NORTHERN EXTENSION TO YALYALUP MINERAL SANDS PROJECT, REFERRAL UNDER S.38 OF THE EP ACT

Prepared For:

DORAL MINERAL SANDS PTY LTD

Report Number:

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1. INTRODUCTION

1.1. PURPOSE AND SCOPE

Doral Mineral Sands Pty Ltd (Doral), is proposing a significant amendment of an approved proposal under Section 40AA of the *Environmental Protection Act 1986* (EP Act). Specifically, Doral is seeking to expand its current mining operation for the Yalyalup Mineral Sands Project (Figure 1-1), which operates under Ministerial Statement No.1168, to include an additional 844.92ha of mining area located immediately north and north-east of the current operations (Figure 1-2 and 1-3).

In accordance with the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual* (EPA, 2021e), Doral seek to refer this Proposal to the Environmental Protection Authority (EPA) under Section 40AA of the EP Act for assessment of a significant amendment to an approved Proposal.

This Referral Document has been prepared as a Supplementary Report (Part B) to the Referral Form (Part A) and aims to provide sufficient information about the environmental impacts of the significant amendment in the context of the approved proposal and the proposed application of the mitigation hierarchy to avoid, minimise, rehabilitate (and offset, if appropriate) those impacts. Doral considers that the existing implementation conditions are adequate to manage the combined and ongoing impacts of the amended Proposal to ensure the EPA's environmental factor objectives are achieved.

The Referral Document (Supplementary Report) has been prepared in accordance with *Referral of a proposal under section 38 of the Environmental Protection Act 1986 Instructions* (EPA, 2021b) and generally follows the *Instructions and Template: Environmental Review Document* (EPA, 2021c).

1.2. PROPONENT

The Proponent for this Proposal is Doral Mineral Sands Pty (Doral).

Doral is a wholly owned subsidiary of Perth-based Doral Proprietary Limited, which itself is an unlisted public company owned by Iwatani International Corporation of Japan.

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1.3. PREVIOUS ASSESSMENTS

Part IV of the EP ACT

Doral referred the Original Proposal for the Yalyalup Mineral Sands Project to the EPA on 26 October 2017 and set a level of assessment of Public Environmental Review on 8 January 2018, with a four-week public review period for the Environmental Review Document (ERD). The EPA approved the Environmental Scoping Document (ESD) on 29 May 2019.

On 5 November 2019, Doral applied for a change to the Proposal during the assessment to include a new internal haul road to access Ludlow Hithergreen Road to avoid significant flora and fauna. The EPA Chairman approved the change on 9 January 2020 under S.43A of the EP Act.

The ERD was released for public review from 22 June 2020 to 20 July 2020, with four agency submissions and three public submissions received.

Key issues raised in the submissions included:

- Groundwater drawdown impacts on conservation of significant flora and fauna species, vegetation communities and fauna habitat;
- Concern regarding the groundwater model;
- Potential acid sulfate soils;
- Management of naturally occurring radioactive material;
- Offsets and land acquisition;
- Surveys of short-range endemic fauna species.

Doral subsequently responded to these submissions by updating environmental management plans, clarifying the groundwater modelling information, preparing a Land Acquisition Offset Strategy and responding to the issues raised in the Response to Submissions document.

The EPA considered that the impacts to the identified critical environmental factors were manageable, provided Ministerial Statement No. 1168 (MS1168) conditions are implemented. MS1168 was subsequently issued on May 17, 2021 (Appendix 1).

1.4. OTHER APPROVALS AND REGULATIONS

EPBC ACT

The Proposal was referred to the Commonwealth (now Department of Climate Change, Energy, the Environment and Water, DCCEEW) on 1 November 2017 for consideration under the EPBC Act. On 8 February 2018, the Proposal was determined to be a Controlled Action and required assessment and decision on approval under the EPBC Act (EPBC Reference: 2017/8094). EPBC Approval (with Conditions) was received on 12 November 2021 (EPBC 2017/8094).

PART V of the EP ACT

Works Approval W6558/2021/1 was granted on the 3 October 2021. Construction commenced 15 November 2021 and Time Limited Operations (TLO) commenced 14 April 2022. An amendment to the Works Approval for an extension of TLO was granted 8 December 2022 to enable time for DWER to adequately

assess the pending new licence application from the Works Approval. TLO ceased 8 March 2023 with the issue of Operating Licence L9342/2022/1 being granted.

1.5. COMPLIANCE

Doral's current environmental performance of the approved Project is provided in the most recent Annual Compliance Assessment Report (CAR) (Appendix 2).

2. PROPOSAL

2.1. PROPOSAL CONTENT

2.2. JUSTIFICATION

Doral is a global supplier of the products of mineral sands mining (ilmenite, leucoxene, rutile and zircon). The continuation of mining is core to Doral's business and crucial to continue to deliver to a global market.

Doral commenced mining the Yalyalup Mineral Sands Mine in November 2021, in accordance with MS1168. Mining of the currently approved mine area is due to be completed by Q1 2026.

Doral has been operating in the southwest region of Western Australia since 2002, predominantly at the Dardanup Mine, which extracted ore from the Dardanup and Burekup Mineral Sands Deposits, located approximately 20km east of Bunbury. Operations ceased at the Dardanup Mine in December 2015, and the Site has been rehabilitated back to the agreed end land use and mining tenements relinquished.

Doral commenced mining the Yoongarillup Mineral Sands Deposit (Yoongarillup Mine), located 17km southeast of Busselton, in January 2017. Mining operations were completed in 2020, with the Site rehabilitated in accordance with the Site's Mine Closure Plan.

Doral also operates a Dry Separation Plant at Picton, 10km east of Bunbury, which receives HMC from Doral's Yalyalup Mine and KLPL's Keysbrook Mine.

Employing approximately 100 Doral staff and contractors, Doral's business is a source of employment locally and provides business for suppliers, distributors and local services (e.g. mechanics, contractors, consultants). Doral contributes financial support to local schools, sporting groups, various volunteer groups, and annual local festivals and is considered a valuable member of the local community.

Mining operations at the Yalyalup Mine are anticipated to be completed by Q1 2026. Therefore, an alternative additional ore source is required to meet global demand and ensure the continued employment of Doral's employees and contractors. The continuation of mining operations at the Yalyalup Mineral Sands Project will enable Doral to continue operating in the Southwest Region of Western Australia, ensure employees and contractors are retained in the region, and ensure local support to communities continues.

A Proposal Content Document has been prepared in accordance with *How to identify the Content of a Proposal, Instruction and template* (EPA, 2021c) and is provided as Appendix 3.

2.3. PROPOSAL ALTERNATIVES

Doral has analysed the alternatives to mining the Northern Extension to the Yalyalup Mineral Sands Project. A discussion of the alternatives is provided as follows.

IS THIS PROPOSAL NEEDED

Doral is a global supplier of the products of mineral sands mining (ilmenite, leucoxene, rutile and zircon). The continuation of mining is core to Doral's business and crucial to continue to deliver to a global market.

Ilmenite, rutile, leucoxene (an alteration product of ilmenite) and HITI (which is a blend of ilmenite and leucoxene) are mainly used to make pure white, highly light refractive and ultra-violet light absorbing Titanium Dioxide pigment for use in protective house and car paints; paper; plastics; ink; rubber; textiles; cosmetics; sunscreens; leather and ceramics. Because titanium dioxide is non-toxic and biologically inert, it can be safely used in foodstuffs and pharmaceuticals. Super strong, lightweight and corrosion-resistant

titanium metals are also used in the construction of aircraft, spacecraft and motor vehicles and for medical implants. Again, its non-reactive properties make titanium one of the few materials the human body will not reject; consequently, it is widely used in such medical operations as hip replacements and the installation of heart pacemakers. This supermetal is also being increasingly used to manufacture strong, lightweight sports equipment, jewellery and other advanced engineering applications.

Zircon is used in ceramics, specialty castings and various refractory applications, where its resistance to high temperature and abrasion make it extremely valuable in the manufacturing processes as well as ceramics such as glazes for tiles and sanitary wear. In industry, it is mainly used as a raw material in making refractory bricks, furnace linings and producing pigments in the ceramic industry; where its opacity and hardness gives a whiteness and durability to tiles, sanitary ware and tableware. It is also utilized in a range of other high-tech industrial and chemical applications.

Doral's operations meet a global need for ilmenite, rutile and zircon and provide the West Australian community with employment. Doral currently abstracts ore to produce these products from its Yalyalup Mine. However, the ore reserves within the approved mine area are due to be exhausted by Q1 2026. An alternative ore source is required to continue to meet global demand and to ensure the continued employment of Doral's employees.

OTHER TECHNOLOGIES OR OPTIONS

Open-cut mining of mineral sands is a well-established practice in Western Australia due to the shallow nature of the deposits, which generally occur between the surface and 10m deep in the region. Deposits are usually strand-like and appear at the location of ancient shorelines. Disturbance occurs only on the surface layers and not at depth compared to other forms of mining (e.g. iron ore mining can have pit depths of greater than 100-200m deep). The use of alternative technologies can be more expensive (e.g. horizontal drilling) have their own associated impacts and may not result in fewer disturbances to the environment.

LOCATION OPTIONS

Doral are constrained spatially, as the location of mineral sands deposits are the targeted location, and in the Southwest Region these are primarily associated from the foothills of the Whicher Scarp to the coast. The grade of HMC discovered through exploration drilling largely determines the areas that are viable and can be extracted for sale. In this case Doral have conducted extensive exploration drilling, and the results of air core testing indicates the Northern Extension area contains viable mineral. The location of the Northern Extension is immediately adjacent to the current mine area, which contains all necessary processing infrastructure. Doral hold other tenements in the southwest, however economic resources have yet to be defined for these as such limited environmental or technical studies have been undertaken on these tenements.

OPTIMISATION OF PROPOSAL TO MINIMISE ENVIRONMENTAL IMPACTS

The design of the Proposal and placement of mine pits is continually evaluated through stages of exploration drilling. Exploration drilling has been occurring in the subject area since approximately 2015 and since that time Doral have designed a series of mine pit configurations, resulting in the layout presented in this Referral Document.

The following design optimisations have been incorporated into the design and layout of the Proposal to minimise environmental impacts:

- Areas containing native vegetation have been avoided where possible to minimise the need to clear vegetation;
- Utilisation of the existing mine infrastructure located within the approved Yalyalup Mine site to reduce the total area disturbed;
- Location of processing equipment in-pit (e.g. hopper) to minimise noise emissions to sensitive receptors;
- Incorporation of noise bunds to minimise potential noise impacts under certain wind conditions on nearby residences;
- Incorporation of several options for emergency water discharge in the event of extended periods of heavy rainfall.

2.4. LOCAL & REGIONAL CONTEXT

The Proposal is located approximately 11km southeast of Busselton (Figure 1-1, 1-2, 1-3), Western Australia. It is situated within the Perth Coastal Plain (SWA2) sub-region of the Swan Coastal Plain biogeographic region, as defined in the Interim Biogeographical Regionalisation for Australia (IBRA) (Australian Government, 2013).

The City of Busselton's Local Planning Scheme (LPS) No. 21 (TPS 21) shows the Proposal area as being zoned as 'Agriculture'. There are 20 Lots within the Proposal area, with all but one (Lot 404) proposed for disturbance (i.e. mined or used for infrastructure (Figure 1-4). Almost all of the land is owned by Doral and for those that aren't, access to landowners' properties will be made available via compensation agreements. The lot numbers, landowners and land tenure that will be affected by this Proposal are summarised in Table 2-1.

2.4.1. LAND TENURE

The legal description of the Proposal area is detailed in the following table, with a copy of the Certificate of Title included in Appendix 4.

TABLE 2-1: LAND TENURE AND LANDOWNER STATUS FOR THE PROPOSAL

LOT NUMBER	LANDOWNER	LAND TENURE
404	Private Ownership (Doral)	Freehold
1322	Private Ownership (Doral)	Freehold
608	Private Ownership (Doral)	Freehold
103	Private Ownership (Doral)	Freehold
104	Private Ownership (Doral)	Freehold
729	Private Ownership (Doral)	Freehold
1464	Private Ownership (Doral)	Freehold
1609	Private Ownership (Doral)	Freehold
820	Private Ownership (Doral)	Freehold

LOT NUMBER	LANDOWNER	LAND TENURE
821	Private Ownership (Doral)	Freehold
45	Private Ownership (Doral)	Freehold
583	Private Ownership (Doral)	Freehold
582	Private Ownership (Doral)	Freehold
1316	Private Ownership (Doral)	Freehold
3124	Private Ownership (Doral)	Freehold
1316	Private Ownership (Doral)	Freehold
687	Private Ownership (Doral)	Freehold
1	Private Ownership (Landowner)	Freehold
2	Private Ownership (Landowner)	Freehold
1451	Private Ownership (Doral)	Freehold

The Proposal is located nearby to the following RAMSAR listed wetland and other developments, as shown on Figure 1-1:

- RAMSAR listed Vasse-Wonnerup System Wetland – located ~4.6km north-northwest
- Tronox Wonnerup Mineral Sands Mine - located ~4km north-northwest
- Iluka Resources Ltd Tutunup South Mineral Sands Mine - located ~2.5km southeast
- Doral's Yoongarillup Mineral Sands Mine - located ~6km southwest.

3. STAKEHOLDER ENGAGEMENT

3.1. KEY STAKEHOLDERS

Doral is committed to undertaking a proactive engagement program with its stakeholders, government and the broader community as part of its community engagement program for the Proposal. Key stakeholders for the Proposal have been identified as having an influence and/or interest throughout the life of the Project and who are impacted by the Proposal's operations.

Doral has proactively engaged with its stakeholders commencing in 2012 (for the Original Project) with the commencement of the exploration program and stakeholders further defined as the Proposal progressed through to the environmental approvals phase. A dedicated Community Relations Officer was appointed in 2019 to enhance the engagement function and will continue to manage all stakeholder interactions.

The key stakeholders for the Proposal identified to date include the following as identified in Table 3-1.

TABLE 3-1: KEY STAKEHOLDERS

KEY STAKEHOLDER GROUP	TIMING	ENGAGEMENT METHOD
Landowners	• Quarterly or as required	• One-On-One meetings • Correspondence /Project Updates • Newsletters /Fact Sheet
Local Government Authorities	• Annually	• Project briefing • Newsletter / Fact Sheet
State Government Departments and Agencies	• Ongoing / as required	• Meetings • Correspondence /Project Updates
Members of Parliament	• Annually	• Meetings • Project updates • Newsletter / Fact Sheet
Non-Government Organisations, including special interest groups	• Quarterly	• Meetings • Project updates • Newsletter / Fact Sheet
Traditional Owners (South West Boojarah)	• Ongoing / As required	• Site surveys • Site Observation at certain disturbance activities • Doral employee cultural awareness training

3.2. STAKEHOLDER ENGAGEMENT PROCESS

The objective of Doral's stakeholder engagement program is to provide timely information to ensure key issues and concerns have been identified and can be managed effectively throughout the life of the project.

Doral's approach to implementing the engagement strategy and ongoing consultation includes:

- Identification of key stakeholders, documenting interests and concerns in relation to the project;
- Communicate clearly the purpose of the consultation and provide information in a timely manner;
- Implement communication tools to manage ongoing engagement activities over the life of the project, whilst allowing for meaningful input into the project design;
- Document and record stakeholder interactions through its Consultation Manager software program;
- Implement the Stakeholder Interaction Policy and Procedure to ensure stakeholder concerns or grievances are appropriately documented and managed.

The following table provides a summary of Doral's Stakeholder Engagement Process

TABLE 3-2: STAKEHOLDER ENGAGEMENT PROCESS

KEY STAKEHOLDER GROUP	TIMING	ENGAGEMENT METHOD
Landowners	• Quarterly or as required	• One-On-One meetings • Correspondence /Project Updates • Newsletters /Fact Sheet
Local Government Authorities	• Annually	• Project briefing • Newsletter / Fact Sheet
State Government Departments and Agencies	• Ongoing / as required	• Meetings • Correspondence /Project Updates
Members of Parliament	• Annually	• Meetings • Project updates • Newsletter / Fact Sheet
Non-Government Organisations, including special interest groups	• Annually	• Meetings • Project updates • Newsletter / Fact Sheet
Traditional Owners (South West Boojarah)	• Ongoing / As required	• Site survey • Observation at certain disturbance activities • Doral employee cultural awareness training

ONGOING STAKEHOLDER CONSULTATION

The implementation of Doral's Stakeholder Engagement Plan will ensure the delivery of timely and regular communication activities based on key milestone dates and events that are relevant to key stakeholders.

Ongoing consultation activities will include:

- One-on-one meetings with landholders.
- Community update letter to landholders and neighbours.
- Project Newsletter to the broader community.
- Project fact sheets.
- Provision of direct contact details to nearest neighbours for any issue or concern;
- Briefings and presentations to local government, community groups and key stakeholders.
- Mine site tour for interested parties.
- Continued appointment of Community Relations Advisor.

3.3. STAKEHOLDER CONSULTATION OUTCOMES

A summary of Stakeholder consultation undertaken to date is provided in the following table.

TABLE 3-3: STAKEHOLDER CONSULTATION UNDERTAKEN

STAKEHOLDER	DATE	ISSUES/TOPICS RAISED	PROPONENT RESPONSE/OUTCOME
DWER (OEPA)	19/10/17	Pre-referral meeting; R Sutherland, R Hughes. All relevant environmental factors discussed.	No significant issues noted at this stage
	26/10/17	Referral Document received.	
	03/01/18	Referral Document accepted and nominated as PER.	
	07/04/18	Draft ESD submitted to EPA.	
	29/08/18	Yalyalup Site Visit – R Hughes and M Spence.	
	05/03/19	ESD Submitted to EPA.	
	21/03/19	Presentation of Yalyalup Project to EPA Board.	
	29/05/19	Submission of Revised version of ESD to EPA.	
	30/05/19	ESD acceptable by EPA services and published on website.	
	04/10/19	Submission to EPA of S43A amendment to Proposal for the amendment of Development Envelope and disturbance areas to include creation of internal access road.	

STAKEHOLDER	DATE	ISSUES/TOPICS RAISED	PROPONENT RESPONSE/OUTCOME
DMIRS	14/02/18	Pre-referral meeting to discuss project; R Hepworth, L Copeland. All relevant environmental factors discussed.	No issues noted
DBCA	24/05/19 03/12/19	A Webb - Post referral meeting to discuss project, flora studies to date and proposed GDE survey scope. Reference to historic mineral sands dewatering incident at Gwinninup mine and likelihood of direct offsets due to dewatering risks of McGibbon Track. Likely offsets requirement due to dewatering risk of McGibbon Track. Several sites mentioned as possible Ironstone community for investigation by Doral. Email to DBCA; A Webb of completed Yalyalup GDE report for discussion.	Acknowledged Proposed meeting to discuss in new year (2020).
DWER-Licencing	01/12/17	Pre-referral meeting - D Hartnup to inform of proposal and relevant environmental factors.	No issues noted.
DWER - DoW	22/11/17	Pre referral meeting to discuss project; A De Chaneet, R Gibbs. Potential for cumulative effects of dewatering with Avocado farm and Wonnerup North Mine.	Acknowledged.
DWER - Contaminated Sites Branch	13/11/17	Pre-referral meeting S Appleyard, S Jenkinson to discuss potential acid sulphate soils risk and intended management actions.	Acknowledged.
City of Busselton	09/08/19 09/12/19 2023 8/9/23 8/2/24	Email correspondence regarding construction for intersection and road reserve crossings. Meeting with City of Busselton Executive and CEO to discuss Yalyalup Proposal. Quarterly update and newsletter mailed. Meeting with CoB CEO and Director of planning to discuss Northern Extension proposal. Meeting with Director of Community planning and Infrastructure/Environment provide northern extension proposal	Committed to ongoing engagement.

STAKEHOLDER	DATE	ISSUES/TOPICS RAISED	PROPONENT RESPONSE/OUTCOME
	20/2/24	overview, timeline, boundary, approvals process. Meeting with Shire council members and Executive to brief on Northern Extension proposal.	
SWALSC	06/08/19	Consultation; P Nettleton and M Benson to review Heritage agreement contract and request nomination of consultants for Ethnographic studies.	Agreed.
DAWE (previously DoEE)	01/11/17 09/11/17 12/02/18	Submission of referral of Project. Request for information; D Rothenfluh regarding Naturally Occurring Radioactive Materials. DAWE (then DoEE) decision a declared action. Assessment by EPA under bilateral agreement.	Information supplied, not a nuclear action. Acknowledged.
Water Corporation	12/12/19	Construction of crossing over Abba River identified as a drain under the *Water Services Act 2012* and will require approval by the Water Corporation.	The proposed construction of the bridge to cross the Abba River (drain) will not impede upon the waterway. Doral will provide suitable engineering drawings of the "bridge" design to the Water Corporation to satisfy Water Corporation Policy requirements.
LANDOWNERS (require approvals and/or agreements)			
Tonkin S & N Lot 2	2020/22 3/11/22 16/5/23 1/6/23 8/8/23 18/10/23 30/11/23 15/12/23	Regular consultation Yalyalup project overview, timeline, new developments and follow up on any concerns. Regular engagement on Northern extension proposal overview, timeline/boundary distance and environmental approvals/assessments. Noise, dust, visual amenity concerns Quarterly update and newsletter mailed. Community update letter Northern Extension proposal overview. Discussion on referral timeline.	Committed to ongoing engagement. Potential impacts assessed in modelling. Mitigation measures presented in management plans (refer social surroundings) Commenced mining lease discussions.
Tonkins G & A Lot 1	2020/22 2022/23	Consultation on Yalyalup project overview, timeline, boundary and exploration drilling. Quarterly update and newsletter mailed.	Investigation of historical bore monitoring results. No impact Potential impacts assessed in ERD and will be incorporated into water

STAKEHOLDER	DATE	ISSUES/TOPICS RAISED	PROPONENT RESPONSE/OUTCOME
	15/2/23 24/11/23	Meeting on exploration drilling and northern extension proposal. Concerns water quality/quantity of bore. Meeting Northern extension proposal overview, timeline/boundary distance. Environmental approvals/assessments No concerns raised.	management plans (refer Hydrological Processes) Committed to ongoing engagement.
Cowcills Lot 102	2021-2023 18/10/23 5/12/23	Regular consultation on Yalyalup project overview, timeline, new developments and follow up concerns. Quarterly update letter/newsletter mailed. Community update overview of northern extension proposal. Meeting on Northern Extension progress, boundary, timeline and approvals process. Concerns with visual amenity and dust.	Potential visual amenity impacts assessed. Tree planting provision. Potential impacts assessed in ERD and incorporated into noise and dust management plans (refer Social Surroundings). Committed to ongoing engagement.
Stone Lot 1833	7/2/23 2022/23 18/10/23	Consultation on exploration drilling and northern extension overview. Quarterly update and newsletter mailed. Community update letter. Northern Extension proposal overview and invitation to meet. Ongoing discussion on suitable meeting date.	No concerns raised
Bills/Waters Lot 3196	18/10/22 13/11/23 29/2/24	Community update letter. Northern Extension proposal overview and invitation to meet. Meeting on project proposal, timeline, boundary, environmental approvals process. Concerns on impact on Surface dam water.	Potential impacts on water supply assessed in the groundwater modelling studies and ERD (refer Hydrological Processes).
Don Lot 1832	18/10/22	Community update letter. Northern Extension proposal overview and invitation to meet.	Potential impacts assessed in ERD and incorporated into dust management plans (refer Social Surroundings).

STAKEHOLDER	DATE	ISSUES/TOPICS RAISED	PROPONENT RESPONSE/OUTCOME
	1/12/23	Project proposal, timeline, boundary, environmental approvals process. Dust concerns.	
Whiteland Lot 4	2019-2023 18/10/22	Regular consultation on Yalyalup project overview, timeline, new developments. Quarterly update letters/newsletter mailed. Regular consultation on exploration drilling and project extension. Community update letter Northern Extension proposal and offer to meet.	Continue to send quarterly Community update and newsletter. **No concerns raised.**
Waters Haddon Lot 1761	2019-2023 18/10/22 15/12/24	Regular consultation providing Yalyalup project overview, timeline, new developments, receive feedback, follow up on any concerns. Quarterly update letters/newsletter mailed. Community update letter Northern Extension proposal and offer to meet. Northern extension proposal, timeline, boundary, environmental approvals process.	No concerns raised. **Committed to ongoing engagement.**
Hodgson Lot 1830	18/10/22 6/3/24	Community update letter. Northern Extension proposal overview and invitation to meet. Meeting Norther Extension overview, timeline, boundary and approvals process. Dust concerns.	Continue to send Quarterly update and newsletter. Potential impacts assessed in modelling. Mitigation measures presented in management plans (refer social surroundings) **Committed to engagement.**
Chapman Lot 1762 Lot 1764 Rentals	2021-2023 7/2/23 18/10/22 9/1/24 7/2/24	Quarterly updates, newsletter mailed. Bore Water quality issue. Quarterly update letter Northern extension overview and offer to meet. Phone/email to provide Northern extension update.	Investigations of historical data identified no impact. Potential impacts on water supply assessed in the groundwater modelling studies and ERD (refer Hydrological Processes). Continue quarterly updates to landowner and tenants.

STAKEHOLDER	DATE	ISSUES/TOPICS RAISED	PROPONENT RESPONSE/OUTCOME
	5/3/24	Meeting to discuss the Northern Extension, timeline, boundary and approvals process. No issues raised	Committed to ongoing engagement.
Denny Lot 1 Lot 107 Rentals	2022/23 18/10/22 10/1/24	Regular consultation on Yalyalup project update, timeline, new developments, follow up on any concerns. Quarterly update letter mailed. Northern Extension overview and offer to meet. Consultation northern extension progress, timeline, boundary, approvals process. Dust concerns.	Dust monitoring and assessment conducted. Dust mitigation strategies adopted. Potential impacts assessed in ERD and incorporated into dust management plans (refer Social Surroundings).
Avery Lot 1270	2020-2023 18/10/22 14/2/24	Regular consultation providing Yalyalup project overview, timeline, new developments, follow up on concerns. Quarterly update letter/newsletter mailed. Northern Extension overview and offer to meet. Discussion on extension proposal, timeline, boundary, approvals process. Dust, water, vermin control concerns.	Potential impacts assessed in ERD and incorporated into noise and dust management plans (refer Social Surroundings). Committed to ongoing engagement
Hodge 309	2019-2022 2022/23 18/10/23 8/1/24 14/02/24	Consultation providing Yalyalup project overview, timeline, new developments, receive feedback, follow up on any concerns. Quarterly update letter/newsletter mailed. Community update letter. Northern Extension proposal overview and invitation to meet. Phone discussion on northern extension. Concerns on summer weather conditions impacting on dust/noise. Follow up to offer to meet to discuss Northern extension proposal, timeline, boundary, and approvals process. No response	Potential impacts assessed in ERD and incorporated into dust and noise management plans (refer Social Surroundings). Committed to ongoing engagement

STAKEHOLDER	DATE	ISSUES/TOPICS RAISED	PROPONENT RESPONSE/OUTCOME
Plank Lot 15	2022/23 2022/23 18/10/23 18/12/23 4/1/24 9/1/24	Quarterly update letter/newsletter mailed. Consultation on Yalyalup mine site and noise concerns. Quarterly community update/newsletter mailed. Community update letter, Northern Extension proposal overview. Phone and email invitation to meet to discuss extension proposal in early 2024. Exploration drilling on adjacent property and invitation to meet. No response.	Potential impacts assessed in ERD and incorporated into noise management plans (refer Social Surroundings).
Teal Lot 1831	18/10/23 29/1/24	Community update letter mailed on Northern extension proposal and invitation to meet. Phone call to discuss extension. Concern on distance and potential impacts.	Continue to send community update sand newsletter. Potential impacts assessed in ERD and incorporated into management plans (refer Social Surroundings).
Harbeck Lot 61 Lot 1757 Rental	2022-2023 18/10/23 26/02/24	Quarterly update letter mailed. Regular consultation exploration drilling. Community update letter. Northern Extension proposal overview and invitation to meet. Meeting on Northern extension overview, timeline, boundary, and approvals process.	No concerns raised
Radford Lot 82	2021-2023 18/10/23 9/1/24	Quarterly update letter/newsletter mailed. Community update letter. Northern Extension proposal overview and invitation to meet. Phone discussion on extension timeline and boundary. Public road condition a concern.	
Buchan Lot 81	2020-2023 18/10/23	Consultation via email. Quarterly update letter emailed to postal address. Community update letter. Northern Extension proposal overview and invitation to meet.	No Concerns raised.

STAKEHOLDER	DATE	ISSUES/TOPICS RAISED	PROPONENT RESPONSE/OUTCOME
	9/1/24 5/2/24	Phone and Email offer to meet to discuss extension plans.	
Van Kleef Lot 651	2019-2022 2022/23 18/10/23 30/11/23 30/1/24 21/02/24	Phone discussion providing project overview. Interested in site plan/ layout and proximity to residence including road haulage options. Quarterly update letter mailed to postal address. Northern extension overview and offer to meet. Phone call and email on extension proposal. Offer to meet to update on intent, boundary, timeline, approvals process.	No concerns raised. Follow up meeting in 2024. Committed to ongoing engagement
Ealing Lot 1759	2022-2023 8/6/23 18/10/23 9/1/24 11/1/24	Quarterly update letter/newsletter emailed. Exploration drilling program Community update letter mailed on northern extension overview and offer to meet. Emailed purpose of meeting, northern extension referral, timeline, boundary, approvals process. Not interested in meeting. Amenity concerns.	Committed to quarterly community update letters and newsletters. Potential impacts assessed in ERD and will be incorporated into noise and dust management plans (refer Social Surroundings).
P & A Macleay Lot 843 Lot 748	2017 – 2022	Regular consultation providing project overview, timeline and any new developments, receive feedback, follow up on any concerns. Quarterly update letter mailed to postal address.	Property sold 2022.
K & J Hester Lot 103 Lot 104	2017 – 2019	Ongoing engagement regarding project proposal, timeline and environmental approvals process.	Property sold 2020
Mark Conrau Lot 4551 Land only	2019-2023 18/10/24	Consultation and quarterly updates on Project overview, approvals process, timeline, new developments. Quarterly update letter mailed on northern extension and offer to meet.	No concerns raised.

STAKEHOLDER	DATE	ISSUES/TOPICS RAISED	PROPONENT RESPONSE/OUTCOME
	21/2/23	Meeting to discuss Northern Extension proposal overview, timeline and approvals process.	
A & K Bashford Lot 1426 Lot 552	2017 – 2022 31/10/22 2022 /2023 18/10/22	Regular consultation providing project overview, timeline, new developments, receive feedback. Quarterly update letter mailed to postal address. Quarterly update letter mailed to postal address. Community update Northern Extension proposal overview and invitation to meet.	Committed to ongoing engagement. **Mining agreement commenced October 2022.**
Boardman Lot 3773	2017 – 2023 18/10/24	Ongoing engagement providing project progress, timeline, new developments, follow up on any concerns. Quarterly update Northern Extension overview and invitation to meet.	Mining agreement discussion commenced. No concerns raised. Committed to ongoing engagement.
Slade Lot 668 Lot 421	2017- 2024 2022/23 18/10/23	Ongoing consultation on project progress, timelines, new developments, follow up concerns raised. Dust management, noise, water concerns. Quarterly update letter mailed. Community update letter. Northern Extension proposal overview and invitation to meet.	Undertake dust sampling pre-mining and radiation survey. Incorporate in Dust Management Plan. Potential noise impacts incorporated in MP. Soil and water testing incorporated in mine closure plan.
Gronya Swift Lot 200	2017-2019 5/06/19	Project overview and next phase of work were discussed. Preliminary mine plan and approvals process discussed.	Potential impacts on water supply assessed in the groundwater modelling studies and ERD (refer Hydrological Processes). **Property sold in 2020**
Jane Gilham Lot 200	2020-2023 18/10/24 24/11/23	New owners contacted and informed of Yalyalup project. Regular engagement on project timeline and progress. Quarterly update letter mailed Northern Extension overview and invitation to meet.	Committed to ongoing engagement. No concerns raised. Committed to ongoing engagement. Potential impacts assessed in ERD and will be incorporated into water management plans (refer Hydrological Processes)

STAKEHOLDER	DATE	ISSUES/TOPICS RAISED	PROPONENT RESPONSE/OUTCOME
		Northern Extension proposal discussion northern extension proposal, timeline and approvals process. Concern on impacts water supply from natural creek line.	
Mitchell & Anstey Lot 292	2019-2024 18/10/222	Regular engagement on project progress, timeline and follow up concerns. Quarterly update letter mailed Northern Extension overview and invitation to meet. Meeting Northern Extension proposal overview, timeline and approvals process.	Potential impacts assessed in ERD and will be incorporated into noise, dust and water management plans (refer Hydrological Processes and Social Surroundings). Committed to ongoing engagement.
McClean Lot 10	2017 – 2022 18/10/22 20/02/24	Regular consultation on Yalyalup project, timeline, new developments and any concerns or feedback. Quarterly update letter mailed. Northern Extension proposal overview and invitation to meet. Discussion on Northern Extension proposal. Arrange time to meet.	No concerns raised.
NEAR NEIGHBOURS (residents)			
Jamie Oates Lot 652	2017 – 2024 18/10/22 16/11/23	Regular consultation on Yalyalup project, timeline, new developments and follow up any concerns. Concern raised at increased traffic on Ludlow Hithergreen Road and visual amenity. Quarterly update letter mailed. Northern Extension proposal overview and invitation to meet. Meeting to discuss Northern Extension proposal overview, timeline, approvals process.	Advised of the proposed road access and haulage route as per mine plan. Potential visual amenity impacts assessed. Tree planting along haulage route. Follow up meeting to advise on mitigation measures (refer social surroundings) No concerns raised
Treanor Lot 60 Rental	2020-2021 2022/23 8/10/23	Overview of project, timeline and approvals process. Concerned at increase in traffic in general and air quality. Quarterly update letter mailed to postal address. Northern Extension proposal overview and invitation to meet.	Advised of the proposed road access and haulage route as per mine plan. Potential impacts assessed in modelling. Mitigation measures presented in management plans (refer social surroundings)

STAKEHOLDER	DATE	ISSUES/TOPICS RAISED	PROPONENT RESPONSE/OUTCOME
			Committed to ongoing engagement with landowner and tenant.
Clifford Lot 52	2020-2023 18/10/23	Meeting to discuss project plan, timeline and update. Concern noise, truck movements Quarterly update letters emailed and mailed to postal address. Northern Extension proposal overview and invitation to meet.	Potential impacts assessed in ERD and incorporated into noise and dust management plans (refer Social Surroundings).
Taylors Lot 102	2020/ 2021	Project overview, timeline and rehabilitation. Quarterly update letter mailed to postal address.	**Property sold 2021**
Phillips Lot 229 Rental	2017 2020/21 18/10/23 6/2/24	Consulted on Yalyalup project overview, mine plan and approvals process. Quarterly update letter mailed to landowner and tenant. Northern Extension proposal overview and invitation to meet. Phone call to discuss Northern Extension. No concerns raised.	Committed to ongoing engagement via tenant. Continue community update letters.
Scott, Spragg, Hartnett Lot 1461	2019-2022	Overview Yalyalup project, timeline, and approvals process. Quarterly update letter mailed.	**Property sold 2022**
Peter Oates Lot 1370, Lot 3382, 1976	2019-2023 18/10/23 15/1/24 5/3/24	Regular consultation of Yalyalup project, mine plan and timeframe. Concerns at McGibbon track access and closure. Quarterly update letter mailed. Community update letter northern extension proposal and offer to meet. Meeting discuss Norther Extension proposal, boundary, timeline and approvals process.	Potential impacts assessed in the Groundwater Dependent Ecosystems Study and the ERD (refer Flora and Vegetation and Hydrological Processes factors). No concerns raised
Copeland Lot 221	2019-2023 18/10/23	Consultation Yalyalup project, mine plan, approvals process and timeframe. Quarterly update letter/newsletter emailed and mailed.	No concerns raised.

STAKEHOLDER	DATE	ISSUES/TOPICS RAISED	PROPONENT RESPONSE/OUTCOME
	15/12/23	Community update letter northern extension proposal and offer to meet. Meeting discuss Northern Extension proposal, boundary, timeline and approvals process.	
A Franklin Lot 52	2019-2022 18/10/23 8/2/24	Phone discussion on Yalyalup project overview, current work, and timeframe. Quarterly update letter mailed to postal address. Community update letter northern extension proposal and offer to meet. Meeting extension overview, timeline, boundary, approvals process.	No concerns raised.
Wright Lot 1758	2022/23 17/2/223 18/10/23	Regular consultation on Yalyalup project, new developments, timeline. Drilling, northern extension preliminary discussions. Community update letter and phone conversation on extension proposal, timeline, boundary, approvals process.	No Concerns raised
Jones	20/02/24	Preliminary discussion on northern extension. Meeting end of March Water supply concerns.	Potential impacts assessed in ERD and will be incorporated into water management plans (refer Hydrological Processes).

4. OBJECT & PRINCIPLES OF THE EP ACT

4.1. PRINCIPLES

The EP Act sets out five principles by which protection of the environment is to be achieved in Western Australia. These principles and the manner in which Doral has sought to apply them in the design and planned implementation of the Proposal are outlined in Table 4-1.

TABLE 4-1: EP ACT PRINCIPLES

PRINCIPLE	CONSIDERATION
1. Precautionary Principle Where there are threats of serious or irreversible damage, lack of complete scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decisions should be guided by: • Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment • An assessment of the risk-weighted consequences of various options.	The precautionary principle has been applied where a lack of complete scientific certainty of the impacts of the Proposal is known to prevent environmental degradation.
2. Intergenerational Equity The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	Doral recognises the importance of intergenerational equity, and throughout the management measures sections of this Referral Document, measures to appropriately manage potential impacts to ensure health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations are presented.
3. Conservation of biological diversity and ecological integrity Conservation of biological diversity and ecological integrity should be a fundamental consideration.	Doral recognises the values of native vegetation present within the Development Envelope and have designed the Proposal to avoid clearing vegetation as far as practicable.
4. Improved valuation, pricing and incentives mechanisms i. Environmental factors should be included in the valuation of assets and services. ii. The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance or abatement. iii. The users of goods and services should pay prices based on the total life cycle costs of providing goods and	Doral have factored in the costs of implementing environmental management measures into annual budgets for the Proposal. The revised Mine Closure Plan will further consider and include costs of rehabilitation and decommissioning.

PRINCIPLE	CONSIDERATION
services, including the use of natural resources and assets and the ultimate disposal of any wastes. iv. Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentives structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.	
5. Waste minimisation All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge.	Doral's Environmental Management System (EMS) includes waste management plans, waste management procedures and incident reporting procedures which will be communicated to staff in inductions and regular meetings to ensure best practise management of wastes is implemented at the Yalyalup Mine.

4.2. IDENTIFICATION OF ENVIRONMENTAL OUTCOMES

The EPA's *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual* (EPA, 2021a) defines a number of environmental factors, organised into five themes: Sea, Land, Water, Air and People that are utilised by the EPA to conduct an Environmental Impact Assessment (EIA).

To assist in determining the Key Environmental Factors for the Proposal, Doral has assessed all information available, including existing information from the approved Yalyalup Mine as assessed by EPA in the EPA Report 1695 (EPA, 2021d), as well as new site-specific information obtained from surveys, investigations and assessments for the Proposal. The following Key Environmental Factors have been identified, which are consistent with the original Proposal:

- Flora and Vegetation;
- Terrestrial Fauna;
- Inland Waters;
- Social Surroundings.

Information relating to these environmental factors, including regional context, baseline data, potential impacts (including cumulative impacts with approved Project area), and mitigation measures, are discussed in detail in Sections 5, 6, 7, and 8.

5. ENVIRONMENTAL FACTOR – FLORA & VEGETATION

5.1. EPA OBJECTIVE

To protect flora and vegetation so that biological diversity and ecological integrity are maintained.

5.2. POLICY & GUIDANCE

EPA Policy and Guidance

- *Statement of Environmental principles, Factors and Objectives* (EPA, 2021e)
- *Environmental Factor Guideline – Flora and Vegetation* (EPA, 2016a).
- *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016b).
- *Instructions on how to Prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* (EPA, 2016c).
- *Environmental Offsets Policy, Perth, Western Australia (Government of Western Australia, 2011).*
- *Environmental Offsets Guidelines, Perth, Western Australia (Government of Western Australia, 2014).*

Other Policy and Guidance

- Matters of National Environmental Significance. Significant Impact Guidelines 1.1. *Environmental Protection and Biodiversity Conservation Act 1999* (DoE, 2013).
- *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy* (DSEWPaC, 2012a).
- *Guidelines for Preparing Mine Closure Plans* (DMP and EPA, 2015).
- *Conservation Advice Banksia squarrosa subsp. argillacea, Whicher Range banksia, Whicher Range dryandra. Canberra: Department of the Environment* (Threatened Species Scientific Committee, 2015).
- *Approved Conservation Advice for Verticordia plumosa 3 var. vassensis (Vasse Featherflower). Canberra: Department of the Environment, Water, Heritage and the Arts* (DEWHA, 2008a).
- *Shrubland Association on Southern Swan Coastal Plain Ironstone (Busselton area) (Southern Ironstone Association) Recovery Plan. Interim recovery plan no. 215. Department of Environment and Conservation* (Meissner & English, 2005).
- *Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi. Canberra, ACT: Commonwealth of Australia (DoE, 2014).*

5.3. ORIGINAL PROJECT

5.3.1. RECEIVING ENVIRONMENT

Ecoedge Environmental completed the following Flora and Vegetation Surveys of the remnant vegetation within and immediately surrounding the Original Project Development Envelope:

- *Report of a Level 1 Flora and Vegetation. February 2016. Revised May 2019*. (Ecoedge, 2020a).
- *Report of a Supplementary Level 1 Flora and Vegetation. November 2017.* (Ecoedge, 2017).
- *Supplementary Reconnaissance and Targeted Flora and Vegetation Survey. November 2019* (Ecoedge, 2020b).

The majority of land within the Original Project area is cleared pasture and used for beef or dairy cattle grazing. Remnant native vegetation occurs in pockets alongside road reserves or streams and as scattered paddock trees due to extensive clearing for agriculture. Long-term cattle grazing has resulted in the removal of the understorey in remnant areas within the approved mining footprint, and consequently, the vegetation condition was predominantly degraded (Ecoedge, 2020a; Ecoedge, 2017; Ecoedge, 2020b).

The vegetation complexes of the remnant vegetation within the Original Project area (37.81ha) are mapped as Abba vegetation. This complex consists of a mixture of open forest of *Corymbia calophylla* (Marri) - *Eucalyptus marginata* (Jarrah) - *Banksia* species and woodland of *Corymbia calophylla* (Marri) with minor occurrences of *Corymbia haematoxylon* (Mountain Marri). Woodland of *Eucalyptus rudis* (Flooded Gum) - *Melaleuca* species along creeks and on flood plains.

Ecoedge (2020a) identified and mapped eight vegetation units within the survey area, totaling 37.81ha. Most areas of remnant vegetation are in Degraded or Completely Degraded condition (~88%) and consequently have low species diversity. As such, it was generally only possible to separate vegetation types based on overstorey composition and, to a lesser extent, soil type (Ecoedge, 2020a). Vegetation units are described in Table 5-1 and include comments on their conservation status.

TABLE 5-1. ORIGINAL PROPOSAL VEGETATION UNITS

VEGETATION UNIT	DESCRIPTION	COMMENTS AND CONSERVATION STATUS	AREA WITHIN DEVELOPMENT ENVELOPE (HA)
A1	Woodland of *Corymbia calophylla* and *Eucalyptus marginata*, with scattered *Agonis flexuosa*, *Banksia attenuata*, *B. grandis*, *Melaleuca preissiana*, *Nuytsia floribunda*, *Persoonia longifolia* or *Xylomelum occidentale* over *Xanthorrhoea preissii* over weeds on grey-brown or grey loamy sand or sand (on farmland usually only *C. calophylla* and *E. marginata* are present).	Degraded form of SWAFCT01b - Southern *Corymbia calophylla* woodlands on heavy soils (Gibson, et al., 2000), which is listed as a Threatened Ecological Community (TEC), with threat status of "Vulnerable" by DBCA. Mostly in Degraded or Completely Degraded Condition. The only area of Unit A1 of sufficient size and in good enough condition to be inferred as an occurrence of TEC SWAFCT01b is on the McGibbon Track.	10.86 (of which 1.18 is FCT01b)
A2	Woodland of *Corymbia calophylla* (sometimes with *Eucalyptus marginata* or *E. rudis*) with scattered *Melaleuca preissiana* or *Banksia littoralis* over open shrubland that may include *Acacia extensa*, *A. saligna*, *Hakea ceratophylla*, *H. lissocarpha*, *H. prostrata*, *H. varia*, *Kingia australis*, *Melaleuca viminea* and *Xanthorrhoea preissii* over weeds on seasonally wet grey loamy sand.	Similar to both SWAFCT01b and SWAFCT02 - Southern wet shrublands, however, the predominance of wetland-adapted species characteristics makes it floristically much closer to SWAFCT02. SWAFCT02 is listed as a TEC, with a threat status of "Endangered" by DBCA. The occurrence of Unit A2 at the northern end of McGibbon Track in good condition is inferred to be an occurrence of TEC SWAFCT02.	4.03 (of which 3.42 is FCT02)
B1	Tall shrubland of *Acacia saligna*, *Banksia squarrosa* subsp. *argillacea*, *Calothamnus quadrifidus* subsp. *teretifolius*, *Hakea oldfieldii* and *Kunzea micrantha* (with scattered emergent *Eucalyptus rudis*) over scattered native herbs including *Drosera glanduligera* and *Sowerbaea laxiflora*, the sedge *Loxocarya magna*, and weeds on shallow red sandy clay on massive ironstone.	Vegetation Unit B1 is recognised as the TEC SWAFCT10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)" (Gibson, et al., 2000); (Meissner & English, 2005). This TEC has a threat status of "Critically Endangered" by DBCA and Endangered under the EPBC Act. The largest occurrence of B1, that on the McGibbon Track (0.34ha) is recognised as an occurrence of Busselton Ironstones community (Webb, 2004) but unaccountably is yet to be added to the DBCA	0.50 (of which 0.45 is FCT10b)

VEGETATION UNIT	DESCRIPTION	COMMENTS AND CONSERVATION STATUS	AREA WITHIN DEVELOPMENT ENVELOPE (HA)
		threatened communities' database (A, Webb, DBCA Bunbury, pers. Comm. 22/02/2016, cited in Ecoedge, 2020a). Except on McGibbon Track where it is classed as Good condition the small fragments of this unit elsewhere are completely degraded and are not considered to be occurrences of the TEC SWAFCT10b.	
B2	Woodland of *Eucalyptus rudis* and (in some areas) *Melaleuca rhaphiophylla* over weeds on massive ironstone.	Severely degraded form of SWAFCT10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area) recognisable only by the presence of massive ironstone and lateritic boulders at or near surface. Completely degraded with only the overstorey remaining, does not represent the TEC SWAFCT10b	2.79
C1	Woodland of *Eucalyptus rudis* (and sometimes *Corymbia calophylla*) over scattered *Agonis flexuosa* and *Melaleuca rhaphiophylla* over weeds on grey-brown clayey loams in drainage lines.	Riverine Jindong Plant Communities (Webb, et al., 2009). All in Completely Degraded condition.	19.08
C3	Tall Open Shrubland that may include *Acacia saligna*, *Jacksonia furcellata*, *Kingia australis*, *Melaleuca osullivanii*, *M. preissiana*, *M. viminea* and *Xanthorrhoea preissii* on seasonally wet grey-brown sandy loam.	Similarities to the TEC SWAFCT09 - Dense shrublands on clay flats (TEC). However, the occurrence is considered to be too small and badly degraded to be inferred as an example of this TEC. A small area in Degraded/Good or Good condition on the verge of Princefield Road.	0.55
PL	Planted Species	Planted non-endemic and exotic trees	6.87

VEGETATION UNIT	DESCRIPTION	COMMENTS AND CONSERVATION STATUS	AREA WITHIN DEVELOPMENT ENVELOPE (HA)
CL	Cleared Pasture	Existing cleared/highly degraded areas (e.g. paddocks/road verges) with scattered trees/shrubs. Some areas seasonally inundated/waterlogged	880.17
TOTAL			924.84

CONSERVATION SIGNIFICANT VEGETATION

Baseline information on conservation signification vegetation mapped within the Original Project area by Ecoedge (2020a), with potential to be impacted directly or indirectly by the proposal is provided as follows:

- SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils

SCP01b (previously SWAFCT01b)- Southern *Corymbia calophylla* woodlands on heavy soils (Gibson, et al., 2000) is listed as a TEC, with threat status of "Vulnerable" by DBCA. The only occurrence of TEC SCP01b is on McGibbon Track (vegetation unit A1 in degraded/good and good condition), totalling 1.18ha. This community is known from the following quadrats and Busselton Plain reference areas; ACTN01, AMBR-1, AMBR-4, AMBR-6, AMBR-9, AMBRAL-1, CAPEL-5, CARB-1, CARB-2, CARB-4, WONN-2, YALLIN-1 and YOON-1 (Webb, et al., 2009). Average species richness for this community is 65.0 (Webb, et al., 2009).

- SCP02 - Southern wet shrublands

SCP02 (previously SWAFCT02) is listed as a TEC, with threat status of "Endangered" by DBCA. The only occurrence of TEC SCP02 is on McGibbon Track (vegetation unit A2 in degraded/good and good condition), totalling 3.42ha. This community is known from the following quadrats and Busselton Plain reference areas; AMBR-2, AMBR-5, AMBR-7, FISH-5, SF1201 and YOON-2 (Webb, et al., 2009) .

- SCP10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)

SCP10b (previously SWAFCT10b*) - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)" (Gibson, et al., 2000);* (Meissner & English, 2005) is listed as a TEC with threat status of "Critically Endangered" by DBCA and Endangered under the EPBC Act. The only occurrence of TEC SCP10b is on McGibbon Track (vegetation unit B1 in good condition), totalling 0.45ha.

CONSERVATION SIGNIFICANT FLORA

Two Threatened (T) Flora species, *Banksia squarrosa* subsp. *Argillacea* (Whicher Range banksia) and *Verticordia plumosa* var. *vassensis* (Vasse Featherflower), were recorded within the Original Project survey area. Both of these species are listed as Threatened pursuant to Section 19 of the BC Act and Endangered pursuant to section 179 of the EPBC Act. Four Priority listed species listed by DBCA, *Loxocarya magna* (P3), *Calothamnus quadrifidus* subsp. *teretifolius* (P4), *Grevillea brachystylis subsp. Brachystylis* (P3) and *Acacia flagelliformis* (P4) were also recorded within the survey area (Table 5-2).

TABLE 5-2. LOCATIONS OF THREATENED AND PRIORITY FLORA WITHIN THE SURVEY AREA.

TAXON	CONSERVATION STATUS	NUMBER	LOCATION
Acacia flagelliformis	P4	13	Princefield Road
Calothamnus quadrifidus subsp. *teretifolius*	P4	12	Cooper's Road Drain Reserve
		5	Oates Road
Grevillea brachystylis subsp. *brachystylis*	P3	2	Princefield Road
Loxocarya magna	P3	1	Cooper's Road Drain Reserve
		3	Princefield Road
Verticordia plumosa var. *vassensis*	T (EN)	23	Princefield Road

5.3.2. POTENTIAL IMPACTS

As documented in the EPA Report and Recommendations (EPA, 2021d) Flora and Vegetation could be directly or potentially indirectly impacted through:

- Disturbance and clearing activities, including direct clearing of 2.72ha of native vegetation;
- Dewatering activities lowering groundwater levels impacting the following:
    - Potential loss of up to 0.34ha of SWAFCT10b - *Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)* from indirect dewatering*;*
    - Potential loss of nine *Banksia squarrosa* subsp. *Argillacea* (present within SCP10b) from indirect dewatering.
- Dewatering activities lowering groundwater levels and exposing potential acid sulfate soils;
- Mining activities and vehicle movement potentially spreading weeds and generating dust.

5.3.3. MITIGATION MEASURES

Doral applied the mitigation hierarchy to avoid, mitigate and rehabilitate potential impacts to flora and vegetation values for the Original Proposal. This primarily included the avoidance of clearing as far as practicable by utilising previously cleared agricultural land resulting in only 2.7ha of clearing with no direct impacts to TECs and/or Threatened and priority flora.

The additional mitigation measures proposed by Doral and included as Conditions of MS1168 include the following:

- Flora and Vegetation (Outcomes Based) (MS1168 Condition 6);
- Flora and Vegetation Management Plan (Management Based) (MS1168 Condition 7);
- Acid Sulfate Soil Management Plan (ASSMP) (MS1168 Condition 9);
- Groundwater Dependent Ecosystem Management Plan (GDEMP) (MS1168 Condition 10);
- Provision of suitable Offset for potential indirect impacts to Threatened flora and vegetation communities (MS1168 Condition 11);
- Abba River Management Plan (MS1168 Condition 13).

Other management plans implemented by Doral to mitigate impacts to flora and vegetation include:

- Dust Management Plan;
- Fire Management Plan;
- Mine Closure Plan.

5.4. PROPOSED AMENDMENT - RECEIVING ENVIRONMENT

5.4.1. SURVEYS

Ecoedge (2023) conducted a detailed reconnaissance and targeted survey of the Proposal area (Northern Extension). The survey was undertaken on 7 and 10 October 2022 and 8 November 2022 by Russell Smith (flora permit FT62000500), in accordance with *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016d) and other State and Commonwealth guidelines for threatened species and communities, such as approved conservation advice for EPBC threatened species and communities. The report is included as Appendix 5. It should be noted that the Survey area includes a section to the east of Ludlow-Hithergreen Rd which is outside the Yalyalup Northern Extension Proposal area however is retained in the vegetation assessment section for consistency.

5.4.2. SOIL LANDSCAPE SYSTEMS

The Proposal area occurs within the Abba soil-landscape system (213Ab), which is very flat, poorly drained and characterised by wet soils and semi-wet soils, pale, deep sands, pale sandy earth and grey deep sandy duplexes (Tille & Lantzke, 1990). These systems have been divided into soil phases based on local soil conditions, with the soil phases found in the survey area described in the table below and shown in Figure 5-1.

TABLE 5-3. SOIL LANDSCAPE SYSTEMS

SYSTEM	SUBSYSTEM	DESCRIPTION
Abba (213Ab)	213AbAB1	Flats and low rises with sandy grey-brown duplex (Abba) and gradational (Busselton) soils. Plain consisting of very low rises. Pale sandy earths, Semi-wet soils and Pale deep sands with some Grey deep sandy duplexes.
	213AbABvw	Small, narrow, swampy depressions along drainage lines. Alluvial soils. Shallow drainage depressions with swampy floors. Wet and Semi-wet soils.
	213AbABw	Winter wet flats and slight depressions with sandy grey-brown duplex (Abba) and gradational (Busselton) soils. Poorly drained flats and depressions. Wet and Semi-wet soils with Pale sandy earths and Pale deep sands.
	213AbABwi	Winter wet flats and slight depressions with shallow red-brown sands and loams over ironstone (i.e. bog iron ore soils). Poorly drained flats and depressions. Wet and Semi-wet soils (shallow loams and sands over bog iron) and red shallow loams.
	213AbABwy	Poorly drained depressions with some areas which become saline in summer. Shallow sands over clay subsoils (i.e. Abba Clays). Depressions susceptible to salinity. Wet and Semi-wet soils, Saline wet soils and Alkaline grey shallow sandy duplexes.
	213AbJD1	Well-drained flats with sandy gradational grey-brown (Busselton) soils, some red-brown sands and loams (Marybrook Soils). Moderately well-drained flats. Pale sandy earths, Semi-wet soils, Red/brown and Brown loamy earths with some Pale deep sands and Brown sandy earths.

5.4.3. VEGETATION COMPLEXES

Only one vegetation complex, the Abba Complex, occurs within the survey area according to the 1:50,000 mapping of the South West Forest Region of Western Australia (Mattiske & Havel, 1998) and the 1:250,000 mapping of vegetation complexes on the SCP (Heddle, Loneragan, & Havel, 1980) as updated by (Webb, Kinloch, Keighery, & Pitt, 2016). This complex is described in the below table and shown in Figure 5-2.

TABLE 5-4. VEGETATION COMPLEX MAPPED FOR THE SURVEY AREA

VEGETATION COMPLEX	DESCRIPTION
Abba Complex (30)	A mixture of open forest of *Corymbia calophylla* (Marri) - *Eucalyptus marginata* (Jarrah) - Banksia species and woodland of *Corymbia calophylla* (Marri) with minor occurrences of *Corymbia haematoxylon* (Mountain Marri). Woodland of *Eucalyptus rudis* (Flooded Gum) - Melaleuca species along creeks and on flood plains.

5.4.4. VEGETATION ASSOCIATION

The Proposal area comprises two Beard Vegetation Associations (Beard, Beeston, Harvey, Hopkins, & Shepherd, 2013):

- Association 973, low forest; paperbark (*Melaleuca rhaphiophylla);*
- Association 1136, medium woodland; marri with some jarrah, wandoo, river gum and casuarina.

The dominant association by area is Association 1136.

5.4.5. VEGETATION UNITS

The following vegetation units were mapped by Ecoedge (2023) during the survey, as shown in Figure 5-3.

TABLE 5-5: VEGETATION UNITS

VEGETATION UNIT	DESCRIPTION	COMMENTS	QUALIFY AS TEC
A1	Woodland/open forest of *Corymbia calophylla* and *Eucalyptus marginata*, with scattered *Agonis flexuosa*, *B. grandis*, *Melaleuca preissiana*, *Nuytsia floribunda*, *Persoonia longifolia* or *Xylomelum occidentale* over *Xanthorrhoea preissii* over weeds on grey-brown or grey loamy sand or sand (on farmland usually only *C. calophylla* and *E. marginata* are present)	When in degraded or better condition it is considered to represent an occurrence of SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils'	Yes (when in degraded or better condition)
B1	Tall shrubland of *Acacia saligna*, *Calothamnus quadrifidus* subsp. *teretifolius*, *Melaleuca incana* and *Kunzea micrantha* (with scattered emergent *Eucalyptus rudis*) over	When in degraded or better condition it is considered to represent an occurrence of	Yes (when in degraded or better condition)

VEGETATION UNIT	DESCRIPTION	COMMENTS	QUALIFY AS TEC
	scattered native herbs including *Drosera glanduligera* and *Sowerbaea laxiflora*, the sedge *Loxocarya magna*, and weeds on shallow red sandy clay on massive ironstone.	SCP10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)'.	
B2	Open woodland of *Melaleuca preissiana* over weeds (rarely with *Hyalosperma cotula*) on seasonally wet brown clay-loam over massive laterite.	When in degraded or better condition, it is considered to represent an occurrence of SCP10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)'.	Yes (when in degraded or better condition)
C1	Open forest of *Eucalyptus rudis* and/or *Corymbia calophylla* over scattered *Agonis flexuosa* and *Melaleuca rhaphiophylla* occasionally over *Acacia saligna*, *A. extensa*, *Astartea scoparia*, *Xanthorrhoea preissii* scattered shrubs over weeds on grey-brown clayey loams in drainage lines and on damp flats.	When in degraded or better condition it is considered to represent an occurrence of SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils'	Yes (when in degraded or better condition)
C2	Open woodland of *Melaleuca preissiana* over weeds on seasonally wet brown clay-loam.	All in completely degraded condition	No
C3	Tall Open Shrubland that may include *Acacia saligna*, *Jacksonia furcellata*, *Kingia australis*, *Melaleuca osullivanii*, *M. preissiana*, *M. viminea* and *Xanthorrhoea preissii* on seasonally wet grey-brown sandy loam	When in degraded or better condition it is considered to represent an occurrence of SCP09 – Dense shrublands on clay flats	Yes (when in degraded or better condition)
Cleared Pasture	Cleared pasture		No
Planted species	Amenity Plantings of Eucalyptus sp. Or Melaleuca sp.		No

5.4.6. VEGETATION CONDITION

Most remnant native vegetation in the survey area (94%), is in Completely Degraded condition. Only 1.6% of vegetation in the survey area is in Good or Very Good condition (Table 5-6). The main reasons for the generally poor condition of remnant native vegetation in the survey area are the small size of the remnants

that are not on farmland, and the fact that all of the remnants on farmland have been grazed for many years. Vegetation condition for each of the vegetation units is shown in Table 5-7 and Figure 5-4.

TABLE 5-6. SUMMARY OF VEGETATION CONDITION THE SURVEY AREA

VEGETATION CONDITION	AREA (HA)	%
Very Good	0.0	0
Good	0.19	0.87
Degraded/Good	0.18	0.83
Degraded	1.20	5.55
Completely Degraded	20.07	92.75
Sub-total Vegetation	**21.64**	**100.00**
Cleared	823.27	-
Grand Total	**844.92**	**-**

5.4.7. CONSERVATION SIGNIFICANT VEGETATION

Six vegetation units comprising native vegetation (A1, B1, B2, C1, C2 and C3) were identified in the survey area with a total area of ~33ha. Most (93.9%) of which were in 'Completely Degraded' condition because of many years of grazing by livestock. The relatively small percentage (6.1%) that remains in Degraded or better condition (vegetation units A1, B1, B2, C1 and C3) are regarded as occurrences of three Threatened Ecological Communities (TEC) (Ecoedge, 2023). These are summarised in the following table and shown in Figure 5-5.

TABLE 5-7. SUMMARY OF TEC BY VEGETATION CONDITION

FCT AND VEGETATION UNIT	CONDITION	AREA (HA)
SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils' Units A1 and C1	Good	0.21
	Degraded	1.96
	Subtotal	**2.17**
SCP10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)' Units B1 and B2	Very Good	0.21
	Good	0.39
	Degraded	0.20
	Subtotal	**0.80**
SCP09 – Dense shrublands on clay flats Unit C3	Good	0.07
	Subtotal	**0.07**
Total TEC		**3.04**

SCP01b - *Corymbia calophylla* woodlands on heavy soils of the southern Swan Coastal Plain

Unit A1, which is dominated by *Corymbia calophylla* on heavier soils and *Eucalyptus marginata* on grey sandy loams appears to be a degraded form of SCP01b 'Southern *Corymbia calophylla* woodlands on heavy soils' (Gibson et al. 1994), which is listed as a Threatened Ecological Community (TEC) under the *BC Act 2016*, with the threat status of 'Vulnerable'. Where its condition is in a Degraded or better condition.

Unit C1 is associated with the winter streams that flow northwards through the western half of the survey area, which empty into the Lower Sabina River, and lower-lying areas with clay-loam soils. Mainly, Unit C1 consists only of the overstorey of *Eucalyptus rudis* or *Corymbia calophylla* and an understorey of pasture species, but occasionally, along the Sabina River, native understorey shrubs such as *Acacia saligna* and *Astartea scoparia* are found, and *Xanthorrhoea preissii* is sometimes found in road verge occurrences. As with Unit A1, it is also inferred to represent an occurrence of the State listed TEC SCP01b when the vegetation is in Degraded or better condition.

SCP10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)

Both units B1 and B2 are associated with the 'Abba Wet Ironstone Flats' (ABwi) soil-landscape mapping unit of Tille and Lantzke (1990), which are described as 'winter wet flats and slight depressions with shallow red-brown sands and loams over ironstone (i.e. bog iron ore soils)'.

Unit B1 is recognised as SCP10b '*Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)*' (Gibson et al. 1994; DEC 2005). The Shrublands on the southern SCP Ironstones ecological community are listed as Critically Endangered under the *BC Act* and Endangered under the *EPBC Act*.

There are two occurrences of Unit B1. One occurrence of Unit B1 is situated is the small area of vegetation on the corner of Princefield Road 890m east of McGibbon Track which is comprised almost entirely of *Astartea scoparia* with about 26 shrubs of the Threatened *Verticordia plumosus* subsp. *vassensis*. The other occurrence is a narrow strip on the verge of Oates Road in Very Good condition.

Unit B2 appears to be a severely degraded variant of SCP10b, recognisable by massive ironstone and lateritic boulders at or near the soil surface. Generally, the only native species still present are *Eucalyptus rudis* and *Melaleuca rhaphiophylla* trees. In a tiny part of an occurrence of this unit, the presence of the native forbs *Brachyscome iberidifolia*, *Chamaescilla corymbosa,* and *Cotula australis* lead to Degraded and Good condition ratings being applied.

Those parts of Units B1 and B2 in Degraded or better condition are inferred to constitute an occurrence of the TEC SCP10b.

According to criteria in the DEC (2005) recovery plan for this community, all areas of Vegetation units B1 and B2 are also regarded as habitat critical to the survival of the Shrublands of the southern SCP Ironstones community, including areas in Completely Degraded Condition. The recovery plan also includes those parts of the local catchment for the surface and groundwaters that maintain the winter-wet habitat of the community. These local catchment areas may extend beyond the mapped occurrences of this community and include areas that are mapped as cleared in this report. However, delineating these boundaries was beyond the scope of the Ecoedge (2023) flora and vegetation survey report. Critical habitat may be listed and recognised under provisions of the BC Act 2016.

SCP09 - Dense shrublands on clay flats

Unit C3, which is all in Good condition, is inferred to be an occurrence of the TEC SCP09 – '*Dense shrublands on clay flats*'. This TEC is part of the Commonwealth listed '*Claypans of the Swan Coastal Plain*' (critically endangered) under the *EPBC Act* and listed as vulnerable under the BC Act. This occurrence is relatively small 0.07ha and is situated towards the eastern end of Princefield Road. An additional occurrence, mapped as part of the original Project is situated towards the western end of Princefield road, but is outside of any proposed disturbance for the Proposal.

5.4.8. CRITICAL VEGETATION – SCP10B

The recovery plan[1] for SCP10b *Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)* recognises that the habitat critical to the survival of the community comprises:

- The area of occupancy of known occurrences;
- Similar habitat adjacent to important occurrences (i.e. within ~200m) i.e. poorly drained flats, depressions or winter wet flats with shallow red-brown sands and loams over massive ironstone;
- Remnant vegetation that surrounds or links several occurrences;
- The local catchment for the surface and groundwaters that maintain the winter-wet habitat of the community.

The recovery plan's position is that because the community is listed as Critically Endangered all known occurrences of the community, and the catchments for the surface and groundwater that support this wetland habitat, are critical to the survival of the community (Meissner & English, 2005).

The table below shows how the survey area is considered in terms of the features recognised in the recovery plan as habitat critical to the survival of the community (SCP10b).

TABLE 5-8. CRITICAL HABITAT FEATURES OF THE SURVEY AREA VEGETATION

CRITICAL HABITAT FEATURES	COMMENT
Known occurrences	According to the criteria all areas of Vegetation Unit B1 and B2 including areas in Completely Degraded condition or better Condition are regarded as critical habitat for the survival of the Shrublands on Southern SCP Ironstone community.
Similar habitat adjacent within 200m to important occurrences	There was no similar habitat within 200m of the mapped occurrences.
Remnant vegetation that surrounds or links occurrences	Given the highly cleared nature of the survey area, there is no remnant vegetation of any real substance that surrounds the mapped occurrences of this ecological community, nor any parcels of vegetation within the survey area that clearly link occurrences of this TEC. There is, however, a narrow strip of roadside vegetation connected to the mapped occurrence of the community on Oates Road. This strip of vegetation extends east beyond the boundary of the survey area.

[1] Note that neither the conservation advice for the Claypan TEC (TSSC 2012) nor the DBCA (2020) fact sheet for the Southern *Corymbia calophylla* woodlands TEC have provisions for critical habitat within them.

CRITICAL HABITAT FEATURES	COMMENT
Local catchment for the surface and groundwaters that maintain the winter-wet habitat of the community.	The identification, or delineation of the local catchment that maintains the winter-wet habitat of the identified occurrences of the community within the survey area was beyond the scope of the flora and vegetation survey. However, it may be reasonable to conclude that because most of the catchment for all occurrences of this TEC within the survey area has been cleared of native vegetation, the peak impacts on hydrology associated with the clearing have already been experienced by the community (Ecoedge, 2023).

The following table provides a breakdown by area and condition of the Critical Habitat within the survey area. The total area of critical habitat is 3.82ha. The location of the Critical Habitat areas is also shown in Figures 5-5.

TABLE 5-9. CRITICAL HABITAT OCCURRENCE BY VEGETATION CONDITION

FCT10b	CONDITION	AREA (HA)	COMMENTS
Critical habitat	Very Good	0.21	TEC occurrence of FCT10b
	Good	0.39	TEC occurrence of FCT10b
	Degraded	0.20	TEC occurrence of FCT10b
	Completely Degraded	3.02	Occurrence of the FCT10b
	Total critical habitat	**3.82**	

5.4.9. RIPARIAN AND WETLAND VEGETATION

Ecoedge (2023) identified that almost all of the survey area is classified as a 'Multiple Use' palusplain wetland, and all of the vegetation units have some species that are either fully or partially phreatophytic or groundwater dependant (e.g. *Eucalyptus rudis, Melaleuca incana, M. Pressiana, M. rhaphiophylla, Acacia saligna* and *Kunzea micrantha*). Ecoedge (2023) considers that it is likely that, to a greater or lesser extent, all vegetation surveyed are GDEs.

5.4.10. FLORA

Seventy-two taxa of vascular plants were identified during the survey, of which 27 taxa (38%) were introduced species. The relatively low number of native species found within the approximately 30.5ha of native vegetation in the survey area is a result of many years of degradation of the small fragments of native bush.

The Fabaceae, with 11 taxa (including four introduced species), Proteaceae, with 16 taxa, and Myrtaceae, with 17 taxa (four being planted tree species), were the dominant genera.

5.4.11. FLORA OF CONSERVATION SIGNIFICANCE

One species of Threatened Flora (*Verticordia plumosa* var. *vassensis*) was found in the survey area (Figure 5-6) in the exact location as those reported in (Ecoedge 2019b) for the Original Proposal. This species is listed as Threatened under the BC Act and Endangered under the EPBC Act.

Four Priority flora (*Acacia flagelliformis, Calothamnus quadrifidus* subsp. *teretifolius*, *Grevillea brachystylis* subs. *brachystylis*, and *Loxocarya magna*) were also found within the survey area. Locations of conservation significant flora species are provided in the following table and shown on Figure 5-6.

TABLE 5-10. LOCATIONS OF THREATENED AND PRIORITY FLORA WITHIN THE SURVEY AREA.

TAXON	CONSERVATION STATUS	NUMBER	LOCATION
Acacia flagelliformis	P4	13	Princefield Road
Calothamnus quadrifidus subsp. *teretifolius*	P4	12	Cooper's Road Drain Reserve
		5	Oates Road
Grevillea brachystylis subsp. *brachystylis*	P3	2	Princefield Road
Loxocarya magna	P3	1	Cooper's Road Drain Reserve
		3	Princefield Road
Verticordia plumosa var. *vassensis*	T (EN)	23	Princefield Road

Ecoedge (2023) reported that the DBCA database (DBCA, 2022d in Ecoedge 2023) recorded several other populations of Threatened and Priority species within the survey area, including *Chamelaucium roycei* (T, EN), *Banksia nivea* subsp. *uliginosa* (T, EN), *Verticordia plumosa* var. *vassensis* (T, EN), *Grevillea longate* (T, EN), [2]*Drakaea elastica* (T, EN) and *Hakea oldfieldii* (P3). These species were searched for but were not able to be re-located. These populations appeared to have disappeared because of ongoing site degradation. Information on the absence of *Chamelaucium roycei* and *Hakea oldfieldii,* previously recorded in the Cooper's Road Drain Reserve is given in Ecoedge (2020b), as per the Original Proposal assessment.

5.4.12. ENVIRONMENTALLY SENSITIVE AREAS

Ecoedge (2023) identified three environmentally sensitive areas (ESAs) in the survey area that are linked to Threatened flora locations. A more significant ESA associated with the TEC 'Shrublands on Swan Coastal Plain Ironstones (Busselton area)' (SCP10b) is also located in the eastern portion of the survey area. However, this area is located outside of the Proposal Development Envelope.

Of the three mapped ESAs associated with Threatened flora, only one of the populations is current. This is related to the population of *Verticordia plumosus* var. *vassensis* found within the southernmost ESA in unit B1 along Princefield Road (in Very Good condition). The Threatened flora (*Banksia nivea* subsp. *ulignosa*, *Verticordia plumosus* var. *vassensis* and *Chamelaucium roycei*) associated with the other two ESAs appears to have disappeared due to the ongoing degradation of the vegetation from competition from weeds and agricultural activities.

[2] In the instance of *Drakaea elastica* the known occurrence was not investigated because it occurred within the middle of a cleared paddock hundreds of metres from any native vegetation and because the location of the record was uncertain being dated at 1986 with a vague written description.

The only TEC occurrence protected under an existing ESA is associated with the SCP10b occurrence in the east of the survey area along Oates Road (outside of the Proposal Development Envelope). All other TEC occurrences mapped within the survey area by Ecoedge (2023) should also be recognised as ESAs.

5.4.13. REGIONAL ECOLOGICAL LINKAGES

While the Proposal area is close to a network of regional ecological axis lines, only a few parcels of vegetation within the survey area have ecological linkage values. These parcels have low 3b and 3c linkage values due to the vegetation's thoroughly degraded condition and separation from other parcels by expanses of pasture.

There is no statutory basis for the protection of this vegetation as an ecological linkage. However, the importance of ecological linkages, in general, has been recognised as an environmental policy consideration in EPA and Planning policy (EPA 2008 and references therein).

5.4.14. DECLARED WEEDS

Two weeds, **Asparagus asparagoides* (Bridal Creeper) and **Zantedeschia aethiopica (Alum Lily),* were found within the survey area. Both species are listed as Declared Pest plants under the *Biosecurity and Agriculture Management Act 2007.* Neither species has an assigned category for their management under the Act. The occurrence of these species within the survey area is shown in Figure 5-7. Doral will continue to implement the Flora and Vegetation Environmental Management Plan, which will manage the Declared Weeds per the Biosecurity and Agricultural Management Act 2007.

5.4.15. DIEBACK

BARK Environmental (2023) conducted a *Phytophthora* Dieback (Dieback) occurrence assessment for the Proposal (Appendix 6). The comprehensive assessment resulted in the majority of the area being mapped as Excluded due to historic disturbance, current grazing, pasture and degraded to completely degraded native condition remaining. The native vegetation structure and communities are no longer intact across the assessment area resulting in an absence of, or too few, suitable indicator plants that are essential to enable Dieback assessment. BARK suggested that all Excluded areas are considered unprotectable from Phytophthora disease given their extensive past and current disturbance, land uses and, in large parts, seasonal waterlogging. One small area of Uninterpretable vegetation was included in this assessment where known Threatened flora exist, but the Proposal will not disturb this area.

During the assessment (BARK Environmental, 2019) for the Original Proposal, one small area (0.3ha) was assessed as dieback 'infested' within the Princefield Rd reserve. This area was previously avoided from disturbance; however, it is now proposed to be disturbed for mining.

5.4.16. WETLANDS AND GROUNDWATER-DEPENDENT ECOSYSTEMS

Almost all of the Proposal area is classified as a 'Multiple Use' palusplain wetland, and all of the vegetation units have some species that are either fully or partially phreatophytic or groundwater dependant and, therefore, are representative of wetland vegetation (Figure 5-8).

Ecoedge (2023) identified twelve areas that contain vegetation that is understood to be potentially groundwater dependent (to a greater or lesser extent). These areas are summarised in Table 5-11 and shown in Figure 5-9.

TABLE 5-11: SUMMARY OF NORTHERN EXTENSION GDEs

GDE #	VEGETATION TYPE[1]	VEGETATION CONDITION	THREATENED ECOLOGICAL COMMUNITY (TECS)	CRITICAL HABITAT SCP10B SOUTHERN IRONSTONE
GDE_1	A1	Degraded	Yes – TEC (FCT01b)	No
GDE_2	B1	Very Good	Yes – TEC (FCT10b)	Yes (SCP10b)
GDE_3	A1	Degraded	Yes – TEC (FCT01b)	No
GDE_4	A1	Degraded to Good	Yes – TEC (FCT01b)	No
GDE_5	B1	Good	Yes – TEC (FCT10b)	Yes (SCP10b)
GDE_6	C1	Degraded	Yes – TECs(FCT01b)	No
GDE_7	C1	Degraded	Yes – TEC (FCT01b)	No
GDE_8	C1 C3	Good Degraded/Good	Yes – TEC (FCT01b) Yes – TEC (FCT09)	No
GDE_10	C1	Degraded	Yes – TECs (FCT01b)	No
GDE_11	B2	Completely Degraded / Good	Yes – TECs (FCT10b)	Yes (SCP10b)
GDE_12	B2	Completely Degraded	No	Yes (SCP10b)

[1] Vegetation types are:

A1 - Woodland/open forest of *Corymbia calophylla* and *Eucalyptus marginata*, with scattered *Agonis flexuosa, B. grandis, Melaleuca preissiana, Nuytsia floribunda, Persoonia longifolia* or *Xylomelum occidentale over Xanthorrhoea preissii* over weeds on grey-brown or grey loamy sand or sand (on farmland usually only *C. calophylla* and *E. marginata* are present) and appears to correspond to the State listed TEC SCP01b (Southern *Corymbia calophylla* woodlands on heavy soils)

B1 - Tall shrubland of *Acacia saligna, Calothamnus quadrifidus subsp. teretifolius, Melaleuca incana* and *Kunzea micrantha* (with scattered emergent Eucalyptus rudis) over scattered native herbs including *Drosera glanduligera* and *Sowerbaea laxiflora*, the sedge *Loxocarya magna*, and weeds on shallow red sandy clay on massive ironstone and are regarded as occurrences of the Shrublands of southern SCP Ironstones SCP10b TEC

B2 - Open woodland of *Melaleuca preissiana* over weeds (rarely with *Hyalosperma cotula*) on seasonally wet brown clay-loam over massive laterite and are regarded as occurrences of the Shrublands of southern SCP Ironstones SCP10b TEC

C1 - Open Forest of *Eucalyptus rudis* and/or *Corymbia calophylla* over scattered *Agonis flexuosa* and *Melaleuca rhaphiophylla* occasionally over *Acacia saligna, A. extensa, Astartea scoparia, Xanthorrhoea preissii* scattered shrubs over weeds on grey-brown clayey loams in drainage lines and on damp flats and it is also inferred to represent an occurrence of the State listed TEC SCP01b (Southern *Corymbia calophylla* woodlands on heavy soils).

C3 - Tall Open Shrubland that may include *Acacia saligna*, *Jacksonia furcellata*, *Kingia australis*, *Melaleuca osullivanii*, *M. preissiana*, *M. viminea* and *Xanthorrhoea preissii* on seasonally wet grey-brown sandy loam

5.5. POTENTIAL IMPACTS

The following aspects of the Proposal may affect flora and vegetation values:

5.5.1. DIRECT

- Clearing 9.83ha of native vegetation will reduce the extent of soil-landscape systems, vegetation complexes, vegetation units and TEC.

5.5.2. INDIRECT

- Reduced water availability to conservation significant vegetation by groundwater abstraction;
- Mining activities and vehicle movement have the potential to spread weeds and dieback within and adjacent to the Development Envelope;
- Mining activities and vehicle movement can potentially deposit dust on vegetation adjacent to the Development Envelope.

5.6. ASSESSMENT OF POTENTIAL IMPACTS

5.6.1. DIRECT IMPACTS

CLEARING AND FRAGMENTATION OF NATIVE VEGETATION

The Proposal has been designed to avoid clearing native vegetation as far as practicable to reduce direct impacts on flora and vegetation values. The Proposal, however, will require clearing ~9.83ha of native vegetation to facilitate the development of mine areas. An additional 64 isolated scattered paddock trees will also be cleared (and addressed under Terrestrial Fauna). This will reduce the regional and local extent of soil-landscape systems, vegetation complexes, vegetation units and TECs. No Threatened or Priority flora species will be directly impacted (cleared) for the Proposal.

SOIL LANDSCAPE MAPPING

The Proposal will require clearing ~9.83ha of native vegetation and disturbance of 835.09ha of cleared pasture and planted species within the Abba Plains soil-landscape system (213Ab). Table 5-12 shows the potential impact on the Abba Plains soil-landscape system and soil mapping units (subsystems of the Abba Plains soil-landscape system).

TABLE 5-12. DIRECT IMPACTS TO SOIL-LANDSCAPE SYSTEMS AND MAPPING UNITS

SOIL MAPPING UNIT	TOTAL EXTENT OF SOIL MAPPING UNIT (HA)	AREA OF SOIL MAPPING UNIT AFFECTED BY PROPOSAL (HA)	PERCENTAGE OF SOIL MAPPING UNIT AFFECTED BY PROPOSAL (%)
TOTAL ABBA PLAINS SOIL-LANDSCAPE SYSTEM	48,954	**844.92**	1.73
213AbABw	3320	287.96	8.67
213AbABvw	1026	0.26	0.03
213AbAB1	2127	230.73	10.85
213AbABwi	154	94.04	61.06

SOIL MAPPING UNIT	TOTAL EXTENT OF SOIL MAPPING UNIT (HA)	AREA OF SOIL MAPPING UNIT AFFECTED BY PROPOSAL (HA)	PERCENTAGE OF SOIL MAPPING UNIT AFFECTED BY PROPOSAL (%)
213AbABwy	871	196.21	22.53
213AbJD1	162	35.73	22.06

VEGETATION COMPLEXES

Utilising the vegetation complex mapping within the Swan Coastal Plain (Webb, et al., 2016), clearing native vegetation for the Proposal will only occur in the Abba vegetation complex. As shown in Table 5-13, the area of native vegetation to be cleared represents only 1.73% of the remaining area of the Abba vegetation complex and, therefore, does not significantly reduce the extent of this vegetation complex.

In 2001, the Commonwealth of Australia stated National Targets and Objectives for Biodiversity Conservation, which recognised that the retention of 30% or more of the pre-European vegetation of each ecological community was necessary if Australia's biological diversity were to be protected (Environment Australia, 2001). This level of recognition is in keeping with the targets set in the EPA's Position Statement No. 2 (EPA, 2000), with particular reference to the agricultural area. With regard to conservation status, the EPA has set a target of 15% of pre-European extent for each community to be protected in a comprehensive, adequate and representative reserve system (EPA, 2006).

Currently, 6.6% of the Abba vegetation complex's pre-European extent remains, below the Commonwealth's 30% target and the EPA's 15% target. Only 1.59% of the Abba vegetation complex is in DBCA managed lands.

TABLE 5-13: DIRECT IMPACTS TO VEGETATION COMPLEXES

VEGETATION COMPLEX	SYSTEM 6 CODE	CURRENT AREA OF VEGETATION COMPLEX REMAINING (HA)	PERCENTAGE OF VEGETATION COMPLEX REMAINING (%)	PERCENTAGE OF VEGETATION COMPLEX IN DBCA MANAGED LANDS (%)	AREA OF VEGETATION COMPLEX TO BE CLEARED (HA)	PERCENTAGE OF VEGETATION COMPLEX AFFECTED BY PROPOSAL %
Abba	30	3,359.08	6.60	1.59	9.83	0.29

VEGETATION UNITS

Clearing for the Proposal will affect the following vegetation units summarised in the following table.

TABLE 5-14: VEGETATION UNITS TO BE CLEARED

VEGETATION UNIT	DESCRIPTION	THE AREA TO BE CLEARED (HA)
A1	Woodland/open forest of *Corymbia calophylla* and *Eucalyptus marginata*, with scattered *Agonis flexuosa*, *B. grandis*, *Melaleuca preissiana*, *Nuytsia floribunda*, *Persoonia longifolia* or *Xylomelum occidentale* over *Xanthorrhoea preissii* over weeds on grey-brown or grey loamy sand or sand (on farmland usually only *C. calophylla* and *E. marginata* are present)	3.69

VEGETATION UNIT	DESCRIPTION	THE AREA TO BE CLEARED (HA)
C1	Open forest of *Eucalyptus rudis* and *Corymbia calophylla* over scattered *Agonis flexuosa* and *Melaleuca rhaphiophylla* occasionally over *Acacia saligna*, *A. extensa*, *Astartea scoparia*, *Xanthorrhoea preissii* scattered shrubs over weeds on grey-brown clayey loams in drainage lines and on damp flats.	5.92
C2	Open woodland of *Melaleuca preissiana* over weeds on seasonally wet brown clay loam.	0.21
Cleared Pasture	Cleared pasture	822.84
Planted species	Amenity Plantings of *Eucalyptus sp*. Or *Melaleuca sp*.	12.25
TOTAL NATIVE VEGETATION		**9.83**
TOTAL DISTURBANCE		**844.92**

Of the ~30ha of native vegetation mapped by Ecoedge (2023) for the Proposal, up to 9.83ha of native vegetation will be cleared for the Proposal. Almost all of this vegetation (~85%) is in completely degraded condition and is of no conservation significance.

The majority of native vegetation to be cleared for the Proposal is within vegetation Unit C1, of which up to 5.92ha will be cleared. Almost all of Unit C1 to be cleared is in completely degraded condition, consisting only of an overstorey of *Eucalyptus rudis* or *Corymbia calophylla* and an understorey of pasture species. Approximately 0.57ha of Unit C1 (in degraded or good condition) appears to be a degraded form of the TEC SCP01b '*Southern Corymbia calophylla woodlands on heavy soils'* (Gibson et al. 1994), which has a threat status of Vulnerable under the *BC Act 2016*.

A total of 3.69ha of Vegetation Unit A1 will be cleared for the Proposal, which is dominated by *Corymbia calophylla* on heavier soils and *Eucalyptus marginata* on grey sandy loams. The majority of Unit A1 to be cleared is in a completely degraded condition, with only 0.68ha in a degraded or better condition considered to be SCP01b 'Southern *Corymbia calophylla* woodlands on heavy soils' (Gibson et al. 1994).

All of Vegetation Unit C2 to be cleared is in completely degraded condition.

The remainder of the disturbance area will occur in cleared pasture (822.84ha), representing ~97% of the total disturbance, and an additional 12.25ha of planted/non-native vegetation.

CONSERVATION SIGNIFICANT VEGETATION

A total of 1.25ha mapped as SCP01b 'Southern *Corymbia calophylla* woodlands on heavy soils' (Gibson et al. 1994) (unit A1 and C1) will be cleared for the Proposal. Limited information is available on the remaining extents of SCP01b; however, as documented in the ERD for the Original Yalyalup Project, (Doral, 2020a) this community is known from 13 quadrats outside of the Proposal.

CONSERVATION SIGNIFICANT FLORA

No conservation significant flora species will be directly impacted by the Proposal.

5.6.2. INDIRECT IMPACTS

GROUNDWATER DRAWDOWN ON GDEs

No groundwater drawdown in the Superficial aquifer is predicted to extend beyond 550m from the edge of the mining area at the proposed Yalyalup Northern Extension. Therefore, it is unlikely that any of the three high-value wetland GDEs, located approximately 6km to either the northeast or southwest of the site, will be impacted by the Proposal.

AQ2 (2024) model predictions suggest that there will be drawdowns in areas of potential GDEs (Figure 5-9) across the Proposal area over the life of the mine. These drawdowns have the potential to impact groundwater-dependent vegetation close to mining areas. It should be noted that the magnitude of change in groundwater level (i.e. drawdowns of more than 0.25m) thresholds have been used by AQ2 (2024) to assist in providing an assessment of risk.

Details of the predicted maximum drawdowns at the GDE locations due to dewatering for the Proposal are shown in Table 5-15.

TABLE 5-15. PREDICTED MAXIMUM DRAWDOWNS AT SELECTED GDE LOCATIONS DUE TO NORTHERN EXTENSION DEWATERING

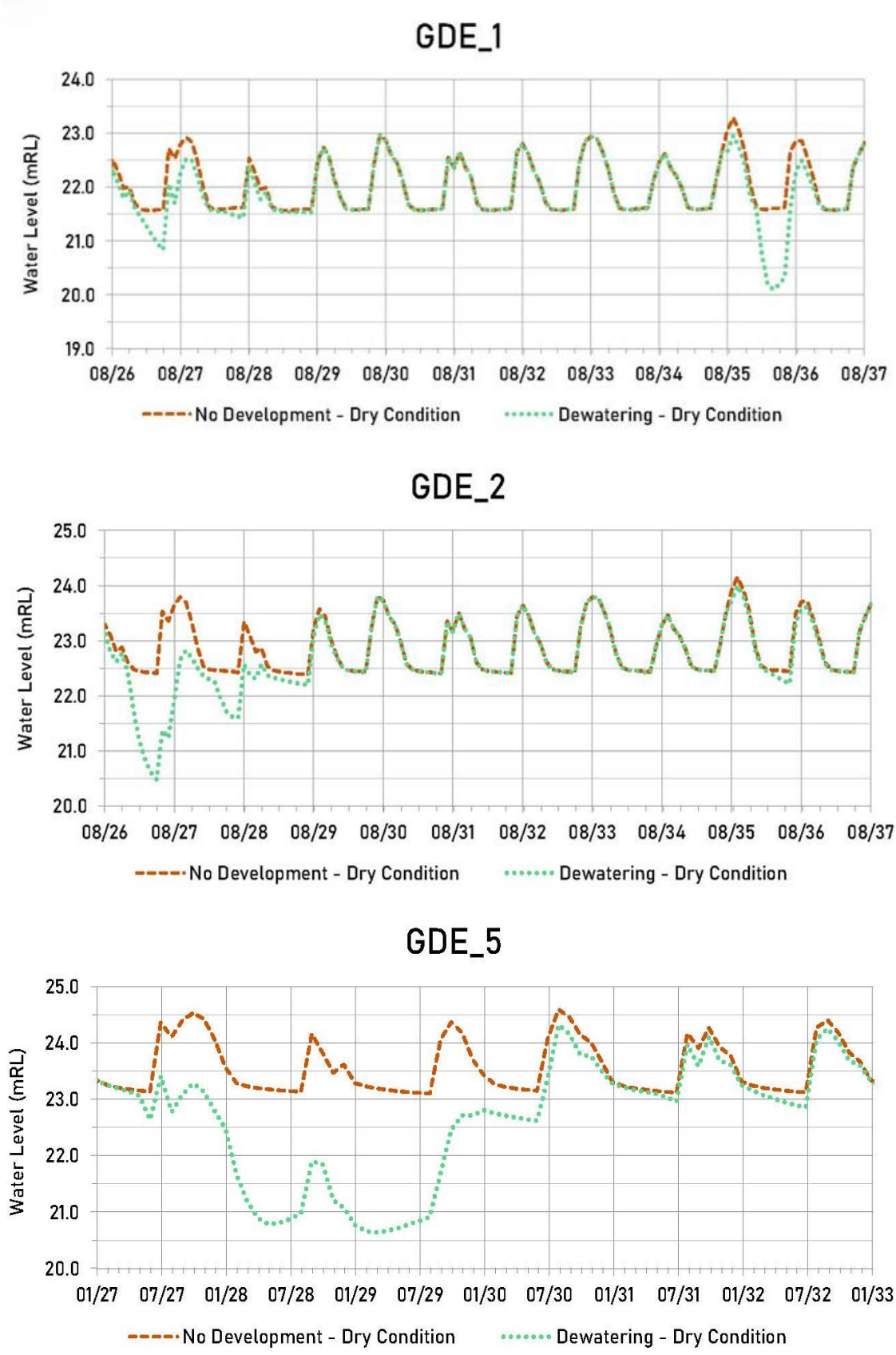
GDE	PREDICTED MAX DRAWDOWN (m)	MONTH OF PREDICTAED MAX DRAWDOWN	PERIOD OF PREDICTED DRAWDOWN (>0.25m)	PREDICTED MAX DRAWDOWN BELOW LOWEST SEASONAL GW LEVEL (m)
YA_MB33_GDE	0.40	March 2027	December 2026 to July 2027	
YA_MB34_GDE	0.11	May 2027	NA	
YA_MB35_GDE	0.20	December 2035	NA	
YA_MB36_GDE	0.38	July 2027	June to July 2027	
YA_MB37_GDE / GDE_2	2.20	June 2027	September 2026 to November 2028	1.92
GDE_1	1.50	April 2036	February to November 2027	1.46
GDE_2 / YA_MB37_GDE	2.20	June 2027	September 2026 to November 2028	1.92
***GDE_3**	**0.34**	**September 2028**	**August to September 2028**	**0.25**
***GDE_4**	**1.62**	**August 2028**	**June 2027 to June 2030**	**1.28**

GDE	PREDICTED MAX DRAWDOWN (m)	MONTH OF PREDICTAED MAX DRAWDOWN	PERIOD OF PREDICTED DRAWDOWN (>0.25m)	PREDICTED MAX DRAWDOWN BELOW LOWEST SEASONAL GW LEVEL (m)
GDE_5	2.57	February 2029	May 2027 to October 2030	2.45
***GDE_6**	**4.73**	**February 2029**	**October 2027 to November 2030**	**4.68**
GDE_7	2.71	August 2029	September 2028 to October 2032	2.43
GDE_8	1.60	June 2030	April 2029 to October 2032	1.20
GDE_10	0.24	July 2032	NA	0.01
GDE_11	0.07	October 2034	NA	0
GDE_12	0.10	October 2034	NA	0

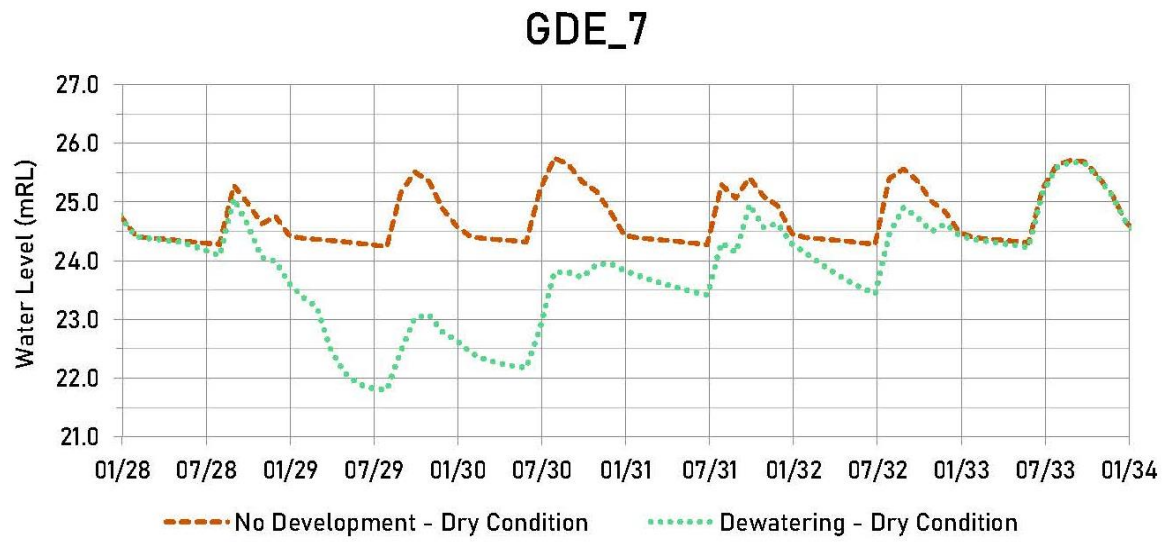
***GDE_3, GDE_4 and GDE_6 will be cleared and not subject to indirect impacts from drawdown. GDE_7 will be partially cleared.**

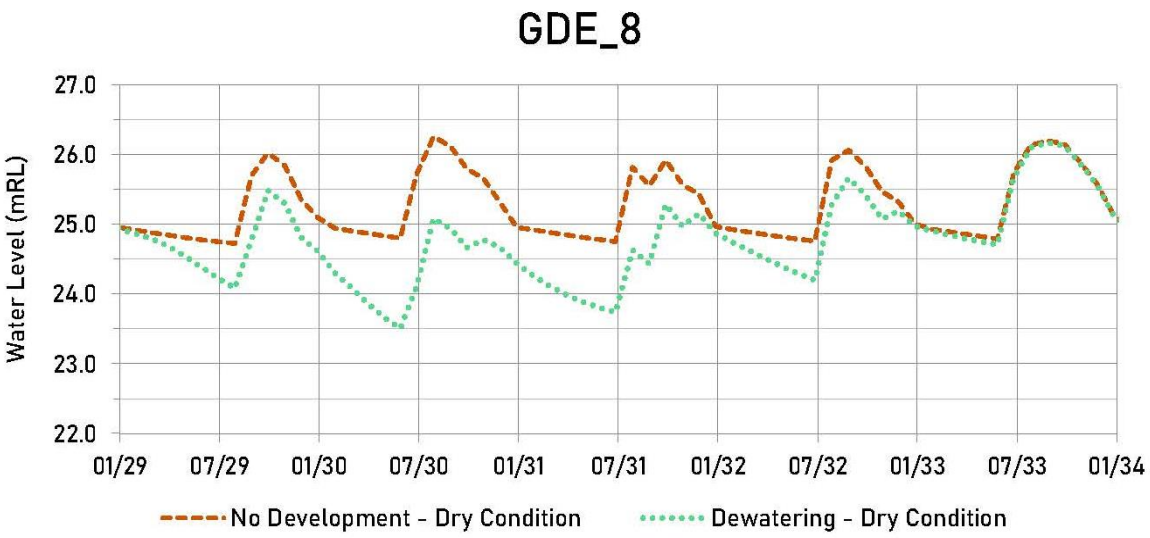
The GDEs with the highest maximum modelled drawdowns (i.e. relative water level changes) assuming dry climate conditions (i.e. most conservative case) are shown below in Charts 5-1 and 5-2, with the maximum drawdowns at each of these GDE's also shown in Charts 5-3 and 5-4, reproduced from (AQ2, 2024). Figures showing the drawdowns for all GDE's are provided in Figures 10-2 to 10-13 of Appendix 10B (AQ2, 2024).

CHARTS 5.1: PREDICTED WATER LEVELS AT GDEs (GDE_1, GDE_2, GDE_5)

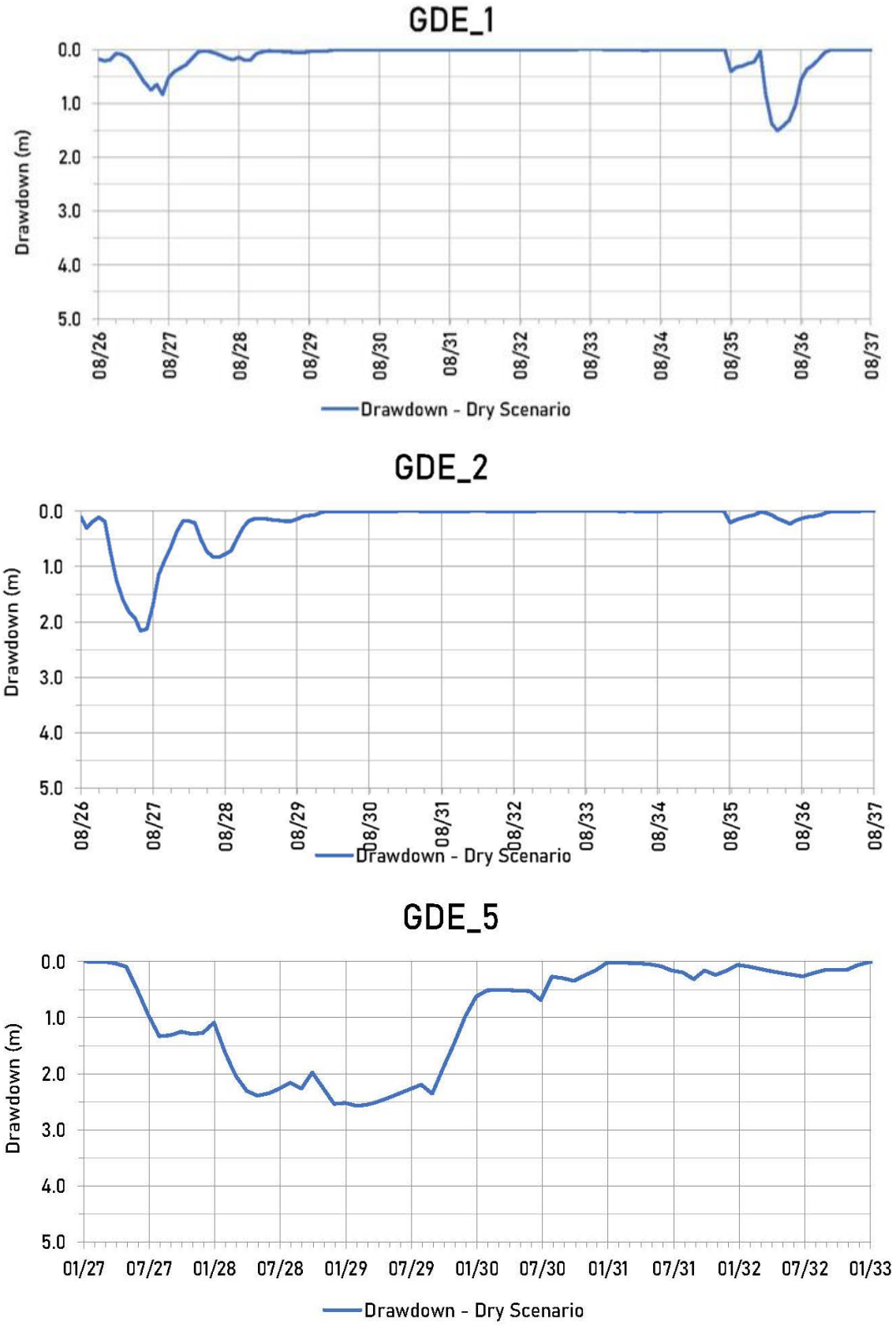


CHARTS 5.2: PREDICTED WATER LEVELS AT GDEs (GDE_7, GDE_8)

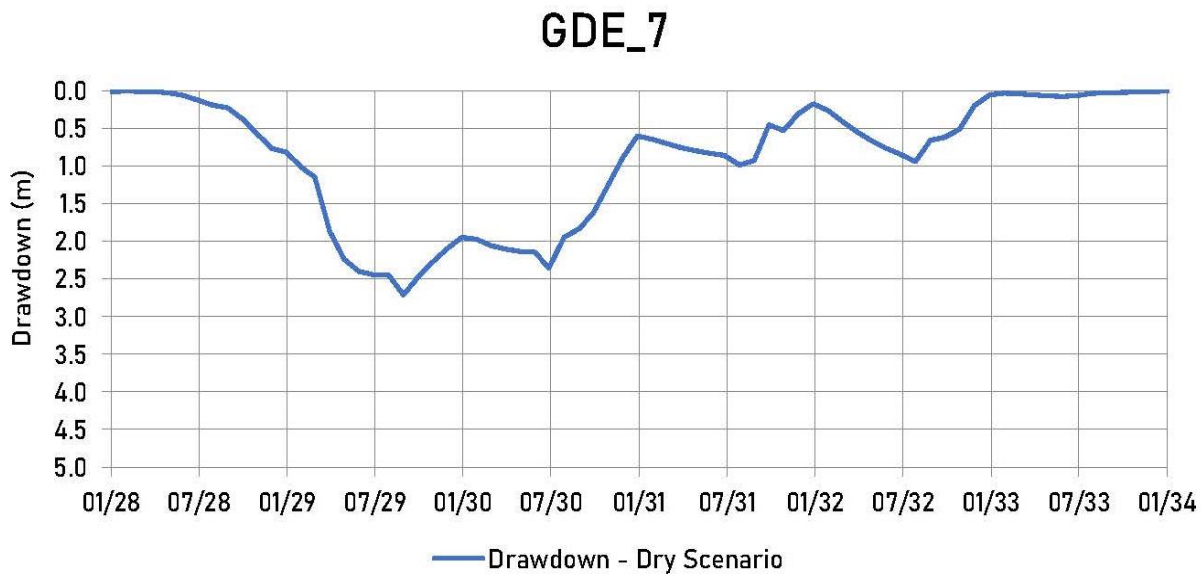


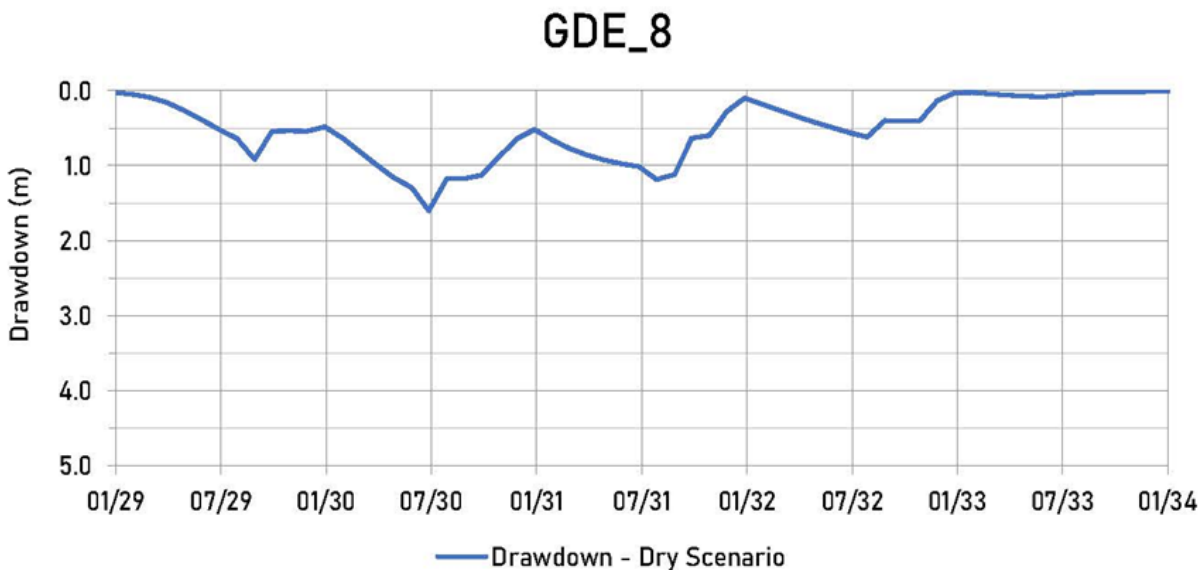


CHARTS 5.3: PREDICTED GDE DRAWDOWNS (GDE_1, GDE_2, GDE_5)



CHARTS 5.4: PREDICTED GDE DRAWDOWNS (GDE_7, GDE_8)





The salient points in relation to groundwater drawdowns to GDEs are as follows:

- The magnitude of drawdowns along the GDE areas varies depending upon the proximity of the Northern Extension active mining pits. However, all drawdowns will be localised and temporary.
- The highest maximum drawdowns are predicted to be at GDE_1, GDE_2, GDE_5, GDE_7 and GDE_8 (i.e. 1.5 to 2.72 m). However, these GDEs, except for GDE_2 and GDE_5 are in heavily degraded condition;
- GDE_7 has the longest predicted drawdown period of more than 0.25m (i.e. ~4 years). As stated above, part of GDE_7 is heavily degraded and in poor condition and will be partially cleared for mining;
- Drawdowns at GDE_10, GDE_11 and GDE12 are less than 0.25m and drawdowns at GDE_3 are short-term (2 months), thus having a low risk of being impacted due to dewatering.
- There are minor drawdowns (less than 0.4m) that extend into the McGibbon Track area in the approved Yalyalup Mine due to mining at the Northern Extension. However, these drawdowns are localised and temporary and much smaller than the original drawdowns predicted due to the dewatering of the approved Yalyalup Mine. Implementation of the existing GDE Management Plan as required by MS1168—Condition 10 will continue to apply to these areas.

In conclusion, groundwater modelling predicts that the dewatering operations for the Proposal will temporarily cause groundwater levels to decline and fall outside the seasonally observed range. The magnitude of the change in groundwater levels (i.e. drawdowns of more than 0.25 m) exceeds thresholds that could potentially result in impacts to 0.68ha of vegetation in GDE_1, GDE_2, GDE_5, GDE_7 and GDE_8 as follows:

- GDE_1 – 0.09ha mapped as SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils'
- GDE_2 – 0.16ha mapped as SCP10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area), includes 26 *Verticordia plumosa* var. *vassensis.*
- GDE_5 – 0.21ha mapped as SCP10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)
- GDE_7– 0.15ha mapped as SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils'
- GDE_8 – 0.05ha mapped as SCP09 and 0.02ha mapped as as SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils'

However, long-term post-mining effects on water levels are expected to be minimal. The recovery of water levels will commence immediately once mining of each active mine pit is completed, owing to backfilling of mined-out pits. Once all mining areas are completed, dewatering will cease, and water levels will continue to rise until a steady state or equilibrium water level is resumed. The numerical model shows that water levels are predicted to return to pre-mining levels within 12 months of mine closure (i.e. by December 2037).

The current management strategy for the GDE's along McGibbon Track (including GDE_2) is to implement the GDE Management Plan as required by MS1168 Condition 10. Doral have prepared a similar strategy for the management of the GDEs within the Proposal area (Appendix 7).

FRAGMENTATION OF VEGETATION

Native vegetation within the Proposal area generally comprises fragmented isolated patches of vegetation in completely degraded condition, likely due to past and current farming activity. There are only few parcels of vegetation within the Proposal area with ecological linkage values. These parcels were classified by Ecoedge (2023) based on the *South West Regional Ecological Linkages (SWREL) Project* (Molloy, et al., 2009), to have low 3b and 3c linkage values due to the overall completely degraded condition of the vegetation and separation from other parcels of vegetation by expanses of pasture.

Given majority of this area of vegetation will not be directly impacted by the Proposal, fragmentation is unlikely to occur as a result of implementing the Proposal.

Clearing for the Proposal is predominantly limited to isolated small patches of fragmented vegetation on farmland or along edges of road reserves. The majority of these areas are in completely degraded condition and generally only comprises *C. calophylla* and *E. marginate,* with no other native species or understorey present. The remainder of clearing is confined to isolated and scattered paddock trees located on cleared farmland.

ALTERED FIRE REGIME

The Proposal area has been identified as a designated bushfire-prone area by the Fire and Emergency Services Commissioner as being subject, or likely to be subject, to bushfire attack.

Alteration of the natural fire regime may occur due to implementing the Proposal due to improved access and increased human activity associated primarily with vehicle movements, combustible materials and general vehicle and plant maintenance duties (hot works). The risk of causing fire during the operations can potentially increase the frequency of fires in the project location. However, large areas of bare earth may act as firebreaks in the event of a blaze from adjacent farming or mining areas.

The potential consequences of an altered fire regime have the potential to affect ~30ha of vegetation within the Proposal area, including TECs, Threatened and Priority species. Fire risk will be managed through the continued implementation of a Bushfire Management Plan, including a fire response procedure.

DUST DEPOSITION

Mining activities and vehicle movement have the potential to generate dust, which may indirectly affect vegetation within and adjacent to the Proposal area through the deposition of dust on the plants. Impacts to flora and vegetation at the Site resulting from dust-disturbing activities are expected to be localised. The specific activity and the direction of the prevailing wind conditions will determine the extent of the dust generated. The main activities likely to create suspended dust particles in the air at the site are associated with mining activities such as vegetation removal, topsoil and subsoil stripping, excavation of overburden and ore, backfilling, truck movements and processing.

Dust impacts are more likely to be attributable to the mine within close proximity (i.e. <1km), with the risk decreasing further away from the mine site. However, under adverse weather conditions, dust can travel considerable distances. Dust can stress vegetation as it accumulates on leaf surfaces and reduces essential processes, including photosynthesis, respiration and transpiration. Dust can also produce physical effects on plants, such as blockage and damage to stomata, shading, and leaf surface or cuticle abrasion. This can result in cumulative effects such as drought stress on already stressed species or decreased plant health and even death in extreme circumstances. Reduced growth and vigour of plants may mean that they are more susceptible to pathogens and other disturbances, and these plants are more likely to be subject to

increased mortality. Such impacts on individual plants generally result in decreased productivity and can result in changes in vegetation and community structure (Farmer, 1993).

Although the generation of localised dust from mining activities is unavoidable, with the implementation of appropriate dust management techniques already employed by Doral for the approved mine area (i.e. Dust Management Plan), dust impacts on flora and vegetation values are considered low.

SPREAD OF WEEDS AND DIEBACK

Mining activities and vehicle movements can potentially result in the spread of weeds within and adjacent to the Proposal area. Environmental weeds are described by (DEC, 1999) as 'plants that establish themselves in natural ecosystems and proceed to modify natural processes, usually adversely, resulting in the decline of communities they invade'. Environments affected by mining activities are highly susceptible to invasion by weeds, as disturbances to soils caused by mining operations (i.e. creating bare ground) provide an ideal habitat where weeds can readily colonise and quickly become the dominant vegetation. Weeds pose a key risk, not only during the operational phases of mining but also during rehabilitation or care and maintenance phases. Weed infestations can compete directly (as well as indirectly) with native or selected revegetation species and also increase the risk of fires (and fire intensity) that may damage revegetated areas. Weeds have the potential to substantially change the dynamics of natural ecosystems by:

- Competing with or displacing native plant species;
- Affecting natural processes such as fire intensity, stream flows and water quality;
- Changing habitats and therefore impacting on ecosystem health;
- Diminishing natural aesthetic values.

Strict weed hygiene measures will continue to be implemented during the proposal's implementation to reduce the risk of weed introduction and spread into areas of native vegetation. Measures will be implemented to target the control of the Declared Plants *Asparagus asparagoides* and *Zantedeschia aethiopica*. Weed management will be implemented per Doral's Flora and Vegetation Management Plan.

One small area (0.3ha) of vegetation identified as 'infested' with *Phytophthora* dieback (BARK Environmental, 2019) is present within the Princefield Road reserve (within the Original Project area). This small area is now included within the proposed mining area and will require management to ensure dieback is not spread. Management of this small area of dieback will include the following:

- Area to be clearly delineated and communicated to Mine personnel,
- Clearing of vegetation and stripping of topsoil/overburden will be undertaken in dry conditions (i.e. Summer/Autumn);
- All vegetation, topsoil and root matter will be removed and deep buried at the base of a deep mine pit (and documented);
- All equipment used to remove at risk topsoil materials to be decontaminated;
- All Doral field staff and earthmoving contractors will continue to be educated during Site induction and weekly meetings regarding the presence of dieback, access and movement restrictions, and necessary hygiene measures to minimise the risk of contaminating dieback-free areas.

5.7. MITIGATION

To protect flora and vegetation values so that biological diversity and ecological integrity are maintained during the implementation of the Proposal, Doral has applied the mitigation hierarchy to avoid, mitigate and rehabilitate potential impacts on flora and vegetation values.

5.7.1. AVOID

Doral's principal mitigation strategy to protect flora and vegetation values is to design the Proposal to avoid clearing of native vegetation, as far as practicable and maximise the use of existing cleared areas. This has resulted in all but 1% of the disturbance area being located on cleared pasture.

Approximately 30ha of remnant vegetation is present within the Proposal area as mapped (Ecoedge, 2023), of which ~94% is completely degraded. Most conservation-significant vegetation and flora species are confined to 3.04ha, predominantly within roadside verges. All conservation significant flora species have been avoided for the Proposal, with only 1.25ha mapped as SCP01b 'Southern *Corymbia calophylla* woodlands on heavy soils' (Gibson et al. 1994) (unit A1 and C1 in Degraded/Good condition) to be directly impacted by clearing for the Proposal. The vast majority of the disturbance area is cleared pastoral land (822.84 ha).

As per MS1168, the following existing Condition will apply to the Proposal to minimise direct impacts on flora and vegetation values:

- Condition 7-1: Avoid where possible, otherwise minimise indirect impacts to significant flora and TECs within the Development Envelope.

5.7.2. MINIMISE

In accordance with MS1168, Doral will continue to implement the following key management measures (updated as required for inclusion of the Proposal) to minimise impacts to flora and vegetation units:

FLORA AND VEGETATION MANAGEMENT PLAN

Doral will update and continue to implement the Flora and Vegetation Management Plan (MS1168 Condition 7) (Appendix 7), which includes the following key management and monitoring actions:

- Implementation of specific clearing procedures to minimise impacts to flora and vegetation. This will include demarcation of vegetation/trees to be cleared and authorisation requirements;
- Establishment of specific stockpile management procedures to store and manage crushed vegetation, topsoil and subsoil;
- Declared Plants *Asparagus asparagoides and Zantedeschia aethiopica ragoides* will be managed in accordance with the Biosecurity and Agricultural Management Act 2007;
- An infested area of dieback (0.3ha) within the Princefield Road reserve will be demarcated, removed, and buried deep within a deep mine void.
- Weed and dust management measures will be incorporated into the ongoing management of flora and vegetation for the Proposal.
- Comply with any necessary approvals, permits and licences required under the BC Act.

GDE MANAGEMENT PLAN

A GDE Management Plan (Appendix 7) has been prepared to minimise impacts to flora and vegetation values from indirect impacts associated with groundwater drawdowns. As detailed in the Plan, monitoring will comprise a combination of hydrological parameters and vegetation health assessments using qualitative criteria. This will comprise:

- Groundwater level monitoring in a network of six proposed new GDE monitoring wells located near GDE_1, GDE_5, GDE_7 and GDE_8 (it is noted an existing GDE monitoring well is located at GDE_2 as part of the existing GDE EMP);
- The following management response triggers and contingency measures will apply:
- Lagging indicators designed to provide redundancy in risk identification and allow verification of the success of management interventions.
- Triggers have been designed around parameters that may be affected by mining-induced changes to the water regime (i.e. groundwater levels). Soil moisture is not included as a monitoring parameter because it is influenced by infiltrating rainfall, and this will not be affected by mining.
- For all trigger exceedances, the management response will be that water supplementation is required. The final design for the supplementation scheme will be completed during the implementation of the GDE Management Plan.
- Supplementation will be based on a combination of:
    - Surface irrigation.

The supplementation scheme will have the following design criteria:

- To supply enough water to offset declines in groundwater levels (i.e., maintain levels within the natural range under the GDEs). This will be determined using the existing groundwater model;
- To be operationally effective. This will be assessed during the engineering design of the scheme based on aquifer parameters derived during previous groundwater investigations;
- To incorporate a monitoring program that can confirm the supplementation system's efficacy. The monitoring program outlined in this plan will achieve this.
- Supplementation water will be sourced from the Yarragadee aquifer to ensure sufficient water quality within the GDEs without risk of impacts due to acidification or dieback.

GROUNDWATER OPERATING STRATEGY

The groundwater system will continue to be carefully managed for the Proposal area in order to avoid or minimise impacts to GDEs due to mining operations. The Groundwater Operating Strategy (GWOS) (Appendix 8) has been amended, to include the Proposal area and includes a groundwater and surface water monitoring program (i.e. abstraction, discharge, water levels and water quality) and has been designed to assess aquifer performance, the potential impacts of groundwater abstraction proposed upon commencement of mining operations and specify operational requirements. Trigger levels and contingency actions have been developed to mitigate potential impacts caused by the mining operations and ensure the actual impacts are not greater than predicted. The GWOS has been prepared in accordance with *Operational Policy 5.08 - Use of operating strategies in the water licensing process* (DoW, 2011) and the DWER guidelines for the preparation of Operating Strategies for mineral sand mine dewatering licences in the South West Region (DWER, 2015).

DUST MANAGEMENT PLAN

Air quality parameter limits have been incorporated into the existing DWER Licence for the existing Site issued under Part V of the EP Act. The DWER Licence will be updated to incorporate the Proposal and it is considered similar air quality limits will apply. Doral will continue to employ mobile real-time dust monitoring to regularly monitor TSP and PM_{10} concentrations in accordance with the Dust Management Plan (Appendix 7). Doral will adhere to the limits set for dust within the licence, focusing on minimising the concentration of TSP and PM_{10} leaving the mine site and potentially impacting neighbours.

5.7.3. REHABILITATE

Doral has prepared and will implement a Rehabilitation Management Plan (Appendix 7) for the Proposal.

Doral will also update and implement an updated Mine Closure Plan and submit it to DEMIRS in conjunction with the Mining Proposal as required under the *Mining Act 1978*.

5.7.4. OFFSET

An assessment of significance for the residual impacts has been undertaken in accordance with the WA Environmental Offset Guidelines (Government of Western Australia, 2014) and is provided in Section 10 Offsets.

Following the application of the mitigation hierarchy, a significant residual impact on the following vegetation community may occur:

- Direct impact to 1.25ha mapped as SCP01b 'Southern *Corymbia calophylla* woodlands on heavy soils' (Gibson et al. 1994) (unit A1 and C1).

As detailed further in Section 11 – Offsets, Doral is committed to providing a suitable offset (land acquisition and revegetation) to secure a positive environmental outcome for the Proposal.

5.8. ASSESSMENT OF RESIDUAL IMPACTS

5.8.1. DIRECT IMPACTS

As documented in the EPA Report and Recommendations (EPA Bulletin 1695), the original Project involved clearing up to 2.72ha of degraded native vegetation. A further 448.61ha of cleared pasture was approved for mining/disturbance, bringing the total disturbance area for the Project to 451.33ha. To manage clearing impacts for the Original Proposal, MS1168 Condition 6 was applied by EPA, which required Doral to clear no more than the stated area of impact and to ensure no attributable direct impacts to TECS within the Development Envelope would occur. In addition, Doral committed to revegetating native vegetation to counterbalance the clearing of 2.72ha. As documented in the 2023 Annual Monitoring Report for the McGibbon Track Revegetation Monitoring (Cape Life, 2024), a total of 3.83ha has been revegetated during 2022/23, with the area separated into two zones to achieve the relevant Project objectives. The wetland zone (1.96ha) includes species that represent SCP10b, whilst the transitional zone (1.87ha) is represented by suitable habitat for threatened fauna, focusing on establishing a sustainable woodland. Monitoring indicates that the revegetation's general trend is positive, with all metrics trending towards the closure criteria.

Doral's current Proposal to expand the Mine to the north will require additional clearing of up to 9.83ha of native vegetation and disturbance of 835.09ha of cleared pasture and planted species. Most of the vegetation to be cleared is in degraded condition and is of no conservation significance. However, 1.25ha of the State listed TEC, SCP01b, will require clearing. This TEC is listed as vulnerable under the *BC Act 2016*.

Doral proposes providing a suitable offset for impacts to this TEC to achieve a nature positive environmental gain for the Proposal. This will be achieved by implementing a suitable Land Acquisition Offset Strategy similar to the one for the Original Yalyalup Mine.

Doral has continued to design the Proposal to avoid direct impacts on native vegetation as far as practical and utilising existing cleared areas. This has resulted in the avoidance of ~20ha of native vegetation within the Proposal's Development Envelope, with the generally larger areas/patches or conservation significant communities being avoided. This equates to a cumulative avoidance of ~50ha of native vegetation for the Original Yalyalup Mine and the current Proposal.

To manage the additional direct impacts of the Proposal, Doral is proposing to revegetate an area of ~14.5ha to counterbalance the additional clearing impacts in accordance with the Rehabilitation Management Plan (Appendix 7).

5.8.2. INDIRECT IMPACTS

Potential indirect impacts on native vegetation associated with the Original Proposal (as reported in Bulletin 1695) include the following:

- Dewatering activities lowering groundwater levels and impacting GDEs;
- Dewatering activities lowering groundwater levels and exposing potential ASS;
- Dust deposition;
- Introduction of weeds and Dieback.

Similar indirect impacts are predicted for the northern extension (Proposal). As such, it is considered that with the implementation of the existing mitigation and management measures (EMPs updated as required), these impacts can continue to be adequately managed to minimise indirect impacts to flora and vegetation values.

These include:

- MS1168 Condition 7 - Flora and Vegetation Management Plan;
- MS1168 Condition 9 – Acid Sulfate Soils Management Plan;
- MS1168 Condition 10 – Groundwater Dependant Ecosystems;
- MS1168 Condition 11 – Offsets;
- Dust Management Plan;
- Groundwater Operating strategy;
- Rehabilitation Management Plan.

<u>GDEs</u>

The most likely indirect impact, which has the potential to affect vegetation and flora values adversely, is due to dewatering activities and lowering of the groundwater table, which may affect the following GDEs (and vegetation):

- GDE_1 – 0.09ha mapped as SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils'
- GDE_2 – 0.16ha mapped as SCP10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area), includes 26 *Verticordia plumosa* var. *vassensis.*

- GDE_5 – 0.21ha mapped as SCP10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)
- GDE_7– 0.15ha mapped as SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils'
- GDE_8 – 0.05ha mapped as SCP09 and 0.02ha mapped as as SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils'

As documented in the most recent 2023 GDE Performance Report (Doral, 2023a), water potential and visual health monitoring results for the McGibbon Track GDEs demonstrate minimal health impacts to vegetation caused by the mining/dewatering operations during the 2022-23 reporting period. Continued implementation of the GDE EMP (amended for the Proposal area) is considered adequate to avoid significant indirect impacts associated with groundwater drawdowns on groundwater-dependent vegetation. As a contingency, a suitable offset will be provided if adverse impacts on vegetation continue to be identified after supplementation.

ASS

The Annual ASS Compliance Report for the 2023 period demonstrates that ASS monitoring for soils (overburden, sand tails and clay fines), dewatering effluent (pit and PWD) and groundwater quality (groundwater bores) were generally below trigger criteria and concluded:

- All soils (overburden, sand tails and clay fines) were neutralised at an appropriate rate, as demonstrated through the CRS results, with all samples below the trigger criteria.
- Most dewatering effluent quality showed no significant or statistical change despite TTA and Total Alkalinity triggers being exceeded in several locations at the PWD and dewatering pits. pH, however, remained above pH6.0 throughout the reporting period, indicating sufficient alkalinity was present in the groundwater system to counterbalance these minor occurrences.
- Groundwater quality (pH, TTA and Total Alkalinity) at the monitoring bores were also generally within the range of pre-mining quality.

This demonstrates that the current ASSMP has been effective to date in preventing adverse impacts on the conservation of significant flora and vegetation as a result of the oxidation of potential ASS. Continued implementation of the same ASS management measures will likely ensure that indirect impacts continue to be minimised as far as practicable.

DUST

An extensive dust monitoring program is already in place at the Yalyalup Mine. Dust emissions are within limits set under the DWER Licence. Elevated dust levels are recorded on occasions, particularly under seasonally dry soil conditions and sustained strong winds. Dust deposition is generally not evident on remnant vegetation and there has been no decline in vegetation condition within or around the mine site, based on visual assessment and wetland vegetation condition monitoring. Inclusion of the Proposal is unlikely to increase the risk of dust deposition on native vegetation, and Doral will continue to implement the Dust Management Plan (updated for the Proposal)

WEEDS AND DIEBACK

Strict weed hygiene measures will continue to be implemented for the Proposal to reduce the risk of weed introduction and spread into areas of native vegetation. Measures will be implemented to target the control

of the Declared Plants *Asparagus asparagoides* and *Zantedeschia aethiopica*. Weed management will be implemented per Doral's Flora and Vegetation Management Plan.

One small area (0.3ha) identified as 'infested' with *Phytophthora* dieback by (BARK Environmental, 2019) is present within the Princefield Road reserve. Management of this small area of dieback will include the following:

- Area to be clearly delineated and communicated to Mine personnel;
- Clearing of vegetation and stripping of topsoil/overburden will be undertaken in dry conditions (i.e. Summer/Autumn);
- All vegetation, topsoil and root matter will be removed and deep buried (>5m) in a deep mine pit;
- All equipment used to remove at-risk topsoil materials to be decontaminated;
- All Doral field staff and earthmoving contractors will continue to be educated during Site induction and weekly meetings regarding the presence of dieback, access and movement restrictions, and necessary hygiene measures to minimise the risk of contaminating dieback-free areas.

Weed and dieback management will continue to be managed in accordance with the Flora and Vegetation EMP (updated for the Proposal) (MS1168 Condition 7) and is therefore unlikely to pose any greater risk of spread or introduction into other areas of vegetation as a result of mining activities.

5.9. ENVIRONMENTAL OUTCOMES

With the inclusion of the Proposal to the approved mine areas for the Yalyalup Mine as per MS1168, the additional cumulative impacts on native vegetation are not considered significant and the EPA's objective *to protect flora and vegetation so that biological diversity and ecological integrity are maintained* will continue to be achieved through existing management measures (particularly the creation of new native vegetation) and the Conditions provided in MS1168 that relate to flora and vegetation. The provision of a suitable offset (via land acquisition) for the direct impacts to the TEC SCP01b will provide a net environmental gain for the Proposal.

6. ENVIRONMENTAL FACTOR – TERRESTRIAL FAUNA

6.1. EPA OBJECTIVE

To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.

6.2. POLICY & GUIDANCE

EPA Policy and Guidance

- *Statement of Environmental principles, Factors and Objectives* (EPA, 2021d)
- *Instructions on how to Prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* (EPA, 2016c).
- *Technical Guidance – Terrestrial Fauna Surveys* (EPA, 2016d).
- *Environmental Offsets Policy, Perth, Western Australia (Government of Western Australia, 2011).*
- *Environmental Offsets Guidelines, Perth, Western Australia (Government of Western Australia, 2014).*

Other Policy and Guidance

- Matters of National Environmental Significance. Significant Impact Guidelines 1.1. *Environmental Protection and Biodiversity Conservation Act 1999* (DoE, 2013).
- Significant impact guidelines for the vulnerable western ringtail possum (*Pseudocheirus occidentalis*) in the southern Swan Coastal Plain, Western Australia. Nationally threatened species and ecological communities. EPBC Act policy statement 3.10. (DEWHA, 2009).
- *Survey guidelines for Australia's threatened mammals. EPBC Act survey guidelines 6.5.* (DSEWPaC, 2011).
- *Survey guidelines for Australia's threatened birds. Guidelines for detecting birds listed as threatened under the EPBC Act*. (DEWHA, 2010).
- *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy October 2012.* (DSEWPaC, 2012a).
- *EPBC Act Referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris, Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii, Forest red-tailed black cockatoo (vulnerable) Calyptorhynchus banksii naso* (DSEWPaC, 2012b)
- *Conservation Advice Pseudocheirus occidentalis Western ringtail possum. Canberra: Department of the Environment and Energy* (Threatened Species Scientific Committee, 2018a)
- *Conservation Advice Calyptorhynchus baudinii* Baudin's Cockatoo*. Canberra: Department of the Environment and Energy* (Threatened Species Scientific Committee, 2018b).
- *Western Ringtail Possum (Pseudocheirus occidentalis) Recovery Plan. Wildlife Management Program No. 58. Department of Parks and Wildlife, Perth, WA* (DPaW, 2017).
- *Approved Conservation Advice for Calyptorhynchus banksii naso (Forest Red-tailed Black Cockatoo). Canberra: Department of the Environment, Water, Heritage and the Arts* (DEWHA, 2009).

- *Forest Black Cockatoo (Baudin's Cockatoo Calyptorhynchus baudinii and Forest Redtailed Black Cockatoo Calyptorhynchus banksii naso) Recovery Plan. Department of Environment and Conservation, Western Australia* (Chapman, 2008).
- *Carnaby's Cockatoo (Calyptorhynchus latirostris) Recovery Plan. Department of Parks and Wildlife, Perth, Western Australia* (DPaW, 2013).
- *Threat abatement plan for predation by feral cats. Canberra, ACT: Commonwealth of Australia* (DoE, 2015a).
- *Threat abatement plan for predation by the European red fox. DEWHA, Canberra* (DEWHA, 2008b).
- *Wildlife Conservation Plan for Migratory Shorebirds. Canberra, ACT: Department of the Environment* (Commonwealth of Australia, 2015).
- *EPBC Act Policy Statement 3.21 - Industry Guidelines for avoiding, assessing and mitigating impacts on EBBC Act listed migratory shorebird species* (DoE, 2015b).

6.3. ORIGINAL PROPOSAL

6.3.1. RECEIVING ENVIRONMENT

Harewood (2020a) conducted a desktop study and Level 1 Fauna Survey for the Original Proposal in accordance with *Technical Guidance – Terrestrial Fauna Surveys* (EPA, 2016g) and *Technical Guidance – Sampling Methods for Terrestrial Vertebrate Fauna* (EPA, 2016h). In addition, targeted surveys of Western Ringtail Possums *Pseudocheirus occidentalis* (WRP) and three species of Black Cockatoos (*Calyptorhynchus latirostris, Calyptorhynchus banksii naso* and *Calyptorhynchus baudinii)*, was undertaken in areas containing suitable habitat. The targeted surveys were undertaken in accordance with EPA and Commonwealth guidance in 2017 and 2019.

Overall fauna habitat values within the Original Proposal area have been severely compromised by the almost total removal of native vegetation, with the remnants present highly degraded and fragmented. Most areas lack any natural attributes and are now only likely to be utilised by generally common and widespread fauna species with non-specific requirements which allow them to persist in highly disturbed habitats (Harewood, 2020a). As a consequence, the fauna biodiversity within the Original Proposal area is well below levels present prior to historical disturbance having occurred and can therefore be regarded as highly depauperate (Harewood, 2020a). The overall fauna assemblage can therefore be regarded as highly unlikely to be of local or regional significance (Harewood, 2020a).

Harewood (2020a) , however, did identify four conservation significant fauna species that were known or had the potential to utilise remnant vegetation within the Original Proposal area (Harewood, 2020a). These include the following, which have been updated to reflect their current name and status:

- Carnaby's cockatoo (*Zanda latirostris*) – Endangered (EPBC Act);
- Baudin's cockatoo (*Zanda baudinii*) – Endangered (EPBC Act);
- Forest Red-tailed Cockatoo (*Calyptorhynchus banksia naso*) – Vulnerable (EPBC Act);
- Western Ringtail Possum (*Pseudocheirus occidentalis*) (WRP) – Critically Endangered (EPBC Act).

Within the Original Proposal area, small areas favour foraging habitats (marri, jarrah) for black cockatoos, with recent evidence of foraging activity. The Original Proposal area also includes larger trees (DBH $\geq$50cm or DBH $\geq$30cm for Wandoo) that could be considered potential breeding habitats. However, only five trees

had hollows that were suitable for black cockatoos and none had any evidence of being used for breeding. The field survey showed no evidence of black cockatoo roosting sites.

Targeted WRP surveys included day and nocturnal surveys and assessment of habitat. In total six WRP dreys were observed during the day survey in 2017 and three in 2019. All dreys were recorded in a short section of habitat at the northern end of McGibbon Track.

No Short-Range Endemics (SREs) were identified within the Original Proposal, most likely due to the historic land use for agriculture.

6.3.2. POTENTIAL IMPACTS

As documented in the EPA Report and Recommendations (EPA, 2021d) Terrestrial Fauna may be impacted directly or indirectly through:

- Direct clearing of 2.72ha of native vegetation and 1.78ha of potential foraging and roosting trees for Black Cockatoos;
- Death, injury and/or displacement of fauna species, because of clearing and construction activities;
- Dewatering activities potentially impacting vegetation which is associated with WRP habitat;
- Loss/injury to individual fauna due to the presence of artificial water bodies;
- Light, noise and dust emissions could disrupt fauna behaviour or reduce the value of fauna habitat;
- Vehicle strikes and feral animals.

6.3.3. MITIGATION MEASURES

The EPA Report and Recommendations (EPA, 2021d) concluded that the potential impacts assessed by Doral were not considered to be significant in the event the following was undertaken:

- Control through authorised extent of clearing (including avoidance of TECs) in Schedule 1 of MS1168 Condition 6;
- Implementation of the *Yalyalup Mineral Sands Project: Flora and Vegetation Management Plan (November 2020)* to minimise impacts on conservation significant flora and TECs (MS1168 Condition 7);
- Implementation of the *Yalyalup Mineral Sands Project: Fauna Environmental Management Plan (November 2020)* to minimise the impact on the conservation significant fauna (MS1168 Condition 8);
- Implementation of the *Yalyalup Mineral Sands Project: DMS-YAL-EMP-2.4 GDE Management Plan October 2020)* to avoid causing deleterious changes to the health of WRP habitat (MS1168 Condition 10);
- Provision of Offsets (MS1168 Condition 11) to counterbalance the significant residual impact of loss of potential breeding and foraging habitat for the Black Cockatoos (Carnaby's, Baudin's and Forest red-tailed);

In addition, Doral was to implement the Mine Closure Plan to ensure the Site's return to the agreed-upon end land use as per the *Mining Act 1978.*

6.4. PROPOSED AMENDMENT - RECEIVING ENVIRONMENT

6.4.1. SURVEYS

Bamford Consulting Ecologists (BCE) completed a fauna assessment for the Proposal area (BCE, 2024) (Appendix 9), which included:

- A Desktop Study and Level 1 Fauna Survey in accordance with Technical Guidance – Terrestrial Fauna Surveys (EPA, 2016h) and Technical Guidance – Sampling Methods for Terrestrial Vertebrate Fauna (EPA, 2016) for Terrestrial Fauna within the Development Envelope;
- Conduct a targeted Western Ringtail Possum assessment in areas containing suitable habitat within the Development Envelope in accordance with relevant EPA and Commonwealth guidance;
- Conduct a targeted black-cockatoo assessment in areas containing suitable habitat within the Development Envelope in accordance with relevant EPA and Commonwealth guidance;
- Conduct a follow-up camera pole survey of 17 Rank 3 trees located within the potential disturbance area to assess hollow suitability;
- Describe the terrestrial fauna, including conservation significant and migratory species that occur or are likely to occur within the Proposal area;
- Conduct targeted surveys for any other significant species, communities or habitats identified by the desktop study and Level 1 survey as potentially being present.

SUMMARY OF FAUNA VALUES

The Proposal area is predominantly cleared pasture used for stock grazing but there are some remnant bushland patches, large paddock trees and established gardens around farm buildings. The degraded nature of the vegetation, presence of stock and absence of any understorey within native vegetation areas are considered to be of limited value to ground-dwelling fauna.

Three threatened Black Cockatoo species, however occur in the area, with their conservation significance under the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and WA *Biodiversity Conservation Act 2016* (BC Act) presented below:

- Carnaby's Black-Cockatoo (*Zanda latirostris*) – listed as Endangered under the *BC Act* and *EPBC Act*.
- Baudin's Black-Cockatoo (*Zanda baudinii*) – listed as Endangered under the *BC Act* and *EPBC Act.*
- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) – listed as Vulnerable under the *BC Act* and *EPBC Act.*

VEGETATION AND SUBSTRATE ASSOCIATIONS (VSAs)

There were eight VSAs identified in the Proposal area, with 'Paddocks with scattered mature trees' (VSA 8) as the dominant VSA. The key fauna values of this VSA were in the mature trees, most of which were large native remnant trees (e.g. Marri). Mixed Marri woodland and Stream with mixed Marri (VSAs 1 and 2) were represented along road verges, in patches, and along the Abba River in the east; this is native remnant vegetation and likely supports the highest biodiversity due to the floristic and structural diversity. There were patches of Melaleuca dampland (VSA 6) which support a unique suite of species. The Flooded Gum stands (VSA 3) also likely provide foraging, roosting and connectivity value. VSA descriptions are in the table below.

TABLE 6-1: VSA DESCRIPTIONS

VEGETATION AND SUBSTRATE ASSOCIATIONS		
VSA 1	Mixed Marri Woodland	Closed woodland of Marri (*Corymbia calophylla*) with scattered Jarrah (*Eucalyptus marginata*), Flooded Gum (*Eucalyptus rudis*) and Swamp Mahogany (*Eucalyptus robusta*) over a sparse midstorey of *Kunzea sp, Agonis flexuosa*, *Xanthorrhoea pressii*, and *Banksia grandis* with a disturbed understory of introduced grasses on grey to white sand.
VSA 2	Stream with mixed Marri	Closed remnant woodland with Marri (*Corymbia calophylla*) and patches of *Eucalyptus rudis* over an open midstorey of Agonis flexuosa and Melaleuca rhaphiophylla, with an understorey of exotic grasses and sedges on grey sand along stream banks.
VSA 3	Flooded Gum stand	Open stand of Flooded Gum (*Eucalyptus rudis*) with no midstorey and understorey consisting of invasive grasses and weeds on grey to white sand.
VSA 4	Planted Eucalypts	Open woodland or stand of scattered planted mature eucalypt trees (often exotic) such as *Eucalyptus camaldulensis* and *Corymbia maculata* over a grassy understorey on grey to white sand.
VSA 5	Stream with Planted Eucalypts	Human-made stream (irrigation channel) with introduced eucalypts on banks with no midstorey or understorey over introduced grasses on grey to white sand.
VSA 6	Melaleuca Dampland	It ranges from open to closed damp land with Melaleuca rhaphiophylla, a midstory of scattered Kunzea, and an understorey of invasive weeds and grasses on dark grey sand. It appears to be seasonally inundated.
VSA 7	Planted Garden	Ornamental species are in proximity to dwellings, with scattered introduced eucalypts, remnant and planted Agonis flexuosa, and pine trees (*Pinus pinaster*) on grey to white sand.
VSA 8	Paddocks with scattered mature trees	Previously cleared paddocks planted with exotic planted grasses, used for grazing, with scattered mature trees, mostly native remnant and some planted, on grey to white sand.

FAUNA ASSEMBLAGE

The desktop study identified 221 vertebrate fauna species as potentially occurring in the Proposal area: 10 fish, nine frogs, 28 reptiles, 150 birds (four introduced), 18 native mammals and six introduced mammals. A further 16 species (10 mammals, two birds, two reptiles and two fish) are considered locally extinct. The assemblage is typical of that expected in similar rural areas of the Swan Coastal Plain. Although a large number of species are expected in the Proposal area, only one-third of these are expected as residents; more species would be expected as residents in the Proposal area if land clearing, habitat fragmentation and habitat degradation were less extensive. The assemblage is likely to be incomplete for all fauna groups, particularly for mammals.

6.4.2. SPECIES OF CONSERVATION SIGNIFICANCE

The extant assemblage includes 56 species of conservation significance and 16 locally extinct species of conservation significance: one fish (CS2), three reptiles (all CS3), 43 birds (six CS1, three CS2, 34 CS3), and

nine mammals (three CS1, four CS2, and two CS3). Species classed as CS1 are those listed under legislation (EPBC Act and BC Act), while those classed as CS2 are listed as Priority by the Department of Biodiversity Conservation and Attractions (DBCA), but not listed under legislation. The CS3 class is more subjective but includes locally significant species that have declined extensively in an area due to natural or human-induced impacts, and species that occur at the edge of their range. A summary of the species is provided in the following tables.

TABLE 6-2: CONSERVATION SIGNIFICANT FAUNA SPECIES EXPECTED TO OCCUR WITHIN THE PROPOSAL AREA

LATIN NAME	COMMON NAME	STATUS	EXPECTED OCCURRENCE*
FISH			
Geotria australis	Pouched Lamprey	CS2 (P3)	Regular visitor
REPTILES			
Chelodina oblonga	South-west Long-necked Tortoise	CS3	Resident
Egernia luctuosa	Mourning Skink	CS3	Resident
Morelia spilota imbricata	South-west Carpet Python	CS3	Irregular visitor
BIRDS			
Dromaius novaehollandiae	Emu	CS3	Irregular visitor
Oxyura australis	Blue-billed Duck	CS2 (P4)	Irregular visitor
Stictonetta naevosa	Freckled Duck	CS3	Irregular visitor
Phaps elegans	Brush Bronzewing	CS3	Irregular visitor
Cacomantis flabelliformis	Fan-tailed Cuckoo	CS3	Regular visitor
Chalcites basalis	Horsfield's Bronze-Cuckoo	CS3	Regular visitor
Chalcites lucidus	Shining Bronze-Cuckoo	CS3	Regular visitor
Heteroscenes pallidus	Pallid Cuckoo	CS3	Regular visitor
Plegadis falcinellus	Glossy Ibis	CS1 (MI, S1D2)	Irregular visitor
Ixobrychus flavicollis australis	Black Bittern (southwest subpop.)	CS2 (P2)	Vagrant
Turnix varius	Painted Button-quail	CS3	Irregular visitor
Glareola maldivarum	Oriental Pratincole	CS1 (MI, S1D2)	Vagrant
Tyto novaehollandiae	Masked Owl (southwest)	CS2 (P3)	Irregular visitor

LATIN NAME	COMMON NAME	STATUS	EXPECTED OCCURRENCE*
Lophoictinia isura	Square-tailed Kite	CS3	Irregular visitor
Merops ornatus	Rainbow Bee-eater	CS3	Regular visitor
Falco berigora	Brown Falcon	CS3	Irregular visitor
Falco peregrinus	**Peregrine Falcon**	**CS1 (S1D3)**	**Regular visitor**
Calyptorhynchus banksii naso	**Forest Red-tailed Black-Cockatoo**	**CS1 (VU, S2D3)**	**Regular visitor**
Zanda baudinii	**Baudin's Black-Cockatoo**	**CS1 (EN, S2D2)**	**Regular visitor**
Zanda latirostris	**Carnaby's Black-Cockatoo**	**CS1 (EN, S2D2)**	**Regular visitor**
Platycercus icterotis	Western Rosella	CS3	Irregular visitor
Polytelis anthopeplus	Regent Parrot	CS3	Regular visitor
Climacteris rufus	Rufous Treecreeper	CS3	Vagrant
Malurus elegans	Red-winged Fairy-wren	CS3	Irregular visitor
Malurus splendens	Splendid Fairy-wren	CS3	Resident
Stipiturus malachurus	Southern Emu-wren	CS3	Irregular visitor
Melithreptus chloropsis	Gilbert's Honeyeater	CS3	Irregular visitor
Acanthiza apicalis	Inland Thornbill	CS3	Resident
Acanthiza inornata	Western Thornbill	CS3	Regular visitor
Sericornis maculatus	Spotted Scrubwren	CS3	Resident
Daphoenositta chrysoptera	Varied Sittella	CS3	Regular visitor
Falcunculus frontatus	Crested Shrike-tit	CS3	Vagrant
Colluricincla harmonica	Grey Shrike-thrush	CS3	Regular visitor
Pachycephala occidentalis	Western Whistler	CS3	Regular visitor
Pachycephala rufiventris	Rufous Whistler	CS3	Resident
Artamus cyanopterus	Dusky Woodswallow	CS3	Regular visitor
Myiagra inquieta	Restless Flycatcher	CS3	Irregular visitor
Eopsaltria griseogularis	Western Yellow Robin	CS3	Irregular visitor
Melanodryas cucullata	Hooded Robin	CS3	Irregular visitor
Microeca fascinans	Jacky Winter	CS3	Irregular visitor

LATIN NAME	COMMON NAME	STATUS	EXPECTED OCCURRENCE*
Petroica boodang	Scarlet Robin	CS3	Regular visitor
Quoyornis georgianus	White-breasted Robin	CS3	Irregular visitor
Stagonopleura oculata	Red-eared Firetail	CS3	Irregular visitor
MAMMALS			
Tachyglossus aculeatus	Echidna	CS3	Irregular visitor
Dasyurus geoffroii	Chuditch	CS1 (VU, S2D3)	Vagrant
Phascogale tapoatafa wambenger	South-western Brush-tailed Phascogale	CS1 (S1D1)	Vagrant
*Isoodon fusciventer**	Quenda	CS2 (P4)	Regular visitor
Pseudocheirus occidentalis	**Western Ringtail Possum**	**CS1 (CR, S2D1)**	**Regular visitor/ possible resident**
Notamacropus irma	Brush Wallaby	CS2 (P4)	Irregular visitor
Hydromys chrysogaster	Rakali	CS2 (P4)	Regular visitor
Rattus fuscipes	Bush Rat	CS3	Resident
Falsistrellus mackenziei	Western False Pipistrelle	CS2 (P4)	Regular visitor

Species are listed in taxonomic order.

- CS1, CS2, CS3 = (summary) levels of conservation significance.
- EPBC Act listings: CR = Critically Endangered, EN = Endangered, VU = Vulnerable, MI = Migratory.
- BC Act 2016 listings: S1 to S3 = Schedules 1 to 3, D1 to D3 = Divisions 1 to 3.
- DBCA Priority species: P1 to P5 = Priority 1 to 5.
- **Bold** = CS1 species that are regular visitors to the Site and of greatest importance.

Most notable for the Proposal is the three Black-Cockatoo species, which are likely to use the area for foraging, roosting, and possibly nesting, and the Western Ringtail Possum, which is expected to be a regular visitor or resident in the area (although not observed during the survey).

Information on the conservation status, distribution and habitat, salient ecology and expected occurrence within the Proposal area is provided in (BCE, 2024) for species or groups of species expected as resident, regular visitor or irregular visitor. Vagrants and locally extinct species are generally not discussed.

6.4.3. TARGETED BLACK COCKATOO ASSESSMENT

All three species of Black-Cockatoo are expected to be regular visitors to the Proposal area, with the Carnaby's Black-Cockatoo observed during the field investigations. Although not directly observed during the investigations, foraging evidence for both Baudin's Black-Cockatoo and Forest Red-tailed Black-Cockatoo was recorded across the Proposal area.

6.4.4. POTENTIAL NESTING HABITAT

The Proposal area's suitability for potential nesting habitat was assessed by checking for large, potentially hollow-bearing trees that may facilitate nesting by Black Cockatoos, and assigning trees a rank using a system developed by Bamford Consulting Ecologists (BCE). DSEWPaC (2012) and DAWE (2022) consider trees that meet the basic criterion of having a DBH >500mm (or >300mm for Wandoo) as being potential Black-Cockatoo nesting trees. The BCE ranking system allows trees that meet this criterion to be assessed as to the likelihood of a tree actually being used for nesting (BCE, 2021; 2022). Trees with a rank of 4 or 5 are extremely unlikely to contain hollows that could be used for nesting, although could eventually develop hollows of suitable size. Trees ranked from 1 to 3 are either being used (rank of 1), have been recently used based on chew marks around a suitable hollow entrance (rank of 2), or have potentially suitable hollows that have not been recently used (rank of 3).

Within the Proposal area, 720 trees met the DAWE and DEE (2017) criteria for nesting trees. Of these, 34 were ranked 3 (i.e. possibly suitable hollows), 46 were ranked 4 and 640 were ranked 5. No trees ranked 2 (evidence of recent use) or 1 (in use) were found.

In January 2024, 17 of the rank 3 trees that lay within the disturbance area were revisited and inspected with a pole camera. Seven of these were downgraded to a rank of 4 or 5 due to what appeared to be the hollow being solid wood or too small on closer inspection, while three trees were considered to possibly be rank 3 but possibly rank 4; one of these could not be reached with the pole camera, in another the entrance was blocked by bees and the third was too difficult to maneuver the camera to see into the hollow. In the case of the hollow that was too high to examine, it appeared the stem below the hollow was too narrow for a black cockatoo (the stem was dead and thus would not grow). This left 7 trees with rank 3 in the disturbance area and 24 rank three trees overall. The final classifications are 24 rank three trees, 57 rank four trees and 640 rank five trees, with a total of 721 trees that met the potential nest-tree criterion. The total number of trees increased to 721 due to changes in accessibility.

Furthermore, 43 trees with DBH>500mm (including two with hollows), previously avoided for the Original Proposal now also require clearing. These trees are co-located within the 9.83ha of native vegetation/foraging habitat to be cleared.

The locations of the trees and their rankings are shown in Figure 6-1, with Figure 6-2 showing the trees with possibly suitable hollows. Details of each tree with DBH>500mm, including GPS coordinates and rankings, are provided in Appendix 8 of BCE (2023) (Appendix 9).

The DBCA threatened species database returned three confirmed nesting hollows within 15km of the project, these are of the Carnaby's Black-Cockatoo and were all natural breeding hollows (not artificial hollows). The closest breeding site to the Proposal area is located 4.2km northeast.

6.4.5. ROOSTING HABITAT

Within the Proposal area, there are potential roost sites scattered throughout; effectively wherever there are tall trees (and there are at least 721 of DBH >500mm or greater). Three Carnaby's Black-Cockatoos were flushed from a stand of planted eucalypts opposite the existing mine. Their presence here in the middle of the day suggests it may be a day roost. There were no Black-Cockatoos heard nor seen during the roost survey, indicating there was no roost present within the Proposal area, at least on that day.

The presence of a nearby water source is an important feature of a roost, as the birds drink before roosting. There are several water sources present in the Proposal area in the form of water troughs, dams and creeks. The BirdLife database (which includes data from the Great Cocky Count) returned seven confirmed roosts

within 25km of the Proposal area, with the closest roost site being of the Forest Red-tailed Cockatoo and located 1.3km southwest of the Proposal area in a habitat similar to the project area's habitat.

6.4.6. FORAGING HABITAT

The Proposal area, in general, consists of low to high foraging values for all three species of Black-Cockatoos; foraging values. This shows foraging value based on vegetation characteristics, with the total value including context and species density (as outlined in Appendix 4 of BCE, 2023). A large proportion of the Proposal area is VSA 8 (paddocks with mature trees), and this VSA has a low foraging value of 3 out of 10 for all species. The presence of scattered mature trees is key to even this foraging value. The VSAs with the highest foraging values for all Black Cockatoos were Mixed Marri Woodland (VSA 1) and Stream with Mixed Marri (VSA 2). These VSAs provide a moderate foraging value for the Carnaby's Black-Cockatoo (6 out of 10) and a high foraging value for the Baudin's and Forest Red-tailed Black-Cockatoos (7 out of 10). In total 9.83ha of native vegetation (foraging habitat), including 113 trees with DBH>500mm will be cleared for the Proposal, with an additional 64 trees (1.07ha) present as isolated scattered paddock trees (DBH>500mm) to be cleared.

CARNABY'S BLACK COCKATOO

The foraging values for each VSA for the Carnaby's Black-Cockatoo are provided in the following table, with foraging values ranging from 1 to 6 out of 10, with most of the Proposal area being paddocks and scoring 3 out of 10. The VSAs with the highest foraging value (6 out of 10) were VSAs 1 and 2, containing Marri trees. VSA 8 was given a site context score of 0 because this VSA is so widespread in the area and a species stocking rate of 1 because it provides a foraging habitat that black cockatoos will use.

The species is expected to forage in the area regularly; Harewood (2020) found records of Carnaby's Black-Cockatoo foraging on marri nuts and pine cones for the Original Project.

BAUDIN'S BLACK COCKATOO

The foraging value for each VSA for the Baudin's Black-Cockatoo is given in the following table, with foraging values ranging from 1 to 7 out of 10, and the majority of the Proposal area being paddocks and scoring 3 out of 10. The VSAs with the highest foraging value (7 out of 10) were VSAs 1 and 2, containing Marri trees.

The species is expected to forage in the area when it visits; Harewood (2020) found records of Baudin's Black-Cockatoo foraging on marri nuts in the immediate vicinity of the Original Project.

FOREST RED-TAILED BLACK COCKATOO

The foraging values for each VSA for the Forest Red-tailed Black-Cockatoo are the same as those for the Baudin's Black-Cockatoo and are given in the following table. Foraging values range from 1 to 7 out of 10, with the majority of the project area being paddocks and scoring 3 out of 10. The VSAs with the highest foraging value (7 out of 10) were VSAs 1 and 2, containing Marri trees. The species is expected to forage in the area regularly.

6.5. WESTERN RINGTAIL POSSUM

There was no evidence of the Western Ringtail Possum in the Proposal area; no dreys or scats were found, and no individuals were observed during spotlighting. However, this species is expected to be at least a regular visitor and possibly a resident (albeit in small numbers, reflecting the limited amount of habitat available) in the Proposal area, as it is known from similar environments in the immediate vicinity and suitable habitat is present in the Proposal area.

The Busselton area is recognised as a stronghold for the species, with over 150 records returned from the DBCA threatened species database within 5km of the Proposal area. Harewood (2009) documented the species as occurring in remnant native vegetation in farmland in an area c. 5km east of the Proposal area. Multiple individuals were observed during BCE surveys at Tutunup in 2019, 2020, and 2022 (McCreery *et al*., 2023). (Harewood, 2020) found dreys and recorded one individual along the McGibbon Track within the Original Proposal area. However, no subsequent sightings have occurred in the year immediately prior to and during the operation of the Mine.

6.6. POTENTIAL IMPACTS

The Proposal may result in the following impacts on fauna and fauna habitats:

- Direct clearing of fauna habitat resulting in the loss or fragmentation of fauna habitat;
- Death, injury and/or displacement of fauna species as a result of clearing and construction activities;
- Dewatering activities may affect GDEs and the ecological character of the Vasse-Wonnerup Ramsar wetland, which may reduce the value of fauna habitat resulting in displacement of fauna and migratory species;
- Vehicle movements during construction and operation may result in the loss of individual fauna, especially less-mobile species, from vehicle strikes;
- The presence of artificial water bodies may result in the loss/injury of individual fauna;
- Increase in the number of predatory introduced species;
- Light, noise and dust emissions could disrupt fauna behaviour or reduce the value of fauna habitat;
- Introduction and/or spread of Phytophthora dieback which may reduce the value of fauna habitat;
- Altered fire regime, which may reduce available fauna habitat.

6.7. ASSESSMENT OF IMPACTS

6.7.1. CLEARING OF FAUNA HABITAT

FAUNA HABITAT CLEARING AND FRAGMENTATION

Determining the regional impacts on fauna habitats is difficult as most fauna would not be confined to a certain vegetation complex or soil-landscape system. However, in order to provide some regional context on the significance of habitat clearing, impacts on the Abba vegetation complex have been assessed. The area proposed to be cleared to facilitate the Proposal represents only 0.29% (i.e. 9.83ha of 3,359.08ha) of the current area remaining, which does not significantly reduce its extent.

Almost all native fauna relies on native vegetation to provide food, shelter, and breeding sites. Clearing native vegetation may reduce the habitat's capacity to support fauna, potentially resulting in the displacement of fauna.

Natural areas in the southwest of Western Australia have been significantly altered since European settlement in the 1830s. A variety of environmental factors, particularly habitat fragmentation and fire, will continue to threaten many species of fauna with local extinction. As the local development of land progresses, the significance of any remnant vegetation increases.

The extent of natural fauna habitat within the Proposal area is relatively small, and the remnants present are generally highly degraded and fragmented. As such, the overall value of fauna can be regarded as low compared to nearby areas such as the Whicher Range and Ludlow Tuart Forest.

Disturbance for the Proposal will primarily be confined to completely degraded vegetation and isolated scattered paddock trees. Therefore, the required clearing will only involve removing a very small area of native vegetation (predominantly overstorey species). These areas would only be utilised by a very small percentage of the predicted/known species given their very low habitat values and do not comprise areas of high biological diversity. Given that the existing value of habitat to fauna is low, along with the location and extent of the Proposal, the clearing of 9.83ha of native vegetation (in Completely Degraded or Degraded condition), including 113 trees with DBH>500mm and 1.07ha (64 trees) of isolated scattered paddock trees is extremely unlikely to affect any area of habitat considered to be of high biological diversity.

Native vegetation within the Proposal area generally comprises fragmented isolated patches of completely degraded or degraded vegetation, likely due to past and current farming activity.

The Proposal area is located within a network of regional ecological axis lines linking the Millbrook State Forest and Whicher National Park in the south to the Vasse-Wonnerup Wetlands and Ludlow State Forest to the north (Ecoedge, 2023). There are few vegetation parcels within the Proposal area with a linkage PV rating due to the cleared and grazed condition of the vegetation. These patches of remnant vegetation have a PV rating of 3b and 3c based on their levels of separation from the axis lines and proximity to the Abba River tributaries (Ecoedge, 2023). Given that the proposal will not directly impact these vegetation corridors, fragmentation is unlikely to occur due to its implementation.

DIRECT IMPACTS TO FAUNA OF CONSERVATION SIGNIFICANCE

BLACK COCKATOO FORAGING HABITAT

All three species of Black Cockatoos are expected to be regular visitors to the Site, as all have recorded observations within 5km of the Site (BCE, 2024). During the BCE field investigation, only the Carnaby's were observed at the time, with the presence of Baudin's and Red-tailed Black Cockatoo only recorded via foraging evidence.

The Proposal area provides value for all three Black-Cockatoo species for foraging and, to a lesser degree, potential nesting. A total area of 9.83ha of native vegetation/Black Cockatoo foraging habitat, including 113 trees with DBH>500mm, will be disturbed for the Proposal, which, although assessed as generally low-quality foraging habitat, includes some patches that are at least of moderate foraging quality for the three species. In addition, 64 trees (1.07ha) with DBH >500mm will also require clearing for the Proposal.

In general, however, the extent of quality foraging habitat within the Proposal area can be regarded as those areas containing marri, jarrah and banksia, located mainly along the Abba River and Road Reserves. Most vegetation does not fall within the disturbance area and will not be affected by the Proposal.

BLACK COCKATOO POTENTIAL NESTING HABITAT

A total of 173 trees with DBH>500mm (113 included within native vegetation areas and 64 present as isolated scattered paddock trees) within the Proposal area will require clearing for the Proposal (Figure 6-1).

Following the January 2024 follow-up visit of Rank 3 trees (BCE, 2024), only seven trees received a rank 3 score (i.e. containing possibly suitable hollows). However, none of the hollows showed any conclusive evidence of actual use by nesting Black Cockatoos. Doral subsequently reviewed the mine plan, and it was

determined that five of the seven Rank 3 trees could be avoided. However, the remaining two rank 3 trees are within or close to a deep mine void and could not be avoided. In addition, two trees containing possibly suitable hollows, avoided from disturbance for the Original Proposal, will also be cleared for the Proposal. The BC trees containing possibly suitable hollows are shown in Figure 6-2.

Based on available vegetation mapping, it is estimated that there is approximately 13,300ha of native vegetation within 10km of the Proposal area, much of which is likely to represent potential Black Cockatoo foraging and breeding habitat of some type.

Doral has designed disturbance areas for the Proposal to utilise existing areas of cleared pasture and avoid clearing native vegetation as far as practicable to reduce direct impacts on Black Cockatoo foraging and potential nesting habitat. This has resulted in avoiding ~20ha of native vegetation and 587 potential nest trees (i.e. DBH>500mm), with the generally larger areas/patches of native vegetation being avoided.

No disturbance to known roost trees will occur due to the implementation of the proposal.

WESTERN RINGTAIL POSSUM HABITAT

Suitable habitat for the species occurs in the Proposal area, particularly along road verges and along the Abba River; however, there was no evidence of the Western Ringtail Possum (WRP) in the Proposal area; no dreys or scats were found, and no individuals were observed during spotlighting (BCE, 2024). All vegetation along the Abba River has been avoided from disturbance, and vegetation to be cleared is generally in completely degraded or degraded condition. Doral has identified no evidence of WRPs during the implementation of the current Project.

Fauna habitat present within the Proposal area is outside of Area 1 - Core Habitat, Area 2 - Primary Corridors and Area 3 - Supporting Habitat as documented in the *Significant Impact Guidelines for the Vulnerable Western Ringtail Possum in the Southern Swan Coastal Plain, Western Australia* (DEWHA, 2009). As such clearing of 9.83ha of Completely Degraded vegetation does not trigger any of the Significant Impact Assessment criteria detailed on page 7 of (DEWHA, 2009). The nearest core habitat to the Site occurs in Tuart Forest National Park (DEWHA, 2009)

MIGRATORY BIRDS

Species of migratory birds assessed by the Commonwealth (2017/8094) during the Original Proposal remain unlikely to utilise the Proposal area, and indirect impacts to these species and habitat (i.e. Vasse-Wonnerup Ramsar wetland) from dewatering activities will not occur, as it is well outside the maximum extent of groundwater drawdown (~3.5km). As such no effect to the ecological character of the Vasse-Wonnerup Ramsar wetlands and migratory species will occur as a result of the Proposal.

Based on available information, no substantial impacts on any fauna species or overall biodiversity values are anticipated as a consequence of the implementation of the proposal. In cases where some impact is anticipated, the degree of the impact is only expected to be very low. It relates to the loss of very small areas of habitat, primarily in the form of a small number of scattered, isolated paddock trees.

6.7.2. DEATH, INJURY AND DISPLACEMENT OF FAUNA FROM CLEARING AND VEHICLE MOVEMENTS

Clearing of native vegetation by machinery prior to mining has the potential to result in death, injury or displacement of resident fauna, particularly on less mobile species. The construction and operation of the Proposal will also result in an increase in vehicle movement to and from the site. Vehicle movements may result in the loss of individual fauna, especially less-mobile species, from vehicle strikes.

Some loss of fauna may occur as a result of these activities. However, mitigation measures will be implemented to ensure that impacts on fauna are minimised as far as practicable. Isolated deaths of individual fauna are not expected to affect any fauna species' distribution or conservation status.

Mitigation measures will include:

- Pre-clearing Surveys and Doral Clearing Permit authorisation;
- Restricted speed limits on access roads;
- Education of staff during inductions and regular toolbox meetings.

6.7.3. GROUNDWATER DRAWDOWN ON GDE/FAUNA HABITAT

AQ2 (2024) model predictions suggest that there will be drawdowns in areas of potential GDEs across the Proposal area over the life of the mine. These drawdowns have the potential to impact groundwater use by areas of groundwater-dependent vegetation close to mining areas. It should be noted that the magnitude of change in groundwater level (i.e. drawdowns of more than 0.25m) thresholds have been used by AQ2 (2024).

The modelling predicts the dewatering operations for the Proposal will temporarily cause groundwater levels to decline and fall outside the seasonally observed range. The magnitude of the change in groundwater levels (i.e. drawdowns of more than 0.25 m) exceeds thresholds that could potentially result in impacts to the vegetation in GDE_1, GDE_2, GDE_5, GDE_7 and GDE_8, totalling 0.68ha.

It is noted that the majority of this vegetation is in Completely Degraded condition and likely to provide little value to most fauna, with the exception of the Black Cockatoo foraging habitat. However, long-term post-mining effects on water levels are expected to be minimal. The recovery of water levels will commence immediately once mining of each active mine pit is completed, owing to backfilling of mined-out pits. Once all mining areas are completed, dewatering will cease, and water levels will continue to rise until a steady state or equilibrium water level is resumed. The numerical model shows that water levels are predicted to return to pre-mining levels within 12 months of mine closure (i.e. by December 2037).

As documented in the most recent 2023 GDE Performance Report (Doral, 2023a), water potential and visual health monitoring results for the McGibbon Track GDEs (including GDE_2) demonstrate minimal health impacts to vegetation caused by the mining/dewatering operations during the 2022-23 reporting period. Continued implementation of the GDE EMP (amended for the Proposal area) is considered adequate to avoid significant indirect impacts associated with groundwater drawdowns on groundwater-dependent vegetation.

6.7.4. PRESENCE OF ARTIFICIAL WATERBODIES

The presence of drains and other artificial water bodies for the Proposal (i.e. open cut drains) may attract native fauna, entrapping animals, possibly resulting in death as a result of drowning. Artificial water bodies may also attract introduced fauna that rely on artificial water bodies for drinking.

As there are existing nearby water sources in the vicinity of the Proposal, such as the Sabina River and Abba River, several on-site drains, and the existing process water dams, drains, etc., associated with the existing Mine, some of the above impacts may already be occurring. The provision of additional artificial water bodies may increase these impacts.

6.7.5. INCREASED PREDATION

Some fauna species (particularly smaller mammals) are sensitive to predation by foxes and feral cats. Foxes and feral cats may increase in abundance around the proposed mine site due to an increase in rodents, access to waste/scraps, and/or feeding by personnel. Waste management procedures currently in place will continue to be implemented by Doral to ensure that fauna has no access to scraps or rubbish.

6.7.6. LIGHT, NOISE AND DUST EMISSIONS

Light, noise and dust emissions are all likely to increase due to mining activities. The impacts of these emissions on fauna are difficult to predict, and therefore, a precautionary approach will be adopted, and emissions will be reduced as far as practicable. Lighting will be directed onto construction and operational areas and will be in accordance with Australian Standard *AS4282-1997 Control of the obtrusive effects of outdoor lighting*. A Noise Management Plan will continue to be implemented to minimise noise emissions and impacts. A Dust Management Plan will continue to be implemented to mitigate the generation of dust as far as practicable.

6.7.7. INTRODUCTION AND SPREAD OF WEEDS AND DIEBACK

Mining activities and vehicle movements have the potential to result in the spread of weeds within and adjacent to the Proposal area. Environmental weeds are described by DEC (1999) as 'plants that establish themselves in natural ecosystems and proceed to modify natural processes, usually adversely, resulting in the decline of communities they invade'. Environments affected by mining activities are highly susceptible to invasion by weeds, as disturbances to soils caused by mining operations (i.e. creating bare ground) provide an ideal habitat where weeds can readily colonise and quickly become the dominant vegetation. Weeds pose a key risk, not only during the operational phases of mining but also during rehabilitation or care and maintenance phases. Weed infestations can compete directly (as well as indirectly) with native or selected revegetation species and also increase the risk of fires (and fire intensity) that may damage revegetated areas. Weeds have the potential to substantially change the dynamics of natural ecosystems by:

- Competing with or displacing native plant species;
- Affecting natural processes such as fire intensity, stream flows and water quality;
- Changing habitats and therefore impacting on ecosystem health;
- Diminishing natural aesthetic values.

Strict weed hygiene measures will continue to be implemented for the Proposal (as they currently are for the existing Project area) to reduce the risk of weed introduction and spread into areas of native vegetation. Measures will be implemented to target the control of the Declared Plants *Asparagus asparagoides* and *Zantedeschia aethiopica*. Weed management will be implemented as per MS1168 Condition 7, Flora and Vegetation Environmental Management Plan, which has been updated for the Proposal.

One small area (0.3ha) of vegetation identified as 'infested' with *Phytophthora* dieback by (BARK Environmental, 2019) is present within the Princefield Road reserve (within the Original Project area). This small area is now included within the proposed mining area and will require management to ensure dieback is not spread. Management of this small area of dieback will include the following:

- Area to be clearly delineated and communicated to Mine personnel;

- Clearing of vegetation and stripping of topsoil/overburden will be undertaken in dry conditions (i.e. Summer/Autumn);
- All vegetation, topsoil and root matter will be removed and deep buried (>5m) in a deep mine pit;
- All equipment used to remove at-risk topsoil materials to be decontaminated;
- All Doral field staff and earthmoving contractors will continue to be educated during Site induction and weekly meetings regarding the presence of dieback, access and movement restrictions, and necessary hygiene measures to minimise the risk of contaminating dieback-free areas.

6.7.8. ALTERED FIRE REGIME

The Proposal area has been identified as a designated bushfire-prone area by the Fire and Emergency Services Commissioner as being subject, or likely to be subject, to bushfire attack.

Implementing the proposal may alter the natural fire regime due to improved access and increased human activity associated primarily with flammable liquids, combustible materials, and hot machinery. The risk of causing fire during the operations can potentially increase the frequency of fires in the project location. However, large areas of bare earth may act as firebreaks in the event of a blaze from adjacent farming or mining areas.

The potential consequences of an altered fire regime have the potential to affect 20ha of vegetation used as fauna habitat within the Proposal Area (excluding vegetation to be cleared). Fire risk will be managed by implementing a Fire Management Plan for the existing Minesite.

6.8. MITIGATION

6.8.1. AVOID

The Proposal has been designed to utilise existing cleared pasture areas (i.e. 871.29 ha) and avoid the need for clearing native vegetation/foraging habitat as far as practicable. This has resulted in ~20ha of native vegetation being successfully avoided from disturbance. In addition, a total of 587 trees with DBH>500mm, including five containing potentially suitable hollows have been avoided from disturbance.

6.8.2. MINIMISE

In accordance with MS1168, Doral will continue to implement the following key management measures to minimise impacts to terrestrial fauna values.

PRE-CLEARING SURVEYS

Pre-clearing surveys will be conducted, including pole-top cameras, where necessary before any vegetation is cleared. Fauna present in the clearing area will be encouraged to move to nearby vegetation or captured and relocated in adjacent vegetation near the Site (such as Woddidup Creek/drainage line, Lower Sabina River or Abba River). The capture/relocation will be undertaken by a qualified fauna handler with the appropriate licences in place.

For Black Cockatoos, a pre-clearing survey using the “Great Cocky Count” method (Peck, et al., 2018) will be undertaken prior to clearing any Black Cockatoo potential nesting tree containing a possibly suitable hollow.

FAUNA MANAGEMENT PLAN

Doral will update and continue to implement a Fauna Management Plan as per MS1168 Condition 8-2, to address potential impacts to fauna of conservation significance and their associated habitat. The Fauna Management Plan will include the following key management actions:

- Development and implementation of specific clearing procedures to minimise impacts on fauna and fauna habitats. This will include demarcation of cleared areas, pre-clearing surveys and authorisation requirements;
- Pre-clearing survey using the "Great Cocky Count" methods (Peck, et al., 2018) will be undertaken prior to clearing any Black Cockatoo potential nesting tree containing a possibly suitable hollow;
- Vehicle speeds on site will be restricted. All collisions with fauna are to be reported and recorded through Doral's Hazard and Incident Management System (myOHS);
- Native fauna injured during clearing or normal site operations should be taken to a designated veterinary clinic or a nominated wildlife carer;
- No dead, standing or fallen timber will be removed from the site unnecessarily;
- To minimise the potential impacts of artificial water bodies and drains on fauna Doral will:
    - Design the site to reduce accessibility to most artificial water sources and drains;
    - If artificial ponds or drains are directly adjacent to native vegetation then use perimeter fencing to exclude larger animals;
    - Prevent overflow of artificial waterbodies and drains in dry conditions;
    - Non-slippery sides to ponds/drains and/or egress points so that any animals that enter the artificial waterbody may escape;
    - Any trenching required for services or drains should be kept open only for as long as necessary, and suitable escape ramps should be provided.
- All staff working on site will be educated with regard to protected fauna;
- Weapons and pets will not be permitted on site;
- Wastes will be managed appropriately to ensure that fauna have no access to scraps or rubbish
- Contribute to feral species removal such as fox/cat;
- Lights at night will be directed towards operation activities in accordance with AS4282-1997, *Control of the obtrusive effects of outdoor lighting.*

Environmental targets and performance indicators will be developed to ensure fauna management can be monitored and audited.

GDE MANAGEMENT PLAN

A GDE Management Plan (Appendix 7) has been prepared to minimise impacts to flora and vegetation values from indirect impacts associated with groundwater drawdowns. As detailed in the Plan, monitoring will comprise a combination of hydrological parameters and vegetation health assessments using qualitative criteria. This will comprise:

- Groundwater level monitoring in a network of six proposed new GDE monitoring wells located near GDE_1, GDE_5, GDE_7 and GDE_8 (it is noted an existing GDE monitoring well is located at GDE_2 as part of the existing GDE EMP);
- The following management response triggers and contingency measures will apply:
- Lagging indicators designed to provide redundancy in risk identification and allow verification of the success of management interventions.
- Triggers have been designed around parameters that may be affected by mining-induced changes to the water regime (i.e. groundwater levels). Soil moisture is not included as a monitoring parameter because it is influenced by infiltrating rainfall, and this will not be affected by mining.
- For all trigger exceedances, the management response will be that water supplementation is required. The final design for the supplementation scheme will be completed during the implementation of the GDE Management Plan.
- Supplementation will be based on a combination of:
    - Surface irrigation.

The supplementation scheme will have the following design criteria:

- To supply enough water to offset declines in groundwater levels (i.e., maintain levels within the natural range under the GDEs). This will be determined using the existing groundwater model;
- To be operationally effective. This will be assessed during the engineering design of the scheme based on aquifer parameters derived during previous groundwater investigations;
- To incorporate a monitoring program that can confirm the supplementation system's efficacy. The monitoring program outlined in this plan will achieve this.
- Supplementation water will be sourced from the Yarragadee aquifer to ensure sufficient water quality within the GDEs without risk of impacts due to acidification or dieback.

GROUNDWATER OPERATING STRATEGY

The groundwater system will continue to be carefully managed for the Proposal area in order to avoid or minimise impacts to GDEs due to mining operations. The Groundwater Operating Strategy (GWOS) (Appendix 8) has been amended to include the Proposal area and includes a groundwater and surface water monitoring program (i.e. abstraction, discharge, water levels and water quality) and has been designed to assess aquifer performance, the potential impacts of groundwater abstraction proposed upon commencement of mining operations and specify operational requirements. Trigger levels and contingency actions have been developed to mitigate potential impacts caused by the mining operations and ensure the actual impacts are not greater than predicted. The GWOS has been prepared in accordance with *Operational Policy 5.08 - Use of operating strategies in the water licensing process* (DoW, 2011) and the DWER guidelines for the preparation of Operating Strategies for mineral sand mine dewatering licences in the South West Region (DWER, 2015).

FIRE MANAGEMENT PLAN

A Bushfire Management Plan will continue to be implemented to manage the risk of unplanned fires and provide contingency measures to minimise any associated impacts. The plan will include a fire response procedure in the event of any bushfires that commence as a result of the works on site.

6.8.3. REHABILITATE

Doral has prepared and will implement a Rehabilitation Management Plan (Appendix 7) for the Proposal.

Doral will also update and implement an updated Mine Closure Plan and submit it to DEMIRS in conjunction with the Mining Proposal as required under the *Mining Act 1978*.

6.8.4. OFFSETS

An assessment of the significance of the residual impacts has been undertaken in accordance with the WA Environmental Offset Guidelines (Government of Western Australia, 2014) and is provided in Section 11 Offsets.

Following the application of the mitigation hierarchy, a significant residual impact on the following fauna habitat may occur:

- Direct impact to 9.83ha, including 113 trees with DBH>500mm of generally low-quality Black Cockatoo foraging habitat
- Direct impact to an additional 64 (1.07ha) trees with DBH>500mm, present as isolated scattered paddock trees;
    - Four of the 173 trees that require clearing (described above) contain possibly suitable hollows; however, show no evidence of actual use.

As detailed further in Section 11 – Offsets, Doral is committed to providing a suitable offset (land acquisition and revegetation) to secure a positive environmental outcome for the Proposal.

6.9. ASSESSMENT OF RESIDUAL IMPACTS

After applying the mitigation hierarchy described above, no substantial impacts on any fauna species or overall biodiversity values are anticipated as a consequence of clearing for the Proposal. In cases where some impacts are anticipated, the degree of the impact is only expected to be very low. It relates to the loss of minimal areas of suitable habitat, primarily in the form of a small number of scattered, isolated paddock trees and/or overstory species. This, coupled with the fact that most of the species known to or likely to occur are widespread, no overall change in their conservation status is anticipated, despite a possible, very localised/slight reduction in habitat extent.

A residual impact of 9.83ha of Black Cockatoo foraging habitat (including 113 trees with DBH>500mm) and 64 (1.07ha) Black Cockatoo potential nesting trees (DBH>500mm) present as isolated scattered paddock trees, will occur due to the Proposal. Of these trees, two are mapped as containing one or more hollows possibly suitable for a Black Cockatoo (Rank 3) which will require removal to enable mining. In addition, two trees containing hollows assessed as part of the Original Proposal by (Harewood, 2020a) (Harewood, 2020b) will also require clearing. All trees are present as scattered, isolated paddock trees, and an assessment by (BCE, 2024) (Harewood, 2020b) indicates that none of these trees show current signs of use for nesting by a Black Cockatoo.

Species of migratory birds identified as Matters of NES by DAWE are not likely to utilise the Proposal area, and indirect impacts to these species and habitat (i.e. Vasse-Wonnerup Ramsar wetland) from dewatering activities will not occur, as it is well outside the maximum extent of groundwater drawdown (~3.5km). As such no effect to the ecological character of the Vasse-Wonnerup Ramsar wetlands and migratory species will occur due to the Proposal.

Doral will implement various management plans, including a Fauna Management Plan, GDE Management Plan and GWOS to monitor vegetation health and groundwater levels during periods of drawdown, as well as conduct pre-clearing surveys of Black Cockatoo potential breeding habitat trees containing possibly suitable hollows in accordance with the "Great Cocky Count" methods (Peck, et al., 2018).

Revegetation of ~14.5ha of native vegetation using local provenance species, including habitat suitable for Black Cockatoos, will be provided to counterbalance the clearing of 9.83ha of predominantly completely degraded vegetation and 64 (1.07ha) isolated scattered paddock trees.

An assessment of significance in accordance with the *WA Environmental Offset Guidelines* (Government of Western Australia, 2014) is provided in Section 11 Offsets for the residual impacts to conservation significant fauna habitat.

6.10. ENVIRONMENTAL OUTCOMES

Doral considers that with the implementation of the above-listed key mitigation measures and provision of a suitable offset in consultation with DBCA and DCCEEW to offset residual impacts to Black Cockatoo foraging and potential nesting habitat, that the EPA's objective to protect terrestrial fauna so that biological diversity and ecological integrity can be maintained.

7. ENVIRONMENTAL FACTOR – INLAND WATERS

7.1. EPA OBJECTIVE

The EPA objective for Inland Waters is:

> *To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.*

7.2. POLICY & GUIDANCE

EPA Policy and Guidance

- *Environmental Factor Guideline – Inland Waters* (EPA, 2016i).

Other Policy and Guidance

- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC & ARMCANZ, 2000).
- *Western Australian Water in Mining Guideline. Water licensing delivery report series. Report No. 12* (DoW, 2013).
- *Hydrogeological Reporting Associated with a Groundwater Well Licence. Operational Policy 5.12.* (DoW, 2009).
- *Identification and investigation of acid sulfate soils and acidic landscapes* (DER, 2015a).
- *Treatment and management of soil and water in acid sulfate soil landscapes* (DER, 2015b).
- *Information Sheet on Ramsar Wetlands (RIS) – 2009-2014 version.*
- *Ecological Character Description for the Vasse Wonnerup Wetlands Ramsar Site in South-west Western Australia. Unpublished report to the Department of Environment and Conservation and Geographe Catchment Council Inc. by Wetland Research & Management. September 2007* (WRM, 2007).
- *Swan Coastal Plain South Management Plan 2016. Management plan number 85. Department of Parks and Wildlife, Perth* (DPaW, 2016).

7.3. ORIGINAL PROPOSAL

7.3.1. RECEIVING ENVIRONMENT

The following hydrogeological and hydrology assessments were undertaken by AQ2:

- Groundwater Modelling Assessment (AQ2, 2020a);
- Surface Water Assessment (AQ2, 2019a);
- Site Water Balance (AQ2, 2020b);
- Surface Water Discharge Assessment (AQ2, 2019b).

ENVIRONMENTAL VALUE AND BENEFICIAL USES

Environmental value is defined under the EP Act as a beneficial use or an ecosystem health condition and is described in (EPA, 2016i). Environmental values and beneficial uses of water considered relevant to the Original Proposal were limited to the following:

- Ramsar listed Vasse-Wonnerup wetlands;
- Lower Sabina River;
- Groundwater which may be abstracted for livestock and non-potable uses.

SURFACE WATER

The Original Proposal is within the Wonnerup (Busselton Coast) Surface Water Management sub-area and the Lower Sabina River sub-catchment. The Original Proposal is not within a proclaimed area for surface water management (DoW, 2009).

The Lower Sabina and Abba Rivers are located within ~1km of the Site to the southwest and northeast, respectively, generally flowing in a northwesterly direction. The Lower Sabina River flows from below the Sabina Diversion Weir to the Ramsar-listed Vasse-Wonnerup Wetlands. The Lower Sabina, Lower Vasse, Abba, and Ludlow rivers drain into the Vasse-Wonnerup Wetlands before discharging through the Wonnerup Inlet into Geographe Bay.

GROUNDWATER

Groundwater is present in the area within a multi-layered aquifer system. Three major aquifers have been identified within the Original Proposal area (ordered from shallow to deep), namely:

- Superficial;
- Leederville;
- Yarragadee.

The Original Proposal is wholly within the Busselton-Capel Groundwater Area (BCGA). The Busselton-Capel sub-area covers 757.3km^2 and is predominantly used by the service sector, mining and industry, and horticulture. Currently, the Superficial and Leederville aquifers in the subarea are fully allocated (DoW, 2009).

The Original Proposal is also within the Busselton-Yarragadee Groundwater Area (Yarragadee aquifer). The Busselton-Yarragadee subarea covers 2,021.4 km^2 and is fully allocated. The predominant use of this aquifer is for public water supply, mining and industry (DoW, 2009).

According to the DWER Water Register Database, there are currently 23 licensed groundwater users within the vicinity of the Site (i.e. within a 2km radius), of which two abstract from the Superficial aquifer, 21 from the Leederville aquifer and none from the Yarragadee aquifer (AQ2, 2020a).

GROUNDWATER DEPENDENT ECOSYSTEMS

Approximately 90% of the Original Proposal is mapped as a wetland in the Geomorphic Wetlands of the Swan Coastal Plain dataset (DEC, 2008a), all of which have been assessed as being in the 'Multiple Use' management category, which is described as wetlands with few ecological attributes and functions remaining. The majority of the wetland area within the Original Proposal (~77%) is mapped as Palusplain (seasonally waterlogged flat), with small areas of Sumpland (seasonally inundated basin, ~3%) and floodplain (seasonally inundated flats, ~17%). No wetlands of environmental significance are present.

Vegetation units within the Original Proposal area were described by Ecoedge (2020a). Three of these vegetation units are considered to be GDEs (A2, B1, and C3), and another unit, A1, while probably not a

GDE, has groundwater-dependant trees within it. Three no longer intact communities[3] (B2, C1, C2), are dominated by phreatophytic species.

The GDEs (A2, SCP02 and B1, SCP10b) and Unit A1 (SCP01b) are listed as TECs under the BC Act. Unit B1 (SCP10b), is also listed as Threatened under the EPBC Act. The occurrence of unit C3, however, is considered to be too small and badly degraded to be inferred as an example of the TEC, SCP09 (Ecoedge, 2020a).

ACID SULFATE SOILS

The Site occurs in an area depicted on an ASS risk map as Class II 'moderate to low risk of ASS occurring within 3m of natural soil surface' and is shown as being underlain by Pliocene to Quarternary sands and silts, which comprise the Superficial Formations.

An Acid Sulfate Soil Investigation was conducted by ABEC Environmental Consulting (ABEC, 2019), which involved the collection of ~500 samples (collected at 1m intervals) across ~50 locations generally targeting the deeper mine pit areas. The soil sample results identified potential unoxidised sulfidic acidity is present in Site soils throughout the soil profile across the Site. If exposed to the atmosphere via excavation or dewatering activities, the sulfide minerals will oxidise and generate sulfidic acidity without appropriate management.

Groundwater monitoring indicated that the Superficial groundwater quality beneath the Site is slightly acidic due to pH levels generally <6.0 (although above the ASS indicator value of pH 5), elevated total acidity concentrations of up to 170mg$CaCO_3$/L and moderate total alkalinity concentrations, generally below 70mg$CaCO_3$/L. The alkalinity/sulfate ratio indicates that groundwater is being affected by, or has already been affected by, the oxidation of sulfides. Moderate alkalinity concentrations coupled with a pH of <6.0 indicates groundwater is generally inadequate to maintain a stable pH in areas vulnerable to acidification. It is also noted that the alkalinity concentrations are approximately equal to the total acidity concentrations, indicating that some buffering capacity is present within the system to offset some of the acidity.

7.3.2. POTENTIAL IMPACTS

The potential impacts from the Original Proposal were:

- Short-term dewatering of mine pits (4 to 5 years) and associated drawdown of the water table, which may affect:
    - Groundwater users;
    - Potential GDE's;
    - Generation of ASS.
- Hydrological impacts on the Lower Vasse River Catchment and Vasse-Wonnerup wetlands including:
    - Minor reduction in surface water yields;
    - Discharge of surplus water.
- Short-term abstraction of water from the Yarragadee aquifer, potentially affecting other users of the Yarragadee aquifer and the overlying Leederville aquifer;

[3] These vegetation units are classed as "Completely Degraded" and while having one or more of the original overstorey species, are devoid of native species in the understorey.

- Reduction in groundwater quality to the Superficial and Leederville aquifers due to dewatering of ASS.

7.3.3. MITIGATION OF RESIDUAL IMPACTS

The EPA Report and Recommendations (EPA, 2021d) considered that the impacts on Inland Waters from the Original Project were able to be effectively managed provided the following mitigation measures were undertaken:

- Control through authorised extent in Schedule 1 of MS1168;
- Preparation and implementation of an ASS Management Plan to minimise impacts of PASS (MS1168 Condition 9);
- Implementation of the *Yalyalup Mineral Sands Project: DMS-YAL-EMP-2.4 GDE Management Plan October 2020)* to minimise indirect impacts to significant flora and TECs (MS1168 Condition 10);
- Implementation of an Abba River Management Strategy (MS1168 Condition 13) to avoid or minimise direct and indirect impacts on the ecological and hydrological functions of the Abba River;
- Implementation of the Groundwater Licence Operating Strategy;
- The Implementation of the Yalyalup Mine Closure Plan.

The Original Proposal also operates under the following licenses, which assist in minimising impacts to Inland Waters:

- Licensing of water abstraction by DWER under the RiWI Act;
- DWER Licence under Part V of the EP Act.

7.4. PROPOSED AMENDMENT - RECEIVING ENVIRONMENT

7.4.1. INLAND WATERS INVESTIGATIONS

AQ2 undertook the following hydrogeological and hydrology assessments for the Proposal:

- Surface Water Management Plan (SWMP) (AQ2, 2023a) (Appendix 10A);
- Yalyalup Mineral Sands Project Northern Extension H3 Hydrogeological Assessment (AQ2, 2024) (Appendix 10B);
- Site Water Balance (AQ2, 2023b) (Appendix 10C).

GROUNDWATER MODELLING

A Leapfrog (Seequent, 2021) geological model was constructed by AQ2 (2024) for the regional aquifer system in the Yalyalup mine area and across the surrounding groundwater catchment using the following information:

- The ground surface in the immediate mine area was assigned consistent with 1m topography data provided by Doral. Across the remainder of the modelled catchment, the ground surface was set consistent with the Department of Primary Industries and Regional Development (DPIRD) Land Monitor Project (2m and 10m contours, Busselton Special Sheet, DPIRD, 1999).
- The geometry of units of the Superficial Formation in the mine area was based on information provided by Doral. As part of the current work, the thickness of the Bassendean Sand, the Guildford Formation and the Yoganup Formation was adjusted to be consistent with data provided by Doral.
- Away from the mine area, the thickness of hydrogeological units was derived from the DWER WIR Database (DWER, 2019b).
- The thickness of the Mowen and Vasse Members of the Leederville Formation and the Yarragadee Formation was based on elevation contours developed for the South West Aquifer Modelling System (SWAMS) groundwater model, reported by Baddock (2005), and cross-checked with site-specific data. The SWAMS groundwater model was developed jointly by the DWER and the Water Corporation in 2005 and incorporated all the major aquifers of the Southern Perth Basin.
- Based on Baddock (2005), the total thickness of Units 1-4 of the Yarragadee Formation in the current model study area is between 200 and 900 m. The Yarragadee is simulated as three layers, representing Units 1 -3. Unit thicknesses were assigned based on regional mapping and the results of the targeted Yarragadee drilling and testing programme and are summarised below:
    - Unit 1, thickness of up to 225 m.
    - Unit 2, thickness of up to 275 m.
    - Unit 3, uniform thickness of 100 m.

The Leapfrog model allowed the generation of a nine-layer groundwater model to represent the aquifers and aquitards present in the groundwater catchment. These layers are summarised in the following table. Using the layer geometry of the Leapfrog model, groundwater model layer geometry and aquifer parameter zones were applied to a nine-layer groundwater flow model grid, described in the following sections.

TABLE 7-1: MODEL LAYER SUMMARY

LAYER	AQUIFER UNITS	LAYER GEOMETRY
1	Alluvium, Estuarine Deposits & Sand derived from Tamala Limestone Alluvium and Estuarine Mud Safety Bay Sand	Thickness of 2 to 6 m Thickness of 1.5 to 2 m Thickness of 1 to 4 m
2	Bassendean Sand Tamala Limestone	Thickness of 1 to 6 m Thickness of 2 to 8 m
3	Guildford Formation	Thickness of 1 to 10 m
4	Yoganup Formation	Thickness of 1 to 10 m
5	Leederville Formation Mowen Member	Thickness of 1 to 27 m
6	Leederville Formation Vasse Member (North Coastal Margin) Leederville Formation Vasse Member (Central)	Thickness of 70 to 200 m Thickness of 20 to 200 m
7	Yarragadee Formation Unit 1	Thickness of 1m to 225m
8	Yarragadee Formation Unit 2	Thickness of 1m to 275m
9	Yarragadee Formation Unit 3	100 m

The groundwater model was developed using the numerical groundwater flow modelling package Modflow Surfact (Version 4.0, Hydrogeological Inc. 1996), operating under the Groundwater Vistas graphical user interface (Version 7, Environmental Simulations Inc., 1996 to 2019).

7.4.2. GEOLOGY

The Proposal area is located in the southern part of the Perth Basin, an elongated north–south rift trough with sub-basins, shelves, troughs, and ridges. The study area is wholly contained within the Bunbury Trough, a sub-basin containing a Permian–Cretaceous succession up to 11km thick. The sub-basin is wedged between the Vasse Shelf and the Yilgarn Craton, bounded east by the Darling Fault and west by the Busselton Fault. Detailed descriptions of the local geology and groundwater system are given by Lasky (1993), Crostella and Backhouse (2000), and Baddock (2005).

Yalyalup geology and the groundwater occurrence in the upper 900m of the Perth Basin at the Proposal area are summarised in Table 7-2 (AQ2, 2024).

TABLE 7-2: SUMMARY OF STRATIGRAPHY AND HYDROGEOLOGY IN THE YALYALUP AREA

AGE	FORMATION	STRATIGRAPHY	THICKNESS (m)	LITHOLOGY	HYDROGEOLOGY
	Superficial	Bassendean Sand	0.5-3	Fine to medium sub-rounded quartz sand	Superficial aquifer

AGE	FORMATION	STRATIGRAPHY	THICKNESS (m)	LITHOLOGY	HYDROGEOLOGY
Quaternary -late Tertiary		Guildford Formation	2-5	Clay and sandy clay with occasional discontinuous sand lenses	Local aquiclude
		Yoganup Formation	2-5	Leached and ferruginised beach sand conglomerate and clay. Local laterite.	Superficial aquifer
UNCONFORMITY					
Cretaceous	Leederville	Mowen Member	1-10	Clay and silty clay, with thin interbedded silt, clayey sand and fine-grained sand	Regional aquitard; local Leederville aquifer (when significant sand is present)
		Vasse Member	50-100	Fine to medium-grained quartz sandstone and interbedded shale.	Leederville aquifer
UNCONFORMITY					
Mid-late Jurassic	Yarragadee	Unit 1	0-50	Medium to coarse grained, weakly consolidated sandstone, minor siltstone and shales	Yarragadee aquifer
		Unit 2	0-250		
		Unit 3	200-500		
		Unit 4	0-100		

The upper geological sequence comprises the Quaternary-late Tertiary aged Superficial Formations, represented at the Proposal area by the Bassendean Sand towards the top, the Guildford Formation and the Yoganup Formation towards the base. The Bassendean Sand comprises a thin bed of fine to medium-grained aeolian sand. The Guildford Formation consists predominantly of silty to sandy clay of fluvial origin. The Yoganup Formation comprises leached and ferruginous coarse-grained beach sand, with localised concentrations of heavy minerals and some sandy silt and clay layers. The superficial deposits commonly contain ironstone caprock, colloquially known as Coffee Rock, in the zone of water table fluctuation. The thickness of the Superficial Formation is irregular, reaching a maximum of 12m at the Site but generally being 7 to 8m thick.

7.4.3. HYDROGEOLOGY

The following information is from the Groundwater Modelling completed for the Proposal (AQ2, 2024).

GROUNDWATER MANAGEMENT AREA

The Proposal area is wholly located within the Busselton-Capel Groundwater Area for the Superficial and Leederville aquifers and within the Busselton-Yarragadee Groundwater Area for the Yarragadee aquifer.

The South West Groundwater Areas Allocation Plan produced by DWER (DWER, 2009) covers all these groundwater areas.

AQUIFER UNITS

Three major aquifers have been identified within the Yalyalup Project (ordered from shallow to deep), namely:

- Superficial;
- Leederville;
- Yarragadee.

A conceptual regional hydrogeological cross-section (north-south) of the Southern Perth Basin is shown in (AQ2, 2024). Calibrated aquifer parameters for the Superficial, Leederville and Yarragadee Aquifers are provided in the following table (AQ2, 2021).

TABLE 7-3. CALIBRATED AQUIFER PARAMETERS (AQ2, 2021)

AQUIFER	AQUIFER UNITS	HORIZONTAL HYDRAULIC CONDUCTIVITY, Kh (m/d)	VERTICAL HYDRAULIC CONDUCTIVITY, KV (m/d)	S	Sy (%)
Superficial	Alluvium, Estuarine Deposits & Sand derived from Tamala Limestone	5	0.5	NA	10
	Alluvium and Estuarine Mud	0.01	0.0001	NA	10
	Safety Bay Sand	15	1.5	NA	20
	Tamala Limestone	50	5	0.0001	20
	Bassendean Sand	10	1	NA	20
	Guildford Formation	0.3	0.03	0.0001	10
	Yoganup Formation	5	0.5	0.0001	20
Leederville	Mowen Member	0.01	0.0001	0.0001	5
	Vasse Member	1	0.0001 (north coastal margin) and 0.001 (remaining study)	0.0001	10
Yarragadee	Yarragadee (Units 1)	0.5	0.0005	0.0001	10
	Yarragadee (Units 2)	1	0.001	0.0001	10
	Yarragadee (Units 3)	10	0.1	0.0001	10

SUPERFICIAL AQUIFER

AQUIFER UNITS AND PROPERTIES

The Bassendean Sand, Guildford Formation and Yoganup Formation form an unconfined Superficial aquifer with a maximum saturated thickness of 9m in the mine site area. The permeability of the Superficial aquifer is variable and depends on sediment type, with saturated sands having higher permeability than clays. At the Project, the Yoganup Formation forms the central portion of the aquifer, while the Bassendean Sand is generally saturated when water levels rise in the wet season. The Guildford Formation is of lower permeability owing to its more clayey nature. The high sand content in all the superficial units at the site means they are in hydraulic connection and behave as a single aquifer unit. There is no evidence of any perched aquifer at the site.

RECHARGE

Recharge of groundwater to the Superficial aquifer is mostly from direct infiltration of rainfall, with some recharge occurring by upward leakage from the underlying Leederville aquifer mainly across the seaward section and from down-slope surface drainage from the Whicher Scarp (Hirschberg, 1989). In the climate of South West of WA, most of the rain that falls is lost again through various forms of evapotranspiration. Any precipitation in excess of soil moisture deficit and evapotranspiration will become runoff or infiltrate the water table downwards. The downward flow of water may or may not reach the water table depending upon the soil properties in the soil profile. The groundwater recharge rate is controlled by climate, land use, vegetation type and density, soil hydraulic properties, geology and topography and is in the range of between 5 and 40% of rainfall, averaging 10%. Much of the Swan Coastal Plain is cleared of native vegetation for pasture, which results in relatively high recharge rates of even up to 50% of rainfall (Baddock, 2005).

GROUNDWATER LEVELS AND FLOW DIRECTIONS

The water table elevation slopes gently from the Whicher Scarp (i.e. ~40mAHD) to the coast (i.e. 0mAHD), and closely parallels the topography in a north-western direction under a low hydraulic gradient. Groundwater levels, as measured in the Superficial monitoring bores (both Doral's monitoring bores, other private users and DWER monitoring bores), are close to the surface, at depths of 0 to 5mbgl (i.e. 15 and 35mAHD). At the Site, low-lying areas are often waterlogged during winter. The seasonal water table fluctuation is less than 0.4m close to the coast, approximately 1 to 2m across the central part of the Swan Coastal Plain (including the mine site) and up to 2 to 4m close to the Whicher Scarp. Hydrographs for superficial deposits on the Coastal Plain show that variations in water level are usually correlated with variations in rainfall. Peaks in the groundwater hydrographs generally occur 1 to 3 months after peaks in rainfall, and the length of the time lag increases with increasing depth in the water table. The average water table elevation contours in the Superficial aquifer across the modelled area are shown in Figure 7-1. Although annual rainfall indicates a drying climate, rainfall and subsequent aquifer recharge experienced in recent years are still sufficient to fill, the Superficial aquifer and a long-term trend of decline in water levels due to climate change are therefore not observed in the Project area.

DISCHARGE

Groundwater is discharged from the Superficial aquifer to the ocean and the coastal swamps to surface drainage, including rivers, streams and an extensive network of constructed drains. It is also discharged via direct evaporation from swamps and evapotranspiration from vegetation where the water table is shallow. There is also a discharge of groundwater downward into the Leederville and Yarragadee aquifers, where the hydraulic head gradient is downward, especially where the superficial lithology is sandy (Baddock, 2005). Owing to the very shallow water table, the loss of groundwater to the atmosphere through evapotranspiration is likely to be high (Hirschberg, 1989).

LEEDERVILLE AQUIFER

AQUIFER UNITS AND PROPERTIES

The Leederville Formation forms a multi-layered confined aquifer system comprising discontinuous interbedded sequences of sand, clayey sand, silt and shale. It underlies the Superficial deposits across the study area, coming to the surface only to the southeast of the study area, where it forms the Whicher Scarp.

In the project area, the Leederville aquifer generally comprises the Vasse Member of the Leederville Formation. The Mowen Member of the Leederville Formation, which overlies the Vasse Member, is commonly considered an aquitard due to its clayey nature. At the eastern portion of the study area, the Mowen Member is likely to be very thin or has a greater sand content.

The hydraulic permeability of the Leederville aquifer is highly variable, dependent on the amount of clay and sand beds and the clay matrix content within the sand beds. Bulk horizontal permeability is estimated to be in the range of 0.1 to 5m/d, with a horizontal permeability of 1 to 3m/d in the sand beds (Baddock, 2005). Pumping test data conducted in the Busselton area (Baddock, 2005) show a horizontal permeability of approximately one m/d, which indicates a higher clay content. The Mowen Member acts as an aquiclude with a low permeability of 0.01m/d.

RECHARGE

The Leederville aquifer is recharged primarily on the Blackwood Plateau by direct recharge where the aquifer is present at the surface, with lower rates by downward leakage through the Mowen aquitard. Chloride mass balance calculations suggest that recharge rates are around 7% of rainfall and locally significantly higher, while leakage recharge through the Mowen aquitard may be equivalent to only 1 to 2% of rainfall (Baddock 2005).

Hirschberg (1989) reports that upward leakage occurs in the Superficial aquifer from the confined aquifers near the Yalyalup site. However, later studies suggest that downward flows have also occurred since then, potentially due to ongoing regional abstraction from the Leederville aquifer (Schafer et al., 2008). Based on the recently measured groundwater levels for the two aquifers, there is generally a 1m or greater difference in equipotential heads between the Superficial and Leederville aquifers, with lower elevations recorded within the Leederville aquifer. However, water levels recorded in bores screened in the deeper section of the Leederville aquifer show upward hydraulic heads. The potential for recharge on the coastal plains is restricted by the upward potentiometric head gradients or small downward gradients between the Leederville and Superficial aquifers.

GROUNDWATER LEVELS AND FLOW DIRECTIONS

Generally, the Leederville Formation receives recharge towards the Whicher Scarp and discharges towards the coast. Groundwater level elevations in the Leederville aquifer reduced from an average of approximately 35 mAHD at the foot of the Whicher Scarp to approximately two mAHD close to the coast. The seasonal water level fluctuations are generally between 2 to 3m. Additionally, a gradual decline associated with ongoing pumping activity in the area has been evident since 2003, especially in the bores screened deeper in the Leederville aquifer. The average water table elevation contours in the Leederville aquifer across the modelled area are shown in Figure 7-2.

DISCHARGE

Groundwater discharge from the Leederville aquifer into the underlying Yarragadee aquifer occurs through most of the study area. However, clay layers within the Leederville Formation and shale layers of the upper

unit of the Yarragadee Formation are believed to restrict vertical flow. Groundwater head gradients are upward in the study area north, where groundwater is discharged into the overlying Superficial Formation near the coast and offshore.

YARRAGADEE AQUIFER

AQUIFER UNITS AND PROPERTIES

The Yarragadee Formation forms the confined Yarragadee aquifer below the Leederville aquifer. Four sub-units (i.e. Units 1 to 4) within the Yarragadee Formation have distinct lithological properties. The Yarragadee Formation Unit 1 comprises the uppermost portion of the Yarragadee aquifer and is a sand unit with extensive clay layers. The underlying Yarragadee Unit 2 comprises sand with common interbedded clay that generally makes up to 40% of the unit. Unit 3 of the Yarragadee Formation is the dominant component of the aquifer present and consists of sand with only minor clay. Yarragadee Unit 4 comprises sand and clayey sand interbedded with clay.

The permeabilities of the Yarragadee aquifer vary between each of the aquifer units. High permeability sands are present within Yarragadee Formation Units 1, 2 and 3, but are most extensive within Unit 3 (i.e. the bulk horizontal permeability of Unit 3 is estimated to be in the range of 5 to 30m/d).

At the Yalyalup site, the Yarragadee Formation will likely encounter all four units up to 900m thick. The bulk permeability of the Yarragadee aquifer (all units) is estimated to be between 1 and 30 m/d, with an average permeability of 14 m/d. However, isotopic dating of groundwater indicates an average hydraulic conductivity of 8m/day (Baddock et al., 2005). Based on literature pumping data in the Busselton region (Baddock, 2005) and the experience from the nearby Tronox's Wonnerup mine and Doral's Yoongarilup mine, permeability ranges from 2 to 19 m/d. It should be noted that most of the permeability values are derived from the estimated values of transmissivity divided by the aquifer thickness (in most cases, this refers to screen intervals). Estimated transmissivities of between 630 to 1,900m^2/d (averaging around 1,000 m^2/d) have been reported in Unit 3 of the Yarragadee aquifer in the Project area, which is known to be the most transmissive unit due to its low clay content. Thus, an average bulk transmissivity of 1,000m^2/d has been assigned for Unit 3 in the numerical model, with a bulk permeability of 10 m/d for the uniform aquifer thickness of 100 m.

RECHARGE

The Yarragadee aquifer receives recharge by downward leakage from the Leederville Formation (Hirschberg 1989), especially in the inland areas around the Whicher Scarp, where downward heads prevail. In addition to downward leakage from the Leederville Aquifer, recharge to the aquifer is likely to occur mainly from the south and southeast, where the formation outcrops.

GROUNDWATER LEVELS AND FLOW DIRECTIONS

Groundwater flow through the upper part of the Yarragadee aquifer is south to southwest toward the coast. Groundwater level elevations in the Yarragadee aquifer reduce from an average of approximately 25 to 35 mAHD at the foot of the Whicher Scarp to approximately five mAHD close to the coast.

Generally, 4 to 5 m of average seasonal water level fluctuation is evident in the study area. The hydrograph for DWER's monitoring bore 61000125, located 3.2 km northwest of the proposed mine site water supply production bore, indicates, apart from seasonal fluctuations (peaks in March and lows in September), a gradual small declining trend associated with ongoing pumping activity in the area since 2009 (i.e. approximately 0.8 m per year). The average water table elevation contours in the Yarragadee aquifer across the modelled area are shown in Figure 7-3. There is a downward potentiometric head gradient within Unit 1,

the underlying Unit 2, and then Unit 3. The greater potentiometric head differences between the units are generally where significant clay bedding is present.

DISCHARGE

A significant volume of groundwater discharge from the Yarragadee aquifer is offshore adjacent to Bunbury, where the aquifer subcrops beneath the Superficial aquifer below the sea floor. Groundwater is also discharged to the overlying Superficial and Leederville Formations adjacent to the coast.

7.4.4. GROUNDWATER USERS

According to the DWER Water Register Database, there are currently 23 licensed groundwater users within the vicinity of the Proposal (i.e. within a 2 km radius), of which two abstract from the Superficial aquifer, 21 from the Leederville aquifer and none from the Yarragadee aquifer (AQ2, 2024).

A total of 503 licensed groundwater users are currently abstracting water within the groundwater-modelled area (refer to Section 9.5.4 of AQ2, 2023b); 43 of them are abstracting from the Superficial aquifer (a total of 4.1 GL/year), 435 from the Leederville aquifer (a total of 6.8 GL/year), and 25 from the Yarragadee aquifer (a total of 32.3 GL/year).

Two licences abstract water from the Superficial aquifer in close proximity to the Proposal; GWL 180363 is allowed to abstract 50,000 kL/year, while GWL182032 is allowed to abstract 30,000 kL/year (Figure 7-4).

All identified groundwater licences within the approved Yalyalup mine site and Proposal area abstract from the Leederville Aquifer (Figure 7-5). The licensed abstraction volumes are generally minor, ranging between 1,000 to 18,400kL/year and are used for livestock and domestic/household purposes. Additionally, five Leederville licences are allowed to abstract between 27,000 and 63,700kL/year. One Leederville licence (GWL180362), located immediately southwest of the Project, is permitted to abstract 100,000 kL/year. Details of these licences within 1km of Proposal are summarised in the table below.

The closest licensed Yarragadee abstraction bore to Doral's second Yarragadee production bore (YA_PB02) is a bore under GWL156423, located approximately 4.1km away. Additionally, there are two major, high-volume abstraction Yarragadee aquifer licences within the groundwater-modelled area: Cable Sands (WA) Pty Ltd (GWL161841 - 3.9 GL/year) and The Trust Company Ltd (GWL151407- 6.66 GL/year). The Cable Sands licence is associated with the Wonnerup North mine. Two avocado farms are covered under one licence (GWL151407), with the first farm located north of the Wonnerup North mine and the second to the northeast of Doral's Yoongarillup mine.

TABLE 7-4. ACTIVE SUPERFICIAL AND LEEDERVILLE AQUIFER GROUNDWATER LICENSEES WITHIN 1KM FROM THE YALYALUP MINE & PROPOSED AMENDMENT AREA (DWER)

WRI LICENCE NUMBER	ISSUE DATE	EXPIRY DATE	LICENCE ALLOCATION (KL/YEAR)	AQUIFER
180363	24/03/2016	31/03/2026	50,000	Superficial
182032	11/12/2015	10/12/2025	30,000	
49902	19/06/2019	18/06/2029	27,000	Leederville
50966	15/06/2015	14/06/2025	14,500	
58886	10/01/2023	9/01/2033	2,500	

WRI LICENCE NUMBER	ISSUE DATE	EXPIRY DATE	LICENCE ALLOCATION (KL/YEAR)	AQUIFER
67672	1/05/2015	30/04/2025	9,500	
94291	14/9/2020	13/9/2030	3,100	
104367	10/6/2016	9/6/2026	6,000	
110289	24/02/2017	23/02/2027	1,500	
110289	24/2/2017	23/2/2027	1,500	
156606	19/03/2015	18/03/2025	2,220	
162993	27/2/2017	26/2/2027	1,500	
168831	30/05/2017	31/05/2027	63,700	
168831	30/5/2017	31/5/2027	63,700	
169309	9/11/2020	8/11/2030	30,500	
173438	24/5/2021	23/5/2031	1,000	
174905	11/08/2022	10/08/2032	1,800	
175045	1/04/2022	31/03/2032	1,500	
177828	7/11/2022	6/11/2032	8,400	
178017	2/09/2013	1/09/2023	1,500	
179889	16/09/2014	15/09/2024	1,500	
180362	8/04/2020	7/04/2030	100,000	
180898	25/2/2022	1/4/2025	4,500	
181194	22/11/2020	21/11/2030	18,400	
183817	10/01/2017	10/01/2027	60,000	
202488	22/02/2019	21/02/2029	1,500	
202488	22/2/2019	21/2/2029	1,500	
204755	8/9/2020	7/9/2030	1,500	
205002	27/10/2020	27/10/2030	1,500	
206001	14/6/2021	13/6/2031	1,500	
206970	22/2/2022	21/2/2032	1,500	
207228	13/04/2022	12/04/2032	1,500	
207397	20/05/2022	19/05/2032	3,000	

WRI LICENCE NUMBER	ISSUE DATE	EXPIRY DATE	LICENCE ALLOCATION (KL/YEAR)	AQUIFER
207402	20/5/2022	19/5/2032	1,500	
207404	23/5/2022	22/5/2032	1,500	
208264	13/1/2023	12/1/2033	1,500	
208473	13/3/2023	12/3/2033	1,500	

7.4.5. HYDROLOGY

The following hydrology information from the Surface Water Management Plan (AQ2, 2023a) has been provided.

REGIONAL HYDROLOGY

The Proposal is located within the Vasse-Wonnerup Estuary catchment and sits across the divide between the Lower Sabina River and Abba River sub-catchments (Figure 7-6). Both sub-catchments flow north to the Ramsar-listed Vasse-Wonnerup System of wetlands and the Lower Vasse and Ludlow rivers before discharging through the Wonnerup Inlet into Geographe Bay. The Vasse-Wonnerup System catchment area is 473 km^2. The Downstream Receptors considered for the Proposal are the immediate Lower Sabina River and the Abba River catchments, then the subsequent Vasse-Wonnerup System. Woddidup Creek, adjacent to the existing Yalyalup Mine and Extension Area E, contributes to the Lower Sabina River Catchment.

Other regional drainage features outside the Vasse-Wonnerup System include the Vasse River and Vasse Diversion Drain, which receives inflows from the diverted Upper Sabina and Upper Vasse Rivers (Marilier, 2018).

VASSE-WONNERUP RAMSAR WETLAND

The Vasse-Wonnerup Ramsar Site (RSIS, 2014), located approximately 4.5 km to the north-west of the Proposal (Figure 7-6), is a shallow, extensive, nutrient-rich wetland system with widely varying salinities that fluctuate from fresh to brackish depending on the season. It is an environmentally sensitive surface water receptor as it provides dry-season habitat for tens of thousands of resident and migrant waterbirds of a wide variety of species, including the Australian shelduck, Australian shoveler, black-winged stilt, and red-necked avocet. It also regularly supports the largest breeding colony of black swans in southwestern Australia. In winter, broad expanses of open water are fringed by samphire and rushes. Melaleuca woodlands are behind the samphire belt, and eucalyptus woodlands are on higher ground.

The Vasse and Wonnerup lagoons (former estuaries) are the two principal components of the Vasse-Wonnerup System and act as compensating basins for water discharging from four rivers through the use of weirs (flood gates) with the aim of minimising flooding of adjoining lands and to keeping seawater out. When the water level in the estuaries rises above sea level, hydrostatic pressure opens the floodgates and allows water to flow out to Wonnerup Inlet and the sea. When the level drops, the gates close, preventing seawater ingress. The system plays a vital role in flood protection for Busselton.

Marillier (2018) analysed gauge information and estimated average annual flows (2001–14) in the major ungauged rivers flowing to the Vasse Estuary Wetland. Marillier (2018) estimated the Lower Sabina discharge as 5.7 GL/year, less than half the Abba River volumes (20.7 GL/yr) (DWER, 2023b). In contrast, 4 GL/year is diverted away from Vasse-Wonnerup Wetlands along the Sabina Diversion Drain, and 24 GL/yr is diverted via the Vasse Diversion Drain (Marillier, 2018). The Ludlow River discharges the second-highest volumes to the Vasse-Wonnerup Wetlands, an annual average of 10.8 GL/yr based on DWER summary statistics for the Ludlow gauging station 610009 (DWER, 2023b).

ABBA RIVER

The Abba River is one of the major tributaries to the Vasse-Wonnerup System and has a catchment area of 135 km^2, which is 29% of the Vasse-Wonnerup System catchment (Figure 7-6). The headwaters of the Abba are located in the forest on the Whicher Scarp and Blackwood Plateau, and the river extends about 20km from the plateau to the eastern end of the Vasse Estuary, falling from more than 100mAHD to sea level. The

Abba River has better water quality than the Vasse and Sabina rivers, although nitrogen concentrations are still high (Marillier, 2018).

A DWER flow gauge is located on the Abba River at Wonnerup South Road (610062), approximately 5km downstream of the Proposal, and a Flood Frequency Analysis (FFA) of this data was completed by Marillier (2018). A second gauge is located at Wonnerup Siding (610016), another 1.5km downstream. DWER developed a RORB model for the Vasse-Wonnerup System (including the Abba and Lower Sabina Rivers) which was calibrated to the FFA data. This RORB model was supplied to AQ2 for use in the SWMP (AQ2, 2023a).

LOWER SABINA RIVER

The Lower Sabina River catchment area of 43 km^2 is around 10% of the Vasse-Wonnerup System (Figure 7-6). The Sabina Diversion Weir was constructed to allow overflow during extreme rainfall events from the Upper Sabina to the Lower Sabina, with regular flows through the Sabina Diversion Drain. The weir was over-designed, and the Upper Sabina catchment (78km^2) no longer contributes any flow directly to the Lower Sabina River. However, some minor sub-drains in the upper catchment may spill in large events. The flow upgradient of the Sabina Diversion Weir is directed through the Sabina Diversion Drain to the Vasse Diversion Drain system and out to the Geographe Bay rather than to the Vasse-Wonnerup System (Marillier, 2018).

The Lower Sabina River extends 8km from the Sabina Diversion weir to the centre of the Vasse Estuary near Barracks Drive and falls in elevation from 25mAHD to 0mAHD. Although some river sections are incised into the coastal plain, the channel is small in most places. The channel is only 5m wide and 1m deep in the upper reaches, with regular breaks along the river banks. Most of the Lower Sabina catchment has been cleared for agricultural uses (primarily cattle grazing) or other mining operations.

There are no stream gauges in the Lower Sabina catchment. The closest stream gauges are on the Upper Sabina at the Sabina Diversion (site 610025) and on the Abba River.

PROJECT HYDROLOGY

Several roads and artificial drains installed in the 20th century have modified the natural drainage patterns across the Proposal. The local drains and waterways in the vicinity of the Proposal are shown in Figure 7-7, as well as the Proposal Extension Areas.

ABBA RIVER CATCHMENT

Abba River tributaries near the Proposal area have been modified with drains, with three from the east running west adjacent to Extension Areas B and C of the Proposal area. Extension Areas B and C runoff flows towards the west/northwest and into the Abba River or its associated drains. The drain along the southern boundary of Extension Area B, the Abba River Drain, is a rural open earthen drain within a paddock. It is classed as a rural drain that should be managed to prevent long inundation periods of land (defined as greater than three days). Flows in rural drains often spill the banks and go onto flood plains that can convey floodwater downstream. The floodplains, in this instance, are typically farm paddocks.

Based on the site inspection by AQ2, the Abba River within the Proposal area also appears to be a modified drainage channel.

WODDIDUP CREEK CATCHMENT

The natural flow direction of runoff from Extension Areas A, D and E is generally north-westerly into Woddidup Creek. Runoff from the Existing Yalyalup Mine and Extension Area A is captured in a Water Corporation Drain adjacent to Princefield Road, which then conveys flows to Woddidup Creek.

Local paddock drains typically convey the remaining flows to the Woddidup Creek. The drains are shallow to very shallow (0.2 to 0.5m depths), where runoff from only small rainfall events could be conveyed, whilst larger events (such as the 1% AEP) are likely to overtop and form a shallow floodplain over the paddocks.

PRE-MINE CATCHMENTS

Pre-mine catchments within the proposal area have been defined using the available topographical datasets and are shown in Figures 7-8. The measured area of each of these sub-catchments is provided in the table below.

TABLE 7-5. BASELINE CATCHMENT AREAS

CATCHMENT	PROJECT CATCHMENT	AREA (km^2)
Abba River	Abba River	69
	Abba River Drain 2	26
	Total	**95**
Woddidup Creek	1	6
	2	2
	3	3
	4	5
	5	7
	Total	**23**

WETLANDS

Most of the Proposal area is mapped as a wetland in DBCA's Geomorphic Wetlands of the Swan Coastal Plain dataset (DEC, 2008), all of which has been assessed as being in the 'Multiple Use' management category, which is described as wetlands with few ecological attributes and functions remaining. Approximately half of the wetland area within the Proposal area is mapped as Palusplain (i.e. seasonally waterlogged flat), with the remainder mostly Floodplain (seasonally inundated flats) and small areas of Sumpland (i.e. seasonally inundated basin (Figure 7-9). There are no wetlands of environmental significance present within the Proposal area.

7.4.6. SITE WATER BALANCE

AQ2 (2023b) prepared a conceptual Site Water Balance for the Proposal using GoldSim (Appendix 10C). The objectives of the water balance include:

- Prepare a conceptual water balance to determine the site water demands over the project's life. This will include:
    - All fluxes (and their seasonal variations);
    - Discussion of capacity to reuse surplus mine dewater;
    - Requirements for supplementary process water to be sourced from the Yarragadee aquifer.

The model operation can be summarised as follows:

- At each time step, open pit areas have been based on the current mining schedule provided by Doral (dated 27 July 2023).
- Each open pit area has an external surface water catchment area, which reports to the pit during the period the pit is open. Each pit's catchment area was estimated based on the location of the proposed internal drainage features and site elevation data.
- The existing Process Water Dam (PWD) and Drop-Out Dam (DOD) collect local runoff from the adjacent plant and administrative and impervious areas, plus receive pumped water being removed from the open pits (dewatering plus stormwater).
- At each model timestep (daily), rainfall is included within the model, with runoff collected in the base of the operating pit(s), and within the PWD and DOD.
- Dewatering inflow rates over the mine life, obtained from groundwater modelling studies, have been used as an inflow to the active pit area.
- Water collected within the active pit area is pumped to the PWD/DOD at an assumed transfer rate (nominally 75L/s).
- Process water demand is sourced from the PWD/DOD.
- The model tracks water that exceeds the PWD/DOD capacity (i.e. potentially requires discharge), plus water shortfall from the PWD/DOD (i.e. needs to be supplemented by pumping from the Yarragadee aquifer).

The model has been run for two dewatering scenarios resulting from different rainfall patterns being applied to the groundwater model – a wet rainfall sequence ("Wet Dewatering" scenario) and a dry rainfall sequence ("Dry Dewatering" scenario).

Based on the water balance model predictions, the following results have been concluded by AQ2 (2023c):

- The water balance model indicates that in the driest conditions modelled, the maximum annual abstraction from the Yarragadee aquifer bore is 1.4GL, less than the requested groundwater abstraction licence limit of 1.6GL. The highest groundwater bore demand is predicted to occur in the final three years of mining, while 2031 is predicted to have the lowest annual groundwater bore demand.
- An annual discharge licence in the order of 100,000m^3 (100ML) would allow the site to discharge from the PWD/DOD during wet conditions without impacting operations. The largest annual

discharge volume was predicted to be 135,000m^3 across the 100 model iterations. Some buffer storage capacity within the open pit is assumed within this estimation.

- Although an annual discharge licence in the order of 150,000m^3 is suggested, the licence is to cover the risk of a wet period occurring during the winters of 2029-2031. Outside this period, the model does not predict a requirement to discharge surplus water. Note that a separate assessment has been documented to estimate runoff from a 100-year event across the site (with different assumptions to this assessment) – refer to AQ2 (2023b).

7.4.7. ACID SULFATE SOILS

The Site occurs in an area depicted on an ASS risk map as Class II 'moderate to low risk of ASS occurring within 3m of natural soil surface' and is shown as being underlain by Pliocene to Quaternary sands and silts, which comprise the Superficial Formations.

An Acid Sulfate Soil Investigation (Appendix 11) was conducted by ABEC Environmental Consulting Pty Ltd (ABEC, 2023), which involved the collection and analysis of 276 samples (collected at 1m intervals) across 23 targeted locations from generally within the deeper mine pit areas.

Field results of the ASS investigation indicate that Site soils are generally slightly acidic to neutral, as a large proportion of pH_F results are within the pH6.0 to pH7.0 range. This indicates that there is minimal actual acidity in the soil profile, which is confirmed by the laboratory results, which show minimal acidity is present as s-TAA (i.e. actual acidity). However, field results also show a high proportion of samples (~46%) with $pH_{FOX} \leq 3$ and a ΔpH above 3.0pH units, indicating additional potential acidity within the soil profile. This is also confirmed by the laboratory Total Sulfur (T_S) analysis results, which show 169 of the 218 samples analysed contain net acidity (NA) as T_S, above the DWER action criterion (0.03%S). The average T_S concentration was 0.203%S. If these soils are exposed to the atmosphere via excavation or dewatering activities, the sulfide minerals will oxidise and generate sulfidic acidity without appropriate management.

7.5. POTENTIAL IMPACTS

Potential impacts of the Proposal on Inland Waters are:

- Short-term dewatering of mine pits and associated changes to water levels (i.e. drawdowns), which may affect:
    - Water availability at surrounding groundwater users of the Superficial aquifer and the underlying Leederville aquifer;
    - Potential GDEs and vegetation;
    - Vasse-Wonnerup System Ramsar Wetland;
    - Surface water courses;
    - Acid Sulfate Soils.
- Short-term groundwater abstraction from the Yarragadee aquifer, which may affect other groundwater users of the Yarragadee aquifer and the overlying Leederville Aquifer.
- Modification and interruption of the existing hydrological regime:
    - Reduced catchment contribution to the Lower Sabina River, the Abba River and the subsequent Vasse-Wonnerup Wetlands.

  - During mine operations, a change in catchment contribution between the Lower Sabina River and the Abba River.
  - Runoff with elevated sediments released into the environment.
  - The emergency discharge locations and when they operate.
  - Scour and erosion risks with high-velocity discharges
- Increased depths and flood extents of the Abba River and Woddidup Creek due to flow constrictions imposed by the proposed mine envelope.
  - Potential increased Loss of Service (LOS) risk due to flooding for nearby infrastructure, such as Princefield Road.

7.6. ASSESSMENT OF POTENTIAL IMPACTS

7.6.1. SHORT-TERM DEWATERING

DRAWDOWNS TO SUPERFICIAL AND LEEDERVILLE AQUIFERS

Groundwater Modelling by (AQ2, 2024) shows that water level drawdowns in the Superficial aquifer are predicted to be localised in the immediate area of the active mining (pits), temporary in duration and relatively small, with a maximum drawdown of 11m predicted at the end of mining in August 2030. The 0.1m cone of depression generally lies within the proposed mining disturbance area and only marginally extends past this area (up to 550m for the dry scenario).

Additionally, some small drawdowns (less than 0.1m) are predicted in the Leederville aquifer due to the dewatering of the overlying Superficial aquifer. The Mowen Member of the Leederville Formation is generally considered an aquitard; however, at the Yalyalup site, the Mowen Member is thin, resulting in small indirect upward leakage of water from the Leederville aquifer from below the pit floor. Based on groundwater modelling results, the drawdowns in the Leederville aquifer are predicted to be local and likely to extend laterally but not vertically (owing to clayey layers within the sand). The extent of 0.1m drawdown is generally limited to areas immediately outside the planned mining areas.

Therefore, it is unlikely that short-term dewatering for the Proposal will have any adverse impacts on the water supply potentials of the Superficial and Leederville aquifer systems. The Superficial aquifer is resilient and will cope with the proposed changes due to mining the Proposal.

Long-term post-mining effects on water levels are expected to be minimal. The recovery of water levels will commence immediately once mining of each active mine pit is completed, owing to backfilling of mined-out pits. Groundwater inflows to the mined-out pits are driven by water level gradients between the mine voids and the surrounding areas. It should be noted that during the mining phase, water recovery in mined-out areas may be interfered with by dewatering of subsequent mining areas. Thus, the rate of water level recovery can be slow. Once all mining areas are completed, dewatering will cease, and water levels will continue to rise until a steady state or equilibrium water level is resumed. The numerical model shows that water levels are predicted to return to pre-mining levels within 12 months of mine closure (i.e. by December 2037).

DRAWDOWN TO EXISTING GROUNDWATER USERS

The modelling indicates that all Superficial aquifer licensed bores are located outside the predicted 0.1m drawdown contour and unlikely to be impacted by dewatering operations associated with the Proposal.

Additionally, several unlicensed bores across the Proposal area are screened in the Superficial aquifer and are within the modelled extent of the 0.1 to 0.5m drawdown contours (generally between 0.1 and 0.25m). Most of these bores have either been decommissioned or used by DWER for monitoring purposes. If any of these unlicensed bores are still in use, this limited drop in water level is unlikely to influence their supply potential.

The Groundwater Model also indicates that small drawdowns (less than 0.1m) are predicted in the Leederville aquifer due to dewatering of the overlying Superficial aquifer. However, no Leederville aquifer licenced bores are located within the drawdown extent of 0.1m that could be affected by mining-related dewatering.

Therefore, it is unlikely that short-term dewatering for the Proposal will have any long-term adverse impacts on the water supply potentials of other users in the Superficial and Leederville aquifers.

Regular monitoring of groundwater levels in the Superficial and Leederville bores (as per GWOS) and clear communication with the nearby groundwater users during the mining operation will provide information on the actual induced drawdowns and impacts on the other users. If Doral's mining operations affect any of the Superficial and Leederville bores, then Doral will implement mitigation measures (such as supplying make-up water as needed) to account for any impacts to neighbouring users.

DRAWDOWN TO POTENTIAL GDEs

No groundwater drawdown in the Superficial aquifer is predicted to extend beyond 550m from the edge of the mining area at the proposed Yalyalup Northern Extension. Therefore, it is unlikely that any of the three high-value wetland GDEs, located approximately 6km to either the northeast or southwest of the site, will be impacted by the Proposal.

AQ2 (2024) model predictions suggest that there will be drawdowns in areas of potential GDEs (Figure 5-9) across the Proposal area over the life of the mine. These drawdowns have the potential to impact groundwater-dependent vegetation close to mining areas. It should be noted that the magnitude of change in groundwater level (i.e. drawdowns of more than 0.25m) thresholds have been used by AQ2 (2024) to assist in providing an assessment of risk.

Details of the predicted maximum drawdowns at the GDE locations due to dewatering for the Proposal are shown in Table 7-7.

TABLE 7-7: PREDICTED MAXIMUM DRAWDOWNS AT SELECTED GDE LOCATIONS DUE TO NORTHERN EXTENSION DEWATERING

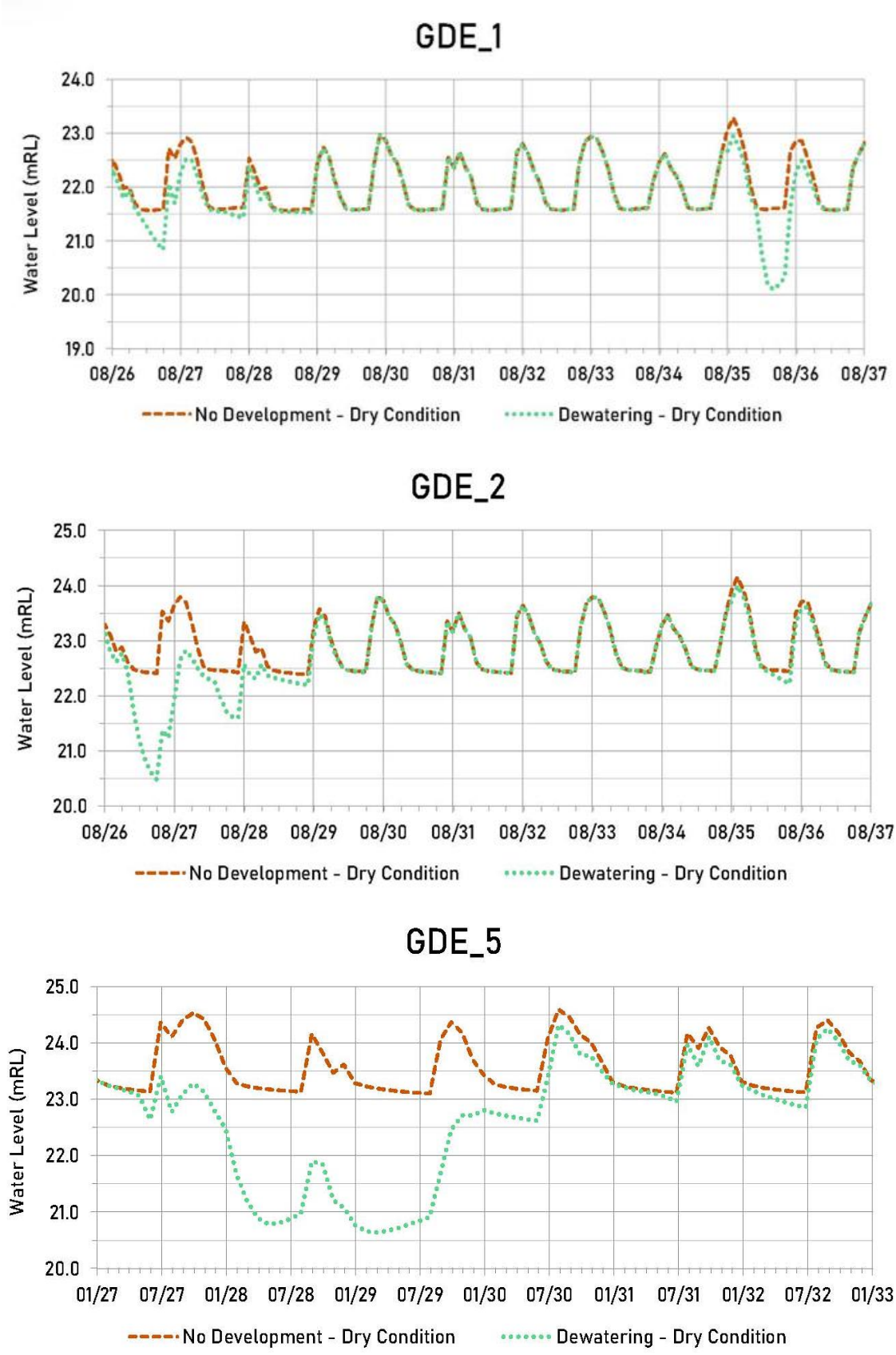
GDE	PREDICTED MAX DRAWDOWN (m)	MONTH OF PREDICTED MAX DRAWDOWN	PERIOD OF PREDICTED DRAWDOWN (>0.25m)	PREDICTED MAX DRAWDOWN BELOW LOWEST SEASONAL GW LEVEL (m)
YA_MB33_GDE	0.40	March 2027	December 2026 to July 2027	
YA_MB34_GDE	0.11	May 2027	NA	
YA_MB35_GDE	0.20	December 2035	NA	

GDE	PREDICTED MAX DRAWDOWN (m)	MONTH OF PREDICTED MAX DRAWDOWN	PERIOD OF PREDICTED DRAWDOWN (>0.25m)	PREDICTED MAX DRAWDOWN BELOW LOWEST SEASONAL GW LEVEL (m)
YA_MB36_GDE	0.38	July 2027	June to July 2027	
YA_MB37_GDE / GDE_2	2.20	June 2027	September 2026 to November 2028	1.92
GDE_1	1.50	April 2036	February to November 2027	1.46
GDE_2 / YA_MB37_GDE	2.20	June 2027	September 2026 to November 2028	1.92
***GDE_3**	**0.34**	**September 2028**	**August to September 2028**	**0.25**
***GDE_4**	**1.62**	**August 2028**	**June 2027 to June 2030**	**1.28**
GDE_5	2.57	February 2029	May 2027 to October 2030	2.45
***GDE_6**	**4.73**	**February 2029**	**October 2027 to November 2030**	**4.68**
GDE_7	2.71	August 2029	September 2028 to October 2032	2.43
GDE_8	1.60	June 2030	April 2029 to October 2032	1.20
GDE_10	0.24	July 2032	NA	0.01
GDE_11	0.07	October 2034	NA	0
GDE_12	0.10	October 2034	NA	0

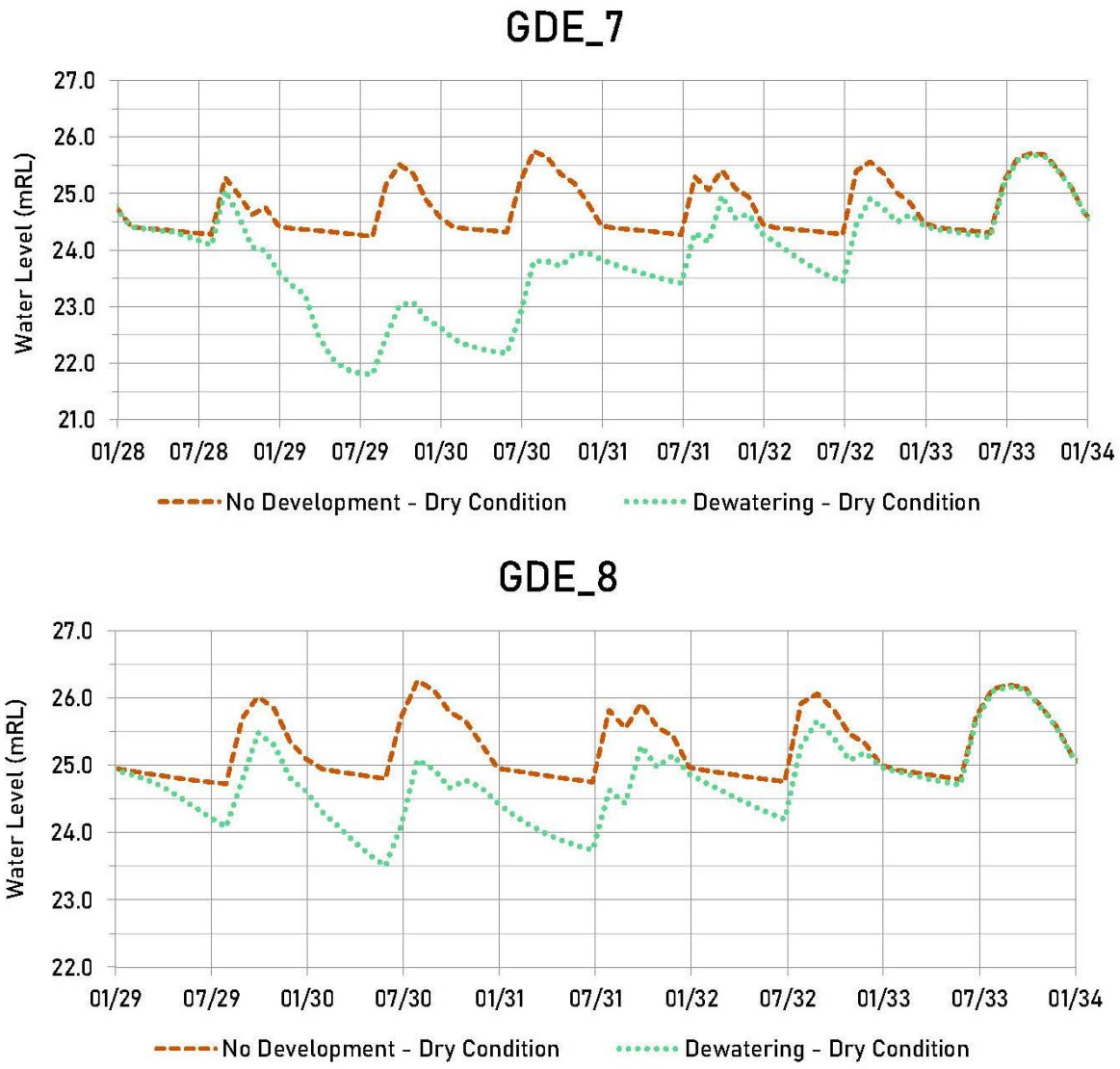
***GDE_3, GDE_4 and GDE_6 will be cleared and not subject to indirect impacts from drawdown. GDE_7 will be partially cleared.**

The GDEs with the highest maximum modelled drawdowns (i.e. relative water level changes) assuming dry climate conditions (i.e. most conservative case) are shown below in Charts 7-1 and 7-2. The maximum drawdowns at each of these GDEs are also shown in Charts 7-3 and 7-4, reproduced from (AQ2, 2024). Figures showing the drawdowns for all GDEs are provided in Figures 10-2 to 10-13 (AQ2, 2024).

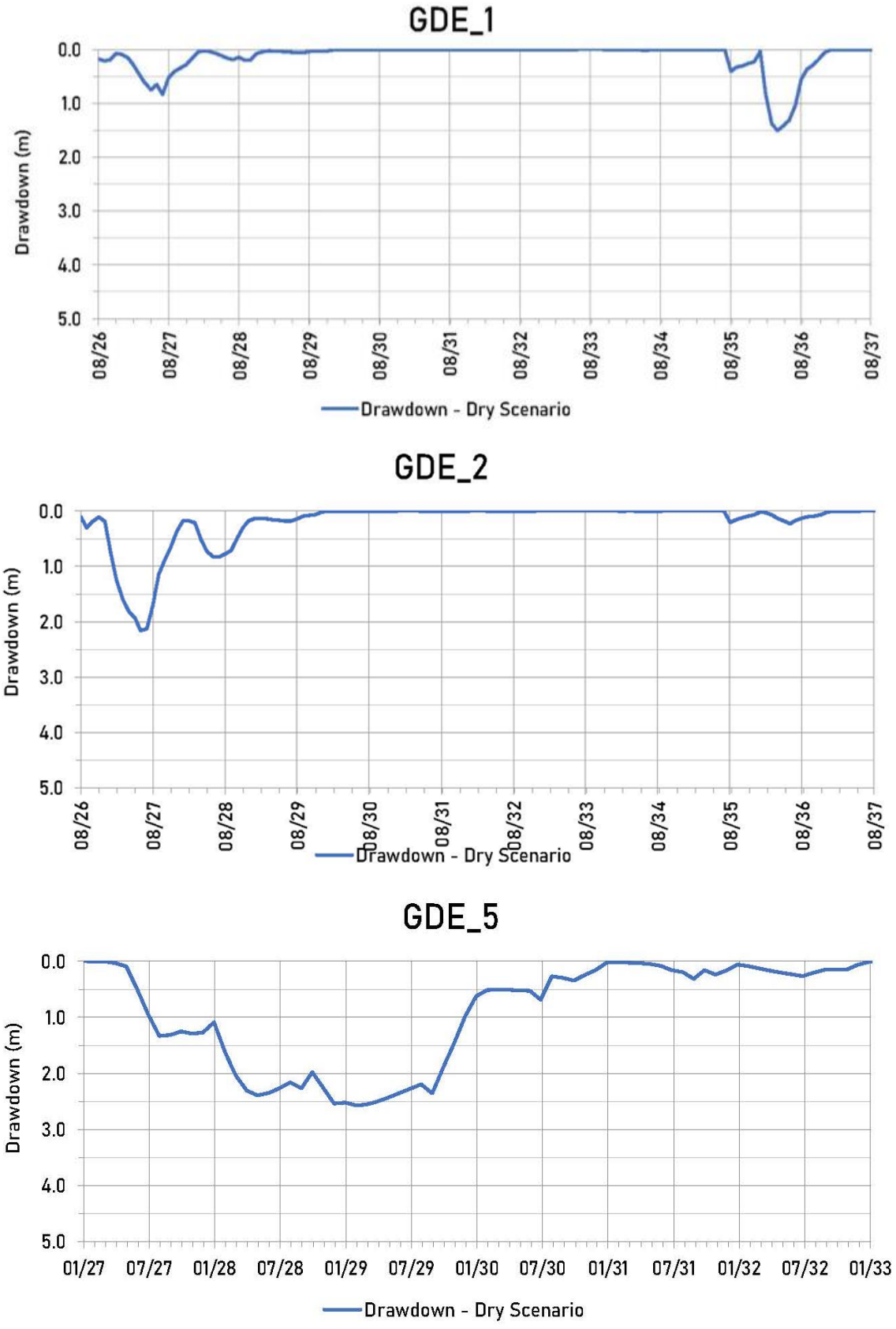
CHARTS 7.1: PREDICTED WATER LEVELS AT GDEs (GDE_1, GDE_2, GDE_5)



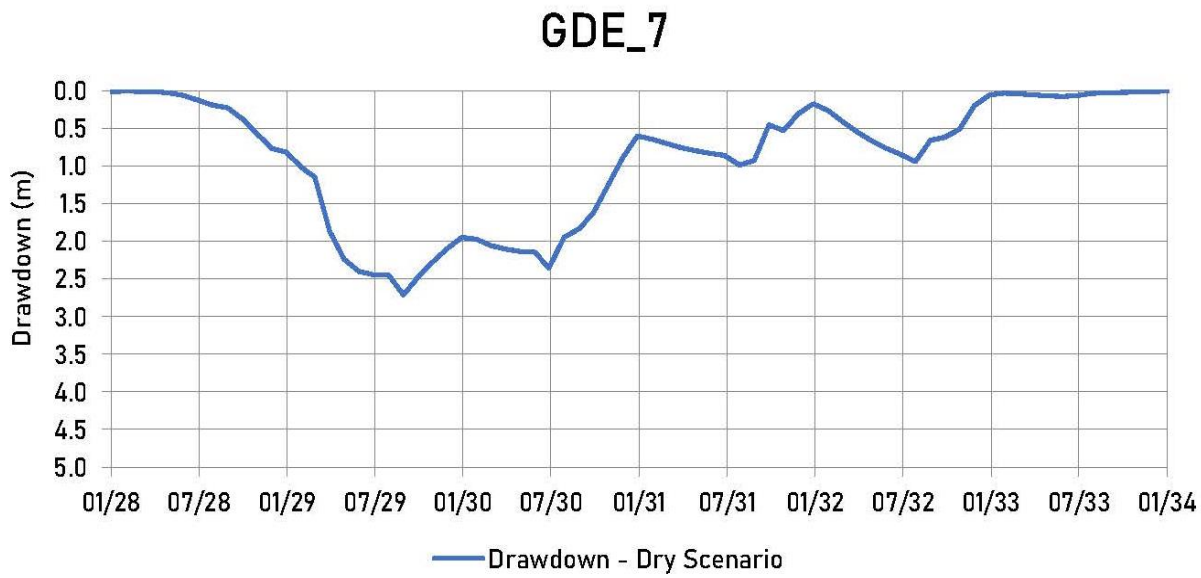
CHARTS 7.2: PREDICTED WATER LEVELS AT GDEs (GDE_7, GDE_8)

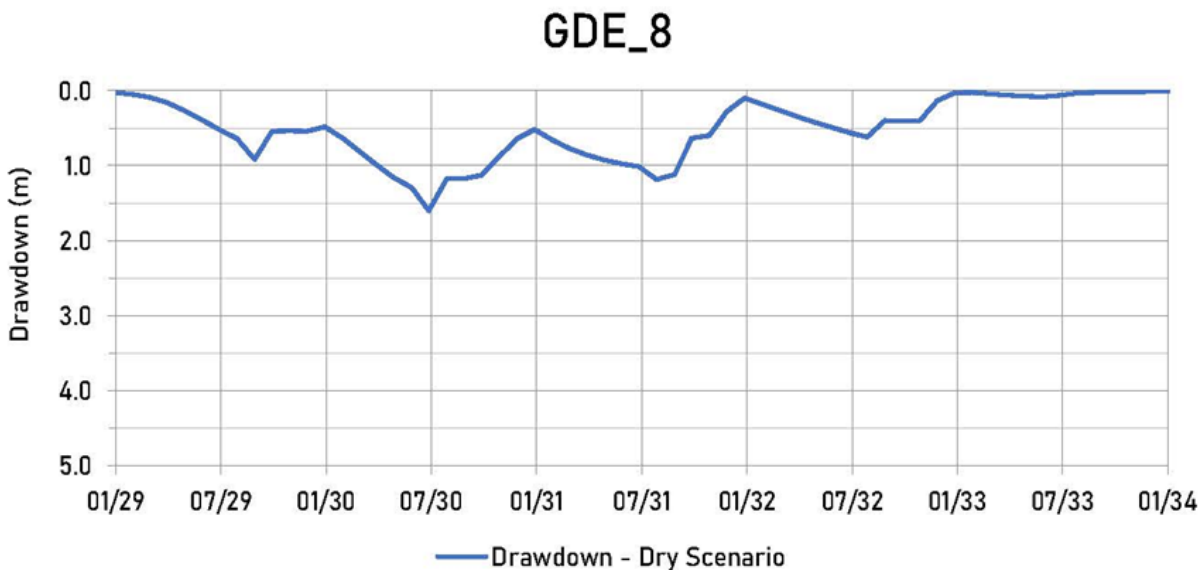


CHARTS 7.3: PREDICTED GDE DRAWDOWNS (GDE_1, GDE_2, GDE_5)



CHARTS 7.4: PREDICTED GDE DRAWDOWNS (GDE_7, GDE_8)





The salient points are as follows:

- The magnitude of drawdowns along the GDEs areas varies depending upon the proximity of the Northern Extension active mining pits. However, all drawdowns will be localised and temporary.
- The highest maximum drawdowns (excluding GDEs that will be directly impacted) are predicted to be along GDE_1, GDE_2, GDE_5, GDE_7 and GDE_8 (i.e. 1.50 to 2.71 m);
- GDE_7 has the longest predicted drawdown period of more than 0.25m (i.e. ~4 years). As stated above, part of GDE_7 is heavily degraded and in poor condition and will be partially cleared for mining;
- Drawdowns at GDE_10, GDE_11, and GDE_12 are less than 0.25m, and drawdowns at GDE_3 are short-term (2 months), thus, there is a low risk of being impacted by dewatering.
- Minor drawdowns (less than 0.4m) extend into the McGibbon Track area in the approved Yalyalup Mine due to mining at the Northern Extension. However, these drawdowns are localised, temporary, and much smaller than predicted due to the mine's dewatering.

In conclusion, groundwater modelling predicts that the dewatering operations for the Proposal will temporarily cause groundwater levels to decline and fall outside the seasonally observed range. The magnitude of the change in groundwater levels (i.e. drawdowns of more than 0.25 m) exceeds thresholds that could potentially result in impacts to 0.68ha of vegetation in GDE_1, GDE_2, GDE_5, GDE_7 and GDE_8 as follows:

- GDE_1 – 0.09ha mapped as SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils'
- GDE_2 – 0.16ha mapped as SCP10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area) includes 26 *Verticordia plumosa* var. *vassensis.*
- GDE_5 – 0.21ha mapped as SCP10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)
- GDE_7– 0.15ha mapped as SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils'
- GDE_8 – 0.05ha mapped as SCP09 and 0.02ha mapped as as SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils'

However, long-term post-mining effects on water levels are expected to be minimal. The recovery of water levels will commence immediately once mining of each active mine pit is completed, owing to backfilling of mined-out pits. Once all mining areas are completed, dewatering will cease, and water levels will continue to rise until a steady state or equilibrium water level is resumed. The numerical model shows that water levels are predicted to return to pre-mining levels within 12 months of mine closure (i.e. by December 2037).

It should be noted that the current management strategy for the McGibbon Track (including GDE_2) is to implement the GDE Management Plan (MS1168—Condition 10). Doral is proposing a similar strategy for the GDE areas within the Northern Extension to manage these potential impacts.

DRAWDOWNS TO VASSE-WONNERUP SYSTEM RAMSAR WETLAND

The Groundwater Model (AQ2, 2024) shows that there will be no drawdown in the Superficial aquifer predicted to extend to the Vasse-Wonnerup System Ramsar Wetland (~4.6km to the north) due to dewatering for the Proposal (i.e. the maximum extent of 0.1m drawdown may extend up to 550m from the

mining disturbance area) (AQ2, 2024). Therefore, it is highly unlikely that the Vasse-Wonnerup wetland will be impacted by groundwater drawdowns associated with the Proposal.

DRAWDOWNS TO SURFACE WATER COURSES

The Groundwater Model (AQ2, 2024) indicates that no drawdowns from the Proposal will extend to the Lower Sabina River (~1.8km to the west). The model also indicates that drawdowns (less than 2m) are predicted to extend to the Abba River due to its close proximity to the proposed mining areas (i.e. in particular, Mining Sections A and B). However, all drawdowns will be localised and temporary in duration. Additionally, there is limited or no groundwater connection with surface water bodies, resulting in minimal or no groundwater contribution to the river's baseflow (AQ2, 2023a). Therefore, the existing surface water flow regime is unlikely to be impacted by the dewatering operations for the Proposal, as it is likely to be dominated by high-rainfall periods generating surface water runoff rather than any substantial groundwater flow component.

Additionally, flows in the local surface water drains around the mining area, similar to the Lower Sabina or Abba Rivers, rely mainly on surface water runoff after heavy rainfall events, with no or limited groundwater contribution to surface water flow in these local drains. The surface water assessments for the existing Yalyalup mine site (AQ2, 2020c) and the Proposal area (AQ2, 2023a) outlined that all runoff from the Lower Sabina River and Abba River catchment areas upstream of the Proposal area will be diverted around mining operations and discharged to a downstream water course. Runoff from areas within the disturbance area will be used in mining operations (generated by rainfall) or discharged through a designated location (i.e. following a large event or if a water surplus exists).

As such, dewatering for the Proposal is unlikely to impact the immediate surface water flow regime, including the Lower Sabina and Abba Rivers.

ACID SULFATE SOILS

Results of Doral's ASS investigation indicate that potential unoxidised sulfidic acidity is present in Site soils. If exposed to the atmosphere, the sulfide minerals will oxidise and generate sulfidic acidity. Oxidation of sulfide minerals may potentially occur during the extraction of soils containing potential ASS and/or as a result of dewatering activities. It should be noted that this section only considers the potential impacts of residual in situ ASS exposed to oxidation by dewatering and does not consider the fate of ASS material removed as overburden or for processing as ore.

Dewatering to the required excavation depth (maximum of ~11mBGL) will occur passively as groundwater enters the mining excavation. The water will be pumped out using a suction pump set at a level to maintain a 0.5m saturated pit floor and sent through to a sump prior to reaching the unlined process water pond, where it mixes with water from other mining processes. This lowering of the water table (although passive) may therefore expose sulfide minerals to oxygen, resulting in the oxidation of in situ soils within the predicted dewatering drawdown extent. If the oxidation of in situ ASS generates sulfidic acidity, then groundwater is the initial pathway by which impacts may migrate. Acidity could, therefore, be mobilised downwards by leachate, upwards with groundwater rebound, or laterally by groundwater migration. If acidic groundwater mobilises heavy metals, they will migrate along the same pathways.

ASS will continue to be managed in accordance with the existing ASSMP as required by MS1168 Condition 9.

7.6.2. YARRAGADEE WATER SUPPLY ABSTRACTION

AQUIFERS

The continued extraction of 1.6GL/year from the existing Yarragadee aquifer (YA_PB02) for the Proposal is unlikely to have any adverse impacts on the water supply potentials of the aquifer systems, as the extraction will result in a piezometric level reduction in this aquifer on the local scale only. A maximum drawdown of 4m is predicted adjacent to the production bore YA_PB02 after 13.25 years of pumping (i.e. between January 2023 and March 2036), with the 1m drawdown cone extending up to 2.6km from the production bore (i.e. Water Supply Scenario). It is noted that these predicted drawdowns are not water table drawdowns but pressure changes.

At the site, the Yarragadee aquifer is a confined aquifer with limited downward leakage from overlying aquifers, due to the presence of low permeable confining layers within the aquifers. However, there may be some small drawdowns (less than 0.05m) recorded in the Leederville aquifer (Vasse Member) during the 13.25 years of pumping the Yarragadee aquifer from YA_PB02, and the drawdown may extend in the vicinity of production bore.

It should be noted that Doral uses YA_PB02 (and any additional Yarragadee production bores) only when required (i.e. when there is a shortage of water from rainfall-runoff and pit dewatering); therefore, the actual drawdowns in the Yarragadee and Leederville aquifers will be smaller than predicted, due to the recovery periods between the extractions (as evident in 2022, refer to Section 5.3.3 of Appendix 10B in (AQ2, 2024).

Regular monitoring of groundwater levels in all aquifers during the mining operation (as per the GWOS) will continue to provide information on the actual induced drawdowns and impacts on these aquifers.

DRAWDOWNS TO EXISTING YARRAGADEE GROUNDWATER USERS

There are four known licensed Yarragadee bores under GWL156423, GWL110298, GWL151407 and GWL156776 that abstract water from the Yarragadee aquifer that are located within the modelled extent of the 0.5m and 1m drawdown cones developed around the production bore (i.e. within 4.1km, 4.26km, 4.7km and 4.9km from bore YA_PB02, respectively, Figure 10.1 of Appendix 10B) (AQ2, 2024).

The Groundwater Model also indicates that small drawdowns (less than 0.05m) are predicted in the Leederville aquifer due to pumping from the underlying Yarragadee aquifer (Figure 10.2 of Appendix 10B), but this is not significant and should not impact any other Leederville aquifer user.

Given the short duration of the abstraction from YA_PB02 and any additional Yarragadee production bore, the impacts on other Yarragadee aquifer users are not expected to be significant. It should be noted that continuously pumping from YA_PB02 has been modelled, whilst it is planned that YA_PB02 and any other production bores will be used only when required, most likely during summer periods when there is a shortfall of water supplied from rainfall, runoff and pit dewatering. Therefore, during the winter periods when minimal to no pumping from the Yarragadee aquifer occurs, water levels will recover, and the actual drawdowns in the Yarragadee and Leederville aquifers will be smaller than predicted.

Regular monitoring of groundwater levels in the Yarragadee and deep Vasse Member of the Leederville bores (as per GWOS) and clear communication with nearby groundwater users during the mining operation will provide information on the actual induced drawdowns and impacts on the other users.

GDEs

Any drawdowns produced by the abstraction from the Yarragadee aquifer at Yalyalup are highly unlikely to adversely impact any GDEs within or near the Proposal, including the Vasse-Wonnerup Wetlands. This is due to the thick clayey layers underlying the Superficial and Leederville Formations, which will protect the GDEs from impacts of abstraction from the deeper Yarragadee aquifer.

7.6.3. MODIFICATION AND INTERRUPTION OF THE EXISTING HYDROLOGICAL REGIME

REDUCTION IN CATCHMENT YIELDS

AQ2 prepared a Surface Water Assessment (2023a) to estimate the extent to which the proposed mine pits will reduce surface water runoff to the downstream water courses and provide management measures to minimise potential impacts.

As the existing Yalyalup mine area is extended north into the Proposal area, the catchment areas of the Lower Sabina River, Abba River and subsequently the Vasse-Wonnerup System (i.e. downstream receptors) will decrease as surface water is captured and treated in each stage of the Proposal. The reduction in catchment is related to the size of the active extension areas – the one being mined and the one being rehabilitated - as surface water is captured and treated.

It is assumed that the entire footprint of the active disturbance areas—the one being mined and the one being rehabilitated—doesn't contribute to the Downstream Receptors, when in reality, runoff from the area under rehabilitation may be entirely or partially due to the sequential mining and rehabilitation approach adopted at Yalyalup.

TABLE 7-8: REDUCTION IN CATCHMENT AREA

CATCHMENT	TOTAL CATCHMENT AREA FROM DWER (km^2)	REDUCTION IN CATCHMENT DUE TO THE NORTHERN EXTENSION (%)					
		EXISTING MINE	EXISTING MINE + A	A + B	B + C	C + D	D + E
Lower Sabina River	42.5	10.5	11.6	2.6	0.4	3.5	8.6
Sabina prior to the diversion	123	3.6	4	0.9	0.1	1.2	3
Abba River	135	0	0.2	1.4	2.4	1.8	0.6
Vasse-Wonnerup Wetlands	461	1	1.1	0.7	0.7	0.8	1

The catchment analysis calculations suggest the impact on the Vasse-Wonnerup System is very low, in the order of 1%. This occurs while Extension Area A is active and the existing mine is under rehabilitation. This aligns with expectations given the disturbance area of the Existing Mine, and the results are comparable to what was reported in the previous Surface Water Management Plan (AQ2, 2021). A change of 1% is relatively small for the Vasse-Wonnerup System, which is the key downstream receptor of the Proposal.

Excluding the impacts of the Existing Mine (which have been assessed previously), the Lower Sabina River catchment seems to be the most affected by the Proposal during the disturbance of Extension Area E (with Area D being rehabilitated) with a maximum 8.6% reduction in catchment estimated. The Lower Sabina

catchment is categorised as a recovery catchment, and work within the catchment to reduce nutrient load is ongoing. Generally, the catchment contributes a disproportionately large nutrient load to the Vasse-Wonnerup System as it is heavily altered and has a small catchment size (DWER, 2018). The Abba River catchment is most affected by the proposal during disturbance to Extension Area C (with Area B being rehabilitated), with an estimated 2.4% reduction.

The proposed upslope diversions and their contributing catchments around the extension areas are provided in Figures 7-10 to 7-15 (AQ2, 2023a).

DISCHARGE OF SURPLUS WATER

The Site Water Balance (AQ2, 2023b) indicates that during wet climate sequences, water pumped to the PWD/DOD from the mine pits (collected groundwater and stormwater) exceeds the mine water demand for a sufficiently sustained period such that the PWD/DOD will overtop. The required period where surplus water would be generated is generally confined to the period between 2029 and 2031. The annual surplus (discharge) water estimates from the GoldSim model (**Error! Reference source not found.** of AQ2, 2023c) show the following:

- The PWD/DOD is predicted to overtop in 45% of the model runs.
- There is a 25% chance that the predicted discharge volume will exceed 20,000m^3.
- The maximum total annual water volume, predicted to overtop the PWD/DOD in any model iterations, is 135,000m^3 (0.135GL).
- Proposed emergency discharge locations are shown in Figure 7-15.

7.6.4. FLOOD

The flood characteristics predicted for the Proposal area suggest an increase in flooding risk to Princefield Road as predicted flood levels in the Abba River and Woddidup Creek increase due to the proposed Extensions encroachment within their respective floodplains. The expected maximum water surface elevation (WSE) from the 1% event in the Mine Development model scenarios (25.5mRL Abba River and 18.0mRL for Woddidup Creek) is shown in Figures 4-6 to 4-12 in (AQ2, 2023a) relative to the elevation profile along Princefield Road between Abba River and Woddidup Creek. The result shows that the potential flood WSE in the Abba River is higher than the road elevation along the entire section of Princefield Road between Abba River and Woddidup Creek. Therefore, there is a risk that flooding from the Abba River could impact the serviceability of the road if a 1% AEP occurred. Note that:

- This risk was still present before the proposed amendment was considered, but the flood level in the Abba River will increase with the proposal.
- The 2D model does not include any allowance for outflow from Abba River along Princefield Road.
- The intent of Figure 4-13 included in (AQ2, 2023a) is not to suggest that flooding along Princefield Road will reach 25.5mRL but to show that Abba River flood levels are predicted to become high enough to impact the road's serviceability potentially.

The predicted flood level in Woddidup Creek is insufficient to impact much of Princefield Road.

The results presented are considered worst-case for the following reasons:

- All extension areas constrain flow at once, in the case flood protection measures remain in place over the full mine life.

- The potentially available flood plain between the upslope diversion for Extension Area D and the Abba River has been modelled as part of mining operations and is unable to store or convey surface water in the model.
- The modelling adopts a constant inflow rate equivalent to the estimated peak 1% AEP flow rate. In reality, storage losses along the floodplains will likely attenuate some of the peak flow.

Overall, the physical tie-in of flood protection measures concerning Princefield Road and maintaining the road's Pre-Mine serviceability will be important to consider as part of the implemented surface water management measures. Further details and management measures are provided in the SWMP (Appendix 10A).

7.7. MITIGATION

7.7.1. AVOID

Doral will avoid groundwater drawdown impacts to key ecological receptors (the Lower Sabina River, Abba River and the Vasse-Wonnerup Ramsar wetland) and avoid exposing large areas of potential acidity at any one time. This will be achieved by mining/dewatering mine pits in a staged approach per the mining schedule. Pits will be mined on a slight incline from the deepest point and then mined, moving up a gradient in order to retain pit water within a sump at the deepest point on the pit floor. This form of dewatering is known as 'passive' as no dewatering apparatus (e.g. spears) is used to actively abstract water, and groundwater drawdown below the base of the pit (i.e. >11m) is highly unlikely to occur. Only suction pumps (no submersible pumps) are used for dewatering, and the suction pumps are set up at a level to maintain a 0.5m saturated pit floor, thus avoiding exposure of the pit floor to significant atmospheric oxygen and potential for acidification of sulfide minerals, whilst also minimising the drawdown extents.

Doral will avoid mining, groundwater drawdowns, and potential acidity exposure to the Leederville aquifer/formations using the above dewatering methodology (i.e., no excavation of and/or no dewatering equipment within the Leederville formation).

Doral's production bore is screened only within the confined Yarragadee aquifer.

Doral will avoid collecting surface water runoff from intercepted upstream catchments by constructing diversions around the disturbance areas. This will allow clean, upgradient flows to go around the disturbance areas and into their intended catchments (Lower Sabina or Abba River) without intercepted site runoff from disturbed areas.

7.7.2. MINIMISE

GROUNDWATER OPERATING STRATEGY

The current GWOS for the existing Yalyalup Mine has been updated to incorporate the Proposal area and includes a groundwater and surface water monitoring program (i.e. abstraction, discharge, water levels and water quality) and has been designed to assess aquifer performance, the potential impacts of groundwater abstraction proposed upon commencement of mining operations and specify operational requirements. Trigger levels and contingency actions have been developed to mitigate the possible effects caused by the mining operations and ensure the actual impacts are not more significant than predicted. The GWOS has been updated per *Operational Policy 5.08 - Use of operating strategies in the water licensing process* (DoW, 2011) and the DWER guidelines for the preparation of Operating Strategies for mineral sand mine dewatering licences in the South West Region (DWER, 2015).

ACID SULFATE SOIL MANAGEMENT PLAN (ASSMP)

The key mitigation measure to reduce potential impacts associated with ASS is to continue to implement the ASSMP as required by MS1168 Condition 9.

A summary of the critical management measures documented in the ASSMP is provided as follows:

- Mining activities will be scheduled to be undertaken on a campaign basis, with a portion of the ore body being mined and processed in a discrete time period to assist in minimising the area of groundwater drawdown at any one time;
- Topsoil/subsoil will be stripped to a depth of ~100mm, stockpiled for rehabilitation and neutralised if pH is <4.0pH;
- Overburden identified as ASS (i.e. NA>0.03%S) will be removed via excavator and trucks or dozers and then immediately transported to an open pit void and backfilled simultaneously with a suitable alkaline material at an appropriate rate to account for the acidity. As far as practical, the backfilling process will aim to mix the neutralising material with the overburden. A guard layer of alkaline material will initially be added to the base and walls (where practical) of the mine void to limit the potential for oxidation;
- Excavated ore identified as ASS will be processed through the wet concentration plant as soon as possible. As this material is maintained as a wet slurry (i.e. saturated), the risk of sulfide oxidation is greatly reduced. The slurry is maintained at pH 5.5 to assist with mineral separation. As such, alkaline (lime sand) material will be added into the in-pit hopper during the excavation of ore to maintain pH5.5 and increase buffering capacity within the wet concentration process;
- Processing of ore results in three streams of material: HMC, clay fines and sand tails. These will be managed as follows:
    - HMC will be stockpiled and stored on a bunded alkaline pad. Leachate emanating from the stockpiled HMC will be captured and returned to the ore processing circuit, which is maintained at pH5.5;
    - Sand tails will be hydraulically returned to pit voids as a single waste stream and/or co-disposed with clay fines into pit voids. This material will have been maintained in a saturated state and with conditions maintained at pH5.5 throughout the process. Furthermore, the unused (unreacted) lime sand that was added to the process at the commencement of the ore processing sequence (i.e. at the in-pit hopper) will form part of this process stream, resulting in the addition of buffering capacity to the locations where this material is hydraulically returned. Sand tails will be regularly assayed for Total Sulfur to ensure concentrations are below 0.03%S. If necessary, additional lime sand will be incorporated during hydraulic disposal. If necessary, additional lime sands will be incorporated during hydraulic disposal;
    - Clay fines will be managed by either:
        - Immediate co-disposal with sand tails by hydraulic return in existing mine voids or
        - Directed to a SEP for storage and future use as void backfill.
    - Clay fines that are immediately co-disposed with sand tails will be maintained in a saturated state before disposal and will include additional buffering capacity provided by the unused

(unreacted) lime sands within the sand tails material. This material will be regularly assayed for Total Sulfur to ensure concentrations are below 0.03%S;

- Clay fines material directed to the SEPs will also be regularly assayed for Total Sulfur to ensure concentrations below 0.03%S. If insufficient buffering capacity is identified, additional neutralising material (lime sand) will be added before being discharged into a SEP. In addition to regular testing during discharge, this material will be re-tested following consolidation and drying within the SEP before final disposal.

- Overburden and non-processed material identified as ASS that will be used for site construction purposes (i.e. roads, pads, bunds etc.) will either be:
  - Neutralised for re-use within 70 hours of excavation; or
  - Stockpiled on a treatment pad for up to 21 days before neutralisation and re-use.
- The water quality of the process water dam will be monitored (three times per week for field measurements) and maintained by the addition of a suitable alkaline material to the in-pit hopper at the commencement of the ore processing sequence (where required) or directly into the process water dam to ensure:
  - Field pH >5.5; or
  - TTA <40 mg$CaCO_3$/L; and
  - TAlk >30 mg$CaCO_3$/L.
- Groundwater monitoring will be conducted during dewatering for a network of monitoring wells. The program will include:
  - Monthly monitoring of groundwater levels;
  - Monthly field testing for pH, EC, TTA and Talk;
  - Monthly laboratory analysis for pH, EC, total acidity, total alkalinity, chloride, sulfate, dissolved aluminium, dissolved iron and dissolved manganese. (If Al >1 mg/L, then the sample will also be analysed for As, Cd, Cr, Cu, Pb, Hb, Ni, Se, and Zn);
  - Comparison of results to site-specific groundwater assessment criteria.

Mining methods for the Proposal will be the same as for the existing areas of the Site, comprising mining progressively via a series of open-cut pits using dry mining techniques to an expected maximum depth of ~1mbgl. Dewatering of groundwater inflows into the mine pits is required in some areas to enable dry mining to occur.

GDE MANAGEMENT PLAN

A GDE Management Plan (Appendix 7) has been prepared to minimise impacts to flora and vegetation values from indirect impacts associated with groundwater drawdowns. As detailed in the Plan, monitoring will comprise a combination of hydrological parameters and vegetation health assessments using qualitative criteria. This will comprise:

- Groundwater level monitoring in a network of six proposed new GDE monitoring wells located near GDE_1, GDE_5, GDE_7 and GDE_8 (it is noted an existing GDE monitoring well is located at GDE_2 as part of the existing GDE EMP);

- The following management response triggers and contingency measures will apply:
- Lagging indicators designed to provide redundancy in risk identification and allow verification of the success of management interventions.
- Triggers have been designed around parameters that may be affected by mining-induced changes to the water regime (i.e. groundwater levels). Soil moisture is not included as a monitoring parameter because it is influenced by infiltrating rainfall, and this will not be affected by mining.
- For all trigger exceedances, the management response will be that water supplementation is required. The final design for the supplementation scheme will be completed during the implementation of the GDE Management Plan.
- Supplementation will be based on a combination of:
    - Surface irrigation.

The supplementation scheme will have the following design criteria:

- To supply enough water to offset declines in groundwater levels (i.e., maintain levels within the natural range under the GDEs). This will be determined using the existing groundwater model;
- To be operationally effective. This will be assessed during the engineering design of the scheme based on aquifer parameters derived during previous groundwater investigations;
- To incorporate a monitoring program that can confirm the supplementation system's efficacy. The monitoring program outlined in this plan will achieve this.
- Supplementation water will be sourced from the Yarragadee aquifer to ensure sufficient water quality within the GDEs without risk of impacts due to acidification or dieback.

SURFACE WATER MANAGEMENT

Management measures to minimise potential impacts associated with surface water impacts, as detailed in the Surface Water Management Plan, (AQ2, 2023a) are summarised below:

- Divert clean flows around the mine disturbance areas where practical. Where required, allow drain diversions and return diverted flows to their original catchment downstream of infrastructure.
- Progressive rehabilitation of mined area during the mine progression.
- Dirty water runoff must be captured and passed through sediment basins before reuse or, if necessary, released back into the catchment.
- Ideally, water management measures should be removed if they are no longer required and water quality is acceptable. At closure, all disturbed areas are to be similar to pre-mining conditions.

7.7.3. REHABILITATION

Sand tails resulting from ore processing will be hydraulically returned to pit voids as a single waste stream and/or co-disposed with clay fines into pit voids as soon as possible to return groundwater levels. This material will have been saturated, with conditions maintained at pH5.5 throughout the process. Furthermore, the unused (unreacted) lime sand that was added to the process at the commencement of the ore processing sequence (i.e. at the in-pit hopper) will form part of this process stream, resulting in the addition of buffering capacity to the locations where this material is hydraulically returned.

Information regarding the final (closure) landforms for the Proposal will be the same as those included in the current Mine Closure Plan (Doral, 2023b), which consists of the following:

- Final landforms are returned to topography similar to Pre-Mine levels and meet landowner specifications.
- Final landforms can support the designated post-mining land use, specifically:
    - Agriculture land use: The top 1 m of soil profiles are consistent with pre-mining soil profiles and, where different, enable improved agricultural productivity (e.g., covering rocky laterite surface with soil).
    - Native vegetation land use: Landforms can support native vegetation.
    - Road Reserve land use: Established Road reserves shall remain intact, unless approved for clearing, and where unbuilt road reserves are impacted, they shall be returned to a suitable standard to support road construction.
- Soils and landforms exhibit erosion rates consistent with surrounding areas and do not compromise postmining land uses.

Long-term post-mining effects on water levels are expected to be minimal. The recovery of water levels will commence immediately once mining of each active mine pit is completed, owing to backfilling of mined-out pits. The numerical model (AQ2, 2024) shows that water levels are predicted to return to pre-mining levels within 12 months of mine closure (i.e. by December 2037).

The Mine Closure Plan will be updated to incorporate the proposed Northern Extension and provided to DEMIRS with the submission of the Mining Proposal.

7.8. ASSESSMENT AND SIGNIFICANCE OF RESIDUAL IMPACTS

DEWATERING MINE PITS AND DRAWDOWN OF WATER TABLE

Dewatering commenced for the Yalyalup Project in January 2022. Data provided in the recent Annual Groundwater Monitoring Summary for the 2022 reporting period indicates the following:

- Groundwater elevations in the Superficial and Leederville monitoring bores were within the historical range of values and the range of natural seasonal water level variations and generally showed no evidence of any long-term trends.
- Groundwater levels in the Superficial and Leederville aquifers at the Yalyalup mine have generally not been affected by any mining activities (i.e. pit dewatering and backfilling and off-site drainage), apart from some localised exceptions to five Superficial aquifer bores YA_MB05S, YA_MB11S, YA_MB12S, YA_MB35_GDE and YA_MB37_GDE, which showed short-term (a few months) reduction in water elevations (i.e. drawdowns between 0.5 and 3m), owing to mining and dewatering at the nearby active mine blocks. Leederville aquifer bores YA_MB31_L, YA_MB30_W, and YA_MB23_L showed abstraction, consistent with previous years.
- Overall, the impact on groundwater levels in the Superficial and Leederville aquifers due to the Yalyalup mine operation has been very limited over the 2022 reporting period. Any changes that have occurred (in the Superficial aquifer) are very localised (adjacent to the active pits) and temporary in duration. The recovery of water levels commences immediately after the mining of each active mine pit is completed, owing to the backfilling of mined-out pits with sand and clay tails.

Groundwater modelling for the current Proposal (AQ2, 2024) predicts impacts similar to those reported in the Annual Groundwater Monitoring Summary GWL206603(1) (AQ2, 2023d) for the current Mine. That is:

- Water level drawdowns in the Superficial aquifer are predicted to be localised in the immediate area of the active mining (pits), temporary in duration and relatively small, with a maximum drawdown of 11m predicted at the end of mining in August 2030.
- The cone of depression of 0.1m generally lies within the proposed mining disturbance area and only marginally extends past this area (up to 550m for the dry scenario).
- Drawdowns in the Leederville aquifer are predicted to be local and likely to extend laterally but not vertically (owing to clayey layers within the sand). The extent of 0.1 m drawdown is generally limited to areas immediately outside the planned mining areas.

Therefore, it is unlikely that short-term dewatering for the proposed Northern Extension will have any additional adverse impacts on the water supply potentials of the Superficial and Leederville aquifer systems as those currently experienced. The Superficial aquifer is resilient and will cope with the proposed changes due to the mining of the Northern Extension.

Long-term post-mining effects on water levels are expected to be minimal. The recovery of water levels will commence immediately once mining of each active mine pit is completed, owing to backfilling of mined-out pits. Water level gradients between the mine voids and the surrounding areas drive groundwater inflows to the mined-out pits. It should be noted that during the mining phase, water recovery in mined-out areas may be interfered with by dewatering of subsequent mining areas. Thus, the rate of water level recovery can be slow. Once all mining areas are completed, dewatering will cease, and water levels will continue to rise until a steady state or equilibrium water level is resumed. The numerical model shows that water levels are predicted to return to pre-mining levels within 12 months of mine closure (i.e. by December 2037).

VASSE-WONNERUP SYSTEM RAMSAR WETLAND

No drawdowns from the existing Mine operations have been experienced due to very localised (adjacent to the active pits) and temporary drawdowns in the Superficial and Leederville aquifers, as reported in (AQ2, 2023d).

Groundwater modelling for the Proposal also predicts drawdowns in the Superficial aquifer are not predicted to extend to the Vasse-Wonnerup System Ramsar Wetland (~4.6km to the north) with the maximum extent of 0.1m extending up to 550m from the mining disturbance area (AQ2, 2024). Therefore, it is highly unlikely that the drawdowns for the Proposal will impact the Vasse-Wonnerup wetland.

DRAWDOWN ON GROUNDWATER USERS

Data collected during the 2022 reporting period indicates that the mining activities (i.e. active pit mining, pit dewatering, pit void backfilling) at the existing Mine site resulted in only localised changes to water levels and water quality, with no increases in a regional scale (AQ2, 2023d). No impacts on other licensed Superficial aquifer users have been identified to date. Three Leederville aquifer bores, YA_MB31_L, YA_MB30_W and YA_MB23_L, reported small drawdowns as a response to abstraction from these bores (unrelated to the Yalyalup project).

Modelling for the Proposal indicates that all Superficial aquifer licensed bores are located outside the predicted 0.1m drawdown contour and are unlikely to be impacted by the proposed dewatering operations

(AQ2, 2024). It is, therefore, unlikely that short-term dewatering for the Proposal will have any long-term adverse impacts on the water supply potentials of other users in the Superficial and Leederville aquifers.

Regular monitoring of groundwater levels in the Superficial and Leederville bores (as per GWOS) and clear communication with the nearby groundwater users during the mining operation will continue to provide information on the actual induced drawdowns and impacts on the other users. If Doral's mining operations affect any of the Superficial and Leederville bores, Doral will implement mitigation measures to account for any impacts to neighbouring users.

DRAWDOWN OF GDES

No groundwater drawdown in the Superficial aquifer has been reported to extend beyond the Yalyalup mining area during 2022 (AQ2, 2023d). Therefore, no impact to any of the three high-value wetland GDEs, located approximately 6km to the site's northeast or southwest, is likely to have occurred.

The magnitude of drawdowns along McGibbon Track from the existing Project, where sensitive vegetation (TECS: SCP02 and SCP10b) were identified, varies depending upon the proximity of the active mining pits. During 2022, short-term (2 months) drawdowns of up to 2.6m were recorded at YA_MB35_GDE, owing to the mining and dewatering of pit 91. These drawdowns are localised in the immediate area of active mining (i.e. there were no drawdowns recorded in the nearby upstream bore (YA_MB08S) or downstream bore (SCPD28A)).

As per the current GDE EMP requirements (MS1168 Condition 10), more frequent water level monitoring was undertaken during 2022, with the supplementation scheme being initiated in February and March 2022 (i.e. a total of 72,000L was irrigated along the McGibbon Track using water carting). Vegetation monitoring increased fortnightly once water level triggers were reached, with all existing sensitive vegetation still present along the McGibbon Track despite the limited surface supplementation. It should be noted that supplementation infrastructure is currently in place with the 2nd Yarragadee aquifer production bore (YA_PB02), which can supply the required volumes of clean water.

Generally, there were no abnormal results during 2022, indicating there is still enough groundwater available for the GDEs on the McGibbon Track. Typically, the plants are more stressed (higher negative pressure) in the drier, hotter months of February, March, and April and show fewer signs of stress after rainfall (Doral, 2023a).

All plants show a visual health (VH) score of 3.5 or above, except for two *Banksia littoralis*. BL02 has died (recorded dead on 22/3/202), and BL03 has a score of 2.5, recorded on 22 March 2023. These plants are adjacent to the mining at the northern end of McGibbon Track.

No groundwater drawdown in the Superficial aquifer is predicted to extend beyond 550m from the edge of the mining area at the proposed Yalyalup Northern Extension. Therefore, it is unlikely that any of the three high-value wetland GDEs, located approximately 6 km to either the northeast or southwest of the site, will be impacted by the proposed Yalyalup development (AQ2, 2024).

Modelled predictions suggest that the dewatering operations for the Proposal will temporarily cause groundwater levels to decline and fall outside the seasonally observed range. The magnitude of change in groundwater levels (i.e. drawdowns of more than 0.25 m) exceeds thresholds that could potentially result in impacts to the vegetation in the Northern Extension GDEs (GDE_1 to GDE_8) and also in a southern part of the McGibbon Track (YA_MB_33_GDE and YA_MB_36_GDE). It is noted that vegetation within GDE_3, GDE_4, and GDE_6 will be cleared to facilitate mining in these areas.

Continued implementation of a GDE EMP (new Plan prepared for the Proposal) is considered adequate to avoid significant indirect impacts associated with groundwater drawdowns on groundwater-dependent vegetation. As a contingency, a suitable offset will be provided if long-term adverse impacts on vegetation continue to be identified after supplementation.

Long-term post-mining effects on water levels are expected to be minimal. The recovery of water levels will commence immediately once mining of each active mine pit is completed, owing to backfilling of mined-out pits. Once all mining areas are completed, dewatering will cease, and water levels will continue to rise until a steady state or equilibrium water level is resumed. The numerical model shows that water levels are predicted to return to pre-mining levels within 12 months of mine closure (i.e. by December 2037).

ACID SULFATE SOILS

ASS for the existing approved Mine is managed in accordance with the ASSMP as required by MS1168 Condition 9. Annual compliance reporting for the 2023 period demonstrated that the monitoring parameters for soils (overburden, sand tails and clay fines), dewatering effluent (pit and PWD) and groundwater quality (groundwater bores) were generally below trigger criteria and concluded:

- All soils (overburden, sand tails and clay fines) were neutralised appropriately, as demonstrated through the CRS results, with all samples below the trigger criteria.
- Most dewatering effluent quality showed no significant or statistical change despite TTA and Total Alkalinity triggers being exceeded in several locations at the PWD and dewatering pits. pH, however, remained above pH 6.0 throughout the reporting period, indicating sufficient alkalinity was present in the groundwater system to counterbalance these minor occurrences.
- Groundwater quality (pH, TTA and Total Alkalinity) at the monitoring bores were also generally within the range of pre-mining quality.

Given similar results were identified during the ASS Investigation for the Proposal area, continued implementation of the existing ASSMP is considered adequate to meet the environmental objective of MS1168 Condition 9-1.

GROUNDWATER QUALITY

Water quality data collected during the 2022 review period from the Superficial and Leederville aquifers monitoring bores at the Yalyalup site show the groundwater to be generally fresh to marginal, acidic to neutral, with low total acidity, total alkalinity, SO_4:Cl ratios and concentrations of sulphate, aluminium and manganese. Most water quality parameter values remained within a relatively small fluctuation range consistent with historical data. In most bores, no evidence of any unacceptable decreasing or increasing trends of changing water quality for the Superficial and Leederville aquifers was noted, including any salinity increase or significant change in the chemical composition of water. The only exception to this occurred in the Superficial bores YA_MB05S and YA_MB06S. At YA_MB05S, there were some water quality parameter increases (pH, salinity, total alkalinity, chloride, sulphate) since July 2022 due to the mining activities adjacent to this bore (e.g. seepage from the sand tails during nearby pit void backfilling). At bore YA_MB06S, there were some water quality parameter decreases (pH, TDS, sulphate, chloride) from July 2022 onwards also due to nearby pits voids being backfilled with tails, where water from tails that had lower water quality parameters than YA_MB06S seeped through.

Overall, the post-mining operation's impact on groundwater quality in the Superficial and Leederville aquifers over the 2022 reporting period has been minimal. Any changes that occurred were localised and short-lasting.

Surface water quality measured at selected surface water monitoring sites showed that existing off-site water discharge activities at the Yalyalup mine did not result in unreasonable changes in surface water quality at these locations, with only temporary spikes.

HYDROLOGICAL IMPACTS TO LOWER SABINA RIVER AND VASSE WONNERUP WETLANDS

Due to reduced surface water flows associated with the existing approved Mine, no adverse hydrogeological impacts have been noted to either the Lower Sabina River or Vasse Wonnerup wetlands. Maximum reductions due to the capture of surface water flows (within mine pits) were modelled to be 8% for the Lower Sabina River and 1% for the Vasse Wonnerup wetland. However, these assumed all mine voids were open at once, whereas only a small portion of the catchment was disturbed at any time. Surface water diversions of clean, upgradient water are also in operation to minimise the capture of upgradient catchment water.

The Proposed extension also has the potential also to reduce surface water flows to the Lower Sabina River, the Abba River and the Vasse Wonnerup Wetlands through modification and interruption of the existing hydrological regime (AQ2, 2023a). The catchment analysis calculations suggest the impact on the Vasse-Wonnerup System is very low, in the order of 1%. In comparison, the Lower Sabina River catchment seems to be the most affected during the disturbance of Extension Area E (with Area D being rehabilitated), with an estimated 8.6% reduction in the catchment. This aligns with expectations assessed for the Original Mine as reported in the previous Surface Water Management Plan (AQ2, 2021). A change of 1% is relatively small for the Vasse-Wonnerup System, which is the key downstream receptor of the Proposal. The Abba River catchment is also affected during disturbance to Extension Area C (with Area B being rehabilitated), with an estimated 2.4% reduction. Implementing the SWMP (AQ2, 2023a), such as the diversion of clean water around mine voids or disturbed areas, will continue to be in place for the Proposal.

SHORT-TERM ABSTRACTION OF WATER FROM THE YARRAGADEE AQUIFER POTENTIALLY AFFECTS OTHER USERS OF THE YARRAGADEE AQUIFER

The continued extraction of 1.6 GL/year from the Yarragadee aquifer (YA_PB02) for the Proposal is unlikely to have any adverse impacts on the water supply potentials of the aquifer systems, as the extraction will result in a piezometric level reduction in this aquifer on the local scale only. A maximum drawdown of 4m is predicted adjacent to the production bore YA_PB02 after 13.25 years of pumping (i.e. between January 2023 and March 2036), with the 1m drawdown cone extending up to 2.6 km from the production bore (i.e. Water Supply Scenario) (AQ2, 2024). It is noted that these predicted drawdowns are not water table drawdowns but pressure changes.

It should be noted that Doral uses YA_PB02 (and any additional Yarragadee production bores) only when required (i.e. when there is a shortage of water from rainfall-runoff and pit dewatering); therefore, the actual drawdowns in the Yarragadee and Leederville aquifers will be smaller than predicted due to the recovery periods between the extractions.

Given the short duration of the abstraction from YA_PB02 and any additional Yarragadee production bore, the impacts on other Yarragadee aquifer users are not expected to be significant. It should be noted that continuously pumping from YA_PB02 has been modelled, whilst it is planned that YA_PB02 and any other production bores will be used only when required, most likely during summer periods when there is a

shortfall of water supplied from rainfall runoff and pit dewatering. Therefore, during the winter periods when minimal to no pumping from the Yarragadee aquifer occurs, water levels will recover, and the actual drawdowns in the Yarragadee and Leederville aquifers will be smaller than predicted.

Regular monitoring of groundwater levels in the Yarragadee and deep Vasse Member of the Leederville bores (as per GWOS) and clear communication with nearby groundwater users during the mining operation will provide information on the actual induced drawdowns and impacts on the other users.

REDUCTION IN SURFACE WATER QUALITY FROM EMERGENCY DISCHARGE OF WATER

Over the 2022 reporting period, water was discharged off-site using the Licenced Discharge Point W1 and the Emergency Discharge Point E2 on multiple occasions (AQ2, 2023d). Generally, the water discharged from the licenced and emergency discharge points was of similar quality to the Superficial aquifer chemistry and surface water chemistry. There are some water quality variations due to rainwater mixing with the Superficial groundwater (in 2022 due to dewatering). No exceedance of the off-site water quality default trigger levels occurred during 2022. No off-site water discharges via the emergency discharge points E1 were recorded during 2022; therefore, no water samples were required to be collected for field measurements and laboratory analysis.

Surface water from areas within the Proposal area will typically be recycled for use in mining operations and only be discharged at set locations in the case of a large rainfall event or if a water surplus exists. Similar to what is currently being used at the mine infrastructure to capture or divert dirty water, it is likely to include a network of bunds or drains around the Proposal to ensure all surface water is retained and recycled or otherwise discharged at controlled discharge locations.

Several sumps equipped with pumps will be required to collect surface water from extension areas and transfer it to the Process Water Pond at the Concentrator. The sumps will be equipped to pump surface water from typical rainfall events (< 1-year ARI), with larger events activating pumps at emergency discharge sumps for controlled release.

7.9. ENVIRONMENTAL OUTCOMES

Doral considers that with the current management regime for groundwater, surface water and acid sulfate soils, any additional impact from mining the Proposal will be minimal and that the EPA objective to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected will be achieved.

8. ENVIRONMENTAL FACTOR – SOCIAL SURROUNDINGS

8.1. EPA OBJECTIVE

The EPA's objective for Social Surroundings is:

To protect social surroundings from significant harm.

The objective recognises the importance of ensuring that social surroundings are not significantly affected due to the implementation of a proposal or scheme.

8.2. POLICY & GUIDANCE

Guidance relevant to Social Surroundings that have been considered during the EIA process are documented in the following document:

- *Environmental Factor Guideline – Social Surroundings* (EPA, 2016j)*;*
- *Environmental Protection (Noise) Regulations 1997;*
- *Aboriginal Heritage Act 1972.*

8.3. ORIGINAL PROPOSAL

8.3.1. RECEIVING ENVIRONMENT

The Original Proposal is located within a rural farming land setting ~11km southeast of Busselton, in a generally flat to slightly undulating landscape. Nineteen residences are located within 1km of the Proposal area, and a further 17 residences are present within 1-2km of the Proposal area.

The Original Proposal is within the South West Boojarah #2 (WC06/4) (SWB) native title claim, which is represented by the South West Aboriginal Land and Sea Council (SWALSC). There is one Registered Aboriginal Site, Abba River (DPLH 17354), that is currently listed within the Original Project area.

Doral has entered into a Noongar Standard Heritage Agreement with SWALSC on behalf of the SWB claimants. Ethnosciences (2020) conducted an ethnographic field survey of the Original Proposal on 28 November 2019 with seven SWB consultants comprising the ethnographic survey team (EST). Except for the Abba River (DPLH 17354), the EST identified no other ethnographic sites during the survey. Snappy Gum Heritage (2019) also conducted an archaeological survey between November 18 and 21, 2019. The archaeological survey did not discover any new Aboriginal archaeological sites.

8.3.1. POTENTIAL IMPACTS

The potential impacts of the Original Proposal to Social Surroundings are:

- Increased noise emissions during construction, mining and processing operations;
- Dust emissions associated with the construction and operation phases of the Proposal;
- Disturbance to Registered Aboriginal Site (DPLH 17354) from construction activities and operation of the Proposal.

8.3.2. MITIGATION

NOISE AND DUST

Doral proposed the following avoidance and mitigation measures to manage potential impacts from noise and dust for the Original Proposal:

- Daytime mining operations only, with minimal equipment operating at night;
- Operating only when Doral can meet the appropriate guidelines;
- Locating fixed plant at the furthest reasonable distance from sensitive receptors;
- Avoidance of mining scenarios identified in the model as potentially causing non-compliance with the Regulations;
- Selection of quietest equipment available;
- Modification of equipment, including installation of acoustic insulation where practicable to reduce sound power levels;
- Creation of noise bunding around the fixed plant to reduce noise;
- Employing real-time noise and dust monitoring to adjust equipment use and mining activities in response to elevated noise and dust levels;
- Restricting machinery operation during worst-case conditions;
- Regular noise and dust monitoring at sensitive receptors to measure control measure performance.

ABORIGINAL HERITAGE

As the Abba River (DPLH 17354) is a registered Aboriginal Site, Doral was granted a Section 18 Notice under the AH Act for Ministerial consent to use the land upon which the Site is located for the construction of the internal road and river crossing.

Doral has signed an Indigenous Land Use Agreement *(Noongar Standard Heritage Agreement)* to ensure that all activities are undertaken in a manner that protects Indigenous Sites and Indigenous Objects to the highest extent possible.

As required under MS1168 Condition 13, Doral has implemented an Abba River Management Strategy (Appendix 7). The Strategy was prepared in consultation with the SWALSC, on the advice of the DWER, and approved by the DWER CEO.

8.4. PROPOSED AMENDMENT – ABORIGINAL HERITAGE

8.4.1. ABORIGINAL HERITAGE

Doral commissioned Ethnosciences (2023) to conduct an ethnographic and Aboriginal Cultural Heritage survey of the Proposal area (Appendix 12A). On behalf of Ethnosciences, Snappy Gum Heritage (2023) also conducted an archaeological survey of the Proposal area (Appendix 12B). Desktop research and consultation with the South West Boojarah (SWB) 'knowledge holders' / consultants identified that the only registered Aboriginal site within the Proposal area was the Abba River (ID 17354).

During consultation with the SWB consultants, no objections were raised to the project proceeding or limited impact (up to two crossings) on the Abba River (ID 17354), the only intangible cultural heritage identified in the Proposal area. No significant tangible cultural heritage was recorded during the archaeological survey.

As the Abba River (DPLH 17354) is a registered Aboriginal Site, Doral was granted a Section 18 Notice under the AH Act for Ministerial consent to use the land upon which the Site is located for the construction of the internal road and river crossing.

Doral has signed an Indigenous Land Use Agreement *(Noongar Standard Heritage Agreement)* to ensure that all activities are undertaken in a manner that protects Indigenous Sites and Indigenous Objects to the highest extent possible.

As required under MS1168 Condition 13, Doral will continue implementing the 'Abba River Management Strategy' (Appendix 7). The Abba River Management Strategy was prepared in consultation with the South West Aboriginal Land and Sea Council (SWALSC), on the advice of the DWER and approved by the CEO of the DWER.

8.4.2. HERITAGE – MITIGATION

AVOID

Doral has avoided, where possible, impacting heritage values as most of the Proposal area does not contain any tangible cultural heritage or registered Aboriginal sites other than DPLH Site 17354.

MINIMISE

To minimise potential impacts on Indigenous heritage values, Doral will ensure that all relevant staff/contractors are informed of the location and registered status of the Abba River (DPLH Site 17354) on the DPLH Aboriginal Heritage Register. This site has historical and mythological importance and has been assessed by the ACMC as an Aboriginal Site under the *Aboriginal Heritage Act 1972.*

Doral will continue to implement the Abba River Management Strategy (ARMS) as per MS1168 Condition 13 to minimise impacts on the Abba River (DPLH Site 17354) (Appendix 7). As the Abba River (DPLH 17354) is a registered Aboriginal Site, a Section 18 Notice under the AH Act to the Aboriginal Cultural Material Committee (ACMC) for Ministerial consent to use the land upon which the Site is located has been acquired for the construction of the internal road and river crossing. The Abba River Management Strategy was prepared in consultation with the SWALSC, on the advice of the DWER, and approved by the CEO of the DWER and will continue to be implemented for the Proposal.

Key management actions regarding the social impacts of the ARMS include:

- The invitation to SWALSC nominated representatives of the South West Boojarah #2 Agreement Group to be present during ground-disturbing activities.

8.5. PROPOSED AMENDMENT - NOISE

Doral commissioned Acoustic Engineering Solutions (AES) to conduct a noise impact assessment for the Proposal (Acoustic Engineering Solutions, 2024) (Appendix 13). The acoustic model was developed to generate noise contours for the site's surrounding area and to predict noise levels at 23 noise-sensitive (residential) receivers (Figure 8-1) under a range of day and night-time meteorological conditions, including calm conditions and worst-case winds in 8 cardinal directions. It is proposed that the Proposal will operate on a continuous 24/7 roster. The Site layout for the assessment is shown in Figure 1-2.

The assessment was based on the proposed location of the fixed plant and mobile equipment according to the proposed mine schedule, sound power levels of the fixed plant and mobile equipment as measured when operational at the Yoongarillup and Yalyalup Mine, and with consideration of likely wind conditions. Background noise emissions from any source other than proposed mining were excluded (e.g. road traffic, aircraft, animals, domestic sources, etc).

Noise-generating activities from the mining process include:

- Clearing and topsoil removal;
- Excavating and trucking ore to minerals processing facilities,
- Processing ore at the Feed Prep Plant (FPP) or In-Pit Field Unit (IPFU) from where it is pumped to a Wet Concentration Plant;
- Tails return and rehabilitation works.

Other activities include the preparation of haul roads and dust suppression using water carts. Mining and rehabilitation activities are limited to daytime hours only, whilst mineral processing is a 24-hour operation.

8.5.1. NOISE REGULATIONS

The EP Act regulates environmental noise by implementing the *Environmental Protection (Noise) Regulations 1997*. The Regulations set noise limits, which are the highest noise levels that can be received at noise-sensitive (residential), commercial, and industrial premises. These noise limits are defined as 'assigned noise levels' at receiver locations. Regulation 7 requires that "*noise emitted from any premises or public place when received at other premises must not cause, or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind*".

ASSIGNED NOISE LEVELS

The noise limits assigned for mining on residences (noise-sensitive premises) are listed in Table 8-1, as assigned by the Environmental Protection (Noise) Regulations 1997, Part 2 Division 1 Regulation 8 (3) Table 1. The LA10 noise limit is the most significant for the Proposal since it is representative of continuous noise emissions from the mining activities.

TABLE 8-1: ASSIGNED NOISE LEVELS AT RECEIVING LOCATIONS

TYPE OF RECEIVING NOISE	TIME OF DAY	ASSIGNED NOISE LEVELS - dB(A)		
		L_{A10}	L_{A1}	L_{AMAX}
Noise-sensitive premises: highly sensitive area	0700 to 1900 hrs Monday to Saturday	45 + Influencing factor	55 + Influencing factor	65 + Influencing factor

TYPE OF RECEIVING NOISE	TIME OF DAY	ASSIGNED NOISE LEVELS - dB(A)		
		L_{A10}	L_{A1}	L_{AMAX}
	0900 to 1900 hrs Sunday and public holidays	40 + Influencing factor	50 + Influencing factor	65 + Influencing factor
	1900 to 2200 hrs All days	40 + Influencing factor	50 + Influencing factor	55 + Influencing factor
	2200 hrs on any day to 0700 hrs Monday to Saturday and 0900 hrs Sunday and public holidays	35 + Influencing factor	45 + Influencing factor	55 + Influencing factor
Noise-sensitive premises: any area other than highly sensitive area	All hrs	60	75	80
Commercial premises	All hrs	60	75	80
Industrial and utility premises other than those in the Kwinana Industrial Area	All hrs	65	80	90
Industrial and utility premises in the Kwinana Industrial Area	All hrs	75	85	90

INFLUENCING FACTORS

Influencing factors vary from residence to residence, depending on the surrounding land use. Traffic flows on roads in the vicinity (450m radius) of the closest residences are insufficient for any roads to be classified as either major or secondary roads. Therefore, no transport factor applies.

Twenty-three (23) noise-sensitive (residential) locations surrounding the mine site are selected for detailed noise impact assessments. These residential locations are shown in Figure 8-1. Most of the closest residences are more than 450m away from mining pits. Schedule 3 Clause 3 of the Regulations classifies the mining pits as Type A land (industrial and utility premises). Due to the presence of the mine site, the calculated influencing factor ranges from 0.3 dB to 11.1 dB, rounded to 0 dB to 11 dB according to the Regulations. Table 8-2 presents the calculated assigned noise levels for the 23 closest residential locations.

TABLE 8-2: CALCULATED ASSIGNED NOISE LEVELS (L_{A10}) IN dB(A)

CLOSEST RESIDENCES	INFLUENCING FACTOR IN dB	CALCULATED ASSIGNED NOISE LEVELS IN dB(A)					
		DAY[1] MONDAY TO SATURDAY		EVENING[2] DAY[3] FOR SUNDAY AND PUBLIC HOLIDAY		NIGHT[4]	
		L_{A10}	L_{A1}	L_{A10}	L_{A1}	L_{A10}	L_{A1}
R7	11	56	66	51	61	46	56
R6	6	51	61	46	56	41	51
R15	5	50	60	45	55	40	50
R4	4	49	59	44	54	39	49
R2	2	47	57	42	52	37	47
R1, R3, R9 and R14	1	46	56	41	51	36	46
Others	0	45	55	40	50	35	45

Notes:

1. 0700 to 1900 hrs for Monday to Saturday

2. 1900 to 2200 hrs for all days.

3. 0900 to 1900 hrs for Sunday and public holidays

4. 2200 hrs any day to 0700 hrs Monday to Saturday and 0900hrs Sunday and public holidays.

8.5.2. NOISE MODELLING

An acoustic model was developed using the SoundPlan v8.0 program developed by SoundPLAN LLC. The CONCAWE5,6 prediction algorithms are selected for the Yalyalup Extension Noise Assessment (Acoustic Engineering Solutions, 2024). The acoustic model generates noise contours for the area surrounding the mine site and predicts noise levels at the closest noise-sensitive (residential) receivers.

The acoustic model does not include noise emissions from sources other than the proposed mining operations. Therefore, noise emissions from road traffic, aircraft, animals, domestic sources, etc, are excluded from the modelling.

Seven (7) scenarios, including pre-mining topsoil stripping and stockpiling earthworks which, although intermittent tasks based on staged mining progress, are modelled to account for worst-case operating conditions:

- Scenario 1 represents the worst-case mining operations in 2026;
- Scenario 2 represents the worst-case mining operations in 2027;

- Scenario 3 represents the worst-case mining operations in 2029;
- Scenario 4 represents the worst-case mining operations in 2030;
- Scenario 5 represents the worst-case mining operations in 2032;
- Scenario 6 represents the worst-case mining operations in 2034;
- Scenario 7 represents the worst-case mining operations in 2035.

MACHINERY AND EQUIPMENT SOUND POWER LEVELS

Table 8-3 presents the sound power levels measured at Doral's Yoongarillup and Yalyalup mines during the multiple site visits. The diesel pump is an 8" silenced dewatering pump, and its sound power level was calculated from the provided information.

TABLE 8-3: SOURCE SOUND POWER LEVELS

EQUIPMENT	OVERALL SOUND POWER LEVEL IN dB(A)
CAT 336D Excavator	99.2
CAT 390F Excavator	100.1
CAT 988K FEL	106.3
WA 500 Loader	99.5
CAT D10T Dozer	106.9
CAT 745 Truck	104.2
16H Grader	106.1
Water cart	106.9
Service Truck	99.8
Silenced Diesel (Sump or Booster) Pump	94.3
Feed Prep Process Water Pump 61-PP-28	107.1
Concentrator Process Water Pump 61-PP-27	108.6
Mobile Feed Plant Water Pump 41-PP-29	110.5
Concentrator Total with drapes	101.8
Trommel	105.5
Scrubber	107.8
Apron Feeder with Control	103.7

EQUIPMENT	OVERALL SOUND POWER LEVEL IN dB(A)
Scalping Screen	105.2
Double Deck Screen	108.0
In-Pit Pump	101.2
In-Pit Conveyor in Total	109.3
In-Pit Generator	104.1
In-Pit Vibration Screen	107.6

8.6. POTENTIAL IMPACTS

The potential impacts of the Proposal on Social Surroundings (noise) include:

- Numerous rural-residential premises located within 2km of the Proposal may potentially be impacted by noise from Minerals Processing and Mining, Tails and Rehabilitation Operations.

8.7. ASSESSMENT OF POTENTIAL IMPACTS

Noise level predictions are provided in the following sections for all properties located within the 2km zone surrounding the Proposal for the seven scenarios detailed previously (Figure 8-1). Results presented in **bold** font indicate noise level predictions that have been adjusted for tonality. This is for information only, to highlight the most affected receptors. Composite noise contours for daytime and night-time operations, representing the worst-case envelope derived from the individual scenarios, are also presented.

8.7.1. NIGHT-TIME MINERAL PROCESSING

TABLE 8-4: TONALITY ADJUSTED WORST-CASE EVENING/NIGHT-TIME NOISE LEVELS IN dB(A).

CLOSEST RESIDENCES	ADJUSTED WORST-CASE EVENING/NIGHT-TIME NOISE LEVELS IN dB(A)						
	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5	SCENARIO 6	SCENARIO 7
R1	24.9	28.9	28.9	24.7	25.6	23.0	28.9
R2	24.9	28.2	28.2	25.6	24.3	22.8	28.2
R3	23.2	25.7	25.8	25.7	22.2	20.9	25.7
R4	24.5	26.1	26.4	29.5	25.0	22.0	26.1
R5	21.8	22.6	22.6	21.5	21.9	19.3	22.6
R6	26.2	27.5	27.6	26.7	27.4	23.2	27.5

CLOSEST RESIDENCES	ADJUSTED WORST-CASE EVENING/NIGHT-TIME NOISE LEVELS IN dB(A)						
	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5	SCENARIO 6	SCENARIO 7
R7	27.0	28.5	28.6	30.0	28.2	24.0	28.5
R8	24.5	25.0	25.1	22.5	24.6	21.1	25.0
R9	28.7	30.6	30.7	30.5	27.0	24.8	30.6
R10	28.8	**37.2**	**37.3**	30.3	27.8	26.4	**37.2**
R11	28.4	35.3	35.3	30.0	28.9	27.9	35.3
R12	27.8	34.0	34.0	28.9	28.3	27.5	34.0
R13	25.5	31.1	31.1	26.6	26.0	25.3	31.1
R14	28.7	28.4	28.4	26.5	27.1	28.9	28.4
R15	26.9	25.4	25.4	23.6	24.5	28.8	25.4
R16	22.7	21.7	21.7	20.2	21.3	27.4	21.7
R17	20.5	20.7	20.7	18.8	21.2	27.3	20.7
R18	19.5	20.4	20.4	18.0	21.4	19.8	20.5
R19	18.6	19.8	19.8	17.6	20.1	18.1	19.8
R20	19.8	20.9	20.8	19.0	20.9	19.1	21.0
R21	24.3	26.2	26.2	24.6	23.6	23.7	26.3
R22	24.7	27.1	27.0	25.7	24.3	23.7	27.1
R23	29.2	32.2	32.0	30.3	31.2	27.9	32.3

All the adjusted evening-time noise levels are below the assigned noise levels $LA_{10,}$ and no exceedance occurs at any of the closest residences. Compliance is achieved for the proposed evening-time operations for all seven scenarios. For the nighttime operations, compliance is achieved for scenarios 1 and 4 to 6, but small (≤2.3dB) exceedance is predicted at:

- R10 under southerly to northerly winds and R11 under south-westerly to northerly winds for scenarios 2, 3 and 7.

8.7.2. DAYTIME MINING AND MINERAL PROCESSING

TABLE 8-5: TONALITY ADJUSTED WORST CASE ASSESSMENT FOR DAY TIME OPERATIONS

CLOSEST RESIDENCES	ADJUSTED WORST-CASE DAY-TIME NOISE LEVELS IN dB(A)						
	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5	SCENARIO 6	SCENARIO 7
R1	26.3	30.4	32.3	**44.2**	**41.6**	26.5	30.1
R2	26.4	30.6	34.2	**44.3**	**42.4**	25.5	29.4
R3	25.4	30.3	37.0	**40.4**	31.8	23.4	27.1
R4	27.0	33.3	43.6	**43.0**	31.0	24.3	27.8
R5	24.6	30.7	35.6	30.7	25.6	21.4	24.3
R6	29.2	**45.1**	44.2	**43.0**	29.9	25.1	29.3
R7	30.1	**47.4**	45.8	**45.5**	30.7	25.8	30.3
R8	27.5	**40.6**	37.5	32.7	26.9	22.9	26.9
R9	32.3	**45.1**	**45.6**	**40.1**	28.6	26.2	31.8
R10	32.8	38.8	39.4	34.0	29.0	27.3	33.0
R11	**42.9**	39.4	39.1	32.3	30.1	29.3	36.2
R12	**43.3**	37.9	36.8	31.0	29.5	29.1	35.0
R13	34.8	34.8	33.7	28.5	27.3	26.9	32.3
R14	33.9	30.1	28.7	26.7	28.7	31.3	31.7
R15	29.3	26.8	25.7	23.9	26.7	31.2	29.8
R16	24.6	23.2	22.2	20.5	23.9	29.4	27.0
R17	21.8	21.5	20.9	20.0	24.6	30.0	26.9
R18	21.1	21.1	20.5	19.8	24.9	27.0	26.6
R19	20.5	20.9	20.3	19.6	24.3	26.1	25.9
R20	21.3	22.2	21.7	21.2	25.8	27.6	27.0
R21	25.5	27.3	27.0	27.6	32.6	33.6	31.5

CLOSEST RESIDENCES	ADJUSTED WORST-CASE DAY-TIME NOISE LEVELS IN dB(A)						
	SCENARIO 1	SCENARIO 2	SCENARIO 3	SCENARIO 4	SCENARIO 5	SCENARIO 6	SCENARIO 7
R22	25.9	28.0	27.9	29.2	33.2	32.8	31.4
R23	30.4	33.1	32.9	34.7	44.4	34.8	35.3

All adjusted day-time noise levels are below the assigned noise levels, and no exceedance occurs at any of the closest residences. For all seven scenarios, compliance is achieved for the daytime mining operations on Monday to Saturday. For Sundays and public holidays mining operations, compliance is achieved for scenarios 6 and 7, but exceedance is predicted at:

- R11 under south-westerly to north-westerly winds and R12 under south-westerly to northerly winds for scenario 1;
- R8 under south-westerly to westerly winds and R9 under south-westerly to northerly winds for scenario 2;
- R9 under south-westerly to northerly winds for scenario 3;
- R1 under easterly to south-westerly winds and R2 under south-easterly to westerly winds for scenario 4;
- R1 is under southeasterly to south-westerly winds, and R2 is under southerly to south-westerly winds for scenario 5.

8.8. MITIGATION

8.8.1. MINIMISE

Management of noise emissions during the mining phase will comprise the following approaches and actions, as outlined in the Noise Management Plan (Appendix 7):

- Use of the quietest equipment reasonably available;
- Install silencers where practicable to reduce the exhaust noise of machines;
- Restrict the operation of machinery, particularly the operation of bulldozers, relative to worst-case weather conditions on Sundays and Public holidays to minimise potential noise impacts;
- Restrict the operation of ancillary machinery (water cart and grader) to operate during day-time only;
- Conduct noise monitoring and calculation of sound power for all earthmoving machines for evaluation of suitability with regards to the noise model;
- Establish preventative maintenance schedules for all vehicles, fixed plant and mobile equipment to maintain performance and, therefore, low noise emission;
- Utilise broadband reversing (squawkers) as opposed to reversing beepers;
- Educate employees and contractors on the importance and requirements for noise management prior to commencing work on the mine as part of the site induction process;

- Monitoring of noise emissions at the boundary and/or at potentially affected residents where available to assist with noise management and neighbour relations;
- Seek to establish amenity agreements with adjacent landowners;
- Maintain ongoing effective dialogue with nearby residents to ensure noise impacts are communicated to Doral to allow for rapid resolution;
- Continue to implement an effective public comment and complaint communication system to ensure all concerns are received, recorded and acted upon.

To ensure that the noise emissions reflect the predicted noise impact levels based on the modelling (Acoustic Engineering Solutions, 2024), the following actions will be undertaken and maintained:

- Select quieter mobile equipment as practical as possible;
- Enclose all levels of the Concentrator;
- The FPP is at 2m below the natural surface. The overburden stockpiles are 8m above the natural surface (10m above the FPP floor). The ore stockpile (to the FPP southwest) is 6m above the natural surface;
- Acoustically insulate or partly enclose the apron feeder, scalping and double-deck screens at the FPP;
- An 8m L-shaped bund is built at 20m from the IPFU to reduce noises propagating towards the most affected residences;
- Silence the IPFU generator;
- The IPFU operates only for scenarios 1 and 4 to 6;
- When the IPFU operates (for scenarios 1 and 4 to 6), only the Trommel operates at the FPP. But when the IPFU is not active (for scenarios 2, 3 and 7), the FPP operates fully with CAT 988 Loader;
- All sump pumps are silenced diesel pumps. Each sump pump has a 270-degree circle bund of:
    - 2m for scenarios 1 to 5; but
    - 4m for scenarios 6 and 7.
- Tails/IPFU booster pumps are diesel pumps sitting at 1m below the natural surface. Each booster pump has a 270-degree circle bund of:
    - 2m for scenarios 1 to 6; but
    - 3m for scenario 7.
- Each of the pump bunds is at 1m from the pump, and the bund opening is away from the closest residences;
- For scenario 3, a 6m overburden stockpile is installed in the east pit edge, as shown in thick black lines in Figure 6 and Figure 7 of Appendix B of Appendix 13 (AES, 2024);
- For scenario 6, a 6m overburden stockpile is built along the part of the north site boundary, as shown in a thick black line in Figure 12 and Figure 13 of Appendix B of Appendix 13 (AES, 2024).

Doral has implemented multiple engineering noise control measures to reduce the noise emission from significant contributors. Although these noise controls significantly reduce noise emissions, small

exceedance (resulting from the 5dB tonality adjustment) is still predicted at some of the closest residences for some mining scenarios. Further engineering noise control measures may not be feasible in practice. To achieve day-time compliance with the Regulations for Scenarios 1 to 5, administrative control may be implemented (when unfavourable wind conditions are present):

- Schedule the day-time mining activities from Sunday to Monday to Saturday; or
- Scale down the mining activities during Sunday and public holidays.

8.9. ASSESSMENT AND SIGNIFICANCE OF RESIDUAL IMPACTS

With consent of the S18 Notice by the Minister of Aboriginal Affairs to construct crossings across the Abba River (DPLH 17354) and continued implementation of the Abba River Management Strategy (ARMS) as per MS1168 Condition 13 Doral is confident that impacts to registered Aboriginal Sites will be minimised.

Noise modelling results for the Proposal demonstrate that mining, tails, and rehabilitation activities can be undertaken while maintaining compliance with the project noise limits for sensitive nearby residences. Compliance was demonstrated assuming the implementation of the following noise mitigation measures:

- Noise bunds at mobile screening plants oriented to attenuate sound propagation towards the nearest affected receptors.
- Noise barriers at field pumps oriented to attenuate sound propagation towards the nearest affected receptors.

No specific noise management measures are required for mobile equipment other than not exceeding the sound power levels and numbers of equipment items operating simultaneously assumed in the modelling scenarios.

Mineral processing can be undertaken at all times; however, mining operations are restricted to weekdays (Monday to Saturday, 0700 to 1900hrs, excluding public holidays).

Doral will seek amenity agreements with affected residences.

8.10. ENVIRONMENTAL OUTCOMES

The ethnographic survey of the Proposal area did not identify any new Aboriginal Archaeological Sites or intersections with Registered Aboriginal Sites or Other Heritage Places (Ethnosciences, 2023). With the consent of a S18 Notice by the Minister of Aboriginal Affairs to construct a crossing across the Abba River (DPLH 17354), and continued implementation of the Abba River Management Strategy (ARMS) as per MS1168 Condition 13, Doral is confident that impacts to registered Aboriginal Sites will be minimised.

Doral is experienced at managing noise associated with mineral sands mine sites. Noise levels associated with mining will be controlled as described above. Effective implementation of these noise management strategies, including avoidance strategies, engineering controls, and administrative controls for mine scheduling (including Amenity Agreements), will ensure that noise emissions from the operations comply with the Noise Regulations.

With the above mitigation measures, Doral is confident the EPA's objective to protect social surroundings from significant harm can be achieved.

9. OTHER ENVIRONMENTAL FACTORS – AIR QUALITY

The EPA identified Air Quality as an 'Other Environmental Factor' or matter relevant to the Original Proposal.

9.1. EPA OBJECTIVE

To maintain air quality and minimise emissions so that environmental values are protected.

9.2. POLICY & GUIDANCE

EPA Policy and Guidance

- *Environmental Factor Guideline – Air Quality* (EPA, 2016k).

Other Policy and Guidance

- *A guideline for managing the impacts of dust and associated contaminants from land development sites, contaminated sites remediation and other related activities* (DEC, 2011)*;*
- *National Environment Protection (Ambient Air Quality) Measure* (AAQ NEPM);
- *National Greenhouse and Energy Reporting Act 2007 (NGER Act).*

9.3. ORIGINAL PROPOSAL

The Original Project had the potential to impact social surroundings through dust emissions associated with the construction, operation, and rehabilitation phases of the proposal. Doral has implemented the *Yalyalup Dust Environmental Management Plan* to mitigate dust impacts to the surrounding environment. Doral has also actively sought amenity agreements, where necessary, to maintain their social licence to operate.

9.3.1. ASSESSMENT OF IMPACTS

The EPA Report and Recommendations (2021b) considered that the impacts of Dust were manageable and no longer significant after implementing the mitigation measures prepared by Doral.

9.4. PROPOSED AMENDMENT - RECEIVING ENVIRONMENT

The Proposal is located within a rural farming land set ~11km southeast of Busselton, in a generally flat to slightly undulating landscape. A total of 23 residences are scattered around the local area less than 1km from the disturbance boundary (Figure 8-1). Wind data from the nearest Bureau of Meteorology (BOM) weather station, Busselton Area (Site No. 006603), indicates the prevailing morning winds (9 am) for most of the year are from the east. Mid-afternoon (3 pm) winds tend to vary in direction, without a predominant vector, but are most commonly between 10-20km/hr from various directions, frequently from the northwest (~20%) or south (~18%), although also from the north, southwest or south (~15% each). In winter, regional weather systems can result in strong westerly and north-westerly winds.

Air quality in the Busselton region is monitored and assessed by DWER as a part of the signatory commitments to the *National Environment Protection Measure (Ambient Air Quality) Measure* (AAQ NEPM). Monitoring in 2021 was conducted for PM_{10} and $PM_{2.5,}$ and the 2021 WA air monitoring report (DWER, 2018) noted that:

- The NEPM (AAQ) goal for PM_{10} and $PM_{2.5}$ was not met during the 2021 reporting period. This was due to the occurrences of bushfires and prescribed burns.

The key energy demands for the Proposal, contributing the most significant proportion of Scope 1 greenhouse gas emissions due to the combustion of diesel within mobile and fixed plant and Scope 2 emissions due to the consumption of electricity supplied by the South West Interconnected System (SWIS) network.

9.5. POTENTIAL IMPACTS

Potential impacts of the Proposal on Air Quality are:

- Particulate emissions associated with construction, mining, handling and processing may be generated during the construction and operation phases of the Proposal;
- Greenhouse gas emissions associated with the combustion of diesel fuel from construction, mining, handling and processing may be generated and released into the atmosphere.

9.6. MITIGATION

9.6.1. MINIMISE

PARTICULATE EMISSIONS

Doral is experienced with dust management due to its previous experience managing this aspect for the current Yalyalup Mine (and former Mines).

Air quality parameter limits have been incorporated into the environmental Licence requirements issued under Part V of the EP Act for prescribed premises. Doral will employ mobile real-time dust monitoring to regularly monitor TSP and PM_{10} concentrations in accordance with the Dust Management Plan (Appendix 7). Doral will continue to adhere to the limits set for dust within the licence, focusing on minimising the concentration of TSP and PM_{10} leaving the mine site and potentially impacting neighbours.

During the pre-mine establishment phase, management may employ up to three water carts for dust suppression on unsealed roads and in new areas of ground disturbance.

A range of control techniques will continue to be implemented to eliminate, minimise and control dust generation activities for the Proposal, which include:

- Restrictions on the areas open at any one time to ensure safe and efficient operations;
- Scheduling topsoil stripping as such to avoid periods of high winds;
- Inform all employees and contractors of the importance of reducing the creation of dust-generating activities;
- When necessary, stripping operations are to be suspended under exceptionally high wind conditions;
- Water all high-traffic and haulage areas routinely for dust suppression, ensuring no runoff into vegetated areas. Up to three water carts will be available for use at any one time;
- Spreading stockpiles, noise control bunds and pond embankments with fine clay solution or PVA sealant such that dust control and soil erosion measures are achieved;
- Minimising the number and size of stockpiles. This involves the direct use of overburden as backfill and the direct replacement of topsoil, wherever possible;

- Encouraging vegetative cover on stockpiles, especially the topsoil stockpiles. Many of these vegetative species are generated from stored seed to minimise dust generation;
- The management and monitoring of ore loading and unloading operations such that dust generation is minimised and controlled;
- Spraying HMC stockpiles at the mine with water if they dry to the extent dust generation occurs. HMC stockpiles generally have a moisture content of between 5-9% and are not vulnerable to the adverse effects of strong winds causing dust;
- The co-disposal of sand tails and clay tails into pit backfill areas. This homogenous mixing increases the average particle size and reduces the potential for dust generation;
- When and where necessary, spraying with water or other dust suppression measures (e.g. emulsion spray, erection of wind barriers) is employed;
- Employ routine maintenance and housekeeping practices to ensure that waste materials in and around the mine voids and infrastructure do not accumulate and lead to generating unacceptable airborne particulates.

GREENHOUSE GAS

Doral will manage greenhouse gas emissions in accordance with the *National Greenhouse and Energy Reporting Act 2007* and report the following annually:

- Energy production;
- Energy consumption;
- Emissions.

Doral is committed to an ongoing program of review to identify opportunities to reduce energy consumption and greenhouse gas emissions further.

9.7. ASSESSMENT OF IMPACTS

GENERATION OF PARTICULATE EMISSIONS

Dry mining has the potential to generate dust from the stripping of topsoil and overburden by vehicular movement and surface lift-off from exposed surfaces (e.g. stockpiles, mine pits) during dry and windy ambient conditions. Dust may also be generated from rehabilitation activities and areas recently rehabilitated before pasture and/or vegetation are established. Dust generation can adversely impact surrounding vegetation and create a nuisance to landowners near the mine disturbance areas.

Particulate emissions in the context of the Proposal are defined as:

- Airborne particles (aerosols) or particulate matter (PM) were released during the proposal activities.
- Airborne particles can be defined as comprising dust, fumes, smoke or mist (DEC, 2011);
- The only emission the Proposal generates will be dust, defined as an aerosol formed by the mechanical subdivision of bulk materials into airborne fibres with the same chemical composition and energy greater than one micrometre (DEC, 2011).

Table 9-1 lists the most susceptible residences to dust each month based on the historical prevailing wind directions. Residences are shown in Figure 8-1.

TABLE 9-1: PREDICTED PREVAILING WIND DIRECTION IN RELATION TO RESIDENCE LOCATIONS

TIME OF DAY	0900 HOURS			1500 HOURS		
MONTH	PREDICTED PREVAILING WIND DIRECTION*	RESIDENCE(S) MOST SUSCEPTIBLE TO PREDICTED PREVAILING WIND DIRECTION	APPROXIMATE DISTANCE TO MINE (m)	PREDICTED PREVAILING WIND DIRECTION*	RESIDENCE(S) MOST SUSCEPTIBLE TO PREDICTED PREVAILING WIND DIRECTION	APPROXIMATE DISTANCE TO MINE (m)
Jan	SE	R1, R2, R4, R20, R19, R18, R21, R22, R23.	~450-1500m	S	R1, R2, R3, R4, R7, R21, R22, R23.	~450-1500m
Feb	E	R17, R18, R19, R20, R21, R22, R23.	~450-1500m	S	R1, R2, R3, R4, R7, R21, R22, R23.	~450-1500m
Mar	E	R17, R18, R19, R20, R21, R22, R23.	~450-1500m	S	R1, R2, R3, R4, R7, R21, R22, R23.	~450-1500m
Apr	E	R17, R18, R19, R20, R21, R22, R23.	~450-1500m	NW	R4, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15.	~100-2000m
May	E	R17, R18, R19, R20, R21, R22, R23.	~450-1500m	N	R11, R12, R13, R14, R15, R16.	~100-2000m
Jun	E	R17, R18, R19, R20, R21, R22, R23.	~450-1500m	N	R11, R12, R13, R14, R15, R16.	~100-2000m
Jul	E	R17, R18, R19, R20, R21, R22, R23.	~450-1500m	N	R11, R12, R13, R14, R15, R16.	~100-2000m
Aug	E	R17, R18, R19, R20, R21, R22, R23.	~450-1500m	NW	R4, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15.	~100-2000m
Sep	W	R4, R5, R6, R7, R8, R9, R10, R11, R12, R13	~450-1,500m	NW	R4, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15.	~100-2000m

TIME OF DAY	0900 HOURS			1500 HOURS		
MONTH	PREDICTED PREVAILING WIND DIRECTION*	RESIDENCE(S) MOST SUSCEPTIBLE TO PREDICTED PREVAILING WIND DIRECTION	APPROXIMATE DISTANCE TO MINE (m)	PREDICTED PREVAILING WIND DIRECTION*	RESIDENCE(S) MOST SUSCEPTIBLE TO PREDICTED PREVAILING WIND DIRECTION	APPROXIMATE DISTANCE TO MINE (m)
Oct	E	R17, R18, R19, R20, R21, R22, R23.	~450-1500m	NW	R4, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15.	~100-2000m
Nov	E	R17, R18, R19, R20, R21, R22, R23.	~450-1500m	S	R1, R2, R3, R4, R7, R21, R22, R23.	~450-1500m
Dec	SE	R1, R2, R4, R20, R19, R18, R21, R22, R23.	~450-1500m	S	R1, R2, R3, R4, R7, R21, R22, R23.	~450-1500m

* *Prevailing wind direction taken from Bureau of Meteorology data (for Busselton Aero 009603) collated from 1997 – 2010

During dry and windy ambient conditions, several residences that are present within 500m from the disturbance area boundary may be potentially impacted by nuisance dust during construction activities, mining of mine pits and other associated dust-generating activities from soil disturbance:

Residences on the eastern boundary are susceptible to north-westerly winds (R4, R6, R7, R8, R9, R10, R11) and are located within 450 to 1000m. In addition, being ~450m to 1,000m from the southeast site boundary, R11 and R12 are susceptible to westerly winds. Residences north of the site boundary within 500m (R1, R2, R3, R4) are susceptible to dust from southern vectors, while operations occur on the northeast corner of the disturbance area. Western residences (R18, R19, R20, R21, R22, R23) are susceptible to easterly winds. However, R23 is the only residence close to the project (~500m) on the western boundary, and the others are ~1km away. Given the proximity of this residence to the disturbance area, dust measures will be implemented to minimise dust emissions leaving the northern boundary, and real-time dust monitoring will be employed in the vicinity of these residences.

The project's mining occurs in a staged approach; therefore, not all residences will be affected simultaneously, and some will only be affected temporarily.

Surrounding vegetation could potentially be affected by dust deposition arising from mining activities. Dust interferes with the physiological processes of plants (e.g. transpiration). In extreme cases, dust can smother the leaves of vegetation, resulting in adverse health of the plant and/or death. Generally, significant dust is not generated from within the mining pits but may be more likely from stockpiles and unsealed road surfaces. Management measures (outlined in the Dust Management Plan, Appendix 7 and Section 9.6) will be implemented to reduce dust generation. The risk of death of vegetation from dust impacts is considered low, given the temporary nature of mining activities and the small area of vegetation within the disturbance area.

GENERATION OF GREENHOUSE GAS

The Proposal will contribute (NGERS 2022-2023 reporting year) to Scope 1 greenhouse emissions of up to approximately 9,000 tonnes of CO_2 equivalent and Scope 2 greenhouse emissions of up to approximately 13,000 tonnes of CO_2 equivalent. Per year (Appendix 14). The key energy demands are from the combustion of diesel for the operation of vehicles and mining fleets and emissions due to generating electricity from diesel generators. The greenhouse gas emissions for the Proposal are not considered to be significantly different to those generated by the existing Yalyalup Mine. As the Proposal is an extension to the existing Mine and will commence sequentially after the former mine areas are complete, the greenhouse gas emissions from this Proposal are not considered to significantly increase Doral's current overall greenhouse gas emissions, as the new emissions would effectively replace the current emissions.

9.8. ENVIRONMENTAL OUTCOMES

Doral considers that with the above management measures, the EPA's objective will be achieved to maintain air quality and minimise emissions so that environmental values are protected.

10. MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Doral proposes to refer the Proposal to the Commonwealth DCCEW for consideration under the EPBC Act due to residual impacts (following the application of the mitigation hierarchy) to the following Matters of National Environmental Significance (MNES):

- Listed threatened species and communities (s18 and 18A)
    - Western Ringtail Possum *(Pseudocheirus occidentalis)* – Critically Endangered;
    - Carnaby`s Black-Cockatoo *Zanda latirostris* – listed as Endangered under the *BC Act* and *EPBC Act*.
    - Baudin's Black-Cockatoo *Zanda baudinii* – listed as Endangered under the *BC Act* and *EPBC Act.*
    - Forest Red-tailed Black-Cockatoo *Calyptorhynchus banksii naso* – listed as Vulnerable under the *BC Act* and *EPBC Act;*
    - Whicher Range Dryandra *(Banksia squarrosa* subsp. *Argillacea)* – Vulnerable;
    - Vasse Featherflower *(Verticordia plumose* var. *vassensis)* – Endangered;
    - Shrublands on the southern Swan Coastal Plain Ironstones – Endangered.
- The ecological character of a declared Ramsar wetland (sections 16 and 17B)
    - Vasse-Wonnerup Ramsar wetland system;
- Migratory species (sections 20 and 20A)
    - Wood sandpiper *(Tringa glareola)* – Migratory;
    - Sharp-tailed sandpiper *(Calidris acuminate)* – Migratory;
    - Long-toed stint *(Calidris subminuta)* – Migratory.

10.1. LEGISLATION, POLICY AND GUIDANCE

Australian Government Protection

The Australian Government EPBC Act protects species listed under Schedule 1 of the EPBC Act. In 1974, Australia signed the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). As a result, an official list of endangered species was prepared and is regularly updated. This listing is administrated through the EPBC Act. The current list differs from the various State lists; however, some species are common to both.

The EPBC Act aims to prevent significant impacts to MNES, including threatened species, by assessing proposed actions against the *Matters of National Environmental Significance: Impact Guidelines* (DSEWPaC, 2013).

The EPBC Act's objectives are to:

- *Provide for the protection of the environment, especially Matters of National Environmental Significance.*

- *Promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources.*
- *Control the international movement of wildlife, wildlife specimens and products made or derived from wildlife.*

International Agreements

Australia is party to the Japan-Australia (JAMBA), China-Australia (CAMBA), Republic of Korea-Australia (ROKAMBA) Migratory Bird Agreements and the Convention on the Conservation of Migratory Species of Wild Animals. Most of the birds listed in these agreements are associated with saline wetlands of coastal shorelines. However, these international treaties also list some migratory birds not associated with water.

EPBC Guidance

- Matters of National Environmental Significance. Significant Impact Guidelines 1.1. *Environmental Protection and Biodiversity Conservation Act 1999* (DoE, 2013).
- *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy* (DSEWPaC, 2012a).
- Significant impact guidelines for the vulnerable western ringtail possum (*Pseudocheirus occidentalis*) in the southern Swan Coastal Plain, Western Australia. Nationally threatened species and ecological communities. EPBC Act policy statement 3.10. (DEWHA, 2009).
- *EPBC Act Referral guidelines for three threatened black cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris, Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii, Forest red-tailed black cockatoo (vulnerable) Calyptorhynchus banksii naso* (DSEWPaC, 2012b).
- *Conservation Advice Pseudocheirus occidentalis Western ringtail possum. Canberra: Department of the Environment and Energy* (Threatened Species Scientific Committee, 2018a).
- *Conservation Advice Calyptorhynchus baudinii* Baudin's Cockatoo*. Canberra: Department of the Environment and Energy* (Threatened Species Scientific Committee, 2018b).
- *Western Ringtail Possum (Pseudocheirus occidentalis) Recovery Plan. Wildlife Management Program No. 58. Department of Parks and Wildlife, Perth, WA* (DPaW, 2017).
- *Approved Conservation Advice for Calyptorhynchus banksii naso (Forest Red-tailed Black Cockatoo). Canberra: Department of the Environment, Water, Heritage and the Arts* (DEWHA, 2009).
- *Forest Black Cockatoo (Baudin's Cockatoo Calyptorhynchus baudinii and Forest Red-tailed Black Cockatoo Calyptorhynchus banksii naso) Recovery Plan. Department of Environment and Conservation, Western Australia* (Chapman, 2008).
- *Carnaby's Cockatoo (Calyptorhynchus latirostris) Recovery Plan. Department of Parks and Wildlife, Perth, Western Australia* (DPaW, 2013).
- *Wildlife Conservation Plan for Migratory Shorebirds. Canberra, ACT: Department of the Environment* (Commonwealth of Australia, 2015).
- *EPBC Act Policy Statement 3.21 - Industry Guidelines for avoiding, assessing and mitigating impacts on EBPC Act listed migratory shorebird species* (DoE, 2015b).

- *Approved Conservation Advice for Verticordia plumosa 3 var. vassensis (Vasse Featherflower). Canberra: Department of the Environment, Water, Heritage and the Arts* (DEWHA, 2008a).
- *Shrubland Association on Southern Swan Coastal Plain Ironstone (Busselton area) (Southern Ironstone Association) Recovery Plan. Interim recovery plan no. 215. Department of Environment and Conservation* (Meissner & English, 2005).

10.2. EXISTING ENVIRONMENT – PROPOSED AMENDMENT

10.2.1. LISTED THREATENED SPECIES & COMMUNITIES (S18 & 18A)

The status, distribution and habitat preferences, along with the results of targeted surveys and threats to the threatened species and communities listed as Controlled Actions and additional matters of NES identified within the Development Envelope (i.e. Black Cockatoos) are outlined below in Table 10-1 to 10-6.

TABLE 10-1: WESTERN RINGTAIL POSSUM *(Pseudocheirus occidentalis)*

SPECIES	WESTERN RINGTAIL POSSUM *(Pseudocheirus occidentalis)*
EPBC Status and distribution	Critically Endangered Once widely distributed across southern and south-western Australia, the WRP has a patchy distribution in forests and woodlands of south-western Australia from the Collie River near Bunbury to Two Peoples Bay near Albany (Jones, et al., 1994a). Coastal or near coastal forests in the southern Swan Coastal Plain support a dense and productive habitat comprising peppermint (*Agonis flexuosa)* trees, which support the highest known populations of WRP. WRPs are distributed in intact habitat patches and vegetation remnants (DEWHA, 2009).
Habitat preference	WRPs are arboreal, spending most of their time in trees. They are typically located close to water courses, swamps, or on floodplains (Jones, et al., 1994a), with the highest density populations occurring in areas with higher canopy continuity. In the near coastal or coastal habitats of the southern Swan Coastal Plain, the WRP predominantly occurs in peppermint forest and woodland, and tuart (*Eucalyptus gomphocephala*) forest, usually with a peppermint understorey. Areas with an understory containing sword sedge and *Lepidosperma* spp. are also important habitat areas for the WRP in the southern Swan Coastal Plain (de Tores, 2008). Two habitat communities primarily used by WRPs in the southern Swan Coastal Plain are: • Coastal peppermint dominated communities; • Myrtaceous and other communities. An individual home range is usually less than five hectares, and the high-density populations in the southern Swan Coastal Plain can be below one hectare. The WRP preferentially rests singly (or with young) in tree hollows and dreys (nests constructed from vegetation). In the southern Swan Coastal Plain WRPs breed once, and occasionally twice a year (Jones, et al., 1994b). Females give birth to one to three offsprings and most commonly occurs in autumn (April- June) (Jones, et al., 1994b). The young gain independence at six to seven months (Jones, et al., 1994b).
Survey results	There was no evidence of the Western Ringtail Possum in the project area; no dreys or scats were found, and no individuals were observed during spotlighting (BCE, 2024). However, this species is expected to be at least a regular visitor and possibly a resident (albeit in small numbers, reflecting

SPECIES	WESTERN RINGTAIL POSSUM *(Pseudocheirus occidentalis)*
	the limited amount of habitat available) in the project area, as it is known from similar environments in the immediate vicinity and suitable habitat is present in the project area. WRP habitat present within the Development Envelope is outside of Area 1 -Core Habitat, Area 2 - Primary Corridors and Area 3 - Supporting Habitat as documented in the *Significant Impact Guidelines for the Vulnerable Western Ringtail Possum in the Southern Swan Coastal Plain, Western Australia* (DEWHA, 2009).
Threats	The critical threats to the WRP detailed in (DEWHA, 2009) include habitat loss through habitat degradation, fragmentation and clearing, predation by foxes and cats, altered fire regimes, and competition with the common brushtail possum.
Reference	(Jones, et al., 1994a), (Jones, et al., 1994b), (de Tores, 2008), (DEWHA, 2009) and (Harewood, 2020a)

TABLE 10-2: VASSE FEATHERFLOWER *(Verticordia plumose* var. *vassensis)*

SPECIES	VASSE FEATHERFLOWER *(Verticordia plumose* var. *vassensis)*
EPBC Status and distribution	Endangered *V. plumosa* var. *vassensis* is endemic to south-west Western Australia, known from 13 populations near Busselton. This species' distribution is severely fragmented and restricted, with known subpopulations occurring over an extensive geographic range in isolated pockets of remnant vegetation (DEC, 2007). Most populations are located within road, rail and recreational reserves or on private property, with only one part of a population occurring within a nature reserve. The total population of *V. plumosa* var. *vassensis* has been estimated at 3,200 mature plants, although this estimate relies on 10-year-old survey counts and may not be accurate (DEC, 2007). Ecoedge (2020a) reported 97 records for this species in the DBCA database, most of which relate to locations on the Swan Coastal Plain south of Busselton, with an east-west range of 30km. This species occurs in the Southwest (Western Australia) Natural Resource Management region. The distribution of this species overlaps with *SWAFCT10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)" (Gibson, et al., 2000);* (Meissner & English, 2005). This species is currently known from Ambergate Reserve, Ruabon, and Ruabon-Tutunup Road Bushland areas in the Busselton and Capel Shires and the Scott Coastal Plain (Webb, et al., 2009).
Habitat preference	*V. plumosa* var. *vassensis* grows on various sands and swampy clay soils in mostly winter-wet flats and depressions. It grows with sedges and rushes or in low heath and is often found on degraded, grassy-weed-infested road verges (Brown, et al., 1998) (Williams, et al., 2001). *V. plumosa* var. *vassensis* flowers from October to February, occasionally continuing until April. It is generated from seed following fire and soil disturbance.
Survey results	*V. plumosa* var. *vassensis* is located inside the Proposal area and on the verge of Princefield Road, 2.1km west of Ludlow-Hithergreen Road. The population size was estimated at 200+ plants in 1996, and 100+ in 2006 (Williams, et al., 2001) (DoEE, 2016f, cited in Ecoedge, 2020a) (Ecoedge, 2023). The population size was difficult to estimate during the Ecoedge (2020a) survey as the plants are situated within an area of thick wet shrubland, however 26 individuals were recorded.
Mapping	Figure 5-6

SPECIES	VASSE FEATHERFLOWER *(Verticordia plumose* var. *vassensis)*
Threats	The key threats to *V. plumosa var. vassensis* are habitat degradation due to horse riding (such as trampling), cattle droving, infrastructure maintenance (such as road and firebreak), invasive weeds, inappropriate fire regimes, and dieback.
Reference	(Brown, et al., 1998), (DEC, 2007), Ecoedge (2020a), *(Gibson, et al., 2000),* (Meissner & English, 2005), (Webb, et al., 2009) and (Williams, et al., 2001).

TABLE 10-3: SHRUBLANDS ON THE SOUTHERN SWAN COASTAL PLAIN IRONSTONES (SCP10b)

SPECIES	SHRUBLANDS ON THE SOUTHERN SWAN COASTAL PLAIN IRONSTONES (SCP10b)
EPBC Status and distribution	Endangered The Shrublands on the southern Swan Coastal Plain ironstones have a restricted distribution and mainly occur on the eastern side of the Swan Coastal Plain along the base of the Whicher Scarp near Busselton (Meissner & English, 2005). This area contains heavy soils that are particularly useful for agriculture and are around 97% cleared (CALM, 1990) (Keighery & Trudgen, 1992). Tille and Lantzke (1990) mapped the original extent of the southern ironstone soils in the Busselton area, totalling ~1,200ha, of which ~139ha remains uncleared. This equates to a 90% loss of the plant community's area, which is distributed in a total of thirteen isolated patches, much of it on private land or road and rail reserves. Of the remaining shrubland, approximately 114ha of the community remains on private land, roads, rail, and nature reserves, including the most significant known occurrence in the Ruabon-Tutunup Bushland and around 25ha in State Forest. Typical and common native species in the community are the shrubs *Kunzea* aff. *Micrantha* (Collection Bronwen Keighery and Neil Gibson 040), *Pericalymma ellipticum, Hakea oldfieldii, Hemiandra pungens* and *Viminaria juncia*, and the herbs *Aphelia cyperoides, Centrolepis aristate* and the introduced species *Hypochaeris glabra* (Gibson, et al., 1994).
Habitat preference	The species-rich plant community is located on seasonal wetlands on ironstone and heavy clay soils on the Swan Coastal Plain near Busselton. The skeletal soils developed over massive ironstone have been historically associated with bogs and, in the present day, undergo seasonal inundation with fresh water.
Survey results	Vegetation units B1 and B2, where they are in Degraded or better condition, are recognised as occurrences of the SCP10b. The total area of this TEC occurrence is 0.8ha; with 0.2ha Very Good, 0.4ha Good and 0.2ha Degraded (Ecoedge, 2023).
Mapping	Figure 5-5
Threats	The critical threats to the community are frequent fire, weed invasion, track maintenance, accidental clearing and possibly salinisation and waterlogging. In addition, many of the endemic, endangered, and priority species of plants are susceptible to dieback.
Reference	(Meissner & English, 2005), (Tille and Lantzke 1990c), (Gibson, et al., 1994), (Webb, 2004) and (Ecoedge, 2020a).

TABLE 10-4: CARNABY'S BLACK-COCKATOO (*Zanda latirostris*)

SPECIES	CARNABY'S BLACK-COCKATOO *Zanda latirostris*
EPBC Status and Distribution	Endangered. It is endemic to and widespread in the southwest of Western Australia. Mainly occurring in the Wheatbelt in areas that receive 300-750mm of rainfall annually, it is also found in wetter regions in the far southwest. Its range extends north to the lower Murchison River and east to Nabawa, Wilroy, Waddi Forest, Nugadong, Manmanning, Durokoppin, and Noongar (Moorine Rock). Lake Cronin, Ravensthorpe Range, head of Oldfield River, 20km east-southeast of Condingup and Cape Arid. It has also occasionally been seen on Rottnest Island (Johnstone & Storr, 1998). The extent of occurrence is estimated at 32,000km² based on Birdlife International GIS. This estimate is considered medium reliability (Garnett & Crowley, 2000). The range of Carnaby's Black-Cockatoo is said to have contracted by more than 30% since the late 1940s (Mawson, 1997) and the species is also said to have disappeared from more than a third of its former breeding range between 1968 and 1990 (Saunders & Ingram, 1998).
Habitat Preference	Carnaby's Black-Cockatoo prefers forest, woodlands, heathlands and farm environments where it feeds on Banksia, Hakea and Marri. This species has specific nesting site requirements - nests are primarily in smooth-barked Eucalypts with the nest hollows ranging from 2.5 to 12m above the ground, an entrance from 23-30cm diameter and a depth of 0.1-2.5m (Johnstone & Storr, 1998). Breeding occurs in winter/spring, mainly in the eastern forests and wheatbelt, where they can find mature hollow-bearing trees to nest in (Morcombe, 2004). Judging from records in the Storr-Johnstone Bird Data Bank, this species is currently expanding its breeding range westward and south into the Jarrah-Marri forest of the Darling Scarp and the Tuart forests of the SCP, including the region between Mandurah and Bunbury. Carnaby's Black-Cockatoo has been known to breed close to the town of Mandurah, as well as Dawesville, Lake Clifton and Baldivis (Ron Johnstone, WA Museum, pers. comm.), and there are small resident populations on the southern SCP near Mandurah, Lake Clifton and near Bunbury. At each site, the birds forage in remnant vegetation and adjacent pine plantations (Johnstone, 2008). Carnaby's Black-Cockatoo lays eggs from July or August to October or November, with most clutches laid in August and September (Saunders, 1986). Most of the breeding is from September to December (Ron Johnstone pers comms). Birds in inland regions may begin laying up to three weeks earlier than those in coastal areas (Saunders, 1977). The female incubates the eggs over a period of 28-29 days. The young depart the nest 10-12 weeks after hatching (Smith & Saunders, 1986).
Results of Targeted Surveys	Small areas of favoured foraging habitat (i.e. marri, jarrah, banksia and pines) are present within the Development Envelope. The species is expected to forage in the area regularly (BCE, 2024). Evidence of foraging (such as chewed marri fruits and pine cones) was observed during the Harewood (2020a) survey. To facilitate mining for the Proposal, 9.83ha of generally low-quality foraging habitat will require removal. Within the Proposal area, 721 trees met the potential nest-tree criterion of DAWE and DEE (2017) (i.e. DBH>500mm or >300mm for Wandoo). Of these, 24 were ranked 3 (contain possibly suitable hollows), 57 were ranked 4 and 640 were ranked 5. No trees ranked 2

SPECIES	CARNABY'S BLACK-COCKATOO *Zanda latirostris*
	(evidence of recent use) or rank 1 (in use) were found. No roosting sites were identified within the Proposal area (BCE, 2024). A total of 173 trees with DBH>500mm will require clearing for the Proposal. A total of 113 of these trees are within the vegetation to be cleared whilst 64 (1.07ha) are present as isolated scattered paddock trees. Following the January 2024 follow up visit of Rank 3 trees (BCE, 2024), only seven trees received a rank 3 score (i.e. containing possibly suitable hollows), however none of the hollows showed any conclusive evidence of actual use by nesting Black Cockatoos. Doral subsequently reviewed the mine plan and it was determined that five of the seven Rank 3 trees could be avoided, however the remaining two rank 3 trees are within or close to a deep mine void and could not be avoided. An additional two trees, avoided as part of the Original Proposal will now also require clearing. These trees were assessed by (Harewood, 2020a) (Harewood, 2020b) as containing possibly suitable hollows, however no evidence of actual use.
Mapping	Figures 6-1 and 6-2
Threats	The decline of Carnaby's Black-Cockatoo is primarily due to habitat loss and fragmentation. This has been caused by the clearing of native vegetation, mainly for agricultural purposes, since the middle of the 20th century (Cale, 2003) (Mawson & Johnstone, 1997) (Saunders, 1986). Carnaby's Black Cockatoo is a highly mobile species. They move sequentially through the landscape, utilising different habitat types at other times of the year, making them especially vulnerable to the loss, fragmentation or degradation of any one component of the landscape. The long-term survival of Carnaby's Black-Cockatoo depends on the persistence of suitable breeding habitat (i.e. woodland), nest sites (i.e. tree hollows) and foraging habitat (e.g. heathlands) capable of providing enough food to sustain the population. The loss of foraging habitat is thought to pose the most significant risk to the species (Saunders & Ingram, 1998). The breeding habitat of Carnaby's Black-Cockatoo has also been extensively cleared (Garnett & Crowley, 2000). Hollow-bearing trees suitable for nesting are now located in remnant patches of woodland and at sites where selected trees have been retained in areas otherwise cleared of native vegetation (Saunders & Ingram, 1998). The impact of clearing has also had other consequences for the remaining habitat. In some areas, the remnant native vegetation has become threatened by an increase in the salinity of soils (Mawson & Johnstone, 1997). Clearing also exposes remnant habitats to invasion by weeds and, potentially, other processes that will degrade the habitat. Other threats include Competition for nest hollows, Illegal trade predation by Wedge-tailed Eagles Aquila audax, collisions with cars, drowning and entrapment in tree hollows (Saunders, 1982). Carnaby's Black-Cockatoo is a long-lived species (Saunders & Ingram, 1998) that does not breed until four years of age (Saunders, 1982, 1986), has an estimated generation time of 15 years (Cale, 2003) (Garnett & Crowley, 2000) and has a low rate of productivity (i.e. most successful pairs fledge only one young per year) (Saunders, 1982). These characteristics limit the potential of the species to sustain numbers or to recover in the presence or aftermath of a threatening process.

TABLE 10-5: BAUDIN'S BLACK-COCKATOO (*Zanda baudinii*)

SPECIES	BAUDIN'S BLACK-COCKATOO *Zanda baudinii*
EPBC Status and Distribution	Vulnerable. The range of the species is confined to the southwest of Western Australia, north to Gidgegannup, east to Mount Helena, Wandering, Quindanning, Kojonup, Frankland and King River and west to the eastern strip of the Swan Coastal Plain, including West Midland, Byford, Nth Dandalup, Yarloop, Wokalup and Bunbury (Johnstone & Storr, 1998). Breeding has been recorded in the far south of the range (Higgins, 1999) (Saunders, 1979b) (Storr, 1991) . Based on published maps, the extent of occurrence is estimated at 40,000km², which is considered highly reliable (Garnett & Crowley, 2000). No specific information is available on past changes in the extent of occurrence; however, it is likely to have declined due to habitat clearance (Blyth, 2005, pers. comm.).
Habitat Preference	The preferred habitat of Baudin's Black-Cockatoo is mainly Eucalypt forests, which feed primarily on Marri seeds (Morcombe, 2004), *Banksia, Hakeas* and *Erodium* sp. They also strip bark from trees in search of Beetle larvae (Johnstone & Storr, 1998). Nests are built in large hollows in tall eucalypts, especially Karri, Marri and Wandoo (Johnstone & Storr, 1998) (Higgins, 1999) (Saunders, 1974) (Saunders, 1979b). Like other black cockatoos, Baudin's Black-Cockatoo nests in large vertical hollows of long-lived trees. Trees with hollows suitable for Baudin's Black-Cockatoo will likely be >50cm DBH. As trees approaching this size are close to developing suitable hollows, trees below 50cm DBH have the potential to create hollows and are, therefore, also important resources for Baudin's Black-Cockatoo. Preferred roosts are in areas with a dense canopy close to permanent water sources, protecting the birds from weather conditions (Johnstone & Kirkby, 2008).
Results of Targeted Surveys	Small areas of favoured foraging habitat (i.e. marri) are present within the Development Envelope; however, most of the project area is cleared paddocks (BCE, 2024). Evidence of foraging (such as chewed marri nuts) was observed during the Harewood (2020a) survey. To facilitate mining for the Proposal, 9.83ha of generally low-quality foraging habitat will require removal. Within the Proposal area, 721 trees met the potential nest-tree criterion of DAWE and DEE (2017) (i.e. DBH>500mm or >300mm for Wandoo). Of these, 24 were ranked 3 (contain possibly suitable hollows), 57 were ranked 4 and 640 were ranked 5. No trees ranked 2 (evidence of recent use) or rank 1 (in use) were found. No roosting sites were identified within the Proposal area (BCE, 2024). A total of 173 trees with DBH>500mm will require clearing for the Proposal. A total of 113 of these trees are within the vegetation to be cleared whilst 64 (1.07ha) are present as isolated scattered paddock trees. Following the January 2024 follow up visit of Rank 3 trees (BCE, 2024), only seven trees received a rank 3 score (i.e. containing possibly suitable hollows), however none of the hollows showed any conclusive evidence of actual use by nesting Black Cockatoos. Doral subsequently reviewed the mine plan and it was determined that five of the seven Rank 3 trees could be avoided, however the remaining two rank 3 trees are within or close to a deep mine void and could not be avoided.

SPECIES	BAUDIN'S BLACK-COCKATOO *Zanda baudinii*
	An additional two trees, avoided as part of the Original Proposal will now also require clearing. These trees were assessed by (Harewood, 2020a) (Harewood, 2020b) as containing possibly suitable hollows, however no evidence of actual use.
Mapping	Figures 6-1 and 6-2
Threats	Loss of habitat was formerly the primary threat to Baudin's Black-Cockatoo. However, the threat has abated for several reasons: the clearing of forest for agricultural purposes has primarily ceased; areas of forest that contain nest sites, or that are likely to contain nest sites, are protected from harvest or clearing; and logging practices are monitored (Blyth, 2005 pers. comm.). The major threats to the species appear to be illegal shooting and competition with introduced bees for nest hollows (Blyth 2005, pers. comm.). Baudin's Black-Cockatoo can feed on and damage cultivated fruit in orchards (Halse, 1986) (Long, 1985). To prevent such damage, the species was subject to shooting under an Open Season Notice from the 1950s until 1989, when the notice was revoked (Mawson & Johnstone, 1997). The species has been protected since 1996 (Mawson & Johnstone, 1997), but illegal shooting may still occur (Garnett & Crowley, 2000). Baudin's Black-Cockatoo has a low annual reproductive rate of 0.6 young per pair (Storr, 1991), which limits the potential of the species to recover in the presence or aftermath of a threatening process.

TABLE 10-6: FOREST RED-TAILED BLACK-COCKATOO (*Calyptorhynchus banksii naso*)

SPECIES	FOREST RED-TAILED BLACK-COCKATOO *Calyptorhynchus banksii naso*
EPBC Status and Distribution	Vulnerable. The Forest Red-tailed Black-Cockatoo is endemic to southwest WA from Gingin in the north and east to Mt Helena, Christmas Tree Well, West Dale, North Bannister, Mt Saddleback, Kojonup, Rocky Gully, upper King River and east to the Green Range (Johnstone and Storr, 1998). Small isolated breeding populations are on the Swan Coastal Plain and can be found during the fruiting season of Cape Lilac (*Melia azederach*) (CALM, 2006) (Stranger, 1997).
Habitat Preference	The Forest Red-tailed Black-Cockatoo prefers Eucalypt forests where it feeds on Marri, Jarrah, Blackbutt, Karri, Sheoak and Snottygobble and nests in the large hollows of Marri, Jarrah and Karri (Johnstone & Kirkby, 1999). In Marri, the Forest Red-tailed Black-Cockatoo nest hollows range from 9-14m above ground, the entrance is 12-41cm in diameter, and the depth is 1.5m (Johnstone & Storr, 1998). The Forest Red-tailed Black-Cockatoo has few breeding records (Johnstone and Storr, 1998). However, Recent data indicates that breeding occurs in all months of the year, with peaks in spring and autumn-winter (Ron Johnstone pers comms). Eggs are typically laid in October and November (Johnstone, 1997) (Johnstone & Storr, 1998) with an incubation period of 29-31 days. Young fledge at 8 to 9 weeks (Simpson & Day, 2004).

SPECIES	FOREST RED-TAILED BLACK-COCKATOO *Calyptorhynchus banksii naso*
Results of Targeted Surveys	Small areas of favoured foraging habitat (i.e. marri) are present within the Development Envelope; however, most of the project area is cleared paddocks (BCE, 2024). Evidence of foraging (such as chewed marri nuts) was observed during the Harewood (2020a) survey. To facilitate mining for the Proposal, 9.83ha of generally low-quality foraging habitat will require removal. Within the Development Envelope, 721 trees met the potential nest-tree criterion of DAWE and DEE (2017) (i.e. DBH>500mm or >300mm for Wandoo). Of these, 24 were ranked 3 (contain possibly suitable hollows), 57 were ranked 4 and 640 were ranked 5. No trees ranked 2 (evidence of recent use) or rank 1 (in use) were found. No roosting sites were identified within the Proposal area (BCE, 2024). A total of 173 trees with DBH>500mm will require clearing for the Proposal. A total of 113 of these trees are within the vegetation to be cleared whilst 64 (1.07ha) are present as isolated scattered paddock trees. Following the January 2024 follow up visit of Rank 3 trees (BCE, 2024), only seven trees received a rank 3 score (i.e. containing possibly suitable hollows), however none of the hollows showed any conclusive evidence of actual use by nesting Black Cockatoos. Doral subsequently reviewed the mine plan and it was determined that five of the seven Rank 3 trees could be avoided, however the remaining two rank 3 trees are within or close to a deep mine void and could not be avoided. An additional two trees, avoided as part of the Original Proposal will now also require clearing. These trees were assessed by (Harewood, 2020a) (Harewood, 2020b) as containing possibly suitable hollows, however no evidence of actual use.
Mapping	Figures 6-1 and 6-2
Threats	The main threats to the Forest Red-tailed Black-Cockatoo are habitat loss, nest hollow shortage, competition for available nest hollows from other species, injury or death from the European Honeybee (*Apis mellifera*), illegal shooting (Chapman, 2005) and fire (CALM, 2006).

10.2.2. ECOLOGICAL CHARACTER OF A DECLARED RAMSAR WETLAND (SECTION 16 AND 17B)

The Vasse-Wonnerup Ramsar wetland is located in the temperate, coastal south-west of Western Australia, within the Swan Coastal Plain biogeographic region and the City of Busselton, ~4.6km to the northwest of the Site (Figures 1-1, and Figure 7-6). The Vasse-Wonnerup Ramsar wetlands are recognised as a Matter of NES under the EPBC Act. The Site meets two of Ramsar's nominating criteria to qualify sites as Wetlands of International Importance. These are:

- Criterion 5: regularly supports more than 20,000 waterbirds;
- Criterion 6: regularly supports at least 1% of the SE Asia-Australasia population of Black-winged Stilt *Himantopus himantopus*, Red-necked Avocet *Recurvirostra novaehollandiae*, Australian Shelduck *Tadorna tadornoides* and Australasian Shoveler *Anas rhynchotis*.

The Vasse-Wonnerup Wetlands catchment area is 473 km^2, excluding the diverted sub-catchments (DWER, 2019) (Figure 7-6). The Lower Sabina River catchment area of 45.5 km^2 is less than 10% of the Vasse-Wonnerup Wetland Catchment (Figure 7-6). The Abba River is one of the other significant tributaries to the

Vasse-Wonnerup Wetland and has a catchment area of 137 km2, which is 29% of the Vasse-Wonnerup Wetlands catchment.

The Vasse-Wonnerup system is already highly hydrologically and chemically altered due to extensive clearing, agricultural practices occurring over most of the Geographe catchment, and other commercial and residential developments in the area. Clearing and farming practices contribute to altered water regimes and increases in nutrients, sedimentation and pollution (DoW, 2010). The system is highly modified, with flow diversion from several rivers into the ocean that historically flowed into the Vasse and Wonnerup estuaries, which has accounted for a significant decrease in water entering the system. The floodgates act as a partial barrier to upstream/downstream movement of fish and reduce flushing flows that may otherwise help ameliorate high nutrient concentrations from catchment runoff. Excessive algal blooms, blooms of potentially toxic cyanobacteria, anoxia and fish deaths are not uncommon. On several documented occasions, sudden, mass fish deaths have occurred in the lower reaches of Vasse-Wonnerup, principally in the channel immediately upstream of the Vasse estuary floodgates (Lane, et al., 2007). Though installing the gates did not cause fish deaths, it has exacerbated the situation. In the summer of 1988, to improve water quality, the (then) Water Authority of Western Australia manually opened the floodgates, allowing seawater to enter and fish to escape the adverse conditions that prevail throughout summer and autumn. However, the continued manual opening of the gates over summer-autumn in subsequent years (to 1997) is believed to have led to other problems, such as increased salinisation of adjoining pastoral lands and death of colonising native vegetation that has encroached upon lower elevations since the floodgates were installed. The gates effectively transformed the estuaries into shallow, winter fresh/ summer saline lagoons, unique in Western Australia (Department of Environment, 2007). DWER estimated a 60% decrease in flow from the Sabina River and a 90% decrease from the Vasse River into the Wonnerup estuary due to these diversions (DoW, 2010).

Other than for waterbirds, there is insufficient baseline and monitoring data to identify changes since Ramsar nomination in 1990. The most recent waterbird monitoring results (1998 - 2000) (Lane, et al., 2007) showed that despite ongoing water quality problems, the Site continued to support waterbird abundance and species population, which was Ramsar listed in 1990. The abundance of waterbird species recorded in the 1998 - 2000 surveys was less than previous estimates. For a few of these species, this was attributed to the fact that most, but not all, habitats were included in post-1998 (and pre-1998) surveys (Lane, et al., 2007). For others, a closer investigation of historical data is needed to determine if apparent declines are actual and not just artefacts of differences in areas surveyed or sampling techniques (Lane, et al., 2007). Species of local and/or regional concern include Blue-billed Duck, Great Cormorant, Great Egret, Curlew Sandpiper, Long-toed Stint and Wood Sandpiper.

10.2.3. MIGRATORY SPECIES (SECTION 20 AND 20A)

The status, distribution, habitat preferences, results of targeted surveys, and threats to the migratory species listed as Controlled Actions are outlined below in Table 10-7.

TABLE 10-7: WOOD SANDPIPER (*Tringa glareola*), SHARP-TAILED SANDPIPER (*Calidris acuminate),* LONG-TOED STINT (*Calidris subminuta*)

SPECIES	WOOD SANDPIPER (*Tringa glareola*), SHARP-TAILED SANDPIPER (*Calidris acuminate),* LONG-TOED STINT (*Calidris subminuta*)
Status and distribution	Migratory, listed under international treaties JAMBA, CAMBA and CMS The wood sandpiper (*Tringa glareola*), sharp-tailed sandpiper (*Calidris acuminate)* and long-toed stint (*Calidris subminuta*) are three of the 17 migratory shorebird species that regularly undertake annual migrations along the East Asian Australasian Flyway to spend their non-breeding season in Australia, where they then occupy several coastal and inland habitats including coastal wetlands, mudlands, estuaries and sandy beaches from August to May each year. These habitats allow the birds to build up energy reserves to support northward migration and subsequent breeding, including the Vasse-Wonnerup Ramsar wetlands, located ~4.6km northwest of the Development Envelope. Wood sandpiper distribution: N & C Europe through C Siberia to Anadyrland, Kamchatka and Commander Is, and NE China; occasionally Aleutian Is. Winters are mainly in tropical and subtropical Africa and across S & SE Asia to S China, Philippines, Indonesia, New Guinea, and Australia. Sharp-tailed sandpiper distribution: NC & NE Siberia from Lena Delta to R Kolyma. Winters from New Guinea through Melanesia to New Caledonia and Fiji, and S to Australia and New Zealand. Long-toed stint distribution: Disjunct populations from forest zone of SW Siberia to S tundra of Koryak Mts and NE Kamchatka; also, Commander Is and N Kuril Is. Winters from E India, Sri Lanka and Indochina to Taiwan, and S through the Philippines and Indonesia to W & SE Australia (del Hoyo, et al., 2019).
Habitat preference	The wood sandpiper (*Tringa glareola*), sharp-tailed sandpiper (*Calidris acuminate)* and long-toed stint (*Calidris subminuta*) have evolved to exploit a wide variety of habitat types for foraging purposes. They are transequatorial migratory birds migrating southward to Australia, including the Vasse-Wonnerup Ramsar Wetlands, during their non-breeding season to feed along shorelines, wet sandflats, mudflats, samphire and shallow waters. The wetlands' seasonal shallow and partial drying attracts the migratory birds that feed on the exposed flats. The Vasse-Wonnerup wetland is considered of international importance since it meets two following Ramsar criteria, namely it regularly supports 1% of individuals in a population of species of waterbird, including the Flyway population, and it supports a total abundance of at least 20,000 waterbirds.
Survey results	These three Migratory species were not identified as utilising the Development Envelope at any time (Harewood, 2020a; BCE, 2024).
Mapping	Habitat occurs within the Vasse-Wonnerup Ramsar wetland (Figure 7-6).
Threats	The critical threats to the species include habitat loss, destruction, and substantial modification by fragmentation, altering fire regimes, altering nutrient cycles, or altering hydrological cycles.
Reference	The above sections have been adapted from (Department of Environment, 2007), (Department of the Environment and Energy, 2017) and (del Hoyo, et al., 2019).

10.3. POTENTIAL IMPACTS – PROPOSED AMENDMENT

Activities or aspects of the Proposal that may potentially affect MNES, not considering mitigation efforts, include:

Direct Impacts

- Vegetation clearing for development of the Proposal could potentially impact the following listed Threatened species and communities:
    - Up to 9.83ha (including 113 trees with DBH>500mm) of low-quality foraging habitat for three species of Black Cockatoos.
    - Up to 64 isolated scattered paddock trees (1.07ha) with DBH >500mm, including two trees that contain potentially suitable hollows.

Indirect Impacts

- Dewatering activities may potentially affect the condition of listed Threatened species and communities and affect the ecological character of the Vasse-Wonnerup Ramsar wetland and associated migratory species habitat;
- Emergency discharge of water from the site may potentially affect the ecological character of the Vasse-Wonnerup Ramsar wetland, including migratory species' habitat;
- Spread of dieback and weeds may negatively affect vegetation health and, therefore, the condition of listed Threatened species and communities;
- Changes to fire regime from introduced ignition sources may affect populations of listed Threatened species and communities;
- Vehicle strikes from vehicle movement during construction and operation may result in the loss of individual Threatened species (i.e. vehicle strikes are considered a threat to WRP).

10.4. ASSESSMENT OF POTENTIAL IMPACTS

10.4.1. DIRECT IMPACTS

CLEARING OF NATIVE VEGETATION

The Proposal has been designed to avoid clearing native vegetation as far as practicable to reduce direct impacts on the listed Threatened species and communities. As a result, no direct impacts will occur to the following listed MNES:

- 26 x Vasse Featherflower *(Verticordia plumose* var. *vassensis)*;
- SCP10b - Shrublands on the southern Swan Coastal Plain Ironstones – Endangered
- SCP09 – '*Dense shrublands on clay flats*' (i.e. '*Claypans of the Swan Coastal Plain'*)
- Vasse-Wonnerup Ramsar wetland

BLACK COCKATOO FORAGING HABITAT

All three species of Black Cockatoos are expected to be regular visitors to the Site, as all have recorded observations within 5km of the Site (BCE, 2024). During the BCE field investigation, only the Carnaby's were

observed at the time, with the presence of Baudin's and Red-tailed Black Cockatoo only recorded via foraging evidence.

The Proposal area provides value for all three Black-Cockatoo species for foraging and, possible although unlikely, potential nesting. A total area of 9.83ha of native vegetation/Black Cockatoo habitat (including 113 trees with DBH>500mm) will be disturbed for the Proposal, which although assessed as generally low-quality foraging habitat, includes some patches that are at least of moderate foraging quality for the three species. In addition, 1.07ha (64 trees) present as isolated scattered paddock trees (with DBH>500mm), will also require clearing for the Proposal.

In general, however, the extent of quality foraging habitat within the Proposal area can be regarded as those areas containing marri, jarrah and banksia, located mainly along the Abba River and Road Reserves. Most vegetation does not fall within the disturbance area and will not be affected by the Proposal.

BLACK COCKATOO POTENTIAL NESTING HABITAT

A total of 173 potential nesting trees from the 721 that meet the DAWE and DEE (2017) criteria within the Development Envelope will require clearing for the Proposal. A total of 113 of these trees are within the 9.83ha of native vegetation to be cleared whilst 64 trees are present as isolated scattered paddock trees (DBH>500mm).

Following the January 2024 follow up visit of Rank 3 trees (i.e. trees with potentially suitable hollows) (BCE, 2024), only seven trees within the disturbance area received a Rank 3 score, however none of the hollows showed any conclusive evidence of actual use by nesting Black Cockatoos. Doral subsequently reviewed the mine plan and it was determined that five of the seven trees could be avoided, however the remaining two trees are within or close to a deep mine void and could not be avoided. An additional two trees, avoided as part of the Original Proposal will also require clearing. These trees were assessed by (Harewood, 2020a) (Harewood, 2020b) as containing possibly suitable hollows, however no evidence of actual use.

The BC trees containing possibly suitable hollows and the ones to be cleared are shown in Figure 6-2.

Based on available vegetation mapping, it is estimated that there is approximately 13,300ha of native vegetation within 10km of the Proposal area, much of which is likely to represent potential Black Cockatoo foraging and breeding habitat of some type.

Doral has designed disturbance areas for the Proposal to utilise existing areas of cleared pasture and avoid clearing native vegetation as far as practicable to reduce direct impacts on Black Cockatoo foraging and potential nesting habitat. This has resulted in avoiding ~20ha of native vegetation and 587 potential nest trees (i.e. DBH>500mm), including five trees containing possibly suitable hollows, with the generally larger areas/patches of native vegetation being avoided.

No disturbance to known roost trees will occur as a result of implementing the Proposal.

WESTERN RINGTAIL POSSUM HABITAT

Suitable habitat for the species occurs in the Proposal area, particularly along road verges and along the Abba River. However, there was no evidence of the Western Ringtail Possum (WRP) in the Proposal area; no dreys or scats were found, and no individuals were observed during spotlighting (BCE, 2024). All vegetation along the Abba River has been avoided from disturbance, and vegetation to be cleared is generally in completely degraded or degraded condition. Doral has not identified any WRPs during the implementation of the current Project.

Fauna habitat present within the Proposal area is outside of Area 1 - Core Habitat, Area 2 - Primary Corridors and Area 3 - Supporting Habitat as documented in the *Significant Impact Guidelines for the Vulnerable Western Ringtail Possum in the Southern Swan Coastal Plain, Western Australia* (DEWHA, 2009). As such clearing of 9.83ha of Completely Degraded vegetation does not trigger any of the Significant Impact Assessment criteria detailed on page 7 of (DEWHA, 2009). The nearest core habitat to the Site occurs in Tuart Forest National Park (DEWHA, 2009).

MIGRATORY BIRDS

Species of migratory birds assessed by the Commonwealth (2017/8094) during the Original Proposal remain unlikely to utilise the Proposal area, and indirect impacts to these species and habitat (i.e. Vasse-Wonnerup Ramsar wetland) from dewatering activities will not occur, as it is well outside the maximum extent of groundwater drawdown (~3.5km). As such no effect to the ecological character of the Vasse-Wonnerup Ramsar wetlands and migratory species will occur as a result of the Proposal.

Based on available information, no substantial impacts on any fauna species or overall biodiversity values are anticipated as a consequence of implementing the Proposal. In cases where some impact is anticipated, the degree of the impact is only expected to be very low and relates to the loss of very small areas of habitat, primarily in the form of a small number of scattered, isolated paddock trees.

10.4.2. INDIRECT IMPACTS

GROUNDWATER DRAWDOWN IMPACTS

Ecoedge (2023) identified twelve areas that contain vegetation that is understood to be potentially groundwater dependent (to a greater or lesser extent). The GDE's containing vegetation (TEC's) listed under the *EPBC Act* are shown in Figure 11-1.

TABLE 10-8: SUMMARY OF NORTHERN EXTENSION GDEs

GDE #	VEGETATION TYPE[1]	AREA (HA)	VEGETATION CONDITION	COMMONWELATH LISTED TECS	CRITICAL HABITAT SCP10b SOUTHERN IRONSTONE
GDE_2	B1	0.17	Very Good	SCP10b 26 x *Verticordia plumosa* var. *vassensis.*	Yes
GDE_5	B1	0.26	Good	SCP10b	Yes
GDE_8	C3	0.07	Completely degraded	SCP09	No
GDE_11	B2 B2	0.33 2.42	Good Completely Degraded	SCP10b No	Yes Yes
GDE_12	B2	0.59	Completely Degraded	No	Yes

[1] Vegetation types are:

B1 - Tall shrubland of *Acacia saligna, Calothamnus quadrifidus subsp. teretifolius, Melaleuca incana* and *Kunzea micrantha* (with scattered emergent Eucalyptus rudis) over scattered native herbs including *Drosera glanduligera* and *Sowerbaea laxiflora*, the sedge

Loxocarya magna, and weeds on shallow red sandy clay on massive ironstone and are regarded as occurrences of the Shrublands of southern SCP Ironstones SCP10b.

B2 - Open woodland of *Melaleuca preissiana* over weeds (rarely with *Hyalosperma cotula*) on seasonally wet brown clay-loam over massive laterite and are regarded as occurrences of the Shrublands of southern SCP Ironstones SCP10b.

C1 - Open Forest of *Eucalyptus rudis* and/or *Corymbia calophylla* over scattered *Agonis flexuosa* and *Melaleuca rhaphiophylla* occasionally over *Acacia saligna, A. extensa, Astartea scoparia, Xanthorrhoea preissii* scattered shrubs over weeds on grey-brown clayey loams in drainage lines and on damp flats and it is also inferred to represent an occurrence of the State listed TEC SCP01b (Southern *Corymbia calophylla* woodlands on heavy soils).

C3 - Tall Open Shrubland that may include *Acacia saligna*, *Jacksonia furcellata*, *Kingia australis*, *Melaleuca osullivanii*, *M. preissiana*, *M. viminea* and *Xanthorrhoea preissii* on seasonally wet grey-brown sandy loam.

AQ2 (2024) model predictions suggest that there will be drawdowns in areas of potential GDEs (Figure 5-9) across the Proposal area over the life of the mine. These drawdowns have the potential to impact groundwater-dependent vegetation close to mining areas. It should be noted that the magnitude of change in groundwater level (i.e. drawdowns of more than 0.25m) thresholds have been used by AQ2 (2024) to assist in providing an assessment of risk.

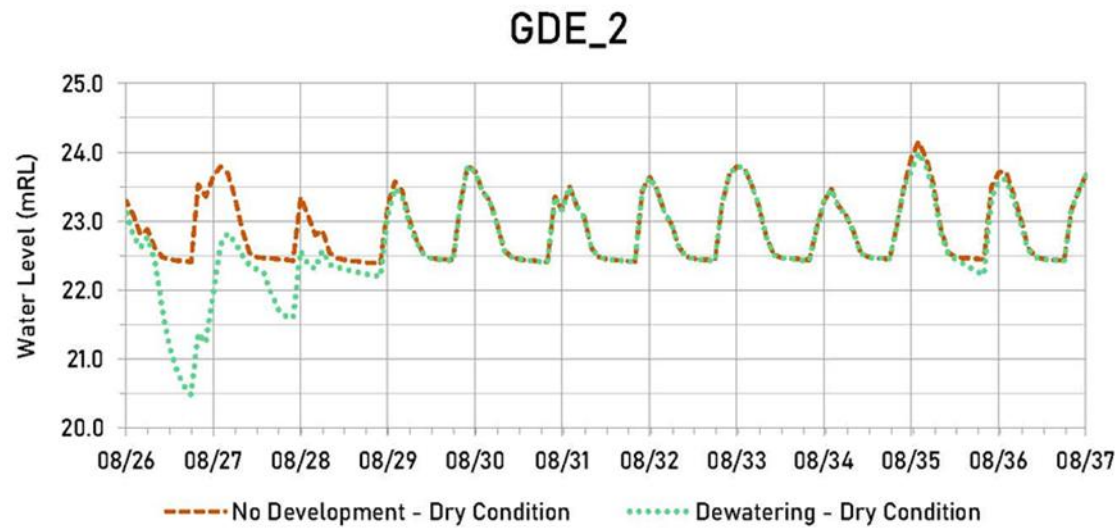
Details of the predicted maximum drawdowns at the GDE locations due to dewatering for the Proposal are shown in Table 11-10.

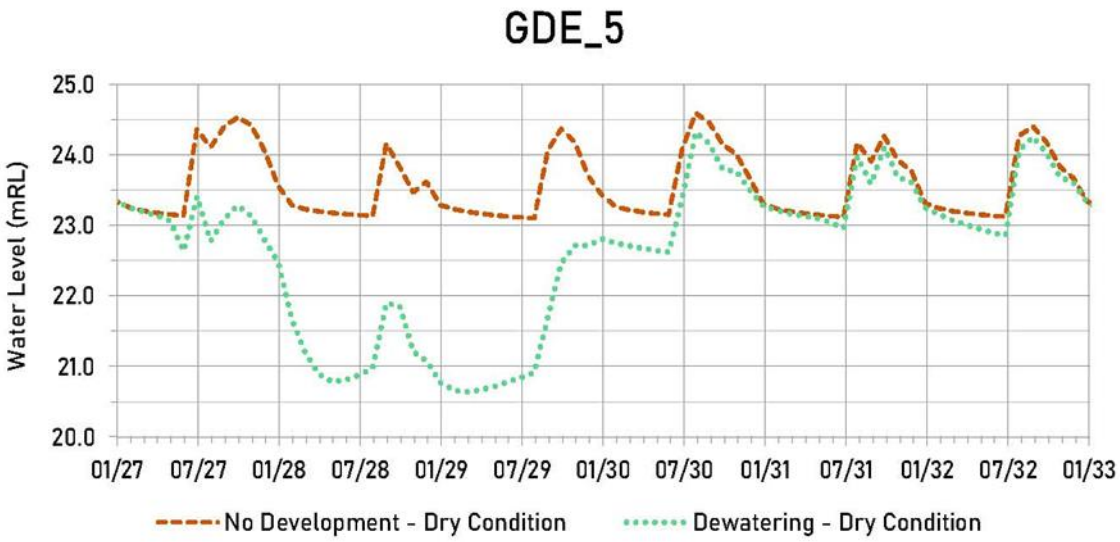
TABLE 10-9. PREDICTED MAXIMUM DRAWDOWNS TO MNES VEGETATION DUE TO NORTHERN EXTENSION DEWATERING

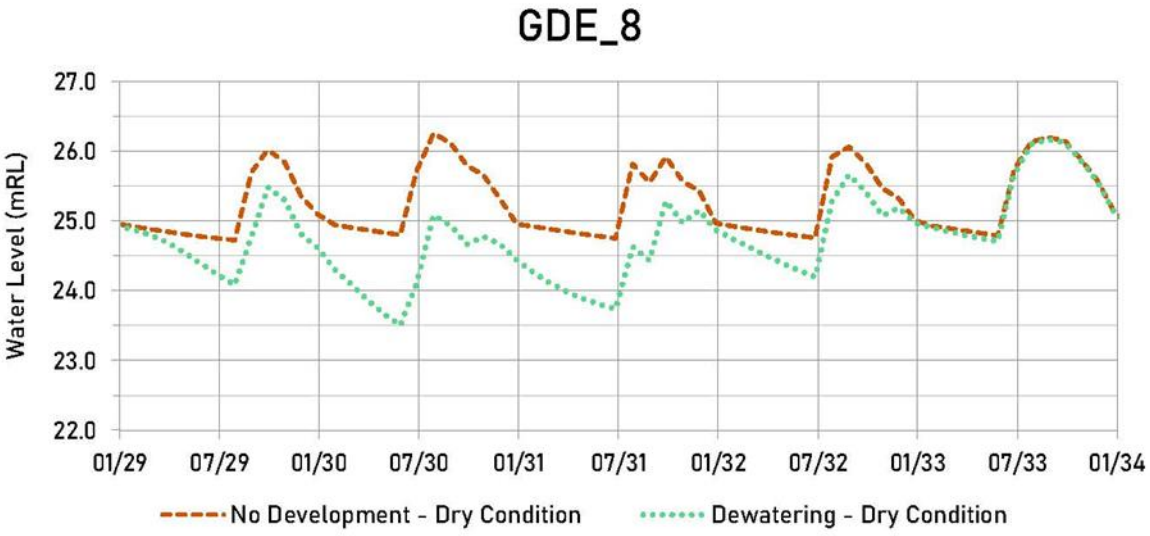
GDE	MNES	PREDICTED MAX DRAWDOWN (m)	MONTH OF PREDICTAED MAX DRAWDOWN	PERIOD OF PREDICTED DRAWDOWN (>0.25m)	PREDICTED MAX DRAWDOWN BELOW LOWEST SEASONAL GW LEVEL (m)
GDE_2	SCP10b *Verticordia plumosa* var. *vassensis.*	2.20	June 2027	September 2026 to November 2028	1.92
GDE_5	SCP10b	2.57	February 2029	May 2027 to October 2030	2.45
GDE_8	SCP09	1.60	June 2030	April 2029 to October 2032	1.20
GDE_11	SCP10b	0.07	October 2034	NA	0
GDE_12	SCP10b Critical Habitat	0.10	October 2034	NA	0

The GDEs with the highest maximum modelled drawdowns (i.e. relative water level changes) assuming dry climate conditions (i.e. most conservative case) are shown below in Charts 10-1, with the maximum drawdowns at each of these GDE's also shown in Charts 10-2, reproduced from (AQ2, 2024). It is noted that drawdowns do not impact GDE_11 and GDE_12.

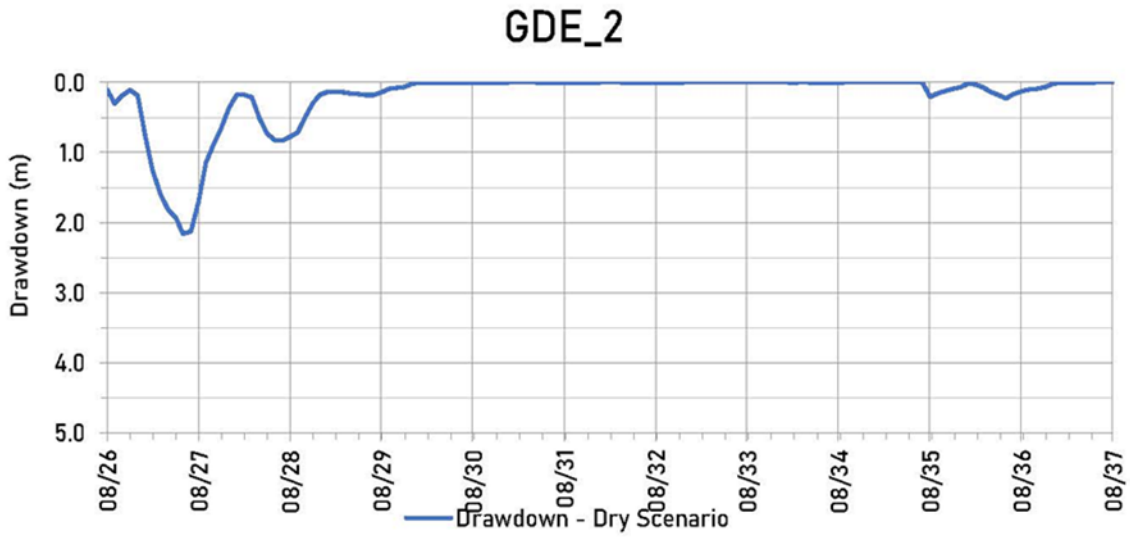
CHARTS 10-1: DRAWDOWN WATER LEVELS AT MNES VEGETATION (GDE_2, GDE_5 and GDE_8)

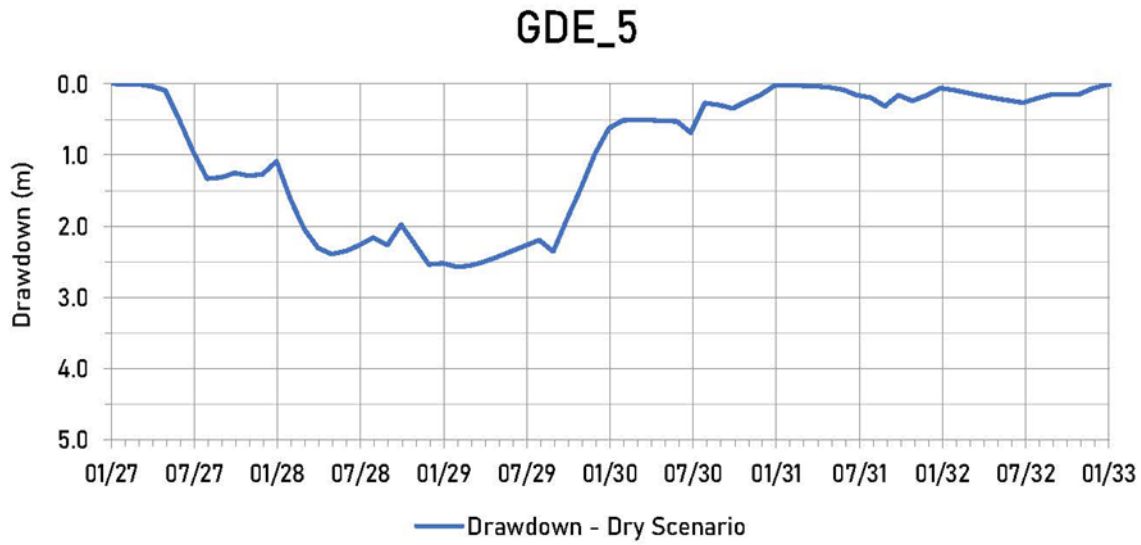


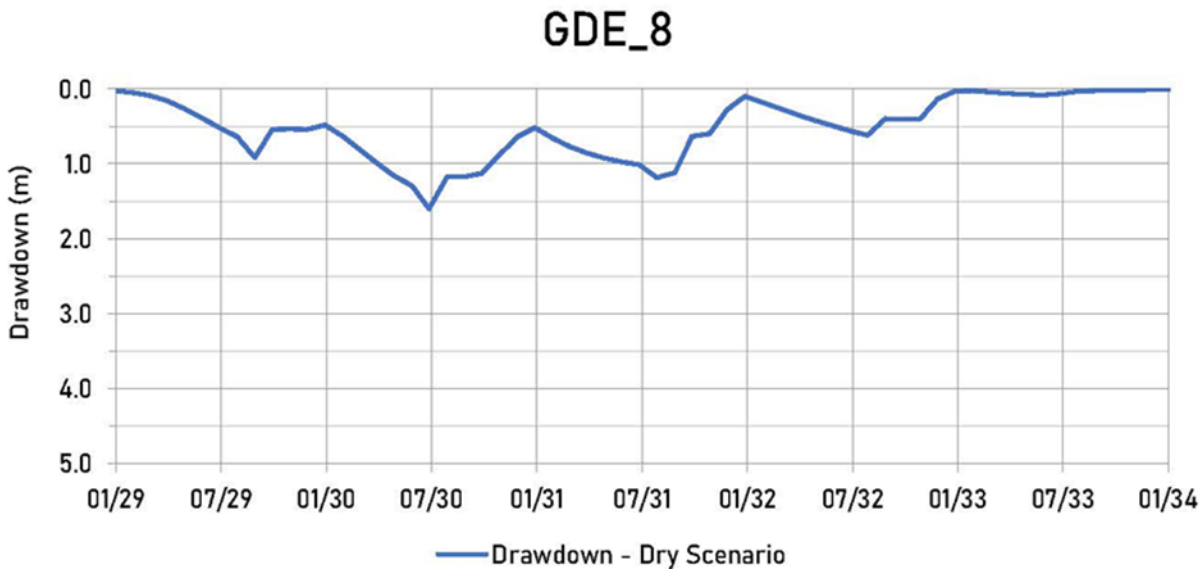




CHARTS 10-2: PREDICTED MNES VEGETATION DRAWDOWNS (GDE_2, GDE_5, GDE_8)







The salient points in relation to groundwater drawdowns to GDEs (containing MNES vegetation are as follows:

- The magnitude of drawdowns along the GDE areas varies depending upon the proximity of the Northern Extension active mining pits. However, all drawdowns will be localised and temporary.
- The highest maximum drawdowns are predicted to be at GDE_2, GDE_5, and GDE_8 (i.e. 1.6 to 2.57m drawdowns). However, these GDEs, except for GDE_2 and GDE_5 are in heavily degraded condition;
- Drawdowns at GDE_11 and GDE12 are less than 0.1m, thus having a low risk of being impacted due to dewatering.
- There are minor drawdowns (less than 0.4m) that extend into the McGibbon Track area in the approved Yalyalup Mine due to mining at the Northern Extension. However, these drawdowns are localised and temporary and much smaller than the original drawdowns predicted due to the dewatering of the approved Yalyalup Mine. Implementation of the existing GDE Management Plan as required by MS1168—Condition 10 will continue to apply to these areas.

In conclusion, groundwater modelling predicts that the dewatering operations for the Proposal will temporarily cause groundwater levels to decline and fall outside the seasonally observed range. The magnitude of the change in groundwater levels (i.e. drawdowns of more than 0.25 m) exceeds thresholds that could potentially result in impacts to 0.42ha of vegetation in GDE_2, GDE_5 and GDE_8 as follows:

- GDE_2 – 0.16ha mapped as SCP10b and includes 26 *Verticordia plumosa* var. *vassensis;*
- GDE_5 – 0.21ha mapped as SCP10b;
- GDE_8 – 0.05ha mapped as SCP09.

However, long-term post-mining effects on water levels are expected to be minimal. The recovery of water levels will commence immediately once mining of each active mine pit is completed, owing to backfilling of mined-out pits. Once all mining areas are completed, dewatering will cease, and water levels will continue to rise until a steady state or equilibrium water level is resumed. The numerical model shows that water levels are predicted to return to pre-mining levels within 12 months of mine closure (i.e. by December 2037).

The current management strategy for the GDE's along McGibbon Track (including GDE_2) is to implement the GDE Management Plan as required by MS1168 Condition 10. Doral have prepared a similar strategy for the management of the GDEs within the Proposal area (Appendix 7A).

REDUCTION IN CATCHMENT YIELDS

AQ2 prepared a Surface Water Assessment (2023a) to estimate how the proposed mine pits will reduce surface water runoff to the downstream water courses and provide management measures to minimise potential impacts.

As the existing Yalyalup mine area is extended north into the Proposal area, the catchment areas of the Lower Sabina River, Abba River and subsequently the Vasse-Wonnerup System (i.e. downstream receptors) will decrease as surface water within the disturbance footprint is captured and recycled into the operations for each stage of the Proposal until rehabilitation. The reduction in catchment is related to the size of the active extension areas – the one being mined and the one being rehabilitated - as surface water is captured and treated.

TABLE 10-10: REDUCTION IN CATCHMENT AREA

CATCHMENT	TOTAL CATCHMENT AREA FROM DWER (km^2)	REDUCTION IN CATCHMENT DUE TO THE NORTHERN EXTENSION (%)					
		EXISTING MINE	EXISTING MINE + A	A + B	B + C	C + D	D + E
Lower Sabina River	42.5	10.5	11.6	2.6	0.4	3.5	8.6
Sabina prior to the diversion	123	3.6	4	0.9	0.1	1.2	3
Abba River	135	0	0.2	1.4	2.4	1.8	0.6
Vasse-Wonnerup Wetlands	461	1	1.1	0.7	0.7	0.8	1

The catchment analysis calculations suggest the impact on the Vasse-Wonnerup System is very low, in the order of 1%. This occurs while Extension Area A is active and the existing mine is under rehabilitation. This aligns with expectations given the disturbance area of the Existing Mine, and the results are comparable to what was reported in the previous Surface Water Management Plan (AQ2, 2021). A change of 1% is relatively small for the Vasse-Wonnerup System, which is the key downstream receptor of the Proposal.

Excluding the impacts of the Existing Mine (which have been assessed previously), the Lower Sabina River catchment seems to be the most affected by the Proposal during the disturbance of Extension Area E (with Area D being rehabilitated) with a maximum 8.6% reduction in catchment estimated. The Lower Sabina catchment is categorised as a recovery catchment, and work within the catchment to reduce nutrient load is ongoing. Generally, the catchment contributes a disproportionately large nutrient load to the Vasse-Wonnerup System as it is heavily altered and has a small catchment size (DWER, 2018). The Abba River catchment is most affected by the proposal during disturbance to Extension Area C (with Area B being rehabilitated), with an estimated 2.4% reduction.

The proposed upslope diversions and their contributing catchments around the extension areas are provided in Figures 7-10 to 7-14 (AQ2, 2023a).

DISCHARGE OF SURPLUS WATER

The Site Water Balance (AQ2, 2023b) indicates that during wet climate sequences, water pumped to the PWD/DOD from the mine pits (collected groundwater and stormwater) exceeds the mine water demand for a sufficiently sustained period such that the PWD/DOD will require to discharge. The required period where surplus water would be generated is generally confined to the period between 2029 and 2031. The annual surplus (discharge) water estimates from the GoldSim model (**Error! Reference source not found.** of AQ2, 2023c) show the following:

- The PWD/DOD is predicted to discharge in 45% of the model runs.
- There is a 25% chance that the predicted discharge volume will exceed 20,000m^3.

- The maximum total annual water volume, predicted to overtop the PWD/DOD in any model iterations, is 135,000m^3 (0.135GL).
- Proposed emergency discharge locations are shown in Figure 7-15.

Over the 2022 reporting period for the Original Project, water was discharged off-site using the Licenced Discharge Point W1 and the Emergency Discharge Point E2 on multiple occasions (AQ2, 2023d). Generally, the water discharged from the licenced and emergency discharge points was of similar quality to the Superficial aquifer chemistry and surface water chemistry. There are some water quality variations due to rainwater mixing with the Superficial groundwater (in 2022 due to dewatering). No exceedance of the off-site water quality default trigger levels occurred during 2022. No off-site water discharges via the emergency discharge points E1 were recorded during 2022; therefore, no water samples were collected for field measurements and laboratory analysis.

Surface water from areas within the Proposal area will typically be used in mining operations or be discharged at set locations in the case of a large rainfall event or if a water surplus exists. Similar to what is currently being used at the mine infrastructure to capture or divert dirty water is likely to include a network of bunds or drains around the Proposal (AQ2, 2023a).

Several sumps equipped with pumps will be required to collect surface water from extension areas and transfer it to the Process Water Pond at the Concentrator. The sumps will be equipped to pump surface water from typical rainfall events (< 1-year ARI), with larger events requiring discharge from the sumps and releasing them at the emergency discharge locations.

SPREAD OF DIEBACK AND WEEDS

Mining activities and vehicle movements can potentially spread weeds within and adjacent to the Development Envelope. Environmental weeds are described by (DEC, 1999) as 'plants that establish themselves in natural ecosystems and proceed to modify natural processes, usually adversely, resulting in the decline of communities they invade'. Environments affected by mining activities are highly susceptible to invasion by weeds, as disturbances to soils caused by mining operations (i.e. creating bare ground) provide an ideal habitat where weeds can readily colonise and quickly become the dominant vegetation. Weeds pose a key risk, not only during the operational phases of mining but also during rehabilitation or care and maintenance phases. Weed infestations can compete directly (as well as indirectly) with native or selected revegetation species and also increase the risk of fires (and fire intensity) that may damage revegetated areas. Weeds have the potential to change the dynamics of natural ecosystems substantially by:

- Competing with or displacing native plant species;
- Affecting natural processes such as fire intensity, stream flows and water quality;
- Changing habitats and therefore impacting on ecosystem health;
- Diminishing natural aesthetic values.

Strict weed hygiene measures will be implemented during the implementation of the Proposal to reduce the risk of weed introduction and spread into areas of native vegetation, which are largely weed-free. Measures will be implemented to target the control of the Declared Plants *Asparagus asparagoides* and *Zantedeschia aethiopica*. Weed management will be implemented as per Doral's Flora and Vegetation Management Plan.

One small area (0.3ha) of vegetation identified as 'infested' with *Phytophthora* dieback (BARK Environmental, 2019) is present within the Princefield Road reserve (within the Original Project area). This small area is now

included within the proposed mining area and will require management to ensure dieback is not spread. Management of this small area of dieback will include the following:

- Area to be clearly delineated and communicated to Mine personnel,
- Clearing of vegetation and stripping of topsoil/overburden will be undertaken in dry conditions (i.e. Summer/Autumn);
- All vegetation, topsoil and root matter will be removed and deep buried at the base of a deep mine pit (and documented);
- All equipment used to remove at risk topsoil materials to be decontaminated;
- All Doral field staff and earthmoving contractors will continue to be educated during Site induction and weekly meetings regarding the presence of dieback, access and movement restrictions, and necessary hygiene measures to minimise the risk of contaminating dieback-free areas.

No impacts to listed Threatened species or communities are expected to occur.

CHANGES TO FIRE REGIME

The Proposal has been identified as a designated bushfire-prone area by the Fire and Emergency Services Commissioner as being subject, or likely to be subject, to bushfire attack.

Alteration of the natural fire regime may occur as a result of implementing the Proposal due to improved access and increased human activity associated primarily with vehicle movements, combustible materials and maintenance activities (hot works). The risk of causing fire during the operations can potentially increase the frequency of fires in the project location. However, large areas of bare earth may act as firebreaks in the event of a blaze from adjacent farming or mining areas.

The potential consequences of an altered fire regime have the potential to affect 30ha of native vegetation within the Development Envelope, including listed Threatened species and communities.

Fire risk will be managed through the continued implementation of a Fire Management Plan, which will include a fire response procedure.

VEHICLE STRIKES

Clearing of native vegetation by machinery prior to mining has the potential to result in death, injury or displacement of resident fauna, particularly on less mobile species. The construction and operation of the Proposal will also result in an increase in vehicle movement to and from the site. Vehicle movements may result in the loss of individual fauna, especially less-mobile species, from vehicle strikes.

Some loss of fauna may occur as a result of these activities. However, mitigation measures will be implemented to ensure that impacts to fauna are minimised as far as practicable. Isolated deaths of individual fauna are not expected to affect any fauna species' distribution or conservation status.

Mitigation measures will include:

- Pre-clearing Surveys;
- Redistricted speed limits on access roads;
- Provide education to contractors during inductions and regular toolbox meetings.

10.5. MITIGATION

To protect MNES for the Proposal, Doral has applied the mitigation hierarchy to avoid, mitigate and rehabilitate potential impacts as a result of implementing the Proposal.

10.5.1. AVOID

Doral's primary mitigation strategy to protect MNES is to design the Proposal to avoid and minimise native vegetation clearing containing Threatened species and communities, as far as practicable. As a result, Doral has successfully avoided direct impacts on the following:

- SCP10b - *Shrublands on the Southern Swan Coastal Plain Ironstones*;
- *Verticordia plumosa* var. *vassensis.*
- 5 x Black Cockatoo potential nest trees which contain possibly suitable hollows (Rank 3 trees), present within the disturbance area.
- 587 potential nest trees (DBH>500mm), including five containing potentially suitable hollows, have been avoided from disturbance.

10.5.2. MINIMISE

Doral has an existing Environmental Management System (EMS), which it implements for the current Yalyalup Mine. The EMS be updated to include the Northern Extension to the Yalyalup Mineral Sands Project, which will include the following management plans and procedures detailed below to mitigate potential impacts to Matters of NES.

Doral's overall principles for managing the impacts to Matters of NES for the Proposal are to:

- Minimise native vegetation clearing and land disturbance;
- Meet the Commonwealth laws governing flora and fauna conservation as contained in the EPBC Act;
- Conduct pre-clearing surveys;
- Implementation of specific clearing procedures, including the demarcation of cleared areas and authorisation requirements;
- Monitor vegetation health in areas containing Matters of NES (i.e. Threatened flora and vegetation);
- Minimise the timeframe between disturbance and rehabilitation.

The potential impacts to Matters of NES will be managed through the development and implementation of several management plans and procedures. Those plans/procedures specific to the protection and management of Matters of NES include:

- Flora and Vegetation Environmental Management Plan;
- GDE Environmental Management Plan;
- Dust Management Plan (Appendix 7);
- A Fire Management Plan;
- Groundwater Operating Strategy;
- A Fauna Environmental Management Plan (refer to Section 6.6);

- Surface Water Management Plan;
- Acid Sulfate Soil Management Plan.

FLORA AND VEGETATION MANAGEMENT PLAN

Doral will update and continue to implement the Flora and Vegetation Management Plan (MS1168 Condition 7) (Appendix 7), which includes the following key management and monitoring actions:

- Implementation of specific clearing procedures to minimise impacts to flora and vegetation. This will include demarcation of vegetation/trees to be cleared and authorisation requirements;
- Establishment of specific stockpile management procedures to store and manage crushed vegetation, topsoil and subsoil;
- Declared Plants *Asparagus asparagoides and Zantedeschia aethiopica ragoides* will be managed in accordance with the Biosecurity and Agricultural Management Act 2007;
- An infested dieback area (0.3ha) within the Princefield Road reserve will be demarcated, removed, and buried deep within a deep mine void.
- Weed and dust management measures will be incorporated into the ongoing management of flora and vegetation for the Proposal.
- Comply with any necessary approvals, permits and licences required under the BC Act.

GDE MANAGEMENT PLAN

A GDE Management Plan (Appendix 7) has been prepared to minimise impacts to flora and vegetation values from indirect impacts associated with groundwater drawdowns. As detailed in the Plan, monitoring will comprise a combination of hydrological parameters and vegetation health assessments using qualitative criteria. This will comprise:

- Groundwater level monitoring in a network of six proposed new GDE monitoring wells located near GDE_1, GDE_5, GDE_7 and GDE_8 (it is noted an existing GDE monitoring well is located at GDE_2 as part of the existing GDE EMP);
- The following management response triggers and contingency measures will apply:
- Lagging indicators designed to provide redundancy in risk identification and allow verification of the success of management interventions.
- Triggers have been designed around parameters that may be affected by mining-induced changes to the water regime (i.e. groundwater levels). Soil moisture is not included as a monitoring parameter because it is influenced by infiltrating rainfall, and this will not be affected by mining.
- For all trigger exceedances, the management response will be that water supplementation is required. The final design for the supplementation scheme will be completed during the implementation of the GDE Management Plan.
- Supplementation will be based on a combination of:
    - Surface irrigation.

The supplementation scheme will have the following design criteria:

- To supply enough water to offset declines in groundwater levels (i.e., maintain levels within the natural range under the GDEs). This will be determined using the existing groundwater model;
- To be operationally effective. This will be assessed during the engineering design of the scheme based on aquifer parameters derived during previous groundwater investigations;
- To incorporate a monitoring program that can confirm the supplementation system's efficacy. The monitoring program outlined in this plan will achieve this.
- Supplementation water will be sourced from the Yarragadee aquifer to ensure sufficient water quality within the GDEs without risk of impacts due to acidification or dieback.

GROUNDWATER OPERATING STRATEGY

The groundwater system will continue to be carefully managed for the Proposal area in order to avoid or minimise impacts to GDEs due to mining operations. The Groundwater Operating Strategy (GWOS) (Appendix 8) has been amended, to include the Proposal area and includes a groundwater and surface water monitoring program (i.e. abstraction, discharge, water levels and water quality) and has been designed to assess aquifer performance, the potential impacts of groundwater abstraction proposed upon commencement of mining operations and specify operational requirements. Trigger levels and contingency actions have been developed to mitigate potential impacts caused by the mining operations and ensure the actual impacts are not greater than predicted. The GWOS has been prepared in accordance with *Operational Policy 5.08 - Use of operating strategies in the water licensing process* (DoW, 2011) and the DWER guidelines for the preparation of Operating Strategies for mineral sand mine dewatering licences in the South West Region (DWER, 2015).

DUST MANAGEMENT PLAN

Air quality parameter limits have been incorporated into the existing DWER Licence for the existing Site issued under Part V of the EP Act. The DWER Licence will be updated to incorporate the Proposal and it is considered similar air quality limits will apply. Doral will continue to employ mobile real-time dust monitoring to regularly monitor TSP and PM_{10} concentrations in accordance with the Dust Management Plan (Appendix 7). Doral will adhere to the limits set for dust within the licence, focusing on minimising the concentration of TSP and PM_{10} leaving the mine site and potentially impacting neighbours.

PRE-CLEARING SURVEYS

Pre-clearing surveys will be conducted, where necessary before any vegetation is cleared. Fauna present in the clearing area will be encouraged to move to nearby vegetation or captured and relocated in adjacent vegetation near the Site (such as Woddidup Creek/drainage line, Lower Sabina River or Abba River). The capture/relocation will be undertaken by a qualified fauna handler with the appropriate licences in place.

For Black Cockatoos, a pre-clearing survey using the “Great Cocky Count” method (Peck, et al., 2018) will be undertaken prior to clearing any Black Cockatoo potential nesting tree containing a possibly suitable hollow.

FAUNA MANAGEMENT PLAN

Doral will update and continue to implement a Fauna Management Plan as per MS1168 Condition 8-2, to address potential impacts to fauna of conservation significance and their associated habitat. The Fauna Management Plan will include the following key management actions:

- Development and implementation of specific clearing procedures to minimise impacts on fauna and fauna habitats. This will include demarcation of cleared areas, pre-clearing surveys and authorisation requirements;
- Pre-clearing survey using the "Great Cocky Count" methods (Peck, et al., 2018) will be undertaken prior to clearing any Black Cockatoo potential nesting tree containing a possibly suitable hollow;
- Vehicle speeds on site will be restricted. All collisions with fauna are to be reported and recorded through Doral's Hazard and Incident Management System (DHIMS);
- Native fauna injured during clearing or normal site operations should be taken to a designated veterinary clinic or a nominated wildlife carer;
- No dead, standing or fallen timber will be removed from the site unnecessarily;
- To minimise the potential impacts of artificial water bodies and drains on fauna Doral will:
    - Design the site to reduce accessibility to most artificial water sources and drains;
    - If artificial ponds or drains are directly adjacent to native vegetation then use fencing to exclude larger animals;
    - Prevent overflow of artificial waterbodies and drains in dry conditions;
    - Use fauna deterrent devices such as high visibility material flapping over water bodies;
    - Non-slippery sides to ponds/drains and/or egress points so that any animals that enter the artificial waterbody may escape;
    - Any trenching required for services or drains should be kept open only for as long as necessary, and suitable escape ramps should be provided.
- All staff working on site will be educated with regard to protected fauna;
- Weapons and pets will not be permitted on site;
- Wastes will be managed appropriately to ensure that fauna have no access to scraps or rubbish
- Contribute to feral species removal such as fox/cat;
- Lights at night will be directed towards construction and operation activities in accordance with AS4282-1997, *Control of the obtrusive effects of outdoor lighting.*

Environmental targets and performance indicators will be developed to ensure fauna management can be monitored and audited.

SURFACE WATER MANAGEMENT

Management measures to minimise potential impacts associated with surface water impacts, as detailed in the Surface Water Management Plan, (AQ2, 2023a) are summarised below:

- Divert clean flows around the mine disturbance areas where practical. Where required, allow drain diversions and return diverted flows to their original catchment downstream of infrastructure.
- Progressive rehabilitation of mined area during the mine progression.
- Dirty water runoff must be captured and passed through sediment basins before reuse or, if necessary, released back into the catchment.

- Ideally, water management measures should be removed if they are no longer required and water quality is acceptable. At closure, all disturbed areas are to be similar to pre-mining conditions.

ACID SULFATE SOIL MANAGEMENT PLAN (ASSMP)

The key mitigation measure to reduce potential impacts associated with ASS is to continue to implement the ASSMP as required by MS1168 Condition 9.

A summary of the critical management measures documented in the ASSMP is provided as follows:

- Mining activities will be scheduled to be undertaken on a campaign basis, with a portion of the ore body being mined and processed in a discrete time period to assist in minimising the area of groundwater drawdown at any one time;
- Topsoil/subsoil will be stripped to a depth of ~100mm, stockpiled for rehabilitation and neutralised if pH is <4.0pH;
- Overburden identified as ASS (i.e. NA>0.03%S) will be removed via excavator and trucks or dozers and then immediately transported to an open pit void and backfilled simultaneously with a suitable alkaline material at an appropriate rate to account for the acidity. As far as practical, the backfilling process will aim to mix the neutralising material with the overburden. A guard layer of alkaline material will initially be added to the base and walls (where practical) of the mine void to limit the potential for oxidation;
- Excavated ore identified as ASS will be processed through the wet concentration plant as soon as possible. As this material is maintained as a wet slurry (i.e. saturated), the risk of sulfide oxidation is greatly reduced. The slurry is maintained at pH 5.5 to assist with mineral separation. As such, alkaline (lime sand) material will be added into the in-pit hopper during the excavation of ore to maintain pH5.5 and increase buffering capacity within the wet concentration process;
- Processing of ore results in three streams of material: HMC, clay fines and sand tails. These will be managed as follows:
    - HMC will be stockpiled and stored on a bunded alkaline pad. Leachate emanating from the stockpiled HMC will be captured and returned to the ore processing circuit, which is maintained at pH5.5;
    - Sand tails will be hydraulically returned to pit voids as a single waste stream and/or co-disposed with clay fines into pit voids. This material will have been maintained in a saturated state and with conditions maintained at pH5.5 throughout the process. Furthermore, the unused (unreacted) lime sand that was added to the process at the commencement of the ore processing sequence (i.e. at the in-pit hopper) will form part of this process stream, resulting in the addition of buffering capacity to the locations where this material is hydraulically returned. Sand tails will be regularly assayed for Total Sulfur to ensure concentrations are below 0.03%S. If necessary, additional lime sand will be incorporated during hydraulic disposal. If necessary, additional lime sands will be incorporated during hydraulic disposal;
    - Clay fines will be managed by either:
        - Immediate co-disposal with sand tails by hydraulic return in existing mine voids or
        - Directed to a SEP for storage and future use as void backfill.

  - Clay fines that are immediately co-disposed with sand tails will be maintained in a saturated state before disposal and will include additional buffering capacity provided by the unused (unreacted) lime sands within the sand tails material. This material will be regularly assayed for Total Sulfur to ensure concentrations are below 0.03%S;
  - Clay fines material directed to the SEPs will also be regularly assayed for Total Sulfur to ensure concentrations below 0.03%S. If insufficient buffering capacity is identified, additional neutralising material (lime sand) will be added before being discharged into a SEP. In addition to regular testing during discharge, this material will be re-tested following consolidation and drying within the SEP before final disposal.

- Overburden and non-processed material identified as ASS that will be used for site construction purposes (i.e. roads, pads, bunds etc.) will either be:
  - Neutralised for re-use within 70 hours of excavation; or
  - Stockpiled on a treatment pad for up to 21 days before neutralisation and re-use.
- The water quality of the process water dam will be monitored (three times per week for field measurements) and maintained by the addition of a suitable alkaline material to the in-pit hopper at the commencement of the ore processing sequence (where required) or directly into the process water dam to ensure:
  - Field pH >5.5; or
  - TTA <40 mg$CaCO_3$/L; and
  - TAlk >30 mg$CaCO_3$/L.
- Groundwater monitoring will be conducted during dewatering for a network of monitoring wells. The program will include:
  - Monthly monitoring of groundwater levels;
  - Monthly field testing for pH, EC, TTA and Talk;
  - Monthly laboratory analysis for pH, EC, total acidity, total alkalinity, chloride, sulfate, dissolved aluminium, dissolved iron and dissolved manganese. (If Al >1 mg/L, then the sample will also be analysed for As, Cd, Cr, Cu, Pb, Hb, Ni, Se, and Zn);
  - Comparison of results to site-specific groundwater assessment criteria.

Mining methods for the Proposal will be the same as for the existing areas of the Site, comprising mining progressively via a series of open-cut pits using dry mining techniques to an expected maximum depth of ~1mbgl. Dewatering of groundwater inflows into the mine pits is required in some areas to enable dry mining to occur.

10.5.3. REHABILITATE

Doral has prepared and will implement a Rehabilitation Management Plan (Appendix 7) for the Proposal.

Doral will also update and implement an updated Mine Closure Plan and submit it to DEMIRS in conjunction with the Mining Proposal as required under the *Mining Act 1978*.

10.5.4. OFFSETS

An assessment of the significance of the residual impacts has been undertaken in accordance with the WA Environmental Offset Guidelines (Government of Western Australia, 2014) and is provided in Section 11 Offsets.

10.6. ENVIRONMENTAL OUTCOMES

The Proposal will result in the following residual impacts on Matters of NES after the application of the above mitigation measures:

- Direct impact to 9.83ha (including 113 trees with DBH>500mm) of generally low-quality Black Cockatoo foraging habitat;
- Direct impact to 64 (1.07ha) isolated scattered paddock trees (i.e. DBH>500mm), which includes four trees that contain possibly suitable hollows; however, show no evidence of actual use.
- Indirect drawdown impact to 0.37ha of SCP10b (includes 26 *Verticordia plumosa* var. *vassensis)*.
- Indirect drawdown to 0.05ha mapped as SCP09.

An assessment of the significance of these residual impacts and proposed offsets is provided in Section 11.

11. OFFSET

Environmental offsets are actions that provide environmental benefits which counterbalance the Significant Residual Environmental Impacts or risks of a Proposal. In accordance with *WA Environmental Offsets Policy, September 2011* (Government of Western Australia, 2011)*, WA Environmental Offsets Guidelines (Government of Western Australia, 2014)* and the *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy Oct 2012 (DSEWPaC, 2012a),* offsets may only be applied after other mitigation measures have been considered, as per the following hierarchy:

- Avoid;
- Minimise;
- Rehabilitate;
- Offset.

As noted in the *WA Environmental Offsets Guidelines (Government of Western Australia, 2014)*, environmental offsets address significant environmental impacts that remain after on-site avoidance and mitigation measures have been undertaken. Environmental offsets will only be considered after strategies to avoid and mitigate significant environmental impacts have been applied. In general, significant residual impacts include those that:

- Affect rare and endangered plants and animals (such as declared rare flora and threatened species that are protected by statute);
- Areas within the formal conservation reserve system;
- Important environmental systems and species that are protected under international agreements (such as Ramsar-listed wetlands);
- Areas already defined as being critically impacted in a cumulative context.

The residual impact significance model detailed in the *WA Environmental Offsets Guidelines (Government of Western Australia, 2014)* identifies four levels of significance for residual impacts:

- Unacceptable impacts – impacts which are environmentally unacceptable or where no offset can be applied to reduce the impact.
- Significant impacts requiring an offset – any significant residual impact of this nature will require an offset. These generally relate to any impacts to species, ecosystems, or reserve areas protected by statute or where the cumulative impact is already determined to be at critical level.
- Potentially significant impact which may require an offset – the residual impact may be significant depending on the context and extent of the impact. These relate to impacts that are likely to result in a species or ecosystems requiring protection under statute or increasing the cumulative impact to a critical level. Whether these impacts require an offset will be determined by the decision-maker based on information provided by the proponent or applicant and expert judgement.
- Impacts which are not significant – impacts which do not trigger the above categories are not expected to have a significant impact on the environment and therefore do not require an offset.

Doral has considered all of these potential residual impacts and risks in the context of both State and Commonwealth values in defining offsets.

11.1. POLICY AND GUIDANCE

The relevant policy and guidelines, which provide a framework for offsets for both State and Commonwealth governments, are described in Tables 11-1 and 11-2.

TABLE 11-1: STATE GOVERNMENT OFFSETS

POLICY/GUIDELINE	OVERVIEW
WA Environmental Offsets Policy, September 2011 (Government of Western Australia, 2011)	This Policy seeks to ensure that environmental offsets are applied in specified circumstances in a transparent manner to engender certainty and predictability while acknowledging that some environmental values are not readily replaceable. It is an overarching framework to underpin environmental offset assessment and decision-making in Western Australia.
WA Environmental Offsets Guidelines (Government of Western Australia, 2014)	These guidelines complement the *Western Australian Environmental Offsets Policy, September 2011* (Government of Western Australia, 2011) (above) by clarifying the determination and application of environmental offsets in WA. Applying these guidelines will ensure that decisions made on environmental offsets are consistent and accountable under the EP Act.

TABLE 11-2: COMMONWEALTH GOVERNMENT OFFSETS

POLICY/GUIDELINE	OVERVIEW
Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy Oct 2012 (DSEWPaC, 2012a).	This Policy Statement describes the types of offsets that may be applied when impacts cannot be adequately reduced through avoidance and mitigation. Eight principles for environmental offsets are provided. Suitable offsets must: 1. Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment protected by national environmental law and affected by the proposed action. 2. Be built around direct offsets but may include other compensatory measures. 3. Be in proportion to the level of statutory protection that applies to the protected matter. 4. Be of a size and scale proportionate to the residual impacts on the protected matter. 5. Effectively account for and manage the risks of the offset not succeeding. 6. It must be in addition to what is already required, determined by law or planning regulations or agreed to under other schemes or programs (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action). 7. Be efficient, effective, timely, transparent, scientifically robust and reasonable.

POLICY/GUIDELINE	OVERVIEW
	8. Have transparent governance arrangements, including being readily measured, monitored, audited, and enforced.

11.2. SIGNIFICANT RESIDUAL IMPACTS

The Proposal has been designed to, as far as practicable, avoid the clearing of native vegetation and associated loss of terrestrial fauna habitat. The design maximises the use of existing cleared areas, which has resulted in all but <1% of the disturbance area being located on cleared pasture. Regionally, clearing will not significantly reduce the remaining area of the Abba Plains soil-landscape system (1.73%) or the Abba vegetation complex (0.29%); however, this vegetation complex is already below the Commonwealth and EPA targets of 30% and 15%, respectively. The remaining extent of the Abba vegetation complex after the implementation of the Proposal is 6.5% (currently 6.6%).

The assessment of Key Environmental Factors is presented in Sections 5, 6, 7 and 8 of this Proposal. It describes the residual impacts and risks of the Proposal that remain after on-site avoidance and mitigation measures (i.e. minimise and rehabilitate) have been applied. This assessment has determined that the Proposal has a potentially significant impact on flora and vegetation values and terrestrial fauna values.

The following provides an assessment of the significance of the Proposal for these residual impacts against applicable matters listed in Section 5 of the *Statement of Environmental Principles, Factors and Objectives* (EPA, 2018b):

a) *Values, sensitivity and quality of the environmental, which is likely to be impacted*

The Proposal may impact the following vegetation communities, flora species and fauna:

- SCP01b—Southern *Corymbia calophylla* woodlands on heavy soils is listed as a TEC, with a threat status of "Vulnerable" by DBCA. Within the Proposal area, this TEC is in degraded/good and good condition.
- SCP10b – *Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)* (Gibson, et al., 2000) are listed as a TEC with threat status of "Critically Endangered" by DBCA and "Endangered" under the EPBC Act. This TEC is in degraded/good and good condition within the Proposal area however outside the direct disturbance boundary.
    - Within one area of SCP10b, a population of ~26 *Verticordia plumosa* var. *vassensis* is present, which arealisted as Threatened under the BC Act and Endangered under the EPBC Act.
- SCP09 – *Dense shrublands on clay flats.* This TEC is part of the Commonwealth listed '*Claypans of the Swan Coastal Plain'* (critically endangered) under the *EPBC Act* and listed as vulnerable under the BC Act. This TEC is in xxx condition within the Proposal area however outside the direct disturbance boundary.
- Black Cockatoo potential foraging and breeding habitat for the following three species:
    - Carnaby`s Black-Cockatoo *Zanda latirostris* – listed as *S2* under the *BC Act* and *Endangered* under the *EPBC Act*.
    - Baudin's Black-Cockatoo *Zanda baudinii* – listed as S3 under the *BC Act* and *Vulnerable* under the *EPBC Act.*

- Forest Red-tailed Black-Cockatoo *Calyptorhynchus banksii naso* – listed as S3 under the *BC Act*, and *Vulnerable* under the *EPBC Act.*

b) Extent (intensity, duration, magnitude and geographic footprint) of the likely impact

Native vegetation clearing for the Proposal will include 9.83ha of the ~30ha remnant vegetation, the majority (85%) of which is in a completely degraded condition and of no conservation significance (Ecoedge, 2023).

A total of 1.25ha mapped as SCP01b 'Southern *Corymbia calophylla* woodlands on heavy soils' (Gibson et al. 1994) (units A1 and C1) will be cleared for the Proposal. Limited information is available on the remaining extent of SCP01b; however, as documented in the ERD for the Original Yalyalup Project, (Doral, 2020a) this community is known from 13 quadrats outside of the Proposal.

A total area of 9.83ha of native vegetation/Black Cockatoo foraging habitat, including 113 trees with DBH>500mm, will be disturbed for the Proposal, which although assessed as generally low-quality foraging habitat, includes some patches that are at least of moderate foraging quality for the three species. In addition, 64 trees (1.07ha) with DBH >500mm will also require clearing for the Proposal.

Following the January 2024 follow-up visit of rank 3 trees by (BCE, 2024), only seven trees received a rank 3 score (i.e. containing possibly suitable hollows). However, none of the hollows showed conclusive evidence of actual use by nesting Black Cockatoos. Doral subsequently reviewed the mine plan, and it was determined that five of the seven Rank 3 trees could be avoided. However, the remaining two rank 3 trees are within or close to a deep mine void and could not be avoided. An additional two trees, avoided as part of the Original Proposal will now also require clearing. These trees were assessed by (Harewood, 2020a) (Harewood, 2020b) as containing possibly suitable hollows, however no evidence of actual use. The BC trees containing possibly suitable hollows are shown in Figure 6-2.

As part of Doral's mitigation measures, an area of ~14.5ha is proposed to be rehabilitated with local native species, including Black Cockatoo foraging habitat, to counterbalance the total clearing area of the Proposal.

Indirect drawdowns to SPC10b, SCP09, and SCP01b are also predicted from dewatering operations for the Proposal. This will temporarily cause groundwater levels to decline and fall outside the seasonally observed range. The magnitude of the change in groundwater levels (i.e. drawdowns of more than 0.25m) exceeds thresholds that could potentially result in impacts (prior to mitigation measures being applied) to 0.68ha of vegetation in GDE_1, GDE_2, GDE_5, GDE_7 and GDE_8 as follows:

- GDE_1 – 0.09ha mapped as SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils'
- GDE_2 – 0.16ha mapped as SCP10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area) includes 26 *Verticordia plumosa* var. *vassensis.*
- GDE_5 – 0.21ha mapped as SCP10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)
- GDE_7– 0.15ha mapped as SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils'
- GDE_8 – 0.05ha mapped as SCP09 and 0.02ha mapped as as SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils'

Importantly, it is noted that despite significant residual impacts (from groundwater drawdowns) to SCP10b and *Banksia squarrosa* subsp. *Argillacea* being predicted for the Original Yalyalup Project (and an offset provided), with the implementation of the GDE Management Plan, no significant impacts to date have occurred. As such although some drawdowns are predicted to affect relatively small areas of generally

degraded TEC vegetation, with continued implementation of the GDE Management Plan, it is likely that no significant impacts will occur from groundwater drawdowns.

c) Consequences of the likely impacts (or change)

Although the extent of clearing within SCP01b (1.25ha) is limited after applying Doral's avoidance measures, as part of Doral's mitigation measures, a portion of the ~14.5ha revegetation area will include SCP01b species to counterbalance clearing of this community.

The maximum indirect impact to conservation significant vegetation (i.e. SCP01b, SCP10b and SCP09) from predicted groundwater drawdowns can potentially affect up to 0.68ha locally. However, mitigation measures such as implementing the GDE Management Plan (Appendix 7), which has shown to be successful for drawdown impacts to the Original Project are expected to minimise the potential impacts to be negligible.

The Proposal will directly impact 9.83ha of native vegetation/Black Cockatoo foraging habitat, (including 113 trees with DBH>500mm) and 64 isolated scattered paddock trees (1.07ha) with DBH >500mm. Of the trees with DBH>500mm, only four contain possibly suitable hollows, however no evidence of actual use has been identified. Based on available mapping, it is estimated that 13,300ha of native vegetation are within 10km of the Proposal. Therefore, there is significant potential for breeding to take place in the wider area. The design of the Proposal has resulted in all but ~1% of the disturbance area being located on cleared pasture. No overall change in the conservation status of this species is anticipated, despite a possible, very localised small reduction in habitat extent.

Mitigation measures such as implementing the various EMPs (i.e. GDE, Fauna, Flora and Vegetation, GWOS, ASSMP (Appendix 7) are expected to minimise potential indirect impacts on flora, vegetation, and fauna habitat. Furthermore, as part of Doral's mitigation measures, an area of ~14.5ha is proposed to be rehabilitated with local native species, including Black Cockatoo habitat and flora species present within SCP01b.

d) Resilience of the environment to cope with the impact

Resilience is associated with the scale of impact on the local population. As previously stated, clearing and potential indirect impacts associated with implementing the Proposal will have varying impacts and potential impacts on threatened vegetation, flora and fauna habitats.

Doral has designed the Proposal as far as practicable to minimise direct impacts to conservation significant vegetation and as such, 86% of vegetation identified to be TECs will not be directly impacted. In addition, no direct impacts to conservation significant flora will occur. Clearing will also avoid ~80% of the Black Cockatoo potential nest trees (DBH>500mm) within the Proposal area. The trees to be impacted are predominately present as isolated scattered paddock trees, and Black Cockatoos can continue to utilise the remaining 587 potential nest trees within the Proposal area.

Revegetating ~14.5ha with local native species will counterbalance and provide additional fauna habitat, including Black Cockatoos, in the immediate area.

Based on what is known about the hydrogeology and groundwater dependence of local vegetation within the Proposal area, including current information obtained from implementation of the GDE Management Plan within the Original Project area, indirect drawdown impacts to conservation significant vegetation and flora are predicted to be very low. With the continued implementation of the GDE Management Plan, which includes triggers for water supplementation to affected groundwater dependent vegetation, it is considered that very minor impacts will occur from groundwater drawdowns.

e) Cumulative impact with other existing or reasonably foreseeable activities, developments, and land uses, connections, and interactions between parts of the environment to inform a holistic view of impacts on the whole environment.

No direct impacts to SCP01b have occurred as a result of implementing the Original Yalyalup Project, as such no cumulative impacts are predicted. Limited information is publicly available for the regional extent of SCP01b, which is predicted to be directly impacted by up to 1.25ha. However, this community is known from 13 quadrats outside the Proposal area regionally. Based on these quadrat locations, no known cumulative impacts from other existing or reasonably foreseeable activities, developments or land uses are known.

To date no indirect groundwater impacts to conservation significant vegetation has occurred from the Original Yalyalup mine. With continued implementation of the GDE Management Plan, it is considered that very minor impacts would occur, if at all, to groundwater dependent vegetation within the Proposal area.

As documented in the EPA Report and Recommendations (EPA Bulletin 1695), the original Project involved clearing up to 2.72ha of degraded native vegetation (present as Black Cockatoo foraging habitat), therefore cumulative impacts to Black Cockatoo foraging habitat will increase by 9.83ha with the implementation of the Proposal. A further four trees (containing possibly suitable hollows) will also be impacted in addition to the five already impacted by the Original Project. Cumulatively (Original Project and current Proposal) a total of 1,538 trees (DBH>500mm) or ~85%, have been avoided.

There are no other known cumulative impacts from other existing or reasonably foreseeable activities, developments, or land uses for Black Cockatoo foraging and potential nesting habitat. Furthermore, revegetation of ~14.5ha with local native species will counterbalance and provide additional Black Cockatoo habitat within the immediate area on top of the 4.7ha already provided for the Original Project.

f) Level of confidence in the prediction of impacts and the success of proposed mitigation.

There is a high level of confidence in the direct impacts to SCP01b, and Black Cockatoo foraging habitat, and the associated mitigation measures (i.e., avoid, minimise, and rehabilitate).

There is a high level of confidence in the groundwater model prepared by AQ2 (2024) and a moderate to high level of confidence that the proposed mitigation measures (i.e. GDE Management Plan) will minimise the extent and severity of indirect impacts. Uncertainty, however, exists around the actual extent of indirect impacts associated with groundwater drawdowns to SCP10b, SCP01b, and SCP9 due to the complex nature of the underlying strata, particularly to the “Busselton Ironstone” (SCP10b).

Table 11-3 provides an assessment of the proposal's significant residual impact using the residual impact significance model.

TABLE 11-3: RESIDUAL IMPACT SIGNIFICANCE MODEL

Part IV Environmental Factors	Vegetation and Flora						
				Terrestrial Fauna			
Part V Clearing Principles	Rare Flora	Threatened Ecological Communities	Remnant Vegetation	Wetlands & Waterways	Conservation Area	High Biological Diversity	Habitat for Fauna
Residual Impact that is environmentally unacceptable or cannot be offset							
Significant residual impacts that will require an offset- All significant residual impacts to species and ecosystems protected by statute or where the cumulative impact is already at a critical level		DIRECT IMPACTS The Proposal will directly impact 1.25ha of SCP01b—Southern *Corymbia calophylla* woodlands on heavy soils (mapped as degraded/good condition) through clearing. Locally, this represents 57.6% of the TEC mapped within the Proposal area, while regionally, this TEC is known from 13 quadrats outside the Proposal (refer Figure 4-1b of Doral ERD V3, 2020).					DIRECT IMPACTS The Proposal will directly impact 9.83ha of Black Cockatoo foraging habitat, (including 113 trees with DBH>500mm) and 64 isolated scattered paddock trees (1.07ha) with DBH >500mm. Of the tress with DBH>500mm, only four contain possibly suitable hollows, however no

Part IV Environmental Factors	Vegetation and Flora						
				Terrestrial Fauna			
Part V Clearing Principles	Rare Flora	Threatened Ecological Communities	Remnant Vegetation	Wetlands & Waterways	Conservation Area	High Biological Diversity	Habitat for Fauna
		Doral's primary mitigation measure has been to design the Proposal to avoid clearing native vegetation, as far as practicable, and maximise the use of existing cleared areas. This has resulted in all but 1% of the disturbance area being located on cleared pasture. Doral will rehabilitate an area of 14.5ha of local native species to counterbalance direct impacts from clearing, including flora species within SCP01b. As clearing will impact one of the DBCA-listed TECs protected by statute, the impacts are considered significant, and in the event of resulting direct impacts (i.e. plant deaths)					evidence of actual use has been identified. Based on available mapping it is estimated that there is ~13,300ha of native vegetation within 10km of the Development Envelope and there is therefore significant potential for Black Cockatoo breeding and/or foraging to take place in the wider area. A review of the 2018 Great Cocky Count database shows no documented, active roost sites within the Development Envelope (BCE, 2024). As clearing will impact habitat of a species

Part IV Environmental Factors	Vegetation and Flora						
				Terrestrial Fauna			
Part V Clearing Principles	Rare Flora	Threatened Ecological Communities	Remnant Vegetation	Wetlands & Waterways	Conservation Area	High Biological Diversity	Habitat for Fauna
		attributable to the dewatering activities an offset is proposed.					protected by statute, the impacts are considered significant and an offset is proposed.
Significant residual impacts that may require an offset – **Any significant residual impact to potentially threatened species and ecosystems, areas of high environmental value or where the cumulative impact may reach critical levels if not managed.**	**DIRECT IMPACTS** No direct impacts to conservation significant flora will occur as a result of implementing the Proposal. **INDIRECT IMPACTS** Indirect impacts from groundwater drawdown may impact up to 26 individuals of *Verticordia plumosa* var. *vassensis.* With the implementation of mitigation	**INDIRECT IMPACTS** Indirect impacts from groundwater drawdown may impact the following TECS, which are protected by statute: • Up to 0.37ha of SCP10b - *Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)* (Gibson, et al., 2000). • Up to 0.26ha of SCP01b - Southern *Corymbia*					**INDIRECT IMPACTS** Indirect impacts from groundwater drawdown may impact up to 0.68ha Black Cockatoo foraging habitat. Based on the available mapping, it is estimated that there is ~13,300ha of native vegetation within 10km of the Development Envelope. Therefore, there is significant potential for Black Cockatoo breeding and/or foraging to

Part IV Environmental Factors	Vegetation and Flora						
				Terrestrial Fauna			
Part V Clearing Principles	Rare Flora	Threatened Ecological Communities	Remnant Vegetation	Wetlands & Waterways	Conservation Area	High Biological Diversity	Habitat for Fauna
	measures, such as the GDE Management Plan, which includes irrigation triggers, contingencies, etc., these impacts are expected to be minimised. However, as uncertainty exists around the actual extent of indirect impacts from groundwater drawdown, the impacts are considered potentially significant, and an offset is proposed.	*calophylla* woodlands on heavy soils. • Up to 0.05ha of SCP09 - *Dense shrublands on clay flats.* With the implementation of mitigation measures, such as the GDE Management Plan, which includes irrigation triggers, contingencies, etc., these impacts are expected to be minimised; however, as uncertainty exists around the actual extent of indirect impacts from groundwater drawdown, the impacts are considered potentially significant and in the event of resulting direct impacts (i.e. plant deaths) attributable to the					take place in the wider area. A review of the 2018 Great Cocky Count database shows no documented, active roost sites within 10km of the subject site (BCE, 2023; Peck, et al., 2018). With the implementation of mitigation measures, such as the GDE Management Plan and the revegetation of 14.5ha of BC habitat, the extent and severity of impacts are expected to be minimised. However, as uncertainty exists around the actual extent of indirect

Part IV Environmental Factors	Vegetation and Flora						
				Terrestrial Fauna			
Part V Clearing Principles	Rare Flora	Threatened Ecological Communities	Remnant Vegetation	Wetlands & Waterways	Conservation Area	High Biological Diversity	Habitat for Fauna
		dewatering activity an offset is proposed.					impacts from groundwater drawdown.
Residual impacts that are not significant			The Proposal will clear 8.58ha (excluding 1.25ha mapped as SCP01b) ha of a total ~30ha of native vegetation within the Proposal area, of which 85% is in Degraded or Completely Degraded condition. Clearing represents disturbance to 0.29% of the area remaining for the Abba vegetation complex and	No conservation-significant wetlands within or near the Proposal area will be affected by the Proposal. The Vasse-Wonnerup Ramsar wetland is located ~4.6km to the north of the Proposal area and will not be significantly affected by the Proposal, either directly or indirectly.	There are no formal conservation reserves or conservation covenants within or in close proximity to the Proposal area. Three 'conservation' Sumplands and Floodplains are located ~6km northeast and southwest of the Proposal area but are outside of	The Proposal does not occur within an area of high biological diversity. Only ~30ha of remnant vegetation is present within the 844.92ha Proposal area, with 85% in Degraded or completely Degraded condition.	The Proposal will clear ~9.83ha of fauna habitat within the Development Envelope, of which 85% is in Completely Degraded condition and is considered of little value to most fauna species (excluding Black-Cockatoos).

Part IV Environmental Factors	Vegetation and Flora						
				Terrestrial Fauna			
Part V Clearing Principles	Rare Flora	Threatened Ecological Communities	Remnant Vegetation	Wetlands & Waterways	Conservation Area	High Biological Diversity	Habitat for Fauna
			does not significantly reduce the regional extent of this vegetation complex (i.e. 9.83ha of the remaining 3,359.08ha).		groundwater drawdowns.	Seventy-two taxa of vascular plants were identified during the survey, of which 27 taxa (38%) were introduced species (Ecoedge, 2023).	

As presented in Table 11-3, under the WA Environmental Offsets Guidelines (Government of Western Australia, 2014), Significant Residual Impacts have the potential to occur in the following flora, vegetation, and fauna habitat (Black Cockatoo), as summarised in Table 11-4.

TABLE 11-4: SUMMARY OF SIGNIFICANT RESIDUAL IMPACTS

ENVIRONMENTAL FACTOR	EXTENT OF SIGNIFICANT RESIDUAL IMPACT (DIRECT IMPACTS)		EXTENT OF POTENTIALLY SIGNIFICANT RESIDUAL IMPACT (INDIRECT IMPACTS)	
Flora and Vegetation	SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils	1.25ha	SCP10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)	0.37ha
			SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils	0.26ha
			SCP09 - *Dense shrublands on clay flats*	0.05ha
			Verticordia plumosa var. *vassensis.*	26 individuals
Terrestrial Fauna	Black Cockatoo foraging habitat	9.83ha of generally low-quality foraging habitat including 113 trees with DBH>500mm). A further 64 trees with DBH>500mm (1.07ha)	Black Cockatoo foraging habitat	0.68ha
	Black Cockatoo potential nesting habitat	Four trees (DBH>500mm) containing possibly suitable hollows		

A completed WA Environmental Offsets Table is provided in Table 11-5, which describes the mitigation measures to be undertaken. The scale of impact, however, as discussed above in Table 11-4 (and listed in Table 11-5), is considered significant to flora, vegetation and fauna habitat.

TABLE 6-5: WA ENVIRONMENTAL OFFSETS TABLE

Project Name: YALYALUP MINERAL SANDS PROJECT									
Existing environment/ Impact	*Mitigation*			*Significant Residual Impact*	*Offset Calculation Methodology*				
	Avoid and minimise	*Rehabilitation Type*	*Likely Rehab Success*		*Type*	*Risk*	*Likely Offset Success*	*Time Log*	*Offset Quantification*
Disturbance of 844.92 hectares									
835.09 ha cleared pasture and planted non-endemic species.	**Avoid** - The proposal has been designed as far as practicable to utilise existing cleared pasture rather than clearing native vegetation. **Minimise**- The following plans and strategy will be prepared and implemented to minimise impacts on flora and vegetation values: 1. A Flora and Vegetation Management Plan 2. GDE Management Plan 3. Dust Management Plan	835.09 ha of cleared pasture and planted non-endemic species will be returned to the pasture in accordance with the Mine Closure Plan.	High—Doral has significant experience returning former mined/disturbed areas to pasture. Doral successfully rehabilitated 770ha of disturbed land at the Dardanup Mineral Sands Mine back to pasture, which has been relinquished by DEMIRS (26/03/24).	No					

Project Name: YALYALUP MINERAL SANDS PROJECT									
Existing environment/ Impact	*Mitigation*			*Significant Residual Impact*	*Offset Calculation Methodology*				
	Avoid and minimise	*Rehabilitation Type*	*Likely Rehab Success*		*Type*	*Risk*	*Likely Offset Success*	*Time Log*	*Offset Quantification*
	4.Bushfire Management Plan 5.Acid Sulfate Soil Management Plan 6.Groundwater Operating Strategy								
Clearing of 8.58ha of Degraded and Completely Degraded native vegetation	Avoid - The proposal has been designed as far as practicable to utilise existing cleared pasture rather than clearing native vegetation. Minimise- The following plans and strategy will be prepared and implemented to minimise impacts to flora and vegetation values: 1. A Flora and Vegetation Management Plan	Doral will rehabilitate 14.5ha of native vegetation and BC habitat using local species to counterbalance the clearing impacts. The revegetation will aim to establish Woodland of Corymbia calophylla, Eucalyptus marginata, and	High—Doral has successfully rehabilitated three Offset areas to native vegetation in accordance with DCCEEW and DBCA/EPA conditions.	No					

Project Name: YALYALUP MINERAL SANDS PROJECT									
Existing environment/ Impact	*Mitigation*			*Significant Residual Impact*	*Offset Calculation Methodology*				
	Avoid and minimise	*Rehabilitation Type*	*Likely Rehab Success*		*Type*	*Risk*	*Likely Offset Success*	*Time Log*	*Offset Quantification*
	2. GDE Management Plan 3. Dust Management Plan 4. Fire Management Plan 5.Acid Sulfate Soil Management Plan 6. Groundwater Operating Strategy	*Agonis flexuosa* over shrubland.							
Clearing 1.25ha of FCT01b - Southern *Corymbia calophylla* woodlands on heavy soils in Degraded/Good or Good condition.	**Avoid**—The proposal has been designed to utilise existing cleared pasture rather than clearing native vegetation. This has resulted in the avoidance of all Threatened and Priority flora species and TECs SCP10b and SCP09, present within Proposal area.	Doral will rehabilitate approximately 14.5ha of native vegetation using local species, including those present in the impacted TEC and those suitable for Black Cockatoo	Can the environmental values be rehabilitated/Evidence? It is unlikely that revegetation activities will be able to return vegetation to TEC status, given that the vegetation has specific substrate requirements that will be disturbed during mining. The rehabilitation area is likely to have a different	Extent 1.25ha Quality Vegetation has been mapped as Good condition. Conservation Significance SCP01b - Vulnerable by DBCA Land Tenure	Land acquisition	Low – Land to be secured and placed under Conservation Covenant by Doral or Doral to provide funding arrangement to DBCA for the purchase and	High – Land acquisition and management in the southwest is well understood and has been previously implemented by Doral and DBCA as an offset for other sites. Can the values be defined and measured?	Secures habitat upon agreement - no time delay	Area contained within Land Acquisition Offset, to be provided.

Project Name: YALYALUP MINERAL SANDS PROJECT									
Existing environment/ Impact	*Mitigation*			*Significant Residual Impact*	*Offset Calculation Methodology*				
	Avoid and minimise	*Rehabilitation Type*	*Likely Rehab Success*		*Type*	*Risk*	*Likely Offset Success*	*Time Log*	*Offset Quantification*
	Minimise- The following plans and strategy will be prepared and implemented to minimise impacts to flora and vegetation values: 1. A Flora and Vegetation Management Plan 2. GDE Management Plan 3. Dust Management Plan 4. Fire Management Plan 5.Acid Sulfate Soil Management Plan 6.Groundwater Operating Strategy	foraging habitat The revegetation will primarily aim to establish Woodland of *Corymbia calophylla, Eucalyptus marginata,* and *Agonis flexuosa* over shrubland.	substrate, although it will not be disturbed by mining. Operator experience in undertaking rehabilitation? Doral has successfully rehabilitated three Offset areas back to native vegetation in accordance with DCCEEW and DBCA/EPA conditions. conditions. What type of vegetation is being rehabilitated? Woodland of *Corymbia calophylla,* E*ucalyptus marginata* and *Agonis flexuosa* over shrubland. Time lag?	Mining Tenements Time Scale The Proposal has an anticipated mine life of 10 years. According to the agreed significance framework, residual impact is considered to be significant because one DBCA-listed TECs protected under the BC Act will be impacted.		management of a suitable offset. It is expected that the offset will be a Ministerial Condition of the approval of the Proposal.	Yes - values of vegetation communities can be measured. Operator experience/Evidence? Doral/DBCA will manage the land. What is the type of vegetation being revegetated? Vegetation with same or similar characteristics to SCP01b and include BC habitat. Is there evidence the environmental values can be re-created (evidence of demonstrated success)? Yes, Doral has successfully provided a Land Acquisition		

Project Name: YALYALUP MINERAL SANDS PROJECT									
Existing environment/ Impact	*Mitigation*			*Significant Residual Impact*	*Offset Calculation Methodology*				
	Avoid and minimise	*Rehabilitation Type*	*Likely Rehab Success*		*Type*	*Risk*	*Likely Offset Success*	*Time Log*	*Offset Quantification*
			5-7 years for vegetation to be established and self-sustaining. <u>Credibility of the rehabilitation proposed (evidence of demonstrated success)</u> Doral have successfully rehabilitated three Offset areas as part of other mine operations. Doral are currently rehabilitating ~9ha of land back to State-Forest.				offset as part of other Ministerial Conditions for the Yoongarillup and Yalyalup mines.		
Direct impact from clearing 9.83ha of Black Cockatoo foraging habitat (inc 113 trees with DBH>500mm) and an	**Avoid**—The proposal has been designed to utilise existing cleared pasture rather than clearing native vegetation. This has resulted in avoidance of ~20ha of native vegetation	Doral will rehabilitate 14.5ha of native vegetation using local species to counterbalance the clearing	<u>Can the environmental values be rehabilitated/Evidence?</u> Yes, Black Cockatoo foraging habitat can be established and be self-sustaining within a relatively short time frame (i.e., 5-7 years).	<u>Extent</u> 10.9ha of Black Cockatoo foraging habitat (inc 134 trees with DBH>500mm). Four of the 134 trees contain possibly suitable hollows for	Land acquisition	Low – Land to be secured and placed under Conservation Covenant by Doral or Doral to provide	High – Land acquisition and management in the southwest is well understood and has been previously implemented by Doral and DBCA as an	Secures habitat upon agreement - no time delay	Area contained within Land Acquisition Offset, to be provided.

Project Name: YALYALUP MINERAL SANDS PROJECT									
Existing environment/ Impact	*Mitigation*			*Significant Residual Impact*	*Offset Calculation Methodology*				
	Avoid and minimise	*Rehabilitation Type*	*Likely Rehab Success*		*Type*	*Risk*	*Likely Offset Success*	*Time Log*	*Offset Quantification*
additional 1.07ha (64 trees with DBH>500mm) of isolated scattered paddock trees. Four of these trees have been identified as containing hollows possibly suitable for a Black Cockatoo to use (although no evidence of actual use)	including 587 Black Cockatoo potential nesting trees within the Proposal area. Five of the seven trees identified to be possibly suitable for a Black Cockatoo to use have also been avoided. **Minimise** - The following plans and strategy will be prepared and implemented to minimise impacts to flora and vegetation values: 1. A Flora and Vegetation Management Plan 2. GDE Management Plan 3.Fauna Management Plan	impacts of the Proposal. The revegetation will aim to establish Woodland of *Corymbia calophylla, Eucalyptus marginata,* and *Agonis flexuosa* over shrubland.	However, potential nesting trees may take up to 200 years to form a suitable hollow. Operator experience in undertaking rehabilitation? Yes, Doral has successfully rehabilitated three Offset areas back to native vegetation in accordance with DCCEEW and DBCA/EPA conditions. What type of vegetation is being rehabilitated? Woodland of *Corymbia calophylla,* E*ucalyptus marginata* and *Agonis flexuosa* over shrubland. Time lag?	a Black Cockatoo to use. Quality Foraging habitat has been assessed as generally low quality and only four trees contain hollows possibly suitable for a Black Cockatoo to use. No evidence of current or previous use. Conservation Significance Black Cockatoo foraging and potential nesting habitat. Land Tenure Mining Tenements Time Scale		funding arrangement to DBCA for the purchase and management of a suitable offset. It is expected that the offset will be a Ministerial Condition of the approval of the Proposal.	offset for the Yoongarillup Mine. Can the values be defined and measured? Yes - values of vegetation communities can be measured. Operator experience/Evidence? Doral/DBCA will manage the land. What is the type of vegetation being revegetated? Vegetation suitable as Black Cockatoo potential breeding habitat. Is there evidence the environmental values can be re-created (evidence of		

Project Name: YALYALUP MINERAL SANDS PROJECT									
Existing environment/ Impact	*Mitigation*			*Significant Residual Impact*	*Offset Calculation Methodology*				
	Avoid and minimise	*Rehabilitation Type*	*Likely Rehab Success*		*Type*	*Risk*	*Likely Offset Success*	*Time Log*	*Offset Quantification*
	4. Dust Management Plan 5. Fire Management Plan 6. Acid Sulfate Soil Management Plan 7.Groundwater Operating Strategy.		5-7 years for foraging habitat to be established and self-sustaining; however, 200 years for trees to form suitable hollows. Credibility of the rehabilitation proposed (evidence of demonstrated success) Doral has successfully rehabilitated several Offset areas as part of other mine operations.	The Proposal has an anticipated mine life of 10 years. According to the agreed significance framework, residual impact is considered significant as clearing will affect a species protected by statute under the BC Act and EPBC Act.			demonstrated success)? Yes, Doral has successfully provided a Land Acquisition offset as part of its Yoongarillup Mine Ministerial Conditions.		

Project Name: YALYALUP MINERAL SANDS PROJECT									
Existing environment/ Impact	*Mitigation*			*Significant Residual Impact*	*Offset Calculation Methodology*				
	Avoid and minimise	*Rehabilitation Type*	*Likely Rehab Success*		*Type*	*Risk*	*Likely Offset Success*	*Time Log*	*Offset Quantification*
Indirect impacts from dewatering to the following GDEs and associated flora: -0.37ha of SCP10b - Shrublands on southern Swan Coastal Plain Ironstones (Busselton area) -0.26ha of SCP01b - Southern *Corymbia calophylla* woodlands on heavy soils. -0.05ha of SCP09 - *Dense*	Groundwater drawdown impacts will be avoided and/or minimised by implementing the following key actions: -Dewatering will be undertaken in a staged approach; -Passive dewatering with sump pump (i.e. no dewatering spears) will be used to minimise the extent of the dewatering cone of depression; -Rapid hydraulic backfill of sand tails, which will aid in returning	Rehabilitation back to the same community types (TECs) is unlikely. Doral will, however, rehabilitate approximately 14.5ha of native vegetation using local provenance species, including those present in the impacted TECs. The revegetation will aim to establish Woodland of	Can the environmental values be rehabilitated/Evidence? Unlikely, given the vegetation to be potentially impacted by dewatering comprises specific substrate requirements. Operator experience in undertaking rehabilitation? Doral has successfully rehabilitated three Offsets areas back to native vegetation. What type of vegetation is being rehabilitated? Woodland of *Corymbia calophylla* and	Extent 0.37ha of SCP10b 0.29ha of SCP01b 0.05ha of SCP09 Population of 26 *Verticordia plumosa* var. *vassensis.* Quality Vegetation has been mapped as Degraded/Good and Good condition Conservation Significance SCP10b - Critically Endangered by DBCA and Endangered under EPBC Act	Land acquisition	Low – Land to be secured and placed under Conservation Covenant by Doral or Doral to provide funding arrangement to DBCA for the purchase and management of a suitable offset. It is expected that the offset will be a Ministerial Condition of the approval	Can the values be defined and measured? Yes - values of vegetation communities can be measured Operator experience/Evidence? Doral/DBCA will manage the land. What is the type of vegetation being revegetated? NA Is there evidence the environmental values can be re-created (evidence of demonstrated success)?	Secures habitat upon agreement - no time delay	Area contained within Land Acquisition Offset, to be provided.

Project Name: YALYALUP MINERAL SANDS PROJECT									
Existing environment/ Impact	*Mitigation*			*Significant Residual Impact*	*Offset Calculation Methodology*				
	Avoid and minimise	*Rehabilitation Type*	*Likely Rehab Success*		*Type*	*Risk*	*Likely Offset Success*	*Time Log*	*Offset Quantification*
shrublands on clay flats. Population of 26 *Verticordia plumosa* var. *vassensis.* present within SCP10b.	groundwater levels, will be conducted; -Provision of reticulation/irrigation to vegetation in accordance with: 1. GDE Management Plan 2. Groundwater Operating Strategy.	*Corymbia calophylla, Eucalyptus marginata,* and *Agonis flexuosa* over shrubland.	E*ucalyptus marginata* over shrubland. <u>Time lag?</u> 5-7 for vegetation to be established and self-sustaining. <u>Credibility of the rehabilitation proposed (evidence of demonstrated success)</u> Doral has successfully rehabilitated three Offset areas as part of other mine operations. Doral are currently rehabilitating ~9ha of land back to State-Forest.	SCP01b – Vulnerable under the BC Act. SCP09 – Critically Endangered by EPBC Act. *Verticordia plumosa var. vassensis* - Threatened (DBCA)/Endangered (EPBC) <u>Land Tenure</u> Mining Tenement/Road reserve <u>Time Scale</u> N/A According to the agreed significance framework, residual impact is considered to be potentially significant as two TECs protected		of the Proposal.	Yes Doral have provided a Land Acquisition offset as part of its Yoongarillup and Yalyalup Mines.		

Project Name: YALYALUP MINERAL SANDS PROJECT									
Existing environment/ Impact	*Mitigation*			*Significant Residual Impact*	*Offset Calculation Methodology*				
	Avoid and minimise	*Rehabilitation Type*	*Likely Rehab Success*		*Type*	*Risk*	*Likely Offset Success*	*Time Log*	*Offset Quantification*
				under the BC Act (inc. one under EPBC Act) have the potential to be impacted from dewatering. In addition, one flora species listed as Threatened by DBCA and Endangered under the EPBC Act, also has the potential to be impacted by dewatering.					
Indirect impacts from dewatering to 0.68ha of Black Cockatoo foraging habitat are present in the GDEs SCP10b, SCP01b, and SCP09	Groundwater drawdown impacts will be avoided and/or minimised by implementing the following key actions: -Dewatering will be undertaken in a staged approach; -Passive dewatering with sump pump (i.e.	Doral will rehabilitate 14.5ha of native vegetation and BC habitat using local species to counterbalance the clearing impacts.	Can the environmental values be rehabilitated/Evidence? Yes, BC habitat can be established and self-sustaining within a relatively short time (i.e., 5-7 years; however, it takes 200 years for trees to form suitable hollows.).	Extent 0.68ha of BC habitat (mapped as SCP01b, SCP09, SCP10b). Quality Good/ Degraded condition	Land acquisition	Low – Land to be secured and placed under Conservation Covenant by Doral or Doral to provide funding arrangement	Can the values be defined and measured? Yes - values of vegetation communities can be measured Operator experience/Evidence? Doral/DBCA will manage the land.	Secures habitat upon agreement - no time delay.	Area contained within Land Acquisition Offset, to be provided.

Project Name: YALYALUP MINERAL SANDS PROJECT									
Existing environment/ Impact	*Mitigation*			*Significant Residual Impact*	*Offset Calculation Methodology*				
	Avoid and minimise	*Rehabilitation Type*	*Likely Rehab Success*		*Type*	*Risk*	*Likely Offset Success*	*Time Log*	*Offset Quantification*
described above.	no dewatering spears) will be used to minimise the extent of the dewatering cone of depression; -Rapid hydraulic backfill of sand tails, which will aid in returning groundwater levels, will be conducted; -Provision of reticulation/irrigation to vegetation in accordance with: 1. GDE Management Plan 2. Groundwater Operating Strategy.	Specifically, the revegetation will aim to establish Woodland of *Corymbia calophylla,* E*ucalyptus marginata* and *Agonis flexuosa* over shrubland.	<u>Operator experience in undertaking rehabilitation?</u> Doral has successfully rehabilitated three Offset areas back to native vegetation in accordance with Department of Agriculture, Water and the Environment and DBCA/EPA conditions. <u>What type of vegetation is being rehabilitated?</u> Woodland of *Corymbia calophylla,* E*ucalyptus marginata* and *Agonis flexuosa* over shrubland. <u>Time lag?</u> It takes 5-7 years for the foraging habitat to be established and self-sustaining; however, it	<u>Conservation Significance</u> <u>Land Tenure</u> Mining Tenement/Road reserve <u>Time Scale</u> N/A According to the agreed significance framework, residual impact is considered significant as clearing will impact a species' habitat protected by statute under the BC Act and EPBC Act.		to DBCA for the purchase and management of a suitable offset. It is expected that the offset will be a Ministerial Condition of the approval of the Proposal.	<u>What is the type of vegetation being revegetated?</u> NA <u>Is there evidence the environmental values can be re-created (evidence of demonstrated success)?</u> Yes Doral have provided a Land Acquisition offset as part of its Yoongarillup Mine.		

Project Name: YALYALUP MINERAL SANDS PROJECT									
Existing environment/ Impact	*Mitigation*			*Significant Residual Impact*	*Offset Calculation Methodology*				
	Avoid and minimise	*Rehabilitation Type*	*Likely Rehab Success*		*Type*	*Risk*	*Likely Offset Success*	*Time Log*	*Offset Quantification*
			takes 200 years for trees to form suitable hollows. Credibility of the rehabilitation proposed (evidence of demonstrated success) Doral has successfully rehabilitated three Offset areas as part of other mine operations and is currently rehabilitating ~9ha of land back to State Forest.						

11.3. OFFSET PROPOSAL

11.3.1. OBJECTIVES AND INTENDED OUTCOME

Doral is committed to delivering an offset strategy that addresses the requirements of both the State and Commonwealth Offset Policies with the objective of providing a net benefit to the environment.

Doral proposes to directly offset the significant residual impacts of the Proposal through undertaking a 100% land acquisition offset within the southwest of WA to secure like for like vegetation communities where possible. The experience of Doral to date in investigating land parcels for an offset package has identified that an adaptable process is required in consultation with DBCA and DCCEEW to ensure that suitable land is acquired as and when it becomes available for purchase. This is due to the following factors:

- There is limited suitable land available that contains the values being impacted;
- Land acquisition requires the agreement of the freehold landowner to sell;
- There is potential of landowner agreement to not be forthcoming within the project timeframes;
- Linking a project approval with a particular property could increase the price for that acquisition;
- Potential for changes in circumstances for a particular property during the approval process (e.g. a change in land ownership, a change in vegetation condition due to fire or clearing or a change in the expected sale price).

11.3.2. OFFSET CALCULATION

The DCCEEW and EPA Offset calculators will be used to provide an offset assessment guide (parameters) associated with the impact of the Proposal and potential offset sites. To assist with quantifying an appropriate offset for both State and Federal significant residual impacts, the calculations rely on using the annual probability of extinction figures for MNES classifications (i.e. critically endangered, endangered, vulnerable), as per the *How to Use the Offsets Assessment Guide* and the associated *EPBC Act Environmental Offsets Policy (DSEWPaC, 2012a).* This is intended to meet the requirements of the *EPBC Act Environmental Offsets Policy (DSEWPaC, 2012a)* for the MNES, as well as providing a conservative estimate for quantifying an appropriate offset for State matters, given there are no published annual probability of extinction figures at State level.

It is intended that the Offset Strategy will be developed in close consultation with both State and Commonwealth agencies during assessment of the Proposal.

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FIGURE 5-7: WEEDS AND DIEBACK

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