BORAL ORANGE GROVE QUARRY

LICENCE AMENDMENT SUPPORTING DOCUMENT (ATTACHMENT 8)

December 2025

Prepared for:

BORAL®

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MBS ENVIRONMENTAL

BORAL ORANGE GROVE QUARRY

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CONTENTS

TABLES

CHARTS

APPENDICES

1. Introduction

Boral Resources (W.A.) Ltd (Boral) is authorised to operate the Orange Grove Quarry site under Ministerial Statement 170, which includes implementation conditions focused on:

- Protection of the watercourse on the southern side of the site.
- Protection of the easterly portion of the watercourse on the northern side of the site.
- Implementation of an Environmental Management Plan for the protection of the watercourse on the southern side of the site and the easterly portion of the watercourse on the northern side of the site.
- Decommissioning and rehabilitation of the site.

The quarry pits have been designed to avoid both watercourse areas.

The Site Water Management Plan is being implemented.

Boral operates the Orange Grove Quarry site under the *Environmental Protection Act 1986* (EP Act) Part V Licence L9121/2018/1 with the following prescribed premise categories listed:

- Category 12: Screening of material.
- Category 13: Crushing of building material.
- Category 61A: Solid waste facility.

The Licence amendment proposes no changes to the existing prescribed premise boundary and no changes to the approved design capacity of any of the prescribed premise categories.

Licence L9121/2018/1 includes conditions relating to waste disposal, dust monitoring and control, noise/vibration monitoring and control, containment of treated wastewater and annual environmental reporting. Licence L9121/2018/1 includes a requirement to report volume and dates of water overflows from the Main Storage Basin (transfer dam) but it does not include a licenced discharge point. The Licence does not include any other conditions relating to management of stormwater.

1.1 Purpose and Scope

This document has been prepared to provide supporting information for a request to amend Licence L9121/2018/1. The amendment is requested to enable stormwater to be discharged from the site.

1.2 Applicant/Occupier Details

Boral Resources (W.A.) Ltd is the landowner under an existing arrangement which has not changed since the grant of the current Licence. The proponent and key contact details are shown in Table 1.

Table 1: Proponent and Key Contact Details

Proponent	
Name	Boral Resources (W.A.) Ltd
Address	Level 3, Triniti 2, 39 Delhi Rd, North Ryde NSW 2113
ACN	008 686 904
[redacted]	

1.3 Premises Details

The premise is located approximately 18 km southeast of Perth at 15 Stephen Street, Orange Grove (Figure 1, Appendix A) and comprises:

- Lots 453, 457, 465, 466 and 467 on Plan 3327.
- Lot 50 on Plan 42517.
- Lot 101 on Diagram 90993.
- Lot 113 on Plan 248353.
- Lot 181 on Plan 250164.

Part of the premise is zoned Special Use - the rest has no zoning under the City of Gosnells Local Planning Scheme 24 (LPS24).

The Premise has a LPS24 Reservation of Parks and Recreation (City of Gosnells, 2025).

Several residences are located less than 5 m from the premise. These residential premises are defined as a sensitive land use as per Environmental Protection Authority (EPA) Guidance Statement No.3 Separation Distances between Industrial and Sensitive Land uses.

2. Siting Relevant to the Proposed Amendment

The environmental setting, including sensitive and environmental receptors remains unchanged from the existing Licence. The key siting information relevant to this Licence amendment application is climate, geology, groundwater and surface water.

2.1 Climate

According to the Köppen-Geiger climate classification, the project area is categorised within temperate climate with hot and dry summers (Class Csa) (Peel, Finlayson and McMahon, 2007). This classification is considered to represent a temperate climate where precipitation in the driest month is less than 40 mm and less than three times the precipitation of the wettest month in winter. The summer temperatures are frequently over 22°C and the temperature of the coldest month is between 0-18°C.

The closest near-coastal Bureau of Meteorology (BoM) site recording long-term rainfall is Gosnells City, station 9106 operating since 1961. This station is located within 5 km of the project area (BoM, 2025). As shown in Chart 1, the mean annual rainfall is 789.8 mm, approximately 55% of which falls in winter (June to August).

February is the hottest month with a mean maximum temperature of 33.0°C and mean minimum of 18.9°C, and July is the coldest month in terms of mean maximum temperature with a mean of 18.6°C and mean minimum temperature of 8.9°C (Chart 1).

Winds in the project area are predominantly from the east and northeast in the morning turning west and southwest in the afternoon. Wind speed and direction from Gosnells City Station for 9am and 3pm are shown in Chart 2.

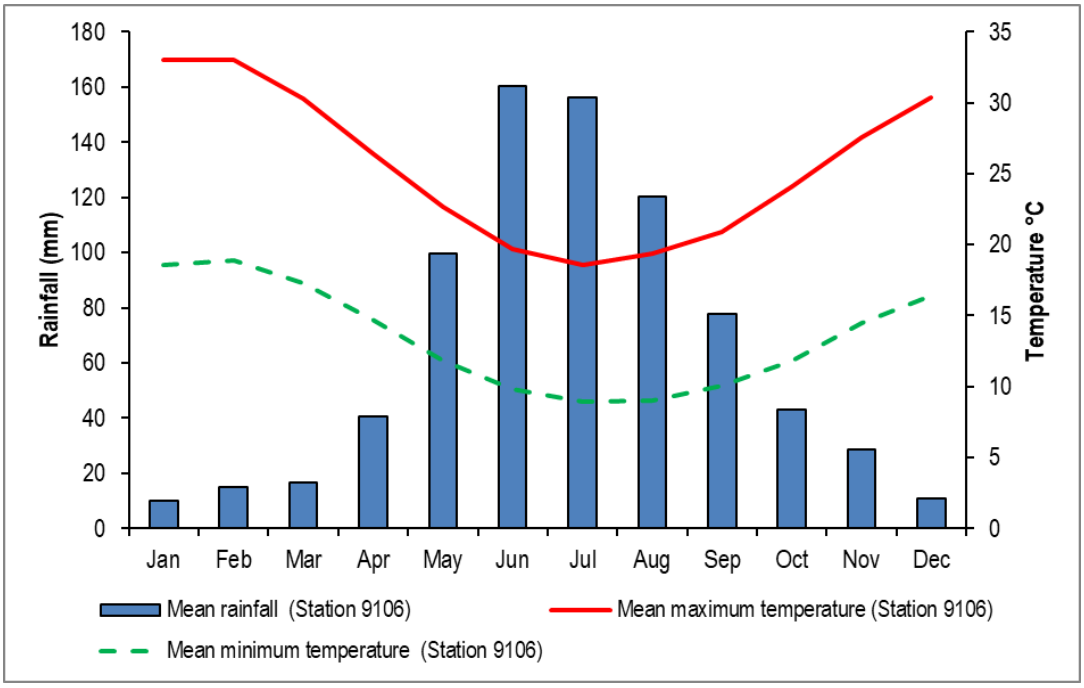

Chart 1: Climate Data, Gosnells City Station #9106 (BoM, 2025)

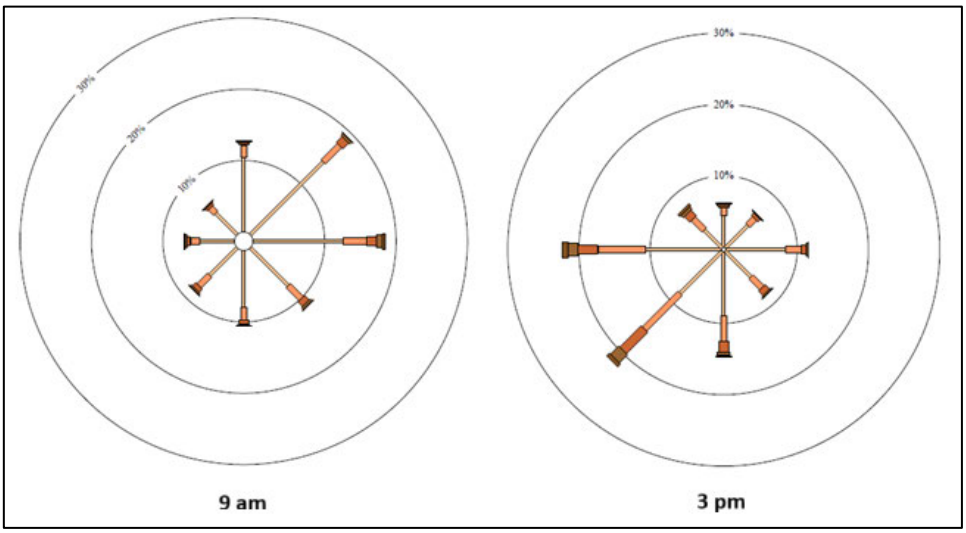

Chart 2: Wind Speed and Direction Data Gosnells City Station #9106 (BoM, 2025)

2.2 Geology

Geology mapping of the premises shows the bedrock geology of the site as being mainly Hard-Rock aggregate. The premises is associated with the Pinjarra Element, Yilgarn Craton and West Australian Element (AGSON, 2022)

2.3 Soils and Landscape

Soil landscapes and land system mapping of Western Australia describes broad soil and landscape characteristics from regional to local scales, and has been captured at scales ranging from 1:20,000 to 1:250,000 (DPIRD, 2022).

The site occurs within three land systems:

- Darling Plateau System (255Dp): Lateritic plateau. Duplex sandy gravels, loamy gravels and wet soils. Jarrah-marri-wandoo forest and woodland.
- Murray Valleys System (255Mv): Western Darling Range from the Avon Valley to Harvey. Deeply incised valleys with Red loamy earths, shallow duplexes and rock outcrop and Jarrah-marri-wandoo forest and woodland with mixed shrubland.
- Forrestfield System (213Fo): Undulating foot slopes of the Darling and Whicher Scarps. Duplex sandy gravels, pale deep sands and grey deep sandy duplexes. Woodland of *E. marginata, calophylla* and *wandoo* and some *B. grandis*.

2.4 Groundwater

Based on groundwater mapping data from the Department of Water and Environmental Regulation (DWER) (DWER, 2024), the site is located within a zone of undifferentiated Precambrian crystalline rocks and laterite over Mesozoic sediments. Groundwater is estimated to typically range from approximately 38-78 m below ground level, and as deep as 80 m below natural ground level in the Stage 2 Pit area, based on the absence of observed groundwater inflows to the pit.

There is no current licence to take groundwater associated with the Premises.

2.5 Surface Water

The Premise is located on the western edge of the Darling Scarp with the highest elevation of approximately 220 mAHD on the east of the premise falling to approximately 45 mAHD at the western boundary.

The Project is situated in the lower reaches of the Swan Avon–Canning River catchment, within the Middle Canning Surface Water Management Subarea (DWER-042) and the Middle Canning Surface Water Allocation Plan (DWER-086). The Bickley Brook catchment divide lies approximately 350 m northeast of the Project. Bickley Brook flows east–west approximately 900 m north of the Project before turning southwest, passing northwest of the site, and discharging to the Canning River about 5 km downstream. Surface water is present in seasonal streamlines within valleys surrounding the quarry.

An unnamed natural flow path enters the Premises from the eastern bushland, with upstream flows directed toward the Stage 2 Pit. Within the Quarry area, the watercourse is conveyed via roadside drains to the Main Storage Basin through sediment traps and the sediment retention pond immediately east of the Main Storage Basin. West of the Premises boundary (Figure 2 of Appendix A), the watercourse continues as a shallow open drain. Off-site it flows through and parallel to residential properties and the Karinya Equestrian Park as a local drain before joining the roadside drain at Staniland Street, which discharges to Bickley Brook at the Tonkin Highway open drain, approximately 1.7 km downstream of the Quarry.

Local catchment delineation (described in MBS 2025, Appendix B) indicates a total Project catchment area of approximately 206.5 ha. Two sub-catchments intersect the Premises, identified as Catchments A and B in Figure 2 of Appendix A. These are separated by a north–south-aligned ridgeline immediately west of the Stage 2 and Stage 3 pits, which is formed from the pits being excavated into the natural slope of the hill.

Catchment A has a total area of approximately 56.24 Ha, approximately 34.83 Ha of which is cleared land, and drains to the Main Storage Basin located at the west of the site. Catchment B has a total area of approximately 150.25 Ha, which drains to the Stage 2 Pit. Catchment B is comprised of approximately 28.35 Ha of cleared land (Stage 3 Pit area) and approximately 121.9 Ha natural bushland extending east about 1.5km.

No Public Drinking Water Source Areas (PDWSA) were identified within the site. The nearest PDWSA is Victoria Reservoir Catchment Area (Unique Feature ID: 773; Priority 1), located approximately 1.2 km east (upstream) of the site.

2.6 Surface Water Management Infrastructure

The Quarry has two water storages, the Main Storage Basin and the Stage 2 Pit.

The Main Storage Basin has an irregular planform and a surface area of approximately 850 m^2. Its deepest point is RL 39.75 m, and the embankment toe is about RL 44.5 m. A freeboard of approximately 0.5 m (RL 44.0 m) is maintained by transferring water to the Stage 2 Pit, with water transferred from Stage 2 Pit to the Main Storage Basin via pipeline as needed for site usage during summer. Water stored in the Main Storage Basin is used for processing, dust suppression (trucks and sprinkler systems), and vehicle washdowns (totalling approximately 244 kL/day).

Stormwater runoff within Catchment A is conveyed by open roadside drains to the Main Storage Basin via the adjacent sediment retention pond. Four sediment traps are located along the primary drain which follows the natural watercourse within the Project area. Treated workshop wastewater is collected and treated through triple interceptors. The treated wastewater is then directed to the Main Storage Basin via the sediment retention pond.

The sediment retention pond is approximately 50 m × 20 m, with inflows entering a sediment trap at the northern end where coarse material is captured. Accumulated coarse material is periodically removed from the SRP as part of ongoing site sediment control and maintenance.

The Stage 2 Pit is estimated to have a total holding capacity of 1,013,000m^3. The pit is excavated in a bench/berm configuration from a ground level of about RL 150 m on its western crest to about 180 m on the eastern side. Based on 1 m contours of the pit shell, the base of the pit is at RL 40, with the crest of the access ramp bund at about RL 78 m. Maximum elevation of the pit access road is approximately RL 81 to 82 m. As of November 2025, the water level is estimated at about RL 74 m, and the pit has a remaining capacity of about 107,000 m^3.

An uncontrolled, grouted, rip-rap-lined spillway is located at the north-west end of the Main Storage Basin to provide emergency overflow when water cannot be transferred to the Stage 2 Pit during significant rainfall events. The spillway is approximately 15 m long and 10 m wide (6 m at the base) and about 1 m deep. The downstream end cascades over a concrete-and-rock embankment approximately 5 m high at an approximate slope of 1V:2H.

An outlet sump is located adjacent to the spillway in a rectangular concrete pit approximately 3.9 m × 5.5 m, with floor levels around RL 42 m and cover around RL 45.5 m. Flow from the Main Storage Basin enters via twin inlet pipes at RL 43 m controlled by knife-gate valves. The pipes converge into a single outlet pipe fitted with a flowmeter, with discharge controlled by a pneumatic knife-gate valve via telemetry. The outlet discharges approximately at the mid-height of the shared rock embankment. A dedicated turbidity mount on the outlet assembly allows water quality (pH and turbidity) monitoring. The gate valve has automatic shut-off functionality when set pH or turbidity limits are exceeded. Technical design details of the outlet sump are provided as Appendix C. Surface water management infrastructure is shown in Figure 3 of Appendix A.

3. Proposed Activities (Attachment 3B)

The Premise currently operates in accordance with Licence L9121/2018/1, which authorises activities under Categories 12, 13 and 61A. The Licence amendment does not seek any changes to the existing prescribed premises boundary or to the approved design capacity of any prescribed premises category.

As outlined in Section 2.6, as part of the Premise's existing surface water management, stormwater and surface water runoff from the Premise's catchments are directed to the Stage 2 Pit and Main Storage Basin (MSB), with treated wastewater also directed to the MSB. Water held in the MSB is utilised on site for dust suppression (trucks and sprinkler systems), processing, and vehicle washdowns. Water is transferred from the MSB to the S2P during winter for storage to prevent uncontrolled discharge. The S2P has a maximum storage capacity of about 1,013,000 m3, with about 107,000 m^3 estimated to remain as of November 2025.

In addition to the current site water storage pressures, there is an approximate annual water surplus of approximately 172,670 m^3 (MBS 2025, Appendix B). To manage water levels effectively at the Stage 2 Pit and to mitigate uncontrolled discharges occurring once water storages reach capacity within the next 1 to 2 years, Boral is seeking inclusion of the proposed discharge point, as shown in Figure 3 of Appendix A, on Licence L9121/2018/1.

Based on the recommendations provided in the site water balance memorandum (MBS 2025, Appendix B) Boral proposes controlled discharges of up to 600,000 m^3 per annum for an initial two-year period (1 June 2026 to 31 May 2028). Followed by controlled discharge of up to 200,000 m^3 per annum beginning 1 June 2028. All discharge is proposed to occur during winter only (1 June to 30 September).

Controlled discharge will occur via the existing outlet sump to an unnamed drainage line.

3.1 Infrastructure and Equipment

Boral will continue to use the existing Main Storage Basin and the Stage 2 Pit to store water for use on site.

All infrastructure for the proposed controlled discharge is currently constructed. Discharge is proposed to occur via the outlet sump with flows entering the shallow open drain.

Water from the Main Storage Basin will enter the outlet sump via twin inlet pipes controlled by knife-gate valves. The pipes converge into a single outlet pipe fitted with a flowmeter, with discharge controlled by a pneumatic knife-gate valve via telemetry. The outlet discharges approximately at the mid-height of a concrete-and-rock embankment. A dedicated turbidity mount on the outlet assembly allows pH and turbidity to be monitored in real time. Technical design details of the outlet sump are provided as Appendix C. Calibration and maintenance of the pH and turbidity units will be completed according to manufacturer specifications with records stored on the site Supervisory Control and Data Acquisition (SCAADA) system.

4. Emissions, Discharges and Waste (Attachment 6A)

The proposed amendment will result in discharge of excess water into an un-named ephemeral creekline to the west of the premise. The water is mainly stormwater and surface water incident on the site with a small volume of treated wastewater from workshops.

There are three main contaminants that may impact the quality of the water to be discharged:

- Particulates from quarrying, crushing, screening, washing of product and plant washdown;
- Hydrocarbons from the plant and mobile equipment; and

4.1 Control Measures

To minimise the availability of hydrocarbon waste on site, all products are stored in designated tanks and locations that are regularly audited and reviewed. Hydrocarbon storage systems are maintained in accordance with manufacturer specifications and risk-based requirements, including routine inspections and maintenance. Spill control devices are available on site, with maintenance and training provided by a third-party contractor.

Sampling of water stored in the Main Storage Basin is undertaken monthly for laboratory analysis (hydrocarbons, nutrients and physico-chemical parameters, including total suspended solids). Sampling will continue to be undertaken at the northern end of the Main Storage Basin. The dedicated turbidity mount on the outlet sump assembly allows real time monitoring of turbidity and pH, with results recorded on the site SCAADA system. The gate valve has automatic shut-off functionality when specified pH and/or turbidity trigger levels are exceeded. In the event that trigger levels are breached, discharge will be halted and the following procedure undertaken:

- Inspect the outlet sump and discharge point to ensure no uncontrolled discharge is occurring.
- Confirm the SCAADA alarm status and manually verify turbidity and pH readings using a calibrated handheld field meter.
- Investigate potential causes of the exceedance (e.g. disturbance of settled material, or equipment or infrastructure malfunction).
- Implement corrective actions, such as allowing time for sediment to settle, adjusting site water management practices, or repairing faulty equipment or infrastructure.
- Resume discharge only once monitoring confirms turbidity and pH have returned to within approved trigger levels and corrective actions are verified as effective.

Workshops are equipped with triple interceptors designed to remove any hydrocarbons that may be present in stormwater during rain events. These interceptors discharge into the roadside drainage network, which then releases water into the sediment retention pond. Hydrocarbon analysis is conducted as part of routine water quality monitoring at the Main Storage Basin.

Given the discharge water management practices in place and disturbed nature of the downstream vegetation, monitoring of vegetation health downstream of the discharge point is not deemed

necessary. Water discharge will be closely managed to ensure that it meets regulatory standards, including regular laboratory analysis suites for hydrocarbons and other potential contaminants.

Discharge events will align with periods of winter flow (June to October) when base streamflow provides dilution within flowing surface water and stormwater runoff in the downstream catchment area before discharge to Bickley Brook. Releasing into a baseflow also reduces erosion potential and lowers the risk of ecological impacts. As a result, the likelihood of adverse impacts on vegetation is minimal, and the existing monitoring and mitigation systems are sufficient to protect the surrounding environment.

Table 2 summarises potential environmental risks associated with discharging the stored water and the proposed management controls to mitigate the potential risks.

Table 2: Risk Assessment for the Discharge of Stored Water

Source/ Activity	Potential Emissions	Potential Pathways and Impact	Sensitive Receptor	Controls
Discharge of water to drainage line	Stormwater, surface water and treated wastewater potentially contaminated with sediment.	Direct discharge to the drainage line potentially decreasing dissolved oxygen content, decreasing light penetration and in-filling channels and altering invertebrate fauna habitat when solids are deposited.	Vegetation, soil and aquatic ecosystem of the creekline	• Capture of potentially contaminated stormwater and surface water in site drainage systems. • Use of sediment traps to reduce sediment load in captured stormwater and surface water. • Water transfers, discharged treated wastewater, and runoff directed to the sediment retention pond to allow suspended solids to settle. • Proposed use of telemetry-controlled outlet sump equipped with flowmeter and in-line water quality monitoring for discharge of water from the Main Storage Basin. • Monthly inspections of drains and sediment traps to ensure they are free of sediment build-up. • Monthly water quality monitoring of Main Storage Basin for hydrocarbons, nutrients and physico-chemical parameters, including total suspended solids. • Monitoring of turbidity and suspended solid concentrations. • Automatic shut-off of outlet sump gate valve when specified pH and/or turbidity trigger levels exceeded.
		Direct discharge to drainage line potentially resulting in permanent water being present in the drainage line or flooding of the surrounding area during winter months.	Ecosystem of the creekline / drainage line	• Discharge to the drainage line will be controlled and timed to occur with winter flows. • Water will be transferred from the Main Storage Basin to the Stage 2 Pit if there is sufficient freeboard rather than discharged, in order to avoid creekline flooding during winter months. • Visual inspection of the water level in the discharge drainage line at least weekly during discharge.

4.2 Receiving Environment

Baseline ecosystem health of the Canning River has been described in the Department of Water (DoW, 2013) Ecosystem health in the Canning River, with the report focusing on the influence of the Kent Street Weir (KSW), located roughly 15 km downstream.

The Canning River ecosystem, particularly near the KSW, supports a range of endemic and native species, including freshwater fish, estuarine species, and native crayfish. The system already experiences ecological stress from climate change, urban runoff, the spread of invasive species, and vegetation clearing (DoW, 2013).

Historical water quality monitoring results for water samples collected from the Main Storage Basin are provided in Appendix D.

Results for baseline testing of water quality monitoring undertaken as part of the Swan-Canning Water Quality Monitoring Project (SCCATCH) in 2019 and 2020 ((DBCA, 2022a); (DBCA, 2023) for the six sites closest to the Premise are presented in Table 3 alongside summarised records for the Main Storage Basin. The SCCATCH monitoring point locations are shown in Figure 1 of Appendix A and all historical water quality monitoring results for the Main Storage Basin are provided in Appendix D.

Water within the Main Storage Basin is fresh to marginal, with Electrical Conductivity (EC) ranging from 790 to 1,200 µS/cm, which is comparable to other Swan-Canning sites Table 3.

Historically, Main Storage Basin pH has ranged from 7.9 to 8.3, which is slightly above the ANZG (2018) 95% species-protection upper guideline value of pH 8.0. Total Suspended Solids (TSS) typically ranges from 10 to 15 mg/L, which is moderately higher than values recorded in Bickley Brook and nearby Swan–Canning systems (Table 3). Total Recoverable Hydrocarbon (TRH) concentrations are consistently low, with all values below the detection limits of 0.05 mg/L (C10–C14) and 0.2 mg/L (C15–C28; C29–C36).

Average Total Nitrogen and Total Phosphorus concentrations recorded in 2025 at the Main Storage Basin (0.63 mg/L and 0.02 mg/L, respectively) are lower than those recorded at Bickley Brook, as well as the published long-term target values for Bickley Brook (DWER, 2019).

Boral's on-site water testing indicates that most metal and metalloid concentrations are below the ANZG 2018 95% freshwater protection values, except for Copper (Cu) and isolated elevated measurements of Nickel (Ni) and Zinc (Zn) (Appendix D). However, elevated concentrations of Cu, Ni and Zn within the Canning River system have been historically recorded (DoW, 2013).

Table 3: Water Quality Results

Analyte	ANZG DGVs / DWER Bickley Brook Long Term Targets	Site	Year	No. Samples	Mean	Min	Max	STD.Dev
TSS (mg/L)		Orange Grove Quarry	2021	10	17.4	7	35	7.13
			2022	11	13.7	2.5	34	10.34
			2023	8	9.8	2.5	14	3.20
			2024	4	14.3	11	22	4.55
			2025	6	12	7	17	3.51
		BICKB	2019	20	2.61	0.5	7	0.64
			2020	20	2.25	1	4	1.21
		ELLISB	2019	7	12.44	0.5	43	0.8
			2020	4	3.25	1	7	2.87
		MADDD	2019	19	9.46	1	61	1.36
			2020	22	11.55	2	19	17.25
		YULEB	2019	23	6.88	2	15	2.35
			2020	24	8.25	3	19	4.37
		STHNR	2019	24	8.13	2	16	1.19
			2020	26	5.08	2	10	2.33
		CANNR	2019	24	1.79	0.5	8	0.88
			2020	26	2.04	1	6	1.54

Analyte	ANZG DGVs / DWER Bickley Brook Long Term Targets	Site	Year	No. Samples	Mean	Min	Max	STD.Dev
EC (µS/cm)		Orange Grove Quarry	2021	10	1079	920	1200	97
			2022	11	1039	800	1200	106
			2023	8	1022	1000	1100	42
			2024	4	1025	900	1100	83
			2025	6	968	790	1100	114
		BICKB	2019	20	1080	2244	282	140
			2020	20	815	380	1600	340
		ELLISB	2019	7	700	432	1251	50
			2020	4	470	440	520	35
		MADDD	2019	19	2020	264	4587	160
			2020	22	1678	730	5350	1323
		YULEB	2019	23	820	318	1162	90
			2020	24	778	483	1155	211
		STHNR	2019	24	830	449	1053	80
			2020	26	834	540	1030	141
		CANNR	2019	24	570	403	697	80
			2020	26	676	450	1960	285

Analyte	ANZG DGVs / DWER Bickley Brook Long Term Targets	Site	Year	No. Samples	Mean	Min	Max	STD.Dev
Total Nitrogen (mg/L)	1.0 mg/L*	Orange Grove Quarry	2025	4	0.63	0.28	1	0.3
		BICKB	2019	20	1.15	0.42	3.4	0.24
			2020	20	0.873	0.49	2.2	0.44
		ELLISB	2019	7	0.6	0.23	1.5	0.05
			2020	4	0.343	0.25	0.47	0.09
		MADDD	2019	19	1.23	0.45	3.4	0.24
			2020	22	1.825	0.52	4	1.052
		YULEB	2019	23	1.39	0.56	5.9	0.12
			2020	24	0.895	0.54	1.6	0.245
		STHNR	2019	24	1.1	0.59	2.1	0.1
			2020	26	0.98	0.55	1.6	0.275
		CANNR	2019	24	0.39	0.13	0.99	0.06
			2020	26	0.374	0.13	0.74	0.167

Analyte	ANZG DGVs / DWER Bickley Brook Long Term Targets	Site	Year	No. Samples	Mean	Min	Max	STD.Dev
Total Phosphorus (mg/L)	0.1 mg/L*	Orange Grove Quarry	2025	4	0.02	0.02	0.02	0
		BICKB	2019	20	0.07	0.018	0.19	0.01
			2020	20	0.05	0.016	0.13	0.041
		ELLISB	2019	7	0.07	0.013	0.22	0
			2020	4	0.025	0.012	0.053	0.019
		MADDD	2019	19	0.08	0.026	0.16	0.01
			2020	22	0.113	0.037	0.44	0.096
		YULEB	2019	23	0.16	0.042	0.35	0.01
			2020	24	0.133	0.051	0.7	0.129
		STHNR	2019	24	0.14	0.075	0.21	0.01
			2020	26	0.104	0.059	0.2	0.044
		CANNR	2019	24	0.02	0.008	0.08	0
			2020	26	0.016	0.008	0.036	0.007

**Bickley Brook Long Term Nutrient Targets (DWER, 2019)*

5. Sensitive Receptors

Environmental and human receptors occurring within a 1 km buffer of the prescribed premise are listed in Table 4. Where the locations of these sensitive receptors are known, they are shown in Figure 4 of Appendix A.

The wetting front of the stormwater discharge is expected to travel a relatively short distance downstream before entering the local drainage network, which eventually flows into the Canning River located 5 km southwest of the site. The proposed discharge is controlled and thoroughly managed through testing of hydrocarbons, salinity, and pH in line with Australian and New Zealand Guidelines (ANZG) (2018) freshwater guideline values and the expected impact on sensitive receptors downstream is minimal. Furthermore, the infrequency and controlled nature of the discharge events, combined with the established separation distance between the discharge point and sensitive receptors, ensures that the risk of environmental impact is low.

Table 4: Sensitive Receptors and Distance from Prescribed Premise

Type	Description	Approximate Distance and Direction from Prescribed Premise
Environmentally Sensitive Areas (ESA)	The site is not located within an ESA. However, discharge from the site will drain through one ESA on route to the Canning River. The ESA is an unnamed palusplain (seasonally waterlogged) wetland falling within the management category of conservation by the (DBCA, 2025).	• The closest ESA is located approximately 490 m south. • The conservation wetland ESA is located approximately 1.2 km west
Threatened Ecological Communities (TEC)	The DWER ESA Data layer (DWER, 2025) shows the buffers of two TEC's within 1 km of the site.	Buffers 490 m south and 730 m northwest
	The Protected Matters Search Tool (PMST) (DCCEEW, 2025) identified potential for two TEC's to occur within a 1 km radius of the site: • Banksia Woodlands of the Swan Coastal Plan ecological community (Endangered) • Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain ecological community (Critically Endangered)	Potentially occurring within 1 km.
Threatened and Priority Flora	The DBCA Threatened and Priority Flora (DBCA-036) Data Layer (DBCA, 2022c) shows a record of a Threatened flora species within 1 km of the site.	Approximately 890 m northeast
	The PMST (DCCEEW, 2025) identified 25 Threatened Flora species that may occur within 1 km of the site.	Potentially occurring within 1 km

Type	Description	Approximate Distance and Direction from Prescribed Premise
Threatened Fauna	The DBCA Threatened and Priority Fauna (DBCA-037) Data Layer (DBCA, 2022b) shows five records of a Threatened fauna species within 1 km of the site.	Approximately 740 m north, 810 m north, 870 m north, 850 south and 960 m southwest
	The PMST (DCCEEW, 2025) identified 15 Threatened Fauna species that may occur within 1 km of the site.	Potentially occurring within 1 km
Aboriginal and other Heritage Sites	A search of the Aboriginal Cultural Heritage Inquiry System (DPLH, 2024) indicated the nearest registered Aboriginal Site is Bickley Ridge (ID 3654), and lodged Aboriginal Site, Bickley Brook (ID 4284), are located within 1 km of the site.	ID 3654 buffer within and directly adjacent to the northern part of the site ID 4284 buffer adjacent to the northern part of the site.
Public drinking water source areas	No Public Drinking Water Source Areas (PDWSA) were identified within the site. The nearest PDWSA is Victoria Reservoir Catchment Area (Unique Feature ID: 773; Priority 1).	1.2 km east
Rivers and other surface water bodies	An unnamed ephemeral creek enters the Premises at the eastern boundary, with upstream flows directed toward the Stage 2 Pit. Within the Quarry area, the watercourse is conveyed via roadside drains to the Main Storage Basin through sediment traps and the sediment retention pond immediately east of the Main Storage Basin. West of the Premises boundary, the watercourse continues as a shallow open drain. Offsite it flows through and parallel to residential properties and the Karinya Equestrian Park as a local drain before joining the roadside drain at Staniland Street, which discharges to Bickley Brook at the Tonkin Highway open drain approximately 1.7 km downstream.	Immediately east and west of the Quarry.
Acid sulfate soils	The site is located in an area of extremely low probability of acid sulfate soils (CSIRO, 2024)	-
National Park	Korung National Park	Directly adjacent (southeast)
Reserve	Ellis Brook Valley Reserve	1 km south
	Prakeela Grove Reserve	1 km southwest
Park	Hardringe Park	360 m north

Type	Description	Approximate Distance and Direction from Prescribed Premise
Human Receptors		
Residential	Residential properties	30 m west
Educational	Orange Grove Primary School	1.2 km west
Conservation	Darling Range Wildlife Centre	780 m south
Recreational	Bickley Outdoor Recreation Camp	660 m northeast
	Orange Grove Shooting Association	100 m southwest
	Karinya Equestrian Park	520 m northwest
Retail	Jadran Wines	220 m west
	Allquip Tilt Trays	600 m west

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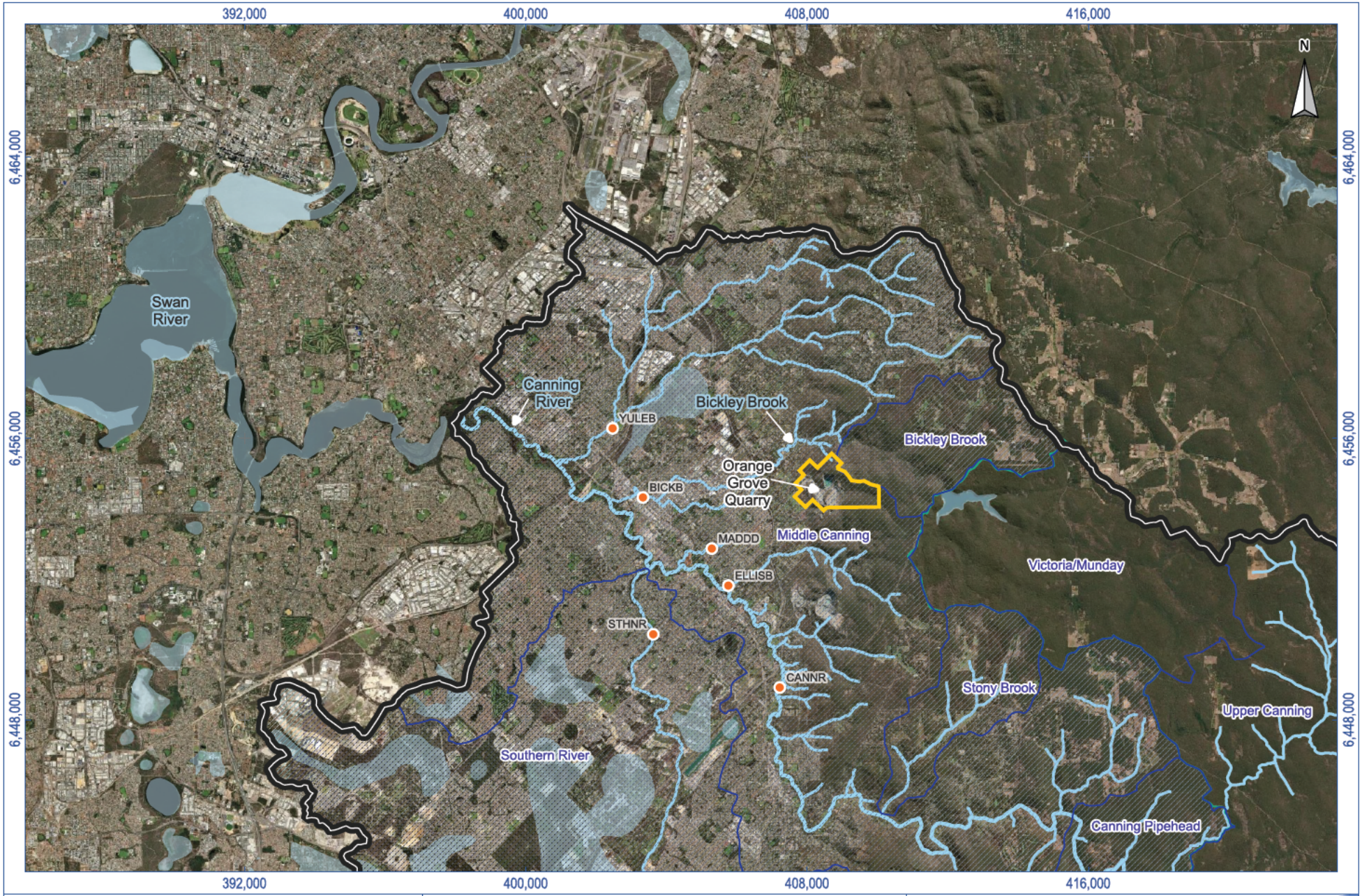
APPENDIX A

APPENDIX A:
ATTACHMENT 2 - FIGURES

MBS ENVIRONMENTAL



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0 2.5 5 km

Legend

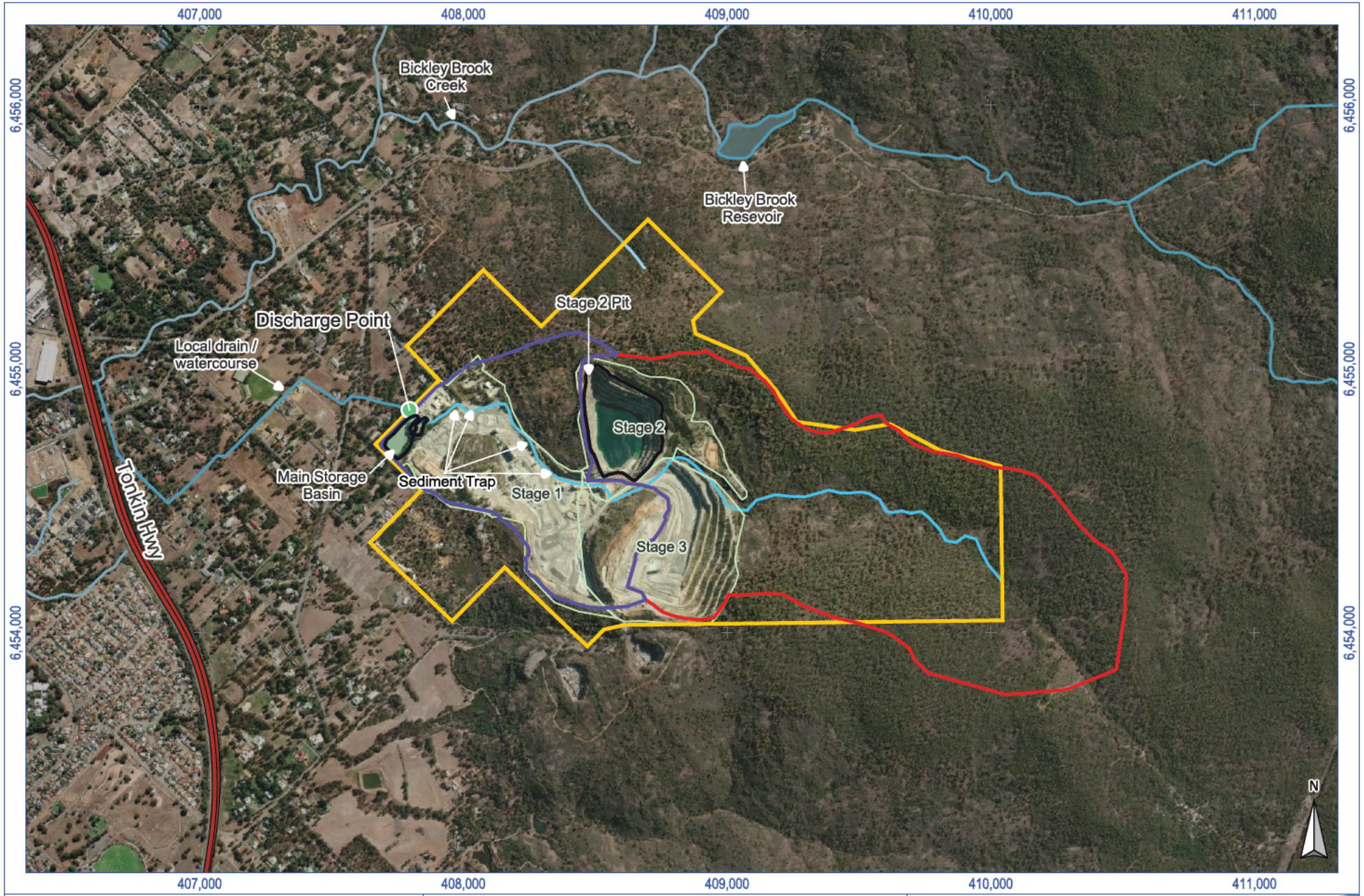
- SCCATCH Monitoring Points
- Prescribed Premise Boundary
- Swan Avon - Canning River Catchment Boundary (DWER-028)
- Lower Canning Surface Water Allocation Plan (DWER-086)
- Surface Water Management Subareas (DWER-042)

Figure 1

Project Location

MBS ENVIRONMENTAL

W:\Boral Resources\Orange Grove\Approvals\Licence Amendment\GIS\BoralQuarryWater_Recovered.qgz 03/12/2025 L1 Project Location



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0 250 500 m

Legend

- Discharge Point
- Prescribed Premise Boundary
- Drainage Lines

Local Catchment

- Catchment A
- Catchment B

Figure 2

Local Drainage and Sediment Traps

MBS ENVIRONMENTAL

W:\Boral Resources\Orange Grove\Approvals\Licence Amendment\GIS\BoralQuarryWater_Recovered.qgz 03/12/2025 L2 Local Drainage

Scale: 1: 7,500
Original Size: A4
Grid: GDA2020 / MGA zone 50
(EPSG:7850)
0 100 200 m

Legend

- Discharge Point
- Prescribed Premise Boundary
- Drainage Lines

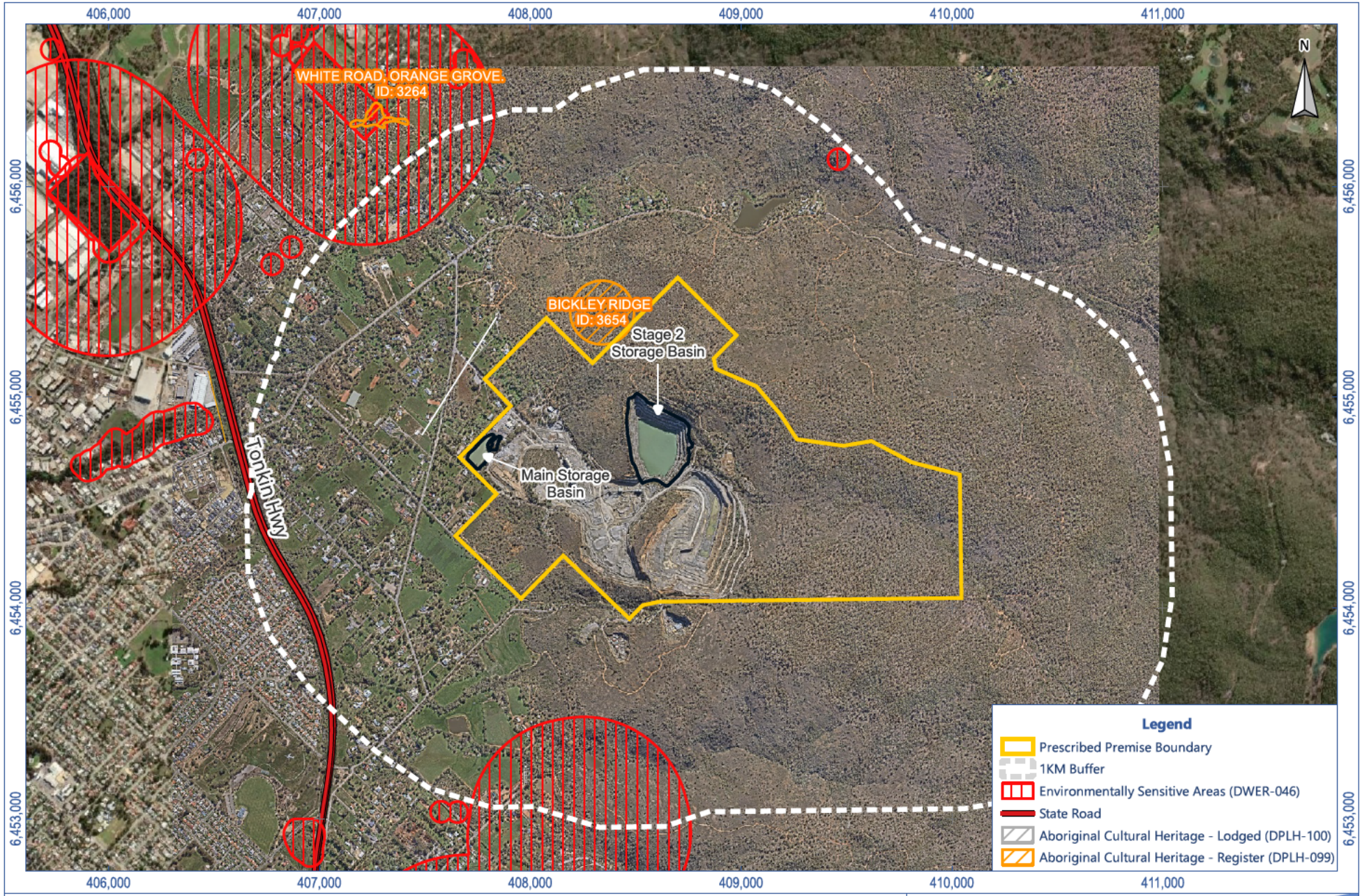
Local Catchment

- Catchment A
- Catchment B

Figure 3

Site Water Infrastructure and Monitoring Locations

MBS ENVIRONMENTAL



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(EPSG:7850)
0 250 500 m

Figure 4

Environmental Sensitivities

MBS ENVIRONMENTAL

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APPENDIX B

APPENDIX B:
MBS (2025) SITE WATER BALANCE

[redacted]

[redacted]

Company:	Boral Resources (W.A.) Ltd	**Date:**	8 December 2025
Subject:	Site Water Balance Report	**Project:**	Orange Grove Quarry

1. Introduction

Boral Resources (W.A.) Ltd (Boral) operates the Orange Grove Quarry (the Quarry), located approximately 20 km southeast of the Perth CBD, at the base of the Darling Scarp, in the City of Gosnells. The Quarry was established in 1962 by Swan Quarries and has been managed by Boral since 1982 supplying Perth and surrounds with construction materials.

The Quarry operates in accordance with Ministerial Statement 170, issued under Part IV of the *Environmental Protection Act 1986* (EP Act), along with Licence L9121/2018/1, issued under Part V of the EP Act, which authorises activities under Categories 12, 13 and 61A. The Licence includes a requirement to report the volume and dates of water overflows from the transfer dam but does not include a licenced discharge point. The Licence does not include any other conditions relating to management of stormwater.

To facilitate ongoing operations, Boral requires off-site discharge of excess water. As part of the site's existing surface water management, stormwater and surface water runoff from the Quarry's catchments are directed to the Stage 2 Pit (S2P) and Main Storage Basin (MSB), with treated wastewater also directed to the Main Storage Basin (MSB). Water held in the MSB is utilised on site for dust suppression (trucks and sprinkler systems), processing, and vehicle washdowns. Water is transferred from the MSB to the S2P during winter for storage to prevent uncontrolled discharge. The S2P has a maximum storage capacity of about 1,013,000 m^3, with about 107,000 m^3 estimated to remain as of November 2025.

An application to amend the Licence to permit discharge of excess water to the environment was submitted to DWER on 20 July 2023. As part of the initial Request for Information (RFI), a Site Water Balance was developed by SLR Consulting in April 2024 and included in the response to the RFI as a supporting document. However, no response was submitted to a subsequent RFI, and the application was withdrawn.

An administrative amendment to extend the duration of the Licence was approved on 23 June 2025, and Boral is now seeking approval for the discharge of excess water at the Quarry. To support the new submission, Boral engaged MBS to develop a new Site Water Balance to improve on the previous model and to advise on discharge rates with consideration of proposed Licence conditions.

2. Scope of Works

The Scope of Works included:

- Development of a series of Site Water Balance models to assess several scenarios for the discharge of excess water from the Quarry.
- Brief report (memorandum) outlining model results, recommendations on site water management and propose licence condition for the discharge rates of excess water to the environment.

3. Site Description

3.1 Climate

The closest near-coastal Bureau of Meteorology (BoM) site recording long-term rainfall is Gosnells City (Station 9106) operating since 1961. This station is located within 5 km of the Quarry (BoM, 2025). The mean annual rainfall is 789.8 mm, approximately 55% of which falls in winter (June to August).

February is the hottest month with a mean maximum temperature of 33.0°C and mean minimum of 18.9°C, and July is the coldest month in terms of mean maximum temperature with a mean maximum of 18.6°C and mean minimum temperature of 8.9°C, Chart 1.

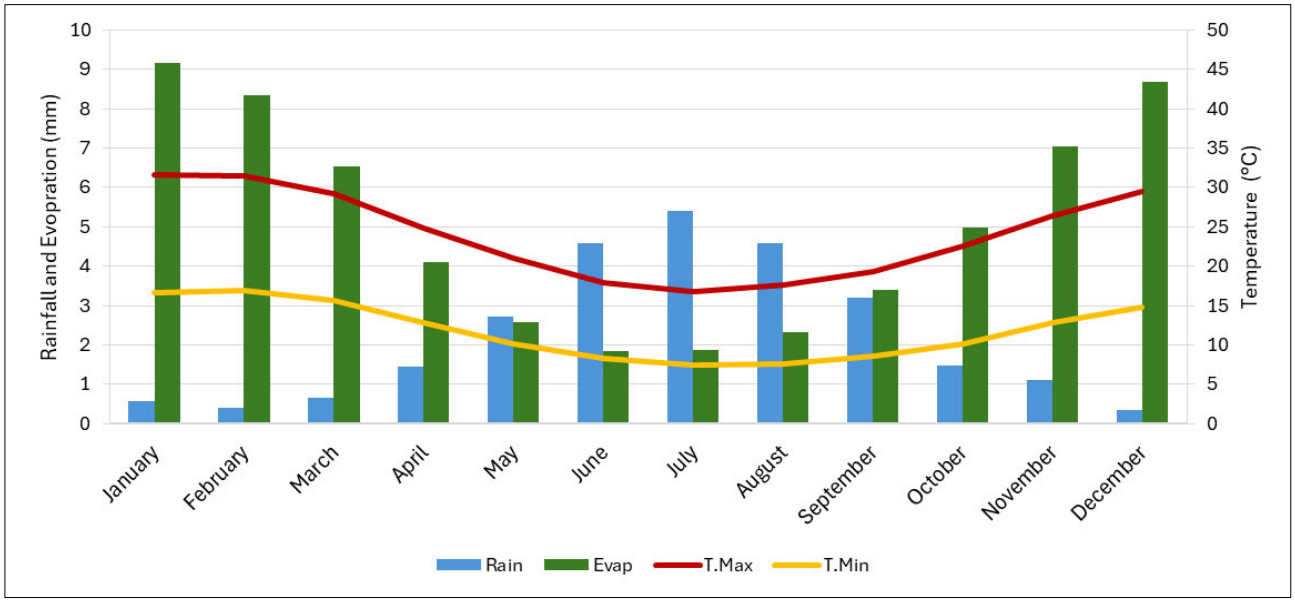


Chart 1: Average Daily Climate Data for 2000-2025 (SILO 2025)

3.2 Topography

The Quarry is located on the western edge of the Darling Scarp with the highest elevation of approximately 220 mAHD on the east of the premise falling to approximately 45 mAHD at the western boundary.

3.3 Hydrology

3.3.1 Surface Water

The Quarry is situated in the lower reaches of the Swan Avon–Canning River catchment, within the Middle Canning Surface Water Management Subarea (DWER-042).

The Bickley Brook catchment divide is located approximately 350 m northeast of the Project. Bickley Brook flows east–west approximately 900 m north of the Quarry before turning southwest, passing northwest of the site, and discharging to the Canning River about 5 km downstream.

Surface water is present in seasonal streamlines within valleys surrounding the Quarry. An unnamed ephemeral natural flow path enters the Quarry from the eastern bushland, with upstream flows directed toward the Stage 2 Pit. Within the Quarry area, the watercourse is conveyed via roadside drains to the MSB through sediment traps and the sediment retention pond immediately east of the MSB. West of the Premises boundary, the watercourse continues as a shallow open drain. It then flows through and parallel to residential properties and the Karinya Equestrian Park as a local drain before joining the roadside drain at Staniland Street, which discharges to Bickley Brook at the Tonkin Highway open drain, approximately 1.7 km downstream of the Quarry.

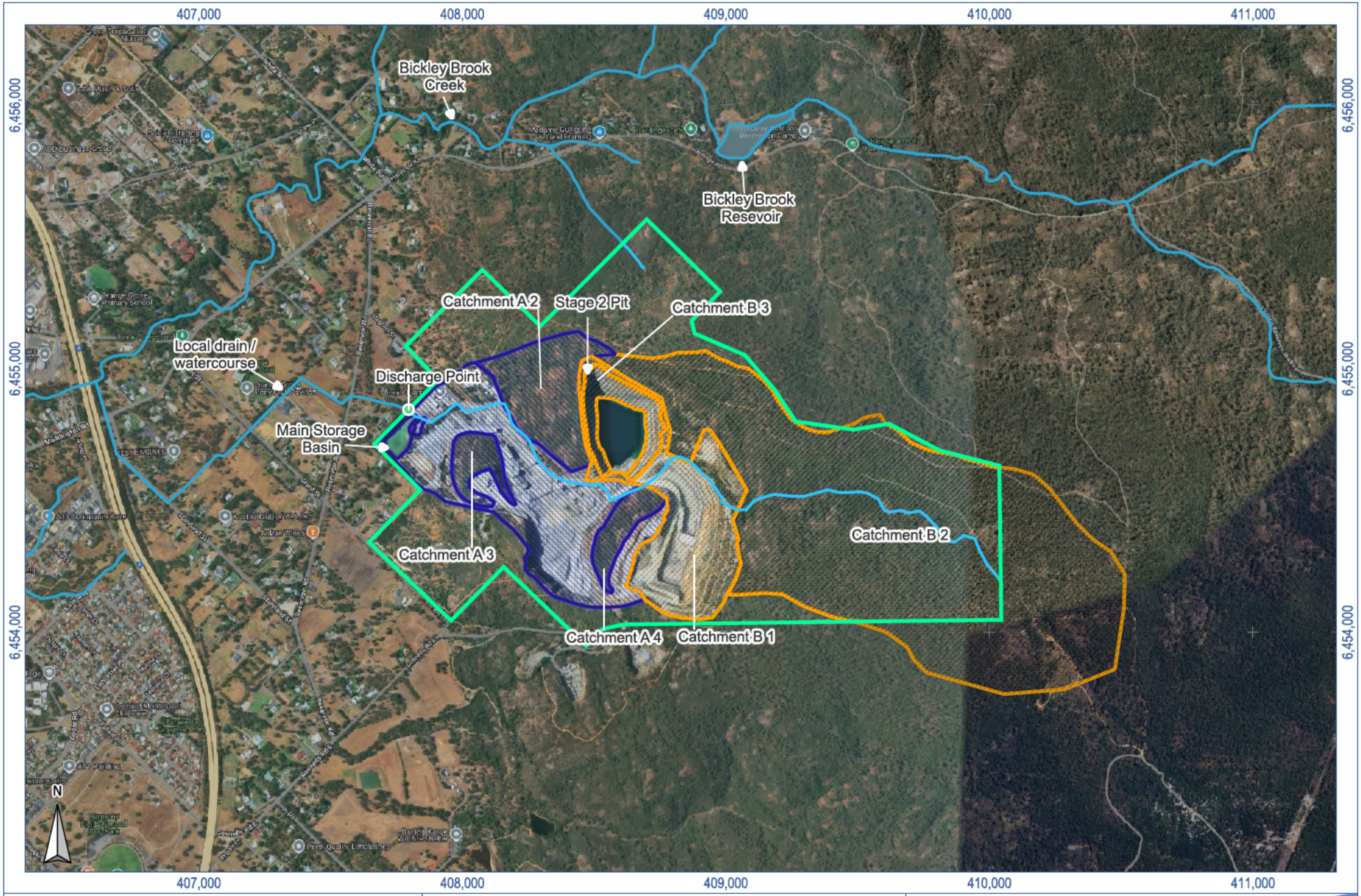
Surface water drainage lines are shown in Figure 1.

3.3.2 Catchment Characteristics

Local catchment delineation (described in Section 4.2.2) indicates a total catchment area of approximately 206.5 ha. Two sub-catchments intersect the Quarry, identified as Catchments A and B as shown in Figure 2 and described in Table 3. These are separated by a north–south-aligned ridgeline immediately west of the Stage 2 and Stage 3 pits, which is formed from the pits being excavated into the natural slope of the hill.

Catchment A has a total area of approximately 56.24 ha, approximately 34.83 ha of which is cleared land, and drains to the MSB located at the west of the site.

Catchment B has a total area of approximately 150.25 ha, which drains to the Stage 2 Pit. Catchment B is comprised of approximately 28.35 ha of cleared land (Stage 3 Pit area) and approximately 121.9 ha of natural bushland extending east about 1.5 km.



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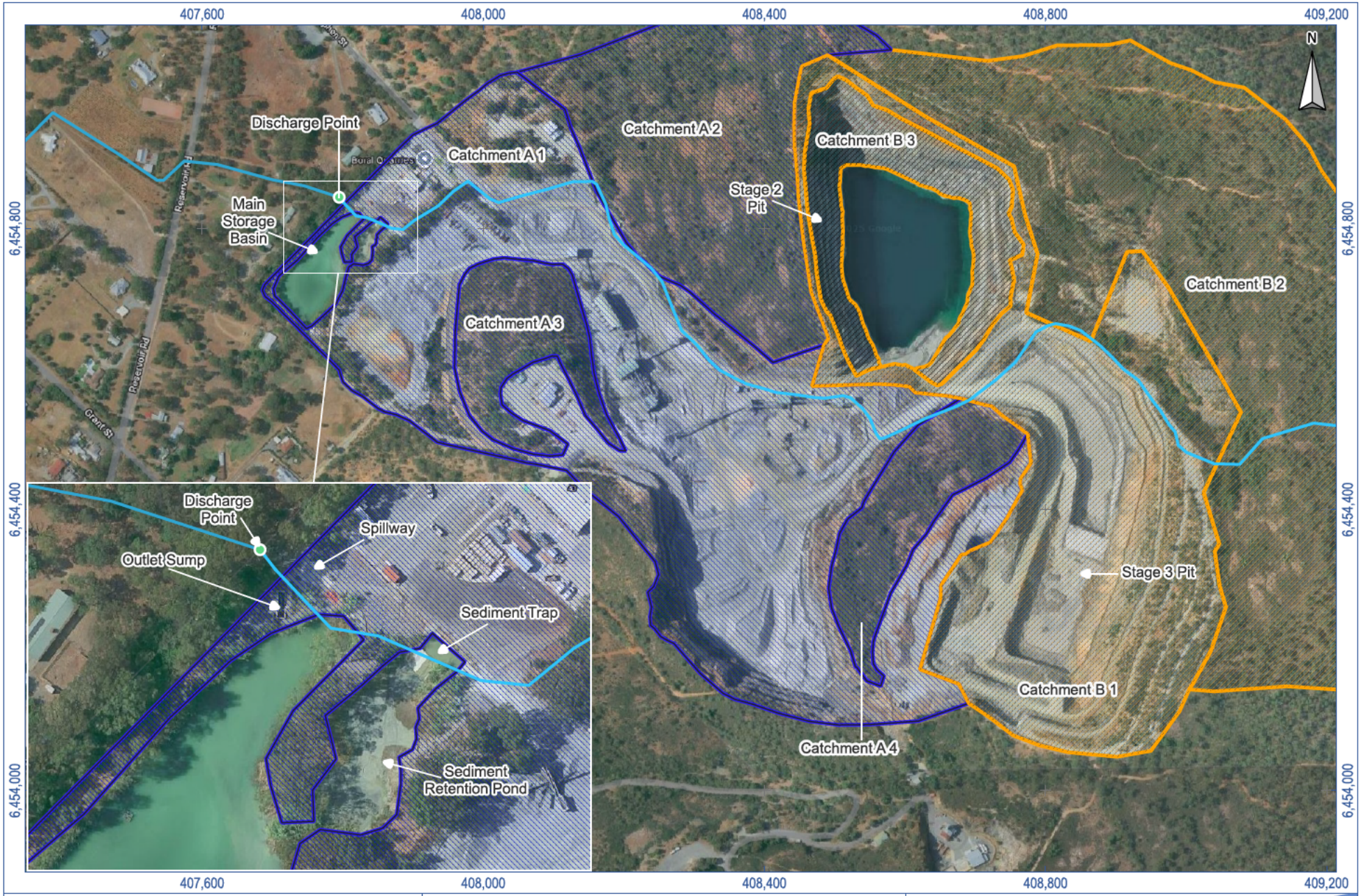
Legend

Prescribed Premise Boundary
Drainage Lines
Subcatchments
Catchment A
Catchment B

Figure 1

Surface Water Drainage Lines

MBS ENVIRONMENTAL



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0 100 200 m

Legend

- Discharge Point
- Drainage Lines
- Subcatchments
  - Catchment A
  - Catchment B

Figure 2

Local Catchments and Water Management Infrastructure

MBS ENVIRONMENTAL

W:\Boral Resources\Orange Grove\Water Balance Model\GIS\Boral_Orange Grove_Water Balance Model.qgz 26/11/2025 L2 Local Catchments and Water Management Infrastructure

3.3.3 Surface Water Management Infrastructure

Stormwater runoff within Catchment A is conveyed to the MSB via the adjacent Sediment Retention Pond (SRP). This includes stormwater drains with four sediment traps located along the natural watercourse within the Quarry. Treated workshop wastewater also reports to the SRP. Water stored in the MSB is used for processing and dust suppression.

The SRP is approximately 50 m × 20 m, with inflows entering a sediment trap at the northern end where coarse material is captured. Accumulated coarse material is periodically removed from the SRP as part of ongoing site sediment control and maintenance.

The MSB has an irregular planform and a surface area of approximately 850 m^2. Its deepest point is RL 39.75 m, and the embankment toe is about RL 44.5 m. A freeboard of approximately 0.5 m (RL 44.0 m) is currently maintained by transferring water to the Stage 2 Pit.

An uncontrolled, grouted, rip-rap-lined spillway is located at the northwest end of the MSB to provide emergency overflow when water cannot be transferred to the Stage 2 Pit during significant rainfall events. The downstream end cascades over a concrete and rock embankment approximately 5 m high at an approximate slope of 1V:2H.

An outlet sump is located adjacent to the spillway in a rectangular concrete pit with floor levels around RL 42 m and cover around RL 45.5 m. Flow from the MSB enters via twin inlet pipes at RL 43 m controlled by knife-gate valves. The pipes converge into a single outlet pipe fitted with a flowmeter, with discharge controlled by a pneumatic knife-gate valve via telemetry. A dedicated turbidity mount on the outlet assembly allows water quality (pH and turbidity) monitoring. The gate valve has automatic shut-off functionality when set pH or turbidity limits are exceeded. The outlet discharges approximately at the mid-height of the shared rock embankment.

The Stage 2 Pit is estimated to have a total holding capacity of 1,013,000 m^3. The pit is excavated in a bench/berm configuration from a ground level of about RL 150 m on its western crest to about 180 m on the eastern side. Based on 1 m contours of the pit shell, the base of the pit is at RL 40, with the crest of the access ramp bund at about RL 78 m. Maximum elevation of the pit access road is approximately RL 81 to 82 m. As of November 2025, the water level is estimated at about RL 74 m and the pit has a remaining capacity of about 107,000 m^3.

3.3.4 Groundwater

Based on groundwater mapping data from the Department of Water and Environmental Regulation (DWER) (DWER, 2024), the site is located within a zone of undifferentiated Precambrian crystalline rocks and laterite over Mesozoic sediments.

Groundwater is estimated to typically range from approximately 38-78 m below ground level, and as deep as 80 m below natural ground level in the Stage 2 Pit area, based on the absence of observed groundwater inflows to the pit.

4. Site Mode Balance Model

4.1 Modelled Scenarios

Three model scenarios were developed. The conditions for each are summarised in Table 1 and a schematic overview of the inputs and output is shown in Plate 1.

Scenario 1 was defined as a base-case scenario where both water storages are independent (no transfer of water). The aim was to determine the time taken for the storages to reach capacity with no water management measures taken, and for the MSB, to estimate the volume and timing of uncontrolled discharges once capacity is reached.

Scenario 2 was developed to determine the volume of water required to be discharged to the environment so that water levels in S2P did not exceed post-2025 winter levels (with all excess S2P water transferred to the MSB). Additionally, water levels in the MSB were required to remain at or above the minimum volume to ensure availability of water for daily site usage in summer.

Scenario 3 simulated a constant daily discharge rate (potential licence condition) from MSB to the environment during winter (June to September) and/or summer (October to May) months. The objective was to determine the time it would take to empty S2P. This required regular transfers from S2P to MSB to maintain MSB minimum freeboard. Two variations of Scenario 3 were completed:

- Scenario 3a: A winter discharge limit of 5,000 m^3.
- Scenario 3b: A winter discharge limit of 5,000 m^3 and a summer discharge limit of 500 m^3.

Winter discharge was prioritised as it aligns with catchment hydrology as a base streamflow provides significant dilution alongside inflowing surface water and stormwater runoff in the downstream catchment are before discharge to Bickley Brook. Releasing into a baseflow also reduces erosion potential and lowers the risk of ecological impacts.

Table 1: Summary of Model Scenario Conditions

Scenario	Conditions	Priority
Scenario 1	• No water transfers between the S2P and MSB. • MSB excess water discharged to the environment. Excess water is equal to the net inflow volume above RL 44.5 m (maximum storage with no freeboard)	Base case
Scenario 2	• Water held in S2P does not exceed the November 2025 level (approximately 74 m RL). All excess water is transferred to MSB. • Water transferred from S2P to MSB as required to maintain RL 42 m at MSB (minimum required for site water usage). • MSB excess water discharged to the environment. Excess water is equal to the net inflow volume above RL 44 m (maximum storage with freeboard)	Medium
Scenario 3a	**1 Oct - 31 May:** • Water transferred from S2P to MSB at rates required to maintain RL 44 m (0.5 m freeboard) at MSB.	High

Scenario	Conditions	Priority
	1 Jun - 30 Sep: • 5,000 m³ controlled discharged from MSB to the environment per day. • Water transferred from S2P to MSB at rates required to maintain MSB water level at RL 44.5 m (maximum storage with no freeboard).	
Scenario 3b	**1 Oct - 31 May:** • Water transferred from S2P to MSB at rates required to maintain RL 44 m (0.5 m freeboard) at MSB. • 500 m³ controlled discharged from MSB to the environment per day from 1st October 2026 onwards. **1 Jun - 30 Sep:** • 5,000 m³ controlled discharged from MSB to the environment per day. • Water transferred from S2P to MSB at rates required to maintain RL 44.5 m (maximum storage with no freeboard) at MSB.	High

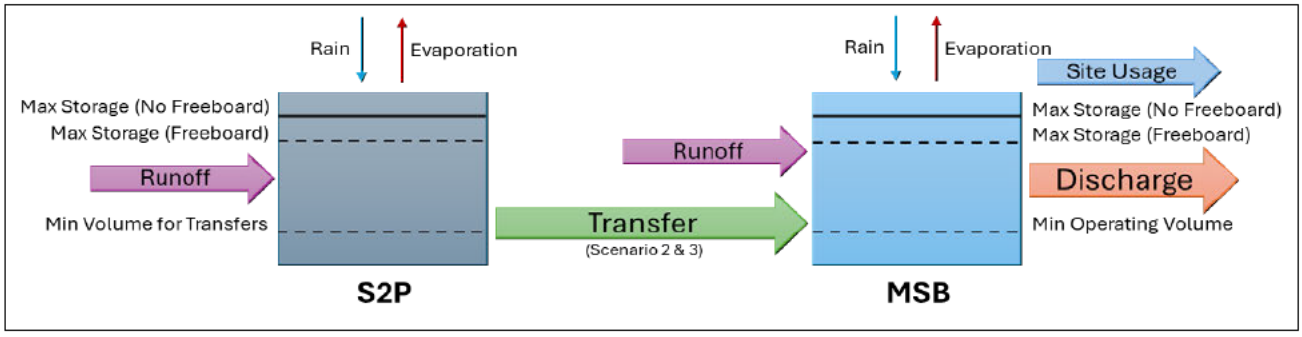

Plate 1: Schematic Overview of Models

4.2 Model Setup

4.2.1 Rainfall and Evaporation

Mean daily rainfall, evaporation, and Morton pan evaporation for the Quarry were calculated from continuous daily data (1 January 2000 to 7 October 2025) available from the SILO climate database. Daily mean rainfall and evaporation are summarised for each month in Table 2.

Table 2: Mean Average Daily Climate Data 2000 - 2025 (SILO 2025)

	Jan	Feb	March	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	0.57	0.42	0.65	1.45	2.71	4.59	5.40	4.57	3.20	1.49	1.12	0.36
Evaporation (mm)	9.16	8.34	6.52	4.10	2.58	1.86	1.86	2.34	3.40	4.97	7.03	8.69

4.2.2 Catchment Runoff

The local catchment was delineated using available Digital Elevation Model raster data areas with subcatchments (Catchments A and B) divided by a north–south-aligned ridgeline formed west of the Stage 2 and Stage 3 pit by the excavations.

Catchment areas were subdivided based on landuse classification using available satellite imagery and site topographic contours (1 m resolution) provided by Boral.

Runoff coefficients were estimated based on landuse type with consideration for level of disturbance and topography based on available literature, notably (Ball *et al.*, 2019) and (DoW, 2015).

Catchment details and model parameters are provided in Table 3.

Table 3: Local Catchment Details and Model Parameters

Catchment	Landuse Division ID	Landuse Class	Runoff Coefficient	Area (ha)
Catchment A	1	Cleared	0.7	34.83
	2	Native Veg.- Steep Slope	0.4	13.47
	3	Disturbed Native Veg. - Steep Slope	0.5	3.87
	4	Disturbed Native Veg. - Steep Slope	0.5	4.07
Catchment B	1	Cleared - Stage 3 Pit area	0.7	23.17
	2	Native Vegetation	0.3	121.90
	3	Cleared - Stage 2 Pit Embankments (above RL 78 m)	0.8	5.18

4.2.3 Water Storages

Summary details for the water storages used in the modelled scenarios are provided in Table 4.

The MSB has an irregular planform with its deepest point at about RL 39.75 m, and the embankment toe is about RL 44.5 m. It has been assumed that a freeboard of approximately 0.5 m (RL 44.0 m) is maintained year-round to reduce the risk of uncontrolled releases from the spillway during/post rainfall events. A minimum operating RL of 42 m has been included for scenarios 2 and 3 for site water usage (i.e. water is transferred from S2P to MSB).

Based on 1 m contours of the S2P shell, the maximum elevation of the access road is approximately RL 81 to 82 m. The water level as of November 2025 is estimated at about RL 74 m and is considered as the maximum water level with freeboard for modelling purposes. The crest of the access ramp bund is at about RL 78 m and was considered the maximum water level with no freeboard. The base of the pit is at approximately RL 40 m.

Table 4: Summary Details of Water Storages Used in Modelled Scenarios

Storage	Key Model Threshold Levels	RL (m)	Surface Area (m^2)	Volume (m^3)	Scenario Use
Main Storage Basin	Minimum Operating Volume	42	484	3,084	2
	Maximum Storage with Freeboard	44	777	17,957	2, 3a, 3b
	Maximum Storage with no Freeboard	44.5	851	22,310	1, 3a, 3b
Stage 2 Pit	Base of Pit	40	13,280	-	1,2, 3a, 3b
	Minimum Volume for Transfers	41	13,650	13,337	3a, 3b
	Maximum Storage with Freeboard	74	38,440	906,928	2, 3a, 3b
	Maximum Storage with no Freeboard	78	41,400	1,013,626	1

4.2.4 On-site Water Usage

The site water usage has been estimated across the average year based on estimates provided by Boral and these are provided in Table 5.

Table 5: Site Water Usage

Activity	Usage (m^3/d)	Frequency (days per week)	Avg Monthly Usage (kL)
Dust Suppression (Trucks)	150	5	3,255
Dust Suppression (Sprinklers)	75	7	2,280
Process Water	15	5	326
Washdown	4	5	87
Total	**244**	-	**5,947**

4.2.5 Model Duration

Each model scenario is from 1 November 2025 to 30 April 2028, except for Scenario 3c (up to 30 April 2030).

The initial dry period was set to be from 1 November 2025 to 30 April 2026.

Controlled discharge from MSB to the environment was simulated beginning from 1 June 2026.

4.2.6 Model Assumptions and Limitations

The following assumptions were made:

- There is no water transferred from the MSB to S2P.
- Due to uncertainty of timing and volumes, it was assumed in the model that any unutilised site usage water is not returned to the MSB.
- Although the actual site usage varies seasonally, the daily site water usage in the model was assumed to be constant throughout the year.

- Runoff calculations assume average climatic conditions; however, given modelling was completed for a two to five year period, this was considered acceptable.
- The SRP was not included as a water storage due to uncertainties of the capacity, with dense vegetation significantly affecting surveys and the volume occupied by coarse material varying over time.

5. Results

5.1 Scenario 1

Scenario 1 model runs for the MSB and S2P were used to estimate the time required for each water storage to reach capacity without transferring water between them and, for the MSB, to determine the minimum daily discharge volumes required before receiving any water from S2P.

Scenario 1 models for the MSB and S2P were to provide an understanding of the base case, to estimate the time taken for both water storage infrastructure to reach capacity independent of transferring water between the two, and in the case for MSB, the volume of water required to be discharged on a daily basis once capacity is reached.

Results are shown in Chart 2 (MSB) and Chart 3 (S2P). The following was inferred from the results:

- MSB would reach capacity in mid-June 2026 with excess water required to be discharged until early-September 2026.
- Average daily discharge over the modelled winter period (including days with no discharge) from MSB is approximately 470 m^3/day, with a total discharge volume of about 57,700 m^3.
- On days when discharge occurs, the average discharge rate from MSB is approximately 1,200 m^3/day, with individual days ranging up to about 3,200 m^3/day.
- The S2P has a remaining capacity of approximately 107,000 m^3 based on November 2025 water levels (RL 74 m) and would reach capacity in July 2027.
- The average daily S2P excess volume over the modelled 2027 winter period is approximately 590 m^3/day (including days with no excess), with individual days reaching up to about 3,000 m^3/day and totalling about 73,150 m^3 for the whole winter period.

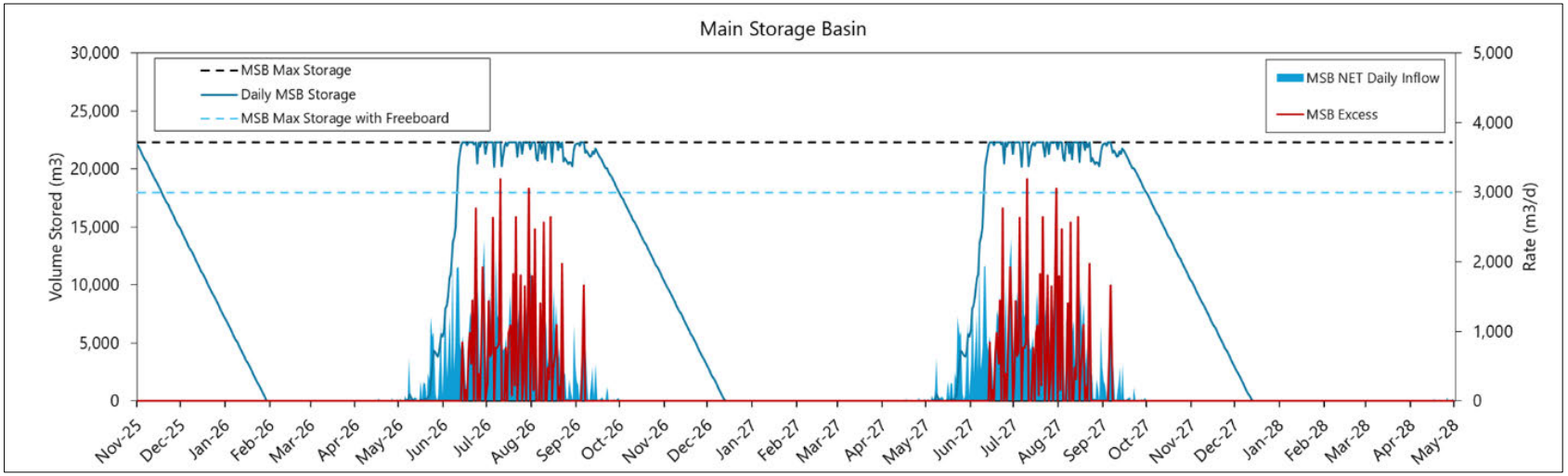

Chart 2: Scenario 1 - MSB Storage, Inflows and Outflows

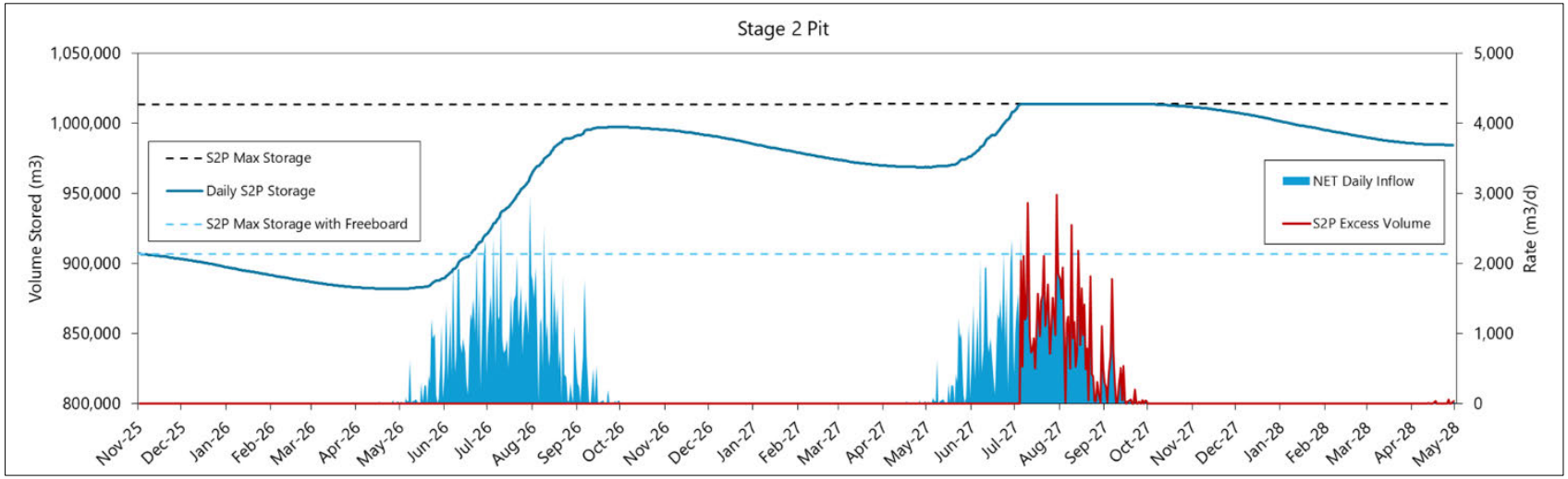

Chart 3: Scenario 1 - S2P Storage, Inflows and Outflows

5.2 Scenario 2

The aim of Scenario 2 was to determine the discharge volume needed to keep S2P water levels from exceeding post-2025 winter levels (with all excess water transferred to the MSB). In addition, MSB water levels must remain at or above the minimum required for site water usage during summer.

Results are shown in Chart 4. The key findings were:

- Maintaining minimum MSB water levels would require approximately 244 m^3/day transferred from S2P to the MSB from January to mid-May, with a total transfer volume of about 32,400 m^3.
- Average daily transfer volume from S2P to the MSB over the 2026 winter period (including days with no transfer) is approximately 470 m^3/day, with a total transfer volume of about 58,000 m^3. On days when transfer occurs, the average transfer rate is approximately 815 m^3/day, with individual days reaching up to about 3,000 m^3/day.
- During winter, average daily discharge from the MSB to the environment is approximately 1,470 m^3/day for 2026 (including days with no discharge). On days when discharge occurs, the average discharge rate is approximately 2,105 m^3/day (2026), with individual days reaching up to about 7,158 m^3/day.
- Discharge of excess water totals approximately 179,000 m^3 in 2026.

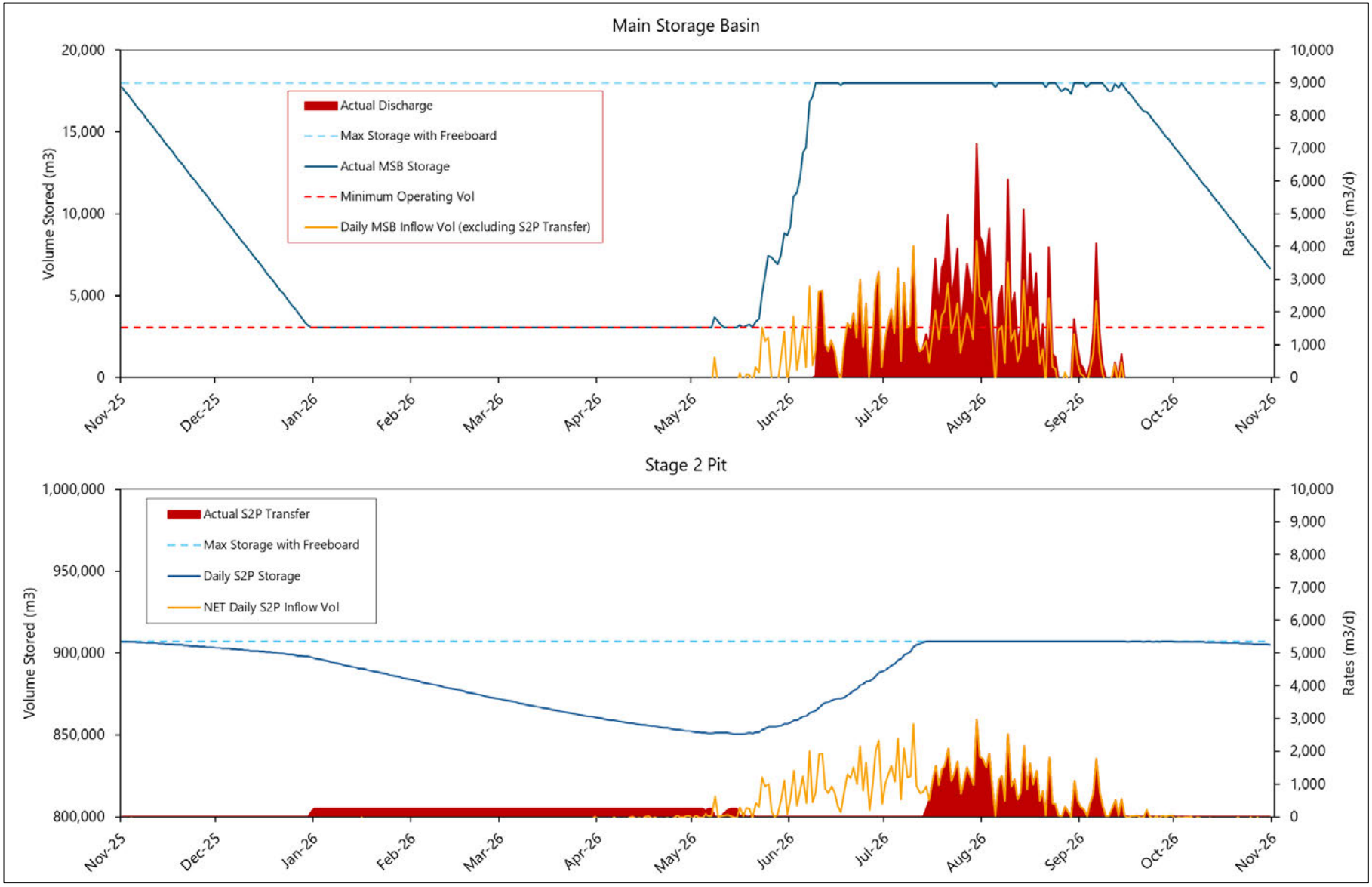

Chart 4: Scenario 2 - Volumes Stored, Transferred and Discharged

5.3 Scenario 3

The aim of Scenario 3 was to lower the water level in S2P by discharging at a constant daily rate from the MSB to the environment during winter (1 June to 30 September), while maintaining sufficient volume in S2P for continued transfer to the MSB for the remainder of the year to maintain MSB maximum freeboard.

Results are shown as Chart 5 (Scenario 3a) and Chart 6 (Scenario 3b).

The key findings were:

- Scenario 3a: with a winter discharge rate of 5,000 m^3/day (610,000 m^3 per annum), model results suggest that:
  - Volumes stored in S2P will be about 480,000 m^3 in October 2026 - nearly half of the starting volume in November 2025 (906,000 m^3).
  - In late September 2027, waters level in S2P will be down to the lowest RL of 41 m and transfers from S2P to MSB would cease. S2P will continue to dry until May 2028 with the water level reaching less than 40.25 m RL, or an approximate volume of 8,500 m^3).
  - There would be a combined total net inflow to S2P and MSB of about 172,671 m^3 in 2027, indicative of the annual surplus volume under average climatic conditions and reduced water levels at S2P.
- Scenario 3b: A discharge rate of 5,000 m^3/day during winter months and 500 m^3 from 1 October until 31 May (beginning October 2026) was applied to MSB which amounted to a total of 731,000 m^3/yr. This scenario achieved the minimum RL at S2P only seven days earlier than Scenario 3a.

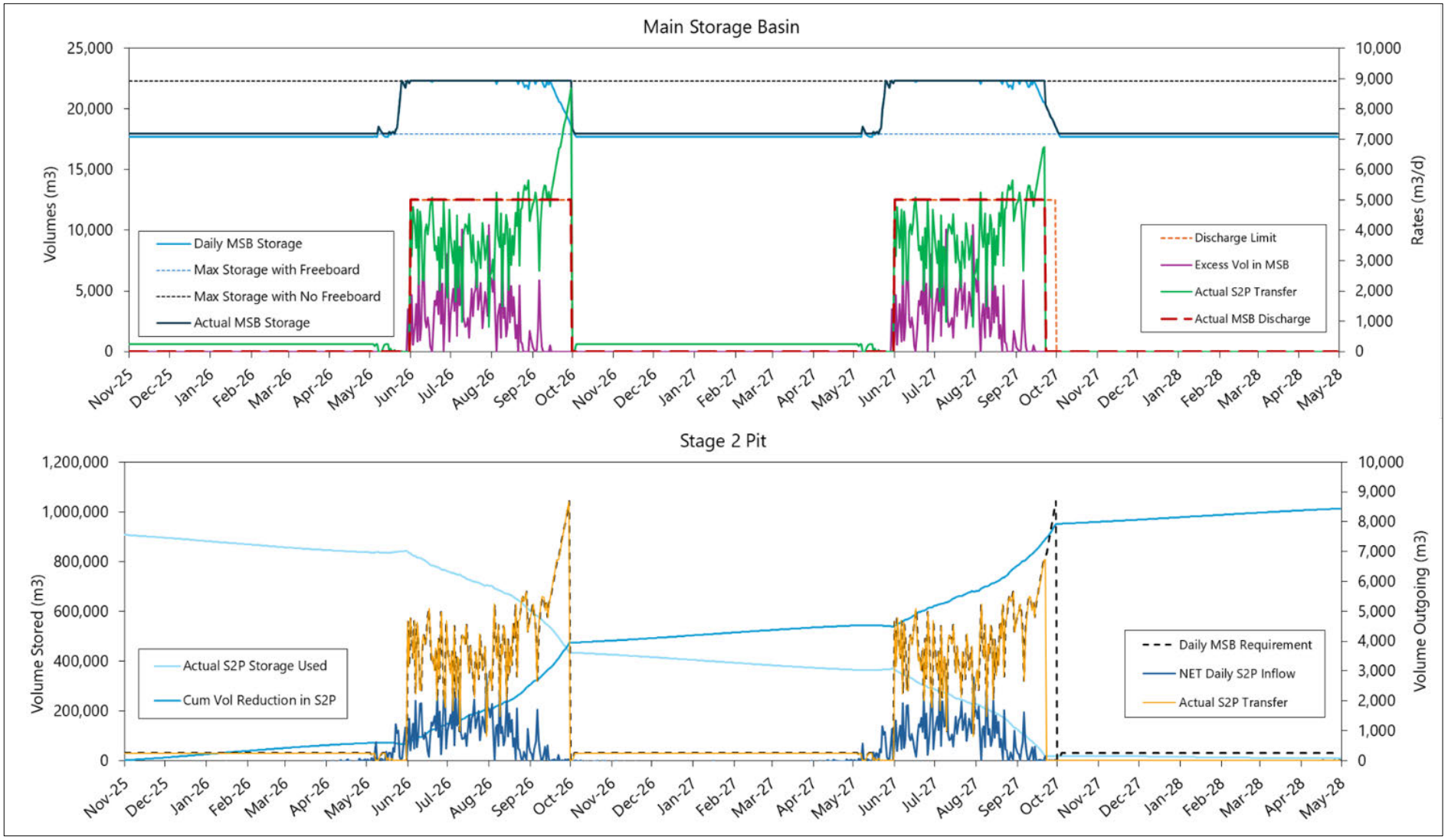

Chart 5: Scenario 3a - Volumes Stored, Transferred and Discharged

Chart 6: Scenario 3b - Volumes Stored, Transferred and Discharged

6. Discussion and Recommendations

Model results suggest that the site has an approximate annual surplus of 172,670 m^3 which equates to a daily net excess of 473 m^3.

Based on scenario 1 results (no water transfers between the two storages), S2P would reach capacity in July 2027. However, maintaining water in S2P at or below November 2025 levels by transferring to the MSB (Scenario 2) would result in uncontrolled discharge from MSB to the environment from June through October 2026 at a daily rate of about 1,000 to 1,200 m^3.

Scenario 3 showed that discharging from MSB to the environment at a constant daily rate (limit) of 5,000 m^3 from 1 June to 30 September (610,000 m^3 per year) would result in a volume of about 18,000 m^3 remaining in S2P in October 2027 and only about 8,500 m^3 remaining by May 2028.

To facilitate operations at the Quarry continuing and to mitigate uncontrolled discharges occurring once water storages are at capacity, management options explored to address the water surplus include:

- Expansion of existing water storages or construction of additional storages. Given the size and layout of the Quarry, this is not a feasible option and would not materially increase capacity or evaporation to address surplus winter inflows.
- Offsite reuse, such as dust suppression for other nearby quarry operations or irrigation of local government areas. This would require a Licence amendment, evidence of suitable water quality, and appropriate controls. Volumes would be limited and insufficient to manage the water surplus.
- Aquifer reinjection. The pits do not intersect groundwater, and no onsite drilling or bore construction has been undertaken, leaving limited hydrogeological information. Aquifer behaviour under artificial recharge is therefore highly uncertain and would require detailed investigations, water quality compatibility assessments, and additional approvals. Given these requirements, uncertainties, and timeframes, reinjection is not considered a practical or feasible option in the short to medium term.
- Use of misters or evaporators. These systems are unlikely to be a practical solution as they typically achieve modest evaporation rates and serve only to augment natural evaporation rather than drive substantial volume reduction. Their effectiveness is particularly limited during winter and operating enough units to meaningfully reduce stored water would be impractical.

Based on the above and the current site infrastructure the most feasible means to manage excess site water is discharging to the drainage system west of the Quarry. It is recommended that an annual discharge limit of 600,000 m^3 for the first two years only (June 2026 to May 2028) be proposed (assuming approval is granted prior to June 2026). Following winter 2028, an ongoing annual discharge limit of 200,000 m^3 would maintain S2P in a dewatered state while providing flexibility for higher than average rainfall years, noting that discharge volumes after S2P is dewatered would likely be around 140,000 m^3 as transfers from S2P to MSB will need to be maintained in summer for site water usage.

Discharge offsite during winter will provide dilution capacity with inflowing surface water and stormwater runoff of the downstream drainage catchment prior to entering Bickley Brook 1.7 km downstream. The downstream vegetation is highly disturbed and while the proposed ongoing discharge limit (post-2028) is considered unlikely to affect Bickley Brook, discharge volumes proposed for the first two winter periods would increase the risk of reduced water quality at Bickley Brook. Maintaining effective sediment controls across the site will therefore be essential, particularly during these initial two winter periods. As a contingency the outlet sump's gate valve has automatic shut-off functionality triggered when pH or turbidity limits are exceeded.

7. References

Ball, J. *et al.* (2019) *Australian Rainfall and Runoff: A Guide to Flood Estimation. Commonwealth of Australia*.

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DoW, (Department of Water) (2015) "Birrega and Oaklands flood modelling and drainage study, Supporting the Birrega and Oaklands Drainage and Water Management Plan." Water Science Technical Series, Report no. 71.

DWER, (Department of Water and Environmental Regulation) (2024) "WRIMS: Groundwater Resources (DWER-084)." Available at: https://catalogue.data.wa.gov.au/dataset/wrims-groundwater-resources (Accessed: December 3, 2024).

APPENDIX C

APPENDIX C:
BORAL OUTLET PUMP DESIGN

MBS ENVIRONMENTAL

GENERAL:

G1 ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
G2 THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND OTHER CONSULTANTS' DRAWINGS AND SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT. ALL DISCREPANCIES SHALL BE REFERRED TO THE CLIENT AND ENGINEER FOR DECISION BEFORE PROCEEDING WITH THE WORK.
G3 DIMENSIONS SHALL NOT BE OBTAINED BY SCALING THE DRAWINGS.
G4 SETTING OUT DIMENSIONS SHOWN ON THE DRAWINGS SHALL BE VERIFIED BY THE CONTRACTOR.
G5 DURING CONSTRUCTION, THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVER-STRESSED. TEMPORARY STRUCTURES, FORMWORK, FALSEWORK, TEMPORARY BRACING, SHORING AND THE LIKE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
G6 ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE CURRENT EDITIONS, INCLUDING AMENDMENTS, OF THE RELEVANT SAA STANDARDS AND SAA CODES OF PRACTICE, EXCEPT AS VARIED BE THE CONTRACT DOCUMENTS AND THE LAWS AND REQUIREMENTS OF STATUTORY AUTHORITIES.
G7 SUBSTITUTIONS ARE TO BE MADE ONLY WITH THE APPROVAL OF THE ENGINEER OR CLIENT.
G8 WHERE THE ENGINEERS ARE ENGAGED FOR INSPECTIONS AND/OR SUPERVISION, A MINIMUM OF 24 HOURS NOTICE SHALL BE GIVEN.

GROUND PREPARATION:

GP1 STRIP ALL VEGETATION, TOPSOIL, ROOT AFFECTED OR OTHER POTENTIALLY DELETERIOUS MATERIAL AND CUT SITE WHERE REQUIRED TO LEVELS INDICATED.
GP2 PROOF ROLL SURFACES WITH 5 PASSES OF AN 8 TONNE ROLLER. REMOVE ANY WET OR EXCESSIVELY DEFLECTING MATERIAL (SOFT SPOTS) AND REPLACE WITH APPROVED SELECT FILL, COMPACTED TO 98% MINIMUM DRY DENSITY RATIO STANDARD COMPACTION (COHESIVE SOIL) OR 70% MINIMUM DENSITY INDEX (COHENSIONLESS SOIL).
GP3 FILL IS TO BE APPROVED BY GEOTECHNICAL ENGINEER, AND IS TO BE WELL GRADED QUARRIED GRAVEL WITH A MINIMUM CBR OF 15%, MINIMUM PI OF 15% AND A MAXIMUM PARTICAL SIZE OF 100mm.
GP4 WHERE FILLING IS REQUIRED, PLACE APPROVED FILL MATERIAL IN NEAR HORIZONTAL LAYERS NOT EXCEEDING 200mm LOOSE THICKNESS. EACH LAYER SHALL BE COMPACTED TO ACHIEVE NOT LESS THAN THE FOLLOWING DENSITIES:-
COHESIVE SOILS - 98% OF STANDARD COMPACTION AT WITHIN 2% OF STANDARD OPTIMUM MOISTURE CONTENT COHESIONLESS SOILS - 70% OF MINIMUM DENSITY INDEX
GP5 ALL FILLING IS TO BE INSPECTED, PLACED, COMPACTED AND TESTED IN ACCORDANCE WITH LEVEL 1 REQUIREMENTS IN THE CURRENT EDITION OF AS3798.
GP6 EXISTING AND BACKFILLED SOIL UNDER CONCRETE WORK TO ACHIVE A MIN ALLOWABLE PRESSURE OF qa = 200 Kpa.

STRUCTURAL STEEL:

S1 ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS4100 AND AS1554 EXCEPT WHERE VARIED BY CONTRACT DOCUMENTS OR CLIENTS INSTRUCTIONS.
S2 UNLESS NOTED OTHERWISE ALL STEEL SHALL BE IN ACCORDANCE WITH:-
AS3679 BARS AND SECTIONS - HOT ROLLED STRUCTURAL STEEL GRADE 300 PLUS
AS3678 PLATES AND FLOORPLATES - HOT ROLLED STRUCTURAL STEEL GRADE 250
AS1163 WELDED AND SEAMLESS STEEL - HOLLOW SECTIONS FOR
GENERAL STRUCTURAL PURPOSES (METRIC UNITS) GRADE C350.
S3 CONTRACTOR TO SUPPLY ENGINEER WITH MANUFACTURER'S CERTIFICATE FOR HIGH STRENGTH BOLTS. CERTIFICATES TO BE SUBMITTED FOR APPROVAL WITH STEEL WORKSHOP DRAWINGS.
S4 UNLESS NOTED OTHERWISE:- ALL BOLTS SHALL BE - M20 8.8/S
ALL WELDS SHALL BE 6mm CONTINUOUS FILLET, GP CATEGORY E49xx/W50x
NO BOLT THREADS WILL BE PERMITTED IN THE BEARING LENGTH
ALL GUSSET PLATES, BASE PLATES, FIN PLATES, STIFFENERS etc. SHALL BE 10mm THICK
COLUMN HOLD DOWN BOLTS CAST IN PLACE SHALL BE GRADE 4.6/S
S5 BUTT WELDS WHERE INDICATED ON THE DRAWINGS ARE TO BE COMPLETE PENETRATION BUTT WELDS AS DEFINED IN AS1554 UNLESS NOTED OTHERWISE.
S6 BOLT TYPE AND INSTALLATION PROCEDURE SHALL BE DENOTED AS FOLLOWS:-
4.6/S COMMERCIAL BOLTS OF STRENGTH GRADE 4.6 MANUFACTURED TO AS1111 AND NUTS TO AS1112, TIGHTENED USING A STANDARD WRENCH TO A SNUG TIGHT CONDITION.
8.8/S HIGH STRENGTH STRUCTURAL BOLTS OF STRENGTH GRADE 8.8 MANUFACTURED TO AS1252, TIGHTENED USING A STANDARD WRENCH TO A SNUG TIGHT CONDITION.
8.8/TF AND 8.8/TB HIGH STRENGTH STRUCTURAL BOLTS OF STRENGTH GRADE 8.8 CONFORMING TO AS1252, TIGHTENED TO CORRECT TENSION USING APPROVED LOAD INDICATING WASHERS ALL IN ACCORDANCE WITH AS1511.
S7 HIGH STRENGTH BOLTS, NUTS AND WASHERS SHALL COMPLY WITH AS1252. CONTACT SURFACES OF ALL TF BOLTED CONNECTIONS SHALL BE LEFT UNPAINTED UNLESS THE APPLIED FINISH HAS BEEN TESTED IN ACCORDANCE WITH AS4100 APPENDIX J TO ESTABLISH THE REQUIRED FRICTION COEFFICIENT.
S8 STRUCTURAL STEEL ELEMENTS SHALL HAVE THE FOLLOWING SURFACE TREATMENT IN ACCORDANCE WITH AS/NZS2312:-

ELEMENT	SURFACE FINISH
ALL (U.N.O.)	HOT DIP GALVANISED

ALL HOT DIP GALVANISING TO BE IN ACCORDANCE WITH:-
AS/NZS4680 - HOT-DIP GALVANISED (ZINC) COATINGS ON FABRICATED FERROUS ARTICLES
AS/NZS4791 - HOT-DIP GALVANISED (ZINC) COATINGS ON FERROUS OPEN SECTIONS, APPLIED BY AN IN LINE PROCESS
AS/NZS4792 - HOT-DIP GALVANISED (ZINC) COATINGS ON FERROUS HOLLOW SECTIONS, APPLIED BY A CONTINUOUS OR A SPECIALISED PROCESS
ALL STEELWORK BUILT INTO MASONRY SHALL BE HOT-DIP GALVANISED (U.N.O.)
FOR ANY ELEMENTS NOT SPECIFIED REFER TO ARCHITECT.

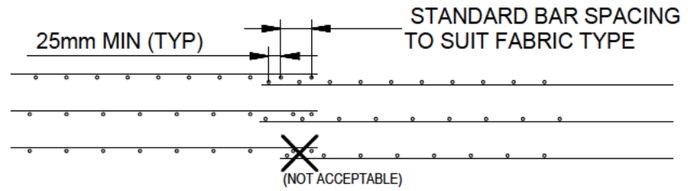
S9 UNLESS NOTED OTHERWISE, THE ENDS OF HOLLOW SECTIONS SHALL BE SEALED WITH A MINIMUM 3mm THICK PLATE. ALL SEALED HOLLOW SECTIONS TO BE GALVANISED SHALL HAVE VENT HOLES DRILLED AS PER THE GALVANISER'S SPECIFICATIONS. ALL HOLES ARE TO BE SHOWN ON SHOP DRAWINGS AND APPROVED BY ENGINEER.
S10 THE CONTRACTOR SHALL PROVIDE ALL CLEATS AND DRILL ALL HOLES NECESSARY FOR FIXING STEEL TO STEEL AND/OR TIMBER WHETHER OR NOT DETAILED ON THE DRAWING.
S11 WHERE CONNECTIONS ARE NOT DETAILED, THEY SHALL BE MINIMUM 10 PLATE CLEAT WITH 2/M20 8.8/S BOLTS (U.N.O.)
S12 MINIMUM EDGE DISTANCES TO FASTENER HOLES AND MEASUREMENTS BETWEEN CENTRES OF FASTENER HOLES SHALL COMPLY WITH AS4100 (U.N.O.)
S13 THE FABRICATION AND ERECTION OF THE STRUCTURAL STEELWORK SHALL BE UNDERTAKEN BY A SUITABLY QUALIFIED PERSON EXPERIENCED IN SUCH PROCEDURES, IN ORDER TO ENSURE THAT ALL REQUIREMENTS OF THE DESIGN ARE MET. ALL BEAMS AND RAFTERS SHALL BE FABRICATED AND ERECTED WITH NATURAL CAMBER UP AND CAMBER DOWN FOR CANTILEVERS (U.N.O.)
S14 DURING ERECTION THE STRUCTURE SHALL BE TEMPORARILY BRACED, STRUTTED OR OTHERWISE SUPPORTED TO ENSURE IT REMAINS STABLE AT ALL TIMES, AND IS ABLE TO WITHSTAND ALL LOADINGS IMPOSED DURING THE ERECTION PROCESS.
S15 WELD TESTING FOR SHOP AND SITE WELDS ARE TO BE PERFORMED IN ACCORDANCE WITH RECOMMENDATIONS OUTLINED IN AS4100 AND AS1554. INSPECTION OF WELDS SHALL BE CARRIED OUT TO AS1554.1.
S16 WHERE CHEMICAL ANCHORS ARE SPECIFIED, UNLESS NOTED OTHERWISE THEY ARE TO BE HILTI HIT-HY 200 MAX OR APPROVED EQUIVALENT. ANCHORS ARE TO BE INSTALLED STRICTLY TO MANUFACTURER'S SPECIFICATIONS AND UNDER DIRECT SUPERVISION BY ENGINEER, UNLESS OTHERWISE AGREED BY CLIENT. ANY CHEMICAL ANCHORS INSTALLED WITHOUT SUPERVISION WILL REQUIRE PROOF LOAD TESTING AS DIRECTED BY ENGINEER.
S17 WHERE CEILING SYSTEMS, DUCTWORK etc. ARE TO BE SUSPENDED FROM PURLINS, HOOK BOLTS SHALL BE FIXED THROUGH THE PURLIN WEB ONLY. FLANGES OF PURLINS OR GIRTS SHALL NOT BE HOLED.
S18 STEELWORK TO BE CONCRETE ENCASED SHALL BE WRAPPED IN F41 STEEL WIRE FABRIC AND SHALL HAVE 50mm MINIMUM CLEAR CONCRETE COVER TO THE STEELWORK. PROVIDE COVER TO STEEL WIRE FABRIC AS SPECIFIED IN AS3600 FOR THE RELEVANT EXPOSURE CLASSIFICATION (U.N.O.)

CONCRETE:

C1 ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS3600, CURRENT EDITION WITH AMENDMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.
C2 CONCRETE QUALITY:

ELEMENT	SLUMP (mm)	MAX. SIZE AGGREGATE	CEMENT TYPE	STRENGTH (MPa)	ADMIXTURE	SHRINKAGE STRAIN μ (MAX)
ALL (U.N.O.)	80	20	GP	32	NIL WITHOUT APPROVAL	650

C3 CONCRETE QUALITY CONTROL TESTING AS FOLLOWS:-
PLANT CONTROL TESTING IN ACCORDANCE WITH AS3600, CURRENT EDITION.
C4 CONCRETE THICKNESSES SHOWN DO NOT INCLUDE THICKNESS OF APPLIED FINISHES.
C5 BEAM DEPTHS ARE WRITTEN FIRST AND INCLUDE SLAB THICKNESS, IF ANY.
C6 NO HOLES OR CHASES OTHER THAN THOSE SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE MADE CONCRETE MEMBERS WITHOUT THE PRIOR APPROVAL OF THE ENGINEER.
C7 CONSTRUCTION JOINTS WHERE NOT SHOWN SHALL BE LOCATED SUBJECT TO THE APPROVAL OF THE ENGINEER.
C8 REINFORCEMENT IS SHOWN DIAGRAMATICALLY, IT IS NOT NECESSARILY SHOWN IN TRUE PROJECTION.
C9 SPLICES IN REINFORCEMENT SHALL BE MADE ONLY IN THE POSITIONS SHOWN. THE WRITTEN APPROVAL OF THE ENGINEER SHALL BE OBTAINED FOR ANY OTHER SPLICES WHERE THE LAP LENGTH IS NOT SHOWN.
C10 WELDING OF REINFORCEMENT WILL NOT BE PERMITTED UNLESS SHOWN ON THE STRUCTURAL DRAWINGS.
C11 PIPES OR CONDUITS SHALL NOT BE PLACED WITHIN THE CONCRETE COVER TO REINFORCEMENT WITHOUT THE APPROVAL OF THE ENGINEER.
C12 REINFORCEMENT SYMBOLS:-
'Y' - DENOTES GRADE 400Y HOT ROLLED DEFORMED BAR TO AS/NZS4671.
'S' - DENOTES GRADE 250S HOT ROLLED DEFORMED BAR TO AS/NZS4671.
'R' - DENOTES GRADE 250R HOT ROLLED PLAIN BARS TO AS/NZS4671.
'F' - DENOTES HARD-DRAWN WIRE REINFORCING FABRIC TO AS/NZS4671.
'W' - DENOTES HARD-DRAWN PLAIN WIRE TO AS/NZS4671.
'N' - DENOTES GRADE D500N DEFORMED BAR WITH 'NORMAL' DUCTILITY TO AS/NZS4671.
'L' - DENOTES GRADE D500L DEFORMED WELDED MESH WITH 'LOW' DUCTILITY TO AS/NZS4671.
'SL' - DENOTES SQUARE CONFIGURATION.
'RL' - DENOTES RECTANGULAR CONFIGURATION.
C13 ALL REINFORCEMENT FABRIC SHALL COMPLY WITH AS/NZS4671, AND SHALL BE SUPPLIED AS FLAT SHEETS.
C14 AT SPLICES FABRIC SHALL BE LAPPED AS FOLLOWS:-



C15 ALL CONCRETE TO BE EFFICIENTLY COMPACTED WITH AN APPROVED VIBRATOR.
C16 ALL CONCRETE SHALL BE PLACED AND 'CURED' IN ACCORDANCE WITH AS3600. WHERE APPROVED CURING COMPOUND IS USED, IT MUST BE APPLIED ONTO:-
a) SLABS WITHIN 2 HOURS OF FINISHING OPERATION.
b) WALLS AND COLUMNS IMMEDIATELY AFTER REMOVAL OF FORMWORK. PVA CURING COMPOUNDS ARE NOT PERMITTED.
C17 TOP AND BOTTOM REINFORCEMENT IN SLABS SHALL BE SUPPORTED IN BOTH DIRECTIONS AT MAXIMUM CENTERS OF 60 DIAMETERS FOR BARS AND 800mm FOR FABRIC. BAR CHAIRS TO ALL EXTERNAL AREAS TO BE PLASTIC CHAIRS OR CONCRETE ASPROS. PLASTIC TIPPED OR STEEL CHAIRS ARE NOT PERMITTED IN EXTERNAL CONCRETE AREAS.
C18 CLEAR CONCRETE COVER TO REINFORCEMENT IS AS FOLLOWS UNLESS SHOWN OTHERWISE ON THE DRAWINGS:-

ELEMENT	BOTTOM (mm)	SIDES (mm)	TOP (mm)
ALL (U.N.O.)	60	60	60

C19 IF HOT AND/OR WINDY CONDITIONS ARE ANTICIPATED AT THE TIME OF CONCRETING, ALIPHATIC ALCOHOL
(eg. CONFILM) IS TO BE APPLIED IN ACCORDANCE WITH MANUFACTURER'S DIRECTIONS TO PREVENT PLASTIC SHRINKAGE CRACKING.
C20 PROVIDE 10mm ABLEFLEX (FULL DEPTH) AGAINST ALL VERTICAL SURFACES WHICH ARE TO BE USED AS FORMWORK (U.N.O.)
C21 SAW-CUT JOINTS TO BE SAWN AS SOON AS CONCRETE HAS HARDENED SUFFICIENTLY THAT IT WILL NOT BE DAMAGED BY SAWING. DEPTH OF SAW-CUT TO BE D/4 (WHERE D = SLAB THICKNESS).
C22 LAP LENGTHS FOR DEFORMED BARS AS FOLLOWS UNLESS SHOWN OTHERWISE ON THE DRAWINGS:-

BAR SIZE	N12	N16	N20	N24	N28
LAP LENGTH	450	600	800	1100	1400
COG LENGTH	270	350	470	650	820

NOTE: WHERE BARS OF DIFFERENT DIAMETERS ARE LAPPING, USE THE LAP LENGTH OF THE SMALLER DIAMETER BAR.

REV	DESCRIPTION	BY	APP.	DATE
0	ISSUED FOR CONSTRUCTION	MJC		23/11/2019
A	ISSUED FOR APPROVAL	MJC		8/08/2019
CAD FILE TYPE	AUTODESK INVENTOR PROFESSIONAL 2018			
CAD FILENAME	EDS AUTOCAD TEMPLATE.DWG			

DO NOT SCALE
DIMENSIONS IN MILLIMETRES
DRAFTING STANDARD: AS1100.101-1992

TOLERANCE TABLE

NOMINAL DIMENSIONS FROM	TO	TOLERANCE	DIMENSIONS WITH DECIMALS NO. OF DECIMALS	TOLERANCE
0	300mm	± 1.0mm	X DECIMALS	± 0.1
300mm	1000mm	± 1.5mm	XX DECIMALS	± 0.05
1000mm	3000mm	± 2.0mm		

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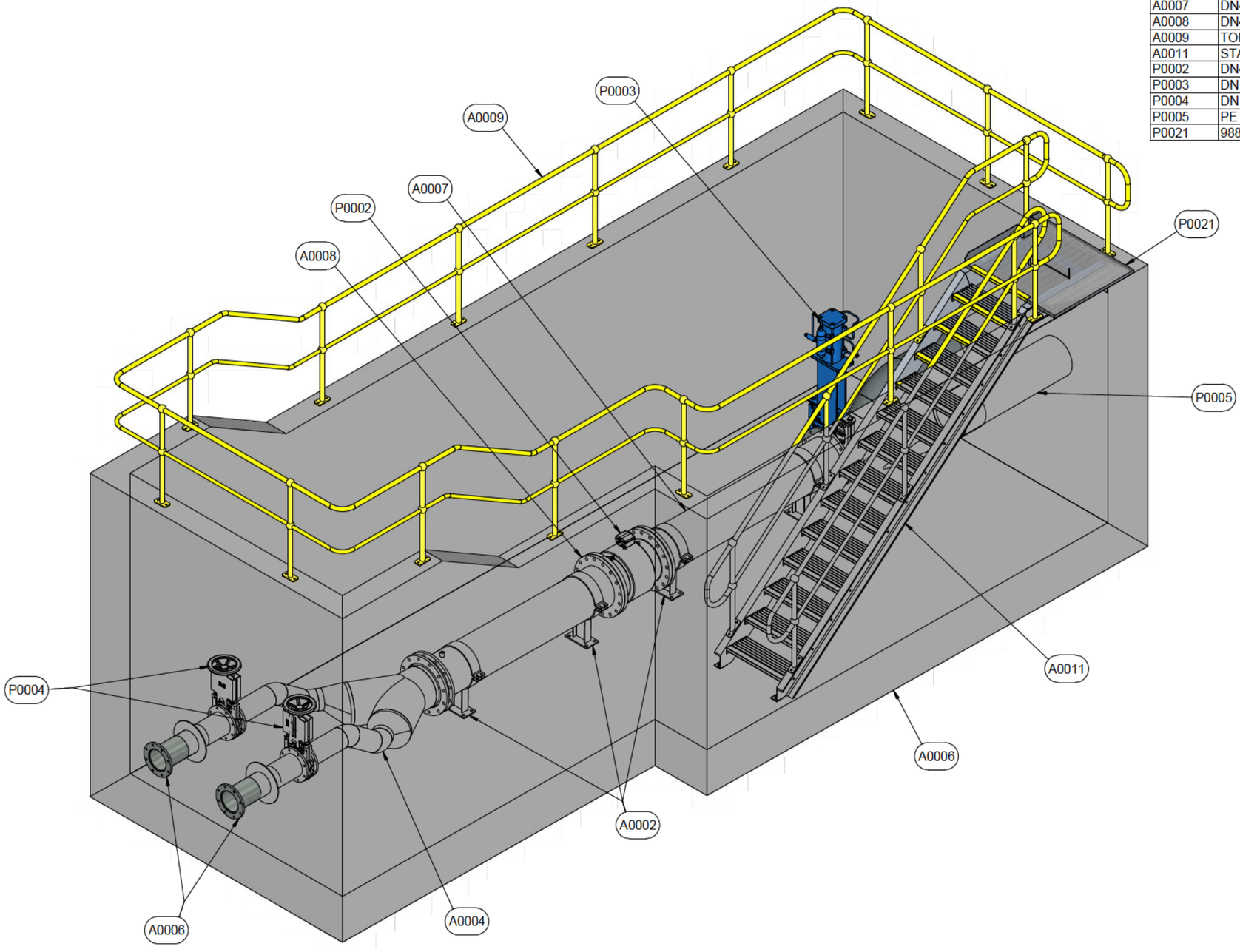
	PRODUCTION	---	---
	CLIENT	---	---

BORAL QUARRY
ORANGE GROVE WA
SEDIMENT POND DISCHARGE MONITOR STATION
A0001 - OUTLET SUMP GENERAL ARRANGEMENT

SIZE	SCALE	DRAWING NUMBER	SHEET	REV
A1	1 : 100	00036-004-ME-FAB-A0001	1 / 3	0

PARTS LIST				
ITEM	DESCRIPTION	ITEM QTY	MASS	REFERENCE
A0002	PIPE SUPPORT	4	18.649 kg	00036-004-ME-FAB-A0002
A0003	PE POLY ASSEMBLY 2	1	141.969 kg	00036-004-ME-FAB-A0003
A0004	PE POLY ASSEMBLY 1	1	119.830 kg	00036-004-ME-FAB-A0004
A0005	TURBIDITY MOUNT	1	2.481 kg	00036-004-ME-FAB-A0005
A0006	CONCRETE SUMP ASSEMBLY	1	63883.618 kg	00036-004-ME-FAB-A0006
A0007	DN400 SPOOL 2	1	266.414 kg	00036-004-ME-FAB-A0007
A0008	DN400 SPOOL 1	1	257.966 kg	00036-004-ME-FAB-A0008
A0009	TOP HANDRAIL ASSEMBLY	1	206.824 kg	00036-004-ME-FAB-A0009
A0011	STAIR ASSEMBLY	1	363.527 kg	00036-004-ME-FAB-A0011
P0002	DN400 FLOW METER	1	37.439 kg	AS PURCHASED
P0003	DN 400 PNEUMATIC KNIFEGATE VALVE	1	103.000 kg	AS PURCHASED
P0004	DN 200 KNIFEGATE VALVE	2	43.000 kg	AS PURCHASED
P0005	PE 400 PIPE No-03	1	52.344 kg	AS PURCHASED
P0021	988 x 32	1	49.681 kg	00036-004-ME-FAB-P0021



A0001 - OUTLET SUMP GENERAL ARRANGEMENT
SCALE: (1 : 20)

GENERAL NOTES: - REFER TO SHEET 1 DRAWING 00036-004-ME-FAB-A0001

- All holes and sharp edges to be deburred and all weld irregularities, slag and spatter is to be removed.
- Dimensions are exact, with no allowance for cutting or welding.
- For dimensions that are not toleranced, refer to tolerance table on drawing.

REV	DESCRIPTION	BY	APP.	DATE
0	ISSUED FOR CONSTRUCTION	MJC		23/11/2019
A	ISSUED FOR APPROVAL	MJC		8/08/2019
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DO NOT SCALE
DIMENSIONS IN MILLIMETRES
DRAFTING STANDARD: AS1100.101-1992

TOLERANCE TABLE

NOMINAL DIMENSIONS			DIMENSIONS WITH DECIMALS	
FROM	TO	TOLERANCE	NO. OF DECIMALS	TOLERANCE
0	300mm	± 1.0mm	X DECIMALS	± 0.1
300mm	1000mm	± 1.5mm	XX DECIMALS	± 0.05
1000mm	3000mm	± 2.0mm		

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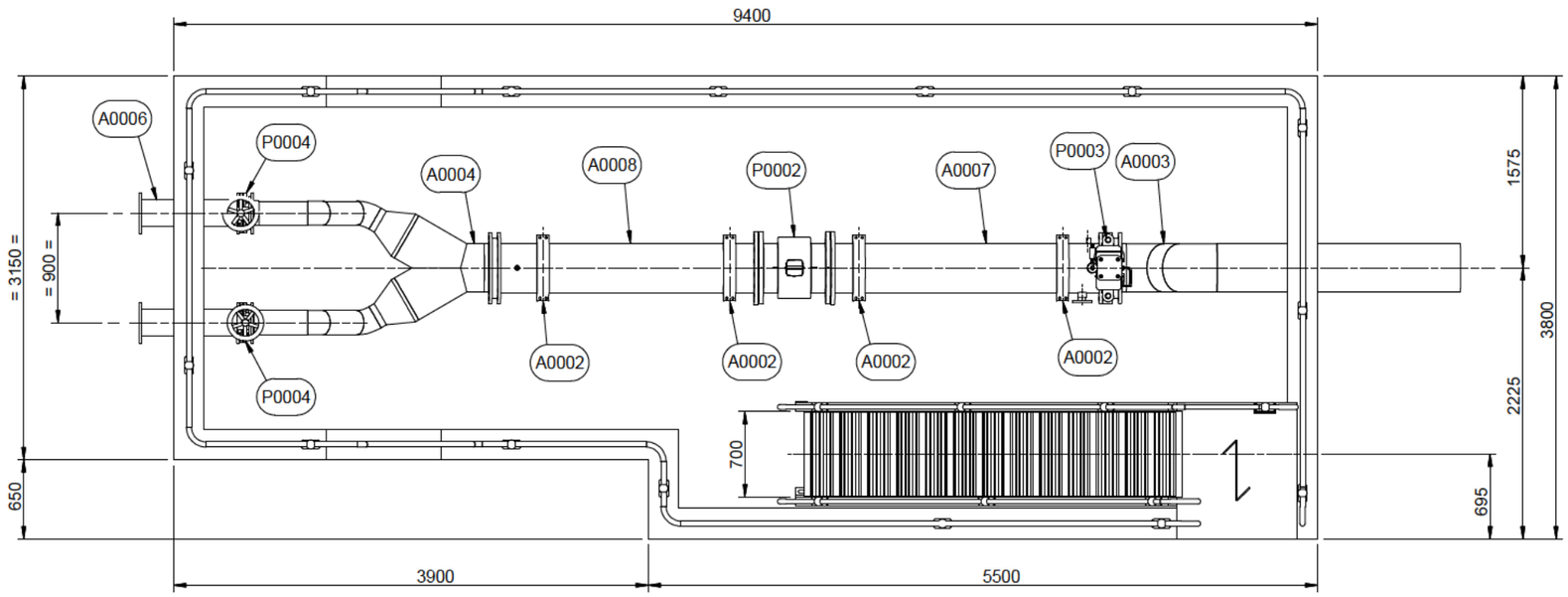
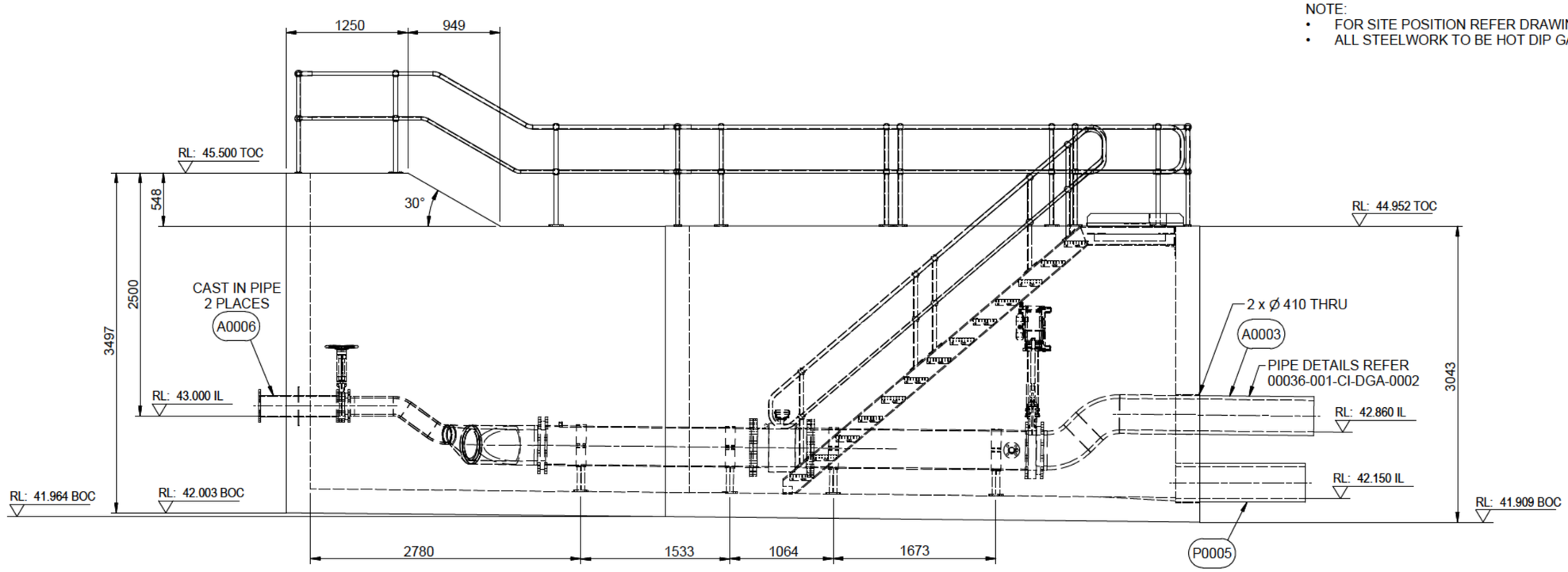
DRAFTING	---	---
PRODUCTION	---	---
CLIENT	---	---

BORAL QUARRY
ORANGE GROVE WA
SEDIMENT POND DISCHARGE MONITOR STATION
A0001 - OUTLET SUMP GENERAL ARRANGEMENT

SIZE	SCALE	DRAWING NUMBER	SHEET	REV
A1	1 : 20	00036-004-ME-FAB-A0001	2 / 3	0





NOTE:
- FOR SITE POSITION REFER DRAWING 00036-001-CI-DGA-00002.
- ALL STEELWORK TO BE HOT DIP GALVANISED REFER S8 IN GENERAL NOTES.

A0001 - OUTLET SUMP GENERAL ARRANGEMENT
SCALE: (1 : 25)

GENERAL NOTES: - REFER TO SHEET 1 DRAWING 00036-004-ME-FAB-A0001
- All holes and sharp edges to be deburred and all weld irregularities, slag and spatter is to be removed.
- Dimensions are exact, with no allowance for cutting or welding.
- For dimensions that are not toleranced, refer to tolerance table on drawing.

REV	DESCRIPTION	BY	APP.	DATE
0	ISSUED FOR CONSTRUCTION	MJC		23/11/2019
A	ISSUED FOR APPROVAL	MJC		8/08/2019
CAD FILE TYPE	AUTODESK INVENTOR PROFESSIONAL 2018			
CAD FILENAME	EDS AUTOCAD TEMPLATE.DWG			

DO NOT SCALE
DIMENSIONS IN MILLIMETRES
DRAFTING STANDARD: AS1100.101-1992

TOLERANCE TABLE

NOMINAL DIMENSIONS			DIMENSIONS WITH DECIMALS	
FROM	TO	TOLERANCE	NO. OF DECIMALS	TOLERANCE
0	300mm	± 1.0mm	X DECIMALS	± 0.1
300mm	1000mm	± 1.5mm	XX DECIMALS	± 0.05
1000mm	3000mm	± 2.0mm		

EDS
ENGDRAW DESIGN SERVICES
design@engdraw.com.au

	CHECK	BY	DATE
	ENGINEERING	---	---
	DRAFTING	---	---
	PRODUCTION	---	---
	CLIENT	---	---

BORAL QUARRY
ORANGE GROVE WA
SEDIMENT POND DISCHARGE MONITOR STATION
A0001 - OUTLET SUMP GENERAL ARRANGEMENT

SIZE	SCALE	DRAWING NUMBER	SHEET	REV
A1	1 : 25	00036-004-ME-FAB-A0001	3 / 3	0

APPENDIX D

APPENDIX D:
HISTORICAL WATER QUALITY MONITORING RESULTS

MBS ENVIRONMENTAL

Sample ID	Analyte	pH	EC	TDS	TSS	TRH C10-C14	TRH C15-C28	TRH C29-C36	Turbidity (NTU)
	Unit	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	ANZECC 95% Fresh Water	-	-	-	-	-	-	-	-
PE150851	4-Jan-21	8.2	1200	760	14	<0.05	<0.2	<0.2	8.5
PE149503	2-Feb-21	8.6	1200	770	12	<0.05	<0.2	<0.2	4.1
PE152286	6-Feb-21	8.1	1100	670	13	<0.05	<0.2	<0.2	12.0
PE154474	9-Feb-21	8.1	1100	730	20	<0.05	<0.2	<0.2	12.0
PE155913	11-Feb-21	8.2	1000	650	7	<0.05	<0.2	<0.2	5.8
PE151480	5-Mar-21	8.3	1200	770	22	<0.05	<0.2	<0.2	3.7
PE155158	10-Apr-21	8.1	990	650	16	<0.05	<0.2	<0.2	13.0
PE152958	7-May-21	8.1	920	580	35	<0.05	<0.2	<0.2	32.0
PE153830	8-May-21	8.1	980	660	18	<0.05	<0.2	<0.2	9.5
PE156854	12-Jul-21	8.1	1100	730	17	<0.05	<0.2	<0.2	9.5
PE158131	2-Feb-22	8.3	1100	700	22	<0.05	<0.2	<0.2	15.0
PE159010	3-Mar-22	8.1	1100	730	31	<0.05	<0.2	<0.2	24.0
PE159762	6-Apr-22	8.1	1100	780	<5	<0.05	<0.2	<0.2	4.4
PE160233	3-May-22	8.1	1200	750	6	<0.05	<0.2	<0.2	3.5
PE160984	2-Jun-22	8.1	1000	640	9	<0.05	<0.2	<0.2	3.6
PE161699	5-Jul-22	8.1	1100	760	7	<0.05	<0.2	<0.2	6.0
PE162411	3-Aug-22	8.0	800	520	34	<0.05	<0.2	<0.2	40.0
PE163174	1-Sep-22	8.1	1000	710	15	<0.05	<0.2	<0.2	12.0
PE163856	30-Sep-22	8.2	1000	680	<5	<0.05	<0.2	<0.2	3.2
PE157593	1-Nov-22	8.2	1100	760	10	<0.05	<0.2	<0.2	5.6
PE164663	3-Nov-22	8.2	910	570	12	<0.05	<0.2	<0.2	11.0
PE166185	2-Jan-23	8.2	1000	660	8	<0.05	<0.2	<0.2	7.1
PE166815	3-Feb-23	8.4	1000	660	14	<0.05	<0.2	<0.2	9.8
PE167426	3-Apr-23	8.1	1000	670	12	<0.05	<0.2	<0.2	6.5
PE168398	22-May-23	8.2	1100	720	9	<0.05	<0.2	<0.2	4.9
PE169471	12-Jul-23	8.2	1000	700	13	<0.05	<0.2	<0.2	9.5
PE169883	3-Aug-23	8.2	1000	640	9	<0.05	<0.2	<0.2	7.3
PE170740	8-Sep-23	8.1	1000	660	<5	<0.05	<0.2	<0.2	8.8
PE171389	4-Oct-23	8.3	1000	690	11	<0.05	<0.2	<0.2	6.7
PE172116	8-Nov-23	8.2	1100	690	10	<0.05	<0.2	<0.2	7.0
PE174331	28-Feb-24	8.1	1100	710	11	<0.05	<0.2	<0.2	8.4
PE175026	8-Apr-24	7.7	1100	730	11	<0.05	<0.2	<0.2	13.0
PE176832	12-Jul-24	7.9	900	590	13	<0.05	<0.2	<0.2	15.0
PE180100	13-Dec-24	8.3	1000	670	22	<0.05	<0.2	<0.2	29.0

Sample ID	Analyte	pH	EC	TDS	TSS	Turbidity	TRH >C10-C16	TRH >C10-C16 - Naphthalene	TRH >C16-C34 (F3)	TRH >C34-C40 (F4)	TRH C10-C14	TRH C10-C40	TRH C15-C28	TRH C29-C36	TRH C6-C10	TRH C6-C10 - BTEX (F1)	TRH C6-C9
	Unit	-	µS/cm	mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	ANZECC 95% Fresh Water	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PE181033	3-Feb-25	8.3	1000	690	8	6.7					<0.05		<0.2	<0.2			
PE182075	18-Mar-25	8.2	1100	680	14	13	<0.06	<0.06	<0.5	<0.5	<0.05	<0.32	<0.2	<0.2	<0.05	<0.05	<0.04
PE182948	30-Apr-25	8.2	1100	730	12	14	<0.01	<0.01	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05		<0.01	
PE184436	16-Jul-25	8.1	950	620	14	14	<0.01	<0.01	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05			
PE185296	3-Sep-25	8.1	790	500	17	20	<0.01	<0.01	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05			
PE186206	15-Oct-25	8.1	870	550	7	9	<0.01	N/A	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05			

Sample ID	Analyte	Nitrogen	Total Kjeldahl Nitrogen	Total Phosporus	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Benzene	Ethylbenzene	m/p-xylene	Naphthalene	o-xylene	Toluene	Total BTEX	Total Xylenes	Benzene (F0)
	Unit	mg/L		mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	ANZECC 95% Fresh Water	-	-	-	0.013	0.20	0.001	0.0014	0.0034	0.60	0.011	0.008	0.95	0.080	0.075	0.016	0.35	0.18	-	-	-
PE181033	3-Feb-25				<0.0005	<0.05	<0.0005	**0.0067**	<0.0005	<0.05	**0.02**	**0.35**									
PE182075	18-Mar-25				<0.0005	<0.05	<0.0005	**0.0016**	<0.0005	<0.05	<0.01	<0.01	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005	<0.003	<0.0015	<0.0005
PE182948	30-Apr-25	0.28	0.47	<0.02	<0.0005	<0.05	<0.0005	**0.0016**	<0.0005	<0.05	<0.01	<0.01									
PE184436	16-Jul-25	0.37	0.25	<0.02	<0.0005	<0.05	<0.0005	**0.002**	<0.0005	<0.05	<0.01	0.005									
PE185296	3-Sep-25	1	0.23	<0.02	<0.0005	<0.05	<0.0005	**0.0022**	<0.0005	<0.05	<0.01	0.002									
PE186206	15-Oct-25	0.84	0.26	0.02	<0.0005	<0.05	<0.0005	**0.0018**	<0.0005	<0.05	<0.01	0.006									