ SWGA	**Project Location:**	Canning Vale SWGA	**Fieldwork Staff:**	~~SJ & HR-G~~ SB/SA	**Sample Date:**	15/5/24

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 15 May 24	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 4.79	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
1241		4.79		0.45	770	6.05	-144	20.9	
1243		4.79		0.34	710	6.01	-143	20.8	Clear, odourless
1245		4.79		0.58	702	6.03	-146	20.8	
1247		4.79	417	0.59	714	5.99	-148.9	20.9	
1249		4.74		0.45	724	5.97	-150.8	20.8	
1251				0.52	758	5.96	-151.9	20.8	
			Stabilised						
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected			QA/QC Information
Field Filtered:	**Unfiltered:**	x 40 mL Vial (HCl)	x 60 mL Ferrous	x 60 mL metals (HNO_3)	
	All	2 x 40 mL Vial (H_2SO_4)	2 x 100 mL Amber	x 250 mL Plastic	
		2 x 60ml HDPE	1 x 500ml	2 x 60ml H_2SO_4	

Field Commets

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Approval and Distribution

Fieldwork Staff Signature — Date: 15/05/24

Checker Name and Signature — Date

Project Manager Signature — Date

Distribution: Project Central File

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FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	~~Ampol Canning Vale EOS~~	**Project Number:**	~~60730711~~	**PM Name:**	Dion Oulton	**Bore ID:**	MW10
Client:	~~Ampol~~ BOR	**Project Location:**	~~Canning Vale~~	**Fieldwork Staff:**	~~SJ & HR-G~~ SB + SA	**Sample Date:**	15/5/2024

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 15/5/2024	Bore Radius (mm):	Chem Kit Serial No.: 13D1600115	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 2.29	Screen Interval (m):	Chem Kit Model: YSI Pro Plus	☒ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Yes	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☒ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
1530		2.29		0.26	502	5.6	-128	22.2	
1532		2.24		0.22	502	5.62	-131	22.1	Clear, odourless
1534		2.23		0.15	504	5.64	-134	22.1	
1536		2.2		0.14	508	5.64	-137	22.1	
1538		2.18		0.15	508	5.63	-136	22.1	
1540		2.15		0.14	510	5.64	-138	22.1	
			Stabilised						
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected			QA/QC Information
Field Filtered:	**Unfiltered:**	x 40 mL Vial (HCl)	x 60 mL Ferrous	x 60 mL metals (HNO_3)	
	All	2 x 40 mL Vial (H_2SO_4)	2 x 100 mL Amber	x 250 mL Plastic	
		2 x 60ml HDPE	1 x 500ml	2 x 60ml HDPE H_2SO_4	

Field Commets

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Approval and Distribution

Fieldwork Staff Signature — Date: 15/5/24

Checker Name and Signature — Date: 15/05/24

Project Manager Signature — Date

Distribution: Project Central File

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	~~Ampol Canning Vale EoS~~	**Project Number:**	~~60730711~~	**PM Name:**	Dion Oulton	**Bore ID:**	MW11
Client:	~~Ampol~~ BORR	**Project Location:**	~~Canning Vale~~	**Fieldwork Staff:**	~~SJ & HR~~ G SBESA	**Sample Date:**	

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 15.5.2024	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	**Monitoring sequence followed (number in order):**
Depth to GW (m-pvc): —	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc): 4m	Casing Radius (mm):	**Corrected Redox:** Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
	DRY								
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	**Unfiltered:**	☐ x 40 mL Vial (HCl)	☐	☐ x 60 mL Ferrous	☐	☐ x 60 mL metals (HNO_3)			Bore volume calculation, bore condition, fate of tubing, redox correction etc.
		☐ x 40 mL Vial (H_2SO_4)	☐	☐ x 100 mL Amber	☐	☐ x 250 mL Plastic			Borehole dry.
		☐	☐	☐	☐	☐			
		☐	☐	☐	☐	☐			

Approval and Distribution

Fieldwork Staff Signature	**Date**	**Checker Name and Signature**	**Date**
Project Manager Signature	**Date**	**Distribution:** Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	~~Ampol~~ Ganning Vale EoS	**Project Number:**	60730711	**PM Name:**	Dion Oulton	**Bore ID:**	MW13
Client:	~~Ampol~~ BORK	**Project Location:**	~~Ganning~~ Vale	**Fieldwork Staff:**	~~SJ & HR~~ SBEA	**Sample Date:**	15/5/24

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 15/5/24	Bore Radius (mm):	Chem Kit Serial No.: 13P100015	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 1.35	Screen Interval (m):	Chem Kit Model:	☒ Dedicated	Intake depth:	Hydrasleeve Type:	Gauging
Bore Depth (m-pvc): 4.2	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Hydrasleeve in
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve out
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Parameters
	Key Type (if applicable):	☐ Retrieved				
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
1628		1.35		0.59	814	6.49	-126	22.9	
1630		1.38		0.69	829	6.49	-129	22.8	clear
1632		1.45		1.64	845	6.51	-127.1	22.8	
1634		1.5		8.5	842	6.62	-114.5	22.9	odourless.
1636		1.51		8.54	830	6.66	-110	22.9	
1638		1.53		9.01	854	6.67	-107	22.9	
1640				8.9	862	6.68	-105	22.8	
1642				8.91	861	6.65	-104	22.8	
				Stabilised					
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected			QA/QC Information
Field Filtered:	**Unfiltered:**	x 40 mL Vial (HCl)	x 60 mL Ferrous	x 60 mL metals (HNO_3)	Duplicates
	All	2 x 40 mL Vial (H_2SO_4)	2 x 100 mL Amber	x 250 mL Plastic	WQA2
		2 x 60ml HDPE	1 x 380ml	2 x 60ml H_2SO_4	

Field Comments

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Approval and Distribution

Fieldwork Staff Signature — Date: 15/05/24

Checker Name and Signature — Date

Project Manager Signature — Date

Distribution: Project Central File

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	~~Ampol Canning Vale EoS~~	**Project Number:**	~~60730744~~	**PM Name:**	~~Dion Oulton~~	**Bore ID:**	MW13
Client:	Ampol	**Project Location:**	Canning Vale BORR	**Fieldwork Staff:**	~~SJ & HR-C~~ SB/SA	**Sample Date:**	15/5/2024

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 15/5/24	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 2.53	Screen Interval (m):	Chem Kit Model:	☒ Dedicated	Intake depth:	Hydrasleeve Type:	Gauging
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Hydrasleeve in
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve out
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Parameters
	Key Type (if applicable):	☒ Retrieved				
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
1710		2.55		0.24	1188	5.8	-130.9	22.4	
1712		2.51		0.22	1180	5.78	-135.4	22.4	
1714				0.24	1165	5.77	-138.7	22.4	Clear, odourless
1716		2.48		0.28	1139	5.76	-142.9	22.3	
1718				0.27	1142	5.77	-144	22.3	
1720		2.41		0.33	1121	5.7	-145	22.3	
			Stabilised						
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected			QA/QC Information	Field Comments
Field Filtered:	**Unfiltered:**	x 40 mL Vial (HCl)	x 60 mL Ferrous	x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
	All	2 x 40 mL Vial (H_2SO_4)	2 x 100 mL Amber	x 250 mL Plastic		
		2 X60ml HDPE	1 X500ml	2 X60ml H_2SO_4		

Approval and Distribution

Fieldwork Staff Signature	Date: 15/05/24	Checker Name and Signature	Date
Project Manager Signature	Date	**Distribution:** Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	~~Moora~~ GME	Project Number:	~~60709653~~	PM Name:	~~D.O~~	Bore ID:	MW 25
Client:	~~AMPOL~~	Project Location:	~~Moora~~ BOPR	Fieldwork Staff:	~~SA~~ SA / SB	Sample Date:	14/05/24

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level:	Bore Radius (mm):	Chem Kit Serial No.: 13D10005	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 8.66	Screen Interval (m):	Chem Kit Model: Professional Plus	☑ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Yes	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Allen	☒ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
~~1104~~		~~8.91~~		~~4.35~~			~~3~~	19.6	
1115		8.91		0.39	3608	5.7	-168.9	20°C	
1117		8.95		0.37	3662	5.7	-166.7	19.8	
1119		8.97		0.35	3689	5.7	-166.6	19.9	
1121		9.01		0.35	3709	5.69	-165.1	19.9	
1123		9.07		043	3682	5.72	-162.3	19.8	
1125		9.21		0.42	3745	5.65	-155.4	19.9	
				Stabilised					
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information
Field Filtered:	Unfiltered:	1	x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	
	AU	2	x 40 mL Vial (H_2SO_4)	2	x 100 mL Amber		x 250 mL Plastic	
		1	x 500ml	1	x 60ml H2O2	2	x 60ml HDPE	
		1	x 125mL 2n					

Field Comments

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Approval and Distribution

Fieldwork Staff Signature	14/5 Date	SB Checker Name and Signature	14/05/24 Date
Project Manager Signature	Date	Distribution: Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	~~Moora CME~~	Project Number:	~~60709696~~	PM Name:	D.O	Bore ID:	MW27
Client:	~~AMPOL~~ BORK	Project Location:	~~Moora~~ Bunbury	Fieldwork Staff:	~~S.J~~ SR/SA	Sample Date:	14/5/2024

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 14.5.24	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 2.47	Screen Interval (m):	Chem Kit Model:	☒ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc): 4.2	Casing Radius (mm):	Corrected Redox: Y / ~~N~~	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☒ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
1325		2.51		0.3	203.9	5.61	-128.1	21	clear (mostly)
1337		2.54		0.27	201.5	5.59	-128.5	21	
1339		2.58		0.24	202.2	5.62	-130.3	21	No odour
1341		2.6		0.23	195.3	5.58	-132.2	21	
1343		2.62		0.18	191.3	5.57	-134.4	21	
1345		2.63		0.20	187.6	5.57	-137.5	21	
					Stabilized				
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	
	All	2	x 40 mL Vial (H_2SO_4)	2	x 100 mL Amber		x 250 mL Plastic	
		1	x 500ml	1	x 60 ml (H_2SO_4)	2	x 60ml HDPE	
		1	x 125ml Zn					

Field Comments

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Approval and Distribution

Fieldwork Staff Signature — Date: 14/5/24

Checker Name and Signature — Date: 14/05/24

Project Manager Signature — Date:

Distribution: Project Central File

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	~~Moora CMP~~	Project Number:	~~60709653~~	PM Name:	D.O	Bore ID:	MW31
Client:	AMPOL BORR	Project Location:	~~Moora~~ Bunbury	Fieldwork Staff:	~~S.J~~ SB KA	Sample Date:	16/5/2024

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 6.5.2024	Bore Radius (mm):	Chem Kit Serial No.: 3P10005	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): 3.61	Screen Interval (m):	Chem Kit Model: YSI Pro Plus	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc): 5.5	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☒ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
~~10:20~~				~~9.47~~	~~20.3~~	~~7.50~~	~~-91.6~~	~~26.7~~	
10:27		3.61		0.4	491.4	5.37	-153.8	20.7	Clear
10:24		3.65		0.23	597	5.25	-156.8	20.7	Odourless
10:26		3.72		0.18	778	5.11	-157	20.6	
10:28				0.23	853	5.07	-159	20.6	
10:30				0.26	857	5.07	-159	20.6	
10:32				0.32	878	5.05	-161	20.7	
		Stabilised							
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)	
	All	2	x 40 mL Vial (H_2SO_4)	2	x 100 mL Amber		x 250 mL Plastic	
		2	x 60 mL HDPE	1	x 500 mL	2	x 60 mL H_2SO_4	

Field Comments

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

Approval and Distribution

Fieldwork Staff Signature — Date: 16/05/24

Checker Name and Signature — Date

Project Manager Signature — Date

Distribution: Project Central File

AECOM

ANZ

FQM - Groundwater Sampling and Purging Record

Q4AN(EV)-405-FM1

						Bore ID:	MW046
Project Name:	Orica Pippingarra GME	Project Number:	~~60718833~~	PM Name:	~~C.M~~	Sample Date:	15/5/24
Client:	~~Orica~~ BoRR	Project Location:	Pippingarra Rd	Fieldwork Staff:	~~S.J~~ SA/SB	Well Development or Well Sampling Event? (circle)	

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
Date of GW Level: 15/5/24	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): ~~2~~ 5.43	Screen Interval (m):	Chem Kit Model:	☒ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	Corrected Redox: Y / (N)	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☒ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO): Yes	Parameter method: ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable): Allen	☒ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
0823				2.01	898	6.18	-168.4	17.1	
825				1.68	926	6.15	-170.6	17.4	Murky
827		5.41		1.89	936	6.12	-170.9	17.3	Slightly turbid
829				1.94	941	6.12	-170.4	17.2	Strong sulphur smell
831				1.98	944	6.11	-167.3	17.1	
833				2.02	946	6.11	-166.4	17.3	
			Stabilised						
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected						QA/QC Information	Field Comments
Field Filtered:	Unfiltered:		x 40 mL Vial (HCl)		x 60 mL Ferrous		x 60 mL metals (HNO_3)		Bore volume calculation, bore condition, fate of tubing, redox correction etc.
	ALL	2	x 40 mL Vial (H_2SO_4)	2	x 100 mL Amber		x 250 mL Plastic		Slow pumping.
		1	x 500ml	1	~~x60ml H_2SO_4~~	2	x 60ml HDPE		Tubing replaced - too shallow + blocked.

Approval and Distribution

Fieldwork Staff Signature — Date: 15/05/24

Checker Name and Signature — Date

Project Manager Signature — Date

Distribution: Project Central File

ANZ

FQM - Groundwater Sampling and Purging Record

MB14: 33.03485 S | S: 9.66mbcl ?
115.61840 E | D 12.94

AECOM

Q4AN(EV)-405-FM1

Project Name:	~~Ampol Canning Vale EoS~~	**Project Number:**	~~60730711~~	**PM Name:**	Dion Oulton	**Bore ID:**	~~MB14~~ MB11
Client:	~~Ampol~~ BOR	**Project Location:**	~~Canning Vale~~	**Fieldwork Staff:**	~~SJ & HR~~ SB + SA	**Sample Date:**	**Well Development or Well Sampling Event? (circle)**

General Bore Information		**Parameter Info.**	**Decontamination**	**Sampling Method**	**Hydrasleeve Info.**	
Date of GW Level: 5.74 (S)	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	**Monitoring sequence followed (number in order):**
Depth to GW (m-pvc): 13.60 (D)	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	**Corrected Redox:** Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		**Bottles Collected**						**QA/QC Information**	**Field Commets**
Field Filtered:	**Unfiltered:**	☐ x 40 mL Vial (HCl)	☐	☐ x 60 mL Ferrous	☐	☐ x 60 mL metals (HNO_3)			Bore volume calculation, bore condition, fate of tubing, redox correction etc.
		☐ x 40 mL Vial (H_2SO_4)	☐	☐ x 100 mL Amber	☐	☐ x 250 mL Plastic			
		☐	☐	☐	☐	☐			
		☐	☐	☐	☐	☐			

Approval and Distribution

Fieldwork Staff Signature	15/05/24 **Date**	**Checker Name and Signature**	**Date**
Project Manager Signature	**Date**	**Distribution:** Project Central File	

ANZ

FQM - Groundwater Sampling and Purging Record

AECOM

Q4AN(EV)-405-FM1

Project Name:	~~Ampol~~ Canning Vale EoS	**Project Number:**	~~60730711~~	**PM Name:**	Dion Oulton	**Bore ID:**	MB14
Client:	~~Ampol~~ BORE SWG A	**Project Location:**	~~Canning Vale~~ BORE	**Fieldwork Staff:**	~~S J & HR G~~ SB / SA	**Sample Date:**	15.5.2024

Well Development or Well Sampling Event? (circle)

General Bore Information		Parameter Info.	Decontamination	Sampling Method	Hydrasleeve Info.	
~~Date of~~ GW Level: 5: 9.66	Bore Radius (mm):	Chem Kit Serial No.:	☐ Decontaminated	☐ Low Flow Pump rate:	Hydrasleeve Size:	Monitoring sequence followed (number in order):
Depth to GW (m-pvc): D: 12.94	Screen Interval (m):	Chem Kit Model:	☐ Dedicated	Intake depth:	Hydrasleeve Type:	
Bore Depth (m-pvc):	Casing Radius (mm):	**Corrected Redox:** Y / N	☐ Disposable	☐ Bailer ☐ Hydrasleeve	Sampling Depth (m-pvc):	Gauging
Depth to Product (m-pvc):	Cover Type (gatic/stick up):	(The correction to apply is probe dependent)	☐ Other (specify)	☐ Peristaltic Pump ☐ Waterra	Hydrasleeve Install time:	Hydrasleeve in
Product Thickness (m):	Bore Locked (YES/NO):	**Parameter method:** ☐ Downhole		☐ Other (specify)	Sampling Start Time:	Hydrasleeve out
	Key Type (if applicable):	☐ Retrieved				Parameters
Calculated bore volume (L):	Includes/ excludes bore annulus (circle)	# purge volumes removed:		Total purged volume (L):		

Water Quality Parameters

Time	Cumulative Vol. Removed (L)	SWL (m-pvc)	Pump Rate	DO (ppm or mg/L)	E.C. (mS/cm or µS/cm)	pH	Redox (mV)	Temp °C	Odour, Colour, Turbidity
Acceptable Parameter Range:				± 10%	± 3%	± 0.05	± 10 mV	± 0.2 °C	± 10% turbidity (if using a turbidity meter)

Analytes Sampled for:		Bottles Collected			QA/QC Information
Field Filtered:	**Unfiltered:**	x 40 mL Vial (HCl)	x 60 mL Ferrous	x 60 mL metals (HNO_3)	
		x 40 mL Vial (H_2SO_4)	x 100 mL Amber	x 250 mL Plastic	

Approval and Distribution

Fieldwork Staff Signature — Date: 15/05/24

Checker Name and Signature — Date

Project Manager Signature — Date

Distribution: Project Central File

Field Commets

Bore volume calculation, bore condition, fate of tubing, redox correction etc.

GPS – 33.43483 S
115.61840 E

Possible roots at MB14S - unsure about GW level taken.

Appendix F
Calibration Records

GK Environmental EQUIPMENT

Calibration Report

Multi-Parameter Water Quality Instrument

Customer:
Contact:

Manufacturer: YSI
Instrument: Professional Plus with Quatro cable
Serial #: 22B104437
Cable length: 1m (22B100428)

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
Condition		✓	Good, clean
pH millivolts for pH7 calibration range 0 mV ± 50 mV		✓	
pH 4 mV range + 165 to + 180 from 7 buffer mV value		✓	172.10 mV
pH slope		✓	55 to 60 mV/pH, ideal 59mV 58.4
Response time < 90 seconds		✓	
Calibrated and conforms to manufacturer's specifications		✓	
ORP			
Condition		✓	Good, clean
Response time < 90 seconds		✓	
within ± 80mv of reference Zobell Reading		✓	
Calibrated and conforms to manufacturer's specifications		✓	variance range ± 20mV 12 mV
Conductivity			
Condition		✓	Good, clean
Temperature		✓	°C
Conductivity cell constant 5.0 ± 1.0 in GLP file		✓	
Clean sensor reads less than 3 uS/cm in dry air		✓	
Calibrated and conforms to manufacturer's specifications		✓	µs/cm
Dissolved Oxygen			
Condition		✓	Good, clean
DO sensor in use		✓	polarographic
1.25 mil PE membrane (yellow membrane):		✓	
DO Sensor Value		✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
Calibrated and conforms to manufacturer's specifications		✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:

						Instrument Readings		
Parameter	**Standards**	**Reference**	**Calibration Point**	**Span**	**Units**	**Before**	**After**	**Units**
Temperature (22B100315)	Check Temp NATA	Room Temp	16	0.1	°C	NA	16.1	°C
pH (22B)	pH 7.00	392512	7.01	-27.80	mV	7.01	7.01	pH
pH (22B)	pH 4.00	394799	4.00	144.30	mV	3.95	4.00	pH
Conductivity (22B100315)	2764 µs/cm at 25°C	23/0402	2764	GLP	5.01	2756	2764	µs/cm
ORP (22A)	Zobell A & B	23/2404	249	249	mV	231.8	236.1	mV
Zero DO (22B100173)	NaSO3 in distilled water	10175	0.0	NA	NA	-0.1	0.0	%
100% DO (22B100173)	100% Air Saturation	Air	100.0	4.9	uA	100.8	100.0	%

Calibrated by: Gaurav Kanwar

Calibration Date: 07-Aug-23
Next Due: 03-Feb-24

Equipment Check Report

Oil/Water Interface Meter

Customer: Aecom
Contact: Sophie

Manufacturer: Heron
Instrument: H.OIL
Serial #: 16DM2307022ML
Cable length: 30m

Item	Test	Pass	Comments
Battery	Voltage (9v battery)	✓	Voltage above 7.9 V
	Capacity	✓	
Probe	Decontaminated	✓	
	Condition	✓	
	Operation	✓	
Connectors	Condition	✓	
Tape Check	Condition	✓	Good, no tears
	Decontaminated	✓	
Instrument Test	Water level mode	✓	
	Interface mode	✓	
Speaker	Operation	✓	

Comments

NA

This is to certify that the above instrument has been checked and is in good working order.

Checked by: Gaurav Kanwar

Check Date 06-Nov-23
Next Due: 06-Dec-23

Calibration Report

Multi-Parameter Water Quality Instrument

Customer: Aecom
Contact: Sophie

Manufacturer: YSI
Instrument: Professional Plus with Quatro cable
Serial #: 20K104050
Cable length: 1m 20K100096

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
Condition		✓	Good, clean
pH millivolts for pH7 calibration range 0 mV ± 50 mV		✓	
pH 4 mV range + 165 to + 180 from 7 buffer mV value		✓	173.60 mV
pH slope		✓	55 to 60 mV/pH, ideal 59mV 58.61
Response time < 90 seconds		✓	
Calibrated and conforms to manufacturer's specifications		✓	
ORP			
Condition		✓	Good, clean
Response time < 90 seconds		✓	
within ± 80mv of reference Zobell Reading		✓	
Calibrated and conforms to manufacturer's specifications		✓	variance range ± 20mV 3 mV
Conductivity			
Condition		✓	Good, clean
Temperature		✓	°C
Conductivity cell constant 5.0 ± 1.0 in GLP file		✓	
Clean sensor reads less than 3 uS/cm in dry air		✓	
Calibrated and conforms to manufacturer's specifications		✓	µs/cm
Dissolved Oxygen			
Condition		✓	Good, clean
DO sensor in use		✓	Galvanic
1.25 mil PE membrane (yellow membrane):		✓	
DO Sensor Value		✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
Calibrated and conforms to manufacturer's specifications		✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:

						Instrument Readings		
Parameter	**Standards**	**Reference**	**Calibration Point**	**Span**	**Units**	**Before**	**After**	**Units**
Temperature (17F100079)	Check Temp NATA	Room Temp	18.6	0	°C	NA	18.6	°C
pH (22F)	pH 7.00	392512	7.01	-12.50	mV	6.99	7.01	pH
pH (22F)	pH 4.00	394799	4.00	161.10	mV	3.97	4.00	pH
Conductivity (17F100079)	2764 µs/cm at 25°C	23/2308	2764	GLP	5.03	2812	2764	µs/cm
ORP (201005SIA605102)	Zobell A & B	23/3006	243	243	mV	247.2	240.3	mV
Zero DO (20H100139)	NaSO3 in distilled water	10175	0.0	NA	NA	0.7	0.0	%
100% DO (20H100139)	100% Air Saturation	Air	100.0	5.26	uA	103.5	100.0	%

Calibrated by: Gaurav Kanwar

Calibration Date: 30-Oct-23
Next Due: 27-Apr-24

Test Certificate

Geotech Peristaltic Pump

Customer: Aecom
Contact: Sophie

Manufacturer: Proactive Environmental
Instrument: 12 Volt Peristaltic Pump
Model: EP PP
Serial #: PP2007-9

Item	Test	Pass	Comments		
Inspection	MasterFlex head	✓	Decontaminated and Clean		
	Controller body	✓	Decontaminated and Clean		
	Case	✓	Decontaminated and Clean		
	Cigarette Plug light	✓	Working		
Switches	Operation	✓	On/Off		
	Operation	✓	Forward/Reverse		
	Operation	✓	Speed Dial	60-350rpm	
	Operation	✓	MasterFlex head Suction test Forward/Reverse with 1/4 silicone tubing		
Connectors	Operation	✓	Cigarette Female Plug to Alligator Clip		
	Operation	✓	Power lead		
	Operation	✓	Cigarette Fuse	10A	Tested continuity with multimeter
Charger	Operation	✓	Charger, Power supply		
	Tested and Tagged	✓			
Flow Rate	Approx 500ml/min	✓	675	ml/min	
Battery	Voltage >12.6	✓	13.30	V	
	5 min Run and Re-test Voltage	✓	13.20	V	

Tested by: Gaurav Kanwar

Test Date: 06-Nov-23
Next Due: 04-May-24

South West Gateway Alliance
Suite 3, 3 Craig Street, Burswood
Western Australia 6100

South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

South West Gateway Alliance

Report

Annual Aquatic Fauna and Surface Water Report (SLR Consulting, 2024)

BORR (Southern Section) Ministerial Statement 1191

Annual Inland Waters and Aquatic Fauna Report

South West Gateway Alliance

2 Dryandra Court, Picton, Bunbury, WA 6230

Prepared by:

SLR Consulting Australia

SLR Project No.: 675.072114.00001

28 August 2024

Revision: 0

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
A	16 July 2024	A.H.	M.T.	M.T.
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Basis of Report

This report has been prepared by Select SLR entity. (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Client Name (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

Executive Summary

Main Roads Western Australia (Main Roads) is constructing a 27-kilometre highway, the Bunbury Outer Ring Road (BORR), that links Forrest Highway to Bussell Highway. The Project area is located approximately 200 km south of Perth and occurs within the City of Bunbury and Shires of Capel, Dardanup and Harvey. The BORR is separated into the BORR (Northern and Central) and BORR (Southern) Sections. The BORR (Southern Section) includes 11 kilometres (km) of dual carriageway connecting the South-Western Highway to Bussell Highway.

The Commissioner of Main Roads Western Australia (Main Roads) has been granted conditional approval for the Bunbury Outer Ring Road Southern Section (the Proposal) under Part IV Division 2 (section 45) of the WA *Environmental Protection Act 1986* by the Minister for Environment. The Proposal is subject to the implementation conditions of Ministerial Statement 1191 (MS1191) which was issued on 31 May 2022 (Minister for Environment, 2022).

In their Report and Recommendations in relation to the Proposal (EPA Report 1714, October 2021), the EPA noted in relation to Inland Waters, the potential for direct and indirect impacts to hydrological regimes and water quality in adjacent Conservation Category Wetlands (CCWs), Resource Enhancement Wetlands (REWs), the Five Mile Brook and Black-Stripe Minnow (BSM) habitats.

To address these impacts, under Condition 2 of MS1191, the EPA required pre-disturbance monitoring of hydrological regimes and baseline conditions, and monitoring of these elements during and post-construction, with reporting requirements, to meet the objective that there are no project-attributable impacts to the hydrological regime and water quality of ‘conservation’ category and ‘resource enhanced’ wetlands, Five Mile Brook, or BSM habitat.

To date, there have been no attributable impacts to the hydrological regime and water quality of any BSM or UFI wetland sites as part of the BORR southern alignment construction. Data collection at monitoring sites will continue to provide both reference and baseline data, to monitor construction activities that could influence water quality, habitat and BSM populations.

BSM population sampling is ongoing during 2024 and post-construction, and will include all existing minnow survey locations. Both current BSM habitats, and UFI wetlands, will continue to be monitored for water quality and potential changes, in relation to construction activities within the Proposal area.

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Acronyms and Abbreviations

ANZECC/ARMCANZ	Australian and New Zealand Environment and Conservation Council/Agriculture and Resource Management Council of Australia and New Zealand
ANZG	Australia and New Zealand Guidelines
BC	Biodiversity Conservation
BORR	Bunbury Outer Ring Road
BSM	Black-stripe Minnow
CCW	Conservation Category Wetlands
CFM	Carter's Freshwater Mussel (*Westralunio carteri*)
CPUE	Catch Per Unit Effort
DBCA	Department of Biodiversity, Conservation and Attractions
DGV	Default Guideline Values
DO	Dissolved Oxygen
DPIRD	Department of Primary Industries and Regional Development
EC	Electrical Conductivity
EPBC	Environmental Protection and Biodiversity Conservation
EXEM	Exemption
IPT	Integrated Project Team
IUCN	International Union for Conservation of Nature
MNES FMP	Matters of National Environmental Significance Fauna Management Plan
MUW	Multiple Use Wetland
NATA	National Association of Testing Authorities
NTU	Nephelometric Turbidity Units
REW	Resource Enhancement Wetland
SCP	Swan Coastal Plain
SL	Standard Length
SWGA	South West Gateway Alliance
UFI	Unique Feature Identifier
UWA	University of Western Australia
WRM	Wetland Research & Management

1.0 Introduction

1.1 Overview and Scope

1.1.1 State Approval – Ministerial Statement 1191

The Commissioner of Main Roads Western Australia (Main Roads) has been granted conditional approval for the Bunbury Outer Ring Road Southern Section (the Proposal) under Part IV Division 2 (section 45) of the WA *Environmental Protection Act 1986* by the Minister for Environment. The Proposal is subject to the implementation conditions of Ministerial Statement 1191 (MS1191) which was issued on 31 May 2022 (Minister for Environment, 2022).

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To address these impacts, under Condition 2 of MS1191, the EPA required pre-disturbance monitoring of hydrological regimes and baseline conditions, and monitoring of these elements during and post-construction, with reporting requirements, to meet the objective that there are no project-attributable impacts to the hydrological regime and water quality of 'conservation' category and 'resource enhanced' wetlands, Five Mile Brook, or BSM habitat.

MS1191, therefore, includes the following conditions in relation to Inland Waters:

> ***Condition 2-1(2)***
>
> *No project attributable impacts to the hydrological regime and water quality of the following values when compared to preconstruction baseline conditions:*
>
> (a) *Five Mile Brook (incorporating Multiple Use Wetland UFI-1163 and Conservation Category Wetland UFI-931);*
>
> *(b) Conservation Category Wetland (UFI-14478);*
>
> *(c) Resource Enhancement Wetlands (UFI-1117 and UFI-15493) and;*
>
> *(d) black-stripe minnow (Galaxiella nigrostriata) habitats defined and mapped in the proponent's Action Management Plan Conservation Significant Fauna (Revision 2 August 2021) that are within or adjoins the development envelope, except for the black-stripe minnow habitats permitted to be cleared in condition 4-1(1)(e).*

> ***Condition 2-3***
>
> *The proponent shall continue to undertake monitoring of hydrological regime and water quality during and post-construction until the CEO is satisfied that the proponent has demonstrated the outcomes in condition 2-1(2) have been met.*

Condition 2-4

The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:

(1) outline the monitoring that was undertaken during the implementation of the proposal;

(2) outline the results of the monitoring undertaken to report whether that the environmental outcomes specified in condition 2-1(2) were achieved;

(3) report whether that the outcomes in condition 2-1(2) were achieved; and

(4) outline any management actions undertaken during the implementation of the proposal to meet the outcomes in condition 2-1(2).

1.2 Background

The Commissioner of Main Roads Western Australia (Main Roads) is constructing the Bunbury Outer Ring Road (BORR). The BORR is a planned Controlled Access Highway linking the Forrest and Bussell Highways and will provide a high standard route for access to the Bunbury Port, improved road user safety, and will facilitate proposed development to the east of the City of Bunbury. The completed BORR will also provide an effective bypass of Bunbury for inter-regional traffic. Project development of the BORR was conducted through the BORR Integrated Project Team (IPT), composed of Main Roads, GHD and BG&E. The project is now in the construction phase, conducted through the South West Gateway Alliance (SWGA), comprising Acciona, NRW Contracting, MACA Civil, AECOM and Aurecon, together with Main Roads.

The Proposal passes through or is adjacent to a number of waterbodies. As part of the approval process, it was necessary to document the ecological values of these ecosystems and determine if they support any aquatic fauna species of conservation significance. Based on field surveys undertaken by WRM in 2018 – 2020, some of these wetlands (Table 1, Figure 1) were found to support one State, Federally and internationally listed species:

> Black-stripe minnow *(Galaxiella nigrostriata)*; Endangered (EPBC Act 1999), Endangered (BC Act 2016, Schedule 2 of the Wildlife Conservation Specially Protected Fauna Notice 2018), Endangered (IUCN Redlist 2022).

In August-October 2022 surveys were conducted on nine additional wetlands within the southern investigation area (WRM 2022), and one of these wetlands were added to the monitoring regime for the Proposal (BSM-S-PI-3).

SLR Consulting (previously Wetland Research and Management) has been contracted since 2018, to monitor and report on the presence of BSM and BSM habitat in the BORR southern alignment on behalf of Main Roads, and the South West Gateway Alliance (SWGA).

1.3 Objectives

To ensure that wetland habitat conditions (including both BSM and UFI listed habitats) are not impacted by construction of the Proposal, and measures are implmented to avoid, mitigate and manage impacts of the Proposal during clearing, construction and operation.

In doing so, this report aims to review potential impacts to the hydrological regime and water quality of the following values when compared to preconstruction baseline conditions:

(a) Five Mile Brook (incorporating Multiple Use Wetland UFI-1163 and Conservation Category Wetland UFI-931);

(b) Conservation Category Wetland (UFI-14478);

(c) Resource Enhancement Wetlands (UFI-1117 and UFI-15493) and;

(d) black-stripe minnow (*Galaxiella nigrostriata*) habitats defined and mapped in the proponent's Action Management Plan Conservation Significant Fauna (Revision 2 August 2021) that are within or adjoins the development envelope, except for the black-stripe minnow habitats permitted to be cleared in condition 4-1(1)(e).

As a result of the occurrences of BSM within the southern investigation area, it is necessary to monitor the potential effects of the Proposal on potential populations. The monitoring includes:

- quarterly water quality monitoring including in situ parameters (pH, oxygen-reduction potential, dissolved oxygen, electrical conductivity, turbidity and temperature) and laboratory analysis of total suspended solids, hydrocarbons and colour,
- quarterly photopoint monitoring from a permanent stake,
- detailed habitat characteristics including mineral substrate and aquatic habitat composition,
- targeted BSM population survey.

Construction commenced in the Proposal area in August 2022, and works in proximity to Five Mile Brook; BSM-S-PI-2 (Table 1, Figure 1), have occurred during the reporting period, therefore, data will be compared between pre and post disturbance.

2.0 Species of Conservation Significance

Aquatic ecosystems in the south-west of the state support a diverse range of taxa with different local, regional, national and international distributions, and therefore taxa vary in their conservation status depending upon their distribution and evolutionary origins. To assess the conservation significance of aquatic fauna recorded a range of sources were referenced, including:

- Nationally Threatened Fauna listed under the EPBC Act 1999,
- Threatened and Priority Fauna in Western Australia under the BC Act 2016 (as listed on the Department of Biodiversity, Conservation and Attractions Threatened and Priority Fauna List (DBCA 2024)),
- Threatened Fauna under the IUCN Redlist of Threatened Species (IUCN 2024), and
- Conservation status of Australian Fishes List (Australian Society for Fish Biology 2016).

One species of conservation significance was specifically targeted during the sampling; the BSM. Information on this species is outlined below in Section 2.1.

2.1 Black-stripe Minnow

The black-stripe minnow (*Galaxiella nigrostriata*) is currently listed as Endangered both nationally (EPBC Act 1999) and at a state level in Western Australia (Schedule 2 of the Wildlife Conservation Specially Protected Fauna Notice 2018), as well as Endangered at an international level (IUCN Redlist 2024). The BSM is a small (up to 48mm) freshwater fish species capable of aestivating (burrowing) into soils to survive drying habitat and therefore can inhabit wetlands that dry over summer, appearing in pools within hours following first rains (Morgan *et al*. 2011). Interestingly, it does not have any specific anatomical or physiological adaptations to aid aestivation and is assumed to survive either within moist soils or within crayfish burrows that contain water through dry periods. Breeding occurs from late autumn to spring, with females releasing multiple batches of eggs over several weeks. It appears that most individuals only live for one year, dying shortly after spawning (Morgan *et al.* 2011).

BSM typically inhabit tannin stained, vegetated, ephemeral wetlands of approximately 300 mm deep with a pH range of 3 - 8 (Morgan and Gill 2000, Galeotti *et al*. 2008). Other than these general observations, and anecdotal information, little is known about the preferred physio-chemical water properties of their habitats, with no correlations found between physio-chemical variables measured in wetlands across the south-west (Galeotti 2013). However, individual populations appear to be sensitive to sudden, localised changes in water quality variables (Knott *et al.* 2002). Little is known about the salinity tolerances of the BSM, although the authors have previously recorded them in wetlands with salinity levels above 3330 µS/cm.

The BSM is endemic to south-western Australia and rare throughout its distribution. Its main distribution lies within the Warren sub-region, where numerous populations are found between Albany and Augusta. However, there are isolated populations on the Swan Coastal Plain, including Lake Chandala (near Gingin), Melaleuca Park (north of Perth), and wetlands within the Kemerton Nature Reserve (north of Bunbury) (Morgan *et al.* 1998, Allen *et al.* 2002). A survey by WRM in October 2018 within the BORR southern alternate investigation area also recorded a population of BSM in Gelorup (WRM 2019). It is thought that the populations on the Swan Coastal Plain are remnants of a once wider distribution (Morgan *et al.* 1998), suggesting that the loss of habitat caused by urban and rural development during the previous hundred years has had a significant impact on the extent of this species. As such, their biggest threat is loss of suitable habitat through urbanisation and rural development.

3.0 Methodology

3.1 Licenses, Standards and Guidelines

This study was conducted under DPIRD Fisheries Licence EXEM 251057222 (*Instruments of Exemption to the Fish Resources Management Act 1994* for Scientific Research Purposes). As a condition of this licence, taxa lists and reports are required to be submitted to DPIRD. The study was also conducted under DBCA Fauna Taking (Biological Assessment) Licence BA27000105-3. As a condition of this licence, a fauna return including taxa lists and locations, is required upon project completion.

Water quality for physio-chemical parameters and nutrients have been compared against ANZECC/ARMCANZ (2000) freshwater guideline values for the protection of slightly/moderately disturbed wetland ecosystems in the south west of Western Australia as these are the most recent locally specific guidelines. It is noted that the ANZECC and ARMCANZ (2000) are now referred to as Australia and New Zealand Guidelines (ANZG) (2018) and came into effect on 4 September 2018 (ANZG, 2018). Preliminary review of these guidelines has identified that new default guideline values are not yet provided for SW WA. For the purposes of this wetland study, ANZECC and ARMCANZ (2000) criteria have been adopted until these values are updated. Results have also been compared to historical data from the pre-development monitoring program (BORR IPT 2020, SWGA 2021).

3.2 Sites and Sampling Design

Three sites were included in initial the monitoring program for BSM, including one reference site and two potential impact sites (Table 1; Figure 1). The reference site was established for the purposes of providing comparative BSM population trend data and seasonal water quality changes, including water depth. An additional potential impact site (BSM-S-PI-3) was added after wetland studies in August-October 2022 (WRM 2022).

All UFI listed sites to be monitored as per Ministerial Conditions 2-1(2) and their current status (including the current presence/absence of BSM) are outlined in Table 2.

Field surveys conducted for the Proposal (WRM 2020), inclusive of long term monitoring of BSM sites (Table 1) have been ongoing since 2020, with the exception of BSM-S-PI-3, which was added in 2022. Monitoring sites outlined in Table 1 include two sites within the Development Envelope (BSM-S-PI-1 and BSM-S-PI-2), one site downstream of the Development Envelope (BSM-S-PI-3), and a reference site (BSM-S-R-1) (Figure 1).

3.3 Habitat

Details of aquatic mineral substrate and in-stream habitat characteristics were made at each black-stripe minnow site during each sampling event. Habitat characteristics recorded included percent cover by inorganic sediment, submerged macrophyte, floating macrophyte, emergent macrophyte, algae, large woody debris, detritus, roots and trailing vegetation. Details of substrate composition were also recorded and included percent cover by bedrock, boulders, cobbles, pebbles, gravel, sand, silt and clay.

Table 1. Summary of all sampling locations for black-stripe minnows (wetlands) within and adjacent to the southern investigation area. GPS points relate to photopoint locations.

Southern targeted wetlands: Black-stripe minnow				
Site name	**Easting**	**Northing**	**Site type**	**Previous name code**
BSM-S-R-1	373503	6298065	Reference	WRM Site 3 (2018 – alternate alignment)
BSM-S-PI-1	373329	6300480	Potential impact	Five Mile Brook – additional sample site
BSM-S-PI-2	373608	6300320	Potential impact	WRM South 8 (2019)
BSM-S-PI-3	373836	6301723	Potential Impact	UFI-931, downstream Five Mile Brook

Table 2. Summary of UFI sites in the southern alignment, and the current monitoring status, as per the ministerial reporting requirements. CCW = Conservation Category Wetland, MUW = Multiple-Use Wetland, REW = Resource Enhancement Wetland.

UFI	Wetland Type	Surface Water Location ID	BSM (presence)	Comments
UFI-931	CCW	BSM-S-PI-1	Y	BSM found during annual monitoring in 2021. Monitoring will continue throughout the development of the project.
UFI-1163	MUW	BSM-S-PI-2	Y	BSM found during annual monitoring in 2021. Monitoring will continue throughout the development of the project.
UFI-1163	MUW	BSM-S-PI-3	Y	Downstream site of BSM-S-PI-2. BSM found during annual monitoring in 2022. Monitoring will continue throughout the development of the project.
UFI-1117	REW	UFI-1117	N	Low levels of water holding during 2022 annual surveys. Topography also unsuited for wetland. Follow up surveys observed no BSM populations. No further follow up BSM surveys required.
UFI-14478	CCW	UFI-14478	N	Initial surveys during May 2022 indicate healthy, wetland habitats that had recently dried due to seasonality. Follow up surveys observed no BSM populations. No further follow up BSM surveys required.
UFI-15493	REW	UFI-15493	N	Initial surveys during May 2022 indicate healthy, wetland habitats that had recently dried due to seasonality. Follow up surveys observed no BSM populations. No further follow up BSM surveys required.

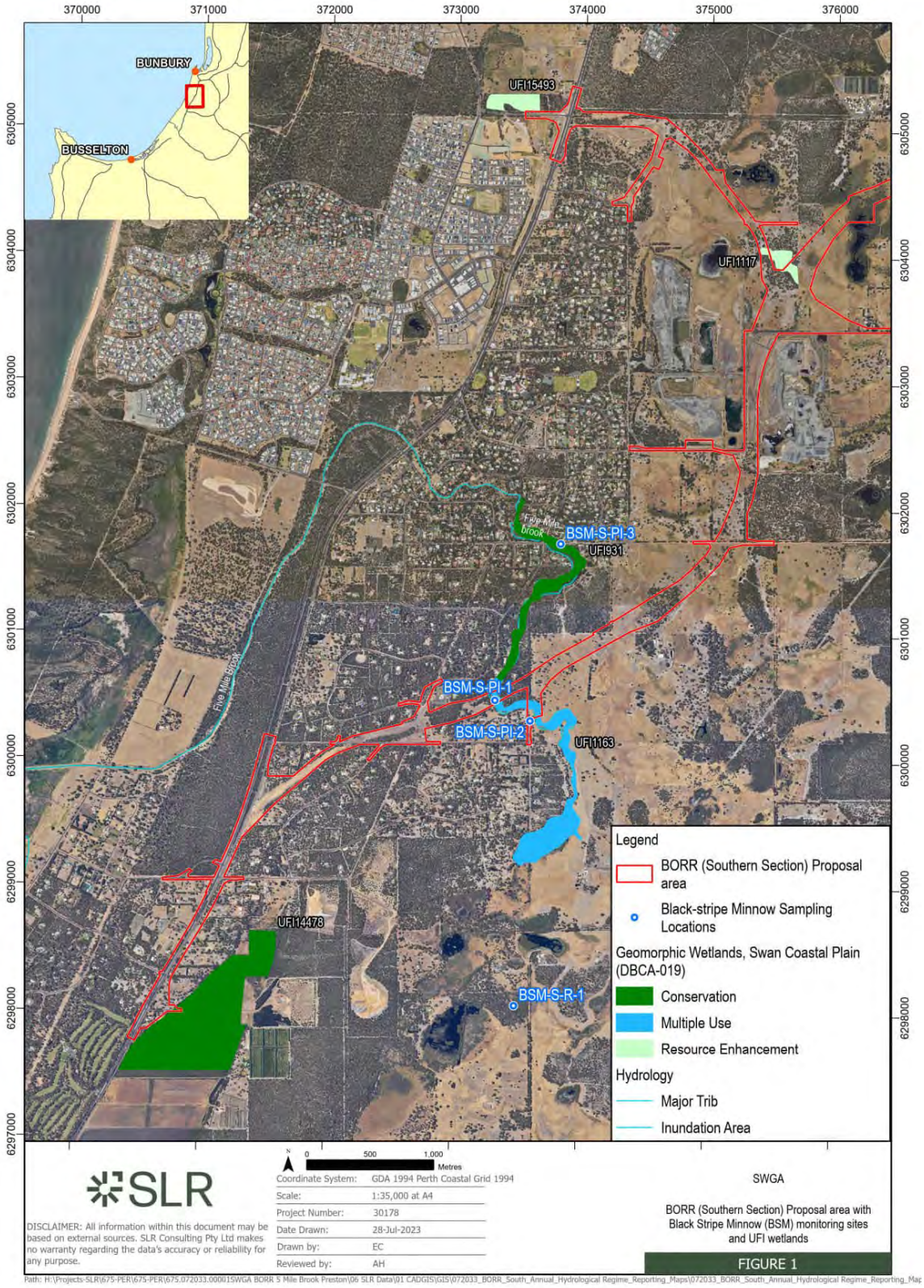


Figure 1. BORR (Southern Section) Proposal Area with Black-Stripe Minnow (BSM) and UFI wetlands (conservation, multiple use and resource enhancement) areas overlayed.

3.4 Surface Water Sampling

During each quarterly monitoring event, *in situ* water quality data were recorded at each site, if it held water, using portable field meters at a depth of approximately 10 cm below the water surface. Variables recorded included pH, oxygen-reduction potential, DO (% and mg/L), EC (µS/cm), turbidity (NTU) and water temperature (°C).

Undisturbed water samples were also collected quarterly from each site, if it held water, for laboratory analysis of colour, total suspended solids, and total recoverable hydrocarbons. All samples were collected from a depth of approximately 15 cm below the water surface. All water samples were kept cool in an esky while in the field and were refrigerated as soon as possible for subsequent transport to the laboratory. All laboratory analyses were conducted by the ChemCentre, Bentley, WA (a NATA accredited laboratory).

Total Recoverable Hydrocarbons (TRH) indicate the presence of polar organic compounds which are often prevalent in inorganic substances such as petroleum and diesels. If identified in a sample, a silica gel cleanup (SGC) will be conducted, which acts to absorb non-hydrocarbon polar organics during the sample extraction process. The remaining TRH after the cleanup will indicate the presence of any petroleum polar hydrocarbons, and their molecular range (F2 >C10-C16 = gasoline/petrol, F3 > C16-C34 = gas oil/diesel). Currently ANZG Default Guideline Values (DGVs) for freshwater systems are predominantly limited to F1 hydrocarbons, with no DGVs for oil or petroleum hydrocarbons (ANZG 2018).

Photopoints were set up at each site during the 2020 monitoring. Photopoints were marked permanently with a stake and their locations recorded using a handheld GPS. Photos were taken from the top of the stake (or similar where stakes were not permitted). Photopoints were revisited on every sampling occasion to note general changes in water level and habitat.

3.5 Black-stripe Minnow

Six double wing fyke nets comprising a double 10 m leader/wing (4 - 6 mm mesh, 1 m drop) and a 5 m hoop, and one single wing fyke net comprising a 5.5 m leader/wing (4 - 6 mm mesh, 0.8 m drop) and a 3 m hoop were set overnight at each site. Net set and pick up times were recorded. Exclusion screens were placed on the opening on each net, to keep out water rats and/or turtles. A floating fauna platform was placed at the cod-end (closest to the bank) of each fyke net to provide an air space for freshwater turtles / water rats if caught (i.e. broke through exclusion screen).

Annual sampling for populations of black-stripe minnow used a standardised catch per unit effort (CPUE) approach to provide abundance data on minnows at each site, to allow comparisons of numbers and population structure over time. CPUE was calculated by dividing 24 (hours) by the number of hours fished (net set time), then multiplying by the raw abundance of fish per net. This gave the abundance of fish per net caught within a 24-hour time period. CPUE was then expressed as abundance per site, allowing for yearly data comparisons to be made.

4.0 Results

4.1 Habitat

Confirmed black-stripe minnow sites within and adjacent to the Proposal area have a diversity of aquatic habitat types including large woody debris, emergent macrophyte, submerged macrophyte, trailing vegetation, floating macrophyte and detritus (Table 3). Differences of in-stream habitat types between sites as part of this sampling period are visualised in Figure 2. All sites had a sand substrate.

Table 3. Average percentage of different habitat types of black-stripe minnow sites sampled 2020 – 2024. Note: data from 2024 is inclusive of Q1 (January) and Q2 (May) monitoring only.

Location ID	Year	Mineral substrate	Emergent vegetation	Submerged vegetation	Floating vegetation	Algal cover	Detritus	Trailing vegetation	Large woody debris
BSM-S-R-1	2020	32.5	7.5	10	12.5	0	15	10	12.5
	2021	23.75	6.25	7.5	25	0.75	9.25	14.5	13
	2022	27.4	3.8	2.5	33.9	0	3.8	8.8	20
	2023	45	2	5	25	2.5	4	12.5	4
	2024	80	0	0	0	0	2	3	15
BSM-S-PI-1	2020	20	40	5	0	0	20	5	10
	2021	50	10	10	2.5	0	10	12.5	5
	2022	77.5	5	0	0	0	10	5	2.5
	2023	DRY							
	2024	DRY							
BSM-S-PI-2	2020	40	2.5	5	0	0	5	42.5	5
	2021	45	5	17.5	7.5	0	6.5	6	12.5
	2022	90	0	0	0	0	5	2.5	2.5
	2023	90	0	0	0	0	5	4.5	0.5
	2024	100	0	0	0	0	0	0	0
BSM-S-PI-3*	2022	55	0	2	3	0	5	30	5
	2023	20	0	0	2.5	2.5	45	15	15
	2024	DRY							

* Site only recorded from Q3 2022

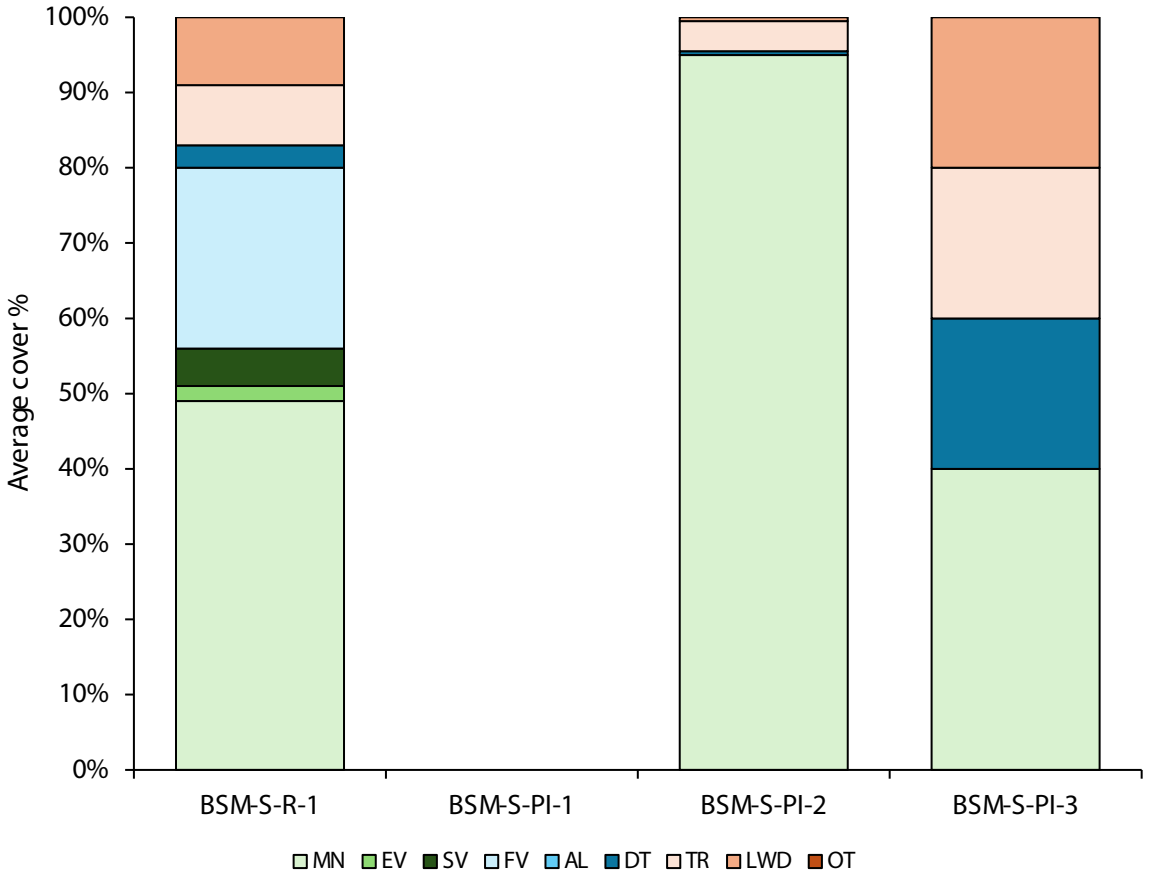


Figure 2. Composition of group-averaged in-stream habitats across site as visually estimated in 2023-24 sampling period (note: no water holding at BSM-S-PI-1 as part of current monitoring period). Habitat types as follows: MN= mineral substrate, EV = emergent vegetation, SV = submerged vegetation, FV = floating vegetation, AL = algal cover, DT = detritus, TR = trailing vegetation, LWD = large woody debris, OT = other.

Changes to habitat due to construction activities were observed at upper 5 Mile Brook (BSM-S-PI-1 and BSM-S-PI-2) during this survey period. Works at BSM-S-PI-1 included the installation of a temporary access in the immediate receiving area downstream of the sampling location (Plate 1) and the construction of a bridge structure, with additional erosion control measures including sediment fences and geo-fabric to protect BSM habitat.

Plate 1. Differences in sampling habitat and the development of construction at BSM-S-PI-1. Left: BSM-S-PI-1 in Q2 2023. Right: BSM-S-PI-1 in Q2 2024.

The installation of large box-culverts downstream of the BSM-S-PI-2 was also observed during this sampling period. Clearing works commenced directly after Q2 monitoring in 2023, with the completed installation of the culverts in Q2 2024 (Plate 2). Additional construction works are ongoing in the area.

Plate 2. Ongoing construction works at BSM-S-PI-2 from photopoint monitoring locations. Left: BSM-S-PI-2 during Q2 monitoring 2023. Right: BSM-S-PI-2 in Q2 2024.

There have been no documented changes in habitat due to erosion (such as bank scaling or alteration) through natural causes, via photopoint analysis, for the duration of the monitoring project for any other locations (BSM-S-PI-3 or BSM-S-R-1). All sites will continue to be monitored closely for impacts due to construction and clearing. It should be noted that there has been no continuous flow of water during the reporting period, and therefore no connectivity, between sites BSM-S-PI-1, BSM-S-PI-2 and BSM-S-PI-3, which are all located on 5 Mile Brook.

4.2 Surface Water

Four sites inhabited by black-stripe minnow in the Proposal Area and surrounding area; including one reference (BSM-S-R-1) and three potential impact sites (BSM-S-PI-1, BSM-S-PI-2 and BSM-S-PI-3), are part of the scope of routine quarterly water quality monitoring. All sites have been routinely monitored since May 2020, with the exception of BSM-S-PI-3, which was added to the sampling design in Q3, 2022 (see Appendix B). All sites were dry during Q2 (May) 2024 monitoring. BSM-S-R-1 and BSM-S-PI-2 were the only sites to hold water during Q1 (January) 2024 monitoring (Table 4). BSM-S-PI-3 only held water on one occasion as part of the current monitoring period (Q3 2023), while BSM-S-PI-1 was dry on all sampling occasions (Table 4).

In situ water quality within the black-stripe minnow sites during the 2023-24 monitoring period was characterised by slightly acidic to slightly basic pH (6.14 – 7.92), very low to moderately-high dissolved oxygen levels (14.3 – 109.2 %), and fresh to brackish electrical conductivities (765.2 – 4270 µs/cm; Table 4). EC values were above the ANZG (2018) default guideline range for slightly disturbed wetlands in the southwest of Western Australia (300 – 1500 µS/cm) during Q4 2023 and Q1 2024 at BSM-S-R-1, and Q4 2023 at BSM-S-PI-2. pH was below the default guideline values (DGVs) (ANZG 2018) for the protection of slightly/moderately disturbed wetland ecosystems in the southwest of W.A. (pH 7 – 8.5) on at least one occasion in both BSM-S-R-1 and BSM-S-PI-3 during the study period. There were no exceedances of pH on any occasion during this period at BSM-S-PI-2. Similar to previous monitoring years, dissolved oxygen concentrations were below the default guideline low value of 90% at all sites on all sampling occasions, with the exception of one sample taken at BSM-S-PI-2 in Q4 2023 (Table 4).

Table 4. *In-situ* water quality results from BSM sites in the southern alignment. Exceedances of DGVs are highlighted in orange.

Site	Date	Temp (°C)	Cond (µs/cm)	pH (H+)	Redox (mV)	Turbidity (NTU)	DO %	DO (mg/L)
ANZECC/ARMCANZ guidelines – wetlands			**300-1500**	**7-8.5**		**10-100**	**90 - 120**	
BSM-S-R-1	18-09-2023	17.1	1352	6.82	3.2	8.18	61.9	5.12
	21-11-2023	19.3	1880	7.75	-44.3	8.43	37.1	3.34
	29-01-2024	23.2	3300	6.27	22.2	16.32	56.5	3.72
	13-05-2024	DRY						
BSM-S-PI-1	18-09-2023	DRY						
	21-11-2023	DRY						
	29-01-2024	DRY						
	13-05-2024	DRY						
BSM-S-PI-2	21-09-2023	19	1090	7.41	-28.8	2.78	61.3	5.67
	20-11-2023	32.6	1379	7.92	-55.9	12.9	109.2	6.13
	29-01-2024	33.5	4270	7.65	-47.9	160.1	31.2	6.2
	13-05-2024	DRY						
BSM-S-PI-3	18-09-2023	15.2	765.2	6.14	36.6	11.97	14.3	1.49
	20-11-2023	DRY						
	29-01-2024	DRY						
	13-05-2024	DRY						

Similar to previous sampling years (Appendix B), total recoverable hydrocarbons were recorded at all sites on at least one sampling occasion for this monitoring period (Table 5). All sites have influences from road and/or farmland runoff external to the Proposal area, which are potential sources of hydrocarbons.

Silica gel clean-up identified that F2 fractions of TRH identified at BSM-S-R-1 (Q1 2024), BSM-S-PI-2 (Q1 2024) and BSM-S-PI-3 (Q3 2023) were inorganic. Similarly, F3 fractions at BSM-S-R-1 (Q1 2024) and BSM-S-PI-2 (Q1 2024) and F4 fractions at BSM-S-PI-2 in Q1 2024 were inorganic.

These events are likely due to a rapid reduction in water level at sites (Plate 3), and subsequent exposure of potential trace TRH levels in sediments to the water column. This is evident during Q1 2024 at site BSM-S-PI-2, which represented the highest measurement of TRH after silica gel clean-up (F3 = 1100 µg/L), in conjunction with a high TSS reading at the time of sampling (199 mg/L). Similarly, reference site BSM-S-R-1 also recorded high amounts of TRH (fraction F3 = 460 µg/L after silica gel clean-up) in Q1 2024, concurrent with high TSS readings (53 mg/L).

Given that these measurements of inorganic TRH were identified at both the reference site (BSM-S-R-1), and a small reduced pool upstream >140 m upstream of the construction area at BSM-S-PI-2 (Plate 3), potential contamination sources at these sites are not Project attributable.

Despite the observed TRH and TSS, there has been no Project attributable impacts to 5 Mile Brook. There has been no connection throughout the Brook for the entirety of this reporting period. BSM-S-PI-1 did not hold any water on any sampling occasion throughout this reporting period, while all water holding at BSM-S-PI-2 was in deeper pools >140 m upstream and separated from construction works.

Total nitrogen (TN) and total phosphorus (TP) measurements were above ANZG (2018) guidelines for wetlands in the south-west on all occasions, however the proximity of all wetland sites to farmlands is likely attributable to these readings (Smith *et al*. 2013). Increases in Q1 2024 readings of TN and TP for both BSM-S-R-1 and BSM-S-PI-2 are also likely attributable to increased TSS at the time of sampling.

Plate 3. Differences in sampling habitat and water depth at BSM-S-PI-2. Left: BSM-S-PI-2 during annual BSM sampling in 2022 (Q3). Right: BSM-S-PI-2 in Q4 2023.

Table 5. Laboratory analysed water quality results for BSM sites in the southern alignment.
Note: guidelines in grey are for TN and TP are based on ANZG (2018) guidelines for south-western wetlands, while guidelines for TRH are above detectable limits. Exceedances of DGVs are highlighted in orange.

Location ID	Date	Colour (TCU)	TSS (mg/L)	TN (mg/L)	TP (mg/L)	TRH				
						F1 (µg/L)	F2 (µg/L)	F3 (µg/L)	F4 (µg/L)	Total TRH (µg/L)
				1.5	**0.06**	**>25**	**>25**	**>100**	**>100**	**>250**
BSM-S-R-1	18-09-2023	470	3	3.3	0.45	<25	46	120	<100	<250
	21-11-2023	480	5	4.9	0.53	<25	<25	170	<100	<250
	29-01-2024	750	53	12	1.3	<25	46	820	<100	860
	13-05-2024	DRY								
BSM-S-PI-1	18-09-2023	DRY								
	21-11-2023	DRY								
	29-01-2024	DRY								
	13-05-2024	DRY								
BSM-S-PI-2	21-09-2023	450	2	3.2	0.57	<25	58	140	<100	<250
	20-11-2023	310	15	4.1	0.88	<25	<25	220	<100	<250
	29-01-2024	250	190	23	3.1	<25	200	2100	370	2700
	13-05-2024	DRY								
BSM-S-PI-3	18-09-2023	670	27	2.5	0.2	<25	110	150	<100	260
	20-11-2023	DRY								
	29-01-2024	DRY								
	13-05-2024	DRY								

Table 6. TRH Gel silica clean-up of BSM sites in the southern alignment. Detectable TRH amounts are highlighted in orange.

Location ID	Date	TRH (after silica gel clean-up)		
		F2: >C10-C16 (µg/L)	F3: >C16-C34 (µg/L)	F4: >C34-C40 (µg/L)
BSM-S-R-1	18-09-2023	<25	<100	<100
	21-11-2023	<25	<100	<100
	29-01-2024	31	460	<100
BSM-S-PI-2	21-09-2023	<25	<100	<100
	20-11-2023	<25	<100	<100
	29-01-2024	130	1100	400
BSM-S-PI-3	18-09-2023	93	<100	<100

Conservation Category and Resource Enhancement Wetlands UFI-14478, UFI-1117 and UFI-15493 were only holding water during one or two sampling events, remaining dry for most of the year (Table 7). *In situ* water quality within these sites was characterised by slightly-acidic to slightly-basic pH, very low to low dissolved oxygen levels, and fresh to slightly-brackish electrical conductivities (EC; Table 7).

Table 7. *In-situ* water quality results from UFI wetland sites in the southern alignment. Exceedances of DGVs are highlighted in orange.

Site	Date	Temp (°C)	Cond (µs/cm)	pH (H+)	Redox (mV)	Turbidity (NTU)	DO (%)	DO (mg/L)
ANZECC/ARMCANZ guidelines – wetlands			**300-1500**	**7-8.5**		**10-100**	**90 - 120**	
UFI-1117	22-09-2023	19	676.3	6.64	14.5	43.85	15.5	1.66
	21-11-2023	22.4	1375	8.09	-66.8	41.03	22.7	1.97
	29-01-2024	DRY						
	13-05-2024	DRY						
UFI-14478	20-09-2023	16.2	742	6.96	-8.1	3.38	5.3	0.47
	21-11-2023	DRY						
	29-01-2024	DRY						
	13-05-2024	DRY						
UFI-15493	20-09-2023	17	568.8	7.44	-32.4	1.86	36.1	3.43
	21-11-2023	DRY						
	29-01-2024	DRY						
	13-05-2024	DRY						

Total recoverable hydrocarbons were recorded at all sites on at UFI-1117 and UFI-14478 during Q3 2023 (Table 8). Silica gel clean-up identified that TRH were most likely from organic sources (Table 9). Total nitrogen (TN) exceeded ANZG (2018) guidelines for wetlands in SW Australia at all sites on all occasions, with the exception of UFI-15493. Total phosphorus (TP) exceeded guidelines at UFI-1117 and UFI-15493 during Q3 2023 monitoring. The exceedances are likely due to historical land use for farming in these wetlands.

Table 8. Laboratory analysed water quality results from UFI wetland sites in the southern alignment. Note: guidelines in grey are for TN and TP are based on ANZG (2018) guidelines for south-western wetlands, while guidelines for TRH are above detectable limits. Exceedances of DGVs are highlighted in orange.

Location ID	Date	Colour (TCU)	TSS (mg/L)	TN (mg/L)	TP (mg/L)	TRH				
						F1 (µg/L)	F2 (µg/L)	F3 (µg/L)	F4 (µg/L)	Total TRH (µg/L)
				1.5	**0.06**	**>25**	**>25**	**>100**	**>100**	**>250**
UFI-1117	22-09-2023	2200	10	4.1	0.11	<25	<25	160	<100	<250
	21-11-2023	-	14	2.6	0.045	<25	<25	<100	<100	<250
	29-01-2024	DRY								
	13-05-2024	DRY								
UFI-14478	20-09-2023		8	6.1	0.029	<25	59	<100	<100	<250
	21-11-2023	DRY								
	29-01-2024	DRY								
	13-05-2024	DRY								
UFI-15493	20-09-2023		0.5	0.7	0.069	<25	<25	<100	<100	<250
	21-11-2023	DRY								
	29-01-2024	DRY								
	13-05-2024	DRY								

Table 9. TRH Gel silica clean-up of UFI wetland sites in the southern alignment.

Location ID	Date	TRH (after silica gel clean-up)		
		F2: >C10-C16 (µg/L)	F3: >C16-C34 (µg/L)	F4: >C34-C40 (µg/L)
UFI-1117	22-09-2023	<25	<100	<100
UFI-14478	20-09-2023	<25	<100	<100

4.3 Annual Black-Stripe Minnow Population Sampling

The annual BSM 2023 survey recorded a total of 112 individual black-stripe minnows. This represents the greatest number of BSM annually recorded in contrast to previous surveys; 2022 (33 individuals), 2021 (98 individuals) and 2020 (1 individual). There was a significant difference in abundance between BSM-S-R-1 and all other sites (Table 10).

Table 10. ANOVA results for differences in fish abundance (per net) between sites for all annual data, with Tukey's post-hoc tests. Groups joined by a common line are not significantly different. Groups are arranged in order of total abundance descending value, left-to-right, with means indicated in brackets.

Source	df	F	*p*	Tukey's post-hoc test			
Average abundance (per net)	3	4.75	<0.05	BSM-S-R-1 (7.39)	BSM-S-PI-1 (1.0)	BSM-S-PI-3 (0.71)	BSM-S-PI-1 (0.5)

Catch per unit effort was only recorded at one location in the southern alignment during 2023, BSM-S-R-1 (CPUE = 114.1 individuals, Figure 3). Four individuals BSM were recorded and measured at BSM-S-PI-3, however due to the size of the pool and methodology used to capture specimens (macro net over a 20 min sampling effort), these were not included in CPUE. There were no BSM recorded at site BSM-S-PI-2 or BSM-S-PI-1. It should however be noted that site BSM-S-PI-1 was not holding water at the time of sampling.

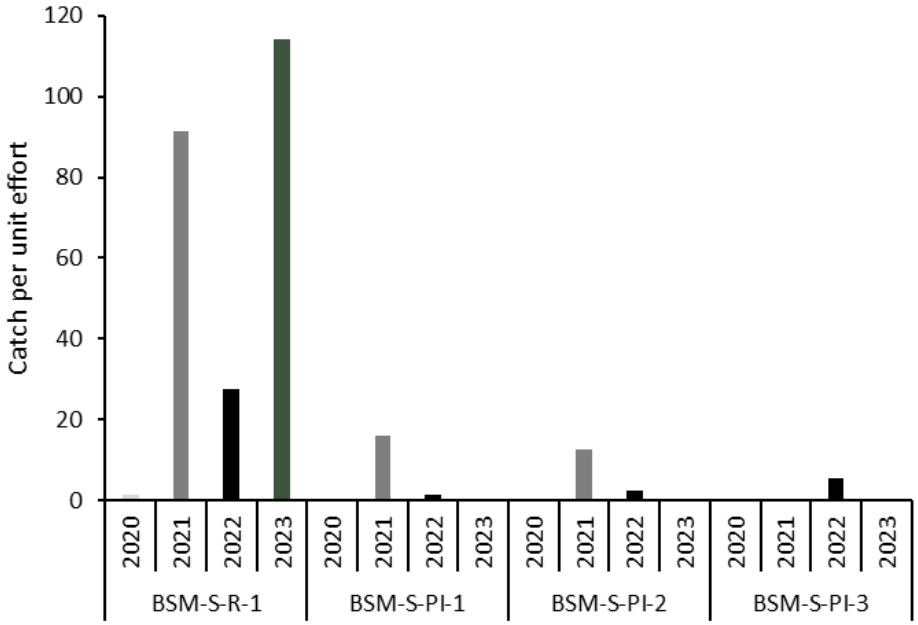


Figure 3. Calculated Catch Per Unit Effort (CPUE) data from 2020 – 2023 for BSM.

BSM-S-PI-2 was reduced to a small, receded pool at the time of sampling (see Plate 3, Appendix A) and had elevated TSS and TRH at the time of sampling (see Table 5). It is possible that BSM present at this site may have already migrated and aestivated at signs of water recession. Surveys conducted within the Kemerton area, north of Bunbury, have shown that BSM populations will disperse in years of high rainfall and BSM were declared extinct in one of the pools, only to be recorded in subsequent surveys (MBS Environmental 2009). Due to the high mobility of the species and increased connectivity between wetlands in wetter years, it is possible that BSM migrate between wetlands. It is also possible that seasonal fluctuations of presence/abundance of minnows may occur, with the highest activity occurring between late June/early July and late September/early October (Smith *et al.* 2002).

A fully factorial ANOVA determined that there was no significant difference in BSM abundance per net between site and year (df = 5, F = 1.88, $p = 0.11$) over all sampling events. There was however a significant difference in abundance per net over years (Table 11). Significant differences can potentially be due to changes in sample sizes in 2023 ($n = 12$) and 2021 ($n = 18$), compared to 2022 ($n = 25$) and 2020 ($n = 21$). This, coupled with low abundance counts in 2020 (1 individual), comparative to other sampling events, may explain these differences.

Table 11. ANOVA results for differences in fish abundance (per net) between years for all annual data, with Tukey's post-hoc tests. Groups joined by a common line are not significantly different. Groups are arranged in order of total abundance descending value, left-to-right, with means indicated in brackets.

Source	df	F	*p*	Tukey's post-hoc test			
Average abundance (per net)	3	4.7	<0.05	2023 (9)	2021 (5.4)	2022 (1.32)	2020 (0.05)

5.0 Summary and Conclusions

There have been no attributable impacts to the hydrological regime and water quality of any BSM or UFI wetland sites as part of the Proposal construction during the reporting period. Additionally, there have been no significant indirect impacts to BSM habitat adjacent to the Proposal. Current data collection will continue to assess any potential impacts associated with construction.

While construction activities have commenced at sites BSM-S-PI-1 and BSM-S-PI-2, the current surface water availability and flow conditions in both of these locations indicates that there has been no project attributable impacts as part of this study period. In addition, elevated levels of TSS and TRH at BSM-S-PI-2 are likely due to a reduction in water level and compounded evapoconcentration, and suspension of sediments. This is supported by trends seen at reference site BSM-S-R-1, as well as the location of the site BSM-S-PI-2, which is > 140m upstream of all construction activities.

The following sites will continue to be monitored for surface water quality, in relation to Condition 2-1(2):

(a) Five Mile Brook (incorporating Multiple Use Wetland UFI-1163 and Conservation Category Wetland UFI-931);

(b) Conservation Category Wetland (UFI-14478);

(c) Resource Enhancement Wetlands (UFI-1117 and UFI-15493) and;

(d) black-stripe minnow (*Galaxiella nigrostriata*) habitats defined and mapped in the proponent's Action Management Plan Conservation Significant Fauna (Revision 2 August 2021) that are within or adjoins the development envelope, except for the black-stripe minnow habitats permitted to be cleared in condition 4-1(1)(e).

BSM population sampling is ongoing in Q3-2024 and will include all of the existing potential impact BSM survey locations (BSM-S-PI-1, BSM-S-PI-2, and BSM-S-PI-3) as well as the reference site (BSM-S-R-1).

6.0 References

Allen GR, Midgley SH, Allen M (2002) Field Guide to the Freshwater Fishes of Australia. Western Australian Museum, Perth WA.

ANZG (2018) Guidelines for Water Quality Management. http://www.waterquality.gov.au/guidelines.

Australian Society of Fish Biology (2016) Conservation Status of Australian Fishes. http://www.asfb.org.au/commitees/threatened-species-committee/

Bunbury Outer Ring Road Integrated Planning Study (BORR IPT) (2020) Groundwater and Surface Water Quality Monitoring 2019-20. Report prepared for Main Roads Western Australia

Department of Biodiversity, Conservation and Attractions (DBCA) (2022). Threatened and Priority Fauna List. December 2021.

Environmental Protection Authority, 2021. Bunbury Outer Ring Road Southern Section, Commissioner for Main Roads Western Australia. Report 1714, October 2021. Environmental Protection Authority, Perth, Western Australia.

Galeotti DM, McCullogh CD, Lund MA (2008) Current state of knowledge of the black-stripe minnow Galaxiella nigrostriatal (Pisces: Galaxiidae) in Western Australia. Centre for Ecosystem Management report 2008-12.

Galeotti DM (2013) Metapopulation theory explains black-stripe minnow (Pisces: Galaxiidae, Galaxiella nigrostriata) distribution in seasonal wetlands in south-western Western Australia. Retrieved from https://ro.ecu.edu/theses/708

IUCN (2022) IUCN Red List of Threatened Species. Version 2017.3. www.iucnredlist.org Downloaded in December 2022.

Knott B, Jasinka J, Smith K (2002). Limnology and aquatic fauna of EPP173, Melaleuca Park, refuge for an outlier population of the Black-stripe minnow Galaxiella nigrostriata (Galaxiidae), in southwestern Australia. Records of the Western Australian Museum 21: 291-298.

MBS Environmental (2009). Kemerton Silica Sand: Public Environmental Review Extension of Kemerton Silica Sand, Dredge Mining. A report prepared for Kemerton Silica Sand Pty. Ltd.

Morgan DL, Gill HS, Potter IC (1998) Distribution, identification and biology of freshwater fishes in south-western Australia. Records of the Western Australian Museum. Supplement No. 56. Western Australian Museum, Perth.

Morgan DL, Gill HS (2000) Fish associations within the different inland habitats of lower south-western Australia. Records of the Western Australian Museum 20: 31-37.

Morgan DL, Beatty SJ, Klunzinger MW, Allen MG, Burnham QF (2011) A field guide to freshwater fishes, crayfishes and mussels of southwestern Australia. SERCUL and Freshwater Fish Group, Perth WA.

Smith K, Knott B, Jaskina E (2002) Biology of the Black-stripe minnow Galaxiella nigrostriata, (Galaxiidae) in acidic, black-water lake in Melaleuca Park near Perth, Western Australia. Records of the Western Australian Museum 21: 277-284.

Smith AP, Western AW, Hanna MC (2013) Linking water quality trends with land use intensification in dairy farming catchments. *Journal of Hydrology* 476 (2013) 1-12.

SWGA (2021) Bunbury Outer Ring Road, Northern and Central Sections Hydrological Regime Report. South West Gateway Alliance. Unpublished report to Environmental Protection Authority, January 2021.

WRM (2019) Bunbury Outer Ring Road: Targeted Conservation Significant Aquatic Fauna Survey 2018. Unpublished final v2 report by Wetland Research & Management to BORR Team Pty Ltd. January 2019.

WRM (2021) Bunbury Outer Ring Road Southern Section: Targeted Conservation Significant Aquatic Fauna Monitoring 2021. Unpublished report by Wetland Research & Management to SWGA. December 2021.

WRM (2022) BORR Sampling Southern Alignment and Alternate Mussel Translocation Sites – October 2022. *Wetland Research and Management.* Unpublished memorandum.

WRM-SLR (2023) Bunbury Outer Ring Road Southern Investigation Area: Targeted Conservation Significant Aquatic Fauna Monitoring 2022. Unpublished report by Wetland Research & Management part of SLR to SWGA Team. February 2023.

Appendix A Site Photos

A.1 Black-stripe minnow sites (southern section)

BSM-S-R-1

Q3 - 2023

Q4 - 2023

Q1 - 2024

Q2 – 2024 (no photo)

BSM-S-PI-1

Q3 - 2023

Q4 - 2023

Q1 - 2024

Q2 - 2024

BSM-S-PI-2

Q3 - 2023

Q4 - 2023

Q1 - 2024

Q2 - 2024

BSM-S-PI-3

Q3 - 2023

Q4 - 2023

Q1 - 2024

Q2 - 2024

Appendix B Historical WQ data

Table A1. Historical *In-situ* water quality results from BSM sites in the southern alignment. Exceedances of DGVS in orange.

Site	Date	Temp (°C)	Cond (µs/cm)	pH (H+)	Redox (mV)	Turbidity (NTU)	DO %	DO (mg/L)
ANZECC/ARMCANZ guidelines – wetlands			**300-1500**	**7-8.5**		**10-100**	**90 - 120**	
BSM-S-R-1	29-05-2020	Not sampled						
	07-08-2020	13.1	820	7.15	-19.8	4.9	72.1	7.88
	28-10-2020	18.8	1056	6.71	18.8	4.86	31	2.2
	28-01-2021	16.4	2610	7.26	8.5	10.64	31.4	9.91
	25-05-2021	11	2810	5.58	7.96	2.76	48.7	5.56
	27-08-2021	8.2	619.6	7.82	-40.2	2.13	48.4	5.68
	13-10-2021	11.5	742.7	6.89	10.1	3.25	55.5	5.97
	31-01-2022	21.1	1360	6.75	27.5	8.96	5	0.51
	01-06-2022	8.5	1947	5.02	118.1	6.8	54.4	6.12
	15-08-2022	12.6	613.5	6.45	25.4	11.59	30.2	3.27
	06-10-2022	14.2	676	7.03	6.3	3.71	61.7	6.17
	31-01-2023	21.7	1519	7.22	-6.8	26.78	26.2	2.83
	15-05-2023	DRY						
	18-09-2023	17.1	1352	6.82	3.2	8.18	61.9	5.12
	21-11-2023	19.3	1880	7.75	-44.3	8.43	37.1	3.34
	29-01-2024	23.2	3300	6.27	22.2	16.32	56.5	3.72
	13-05-2024	DRY						
BSM-S-PI-1	29-05-2020	DRY						
	07-08-2020	14.1	837	7.24	-24.9	1.52	72.2	7.55
	28-10-2020	DRY						
	28-01-2021	DRY						
	25-05-2021	DRY						
	27-08-2021	10.2	520.9	7.36	-14.7	6.61	63.5	7.09
	14-10-2021	13.9	778.9	7.12	-1.5	5.95	83	8.34
	31-01-2022	DRY						
	01-06-2022	DRY						
	15-08-2022	14.4	492.9	6.79	14	5.34	54.8	4.4

	05-10-2022	19.7	596.3	7.3	-1.6	3.98	55	5
	31-01-2023	DRY						
	15-05-2023	DRY						
	18-09-2023	DRY						
	21-11-2023	DRY						
	29-01-2024	DRY						
	13-05-2024	DRY						
BSM-S-PI-2	29-05-2020	DRY						
	08-08-2020	11	846	7.41	-34.8	3.55	76.9	8.47
	28-10-2020	20.5	1125	6.96	5.3	26.57	34.4	3.35
	28-01-2021	DRY						
	25-05-2021	DRY						
	27-08-2021	10.1	528.1	7.74	-36	6.78	55	6.78
	14-10-2021	16.6	716.1	7.31	-13.5	4.87	83.5	8.43
	31-01-2022	DRY						
	01-06-2022	DRY						
	15-08-2022	15.7	505.6	6.8	13	5.89	53.4	5.24
	05-10-2022	21.5	607	7.11	0.4	3.81	63	5.65
	31-01-2023	25.7	1087	8.04	-55.2	12.71	114.3	8.94
	15-05-2023	16.6	1600	7.33	-24.6	6.42	21.8	1.73
	21-09-2023	19	1090	7.41	-28.8	2.78	61.3	5.67
	20-11-2023	32.6	1379	7.92	-55.9	12.9	109.2	6.13
	29-01-2024	33.5	4270	7.65	-47.9	160.1	31.2	6.2
	13-05-2024	DRY						
BSM-S-PI-3	17-08-2022	14.1	524.4	7.17	-10.7	6.61	40.3	4.17
	15-09-2022	18.5	508	6.63	20.9	4.6	25.5	2.39
	12-10-2022	12.7	760.9	7.3	7.6	5.69	20.8	2.22
	31-01-2023	DRY						
	15-05-2023	DRY						
	18-09-2023	15.2	765.2	6.14	36.6	11.97	14.3	1.49
	20-11-2023	DRY						
	29-01-2024	DRY						

	13-05-2024	DRY

Table A2. Historical laboratory analysed water quality results for BSM sites in the southern alignment. Note: guidelines in grey are for TN and TP are based on ANZG (2018) guidelines for south-western wetlands, while guidelines for TRH are above detectable limits. Exceedances of DGVs are highlighted in orange.

Location ID	Date	Colour (TCU)	TSS (mg/L)	TN	TP	TRH				
						F1 (µg/L)	F2 (µg/L)	F3 (µg/L)	F4 (µg/L)	Total TRH (µg/L)
BSM-S-R-1	29-05-2020	Not sampled								
	07-08-2020	700	17			<25	<25	<100	<100	<250
	28-10-2020	790	130			<25	110	650	100	860
	28-01-2021	520	9			<25	48	340	<100	<250
	25-05-2021	200	1			<25	<25	140	<100	<250
	27-08-2021	670	3			<25	<25	<100	<100	<250
	13-10-2021	560	6			<25	400	130	<100	530
	31-01-2022	740	18			<25	<25	180	<100	<250
	01-06-2022	390	16			<25	<25	180	<100	<250
	15-08-2022	750	5			<25	<25	<100	<100	<250
	11-11-2022	640	N/A			<25	<25	<100	<100	<250
	31-01-2023	790	61			<25	<25	260	<100	260
	15-05-2023	DRY								
	18-09-2023	470	3	3.3	0.45	<25	46	120	<100	<250
	21-11-2023	480	5	4.9	0.53	<25	<25	170	<100	<250
	29-01-2024	750	53	12	1.3	<25	46	820	<100	860
	13-05-2024	DRY								
BSM-S-PI-1	29-05-2020	DRY								
	07-08-2020	640	1			<25	<25	<100	<100	<250
	28-10-2020	DRY								
	28-01-2021	DRY								
	25-05-2021	DRY								
	27-08-2021	650	4			<25	<25	<100	<100	<250
	14-10-2021	560	4			<25	<25	130	<100	<250
	31-01-2022	DRY								
	01-06-2022	DRY								
	15-08-2022	720	1			<25	<25	<100	<100	<250
	09-11-2022	990	N/A			<25	<25	200	<100	<250
	31-01-2023	DRY								
	15-05-2023	DRY								
	18-09-2023	DRY								
	21-11-2023	DRY								
	29-01-2024	DRY								
	13-05-2024	DRY								
	29-05-2020	DRY								

BSM-S-PI-2	08-08-2020	640	1			<25	<25	<100	<100	<250
	28-10-2020	800	22			<25	<25	140	<100	<250
	28-01-2021	DRY								
	25-05-2021	DRY								
	27-08-2021	650	7			No sample taken				
	14-10-2021	590	3			<25	48	120	<100	<250
	31-01-2022	DRY								
	01-06-2022	DRY								
	15-08-2022	720	3			<25	<25	<100	<100	<250
	09-11-2022	870	N/A			<25	<25	240	<100	<250
	31-01-2023	380	18			<25	<25	310	<100	310
	15-05-2023	180	15			<25	26	340	<100	360
	21-09-2023	450	2	3.2	0.57	<25	58	140	<100	<250
	20-11-2023	310	15	4.1	0.88	<25	<25	220	<100	<250
	29-01-2024	250	190	23	3.1	<25	200	2100	370	2700
	13-05-2024	DRY								
BSM-S-PI-3	17-08-2022	710	4			<25	<25	<100	<100	<250
	15-09-2022	660	46			<25	<25	<100	<100	<250
	12-10-2022	760	5			<25	140	<100	<100	<250
	31-01-2023	DRY								
	15-05-2023	DRY								
	18-09-2023	670	27	2.5	0.2	<25	110	150	<100	260
	20-11-2023	DRY								
	29-01-2024	DRY								
	13-05-2024	DRY								

Table A3. Historical TRH Gel silica clean-up of BSM sites in the southern alignment. Detectable TRH amounts are highlighted in orange.

Location ID	Date	TRH (after silica gel clean-up)		
		F2: >C10-C16 (µg/L)	F3: >C16-C34 (µg/L)	F4: >C34-C40 (µg/L)
BSM-S-R-1	31-01-2022	<25	<100	<100
	01-06-2022	<25	<100	<100
	31-01-2023	<25	<100	<100
	18-09-2023	<25	<100	<100
	21-11-2023	<25	<100	<100
	29-01-2024	31	460	<100
BSM-S-PI-1	09-11-2022	<25	<100	<100
BSM-S-PI-2	09-11-2022	<25	<100	<100
	31-01-2023	<25	<100	<100
	15-05-2023	<25	<100	<100
	21-09-2023	<25	<100	<100
	20-11-2023	<25	<100	<100
	29-01-2024	130	1100	400
BSM-S-PI-3	12-10-2022	37	<100	<100
	18-09-2023	93	<100	<100

Table A4. Historical *In-situ* water quality results from UFI sites in the southern alignment. Exceedances of DGVs are highlighted in orange.

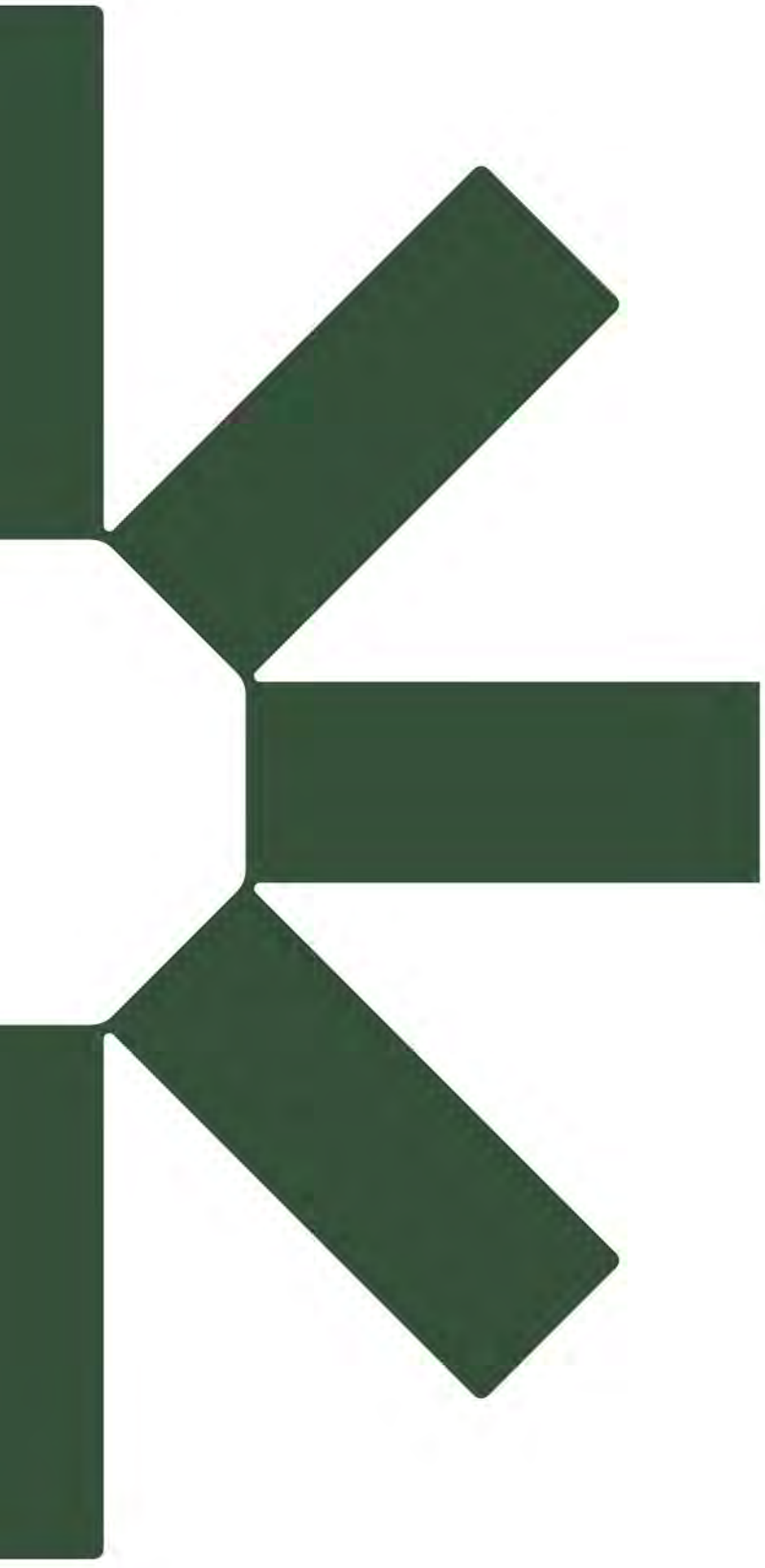
Site	Date	Temp (°C)	Cond (µs/cm)	pH (H+)	Redox (mV)	Turbidity (NTU)	DO (%)	DO (mg/L)
ANZECC/ARMCANZ guidelines – wetlands			**300-1500**	**7-8.5**		**10-100**	**90 - 120**	
UFI-1117	17-08-2022	7.6	458	5.42	8.7	5.29	41	5.35
	15-09-2022	24	744.5	4.77	139.4	1.9	27.4	2.27
	11-10-2022	22.1	1175	5.77	79.8	6.68	27	2.32
UFI-14478	17-08-2022	14.9	2904	6.3	40.4	1.91	24.8	1.53
	15-09-2022	19.2	1521	6.81	10.4	3.8	25.5	2.18
	11-10-2022	15.9	1700	6.96	9.8	1.01	27.4	1.01
UFI-15493	16-08-2022	16.3	483	6.71	17.6	0.55	17	1.75
	16-09-2022	14.5	619.5	7.33	-17.1	2.99	9.6	0.82
	10-10-2022	20.7	792.8	7.57	-26.9	1.75	42.6	3.87

Table A5. Historical laboratory analysed water quality results for UFI sites in the southern alignment. Note: guidelines in grey are for TN and TP are based on ANZG (2018) guidelines for south-western wetlands, while guidelines for TRH are above detectable limits. Exceedances of DGVs are highlighted in orange.

Location ID	Date	Colour (TCU)	TSS (mg/L)	TRH				
				F1 (µg/L)	F2 (µg/L)	F3 (µg/L)	F4 (µg/L)	Total TRH (µg/L)
UFI-1117	18-08-2022	1700	3	<25	<25	110	<100	<250
	15-09-2022	2800	4	<25	<25	190	<100	<250
	11-10-2022	5300	16	<25	62	340	<100	400
UFI-14478	17-08-2022	340	4	<25	<25	<100	<100	<250
	15-09-2022	710	1	<25	<25	<100	<100	<250
	12-10-2022	810	2	<25	63	110	<100	<250
UFI-15493	16-08-2022	160	6	<25	<25	<100	<100	<250
	16-09-2022	220	3	<25	50	<100	<100	<250
	12-10-2022	120	2	<25	<25	<100	<100	<250

Table A6. Historical TRH Gel silica clean-up of UFI sites in the southern alignment. Detectable TRH amounts are highlighted in orange.

Location ID	Date	TRH (after silica gel clean-up)		
		F2: >C10-C16 (µg/L)	F3: >C16-C34 (µg/L)	F4: >C34-C40 (µg/L)
UFI-1117	18-08-2022	<25	<100	<100
	15-09-2022	<25	<100	<100
	11-10-2022	<25	<100	<100
UFI-14478	12-10-2022	<25	<100	<100
UFI-15493	16-09-2022	42	<100	<100



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Suite 3, 3 Craig Street, Burswood
Western Australia 6100

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Appendix J

M3.4 Environmental Performance Report – Flora and Vegetation (PEC)

Bunbury Outer Ring Road

Southern Section

Ministerial Statement 1191: M3-4

Environmental Performance Report

Flora and Vegetation (2023 – 2024)

Priority Ecological Communities

Main Roads WA

Revision 0

28-Aug-24

South West Gateway Alliance

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Document control record

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Document control						
Report title		Ministerial Statement 1191 | M2-4 Environmental Performance Report – PEC				
Client		Main Roads WA				
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
A	02-Aug-24	EcoEdge Review	C.S.	D.B.		D.B.
B	09-Aug-24	SWGA Review	D.B.	E.R.		A.H.
C	19-Aug-24	Main Roads Review	E.R.	Main Roads		A.H.
0	28-Aug-24	Issued	C.S	D.B	E.R.	M.S.
Current revision		**0**				

Contents

Report

Environmental Performance Report - Priority Ecological Communities (EcoEdge, 2023)

Figures

Tables

1 Introduction

1.1 Proposal

Main Roads Western Australia (Main Roads) is constructing a 27-kilometre highway, the Bunbury Outer Ring Road (BORR), that links Forrest Highway to Bussell Highway.

The BORR Southern Section (the Proposal) includes 11 kilometres (km) of dual carriageway connecting the South-Western Highway to Bussell Highway (Figure 1). The Proposal area is located approximately 200 km south of Perth and occurs within the City of Bunbury and Shire of Capel.

1.2 Overview and Scope

The Commissioner of Main Roads has been granted conditional approval for the Bunbury Outer Ring Road Southern Section (the Proposal) under Part IV Division 2 (section 45) of the *Environmental Protection Act 1986* by the Minster for Environment. The Proposal is subject to the implementation conditions of Ministerial Statement 1191 (MS 1191) which was issued on 31 May 2022 (Minister for Environment, 2022).

In their Report and Recommendations in relation to the Proposal (Environmental Protection Authority (EPA) Report 1714, October 2021), the EPA noted that in relation to Flora and Vegetation, the following Priority Ecological Communities (PECs) (Priority 3) were identified in the development envelope (Figure 2):

- Banksia woodlands of the Swan Coastal Plain (referred to as the Banksia Woodlands TEC/PEC)
- Tuart *(Eucalyptus gomphocephala)* woodlands and forests of the Swan Coastal Plain (referred to as the Tuart Woodlands TEC/PEC)
- Southern Swan Coastal Plain *Eucalyptus gomphocephala – Agonis flexuosa* woodlands (FCT 25) (referred to as the Tuart-Peppermint Woodlands PEC).

Two of these communities are listed as Threatened Ecological Communities (TECs) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and are considered Matters of National Environmental Significance for the Commonwealth assessment. The Banksia Woodlands is listed as Endangered, and the Tuart Woodlands is listed as Critically Endangered.

The proposal has the potential to directly impact these communities through clearing, and potential indirect impacts which include the introduction/spread of weeds and disease (including dieback *Phytophthora cinnamomi*) and altered hydrological regimes.

To address these impacts, the EPA recommended Condition 3. Ministerial Statement 1191, therefore, includes the following conditions in relation to Flora and Vegetation:

Condition 3-1

The proponent shall implement the proposal to achieve the following environmental outcomes:

(1) clear no more than:

(a) 23.4 ha of vegetation representative of the Banksia Woodlands of the Swan Coastal Plain Priority Ecological Community (PEC) (Banksia Woodlands);

(b) 4.4 ha of vegetation representative of the Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain PEC (Tuart Woodlands); and

(c) 4.5 ha of vegetation representative of the Southern Swan Coastal Plain Eucalyptus gomphocephala – Agonis flexuosa Woodlands PEC (Tuart-Peppermint Woodlands), overlapping the Tuart Woodlands PEC.

(2) ensure there are no project attributable indirect impacts, when compared to preconstruction baseline conditions, to Banksia Woodlands, Tuart Woodlands and Tuart-Peppermint Woodlands within twenty (20) metres outside the development envelope (defined in Figure 2a and Figure 2b) and within the clearing exclusion areas (defined in Figure 1).

Condition 3-2

Prior to ground-disturbing activities, the proponent shall undertake monitoring of the values listed in condition 3-1(2) and submit a report about the preconstruction baseline conditions to the CEO.

Condition 3-3

The proponent shall continue to undertake monitoring during and postconstruction until the CEO is satisfied that the proponent has demonstrated the outcomes in condition 3-1(2) has been met.

2 Environmental Performance Report

2.1 Purpose and Objective

The purpose of this Environmental Performance Report (EPR) is to address the compliance of the BORR Southern Section with condition 3-4 set out in MS 1191.

Condition 3-4 of MS 1191 requires an annual environmental performance report to be submitted to the Chief Executive Officer (CEO) of the EPA as part of the Compliance Assessment Report (CAR).

Condition 3-4

The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:

(1) outline the monitoring that was undertaken during the implementation of the proposal;

(2) outline the results of the monitoring undertaken to report whether that the environmental outcomes specified in condition 3-1(2) were achieved;

(3) report whether that the outcomes in condition 3-1(1) and 3-1(2) were achieved; and

(4) outline any management actions undertaken during the implementation of the proposal to meet the outcomes in condition 3-1(1) and 3-1(2).

This EPR has been produced in accordance with condition M3-4, and incorporates a 12-month audit period from 31 May 2023 to 31 May 2024. This is the second EPR for M3-4 to be submitted under MS 1191.

The report prepared by EcoEdge (2024) is attached.

2.2 Priority Ecological Communities

The areas of Banksia Woodlands TEC/PEC and Tuart Woodlands TEC/PEC adjacent to the Development Envelope are indicated in Figure 3, noting the Tuart-Peppermint Woodlands PEC largely overlaps the Tuart Woodlands TEC/PEC.

The monitoring locations of Banksia Woodlands TEC/PEC and Tuart Woodlands TEC/PEC adjacent to the development are indicated in Figure 4.

2.3 Clearing metrics in relation to Flora and Vegetation (PEC) during the reporting period

Construction of the Proposal commenced on 1 August 2022.

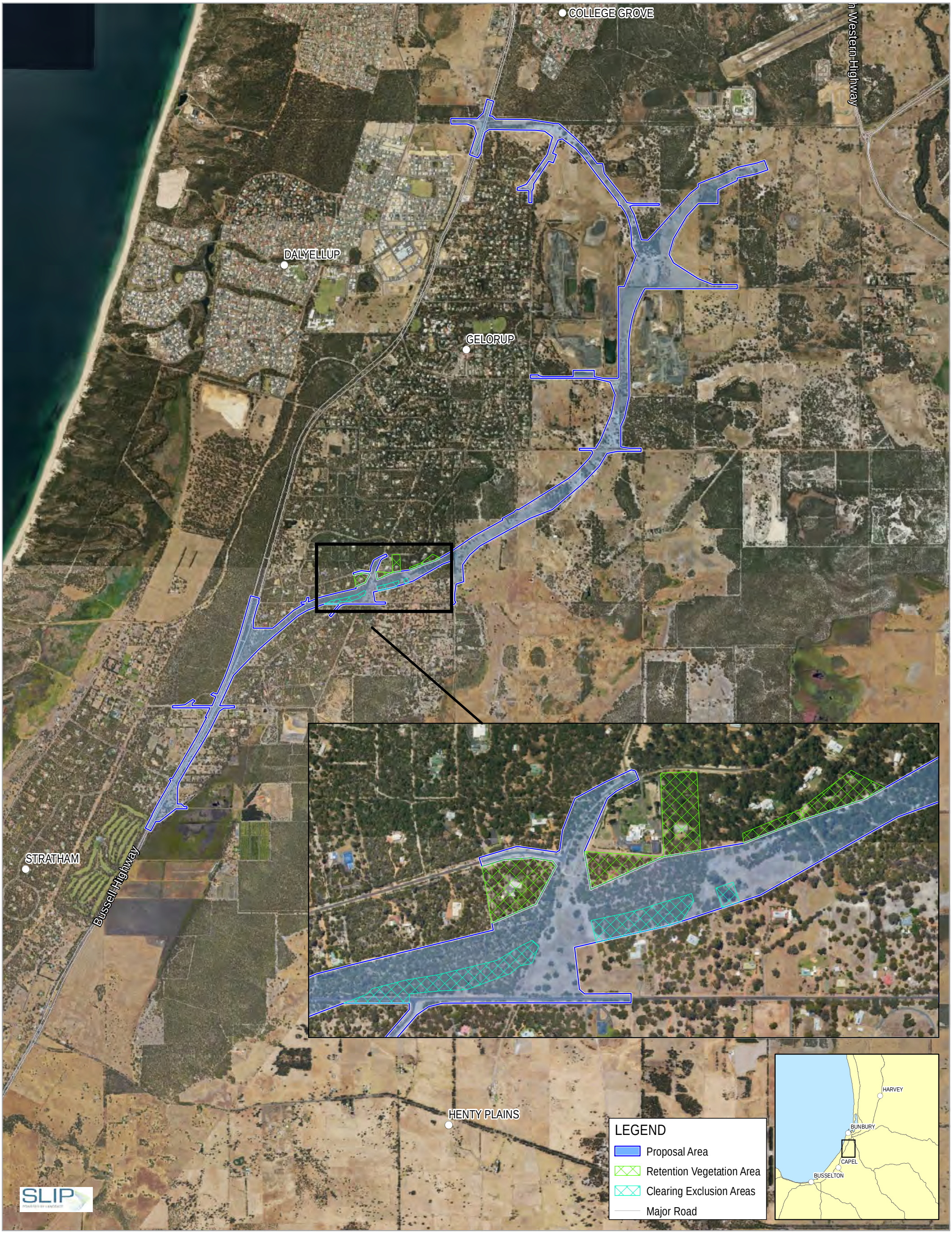
Clearing and disturbance of Priority Ecological Community (PEC) during the reporting period is summarised in Table 1 and Figure 5.

Table 1. Clearing metrics during the reporting period.

Environmental Aspect	Area / quantity specified in Ministerial Statement 1191	Area / quantity cleared during the 2022 - 2023 reporting period	Area / quantity cleared during this 2023 – 2024 reporting period	Total area / quantity cleared
Vegetation representative of the Banksia Woodlands of the Swan Coastal Plain Priority Ecological Community (PEC) (Banksia Woodlands)	23.4 ha	11.49 ha	6.16 ha	17.65 ha
Vegetation representative of the Tuart *(Eucalyptus gomphocephala)* woodlands and forests of the Swan Coastal Plain PEC (Tuart Woodlands)	4.4 ha	2.06 ha	1.42 ha	3.48 ha
Vegetation representative of the Southern Swan Coastal Plain *Eucalyptus gomphocephala – Agonis flexuosa* Woodlands PEC (Tuart-Peppermint Woodlands), overlapping the Tuart Woodlands PEC	4.5ha	2.15 ha	1.42 ha	3.58 ha

…

Figure 1. Proposal area (Proposal area as shown in Ministerial Statement 1191)



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Meters

Map Projection: Transverse Mercator
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Grid: GDA 1994 Perth Coastal Grid 1994

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Proposal Area

FIGURE 1

Figure 2. Distribution of Banksia Woodlands TEC/PEC, Tuart Woodlands TEC/PEC and Tuart-Peppermint Woodlands PEC in proximity to the Proposal area

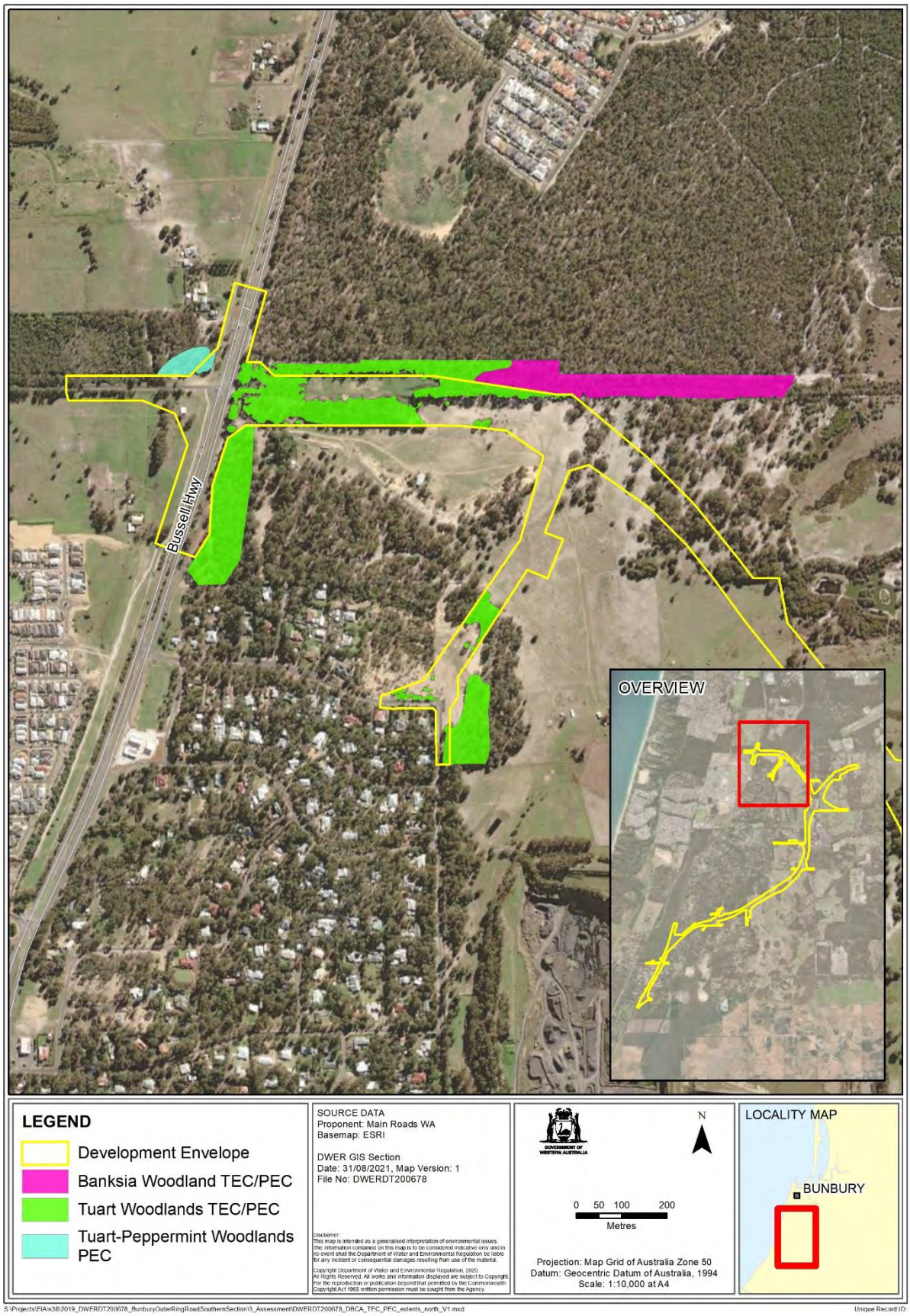

Figure 2a Distribution of Banksia Woodlands TEC/PEC, Tuart Woodlands TEC/PEC and Tuart-Peppermint Woodlands PEC in proximity to the Proposal area.

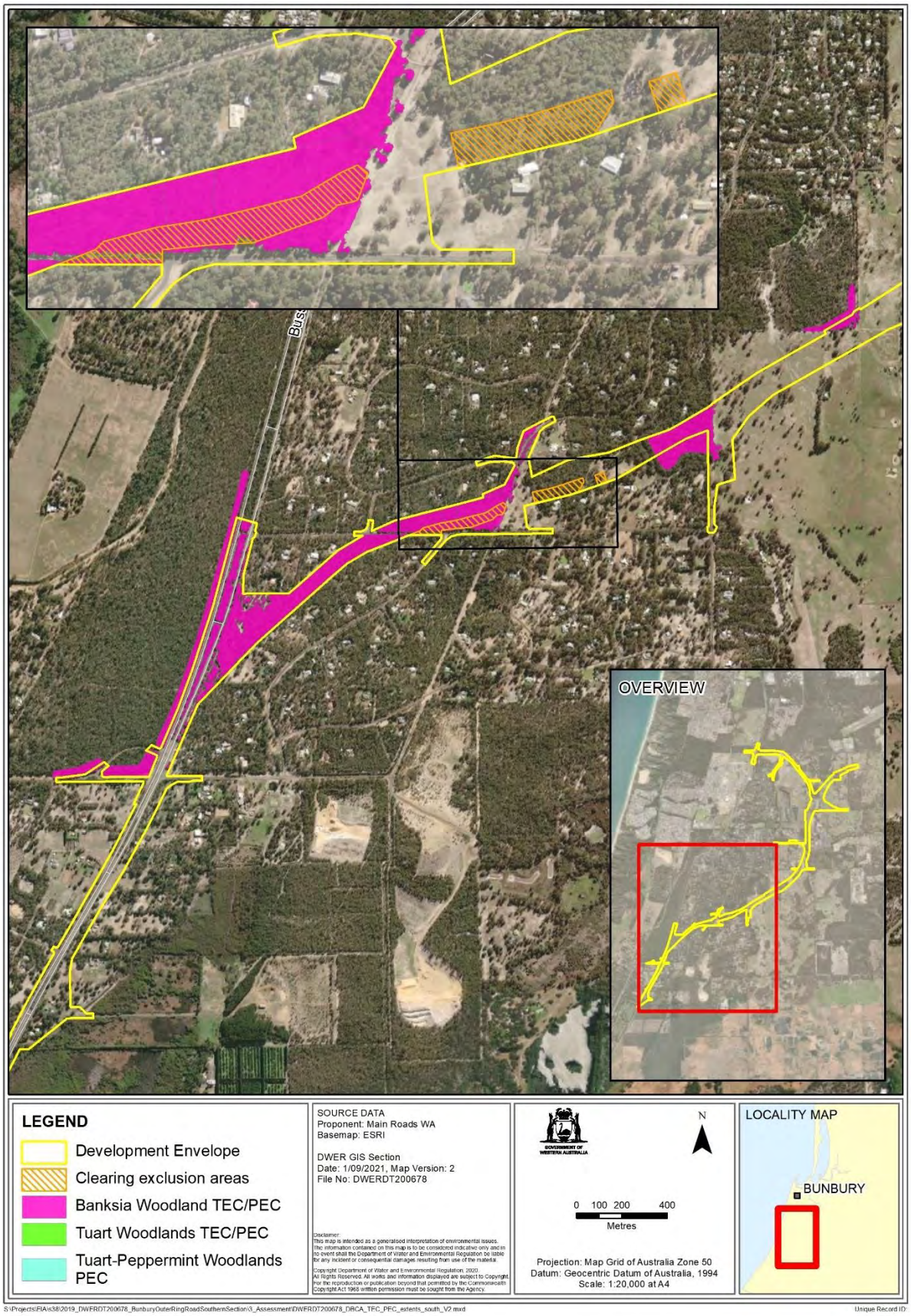

Figure 2b **Distribution of Banksia Woodlands TEC/PEC, Tuart Woodlands TEC/ PEC and Tuart-Peppermint Woodlands PEC in proximity to the Proposal area.**

Figure 3. Distribution of Banksia Woodlands TEC/PEC and Tuart Woodlands TEC/PEC adjacent to the Development Envelope

Note: A 60 m buffer to the Development Envelope is included for Tuart Woodlands TEC/PEC in this figure in relation to monitoring requirements under Commonwealth Approval Notice EPBC 2019/8543.

LEGEND

- Major road
- Banksia Woodland TEC
- Tuart Woodland TEC
- BORR Southern Section Referral Boundary
- BORR Southern Section Referral Boundary 60m Buffer
- BORR Southern Section Referral Boundary 20m Buffer

TW-S-PI-2
TW-S-PI-2
BW-S-PI-1
TW-S-PI-3
TW-S-PI-4
TW-S-PI-4

USHER
COLLEGE GROVE
DALYELLUP
GELORUP

Centenary Rd
Bussell Hwy
Neslite Rd
Ashberg Link
Starlite Bend
Rutile Lane
Ferndale Av
Ferndale Av
Holly Hill Av
Sleaford Dr
Epidote Loop
Logan Lane
Meadow View Rd
Crystal Bend
Maynard Pde
Dunmow Rise
Jules Rd

33500 33600 33700 33800 33900 34000 34100 34200 34300 34400 34500

104900 104800 104700 104600 104500 104400 104300 104200 104100 104000 103900 103800 103700 103600

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 20 40 60 80

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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TEC/PEC adjacent to the Proposal Area

Project No. 61-37041
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FIGURE 3

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LEGEND

- Banksia Woodland TEC
- Tuart Woodland TEC
- BORR Southern Section Referral Boundary
- BORR Southern Section Referral Boundary 60m Buffer
- BORR Southern Section Referral Boundary 20m Buffer

TW-S-PI-2
BW-S-PI-1
BW-S-PI-1
TW-S-PI-4
TW-S-PI-4
Centenary Rd
Sleaford Dr
Dunmow Rise
Jules Rd
Maynard Pde
COLLEGE GROVE
GELORUP
NORTH BOYANUP

Paper Size ISO A3

0 20 40 60 80

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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33900 34000 34100 34200 34300 34400 34500

100800 100700 100600 100500 100400 100300 100200 100100 100000

LEGEND

- Banksia Woodland TEC
- BORR Southern Section Referral Boundary
- BORR Southern Section Referral Boundary 60m Buffer
- BORR Southern Section Referral Boundary 20m Buffer

Marchetti Rd

GELORUP

BW-S-PI-3

SLIP POWERED BY LANDGATE

1 2 3 4 5 6

Paper Size ISO A3

0 20 40 60 80

Metres

N

Map Projection: Transverse Mercator
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FIGURE 3

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33200 33300 33400 33500 33600 33700 33800 33900

100400 100300 100200 100100 100000 99900 99800 99700 99600 99500 99400

LEGEND

- Banksia Woodland TEC
- BORR Southern Section Referral Boundary
- BORR Southern Section Referral Boundary 60m Buffer
- BORR Southern Section Referral Boundary 20m Buffer

Yalinda Dr

BW-S-PI-4

GELORUP

Woods Rd

Jilley Rd

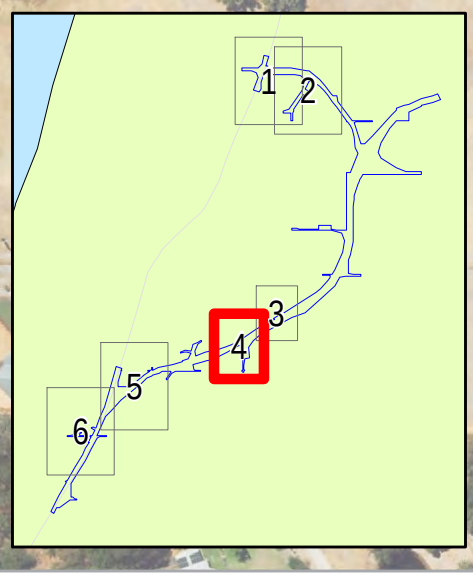

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FIGURE 3

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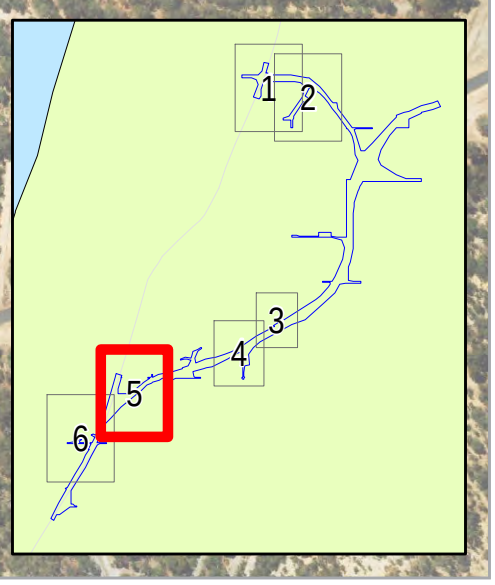
LEGEND

- Major road
- Banksia Woodland TEC
- BORR Southern Section Referral Boundary
- BORR Southern Section Referral Boundary 60m Buffer
- BORR Southern Section Referral Boundary 20m Buffer

31300 31400 31500 31600 31700 31800 31900 32000 32100 32200 32300

99900 99800 99700 99600 99500 99400 99300 99200 99100 99000 98900 98800 98700 98600

Bussell Hwy
Eucalypt Dr
Banksia Rd
Woods Rd
DALYELLUP
BW-S-PI-5
GELORUP
St Clair Ct
Brockway Dr
Manea Dr
SLIP



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30400 30500 30600 30700 30800 30900 31000 31100 31200 31300 31400

99200 99100 99000 98900 98800 98700 98600 98500 98400 98300 98200 98100 98000 97900 97800

LEGEND

- Major road
- Banksia Woodland TEC
- BORR Southern Section Referral Boundary
- BORR Southern Section Referral Boundary 60m Buffer
- BORR Southern Section Referral Boundary 20m Buffer

Quambi Dr

DALYELLUP

BW-S-PI-5

GELORUP

Lakes Rd

Bussell Hwy

BW-S-PI-5

Tamra Cl

BW-S-PI-5

Calinup Rd

STRATHAM

Jaym

SLIP POWERED BY LANDGATE

1 2 3 4 5 6

Paper Size ISO A3

0 20 40 60 80

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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Date	30/06/2022

FIGURE 3

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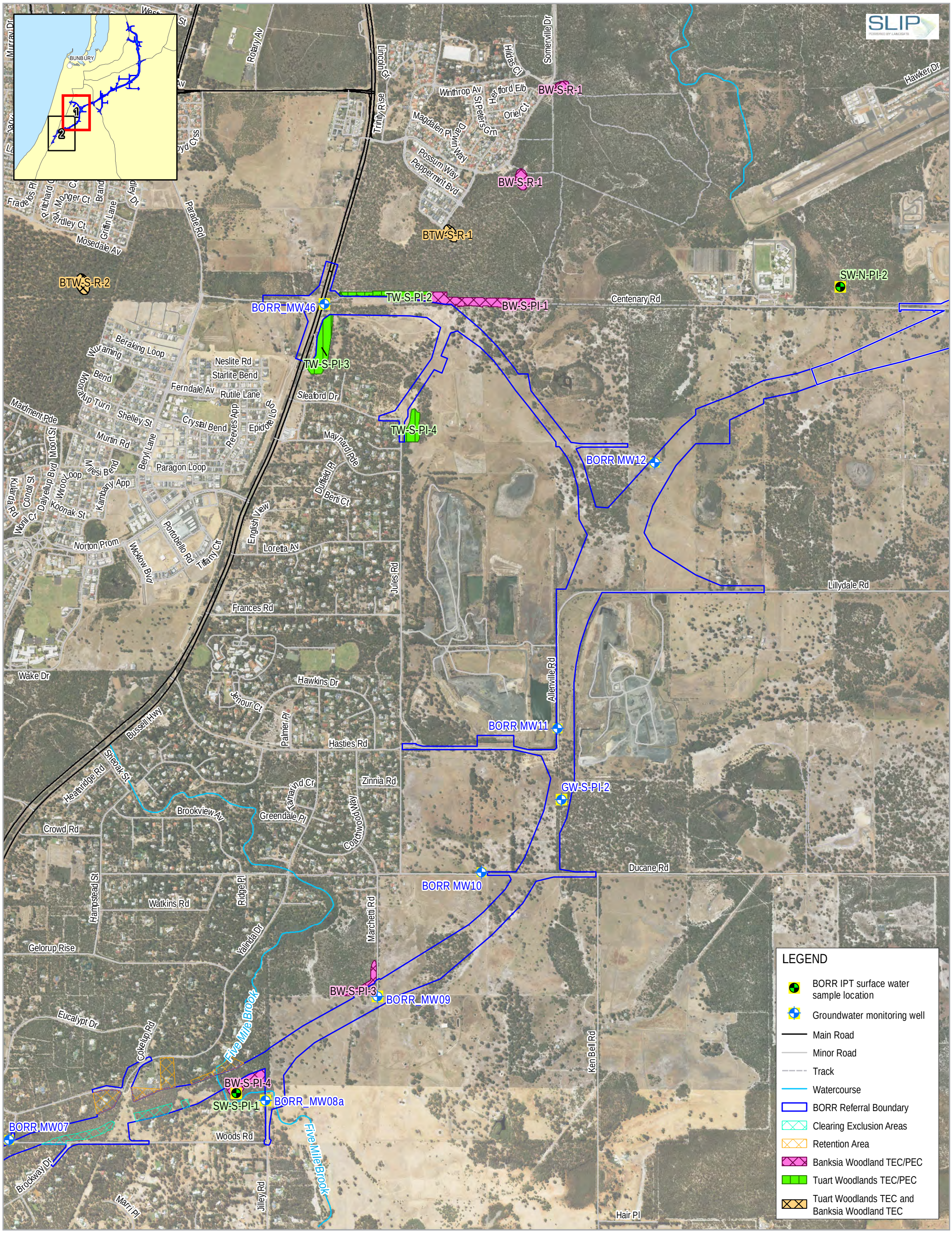
Print date: 30 Jun 2022 - 14:43

Data source: BORR team: South referral boundary - 20191212, TEC/PEC - 202005, Reference sites - 20200327; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20220630; EcoEdge: Reference sites - 20200325. Created by: mmikkonen

Figure 4. Overview of monitoring location for Banksia Woodlands TEC/PEC and Tuart Woodlands TEC/PEC



Paper Size ISO A3

0 200 400 600

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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Bunbury Outer Ring Road

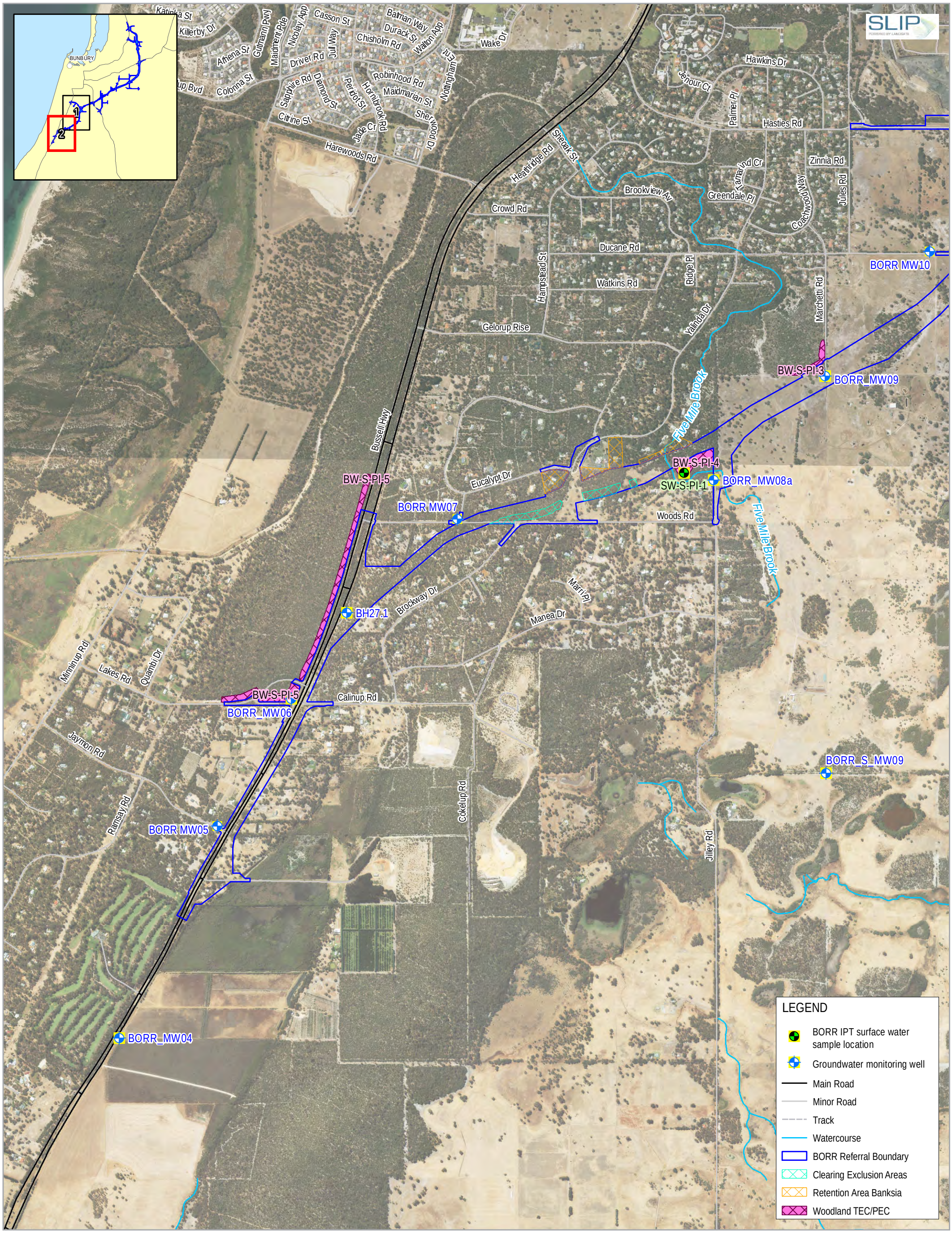
TEC/**PEC** potential impact monitoring locations

Project No.	61-37041
Revision No.	0
Date	30/06/2022

FIGURE **4**

G:\61\37041\19_0_GIS\Maps\Working\BORR South EPBC AR\DAWE submission\Vegetation Management Plan\6137041_005_BORRSouthTECMonitoring_Rev0.mxd
Print date: 30 Jun 2022 - 16:17

Data source: BORR: BORR North Referral Boundary - 20191016, BORR South Referral Boundary - 20191212; TEC/PEC: 2020; Biota: Western Ringtail Possum reference sites - 20200714; WRM: Sampling sites - 20200713; Geoscience Australia: GeoData Topo 250k Series III - 2006; Landgate: Roads, LGA Boundaries - 20180501, Imagery - WA Now accessed 20220630. Created by: mmikkonen



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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TEC/**PEC** potential impact monitoring locations

Project No. 61-37041
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FIGURE **4**

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Print date: 30 Jun 2022 - 16:17

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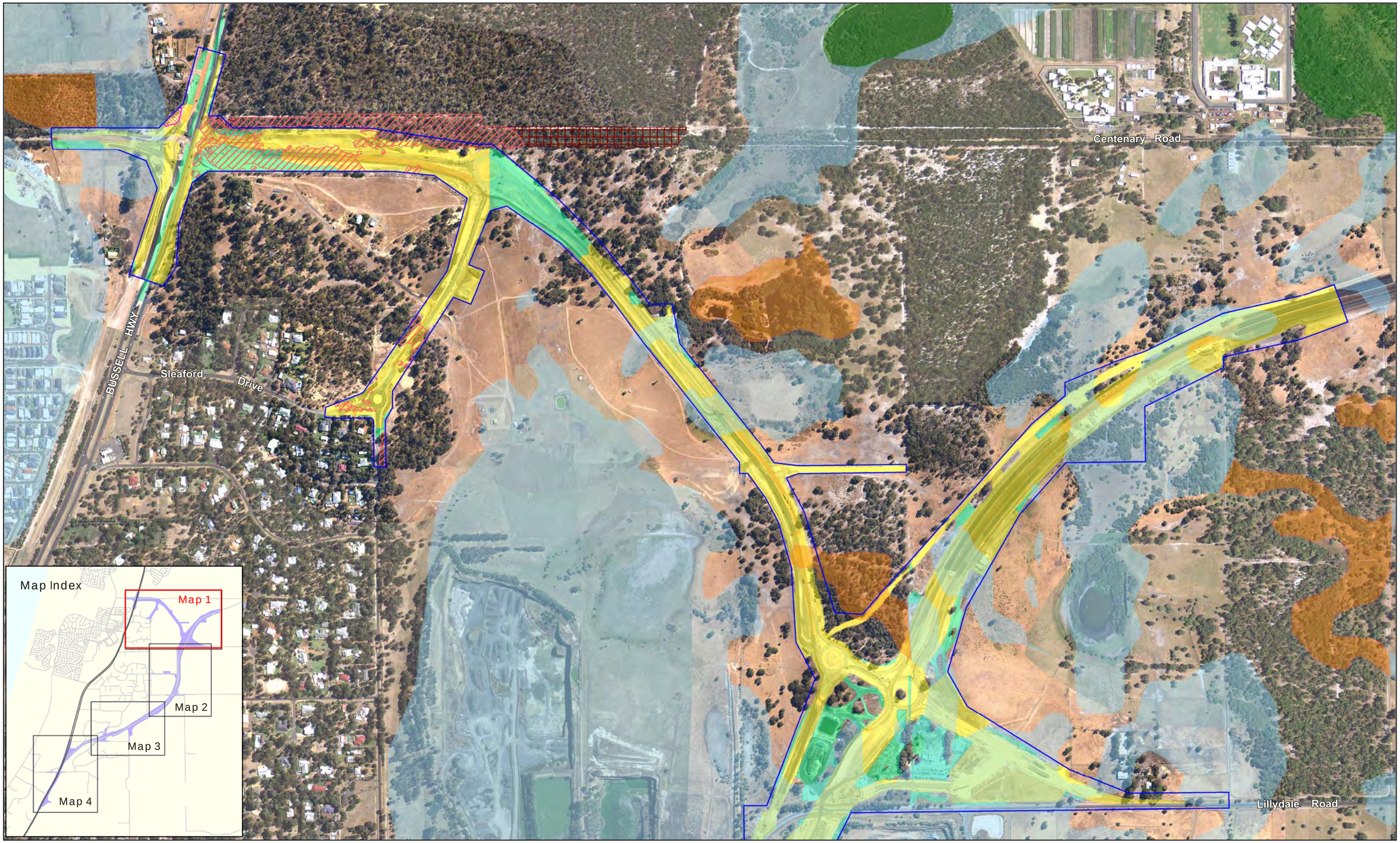
Figure 5. Ground disturbance and clearing extents during the reporting period in relation to TEC/PEC vegetation



Location Map

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents 2022 - 2023
- Ground disturbance and clearing extents 2023 - 2024

TEC PEC

- Banksia Woodland TEC/PEC
- Tuart Woodland TEC/PEC
- Tuart-Peppermint Woodland PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

- Conservation Category Wetlands
- Multiple Use Wetlands
- Resource Enhancement Wetlands

N

0 300

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to TEC PEC and Geomorphic Wetlands - Map 1

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 22 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:8,2500 @ A3

N

0 400

meters

Lillydale Road

Hasties Road

Ducane Road

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents 2022 - 2023

Ground disturbance and clearing extents 2023 - 2024

BORR South Imagery March 2024

TEC PEC

Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

Conservation Category Wetlands

Resource Enhancement Wetlands

Multiple Use Wetlands

Ground Disturbance and Clearing Extents in Relation to TEC PEC and Geomorphic Wetlands Map 2

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 22 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,500 @ A3

BUSSELL HWY

Yalinda Drive

Eucalypt Drive

Woods Road

Jilley Road

Brockway Drive

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

PERTH

KALGOORLIE

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents 2022 - 2023

Ground disturbance and clearing extents 2023 - 2024

TEC PEC

Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

Conservation Category Wetlands

Multiple Use Wetlands

N

0 300

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to TEC PEC and Geomorphic Wetlands - Map 3

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 22 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,250 @ A3

Map Index

Map 1

Map 2

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Map 4

Woods Road

Road

Lakes

BUSSELL HWY

Calinup Road

Jaymon Road

N

0 300

meters

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents 2022 - 2023

Ground disturbance and clearing extents 2023 - 2024

BORR South Imagery March 2024

TEC PEC

Banksia Woodland TEC/PEC

Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)

Conservation Category Wetlands

Multiple Use Wetlands

Ground Disturbance and Clearing Extents in Relation to TEC PEC and Geomorphic Wetlands Map 4

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 22 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,000 @ A3

South West Gateway Alliance

Report

Environmental Performance Report - Priority Ecological Communities (EcoEdge, 2024)

Bunbury Outer Ring Road

Southern Section

Threatened and Priority Ecological Communities

Annual Monitoring Report

31 May 2023 – 31 May 2024

Prepared for
Southwest Gateway Alliance
2024

PO Box 9179, Picton WA 6229

0484 771 825|enquiries@ecoedge.com.au

Version	Origin	Review	Review date	Release approval	Issue date
Rev A	CS	DB	2/8/2024	Ecoedge	7/8/2024
Rev B	CS	DB	8/8/2024	Ecoedge	9/8/2024
Rev C	DB	SWGA	12/8/2024	SWGA	17/8/2024
Rev D	CS / DB	Main Roads	19/8/2024	EcoEdge	27/8/2024
Rev 0	CS / DB	SWGA	28/8/2024	Main Roads	28/8/2024

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Statement of Limitations

Reliance on Data

In the preparation of this report, Ecoedge has relied on data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report. Unless stated otherwise in the report, Ecoedge has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report are based in whole or in part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Ecoedge will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, unavailable, misrepresented or otherwise not fully disclosed to Ecoedge.

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The report has been prepared for the benefit of the Client and for no other party. Ecoedge assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including, without limitation, matters arising from any negligent act or omission of Ecoedge or for any loss or damage suffered by any other party relying on the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

1 Introduction

The second annual Threatened and Priority Ecological Community (TEC PEC) monitoring report is prepared in view of conditions stipulated under approvals issued by both the Western Australian State Minister for the Environment and the Commonwealth Environment Minister for the Bunbury Outer Ring Road (BORR) Southern Section Project. These conditions relate to the protection and mitigation of impacts to Threatened Ecological Communities protected under the *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Threatened and Priority Ecological Communities protected under the State *Environmental Protection Act 1986* (EP Act).

These communities include[1]:

- Banksia woodlands of the Swan Coastal Plain, listed as both a TEC (Commonwealth (Cth)) and Priority 3 PEC (State) (Banksia woodlands TEC PEC)
- Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain, listed as both a TEC (Cth) and Priority 3 PEC (State) (Tuart woodlands TEC PEC[2]).
- Southern Swan Coastal Plain *Eucalyptus gomphocephala* - *Agonis flexuosa* woodlands (floristic community type 25)[3]

The conditions relevant to this TEC PEC monitoring report are presented below.

EPBC Approval 2019/8543

Approval date: 29 June 2022

Relevant conditions:

> '4. The approval holder must not cause a reduction in habitat quality within the clearing exclusion areas.
>
> 5. For the protection of listed threatened species and communities the approval holder must not cause a reduction in habitat quality, for:
>
> a. any Banksia Woodland TEC within 20 metres of the proposal area.

[1] An additional state and Commonwealth protected TEC, the Herb Rich Shrublands in Claypans (Floristic Community Type (FCT) 08 TEC, part of the Federally protected Claypans of the Swan Coastal Plain TEC (Claypan TEC) was also monitored. This community is NOT subject to any environmental approvals associated with the proposal, but for precautionary reasons was included in the TEC PEC monitoring program submitted as part of the referral documentation submitted for State approval in 2020 (BORR Team 2020). The monitoring program states that:

> 'No Claypan TEC occurrences will be impacted by the Proposal however one occurrence, situated approximately 500 m at its nearest from the Proposal Area is being included in the monitoring plan to enable the detection of any indirect impacts resulting from Proposal implementation.'

[2] Tuart woodland and Banksia woodlands co-occur in the Project Area and are referred to as Banksia Tuart Woodlands in this report.

[3] Can be a component of the Endangered Banksia Woodlands of the Swan Coastal Plain EPBC listed TEC or the Critically Endangered Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain EPBC Act listed TEC.

b. any Tuart Woodlands and Forests TEC within 60 metres of the proposal area.'

Condition 12, required a Vegetation Management Plan (VMP) to be prepared that established the environmental management actions to manage, monitor and mitigate direct and potential indirect impacts on the TECs. It also required the identification of the baseline habitat quality of the areas of TEC to be protected.

Condition 28, requires the approval holder to prepare a compliance report for each 12 month period following the date of commencement of the action.

State Approval Ministerial Statement (MS) 1191.

Approval date: 31 May 2022

Relevant conditions:

> **3-1(2**) 'The proponent shall implement the proposal to achieve the following environmental outcome: (2) ensure there are no project attributable indirect impacts, when compared to preconstruction baseline conditions, to Banksia Woodlands, Tuart Woodlands and Tuart-Peppermint Woodlands within twenty (20) metres outside the development envelope (defined in Figure 2a and Figure 2b) and within the clearing exclusion areas (defined in Figure 1) (Minister for Environment 2022).'
>
> **3-3** The proponent shall continue to undertake monitoring during and postconstruction until the CEO is satisfied that the proponent has demonstrated the outcomes in condition 3-1(2) has been met.
>
> **3-4** The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:
>
> **(1)** outline the monitoring that was undertaken during the implementation of the proposal;
>
> **(2)** outline the results of the monitoring undertaken to report whether that the environmental outcomes specified in condition 3-1(2) were achieved;
>
> **(3)** report whether that the outcomes in conditions 3-1(1) and 3-1(2) were achieved; and
>
> **(4**) outline any management actions undertaken during the implementation of the proposal to meet the outcomes in conditions 3-1(1) and 3-1(2).

Condition **12-1** requires the first compliance assessment report to be submitted within 15 months of the date of issue of the approval which is the 31 August 2023.

This TEC PEC monitoring report is submitted in respect of condition 12-1 of State approval MS 1191 for the period 31 May 2022 to 31 May 2023. It compares the results of parameters monitored since construction of the BORR Southern Project area commenced in August 2022 with baseline levels established by Ecoedge between October 2019 and July 2022 (Ecoedge 2023).

2 Methods

There are two components to the monitoring program, vegetation monitoring and drainage monitoring.

The vegetation monitoring program focuses on monitoring changes in the status of vegetation at reference sites and potential impact sites, such as its condition, species composition, vegetation structure and plant stress. Vegetation monitoring is carried out bi-annually in autumn and spring.

The drainage monitoring focuses on impacts of drainage and changes in hydrology on vegetation, specifically impacts from erosion, inundation/flooding and drying effects. Drainage monitoring is carried out quarterly in summer, autumn, winter and spring.

Data is collected from all TEC PEC sites that have a potential to be impacted by the project, due to their close proximity to the project and TEC PEC reference sites that are unlikely to be impacted due to their distance away from the project.

2.1 Location of monitoring sites

There are nine potential impact and five reference monitoring sites within the BORR Southern project area (**Table 1**). The location of these sites is shown in **Figure 1** and individual sites shown in **Appendix 1**.

Table 1. Current site name and location within the Southern project area.

No	Site Name	Location
Potential Impact sites		
1	BW-S-PI-1	South of Centenary Road, east of Bussell Hwy
2	BW-S-PI-3	East of Yalinda Drive, west of Marchetti Road
3	BW-S-PI-4	Jilley Road north of Woods Road. Photopoints established along the BORR boundary
4	BW-S-PI-5	West of Bussell Hwy
5	BW-S-PI-8	Woods Road, Gelorup
6	CP-S-PI-1	Manea Park middle claypan, south of CP-NS-R-2
7	TW-S-PI-2	Road reserve on the north side of Centenary Road east of Bussell Hwy, and extending into the adjacent reserve to the north
8	TW-S-PI-3	Bussell Hwy southbound, south of Centenary Road (adjacent the parking bay)
9	TW-S-PI-4	Jules Road near Sleaford Drive
Reference sites		
10	BW-S-R-1	Manea Park (R 32963)
11	BTW-S-R-1	Manea Park corner of Lakeside and Melaleuca Drive
12	BTW-S-R-2	North-side of Centenary Rd east of Bussell Hwy
13	CP-NS-R-1	Waterloo Nature reserve (R46108)
14	CP-NS-R-2	Manea Park (R16044)

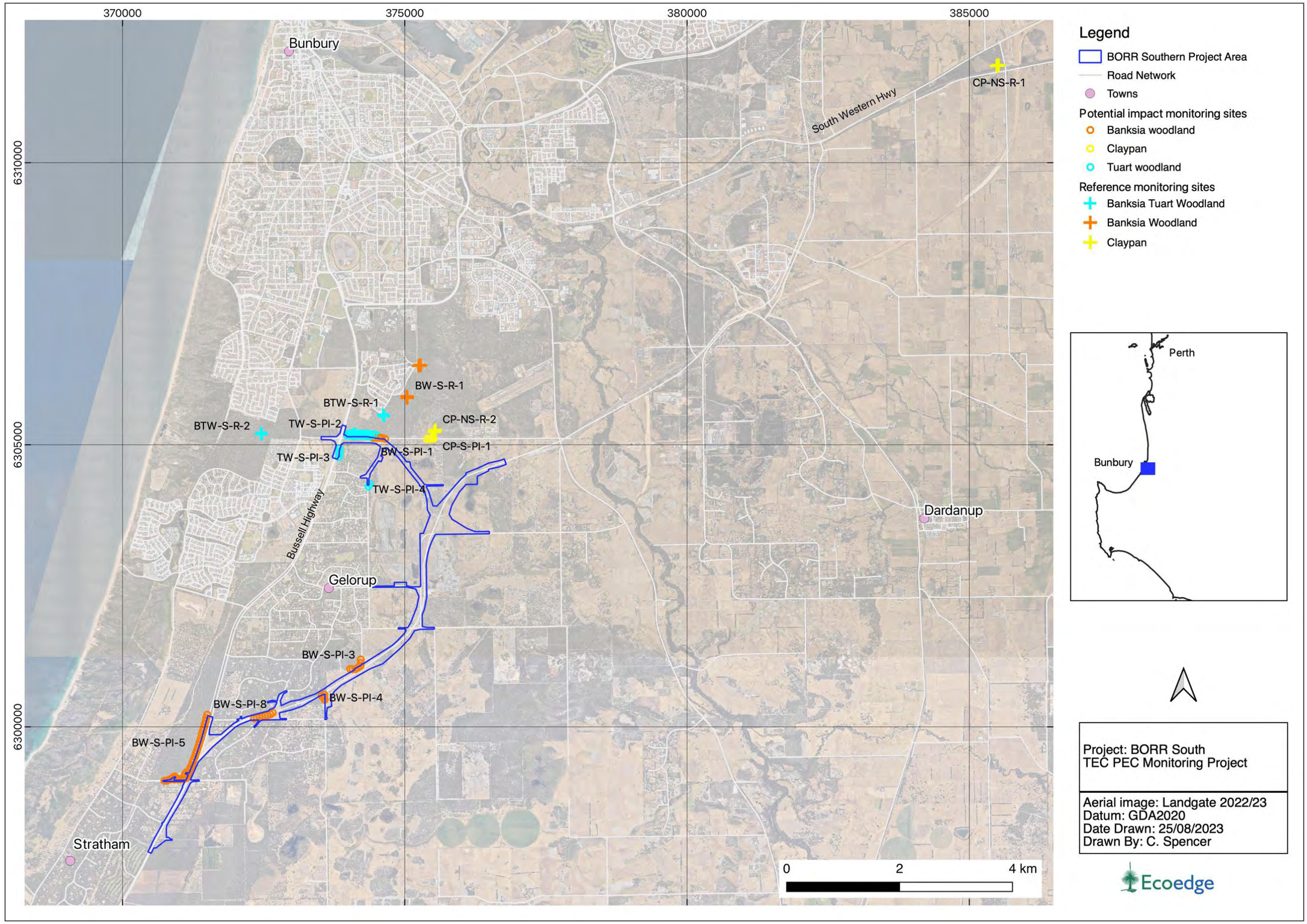


Figure 1. Location of potential impact and reference sites within the BORR Southern vegetation monitoring program.

2.2 Site nomenclature

The naming convention for vegetation monitoring points is as follows:

- Which vegetation TEC PEC type (**BW** = Banksia Woodlands, **BTW** = Banksia Tuart Woodlands, **CP** = Claypan, **TW**= Tuart Woodland)
- Whether it's in the **N**orth or **S**outh (Northern & Central or South referral areas, or **NS** for both)
- Whether it's a **P**otential **I**mpact site, or a **R**eference site.
- Whether it was a transect **T** or boundary photopoint **P** and a
- Site number if more than one site monitored in the TEC PEC.

For example, TW-S-PI-2_P01 is a potential impact Tuart Woodlands TEC site in the Southern referral area.

The naming convention for drainage monitoring points is as follows:
Example monitoring point: BTW-S-R-1_E1(a21)

BTW-S-R-1 - site name
D - drying, **E** - erosion, **I** - inundation
1 - chronological number of particular issue recorded at site.
(**a** - autumn, **w** - winter, **sp** = spring, **su** - summer) – the season first recorded.
21 -2021, the year it was first recorded.

2.3 Timing and frequency of survey

The boundary photopoint vegetation monitoring program is carried out bi-annually in autumn and spring. Transect vegetation monitoring is carried out annually in spring, except for the claypan transects which are carried out twice a year[4], once in mid spring and once in late spring mid to late November. This is in order to maximise the identification of herbaceous annuals which progressively germinate following the steady subsidence of claypan water levels as the weather warms up. Drainage monitoring is conducted quarterly to account for any seasonal variations.

An overview of the aspects of the monitoring program is presented in **Table 2**, and the timing of monitoring rounds conducted to date are presented in **Table 3**.

[4] Claypans were originally to be monitored twice once in late winter and once in spring, but observations showed that they were too inundated to be meaningfully monitored in winter. Instead, the second monitoring round was scheduled for late spring.

Table 2. Annual monitoring program overview.

Monitoring type	Activity	Sites	Frequency	Timing
Vegetation	Transects	BW-S-PI-1, BW-S-PI-5, TW-S-PI-2, CP-S-PI-1, BW-S-R-1, BTW-S-R-1, BTW-S-R-2, CP-NS-R-1, CP-NS-R-2	Annually	Spring
Vegetation	Transects	Claypan TEC	Bi-annually	Dependent on rainfall, but typically October and mid to late November.
Vegetation	Photopoints	Boundary points	Bi-annually	Spring and autumn
Drainage	Visual inspection	All sites	Quarterly	Spring, summer, autumn and winter

Table 3. Monitoring dates of monitoring rounds.

Year	Season	Drainage	Boundary photopoint	Transect/ quadrat assessment (spring only)
2019	Spring / summer	Not started	19 November to 3 December	
2020	Summer	Not started	N/A	
2020	Autumn	29-30 April	20-26 May	N/A
2020	Winter	28 – 31 July	N/A	4 August
2020	Spring	9 October – 28 October		
2021	Summer	10-12 February	N/A	
2021	Autumn	31 May	No monitoring	N/A
2021	Winter	7 September	N/A	N/A
2021	Spring	13 October	13 October	8 September - 14 October
2022	Summer	22 February	1 December	N/A
2022	Autumn	25 May	25 & 26 May	N/A
2022	Winter	20 June	20 June	N/A
2022	Spring	17 October – 20 October	17 October – 20 October	22 September – 21

Year	Season	Drainage		Boundary photopoint	Transect/ quadrat assessment (spring only)
					November 2022
2023	Summer	17 February 2023	N/A	N/A	
2023	Autumn	26 May 2023		22 – 26 May	N/A
2023	Winter	24 August 2023		N/A	N/A
2023	Spring	7 November 2023		29 September to 14 October	9 October – 27 November
2024	Summer	16 February 2024		N/A	N/A
2024	Autumn	25 May 2024		23 May to 27 May	N/A

2.4 Transects and Quadrats

Monitoring transects of 30 m in length were established within both potential impact and reference sites[5]. The ends of each transect were marked with a steel peg which will be left in place until the end of the monitoring program (noting that the stakes were removed from all roadside sites). Along each transect, 2 x 2 m quadrats were established at 10 m intervals, the first at 0 m and the last at 30 m. Each quadrat, marked at the corners with temporarily placed pegs, were placed alternately, left and right of the transect line. A total of four quadrats were established per transect. At most sites, only one transect was established. A photopoint was established at either end of the transect, and a photo taken of each quadrat. The layout of a transect is shown in **Figure 2**.

[5] Transects were not installed in potential impact sites located on private property, or where access was restricted.

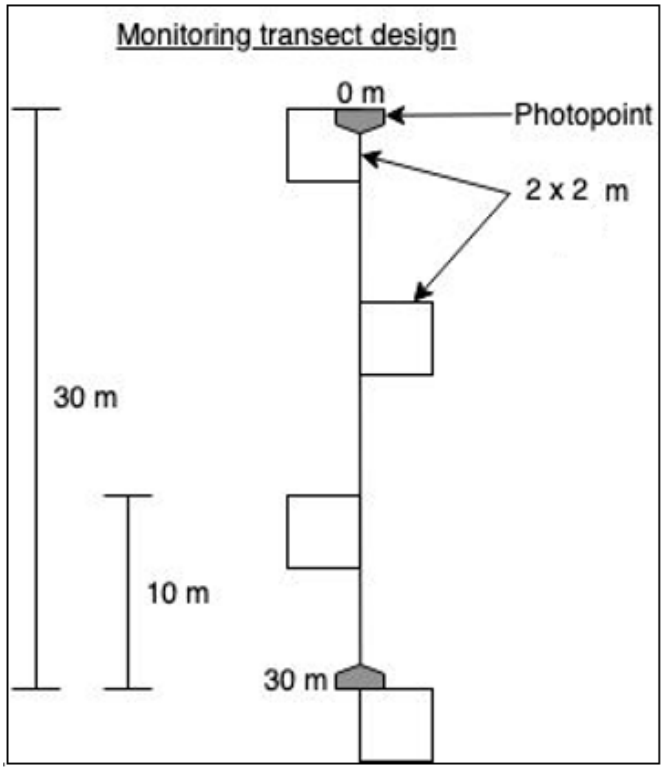


Figure 2. Layout plan for a transect.

To the extent practicable, the locations of transects at reference sites were placed in vegetation that was similar to Potential Impact sites for the Banksia and Tuart Woodlands and Claypan TEC.

The following parameters were recorded for each quadrat: Information on dominant plant species present, species cover, plant stress within transect quadrats. Data was recorded using various methods including Fulcrum application (https://www.fulcrumapp.com/), Excel spreadsheets and/or paper-based data collection sheets.

The parameters that are to be analysed for each quadrat are: species diversity, species composition, level of plant stress, weed species, plant deaths, vegetation health and ground characteristics. Changes in these parameters within the quadrats, along these transects, are compared between data collected at Reference and Potential Impact sites and between data collected at the same site over time.

The physical characteristics recorded for each quadrat include:

- Species composition: species identified in each quadrat.
- Vegetation cover[6] assessed using the scale presented in **Table 4**.

[6] Vegetation cover scale: Vegetation cover at non-transect monitoring sites is recorded using the National Vegetation Information Vegetation System NVIS scale instead of the Domin-Krajina scale as agreed to previously by the BORR Team. The reason for this is that it more easily applied than the Domin-Krajina scale in non-quadrat estimates of cover and abundance.

- Stress of perennial shrubs and trees: assessed using the scale[7] presented in **Table 5**.
- Evidence of obvious plant pests and diseases, such as Phytophthora dieback, Marri Canker and scale.
- Bare ground: assessed using the same scale as the vascular plant cover, from 1 equalling no bare ground to 10, which equalled 100% bare ground.
- Leaf litter: recorded as a % coverage of the quadrat.

Table 4. Cover scores for vascular plants within transect quadrats (BORR Team 2019).

Cover score	Description
1	Seldom found species with insignificant cover
2	Very scattered individuals of a species with less than 1% cover
3	Scattered individuals of a species with 1-5% cover
4	Any number of individuals of a species with 5-10% cover
5	Any number of individuals of a species with 10-25% cover
6	Any number of individuals of a species with 25-33% cover
7	Any number of individuals of a species with 33-50% cover
8	Any number of individuals of a species with 50-75% cover
9	Any number of individuals of a species with greater than 75 % but less than 100%
10	Any number of individuals of a species with complete cover (100%) in the stand

7 The vegetation health / plant stress monitoring scale used for assessing plant stress in transects and at boundary photopoint from 2020 was updated from the initial round of baseline survey to include a wider range of plant stress indicators (BORR Team 11 August 2020).

Table 5. Plant stress scale for shrubs and trees within transect quadrats.

Plant Stress Level	Description
5	Plant with >81 % of the original canopy present; healthy overall; little or no leaf yellowing. No evidence of wilting of foliage. Plants not stressed.
4	Plant with 61-80% of the original canopy present; occasional dead branches (< 20 % of canopy); small patches of leaf yellowing. Plant leaves may show signs of wilting at periphery. Plants potentially stressed.
3	Plant with 41-60 % of the original canopy present; some smaller dead branches evident (21-40 % of canopy); moderate amount of leaf yellowing (21-40 % of canopy). Plant leaves may show signs of wilting with noticeable curling of leaf periphery. Plants exhibiting symptoms of stress.
2	Plant with 21-40 % of original canopy present; some main branches dead (50 – 80 % of canopy; abundant leaf yellowing (> 41 % of canopy). Plant leaves may show signs of wilting with noticeable curling of leaf. Plants exhibiting signs of stress.
1	Plant with <20 % of original canopy; most main branches dead; remaining leaves mostly dying off. Plant leaves may show signs of wilting with noticeable curling of leaf (approaching closure). Plants clearly stressed.

2.5 Boundary photopoints

Boundary photopoints are located at approximately 50 m intervals along the boundary of monitoring sites and the BORR project area (not around the perimeter of monitoring sites). The monitoring boundary for each site is 20 m from the photopoint. That is, 10 m on either side of the observer (photopoint) and 20 m into the vegetation being monitored. It is considered this area can be reasonably observed from a photopoint and will incorporate most elements required to be assessed at the monitoring point, e.g. all vegetation structural layers – upper, middle and understorey elements.

Boundary photographs are taken looking at right angles to the boundary towards the TEC or PEC occurrence using the phone/tablet app Photomon (Northern Agricultural Catchments Council 2014). With the use of the Photomon application, the exact location and direction can be guaranteed, due to the fact the photos have a ghosting feature from a 'guide' photo taken previously.

Photopoints are also situated at each end of transects (transect photopoints), with the vegetation 10 m on either side of the transect being assessed.

An index of photographs taken during all monitoring rounds is provided in **Appendix 2.**

The full set of comparative data collected since monitoring commenced for the key variables recorded at the boundary photopoints sites and transect end points are presented in **Appendix 3**.

At each photopoint, the following information was collected:

- The location using a handheld GPS unit.
- A photograph (using the Photomon app) taken looking into the TEC/PEC or along the length of the transect.
- A description of the vegetation (including dominant tree, shrub, grass, sedge and herbaceous species), weed cover percentage, vegetation condition, evidence of erosion, flooding, pathogens, rubbish and grazing impacts.
- Major weed species and their percentage cover (except at transect photopoints[8]).
- Percentage cover of natives (autumn 2020 onwards) this value was assessed as a single, composite value in the autumn 2020 monitoring round. Prior to this, native cover was assessed as part of the assessment of vegetation structure[9].
- Record the stress of the trees (dominant shrubs, in the absence of trees) within the 20 x 20 m assessment area using the revised stress scale presented in **Table 5.**

Variables of species/cover, disease, disturbance, etc., are recorded using Fulcrum.

Vegetation condition is assessed against the method of the EPA (2016) (**Appendix 4**).

Assessment of vegetation structure is based on the Keighery (1994) structural classification, which is similar to that of the foliage cover of the National Vegetation Information System (NVIS) structural classification system (NVIS 2017).

The percentage cover of natives and weeds vegetation cover at non-transect monitoring sites is recorded using the National NVIS (2017) canopy cover scales.

Impact from Phytophthora dieback and Marri canker were recorded as part of standard vegetation monitoring undertaken at all monitoring locations. Four scales of impact were recorded:

1. Low impact: 1-2 plants
2. Medium impact: active front visible, some death
3. Heavy impact: active front visible, numerous deaths
4. Old impact site: vegetation structure altered.

[8] This information was not collected at photopoints associated with transects because it was collected for the transect quadrats.

[9] The method of assessment for native vegetation cover was not stipulated in the original scope for the project, just that it should be assessed as a percentage.

2.6 Transect and photopoint monitoring site summary

Transects were established at three potential impact Banksia sites (BW-S-PI-1, BW-S-PI-5, BW-S-PI-8), one potential impact Tuart site (TW-S-PI-2) and one potential impact Claypan site (CP-S-PI-1). The remaining potential impact sites are monitored via photopoints only. All reference sites have transects and photopoints. A breakdown of the number and type of transects and/or photopoints within each monitoring site is provided **Table 6**.

Table 6. Breakdown of monitoring points at each site.

Number	Site	Number boundary monitoring sites	Number transects (number of photopoints in brackets)
Potential impact sites			
1	BW-S-PI-1	5	1 (2)
2	BW-S-PI-3	7	-
3	BW-S-PI-4	4	-
4	BW-S-PI-5	34	1 (2)
5	BW-S-PI-8	8	1 (2)
6	TW-S-PI-2	20	1(2)
7	TW-S-PI-3	4	-
8	TW-S-PI-4	3	-
9	CP-S-PI-1	3	1 (2)
	Total	**88**	**5(10)**
Reference sites			
1	BW-S-R-1		2 (4)
2	BTW-S-R-1		1 (2)
3	BTW-S-R-2		1 (2)
4	CP-NS-R-1[10]		1 (2)
5	CP-NS-R-2		1 (2)
	Total		**6(12)**
	Grand Total	**88**	**11(22)**

[10] The CP-NS-R-1 and CP-NS-R-2 sites serve as Reference Sites for both the BORR Northern & Central Section and BORR Southern Section due to the limited number of suitable Claypan TEC occurrences within reasonable proximity to the referral area.

2.7 Drainage monitoring

Drainage monitoring was first undertaken in autumn 2020. Drainage monitoring is carried out quarterly (each season).

Drainage monitoring is conducted via a foot traverse along the length of potential impact site boundaries and along the transects within Reference sites. Three drainage disturbance variables are measured: flooding/inundation, erosion and non-seasonal drying effects (**Table 7**). If drainage disturbance is noticed, the location of this point are recorded using a hand-held GPS, and a photograph and description of the disturbance are taken. Where a disturbance is considered to have impacted vegetation, a plant stress assessment is conducted using the scale shown in **Table 5**. This scale was used to describe non-seasonal drying effects, i.e., those that would not normally be expected during the particular season.

The drainage monitoring information recorded has been based on the visual assessment field sheet created by the BORR IPT and provided in **Appendix 5.** This information is currently collected using the infield app, Fulcrum.

Table 7. Descriptions of the three disturbance variables recorded during drainage monitoring.

Disturbance Variable	Description
Flooding/Inundation	Flooding or inundation of vegetation resulting from run-off from a roadway
Erosion	Erosion, primarily caused by water that has resulted from runoff from a roadway
Drying effects	Drying off (yellowing and/or death) of vegetation that may have been caused by changes in hydrology caused by roadway construction. (Potentially as a result of new *Phytophthora* disease infection, but not including normal seasonal leaf drop in summer and early autumn).

The triggers for investigation with regards to 'drainage disturbance impacts' are:

- If TEC vegetation is inundated or flooded for 24 hours as a result of project activities.
- Evidence of new erosion in monitored TEC vegetation.
- TEC vegetation health declined relative to reference sites.

2.8 Comparative analysis

Comparative analysis of data occurs on two bases: between different monitoring rounds for the same sites, and between Potential Impact and Reference sites of the same community type. The analysis considers changes with regard to absolute number (e.g., number of species) and category score (e.g., cover or stress rating)

While it is not considered likely that statistical analysis will be required to detect changes reaching either specified trigger or threshold levels (BORR Team 2020, Main Roads 2022), where warranted, a paired t-test or repeated measures ANOVA may be used, noting that, due to differences in some vegetation characteristics between Potential Impact and Reference sites, and the relatively low number of sites, the tests would have a low "power" to detect a real difference between the two means.

A change is potentially significant and worthy of further investigation when there is a negative variation in the result for any measured variable, in particular for dominant vegetation structure, vegetation condition, weed cover, native diversity and cover at anyone monitoring point. For example, a change worthy of investigation may include:

- Vegetation structure: A Banksia Low Woodland changing to a Banksia Open Low Woodland
- Vegetation condition: Good condition vegetation changing to Degraded condition vegetation
- Weed cover: <2% weed cover changing to 2-10% weed cover
- Native cover: 30-70% native cover changing to 10-30% native cover and
- Plant Stress: trees / largest shrubs within the survey area changing by one grade point, for example, from a 5 to 4.

These changes are compared against reference sites of the same vegetation type, or data from previous rounds at the same site, to determine whether the change is the result of project-attributable impacts, or of other more regional scale impacts, such as drought.

Where possible site averages have been determined using field data. This was possible for three of the measured variables, weed cover, native cover and plant stress. For these parameters the mid-point of the category range was used as the representative value as shown in **Table 8**, **Table 9** and **Table 10**. Vegetation condition could not be averaged because its determination is not based on a numerical assessment.

Where appropriate the results of comparisons are shown in graphs which have bars showing the 20% threshold which if exceeded presents a potential reportable decline.

Table 8. Mid-point category score for weed cover.

Weed cover	Category score mid-point %
<2%	1
2-10%	4
11-30%	20
31-70%	50
>70%	85

Table 9. Mid-point category score for native cover.

Native cover	Category score mid-point %
<2%	1
2-10%	4
11-30%	20
31-70%	50
>70%	85

Table 10. Mid-point category score for plant stress.

Plant stress	Category score mid-point %
>81%	90
61-80%	70
41-60%	50
21-40%	30
<20%	10

2.9 Reportable decline

The Vegetation Monitoring Plan (BORR Team 2020) submitted as part of the State environmental approval defines a change or decline considered to be a reportable decline as 'where monitoring shows a 20% decline in the species composition and / or health / stress attributes of the TEC / PEC potential impact sites against the change at reference sites'.

The process for determining whether a reportable decline has occurred is outlined chronologically in the following steps:

1. Determine whether a significant change/decline has occurred

2. If yes, determine whether the significant change/decline is project attributable

3. If yes, then a reportable decline has occurred.

It is understood for the purposes of the monitoring that the reportable declines are to be relative to baseline levels across a site or data from reference sites. The baseline levels for this project, reported in Ecoedge (2023) are based on TEC PEC monitoring data collected from spring 2019 to winter 2022 prior to the commencement of the project which commenced in August 2022.

3 Personnel

The TEC PEC monitoring for the period May 31, 2023 to May 31 2024 was conducted by Colin Spencer, lead botanist (flora permit FB62000169), Ben Eckermann, botanist (flora permit FB62000262), and Debbie Brace, botanist (flora permit FB62000504).

4 Limitations

Limitations with regard to this reporting period are addressed in **Table 11.**

Table 11. Limitations of the field monitoring with regard to assessment adequacy and accuracy.

Aspect	Constraint	Comment
Proportion of flora identified	Minor	Spring transect monitoring was carried out from 9 October to 27 November 2022, which covers the optimum time for identification of flora within the Bunbury region.
Climatic and seasonal effects	Minor	About average rainfall was experienced for the for the Bunbury Weather Station (No. 9965) for the 2023 May to September wet season. This meant that spring flowering in general and germination of annuals was about average meaning that the spring monitoring was not compromised. However, the late spring, summer and early autumn rainfall was the driest on record BOM 2024a and 2024b. This resulted in a shorter growth season for annuals, both native and non-natives, resulting in some lower weed covers for weeds in the autumn monitoring round. It also resulted in widespread plant stress.
Availability of contextual information	Not a constraint	Data and reports from numerous studies conducted on Swan Coastal Plain vegetation are available to provide context for the monitoring program.
Completeness of the survey	Not a constraint	All monitoring sites were accessible and able to be easily assessed.
Skill and knowledge of the botanists	Minor	The lead botanist has nine years' experience in undertaking botanical survey and over 20 years' experience in vegetation management on the Swan Coastal Plain.
Consistency of monitoring personnel	Minor	The lead botanist has participated in all vegetation monitoring episodes since the project commenced in spring 2019 and has ensured consistency in assessment of monitored parameters including vegetation condition, plant stress and weed cover. However, it is acknowledged that some variation in assessment values due to interpretation of field conditions between observers may occur.

Aspect	Constraint	Comment
Disturbance (fire, grazing, clearing etc.)	Minor	At the time of survey, no sites were impacted/disturbed, such that they could not be meaningfully surveyed.
Collection and storage of data	Minor	Data was collected and stored using various applications on electronic devices and pen/paper notebooks. A coordinated approach is required, so data does not get lost or corrupt.

5 Results

5.1 Weather

Rainfall and temperature statistics for the 2019 – 2023 survey period as compared to the 1995-2023 average for the Bunbury Weather Station (No.9965) are shown in **Figure 3** and **Figure 4,** and **Table 12**. This information provides context to observed changes or trends in vegetation that may arise from variations in weather, for example, from prolonged, unseasonal drought impacts reducing plant germination and increasing plant stress.

The statistics show that the mean temperature for the period between 2020 – 2023 was higher than the mean temperature measured between 1995 and 2023 (BOM 2024a) for four of the five monitoring years with a range of 0.2 – 0.6 degrees. 2023 was the warmest monitoring year followed by 2019. The average temperatures from February until May 31 for 2024 were also the highest recorded since monitoring commenced and coincided with the driest summer to mid-autumn monitoring period (**Figure 4**, **Table 12**).

The 'wet season' (May to September) rainfall for Bunbury in 2023 was about average **Figure5**, however, this was in strong contrast to the lowest on record rainfall for Bunbury the 9-month period from August 2023 to May 2024 reported by the Bureau of Meteorology (BOM 2024b) **Figure 6**. The low rainfall and elevated temperatures also resulted in Bunbury, experiencing in April 2024 the lowest soil moisture on record (based on all years since 1911) (BOM 2024c) **Figure 7**.

The very low late spring and summer rainfall, combined with higher-than-average temperatures, meant that the growth and flowering season for herbaceous annuals (both native and non-native) was short. The existing plants quickly withered, and with no supplementary rains there was practically no replenishment of later germinating plants.

Table 12. Rainfall and temperature statistics for 2019 autumn 2024 for the Bunbury weather station No. 9965 (BOM 2023).

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan – Dec
Rainfall Totals													
2019	10.6	0	21.2	16.2	34.8	182	94.6	91.8	30	53.2	15.4	0.2	550
2020	1.2	12.4	35.2	23.6	114.4	152.2	129	65.6	88.2	23	3	5	652.8
2021	0.2	54.6	36.4	74.0	147.8	101.0	199.8	108.2	95.2	123.4	12.6	10.6	963.8
2022	0	2.8	8.6	61.6	111	110.4	226.2	132.8	70.2	30.6	18	0	772.2
2023	0.6	0	15.8	112	37	167.4	168.6	126.8	72.4	11.8	2.6	1	716.4
2024	0	0	0.4	0	177.4								
1995 - 2022	10.4	8.8	19.9	38.4	99.5	134.5	145.5	118.2	79.7	36.4	21.4	15.8	730.4
Temperature Averages													
2019	28.6	29.9	28.2	23.9	20.6	18.8	17.9	18.9	19.9	21.2	26.1	30.4	23.7
2020	28.9	30.6	27.7	24.2	20.1	19.6	18.1	17.6	19.4	22.6	22.6	29.3	23.4
2021	31.5	28.5	27.4	24.2	20.8	18.0	17.2	17.9	19.1	19.4	23.7	28.2	23
2022	31.7	31.4	28	24.2	20.9	18.1	17.7	17.2	19.3	19.9	24.1	28	23.4
2023	30.9	29.9	27.7	22.3	20.7	16.4	17.1	18.2	20.2	24	28.6	29.8	23.8
2024	30.7	32.8	28.9	26.7	23.2								
1995 - 2022	29.8	30	27.7	24.2	21	18.6	17.3	17.7	18.6	21.2	24.5	27.5	23.2

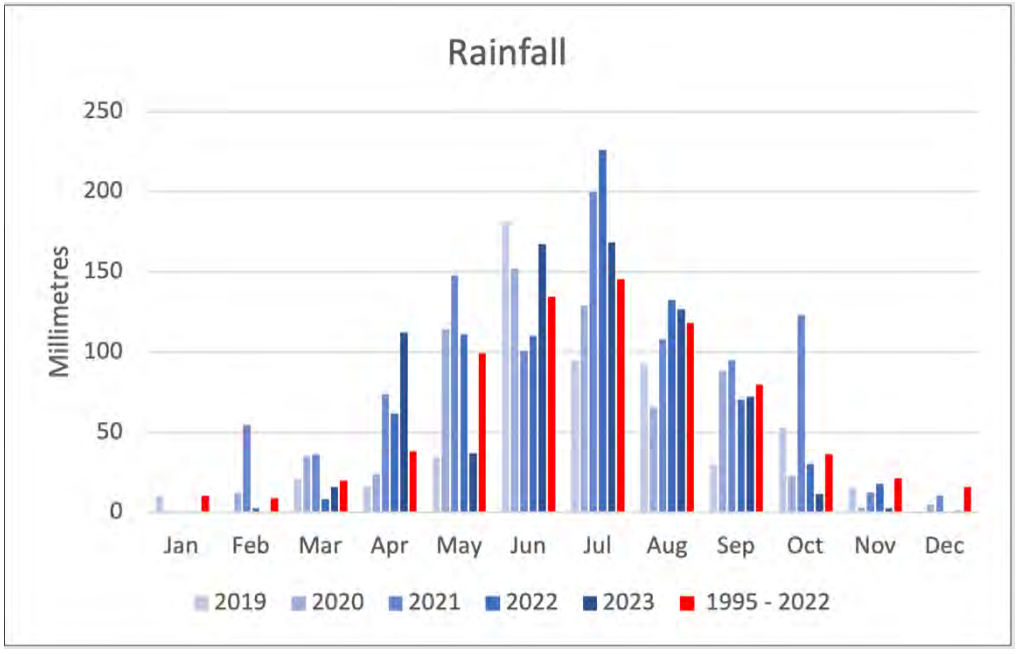


Figure 3. Long term mean and 2019 to 2023 mean rainfall for Bunbury Rain station 9965 (BOM 2024a).

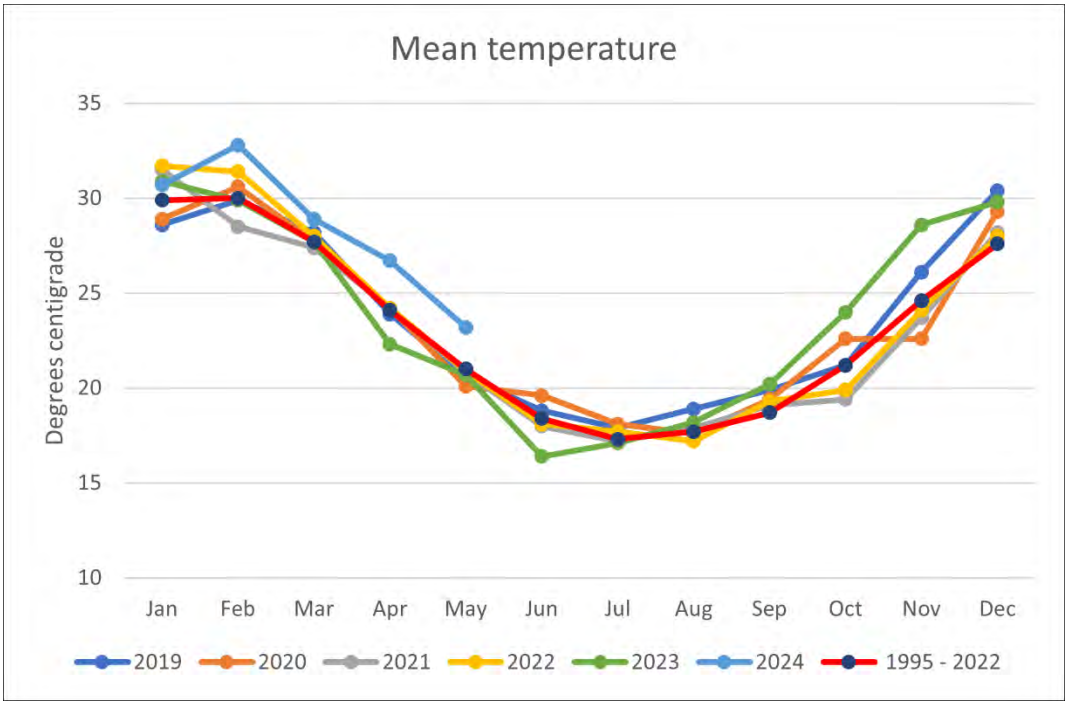


Figure 4. Long term mean and 2019 to Autumn 2024 mean temperature for Bunbury Rain station 9965 (BOM 2024a).

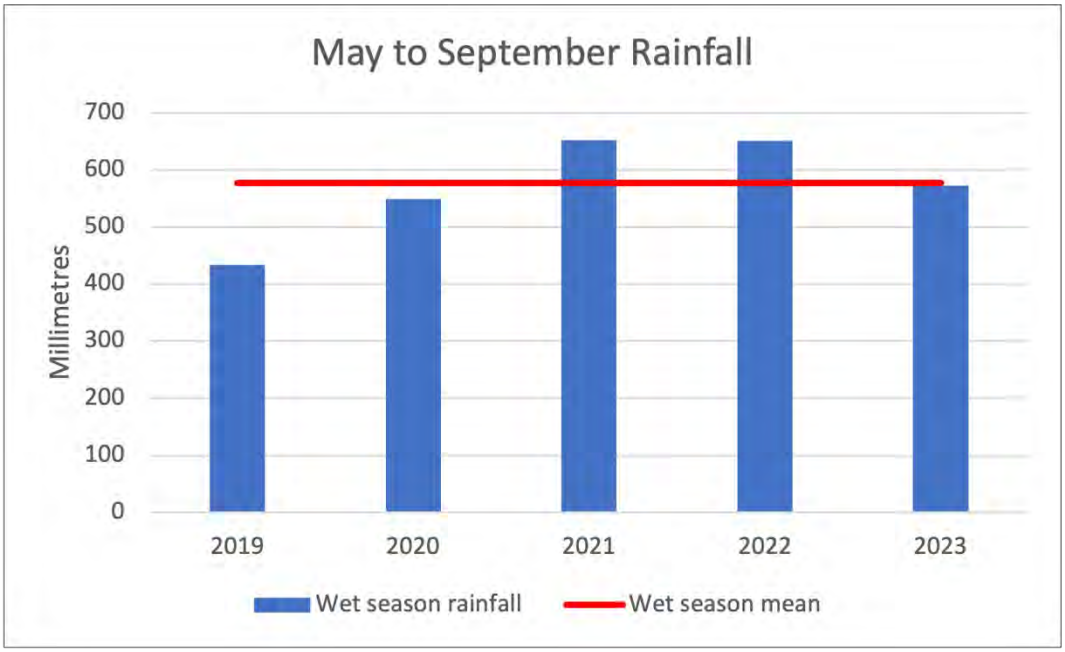


Figure 5. Long term and 2019 to 2023 mean wet season (May to September) rainfall for Bunbury weather station 9965 BOM (BOM 2024a).

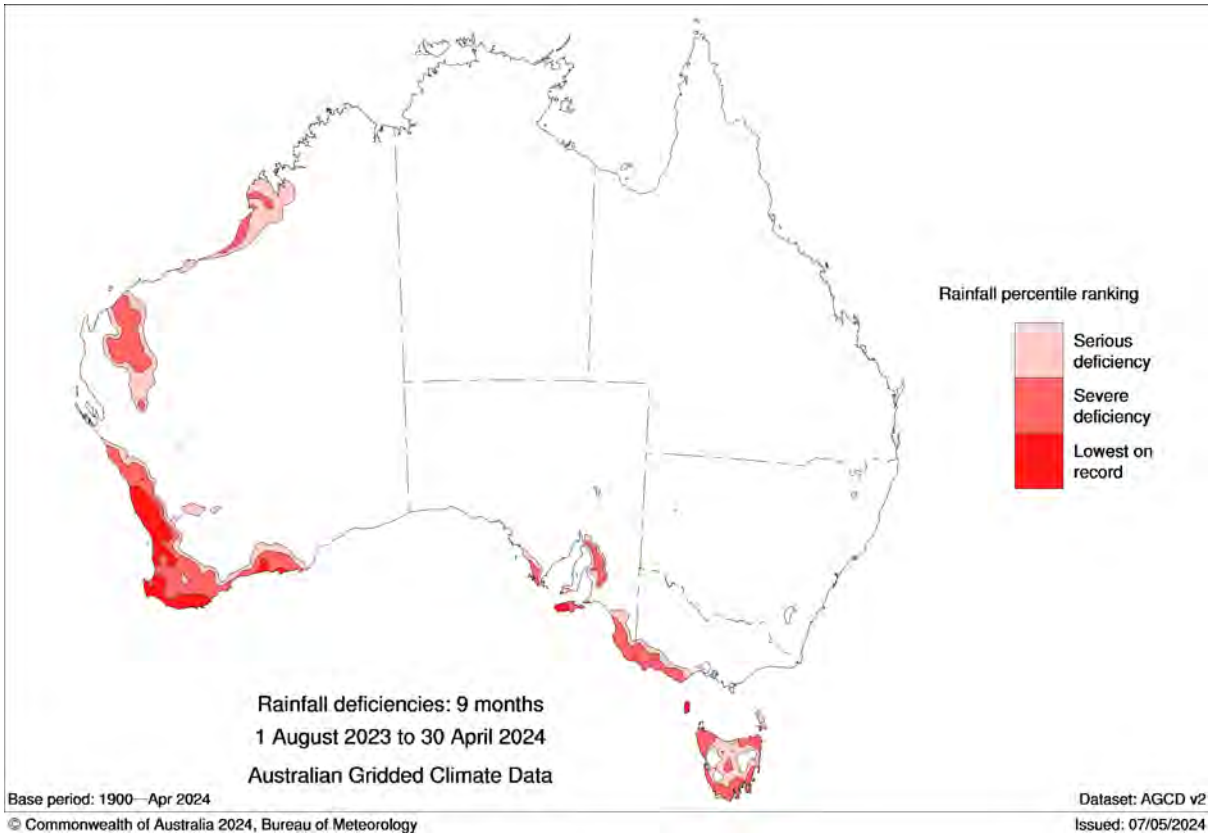


Figure 6. Rainfall deficiencies: 9 months 1 August 2023 to 30 April 2024. (BOM 2024b, used with permission – Creative Commons, CC- BY).

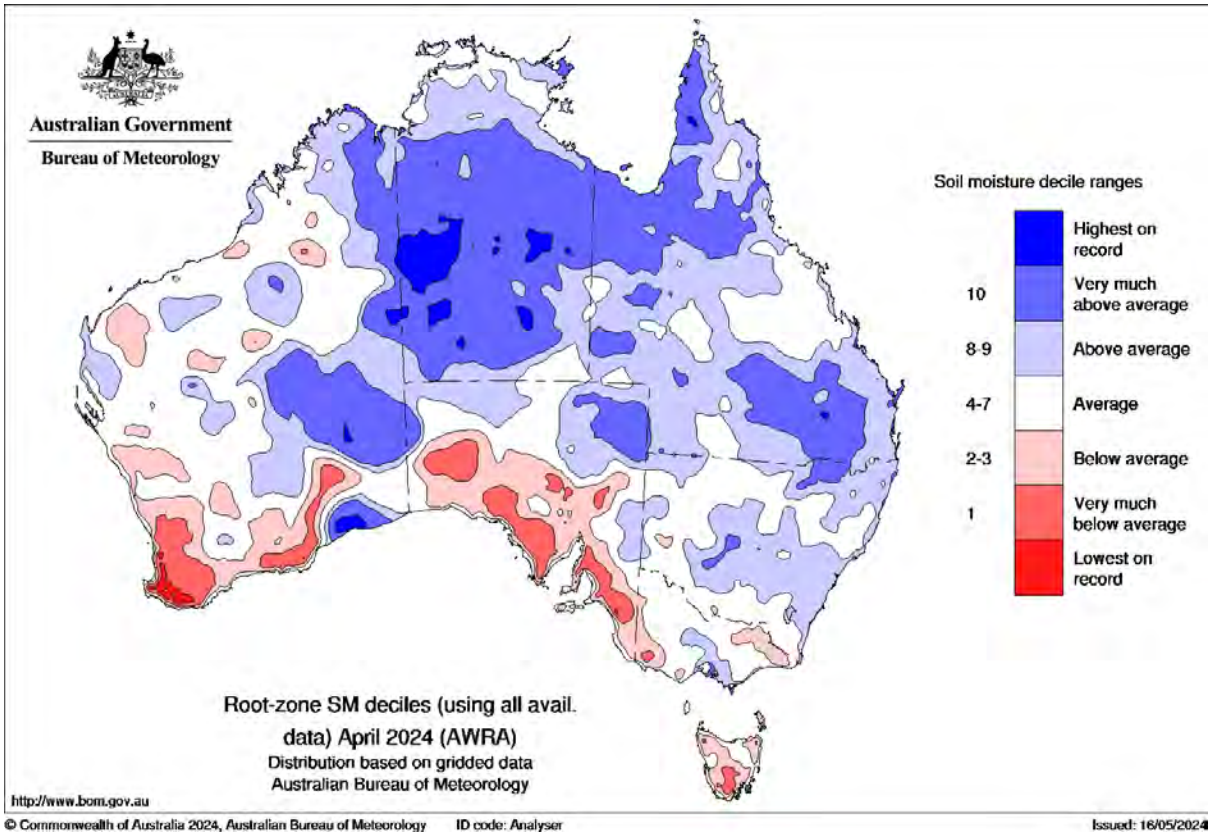


Figure 7. Root zone soil moisture for April 2024 (BOM 2024c, used with permission – Creative Commons, CC- BY).

5.2 Potential impact and reference site vegetation descriptions

A description of the modal vegetation for each monitoring site based on dominant vegetation identified within each structural layer is presented in **Table 13**. These descriptions are based on an assessment of vegetation at each photopoint across the monitoring site. A total of six Banksia Woodlands, two Banksia Tuart Woodlands, three clay pans and three Tuart Woodland sites were monitored.

Table 13. Vegetation descriptions for current monitoring sites

Site Name	Vegetation description Autumn 2023
BW-S-PI-1	*Corymbia calophylla* and *Eucalyptus marginata* Open Woodland over *Banksia attenuata, Agonis flexuosa, Xylomelum occidentale, Banksia grandis* Low Open Woodland over *Kunzea glabrescens* Tall Open Shrubland over *Jacksonia sternbergiana, Acacia extensa, Stirlingia latifolia brunonis* Open Shrubland over *Xanthorrhoea brunonis, Hibbertia hypericoides* and *Macrozamia riedlei* Low Open Shrubland over Lomandra micrantha, *Phlebocarya ciliata* Very Open Herbland and **Ehrharta calycina*, **Briza maxima* Very Open Grassland and *Lepidosperma squamatum* and *Hypolaena exsulca* Very Open Sedgeland.
BW-S-PI-3	*Eucalyptus marginata* Open Woodland over *Banksia attenuata Banksia ilicifolia, Xylomelum occidentale* Low Open Woodland over *Kunzea glabrescens* Tall Open Shrubland over *Macrozamia riedlei, Stirlingia latifolia* Open Shrubland over *Hibbertia hypericoides, Melaleuca thymoides, Acacia pulchella* Low Shrubland over *Phlebocarya ciliata Dasypogon bromeliifolius* Very Open Herbland over *Lepidosperma pubisquameum* Very Open Sedgeland and **Ehrharta calycina* Very Open Grassland.
BW-S-PI-4	*Eucalyptus marginata, Corymbia calophylla* Woodland Corymbia calophylla, Banksia attenuata, Banksia grandis, Xylomelum occidentale Low Open Woodland *Kunzea glabrescens, Persoonia longifolia* Tall Open Shrubland over *Hibbertia hypericoides, Acacia pulchella, Dasypogon bromeliifolius, Opercularia hispidula* Low Shrubland *Phlebocarya ciliata, Lomandra micrantha* Open Herbland *Lepidosperma squamatum, Lyginia imberbis, Lepidosperma pubisquameum* Open Sedgeland
BW-S-PI-5	*Eucalyptus marginata* and *Corymbia calophylla* Open Woodland over *Banksia attenuata, Xylomelum occidentale, Banksia grandis* Low Open Forest over *Hibbertia hypericoides, Xanthorrhoea brunonis* and *Macrozamia riedlei* Low shrubland over *Phlebocarya ciliata*, *Conostylis aculeata*, *Burchardia congesta*, *Orthrosanthus laxus* Very Open Herbland **Ehrharta calycina*, **Briza maxima* Very Open Grassland and *Lepidosperma squamatum*, *Lepidosperma pubisquameum* and *Hypolaena exsulca* Very Open Sedgeland.
BW-S-PI-8	*Eucalyptus marginata, Corymbia calophylla Open Woodland over Agonis flexuosa, Banksia attenuata, Banksia grandis and Xylomelum occidentale Low Open Forest over Spyridium globulosum, Jacksonia horrida, Acacia cochlearis, * Acacia iteaphylla Open Shrubland over Hibbertia hypericoides, Macrozamia riedlei, Xanthorrhoea brunonis, Phyllanthus calycinus and Styphelia racemulosa Low Shrubland to Open Low Heath over Dichopogon capillipes, Lagenophora huegelii, Lomandra micrantha, Orthrosanthus laxus and *Hypochaeris glabra Open Herbland over *Briza maxima, *Ehrharta calycina Open Grass land and Morelotia octandra and Lepidosperma squamatum Very Open Sedgeland.*
BTW-S-R-1	*Eucalyptus gomphocephala, Eucalyptus marginata, Corymbia calophylla* Open Woodland over *Banksia attenuata, Xylomelum occidentale* Low Woodland over *Macrozamia riedlei, Xanthorrhoea brunonis* Open Shrubland over *Hibbertia hypericoides, Phyllanthus calycinus* Low Shrubland over Lomandra caespitosa, **Ursinia anthemoides* Open Herbland over **Briza maxima* Very Open Herbland.
BTW-S-R-2	*Eucalyptus gomphocephala* Open Woodland over *Agonis flexuosa*, *Banksia grandis* Low Woodland over *Spyridium globulosum* Tall Open Shrubland over *Macrozamia riedlei* Open Shrubland over *Hibbertia hypericoides* Very Open Shrubland over *Orthrosanthus laxus*, *Phlebocarya ciliata* Open Herbland, *Morelotia octandra*, *Lepidosperma squamatum* Very Open Sedgeland and **Briza maxima* Very Open Grassland.

Site Name	Vegetation description Autumn 2023
BW-S-R-1	*Eucalyptus marginata* Open Woodland over *Banksia attenuata, Eucalyptus marginata* Low Woodland over *Kunzea glabrescens* Tall Shrubland over *Hibbertia hypericoides, Calytrix flavescens, Gompholobium tomentosum, Bossiaea eriocarpa* Low Shrubland over *Lepidosperma squamatum* Very Open Sedgeland.
CP-S-PI-1	*Eucalyptus marginata, Corymbia calophylla* Open Woodland over *Banksia attenuata, Banksia grandis, Banksia ilicifolia* Low Open Woodland over *Macrozamia riedlei* Open Shrubland over *Macrozamia riedlei, Hibbertia hypericoides, Xanthorrhoea brunonis* Low Shrubland over *Lomandra micrantha, Conostylis aculeata, Burchardia congesta* Very Open Herbland over *Lepidosperma squamatum* Very Open Sedgeland and **Briza maxima, *Ehrharta calycina* Open Grassland.
CP-NS-R-1	*Corymbia calophylla, Eucalyptus rudis* Open Woodland over *Melaleuca rhaphiophylla, Acacia saligna Low* Open Woodland over *Viminaria juncea* Tall Shrubland over *Xanthorrhoea preissii, Hakea varia* Shrubland over *Hakea varia, Grevillea bipinnatifida, Hypocalymma angustifolia* Low Open Shrubland over **Babiana angustifolia* Open Herbland over *Mesomelaena tetragona, Morelotia octandra, Cyathochaeta avenacea* Open Sedgeland.
CP-NS-R-2	*Melaleuca viminea Tall Shrubland* over *Blennospora doliiformis, Centrolepis aristatus, *Bartsia viscosa* Herbland.
TW-S-PI-2	*Eucalyptus gomphocephala* Open Woodland over *Banksia attenuata, Agonis flexuosa, Xylomelum occidentale* Low Woodland over *Spyridium globulosum* Tall Open Shrubland over *Hibbertia hypericoides, Xanthorrhoea brunonis* and *Macrozamia riedlei* Low Shrubland over *Orthrosanthus laxus, Dichopogon capillipes*, **Ursinia anthemoides* Very Open Herbland and **Briza maxima, *Avena barbata, *Ehrharta calycina* Open Grassland and *Lepidosperma squamatum* Very Open Sedgeland.
TW-S-PI-3	*Eucalyptus gomphocephala, Corymbia calophylla* and *Eucalyptus marginata* Woodland over *Agonis flexuosa* and *Banksia attenuata Low* Woodland *over Jacksonia furcellata and Daviesia divaricata Open Shrubland over Xanthorrhoea brunonis and Macrozamia riedlei* Very Open Shrubland over *Lomandra micrantha, Conostylis aculeata* var*. preissii* Very Open Herbland and *Ehrharta calycina* Open Grassland.
TW-S-PI-4	*Eucalyptus gomphocephala, Eucalyptus marginata* Woodland over *Agonis flexuosa, Banksia attenuata, Banksia grandis* Low Woodland *over Xanthorrhoea brunonis* Very Open Shrubland *Lomandra suaveolens, Lomandra micrantha, Conostylis aculeata* var*. preissii, *Anagallis sp., Oxalis pes-caprae* Open Herbland *Briza maxima Ehrharta calycina* Open Grassland.

* Denotes introduced species.

5.2.1 Comparison of potential impact and reference site transect monitoring sites

Representative data for the key variables (diversity of natives, including orchids, diversity and cover of weeds and shrub and trees stress) monitored at each transect monitoring site for the 2019 to 2023 spring monitoring periods is presented in **Table 14**. Graphs showing the comparative trends in this data between potential impact sites and reference sites for each TEC PEC type is presented below, **Figure 8** for Banksia woodland sites, **Figure 9** for Claypan sites, **Figure 10** for Banksia Tuart woodland sites and **Figure 11** showing average stress for all TEC/ PEC sites monitored.

The trends are discussed for each TEC PEC and an assessment is made with regards to the need to make a reportable decline and project attributable indirect impacts.

Twenty percent standard error bars are shown on each graph for the 2021 survey season in order to provide a baseline reference point. This point is 'imperfect' as some monitoring was completed in autumn and winter 2022 prior to the commencement of the project in August 2022, but it serves as a conservative point from which to make visual comparisons from.

Table 14. Representative data for the six key variables for Potential Impact and Reference sites in the BORR South project area.

Site Name	Year	Total taxa	Natives	Orchids	Weeds	Maximum weed cover	Average stress
BW-S-PI-1_T1	2019	21	17	0	4	3	4.67
	2020	29	23	1	6	6	4.50
	2021	31	23	1	8	6	3.67
	2022	36	28	1	8	5	5.00
	2023	36	26	2	9	5	5.00
BW-S-PI-5_T1	2019	22	20	0	2	3	4.88
	2020	40	36	1	4	8	4.83
	2021	35	31	2	4	5	4.71
	2022	36	32	3	4	5	4.38
	2023	36	31	3	4	5	4.91
BW-S-PI-8_T1	2022	51	44	3	7	4	4.92
	2023	52	42	2	9	4	4.84
BW-S-R-1_T1	2019	58	54	0	4	4	4.86
	2020	30	28	3	2	2	5.00
	2021	26	23	3	3	1	4.71
	2022	35	30	3	5	2	4.89
	2023	43	36	2	6	3	4.88
BW-S-R-1_T2	2020	31	30	5	1	4	5.00
	2021	31	30	5	1	3	4.44
	2022	30	28	4	2	2	4.58
	2023	34	31	4	2	3	4.48
BTW-S-R-1_T1	2020	41	35	0	6	7	4.78

Site Name	Year	Total taxa	Natives	Orchids	Weeds	Maximum weed cover	Average stress
	2021	42	35	2	7	6	4.67
	2022	50	44	3	6	6	4.55
	2023	52	43	2	8	6	4.84
BTW-S-R-2_T1	2020	34	28	1	6	5	3.50
	2021	44	32	3	12	6	4.33
	2022	42	32	4	10	5	3.80
	2023	44	32	4	11	5	3.67
TW-S-PI-2_T1	2019	25	21	4	0	8	5.00
	2020	38	25	13	0	5	4.67
	2021	42	28	14	2	5	4.71
	2022	47	33	14	3	5	4.71
	2023	41	24	16	2	6	4.67
CP-S-PI-1_T1	2019	37	24	13	0	4	
	2020	35	14	21	0	9	
	2021	46	27	19	0	5	
	2022	52	33	19	0	5	
	2023	53	30	0	22	5	
CP-NS-R-1_T1	2019	21	17	0	4	4	4.81
	2020	36	28	0	8	4	3.56
	2021	36	26	0	10	5	4.83
	2022	33	23	0	10	6	4.86
	2023	33	23	1	9	6	4.50
CP-NS-R-2_T1	2020	34	22	1	12	5	
	2021	19	11	0	8	5	5.00
	2022	31	21	1	10	4	4.50[11]
	2023	41	22	0	18	5	

[11] Note these stress scores were for the presence of *Melaleuca lateritia* and *Hibbertia vaginata* seedlings which were not recorded in the 2023 monitoring round.

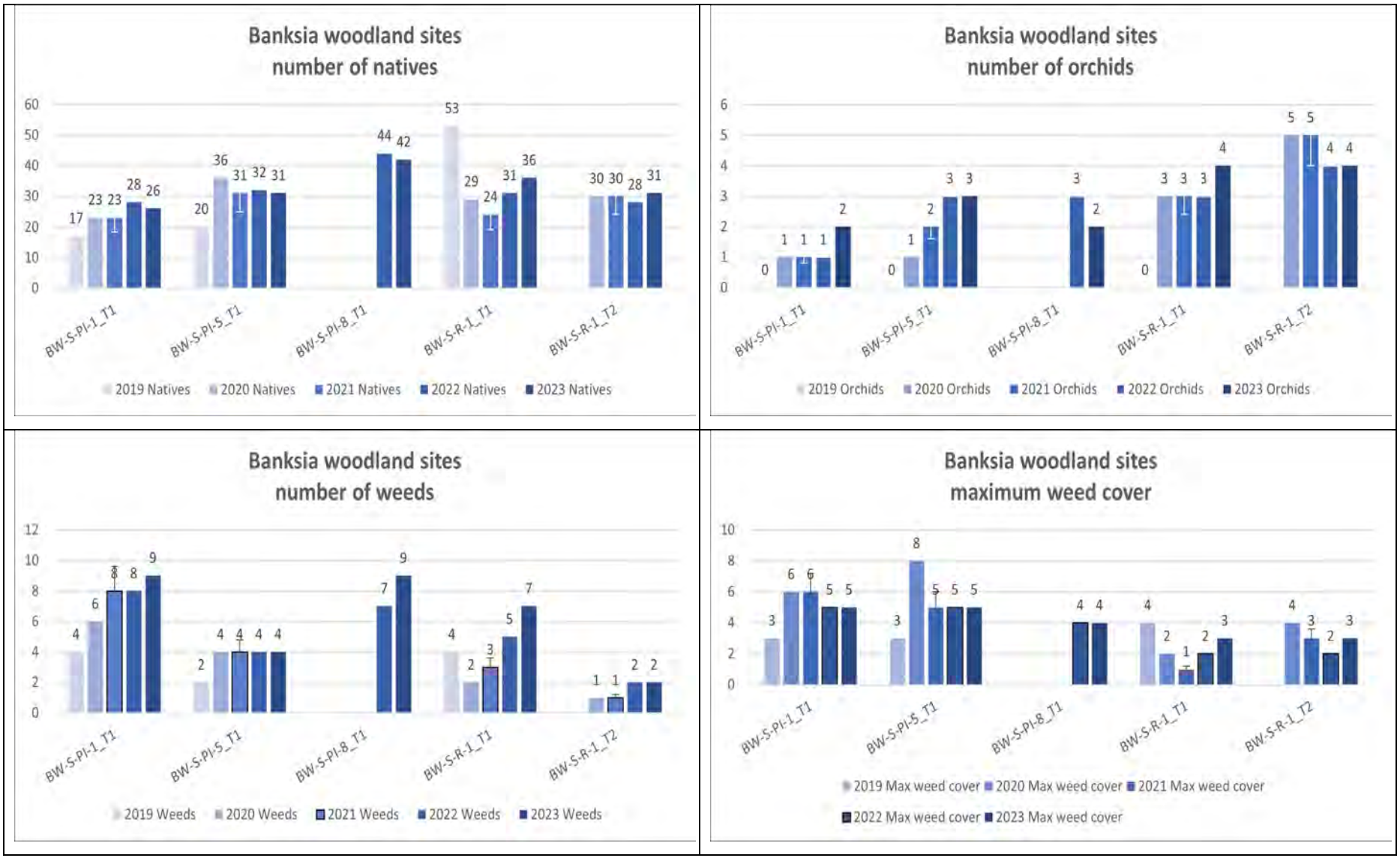


Figure 8. Banksia woodland transect graphs showing comparative data for potential impact sites and reference sites for weeds, native species and orchids.

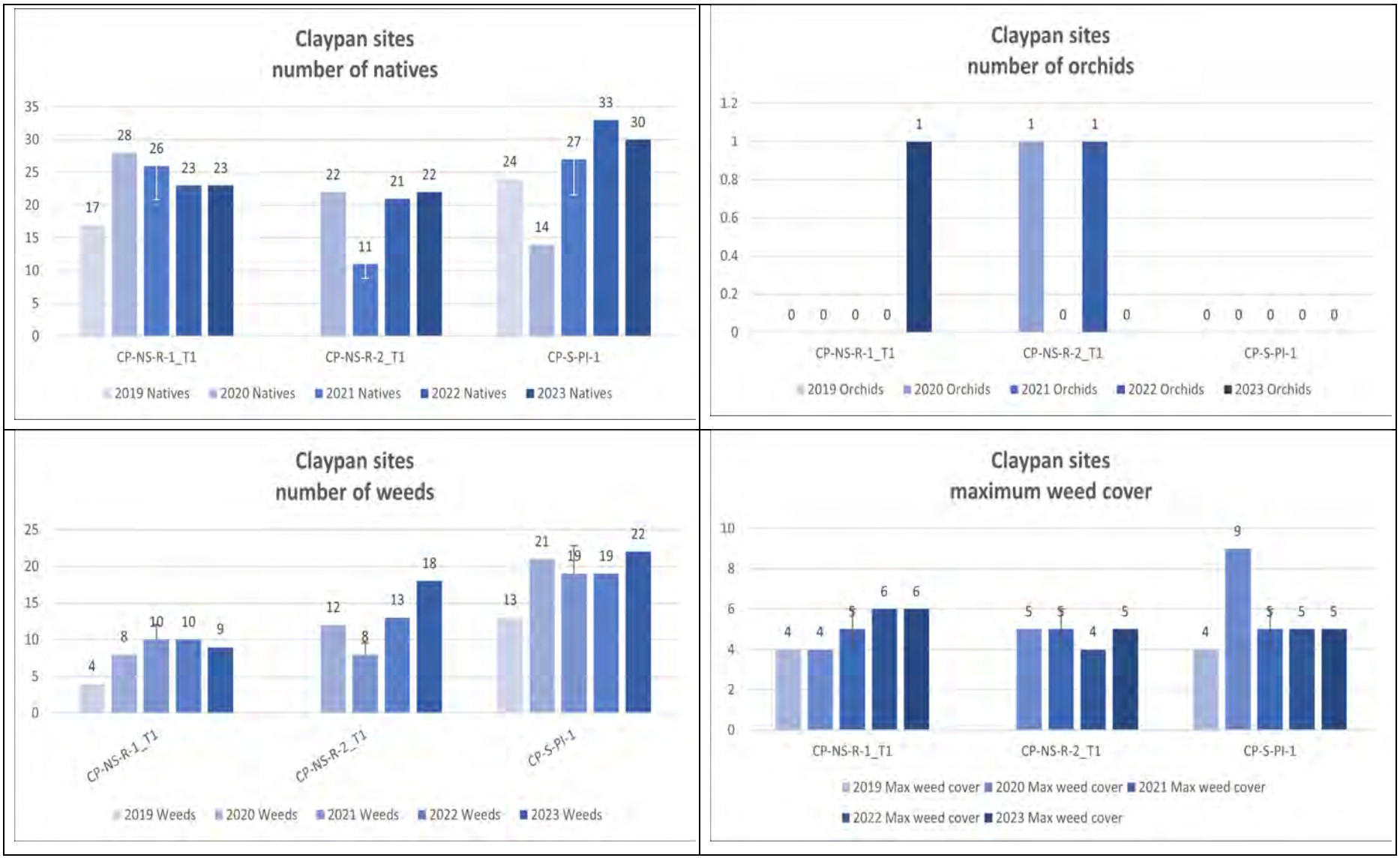


Figure 9. Claypan transect graphs showing comparative data for potential impact sites and reference sites for weeds, native species and orchids.

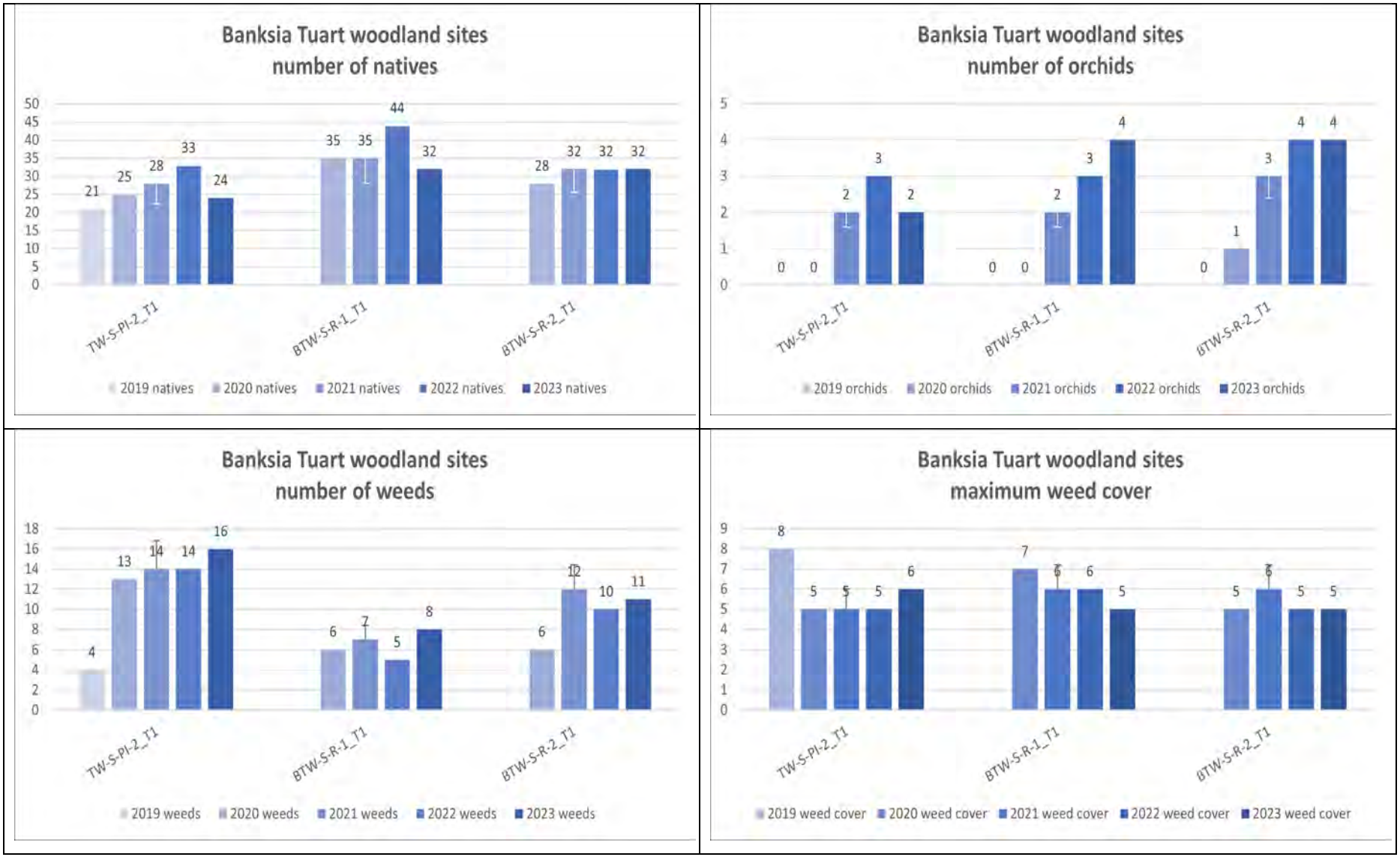


Figure 10. Banksia Tuart woodland transect graphs showing comparative data for potential impact sites and reference sites for weeds, native species and orchids.

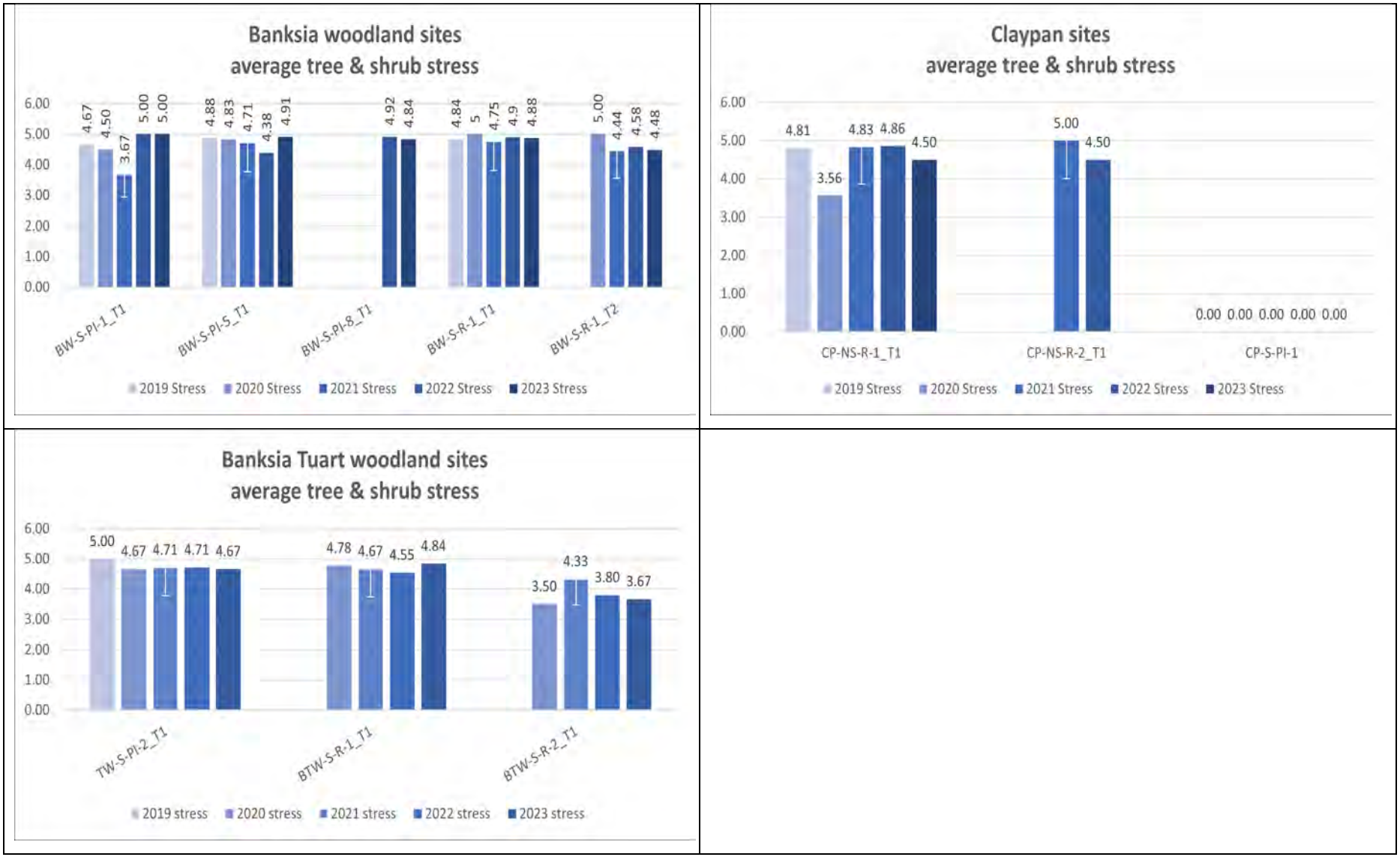


Figure 11. Graphs showing comparative data for potential impact sites and reference sites for average tree and shrub stress in Banksia woodland, Claypan and Banksia Tuart woodland TEC PEC sites.

5.2.2 Weed diversity and cover

Banksia woodlands

Weed diversity increased at two of the three Banksia woodland potential impact sites BW-S-PI-1_T1 and BW-S-PI-8_T1 by one to two species relative to the spring 2021 baseline levels, however weed diversity was stable for BW-S-PI-5_T1. T. Similar increases in weed diversity of one to two species were observed in all of the Banksia woodland reference sites. Maximum weed cover was stable at 10-25% for BW-S-PI-1_T1 and BW-S-PI-5_T1 and 5-10% for BW-S-PI-8_T1 relative to baseline conditions. Weed cover fluctuated in the reference sites with minor increases in the 1% and 1-5% range between the 2022 and 2023 monitoring rounds. These variations are largely due to variable germination of common annual weeds such as *Briza maxima* and *Briza minor*.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts with regards to weeds for Banksia woodland potential impact TEC sites because the minor one to two species increases was experienced in both potential impact and reference sites and because the increase in weed diversity is attributed to colonisation of weeds from immediately adjacent bushland and not from the nearby BORR project area.

Claypans

The levels of weed diversity increased by three species at the one Claypan potential impact site CP-S-PI-1_T1 relative to baseline levels however maximum weed cover remained stable. A comparable increase was experienced at one of the reference sites CP-NS-R-2_T1. Maximum weed cover for CP-S-PI-1_T1 was consistent with base line levels (**Figure 9**). The claypan weeds tend to be dominated by small annual weeds, which are observed to have a variable germination. These small annuals e.g. < 10 cm have a low potential weed cover, unless present in very high numbers, so require large quantities to cause a change in maximum weed cover.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts with regards to weeds for Claypan potential impact sites CP-S-PI-1_T1 because there was no increase in weed diversity or maximum weed cover relative to the reference sites compared to baseline levels.

Tuart woodlands

The levels of weed diversity within the Tuart woodland potential impact site TW-S-PI-2_T1 increased by two species compared with baseline levels. This trend is generally similar with one of the reference sites BTW-S-R-1_T1 which also experienced a minor increase in weed diversity. A minor decrease in weed diversity (one species) was experienced at the other reference site BTW-S-R-2_T1. Maximum weed cover increased from 10-25% to 25-30% at TW-S-PI-2_T1 due to increases in small annual grasses. This increase was not experienced at the reference sites which both decreased in maximum weed cover. The variation in is attributed to variable germination in small annual weeds.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts with regards to weed diversity as the increase at TW-S-PI-2 was less than 20% and comparable to reference site BTW-S-R-1_T1.

There were also no project attributable indirect impacts with regards to the observed increases for weed cover at TW-S-PI-2_T1 as these increases were attributed to increases in existing annually

renewed weeds present within and adjacent to the site rather than from BORR related activities which are located approximately 50 m from the monitoring transect.

5.2.3 Native diversity

Banksia woodlands

The diversity within the three Banksia woodland potential impact sites remained generally stable for one site BW-S-PI-5_T1, increased by three for BW-PI-1_T1 and decreased by two species for BW-S-PI-8_T1.

These generally small fluctuations (minor increases and decreases) in the diversity of potential impact sites are similar to the fluctuations observed for the reference site BW-S-R-1_T2 and are attributed to variations in the diversity of small annual herbs, in particular species of the *Isolepis, Centrolepis* and *Hydrocotyle* and new seedlings which are more prevalent in higher rainfall years, such as that which followed the hot and dry 2019.

Noting that the 53 species recorded in 2019 for BW-S-R-1_T1 is an anomaly most likely due to a recording error, with levels around 30 species more accurately reflecting the site's diversity.

Orchid diversity increased for BW-S-PI-1_T1 and BW-S-PI-5 and decreased for BW-S-PI-8_T1. These increases and decreases were similar to the reference sites with one reference site increasing in diversity (BW-S-R-1_T2 and the other decreasing (BW-S-R-1_T2). The overall increases in the sites from the first monitoring period in 2019 can be attributed to wetter and more moderate seasons which followed the dry 2019 season.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts with regards to native diversity for the Banksia woodland potential impact sites, because two of the sites increased in diversity and the slight decrease in diversity at BW-S-PI-8 is less than 20% and attributed to variations in the germination of annual herbs, including orchids within the site and not from impacts from BORR related activities.

Claypans

The diversity of natives in Potential Impact site CP-S-PI-1_T1 increased from baseline levels. This is similar to CP-NS-R-2 which also experienced an increase in species diversity relative to base line levels but in contrast to reference site CP-NS-R-1 which experienced a minor decrease in diversity. The variations, both positive and negative, can be attributed to the variable germination in annual herbs within the claypans some of which had low cover / abundance scores of 1 (seldom found species with insignificant cover) or 2 (very scattered individuals of a species with less than 1% cover). This means that they are vulnerable to changes within the local environment.

There were no orchids recorded within the potential impact site in the post construction period which was consistent with baseline levels.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts with regards to native diversity for the Claypan potential impact sites because there was no decrease in native diversity, including orchid diversity compared to baseline levels.

Tuart woodlands

The diversity of natives in the one Tuart woodland potential impact transect site TW-S-PI-2_T1 decreased from baseline levels. The pattern of decrease was similar and of comparable magnitude

to the similar reference site BTW-S-R-1_T1 where there was an increase in native species in 2022 followed by a decrease in 2023. The pattern is due to variation in the germination of annual herb species, including orchids. These herbs include *Caesia micrantha, Caladenia flava, Centrolepis drummondiana, Chamaescilla corymbosa, Corynotheca micrantha, Crassula colorata, Drosera stolonifera, Ficinia marginata and Millotia myosotidifolia.* This variation is attributed local patterns in soil moisture and not to BORR related project activities. BTW-S-R-1_T1 is similar to TW-S-PI-2_T1 in that it has a range of micro-habitats including open areas and large logs conducive to colonisation of annually regenerating species.
By contrast levels of native diversity at reference site BW-S-R-2_T1 was consistent with baseline levels. BTW-S-R-2_T1 has an overall denser understorey with fewer open areas conducive for the colonisation of small annual herbs, so the fluctuation in diversity and number of annual herbs is less likely than for either BTW-S-R_T1 and TW-S-PI-2_T1.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts with regards to native diversity for the Tuart woodland potential impact sites because the decrease in native diversity for the potential impact site TW-S-PI-2_T1 was less than 20% and comparable to its similar reference site BTW-S-R-1_T1. The decrease is attributable to local variations in soil moisture rather than BORR related activities.

5.2.4 Shrub and tree stress

Banksia woodlands
Stress levels were observed to increase by over 20% in 2021 for BW-S-PI-1_T1 from prior monitoring levels. This increase in stress is attributed to the absence of a single *Macrozamia reidlei* which was observed in very poor health with a 1 health rating in 2021 but not recorded in 2022. This *Macrozamia* may be regarded as an outlier which skewed the results in 2021 as the other stress levels were all either 4 or 5. Apart from this distinct decrease the overall stress for both potential impact and reference sites is generally stable with little variation from baseline levels across all sites. All scores were between a stress level of 4 and the maximum health of 5.

Project attributable indirect impacts and or reportable decline: At the time of monitoring in spring 2023 there are no project attributable indirect impacts with regards to plant stress for the Banksia woodland potential impact sites because increases in stress were less than 20% and fluctuations comparable to the reference sites.

Claypans
Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts with regards to stress in trees or shrubs for the monitored Claypan Potential Impact sites because there are no trees or shrubs within the monitoring quadrats. All plants are annual, or semi perennial herbs which die or dieback soon after the end of the rain season.

Tuart woodlands[12]

The average stress level within the potential impact site TW-S-PI-2_T1 is practically consistent with baseline levels which have remained generally stable since 2020. This is comparable to stress levels within the reference site BTW-S-R-1_T1 which have also been generally stable but with minor fluctuations up and down between 4.5 and 5.00. The other reference site BTW-S-R-1_T2 is the overall most stressed monitoring point. However, this site has also remained generally stable despite a decrease in observed stress in 2022.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts with regards to plant stress for the monitored Tuart woodland potential impact site TW-S-PI-2_T1 because stress levels have remained practically stable relative to baseline levels.

5.2.5 Plant deaths

Plant deaths for all perennial shrubs and trees have been recorded within potential impact and reference site transects since monitoring commenced in 2019. During this time there have been no deaths recorded.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts with regards to plant deaths for the monitored TEC and PEC community types relative to baseline levels.

[12] The Tuart potential impact transect sites are compared with Banksia Tuart woodland transect reference sites due to the absence of transect reference sites within just Tuart woodland.

5.3 Comparison of biannual photopoints

5.3.1 Vegetation structure

There were no significant changes in dominant species or vegetation structure at any of the 108 photopoints monitored between autumn 2024 and the commencement of monitoring in spring 2019. This means that there was no change in the vegetation descriptions described for the monitoring sites.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts and therefore any potentially reportable declines with regards to vegetation structure at any of the monitored TEC and PEC community types relative to baseline levels.

5.3.2 Vegetation condition

There were only two changes in vegetation condition out of the 125 monitoring points between the 2019 and 2024 monitoring rounds for all monitored Banksia woodland, Claypan and Tuart woodland PEC/TEC occurrences and for all other monitored vegetation types.

Both were recorded in the Banksia woodland community, one at BW-S-PI-4_P02 on 17 October 2022 and the other at BW-S-PI-5_P04 on 20 October 2022. The condition of both these monitoring points was downgraded from Excellent to Very Good due to the significant establishment of weeds. For BW-S-PI-4_P02 it was due to the establishment of the environmental weed *Acacia longifolia* first observed in the area during the autumn 2022 monitoring round and for BW-S-PI-5_P04 it was due to the substantive increase in grass weeds, in particular *Briza maxima.* The impacts of *Acacia longifolia* are clearly evident due to its aggressive competition with most mid storey and low storey species whereas *Briza maxima's* impacts are more insidious compromising the structure of Excellent vegetation by out competing low herbaceous annuals.

The greatest potential for a downgrading of vegetation condition is within marginally Excellent condition monitoring points due to the invasion of weeds. This potential is currently observed at BW-S-PI-5_P14 which is currently Excellent but due to increasing presence of weeds may be downgraded to Very Good. This potential was first observed in the spring 2022 monitoring rounds. Interestingly the observed absence of annual weeds due to the autumn 2024 drought supported the continued assignment of Excellent to this monitoring point.

The comparative data for vegetation condition recorded at the boundary photopoint sites is presented in **Appendix 3.**

Project attributable indirect impacts and or reportable decline:
There was a decline in vegetation condition for two monitored photopoints BW-S-PI-4_P02 and BW-S-PI-5_P04 due to the invasion of weeds, however neither of these can be attributed to BORR project activities as these weeds were present and establishing prior to project commencement.

5.3.3 Weed cover

Weeds cover increased at nine of the 14 sites actively monitored[13] during the baseline monitoring period spring 2019 to Autumn 2022 (**Table 15**). The increases affected all vegetation types, Banksia woodland, Tuart woodland and Claypans, and were evident in potential impact and reference sites. This increase is likely due to the increases in annual rainfall and compounding increases in weed seed set over the monitoring period.

Post baseline monitoring shows that weed cover has continued to increase with cover increasing at two Banksia woodland sites, BW-S-PI-4 and BW-S-PI-5 and one Tuart woodland site TW-S-PI-2. Twelve of these increases occurred in the 22/23 monitoring period with a further six increases in the 23/24 monitoring period. These increases are shown in **Table 16**. These sites already had a high proportion of points with previously recorded increases in weeds.

A full set of comparative transect results for weed cover is available in **Appendix 3**.

Table 15. Number of monitoring points with a change (increase) in weed during the baseline monitoring period per monitoring site.

Site type	Site	Number of points with a change in weed cover*
Potential impact sites	BW-S-PI-1	6 (7)
	BW-S-PI-3	5 (7)
	BW-S-PI-4	3 (4)
	BW-S-PI-5	12 (37)
	BW-S-PI-8	first monitored in winter 2022
	CP-S-PI-1	2 (5)
	TW-S-PI-2	6 (11) an additional 11 sites were added in winter 2022
	TW-S-PI-3	0 (4)
	TW-S-PI-4	1 (3)
Reference sites	BW-S-R-1	0 (4)
	BTW-S-R-1	2 (2)
	BTW-S-R-2	2 (2)
	CP-NS-R-1	1 (2)
	CP-NS-R-2	1 (2)

* The number in the brackets is the total number of monitoring points at a monitoring site.

[13] BW-S-PI-8 was only monitored for the first time in Winter 2022, as this is in the clearing exclusion zone.

Table 16. Site with increased weed cover recorded post the baseline monitoring period.

Monitoring point	Baseline	Post baseline			
	Autumn / Winter 2022	Spring 2022	Autumn 2023	Spring 2023	Autumn 2024
BW-S-PI-4_P01	2-10%	**30-70%***	30-70%	30-70%	30-70%
BW-S-PI-5_P01	<2%	**2-10%**	2-10%	2-10%	2-10%
BW-S-PI-5_P02	30-70%	**>70%**	>70%	>70%	>70%
BW-S-PI-5_P04	<2%	**10-30%**	10-30%	10-30%	10-30%
BW-S-PI-5_P05	2-10%	2-10%	2-10%	**10-30%**	10-30%
BW-S-PI-5_P06	30-70%	**>70%**	>70%	>70%	>70%
BW-S-PI-5_P07	30-70%	**>70%**	>70%	>70%	>70%
BW-S-PI-5_P08	30-70%	**>70%**	>70%	>70%	>70%
BW-S-PI-5_P10	10-30%	10-30%	10-30%	30-70%	30-70%
BW-S-PI-5_P14	<2%	**2-10%**	2-10%	2-10%	2-10%
BW-S-PI-5_P15	10-30%	**30-70%**	30-70%	30-70%	30-70%
BW-S-PI-5_P25	<2%	<2%	<2%	**2-10%**	2-10%
BW-S-PI-5_P26	2-10%	2-10%	2-10%	**10-30%**	10-30%
BW-S-PI-5_P30	2%	2%	2%	**2-10%**	2-10%
BW-S-PI-5_P31	2%	2%	2%	**2-10%**	2-10%
TW-S-PI-2_P03	10-30%	**30-70%**	30-70%	30-70%	30-70%
TW-S-PI-2_P05	10-30%	**>70%**	>70%	>70%	>70%

*Figures in bold type mark the first increase in weed cover.

Banksia woodlands

There was an increase in the averaged weed cover at three banksia woodland monitoring potential impact sites since construction commenced in 2022 (**Figure 12**). These increases occurred at BW-S-PI-1, BW-S-PI-4, BW-S-PI-5 and were generally of a similar magnitude to one reference site BTW-S-R-2 (**Figure 12**). All of these increases relate to increases in invasive grasses already present at site. In respect of the other sites, BW-S-PI-3 remained steady with regards to weeds and BW-S-PI-8 experienced a decrease in weeds. No increases were recorded for two of the three reference sites (BW-S-R-1 and BTW-S-R-1) as these sites were largely weed free.

Project attributable indirect impacts and or reportable decline: The increases in weed cover at these sites are not regarded as being attributable to the project, and instead are attributable to weeds already within and directly adjacent to the monitoring points and are comparable to the increase observed for the reference site BTW-S-R-2.

Noting that no construction work, including clearing activities, had commenced in proximity to BW-S-PI_4 at the time of the observed increase of weeds at this site. Ongoing observations of the cleared area adjacent to BW-S-PI-1, BW-S-PI-5 show it to be relatively free of weeds and highly unlikely to be the cause of increase.

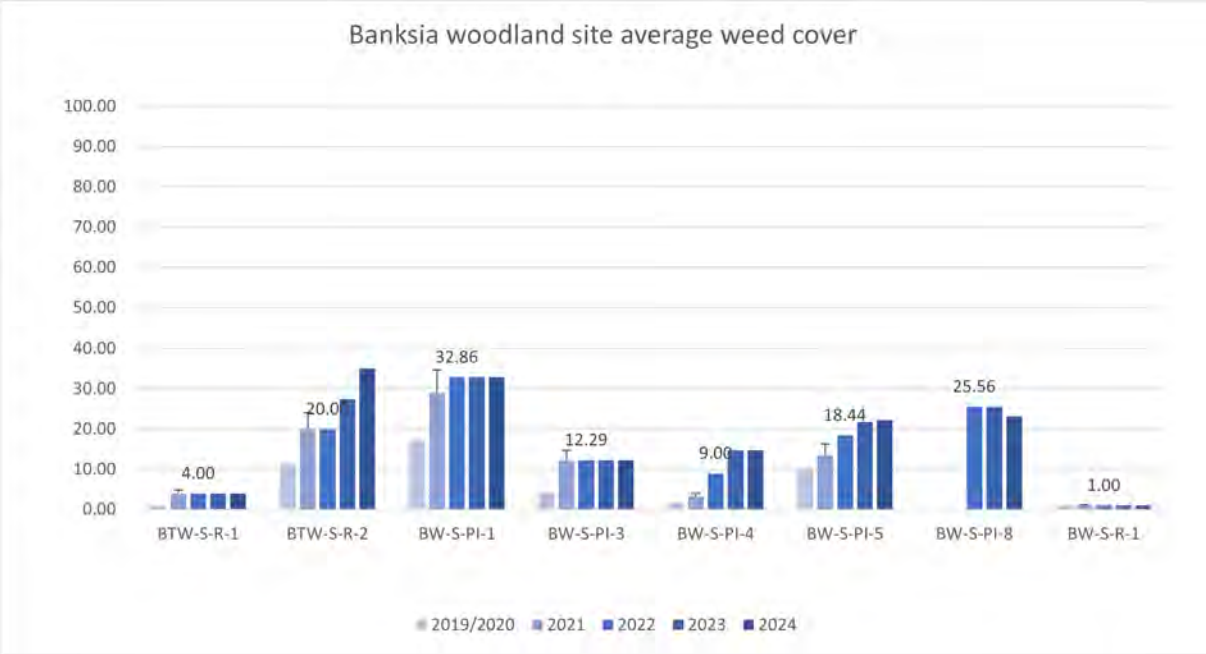


Figure 12. Change in average weed cover for Banksia woodland potential impact and reference sites.

Claypans

Project attributable indirect impacts and or reportable decline:

There are no project attributable indirect impacts nor reportable declines with regards to weed cover for the potential impact claypan site CP-S-PI-1 because there was no increase in weed cover relative to baseline levels (**Figure 13**).

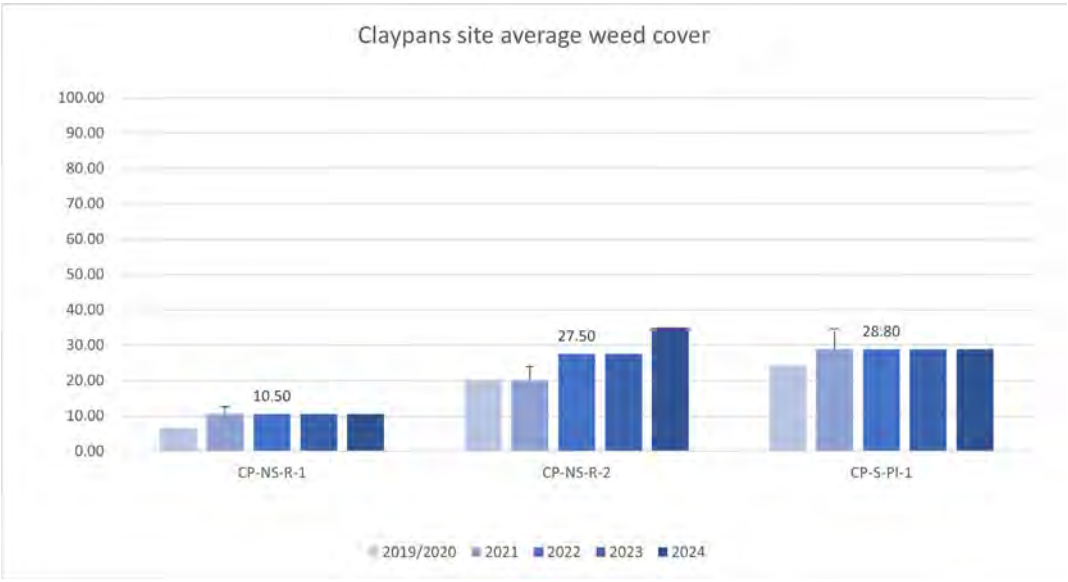


Figure 13. Change in average weed cover for claypans potential impact and reference sites.

Tuart woodlands

Project attributable indirect impacts and or reportable decline:

There are no project attributable indirect impacts with regards to weed cover at Tuart woodlands potential impact sites (**Figure 14**).

There was a slight increase, approximately 2%, in average weed cover for TW-S-PI-2. This is attributed to increases in weed cover at two out of the 19 site monitoring points TW-S-PI-2_P03 and TW-S-PI-2_P05. The increases in weed cover at all these sites are not regarded as being attributable to the project, and instead is attributable to weeds already within and directly adjacent to the monitoring points. Ongoing observations of the cleared area adjacent to TW-S-PI-2 show it to be relatively free of weeds and highly unlikely to be the cause of increase (**Figure 15**).

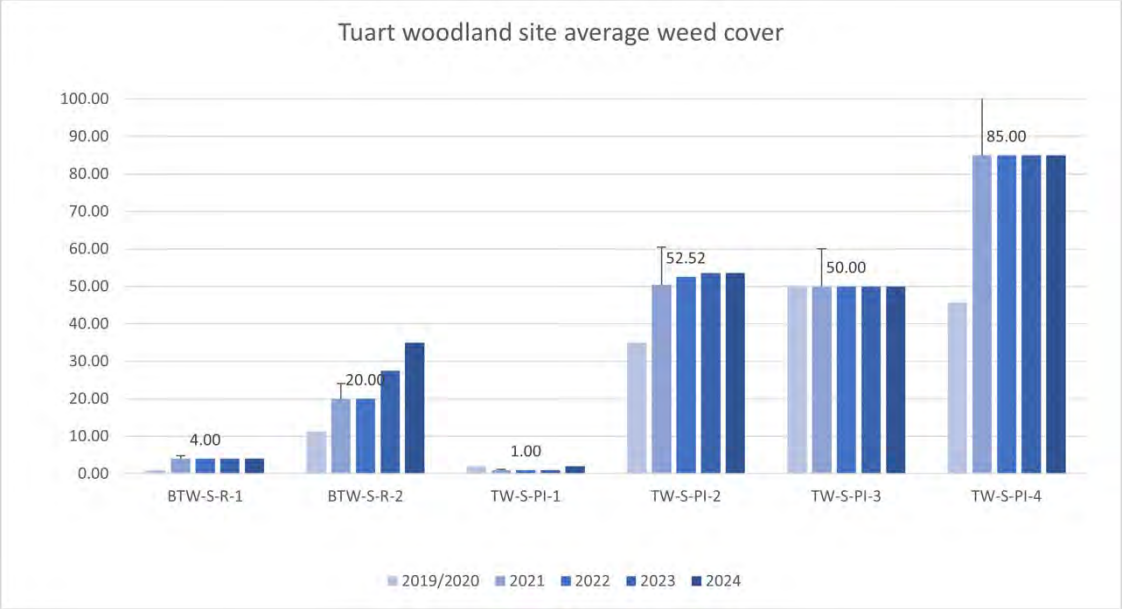


Figure 14. Change in average weed cover for Tuart woodland potential impact and reference sites.

Figure 15. Cleared areas adjacent to TW-S-PI-2 relatively free of weeds.

5.3.4 Native cover

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts or reportable declines with regards to native cover for any potential impact sites.

There was no change in the percentage cover of native plants between the 2019 and 2023 monitoring rounds for all monitored sites within the Banksia woodland, Claypan and Tuart woodland PEC/TEC occurrences and for all other monitored vegetation types (**Figure 16** and **Figure 17**).

The comparative data for native cover recorded at the boundary photopoints sites is presented in **Appendix 3**.

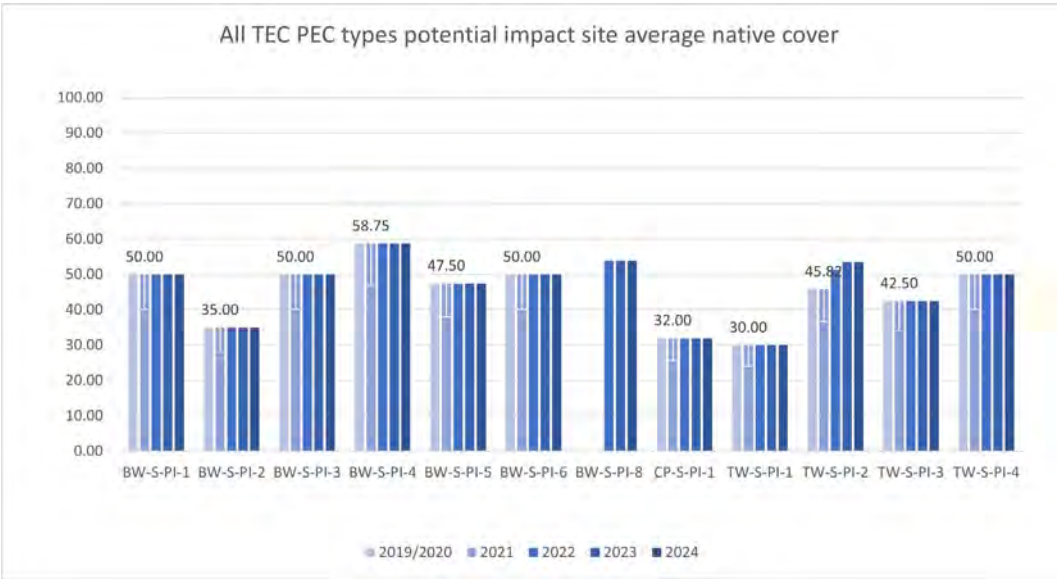


Figure 16. Average native cover of all potential impact sites.

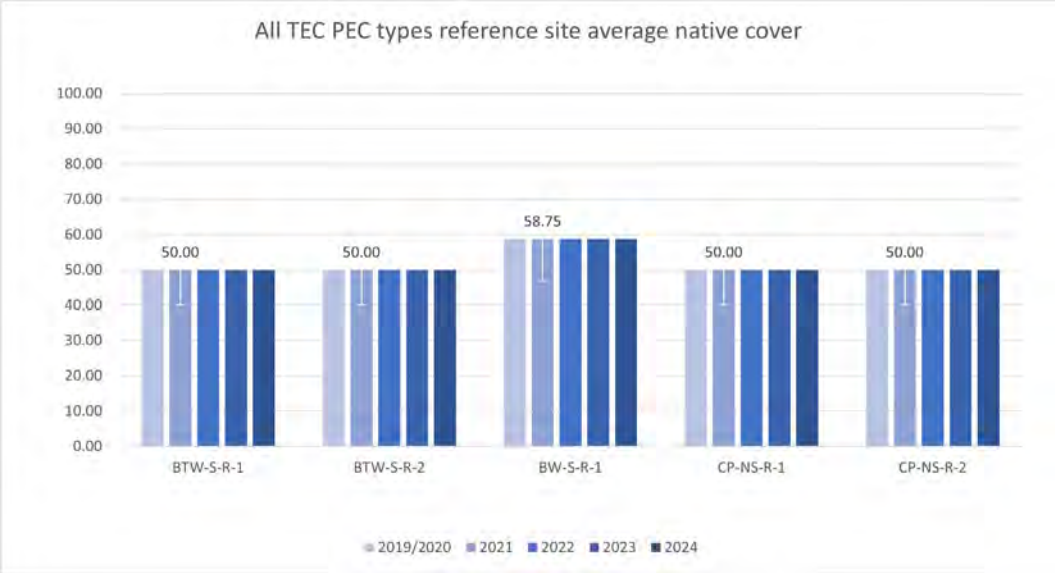


Figure 17. Average native cover of all reference sites.

5.3.5 Plant stress

The plant stress of the dominant trees/shrubs within a 20 m x 20 m area of all 88 boundary photopoints and 20 transect end points have been recorded since spring 2020. A comparison of the monitoring point data obtained since the project commenced in August 2022 and baseline data is summarised below. The full results showing the comparison of plant stress are provided in tables in **Appendix 3**.

Banksia Woodlands

Average stress increased at three potential impact Banksia / Banksia Tuart woodland sites (BW-S-PI-3, BW-S-PI-4 and BW-S-PI-8 and one reference sites (BW-S-R-1) relative to 2021/2022 baseline levels, however only one of these sites, BW-S-PI-8, recorded an average increase greater than 20%. Two sites remained stable (BTW-S-R-1, BW-S-PI-1) and one site increased in health from spring 2021 levels, BW-S-PI-5. These patterns in stress can be seen in **Figure 18**.

Further analysis was undertaken to investigate increases in stress at specific monitoring points where an increase was recorded within the Potential impact sites. This occurred at BW-S-PI-3, BW-S-P1-4 and BW-S-PI5. These increases were assessed individually to determine trends, scale of increase and the potential cause of increase, in particular whether they could be attributed to the BORR project.

The graphs of sites with stable and reduced stress are shown in **Appendix 6**.

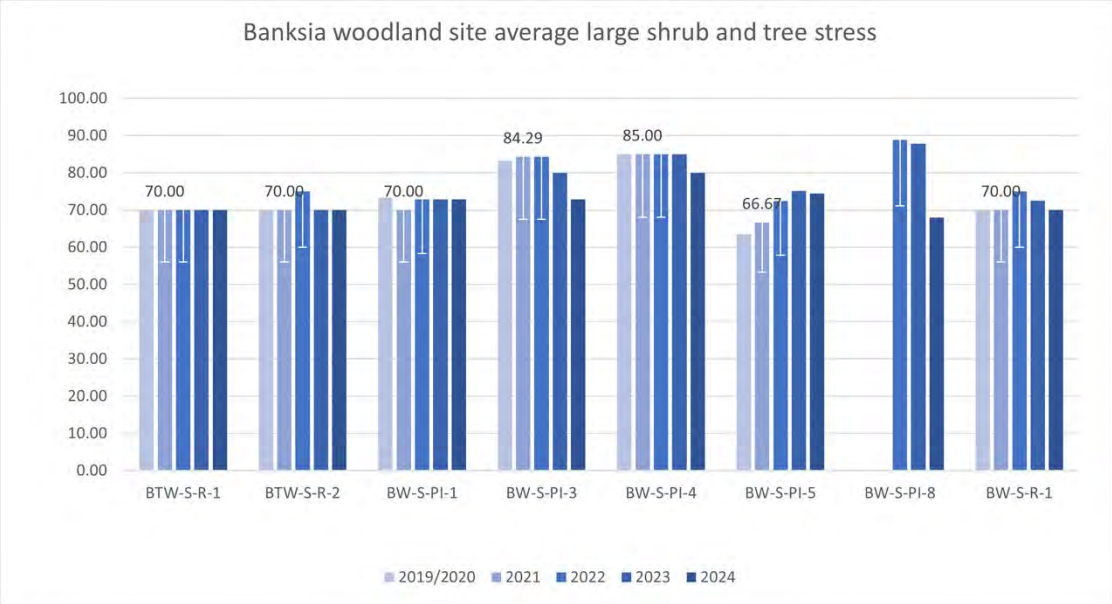


Figure 18. Change in average large shrub and tree stress for Banksia woodland potential impact and reference sites.

BW-S-PI-3

Stress levels were observed to increase in three of the seven sites P05, P06 and P07 whilst the other sites remained stable (**Figure 19**). The increase at P05 and P07 occurred in the 2023 / 2024 monitoring round whilst P06 occurred in the 2022/2023 monitoring period.

The increase at BW-S-PI-3_P06 is unlikely to be attributable to the project because no project activities had commenced in proximity to the site at time of recording in autumn 2023 and because this monitoring point is observed to be impacted by an old infestation of Phytophthora dieback which is the cause of stress at the site.

The increase in stress for both P05 and P07 is also unlikely to be attributable to the project because the increase in stress in spring 2023 at P05 and P07 in autumn 2024 are likely due to ongoing impacts of Phytophthora dieback observed prior to project activities. The impacts of the autumn drought were generally evident, but not uniform across the whole site and likely exacerbated the stress at P07. The most drought affected species across the site were *Banksia grandis* and Jarrah trees, mostly saplings.

Project attributable indirect impacts and or reportable decline:

There are no project attributable indirect impacts and therefore reportable declines associated with potential impact site BW-S-PI-3. The increases in stress at the three sites are attributable to ongoing impacts of Phytophthora dieback observed prior to project activities, which are likely to have been exacerbated by the autumn 2024 drought conditions, as discussed above.

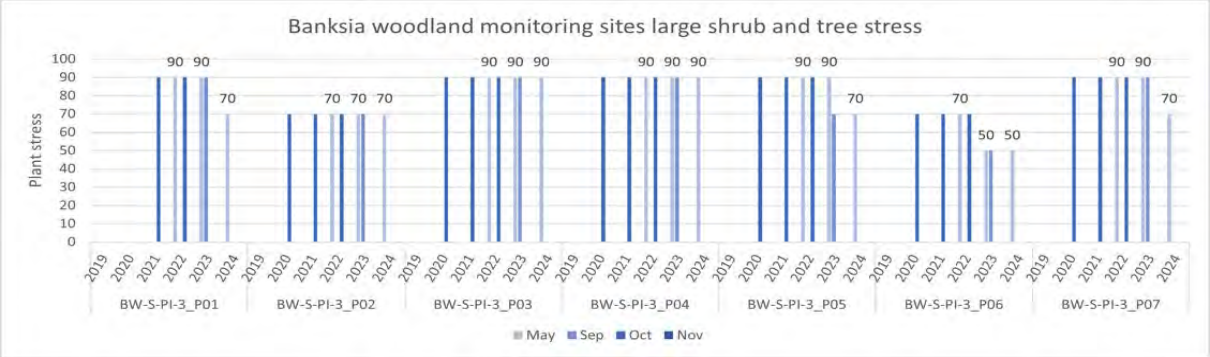


Figure 19. Change in average large shrub and tree stress for Banksia woodland potential impact site BW-S-PI-3.

BW-S-PI-4

The stress levels increased at one of the four monitoring points for this site, BW-S-PI-4_P01 in autumn 2024 (**Figure 20**). The increase in stress at this site is unlikely due to BORR project activities located approximately 50 m from the monitoring point, and likely due to the steady impacts of Marri canker, caused by the native fungal pathogen *Quambalaria coyrecup,* in the *Corymbia calophylla* recorded at the site. These impacts were recorded prior to the start of BORR activities near the site and the record autumn drought conditions of 2024.

The impact of drought was evident across the site with but was not uniform. The impacts were scattered with some species being more affected than others including young jarrah trees and *Xylomelum occidentale* and interestingly the weed species *Acacia longifolia* (**Figure 21**).

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts and therefore reportable declines associated with potential impact site BW-S-PI-4. The increases in stress at one site in autumn 2024 are attributable to ongoing stress factors recorded at site prior to start of BORR works, as discussed above.

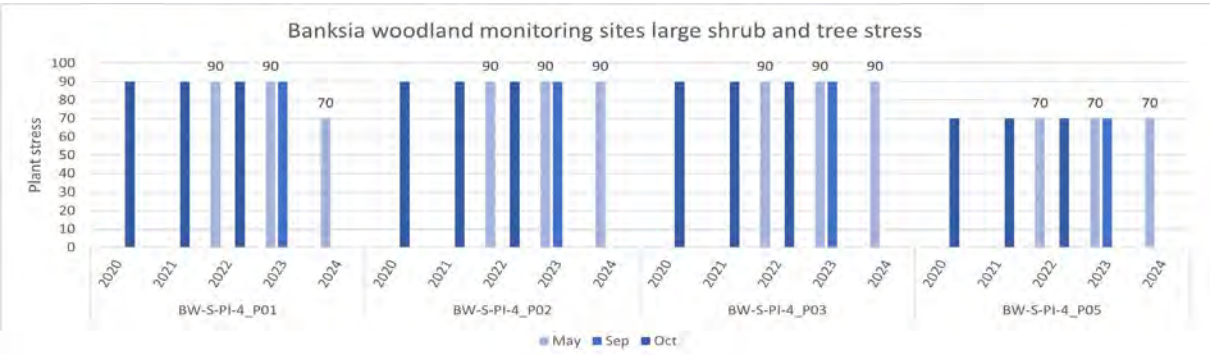


Figure 20. Change in average large shrub and tree stress for Banksia woodland potential impact site BW-S-PI-4.

Figure 21. Dead Acacia longifolia trees within BW-S-PI-4.

BW-S-PI-5

BW-S-PI-5 has 36 monitoring points. Stress levels in trees and large shrubs have remained stable at 16 sites, reduced at 18 sites and increased at only two sites (BW-S-PI-5_P04 and P34) since monitoring commenced in 2019. The reduction in stress and overall stability at the site is attributed recuperation of stressed trees and large shrubs with persistent average rains which followed the drier and warmer than average 2019 monitoring period (**Figure 22**).

Figure 22. Change in average large shrub and tree stress for Banksia woodland potential impact site BW-S-PI-5.

Similar to other sites such as BW-S-PI-3 the impacts of the record summer / autumn 2024 drought were evident but scattered or patchy and largely limited to certain species – such as *Banksia grandis, Banksia attenuata, Eucalyptus marginata* (mostly saplings) and the small shrub *Hibbertia hypericoides* (**Figure 23**). **Figure 24** and **Figure 25** show the variable pattern of stress in the vegetation with some areas such as **Figure 24** directly adjacent recent clearing along Bussell Highway appearing unstressed and other such as **Figure 25** in the bush near monitoring point BW-S-PI-5_P025 being stressed.

The scattered nature of impacts meant that only one site, BW-S-PI-5_34, of the 36 sites recorded increase stress in the 2024 autumn monitoring round. Ironically, the health of the canopy (mostly Marri) at this site actually steadily decreased in stress from a 41 – 60% canopy in 2021 to a > 80% canopy in 2022, but declined in health in the autumn to 61 – 80%. This stress pattern was very similar to that at reference site BW-S-R-1_T2S.

The increases in stress at the two monitoring points (BW-S-PI-5_P04 and P34) site is unlikely to be attributed to BORR related activities and attributed to local factors, such as variable soil moisture and potentially exacerbated by drought conditions.

Interestingly most of the significant stress impacts in jarrah trees appeared to be due to impacts from wood borer and predation of the wood borer by forest red tail and white tail black cockatoos (**Figure 26**). Other tree species *Corymbia calophylla* and *Eucalyptus gomphocephala* were also impacted by wood borer and cockatoos, but to a lesser extent.

Project attributable indirect impacts and or reportable decline: There are no project attributable indirect impacts and therefore reportable declines associated with potential impact site BW-S-PI-5. The two increases in stress at the site in autumn 2024 are attributable local factors and to the record drought (BOM 2024), as discussed above.

Figure 23. Drought affected *Hibbertia hypericoides* located near BW-S-PI-5_P23.

Figure 24. Healthy unstressed vegetation adjacent to the cleared edge along Bussell Highway east of BW-S-PI-5_P014.

Figure 25. Scattered dead *Banksia grandis* and *Banksia attenuata* saplings near BW-S-PI-5_P025.

Figure 26. Highly stressed Jarrah sapling tunnelled out by Jarrah wood borer which has been predated by forest red-tail-cockatoos.

BW-S-PI-8

Widespread effects of the severe autumn 2024 drought were evident across most of the site with stress and death evident in much of the canopy with *Agonis flexuosa* and *Banksia attenuata* most affected. This was reflected in increased stress levels increased at seven of the eight monitoring points in the 2024 autumn monitoring round (**Figure 27**). This is the most drought affected monitoring site in the BORR Southern Referral area (**Figure 28**).

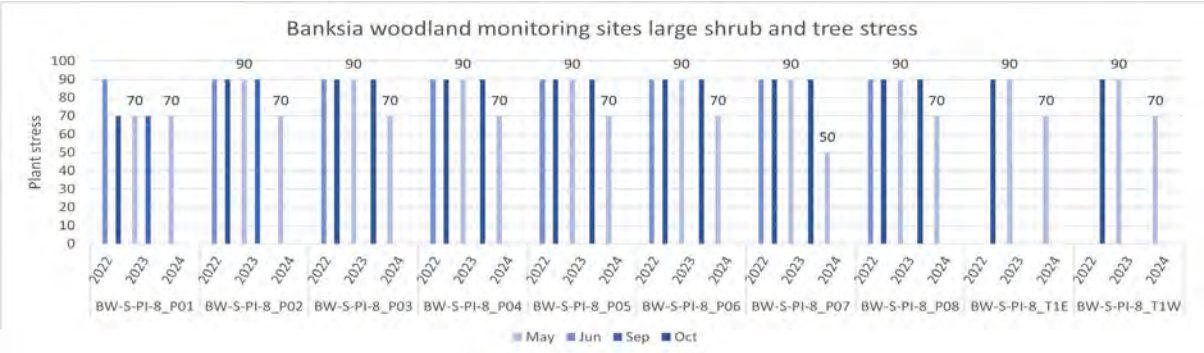


Figure 27. Large shrub and tree stress at BW-S-PI-8.

Figure 28. Stressed and dead *Agonis flexuosa* and *Banksia attenuata* near BW-S-PI-8_P06 and P07.

It is possible that the increased manifestation of drought impacts at this site relative to others which remained relative stable could be linked to topography and aspect, being north facing and near the top of the landscape (**Figure 29**). The means the site would drain faster and earlier in the season than lower flatter sites such as BW-S-PI-5, BW-S-PI-3, BW-S-PI4 which generally experienced lower levels of manifested stress, and therefore have less moisture available for plant growth. The only other site with a similar scale of impacts was the Tuart woodland potential impact site TW-S-PI-2 which also has relatively similar topography (**Figure 30**).

Although BW-S-PI-8 monitoring site is adjacent to batters constructed for the BORR, it is difficult to draw a link between the observations at this site and the BORR project. This is because of the patchiness of manifested stress with a mix of stressed and unstressed vegetation across the monitoring area, including vegetation immediately adjacent to the batters which was relatively unstressed compared to vegetation further from the batters (**Figure 31** and **Figure 32**). Potential impacts due to the batters are also likely to have been observed in previous monitoring rounds, including drainage monitoring rounds (**section 5.4)**.

Noting however that previous monitoring rounds had identified potential project related stress at monitoring point BW-S-PI-8_P01 which could be attributed to the project because this point is in the closest proximity to the boundary of the cleared area. Stress increased at this site while all the other points remained stable at a 5 rating. The plant stress for this point relate to reductions in the health of large marri and jarrah trees present at the site. The stress was first observed during the spring 2022 monitoring period soon after the commencement of the project. The 2023 report considered it unlikely that the increase in stress was project attributed because increases in stress independent of the clearing activities were commonly observed in Jarrah and Marri trees in intact vegetation such as that evidenced at transect BW-S-R_T1E and at the drainage monitoring points BW-S-PI-3_D1 (w20), BW-S-PI-5_D1 (w20) and BW-S-R-1_D1(w20) refer to **Table 15.** No further increases in stress were observed at this point in the 2024 monitoring round.

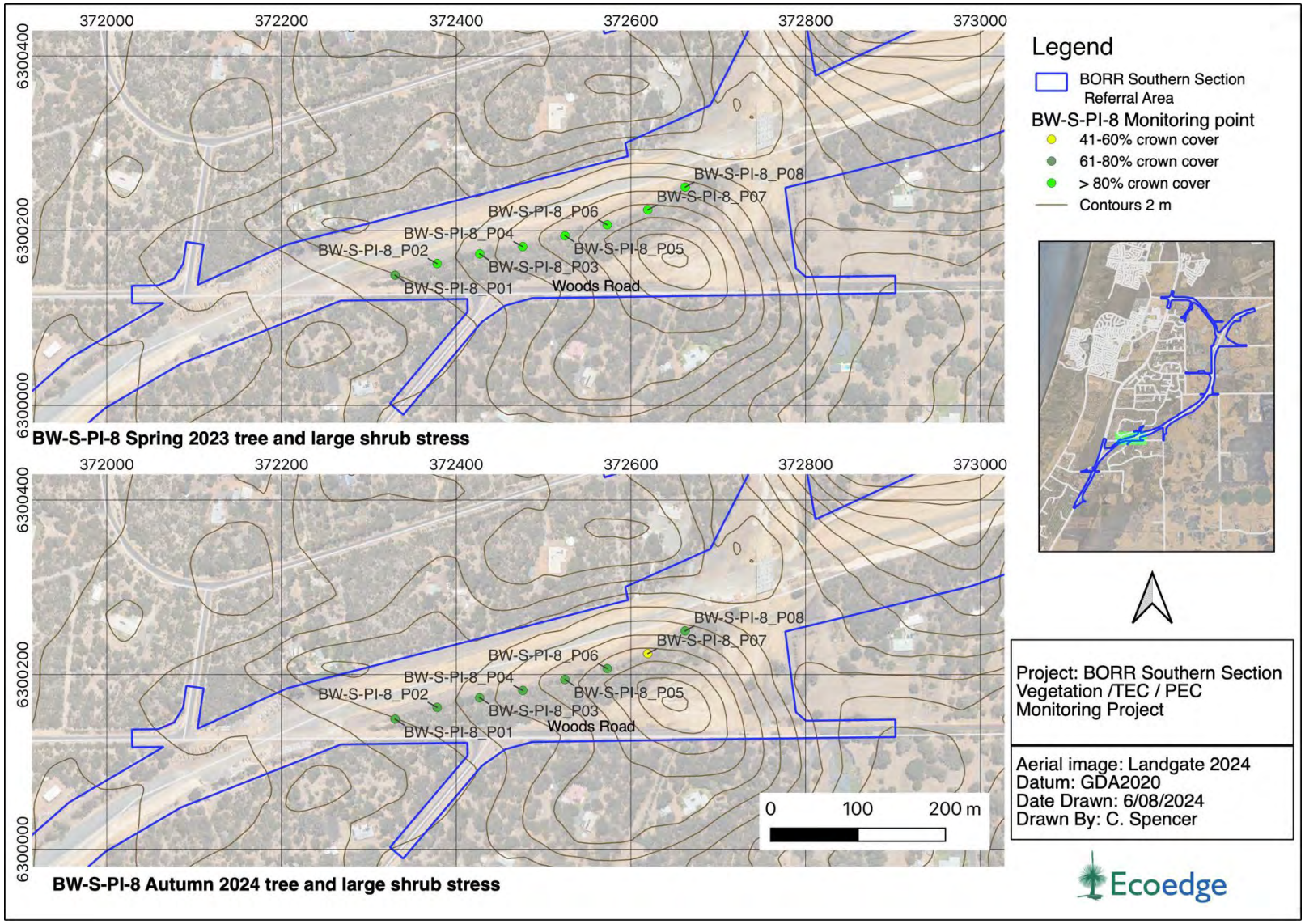


Figure 29. Location of stress affected monitoring points at BW-S-PI-8 near the top of the local landscape.

Figure 30. BW-S-PI-8 adjacent to cutting near BW-S-PI-8_P01.

Figure 31. BW-S-PI-8 adjacent to cutting near BW-S-PI-8_P06.

BW-S-R-1

Stress levels have fluctuated at the two transect based reference monitoring points BW-S-R-1_T1 and BW-S-R-1_T2 within this site (**Figure 33**). The decline and generally lower health at BW-S-R-1_T1 is attributed to the ongoing impacts of Phytophthora dieback. Whereas the variation in stress at BW-S-R-1_T2 appear related more to variations in seasonal rainfall rather than Phytophthora. This site occurs on relatively alkaline Spearwood soils which can retard or limit the impacts of the pathogen.

BW-S-R-1_T2 is likely to behave similarly to other Banksia woodland sites on Spearwood soils such as BW-S-PI-4, BW-S-PI-5 and BW-S-PI-8.

BW-S-R-1_T1 is likely to behave similarly to other Banksia woodland sites on Bassendean soils such as BW-S-PI-1 and BW-S-PI-3.

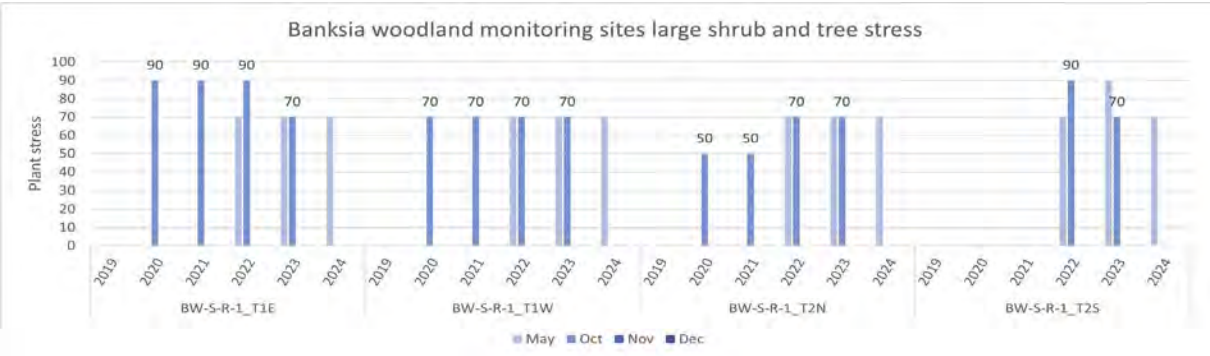


Figure 32. Large shrub and tree stress at BW-S-R-1.

Tuart woodland

Average stress increased at two of the three Tuart woodland potential impact sites, (TW-S-PI-2 and TW-S-PI-3) relative to baseline levels, with largest increase in stress occurring at TW-S-PI-2. However, none of the average site increases was above 20%. The other potential impact site TW-S-PI-4 and the two reference sites BTW-S-R-1 and BTW-S-R-2 remained stable. The averaged stress for each site is shown in **Figure 34**. Further analysis was undertaken to investigate increases in stress at specific monitoring points where an increase in stress was recorded within the Potential impact sites. This occurred at TW-S-P1-2 and TW-S-PI-3.
The graphs of sites with stable and reduced stress are shown in **Appendix 6.**

Figure 33. Change in average large shrub and tree stress for Tuart woodland potential impact and reference sites.

<u>TW-S-PI-2</u>

Increases at stress levels have been recorded at 13 of the 22 monitoring points since construction commenced in August 2022 (**Figure 35**). Twelve of these were recorded during the autumn 2024 monitoring period corresponding with the record drought (BOM 2024) and soil dryness (BOM 2024) levels **Figure 6** and **Figure 7, Section 5.1**. This is one of the most stress affected monitoring sites, with only BW-S-PI-8 being more stressed.

Similar to BW-S-PI-8, it is possible that the increased manifestation of drought impacts at this site relative to others which remained relative stable could be linked to its steeper topography location near the top of the landscape (**Figure 36)**, BW-S-PI-8 (**Figure 29**). The means the site would drain faster and earlier in the season than lower flatter sites such as BW-S-PI-5, BW-S-PI-3, BW-S-PI4 which generally experienced lower levels of manifested stress, and therefore have less moisture available for plant growth.

As for BW-S-PI-8, although this site is located adjacent to batters associated with road construction, **Figure 36** and **Figure 38**, it is unclear if these have had an influence given the vegetation immediately adjacent to the batters is generally similar to that observed hundreds of metres from the site, with a mix of stressed and unstressed vegetation (**Figure 39**). If the batters did influence vegetation stress, it is expected that impacts from the batters would be experienced more substantially adjacent to it and then taper off with distance. This was not generally the case.

The impacts of the drought were evident across the whole site, however similar to the other drought affected the sites the impacts were not uniform, but patchy and scattered across the site and some species were more affected than others. This patchiness is shown in the panoramic photograph which is taken from the west and looking east into the monitoring site **Figure 37**. This photograph shows the impact occurs far beyond the 50 m monitoring buffer. The most affected species were the canopy species including *Agonis flexuosa, Banksia attenuata*, *Banksia grandis*, *Xylomelum occidentale* and *Eucalyptus marginata.* Most of the understorey, including the priority 3 listed *Lasiopetalum membranaceum* whilst stressed appeared ok, the exception being the common small shrub *Hibbertia hypericoides*, and to a lesser extent *Styphelia propinqua* which were very stressed in some patches. This species-specific stress appeared common across most of the Banksia and Tuart woodland sites.

Project attributable indirect impacts and or reportable decline:

There are no project attributable indirect impacts and therefore no reportable declines associated with potential impact site TW-S-PI-2. The significant increases in stress at the site in autumn 2024 are all attributable to the record drought (BOM 2024a and BOM 2024b), as discussed above.

Figure 34. Change in average large shrub and tree stress for Tuart woodland potential impact and reference sites.

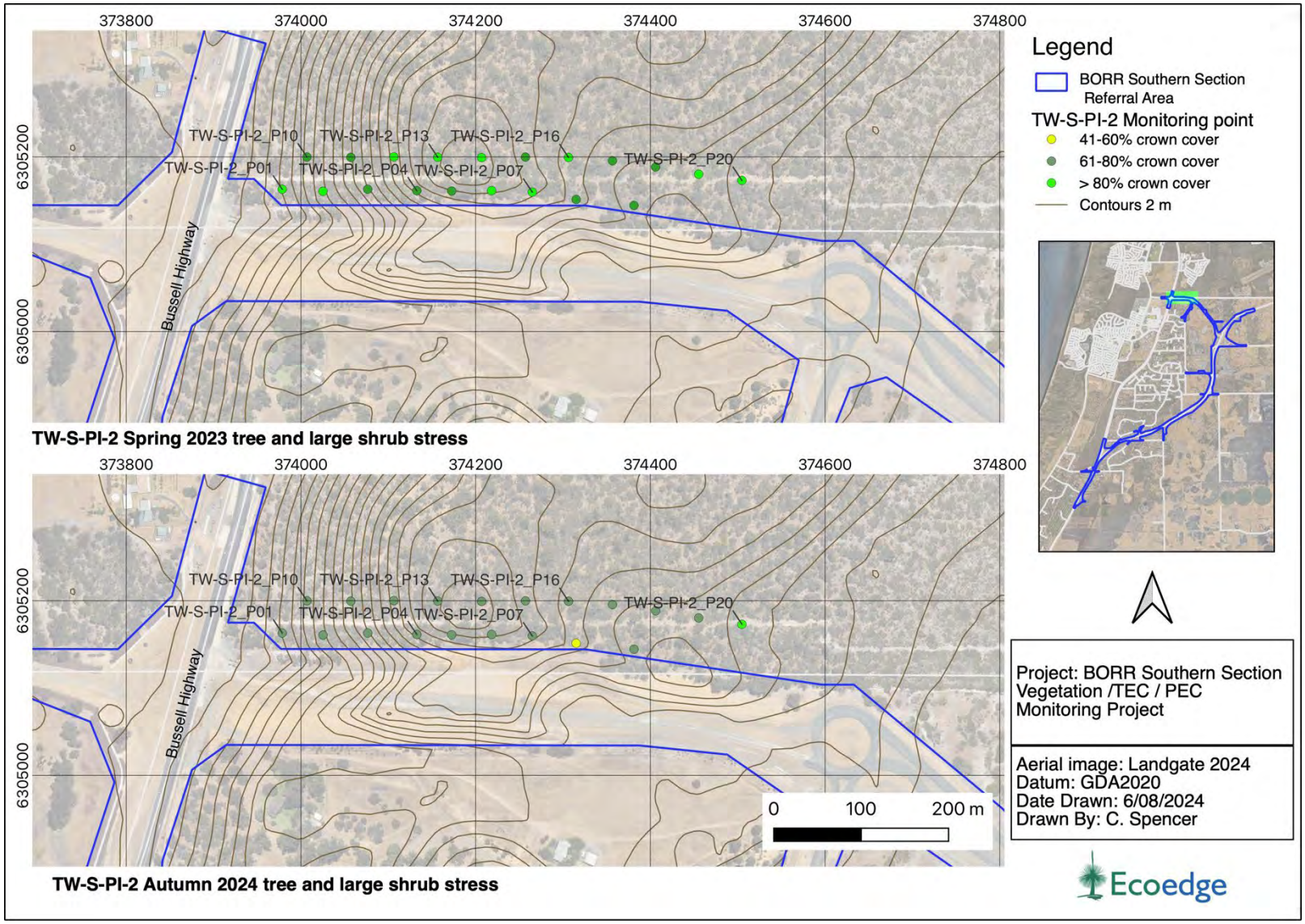


Figure 35. Location of stress affected monitoring points at TW-S-PI-2 near the top of the local landscape.

Figure 36. Panoramic view looking east towards TW-S-PI-2 showing patchy, stressed vegetation extending north well beyond the TW-S-PI-2 monitoring area.

Figure 37. Location of steep cutting adjacent to TW-S-PI-2_P07 and

Figure 38. Relatively healthy vegetation adjacent TW-S-PI-2_P06.

TW-S-PI-3

Stress levels in the trees and large shrubs have remained relatively stable since monitoring commenced in 2019 with only one recorded increase in stress at TW-S-PI-3_ P02 in the Autumn 2024 monitoring round (**Figure 40**). This was due to observed stress in *Agonis flexuosa* and the medium shrub *Jacksonia furcellata* which was attributed to severe autumn drought impacts and not due to BORR related work. BORR project works are close to this site at TW-S-PI-3_ P01, but this site remained relatively unstressed (**Figure 41**).

Project attributable indirect impacts and or reportable decline:

There are no project attributable indirect impacts and therefore reportable declines associated with potential impact site TW-S-PI-3, as discussed above.

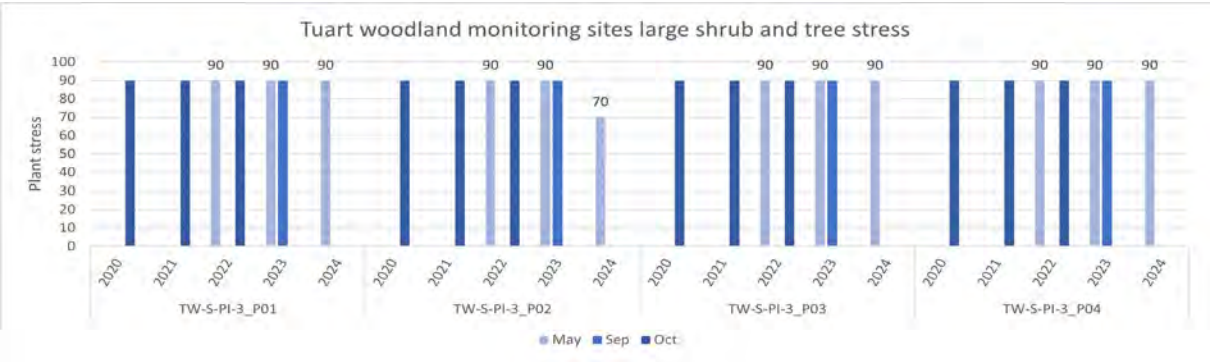


Figure 39. Change in average large shrub and tree stress for Tuart woodland potential impact site TW-S-PI-3.

Figure 40. Vegetation adjacent TW-S-PI-3_P01.

5.3.6 Tuart woodland sites with stable vegetation

Claypans

Average tree and shrub stress at monitored claypan sites has only decreased at one of the reference sites, CP-NS-R-1 since monitoring commenced in 2019. This occurred in autumn 2024. The stress levels at the other reference site CP-NS-R-1_T2 and the potential impact site CP-S-PI-1 have remained stable (**Figure 42)**. **Figure 43** to **Figure 45** show the trends in tree and shrub stress for all monitored claypan sites.

<u>Project attributable indirect impacts and or reportable decline:</u>

There are therefore no project attributable indirect impacts with regards to plant stress for the potential impact claypan site CP-S-PI-1 because there was no increase in plant stress recorded for this site relative to baseline levels.

These sites are lower in the landscape with soils with a high clay fraction. The canopy which mostly comprises medium sized shrubs dominated by *Melaleuca viminea* appeared resilient to the autumn drought stresses and the lower storey is dominated by annual herbs which are mostly naturally dormant during summer and autumn.

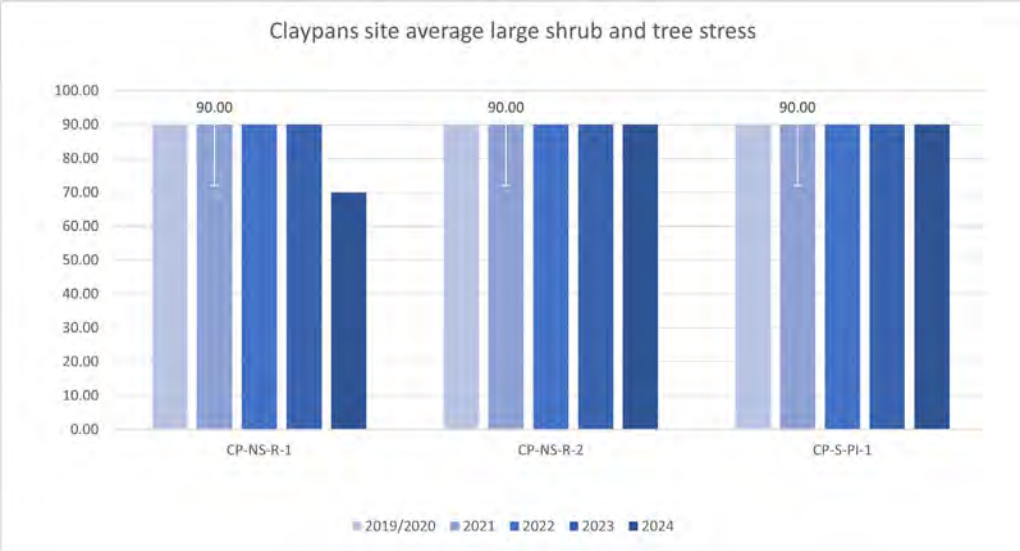


Figure 41. Change in average large shrub and tree stress for claypan potential impact and reference sites.

Figure 42. Change in average large shrub and tree stress for Tuart woodland potential impact site CP-NS-R-1.

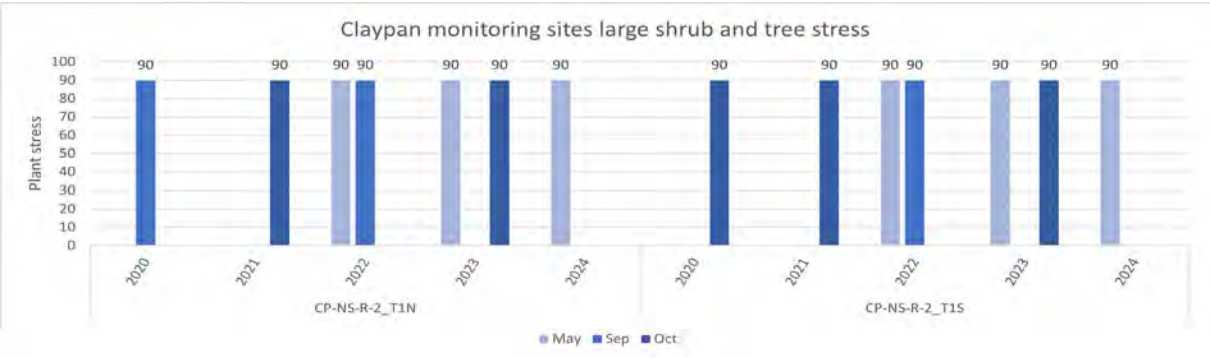


Figure 43. Change in average large shrub and tree stress for Tuart woodland potential impact site CP-NS-R-2.

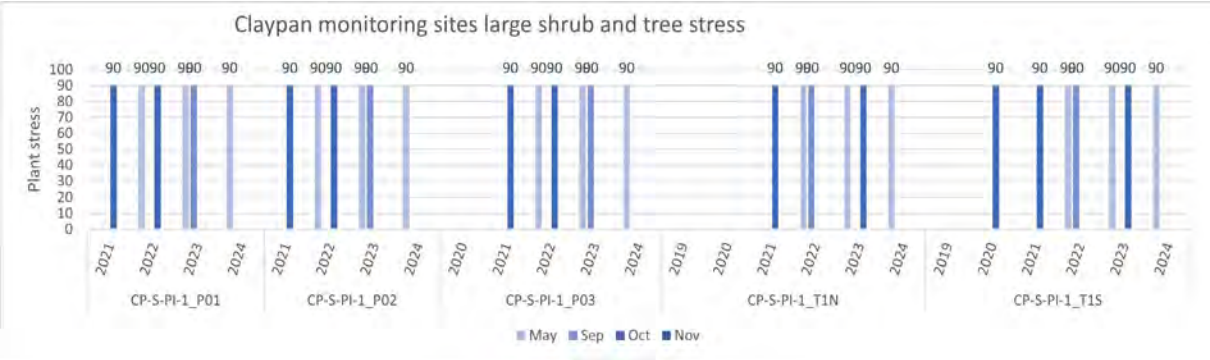


Figure 44. Change in average large shrub and tree stress for Tuart woodland potential impact site CP-S-PI-1.

5.4 Drainage Monitoring

Quarterly drainage monitoring targeted erosion, flooding and drying effects associated with attributable indirect impacts and compared the results to the baseline preconstruction conditions for Banksia Woodland, Tuart Woodland and Claypan TEC PEC.

Drainage monitoring is conducted four times a year, once in each season. The results of these monitoring rounds are summarised since the baseline monitoring commenced until autumn 2024 (**Table 17).**

5.4.1 Inundation effects on TEC PEC

Project attributable indirect impacts and or reportable decline:

There was no TEC PEC vegetation abnormally inundated or flooded for 24 hours as a result of the project activities. There was no project attributable indirect flooding or inundation impacts, when compared to preconstruction baseline conditions to the Banksia woodland, Tuart woodland or Claypan TEC PEC.

5.4.2 Erosion effects on TEC PEC

Project attributable indirect impacts and or reportable decline:

At the time of this report no new erosion has been recorded within the TEC PEC vegetation. There were no project attributable indirect erosion impacts or reportable declines in regard to erosion effects when compared to preconstruction baseline conditions for the Banksia woodland, Tuart woodland or Claypan TEC PEC.Inundation effects on TEC PEC

5.4.3 Drying effects on TEC PEC

Five of the nine potential impact sites have recorded drying effects since August 2022 when the BORR project commenced. Three of these occurred in Banksia woodland potential impact sites (BW-S-PI-1, BS-S-PI-4 and BW-S-PI-8) and two occurred in Tuart woodland potential impact sites (TW-S-PI-2 and TW-S-PI-3). The effects were also observed in two reference sites, both Banksia Tuart woodland sites (BTW-S-R-1 and BTW-S-R-2). No potential impact or reference claypan sites showed signs of stress due to drying effects. A summary of the sites is provided in **Table 17**.

Within the Banksia woodlands the species most affected were *Banksia grandis, Banksia attenuata, Eucalyptus marginata* and *Agonis flexuosa.* In the Tuart woodlands *A. flexuosa* and *E. marginata* showed signs of drying effects and there was localised drying of low shrubs such as *Hibbertia hypericoides, Orthrosanthus laxus* and *Styphelia propinqua* (**Table 18** and **Figure 46**). Some of the dead and very stressed trees, mostly Jarrah, have been impacted by wood borer and predation of the wood borer by black white-tail and forest red-tail cockatoos stripping the bark. Some images of this are provided in **Figure 47**.

The drying impacts were observed to be patchy and irregularly distributed across the monitored communities. The two most affected monitoring sites were BW-S-PI-8 (with about 30-70% of the site affected) and TW-S-PI-2 (10-30% of the site affected). The other monitored sites were about 2-10 % affected. The increase impact relative to the other sites is suggested

to be related to the elevated position and steeper slopes of these sites, as discussed in **Section 5.3.5**.

Project attributable indirect impacts and or reportable decline:

Most of these observed drying effects were recorded in the driest autumn on record, autumn 2024 (BOM 2024b and 2024c). So, whilst the observed impacts of drying were significant and 'abnormal' they are most logically attributed to the effects of the record dry summer and autumn of 2024 and not to the BORR. These abnormal drying effects were recorded at reference sites as well as potential impact sites and extended well beyond what may be regarded as a reasonable potential impact area that could be associated with the BORR project. Opportunistic observations of drying effects in Banksia and Tuart woodlands have been noticed from Perth to Busselton and east to Donnybrook, reflecting the distribution of mapped record deficiencies in rainfall and soil moisture for these areas (BOM 2024b and BOM 2024c). These abnormal drying impacts all coincided with this phenomenon and were not experienced in any of the prior monitoring rounds.

The drying affects observed within the three Banksia woodland and two Tuart woodland potential impact sites are attributed to the record deficiencies in rainfall and soil moisture experienced across parts of the southwest of WA, including the Bunbury region (BOM 2024b and BOM 2024c).

The potential that the BORR project has exacerbated the impacts of the drought was reviewed, however, the irregular pattern of observed drying impacts due to the due to the driest summer autumn period on record, make any potential positive link attributing exacerbating drying effects due to the Project very challenging. The absence of any pattern of negative drying effects post construction and prior to autumn 2024 indicate that any impacts from BORR, if present, have not been significant.

Table 17. Summary of drainage monitoring sites and points for the Southern Project Area.

Number	Site Name	Drainage site _Effect (season year)	Issues in previous rounds	2022 Autumn	2022 Winter	2022 Spring	2023 Summer	2023 Autumn	Winter 2023	Spring 2023	Summer 2024	Autumn 2024
Date					26/05/2022	19/10/2022	17/02/2023	26/05/2023	24/08/2023	7/11/2023	16/02/2024	25/05/2024
Potential impact sites												
1	BW-S-PI-1	-	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues	Drying effects
2	BW-S-PI-3	BW-S-PI-3_D1 (w20)	Thinning of canopies in Marri	No issue canopy normal	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues
3	BW-S-PI-4	BW-S-PI-4_D1 (w20)	Yellowing of leaves	No issue	No issues	New growth after winter rain	No issues	No issues	No issues	No issues	No issues	Drying effects
4	BW-S-PI-5	BW-S-PI-5_D1 (w20)	*Eucalyptus marginata, Eucalyptus gomphocephala*	Drying effects on marri and jarrah	No issue in winter	Less stressed after rain	No issues	No issues	No issues	No issues	No issues	No issues
5	BW-S-PI-8	-	-	-	-	New site	No issue	No issues	No issues	No issues	No issues	Drying effects
6	CP-S-PI-1	-	No issue	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues
7	TW-S-PI-2	TW_S-PI-2_D1 (w20)	Tuart thinning canopy	New tip growth. Looking healthier	No issues	No issues	No issues	No issues	No issues	No issues	No issues	Drying effects
8	TW-S-PI-3	-	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues	Drying effects
9	TW-S-PI-4	-	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues

Reference sites												
1	BW-S-R-1	BW-S-R-1_D1 (w20)	Drought-affected site, thinning canopies in Jarrah and Banksia attenuata	No issues	No issues	Recovered after winter - no issues	No issues	No issues	No issues	No issues	No issues	No issues
2	BTW-S-R-1	BTW-S-R-1_D1 (a24)	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues	Drying effects
3	BTW-S-R-2	BTW-S-R-2_D1 (a24)	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues	Drying effects
4	CP-NS-R-1	CP-NS-R-1_D1(w20)	Evidence of yellowing of *X.p* Leaves across site - unknown cause - water table is high at site	No issue - autumn 2022, all leaves of *X.p* green.	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues
5	CP-NS-R-2	-	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues	No issues

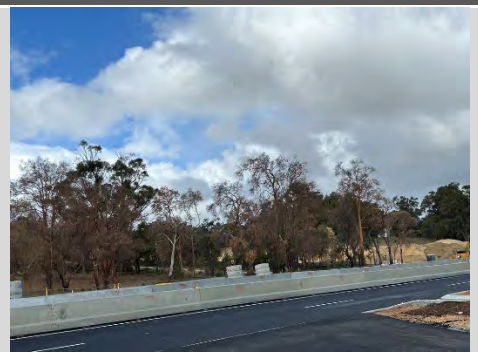
An example of site report 2024 autumn (drying issues) is provided in **Appendix 7,** (TW-S-PI-2).

Table 18. Sites that have drying effects as of autumn 2024.

#	Site	Site name	Affected species	General comments	latitude	longitude	Estimated level of impact.	Photo
	Potential impact sites							
1	BW-S-PI-1	BW-S-PI-1_D1 (a24)	*Banksia grandis, Banksia attenuata*	Regularly scattered *Banksia* death, approximately 50% dead of banksia species only	-33.38588156	115.6516445	2-10%	
3	BW-S-PI-4	BW-S-PI-4_D1(w20)	*Eucalyptus marginata*	Wood borer and Bark stripping by cockatoos affecting some *E. marginata*	-33.42666702	115.639844	2-10%	
4	BW-S-PI-8	BW-S-PI-8	*Agonis flexuosa*	Stressed *A. flexuosa*	-33.4300577	115.629749	30-70%	

#	Site	Site name	Affected species	General comments	latitude	longitude	Estimated level of impact.	Photo
								
5	BW-S-PI-8	BW-S-PI-8_D1 (su22)	*Agonis flexuosa*	Stressed A. flexuosa	-33.43058108	115.6277186	30-70%	

#	Site	Site name	Affected species	General comments	latitude	longitude	Estimated level of impact.	Photo
7	TW-S-PI-2	TW-S-PI-2_D1 (su 22)	Shrubs	Localise drying low shrubs – *Hibbertia hypericoides, Orthrosanthus laxus* and *Styphelia propinqua*	-33.38544358	115.6461724	10-30%	
	TW-S-PI-2	TW-S-PI-2_D1 (a24)	*Agonis flexuosa*	Patches of dead *A. flexuosa.* Tuart alive	-33.38515578	115.6469832	10-30%	

#	Site	Site name	Affected species	General comments	latitude	longitude	Estimated level of impact.	Photo
	TW-S-PI-2	TW-S-PI-2_D1 (a24)	*Eucalyptus marginata*	Cockatoo damage to *E. marginata*	-33.3847155	115.6447531	10-30%	
	Reference sties							
11	BTW-S-R-1	BTW-S-R-1_D1 (a24)	*Banksia attenuata*	Understory shrubs showing signs of drought stress	-33.38218656	115.6519813	2-10%	

#	Site	Site name	Affected species	General comments	latitude	longitude	Estimated level of impact.	Photo
12	BTW-S-R-2	BTW-S-R-2_D1 (w20)	*Agonis flexuosa*		-33.38482406	115.628727	2-10%	

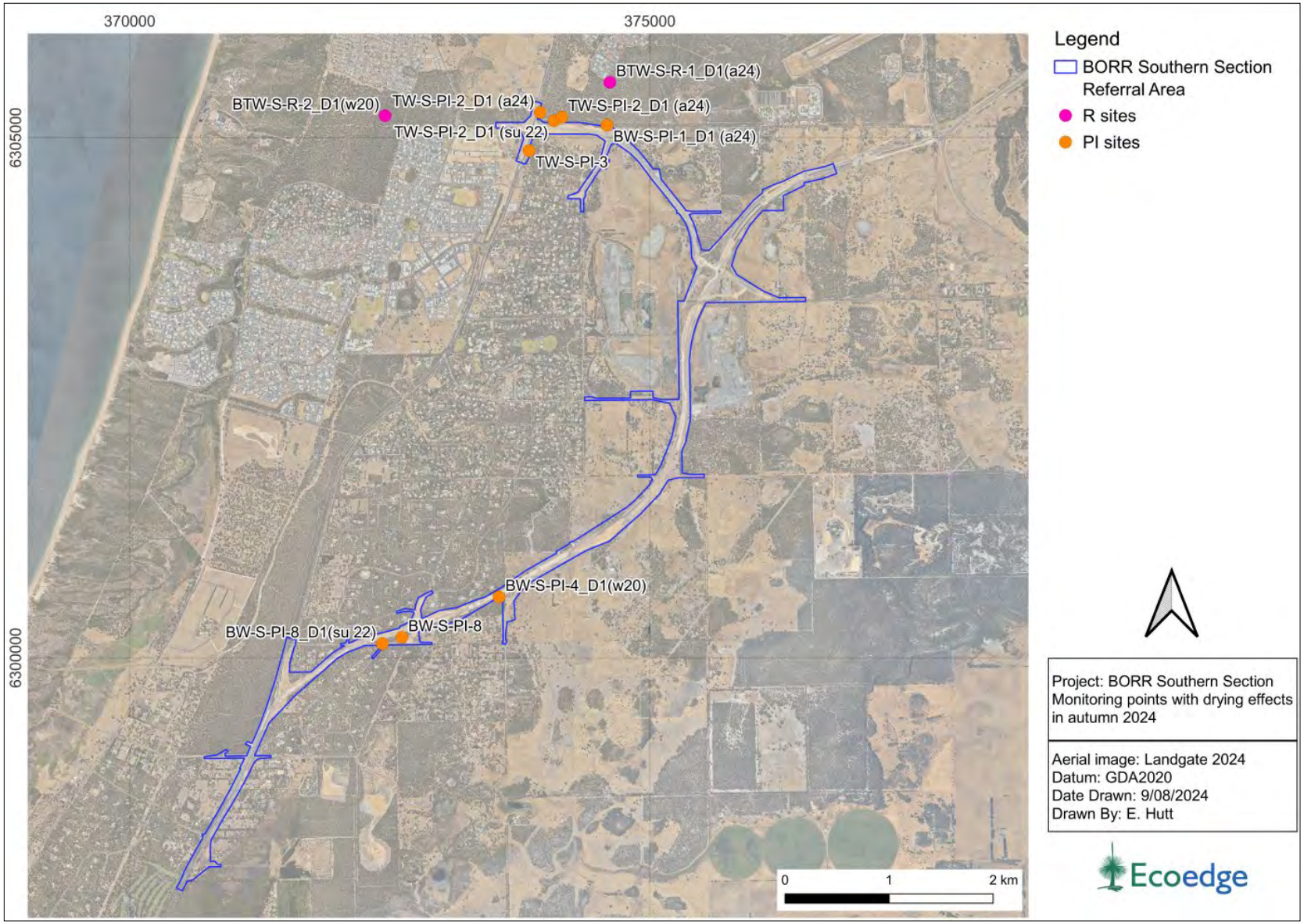


Figure 45. Monitoring points that have shown drying effects in autumn 2024.

Figure 46. Photos of stressed *E. marginata* trees at TW-S-PI-2 due to wood borer and native cockatoos.

5.5 Phytophthora Dieback

Phytophthora cinnamomi is a microscopic, soil borne plant pathogen which impacts about 40% of native vegetation in the Southwest of WA. Impacts on vegetation from *Phytophthora cinnamomi,* referred to as Phytophthora dieback, may appear similar in appearance to impacts of drying but Phytophthora dieback can usually be distinguished from drying and other plant stressors by its rapid impact on Phytophthora sensitive plants, normally occurring at the end of the summer and dry period.

Impact from Phytophthora dieback was assessed as part of standard vegetation monitoring undertaken at all monitoring locations with four scales of impact being recorded:

1. Low impact: 1-2 plants
2. Medium impact: active front visible, some death
3. Heavy impact: active front visible, lots of death
4. Old impact site: vegetation structure altered.

Ten monitoring points were recorded with Phytophthora dieback during the baseline monitoring period. These impacts were mostly recorded in Banksia Woodland, with relatively little observed impact within the Banksia/Tuart Woodland and no evidence recorded in the Claypan sites. This is not unusual as the Banksia/Tuart Woodland, which typically occurs on more alkaline soils which is not favoured by *Phytophthora cinnamomi*.

There was no change in the number of photo points recorded to have symptoms of Phytophthora dieback relative to baseline monitoring levels. A breakdown of impacts from Phytophthora dieback at each monitoring site is provided in **Table 19.**

Table 19. Breakdown of observed impacts of Phytophthora dieback per monitoring sites relative to Autumn 22 baseline levels.

Site	Aut 22 Low	Aut 24 Low	Aut 22 Medium	Aut 24 Medium	Aut 22 Heavy	Aut 24 Heavy	Aut 22 Old*	Aut 24 Old*	Aut 22 Site total	Aut 24 Site total	Total Photopoints
Potential impact sites											
BW-S-PI-1									0	0	5
BW-S-PI-3							4	4	4	4	7
BW-S-PI-4	1	1							1	1	4
BW-S-PI-5	1	1	2	2					3	3	34
BW-S-PI-8									0	0	8
CP-S-PI-1									0	0	3
TW-S-PI-2									0	0	20
TW-S-PI-3									0	0	4
TW-S-PI-4									0	0	3
Reference sites											
BW-S-R-1			2	2					2	2	4
BTW-S-R-1									0	0	2
BTW-S-R-2									0	0	2
CP-NS-R-1									0	0	2
CP-NS-R-2									0	0	2
Totals	**2**	**2**	**4**	**4**	**0**	**0**	**4**	**4**	**10**	**10**	**100**

* The site is devoid of *P. cinnamomi*-susceptible species and therefore *P. cinnamomi* is not perceived to be actively causing death.

6 Conclusion

This TEC PEC annual monitoring report (2024) compares results from the preconstruction baseline monitoring undertaken between spring of 2019 and summer of 2020 with all subsequent monitoring rounds completed prior to the end of this reporting period on May 31, 2024.

The results of this monitoring show that there are no Project attributable indirect impacts or reportable declines associated with any of the monitored occurrences of Banksia Woodland TEC PEC, Claypan TEC or Tuart Woodland TEC PEC for any of the monitored variables, including: weed diversity or cover, native diversity or cover, plant stress, erosion, flooding, or drying since baseline monitoring commenced in spring of 2019.

The autumn 2024 monitoring round recorded the impacts of the driest summer and autumn across parts of the southwest including the Bunbury Region. These impacts in native vegetation were observed to be wide ranging and significant with high levels of plant stress observed in the Banksia woodland and Tuart woodland communities. However, the manifestation of stress within the vegetation was non – uniform or 'patchy' with some parts and certain species affected far more than others. This was reflected in the vegetation monitoring with some monitoring sites and monitoring points affected differently.

The irregular pattern of observed drying impacts due to the driest summer autumn period on record make any potential positive link attributing exacerbating drying effects due to the project very challenging. However, the absence of any pattern of negative drying effects post construction and prior to autumn 2024 indicates that any impacts associated with the BORR project for this period, if present, have not been significant.

7 References

BORR Team (2019). BORR Baseline TEC/PEC Vegetation Monitoring Scope.

BORR Team (2020). TEC Vegetation Monitoring Program, Appendix I. Updated Environmental Referral Supporting Document and Additional Information REV 2.

Bureau of Meteorology (BOM) (2024a). Climate Data Online, Bunbury Weather Station, Station No. 9965, http://www.bom.gov.au/climate/data/index.shtml

Bureau of Meteorology (2024b). Drought, Rainfall deficiencies and water availability. Deficiencies for the 9 months since August 2023 http://www.bom.gov.au/climate/drought/archive/20240506.archive.shtml#tabs=Rainfall-deficiencies

Bureau of Meteorology (2024c). Drought, Rainfall deficiencies and water availability. Below average soil moisture in the south. http://www.bom.gov.au/climate/drought/archive/20240506.archive.shtml#tabs=Soil-moisture

Ecoedge (2023) Bunbury Outer Ring Road Southern Project Area Threatened and Priority Ecological Communities Vegetation and Drainage Monitoring Baseline Report. Prepared for the South West Gateway Alliance.

Environmental Protection Authority of WA (2016). *Technical Guidance Flora and Vegetation Surveys for Environmental Impact.* EPA, Perth, Western Australia. http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/EPA_Technical Guidance - Flora and Vegetation survey

Keighery, B. (1994). *Bushland Plant Survey, A Guide to Plant Community Survey for the Community.* Wildflower Society of WA (Inc.).

Main Roads (2022) Bunbury Outer Ring Road – Southern Section Vegetation Management Plan

Northern Agricultural Catchments Council (2014). U*sing Photomon for Monitoring Environmental Change.* https://www.nacc.com.au/wp-content/uploads/2015/05/Photomon-Users-Guide.pdf

NVIS Technical Working Group (2017) *Australian Vegetation Attribute Manual: National Vegetation Information System, Version 7.0.* Department of the Environment and Energy, Canberra. Prep by Bolton, M.P., deLacey, C. and Bossard, K.B. (Eds).

8 Appendices

Appendix 1. Location of current boundary and transect photopoints, with current and baseline vegetation condition, percentage cover for weeds and native plants at site.

Appendix 2. Index to all photographs taken during the monitoring survey.

Appendix 3. Comparative data for vegetation condition, crown extent density, weed cover and native cover from spring / summer 2019 to autumn 2024.

Appendix 4. Vegetation condition scale (EPA, 2016).

Appendix 5. Recording sheet template

Appendix 6. The graphs of sites with stable and reduced stress.

Appendix 7. An example of drainage monitoring report.

Appendix 1. Location of current boundary and transect photopoints, with current and baseline vegetation condition, percentage cover for weeds and native plants at site.

Maps are arranged in order from north to south of their location within the BORR southern section referral area.

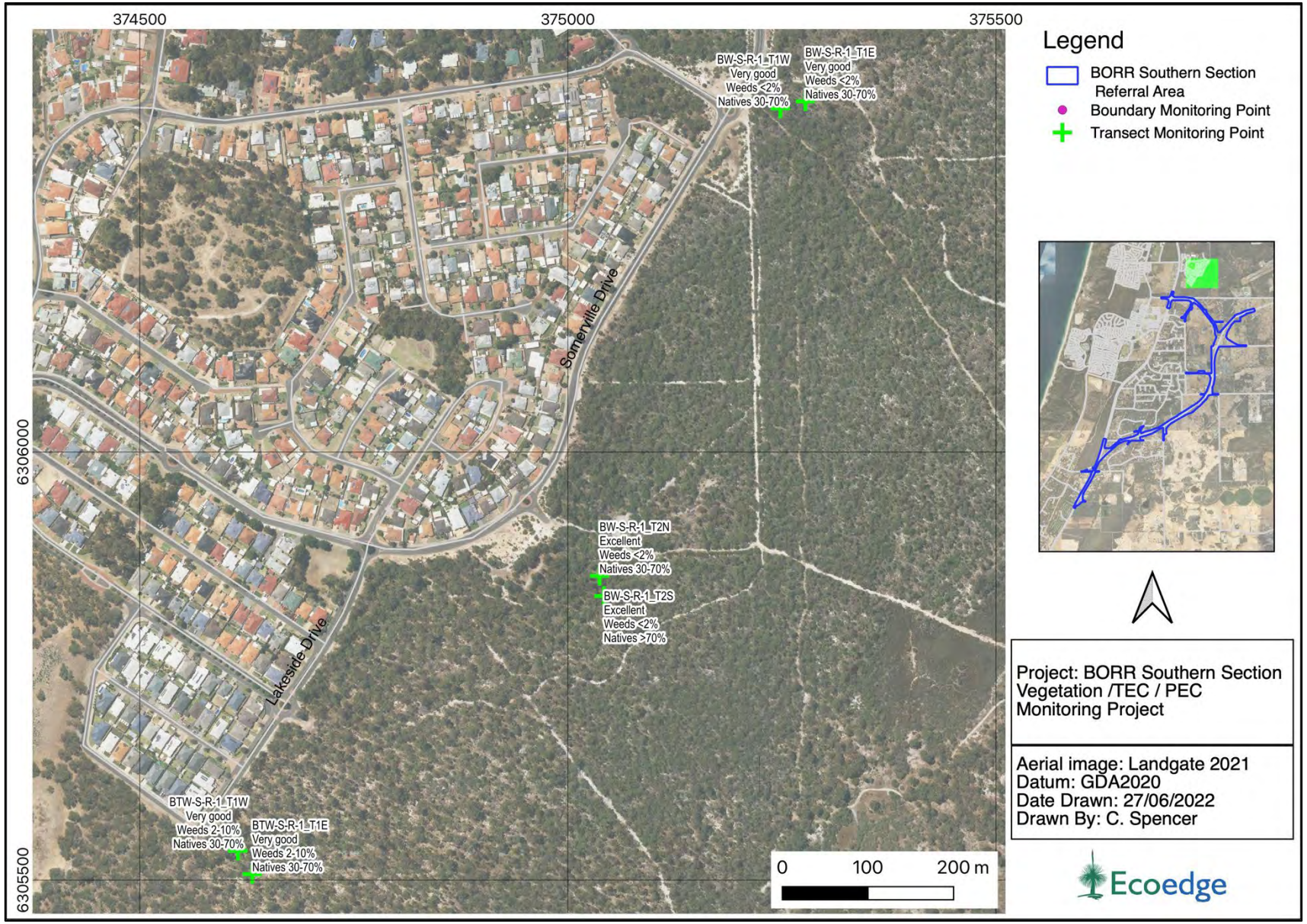


Figure 1. Baseline reference site BW-S-R-1 and BTW-S-R-1 vegetation condition, weed and native cover.

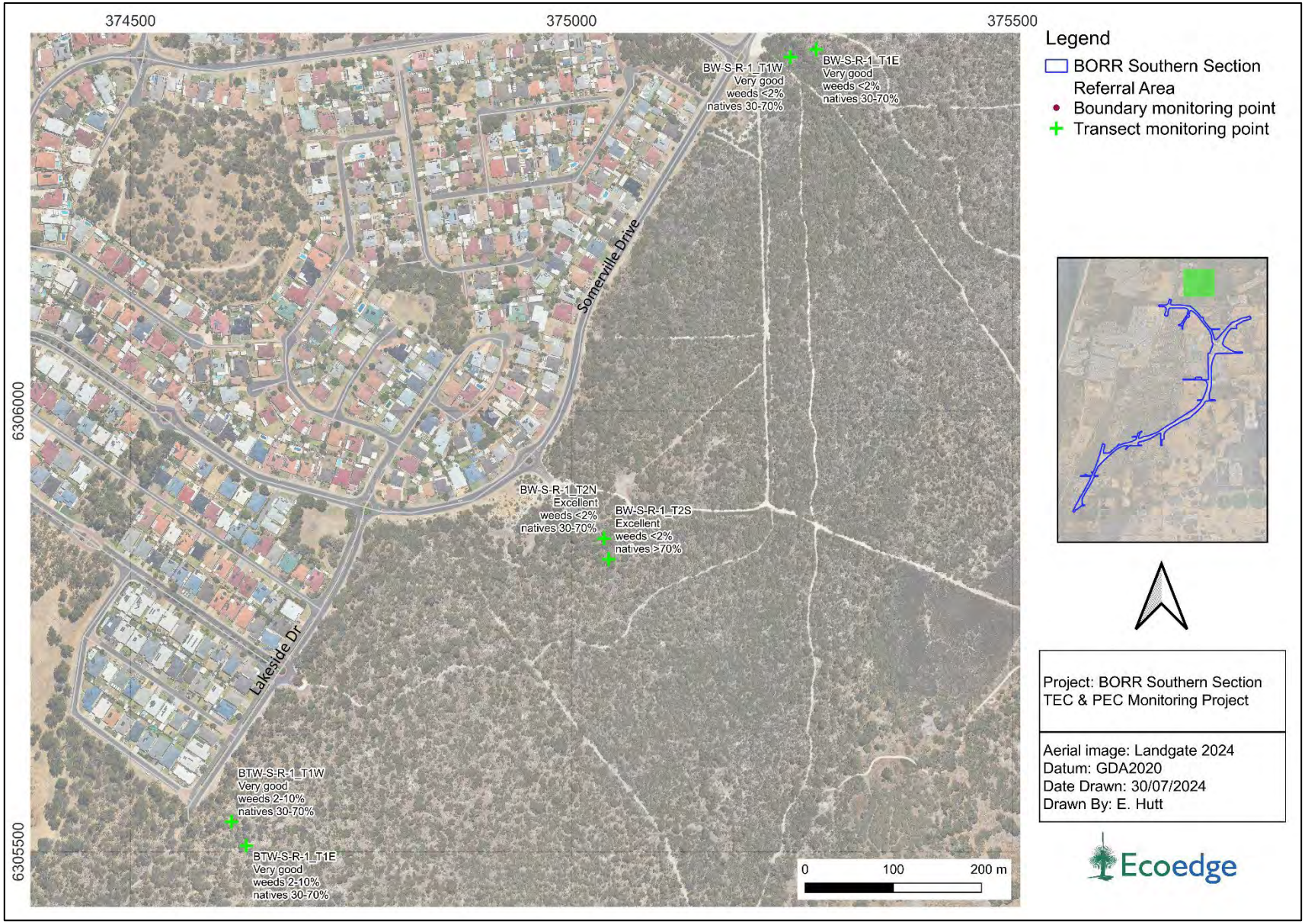


Figure 2. 2024 reference site BW-S-R-1 and BTW-S-R-1 vegetation condition, weed and native cover.

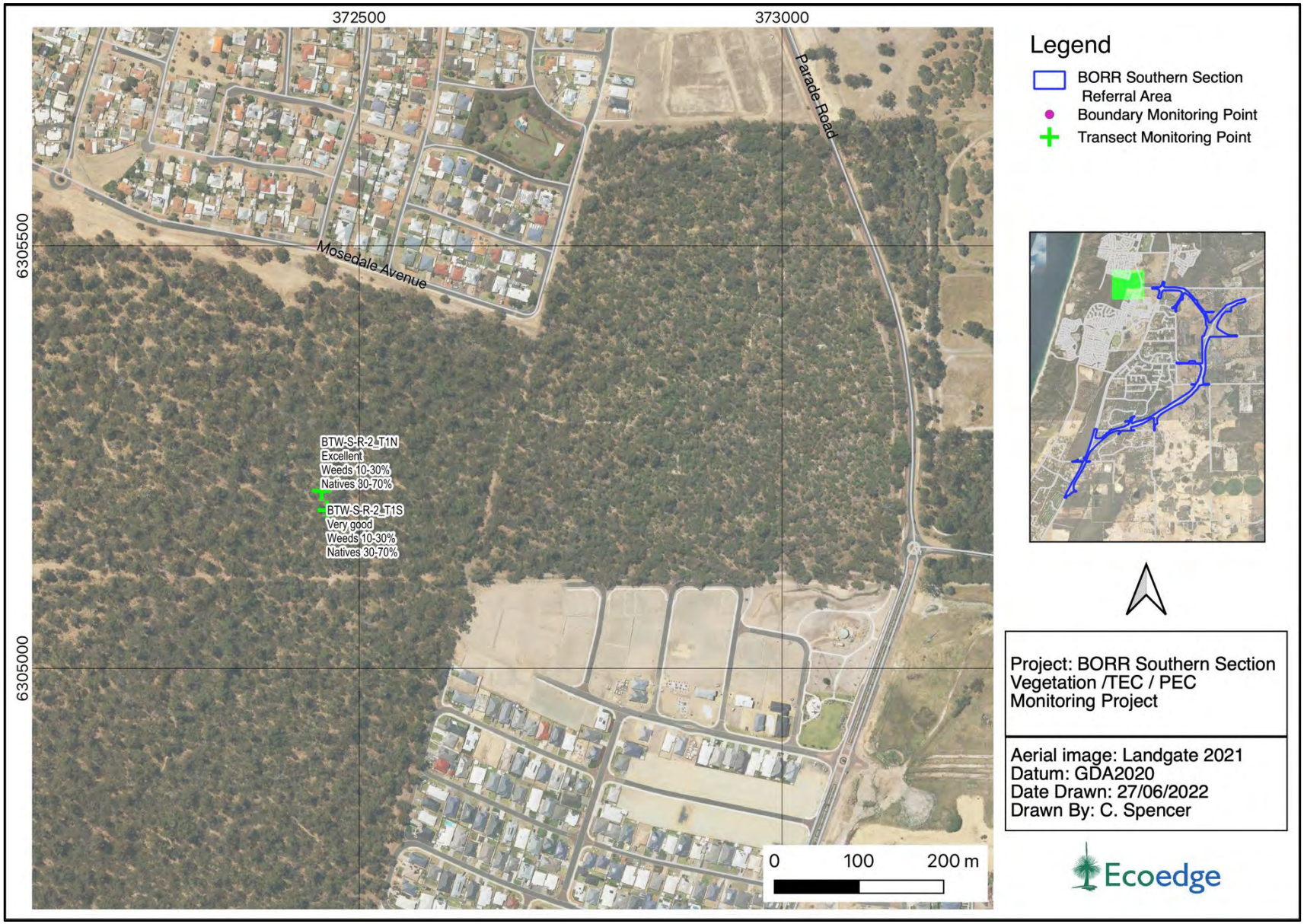


Figure 3. Baseline reference site BTW-S-R-2 vegetation condition, weed and native cover.

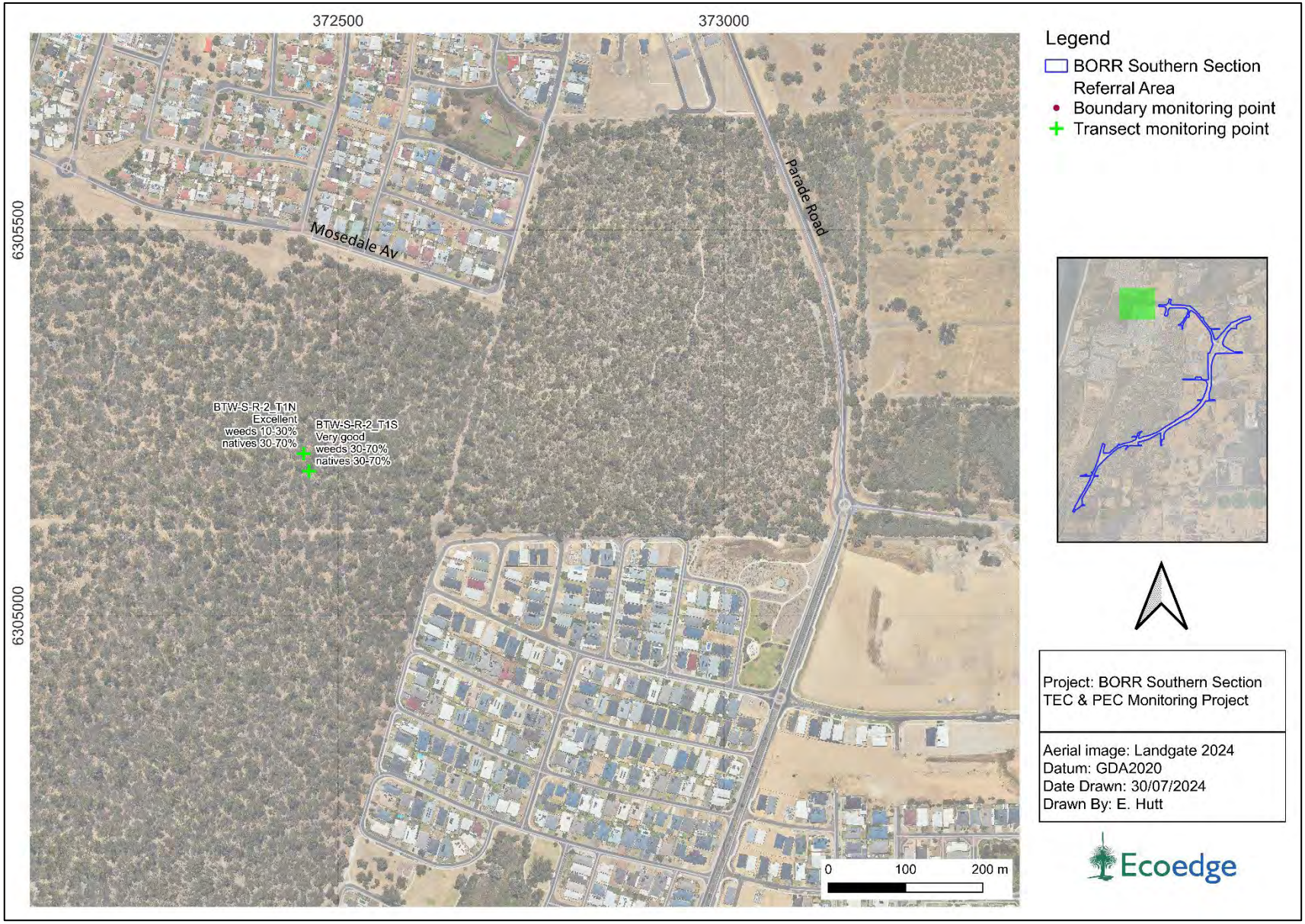


Figure 4. 2024 reference site BTW-S-R-2 vegetation condition, weed and native cover.

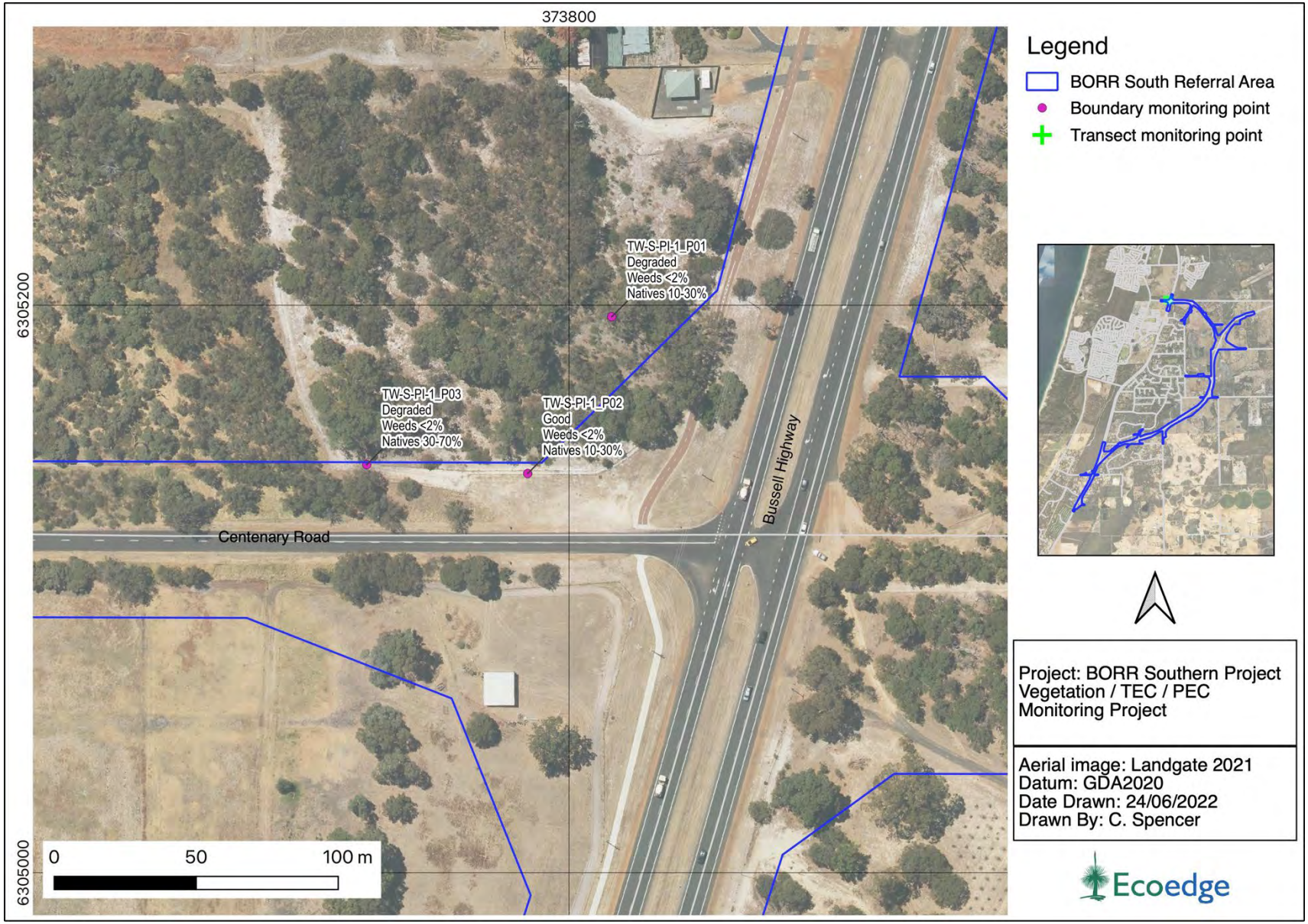


Figure 5. Baseline potential impact site TW-S-PI-1 vegetation condition, weed and native cover.

Figure 6. 2024 potential impact site TW-S-PI-1 vegetation condition, weed and native cover.

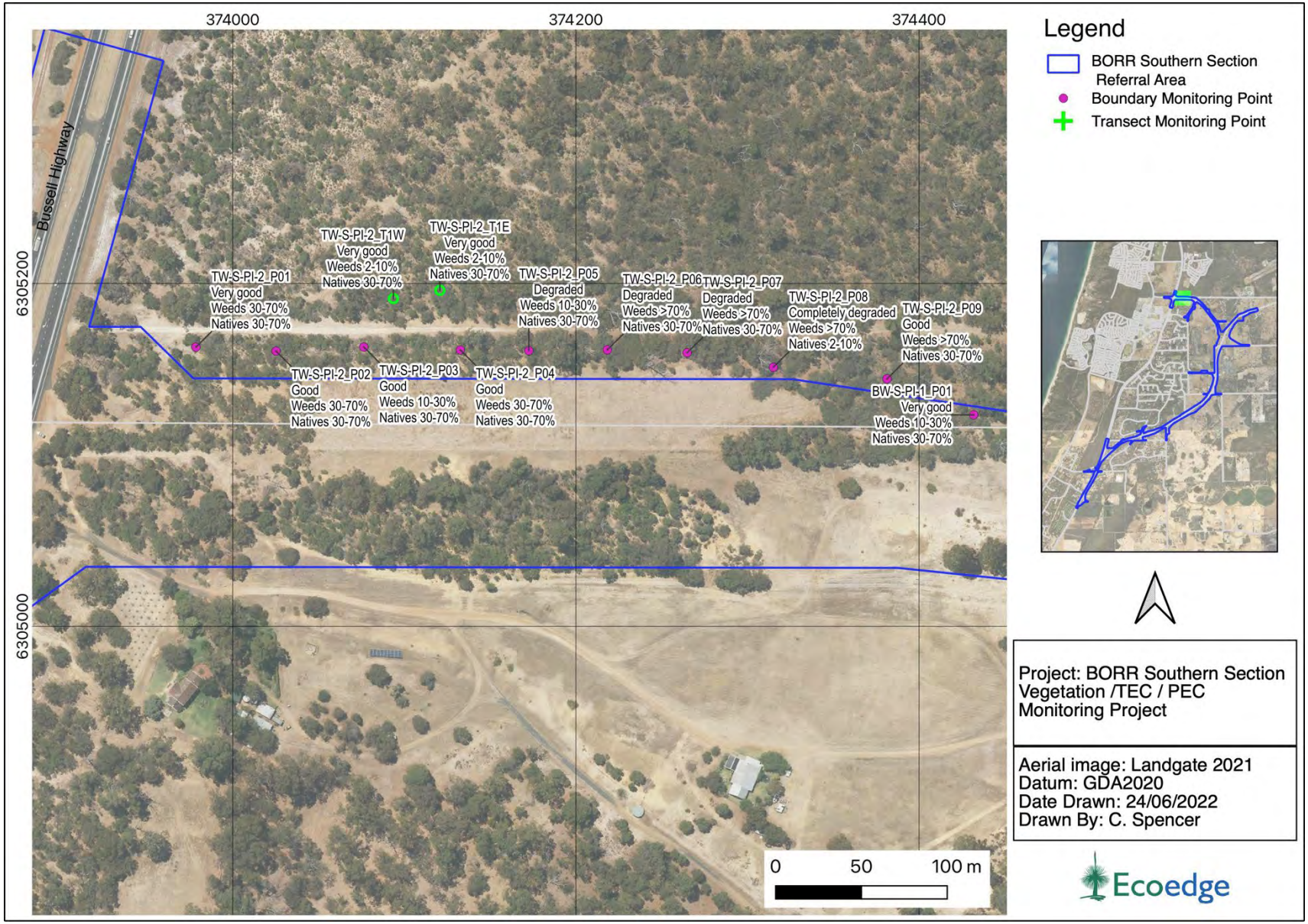


Figure 7. Baseline potential impact site TW-S-PI-2 vegetation condition, weed and native cover.

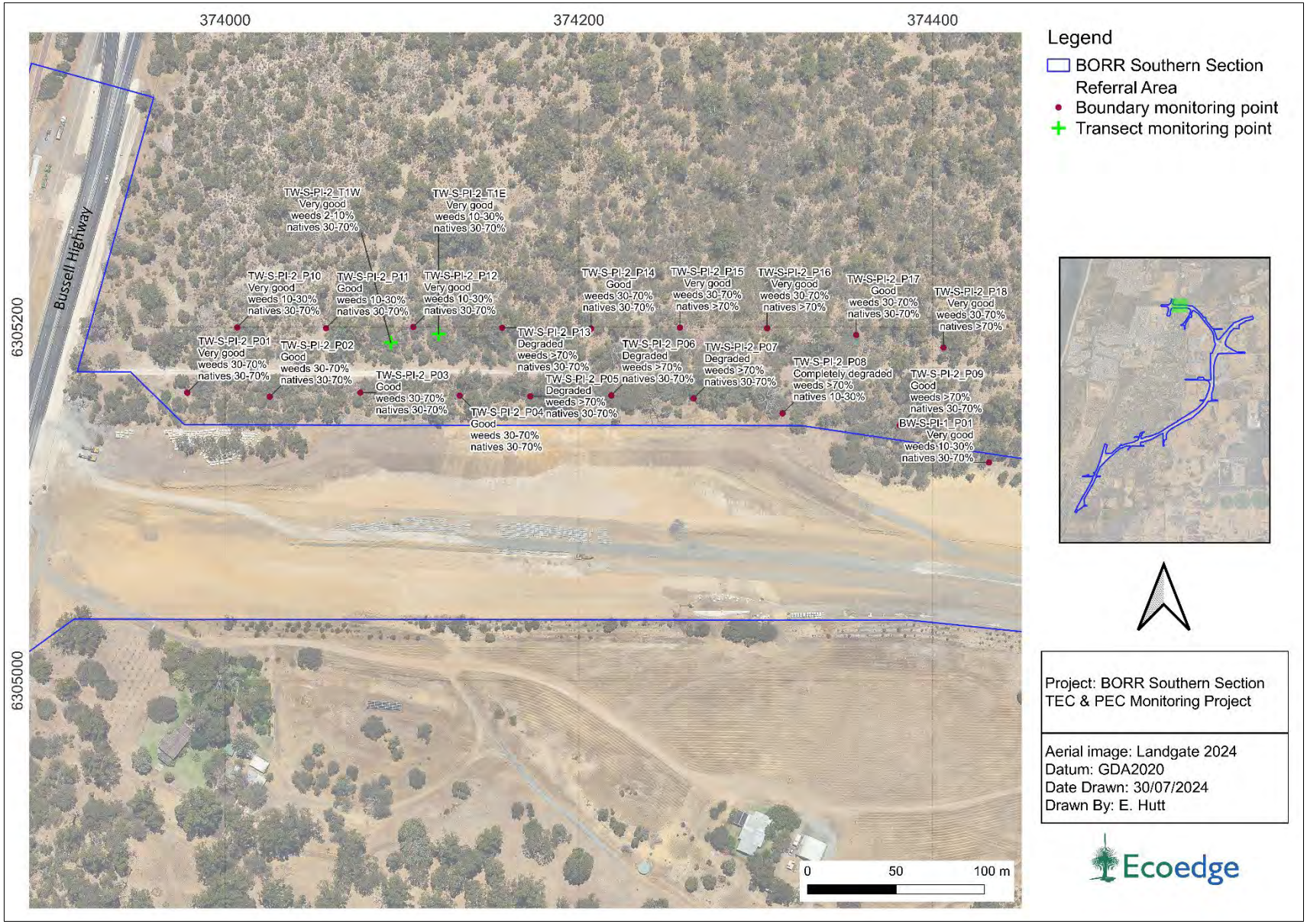


Figure 8. 2024 potential impact site TW-S-PI-2 vegetation condition, weed and native cover.

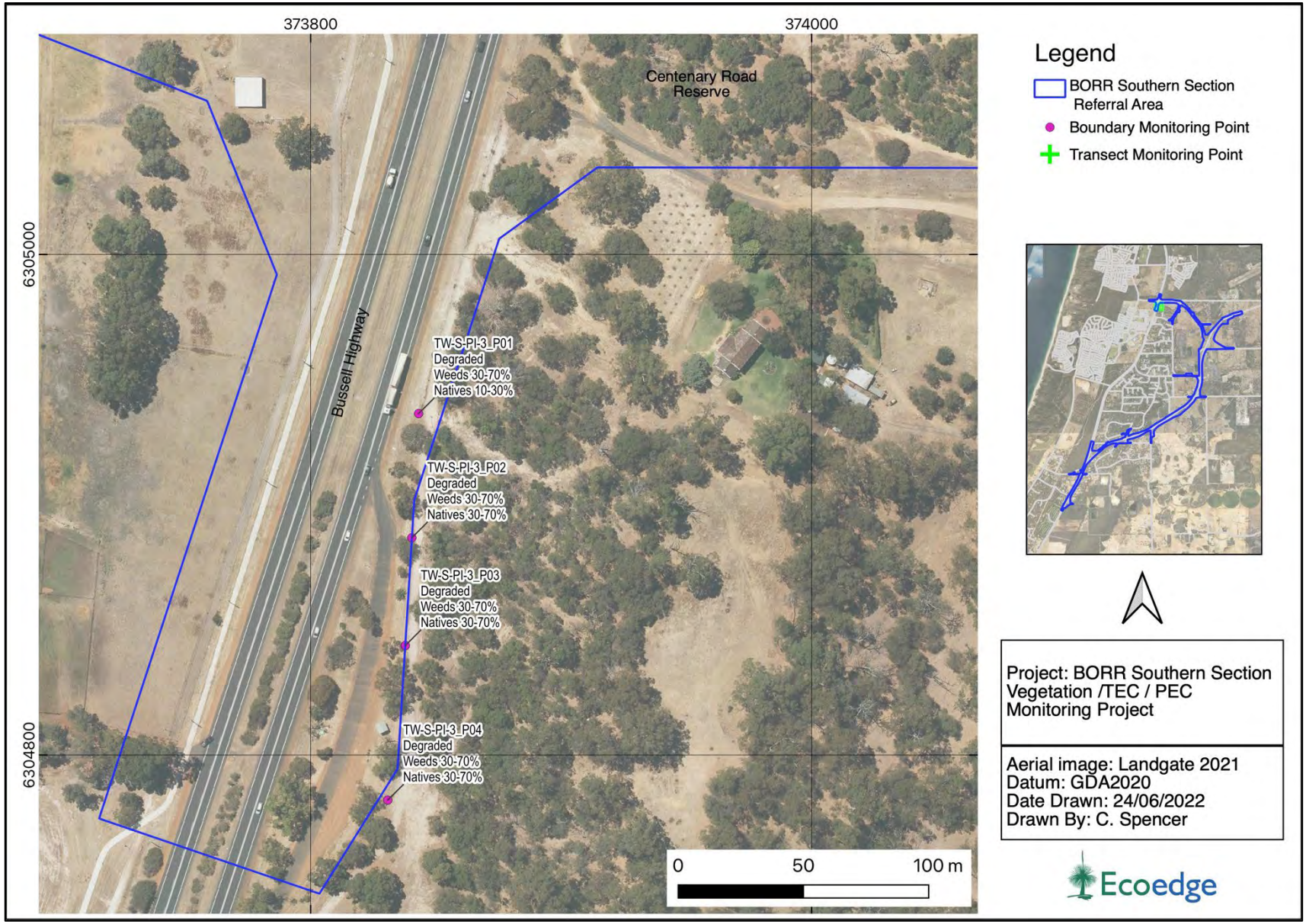


Figure 9. Baseline potential impact site TW-S-PI-3 vegetation condition, weed and native cover.

Figure 10. 2024 potential impact site TW-S-PI-3 vegetation condition, weed and native cover.

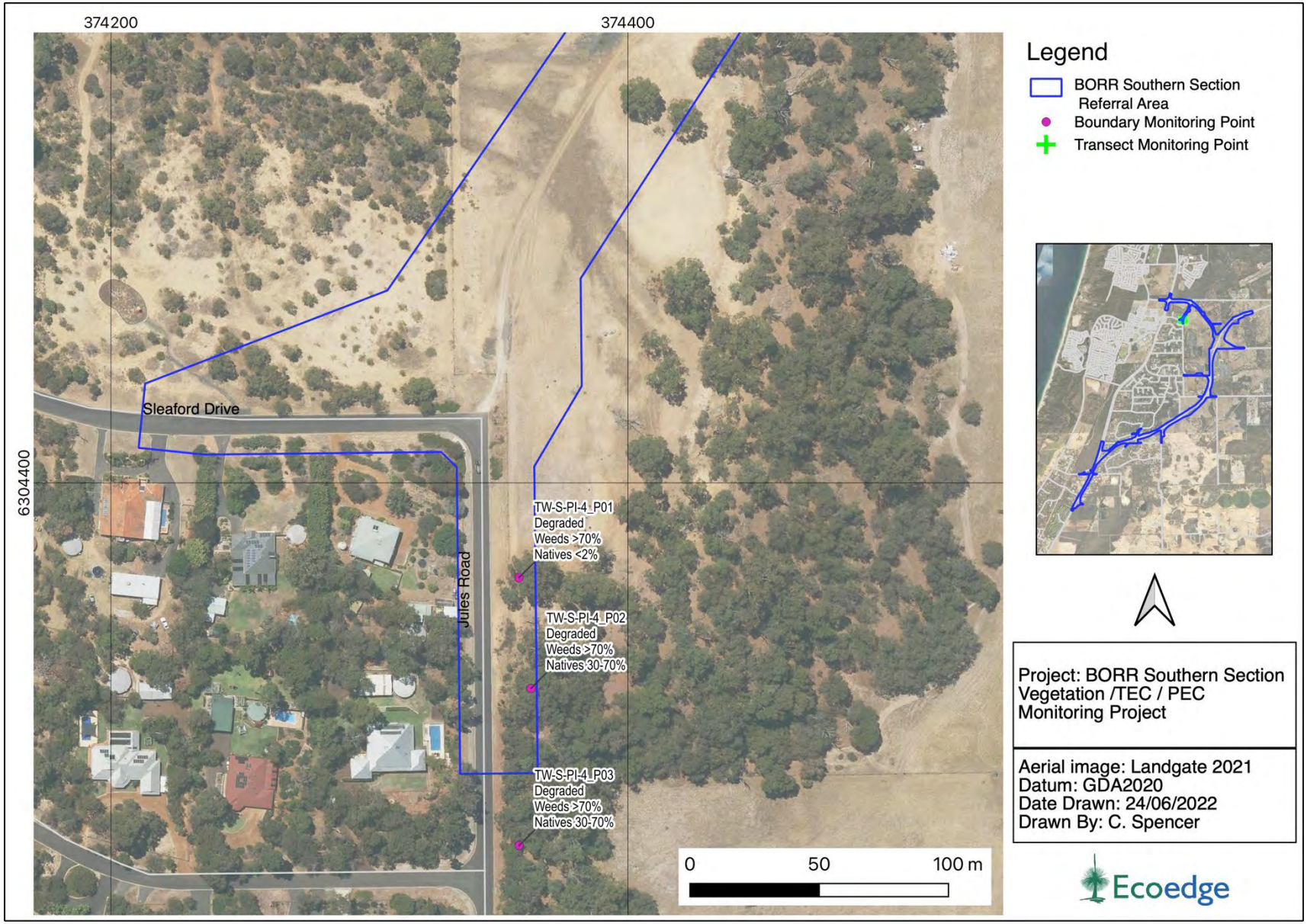


Figure 11. Baseline potential impact site TW-S-PI-4 vegetation condition, weed and native cover.

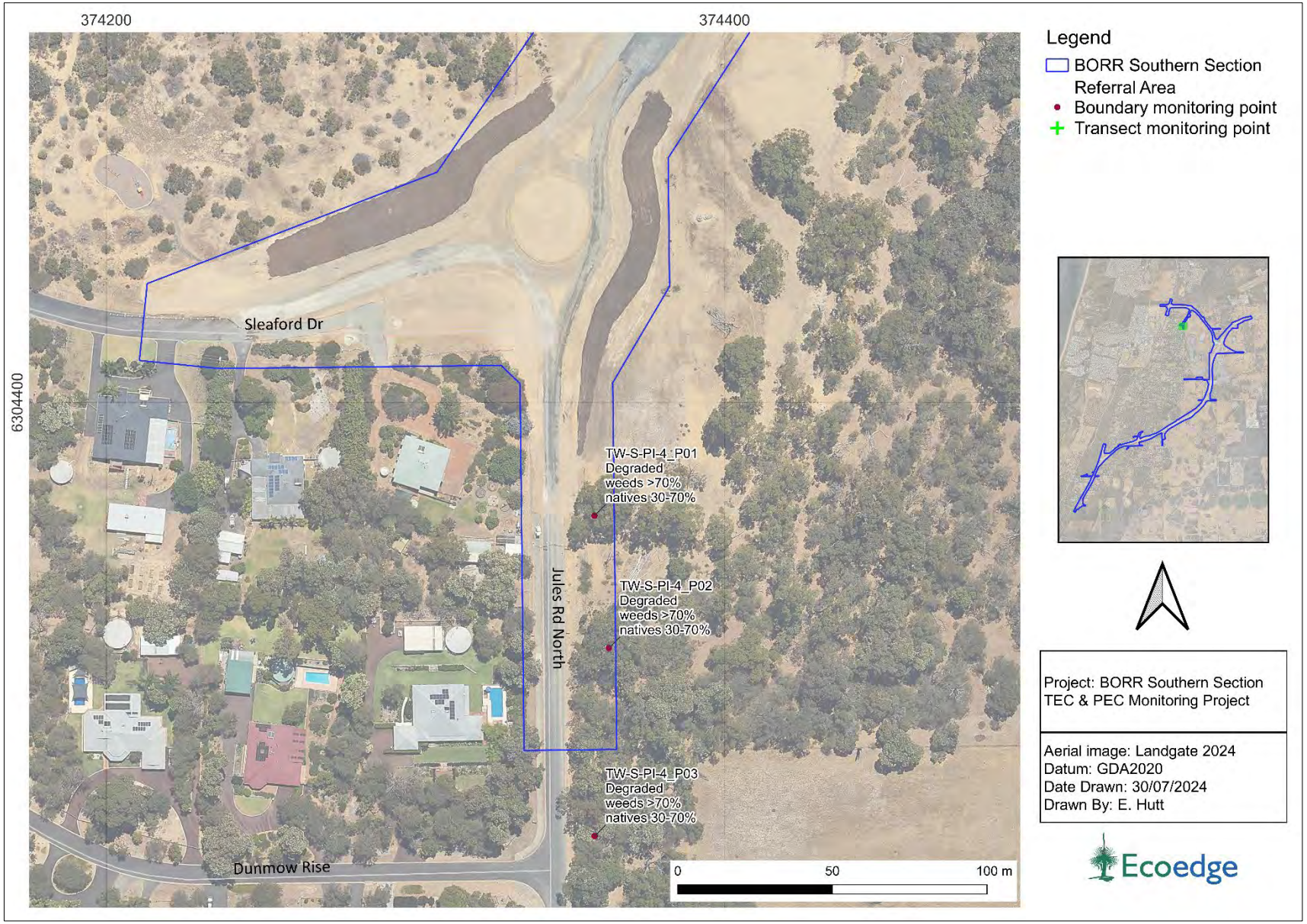


Figure 12. 2024 potential impact site TW-S-PI-4 vegetation condition, weed and native cover.

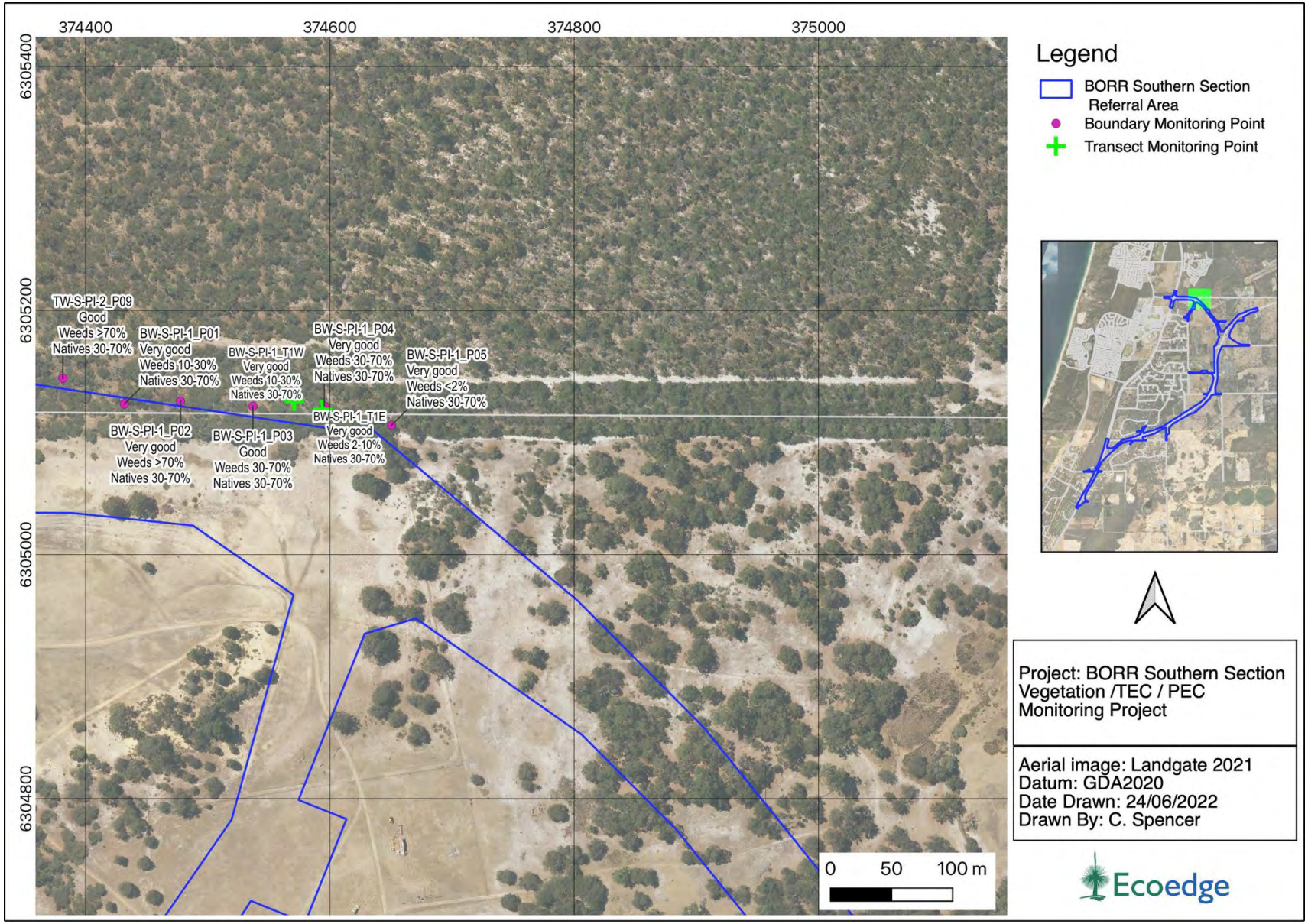


Figure 13. Baseline potential impact site BW-S-PI-1 vegetation condition, weed and native cover.

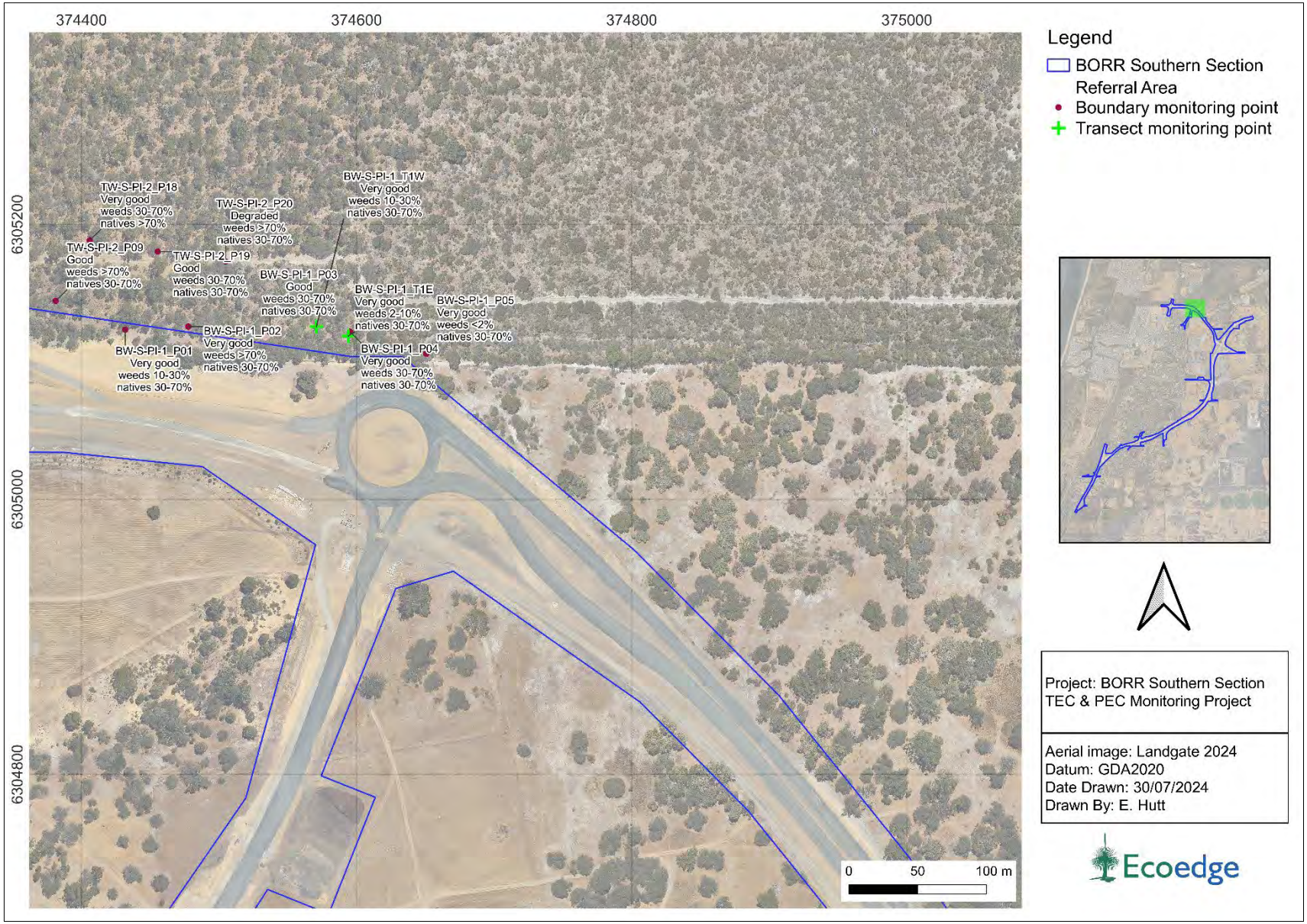


Figure 14. 2024 potential impact site BW-S-PI-1 vegetation condition, weed and native cover.

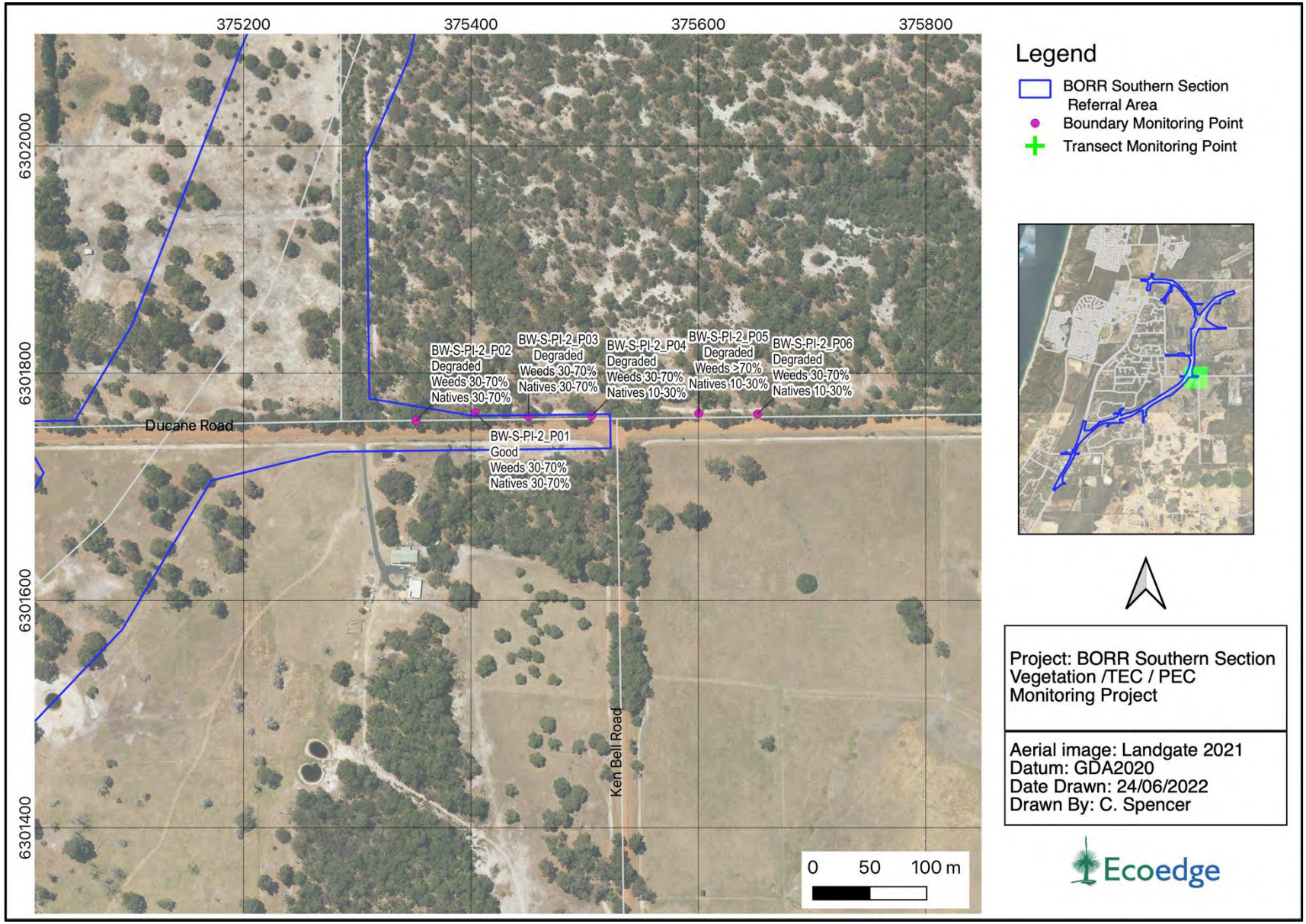


Figure 15. Baseline potential impact site BW-S-PI-2 vegetation condition, weed and native cover.

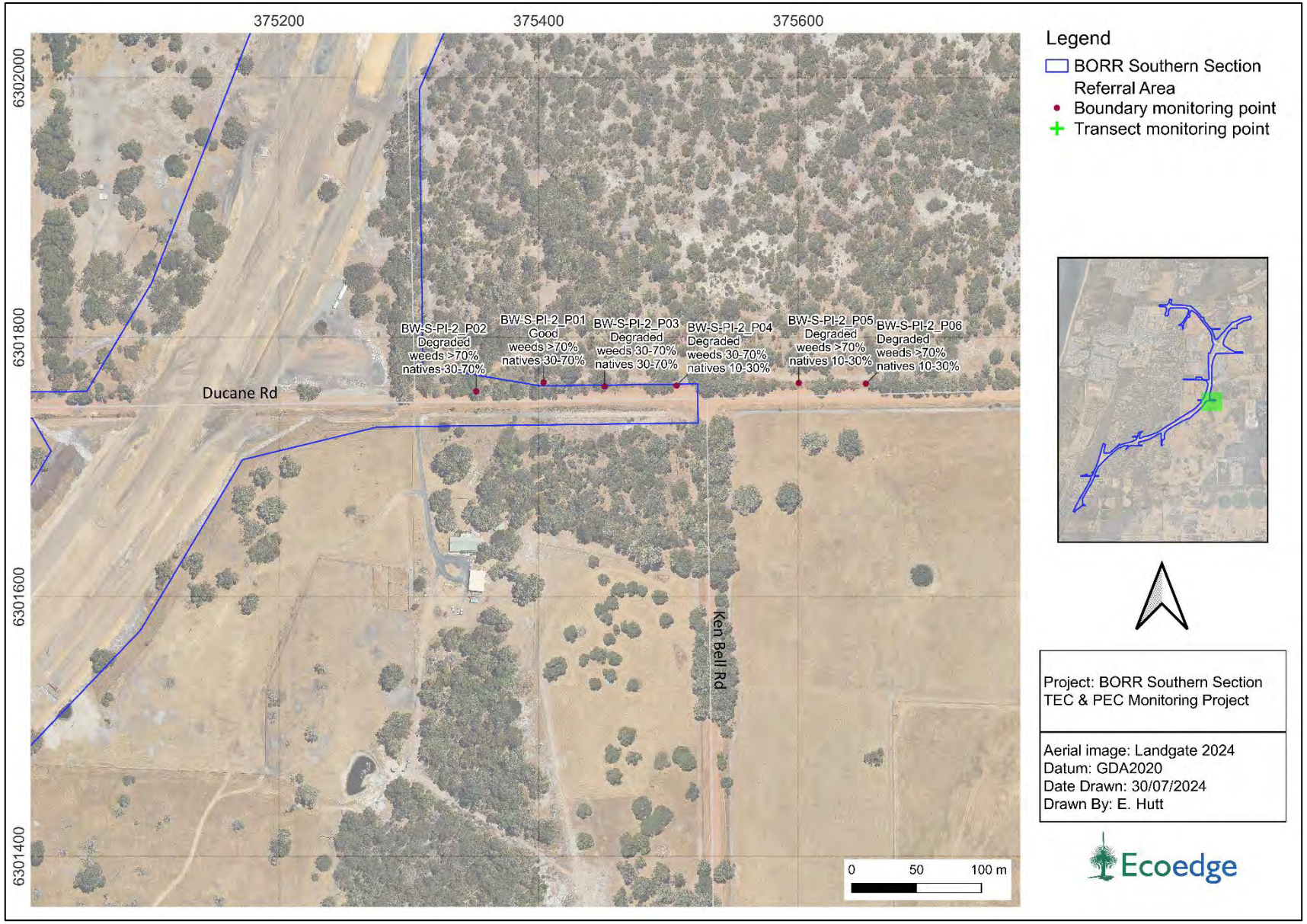


Figure 16. 2024 potential impact site BW-S-PI-2 vegetation condition, weed and native cover.

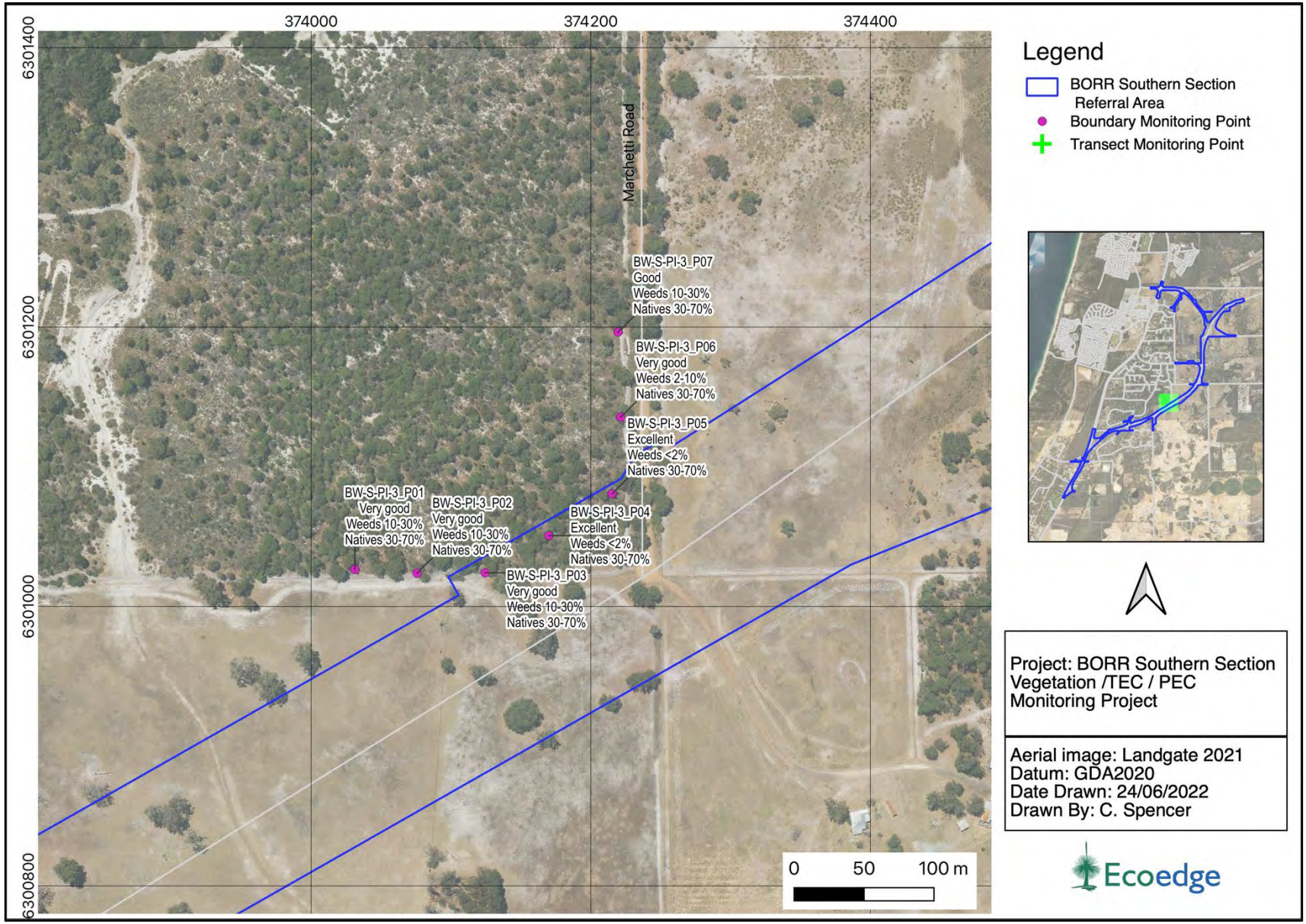


Figure 17. Baseline potential impact site BW-S-PI-3 vegetation condition, weed and native cover.

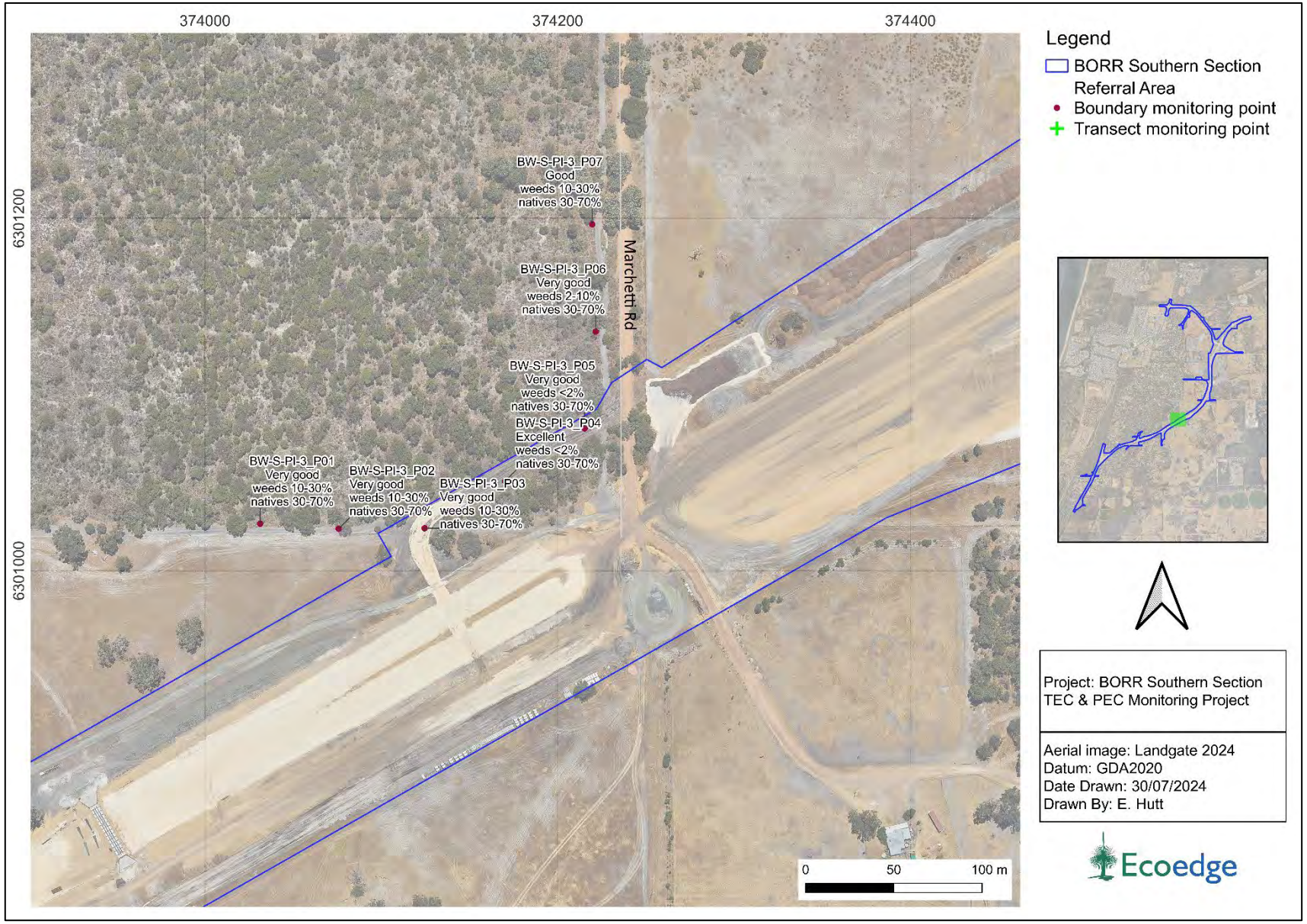


Figure 18. 2024 potential impact site BW-S-PI-3 vegetation condition, weed and native cover.

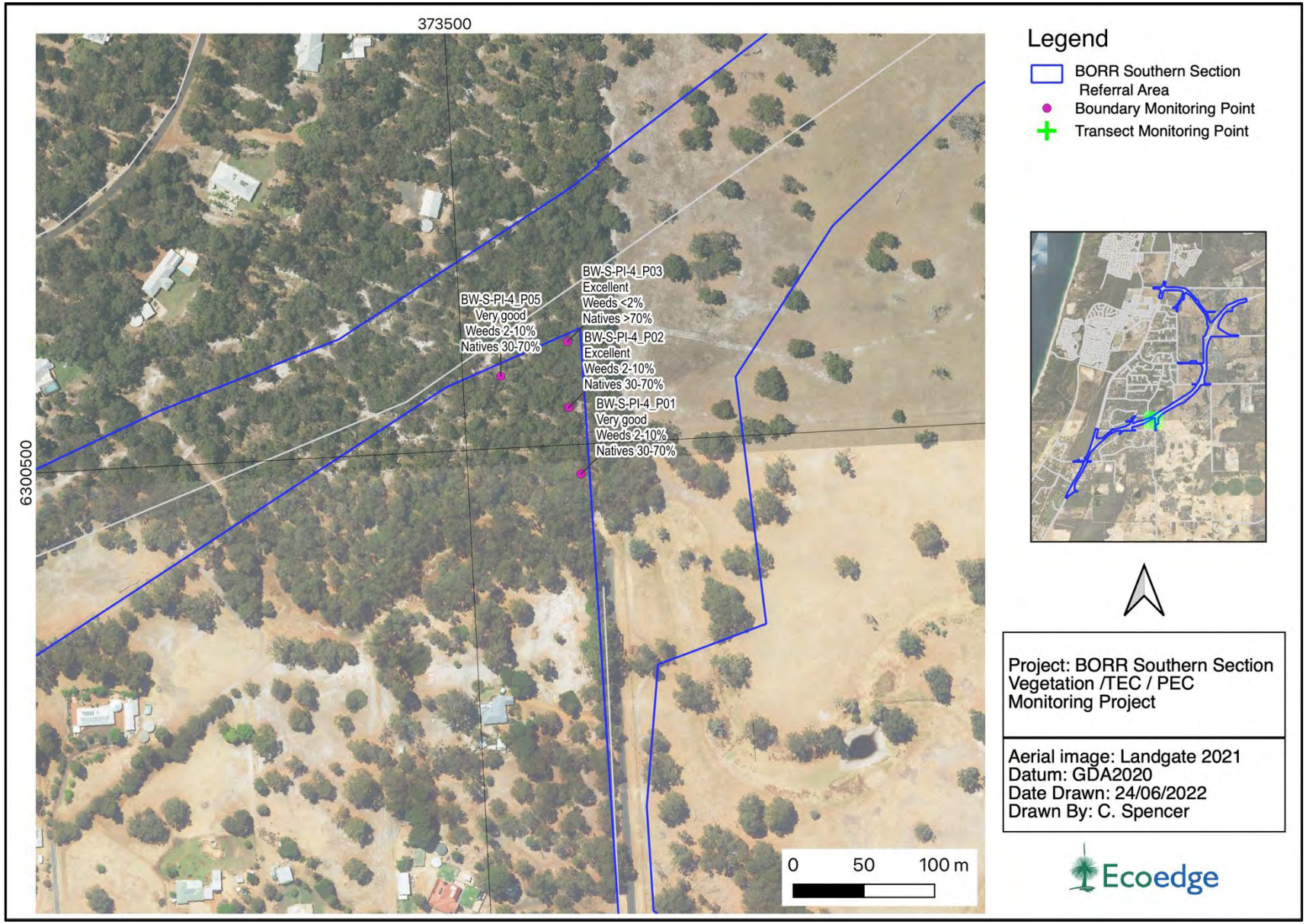


Figure 19. Baseline potential impact site BW-S-PI-4 vegetation condition, weed and native cover.

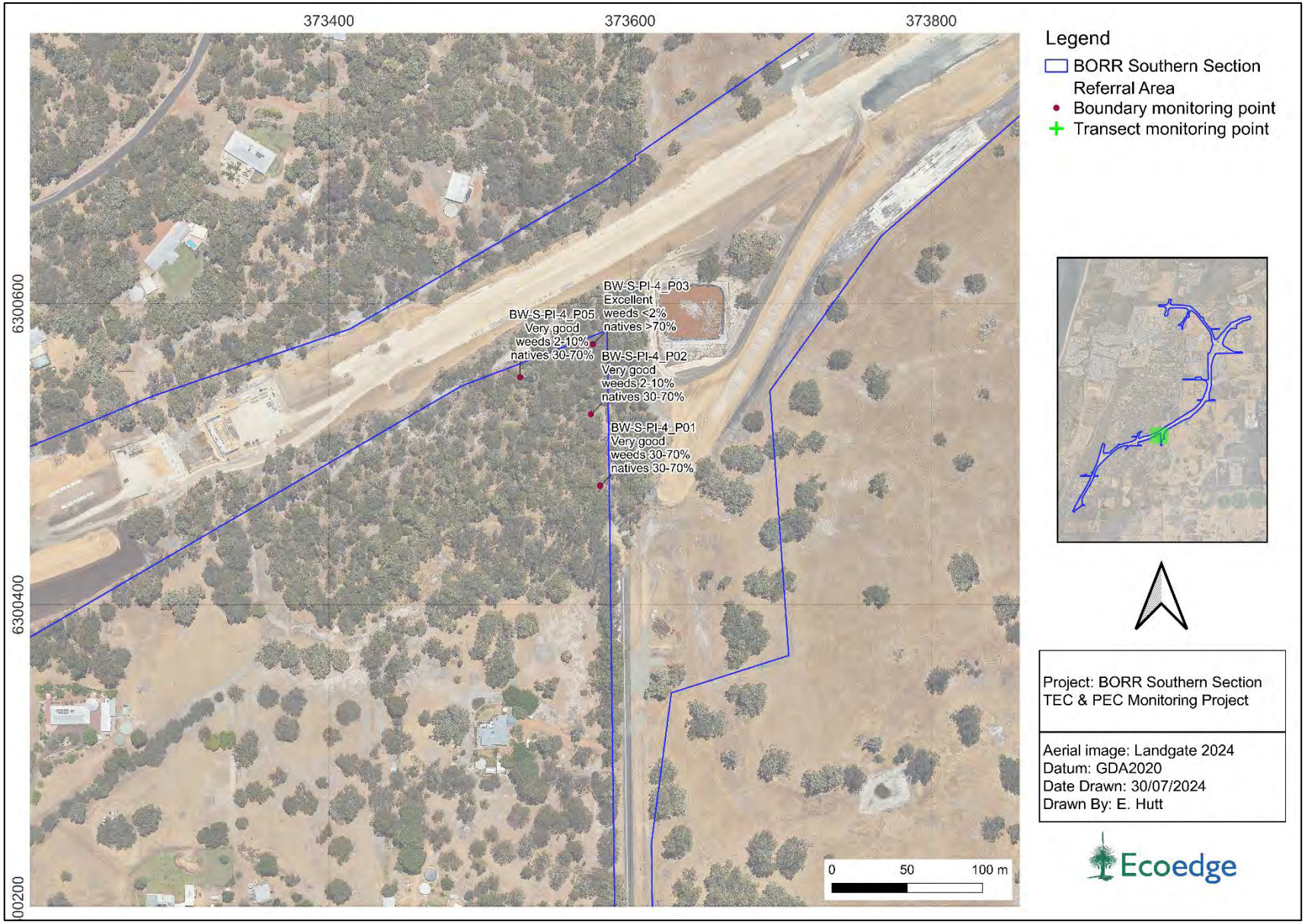


Figure 20. 2024 potential impact site BW-S-PI-4 vegetation condition, weed and native cover.

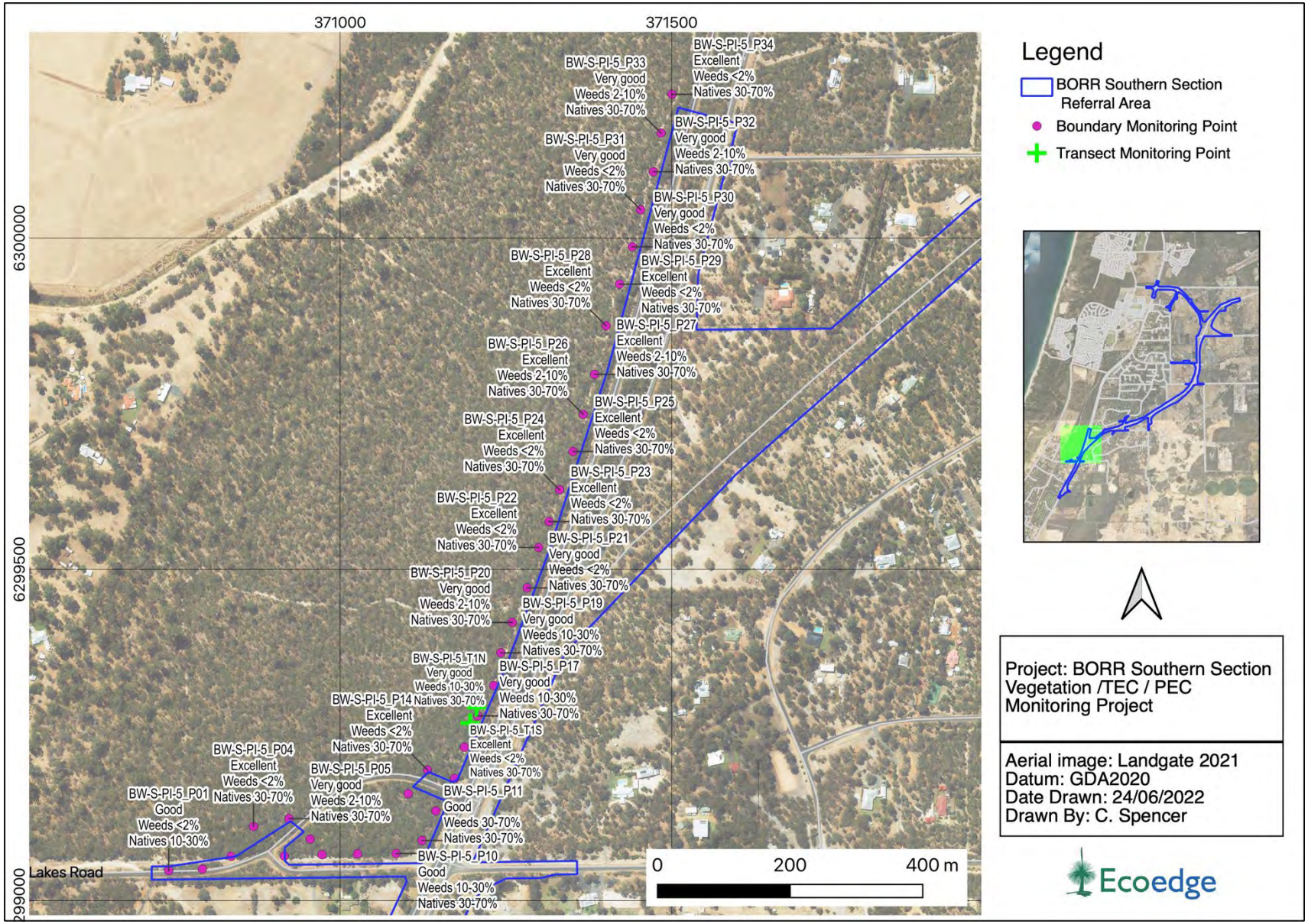


Figure 21. Baseline potential impact site BW-S-PI-5 vegetation condition, weed and native cover.

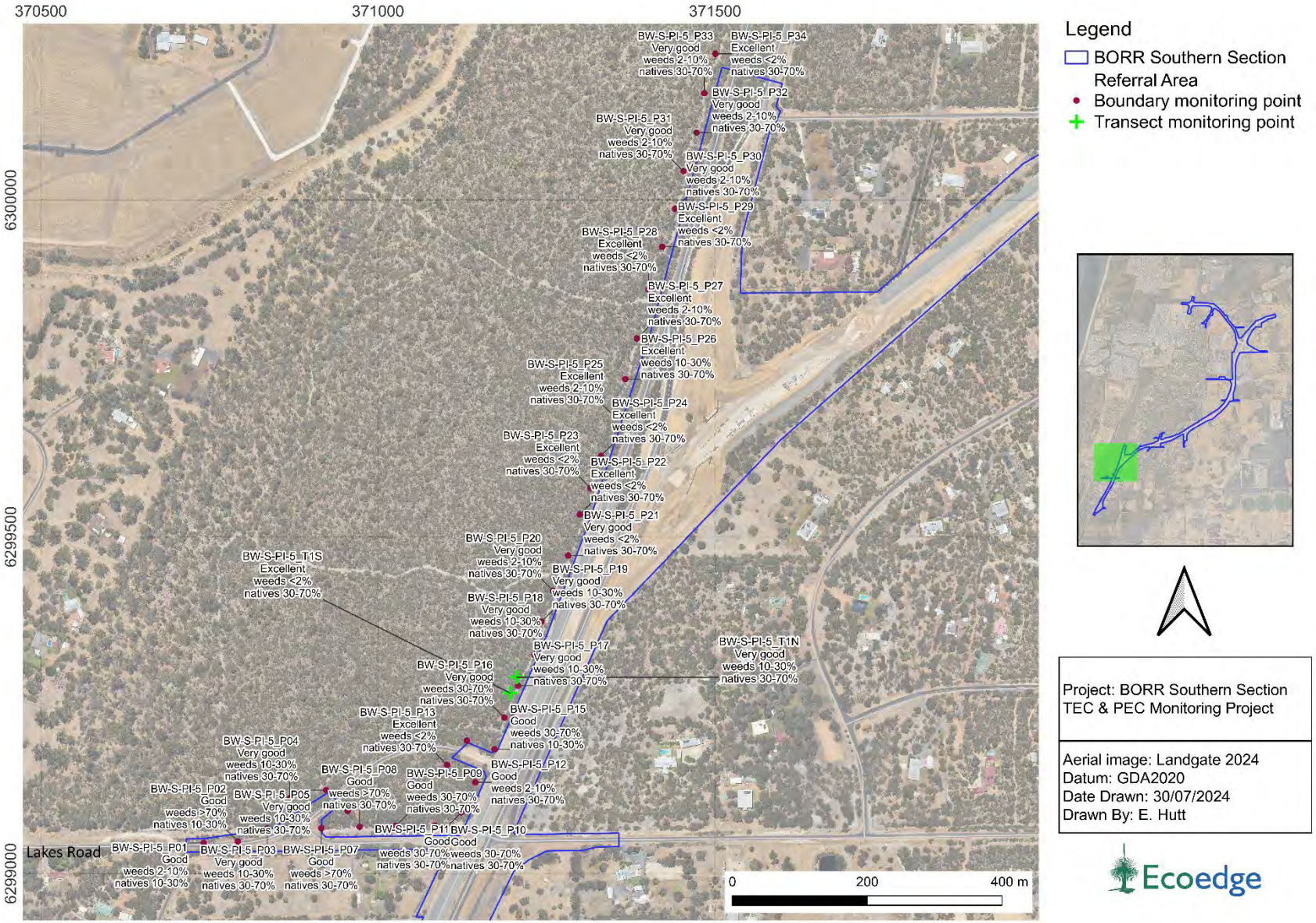


Figure 22. 2024 potential impact site BW-S-PI-5 vegetation condition, weed and native cover.

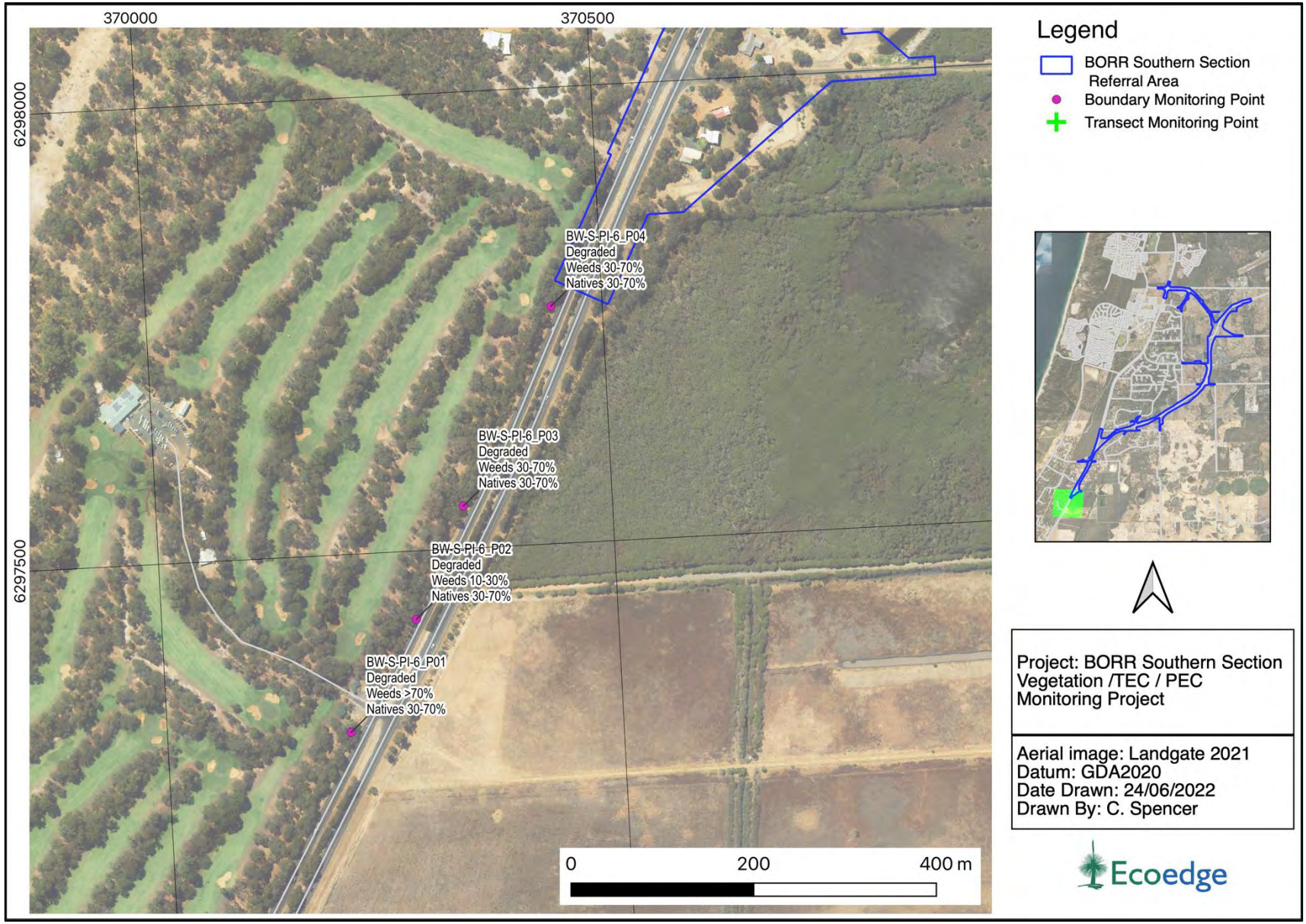


Figure 23. Baseline potential impact site BW-S-PI-6 vegetation condition, weed and native cover.

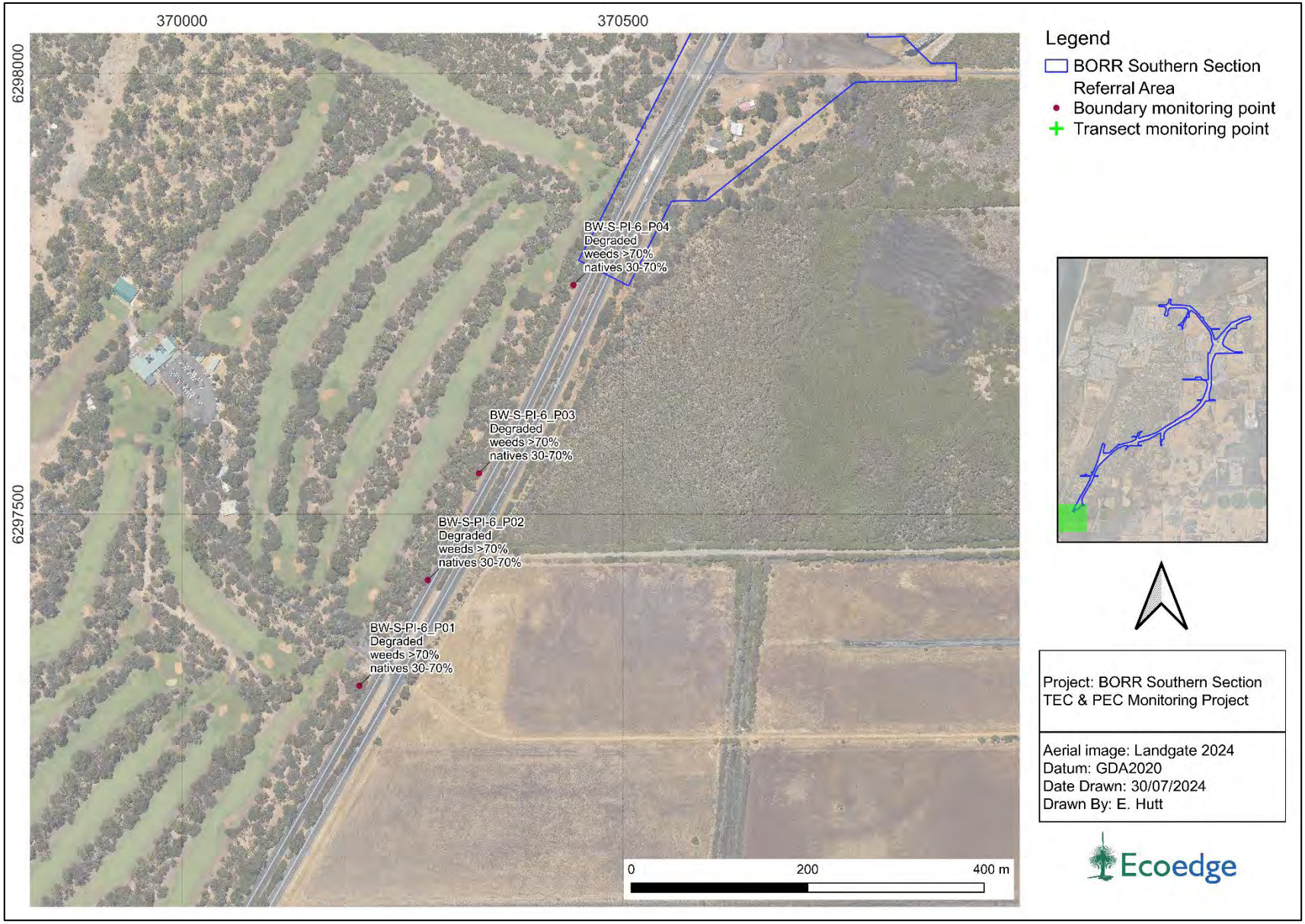


Figure 24. 2024 potential impact site BW-S-PI-6 vegetation condition, weed and native cover.

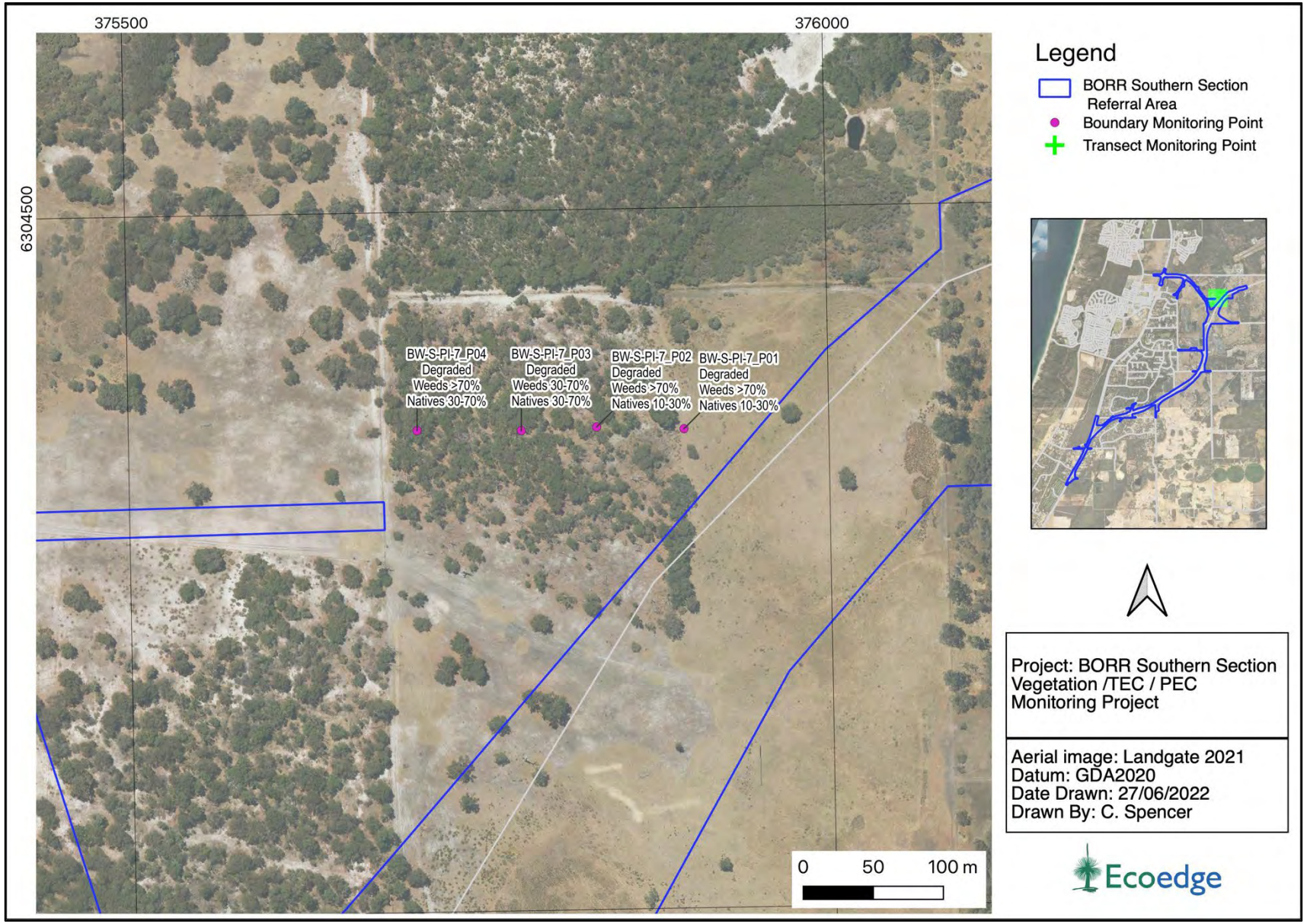


Figure 25. Baseline potential impact site BW-S-PI-7 vegetation condition, weed and native cover. **Note** data is only current to Spring 2019 due to site access issues.

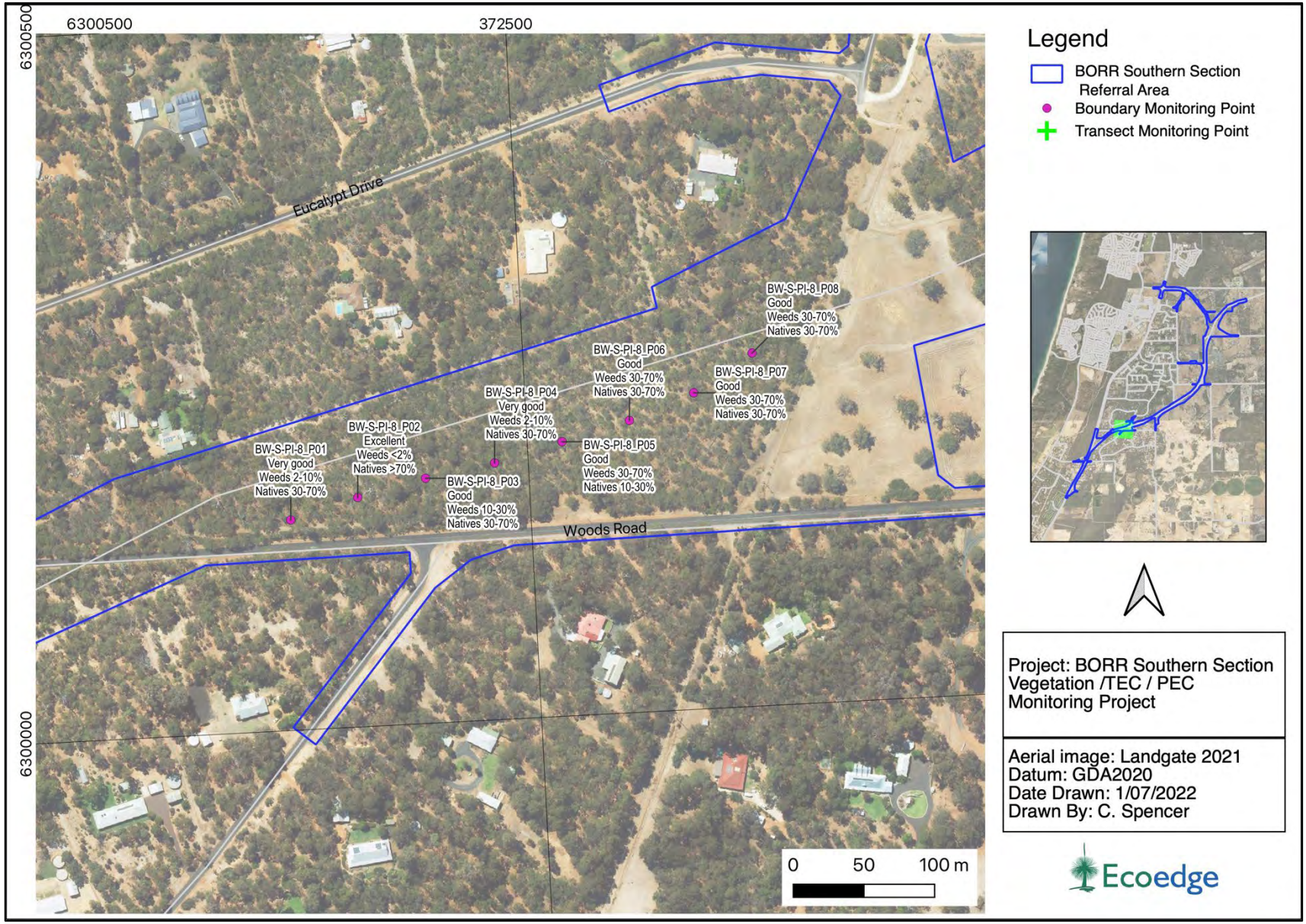


Figure 26. Baseline potential impact site BW-S-PI-8 vegetation condition, weed and native cover.

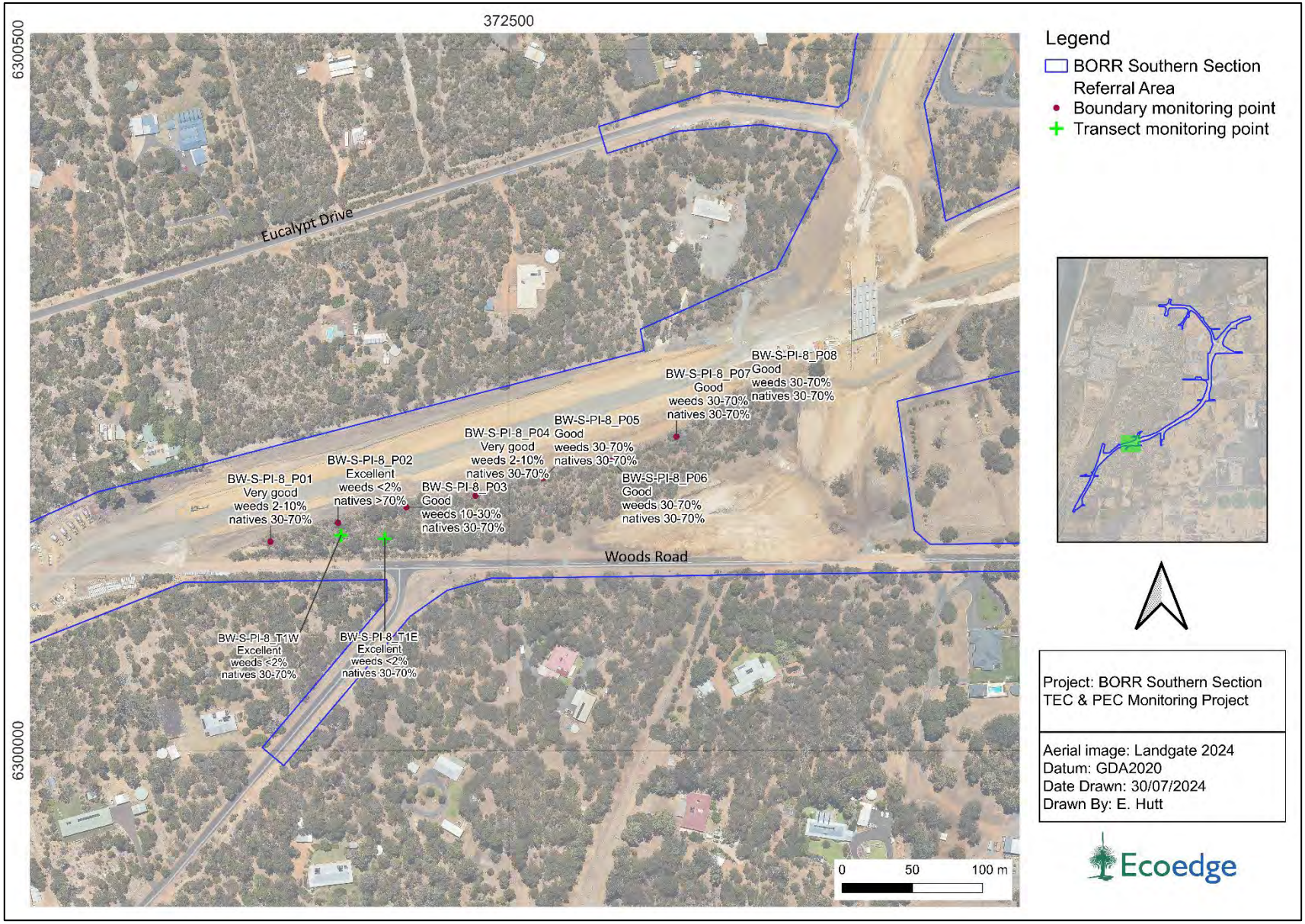


Figure 27. 2024 potential impact site BW-S-PI-8 vegetation condition, weed and native cover

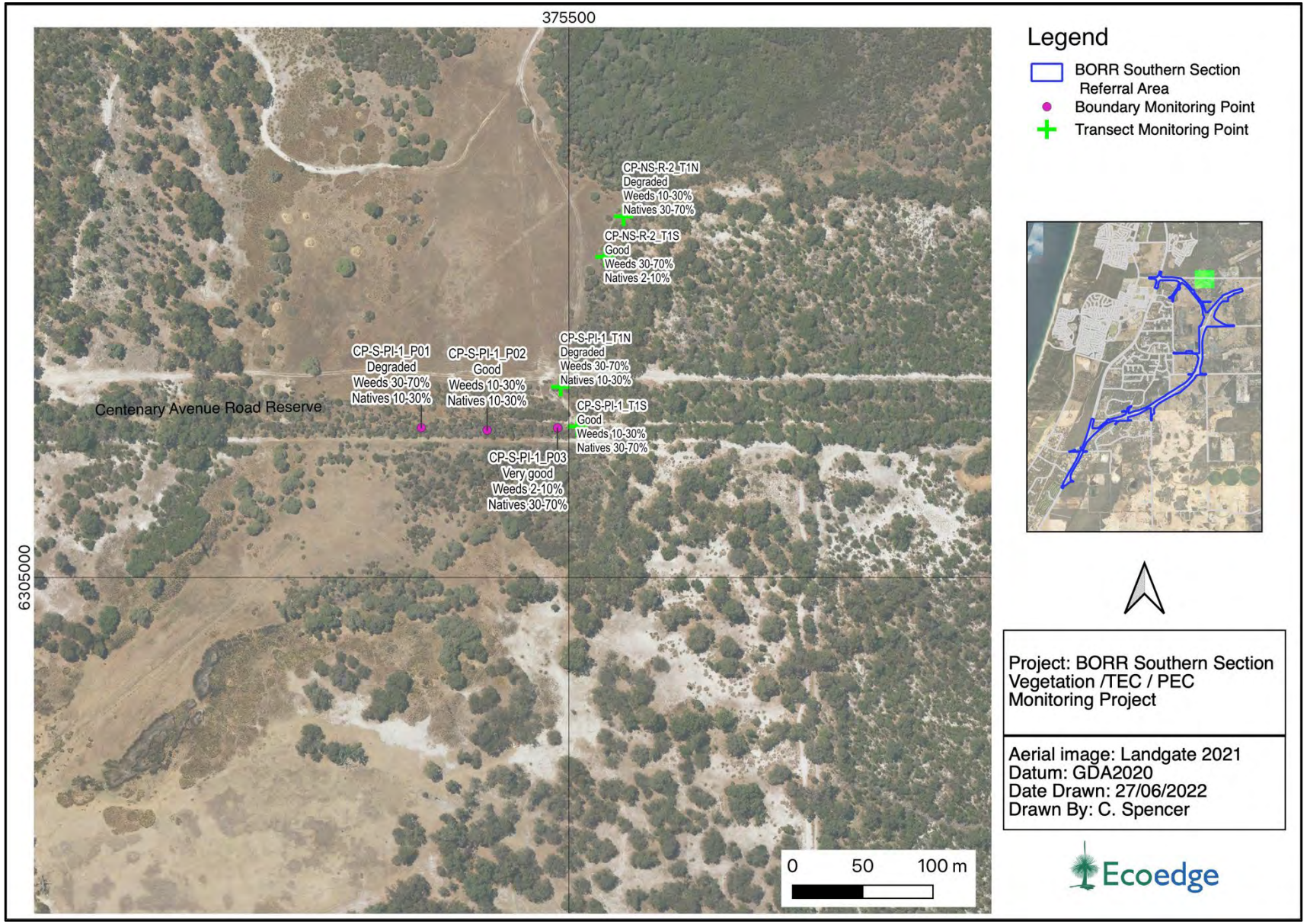


Figure 28. Baseline potential impact sites CP-S-PI-1 and reference site CP-NS-R-2 vegetation condition, weed and native cover.

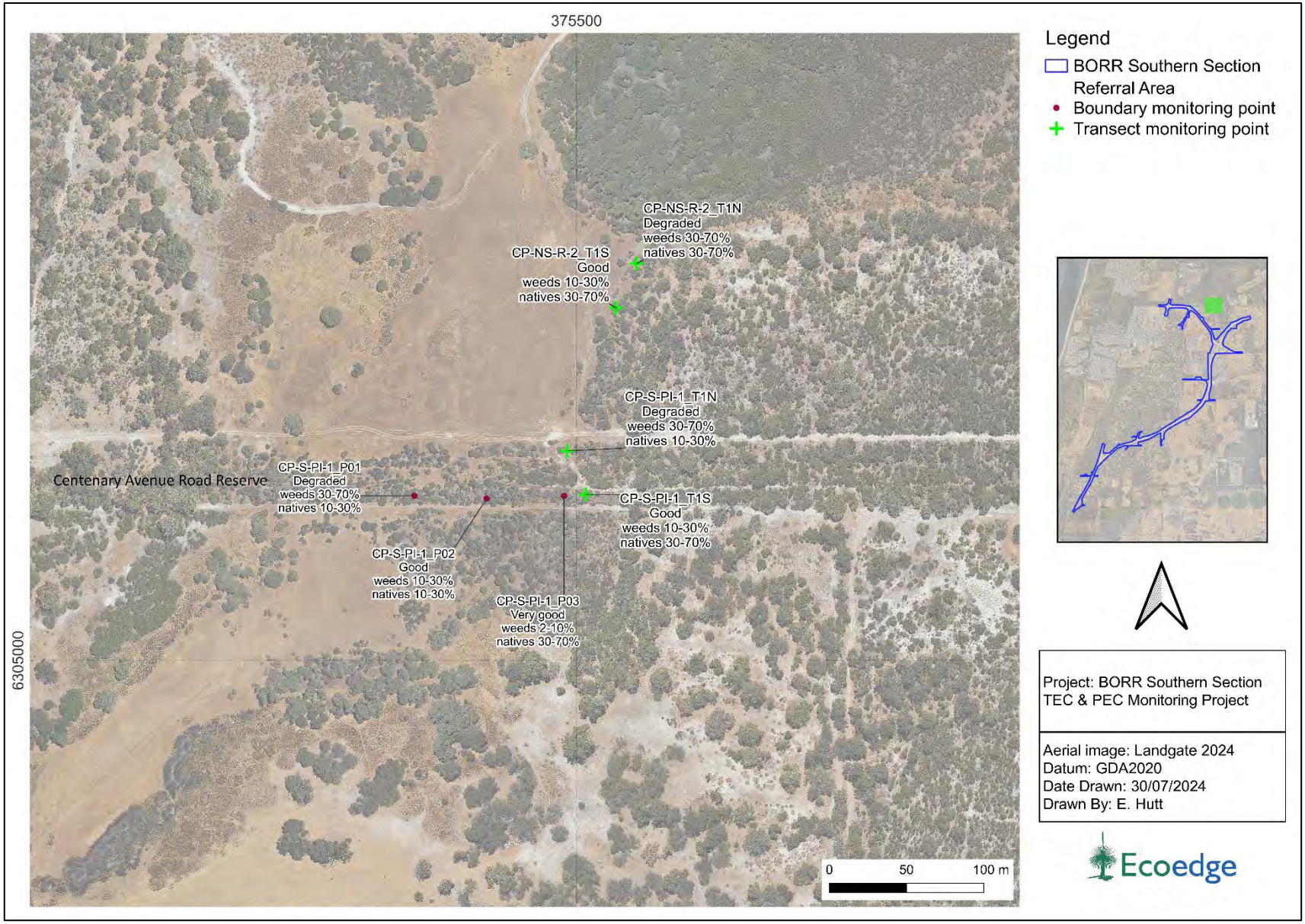


Figure 29. 2024 potential impact site CP-S-PI-1 and reference site CP-NS-R-2 vegetation condition, weed and native cover.

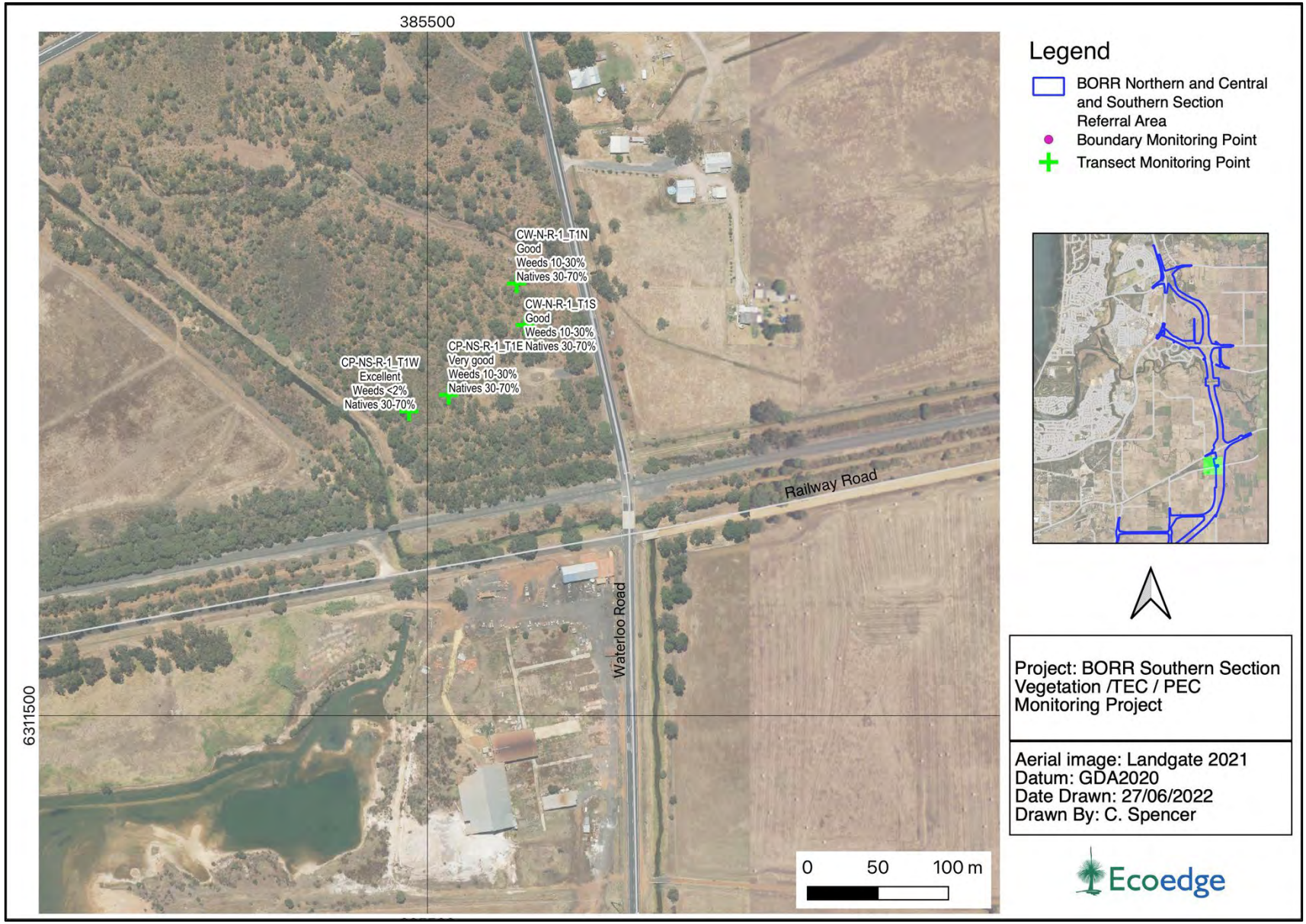


Figure 30. Baseline reference site CP-NS-R-1 vegetation condition, weed and native cover.

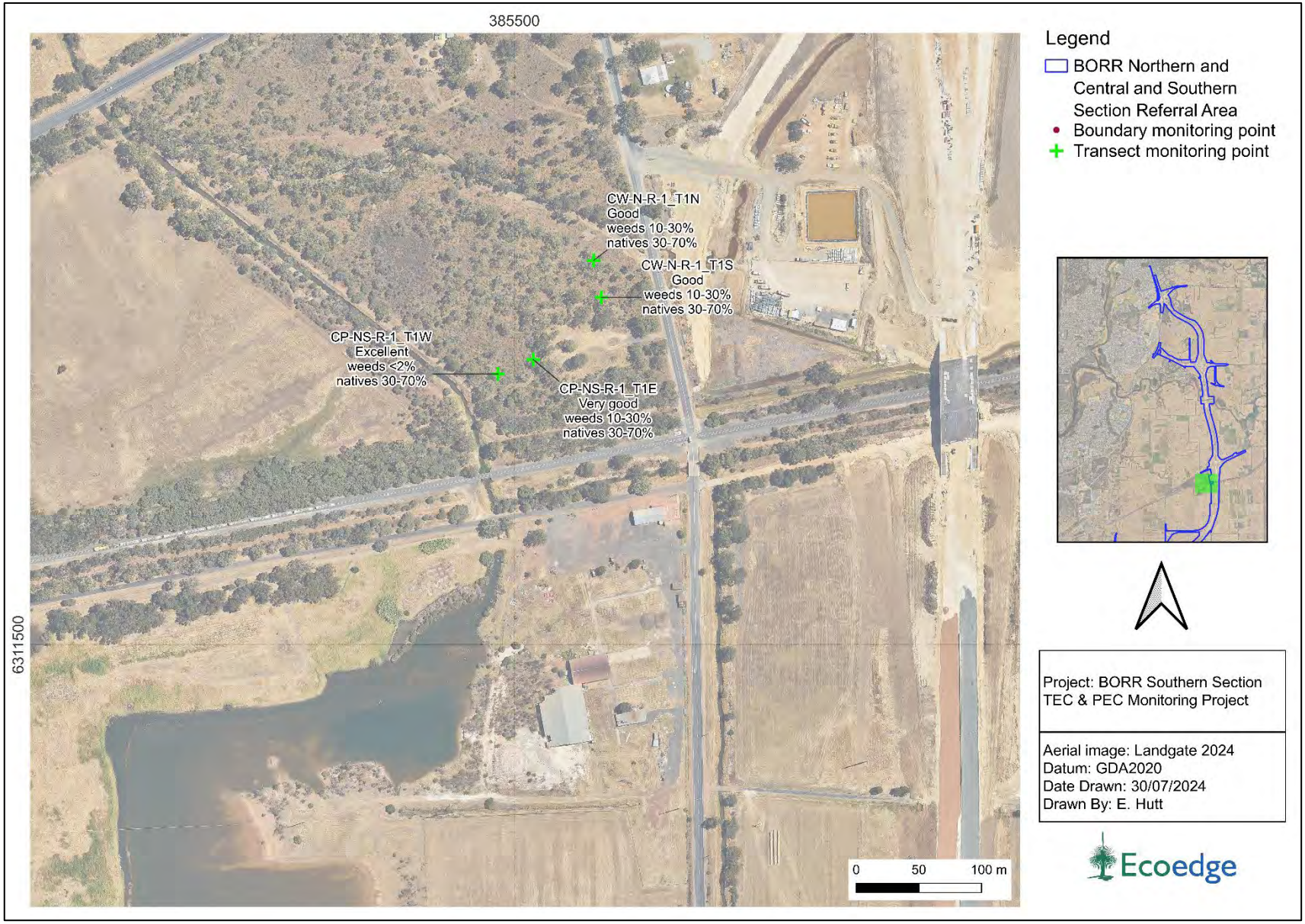


Figure 31. 2024 reference site CP-NS-R-1 vegetation condition, weed and native cover.

Appendix 2. Index to all photographs taken during the monitoring survey.

Name [Site]	Photo Id	Latitude [Site]	Longitude [Site]	Date and time of photo
BTW-S-I-3_T1E	664ffd524be8e4051da94d54	-33.3858393	115.6516662	May 24, 2024 10:36
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BTW-S-I-3_T1E	628ed7194be8e47fc6d9d078	-33.3858393	115.6516662	May 24, 2024 10:36
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BTW-S-I-3_T1E	628ed6b94be8e47fc6d9d06f	-33.3858393	115.6516662	May 24, 2024 10:36
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BTW-S-I-3_T1W	628ed6814be8e47fc6d9d069	-33.3857365	115.6514139	May 24, 2024 10:40
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BTW-S-I-3_T1W	628ed63e4be8e47fc5af0fce	-33.3857365	115.6514139	May 24, 2024 10:40
BTW-S-I-3_T1W	628ed6224be8e47fc6d9d066	-33.3857365	115.6514139	May 24, 2024 10:40

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BTW-S-I-3_T1W	6167def04be8e4203d3cba84	-33.3857365	115.6514139	May 24, 2024 10:40
BTW-S-I-3_T1W	60c2e1487f1cccf58e00000d	-33.3857365	115.6514139	May 24, 2024 10:40
BTW-S-I-3_T1W	60c2e0a77f1cccf58e000004	-33.3857365	115.6514139	May 24, 2024 10:40
BTW-S-I-3_T1W	5f967b8c7f1ccc23e200000e	-33.3857365	115.6514139	May 24, 2024 10:40
BTW-S-I-3_T1W	5f967b417f1cccac22000007	-33.3857365	115.6514139	May 24, 2024 10:40
BTW-S-I-3_T1W	5f967a5c7f1ccc23e2000008	-33.3857365	115.6514139	May 24, 2024 10:40
BTW-S-I-3_T1W	5f967a057f1ccc23e2000001	-33.3857365	115.6514139	May 24, 2024 10:40
BTW-S-I-3_T1W	5ecc795e7f1ccc22ac000019	-33.3857365	115.6514139	May 24, 2024 10:40
BTW-S-I-3_T1W	5dd37e2f7f1cccf0cb000017	-33.3857365	115.6514139	May 24, 2024 10:40
BTW-S-I-5_P01	5dd7578b7f1ccc82ad000046	-33.4012035	115.6749654	November 22, 2019 11:35
BTW-S-I-6_P01	665142574be8e4051da94dcf	-33.4161131	115.6592936	May 25, 2024 09:43
BTW-S-I-6_P01	6549ad2d4be8e4051da941d7	-33.4161131	115.6592936	May 25, 2024 09:43
BTW-S-I-6_P01	634cd93f4be8e47fc6d9d5f7	-33.4161131	115.6592936	May 25, 2024 09:43
BTW-S-I-6_P01	628d86b74be8e47fc5af0f30	-33.4161131	115.6592936	May 25, 2024 09:43
BTW-S-I-6_P01	61667fbe4be8e4203d3cb862	-33.4161131	115.6592936	May 25, 2024 09:43
BTW-S-I-6_P01	6166791f4be8e4203d3cb843	-33.4161131	115.6592936	May 25, 2024 09:43
BTW-S-I-6_P01	5f8fdacd7f1ccc2ac100002d	-33.4161131	115.6592936	May 25, 2024 09:43
BTW-S-I-6_P01	5ec4e6027f1ccc67da000008	-33.4161131	115.6592936	May 25, 2024 09:43
BTW-S-I-6_P01	5dd740be7f1ccc82ad000026	-33.4161131	115.6592936	May 25, 2024 09:43
BTW-S-I-6_P02	665142bb4be8e4051da94dd2	-33.4161588	115.6595102	May 25, 2024 09:45
BTW-S-I-6_P02	6549aca44be8e4051cbf7b3c	-33.4161588	115.6595102	May 25, 2024 09:45
BTW-S-I-6_P02	634cd8934be8e47fc5af15b9	-33.4161588	115.6595102	May 25, 2024 09:45
BTW-S-I-6_P02	628d841b4be8e47fc6d9cfcd	-33.4161588	115.6595102	May 25, 2024 09:45
BTW-S-I-6_P02	616686d84be8e4203d3cb869	-33.4161588	115.6595102	May 25, 2024 09:45
BTW-S-I-6_P02	616679234be8e4203d3cb845	-33.4161588	115.6595102	May 25, 2024 09:45
BTW-S-I-6_P02	5f8fdc577f1ccc2ac1000037	-33.4161588	115.6595102	May 25, 2024 09:45
BTW-S-I-6_P02	5ec4e4c97f1ccc67da000004	-33.4161588	115.6595102	May 25, 2024 09:45
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BTW-S-I-6_P03	6651432e4be8e4051da94dd5	-33.4162611	115.6603852	May 25, 2024 09:47
BTW-S-I-6_P03	6549ac344be8e4051cbf7b39	-33.4162611	115.6603852	May 25, 2024 09:47
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BTW-S-I-6_P03	61667d004be8e4203d3cb849	-33.4162611	115.6603852	May 25, 2024 09:47
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BTW-S-I-6_P03	5f8fdd117f1ccc2ac100003a	-33.4162611	115.6603852	May 25, 2024 09:47
BTW-S-I-6_P03	5ec4e4227f1ccc67da000001	-33.4162611	115.6603852	May 25, 2024 09:47
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BTW-S-I-6_P04	665144054be8e4051da94dd8	-33.4162714	115.6610338	May 25, 2024 09:48
BTW-S-I-6_P04	6549abb74be8e4051cbf7b36	-33.4162714	115.6610338	May 25, 2024 09:48
BTW-S-I-6_P04	634cd5a84be8e47fc6d9d5f4	-33.4162714	115.6610338	May 25, 2024 09:48
BTW-S-I-6_P04	628d831f4be8e47fc6d9cfca	-33.4162714	115.6610338	May 25, 2024 09:48
BTW-S-I-6_P04	616674bb4be8e4203d3cb826	-33.4162714	115.6610338	May 25, 2024 09:48
BTW-S-I-6_P04	5f8fdd407f1ccc2ac100003d	-33.4162714	115.6610338	May 25, 2024 09:48
BTW-S-I-6_P04	5ec4e1ae7f1ccc0b9800000d	-33.4162714	115.6610338	May 25, 2024 09:48

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BTW-S-I-6_P05	665144234be8e4051cbf8656	-33.4162598	115.662019	May 25, 2024 09:51
BTW-S-I-6_P05	6549aaf54be8e4051cbf7b33	-33.4162598	115.662019	May 25, 2024 09:51
BTW-S-I-6_P05	634cd53f4be8e47fc5af15b3	-33.4162598	115.662019	May 25, 2024 09:51
BTW-S-I-6_P05	628d82724be8e47fc6d9cfc7	-33.4162598	115.662019	May 25, 2024 09:51
BTW-S-I-6_P05	5f8fde147f1ccc2ac1000041	-33.4162598	115.662019	May 25, 2024 09:51
BTW-S-I-6_P05	5ec4e26e7f1ccc0b98000010	-33.4162598	115.662019	May 25, 2024 09:51
BTW-S-I-6_P05	5dd7469f7f1ccc82ad000036	-33.4162598	115.662019	May 25, 2024 09:51
BTW-S-I-6_P06	665144674be8e4051da94ddb	-33.416307	115.6625752	May 25, 2024 09:52
BTW-S-I-6_P06	6549aa3f4be8e4051da941d4	-33.416307	115.6625752	May 25, 2024 09:52
BTW-S-I-6_P06	634cd4054be8e47fc6d9d5f1	-33.416307	115.6625752	May 25, 2024 09:52
BTW-S-I-6_P06	628d81cb4be8e47fc6d9cfc4	-33.416307	115.6625752	May 25, 2024 09:52
BTW-S-I-6_P06	61667d214be8e4203d3cb84d	-33.416307	115.6625752	May 25, 2024 09:52
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BTW-S-I-6_P06	5f962d537f1ccc707400000d	-33.416307	115.6625752	May 25, 2024 09:52
BTW-S-I-6_P06	5f962d067f1ccc7074000007	-33.416307	115.6625752	May 25, 2024 09:52
BTW-S-I-6_P06	5f962cf47f1ccc7074000004	-33.416307	115.6625752	May 25, 2024 09:52
BTW-S-I-6_P06	5f962cc47f1ccc7074000001	-33.416307	115.6625752	May 25, 2024 09:52
BTW-S-I-6_P06	5f9618957f1ccc7e15000008	-33.416307	115.6625752	May 25, 2024 09:52
BTW-S-I-6_P06	5f96187d7f1ccc7e15000005	-33.416307	115.6625752	May 25, 2024 09:52
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BTW-S-I-6_P06	5ec4e3847f1ccc0b98000013	-33.416307	115.6625752	May 25, 2024 09:52
BTW-S-I-6_P06	5dd747f87f1ccc82ad00003a	-33.416307	115.6625752	May 25, 2024 09:52
BTW-SI-I-2_P9a	5f8f8ffb7f1ccc23a300001c	-33.38562668	115.6491556	October 21, 2020 09:33
BTW-SI-I-2_P9a	5f236b207f1cccec9d000001	-33.38562668	115.6491556	October 21, 2020 09:33
BTW-S-R-2_T1N	6653d6bc4be8e4051cbf8693	-33.3848005	115.6287575	May 27, 2024 08:40
BTW-S-R-2_T1N	634f55654be8e47fc6d9d6e0	-33.3848005	115.6287575	May 27, 2024 08:40
BTW-S-R-2_T1N	628f07024be8e47fc6d9d100	-33.3848005	115.6287575	May 27, 2024 08:40
BTW-S-R-2_T1N	628f06204be8e47fc5af103f	-33.3848005	115.6287575	May 27, 2024 08:40
BTW-S-R-2_T1N	617360234be8e4e8b9b4b9ad	-33.3848005	115.6287575	May 27, 2024 08:40
BTW-S-R-2_T1N	60c2e1787f1cccf58e000010	-33.3848005	115.6287575	May 27, 2024 08:40
BTW-S-R-2_T1N	60c2e1257f1cccf58e000007	-33.3848005	115.6287575	May 27, 2024 08:40
BTW-S-R-2_T1N	60c2e09f7f1cccf58e000001	-33.3848005	115.6287575	May 27, 2024 08:40
BTW-S-R-2_T1N	5f967ba07f1ccc23e2000011	-33.3848005	115.6287575	May 27, 2024 08:40
BTW-S-R-2_T1N	5f967b7d7f1cccac2200000b	-33.3848005	115.6287575	May 27, 2024 08:40
BTW-S-R-2_T1N	5f967b367f1cccac22000004	-33.3848005	115.6287575	May 27, 2024 08:40
BTW-S-R-2_T1N	5ec7764d7f1ccc9315000004	-33.3848005	115.6287575	May 27, 2024 08:40
BTW-S-R-2_T1N	5eb3c1367f1ccc7087000001	-33.3848005	115.6287575	May 27, 2024 08:40
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BTW-S-R-2_T1S	6653f1044be8e4051cbf8696	-33.3851131	115.6286841	May 27, 2024 08:47
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BTW-S-R-2_T1S	6536542d4be8e4051da9409d	-33.3851131	115.6286841	May 27, 2024 08:47
BTW-S-R-2_T1S	634f58174be8e47fc5af16b9	-33.3851131	115.6286841	May 27, 2024 08:47
BTW-S-R-2_T1S	617360f24be8e4e8b9b4b9bb	-33.3851131	115.6286841	May 27, 2024 08:47
BTW-S-R-2_T1S	617360774be8e4e8b9b4b9af	-33.3851131	115.6286841	May 27, 2024 08:47

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BTW-S-R-2_T1S	5ec776217f1ccc9315000001	-33.3851131	115.6286841	May 27, 2024 08:47
BW-S-PI-1_P01	665002464be8e4051da94d57	-33.3858932	115.6498828	May 24, 2024 10:58
BW-S-PI-1_P01	65166a0b4be8e4051cbf7931	-33.3858932	115.6498828	May 24, 2024 10:58
BW-S-PI-1_P01	634f8a184be8e47fc6d9d6fe	-33.3858932	115.6498828	May 24, 2024 10:58
BW-S-PI-1_P01	628ee9d24be8e47fc6d9d0e2	-33.3858932	115.6498828	May 24, 2024 10:58
BW-S-PI-1_P01	628ee9bb4be8e47fc5af102b	-33.3858932	115.6498828	May 24, 2024 10:58
BW-S-PI-1_P01	628ee9654be8e47fc5af1022	-33.3858932	115.6498828	May 24, 2024 10:58
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BW-S-PI-1_P01	628ee8bc4be8e47fc6d9d0ca	-33.3858932	115.6498828	May 24, 2024 10:58
BW-S-PI-1_P01	628ee8864be8e47fc6d9d0c1	-33.3858932	115.6498828	May 24, 2024 10:58
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BW-S-PI-1_P01	628ee7fb4be8e47fc6d9d0a3	-33.3858932	115.6498828	May 24, 2024 10:58
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BW-S-PI-1_P01	6167c7784be8e4203d3cba68	-33.3858932	115.6498828	May 24, 2024 10:58
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BW-S-PI-1_P01	5ecc79e97f1cccda86000007	-33.3858932	115.6498828	May 24, 2024 10:58
BW-S-PI-1_P01	5dd5fd5d7f1ccc236a000018	-33.3858932	115.6498828	May 24, 2024 10:58
BW-S-PI-1_P02	665000fe4be8e4051cbf85da	-33.3858199	115.6503764	May 24, 2024 10:52
BW-S-PI-1_P02	651669644be8e4051da93f9c	-33.3858199	115.6503764	May 24, 2024 10:52
BW-S-PI-1_P02	634f8ccd4be8e47fc6d9d737	-33.3858199	115.6503764	May 24, 2024 10:52
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BW-S-PI-1_P02	634f8c314be8e47fc6d9d728	-33.3858199	115.6503764	May 24, 2024 10:52
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BW-S-PI-1_P02	628ee9504be8e47fc6d9d0d9	-33.3858199	115.6503764	May 24, 2024 10:52
BW-S-PI-1_P02	628ee8f34be8e47fc5af100a	-33.3858199	115.6503764	May 24, 2024 10:52
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BW-S-PI-1_P03	634f8cf54be8e47fc6d9d740	-33.3857995	115.6510326	May 24, 2024 10:46
BW-S-PI-1_P03	634f8cd64be8e47fc6d9d73a	-33.3857995	115.6510326	May 24, 2024 10:46
BW-S-PI-1_P03	634f8c904be8e47fc5af16e9	-33.3857995	115.6510326	May 24, 2024 10:46
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BW-S-PI-1_P03	634f8b164be8e47fc6d9d707	-33.3857995	115.6510326	May 24, 2024 10:46
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BW-S-PI-1_P03	628ee9464be8e47fc6d9d0d3	-33.3857995	115.6510326	May 24, 2024 10:46
BW-S-PI-1_P03	628ee8f44be8e47fc5af100b	-33.3857995	115.6510326	May 24, 2024 10:46
BW-S-PI-1_P03	628ee89e4be8e47fc5af1004	-33.3857995	115.6510326	May 24, 2024 10:46
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BW-S-PI-1_P03	616928904be8e4203d3cbb95	-33.3857995	115.6510326	May 24, 2024 10:46
BW-S-PI-1_P03	616922de4be8e4203d3cbb7f	-33.3857995	115.6510326	May 24, 2024 10:46
BW-S-PI-1_P03	6168c6c84be8e4203d3cbae1	-33.3857995	115.6510326	May 24, 2024 10:46
BW-S-PI-1_P03	6167e8704be8e4203d3cbaac	-33.3857995	115.6510326	May 24, 2024 10:46
BW-S-PI-1_P03	6167e6664be8e4203d3cba99	-33.3857995	115.6510326	May 24, 2024 10:46
BW-S-PI-1_P03	6167e5774be8e4203d3cba90	-33.3857995	115.6510326	May 24, 2024 10:46
BW-S-PI-1_P03	5f8f98167f1ccca22b000007	-33.3857995	115.6510326	May 24, 2024 10:46
BW-S-PI-1_P03	5ecc79c77f1cccda86000004	-33.3857995	115.6510326	May 24, 2024 10:46
BW-S-PI-1_P03	5dd600437f1ccc236a000020	-33.3857995	115.6510326	May 24, 2024 10:46
BW-S-PI-1_P04	664ffbb04be8e4051cbf85d1	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	651668484be8e4051da93f96	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	634f8ce04be8e47fc6d9d73d	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	634f8ca34be8e47fc6d9d734	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	634f8c8e4be8e47fc5af16e6	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	634f8c334be8e47fc5af16dd	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	634f8be34be8e47fc6d9d713	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	634f8b004be8e47fc5af16cb	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	634f8a2e4be8e47fc6d9d701	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	628ee9a94be8e47fc5af1028	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	628ee9514be8e47fc5af101c	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	628ee8f94be8e47fc5af1010	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	628ee8ba4be8e47fc6d9d0c7	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	628ee87c4be8e47fc6d9d0be	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	628ee83c4be8e47fc6d9d0ac	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	617360df4be8e4e8b9b4b9b7	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	616922ef4be8e4203d3cbb83	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	6168c6c94be8e4203d3cbae3	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	6167e8744be8e4203d3cbab0	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	6167e69f4be8e4203d3cba9b	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	6167e5674be8e4203d3cba8e	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	5f8f9a637f1ccca22b00000a	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	5ecc79527f1ccc22ac000016	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P04	5dd601657f1ccc236a000024	-33.3859093	115.6516872	May 24, 2024 10:29
BW-S-PI-1_P05	664ffb354be8e4051da94d51	-33.3860766	115.652174	May 24, 2024 10:27
BW-S-PI-1_P05	651666b24be8e4051cbf792e	-33.3860766	115.652174	May 24, 2024 10:27
BW-S-PI-1_P05	634f8cea4be8e47fc5af16ef	-33.3860766	115.652174	May 24, 2024 10:27

Name [Site]	Photo Id	Latitude [Site]	Longitude [Site]	Date and time of photo
BW-S-PI-1_P05	634f8c8f4be8e47fc6d9d72e	-33.3860766	115.652174	May 24, 2024 10:27
BW-S-PI-1_P05	634f8c364be8e47fc5af16e0	-33.3860766	115.652174	May 24, 2024 10:27
BW-S-PI-1_P05	634f8be84be8e47fc6d9d719	-33.3860766	115.652174	May 24, 2024 10:27
BW-S-PI-1_P05	634f8b744be8e47fc5af16d1	-33.3860766	115.652174	May 24, 2024 10:27
BW-S-PI-1_P05	628ee8344be8e47fc5af0fef	-33.3860766	115.652174	May 24, 2024 10:27
BW-S-PI-1_P05	617360f24be8e4e8b9b4b9bc	-33.3860766	115.652174	May 24, 2024 10:27
BW-S-PI-1_P05	6167e8714be8e4203d3cbaae	-33.3860766	115.652174	May 24, 2024 10:27
BW-S-PI-1_P05	6167e6ae4be8e4203d3cba9d	-33.3860766	115.652174	May 24, 2024 10:27
BW-S-PI-1_P05	6167e5784be8e4203d3cba91	-33.3860766	115.652174	May 24, 2024 10:27
BW-S-PI-1_P05	5f8f9b847f1ccca22b00000d	-33.3860766	115.652174	May 24, 2024 10:27
BW-S-PI-1_P05	5ecc741a7f1cccddde000027	-33.3860766	115.652174	May 24, 2024 10:27
BW-S-PI-1_P05	5dd602267f1ccc236a000028	-33.3860766	115.652174	May 24, 2024 10:27
BW-S-PI-2_P01	66515e814be8e4051cbf8677	-33.42761859	115.6401493	May 25, 2024 11:43
BW-S-PI-2_P01	65164b664be8e4051cbf7928	-33.42761859	115.6401493	May 25, 2024 11:43
BW-S-PI-2_P01	634cf0a34be8e47fc6d9d5fd	-33.42761859	115.6401493	May 25, 2024 11:43
BW-S-PI-2_P01	628d9b924be8e47fc6d9cfdc	-33.42761859	115.6401493	May 25, 2024 11:43
BW-S-PI-2_P01	6166952b4be8e4203d3cb898	-33.42761859	115.6401493	May 25, 2024 11:43
BW-S-PI-2_P01	5f8fc65b7f1ccc5ea6000001	-33.42761859	115.6401493	May 25, 2024 11:43
BW-S-PI-2_P01	5ecca7c87f1ccc3cd1000010	-33.42761859	115.6401493	May 25, 2024 11:43
BW-S-PI-2_P02	66515ebb4be8e4051da94e08	-33.42725507	115.6401015	May 25, 2024 11:44
BW-S-PI-2_P02	65164bbd4be8e4051da93f86	-33.42725507	115.6401015	May 25, 2024 11:44
BW-S-PI-2_P02	634cf0ee4be8e47fc6d9d600	-33.42725507	115.6401015	May 25, 2024 11:44
BW-S-PI-2_P02	628d9c3d4be8e47fc6d9cfdf	-33.42725507	115.6401015	May 25, 2024 11:44
BW-S-PI-2_P02	5f8fc87f7f1ccc5ea6000005	-33.42725507	115.6401015	May 25, 2024 11:44
BW-S-PI-2_P02	5ecc9cfe7f1cccce9400000a	-33.42725507	115.6401015	May 25, 2024 11:44
BW-S-PI-2_P03	66515f2b4be8e4051da94e0b	-33.4268483	115.6401301	May 25, 2024 11:46
BW-S-PI-2_P03	651661414be8e4051da93f8c	-33.4268483	115.6401301	May 25, 2024 11:46
BW-S-PI-2_P03	634cf1d24be8e47fc5af15ce	-33.4268483	115.6401301	May 25, 2024 11:46
BW-S-PI-2_P03	628d9ccf4be8e47fc6d9cfe2	-33.4268483	115.6401301	May 25, 2024 11:46
BW-S-PI-2_P03	628d9cbf4be8e47fc5af0f3f	-33.4268483	115.6401301	May 25, 2024 11:46
BW-S-PI-2_P03	6167703d4be8e4203d3cb8ba	-33.4268483	115.6401301	May 25, 2024 11:46
BW-S-PI-2_P03	616696564be8e4203d3cb8a1	-33.4268483	115.6401301	May 25, 2024 11:46
BW-S-PI-2_P03	616689914be8e4203d3cb886	-33.4268483	115.6401301	May 25, 2024 11:46
BW-S-PI-2_P03	5f8fc8e07f1ccc5ea6000008	-33.4268483	115.6401301	May 25, 2024 11:46
BW-S-PI-2_P03	5ecc95e27f1cccb399000044	-33.4268483	115.6401301	May 25, 2024 11:46
BW-S-PI-2_P05	665160284be8e4051da94e0e	-33.4268697	115.6396042	May 25, 2024 11:50
BW-S-PI-2_P05	65164ccf4be8e4051da93f89	-33.4268697	115.6396042	May 25, 2024 11:50

Name [Site]	Photo Id	Latitude [Site]	Longitude [Site]	Date and time of photo
BW-S-PI-2_P05	634cf66e4be8e47fc5af15d1	-33.4268697	115.6396042	May 25, 2024 11:50
BW-S-PI-2_P05	628d9d564be8e47fc6d9cfe5	-33.4268697	115.6396042	May 25, 2024 11:50
BW-S-PI-2_P05	616774094be8e4203d3cb8d8	-33.4268697	115.6396042	May 25, 2024 11:50
BW-S-PI-2_P05	6167701c4be8e4203d3cb8b4	-33.4268697	115.6396042	May 25, 2024 11:50
BW-S-PI-2_P05	616696364be8e4203d3cb89b	-33.4268697	115.6396042	May 25, 2024 11:50
BW-S-PI-2_P05	5f8fcf377f1ccc2ac1000004	-33.4268697	115.6396042	May 25, 2024 11:50
BW-S-PI-2_P05	5f8fcf177f1ccc2ac1000001	-33.4268697	115.6396042	May 25, 2024 11:50
BW-S-PI-2_P05	5ecc99467f1ccc21a1000005	-33.4268697	115.6396042	May 25, 2024 11:50
BW-S-PI-3_P01	66514a534be8e4051cbf865f	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	6549b7d74be8e4051da941e6	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	634cea224be8e47fc5af15cb	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	628d972b4be8e47fc6d9cfd9	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	616770294be8e4203d3cb8b8	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	616696384be8e4203d3cb89d	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	616689e54be8e4203d3cb88c	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	616687784be8e4203d3cb871	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	6166870f4be8e4203d3cb86d	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	5f8fdafc7f1ccc2ac1000034	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	5f8fdadf7f1ccc2ac1000030	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	5f8fda3a7f1ccc2ac100002a	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	5f8fda287f1ccc2ac1000027	-33.4226741	115.6450023	May 25, 2024 10:17
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BW-S-PI-3_P01	5f8fd6e27f1ccc2ac100001c	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	5ec649717f1cccc9f6000004	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	5ec6495f7f1cccc9f6000001	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	5ec649407f1ccc668000001f	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	5ec6492e7f1ccc668000001c	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	5ec649177f1ccc6680000019	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	5ec649047f1ccc6680000016	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	5ec648cc7f1ccc6680000013	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	5ec648b97f1ccc6680000010	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	5ec6488c7f1ccc668000000d	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	5ec4edec7f1ccc3711000005	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P01	5dd61f447f1ccc82ad000002	-33.4226741	115.6450023	May 25, 2024 10:17
BW-S-PI-3_P02	665149fc4be8e4051da94de1	-33.4226731	115.6455322	May 25, 2024 10:16
BW-S-PI-3_P02	6549b7584be8e4051da941e3	-33.4226731	115.6455322	May 25, 2024 10:16
BW-S-PI-3_P02	634ce99b4be8e47fc5af15c8	-33.4226731	115.6455322	May 25, 2024 10:16
BW-S-PI-3_P02	628d8c824be8e47fc5af0f3c	-33.4226731	115.6455322	May 25, 2024 10:16
BW-S-PI-3_P02	628d8c754be8e47fc5af0f39	-33.4226731	115.6455322	May 25, 2024 10:16
BW-S-PI-3_P02	616696524be8e4203d3cb89f	-33.4226731	115.6455322	May 25, 2024 10:16
BW-S-PI-3_P02	616689dd4be8e4203d3cb88a	-33.4226731	115.6455322	May 25, 2024 10:16
BW-S-PI-3_P02	616687aa4be8e4203d3cb873	-33.4226731	115.6455322	May 25, 2024 10:16
BW-S-PI-3_P02	6166870d4be8e4203d3cb86b	-33.4226731	115.6455322	May 25, 2024 10:16
BW-S-PI-3_P02	5f8fd5b57f1ccc2ac1000019	-33.4226731	115.6455322	May 25, 2024 10:16
BW-S-PI-3_P02	5f8fd59f7f1ccc2ac1000016	-33.4226731	115.6455322	May 25, 2024 10:16
BW-S-PI-3_P02	5ec4ecb07f1ccce3c0000010	-33.4226731	115.6455322	May 25, 2024 10:16
BW-S-PI-3_P02	5dd6203f7f1ccc82ad000006	-33.4226731	115.6455322	May 25, 2024 10:16

Name [Site]	Photo Id	Latitude [Site]	Longitude [Site]	Date and time of photo
BW-S-PI-3_P03	66514b714be8e4051da94de4	-33.4227269	115.6460349	May 25, 2024 10:19
BW-S-PI-3_P03	6549b6de4be8e4051da941e0	-33.4227269	115.6460349	May 25, 2024 10:19
BW-S-PI-3_P03	634ce9524be8e47fc5af15c5	-33.4227269	115.6460349	May 25, 2024 10:19
BW-S-PI-3_P03	628d8c0b4be8e47fc6d9cfd6	-33.4227269	115.6460349	May 25, 2024 10:19
BW-S-PI-3_P03	616689c24be8e4203d3cb888	-33.4227269	115.6460349	May 25, 2024 10:19
BW-S-PI-3_P03	616687d24be8e4203d3cb877	-33.4227269	115.6460349	May 25, 2024 10:19
BW-S-PI-3_P03	61667f094be8e4203d3cb859	-33.4227269	115.6460349	May 25, 2024 10:19
BW-S-PI-3_P03	5f8fd4cc7f1ccc2ac1000012	-33.4227269	115.6460349	May 25, 2024 10:19
BW-S-PI-3_P03	5ec4eb9e7f1ccce3c0000007	-33.4227269	115.6460349	May 25, 2024 10:19
BW-S-PI-3_P03	5dd621337f1ccc82ad00000a	-33.4227269	115.6460349	May 25, 2024 10:19
BW-S-PI-3_P04	66514bef4be8e4051da94de7	-33.4225602	115.646502	May 25, 2024 10:24
BW-S-PI-3_P04	6549b5fe4be8e4051cbf7b45	-33.4225602	115.646502	May 25, 2024 10:24
BW-S-PI-3_P04	634ce8e84be8e47fc5af15c2	-33.4225602	115.646502	May 25, 2024 10:24
BW-S-PI-3_P04	628d8b684be8e47fc5af0f36	-33.4225602	115.646502	May 25, 2024 10:24
BW-S-PI-3_P04	6166893b4be8e4203d3cb884	-33.4225602	115.646502	May 25, 2024 10:24
BW-S-PI-3_P04	616687cc4be8e4203d3cb875	-33.4225602	115.646502	May 25, 2024 10:24
BW-S-PI-3_P04	61667fa24be8e4203d3cb85f	-33.4225602	115.646502	May 25, 2024 10:24
BW-S-PI-3_P04	61667f374be8e4203d3cb85c	-33.4225602	115.646502	May 25, 2024 10:24
BW-S-PI-3_P04	61667d0d4be8e4203d3cb84b	-33.4225602	115.646502	May 25, 2024 10:24
BW-S-PI-3_P04	5f8fd3bd7f1ccc2ac100000e	-33.4225602	115.646502	May 25, 2024 10:24
BW-S-PI-3_P04	5ec4e9ec7f1ccce3c0000001	-33.4225602	115.646502	May 25, 2024 10:24
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BW-S-PI-3_P05	66514c4a4be8e4051cbf8662	-33.422316	115.6470271	May 25, 2024 10:26
BW-S-PI-3_P05	665149314be8e4051cbf865c	-33.422316	115.6470271	May 25, 2024 10:26
BW-S-PI-3_P05	6549b4964be8e4051da941da	-33.422316	115.6470271	May 25, 2024 10:26
BW-S-PI-3_P05	634ce80f4be8e47fc5af15bf	-33.422316	115.6470271	May 25, 2024 10:26
BW-S-PI-3_P05	628d8a6c4be8e47fc6d9cfd3	-33.422316	115.6470271	May 25, 2024 10:26
BW-S-PI-3_P05	61667e494be8e4203d3cb852	-33.422316	115.6470271	May 25, 2024 10:26
BW-S-PI-3_P05	5ec4ebad7f1ccce3c000000a	-33.422316	115.6470271	May 25, 2024 10:26
BW-S-PI-3_P05	5ec4eb2e7f1ccce3c0000004	-33.422316	115.6470271	May 25, 2024 10:26
BW-S-PI-3_P05	5dd6233e7f1ccc82ad000012	-33.422316	115.6470271	May 25, 2024 10:26
BW-S-PI-3_P06	665148c74be8e4051da94dde	-33.4216707	115.6470518	May 25, 2024 10:10
BW-S-PI-3_P06	6549b3074be8e4051cbf7b42	-33.4216707	115.6470518	May 25, 2024 10:10
BW-S-PI-3_P06	634ce6dc4be8e47fc6d9d5fa	-33.4216707	115.6470518	May 25, 2024 10:10
BW-S-PI-3_P06	628d895e4be8e47fc6d9cfd0	-33.4216707	115.6470518	May 25, 2024 10:10
BW-S-PI-3_P06	616688854be8e4203d3cb87e	-33.4216707	115.6470518	May 25, 2024 10:10
BW-S-PI-3_P06	5f8fd1467f1ccc2ac100000a	-33.4216707	115.6470518	May 25, 2024 10:10
BW-S-PI-3_P06	5ec4ec297f1ccce3c000000d	-33.4216707	115.6470518	May 25, 2024 10:10
BW-S-PI-3_P06	5dd624287f1ccc82ad000016	-33.4216707	115.6470518	May 25, 2024 10:10
BW-S-PI-3_P07	665148334be8e4051cbf8659	-33.4212879	115.6470898	May 25, 2024 10:08
BW-S-PI-3_P07	6549b2bf4be8e4051cbf7b3f	-33.4212879	115.6470898	May 25, 2024 10:08
BW-S-PI-3_P07	634ce5b64be8e47fc5af15bc	-33.4212879	115.6470898	May 25, 2024 10:08
BW-S-PI-3_P07	628d88d04be8e47fc5af0f33	-33.4212879	115.6470898	May 25, 2024 10:08
BW-S-PI-3_P07	5f8fd03d7f1ccc2ac1000007	-33.4212879	115.6470898	May 25, 2024 10:08
BW-S-PI-3_P07	5ec4ece57f1ccc3711000001	-33.4212879	115.6470898	May 25, 2024 10:08
BW-S-PI-3_P07	5dd625277f1ccc82ad00001a	-33.4212879	115.6470898	May 25, 2024 10:08
BW-S-PI-5_P01	665048d44be8e4051da94dc0	-33.4403155	115.6092812	May 24, 2024 15:59

Name [Site]	Photo Id	Latitude [Site]	Longitude [Site]	Date and time of photo
BW-S-PI-5_P01	6516306c4be8e4051cbf7909	-33.4403155	115.6092812	May 24, 2024 15:59
BW-S-PI-5_P01	6350baf34be8e47fc5af1773	-33.4403155	115.6092812	May 24, 2024 15:59
BW-S-PI-5_P01	628dc77d4be8e47fc5af0f9f	-33.4403155	115.6092812	May 24, 2024 15:59
BW-S-PI-5_P01	616777de4be8e4203d3cb8fd	-33.4403155	115.6092812	May 24, 2024 15:59
BW-S-PI-5_P01	616775e04be8e4203d3cb8ea	-33.4403155	115.6092812	May 24, 2024 15:59
BW-S-PI-5_P01	616773714be8e4203d3cb8d2	-33.4403155	115.6092812	May 24, 2024 15:59
BW-S-PI-5_P01	5f9239bf7f1ccc903d000016	-33.4403155	115.6092812	May 24, 2024 15:59
BW-S-PI-5_P01	5ec7398e7f1cccbde0000001	-33.4403155	115.6092812	May 24, 2024 15:59
BW-S-PI-5_P01	5dd497a37f1ccc6080000005	-33.4403155	115.6092812	May 24, 2024 15:59
BW-S-PI-5_P02	665048384be8e4051da94db7	-33.4402387	115.6099411	May 24, 2024 15:56
BW-S-PI-5_P02	65162ffc4be8e4051da93f6b	-33.4402387	115.6099411	May 24, 2024 15:56
BW-S-PI-5_P02	6350ba4e4be8e47fc5af1770	-33.4402387	115.6099411	May 24, 2024 15:56
BW-S-PI-5_P02	628dc6f64be8e47fc5af0f9c	-33.4402387	115.6099411	May 24, 2024 15:56
BW-S-PI-5_P02	61677ab94be8e4203d3cb919	-33.4402387	115.6099411	May 24, 2024 15:56
BW-S-PI-5_P02	616777f84be8e4203d3cb8ff	-33.4402387	115.6099411	May 24, 2024 15:56
BW-S-PI-5_P02	6167764a4be8e4203d3cb8ed	-33.4402387	115.6099411	May 24, 2024 15:56
BW-S-PI-5_P02	616773524be8e4203d3cb8d0	-33.4402387	115.6099411	May 24, 2024 15:56
BW-S-PI-5_P02	5f9238a57f1ccc903d000013	-33.4402387	115.6099411	May 24, 2024 15:56
BW-S-PI-5_P02	5ec73a427f1cccbde0000004	-33.4402387	115.6099411	May 24, 2024 15:56
BW-S-PI-5_P02	5dd498de7f1ccc6080000009	-33.4402387	115.6099411	May 24, 2024 15:56
BW-S-PI-5_P03	665047ce4be8e4051cbf8632	-33.4400637	115.6103677	May 24, 2024 15:54
BW-S-PI-5_P03	65162f8d4be8e4051da93f68	-33.4400637	115.6103677	May 24, 2024 15:54
BW-S-PI-5_P03	65162f714be8e4051cbf7906	-33.4400637	115.6103677	May 24, 2024 15:54
BW-S-PI-5_P03	6350b93c4be8e47fc5af176d	-33.4400637	115.6103677	May 24, 2024 15:54
BW-S-PI-5_P03	628dc6684be8e47fc5af0f99	-33.4400637	115.6103677	May 24, 2024 15:54
BW-S-PI-5_P03	61677a214be8e4203d3cb915	-33.4400637	115.6103677	May 24, 2024 15:54
BW-S-PI-5_P03	616777a84be8e4203d3cb8f9	-33.4400637	115.6103677	May 24, 2024 15:54
BW-S-PI-5_P03	6167767c4be8e4203d3cb8f0	-33.4400637	115.6103677	May 24, 2024 15:54
BW-S-PI-5_P03	616775964be8e4203d3cb8e6	-33.4400637	115.6103677	May 24, 2024 15:54
BW-S-PI-5_P03	5f9238147f1ccc903d000010	-33.4400637	115.6103677	May 24, 2024 15:54
BW-S-PI-5_P03	5ec73aee7f1cccbde0000007	-33.4400637	115.6103677	May 24, 2024 15:54
BW-S-PI-5_P03	5dd499837f1ccc608000000d	-33.4400637	115.6103677	May 24, 2024 15:54
BW-S-PI-5_P04	665048b14be8e4051da94dbd	-33.43959751	115.6108167	May 24, 2024 15:51
BW-S-PI-5_P04	6650483f4be8e4051da94dba	-33.43959751	115.6108167	May 24, 2024 15:51
BW-S-PI-5_P04	665048244be8e4051cbf863e	-33.43959751	115.6108167	May 24, 2024 15:51
BW-S-PI-5_P04	665048164be8e4051cbf863b	-33.43959751	115.6108167	May 24, 2024 15:51
BW-S-PI-5_P04	665047f74be8e4051cbf8638	-33.43959751	115.6108167	May 24, 2024 15:51
BW-S-PI-5_P04	665047ed4be8e4051cbf8635	-33.43959751	115.6108167	May 24, 2024 15:51
BW-S-PI-5_P04	665047dd4be8e4051da94db4	-33.43959751	115.6108167	May 24, 2024 15:51
BW-S-PI-5_P04	665047be4be8e4051cbf862f	-33.43959751	115.6108167	May 24, 2024 15:51

Name [Site]	Photo Id	Latitude [Site]	Longitude [Site]	Date and time of photo
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BW-S-PI-5_P04	665047464be8e4051cbf862c	-33.43959751	115.6108167	May 24, 2024 15:51
BW-S-PI-5_P04	665047254be8e4051cbf8629	-33.43959751	115.6108167	May 24, 2024 15:51
BW-S-PI-5_P04	65162ed34be8e4051da93f65	-33.43959751	115.6108167	May 24, 2024 15:51
BW-S-PI-5_P04	6350b7b54be8e47fc6d9d7b7	-33.43959751	115.6108167	May 24, 2024 15:51
BW-S-PI-5_P04	628dc5f84be8e47fc6d9d026	-33.43959751	115.6108167	May 24, 2024 15:51
BW-S-PI-5_P04	61677d954be8e4203d3cb930	-33.43959751	115.6108167	May 24, 2024 15:51
BW-S-PI-5_P04	61677a104be8e4203d3cb913	-33.43959751	115.6108167	May 24, 2024 15:51
BW-S-PI-5_P04	616777c14be8e4203d3cb8fb	-33.43959751	115.6108167	May 24, 2024 15:51
BW-S-PI-5_P04	5f225e017f1ccc2172000008	-33.43959751	115.6108167	May 24, 2024 15:51
BW-S-PI-5_P05	665046af4be8e4051cbf8626	-33.43942836	115.6113988	May 24, 2024 15:49
BW-S-PI-5_P05	65162e5b4be8e4051cbf7903	-33.43942836	115.6113988	May 24, 2024 15:49
BW-S-PI-5_P05	6350b7174be8e47fc5af176a	-33.43942836	115.6113988	May 24, 2024 15:49
BW-S-PI-5_P05	628dc5104be8e47fc5af0f96	-33.43942836	115.6113988	May 24, 2024 15:49
BW-S-PI-5_P05	61677fc44be8e4203d3cb945	-33.43942836	115.6113988	May 24, 2024 15:49
BW-S-PI-5_P05	61677d954be8e4203d3cb931	-33.43942836	115.6113988	May 24, 2024 15:49
BW-S-PI-5_P05	61677ab64be8e4203d3cb917	-33.43942836	115.6113988	May 24, 2024 15:49
BW-S-PI-5_P05	5f9234b57f1ccc903d00000a	-33.43942836	115.6113988	May 24, 2024 15:49
BW-S-PI-5_P05	5f2261257f1ccc217200000c	-33.43942836	115.6113988	May 24, 2024 15:49
BW-S-PI-5_P06	665046344be8e4051da94dae	-33.43975391	115.6117089	May 24, 2024 15:47
BW-S-PI-5_P06	65162e174be8e4051da93f62	-33.43975391	115.6117089	May 24, 2024 15:47
BW-S-PI-5_P06	6350b5c64be8e47fc5af1767	-33.43975391	115.6117089	May 24, 2024 15:47
BW-S-PI-5_P06	628dc0f54be8e47fc5af0f90	-33.43975391	115.6117089	May 24, 2024 15:47
BW-S-PI-5_P06	61677f1d4be8e4203d3cb940	-33.43975391	115.6117089	May 24, 2024 15:47
BW-S-PI-5_P06	61677cf14be8e4203d3cb92c	-33.43975391	115.6117089	May 24, 2024 15:47
BW-S-PI-5_P06	5f92356f7f1ccc903d00000d	-33.43975391	115.6117089	May 24, 2024 15:47
BW-S-PI-5_P06	5f22671c7f1ccc2172000011	-33.43975391	115.6117089	May 24, 2024 15:47

Name [Site]	Photo Id	Latitude [Site]	Longitude [Site]	Date and time of photo
BW-S-PI-5_P07	665045984be8e4051cbf8623	-33.4400094	115.6112618	May 24, 2024 15:44
BW-S-PI-5_P07	65162d454be8e4051cbf7900	-33.4400094	115.6112618	May 24, 2024 15:44
BW-S-PI-5_P07	6350b5194be8e47fc6d9d7b4	-33.4400094	115.6112618	May 24, 2024 15:44
BW-S-PI-5_P07	628dc3254be8e47fc5af0f93	-33.4400094	115.6112618	May 24, 2024 15:44
BW-S-PI-5_P07	61677f1f4be8e4203d3cb942	-33.4400094	115.6112618	May 24, 2024 15:44
BW-S-PI-5_P07	61677cf14be8e4203d3cb92e	-33.4400094	115.6112618	May 24, 2024 15:44
BW-S-PI-5_P07	5f923a8a7f1ccc903d000019	-33.4400094	115.6112618	May 24, 2024 15:44
BW-S-PI-5_P07	5f225a227f1ccc2172000001	-33.4400094	115.6112618	May 24, 2024 15:44
BW-S-PI-5_P07	5ec73c557f1cccbde000000a	-33.4400094	115.6112618	May 24, 2024 15:44
BW-S-PI-5_P07	5dd49b8e7f1ccc6080000012	-33.4400094	115.6112618	May 24, 2024 15:44
BW-S-PI-5_P08	665044d44be8e4051cbf8620	-33.4399534	115.6117959	May 24, 2024 15:41
BW-S-PI-5_P08	65162cda4be8e4051da93f5f	-33.4399534	115.6117959	May 24, 2024 15:41
BW-S-PI-5_P08	6350b4724be8e47fc5af1764	-33.4399534	115.6117959	May 24, 2024 15:41
BW-S-PI-5_P08	628dc0734be8e47fc5af0f8d	-33.4399534	115.6117959	May 24, 2024 15:41
BW-S-PI-5_P08	5f923b257f1ccc903d00001c	-33.4399534	115.6117959	May 24, 2024 15:41
BW-S-PI-5_P08	5ec73d987f1cccbde000000d	-33.4399534	115.6117959	May 24, 2024 15:41
BW-S-PI-5_P08	5dd49c547f1ccc6080000016	-33.4399534	115.6117959	May 24, 2024 15:41
BW-S-PI-5_P09	665044774be8e4051da94dab	-33.4400469	115.6125537	May 24, 2024 15:40
BW-S-PI-5_P09	65162c554be8e4051cbf78fd	-33.4400469	115.6125537	May 24, 2024 15:40
BW-S-PI-5_P09	6350b2ff4be8e47fc5af1761	-33.4400469	115.6125537	May 24, 2024 15:40
BW-S-PI-5_P09	628dbf774be8e47fc5af0f8a	-33.4400469	115.6125537	May 24, 2024 15:40
BW-S-PI-5_P09	5f923c2d7f1ccc903d00001f	-33.4400469	115.6125537	May 24, 2024 15:40
BW-S-PI-5_P09	5ec73ea37f1cccbde0000010	-33.4400469	115.6125537	May 24, 2024 15:40
BW-S-PI-5_P09	5dd49daf7f1ccc608000001a	-33.4400469	115.6125537	May 24, 2024 15:40
BW-S-PI-5_P10	665043914be8e4051da94da8	-33.4400371	115.6131205	May 24, 2024 15:36
BW-S-PI-5_P10	65162a754be8e4051da93f5c	-33.4400371	115.6131205	May 24, 2024 15:36
BW-S-PI-5_P10	6350b1484be8e47fc6d9d7b1	-33.4400371	115.6131205	May 24, 2024 15:36
BW-S-PI-5_P10	628dbeac4be8e47fc5af0f87	-33.4400371	115.6131205	May 24, 2024 15:36
BW-S-PI-5_P10	6167abd24be8e4203d3cba0c	-33.4400371	115.6131205	May 24, 2024 15:36
BW-S-PI-5_P10	5f923cd37f1ccc903d000022	-33.4400371	115.6131205	May 24, 2024 15:36
BW-S-PI-5_P10	5ec73f797f1cccbde0000013	-33.4400371	115.6131205	May 24, 2024 15:36
BW-S-PI-5_P10	5dd49f2b7f1ccc608000001e	-33.4400371	115.6131205	May 24, 2024 15:36
BW-S-PI-5_P11	665042d94be8e4051da94da5	-33.4397621	115.613363	May 24, 2024 15:33
BW-S-PI-5_P11	6516297d4be8e4051cbf78fa	-33.4397621	115.613363	May 24, 2024 15:33
BW-S-PI-5_P11	6350b0f84be8e47fc6d9d7ae	-33.4397621	115.613363	May 24, 2024 15:33
BW-S-PI-5_P11	628dbdd44be8e47fc5af0f84	-33.4397621	115.613363	May 24, 2024 15:33
BW-S-PI-5_P11	616794754be8e4203d3cb9e2	-33.4397621	115.613363	May 24, 2024 15:33
BW-S-PI-5_P11	5f923d827f1ccc903d000025	-33.4397621	115.613363	May 24, 2024 15:33
BW-S-PI-5_P11	5ec740267f1cccbde0000016	-33.4397621	115.613363	May 24, 2024 15:33
BW-S-PI-5_P11	5dd4a03c7f1ccc6080000022	-33.4397621	115.613363	May 24, 2024 15:33
BW-S-PI-5_P12	6650422c4be8e4051cbf861d	-33.4395357	115.6139467	May 24, 2024 15:30
BW-S-PI-5_P12	6516290b4be8e4051cbf78f7	-33.4395357	115.6139467	May 24, 2024 15:30
BW-S-PI-5_P12	6350b02c4be8e47fc6d9d7ab	-33.4395357	115.6139467	May 24, 2024 15:30
BW-S-PI-5_P12	628dbd804be8e47fc5af0f81	-33.4395357	115.6139467	May 24, 2024 15:30
BW-S-PI-5_P12	5f9242377f1ccc57b8000001	-33.4395357	115.6139467	May 24, 2024 15:30
BW-S-PI-5_P12	5ec740db7f1cccbde0000019	-33.4395357	115.6139467	May 24, 2024 15:30
BW-S-PI-5_P12	5dd4a1147f1ccc6080000026	-33.4395357	115.6139467	May 24, 2024 15:30

Name [Site]	Photo Id	Latitude [Site]	Longitude [Site]	Date and time of photo
BW-S-PI-5_P13	6650419c4be8e4051cbf861a	-33.43920071	115.6133654	May 24, 2024 15:28
BW-S-PI-5_P13	6516288f4be8e4051da93f59	-33.43920071	115.6133654	May 24, 2024 15:28
BW-S-PI-5_P13	6350af764be8e47fc5af175e	-33.43920071	115.6133654	May 24, 2024 15:28
BW-S-PI-5_P13	628dbcd84be8e47fc5af0f7e	-33.43920071	115.6133654	May 24, 2024 15:28
BW-S-PI-5_P13	616792734be8e4203d3cb9d2	-33.43920071	115.6133654	May 24, 2024 15:28
BW-S-PI-5_P13	5f9233357f1ccc903d000007	-33.43920071	115.6133654	May 24, 2024 15:28
BW-S-PI-5_P13	5f226b497f1ccc2172000019	-33.43920071	115.6133654	May 24, 2024 15:28
BW-S-PI-5_P14	665040bf4be8e4051da94da2	-33.43889548	115.6136528	May 24, 2024 15:24
BW-S-PI-5_P14	651627f94be8e4051da93f56	-33.43889548	115.6136528	May 24, 2024 15:24
BW-S-PI-5_P14	6350adb24be8e47fc6d9d7a8	-33.43889548	115.6136528	May 24, 2024 15:24
BW-S-PI-5_P14	628dbbfd4be8e47fc6d9d023	-33.43889548	115.6136528	May 24, 2024 15:24
BW-S-PI-5_P14	616791d34be8e4203d3cb9cd	-33.43889548	115.6136528	May 24, 2024 15:24
BW-S-PI-5_P14	5f9232197f1ccc903d000004	-33.43889548	115.6136528	May 24, 2024 15:24
BW-S-PI-5_P14	5f226d5e7f1cccaf9b000002	-33.43889548	115.6136528	May 24, 2024 15:24
BW-S-PI-5_P15	6650400e4be8e4051da94d9f	-33.4390552	115.6141635	May 24, 2024 15:21
BW-S-PI-5_P15	651627974be8e4051da93f53	-33.4390552	115.6141635	May 24, 2024 15:21
BW-S-PI-5_P15	6350abab4be8e47fc5af175b	-33.4390552	115.6141635	May 24, 2024 15:21
BW-S-PI-5_P15	628dbb3c4be8e47fc5af0f7b	-33.4390552	115.6141635	May 24, 2024 15:21
BW-S-PI-5_P15	616791044be8e4203d3cb9c5	-33.4390552	115.6141635	May 24, 2024 15:21
BW-S-PI-5_P15	5f9242ea7f1ccc57b8000004	-33.4390552	115.6141635	May 24, 2024 15:21
BW-S-PI-5_P15	5ec7420b7f1cccbde000001c	-33.4390552	115.6141635	May 24, 2024 15:21
BW-S-PI-5_P15	5dd4a2177f1ccc608000002a	-33.4390552	115.6141635	May 24, 2024 15:21
BW-S-PI-5_P16	66503cc44be8e4051da94d99	-33.4381435	115.6143935	May 24, 2024 15:07
BW-S-PI-5_P16	651625f94be8e4051cbf78f1	-33.4381435	115.6143935	May 24, 2024 15:07
BW-S-PI-5_P16	6350a9d84be8e47fc6d9d79f	-33.4381435	115.6143935	May 24, 2024 15:07
BW-S-PI-5_P16	628db9454be8e47fc5af0f73	-33.4381435	115.6143935	May 24, 2024 15:07
BW-S-PI-5_P16	61676f674be8e4203d3cb8b0	-33.4381435	115.6143935	May 24, 2024 15:07
BW-S-PI-5_P16	5f9245d17f1ccc57b8000007	-33.4381435	115.6143935	May 24, 2024 15:07
BW-S-PI-5_P16	5ec745967f1cccbde0000022	-33.4381435	115.6143935	May 24, 2024 15:07
BW-S-PI-5_P16	5ec744fd7f1cccbde000001f	-33.4381435	115.6143935	May 24, 2024 15:07
BW-S-PI-5_P16	5dd4a40a7f1ccc0978000002	-33.4381435	115.6143935	May 24, 2024 15:07
BW-S-PI-5_P17	66503c054be8e4051da94d96	-33.4377572	115.6147622	May 24, 2024 15:04
BW-S-PI-5_P17	651625564be8e4051da93f50	-33.4377572	115.6147622	May 24, 2024 15:04
BW-S-PI-5_P17	6350a90a4be8e47fc5af1755	-33.4377572	115.6147622	May 24, 2024 15:04
BW-S-PI-5_P17	628db84c4be8e47fc6d9d016	-33.4377572	115.6147622	May 24, 2024 15:04
BW-S-PI-5_P17	616774524be8e4203d3cb8dc	-33.4377572	115.6147622	May 24, 2024 15:04

Name [Site]	Photo Id	Latitude [Site]	Longitude [Site]	Date and time of photo
BW-S-PI-5_P17	5f9247197f1ccc57b800000a	-33.4377572	115.6147622	May 24, 2024 15:04
BW-S-PI-5_P17	5ec7478b7f1cccbde000002b	-33.4377572	115.6147622	May 24, 2024 15:04
BW-S-PI-5_P17	5dd4a5117f1ccc0978000006	-33.4377572	115.6147622	May 24, 2024 15:04
BW-S-PI-5_P18	66503b744be8e4051cbf8611	-33.4373637	115.6148172	May 24, 2024 15:01
BW-S-PI-5_P18	651624ef4be8e4051cbf78ee	-33.4373637	115.6148172	May 24, 2024 15:01
BW-S-PI-5_P18	6350a8774be8e47fc6d9d796	-33.4373637	115.6148172	May 24, 2024 15:01
BW-S-PI-5_P18	628db76b4be8e47fc5af0f70	-33.4373637	115.6148172	May 24, 2024 15:01
BW-S-PI-5_P18	616775724be8e4203d3cb8e4	-33.4373637	115.6148172	May 24, 2024 15:01
BW-S-PI-5_P18	5f924cb17f1ccc57b800000d	-33.4373637	115.6148172	May 24, 2024 15:01
BW-S-PI-5_P18	5ec749ed7f1cccbde000002e	-33.4373637	115.6148172	May 24, 2024 15:01
BW-S-PI-5_P18	5dd4a5fb7f1ccc097800000a	-33.4373637	115.6148172	May 24, 2024 15:01
BW-S-PI-5_P19	66503ac54be8e4051da94d93	-33.4368847	115.6148976	May 24, 2024 14:58
BW-S-PI-5_P19	6516245a4be8e4051da93f4d	-33.4368847	115.6148976	May 24, 2024 14:58
BW-S-PI-5_P19	6350a8074be8e47fc6d9d793	-33.4368847	115.6148976	May 24, 2024 14:58
BW-S-PI-5_P19	628db6c04be8e47fc5af0f6d	-33.4368847	115.6148976	May 24, 2024 14:58
BW-S-PI-5_P19	616776a04be8e4203d3cb8f2	-33.4368847	115.6148976	May 24, 2024 14:58
BW-S-PI-5_P19	5f924d937f1ccc57b8000010	-33.4368847	115.6148976	May 24, 2024 14:58
BW-S-PI-5_P19	5ec7542c7f1cccbde0000031	-33.4368847	115.6148976	May 24, 2024 14:58
BW-S-PI-5_P19	5dd4aa2d7f1ccca2bf000002	-33.4368847	115.6148976	May 24, 2024 14:58
BW-S-PI-5_P20	665039ae4be8e4051da94d90	-33.4364571	115.6152007	May 24, 2024 14:54
BW-S-PI-5_P20	651624044be8e4051cbf78eb	-33.4364571	115.6152007	May 24, 2024 14:54
BW-S-PI-5_P20	6350a7174be8e47fc5af1752	-33.4364571	115.6152007	May 24, 2024 14:54
BW-S-PI-5_P20	628db6084be8e47fc6d9d013	-33.4364571	115.6152007	May 24, 2024 14:54
BW-S-PI-5_P20	616779474be8e4203d3cb909	-33.4364571	115.6152007	May 24, 2024 14:54
BW-S-PI-5_P20	5f924ea97f1ccc57b8000013	-33.4364571	115.6152007	May 24, 2024 14:54
BW-S-PI-5_P20	5ec755227f1cccfa0d000004	-33.4364571	115.6152007	May 24, 2024 14:54
BW-S-PI-5_P20	5dd4aad67f1ccca2bf000006	-33.4364571	115.6152007	May 24, 2024 14:54
BW-S-PI-5_P21	665039014be8e4051da94d8d	-33.4359254	115.6153474	May 24, 2024 14:51
BW-S-PI-5_P21	651623704be8e4051da93f4a	-33.4359254	115.6153474	May 24, 2024 14:51
BW-S-PI-5_P21	6350a6aa4be8e47fc6d9d790	-33.4359254	115.6153474	May 24, 2024 14:51
BW-S-PI-5_P21	628db5714be8e47fc6d9d010	-33.4359254	115.6153474	May 24, 2024 14:51
BW-S-PI-5_P21	616779634be8e4203d3cb90d	-33.4359254	115.6153474	May 24, 2024 14:51
BW-S-PI-5_P21	5f924fce7f1ccc57b8000016	-33.4359254	115.6153474	May 24, 2024 14:51
BW-S-PI-5_P21	5ec7566d7f1cccfa0d000008	-33.4359254	115.6153474	May 24, 2024 14:51
BW-S-PI-5_P21	5dd4abce7f1ccca2bf00000a	-33.4359254	115.6153474	May 24, 2024 14:51
BW-S-PI-5_P22	6650385f4be8e4051cbf860e	-33.4355875	115.6156514	May 24, 2024 14:47
BW-S-PI-5_P22	651622d44be8e4051da93f47	-33.4355875	115.6156514	May 24, 2024 14:47
BW-S-PI-5_P22	6350a6214be8e47fc5af174f	-33.4355875	115.6156514	May 24, 2024 14:47
BW-S-PI-5_P22	628db4f24be8e47fc6d9d00d	-33.4355875	115.6156514	May 24, 2024 14:47
BW-S-PI-5_P22	6167794f4be8e4203d3cb90b	-33.4355875	115.6156514	May 24, 2024 14:47
BW-S-PI-5_P22	5f92659a7f1ccc57b8000019	-33.4355875	115.6156514	May 24, 2024 14:47
BW-S-PI-5_P22	5ec757427f1cccfa0d00000b	-33.4355875	115.6156514	May 24, 2024 14:47
BW-S-PI-5_P22	5dd4ad1b7f1ccc3da8000002	-33.4355875	115.6156514	May 24, 2024 14:47
BW-S-PI-5_P23	665037244be8e4051da94d8a	-33.4351053	115.6157648	May 24, 2024 14:43
BW-S-PI-5_P23	6350a5854be8e47fc6d9d78d	-33.4351053	115.6157648	May 24, 2024 14:43
BW-S-PI-5_P23	628db2ab4be8e47fc5af0f69	-33.4351053	115.6157648	May 24, 2024 14:43
BW-S-PI-5_P23	616779f54be8e4203d3cb910	-33.4351053	115.6157648	May 24, 2024 14:43

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BW-S-PI-5_P23	5ec758727f1cccfa0d00000e	-33.4351053	115.6157648	May 24, 2024 14:43
BW-S-PI-5_P23	5dd4ade27f1ccc3da8000006	-33.4351053	115.6157648	May 24, 2024 14:43
BW-S-PI-5_P24	6650363c4be8e4051da94d87	-33.4346058	115.6160213	May 24, 2024 14:39
BW-S-PI-5_P24	65161e324be8e4051cbf78e8	-33.4346058	115.6160213	May 24, 2024 14:39
BW-S-PI-5_P24	6350a4fa4be8e47fc6d9d78a	-33.4346058	115.6160213	May 24, 2024 14:39
BW-S-PI-5_P24	628db1de4be8e47fc6d9d00a	-33.4346058	115.6160213	May 24, 2024 14:39
BW-S-PI-5_P24	61677b804be8e4203d3cb921	-33.4346058	115.6160213	May 24, 2024 14:39
BW-S-PI-5_P24	5f9267a27f1ccc57b800001f	-33.4346058	115.6160213	May 24, 2024 14:39
BW-S-PI-5_P24	5ec7598f7f1cccfa0d000011	-33.4346058	115.6160213	May 24, 2024 14:39
BW-S-PI-5_P24	5dd4aeb97f1ccc3da800000a	-33.4346058	115.6160213	May 24, 2024 14:39
BW-S-PI-5_P25	665035ef4be8e4051da94d84	-33.4340331	115.6162208	May 24, 2024 14:38
BW-S-PI-5_P25	65161da94be8e4051cbf78e5	-33.4340331	115.6162208	May 24, 2024 14:38
BW-S-PI-5_P25	628db0a74be8e47fc5af0f66	-33.4340331	115.6162208	May 24, 2024 14:38
BW-S-PI-5_P25	616781d84be8e4203d3cb955	-33.4340331	115.6162208	May 24, 2024 14:38
BW-S-PI-5_P25	5f9268d17f1ccc57b8000022	-33.4340331	115.6162208	May 24, 2024 14:38
BW-S-PI-5_P25	5ec75aa67f1ccca8e4000004	-33.4340331	115.6162208	May 24, 2024 14:38
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BW-S-PI-5_P26	665032f24be8e4051cbf860b	-33.4336439	115.6162346	May 24, 2024 14:25
BW-S-PI-5_P26	65161d804be8e4051da93f44	-33.4336439	115.6162346	May 24, 2024 14:25
BW-S-PI-5_P26	6350a3524be8e47fc6d9d787	-33.4336439	115.6162346	May 24, 2024 14:25
BW-S-PI-5_P26	628daf5d4be8e47fc6d9d007	-33.4336439	115.6162346	May 24, 2024 14:25
BW-S-PI-5_P26	61677dc04be8e4203d3cb936	-33.4336439	115.6162346	May 24, 2024 14:25
BW-S-PI-5_P26	5f9269c67f1ccc57b8000025	-33.4336439	115.6162346	May 24, 2024 14:25
BW-S-PI-5_P26	5ec75b727f1ccca8e4000016	-33.4336439	115.6162346	May 24, 2024 14:25
BW-S-PI-5_P26	5dd4b03c7f1ccc7137000002	-33.4336439	115.6162346	May 24, 2024 14:25
BW-S-PI-5_P27	665031724be8e4051cbf8608	-33.4324012	115.6167063	May 24, 2024 14:19
BW-S-PI-5_P27	65161c094be8e4051da93f41	-33.4324012	115.6167063	May 24, 2024 14:19
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BW-S-PI-5_P27	6350a1434be8e47fc6d9d781	-33.4324012	115.6167063	May 24, 2024 14:19
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BW-S-PI-5_P27	5f926b927f1ccc57b8000028	-33.4324012	115.6167063	May 24, 2024 14:19
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BW-S-PI-5_P27	5dd4b5cd7f1ccc7137000006	-33.4324012	115.6167063	May 24, 2024 14:19
BW-S-PI-5_P28	66502ffb4be8e4051cbf8605	-33.4317055	115.6169872	May 24, 2024 14:12
BW-S-PI-5_P28	65161b4e4be8e4051cbf78df	-33.4317055	115.6169872	May 24, 2024 14:12
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BW-S-PI-5_P28	5ec75a747f1cccfa0d000017	-33.4317055	115.6169872	May 24, 2024 14:12
BW-S-PI-5_P28	5dd4c7647f1ccc713700000a	-33.4317055	115.6169872	May 24, 2024 14:12
BW-S-PI-5_P29	66502ef04be8e4051da94d7e	-33.4312614	115.6172137	May 24, 2024 14:08
BW-S-PI-5_P29	65161abe4be8e4051da93f3e	-33.4312614	115.6172137	May 24, 2024 14:08
BW-S-PI-5_P29	63509ff94be8e47fc5af1746	-33.4312614	115.6172137	May 24, 2024 14:08

Name [Site]	Photo Id	Latitude [Site]	Longitude [Site]	Date and time of photo
BW-S-PI-5_P29	628da95d4be8e47fc6d9cffa	-33.4312614	115.6172137	May 24, 2024 14:08
BW-S-PI-5_P29	616785fd4be8e4203d3cb975	-33.4312614	115.6172137	May 24, 2024 14:08
BW-S-PI-5_P29	5f926d397f1ccc57b800002e	-33.4312614	115.6172137	May 24, 2024 14:08
BW-S-PI-5_P29	5ec75a867f1cccc384000001	-33.4312614	115.6172137	May 24, 2024 14:08
BW-S-PI-5_P29	5dd4c84e7f1ccc713700000e	-33.4312614	115.6172137	May 24, 2024 14:08
BW-S-PI-5_P30	66502df04be8e4051da94d7b	-33.4306416	115.6173231	May 24, 2024 14:04
BW-S-PI-5_P30	65161a9c4be8e4051da93f3b	-33.4306416	115.6173231	May 24, 2024 14:04
BW-S-PI-5_P30	63509f5d4be8e47fc5af1743	-33.4306416	115.6173231	May 24, 2024 14:04
BW-S-PI-5_P30	628da83b4be8e47fc6d9cff4	-33.4306416	115.6173231	May 24, 2024 14:04
BW-S-PI-5_P30	616788cb4be8e4203d3cb98d	-33.4306416	115.6173231	May 24, 2024 14:04
BW-S-PI-5_P30	5f926e047f1ccc57b8000031	-33.4306416	115.6173231	May 24, 2024 14:04
BW-S-PI-5_P30	5ec75b377f1ccca8e4000010	-33.4306416	115.6173231	May 24, 2024 14:04
BW-S-PI-5_P30	5ec75afb7f1cccc384000007	-33.4306416	115.6173231	May 24, 2024 14:04
BW-S-PI-5_P30	5ec75acf7f1ccca8e400000a	-33.4306416	115.6173231	May 24, 2024 14:04
BW-S-PI-5_P30	5ec75a697f1cccfa0d000014	-33.4306416	115.6173231	May 24, 2024 14:04
BW-S-PI-5_P30	5dd4cca97f1ccc7137000012	-33.4306416	115.6173231	May 24, 2024 14:04
BW-S-PI-5_P31	66502d584be8e4051da94d78	-33.4302755	115.6175042	May 24, 2024 14:01
BW-S-PI-5_P31	651619e34be8e4051cbf78dc	-33.4302755	115.6175042	May 24, 2024 14:01
BW-S-PI-5_P31	63509dc24be8e47fc5af1740	-33.4302755	115.6175042	May 24, 2024 14:01
BW-S-PI-5_P31	628da7b64be8e47fc5af0f57	-33.4302755	115.6175042	May 24, 2024 14:01
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BW-S-PI-5_P31	5ec75a857f1ccc6f0c000001	-33.4302755	115.6175042	May 24, 2024 14:01
BW-S-PI-5_P31	5dd4cd887f1ccc7137000016	-33.4302755	115.6175042	May 24, 2024 14:01
BW-S-PI-5_P32	66502c8c4be8e4051cbf8602	-33.4297671	115.6176874	May 24, 2024 13:58
BW-S-PI-5_P32	6516195e4be8e4051da93f38	-33.4297671	115.6176874	May 24, 2024 13:58
BW-S-PI-5_P32	63509ccb4be8e47fc6d9d77e	-33.4297671	115.6176874	May 24, 2024 13:58
BW-S-PI-5_P32	628da7334be8e47fc5af0f54	-33.4297671	115.6176874	May 24, 2024 13:58
BW-S-PI-5_P32	61678fba4be8e4203d3cb9bf	-33.4297671	115.6176874	May 24, 2024 13:58
BW-S-PI-5_P32	5f92702e7f1ccc57b8000037	-33.4297671	115.6176874	May 24, 2024 13:58
BW-S-PI-5_P32	5ec75b3f7f1ccca8e4000013	-33.4297671	115.6176874	May 24, 2024 13:58
BW-S-PI-5_P32	5ec75afd7f1ccca8e400000d	-33.4297671	115.6176874	May 24, 2024 13:58
BW-S-PI-5_P32	5ec75a867f1ccca8e4000001	-33.4297671	115.6176874	May 24, 2024 13:58
BW-S-PI-5_P32	5dd4d0a07f1ccc713700001a	-33.4297671	115.6176874	May 24, 2024 13:58
BW-S-PI-5_P33	5f92717d7f1ccc57b800003a	-33.4291572	115.6177403	October 23, 2020 13:55
BW-S-PI-5_P33	5dd4d3447f1ccc713700001e	-33.4291572	115.6177403	October 23, 2020 13:55
BW-S-PI-5_P34	5f9272cd7f1ccc57b800003d	-33.4286451	115.6180688	October 23, 2020 14:01
BW-S-PI-5_P34	5dd4d5da7f1ccc56be000002	-33.4286451	115.6180688	October 23, 2020 14:01
BW-S-PI-5_P35	5fb9f9ac7f1ccc9f2d000001	-33.4282338	115.6181962	October 23, 2020 14:07
BW-S-PI-5_P35	5dd4d8227f1ccc56be000006	-33.4282338	115.6181962	October 23, 2020 14:07
BW-S-PI-5_T1N	66503d504be8e4051cbf8614	-33.4381292	115.6144303	May 24, 2024 15:09
BW-S-PI-5_T1N	6528b2d54be8e4051cbf7a06	-33.4381292	115.6144303	May 24, 2024 15:09
BW-S-PI-5_T1N	6350a9754be8e47fc6d9d79c	-33.4381292	115.6144303	May 24, 2024 15:09
BW-S-PI-5_T1N	634d02324be8e47fc5af15da	-33.4381292	115.6144303	May 24, 2024 15:09
BW-S-PI-5_T1N	628db8b04be8e47fc6d9d019	-33.4381292	115.6144303	May 24, 2024 15:09
BW-S-PI-5_T1N	5f86b7027f1ccc8a9d00000f	-33.4381292	115.6144303	May 24, 2024 15:09
BW-S-PI-5_T1N	5ec746ab7f1cccbde0000028	-33.4381292	115.6144303	May 24, 2024 15:09

Name [Site]	Photo Id	Latitude [Site]	Longitude [Site]	Date and time of photo
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BW-S-PI-5_T1S	6350aa114be8e47fc6d9d7a2	-33.4383257	115.614306	May 24, 2024 15:11
BW-S-PI-5_T1S	634d0a8c4be8e47fc6d9d609	-33.4383257	115.614306	May 24, 2024 15:11
BW-S-PI-5_T1S	628db97d4be8e47fc6d9d01c	-33.4383257	115.614306	May 24, 2024 15:11
BW-S-PI-5_T1S	6167b9904be8e4203d3cba19	-33.4383257	115.614306	May 24, 2024 15:11
BW-S-PI-5_T1S	5f86aa4c7f1ccc8a9d00000c	-33.4383257	115.614306	May 24, 2024 15:11
BW-S-PI-5_T1S	5f86a6f37f1ccc8a9d000008	-33.4383257	115.614306	May 24, 2024 15:11
BW-S-PI-5_T1S	5ec746287f1cccbde0000025	-33.4383257	115.614306	May 24, 2024 15:11
BW-S-PI-5_T1S	5dd4e7137f1ccc12cb000006	-33.4383257	115.614306	May 24, 2024 15:11
BW-S-PI-6_P01	66504c2c4be8e4051cbf8644	-33.4547108	115.6041219	May 24, 2024 16:13
BW-S-PI-6_P01	651641614be8e4051da93f7a	-33.4547108	115.6041219	May 24, 2024 16:13
BW-S-PI-6_P01	634cf8494be8e47fc5af15d4	-33.4547108	115.6041219	May 24, 2024 16:13
BW-S-PI-6_P01	628dd3054be8e47fc5af0fa2	-33.4547108	115.6041219	May 24, 2024 16:13
BW-S-PI-6_P01	6168eee14be8e4203d3cbb35	-33.4547108	115.6041219	May 24, 2024 16:13
BW-S-PI-6_P01	5f9223447f1ccc78d0000004	-33.4547108	115.6041219	May 24, 2024 16:13
BW-S-PI-6_P01	5ec76cf47f1ccca8e4000025	-33.4547108	115.6041219	May 24, 2024 16:13
BW-S-PI-6_P01	5ec764f27f1ccca8e400001a	-33.4547108	115.6041219	May 24, 2024 16:13
BW-S-PI-6_P02	66504d134be8e4051da94dc3	-33.453729	115.6048411	May 24, 2024 16:17
BW-S-PI-6_P02	6516428a4be8e4051da93f7d	-33.453729	115.6048411	May 24, 2024 16:17
BW-S-PI-6_P02	634cf8fb4be8e47fc5af15d7	-33.453729	115.6048411	May 24, 2024 16:17
BW-S-PI-6_P02	628dd3c04be8e47fc6d9d02a	-33.453729	115.6048411	May 24, 2024 16:17
BW-S-PI-6_P02	6168f0ad4be8e4203d3cbb3f	-33.453729	115.6048411	May 24, 2024 16:17
BW-S-PI-6_P02	5f92245d7f1ccc78d0000007	-33.453729	115.6048411	May 24, 2024 16:17
BW-S-PI-6_P02	5ec766207f1ccca8e400001e	-33.453729	115.6048411	May 24, 2024 16:17
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BW-S-PI-6_P03	634cfa364be8e47fc6d9d606	-33.4517653	115.6060602	May 24, 2024 16:23
BW-S-PI-6_P03	628dd7724be8e47fc5af0fa9	-33.4517653	115.6060602	May 24, 2024 16:23
BW-S-PI-6_P03	628dd6ce4be8e47fc5af0fa6	-33.4517653	115.6060602	May 24, 2024 16:23
BW-S-PI-6_P03	628dd6984be8e47fc6d9d037	-33.4517653	115.6060602	May 24, 2024 16:23
BW-S-PI-6_P03	628dd68c4be8e47fc6d9d034	-33.4517653	115.6060602	May 24, 2024 16:23
BW-S-PI-6_P03	628dd6644be8e47fc6d9d030	-33.4517653	115.6060602	May 24, 2024 16:23
BW-S-PI-6_P03	628dd4e34be8e47fc6d9d02d	-33.4517653	115.6060602	May 24, 2024 16:23
BW-S-PI-6_P03	616918354be8e4203d3cbb6a	-33.4517653	115.6060602	May 24, 2024 16:23
BW-S-PI-6_P03	5f92312c7f1ccc903d000001	-33.4517653	115.6060602	May 24, 2024 16:23
BW-S-PI-6_P03	5ec767417f1ccca8e4000022	-33.4517653	115.6060602	May 24, 2024 16:23
BW-S-PI-6_P04	66504b564be8e4051cbf8641	-33.45583966	115.6033989	May 24, 2024 16:09
BW-S-PI-6_P04	651640cb4be8e4051da93f77	-33.45583966	115.6033989	May 24, 2024 16:09
BW-S-PI-6_P04	634cf7984be8e47fc6d9d603	-33.45583966	115.6033989	May 24, 2024 16:09
BW-S-PI-6_P04	628dd6ad4be8e47fc6d9d03a	-33.45583966	115.6033989	May 24, 2024 16:09

Name [Site]	Photo Id	Latitude [Site]	Longitude [Site]	Date and time of photo
BW-S-PI-6_P04	6168ed824be8e4203d3cbb2a	-33.45583966	115.6033989	May 24, 2024 16:09
BW-S-PI-6_P04	5f9221c37f1ccc78d0000001	-33.45583966	115.6033989	May 24, 2024 16:09
BW-S-PI-6_P04	5ec76fe07f1ccc4a93000002	-33.45583966	115.6033989	May 24, 2024 16:09
BW-S-PI-7_P01	5ecc6ac57f1cccddde000012	-33.3930649	115.6655904	May 26, 2020 09:02
BW-S-PI-7_P01	5dd76a877f1ccc82ad00004a	-33.3930649	115.6655904	May 26, 2020 09:02
BW-S-PI-7_P02	5ecc6a4b7f1cccddde00000f	-33.3930443	115.664931	May 26, 2020 09:00
BW-S-PI-7_P02	5dd76cff7f1ccc82ad00004e	-33.3930443	115.664931	May 26, 2020 09:00
BW-S-PI-7_P03	5ecc69267f1cccddde00000c	-33.3931799	115.6642422	May 26, 2020 08:55
BW-S-PI-7_P03	5dd76dc27f1ccc82ad000052	-33.3931799	115.6642422	May 26, 2020 08:55
BW-S-PI-7_P04	5ecc675b7f1cccddde000003	-33.3929051	115.6634501	May 26, 2020 08:48
BW-S-PI-7_P04	5dd76f457f1ccc82ad000056	-33.3929051	115.6634501	May 26, 2020 08:48
BW-S-PI-8_p01	665159094be8e4051cbf8674	-33.4304361	115.6266668	May 25, 2024 11:20
BW-S-PI-8_p01	65289ea54be8e4051da94076	-33.4304361	115.6266668	May 25, 2024 11:20
BW-S-PI-8_p01	651646594be8e4051cbf7925	-33.4304361	115.6266668	May 25, 2024 11:20
BW-S-PI-8_p01	6350d11f4be8e47fc5af177c	-33.4304361	115.6266668	May 25, 2024 11:20
BW-S-PI-8_p01	62e330eb4be8e47fc5af12a7	-33.4304361	115.6266668	May 25, 2024 11:20
BW-S-PI-8_p01	62afd78d4be8e47fc6d9d196	-33.4304361	115.6266668	May 25, 2024 11:20
BW-S-PI-8_p02	6651585b4be8e4051da94e05	-33.43036816	115.6271793	May 25, 2024 11:15
BW-S-PI-8_p02	65289fd74be8e4051da94079	-33.43036816	115.6271793	May 25, 2024 11:15
BW-S-PI-8_p02	651647334be8e4051da93f83	-33.43036816	115.6271793	May 25, 2024 11:15
BW-S-PI-8_p02	6350d0a84be8e47fc6d9d7c6	-33.43036816	115.6271793	May 25, 2024 11:15
BW-S-PI-8_p02	62e32ff94be8e47fc5af12a4	-33.43036816	115.6271793	May 25, 2024 11:15
BW-S-PI-8_p02	62afd5804be8e47fc6d9d192	-33.43036816	115.6271793	May 25, 2024 11:15
BW-S-PI-8_p03	665156d84be8e4051da94dff	-33.43028937	115.6277484	May 25, 2024 11:11
BW-S-PI-8_p03	6528a0d54be8e4051cbf79fd	-33.43028937	115.6277484	May 25, 2024 11:11
BW-S-PI-8_p03	6350d0384be8e47fc5af1779	-33.43028937	115.6277484	May 25, 2024 11:11
BW-S-PI-8_p03	62e32f234be8e47fc5af12a1	-33.43028937	115.6277484	May 25, 2024 11:11
BW-S-PI-8_p03	62afd46d4be8e47fc5af10ea	-33.43028937	115.6277484	May 25, 2024 11:11
BW-S-PI-8_p04	665155f44be8e4051cbf866e	-33.43018725	115.6282257	May 25, 2024 11:06
BW-S-PI-8_p04	6528a1124be8e4051da9407c	-33.43018725	115.6282257	May 25, 2024 11:06
BW-S-PI-8_p04	6350cf5a4be8e47fc6d9d7c3	-33.43018725	115.6282257	May 25, 2024 11:06
BW-S-PI-8_p04	62e32c9d4be8e47fc6d9d318	-33.43018725	115.6282257	May 25, 2024 11:06
BW-S-PI-8_p04	62afd32e4be8e47fc5af10e7	-33.43018725	115.6282257	May 25, 2024 11:06

Name [Site]	Photo Id	Latitude [Site]	Longitude [Site]	Date and time of photo
BW-S-PI-8_p05	6651554a4be8e4051da94dfc	-33.43007145	115.6287699	May 25, 2024 11:04
BW-S-PI-8_p05	6528a1ac4be8e4051cbf7a00	-33.43007145	115.6287699	May 25, 2024 11:04
BW-S-PI-8_p05	6350ce7f4be8e47fc6d9d7c0	-33.43007145	115.6287699	May 25, 2024 11:04
BW-S-PI-8_p05	62e32bfb4be8e47fc5af129e	-33.43007145	115.6287699	May 25, 2024 11:04
BW-S-PI-8_p05	62afd1b14be8e47fc6d9d18c	-33.43007145	115.6287699	May 25, 2024 11:04
BW-S-PI-8_p06	665152cc4be8e4051cbf8668	-33.42994182	115.6293096	May 25, 2024 10:53
BW-S-PI-8_p06	6528a3244be8e4051cbf7a03	-33.42994182	115.6293096	May 25, 2024 10:53
BW-S-PI-8_p06	6350cdd94be8e47fc6d9d7bd	-33.42994182	115.6293096	May 25, 2024 10:53
BW-S-PI-8_p06	62e32b344be8e47fc6d9d315	-33.42994182	115.6293096	May 25, 2024 10:53
BW-S-PI-8_p06	62afd04e4be8e47fc6d9d188	-33.42994182	115.6293096	May 25, 2024 10:53
BW-S-PI-8_p07	665151574be8e4051da94dea	-33.42951194	115.6302364	May 25, 2024 10:47
BW-S-PI-8_p07	6528a6154be8e4051da94083	-33.42951194	115.6302364	May 25, 2024 10:47
BW-S-PI-8_p07	6350cad54be8e47fc6d9d7ba	-33.42951194	115.6302364	May 25, 2024 10:47
BW-S-PI-8_p07	62e3362c4be8e47fc6d9d31b	-33.42951194	115.6302364	May 25, 2024 10:47
BW-S-PI-8_p07	62e329064be8e47fc5af1298	-33.42951194	115.6302364	May 25, 2024 10:47
BW-S-PI-8_p07	62afcb324be8e47fc5af10df	-33.42951194	115.6302364	May 25, 2024 10:47
BW-S-PI-8_p08	665153334be8e4051da94df9	-33.42974214	115.6297448	May 25, 2024 10:50
BW-S-PI-8_p08	665152de4be8e4051cbf866b	-33.42974214	115.6297448	May 25, 2024 10:50
BW-S-PI-8_p08	665152b34be8e4051cbf8665	-33.42974214	115.6297448	May 25, 2024 10:50
BW-S-PI-8_p08	665152a54be8e4051da94df6	-33.42974214	115.6297448	May 25, 2024 10:50
BW-S-PI-8_p08	6651528a4be8e4051da94df3	-33.42974214	115.6297448	May 25, 2024 10:50
BW-S-PI-8_p08	6651527d4be8e4051da94df0	-33.42974214	115.6297448	May 25, 2024 10:50
BW-S-PI-8_p08	665152504be8e4051da94ded	-33.42974214	115.6297448	May 25, 2024 10:50
BW-S-PI-8_p08	6528a4144be8e4051da94080	-33.42974214	115.6297448	May 25, 2024 10:50
BW-S-PI-8_p08	6350ccdb4be8e47fc5af1776	-33.42974214	115.6297448	May 25, 2024 10:50
BW-S-PI-8_p08	62e32ad04be8e47fc5af129b	-33.42974214	115.6297448	May 25, 2024 10:50
BW-S-PI-8_p08	62afce164be8e47fc5af10e3	-33.42974214	115.6297448	May 25, 2024 10:50

Name [Site]	Photo Id	Latitude [Site]	Longitude [Site]	Date and time of photo
BW-s-pi-8_T1E	665157104be8e4051cbf8671	-33.43030447	115.6274848	May 25, 2024 11:12
BW-s-pi-8_T1E	65289a824be8e4051cbf79f7	-33.43030447	115.6274848	May 25, 2024 11:12
BW-s-pi-8_T1E	6350d4cc4be8e47fc6d9d7c9	-33.43030447	115.6274848	May 25, 2024 11:12
BW-s-pi-8_T1w	665157b04be8e4051da94e02	-33.43039764	115.6272319	May 25, 2024 11:14
BW-s-pi-8_T1w	65289b684be8e4051cbf79fa	-33.43039764	115.6272319	May 25, 2024 11:14
BW-s-pi-8_T1w	6350d9784be8e47fc6d9d7cd	-33.43039764	115.6272319	May 25, 2024 11:14
BW-S-R-1_T1E	664fdc6b4be8e4051da94d29	-33.3743006	115.6592384	May 24, 2024 08:16
BW-S-R-1_T1E	664fdc624be8e4051da94d26	-33.3743006	115.6592384	May 24, 2024 08:16
BW-S-R-1_T1E	6524b7b74be8e4051cbf79b9	-33.3743006	115.6592384	May 24, 2024 08:16
BW-S-R-1_T1E	63478e254be8e47fc6d9d593	-33.3743006	115.6592384	May 24, 2024 08:16
BW-S-R-1_T1E	628ec9ca4be8e47fc5af0fc5	-33.3743006	115.6592384	May 24, 2024 08:16
BW-S-R-1_T1E	6166273e4be8e4203d3cb636	-33.3743006	115.6592384	May 24, 2024 08:16
BW-S-R-1_T1E	6166210e4be8e4203d3cb61f	-33.3743006	115.6592384	May 24, 2024 08:16
BW-S-R-1_T1E	6166206c4be8e4203d3cb616	-33.3743006	115.6592384	May 24, 2024 08:16
BW-S-R-1_T1E	6165333e4be8e4203d3cb608	-33.3743006	115.6592384	May 24, 2024 08:16
BW-S-R-1_T1E	5ec7259a7f1ccc4b1a000004	-33.3743006	115.6592384	May 24, 2024 08:16
BW-S-R-1_T1E	5ec725777f1ccc4b1a000001	-33.3743006	115.6592384	May 24, 2024 08:16
BW-S-R-1_T1E	5ec7249c7f1ccc466b000004	-33.3743006	115.6592384	May 24, 2024 08:16
BW-S-R-1_T1E	5dd778b87f1ccc82ad00005a	-33.3743006	115.6592384	May 24, 2024 08:16
BW-S-R-1_T1W	664fdd174be8e4051cbf85b6	-33.3743638	115.6589942	May 24, 2024 08:19
BW-S-R-1_T1W	6524b7454be8e4051da94023	-33.3743638	115.6589942	May 24, 2024 08:19
BW-S-R-1_T1W	6347a71a4be8e47fc5af153c	-33.3743638	115.6589942	May 24, 2024 08:19
BW-S-R-1_T1W	6347a7004be8e47fc6d9d596	-33.3743638	115.6589942	May 24, 2024 08:19
BW-S-R-1_T1W	628ec9954be8e47fc5af0fc2	-33.3743638	115.6589942	May 24, 2024 08:19
BW-S-R-1_T1W	616627394be8e4203d3cb634	-33.3743638	115.6589942	May 24, 2024 08:19
BW-S-R-1_T1W	6166210c4be8e4203d3cb61d	-33.3743638	115.6589942	May 24, 2024 08:19
BW-S-R-1_T1W	6166205e4be8e4203d3cb612	-33.3743638	115.6589942	May 24, 2024 08:19
BW-S-R-1_T1W	616533224be8e4203d3cb603	-33.3743638	115.6589942	May 24, 2024 08:19
BW-S-R-1_T1W	5ec725a27f1ccc4b1a000007	-33.3743638	115.6589942	May 24, 2024 08:19
BW-S-R-1_T1W	5dd779697f1ccc82ad00005e	-33.3743638	115.6589942	May 24, 2024 08:19
BW-S-R-1_T2N	664fe2044be8e4051da94d30	-33.3792152	115.6566059	May 24, 2024 08:40
BW-S-R-1_T2N	6524df184be8e4051da94032	-33.3792152	115.6566059	May 24, 2024 08:40
BW-S-R-1_T2N	6347af844be8e47fc6d9d599	-33.3792152	115.6566059	May 24, 2024 08:40
BW-S-R-1_T2N	628eccbd4be8e47fc6d9d05d	-33.3792152	115.6566059	May 24, 2024 08:40
BW-S-R-1_T2N	5ec72b607f1ccc4b1a00000e	-33.3792152	115.6566059	May 24, 2024 08:40
BW-S-R-1_T2N	5de5a00c7f1ccc501400001c	-33.3792152	115.6566059	May 24, 2024 08:40
BW-S-R-1_T2S	664fe1774be8e4051cbf85b9	-33.3795493	115.6566127	May 24, 2024 08:37
BW-S-R-1_T2S	6524c9044be8e4051da9402f	-33.3795493	115.6566127	May 24, 2024 08:37
BW-S-R-1_T2S	6347afdd4be8e47fc5af153f	-33.3795493	115.6566127	May 24, 2024 08:37
BW-S-R-1_T2S	628ecd444be8e47fc6d9d060	-33.3795493	115.6566127	May 24, 2024 08:37
BW-S-R-1_T2S	61662a844be8e4203d3cb650	-33.3795493	115.6566127	May 24, 2024 08:37
BW-S-R-1_T2S	616626e74be8e4203d3cb630	-33.3795493	115.6566127	May 24, 2024 08:37

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BW-S-R-1_T2S	616621024be8e4203d3cb619	-33.3795493	115.6566127	May 24, 2024 08:37
BW-S-R-1_T2S	616620614be8e4203d3cb614	-33.3795493	115.6566127	May 24, 2024 08:37
BW-S-R-1_T2S	5ec72ab77f1ccc4b1a00000a	-33.3795493	115.6566127	May 24, 2024 08:37
BW-S-R-1_T2S	5de5a05a7f1ccc5014000020	-33.3795493	115.6566127	May 24, 2024 08:37
BW-S-R-1_T3E	664fe4dd4be8e4051da94d33	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6524df3e4be8e4051cbf79bf	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6348ae724be8e47fc5af156e	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6348ae634be8e47fc5af156b	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6348ae524be8e47fc5af1565	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6348ae284be8e47fc5af1562	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6348adf44be8e47fc5af155f	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6348adb94be8e47fc6d9d5af	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6348adab4be8e47fc5af1559	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6348ad844be8e47fc5af1556	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6348ad6d4be8e47fc6d9d5ac	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6348ad164be8e47fc6d9d5a9	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6348ad034be8e47fc5af1550	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6348acf24be8e47fc5af154d	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6348aca04be8e47fc6d9d5a6	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6348ac874be8e47fc5af154a	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6348ac754be8e47fc5af1547	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6348ac4e4be8e47fc6d9d5a0	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	6348abf54be8e47fc6d9d59d	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	628ddf4b4be8e47fc6d9d05a	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	5f962d3d7f1ccc707400000a	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	5ec72daf7f1ccc8804000001	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3E	5de5b4d17f1ccc5014000030	-33.3823649	115.6521701	May 24, 2024 08:52
BW-S-R-1_T3W	664fe38b4be8e4051cbf85bc	-33.3822052	115.6520015	May 24, 2024 08:47
BW-S-R-1_T3W	6524f5494be8e4051cbf79c2	-33.3822052	115.6520015	May 24, 2024 08:47
BW-S-R-1_T3W	6347b5934be8e47fc5af1544	-33.3822052	115.6520015	May 24, 2024 08:47
BW-S-R-1_T3W	628ddf9b4be8e47fc5af0fbf	-33.3822052	115.6520015	May 24, 2024 08:47
BW-S-R-1_T3W	5f9618b37f1ccc7e1500000b	-33.3822052	115.6520015	May 24, 2024 08:47
BW-S-R-1_T3W	5de5b58a7f1ccc5014000034	-33.3822052	115.6520015	May 24, 2024 08:47
CP-NS-R-1_T1E	664edce24be8e4051da94cf9	-33.3275144	115.7697476	May 23, 2024 14:02
CP-NS-R-1_T1E	652643ac4be8e4051da94058	-33.3275144	115.7697476	May 23, 2024 14:02
CP-NS-R-1_T1E	6333bfff4be8e47fc6d9d4b9	-33.3275144	115.7697476	May 23, 2024 14:02
CP-NS-R-1_T1E	628c521d4be8e47fc6d9cf8e	-33.3275144	115.7697476	May 23, 2024 14:02
CP-NS-R-1_T1E	628c520d4be8e47fc5af0eed	-33.3275144	115.7697476	May 23, 2024 14:02
CP-NS-R-1_T1E	5f83eeb97f1ccce8ed00002f	-33.3275144	115.7697476	May 23, 2024 14:02
CP-NS-R-1_T1E	5ec47b757f1ccc1e33000002	-33.3275144	115.7697476	May 23, 2024 14:02
CP-NS-R-1_T1E	5dc254da7f1ccc1d4e00000c	-33.3275144	115.7697476	May 23, 2024 14:02
CP-NS-R-1_T1W	664edd374be8e4051cbf85a0	-33.3275767	115.7695486	May 23, 2024 14:06
CP-NS-R-1_T1W	65262d704be8e4051cbf79da	-33.3275767	115.7695486	May 23, 2024 14:06
CP-NS-R-1_T1W	6333c0524be8e47fc5af1437	-33.3275767	115.7695486	May 23, 2024 14:06
CP-NS-R-1_T1W	628c530a4be8e47fc6d9cf91	-33.3275767	115.7695486	May 23, 2024 14:06
CP-NS-R-1_T1W	5f84015f7f1ccc1a8a000004	-33.3275767	115.7695486	May 23, 2024 14:06
CP-NS-R-1_T1W	5ec47be57f1ccc1e33000005	-33.3275767	115.7695486	May 23, 2024 14:06

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CP-NS-R-1_T1W	5dc254367f1ccc1d4e000008	-33.3275767	115.7695486	May 23, 2024 14:06
CP-NS-R-2_T1N	664ff37d4be8e4051da94d42	-33.3858477	115.661357	May 24, 2024 09:55
CP-NS-R-2_T1N	6527829b4be8e4051da94061	-33.3858477	115.661357	May 24, 2024 09:55
CP-NS-R-2_T1N	634f6e134be8e47fc6d9d6fb	-33.3858477	115.661357	May 24, 2024 09:55
CP-NS-R-2_T1N	628ed97d4be8e47fc6d9d099	-33.3858477	115.661357	May 24, 2024 09:55
CP-NS-R-2_T1N	6168e2734be8e4203d3cbb0f	-33.3858477	115.661357	May 24, 2024 09:55
CP-NS-R-2_T1N	5ec4d1de7f1ccc25c5000029	-33.3858477	115.661357	May 24, 2024 09:55
CP-NS-R-2_T1N	5dc0c7f17f1ccc95d000001d	-33.3858477	115.661357	May 24, 2024 09:55
CP-NS-R-2_T1S	664ff44d4be8e4051cbf85c8	-33.3861279	115.6613561	May 24, 2024 09:58
CP-NS-R-2_T1S	65279de24be8e4051da94073	-33.3861279	115.6613561	May 24, 2024 09:58
CP-NS-R-2_T1S	65279dc04be8e4051da9406d	-33.3861279	115.6613561	May 24, 2024 09:58
CP-NS-R-2_T1S	65279db84be8e4051cbf79f4	-33.3861279	115.6613561	May 24, 2024 09:58
CP-NS-R-2_T1S	65279da34be8e4051da9406a	-33.3861279	115.6613561	May 24, 2024 09:58
CP-NS-R-2_T1S	65279d954be8e4051da94067	-33.3861279	115.6613561	May 24, 2024 09:58
CP-NS-R-2_T1S	65279d8a4be8e4051cbf79ee	-33.3861279	115.6613561	May 24, 2024 09:58
CP-NS-R-2_T1S	65279d7d4be8e4051cbf79eb	-33.3861279	115.6613561	May 24, 2024 09:58
CP-NS-R-2_T1S	652782d34be8e4051da94064	-33.3861279	115.6613561	May 24, 2024 09:58
CP-NS-R-2_T1S	634f6c1c4be8e47fc6d9d6f8	-33.3861279	115.6613561	May 24, 2024 09:58
CP-NS-R-2_T1S	634f67844be8e47fc5af16c2	-33.3861279	115.6613561	May 24, 2024 09:58
CP-NS-R-2_T1S	628ed9de4be8e47fc6d9d09c	-33.3861279	115.6613561	May 24, 2024 09:58
CP-NS-R-2_T1S	5ec4d13b7f1ccc25c5000026	-33.3861279	115.6613561	May 24, 2024 09:58
CP-NS-R-2_T1S	5dc0c85d7f1ccc95d0000021	-33.3861279	115.6613561	May 24, 2024 09:58
CP-NS-R-2_T2N	664ff8804be8e4051da94d4e	-33.3848678	115.6618369	May 24, 2024 10:14
CP-NS-R-2_T2N	65279da14be8e4051cbf79f1	-33.3848678	115.6618369	May 24, 2024 10:14
CP-NS-R-2_T2N	634f76d04be8e47fc5af16c8	-33.3848678	115.6618369	May 24, 2024 10:14
CP-NS-R-2_T2N	628edda94be8e47fc5af0fe9	-33.3848678	115.6618369	May 24, 2024 10:14
CP-NS-R-2_T2N	6168e9ea4be8e4203d3cbb16	-33.3848678	115.6618369	May 24, 2024 10:14
CP-NS-R-2_T2N	5f6e8f887f1cccf40a000002	-33.3848678	115.6618369	May 24, 2024 10:14
CP-NS-R-2_T2S	664ff7bf4be8e4051da94d4b	-33.3850267	115.6617319	May 24, 2024 10:12
CP-NS-R-2_T2S	664ff7a54be8e4051cbf85ce	-33.3850267	115.6617319	May 24, 2024 10:12
CP-NS-R-2_T2S	65279dd94be8e4051da94070	-33.3850267	115.6617319	May 24, 2024 10:12
CP-NS-R-2_T2S	634f75924be8e47fc5af16c5	-33.3850267	115.6617319	May 24, 2024 10:12
CP-NS-R-2_T2S	628edb8a4be8e47fc6d9d09f	-33.3850267	115.6617319	May 24, 2024 10:12
CP-NS-R-2_T2S	5f6e8fe67f1cccf40a000006	-33.3850267	115.6617319	May 24, 2024 10:12
CP-S-PI-1_P01	664ff7814be8e4051da94d48	-33.3861547	115.6603239	May 24, 2024 10:05
CP-S-PI-1_P01	651662484be8e4051da93f8f	-33.3861547	115.6603239	May 24, 2024 10:05
CP-S-PI-1_P01	634f658e4be8e47fc5af16bc	-33.3861547	115.6603239	May 24, 2024 10:05
CP-S-PI-1_P01	628ed6e34be8e47fc6d9d073	-33.3861547	115.6603239	May 24, 2024 10:05
CP-S-PI-1_P01	6168c8954be8e4203d3cbaed	-33.3861547	115.6603239	May 24, 2024 10:05
CP-S-PI-1_P01	5f8fa1357f1ccca22b000013	-33.3861547	115.6603239	May 24, 2024 10:05
CP-S-PI-1_P01	5ec4d8577f1ccc0b9800000a	-33.3861547	115.6603239	May 24, 2024 10:05
CP-S-PI-1_P01	5dd38ea47f1ccc483e000005	-33.3861547	115.6603239	May 24, 2024 10:05
CP-S-PI-1_P02	664ff5af4be8e4051da94d45	-33.3861386	115.6607547	May 24, 2024 10:03
CP-S-PI-1_P02	651663494be8e4051cbf792b	-33.3861386	115.6607547	May 24, 2024 10:03
CP-S-PI-1_P02	634f66214be8e47fc5af16bf	-33.3861386	115.6607547	May 24, 2024 10:03
CP-S-PI-1_P02	628ed7794be8e47fc6d9d08a	-33.3861386	115.6607547	May 24, 2024 10:03
CP-S-PI-1_P02	6168cadb4be8e4203d3cbaff	-33.3861386	115.6607547	May 24, 2024 10:03

Name [Site]	Photo Id	Latitude [Site]	Longitude [Site]	Date and time of photo
CP-S-PI-1_P02	5f8fa3a27f1ccc098c000005	-33.3861386	115.6607547	May 24, 2024 10:03
CP-S-PI-1_P02	5f8fa37d7f1ccc098c000001	-33.3861386	115.6607547	May 24, 2024 10:03
CP-S-PI-1_P02	5ec4d7a87f1ccc0b98000007	-33.3861386	115.6607547	May 24, 2024 10:03
CP-S-PI-1_P02	5dd3900c7f1ccc483e00000e	-33.3861386	115.6607547	May 24, 2024 10:03
CP-S-PI-1_P03	664ff4b04be8e4051cbf85cb	-33.3862765	115.6611953	May 24, 2024 10:00
CP-S-PI-1_P03	651663be4be8e4051da93f93	-33.3862765	115.6611953	May 24, 2024 10:00
CP-S-PI-1_P03	634f67bf4be8e47fc6d9d6f5	-33.3862765	115.6611953	May 24, 2024 10:00
CP-S-PI-1_P03	628ed9184be8e47fc5af0fe6	-33.3862765	115.6611953	May 24, 2024 10:00
CP-S-PI-1_P03	6168cbb14be8e4203d3cbb07	-33.3862765	115.6611953	May 24, 2024 10:00
CP-S-PI-1_P03	5f8fac5a7f1ccc098c000008	-33.3862765	115.6611953	May 24, 2024 10:00
CP-S-PI-1_P03	5ec4d6e67f1ccc0b98000004	-33.3862765	115.6611953	May 24, 2024 10:00
CP-S-PI-1_P03	5ec4d6ca7f1ccc0b98000001	-33.3862765	115.6611953	May 24, 2024 10:00
CP-S-PI-1_P03	5dd391a47f1ccc84c7000003	-33.3862765	115.6611953	May 24, 2024 10:00
TW-S-3_P03	66516cfc4be8e4051cbf8681	-33.3882961	115.6435389	May 25, 2024 12:45
TW-S-3_P03	65167a424be8e4051da93fc6	-33.3882961	115.6435389	May 25, 2024 12:45
TW-S-3_P03	634faa214be8e47fc6d9d76c	-33.3882961	115.6435389	May 25, 2024 12:45
TW-S-3_P03	628ef5d24be8e47fc5af1038	-33.3882961	115.6435389	May 25, 2024 12:45
TW-S-3_P03	5f8fb71f7f1ccc6147000004	-33.3882961	115.6435389	May 25, 2024 12:45
TW-S-3_P03	5eccafee7f1ccc361400002b	-33.3882961	115.6435389	May 25, 2024 12:45
TW-S-PI-1_P01	6653d6b94be8e4051da94e1a	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	6653d6534be8e4051da94e17	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	665164e44be8e4051da94e11	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	656aa45d4be8e4051da944bc	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	634fb59c4be8e47fc5af1737	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	634fb56a4be8e47fc5af1731	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	628f101b4be8e47fc6d9d106	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	628f0fca4be8e47fc5af1049	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	628efaa44be8e47fc6d9d0f7	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	6173613e4be8e4e8b9b4b9bf	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	617360de4be8e4e8b9b4b9b5	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	61692bc84be8e4203d3cbb9d	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	616928924be8e4203d3cbb97	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	616922e04be8e4203d3cbb81	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	6168c6c44be8e4203d3cbadf	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	6167e7f94be8e4203d3cbaaa	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	5f8fadc57f1ccc098c00000b	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	5eccaa0d7f1ccc8759000003	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P01	5dd5d9377f1ccc71ee000005	-33.3850522	115.6433727	May 25, 2024 12:11
TW-S-PI-1_P02	665165c24be8e4051cbf867a	-33.3856479	115.6430364	May 25, 2024 12:14
TW-S-PI-1_P02	656aa5434be8e4051da944bf	-33.3856479	115.6430364	May 25, 2024 12:14
TW-S-PI-1_P02	634fb4764be8e47fc6d9d778	-33.3856479	115.6430364	May 25, 2024 12:14
TW-S-PI-1_P02	628ef8da4be8e47fc5af103b	-33.3856479	115.6430364	May 25, 2024 12:14
TW-S-PI-1_P02	617360c74be8e4e8b9b4b9b3	-33.3856479	115.6430364	May 25, 2024 12:14
TW-S-PI-1_P02	616930584be8e4203d3cbbb2	-33.3856479	115.6430364	May 25, 2024 12:14
TW-S-PI-1_P02	61692bb74be8e4203d3cbb99	-33.3856479	115.6430364	May 25, 2024 12:14
TW-S-PI-1_P02	616928854be8e4203d3cbb91	-33.3856479	115.6430364	May 25, 2024 12:14
TW-S-PI-1_P02	616922a24be8e4203d3cbb7d	-33.3856479	115.6430364	May 25, 2024 12:14

Name [Site]	Photo Id	Latitude [Site]	Longitude [Site]	Date and time of photo
TW-S-PI-1_P02	616918184be8e4203d3cbb68	-33.3856479	115.6430364	May 25, 2024 12:14
TW-S-PI-1_P02	6168c6b54be8e4203d3cbadd	-33.3856479	115.6430364	May 25, 2024 12:14
TW-S-PI-1_P02	5eccab9a7f1ccc3614000007	-33.3856479	115.6430364	May 25, 2024 12:14
TW-S-PI-1_P02	5dd5da2e7f1ccc71ee00000c	-33.3856479	115.6430364	May 25, 2024 12:14
TW-S-PI-1_P03	665166524be8e4051cbf867e	-33.3855386	115.642477	May 25, 2024 12:17
TW-S-PI-1_P03	656aa6724be8e4051cbf7d5d	-33.3855386	115.642477	May 25, 2024 12:17
TW-S-PI-1_P03	634fb3cf4be8e47fc5af1728	-33.3855386	115.642477	May 25, 2024 12:17
TW-S-PI-1_P03	628ef82a4be8e47fc6d9d0f4	-33.3855386	115.642477	May 25, 2024 12:17
TW-S-PI-1_P03	6168c7294be8e4203d3cbae6	-33.3855386	115.642477	May 25, 2024 12:17
TW-S-PI-1_P03	5f8fb73c7f1ccc614700000a	-33.3855386	115.642477	May 25, 2024 12:17
TW-S-PI-1_P03	5f8fb72c7f1ccc6147000007	-33.3855386	115.642477	May 25, 2024 12:17
TW-S-PI-1_P03	5f8fb6db7f1ccc6147000001	-33.3855386	115.642477	May 25, 2024 12:17
TW-S-PI-1_P03	5f8fb6d97f1ccc2b01000001	-33.3855386	115.642477	May 25, 2024 12:17
TW-S-PI-1_P03	5f8fb6b27f1ccca032000001	-33.3855386	115.642477	May 25, 2024 12:17
TW-S-PI-1_P03	5ecca81b7f1ccce69e000004	-33.3855386	115.642477	May 25, 2024 12:17
TW-S-PI-1_P03	5dd5dbe87f1cccb5ef000005	-33.3855386	115.642477	May 25, 2024 12:17
TW-s-pi-2_11	66500eb04be8e4051cbf85ea	-33.38506111	115.6459322	May 24, 2024 11:51
TW-s-pi-2_11	651671ab4be8e4051da93fb1	-33.38506111	115.6459322	May 24, 2024 11:51
TW-s-pi-2_11	634f93684be8e47fc5af16fc	-33.38506111	115.6459322	May 24, 2024 11:51
TW-s-pi-2_12	665010f64be8e4051cbf85f3	-33.38509489	115.6469407	May 24, 2024 12:00
TW-s-pi-2_12	66500fba4be8e4051da94d6c	-33.38502621	115.6463898	May 24, 2024 11:55
TW-s-pi-2_12	651672224be8e4051cbf7940	-33.38502621	115.6463898	May 24, 2024 11:55
TW-s-pi-2_12	634f95724be8e47fc5af1703	-33.38502621	115.6463898	May 24, 2024 11:55
Tw-s-pi-2_13	651672c24be8e4051da93fb4	-33.38510359	115.6469343	September 29, 2023 14:46
Tw-s-pi-2_13	634f98174be8e47fc5af1708	-33.38510359	115.6469343	September 29, 2023 14:46
TW-s-pi-2_14	665012964be8e4051da94d6f	-33.38512872	115.6475099	May 24, 2024 12:07
TW-s-pi-2_14	6516733d4be8e4051da93fb7	-33.38512872	115.6475099	May 24, 2024 12:07
TW-s-pi-2_14	634f99e74be8e47fc6d9d751	-33.38512872	115.6475099	May 24, 2024 12:07
TW-s-pi-2_15	665013314be8e4051da94d72	-33.38508928	115.6480337	May 24, 2024 12:10
TW-s-pi-2_15	651673974be8e4051cbf7943	-33.38508928	115.6480337	May 24, 2024 12:10
TW-s-pi-2_15	634f9baa4be8e47fc5af170b	-33.38508928	115.6480337	May 24, 2024 12:10
TW-s-pi-2_16	665013ce4be8e4051cbf85f6	-33.38503536	115.6485608	May 24, 2024 12:12
TW-s-pi-2_16	6516742a4be8e4051da93fba	-33.38503536	115.6485608	May 24, 2024 12:12

Name [Site]	Photo Id	Latitude [Site]	Longitude [Site]	Date and time of photo
TW-s-pi-2_16	634fa37d4be8e47fc6d9d766	-33.38503536	115.6485608	May 24, 2024 12:12
TW-s-pi-2_16	634fa2964be8e47fc6d9d760	-33.38503536	115.6485608	May 24, 2024 12:12
TW-s-pi-2_16	634fa0e64be8e47fc6d9d75a	-33.38503536	115.6485608	May 24, 2024 12:12
TW-s-pi-2_16	634fa07d4be8e47fc6d9d757	-33.38503536	115.6485608	May 24, 2024 12:12
TW-s-pi-2_16	634f9ffd4be8e47fc5af1710	-33.38503536	115.6485608	May 24, 2024 12:12
Tw-s-pi-2_17	665015004be8e4051cbf85f9	-33.38510047	115.6490172	May 24, 2024 12:17
Tw-s-pi-2_17	651674ee4be8e4051cbf7946	-33.38510047	115.6490172	May 24, 2024 12:17
Tw-s-pi-2_17	634fa03a4be8e47fc5af1713	-33.38510047	115.6490172	October 19, 2022 14:56
TW-s-pi-2_18	665017124be8e4051cbf85fc	-33.38522225	115.6494441	May 24, 2024 12:25
TW-s-pi-2_18	6516761a4be8e4051da93fbd	-33.38522225	115.6494441	May 24, 2024 12:25
TW-s-pi-2_18	634fa3654be8e47fc6d9d763	-33.38515401	115.649464	October 19, 2022 15:01
TW-s-pi-2_18	634fa2824be8e47fc6d9d75d	-33.38515401	115.649464	October 19, 2022 15:01
TW-s-pi-2_19	665018cb4be8e4051cbf85ff	-33.38539612	115.6501371	May 24, 2024 12:33
TW-s-pi-2_19	6516766c4be8e4051da93fc0	-33.38539612	115.6501371	May 24, 2024 12:33
TW-s-pi-2_19	634fa2fa4be8e47fc5af1718	-33.38539612	115.6501371	May 24, 2024 12:33
TW-s-pi-2_20	665019724be8e4051da94d75	-33.38531558	115.6506432	May 24, 2024 12:36
TW-s-pi-2_20	651677834be8e4051da93fc3	-33.38531558	115.6506432	May 24, 2024 12:36
TW-s-pi-2_20	6516775f4be8e4051cbf7949	-33.38531558	115.6506432	May 24, 2024 12:36
TW-s-pi-2_20	634fa4304be8e47fc5af171c	-33.38531558	115.6506432	May 24, 2024 12:36
TW-S-PI-2_P1	66500d0e4be8e4051da94d69	-33.38546676	115.6451456	May 24, 2024 11:41
TW-S-PI-2_P1	651670ac4be8e4051cbf793d	-33.38546676	115.6451456	May 24, 2024 11:41
TW-S-PI-2_P1	634f8ef24be8e47fc5af16f5	-33.38546676	115.6451456	May 24, 2024 11:41
TW-S-PI-2_P1	628eed3d4be8e47fc5af1034	-33.38546676	115.6451456	May 24, 2024 11:41
TW-S-PI-2_P1	6167c04b4be8e4203d3cba2f	-33.38546676	115.6451456	May 24, 2024 11:41
TW-S-PI-2_P1	5f8f84797f1ccc23a3000001	-33.38546676	115.6451456	May 24, 2024 11:41
TW-S-PI-2_P1	5f235cc67f1cccaf9b000006	-33.38546676	115.6451456	May 24, 2024 11:41
TW-s-pi-2_p10	66500e0c4be8e4051cbf85e7	-33.38514689	115.6454169	May 24, 2024 11:48

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TW-s-pi-2_p10	651671594be8e4051da93fae	-33.38514689	115.6454169	May 24, 2024 11:48
TW-s-pi-2_p10	634f90004be8e47fc5af16f8	-33.38514689	115.6454169	May 24, 2024 11:48
TW-S-PI-2_P2	66500bbc4be8e4051da94d66	-33.3854663	115.645611	May 24, 2024 11:38
TW-S-PI-2_P2	65166ff74be8e4051cbf793a	-33.3854663	115.645611	May 24, 2024 11:38
TW-S-PI-2_P2	634f8e644be8e47fc6d9d746	-33.3854663	115.645611	May 24, 2024 11:38
TW-S-PI-2_P2	628eec9f4be8e47fc5af1031	-33.3854663	115.645611	May 24, 2024 11:38
TW-S-PI-2_P2	6167c0f04be8e4203d3cba33	-33.3854663	115.645611	May 24, 2024 11:38
TW-S-PI-2_P2	5f8f884c7f1ccc23a3000004	-33.3854663	115.645611	May 24, 2024 11:38
TW-S-PI-2_P2	5f235e5e7f1cccaf9b00000a	-33.3854663	115.645611	May 24, 2024 11:38
TW-S-PI-2_P3	66500a3e4be8e4051da94d63	-33.3854694	115.6461629	May 24, 2024 11:32
TW-S-PI-2_P3	65166e9c4be8e4051da93fab	-33.3854694	115.6461629	May 24, 2024 11:32
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TW-S-PI-2_P6	65166c4a4be8e4051cbf7937	-33.38550133	115.6477226	May 24, 2024 11:20
TW-S-PI-2_P6	634f8c094be8e47fc6d9d722	-33.38550133	115.6477226	May 24, 2024 11:20
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TW-S-PI-2_P9	634f8c054be8e47fc6d9d71c	-33.38566449	115.6494547	May 24, 2024 11:00
TW-S-PI-2_P9	634f8bd04be8e47fc5af16d4	-33.38566449	115.6494547	May 24, 2024 11:00
TW-S-PI-2_P9	634f8aed4be8e47fc6d9d704	-33.38566449	115.6494547	May 24, 2024 11:00
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TW-S-PI-2_P9	628ee8ea4be8e47fc6d9d0cd	-33.38566449	115.6494547	May 24, 2024 11:00
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TW-S-PI-2_T1W	5ecc73fd7f1cccddde000024	-33.3852271	115.646394	May 24, 2024 11:53
TW-S-PI-2_T1W	5dd356de7f1cccf0cb00000b	-33.3852271	115.646394	May 24, 2024 11:53
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TW-S-PI-4_P02	628dde3b4be8e47fc6d9d054	-33.393619	115.6490432	May 25, 2024 13:01
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Appendix 3. Boundary photopoint and transect end point comparative data for vegetation condition, crown extent density, weed cover and native cover from spring / summer 2019 to autumn 2024.

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BTW-S-R-1_T1E	3/12/2019	Very good				
BTW-S-R-1_T1E	22/5/2020	Very good		<2%	30-70%	Historic drought affects evident
BTW-S-R-1_T1E	26/10/2020	Very good	4	<2%	30-70%	Historic drought affects evident,
BTW-S-R-1_T1E	12/10/2021	Very good	4	2-10%	30-70%	
BTW-S-R-1_T1E	25/5/2022	Very good	4	2-10%	30-70%	
BTW-S-R-1_T1E	**13/10/2022**	**Very good**	**4**	**2-10%**	**30-70%**	
BTW-S-R-1_T1E	22/5/2023	Very good	4	2-10%	30-70%	
BTW-S-R-1_T1E	10/10/2023	Very good	4	2-10%	30-70%	
BTW-S-R-1_T1E	27/5/2024	Very good	4	2-10%	30-70%	
BTW-S-R-1_T1W	3/12/2019	Very good				
BTW-S-R-1_T1W	22/5/2020	Very good		<2%	30-70%	
BTW-S-R-1_T1W	26/10/2020	Very good	4	<2%	30-70%	
BTW-S-R-1_T1W	12/10/2021	Very good	4	2-10%	30-70%	
BTW-S-R-1_T1W	25/5/2022	Very good	4	2-10%	30-70%	
BTW-S-R-1_T1W	**13/10/2022**	**Very good**	**4**	**2-10%**	**30-70%**	
BTW-S-R-1_T1W	22/5/2023	Very good	4	2-10%	30-70%	Note Styphelia racemulosa is a common shrub now in the middle story.
BTW-S-R-1_T1W	10/10/2023	Very good	4	2-10%	30-70%	Note Styphelia racemulosa is a common shrub now in the middle story. Jarrah trees in the background are dead and Tuart tree looks stressed. P2993
BTW-S-R-1_T1W	27/5/2024	Very good	4	2-10%	30-70%	Note Styphelia racemulosa is a common shrub now in the middle story. Jarrah trees in the background are dead and Tuart tree looks stressed. P2993
BTW-S-R-2_T1N	22/11/2019	Very good				
BTW-S-R-2_T1N	22/5/2020	Excellent		<2%	30-70%	
BTW-S-R-2_T1N	26/10/2020	Excellent	4	10-30%	30-70%	
BTW-S-R-2_T1N	20/10/2021	Excellent	4	10-30%	30-70%	
BTW-S-R-2_T1N	**26/5/2022**	**Excellent**	**4**	**10-30%**	**30-70%**	
BTW-S-R-2_T1N	19/10/2022	Excellent	5	10-30%	30-70%	Vegetation health has improved, Briza maxima increasing.
BTW-S-R-2_T1N	25/5/2023	Excellent	4	10-30%	30-70%	Some Jarrah and peppermint trees showing signs of stress. Lowering overall health of trees. Perhaps due to dry summer
BTW-S-R-2_T1N	14/10/2023	Excellent	4	10-30%	30-70%	Some Jarrah and peppermint trees showing signs of stress. Lowering overall health of trees. Perhaps due to dry summer/ jarrah trees continue to show signs of stress. Eg & Af ok.
BTW-S-R-2_T1N	27/5/2024	Excellent	4	10-30%	30-70%	Some Jarrah and peppermint trees showing signs of stress. wering overall health of trees. Perhaps due to dry summer/ Jarrah trees continue to show signs of stress. Eg & Af .2024 per 2023 site appears stable.
BTW-S-R-2_T1S	22/11/2019	Very good				
BTW-S-R-2_T1S	22/5/2020	Very good		2-10%	30-70%	Large Jarrah drought affected
BTW-S-R-2_T1S	26/10/2020	Very good	4	10-30%	30-70%	Large Jarrah drought affected
BTW-S-R-2_T1S	20/10/2021	Very good	4	10-30%	30-70%	
BTW-S-R-2_T1S	**26/5/2022**	**Very good**	**4**	**10-30%**	**30-70%**	
BTW-S-R-2_T1S	19/10/2022	Very good	4	10-30%	30-70%	

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BTW-S-R-2_T1S	25/5/2023	Very good	4	10-30%	30-70%	Trees are generally stressed across the site with a level of dieback in most trees. Due to drought?
BTW-S-R-2_T1S	14/10/2023	Very good	4	30-70%	30-70%	Trees are generally stressed across the site with a level of dieback in most trees. Due to drought?/ weed cover has increased, mostly jarrah trees still stressed.
BTW-S-R-2_T1S	27/5/2024	Very good	4	30-70%	30-70%	Trees are generally stressed across the site with a level of dieback in most trees. Due to drought?/ weed cover has increased, mostly jarrah trees still stressed. 2024 per 2023 site appears stable. Jarrah in foreground less than 50% canopy.
BW-S-PI-1_P01	21/11/2019	Very good		2-10%		
BW-S-PI-1_P01	26/5/2020	Very good		2-10%	30-70%	
BW-S-PI-1_P01	28/10/2020	Very Good	4	10-30%	30-70%	The large Marri in the background is almost dead.
BW-S-PI-1_P01	14/10/2021	Very Good	4	10-30%	30-70%	
BW-S-PI-1_P01	**26/5/2022**	**Very good**	**4**	**10-30%**	**30-70%**	
BW-S-PI-1_P01	19/10/2022	Very good	4	10-30%	30-70%	
BW-S-PI-1_P01	25/5/2023	Very good	4	10-30%	30-70%	
BW-S-PI-1_P01	29/9/2023	Very good	4	10-30%	30-70%	Large marris in the background very stressed. P2522 2523
BW-S-PI-1_P01	24/5/2024	Very good	4	10-30%	30-70%	Large marris in the background very stressed. P2522 2523, almost dead. 2024 Dead jarrah sapling in foreground from drought? Dead banksia scattered in background. Site adjacent to BORR clearing, note trees healthy in this space. Pic 159
BW-S-PI-1_P02	21/11/2019	Very good		2-10%		
BW-S-PI-1_P02	26/5/2020	Very good		2-10%	30-70%	
BW-S-PI-1_P02	28/10/2020	Very Good	4	>70%	30-70%	Some jarrah trees very thin, others not.
BW-S-PI-1_P02	14/10/2021	Very Good	4	>70%	30-70%	
BW-S-PI-1_P02	**26/5/2022**	**Very good**	**4**	**>70%**	**30-70%**	Marri crowns thinning
BW-S-PI-1_P02	19/10/2022	Very good	4	>70%	30-70%	Marri crowns thinning , small jarrah tree almost dead,
BW-S-PI-1_P02	25/5/2023	Very good	4	>70%	30-70%	Marri crowns thinning , small jarrah tree almost dead,
BW-S-PI-1_P02	29/9/2023	Very good	4	>70%	30-70%	Marri crowns thinning , small jarrah tree almost dead, / dead
BW-S-PI-1_P02	24/5/2024	Very good	4	>70%	30-70%	Marri crowns thinning , small jarrah tree almost dead, / dead. 2024 scattered Xylomelum occidentale very stressed, Banksia also dead / stressed but less dense on vegetation.
BW-S-PI-1_P03	21/11/2019	Good		<2%		
BW-S-PI-1_P03	26/5/2020	Good		<2%	30-70%	
BW-S-PI-1_P03	28/10/2020	Good	4	30-70%	30-70%	Half trees thin half ok
BW-S-PI-1_P03	14/10/2021	Good	4	30-70%	30-70%	
BW-S-PI-1_P03	**26/5/2022**	**Good**	**4**	**30-70%**	**30-70%**	
BW-S-PI-1_P03	19/10/2022	Good	4	30-70%	30-70%	Acacia iteaphylla invading
BW-S-PI-1_P03	25/5/2023	Good	4	30-70%	30-70%	Acacia iteaphylla invading
BW-S-PI-1_P03	29/9/2023	Good	4	30-70%	30-70%	Acacia iteaphylla invading
BW-S-PI-1_P03	24/5/2024	Good	4	30-70%	30-70%	dead banksias mostly saplings and young trees are scattered throughout the surrounding vegetation. Pic 158
BW-S-PI-1_P04	21/11/2019	Very good		<2%		
BW-S-PI-1_P04	26/5/2020	Very good		<2%	30-70%	
BW-S-PI-1_P04	28/10/2020	Very good	4	30-70%	30-70%	
BW-S-PI-1_P04	14/10/2021	Very good	4	30-70%	30-70%	
BW-S-PI-1_P04	**26/5/2022**	**Very good**	**4**	**30-70%**	**30-70%**	Autumn survey doesn't show weeds
BW-S-PI-1_P04	19/10/2022	Very good	4	30-70%	30-70%	Autumn survey doesn't show weeds

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-1_P04	25/5/2023	Very good	4	30-70%	30-70%	Recently cleared hard up against monitoring boundary. P686
BW-S-PI-1_P04	29/9/2023	Very good	4	30-70%	30-70%	
BW-S-PI-1_P04	24/5/2024	Very good	4	30-70%	30-70%	Some scattered deaths of Banksia, mostly Banksia grandis saplings with some b attenuata trees. Impact appears localised? Low in landscape.pic 155. Not related to Borr.
BW-S-PI-1_P05	21/11/2019	Very good		<2%		
BW-S-PI-1_P05	26/5/2020	Very good		<2%	30-70%	
BW-S-PI-1_P05	28/10/2020	Very good	5	<2%	30-70%	
BW-S-PI-1_P05	14/10/2021	Very good	5	<2%	30-70%	
BW-S-PI-1_P05	**26/5/2022**	**Very good**	**5**	**<2%**	**30-70%**	
BW-S-PI-1_P05	19/10/2022	Very good	5	<2%	30-70%	
BW-S-PI-1_P05	25/5/2023	Very good	5	<2%	30-70%	
BW-S-PI-1_P05	29/9/2023	Very good	5	<2%	30-70%	
BW-S-PI-1_P05	24/5/2024	Very good	5	<2%	30-70%	Vegetation appears healthy, no drying effects apparent.
BW-S-PI-1_T1E	19/11/2019	Very good				
BW-S-PI-1_T1E	26/5/2020	Very good		<2%	30-70%	
BW-S-PI-1_T1E	8/2/2021	Very good	3	<2%	30-70%	
BW-S-PI-1_T1E	14/10/2021	Very good	4	2-10%	30-70%	Some improvement in the condition of the trees
BW-S-PI-1_T1E	**26/5/2022**	**Very good**	**4**	**2-10%**	**30-70%**	Jarrah and Marri tree crowns are thin
BW-S-PI-1_T1E	13/10/2022	Very good	4	2-10%	30-70%	Some improvement in the condition of the trees
BW-S-PI-1_T1E	25/5/2023	Very good	4	2-10%	30-70%	Dieback appears limited to jarrah
BW-S-PI-1_T1E	10/10/2023	Very good	4	2-10%	30-70%	Dieback appears limited to jarrah
BW-S-PI-1_T1E	24/5/2024	Very good	4	2-10%	30-70%	Dieback appears limited to jarrah, 2024 banksias, in particular b grandis saplings dead from drought. Affect appears regularly scattered through the bush. Pic 156.
BW-S-PI-1_T1W	19/11/2019	Very good				Marri blight present in most Marri trees. Moderate infected
BW-S-PI-1_T1W	26/5/2020	Very good		<2%	30-70%	Marri blight does not seem to be impacting trees so badly
BW-S-PI-1_T1W	26/10/2020	Very good	4	2-10%	30-70%	Jarrah and Banksia attenuata thinning
BW-S-PI-1_T1W	14/10/2021	Very good	4	10-30%	30-70%	
BW-S-PI-1_T1W	26/5/2022	Very good	4	10-30%	30-70%	
BW-S-PI-1_T1W	**13/10/2022**	**Very good**	**4**	**10-30%**	**30-70%**	
BW-S-PI-1_T1W	25/5/2023	Very good	4	10-30%	30-70%	
BW-S-PI-1_T1W	10/10/2023	Very good	4	10-30%	30-70%	
BW-S-PI-1_T1W	24/5/2024	Very good	4	10-30%	30-70%	Dead banksias mostly saplings and young trees are scattered throughout the surrounding vegetation.
BW-S-PI-3_P01	21/11/2019	Very good		<2%		
BW-S-PI-3_P01	20/5/2020	Very good		<2%	30-70%	
BW-S-PI-3_P01	9/9/2020	Very good		<2%	30-70%	
BW-S-PI-3_P01	13/10/2021	Very good	5	10-30%	30-70%	Exotic grasses have increased, B maxima.
BW-S-PI-3_P01	**25/5/2022**	**Very good**	**5**	**10-30%**	**30-70%**	Exotic grasses have increased, B maxima.
BW-S-PI-3_P01	17/10/2022	Very good	5	10-30%	30-70%	Exotic grasses have increased, B maxima.
BW-S-PI-3_P01	24/5/2023	Very good	5	10-30%	30-70%	Exotic grasses have increased, B maxima.
BW-S-PI-3_P01	30/9/2023	Very good	5	10-30%	30-70%	Exotic grasses have increased, B maxima.
BW-S-PI-3_P01	27/5/2024	Very good		10-30%	30-70%	Exotic grasses have increased, B maxima. Tree canopy has thinned to about 75 %. No deaths , understory ok
BW-S-PI-3_P02	21/11/2019	Very good		<2%		Possible historically cleared? Of trees
BW-S-PI-3_P02	20/5/2020	Very good		<2%	30-70%	Possible historically cleared? Of trees

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-3_P02	28/10/2020	Very good	4	2-10%	30-70%	Possible historically cleared? Of trees
BW-S-PI-3_P02	13/10/2021	Very good	4	10-30%	30-70%	Note flat weed and grasses have increased
BW-S-PI-3_P02	**25/5/2022**	**Very good**	**4**	**10-30%**	**30-70%**	Trees appear healthy, but crowns are still thin.
BW-S-PI-3_P02	17/10/2022	Very good	4	10-30%	30-70%	Trees appear healthy, but crowns are still thin.
BW-S-PI-3_P02	24/5/2023	Very good	4	10-30%	30-70%	Trees appear healthy, but crowns are still thin.
BW-S-PI-3_P02	30/9/2023	Very good	4	10-30%	30-70%	Trees appear healthy, but crowns are still thin. Per previous monitoring round.
BW-S-PI-3_P02	27/5/2024	Very good	4	10-30%	30-70%	Trees appear healthy, but crowns are still thin. Per previous monitoring round. 2024 stable, perhaps more loss of leaves on jarrah trees .
BW-S-PI-3_P03	21/11/2019	Very good		<2%		
BW-S-PI-3_P03	20/5/2020	Very good		<2%	30-70%	
BW-S-PI-3_P03	28/10/2020	Very good	5	10-30%	30-70%	
BW-S-PI-3_P03	13/10/2021	Very good	5	10-30%	30-70%	
BW-S-PI-3_P03	**25/5/2022**	**Very good**	**5**	**10-30%**	**30-70%**	
BW-S-PI-3_P03	17/10/2022	Very good	5	10-30%	30-70%	
BW-S-PI-3_P03	24/5/2023	Very good	5	10-30%	30-70%	
BW-S-PI-3_P03	30/9/2023	Very good	5	10-30%	30-70%	Weeds are increasing but still 10-30%. Crowns of marri and jarrah are thinning, still 5
BW-S-PI-3_P03	27/5/2024	Very good	5	10-30%	30-70%	Weeds are increasing but still 10-30%. Crowns of marri and jarrah are thinning, still 5. 2024 site stable, jarrah trees in background stressed most appear affected by borer . Pic 212,213. Understory ok.
BW-S-PI-3_P04	21/11/2019	Excellent		<2%		
BW-S-PI-3_P04	20/5/2020	Excellent		<2%	30-70%	
BW-S-PI-3_P04	28/10/2020	Excellent	5	<2%	30-70%	
BW-S-PI-3_P04	13/10/2021	Excellent	5	<2%	30-70%	
BW-S-PI-3_P04	**25/5/2022**	**Excellent**	**5**	**<2%**	**30-70%**	Dead kunzea has fallen in previous storms.
BW-S-PI-3_P04	17/10/2022	Excellent	5	<2%	30-70%	Dead kunzea has fallen in previous storms.
BW-S-PI-3_P04	24/5/2023	Excellent	5	<2%	30-70%	Dead Kunzea has fallen in previous storms.
BW-S-PI-3_P04	30/9/2023	Excellent	5	<2%	30-70%	Dead kunzea has fallen in previous storms.
BW-S-PI-3_P04	27/5/2024	Excellent	5	<2%	30-70%	Dead kunzea has fallen in previous storms. Site appears stable and healthy, perhaps not affected by dieback, evidence of previous burn.
BW-S-PI-3_P05	21/11/2019	Excellent		<2%		
BW-S-PI-3_P05	20/5/2020	Excellent		<2%	30-70%	
BW-S-PI-3_P05	28/10/2020	Excellent	5	<2%	30-70%	
BW-S-PI-3_P05	13/10/2021	Excellent	5	<2%	30-70%	
BW-S-PI-3_P05	**25/5/2022**	**Excellent**	**5**	**<2%**	**30-70%**	Trees have died due to fire/ dieback
BW-S-PI-3_P05	17/10/2022	Excellent	5	<2%	30-70%	Trees have died due to fire/ dieback. Remaining trees are healthy and have the 5 health rating.
BW-S-PI-3_P05	24/5/2023	Excellent	5	<2%	30-70%	Trees have died due to fire/ dieback. Remaining trees are healthy and have the 5 health rating.
BW-S-PI-3_P05	30/9/2023	Excellent	4	<2%	30-70%	Trees have died due to fire/ dieback. Remaining trees are healthy and have the 5 health rating. Banksia and Jarrah trees in background are stressed.
BW-S-PI-3_P05	27/5/2024	Very good	4	<2%	30-70%	2024 Ba and Em trees are now very stressed site is about 50% canopy. Borer damage pic 2014Understory veg ok. Perhaps fire and drought. VG because structure clears altered with most trees dead / very stressed. Check dieback mapping.
BW-S-PI-3_P06	21/11/2019	Very good		<2%		
BW-S-PI-3_P06	20/5/2020	Very good		<2%	30-70%	

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-3_P06	28/10/2020	Very good	4	2-10%	30-70%	Jarrah is thin
BW-S-PI-3_P06	13/10/2021	Very good	4	2-10%	30-70%	
BW-S-PI-3_P06	**25/5/2022**	**Very good**	**4**	**2-10%**	**30-70%**	Fire impacts are between 1-10 years
BW-S-PI-3_P06	17/10/2022	Very good	4	2-10%	30-70%	Fire impacts are between 1-10 years, regrowth evident.
BW-S-PI-3_P06	24/5/2023	Very good	3	2-10%	30-70%	Fire impacts are between 1-10 years, regrowth evident. Canopy of jarrah trees is very thin. Dieback appears active with recent death of Macrozamia
BW-S-PI-3_P06	30/9/2023	Very good	3	2-10%	30-70%	Fire impacts are between 1-10 years, regrowth evident. Canopy of jarrah trees is very thin. Dieback appears active with recent death of Macrozamia. Site appears stable no recent decline.
BW-S-PI-3_P06	27/5/2024	Very good	3	2-10%	30-70%	2024 further decline in trees with one medium sized jarrah recently dead. Understory stressed mostly Phlebocarya ciliata Dasypogon some dead. Pic 211.Macrozamia in foreground very stressed , drought or pc.
BW-S-PI-3_P07	21/11/2019	Good		2-10%		
BW-S-PI-3_P07	20/5/2020	Good		2-10%	30-70%	
BW-S-PI-3_P07	28/10/2020	Good	5	10-30%	30-70%	
BW-S-PI-3_P07	13/10/2021	Good	5	10-30%	30-70%	
BW-S-PI-3_P07	**25/5/2022**	**Good**	**5**	**10-30%**	**30-70%**	Site has lost much of its canopy and mid story species, due to dieback and perhaps fire
BW-S-PI-3_P07	17/10/2022	Good	5	10-30%	30-70%	Site has lost much of its canopy and mid story species, due to dieback and perhaps fire, hence its good condition rating.
BW-S-PI-3_P07	24/5/2023	Good	5	10-30%	30-70%	Site has lost much of its canopy and mid story species, due to dieback and perhaps fire, hence its good condition rating.
BW-S-PI-3_P07	30/9/2023	Good	5	10-30%	30-70%	Site has lost much of its canopy and mid story species, due to dieback and perhaps fire, hence its good condition rating.
BW-S-PI-3_P07	27/5/2024	Good	4	10-30%	30-70%	Site has lost much of its canopy and mid story species, due to dieback and perhaps fire, hence its good condition rating. Trees are stressed most at about 75% canopy, jarrah tree recently half dead.
BW-S-PI-4_P01	26/5/2020	Very good		<2%	30-70%	
BW-S-PI-4_P01	28/10/2020	Very good	5	2-10%	30-70%	
BW-S-PI-4_P01	13/10/2021	Very good	5	2-10%	30-70%	
BW-S-PI-4_P01	**25/5/2022**	**Very good**	**5**	**2-10%**	**30-70%**	Acacia longifolia also present
BW-S-PI-4_P01	17/10/2022	Very good	5	30-70%	30-70%	Acacia longifolia also present , marri blight is still active, weeds increasing.
BW-S-PI-4_P01	26/5/2023	Very good	5	30-70%	30-70%	Acacia longifolia also present , marri blight is still active, weeds increasing.
BW-S-PI-4_P01	29/9/2023	Very good	5	30-70%	30-70%	Acacia longifolia also present , marri blight is still active, weeds increasing.
BW-S-PI-4_P01	27/5/2024	Very good	4	30-70%	30-70%	2024 marri blight slow but active. Trees stressed 75% canopy all species. Some jarrah affected by wood borer, out side monitoring area. Some Acacia longifolia dead. Drought or control?
BW-S-PI-4_P02	26/5/2020	Excellent		<2%	30-70%	
BW-S-PI-4_P02	28/10/2020	Excellent	5	2-10%	30-70%	
BW-S-PI-4_P02	13/10/2021	Excellent	5	2-10%	30-70%	
BW-S-PI-4_P02	**25/5/2022**	**Excellent**	**5**	**2-10%**	**30-70%**	Note Acacia longifolia becoming established.
BW-S-PI-4_P02	17/10/2022	Very good	5	2-10%	30-70%	Note Acacia longifolia becoming established. Presence of more aggressive weeds lowering veg condition
BW-S-PI-4_P02	26/5/2023	Very good	5	2-10%	30-70%	Note Acacia longifolia becoming established. Presence of more aggressive weeds lowering veg condition
BW-S-PI-4_P02	29/9/2023	Very good	5	2-10%	30-70%	Note Acacia longifolia becoming established. Presence of more aggressive weeds lowering veg condition . Large marri in the background (out of monitoring area recently dead p2521

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-4_P02	27/5/2024	Very good	5	2-10%	30-70%	Some stress in canopy but still above 80%. Some scattered stressed / dead Acacia longifolia in background. Pic 207, 208
BW-S-PI-4_P03	26/5/2020	Excellent		<2%	>70%	
BW-S-PI-4_P03	28/10/2020	Excellent	5	<2%	>70%	
BW-S-PI-4_P03	13/10/2021	Excellent	5	<2%	>70%	
BW-S-PI-4_P03	**25/5/2022**	**Excellent**	**5**	**<2%**	**>70%**	
BW-S-PI-4_P03	17/10/2022	Excellent	5	<2%	>70%	
BW-S-PI-4_P03	26/5/2023	Excellent	5	<2%	>70%	
BW-S-PI-4_P03	29/9/2023	Excellent	5	<2%	>70%	
BW-S-PI-4_P03	27/5/2024	Excellent	5	<2%	>70%	2024 site appears stable.
BW-S-PI-4_P05	26/5/2020	Very good		<2%	30-70%	
BW-S-PI-4_P05	28/10/2020	Very good	4	<2%	30-70%	
BW-S-PI-4_P05	13/10/2021	Very good	4	2-10%	30-70%	Briza has increased at the site
BW-S-PI-4_P05	**25/5/2022**	**Very good**	**4**	**2-10%**	**30-70%**	Crowns in large marri and jarrah are thin
BW-S-PI-4_P05	17/10/2022	Very good	4	2-10%	30-70%	Crowns in large marri and jarrah are thin
BW-S-PI-4_P05	26/5/2023	Very good	4	2-10%	30-70%	Crowns in large marri and jarrah are thin
BW-S-PI-4_P05	29/9/2023	Very good	4	2-10%	30-70%	Crowns in large marri and jarrah are thin
BW-S-PI-4_P05	27/5/2024	Very good	4	2-10%	30-70%	Crowns in large marri and jarrah are thin. 2024 per 2023 + young Persoonia longifolia dead in site, scattered Acacia longifolia dead in background due to drought/ control?pic 209 isolated young jarrah stressed/ dead , Xylomelon stressed Understory ok,
BW-S-PI-5_P01	20/11/2019	Good		<2%		
BW-S-PI-5_P01	22/5/2020	Good		<2%	10-30%	
BW-S-PI-5_P01	23/10/2020	Good	4	<2%	10-30%	
BW-S-PI-5_P01	14/10/2021	Good	4	<2%	10-30%	
BW-S-PI-5_P01	**25/5/2022**	**Good**	**4**	**<2%**	**10-30%**	New Acacia iteaphylla infestation
BW-S-PI-5_P01	20/10/2022	Good	5	2-10%	10-30%	New Acacia iteaphylla infestation
BW-S-PI-5_P01	25/5/2023	Good	5	2-10%	10-30%	New Acacia iteaphylla infestation
BW-S-PI-5_P01	29/9/2023	Good	5	2-10%	10-30%	New Acacia iteaphylla infestation, Peppi litter suppressing weeds
BW-S-PI-5_P01	24/5/2024	Good	5	2-10%	10-30%	New Acacia iteaphylla infestation, Peppi litter suppressing weeds, 2024 per 2023.
BW-S-PI-5_P02	20/11/2019	Good		<2%		
BW-S-PI-5_P02	22/5/2020	Good		<2%	10-30%	
BW-S-PI-5_P02	23/10/2020	Good	5	2-10%	10-30%	
BW-S-PI-5_P02	14/10/2021	Good	5	10-30%	10-30%	Increase in exotic grasses
BW-S-PI-5_P02	**25/5/2022**	**Good**	**5**	**30-70%**	**10-30%**	Increase in exotic grasses
BW-S-PI-5_P02	20/10/2022	Good	5	>70%	10-30%	Increase in exotic grasses
BW-S-PI-5_P02	25/5/2023	Good	5	>70%	10-30%	Increase in exotic grasses
BW-S-PI-5_P02	29/9/2023	Good	5	>70%	10-30%	Increase in exotic grasses
BW-S-PI-5_P02	24/5/2024	Good	5	>70%	10-30%	Increase in exotic grasses. 2024 per 2023.
BW-S-PI-5_P03	20/11/2019	Very good		<2%		
BW-S-PI-5_P03	22/5/2020	Very good		<2%	30-70%	
BW-S-PI-5_P03	23/10/2020	Very good	4	10-30%	30-70%	
BW-S-PI-5_P03	14/10/2021	Very good	4	10-30%	30-70%	
BW-S-PI-5_P03	**25/5/2022**	**Very good**	**4**	**10-30%**	**30-70%**	

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-5_P03	20/10/2022	Very good	4	10-30%	30-70%	Veg structure and diversity intact
BW-S-PI-5_P03	25/5/2023	Very good	4	10-30%	30-70%	Veg structure and diversity intact
BW-S-PI-5_P03	29/9/2023	Very good	4	10-30%	30-70%	Veg structure and diversity intact, but weeds increasing
BW-S-PI-5_P03	24/5/2024	Very good	4	10-30%	30-70%	Veg structure and diversity intact, but weeds increasing. Recent deaths in stressed small marri most likely due to borer, pic 191.
BW-S-PI-5_P04	30/7/2020	Excellent		<2%	30-70%	
BW-S-PI-5_P04	9/9/2020	Excellent		<2%	30-70%	
BW-S-PI-5_P04	14/10/2021	Excellent	5	<2%	30-70%	Increase in native herbs
BW-S-PI-5_P04	**25/5/2022**	**Excellent**	**5**	**<2%**	**30-70%**	Increase in native herbs
BW-S-PI-5_P04	20/10/2022	Very good	5	10-30%	30-70%	Site has a high concentration of Briza maxima
BW-S-PI-5_P04	25/5/2023	Very good	4	10-30%	30-70%	Site has a high concentration of Briza maxima , crowns of jarrah and banksia are thin.
BW-S-PI-5_P04	29/9/2023	Very good	4	10-30%	30-70%	Site has a high concentration of Briza maxima , crowns of jarrah and banksia are thin.
BW-S-PI-5_P04	24/5/2024	Very good	4	10-30%	30-70%	Site has a high concentration of Briza maxima , crowns of jarrah and banksia are thin. 2024 canopy thin but overall healthy. One large b grandis dead.
BW-S-PI-5_P05	30/7/2020	Very good		2-10%	30-70%	
BW-S-PI-5_P05	23/10/2020	Very good	3	2-10%	30-70%	
BW-S-PI-5_P05	14/10/2021	Very good	3	2-10%	30-70%	
BW-S-PI-5_P05	**25/5/2022**	**Very good**	**4**	**2-10%**	**30-70%**	Crowns are reasonably healthy
BW-S-PI-5_P05	20/10/2022	Very good	4	2-10%	30-70%	Crowns are reasonably healthy
BW-S-PI-5_P05	25/5/2023	Very good	4	2-10%	30-70%	Crowns are reasonably healthy
BW-S-PI-5_P05	29/9/2023	Very good	4	10-30%	30-70%	Crowns are reasonably healthy, weeds have increased
BW-S-PI-5_P05	24/5/2024	Very good	4	10-30%	30-70%	Crowns are reasonably healthy, weeds have increased, 2024 canopy healthy, some stress in Hh.
BW-S-PI-5_P06	30/7/2020	Good		30-70%	30-70%	
BW-S-PI-5_P06	23/10/2020	Good	4	30-70%	30-70%	
BW-S-PI-5_P06	14/10/2021	Good	4	30-70%	30-70%	
BW-S-PI-5_P06	**25/5/2022**	**Good**	**4**	**30-70%**	**30-70%**	
BW-S-PI-5_P06	20/10/2022	Good	5	>70%	30-70%	
BW-S-PI-5_P06	25/5/2023	Good	5	>70%	30-70%	
BW-S-PI-5_P06	29/9/2023	Good	5	>70%	30-70%	
BW-S-PI-5_P06	24/5/2024	Good	5	>70%	30-70%	Site appears healthy
BW-S-PI-5_P07	20/11/2019	Good		30-70%		Adjacent power line
BW-S-PI-5_P07	22/5/2020	Good		30-70%		Adjacent power line
BW-S-PI-5_P07	23/10/2020	Good	4	30-70%	30-70%	Adjacent power line
BW-S-PI-5_P07	14/10/2021	Good	5	30-70%	30-70%	Tree health is really good
BW-S-PI-5_P07	**25/5/2022**	**Good**	**5**	**30-70%**	**30-70%**	Tree health is really good
BW-S-PI-5_P07	20/10/2022	Good	5	>70%	30-70%	Tree health is really good , Oxalis glabra and O. Pescaprae increasing, along with Briza maxima
BW-S-PI-5_P07	25/5/2023	Good	5	>70%	30-70%	Tree health is really good , Oxalis glabra and O. Pes-caprae increasing, along with Briza maxima
BW-S-PI-5_P07	29/9/2023	Good	5	>70%	30-70%	Tree health is really good , Oxalis glabra and O. Pescaprae increasing, along with Briza maxima
BW-S-PI-5_P07	24/5/2024	Good	5	>70%	30-70%	Tree health is really good , Oxalis glabra and O. Pescaprae increasing, along with Briza maxima. 2024 canopy health good, butt One b grandis sapling dead.
BW-S-PI-5_P08	20/11/2019	Good		2-10%		
BW-S-PI-5_P08	22/5/2020	Good		2-10%	30-70%	

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-5_P08	23/10/2020	Good	4	10-30%	30-70%	
BW-S-PI-5_P08	14/10/2021	Good	4	30-70%	30-70%	Understory shrubs Ap, and M thy very reduced
BW-S-PI-5_P08	25/5/2022	Good	4	30-70%	30-70%	Dipogon lignosus infestation, Oxalis pes-caprae spreading also.
BW-S-PI-5_P08	20/10/2022	Good	4	>70%	30-70%	Dipogon lignosus infestation, Oxalis pes-caprae spreading also. Briza maxima very dense. Locally good.
BW-S-PI-5_P08	**25/5/2023**	**Good**	**4**	**>70%**	**30-70%**	Dipogon lignosus infestation, Oxalis pes-caprae spreading also. Briza maxima very dense. Locally good. Dipogon appears to have been controlled.
BW-S-PI-5_P08	29/9/2023	Good	4	>70%	30-70%	Dipogon lignosus infestation, Oxalis pes-caprae spreading also. Briza maxima very dense. Locally good. Dipogon appears to have been controlled.
BW-S-PI-5_P08	24/5/2024	Good	4	>70%	30-70%	Dipogon lignosus infestation, Oxalis pes-caprae spreading also. Briza maxima very dense. Locally good. Dipogon appears to have been controlled. 2024 per 2023.
BW-S-PI-5_P09	20/11/2019	Good		2-10%		
BW-S-PI-5_P09	22/5/2020	Good		2-10%	30-70%	
BW-S-PI-5_P09	23/10/2020	Good	4	10-30%	30-70%	
BW-S-PI-5_P09	14/10/2021	Good	4	30-70%	30-70%	Weeds have increased
BW-S-PI-5_P09	**25/5/2022**	**Good**	**4**	**30-70%**	**30-70%**	Weeds have increased
BW-S-PI-5_P09	20/10/2022	Good	5	30-70%	30-70%	Weeds have increased , site is bordering degraded, basic veg structure across portion of the site is intact,
BW-S-PI-5_P09	25/5/2023	Good	5	30-70%	30-70%	Weeds have increased , site is bordering degraded, basic veg structure across portion of the site is intact,
BW-S-PI-5_P09	29/9/2023	Good	5	30-70%	30-70%	Weeds have increased , site is bordering degraded, basic veg structure across portion of the site is intact, bridal creeper, prickly pear
BW-S-PI-5_P09	24/5/2024	Good	5	30-70%	30-70%	Weeds have increased , site is bordering degraded, basic veg structure across portion of the site is intact, bridal creeper, prickly pear. 2024 per 2023.
BW-S-PI-5_P10	20/11/2019	Good		<2%		Geraldton wax along power line
BW-S-PI-5_P10	22/5/2020	Good		<2%	30-70%	Geraldton wax along power line
BW-S-PI-5_P10	23/10/2020	Good	4	2-10%	30-70%	Geraldton wax along power line
BW-S-PI-5_P10	14/10/2021	Good	4	2-10%	30-70%	Rubbish has been cleaned up
BW-S-PI-5_P10	**25/5/2022**	**Good**	**4**	**10-30%**	**30-70%**	Weed cover increased at site. Near access track.
BW-S-PI-5_P10	20/10/2022	Good	5	10-30%	30-70%	Weed cover increased at site. Near access track. This site is bordering degraded. Basic structure is present but weeds are increasing.
BW-S-PI-5_P10	25/5/2023	Good	5	10-30%	30-70%	Weed cover increased at site. Near access track. This site is bordering degraded. Basic structure is present but weeds are increasing.
BW-S-PI-5_P10	29/9/2023	Good	5	30-70%	30-70%	Weed cover increased at site. Near access track. This site is bordering degraded. Basic structure is present but weeds are increasing. Some jarrah and Banksia trees cut down.
BW-S-PI-5_P10	24/5/2024	Good	5	30-70%	30-70%	Weed cover increased at site. Near access track. This site is bordering degraded. Basic structure is present but weeds are increasing. Some jarrah and Banksia trees cut down. 2024 canopy is healthy.
BW-S-PI-5_P11	20/11/2019	Good		30-70%		
BW-S-PI-5_P11	22/5/2020	Good		30-70%	30-70%	
BW-S-PI-5_P11	23/10/2020	Good	4	30-70%	30-70%	
BW-S-PI-5_P11	14/10/2021	Good	4	30-70%	30-70%	Rubbish cleaned up
BW-S-PI-5_P11	25/5/2022	Good	4	30-70%	30-70%	
BW-S-PI-5_P11	**20/10/2022**	**Good**	**5**	**30-70%**	**30-70%**	
BW-S-PI-5_P11	25/5/2023	Good	5	30-70%	30-70%	
BW-S-PI-5_P11	29/9/2023	Good	5	30-70%	30-70%	
BW-S-PI-5_P11	24/5/2024	Good	5	30-70%	30-70%	Vegetation appears healthy
BW-S-PI-5_P12	20/11/2019	Good		2-10%		

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-5_P12	22/5/2020	Good		2-10%	30-70%	
BW-S-PI-5_P12	23/10/2020	Good	4	2-10%	30-70%	
BW-S-PI-5_P12	14/10/2021	Good	4	2-10%	30-70%	Litter cleaned up
BW-S-PI-5_P12	**25/5/2022**	**Good**	**4**	**2-10%**	**30-70%**	
BW-S-PI-5_P12	20/10/2022	Good	5	2-10%	30-70%	Canopy crown is healthy
BW-S-PI-5_P12	25/5/2023	Good	5	2-10%	30-70%	Canopy crown is healthy
BW-S-PI-5_P12	29/9/2023	Good	5	2-10%	30-70%	Canopy crown is healthy
BW-S-PI-5_P12	24/5/2024	Good	5	2-10%	30-70%	Canopy crown is healthy, 2024 vegetation appears healthy. The absence of annual weeds makes the site look suitable for a very good condition rating.
BW-S-PI-5_P13	30/7/2020	Excellent		<2%	30-70%	
BW-S-PI-5_P13	23/10/2020	Excellent	3	<2%	30-70%	
BW-S-PI-5_P13	14/10/2021	Excellent	3	<2%	30-70%	
BW-S-PI-5_P13	25/5/2022	Excellent	3	<2%	30-70%	Crowns of most trees are thin
BW-S-PI-5_P13	20/10/2022	Excellent	3	<2%	30-70%	Crowns of most trees are thin , locally excellent, but broadly very good
BW-S-PI-5_P13	25/5/2023	Excellent	3	<2%	30-70%	Crowns of most trees are thin , locally excellent, but broadly very good
BW-S-PI-5_P13	29/9/2023	Excellent	3	<2%	30-70%	Crowns of most trees are thin , locally excellent, but broadly very good
BW-S-PI-5_P13	24/5/2024	Excellent	3	<2%	30-70%	Crowns of most trees are thin , locally excellent, but broadly very good . Large jarrah tree is stressed, branches impacted by borer. Pic 190.
BW-S-PI-5_P14	30/7/2020	Excellent		<2%	30-70%	
BW-S-PI-5_P14	23/10/2020	Excellent	4	<2%	30-70%	
BW-S-PI-5_P14	14/10/2021	Excellent	4	<2%	30-70%	
BW-S-PI-5_P14	**25/5/2022**	**Excellent**	**4**	**<2%**	**30-70%**	
BW-S-PI-5_P14	20/10/2022	Excellent	5	2-10%	30-70%	Veg condition locally maybe excellent, but broadly it is only very good. Briza maxima is increasing
BW-S-PI-5_P14	25/5/2023	Excellent	5	2-10%	30-70%	Veg condition locally maybe excellent, but broadly it is only very good. Briza maxima is increasing
BW-S-PI-5_P14	29/9/2023	Excellent	5	2-10%	30-70%	Veg condition locally maybe excellent, but broadly it is only very good. Briza maxima is increasing
BW-S-PI-5_P14	24/5/2024	Excellent	5	2-10%	30-70%	Veg condition locally maybe excellent, but broadly it is only very good. Briza maxima is increasing. 2024 site looks healthy when few weeds present. Canopy healthy.
BW-S-PI-5_P15	20/11/2019	Good		10-30%		
BW-S-PI-5_P15	22/5/2020	Good		10-30%	10-30%	
BW-S-PI-5_P15	23/10/2020	Good	4	10-30%	10-30%	
BW-S-PI-5_P15	14/10/2021	Good	5	10-30%	10-30%	
BW-S-PI-5_P15	**25/5/2022**	**Good**	**5**	**10-30%**	**10-30%**	Rubbish dumped at gate
BW-S-PI-5_P15	20/10/2022	Good	5	30-70%	10-30%	Rubbish dumped at gate , weed cover has increased substantially.
BW-S-PI-5_P15	25/5/2023	Good	5	30-70%	10-30%	Close to recently cleared areas.
BW-S-PI-5_P15	29/9/2023	Good	5	30-70%	10-30%	Close to recently cleared areas. P2517 few weeds in cleared area
BW-S-PI-5_P15	24/5/2024	Good	5	30-70%	10-30%	Close to recently cleared areas. P2517 few weeds in cleared area . 2024 per 2023.
BW-S-PI-5_P16	20/11/2019	Very good		30-70%		
BW-S-PI-5_P16	9/9/2020	Very good		30-70%	30-70%	
BW-S-PI-5_P16	14/10/2021	Very good	4	30-70%	30-70%	
BW-S-PI-5_P16	**25/5/2022**	**Very good**	**4**	**30-70%**	**30-70%**	
BW-S-PI-5_P16	20/10/2022	Very good	4	30-70%	30-70%	Weed cover increasing.
BW-S-PI-5_P16	25/5/2023	Very good	4	30-70%	30-70%	Weed cover increasing. Crowns look reasonably healthy.

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-5_P16	29/9/2023	Very good	4	30-70%	30-70%	Weed cover increasing. Crowns look reasonably healthy.
BW-S-PI-5_P16	24/5/2024	Very good	4	30-70%	30-70%	Weed cover increasing. Crowns look reasonably healthy. per 2023, 1-2 banksia grandis saplings dead in background. Surrounding veg ok.
BW-S-PI-5_P17	20/11/2019	Very good		10-30%		
BW-S-PI-5_P17	22/5/2020	Very good		10-30%	30-70%	
BW-S-PI-5_P17	23/10/2020	Very good	4	10-30%	30-70%	
BW-S-PI-5_P17	14/10/2021	Very good	4	10-30%	30-70%	
BW-S-PI-5_P17	**25/5/2022**	**Very good**	**4**	**10-30%**	**30-70%**	
BW-S-PI-5_P17	20/10/2022	Very good	4	10-30%	30-70%	
BW-S-PI-5_P17	25/5/2023	Very good	4	10-30%	30-70%	
BW-S-PI-5_P17	29/9/2023	Very good	4	10-30%	30-70%	
BW-S-PI-5_P17	24/5/2024	Very good	4	10-30%	30-70%	Site appears stable , but most Hh very stressed.
BW-S-PI-5_P18	20/11/2019	Very good		10-30%		
BW-S-PI-5_P18	22/5/2020	Very good		10-30%	30-70%	Drought effects in Jarrah
BW-S-PI-5_P18	23/10/2020	Very good	3	10-30%	30-70%	Drought effects in Jarrah
BW-S-PI-5_P18	14/10/2021	Very good	4	10-30%	30-70%	
BW-S-PI-5_P18	**25/5/2022**	**Very good**	**4**	**10-30%**	**30-70%**	
BW-S-PI-5_P18	20/10/2022	Very good	4	10-30%	30-70%	
BW-S-PI-5_P18	25/5/2023	Very good	4	10-30%	30-70%	Large Marri very stressed.
BW-S-PI-5_P18	29/9/2023	Very good	4	10-30%	30-70%	Large Marri very stressed. Has recovered somewhat but still very stressed.
BW-S-PI-5_P18	24/5/2024	Very good	4	10-30%	30-70%	Large Marri very stressed. Has recovered somewhat but still very stressed. 2024 per 2023, 1-2 scattered b grandis and jarrah sapling dead in background
BW-S-PI-5_P19	20/11/2019	Very good		2-10%		
BW-S-PI-5_P19	22/5/2020	Very good		2-10%	30-70%	Drought effects in Jarrah
BW-S-PI-5_P19	23/10/2020	Very good	3	10-30%	30-70%	Drought effects in Jarrah
BW-S-PI-5_P19	14/10/2021	Very good	3	10-30%	30-70%	
BW-S-PI-5_P19	**25/5/2022**	**Very good**	**4**	**10-30%**	**30-70%**	Tree crowns look ok, 4 score ok
BW-S-PI-5_P19	20/10/2022	Very good	4	10-30%	30-70%	Tree crowns look ok, 4 score ok
BW-S-PI-5_P19	25/5/2023	Very good	4	10-30%	30-70%	Tree crowns look ok, 4 score ok
BW-S-PI-5_P19	29/9/2023	Very good	4	10-30%	30-70%	Tree crowns look ok, 4 score ok
BW-S-PI-5_P19	24/5/2024	Very good	4	10-30%	30-70%	Tree crowns look ok, 4 score ok, per 2023 sight looks ok, no dead canopy. Some stressed Hh.
BW-S-PI-5_P20	20/11/2019	Very good		2-10%		
BW-S-PI-5_P20	22/5/2020	Very good		2-10%	30-70%	
BW-S-PI-5_P20	23/10/2020	Very good	3	2-10%	30-70%	
BW-S-PI-5_P20	14/10/2021	Very good	3	2-10%	30-70%	
BW-S-PI-5_P20	**25/5/2022**	**Very good**	**3**	**2-10%**	**30-70%**	
BW-S-PI-5_P20	20/10/2022	Very good	4	2-10%	30-70%	Canopy health has improved
BW-S-PI-5_P20	25/5/2023	Very good	4	2-10%	30-70%	Canopy health has improved , still a 4 rating
BW-S-PI-5_P20	29/9/2023	Very good	4	2-10%	30-70%	Canopy health has improved , still a 4 rating
BW-S-PI-5_P20	24/5/2024	Very good	4	2-10%	30-70%	Canopy health has improved , still a 4 rating . 2024 per 2023. Site appears largely unstressed. Adjacent borr works no weeds pic 187 and healthy vegetation.
BW-S-PI-5_P21	20/11/2019	Very good		<2%		
BW-S-PI-5_P21	22/5/2020	Very good		<2%	30-70%	

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-5_P21	23/10/2020	Very good	3	<2%	30-70%	
BW-S-PI-5_P21	14/10/2021	Very good	3	<2%	30-70%	
BW-S-PI-5_P21	**25/5/2022**	**Very good**	**3**	**<2%**	**30-70%**	Crowns are thin
BW-S-PI-5_P21	20/10/2022	Very good	4	<2%	30-70%	Canopy health has improved
BW-S-PI-5_P21	29/9/2023	Very good	4	<2%	30-70%	Canopy health has improved
BW-S-PI-5_P21	24/5/2024	Very good	4	<2%	30-70%	Canopy health has improved , 2024 stable , jarrah sapling dead in background, surrounding veg ok, borer?
BW-S-PI-5_P21	25/5/2023	Very good	4	<2%	30-70%	Canopy health has improved
BW-S-PI-5_P22	20/11/2019	Excellent		<2%		
BW-S-PI-5_P22	22/5/2020	Excellent		<2%	30-70%	Jarrah drought effects
BW-S-PI-5_P22	23/10/2020	Excellent	4	<2%	30-70%	Jarrah drought effects
BW-S-PI-5_P22	14/10/2021	Excellent	4	<2%	30-70%	
BW-S-PI-5_P22	**25/5/2022**	**Excellent**	**4**	**<2%**	**30-70%**	Banksia crowns look healthy. Jarrah stressed
BW-S-PI-5_P22	20/10/2022	Excellent	4	<2%	30-70%	Banksia crowns look healthy. Jarrah stressed
BW-S-PI-5_P22	25/5/2023	Excellent	4	<2%	30-70%	Banksia crowns look healthy. Small Jarrah saplings stressed
BW-S-PI-5_P22	29/9/2023	Excellent	4	<2%	30-70%	Banksia crowns look healthy. Small Jarrah saplings stressed, large jarrah almost dead.
BW-S-PI-5_P22	24/5/2024	Excellent	4	<2%	30-70%	Banksia crowns look healthy. Small Jarrah saplings stressed, large jarrah almost dead. 2024 per 2023
BW-S-PI-5_P23	20/11/2019	Excellent		<2%		
BW-S-PI-5_P23	22/5/2020	Excellent		<2%	30-70%	Jarrah drought effects
BW-S-PI-5_P23	23/10/2020	Excellent	4	<2%	30-70%	Jarrah drought effects
BW-S-PI-5_P23	14/10/2021	Excellent	4	<2%	30-70%	
BW-S-PI-5_P23	20/10/2022	Excellent	4	<2%	30-70%	
BW-S-PI-5_P23	25/5/2023	Excellent	4	<2%	30-70%	
BW-S-PI-5_P23	29/9/2023	Excellent	4	<2%	30-70%	Site is healthy
BW-S-PI-5_P23	24/5/2024	Excellent	4	<2%	30-70%	Site is healthy, 1-2 stressed kunzea in background, lots Hh stressed / dead pic 186
BW-S-PI-5_P23	25/5/2022	Excellent	4	<2%	30-70%	
BW-S-PI-5_P24	20/11/2019	Excellent		<2%		
BW-S-PI-5_P24	22/5/2020	Excellent		<2%	30-70%	
BW-S-PI-5_P24	23/10/2020	Excellent	4	<2%	30-70%	
BW-S-PI-5_P24	14/10/2021	Excellent	4	<2%	30-70%	
BW-S-PI-5_P24	**25/5/2022**	**Excellent**	**4**	**<2%**	**30-70%**	Canopies of large marri and jarrah trees are thin
BW-S-PI-5_P24	20/10/2022	Excellent	4	<2%	30-70%	Canopies of large marri and jarrah trees are thin
BW-S-PI-5_P24	25/5/2023	Excellent	4	<2%	30-70%	Canopies of large marri and jarrah trees are thin
BW-S-PI-5_P24	24/5/2024	Excellent	4	<2%	30-70%	Canopies of large marri and jarrah trees are thin. 2024 site is ok but Hh still stressed.
BW-S-PI-5_P24	29/9/2023	Excellent	4	<2%	30-70%	Canopies of large marri and jarrah trees are thin
BW-S-PI-5_P25	20/11/2019	Excellent		<2%		
BW-S-PI-5_P25	22/5/2020	Excellent		<2%	30-70%	Was incorrectly labeled P21
BW-S-PI-5_P25	23/10/2020	Excellent	3	<2%	30-70%	Was incorrectly labeled P21
BW-S-PI-5_P25	14/10/2021	Excellent	3	<2%	30-70%	
BW-S-PI-5_P25	**25/5/2022**	**Excellent**	**3**	**<2%**	**30-70%**	Jarrah trees very stressed with thinning crowns
BW-S-PI-5_P25	20/10/2022	Excellent	4	<2%	30-70%	Jarrah trees have improved in condition.
BW-S-PI-5_P25	25/5/2023	Excellent	4	<2%	30-70%	Jarrah trees have improved in condition.
BW-S-PI-5_P25	29/9/2023	Excellent	4	2-10%	30-70%	Jarrah and Banksia trees are stressed. May go down to 3.

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-5_P25	24/5/2024	Excellent	4	2-10%	30-70%	Jarrah and Banksia trees are stressed. May go down to 3. Two banksia dead, but jarrah ok. Rest of site ok
BW-S-PI-5_P26	20/11/2019	Excellent		<2%		
BW-S-PI-5_P26	22/5/2020	Excellent		<2%	30-70%	Possible storm damage in past: Incorrectly labeled P22
BW-S-PI-5_P26	23/10/2020	Excellent	3	2-10%	30-70%	Possible storm damage in past: Incorrectly labeled P22
BW-S-PI-5_P26	14/10/2021	Excellent	3	2-10%	30-70%	
BW-S-PI-5_P26	**25/5/2022**	**Excellent**	**4**	**2-10%**	**30-70%**	Tree crowns look healthy, some older Banksia dead and have lost all their leaves. Increased rating based on overall quality of tree health.
BW-S-PI-5_P26	25/5/2023	Excellent	4	2-10%	30-70%	Tree crowns look healthy, some older Banksia dead and have lost all their leaves. Increased rating based on overall quality of tree health. Trees still at 4 rating
BW-S-PI-5_P26	29/9/2023	Excellent	4	10-30%	30-70%	Tree crowns look healthy, some older Banksia dead and have lost all their leaves. Increased rating based on overall quality of tree health. Trees still at 4 rating
BW-S-PI-5_P26	24/5/2024	Excellent	4	10-30%	30-70%	Tree crowns look healthy, some older Banksia dead and have lost all their leaves. Increased rating based on overall quality of tree health. Trees still at 4 rating. 2024 per 23 assessment. Site relatively healthy.
BW-S-PI-5_P26	20/10/2022	Excellent	4	2-10%	30-70%	Tree crowns look healthy, some older Banksia dead and have lost all their leaves. Increased rating based on overall quality of tree health.
BW-S-PI-5_P27	20/11/2019	Excellent		<2%		Possible storm damage in past
BW-S-PI-5_P27	22/5/2020	Excellent		<2%	30-70%	Incorrectly labeled 0P23
BW-S-PI-5_P27	23/10/2020	Excellent	3	2-10%	30-70%	Incorrectly labeled 0P23
BW-S-PI-5_P27	14/10/2021	Excellent	3	2-10%	30-70%	
BW-S-PI-5_P27	25/5/2022	Excellent	3	2-10%	30-70%	Note large marri jarrah tree crowns are very thin hence 3 rating.
BW-S-PI-5_P27	20/10/2022	Excellent	3	2-10%	30-70%	Note large marri jarrah tree crowns are very thin hence 3 rating.
BW-S-PI-5_P27	25/5/2023	Excellent	3	2-10%	30-70%	Note large marri jarrah tree crowns are very thin hence 3 rating.
BW-S-PI-5_P27	29/9/2023	Excellent	3	2-10%	30-70%	Note large marri jarrah tree crowns are very thin hence 3 rating.
BW-S-PI-5_P27	24/5/2024	Excellent	3	2-10%	30-70%	Note large marri jarrah tree crowns are very thin hence 3 rating. Some scattered b grandis saplings and kunzea glabrescens dead in background due to drought. Other Banksia ok pic 185. Hh stressed
BW-S-PI-5_P28	20/11/2019	Excellent		<2%		
BW-S-PI-5_P28	25/6/2020	Excellent		<2%		
BW-S-PI-5_P28	9/9/2020	Excellent		<2%		
BW-S-PI-5_P28	14/10/2021	Excellent	4	<2%	30-70%	Point for old photocode number
BW-S-PI-5_P28	25/5/2023	Excellent	4	<2%	30-70%	Banksia healthy. Marri showing continued stress, hence 4 rating.
BW-S-PI-5_P28	29/9/2023	Excellent	4	<2%	30-70%	Banksia healthy. Marri showing continued stress, hence 4 rating. Weeds are increasing mostly bmax
BW-S-PI-5_P28	24/5/2024	Excellent	4	<2%	30-70%	Banksia healthy. Marri showing continued stress, hence 4 rating. Weeds are increasing mostly bmax. Site relatively healthy. One dead banksia grandis sapling. Due to drought.
BW-S-PI-5_P28	25/5/2022	Excellent	4	<2%	30-70%	Banksia canopies look healthy. Other tree crowns are thinning.
BW-S-PI-5_P28	20/10/2022	Excellent	4	<2%	30-70%	Banksia canopies look healthy. Other tree crowns are thinning.
BW-S-PI-5_P29	20/11/2019	Excellent		<2%		
BW-S-PI-5_P29	22/5/2020	Excellent		<2%	30-70%	Note recent death of Banksia attenuata due to die back
BW-S-PI-5_P29	23/10/2020	Excellent	4	<2%	30-70%	Note recent death of two Banksia attenuata due to die back
BW-S-PI-5_P29	14/10/2021	Excellent	4	<2%	30-70%	
BW-S-PI-5_P29	25/5/2022	Excellent	4	<2%	30-70%	Canopies of large trees are thin

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-5_P29	20/10/2022	Excellent	4	<2%	30-70%	Canopies of large trees are thin, recent death of Banksia sapling may indicate active pc front. Xanthorrhoea brunonis fronds yellowing.
BW-S-PI-5_P29	25/5/2023	Excellent	4	<2%	30-70%	Canopies of large trees are thin, recent death of Banksia sapling may indicate active pc front. Xanthorrhoea brunonis fronds yellowing. Xanthorrhoea still alive,
BW-S-PI-5_P29	29/9/2023	Excellent	4	<2%	30-70%	Canopies of large trees are thin, recent death of Banksia sapling may indicate active pc front. Xanthorrhoea brunonis fronds yellowing. Xanthorrhoea still alive, / healthy
BW-S-PI-5_P29	24/5/2024	Excellent	4	<2%	30-70%	Canopies of large trees are thin, recent death of Banksia sapling may indicate active pc front. 2024 Xb ok. Further death of some scattered Banksia grandis saplings in and near site. Jarrah tree dead due to wood borer. hh stressed but site looks ok.
BW-S-PI-5_P30	20/11/2019	Very good		<2%		
BW-S-PI-5_P30	22/5/2020	Very good		<2%	30-70%	
BW-S-PI-5_P30	23/10/2020	Very good	4	<2%	30-70%	
BW-S-PI-5_P30	14/10/2021	Very good	4	<2%	30-70%	
BW-S-PI-5_P30	**25/5/2022**	**Very good**	**4**	**<2%**	**30-70%**	Dead Banksia trees have fallen.
BW-S-PI-5_P30	20/10/2022	Very good	4	<2%	30-70%	Dead Banksia trees have fallen.
BW-S-PI-5_P30	25/5/2023	Very good	4	<2%	30-70%	Dead Banksia trees have fallen. Dieback does not appear to be very active, no recent death.
BW-S-PI-5_P30	29/9/2023	Very good	4	2-10%	30-70%	Dead Banksia trees have fallen. Dieback does not appear to be very active, no recent death. Weeds have increased near track
BW-S-PI-5_P30	24/5/2024	Very good	4	2-10%	30-70%	Dead Banksia trees have fallen. Dieback does not appear to be very active, no recent death. Weeds have increased near track. Dead Persoonia longifolia in background. All Hh very stressed.
BW-S-PI-5_P31	20/11/2019	Very good		2-10%		
BW-S-PI-5_P31	22/5/2020	Very good		<2%	30-70%	Weeds not evident at this time
BW-S-PI-5_P31	23/10/2020	Very good	4	<2%	30-70%	Weeds not evident at this time
BW-S-PI-5_P31	14/10/2021	Very good	4	<2%	30-70%	
BW-S-PI-5_P31	25/5/2022	Very good	4	<2%	30-70%	
BW-S-PI-5_P31	20/10/2022	Very good	4	<2%	30-70%	
BW-S-PI-5_P31	25/5/2023	Very good	4	<2%	30-70%	
BW-S-PI-5_P31	29/9/2023	Very good	4	2-10%	30-70%	Weed cover increased
BW-S-PI-5_P31	24/5/2024	Very good	4	2-10%	30-70%	Weed cover increased, no annual weeds, too dry. Some occasional scattered dead jarrah saplings due to wood borer. Pic 184
BW-S-PI-5_P32	20/11/2019	Good		2-10%		
BW-S-PI-5_P32	22/5/2020	Very good		<2%	30-70%	Access issues previously reported have passed
BW-S-PI-5_P32	23/10/2020	Very good	4	2-10%	30-70%	Access issues previously reported have passed
BW-S-PI-5_P32	14/10/2021	Very good	4	2-10%	30-70%	
BW-S-PI-5_P32	25/5/2022	Very good	4	2-10%	30-70%	Tree crowns look healthy. Old trees have died and what remains is good
BW-S-PI-5_P32	20/10/2022	Very good	4	2-10%	30-70%	Tree crowns look healthy. Old trees have died and what remains is good
BW-S-PI-5_P32	25/5/2023	Very good	4	2-10%	30-70%	Tree crowns look healthy. Old trees have died and what remains is good
BW-S-PI-5_P32	29/9/2023	Very good	4	2-10%	30-70%	Tree crowns look healthy. Old trees have died and what remains is good
BW-S-PI-5_P32	24/5/2024	Very good	4	2-10%	30-70%	Tree crowns look healthy. Old trees have died and what remains is good. Some scattered jarrah saplings and Banksia grandis dead, jarrah affected by wood borer pic 183. Hh stressed.
BW-S-PI-5_P33	20/11/2019	Very good		2-10%		
BW-S-PI-5_P33	22/5/2020	Very good		<2%	30-70%	Autumn view presents less weeds

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-5_P33	23/10/2020	Very good	3	2-10%	30-70%	Autumn view presents less weeds
BW-S-PI-5_P33	14/10/2021	Very good	3	2-10%	30-70%	
BW-S-PI-5_P33	25/5/2022	Very good	3	2-10%	30-70%	
BW-S-PI-5_P33	20/10/2022	Very good	3	2-10%	30-70%	
BW-S-PI-5_P33	25/5/2023	Very good	3	2-10%	30-70%	
BW-S-PI-5_P33	29/9/2023	Very good	3	2-10%	30-70%	Trees don,Äôt look stressed, but foliage missing on old stressed trees.
BW-S-PI-5_P33	24/5/2024	Very good	3	2-10%	30-70%	Some scattered dead jarrah saplings young trees in background. Pic 181 most Hibbertia hypercoides is very stressed almost dead pic 182
BW-S-PI-5_P34	20/11/2019	Very good		2-10%		
BW-S-PI-5_P34	22/5/2020	Excellent		<2%	30-70%	
BW-S-PI-5_P34	23/10/2020	Excellent	3	<2%	30-70%	
BW-S-PI-5_P34	14/10/2021	Excellent	3	<2%	30-70%	
BW-S-PI-5_P34	25/5/2022	Excellent	4	<2%	30-70%	Tree crowns look healthy , increased health from 3 to 5
BW-S-PI-5_P34	20/10/2022	Excellent	5	<2%	30-70%	Tree crowns look healthy , increased health from 3 to 5, Briza maxima is increasing in the area west of monitoring area. Substantial increases in the monitoring area will result in a lowering of veg condition.
BW-S-PI-5_P34	25/5/2023	Excellent	5	<2%	30-70%	Tree crowns look healthy , increased health from 3 to 5, Briza maxima is increasing in the area west of monitoring area. Substantial increases in the monitoring area will result in a lowering of veg condition.
BW-S-PI-5_P34	29/9/2023	Excellent	5	<2%	30-70%	Tree crowns look healthy , increased health from 3 to 5, Briza maxima is increasing in the area west of monitoring area. Substantial increases in the monitoring area will result in a lowering of veg condition. Weeds stable.
BW-S-PI-5_P34	24/5/2024	Excellent	4	<2%	30-70%	Some scattered dead very stressed banksia and jarrah trees in background.
BW-S-PI-5_T1N	20/11/2019	Very good				
BW-S-PI-5_T1N	22/5/2020	Very good		<2%	30-70%	
BW-S-PI-5_T1N	14/10/2020	Very good	3	30-70%	30-70%	
BW-S-PI-5_T1N	14/10/2021	Very good	4	10-30%	30-70%	Weed cover has reduced
BW-S-PI-5_T1N	25/5/2022	Very good	4	10-30%	30-70%	
BW-S-PI-5_T1N	17/10/2022	Very good	5	10-30%	30-70%	
BW-S-PI-5_T1N	26/5/2023	Very good	5	10-30%	30-70%	
BW-S-PI-5_T1N	13/10/2023	Very good	5	10-30%	30-70%	Weed cover has reduced. Still 10-30%
BW-S-PI-5_T1N	24/5/2024	Very good	5	10-30%	30-70%	Weed cover has reduced. Still 10-30%. Canopy mostly healthy but Hh very stressed may revive over winter. Pic 188.
BW-S-PI-5_T1S	20/11/2019	Very good				
BW-S-PI-5_T1S	22/5/2020	Excellent		<2%	30-70%	Historic drought deaths Jarrah
BW-S-PI-5_T1S	14/10/2020	Excellent	4	<2%	30-70%	Historic drought deaths Jarrah, rlrl from south
BW-S-PI-5_T1S	14/10/2021	Excellent	4	<2%	30-70%	
BW-S-PI-5_T1S	25/5/2022	Excellent	4	<2%	30-70%	
BW-S-PI-5_T1S	17/10/2022	Excellent	4	<2%	30-70%	
BW-S-PI-5_T1S	26/5/2023	Excellent	4	<2%	30-70%	Trees still partially stressed.
BW-S-PI-5_T1S	13/10/2023	Excellent	4	<2%	30-70%	Trees still partially stressed./ trees look healthy and in stressed.
BW-S-PI-5_T1S	24/5/2024	Excellent	4	<2%	30-70%	Trees still partially stressed./ trees look healthy and in stressed. 20241-2 banksia grandis and jarrah sapling dead/ stressed. 1 kunzea dead. Pic of adjacent borr 189.
BW-S-PI-8_P01	20/6/2022	Very good	5	2-10%	30-70%	
BW-S-PI-8_P01	20/10/2022	Very good	4	2-10%	30-70%	Large marri and jarrah trees are stressed

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-8_P01	26/5/2023	Very good	4	2-10%	30-70%	Large marri and jarrah trees are stressed , still stressed. Cleared within 10m of site.
BW-S-PI-8_P01	29/9/2023	Very good	4	2-10%	30-70%	Large marri and jarrah trees are stressed , still stressed. Cleared within 10m of site. P2518 stressed jarrah and marri trees. P2519 cleared edge weed free.
BW-S-PI-8_P01	25/5/2024	Very good	4	2-10%	30-70%	Large marri and jarrah trees are stressed , still stressed. Cleared within 10m of site. P2518 stressed jarrah and marri trees. P2519 cleared edge weed free. 2024 per 2023. Close to works. Pic 195
BW-S-PI-8_P02	20/6/2022	Excellent	5	<2%	>70%	
BW-S-PI-8_P02	20/10/2022	Excellent	5	<2%	>70%	
BW-S-PI-8_P02	26/5/2023	Excellent	5	<2%	>70%	Site looks healthy
BW-S-PI-8_P02	29/9/2023	Excellent	5	<2%	>70%	Site looks healthy / one jarrah sapling about 3m from cleared edge is almost dead P2520. All other trees healthy. P3086
BW-S-PI-8_P02	25/5/2024	Excellent	4	<2%	>70%	Site looks healthy / one jarrah sapling about 3m from cleared edge is almost dead P2520. All other trees healthy. P3086. 2024 jarrah dead. Large Banksia attenuata dead, with another in background dead due to drought. Hh stressed-
BW-S-PI-8_P03	20/6/2022	Good	5	10-30%	30-70%	Site has been disturbed, towards road edge it is good, but condition improves away from road
BW-S-PI-8_P03	20/10/2022	Good	5	10-30%	30-70%	Site has been disturbed, towards road edge it is good, but condition improves away from referral area.
BW-S-PI-8_P03	26/5/2023	Good	5	10-30%	30-70%	Site has been disturbed, towards road edge it is good, but condition improves towards the project area.
BW-S-PI-8_P03	13/10/2023	Good	5	10-30%	30-70%	Site has been disturbed, towards road edge it is good, but condition improves towards the project area./ site stable
BW-S-PI-8_P03	25/5/2024	Good	4	10-30%	30-70%	Site has been disturbed, towards road edge it is good, but condition improves towards the project area./ site stable. 2024 annual weeds absent. Large agonis, and Ba dead in site. Scattered Agonis in background also dead due to drought. Pic 196.
BW-S-PI-8_P04	20/6/2022	Very good	5	2-10%	30-70%	
BW-S-PI-8_P04	20/10/2022	Very good	5	2-10%	30-70%	
BW-S-PI-8_P04	26/5/2023	Very good	5	2-10%	30-70%	
BW-S-PI-8_P04	13/10/2023	Very good	5	2-10%	30-70%	Site looks healthy
BW-S-PI-8_P04	25/5/2024	Very good	4	2-10%	30-70%	2024 trees look stressed with 75% of canopy. Young jarrah and Banksia attenuata dead but Note vegetation adjacent to borr ok. Pic 197, 198
BW-S-PI-8_P05	20/6/2022	Good	5	30-70%	10-30%	
BW-S-PI-8_P05	20/10/2022	Good	5	30-70%	30-70%	
BW-S-PI-8_P05	26/5/2023	Good	5	30-70%	30-70%	
BW-S-PI-8_P05	13/10/2023	Good	5	30-70%	30-70%	Site looks healthy. Adjacent veg similar P3095,3096
BW-S-PI-8_P05	25/5/2024	Good	4	30-70%	30-70%	Site looks healthy. Adjacent veg similar P3095,3096. 2024 3 dead banksia. Several very stressed/ dead agonis on site . This death and stress pattern is repeated to south behind monitoring site. Under story stressed but ok.pic 199. About 50% canopy.
BW-S-PI-8_P06	20/6/2022	Good	5	30-70%	30-70%	
BW-S-PI-8_P06	20/10/2022	Good	5	30-70%	30-70%	
BW-S-PI-8_P06	26/5/2023	Good	5	30-70%	30-70%	
BW-S-PI-8_P06	13/10/2023	Good	5	30-70%	30-70%	Peppi tree to west adjacent clearing healthy. P3097
BW-S-PI-8_P06	25/5/2024	Good	4	30-70%	30-70%	Peppi tree to west adjacent clearing healthy. P3097 2024 2 mature batt dead, 3-4 agonis very stressed / dead. Due to drought. Hh stressed but ok. Note vegetation adjacent to borr cutting ok - Pic 200.
BW-S-PI-8_P07	20/6/2022	Good	5	30-70%	30-70%	
BW-S-PI-8_P07	20/10/2022	Good	5	30-70%	30-70%	
BW-S-PI-8_P07	26/5/2023	Good	5	30-70%	30-70%	

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-PI-8_P07	13/10/2023	Good	5	30-70%	30-70%	Jarrah tree sapling just east of cleared area stressed. P3098. All other trees ok. Cutting at this side deep.p3099. Else ok
BW-S-PI-8_P07	25/5/2024	Good	3	30-70%	30-70%	. Else ok. 2024 - Most trees agonis and Banksia attenuata very stressed/ dead within 20 - 30 m of monitoring point. Pic 201 204. Understory stressed but ok. Highest point, pic c205 perhaps very dry.
BW-S-PI-8_P08	20/6/2022	Good	5	30-70%	30-70%	
BW-S-PI-8_P08	20/10/2022	Good	5	30-70%	30-70%	
BW-S-PI-8_P08	26/5/2023	Good	5	30-70%	30-70%	
BW-S-PI-8_P08	13/10/2023	Good	5	30-70%	30-70%	Site looks healthy, no stress in trees or shrubs
BW-S-PI-8_P08	25/5/2024	Good	4	30-70%	30-70%	Site looks healthy, no stress in trees or shrubs. 2024 8-10 Adonis saplings dead, 1 small B grandis dead in site. Scattered dead/stressed ag and ba in background. Under story stressed but ok. Vegetation adjacent to cutting ok pic 206.
BW-S-PI-8_T1E	20/10/2022	Excellent	5	<2%	30-70%	
BW-S-PI-8_T1E	26/5/2023	Excellent	5	<2%	30-70%	
BW-S-PI-8_T1E	13/10/2023	Excellent	5	<2%	30-70%	
BW-S-PI-8_T1E	25/5/2024	Excellent	4	<2%	30-70%	2 large dead banksia to south. Other trees stressed 75% canopy but ok. Note it seems agonis most affeyby drought. Understory ok.
BW-S-PI-8_T1W	20/10/2022	Excellent	5	<2%	30-70%	
BW-S-PI-8_T1W	26/5/2023	Excellent	5	<2%	30-70%	
BW-S-PI-8_T1W	13/10/2023	Excellent	5	<2%	30-70%	
BW-S-PI-8_T1W	25/5/2024	Excellent	4	<2%	30-70%	One large Ba to north dead. Other trees stressed but ok 75% canopy. Understory ok.
BW-S-R-1_T1E	22/11/2019	Very good				Grey sand, note delete photos for this point
BW-S-R-1_T1E	22/5/2020	Very good		<2%	30-70%	Grey sand, note delete photos for this point
BW-S-R-1_T1E	22/10/2020	Very good	5	<2%	30-70%	Grey sand, note delete photos for this point
BW-S-R-1_T1E	12/10/2021	Very good	5	<2%	30-70%	
BW-S-R-1_T1E	26/5/2022	Very good	4	<2%	30-70%	Dieback has killed a number of banksia trees. The jarrah trees are stressed and have a thin crown.
BW-S-R-1_T1E	13/10/2022	Very good	5	<2%	30-70%	
BW-S-R-1_T1E	22/5/2023	Very good	4	<2%	30-70%	Large banksia attenuata has fallen across the transect impacting a small jarrah tree. All banksia attenuata in area is now dead. Need to swap veg unit description east for west.
BW-S-R-1_T1E	10/10/2023	Very good	4	<2%	30-70%	Large banksia attenuata has fallen across the transect impacting a small jarrah tree. All banksia attenuata in area is now dead. Need to swap veg unit description east for west. Still need to swap veg unit description
BW-S-R-1_T1E	25/5/2024	Very good	4	<2%	30-70%	Large banksia attenuata has fallen across the transect impacting a small jarrah tree. All banksia attenuata in area is now dead. Need to swap veg unit description east for west. Still need to swap veg unit description
BW-S-R-1_T1W	22/11/2019	Excellent				Transects photos from west rlrl
BW-S-R-1_T1W	22/5/2020	Very good		<2%	30-70%	Transects photos from west rlrl
BW-S-R-1_T1W	22/10/2020	Very good	4	<2%	30-70%	Transects photos from west rlrl, q1 is at 0- minus 2n on the left side because of fallen branches.
BW-S-R-1_T1W	12/10/2021	Very good	4	<2%	30-70%	
BW-S-R-1_T1W	26/5/2022	Very good	4	<2%	30-70%	Lots of storm detritus
BW-S-R-1_T1W	13/10/2022	Very good	4	<2%	30-70%	
BW-S-R-1_T1W	22/5/2023	Very good	4	<2%	30-70%	West end of site not as impacted by dieback. Note absence of calytryx flavescens and bossiaea eriocarpa and gompholobium tomentosum in the under story.
BW-S-R-1_T1W	10/10/2023	Very good	4	<2%	30-70%	West end of site not as impacted by dieback. Note absence of calytryx flavescens and bossiaea eriocarpa and gompholobium tomentosum in the under story.

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
BW-S-R-1_T1W	25/5/2024	Very good	4	<2%	30-70%	West end of site not as impacted by dieback. Note absence of calytryx flavescens and bossiaea eriocarpa and gompholobium tomentosum in the under story.
BW-S-R-1_T2N	3/12/2019	Excellent				
BW-S-R-1_T2N	22/5/2020	Excellent		<2%	30-70%	Storm damage evident in site with fallen shrubs
BW-S-R-1_T2N	22/10/2020	Excellent	3	<2%	30-70%	Storm damage evident in site with fallen shrubs , jarrah trees stressed
BW-S-R-1_T2N	12/10/2021	Excellent	3	<2%	30-70%	
BW-S-R-1_T2N	26/5/2022	Excellent	4	<2%	30-70%	Vegetation looks healthy, but large jarrah is stressed.
BW-S-R-1_T2N	13/10/2022	Excellent	4	<2%	30-70%	The condition of vegetation has improved. Two good seasons of rain.
BW-S-R-1_T2N	22/5/2023	Excellent	4	<2%	30-70%	The condition of vegetation has improved. Two good seasons of rain. Condition hasn't deteriorated. However x brunonis appears stressed.
BW-S-R-1_T2N	10/10/2023	Excellent	4	<2%	30-70%	The condition of vegetation has improved. Two good seasons of rain. Condition hasn,Äôt deteriorated. However x brunonis appears stressed.
BW-S-R-1_T2N	25/5/2024	Excellent	4	<2%	30-70%	The condition of vegetation has improved. Two good seasons of rain. Condition hasn,Äôt deteriorated. However x brunonis appears stressed.
BW-S-R-1_T2S	3/12/2019	Excellent				
BW-S-R-1_T2S	22/5/2020	Excellent		<2%	>70%	
BW-S-R-1_T2S	22/10/2020	Excellent		<2%	>70%	
BW-S-R-1_T2S	12/10/2021	Excellent		<2%	>70%	
BW-S-R-1_T2S	26/5/2022	Excellent	4	<2%	>70%	
BW-S-R-1_T2S	13/10/2022	Excellent	5	<2%	>70%	
BW-S-R-1_T2S	22/5/2023	Excellent	5	<2%	>70%	Note Leucopogon racemulosa is a dominant shrub in the under story
BW-S-R-1_T2S	10/10/2023	Excellent	4	<2%	>70%	Note Leucopogon racemulosa is a dominant shrub in the under story. Trees are all moderately stressed with less foliage.
BW-S-R-1_T2S	25/5/2024	Excellent	4	<2%	>70%	Note Leucopogon racemulosa is a dominant shrub in the under story. Trees are all moderately stressed with less foliage.
CP-NS-R-1_T1E	6/11/2019	Very good				Quadrat from east end right left right left
CP-NS-R-1_T1E	20/5/2020	Very good		2-10%		Quadrat from east end right left right left
CP-NS-R-1_T1E	12/10/2020	Very good	5	10-30%	30-70%	Quadrat from east end right left right left
CP-NS-R-1_T1E	9/11/2021	Very good	5	10-30%	30-70%	Viminaria juncea dieing due to old age.
CP-NS-R-1_T1E	24/5/2022	Very good	5	10-30%	30-70%	Viminaria juncea dieing due to old age.
CP-NS-R-1_T1E	28/9/2022	Very good	5	10-30%	30-70%	Viminaria juncea dieing due to old age.
CP-NS-R-1_T1E	24/5/2023	Very good	5	10-30%	30-70%	Viminaria juncea dieing due to old age.
CP-NS-R-1_T1E	11/10/2023	Very good	5	10-30%	30-70%	Viminaria juncea dieing due to old age.
CP-NS-R-1_T1E	23/5/2024	Very good	4	10-30%	30-70%	Viminaria juncea dieing due to old age. Some Vj dead and some declining still. Crown cover of marris has thinned , perhaps due to dry summer.
CP-NS-R-1_T1W	6/11/2019	Excellent				
CP-NS-R-1_T1W	20/5/2020	Excellent		<2%	30-70%	
CP-NS-R-1_T1W	12/10/2020	Excellent	5	<2%	30-70%	
CP-NS-R-1_T1W	9/11/2021	Excellent	5	<2%	30-70%	
CP-NS-R-1_T1W	24/5/2022	Excellent	5	<2%	30-70%	
CP-NS-R-1_T1W	28/9/2022	Excellent	5	<2%	30-70%	
CP-NS-R-1_T1W	24/5/2023	Excellent	5	<2%	30-70%	
CP-NS-R-1_T1W	11/10/2023	Excellent	5	<2%	30-70%	Site looks healthy
CP-NS-R-1_T1W	23/5/2024	Excellent	4	<2%	30-70%	Site looks healthy, but the crowns of marri have declined to about 75%. Hakea prostrata stressed.

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
CP-NS-R-2_T1N	26/9/2020	Degraded	5	10-30%	30-70%	
CP-NS-R-2_T1N	15/10/2021	Degraded	5	10-30%	30-70%	
CP-NS-R-2_T1N	26/5/2022	Degraded	5	10-30%	30-70%	
CP-NS-R-2_T1N	26/9/2022	Degraded	5	10-30%	30-70%	
CP-NS-R-2_T1N	25/5/2023	Degraded	5	10-30%	30-70%	
CP-NS-R-2_T1N	12/10/2023	Degraded	5	30-70%	30-70%	
CP-NS-R-2_T1N	24/5/2024	Degraded	5	30-70%	30-70%	Vegetation is healthy inspite of dry summer.
CP-NS-R-2_T1S	20/10/2020	Good	5	10-30%	30-70%	
CP-NS-R-2_T1S	15/10/2021	Good	5			
CP-NS-R-2_T1S	26/5/2022	Good	5	30-70%	2-10%	
CP-NS-R-2_T1S	29/9/2022	Good	5	10-30%	30-70%	
CP-NS-R-2_T1S	25/5/2023	Good	5	10-30%	30-70%	
CP-NS-R-2_T1S	12/10/2023	Good	5	10-30%	30-70%	Rescored 10 November
CP-NS-R-2_T1S	24/5/2024	Good	5	10-30%	30-70%	Vegetation appears healthy inspite of dry summer
CP-S-PI-1_P01	19/11/2019	Degraded		10-30%		
CP-S-PI-1_P01	20/5/2020	Degraded		10-30%	10-30%	
CP-S-PI-1_P01	15/10/2021	Degraded	5	30-70%	10-30%	Sheep foot plugs in clay
CP-S-PI-1_P01	**26/5/2022**	**Degraded**	**5**	**30-70%**	**10-30%**	Fire track inundated, as expected in clay pan after rain
CP-S-PI-1_P01	19/10/2022	Degraded	5	30-70%	10-30%	Fire track inundated, as expected in clay pan after rain
CP-S-PI-1_P01	25/5/2023	Degraded	5	30-70%	10-30%	Fire track slightly inundated. Dry autumn
CP-S-PI-1_P01	29/9/2023	Degraded	5	30-70%	10-30%	Fire track slightly inundated. Dry autumn
CP-S-PI-1_P01	24/5/2024	Degraded	5	30-70%	10-30%	Vegetation appears healthy, even after the dry summer.
CP-S-PI-1_P02	19/11/2019	Good		2-10%		Farm
CP-S-PI-1_P02	20/5/2020	Good		2-10%	10-30%	Farm
CP-S-PI-1_P02	15/10/2021	Good	5	10-30%	10-30%	
CP-S-PI-1_P02	**26/5/2022**	**Good**	**5**	**10-30%**	**10-30%**	No native annuals germinated yet
CP-S-PI-1_P02	19/10/2022	Good	5	10-30%	10-30%	Track inundated as expected for this time of year.
CP-S-PI-1_P02	25/5/2023	Good	5	10-30%	10-30%	Track dry
CP-S-PI-1_P02	29/9/2023	Good	5	10-30%	10-30%	Track inundated
CP-S-PI-1_P02	24/5/2024	Good	5	10-30%	10-30%	Shrubs appear healthy.
CP-S-PI-1_P03	19/11/2019	Very good		2-10%		
CP-S-PI-1_P03	20/5/2020	Very good		2-10%	30-70%	Adjacent to fire access track
CP-S-PI-1_P03	15/10/2021	Very good	5	2-10%	30-70%	
CP-S-PI-1_P03	**26/5/2022**	**Very good**	**5**	**2-10%**	**30-70%**	
CP-S-PI-1_P03	19/10/2022	Very good	5	2-10%	30-70%	
CP-S-PI-1_P03	25/5/2023	Very good	5	2-10%	30-70%	Dry autumn, no water.
CP-S-PI-1_P03	29/9/2023	Very good	5	2-10%	30-70%	Damp lots of herbs
CP-S-PI-1_P03	24/5/2024	Very good	5	2-10%	30-70%	Site appears healthy and stable.
CP-S-PI-1_T1N	5/11/2019	Degraded				
CP-S-PI-1_T1N	20/5/2020	Degraded		30-70%	10-30%	
CP-S-PI-1_T1N	20/10/2020	Degraded		30-70%	10-30%	
CP-S-PI-1_T1N	15/10/2021	Degraded	5	30-70%	10-30%	
CP-S-PI-1_T1N	**26/5/2022**	**Degraded**	**5**	**30-70%**	**10-30%**	

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
CP-S-PI-1_T1N	29/9/2022	Degraded	5	30-70%	10-30%	
CP-S-PI-1_T1N	25/5/2023	Degraded	5	30-70%	10-30%	
CP-S-PI-1_T1N	12/10/2023	Degraded	5	30-70%	10-30%	Annuals are really dense across the site this season
CP-S-PI-1_T1N	24/5/2024	Degraded	5	30-70%	10-30%	
CP-S-PI-1_T1S	5/11/2019	Good				Near historic access track
CP-S-PI-1_T1S	20/5/2020	Good		10-30%	30-70%	Near historic access track
CP-S-PI-1_T1S	20/10/2020	Good	5	10-30%	30-70%	Near historic access track
CP-S-PI-1_T1S	15/10/2021	Good	5	10-30%	30-70%	
CP-S-PI-1_T1S	**26/5/2022**	**Good**	**5**	**10-30%**	**30-70%**	
CP-S-PI-1_T1S	29/9/2022	Good	5	10-30%	30-70%	
CP-S-PI-1_T1S	25/5/2023	Good	5	10-30%	30-70%	
CP-S-PI-1_T1S	12/10/2023	Good	5	10-30%	30-70%	Date 10 November, colin q4 is q1.
CP-S-PI-1_T1S	24/5/2024	Good	5	10-30%	30-70%	
CP-S-PI-1_P01	28/10/2020	Degraded	5	30-70%	10-30%	10 Cm inundated fire break
CP-S-PI-1_P02	28/10/2020	Good	5	10-30%	10-30%	Site fully inundated, 20x20m. 10cm
CP-S-PI-1_P03	28/10/2020	Very good	5	2-10%	30-70%	Adjacent to fire access track
TW-S-PI-2_P01	31/7/2020	Very good		10-30%	30-70%	
TW-S-PI-2_P01	28/10/2020	Very good	5	30-70%	30-70%	Site is in the border of being good
TW-S-PI-2_P01	14/10/2021	Very good	5	30-70%	30-70%	
TW-S-PI-2_P01	**26/5/2022**	**Very good**	**5**	**30-70%**	**30-70%**	
TW-S-PI-2_P01	19/10/2022	Very good	5	30-70%	30-70%	Weeds are invading the condition of the site is declining
TW-S-PI-2_P01	25/5/2023	Very good	5	30-70%	30-70%	Weeds are invading the condition of the site is declining. Autumn dry no annual weeds.
TW-S-PI-2_P01	29/9/2023	Very good	5	30-70%	30-70%	Weeds are invading the condition of the site is declining. Autumn dry no annual weeds. Briza maxima, Ursinia invading
TW-S-PI-2_P01	24/5/2024	Very good	4	30-70%	30-70%	Scattered stressed agonis, most hibbertia hypericoides dead / stressed in site. Pic 168
TW-S-PI-2_P02	31/7/2020	Good		10-30%	30-70%	
TW-S-PI-2_P02	28/10/2020	Good	5	30-70%	30-70%	Weed cover increased significantly
TW-S-PI-2_P02	14/10/2021	Good	5	30-70%	30-70%	
TW-S-PI-2_P02	**26/5/2022**	**Good**	**5**	**30-70%**	**30-70%**	
TW-S-PI-2_P02	19/10/2022	Good	5	30-70%	30-70%	
TW-S-PI-2_P02	25/5/2023	Good	5	30-70%	30-70%	
TW-S-PI-2_P02	29/9/2023	Good	5	30-70%	30-70%	
TW-S-PI-2_P02	24/5/2024	Good	4	30-70%	30-70%	Scattered dead/ stressed Banksia, agonis and Xylomelon.
TW-S-PI-2_P03	31/7/2020	Good		10-30%	30-70%	
TW-S-PI-2_P03	28/10/2020	Good	5	10-30%	30-70%	
TW-S-PI-2_P03	14/10/2021	Good	5	10-30%	30-70%	
TW-S-PI-2_P03	**26/5/2022**	**Good**	**5**	**10-30%**	**30-70%**	Peppermint, Banksia and Spyridium crowns thin, hence 4 rating
TW-S-PI-2_P03	19/10/2022	Good	4	30-70%	30-70%	Peppermint, Banksia and Spyridium crowns thin, hence 4 rating
TW-S-PI-2_P03	25/5/2023	Good	4	30-70%	30-70%	Peppermint, Banksia and Spyridium crowns thin, hence 4 rating
TW-S-PI-2_P03	29/9/2023	Good	4	30-70%	30-70%	Peppermint, Banksia and Spyridium crowns thin, hence 4 rating/ 2 Spyridium dead, possibly old age
TW-S-PI-2_P03	24/5/2024	Good	4	30-70%	30-70%	2024 3 Spyridium dead and 2 very stressed. Several Young melaleuca thymoides also dead in site. This appears localised and maybe exacerbated by drought. Pic 167.

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
TW-S-PI-2_P04	31/7/2020	Good		10-30%	30-70%	
TW-S-PI-2_P04	28/10/2020	Good	4	30-70%	30-70%	Banksia and agonis have some thinning of the canopy.
TW-S-PI-2_P04	14/10/2021	Good	4	30-70%	30-70%	
TW-S-PI-2_P04	**26/5/2022**	**Good**	**4**	**30-70%**	**30-70%**	
TW-S-PI-2_P04	19/10/2022	Good	4	30-70%	30-70%	
TW-S-PI-2_P04	25/5/2023	Good	4	30-70%	30-70%	
TW-S-PI-2_P04	29/9/2023	Good	4	30-70%	30-70%	
TW-S-PI-2_P04	24/5/2024	Good	4	30-70%	30-70%	Scattered dead/ very stressed agonis. Some dead and healthy Agonis adjacent to borr pic 166.
TW-S-PI-2_P05	31/7/2020	Degraded		10-30%	30-70%	
TW-S-PI-2_P05	9/9/2020	Degraded		10-30%	30-70%	
TW-S-PI-2_P05	14/10/2021	Degraded	4	10-30%	30-70%	
TW-S-PI-2_P05	**26/5/2022**	**Degraded**	**4**	**10-30%**	**30-70%**	
TW-S-PI-2_P05	19/10/2022	Degraded	4	>70%	30-70%	
TW-S-PI-2_P05	25/5/2023	Degraded	4	>70%	30-70%	
TW-S-PI-2_P05	29/9/2023	Degraded	4	>70%	30-70%	
TW-S-PI-2_P05	24/5/2024	Degraded	4	>70%	30-70%	Scattered dead/ stressed agonis in vegetation. This is similar adjacent to Borr, pic 165
TW-S-PI-2_P06	31/7/2020	Degraded		10-30%	30-70%	
TW-S-PI-2_P06	28/10/2020	Degraded	5	>70%	30-70%	
TW-S-PI-2_P06	14/10/2021	Degraded	5	>70%	30-70%	
TW-S-PI-2_P06	**26/5/2022**	**Degraded**	**5**	**>70%**	**30-70%**	
TW-S-PI-2_P06	19/10/2022	Degraded	5	>70%	30-70%	
TW-S-PI-2_P06	25/5/2023	Degraded	5	>70%	30-70%	
TW-S-PI-2_P06	29/9/2023	Degraded	5	>70%	30-70%	
TW-S-PI-2_P06	24/5/2024	Degraded	4	>70%	30-70%	Scattered patchy dead/ stressed agonis in vegetation in Manea park. Note vegetation adjacent to Borr is healthy at this point. Pic 164
TW-S-PI-2_P07	31/7/2020	Degraded		10-30%	30-70%	
TW-S-PI-2_P07	28/10/2020	Degraded	5	>70%	30-70%	
TW-S-PI-2_P07	14/10/2021	Degraded	5	>70%	30-70%	
TW-S-PI-2_P07	**26/5/2022**	**Degraded**	**5**	**>70%**	**30-70%**	
TW-S-PI-2_P07	19/10/2022	Degraded	5	>70%	30-70%	
TW-S-PI-2_P07	25/5/2023	Degraded	5	>70%	30-70%	
TW-S-PI-2_P07	29/9/2023	Degraded	5	>70%	30-70%	
TW-S-PI-2_P07	24/5/2024	Degraded	4	>70%	30-70%	Very stressed Agonis scattered in vegetation. Note adjacent to Borr clearing pic 162, 163. Affect is consistent away from borr.
TW-S-PI-2_P08	31/7/2020	Completely degraded		>70%	2-10%	
TW-S-PI-2_P08	28/10/2020	Completely degraded	4	>70%	2-10%	
TW-S-PI-2_P08	14/10/2021	Completely degraded	4	>70%	2-10%	
TW-S-PI-2_P08	26/5/2022	Completely degraded	4	>70%	2-10%	
TW-S-PI-2_P08	19/10/2022	Completely degraded	4	>70%	10-30%	Small tuart tree is very stressed
TW-S-PI-2_P08	25/5/2023	Completely degraded	4	>70%	10-30%	Small tuart tree is very stressed, still stressed.
TW-S-PI-2_P08	29/9/2023	Completely degraded	4	>70%	10-30%	Small jarrah tree is very stressed, still stressed. / still stressed

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
TW-S-PI-2_P08	24/5/2024	Completely degraded	3	>70%	10-30%	Small jarrah tree is very stressed, still stressed. / still stressed. 2024 dead. Most Agonis is very stressed in the site 2 rating. Pic 160, 161.
TW-S-PI-2_P09	31/7/2020	Good		10-30%	30-70%	
TW-S-PI-2_P09	28/10/2020	Good	4	>70%	30-70%	
TW-S-PI-2_P09	14/10/2021	Good	4	>70%	30-70%	
TW-S-PI-2_P09	**26/5/2022**	**Good**	**4**	**>70%**	**30-70%**	
TW-S-PI-2_P09	19/10/2022	Good	4	>70%	30-70%	
TW-S-PI-2_P09	25/5/2023	Good	4	>70%	30-70%	
TW-S-PI-2_P09	29/9/2023	Good	4	>70%	30-70%	
TW-S-PI-2_P09	24/5/2024	Good	4	>70%	30-70%	Recent dead banksia saplings young trees in site and background. Dead jarrah sapling in back of site.
TW-S-PI-2_P10	31/7/2020	Good		10-30%	30-70%	
TW-S-PI-2_P10	19/10/2022		4	10-30%	30-70%	Possible impacts from pc. But old impact site.
TW-S-PI-2_P10	25/5/2023		4	10-30%	30-70%	Possible impacts from pc. But old impact site.
TW-S-PI-2_P10	29/9/2023	Very good	4	10-30%	30-70%	Possible impacts from pc. But old impact site.
TW-S-PI-2_P10	24/5/2024	Very good	4	10-30%	30-70%	Possible impacts from pc. But old impact site. Some scattered stressed banksia and Xylomelon, . Lots of Hibbertia hypericoides and Orthrosanthus laxus abnormal stressed dead in due to drought.
TW-S-PI-2_P11	**19/10/2022**	**Good**	**4**	**10-30%**	**30-70%**	
TW-S-PI-2_P11	25/5/2023	Good	4	10-30%	30-70%	
TW-S-PI-2_P11	29/9/2023	Good	4	10-30%	30-70%	
TW-S-PI-2_P11	24/5/2024	Good	4	10-30%	30-70%	Trees mostly healthy. Hibbertia hypericoides very stressed.
TW-S-PI-2_P12	**19/10/2022**	**Very good**	**5**	**10-30%**	**30-70%**	
TW-S-PI-2_P12	25/5/2023	Very good	5	10-30%	30-70%	
TW-S-PI-2_P12	29/9/2023	Very good	5	10-30%	30-70%	
TW-S-PI-2_P12	24/5/2024	Very good	4	10-30%	30-70%	Scattered very stressed dead banksia and agonis mostly upslope from monitoring point. Pic 169. Almost all Lots Hibbertia hypericoides very stressed. Pic 170.Tuart ok.
TW-S-PI-2_P13	**19/10/2022**	**Degraded**	**5**	**>70%**	**30-70%**	Veg structure impacted , low scope for regeneration
TW-S-PI-2_P13	25/5/2023	Degraded	5	>70%	30-70%	Veg structure impacted , low scope for regeneration
TW-S-PI-2_P13	29/9/2023	Degraded	5	>70%	30-70%	Veg structure impacted , low scope for regeneration
TW-S-PI-2_P13	24/5/2024	Degraded	4	>70%	30-70%	Veg structure impacted , low scope for regeneration. Almost all Agonis dead or very stressed to north pic 171. but to south ok pic 172.
TW-S-PI-2_P14	**19/10/2022**	**Good**	**5**	**30-70%**	**30-70%**	
TW-S-PI-2_P14	25/5/2023	Good	5	30-70%	30-70%	
TW-S-PI-2_P14	29/9/2023	Good	5	30-70%	30-70%	
TW-S-PI-2_P14	24/5/2024	Good	4	30-70%	30-70%	Most agonis, hibbertia hyp very stressed in site. Tuart ok.
TW-S-PI-2_P15	**19/10/2022**	**Very good**	**4**	**30-70%**	**>70%**	Weeds are small, competing with smaller herbs.
TW-S-PI-2_P15	25/5/2023	Very good	4	30-70%	>70%	Few autumn weeds.
TW-S-PI-2_P15	29/9/2023	Very good	4	30-70%	>70%	Few autumn weeds./ lots of spring annual weeds
TW-S-PI-2_P15	24/5/2024	Very good	4	30-70%	>70%	Few autumn weeds./ lots of spring annual weeds 2024 no autumn weeds, some agonis and hibbertia stressed on site. Relatively ok.
TW-S-PI-2_P16	**19/10/2022**	**Very good**	**5**	**30-70%**	**>70%**	
TW-S-PI-2_P16	25/5/2023	Very good	5	30-70%	>70%	All Macrozamia riedlei plants are stressed with outer leaves dead.
TW-S-PI-2_P16	29/9/2023	Very good	5	30-70%	>70%	All Macrozamia reidleii plants are stressed with outer leaves dead/ this a natural part of their growth cycle.

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
TW-S-PI-2_P16	24/5/2024	Very good	4	30-70%	>70%	All Macrozamia reidleii plants are stressed with outer leaves dead/ this a natural part of their cycle 2024 Macrozamia healthy. Most 75% of agonis dead / stressed. Most Styphelia propinqua and hibbertia hyp dead stressed.pic 173
TW-S-PI-2_P17	**19/10/2022**	**Good**	**4**	**30-70%**	**30-70%**	
TW-S-PI-2_P17	25/5/2023	Good	4	30-70%	30-70%	Outer leaves of Macrozamia dead, but plants look healthy
TW-S-PI-2_P17	29/9/2023	Good	4	30-70%	30-70%	Outer leaves of Macrozamia dead, but plants look healthy. Lots of Ursinia invading the site.
TW-S-PI-2_P17	24/5/2024	Good	4	30-70%	30-70%	Some scattered stressed agonis. Priority listed lasiopetalum stressed but surviving. Pic 174
TW-S-PI-2_P18	**19/10/2022**	**Very good**	**4**	**30-70%**	**>70%**	
TW-S-PI-2_P18	25/5/2023	Very good	4	30-70%	>70%	
TW-S-PI-2_P18	29/9/2023	Very good	4	30-70%	>70%	
TW-S-PI-2_P18	24/5/2024	Very good	4	30-70%	>70%	Some scattered stressed Banksia attenuata in background. Large marri tree has died suddenly due to wood borer, cockie predation and drought stress pic 176, 177, 178
TW-S-PI-2_P19	**19/10/2022**	**Good**	**5**	**30-70%**	**30-70%**	Dieing Agonis flexuosa north of site
TW-S-PI-2_P19	25/5/2023	Good	5	30-70%	30-70%	Dying Agonis flexuosa north of site, half is dead.
TW-S-PI-2_P19	29/9/2023	Good	5	30-70%	30-70%	Dieing Agonis flexuosa north of site, half is dead. Still dead
TW-S-PI-2_P19	24/5/2024	Good	4	30-70%	30-70%	Dieing Agonis flexuosa north of site, half is dead. Still dead. Scattered stressed agonis in site and background .
TW-S-PI-2_P20	**19/10/2022**	**Degraded**	**5**	**>70%**	**30-70%**	
TW-S-PI-2_P20	25/5/2023	Degraded	5	>70%	30-70%	
TW-S-PI-2_P20	29/9/2023	Degraded	5	>70%	30-70%	Three large tuarts on the background are dead. Large Marri to the east is very stressed. P2524
TW-S-PI-2_P20	24/5/2024	Degraded	5	>70%	30-70%	Three large tuarts on the background are dead. Large Marri to the east is very stressed. P2524 and is now dead pic 180. A few scattered dead banksia attenuata in background vegetation. Site relatively ok.
TW-S-PI-2_T1E	19/11/2019	Good				
TW-S-PI-2_T1E	26/5/2020	Very good		<2%	30-70%	
TW-S-PI-2_T1E	26/10/2020	Very good	5	2-10%	30-70%	
TW-S-PI-2_T1E	14/10/2021	Very good	5	10-30%	30-70%	
TW-S-PI-2_T1E	**26/5/2022**	**Very good**	**5**	**10-30%**	**30-70%**	
TW-S-PI-2_T1E	19/10/2022	Very good	5	10-30%	30-70%	
TW-S-PI-2_T1E	25/5/2023	Very good	5	10-30%	30-70%	
TW-S-PI-2_T1E	10/10/2023	Very good	5	10-30%	30-70%	
TW-S-PI-2_T1E	24/5/2024	Very good	4	10-30%	30-70%	Scattered Banksia death in background
TW-S-PI-2_T1W	19/11/2019	Good				
TW-S-PI-2_T1W	26/5/2020	Very good		<2%	30-70%	
TW-S-PI-2_T1W	26/10/2020	Very good	5	2-10%	30-70%	Quadrants start rlrl from south
TW-S-PI-2_T1W	14/10/2021	Very good	5	2-10%	30-70%	
TW-S-PI-2_T1W	**26/5/2022**	**Very good**	**5**	**2-10%**	**30-70%**	
TW-S-PI-2_T1W	19/10/2022	Very good	5	2-10%	30-70%	
TW-S-PI-2_T1W	25/5/2023	Very good	5	2-10%	30-70%	
TW-S-PI-2_T1W	10/10/2023	Very good	5	2-10%	30-70%	
TW-S-PI-2_T1W	24/5/2024	Very good	4	2-10%	30-70%	Jarrah saplings dead, some stressed agonis in background.
TW-S-PI-3_P01	26/5/2020	Degraded		30-70%	10-30%	
TW-S-PI-3_P01	28/10/2020	Degraded	5	30-70%	10-30%	
TW-S-PI-3_P01	14/10/2021	Degraded	5	30-70%	10-30%	

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
TW-S-PI-3_P01	**26/5/2022**	**Degraded**	**5**	**30-70%**	**10-30%**	
TW-S-PI-3_P01	19/10/2022	Degraded	5	30-70%	10-30%	
TW-S-PI-3_P01	22/5/2023	Degraded	5	30-70%	10-30%	A new fence is being constructed on opposite side of the fire access track.
TW-S-PI-3_P01	29/9/2023	Degraded	5	30-70%	10-30%	A new fence is being constructed on opposite side of the fire access track. Access track is disturbed as part of borr works
TW-S-PI-3_P01	25/5/2024	Degraded	5	30-70%	10-30%	Trees have thinned but still retain greater than 80% foliage. Note Borr works close to site pic 194.
TW-S-PI-3_P02	26/5/2020	Degraded		30-70%	30-70%	
TW-S-PI-3_P02	28/10/2020	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P02	14/10/2021	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P02	**26/5/2022**	**Degraded**	**5**	**30-70%**	**30-70%**	
TW-S-PI-3_P02	19/10/2022	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P02	22/5/2023	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P02	29/9/2023	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P02	25/5/2024	Degraded	4	30-70%	30-70%	Jacksonia furcellata stressed, Agonis tree very stressed in the background.
TW-S-PI-3_P03	26/5/2020	Degraded		30-70%	30-70%	
TW-S-PI-3_P03	28/10/2020	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P03	14/10/2021	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P03	**26/5/2022**	**Degraded**	**5**	**30-70%**	**30-70%**	
TW-S-PI-3_P03	19/10/2022	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P03	22/5/2023	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P03	29/9/2023	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P03	25/5/2024	Degraded	5	30-70%	30-70%	Jacksonia furcellata has died possibly due to drought.
TW-S-PI-3_P04	26/5/2020	Degraded		30-70%	30-70%	
TW-S-PI-3_P04	28/10/2020	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P04	14/10/2021	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P04	**26/5/2022**	**Degraded**	**5**	**30-70%**	**30-70%**	
TW-S-PI-3_P04	19/10/2022	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P04	22/5/2023	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P04	29/9/2023	Degraded	5	30-70%	30-70%	
TW-S-PI-3_P04	25/5/2024	Degraded	5	30-70%	30-70%	
TW-S-PI-4_P01	26/5/2020	Degraded		30-70%	30-70%	Historical grazing
TW-S-PI-4_P01	19/10/2020	Degraded	5	>70%	30-70%	Historical grazing
TW-S-PI-4_P01	13/10/2021	Degraded	5	>70%	<2%	Farmland
TW-S-PI-4_P01	**25/5/2022**	**Degraded**	**5**	**>70%**	**<2%**	Farmland
TW-S-PI-4_P01	19/10/2022	Degraded	5	>70%	30-70%	Farmland
TW-S-PI-4_P01	22/5/2023	Degraded	5	>70%	30-70%	Farmland
TW-S-PI-4_P01	29/9/2023	Degraded	5	>70%	30-70%	Farmland
TW-S-PI-4_P01	25/5/2024	Degraded	5	>70%	30-70%	Farmland
TW-S-PI-4_P02	26/5/2020	Degraded		2-10%	30-70%	Historic clearing
TW-S-PI-4_P02	9/9/2020	Degraded		2-10%	30-70%	Historic clearing
TW-S-PI-4_P02	13/10/2021	Degraded	5	>70%	30-70%	Farm site.
TW-S-PI-4_P02	**25/5/2022**	**Degraded**	**5**	**>70%**	**30-70%**	Farm site. Photomon needs updating

Current photocode	date	condition	Crown extent density	Weed cover	Native cover	Comments
TW-S-PI-4_P02	19/10/2022	Degraded	5	>70%	30-70%	Farm site. Photomon needs updating , updated with new guide photo
TW-S-PI-4_P02	22/5/2023	Degraded	5	>70%	30-70%	Fire access track recently graded
TW-S-PI-4_P02	29/9/2023	Degraded	5	>70%	30-70%	
TW-S-PI-4_P02	25/5/2024	Degraded	5	>70%	30-70%	Site stable, Tuart healthy
TW-S-PI-4_P03	19/10/2020	Degraded	5	>70%	30-70%	Historically cleared
TW-S-PI-4_P03	13/10/2021	Degraded	5	>70%	30-70%	Note dichopogon capillipes is common in understory
TW-S-PI-4_P03	**25/5/2022**	**Degraded**	**5**	**>70%**	**30-70%**	Note dichopogon capillipes is common in understory
TW-S-PI-4_P03	19/10/2022	Degraded	5	>70%	30-70%	Note dichopogon capillipes is common in understory
TW-S-PI-4_P03	22/5/2023	Degraded	5	>70%	30-70%	Note Dichopogon capillipes is common in understory
TW-S-PI-4_P03	29/9/2023	Degraded	5	>70%	30-70%	Note dichopogon capillipes is common in understory
TW-S-PI-4_P03	25/5/2024	Degraded	5	>70%	30-70%	Note dichopogon capillipes is common in understory , some stress in the Jarrah at south of site. Overall ok.

Appendix 4. Vegetation condition scale (EPA, 2016).

Vegetation Condition	South West and Interzone Botanical Provinces
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact, and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

Appendix 5. Recording sheet template

BORR Drainage Monitoring Program.
Quarterly visual inspection Sheet

Site name	Date	Field personnel

Flooding/inundation

If flooding/inundation is present, complete a plant health assessment using the scale included below. The plant health assessment should be conducted over the portion of the TEC/PEC that is flooded/inundated.
Considering the degree of impact (or lack of impact), make a recommendation for when the subsequent assessment should occur (quarterly as is the standard or within a shorter timeframe)

Standing water present (Y/N)	
Estimated area of standing water (m^2)	
% of TEC / PEC occurrence impacted by standing water	
TEC/PEC vegetation affected (Y/N) If yes, describe effect.	
List main species affected	
Photograph and waypoint taken (Y)	
Plant health assessment conducted (Y/N)	

Erosion

If TEC/PEC vegetation is impacted by active erosion, complete a plant health assessment using the scale included below. The plant health assessment should be conducted over the portion of the TEC/PEC suspected to be impacted.

Active erosion present (Y/N)	
Estimated area of active erosion (m^2)	
Photograph and waypoint taken (Y)	
TEC/PEC vegetation affected (Y/N) If yes, describe effect. Complete plant health assessment if required.	
Plant health assessment conducted (Y/N)	

Drying

If a drying effect is suspected, complete a plant health assessment using the scale included below. The plant health assessment should be conducted over the portion of the TEC/PEC suspected to be impacted.
Considering the degree of impact (or lack of impact), make a recommendation for when the subsequent assessment should occur (quarterly as is the standard or within a shorter timeframe)

Drying effect present or suspected (Y/N)	
% of TEC / PEC occurrence impacted	
Describe effect	
List main species affected	
Photograph and waypoint taken (Y)	
Plant health assessment conducted (Y/N)	

Appendix 6. Banksia woodland / Banksia Tuart and Tuart woodland sites with a stable plant stress profile.

BTW-S-R-1

Stress at BTW-S-R-1 remained stable for the duration of the monitoring period (**Figure 1**).

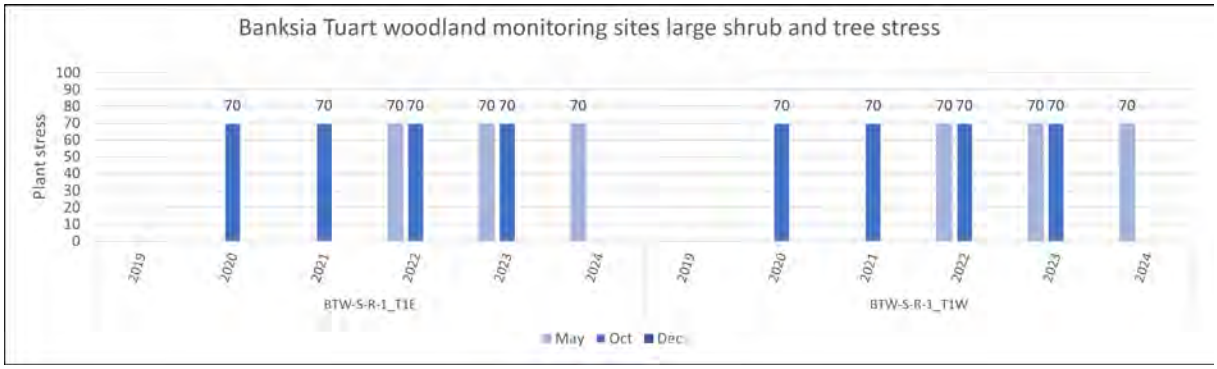

Figure 1. Stress at BTW-S-R-1.

BW-S-PI-1

Stress at BW-S-PI-1 has remained practically stable for the duration of the monitoring period (**Figure 2**).

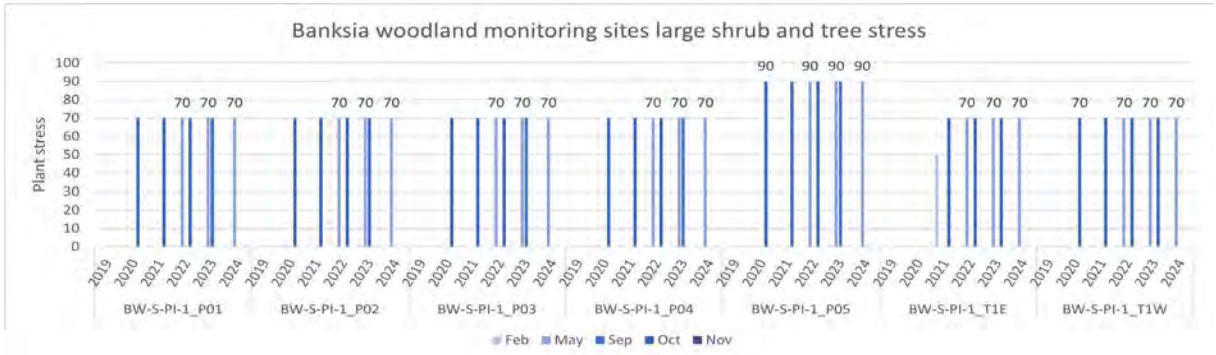

Figure 2. Stress at BW-S-PI-1.

BTW-S-R-2

Stress levels reduced to 5 in 2022 and then returned to 4 in 2023 and have remained stable since (**Figure 3**.)

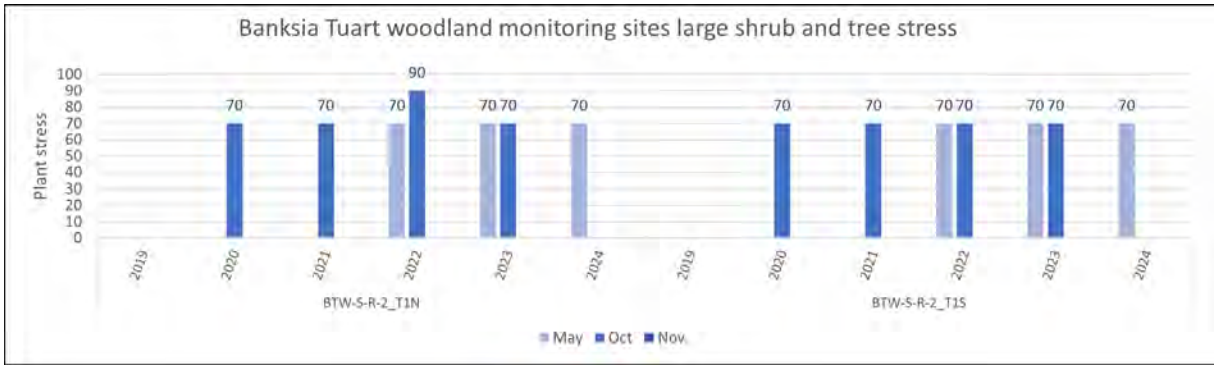

Figure 3. Change in average large shrub and tree stress for Banksia woodland potential impact site BTW-S-R-2.

TW-S-PI-4

Tree and large shrub stress have remained stable at TW-S-PI-4 since monitoring commenced in 2020 (**Figure 4**).

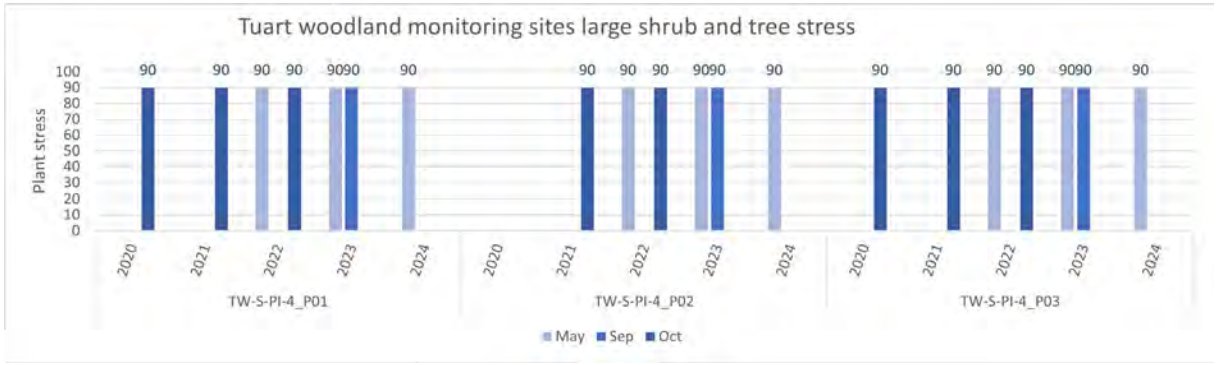

Figure 4. Change in average large shrub and tree stress for Tuart woodland potential impact site TW-S-PI-4.

Appendix 7. An example of drainage monitoring report autumn 2024.

TW-S-PI -2

Created	2022-05-26 02:55:23 UTC by Debbie Brace
Updated	2024-05-24 03:57:00 UTC by Debbie Brace
Location	-33.38536583821613, 115.64596488151294
Site name	TW-S-PI-2
Point name	TW-S-PI -2
Recorder	Debbie Brace
Date	2024-05-24
Issue Y/N	Yes
Issue	Drying effects
Species affected	Banksia attenuata, Eucalyptus marginata, Agonis flexuosa
Photos	

General comments	Scattered deaths, banksia attuattaand Agonis flexuosa

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South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

Appendix K

M4.7 Environmental Performance Report – Black Cockatoos

Bunbury Outer Ring Road

Southern Section

Ministerial Statement 1191: M4-7

Environmental Performance Report

Black Cockatoo Artificial Hollows

(2023 - 2024)

Main Roads WA

Revision 0

28-Aug-24

South West Gateway Alliance

Delivering the Bunbury Outer Ring Road

Document control record

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Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
A	19-Jul-24	SWGA Review	A.G.	E.R.		A.M.
B	27-Jul-24	SWGA Review	A.G.	E.R.		A.M.
C	19-Aug-24	Main Roads Review	A.G.	E.R.		A.M.
0	28-Aug-24	Issued	E.R	Main Roads		M.S.
Current revision		**0**				

Contents

Figures

Tables

1 Introduction

1.1 Background

The Commissioner of Main Roads Western Australia (MRWA) has been granted conditional approval for the Bunbury Outer Ring Road Southern Section (the Proposal) under Part IV Division 2 (section 45) of the *Environmental Protection Act 1986* by the Minster for Environment. The Proposal is subject to the implementation conditions of Ministerial Statement 1191 (MS 1191) which was issued on 31 May 2022 (Minister for Environment, 2022).

In their Report and Recommendations in relation to the Proposal (EPA Report 1714, October 2021), the EPA noted that in relation to Terrestrial Fauna, the key values likely to be impacted by the proposal are the local and regional population levels of conservation significant terrestrial fauna. The residual impacts to these values are predominately from clearing of breeding and foraging habitat, habitat fragmentation and changes to hydrological regimes of aquatic habitat.

1.2 Overview and Scope

In relation to the potential for direct and indirect impacts to Terrestrial Fauna, the EPA recommended a number of conditions including Condition 4, and Ministerial Statement 1191, therefore, includes the following conditions in relation to Terrestrial Fauna, specifically the following fauna taxa:

- Carnaby's Cockatoo *Calyptorhynchus latirostris*
- Baudin's Cockatoo *Calyptorhynchus baudinii*
- Forest Red-tailed Black Cockatoo *Calyptorhynchus banksia naso*

To address the impacts, the EPA recommended Condition 4. Ministerial Statement 1191, therefore, includes the following conditions in relation to Terrestrial Fauna:

Condition 4-1

The proponent shall implement the proposal to achieve the following environmental outcomes:

(1) clear no more than:

(a) 60.9 ha of habitat for western ringtail possum;

(b) 60.9 ha of black cockatoo foraging and breeding habitat;

(c) 1088 black cockatoo potential nesting trees, and 11 trees with suitable hollows;

(d) 39.2 ha of habitat for south-western brush-tailed phascogale; and

(e) 5.5 ha of habitat for black-stripe minnow.

Condition 4-2

Prior to ground-disturbing activities the proponent shall undertake the following actions:

(1) within seven (7) days prior to clearing, using a qualified and licensed terrestrial fauna spotter with experience in surveying for black cockatoos, inspect all potential nesting trees hollows within the development envelope to determine if any hollows are being used for nesting by black cockatoos;

(2) if any hollows are in use by black cockatoos, the proponent shall not disturb or clear the nesting tree, or vegetation within a ten (10) metre radius of the nesting tree, until after the cockatoos have naturally completed nesting (young have fledged and dispersed) and an appropriately qualified terrestrial fauna spotter has verified that the hollow(s) are no longer being used by black cockatoos; and

(3) within seven (7) days prior to clearing (or if staged, prior to each stage) implement pre-clearance protocols to minimise impacts to terrestrial fauna.

Condition 4-3

During the construction of the proposal the proponent shall:

(1) ensure the presence of appropriately qualified fauna spotters during clearing activities;

(2) not clear or cause any project attributable indirect impacts to the clearing exclusion areas as defined in Figure 1; and

(3) ensure foraging species for black cockatoos are not planted within ten (10) metres of the road.

Condition 4-4

The proponent must install one artificial black cockatoo nesting hollow for each suitable hollow that cannot be avoided in the 11 trees with suitable hollows identified in condition 4-1(1)(c).

Condition 4-5

Each artificial black cockatoo nesting hollow required by condition 4-4 must be installed prior to commencement of the next black cockatoo breeding season following clearing.

Condition 4-6

The artificial black cockatoo nest hollow(s) required by condition 4-4 of must:

(1) be installed at the locations identified by DBCA within property locations as set out and described in Table 1 of condition 9-2.

(2) be designed and placed in accordance with the specifications details in How to design and place artificial hollows for Carnaby's cockatoo (DPAW Fauna Notes 2015), or any subsequent DBCA revision of this guideline; and

(3) be monitored and maintained in accordance with the specifications detailed in How to monitor and maintain artificial hollows for Carnaby's cockatoo (DPAW Fauna Notes 2015), or any subsequent DBCA revision of this guideline, for a period of at least ten (10) years.

2 Environmental Performance Report

2.1 Purpose and scope

The purpose of this Environmental Performance Report (EPR) is to address the compliance of the Bunbury Outer Ring Road (BORR) Southern Section (the Proposal) with condition 4-7 set out in Ministerial Statement 1191 (MS 1191).

Condition 4-7 of MS 1191 requires an annual environmental performance report to be submitted to the Chief Executive Officer (CEO) of the Environmental Protection Authority (EPA) as part of the Compliance Assessment Report (CAR).

Condition 4-7

The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, for a period of at least ten (10) years, that shall:

(1) outline the monitoring and maintenance that was undertaken in accordance with the specifications detailed in How to Monitor and maintain artificial hollows for Carnaby's cockatoo (DPAW Fauna Notes 2015), or any subsequent DBCA revision of this guideline;

(2) outline the results of the monitoring and maintenance undertaken.

This EPR has been produced in accordance with condition M4-7 and incorporates a 12-month audit period from 31 May 2023 to 31 May 2024. This is the first EPR for M4-7 to be submitted under Ministerial Statement 1191.

A monitoring report was prepared by Australian Black Cockatoo Specialists (2024) for the three artificial nesting hollows located at the nearby Ducane offset site (refer attached Report).

2.2 Clearing metrics in relation to Black cockatoos during the reporting period

Construction of the Proposal (BORR Southern Section) commenced on 1 August 2022.

Clearing and disturbance in relation to Terrestrial Fauna, specifically Black Cockatoo habitat during the reporting period is summarised in Table 1 and Figure 1.

Table 1. Ground disturbance and clearing in relation to Terrestrial Fauna (Black Cockatoo foraging habitat and trees) during the reporting period (May 2023 – 2024).

Environmental Aspect	Area specified in Ministerial Statement 1191	Area / quantity cleared during 2022 2023 reporting period	Area / quantity cleared during this 2023 2024 reporting period	Total area / quantity cleared
Black Cockatoo Habitat	60.9 ha	24.39 ha	17.94 ha	42.32 ha
No more than 1088 trees with a diameter at breast height of >500mm	1088	397	305 trees	702 trees
No more than 11 trees with suitable nest hollows	11	3	0 trees	3 trees

Figure 1. Ground disturbance and clearing extents during the reporting period in relation to Black Cockatoo habitat and habitat trees.

See Enlargement

Centenary Road

BUSSELL HWY

Sleaford Drive

Lillydale Road

Map Index

Map 1

Map 2

Map 3

Map 4

ENLARGEMENT

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents 2022 - 2023
- Ground disturbance and clearing extents 2023 - 2024
- Black cockatoo habitat

BC Tree Habitat Hollow Assessment 2024

- Potentially suitable
- Unlikely suitable
- Not suitable
- Tree suitable DBH - no hollows

N

0 400

metres

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Black Cockatoo Habitats - Map 1

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:8,2500 @ A3

N

0 300

metres

Hasties Road

Ducane Road

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents 2022 - 2023

Ground disturbance and clearing extents 2023 - 2024

Black cockatoo habitat

BC Tree Habitat Hollow Assessment 2024

Potentially suitable

Unlikely suitable

Not suitable

Tree suitable DBH - no hollows

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Black Cockatoo Habitat Map 2

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA2094)	Scale: 1:7,500 @ A3

BUSSELL HWY

Yalinda Drive

Eucalypt Drive

Woods Road

Jilley Road

Brockway Drive

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

- Environmental Boundary (MS 1191)
- Ground disturbance and clearing extents 2022 - 2023
- Ground disturbance and clearing extents 2023 - 2024
- Black cockatoo habitat

BC Tree Habitat Hollow Assessment 2024

- Potentially suitable
- Unlikely suitable
- Not suitable
- Tree suitable DBH - no hollows

N

0 400

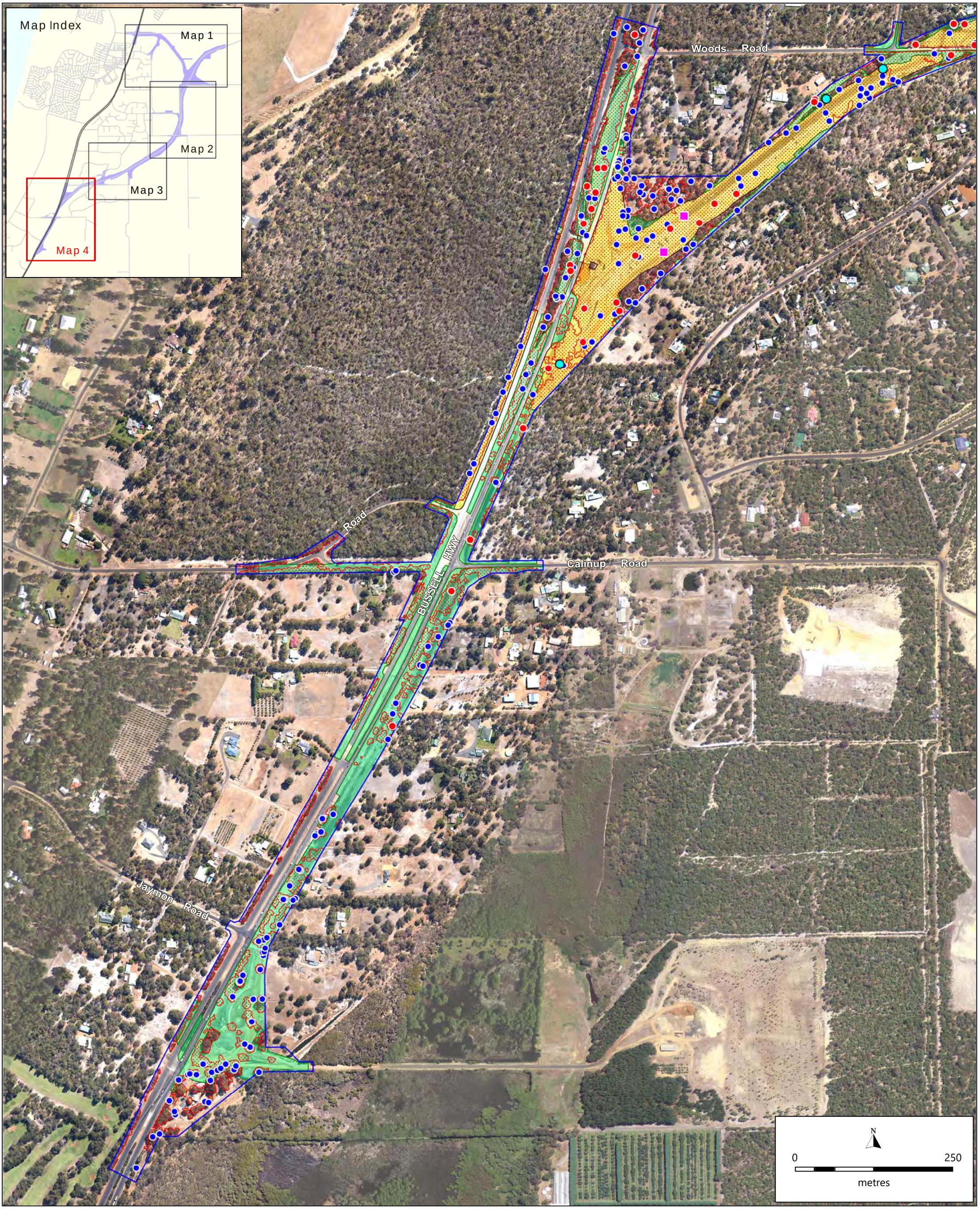
meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Realtion to Black Cockatoo Habitat - Map 3

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,250 @ A3



Location Map

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents 2022 - 2023
- Ground disturbance and clearing extents 2023 - 2024
- Black cockatoo habitat

BC Tree Habitat Hollow Assessment 2024

- Potentially suitable
- Unlikely suitable
- Not suitable
- Trees suitable DBH - no hollows

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Black Cockatoo Habitat Map 4

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,000 @ A3

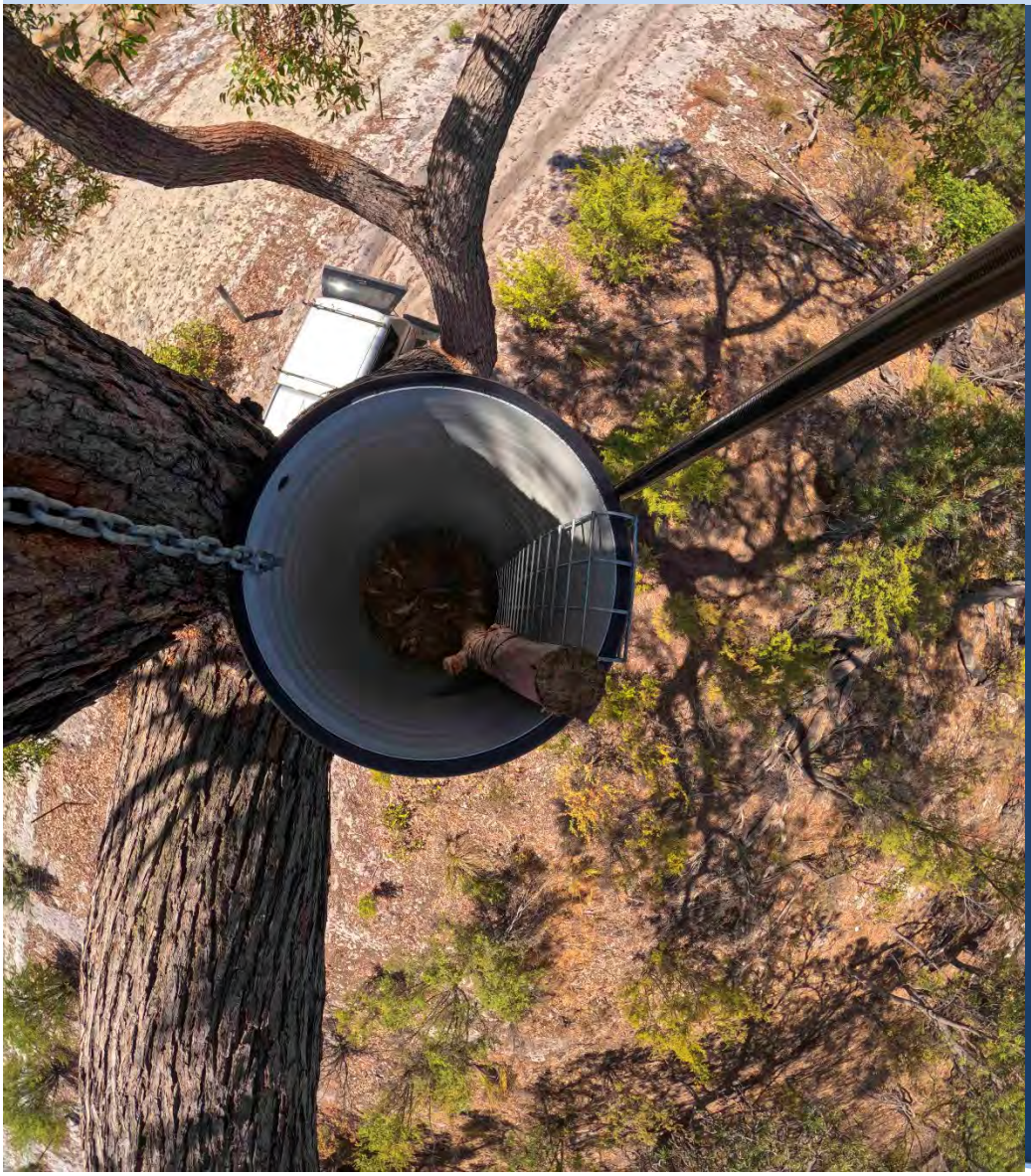
South West Gateway Alliance

Report

Environmental Performance Report (Australia Black Cockatoo Specialists, 2024)

Australian Black Cockatoo Specialists

Report:
Nesting survey of four artificial hollows Ducane Offset Site W.A



Main Roads
Western Australia

12 March 2024

Australian Black Cockatoo Specialists

CONTENTS

All images source: Rick Dawson

INTRODUCTION

Australian **B**lack **C**ockatoo **S**pecialists (ABCS) are pleased to submit this report to the Department of Main Roads Western Australia (MRWA) regarding the inspection/nesting survey of four Artificial hollows (ANH) in the Ducane Offset Site on Thursday 7th March 2024.

INSPECTION METHOD

The objective of the survey was to establish if there has been Black Cockatoo 'prospecting' and/or nesting activity. The scope of this project included:

- undertaking a close visual inspection of all ANH's via camera pole, any activity detected was then photographed.
- Inspect tree, fixings and hollow condition.
- Any Black Cockatoo nestlings older than 21days, will be photographed, leg banded, measured, weighed, aged (this will give us the date egg laid) and DNA taken, under licences from DPAW.
- Details of any use including non-target species recorded.

All four ANH's were inspected in accordance with protocols used by CSIRO and the Department of Biodiversity, Conservation and Attractions. The inside of each artificial hollow was viewed using a pole camera (high quality Gopro images) and photographs taken (which are available on request) of any chipping detected, nesting activity or obstructions. A photograph (>50mb) was taken from the ground using a 500m lens of the sacrificial posting detailing any chipping or signs of prospecting. Details of observations were recorded and are attached at Annex 2 and 3.

RESULTS

Unfortunately, there is no sign of prospecting or nesting by Black Cockatoos. However, there were no cobwebs in the four ANH's which is consistent with fauna entering the hollow.
There was no chipping detected, however a score of 0-10 is used to rate the amount of chipping with '0' being none detected and '10' requiring the sacrificial post to be replaced.
No black cockatoos were observed or heard during the survey. However, Forest Red-tail Black cockatoos were observed feeding in three Jarrah trees on the roads leading to the site.

REPAIRS

All four hollows and their fixings are in very good condition and do not require any repairs or replenishing prior to the next breeding season. All four trees are in good condition, providing excellent shade and there is no need to relocate any hollows at this stage.

RECOMMENDATIONS

That next year's nesting surveys are conducted in early Oct and Mid December, to ensure that all nesting attempts are identified.

CONCULSIONS

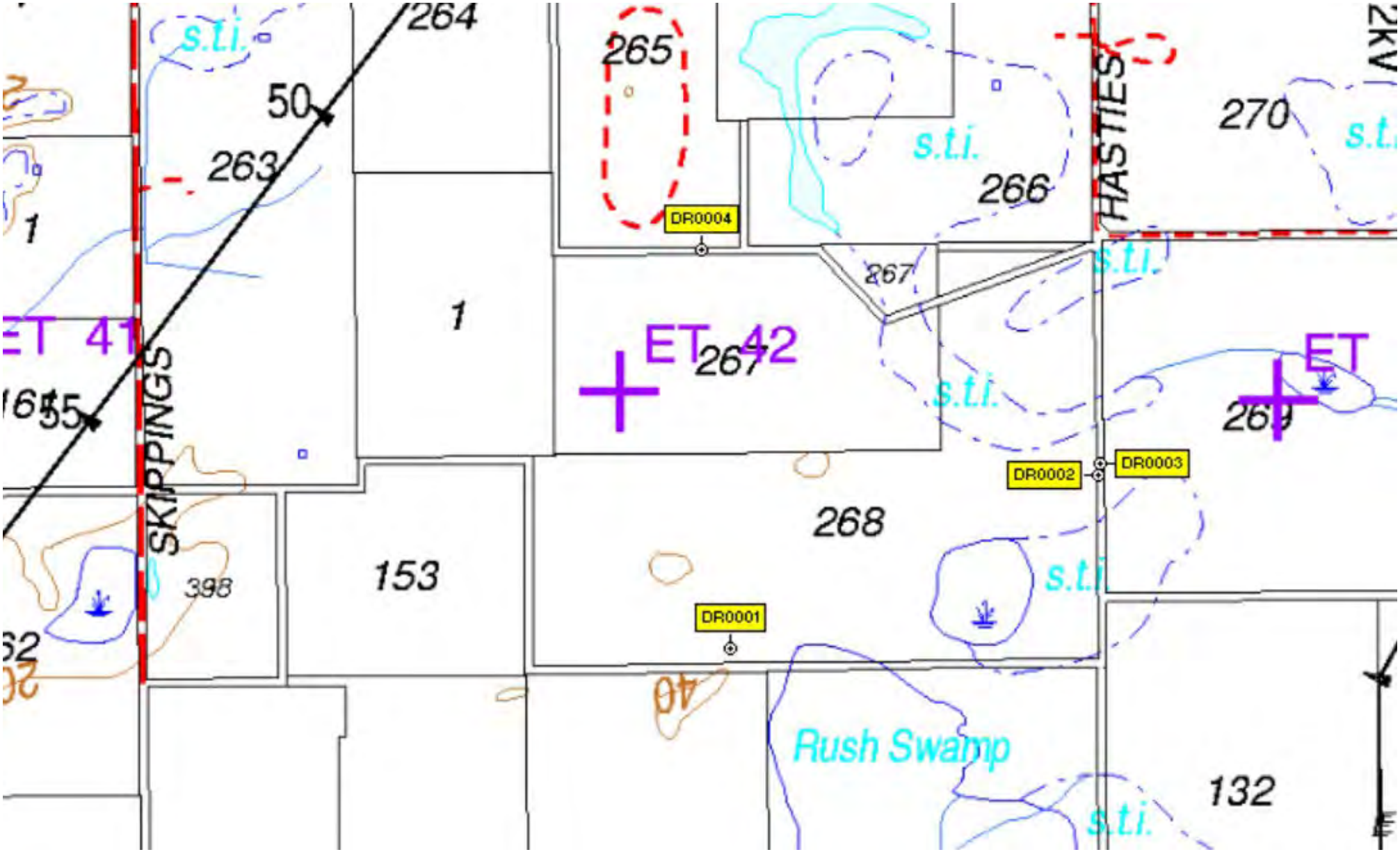
The four ANH were not installed until June 2023, and like other sites it has taken a couple of years for the birds to become comfortable enough to breed in them. All three species have been seen in the site during previous survey's and there is adequate water, roosting trees and resources for them to breed.

CONTACT INFORMATION

Contact Name:	Rick Dawson
Position:	Principal Consultant
Phone:	0448 170 670
Email:	dawsonrick60@gmail.com

Rick Dawson
Director
Australian Black Cockatoo Specialist
12 March 2024

APPENDIX 1 – MAP OF ANH THAT HAVE CHIPPING MARKED RED, NO CHIPPING MARKED YELLOW NESTING MARKED BLUE BY BLACK COCKATOOS



APPENDIX 2 – DETAILS OF ANH OBSERVATIONS

Hollow No	Comments	Chipping	Wood Chips	Tree condition	Fixings and Hollow condition	Recommended repairs
D01	No signs of nesting or prospecting by Black Cockatoos	0	Nil	Good	Good	Nil
D02	No signs of nesting or inspection by Black Cockatoos	0	Nil	Good	Good	Nil
D03	No signs of nesting or inspection by Black Cockatoos	0	Nil	Good	Good	Nil
D04	No signs of nesting or inspection by Black Cockatoos	0	Nil	Good	Good	NIL

APPENDIX 3 – DETAILS OF NESTING SURVEY OF EACH HOLLOW

Artificial Hollow DO1

Hollow No	Comments	Chipping on Post score 0-10	Signs of nesting on floor	Recommended repairs
D01	No signs of nesting or prospecting by Black Cockatoos	0	NIL	NIL

Artificial Hollow DO2

Hollow No	Comments	Chipping on Post score 0-10	Signs of nesting on floor	Recommended repairs
D02	No signs of nesting or prospecting by Black Cockatoos	0	NIL	NIL

Artificial Hollow DO3

Hollow No	Comments	Chipping on Post score 0-10	Signs of nesting on floor	Recommended repairs
D03	No signs of nesting or prospecting by Black Cockatoos	0	NIL	NIL

Artificial Hollow DO4

Hollow No	Comments	Chipping on Post score 0-10	Signs of nesting on floor	Recommended repairs
D04	No signs of nesting or prospecting by Black Cockatoos	0	NIL	NIL

South West Gateway Alliance
Suite 3, 3 Craig Street, Burswood
Western Australia 6100

South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

Appendix L

M5.3 Environmental Performance Report – Construction Fauna Management Plan

Bunbury Outer Ring Road

Southern Section

Ministerial Statement 1191: M5-3

Environmental Performance Report

Construction Fauna Management Plan

(2023 - 2024)

Main Roads WA

Revision 0

28-Aug-24

South West Gateway Alliance

Delivering the Bunbury Outer Ring Road

Document control record

Document prepared by:

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Western Australia 6100

T 1800 979 770
E enquiries@swgateway.com.au

Document control						
Report title		Ministerial Statement 1191 | M5-3 Environmental Performance Report – CFMP				
Client		Main Roads WA				
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
A	19-Jul-24	SWGA Review	A.G.	E.R.		A.M.
B	27-Jul-24	SWGA Review	A.G.	E.R.		A.M.
C	19-Aug-24	Main Roads Review	A.G.	E.R.		A.M.
0	28-Aug-24	Issued	E.R	Main Roads		M.S.
Current revision		**0**				

Contents

Figures

Tables

1 Introduction

1.1 Background

The Commissioner of Main Roads Western Australia (MRWA) has been granted conditional approval for the Bunbury Outer Ring Road Southern Section (the Proposal) under Part IV Division 2 (section 45) of the *Environmental Protection Act 1986* by the Minster for Environment. The Proposal is subject to the implementation conditions of Ministerial Statement 1191 (MS 1191) which was issued on 31 May 2022 (Minister for Environment, 2022).

In their Report and Recommendations in relation to the Proposal (EPA Report 1714, October 2021), the EPA noted that in relation to Terrestrial Fauna, the key values likely to be impacted by the proposal are the local and regional population levels of conservation significant terrestrial fauna. The residual impacts to these values are predominately from clearing of breeding and foraging habitat, habitat fragmentation and changes to hydrological regimes of aquatic habitat.

1.2 MS 1191 Condition 5

In relation to the potential for direct and indirect impacts to Terrestrial Fauna, the EPA recommended a number of conditions including Condition 5, and Ministerial Statement 1191, therefore, includes the following conditions in relation to Terrestrial Fauna:

Condition 5-1

The proponent shall implement the proposal to achieve the following environmental objective:

(1) during construction, minimise and manage project attributable adverse impacts to conservation significant terrestrial fauna including western ringtail possum and south-western brush-tailed phascogale.

Condition 5-2

The proponent shall prepare a Construction Fauna Management Plan and

submit to the CEO prior to ground-disturbing activities. This Plan shall:

(1) specify the passive relocation management actions to be implemented prior to and during clearing;

(2) define the low-risk clearing timeframe for western ringtail possum applicable to Category 1 Clearing Areas and append supplementary survey evidence to justify the chosen timeframe;

(3) specify monitoring that:

(a) includes a baseline survey to be undertaken within thirty (30) days prior to clearing (or if staged, prior to each clearing stage) to confirm presence/absence and number of western ringtail possum and south-western brush-tailed phascogale individuals within the development envelope and at receival sites. The baseline survey shall be prepared and undertaken on advice of DBCA during the preparation of the Construction Fauna Management Plan;

(b) records whether threatened or priority fauna is encountered during clearing, and reports to the CEO and DBCA within thirty (30) days after clearing (or each clearing stage) on the number of individuals relocated in accordance with any requirements of the lawful authority obtained under the Biodiversity Conservation Act 2016;

(c) evaluates the suitability, adequacy and effectiveness of passive relocation management actions at reducing impacts to western ringtail possum individuals displaced by clearing from Category 1 Clearing Areas defined in Figure 3;

(d) evaluates impacts to residential western ringtail possum individuals at receival sites; and

(e) uses monitoring methods including, but not limited to, radio telemetry with robust sample sizes (the minimum number of tagged animals to be determined in consultation with DBCA).

(4) identify and spatially define the study area(s) and reference sites proposed for monitoring and evaluation and provide rationale for the location of the sites;

(5) specify management actions; management targets; monitoring locations, methodologies, indicators and timing; and actions and investigations in the event of a failure to meet a management target to demonstrate that the objective in condition 5-1 will be met; and

(6) *be prepared in consultation with the DBCA and in accordance with any requirements of a lawful authority obtained under the Biodiversity Conservation Act 2016.*

2 Environmental Performance Report

2.1 Purpose and scope

This Environmental Performance Report (EPR) addresses the compliance of the Bunbury Outer Ring Road (BORR) Southern Section (the Proposal) with Condition 5-3 set out in Ministerial Statement 1191 (MS 1191).

Condition 5-3 of MS 1191 requires an annual environmental performance report to be submitted to the Chief Executive Officer (CEO) of the Environmental Protection Authority (EPA) as part of the Compliance Assessment Report (CAR).

Condition 5-3

The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:

(1) outline the monitoring that was undertaken during the implementation of the Construction Faun Management Plan required in condition 5-2;

(2) outline the results of the monitoring undertaken to report whether that the environmental outcomes specified in condition 5-1(1) were achieved;

(3) report whether that the outcomes in condition 5-1(1) were achieved; and

(4) outline any management actions undertaken during the implementation of the Construction Fauna Management Plan required in condition 5-2 to meet the objective in condition 5-1(1).

An Environmental Performance Report (EPR) has been prepared to address Conditions 5-1(1), 5-2 and 5-3 of MS 1191 during the reporting period (refer attached report prepared by Biota Environmental Sciences, August 2024).

This EPR incorporates a 12-month audit period from 31 May 2023 to 30 May 2024. This is the first EPR associated with Condition 5-3 to be submitted under Ministerial Statement 1191.

2.2 Compliance with MS 1191Conditions 5-1, 5-2 and 5-3

Compliance with Conditions 5-1, 5-2 and 5-3 is addressed in Table 1.

Table 1. Compliance status with regard to MS 1191 Conditions 5-1, 5-2 and 5-3.

MS 1191 Condition	Condition	Status	Evidence / Compliance
5-1	*The proponent shall implement the proposal to achieve the following environmental objective:* *(1) during construction, minimise and manage project attributable adverse impacts to conservation significant terrestrial fauna including western ringtail possum and south-western brush-tailed phascogale.*	Compliant	This CAR.
5-2	*The proponent shall prepare a Construction Fauna Management Plan and submit to the CEO prior to ground-disturbing activities. This Plan shall:* *(1) specify the passive relocation management actions to be implemented prior to and during clearing;* *(2) define the low-risk clearing timeframe for western ringtail possum applicable to Category 1 Clearing Areas and append supplementary survey evidence to justify the chosen timeframe;* *(3) specify monitoring that:* *(a) includes a baseline survey to be undertaken within thirty (30) days prior to clearing (or if staged, prior to each clearing stage) to confirm presence/absence and number of western ringtail possum and south-western brush-tailed phascogale individuals within the development envelope and at receival sites. The baseline survey shall be prepared and undertaken on advice of DBCA during the preparation of the Construction Fauna Management Plan;*	Compliant	Construction Fauna Management Plan (approved 22 July 2022).

MS 1191 Condition	Condition	Status	Evidence / Compliance
	(b) records whether threatened or priority fauna is encountered during clearing, and reports to the CEO and DBCA within thirty (30) days after clearing (or each clearing stage) on the number of individuals relocated in accordance with any requirements of the lawful authority obtained under the Biodiversity Conservation Act 2016; *(c) evaluates the suitability, adequacy and effectiveness of passive relocation management actions at reducing impacts to western ringtail possum individuals displaced by clearing from Category 1 Clearing Areas defined in Figure 3;* *(d) evaluates impacts to residential western ringtail possum individuals at receival sites; and* *(e) uses monitoring methods including, but not limited to, radio telemetry with robust sample sizes (the minimum number of tagged animals to be determined in consultation with DBCA).* *(4) identify and spatially define the study area(s) and reference sites proposed for monitoring and evaluation and provide rationale for the location of the sites;* *(5) specify management actions; management targets; monitoring locations, methodologies, indicators and timing; and actions and investigations in the event of a failure to meet a management target to demonstrate that the objective in condition 5-1 will be met; and* *(6) be prepared in consultation with the DBCA and in accordance with any requirements of a lawful authority obtained under the Biodiversity Conservation Act 2016.*		

MS 1191 Condition	Condition	Status	Evidence / Compliance
5.3 (1)	*The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:* *(1) outline the monitoring that was undertaken during the implementation of the Construction Fauna Management Plan required in condition 5-2*	Compliant	The Construction Fauna Management Plan identified the following monitoring: • Pre-clearing WRP and BTP surveys • Recording of conservation significant fauna encounters that occur during clearing • Post-clearing WRP and BTP surveys of the receival and reference sites as part of on-going bi-monthly surveys • Mark-resight study using PIT tags of WRP within the Development Envelope and receival sites • Telemetry study using GPS collars on up to fifty WRP and monitoring these animals for up to 3 months • A genetic relatedness study of WRP with a minimum of 20 and up to 50 a samples DNA sequenced. Please refer to this CAR. Please refer also to attached EPR report (Biota Environmental Science, 2024).
5.3 (2)	*The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:* *(2) outline the results of the monitoring undertaken to report whether that the environmental outcomes specified in condition 5-1(1) were achieved;*	Compliant	Please refer to this CAR. Please refer also to attached EPR report (Biota Environmental Science, 2024) with regard to the bi-monthly, telemetry and mark-resight surveys and genetic relatedness study.
5-3(3)	*The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:* *(3) report whether that the outcomes in condition 5-1(1) were achieved; and*	Compliant	The objectives of Condition 5-1 is that *during construction, minimise and manage project attributable adverse impacts to conservation significant terrestrial fauna including western ringtail possum and south-western brush-tailed phascogale.* Given the work undertaken to minimise and manage project attributable impacts, with one clearing related WRP mortality being recorded during the entire clearing program, it is considered that the management measures in place have achieved the objective. Ongoing monitoring will continue to measure whether this objective is being achieved.

MS 1191 Condition	Condition	Status	Evidence / Compliance
5-3(4)	*The proponent shall annually submit an Environmental Performance Report as part of the Compliance Assessment Report required by condition 12-6, that shall:* *(4) outline any management actions undertaken during the implementation of the Construction Fauna Management Plan required in condition 5-2 to meet the objective in condition 5-1(1)*	Compliant	Please refer to this CAR.

2.3 Clearing metrics in relation to Terrestrial Fauna during the reporting period

Construction of the Proposal (BORR Southern Section) commenced on 1 August 2022.

Clearing and disturbance in relation to Terrestrial Fauna, specifically Western ringtail possum (WRP) habitat and Brush-tailed phascogale (BPh) habitat during the reporting period is summarised in Table 1 and Figure 1.

Table 2. Ground disturbance and clearing in relation to Terrestrial Fauna (Western ringtail possum habitat and South-western brush-tailed phascogale habitat) during the reporting period (May 2023 – May 2024).

Environmental Aspect	Area specified in Ministerial Statement 1191	Area cleared during the 2022 – 2023 reporting period	Area cleared during this 2023 – 2024 reporting period	Total area / quantity cleared
Western ringtail possum habitat (WRP)	60.9 ha	24.39 ha	17.94 ha	42.32 ha
Brush-tailed phascogale habitat (BPh)	39.2 ha	18.09 ha	11.72 ha	29.80 ha

Figure 1. Ground disturbance and clearing extents during the reporting period in relation to Terrestrial Fauna (Western ringtail possum habitat and South-western brush-tailed phascogale habitat).

BUSSELL HWY

Sleaford Drive

Centenary Road

Lillydale Road

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

PERTH

KALGOORLIE

Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents 2022 - 2023

Ground disturbance and clearing extents 2023 - 2024

Western Ringtail Possum habitat

Brush-tailed Phscogale habitat

N

0 400

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Western Ringtail Possum Habitat and South-western Brush-tailed Phascogale Habitat - Map 1

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:8,2500 @ A3

Hasties Road

Ducane Road

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Map 2

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Location Map

KARRATHA

W A

KALGOORLIE

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Map Area

LEGEND

Proposal approval boundary (MS1191)

Ground disturbance and clearing extents 2022 - 2023

Ground disturbance and clearing extents 2023 - 2024

Western Ringtial Possum habitat

Brush-tailed Phascogale habitat

N

0 400

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Western Ringtail Possum Habitat and South-western Brush-tailed Phascogale Habitat Map 2

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,500 @ A3

BUSSELL HWY

Yalinda Drive

Eucalypt Drive

Woods Road

Jilley Road

Brockway Drive

Map Index

Map 1

Map 2

Map 3

Map 4

Location Map

KARRATHA

W A

PERTH

KALGOORLIE

Map Area

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents 2022 - 2023
- Ground disturbance and clearing extents 2023 - 2024
- Western Ringtail Possum habitat
- Brush-tailed Phascogale habitat

N

0 400

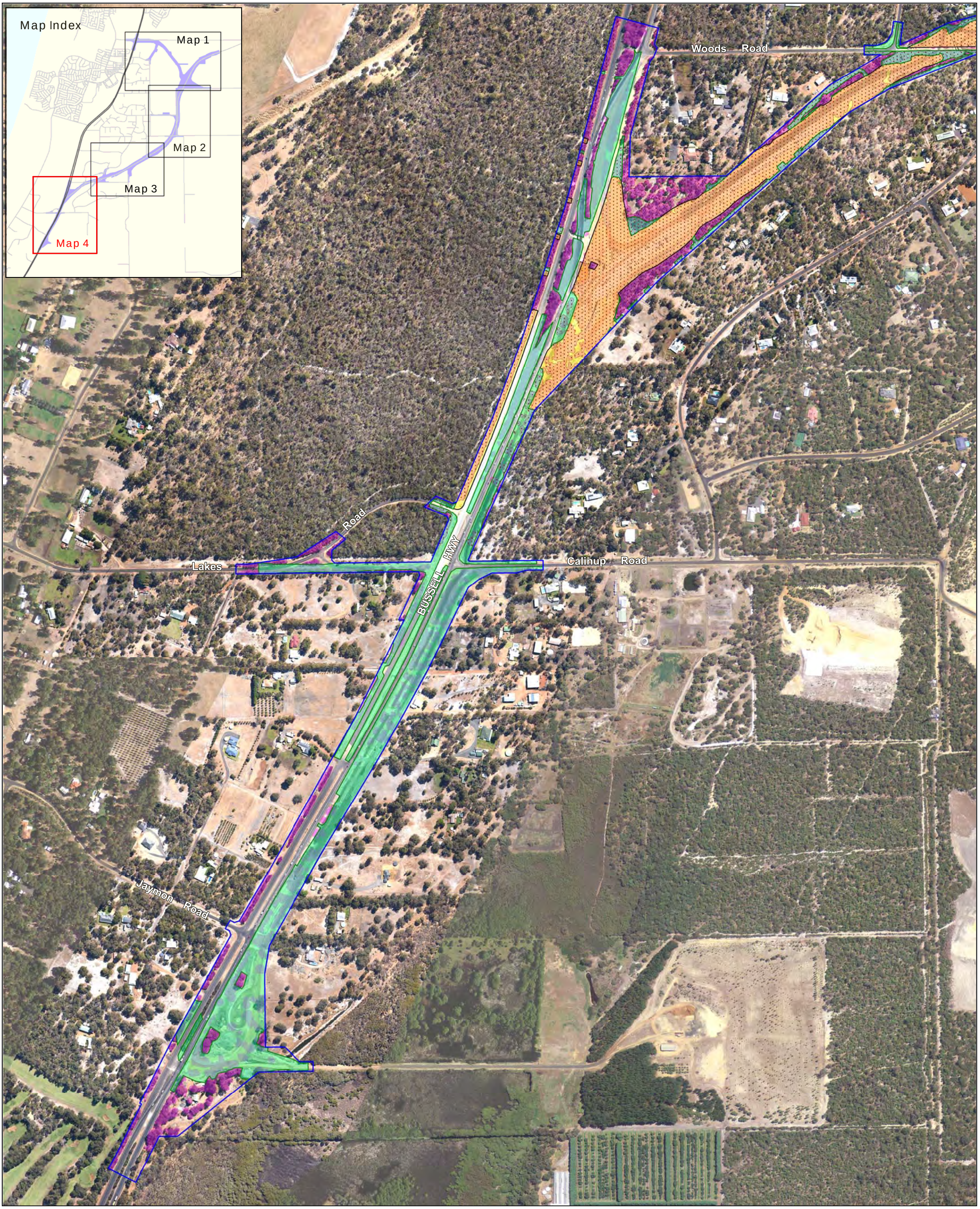
meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Western Ringtail Possum Habitat and South-western Brush-tailed Phascogale Habitat - Map 3

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,250 @ A3



Location Map

KARRATHA
W A
KALGOORLIE
PERTH
Map Area

LEGEND

- Proposal approval boundary (MS1191)
- Ground disturbance and clearing extents 2022 - 2023
- Ground disturbance and clearing extents 2023 - 2024
- Western Ringtail Possum habitat
- Brush-tailed Phascogale habitat

N

0 400

meters

BORR South Imagery March 2024

Ground Disturbance and Clearing Extents in Relation to Western Ringtail Possum Habitat and South-western Brush-tailed Phascogale Habitat Map 4

Biota Environmental Sciences

Author: Biota	Drawn: P Sawers	Job No.: 1855	Date: 20 Aug 2024	Revised:	Projection: MGA Z50 (GDA94)	Scale: 1:7,000 @ A3

South West Gateway Alliance

Report

Environmental Performance Report (Biota Environmental Sciences, 2024)

23 August 2024

Ernie Stead-Richardson
Environmental Manager Construction
South West Gateway Alliance
Via Email

Dear Ernie

Biota Environmental Sciences

Biota [n]: The living creatures of an area; the flora and fauna together

Bunbury Outer Ring Road (Southern Section): Compliance Assessment Report (CAR) May 31 2023 to 31 May 2024.

Biota Environmental Sciences have contributed to several scopes of work related to the Bunbury Outer Ring Road (BORR) Southern Section, required under Ministerial Approval 1191. These scopes largely relate to Western Ringtail Possum (WRP) monitoring activities documented in the Construction Fauna Management Plan (CFMP) and Habitat Fragmentation Management Plan (HFMP). The scopes include bi-monthly surveys, telemetry studies, mark-resight studies, a genetic relatedness study and WRP habitat condition surveys.

Compliance Assessment Reporting (CAR) is a requirement for the BORR (Southern Section) under the Ministerial Approval 1191 with the current reporting period coinciding with the period 31st May 2023 to 31st May 2024.

This document reports on the aspects of WRP monitoring required under the CFMP that were undertaken by Biota Environmental Sciences.

With regard to the scope of works issued to Biota these are specifically:

- Pre-clearing WRP and Brush-tailed Phascogale (BTP) survey of the Development Envelope, receival sites and reference sites (reported elsewhere);
- Post-clearing WRP and BTP surveys of the receival and reference sites as part of the on-going bi-monthly survey;
- Mark-resight study using PIT tags of WRP within the Development Envelope and receival sites;
- Telemetry study using GPS collars on up to fifty WRP and monitoring these animals for up to 3 months; and
- A genetic relatedness study of WRP with an expected fifty (50) samples DNA sequenced.
- WRP habitat condition surveys via assessment of 3D aerial imagery.

Bi-monthly surveys

Bi-monthly (every two months) surveys have been completed throughout the reporting period (31 May 2023 – 31 May 2024) (Table 1) and have included habitat within the development envelop, the receiving habitat and Reserve 23,000 (the BORR S reference site). The bi-monthly surveys commenced in August 2019 and the almost four years of continuous data provide a robust baseline for population size and natural fluctuations within the survey footprint. Methods adopted for these surveys are provided in Appendix A. The count data from each bimonthly survey of the development envelop and adjacent receiving habitat are shown in Figure 1 and are divided into Patches with these delineated in Appendix Figure A1.

Effort, measured by the length of transects walked for each patch, was not always consistent across the surveys in this monitoring program. This inconsistency was partly due to variable access constraints on different parcels of land, including within the receiving habitat. For example, during the current reporting period, the landowner routinely denied access to survey Patches 1 to 4. However, progressive clearing throughout the reporting period has been the primary contributor to the differences in survey effort (and consequently, counts) between phases. As a result, the variation in counts between bimonthly surveys during the reporting period is now largely attributable to clearing, with seasonal and demographic changes playing a less significant role. The relative impact of seasonal and demographic changes may be better understood by examining the results of the bi-monthly surveys conducted in Reserve 23,000 (see below).

Table 1. BORR South bi-monthly survey dates during current reporting period.

Phase	Survey Date
June 2023	1st June – 3rd June, 7th June – 9th June, 27th – 30th June 2023
August 2023	9th August – 11th, 21st August – 25th August 2023
October 2023	2nd October – 6th October 2023
December 2023	4th December – 7th December 2023
February 2024	21st February – 24th February 2024
April 2024	2nd April – 5th April and 28th April – 29th April 2024

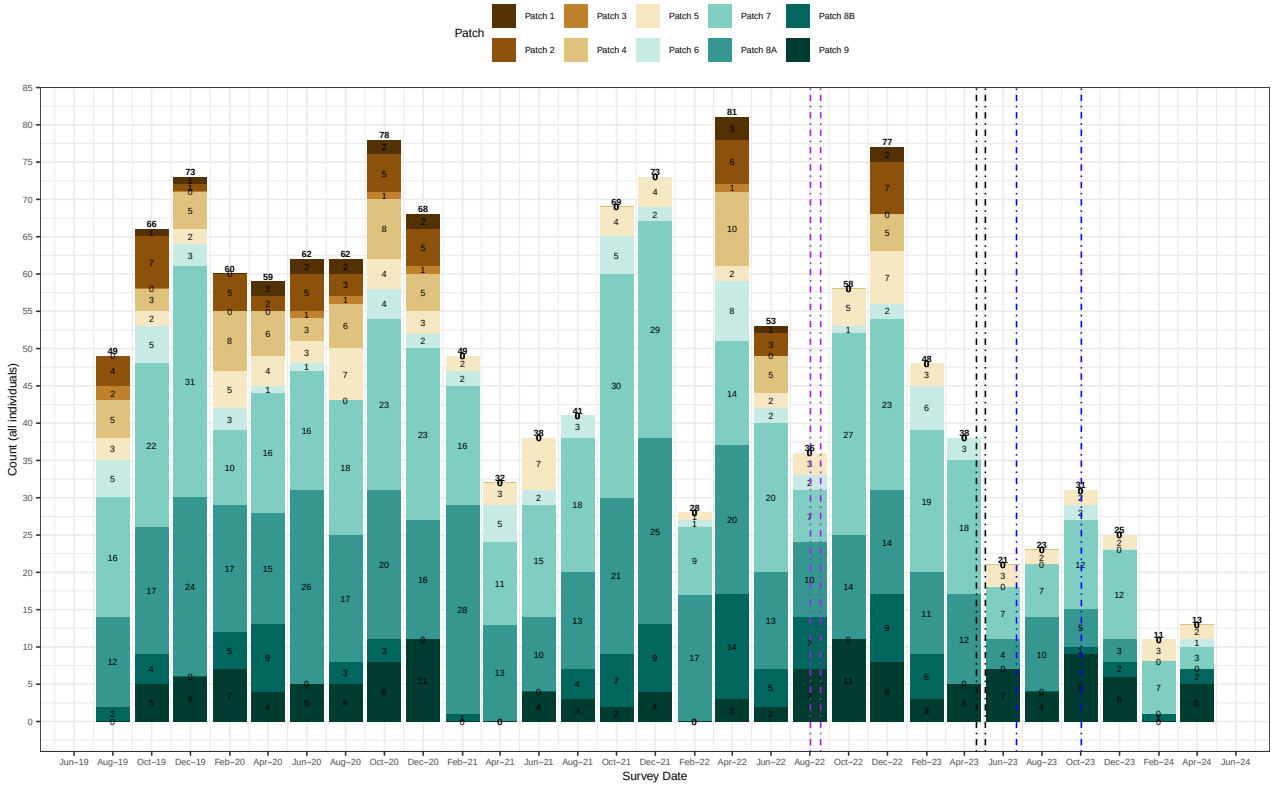


Figure 1. Results of counts of Western Ringtail Possums in the BORR South study area. Note effort is not always equivalent for each phase of the counts which would contribute to some of the variation between each phase. Purple hatched lines represent Stage 1 clearing, black and blue hashed lines represent Stage 2 clearing.

Considering the changing access permissions and the subsequent effect on the bi-monthly counts particularly within the receiving habitat, we suggest that the impact of clearing on WRP abundance within the receiving habitat is best understood by examining the results of the movement study. The movement study (described below) modelled home ranges of over 100 WRP in the section between Bussell Highway and Jilly Road (patches 7, 8A and 8B) (see below), including WRP living exclusively within the receiving habitat. Generally, the

home ranges within the adjacent receiving habitat remained largely unaffected for the six week period following clearing.

The BORR S reference site (Reserve 23,000) comprising 72 km of transects, is considered sufficiently large to provide a demographic snapshot of the entire monitoring period (commencing November 2019). Approximately 5 ha of Reserve 23,000 representing 3.4 % of the total area (146 ha) was burnt following a lightning strike on the 3/01/2023 and should be considered when interrogating the bi-monthly counts for this Reserve. The seasonal peaks and troughs are broadly comparable across years (with the exception of the most recent summer). The peaks are associated with the emergence of young from the pouch typically evident in the October and December counts but with an occasional April peak (Figure 2). Troughs are evident in the winter counts (Figure 2). Very hot and dry conditions experiences across the south-west of Western Australia during the summer of 2023/24 and extending well into Autumn likely led to the significant decline in the February 2024 and April 2024 counts of WRP in Reserve 23,000 (Figure 2). The decline was most marked in the juvenile population where nearly all the young recorded in December had apparently perished by February.

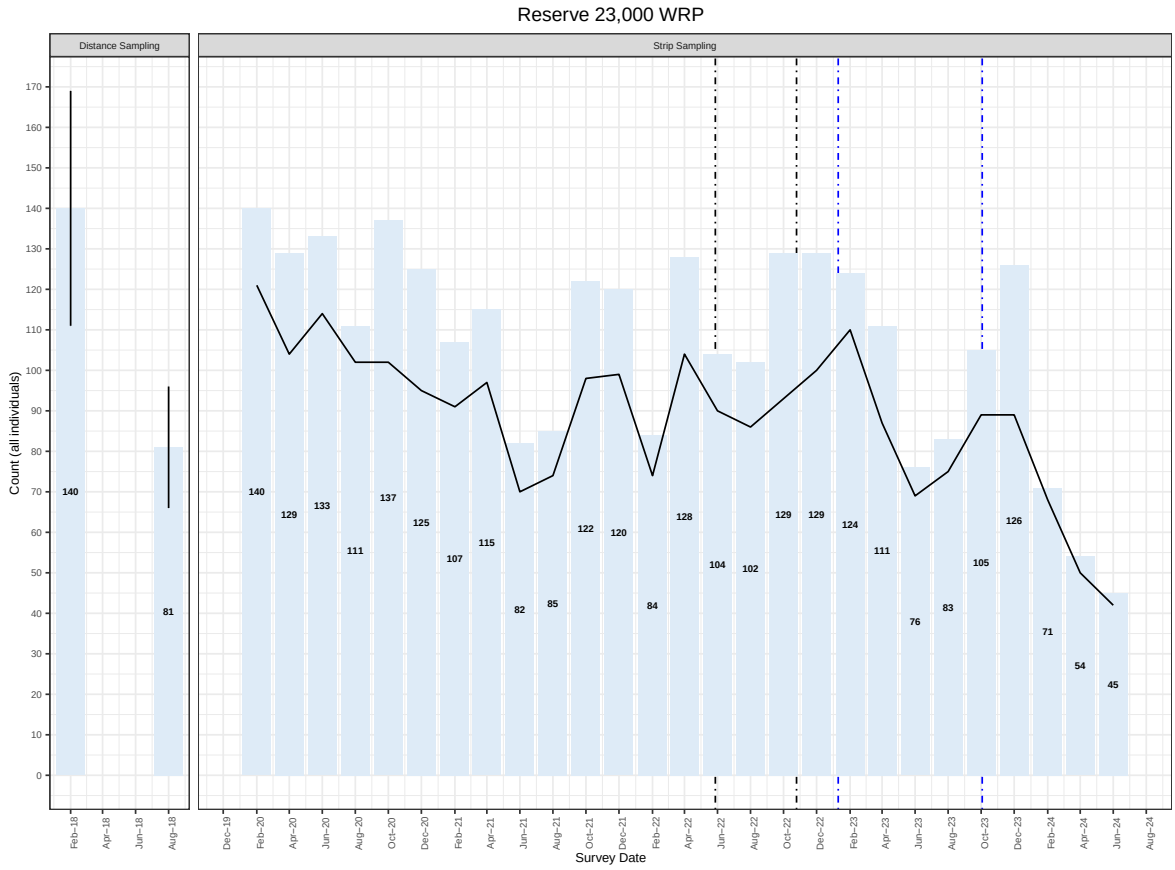


Figure 2. Results of counts of Western Ringtail Possums in Reserve 23,000 using distance sampling in the first panel (blue bars represent total number of individuals, black vertical bars are standard error estimates) and strip sampling in the second panel (blue bars represent total number of individuals, black line representing the total number of detections).

Mark-resight study

For the period up to December 2023, the transponder mark-recapture/resight study has been largely superseded by the comprehensiveness of the GPS collaring study (see below). This is because the fate of collared animals (n=108) has been studied intensively before, during, and after clearing, both within the clearing area and in the receiving habitat (where access was permitted). We estimate that the total number of WRP captured represents approximately 90% of the individuals available for capture in the accessible

parts of the receiving habitat and throughout the clearing footprint. Following the completion of the telemetry study, the first round of captures for the mark-recapture study is proposed for August 2024. However, we note that the number of individuals within accessible areas of the Gelorup Corridor has declined markedly during the prolonged hot, dry summer (Figure 1), consistent with observations in the BORR S reference site (Figure 2).

Telemetry study

During the current reporting period, the collection of GPS relocation data associated with phase 2 clearing was finalised (during October 2023) (see Figure 3). Collars were retrieved and the animal's condition assessed and reported under our animal ethics obligations. Home range modelling continues for the stage 2 clearing. Methods and preliminary results are provided as Appendix B.

Pre-clearing Radio Telemetry Assistance

Whilst the primary purpose of the GPS collaring study was to document changes in modelled home ranges before and after clearing, being able to locate collared animals immediately prior to clearing stages (Appendix C) helped reduce the risk of accidental WRP death.

The recorded daytime refuges (dens, dreys and other locations) of collared animals were plotted onto maps showing the animals home range and clearing footprint these were updated daily. The location of all collared animals at the clearing front were identified in the field and shown to fauna spotters of the clearing team. Each denning tree was clearly marked daily with high-visibility flagging tape, and their locations and details recorded including:

1. WRP known to be present today
2. WRP with Young at Heel known to be present today
3. Previously used for denning by WRP
4. Previously used for denning by WRP with Young at Heel

The likelihood of an uncollared WRP being present within the clearing footprint was informed via nocturnal spotlighting surveys, undertaken over two nights within five nights, prior to each stage of clearing.

Mortality Events

Two mortality events of collared animals were recorded during the current reporting period (Table 2). Female #956000012887775 was found in a highly decayed state of the ground and the cause of death is unknown. Female #956000012885906 was found deceased on the ground adjacent to a tree with a known drey site. There was no evidence of predation and was considered to have died due to hot persistent hot and dry conditions at the site throughout summer of 2023/24.

Table 2. Summary of all known mortality events of collared Western Ringtail Possums during the current reporting period.

Animal Identifier	Sex	Approximate date of mortality	Notes
956000012887775 F_D (VHF Collar)	Female	Retrieved from decayed body on 3rd October 2023	No recovered DNA
956000012885906 F_D_32533	Female	Feb 23, 2024	No recovered DNA

Across the entire collaring study to the end of the reporting period, a further 21 collars (21%) have been retrieved from animals that had died (Table 3). Twelve (60%) mortality events occurred when no clearing was being undertaken. Two mortality events occurred during phase 1 clearing and seven mortality events occurred during the phase 2 clearing. Four mortality events were recorded coincident with clearing activities, two in each of the phases of clearing. A destroyed collar belonging to a male (956000012885932) was recovered from Bussell Highway on the 11th of August 2022. A female (F_D_33855) was injured during clearing on the 23rd of August 2022. During the clearing window of the

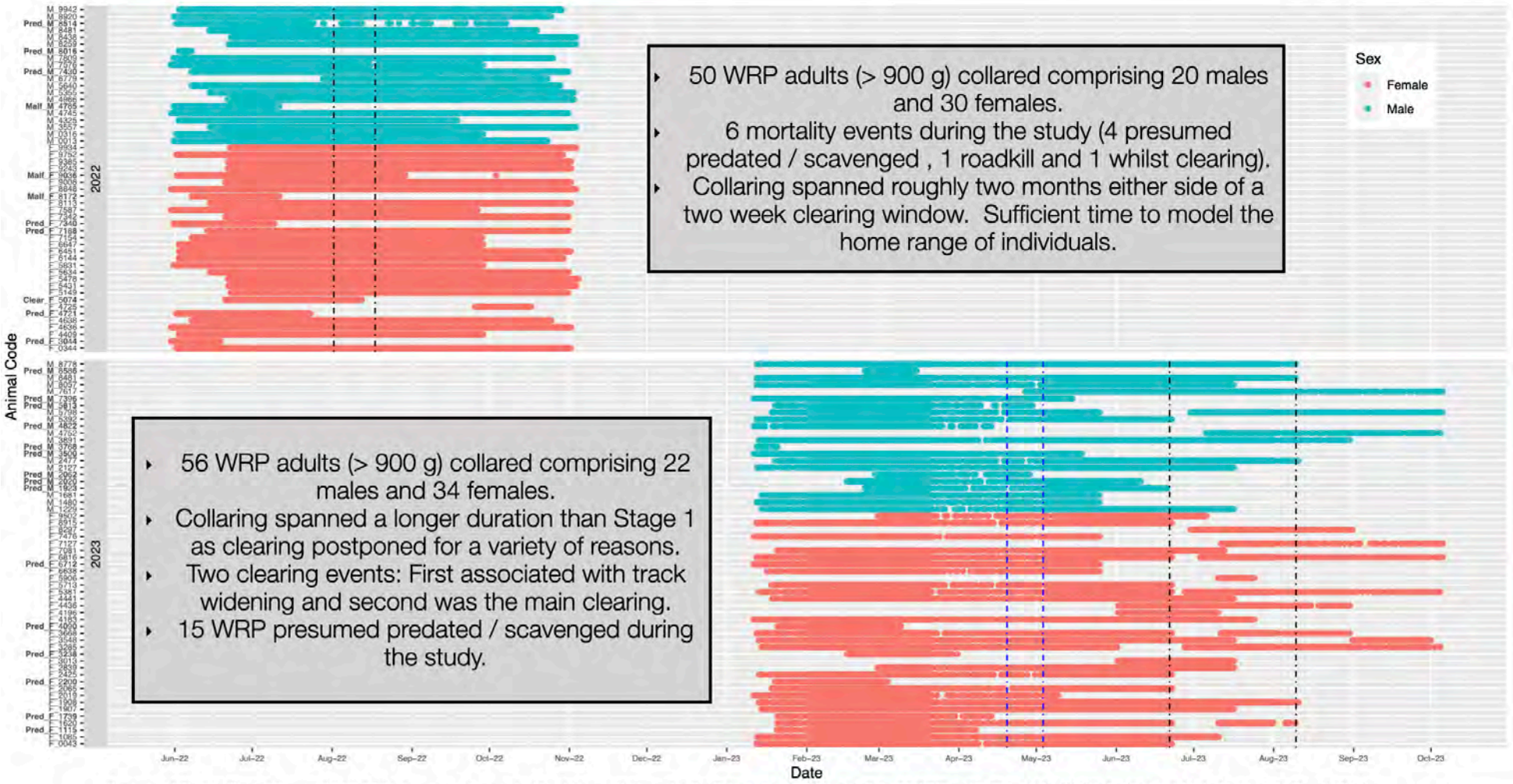
construction of a central access track, the collars from two males (M_D_33854_A_36 and M_D_32541_51) were collected at 'Banksia Hill'.

One mortality event (F_D_33855) has been directly linked to the project's clearing activities. In seven cases evidence of Fox DNA was recovered from collars (Table 3).

Table 3. Summary of all known mortality events of collared Western Ringtail Possums prior to the current reporting period.

Animal Identifier	Sex	Approximate date of mortality	Notes
956000014468016 M_D_32538A	Male	Jun 6, 2022	Fox DNA recovered
953010003843044 F_D_33859	Female	Jun 17, 2022	No recovered DNA
956000013287340 F_D_32934A	Female	Jul 8, 2022	Fox DNA recovered
956000013284721 F_D_33864A	Female	Jul 18, 2022	No recovered DNA
956000013278514 M_D_33856	Male	Jul 23, 2022	No Result
956000012885932*	Male	Approx. Aug 5, 2022	Killed on road
956000014465074 F_D_33855	Female	Aug 23, 2022	Tree felling
956000012887430 M_D_32527	Male	Oct 21, 2022	No Result
956000012887188 F_D_33342	Female	Oct 28, 2022	No Result
956000016553768 M_D_33864	Male	Jan 21, 2023	Fox DNA recovered
956000016552200 F_D_32537	Female	Mar 05, 2023	Fox DNA recovered
956000016554090 F_D_32532	Female	Mar 09, 2023	No recovered DNA
956000016558586 M_D_33856	Male	Mar 14, 2023	No recovered DNA
956000016623238 F_D_34485	Female	Apr 1, 2023	Fox DNA recovered
956000016551115 F_D_33337	Female	Apr 9 2023	No recovered DNA
956000016561739 F_D_33855	Female	Apr 14, 2023	Fox DNA recovered
956000013284822 M_D_34367	Male	Apr 15, 2023	Fox DNA recovered
956000016552062 M_D_32541	Male	Apr 29, 2023	No recovered DNA
956000016555813 M_D_33854_A	Male	Apr 30, 2023	No recovered DNA
956000013267396 M_D_34359	Male	May 15, 2023	No recovered DNA
956000012883500 M_D_34361	Male	May 19, 2023	No recovered DNA

* This individual wore a collar for approximately 14 days but no data were collected and hence it is not included in the summary Figure 2 above (Orange = clearing period, Blue = directly related to clearing activities, Red = adjacent to clearing activities and Green = not related to clearing activities).



Summary of Western Ringtail Possum (WRP) GPS telemetry studies required for clearing activities within the Gelorup Corridor during 2022 (n=50 WRP) and 2023 (n=55 WRP) (Pred = Predated, Malf = Malfunction, Clear = Clearing). Black hashed line = duration of main clearing activities. Blue hashed line = duration of minor clearing associated with track widening.

Figure 3. Summary of duration over which WRP wore GPS collars during phases 1 (Bussell Highway to Yalinda Drive) and 2 (Yaliinda Drive to Jilly Road) of clearing within the Gelorup corridor. Note that the current reporting period extends from May 31st 2023 to May 31st 2024 and the collaring study was completed in early October 2023.

WRP Habitat Condition Survey

Aerial 3D imagery of the development envelope and receiving habitat was captured prior to the commencement of clearing in July 2022. Subsequently, the aerial survey was expanded to include additional areas, including part of the BORR S reference site (Shire of Capel's Reserve 23,000) on February 28, 2023, and eventually covering the entirety of the BORR S reference site with flights conducted on September 21, 2023, and March 26, 2024.

The following datasets have been captured:

- 25cm SpecTerra multispectral imagery (4-band) with co-registered 6 cm high resolution RGB imagery.
- Digital Surface Models (DSM) and Digital Terrain Models (DTM).
- Delineation and segmentation of canopy polygons with height, area and Plant Cell Density (PCD) / Normalised Difference Vegetation Index attributes.

The resultant data has been used to both document the utility of the captured parameters in relation to home range modelling undertaken in the Gelorup corridor and examine any changes in habitat quality as clearing progresses.

In the first example (Figure 4) female home ranges have been plotted onto the canopy structure of a section of the Gelorup corridor to investigate the importance of canopy height (categorised into 5 m intervals) and connectivity on size (both area and volume) and extent of overlap of home ranges.

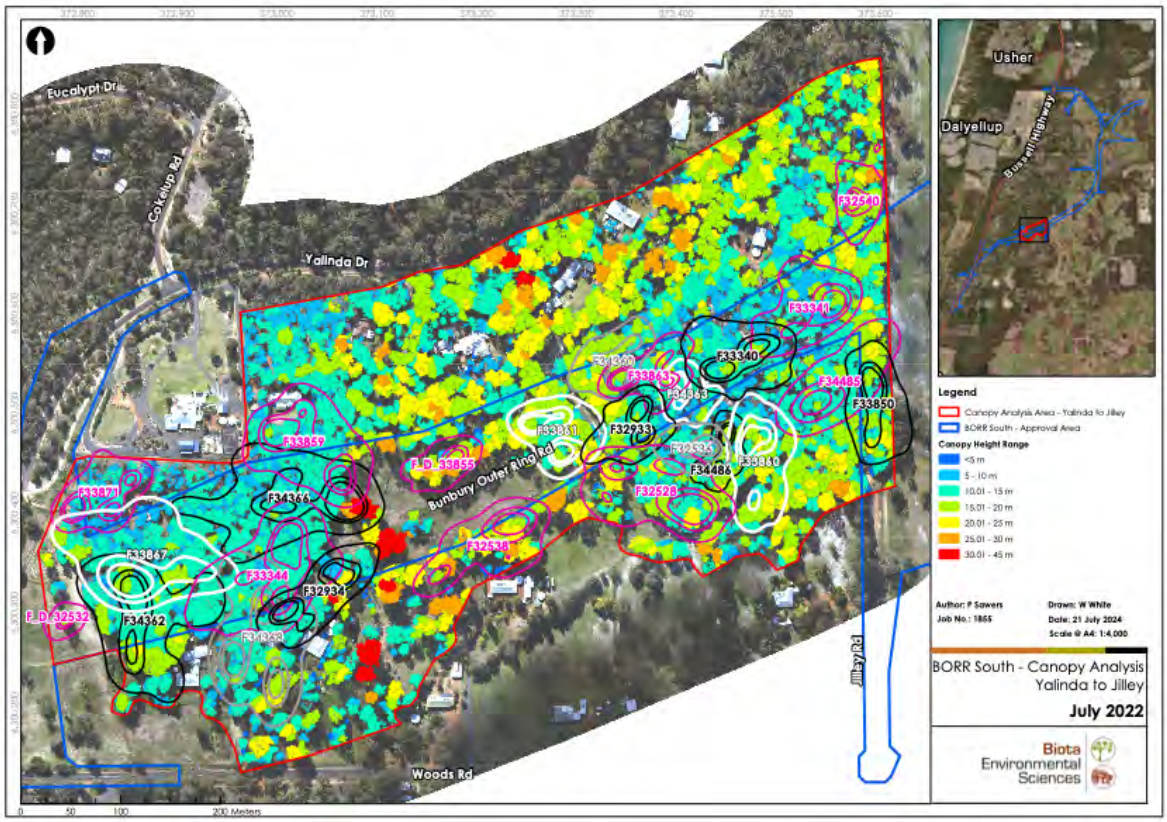


Figure 4. Modelled home ranges of female Western Ringtail Possums overlaid on a digital elevation model of canopy heights within the stage 2 clearing area (Yalinda Drive to Jilly Road).

In the next example (Figure 5), the extent of canopy loss (depicted as green polygons) has been documented for the receiving habitat post-clearing and contextualized by including canopy loss within Reserve 23,000. The unusually hot and dry period between November 2023 and May 2024 resulted in measurable canopy loss throughout the area covered by the aerial imagery, with the most pronounced effects observed in sections of Reserve 23,000. This event has obscured any potential impact arising from the clearing and

construction of the BORR S section, but it underscores the importance of the reference site for context.

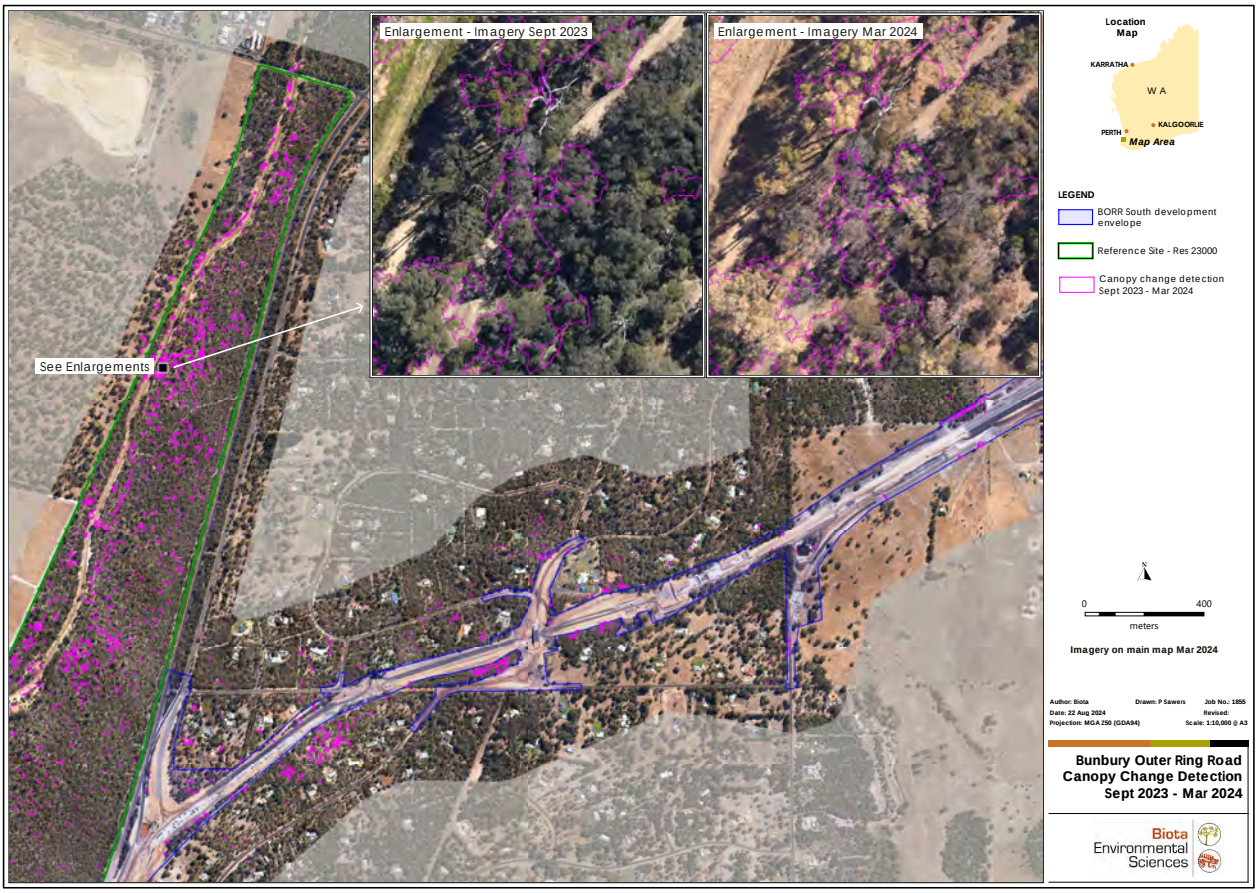


Figure 5. Identified canopy loss in the Gelorup Corridor and adjacent Reserve 23,00 between September 2023 and May 2024 likely caused by an extreme dry and hot climate event.

Genetic Relatedness Study.

In the context of the passive dispersal proposal, we argued that that an improved ethical outcome for displaced or partially displaced WRP is to allow them to passively disperse or reorganize themselves within uncleared areas of their home range and within existing social relationships. The social relationships are assumed to exist based on anecdotal information that females are more tolerant of related females compared to unrelated females. To try and test this assumption a genetic relatedness study was undertaken between all animals captured during the collaring study and is discussed in more detail in Appendix E.

Yours sincerely,

Biota Environmental Sciences Pty Ltd

Roy Teale
Director / Principal Zoologist

Appendix A: Standard Western Ringtail Possum Survey Methods

To document WRP seasonal population variation and to guide management actions, censuses within the BORR South Study Area and the BORR South Referral Boundary have been undertaken at two-monthly (bimonthly) intervals since August 2019. Counts within the BORR South Reference Site (Reserve 23,000) commenced in early November 2019 and were then timed to match those undertaken in the BORR South Study Area (i.e., from December 2019 and then bimonthly). To simplify reporting, the BORR South Study Area and Referral Boundary have been divided into Patches (Figure A1).

A strip-sampling approach using 20 m wide strips, was adopted in each of the survey areas. This was preferred over using distance sampling for a number of reasons, mainly that many habitat remnants were too small to implement robust distance sampling. However, the width of the strip was guided by the detection function developed from the regional distance sampling program (based on thousands of detections) which indicated a probability of detection of 95% within 10 m either side of an observer (and even higher in the more open habitat characteristic of the BORR study sites). To obtain accurate and repeatable counts of the number of possums utilizing the BORR South Study Area and Referral Boundary, each section of habitat (including the Reserve 23000 Reference Site) was divided into 20 m strips.

These strips were pre-loaded onto map imagery and displayed on tablets (UniStrong UT 10) with a GPS accuracy typically to within 1.5 m. Each strip was surveyed by an appropriately experienced zoologist walking centrally through the strip at a slow steady pace (typically less than 1 km/hr), using a high-powered head torch (Led Lenser XEO 19R model) to detect animals. In open pasture with scattered trees, searching individual paddock trees was undertaken in favour of searching strips. In addition to the Western Ringtail Possum, observations of the Common Brushtail Possum and Brush-tailed Phascogale were also recorded.

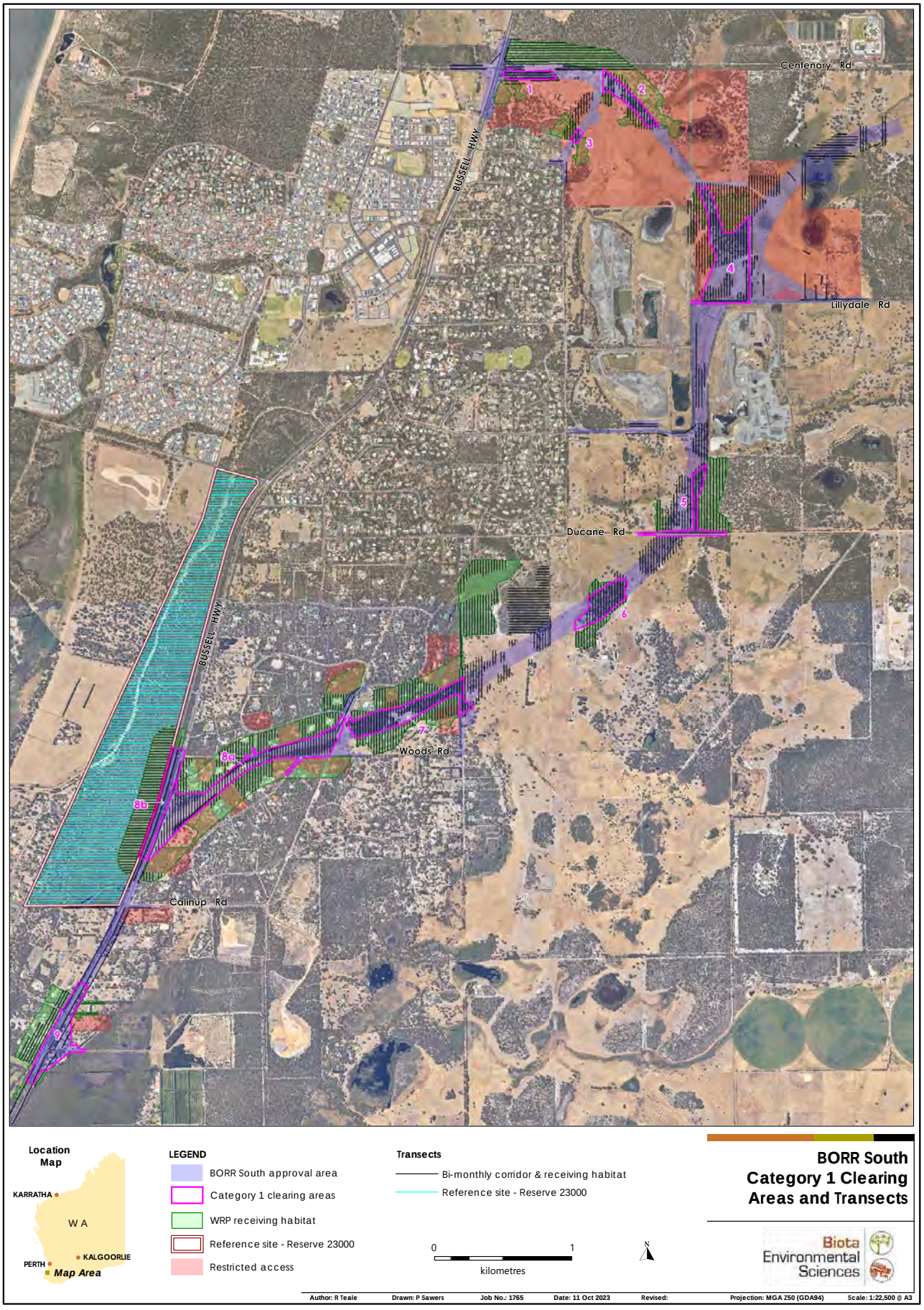


Figure A1. Designation of clearing patches within the BORR S study area.

Appendix B Collaring Study

The collaring project is designed as a longitudinal study, where the home range of WRP individuals is modelled from GPS re-locations obtained prior to, during and after clearing.

Main objectives

- Estimate home range size for WRP before, during and after clearing in the Gelorup section of BORR South.
- Determine the extent to which shepherded WRP remain in modified home ranges or re-establish new home ranges within adjacent habitat.
- Determine the extent to which new home ranges overlap with pre-existing home ranges.
- Determine whether genetic relatedness influences the likelihood of WRP successfully sharing home ranges.
- Determine whether rope bridges. artificial water sources and dens can be used to shepherd WRP into adjacent home ranges before and during clearing.
- Determine whether artificial den sites, rope connections and water sources and dens continue to be utilised post-clearing, and whether they allow WRP to coexist at higher densities in the receiving habitat.

Methods

WRP were hand-captured using the hook-fitted pole techniques outlined in Jones et al (1994) and in accordance with animal ethics AEC NO. 21-1-05. Following capture, possums were weighed, sexed, scanned for microchips, and given a visual health assessment. All individuals were marked with a microchip if none was already present. Female's pouches were examined to determine their reproductive status, and the size of any pouch young. WRP which were visually healthy, weighed >900g, and not carrying large pouch young were fitted with Lotek® Litetrack-30 RF whip-antenna collars (Lotek, Havelock North, New Zealand), and then released at point of capture. Collars weighed 35g; no more than 3.9% of total body weight for any individual. Follow-up visual assessments were conducted the night post-release, and throughout the study.

GPS data was remotely downloaded from the collars throughout the study using a Lotek® PinPoint Commander unit (Lotek, Havelock North, New Zealand) attached to a three-prong Yagi antenna (Advanced Telemetry Solutions Australia, Gold Coast, Australia). This data was used to assess each individual's movement and check for signs of mortality progressively throughout the course of the clearing.

VHF Collars

The VHF collars are the same model as the GPS units described above (Litetrack collars, manufactured by Lotek), but are VHF-only. They are also lighter, at 22g, and have been used to track lighter (>600 g) WRP during clearing activities. A 22g collar on 600g animal represents <4% of body weight (3.66%). The collars are intended for short-term use, allowing us to locate smaller WRP during clearing activities, and was fitted with a drop-off mechanism. The drop-off mechanism was either light foam or elastic and designed in consultation with DBCA Senior Research Scientist Mark Cowan.

Results

A total of 153 WRP were captured as part of the telemetry study (raw data see Appendix C), these included animals from both the development footprint and the receiving habitat and across both phases of clearing: phase 1 – Bussell Highway to Yalinda Drive; and phase 2 – Yalinda Drive to Jilly Road and "Banksia Hill". The telemetry study provides a robust assessment of the extent to which home ranges have been modified because of clearing and therefore provide more detail about impacts to WRP within the receiving environment than do the bi-monthly counts (especially given the variability in access to parts of the receiving habitat throughout the period of bi-monthly counts).

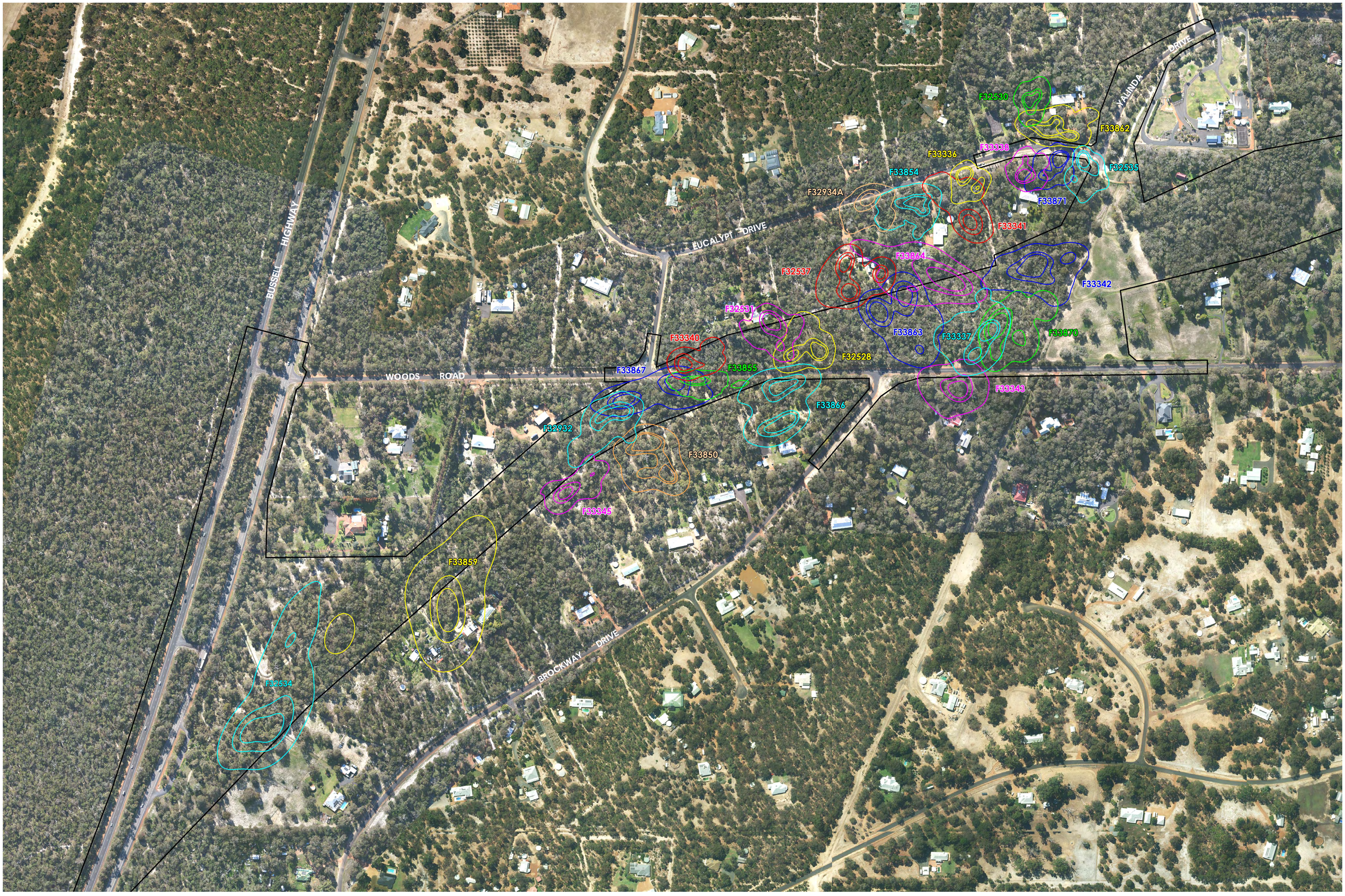
Phase 1 Clearing: Bussell Highway to Yalinda Drive
During phase 1 of clearing, a total of 76 animals were captured between 30th May 2022 and 3rd August 2022 of which 52 animals were collared. The remaining 24 animals caught were too small to collar.

Phase 2 Clearing: Yalinda Drive to Jilly Road
During phase 2 of clearing, a total of 79 animals were captured between 16th February 2024 and the completion of the main clearing activities in early August 2023 of which 56 animals were collared. The remaining animals caught were too small to collar using the Litetrack 30 GPS collars.

The relocation data associated with phase 1 clearing have been analysed but not formally reported. The results suggest that modelled home ranges (based on relocation data collected for approximately six weeks either side of clearing) that were positioned outside of the clearing footprint remained largely unchanged (Figures B1 – B4). Home ranges of females that were partially cleared generally retracted back to those areas that remained uncleared (Figure B1 – B2). Home ranges of males that were partially cleared repositioned to overlap with female home ranges post clearing (Figure B3 – B4).

References

Jones, B.A.; How, R.A. and Kitchener, D.J. (1994). A Field Study of *Pseudocheirus occidentalis* (Marsupialia: Petauridae). II. Population studies. Wildlife Research 21: 189-201.



Bunbury Outer Ring Road

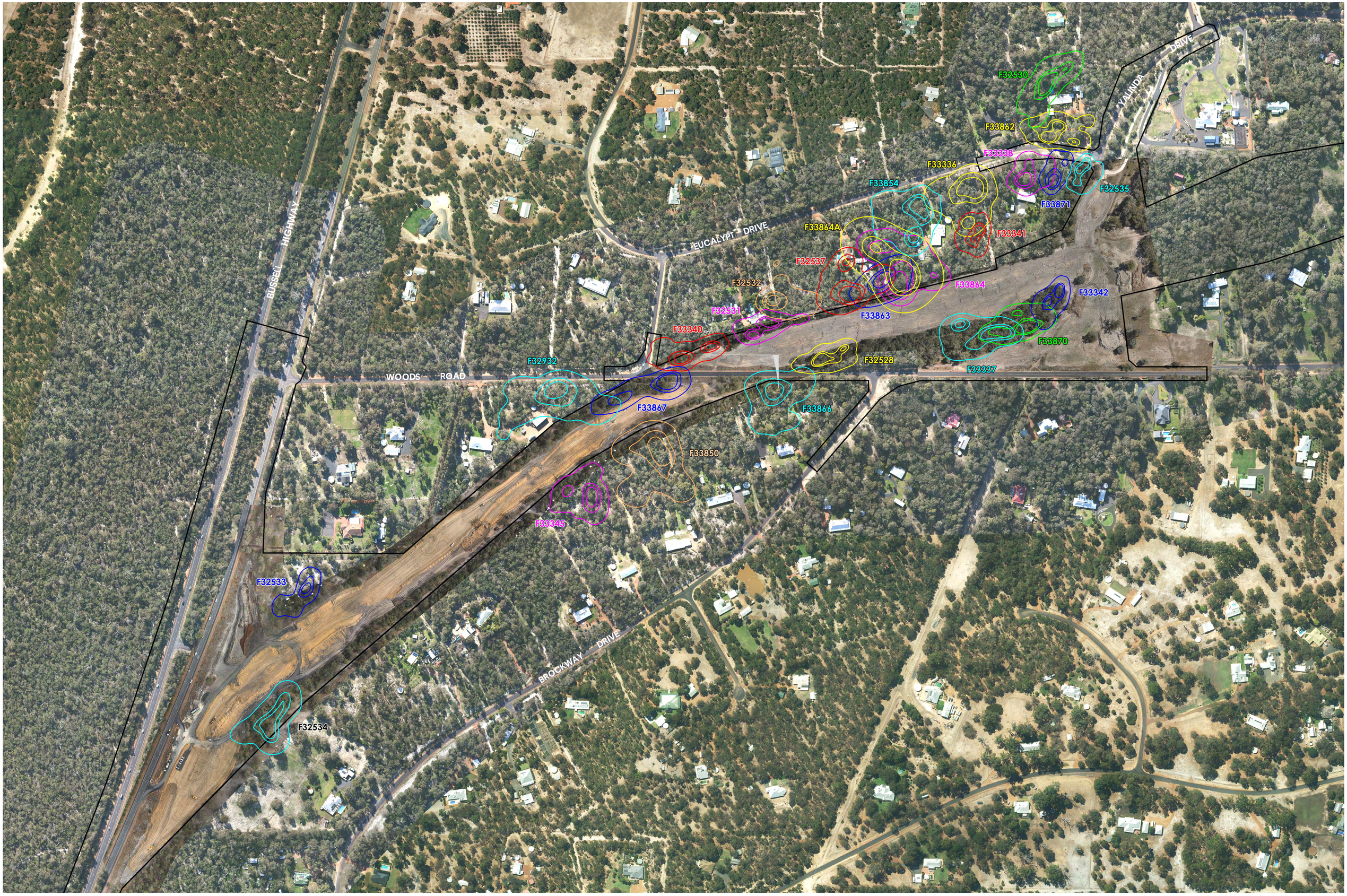
Western Ringtail Possum
Female Home Ranges - Pre Clearance

BORR South Development Envelope

0 200
metres

Scale 1: 1650 @ A0 Drawn 30 Nov 2022

Biota Environmental Sciences



Bunbury Outer Ring Road

Western Ringtail Possum
Female Home Ranges - Post Clearance

BORR South Development Envelope

0 200.1
metres

Scale 1: 1650 @ A0 Drawn 30 Nov 2022

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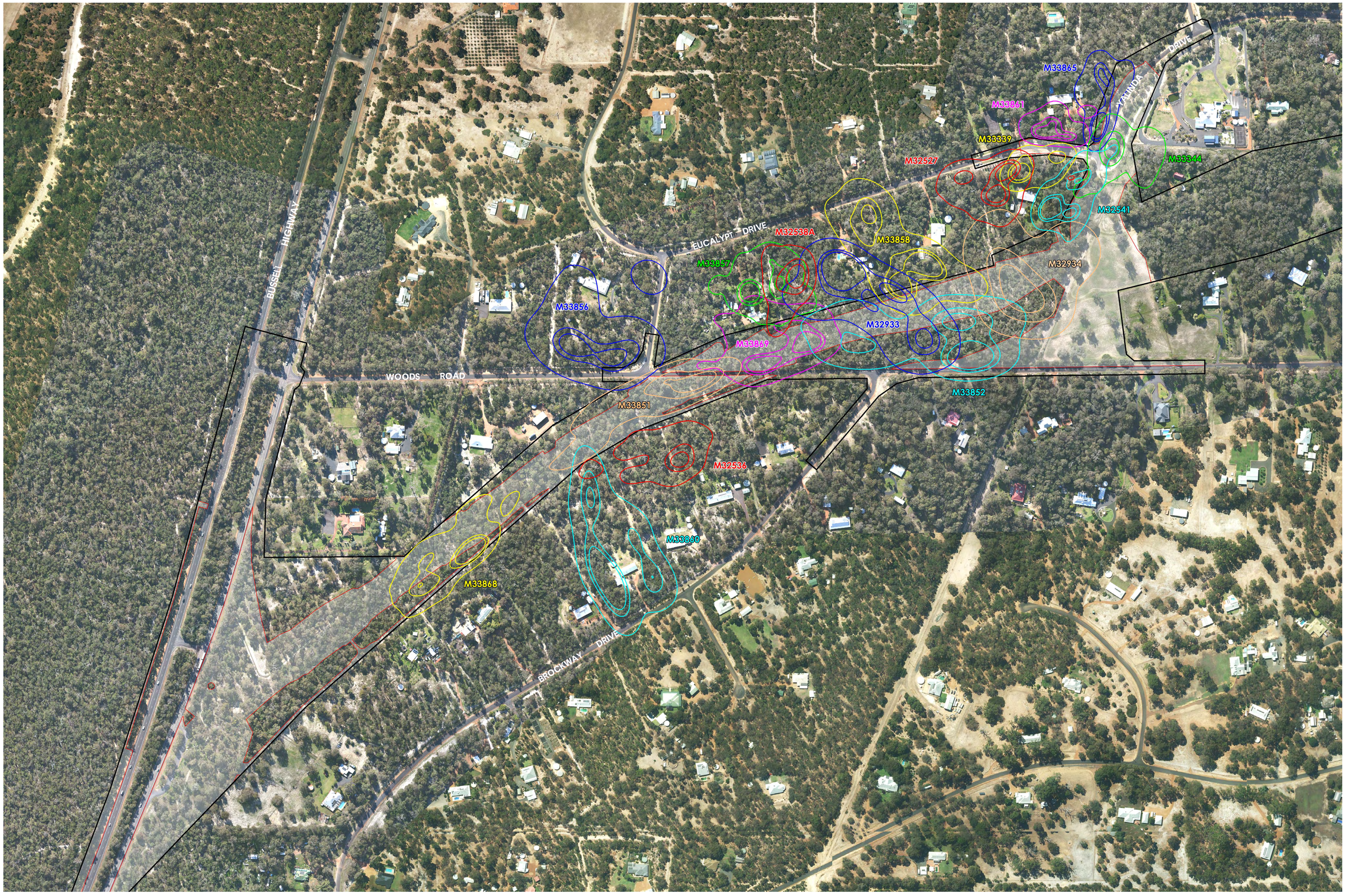

Bunbury Outer Ring Road

Western Ringtail Possum
Male Home Ranges - Pre Clearance

BORR South Development Envelope

Proposed Clearing Area

0 200.1
metres

Scale 1: 1650 @ A0 Drawn 30 Nov 2022

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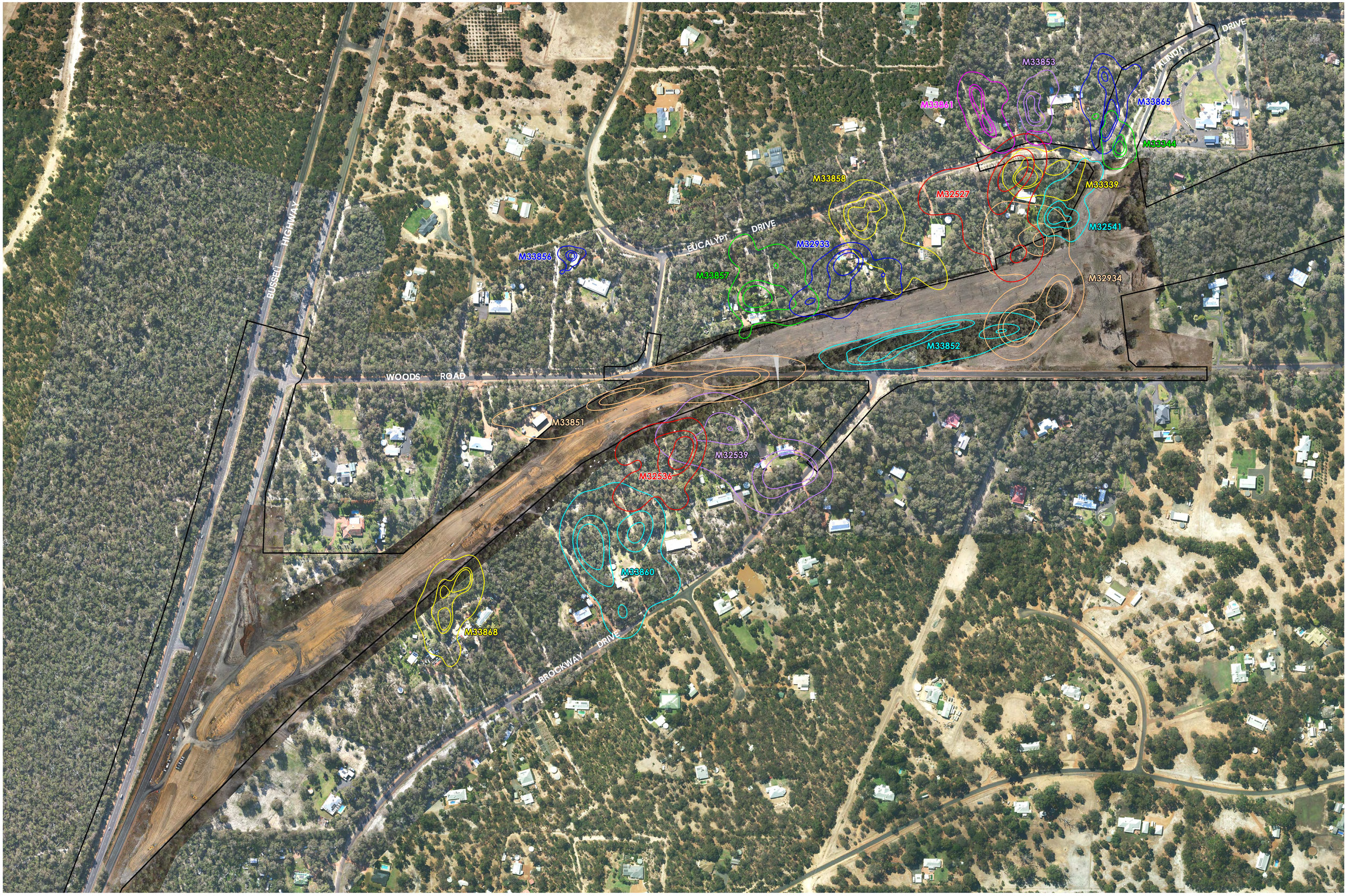

Bunbury Outer Ring Road

Western Ringtail Possum
Male Home Ranges - Post Clearance

BORR South Development Envelope

0 200.1
metres

Scale 1: 1650 @ A0 Drawn 30 Nov 2022

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Appendix D: Example of imagery captured for habitat quality assessments.

ENLARGEMENT 1

Tree/Grove canopy

Multispectral July 2023

ENLARGEMENT 2

Multispectral July 2022

Tree/Grove canopy

Multispectral Feb 2023

Tree/Grove canopy

Location Map

KARRATHA

W A

KALGOORLIE

PERTH

Map Area

LEGEND

Proposal approval boundary (MS1191)

AOI - Imagery acquistion 19 July 2022

AOI - Imagery acquisition 28 Feb 2023

N

0 1

kilometres

Imagery source - Specterra Services Pty Ltd

BORR South Habitat Assessment Acquisition of Multispectral & RGB Imagery Generating Tree/Grove Canopy Polygons

Biota Environmental Sciences

Author: Biota | Drawn: P Sawers | Job No.: 1765 | Date: 24 Aug 2023 | Revised: | Projection: MGA Z50 (GDA2020) | Scale: 1:25,000 @A3

Appendix E: Genetic Relatedness Study.

The genetic relatedness between a pair of individuals (a dyad) is defined as the probability that two alleles at a particular locus, one drawn randomly from each individual, are identical by descent (IBD; Jacquard 1972, Blouin 2003, Wang 2022). Simply put, these alleles have originated from a common ancestor. The degree of relatedness is estimated relative to a pre-defined reference population using the coefficient of relatedness, Rxy. Rxy measures the expected fraction of alleles within the genome of a pair of individuals (x and y) that are shared by descent and is estimated using a reference population with known allelic frequencies (e.g., the sampled population; Milligan 2003, Blouin 2003, Attard et al. 2018, Wang 2022).

Dyads are classified and divided into discrete genealogical categories according to their percentage of IBD alleles. Jacquard's (1972) nine condensed identity states, S1-S9, fully describe the way four alleles (two from diploid individual X and two from diploid individual Y) can be partitioned at a locus. As the states cannot be directly observed, they must be ascertained using probabilities derived from Jacquard's (1972) condensed IBD coefficients, Δ1 - Δ9, and defined relative to the reference population (Weir et al. 2006, Wang 2022).

Parent-offspring and full-sibling pairs are referred to as first-degree relatives, and they will, on average, share one IBD allele per locus and have a predicted Rxy = 0.5 (Blouin 2003). More distant relationships can also be inferred, such as second-degree relative pairs (e.g. half-siblings, grandparents-grandchildren, avuncular) where there is an expected average Rxy = 0.25, and so on (Blouin 2003). However, as the relationship becomes more distant, the number of possible allele-sharing patterns increases along with the sampling variance of the estimate. Values estimated with microsatellite markers are typically only approximate for the dyad (Taylor 2015).

An example of the preliminary results is shown below for male first order dyads within the Gelorup corridor.

Attard CRM, Beheregaray LB, Möller LM. 2018. Genotyping-by-sequencing for estimating relatedness in nonmodel organisms: Avoiding the trap of precise bias. Molecular Ecology Resources, 18: 381-390. doi: 10.1111/1755-0998.12739.

Blouin M. 2003. DNA-based methods for pedigree reconstruction and kinship analysis in natural populations. Trends in Ecology & Evolution, 18: 503-511. doi: 10.1016/S0169-5347(03)00225-8.

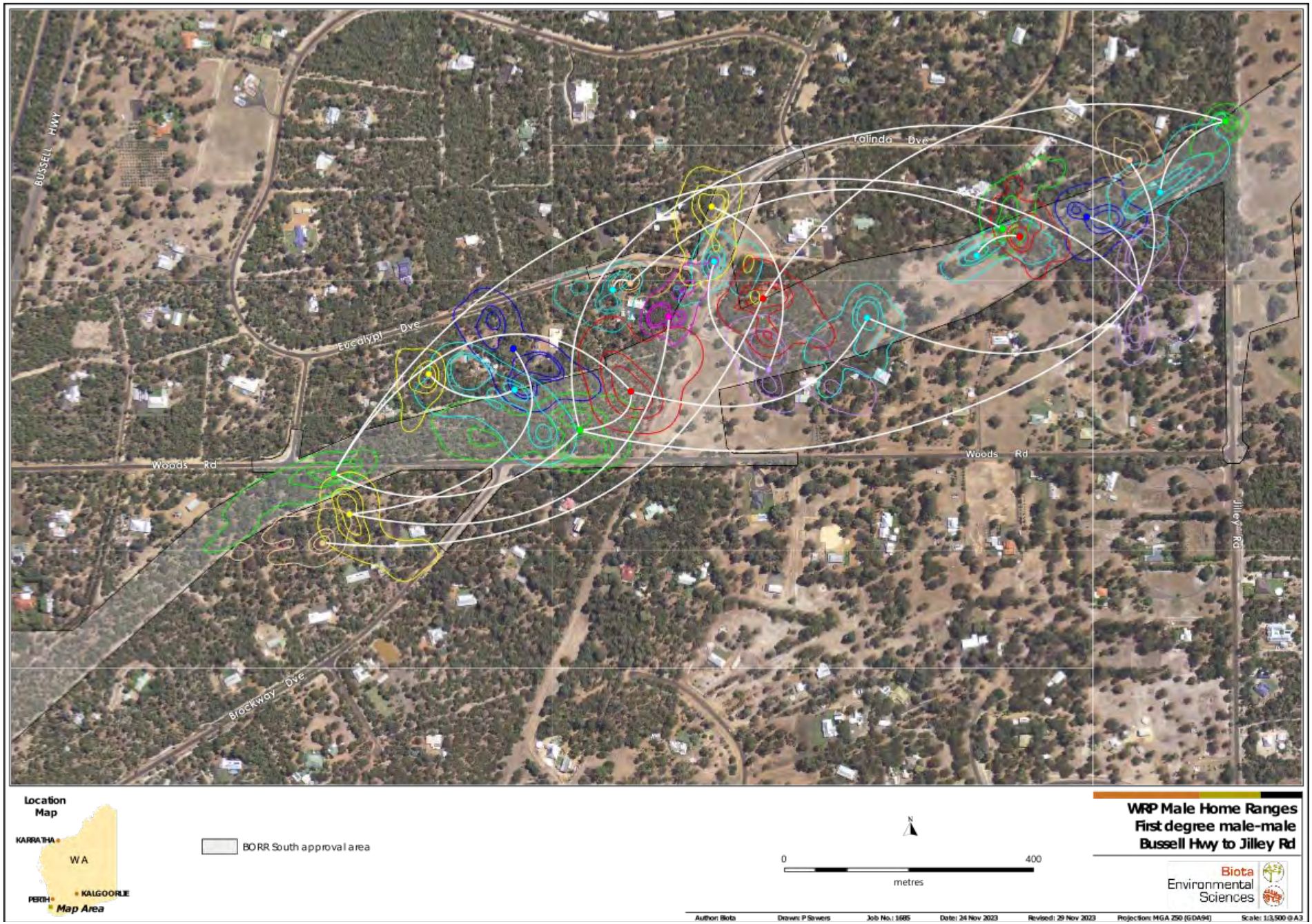
Jacquard A. 1972. Genetic information given by a relative. Biometrics, 28: 1101-1114. doi: https://doi.org/10.2307/2528643

Milligan BG. 2003. Maximum-likelihood estimation of relatedness. Genetics, 163: 1153–1167. doi: 10.1093/genetics/163.3.1153

Taylor HR. 2015. The use and abuse of genetic marker-based estimates of relatedness and inbreeding. Ecology and Evolution, 5: 3140-3150. doi: 10.1002/ece3.1541.

Wang J. 2022. A joint likelihood estimator of relatedness and allele frequencies from a small sample of individuals. Methods in Ecology and Evolution, 13: 2443– 2462. doi: https://doi.org/10.1111/2041-210X.13963

Weir BS, Anderson AD, Hepler AB. 2006. Genetic relatedness analysis: modern data and new challenges. Nature Reviews Genetics, 7: 771-780. doi: 10.1038/nrg1960


Bussell Hwy
Yalindo Dve
Eucalypt Dve
Woods Rd
Woods Rd
Jilley Rd
Brockway Dve
Location Map
KARRATHA
W A
PERTH
KALGOORLIE
Map Area
BORR South approval area
N
0
400
metres
WRP Male Home Ranges
First degree male-male
Bussell Hwy to Jilley Rd
Biota Environmental Sciences
Author: Biota
Drawn: P Sewers
Job No.: 1685
Date: 24 Nov 2023
Revised: 29 Nov 2023
Projection: MGA Z50 (GDA94)
Scale: 1:3,500 @ A3

South West Gateway Alliance
Suite 3, 3 Craig Street, Burswood
Western Australia 6100

South West Gateway Alliance
Delivering the Bunbury Outer Ring Road

South West Gateway Alliance
Suite 3, 3 Craig Street, Burswood
Western Australia 6100

South West Gateway Alliance
Delivering the Bunbury Outer Ring Road