Dubbo Quarry

2024 Annual Review

Site Details

Name of operation	Dubbo Quarry
Name of operator	Holcim (Australia) Pty Ltd
Document Version	A
Development consent #	SSD 10417
Annual review start date	1 January 2024
Annual review end date	31 December 2024

I, Leeroy Wall, certify that this report is a true and accurate record of the compliance status of Dubbo Quarry for the period 1 January 2024 to 31 December 2024 and that I am authorised to make this statement on behalf of Holcim.

Note.

a) *The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.*

b) *The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement – maximum penalty 5 years imprisonment): sections 307A, 307B and 307C (False or misleading applications/information/documents – maximum penalty 2 years imprisonment or $22,000, or both).*

Name of authorized reporting officer	Leeroy Wall
Title of authorized reporting officer	Dubbo Quarry Manager
Signature of authorised reporting officer	
Date	31/03/2025

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1 Statement of Compliance

See **Table 1** for statement of compliance for the reporting period (1 January 2024 - 31 December 2024) for Dubbo Quarry. **Table 2** displays the compliance status key. **Table 3** details the non-compliances identified within the reporting period.

Table 1: Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
State Significant Development (SSD) No. 10417	No
Environment Protection License (EPL) No. 2212	Yes

Table 2: Compliance Status Key

Risk level	Colour code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-compliant	Non-compliance with: • Potential for serious environmental consequences, but is unlikely to occur; or • Potential for moderate environmental consequences, but is likely to occur
Low	Non-compliant	Non-compliance with: • Potential for moderate environmental consequences, but is unlikely to occur; or • Potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

Table 3: Non-compliances for Reporting Period

Relevant Approval	Condition	Condition description	Compliance status	Section addressed in Annual Review / Comment
SSD-10417	Part B, Condition B19	**Air Quality Criteria** The Applicant must ensure that particulate matter emissions generated by the development do not cause exceedances of the criteria in Table 5 at any residence on privately-owned land.	Non-Compliant	**Section 6.3.3** and **Section 12** SW Monitor recorded PM10 results exceeding the 24-hour criteria on the following dates: • 100.25 µg/m³ on 6 May 2024 • 62.29 µg/m³ on 24 June 2024, and • 54.71 µg/m³ on 18 December 2024.

2 Introduction

2.1 Background

Holcim (Australia) Pty Ltd (Holcim) operates Dubbo Quarry (the 'Quarry'), a hard rock quarry located within the Dubbo Regional Council Local Government Area (LGA) on Sheraton Road approximately 1.9 kilometres (km) west of the city of Dubbo. The site produces high quality basalt aggregates for use in concrete, asphalt, road base and other applications. The Quarry also produces many types of road base and precoated sealing aggregates.

The Quarry has been operating since 1980 under a development consent granted by the former Talbragar Shire Council, now Dubbo Regional Council. Accessible basalt resources within the existing quarry boundary are close to exhaustion and planning approval SSD 10417 (Development Consent) was granted under Part 4, Division 4.7 of the NSW Environmental Planning Assessment Act 1979 (EP&A Act) to allow the Quarry to continue operating as the Dubbo Quarry Continuation Project (henceforth referred to as 'the project'). The project involves continued operation in the existing quarry as well as the development of two new resource areas, the Western Extension Area (WEA) and Southern Extension Area (SEA).

The site also operates in accordance with EPL No. 2212 issued by the Environment Protection Authority (EPA). The site locality and Development Consent area are outlined in **Figure 1** and **Figure 2** below.

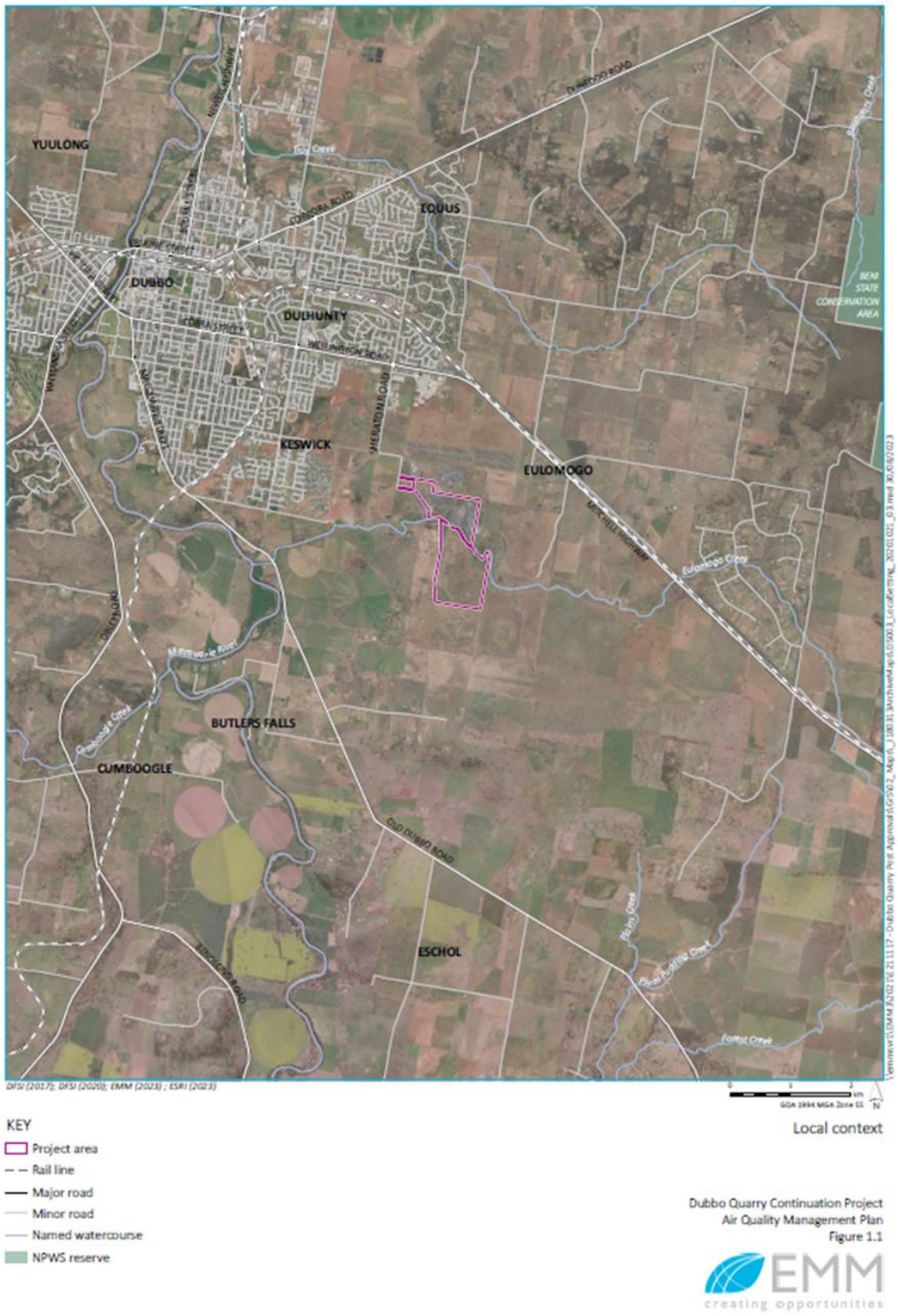

Figure 1: Regional locality (source: Air Quality Management Plan 2023)

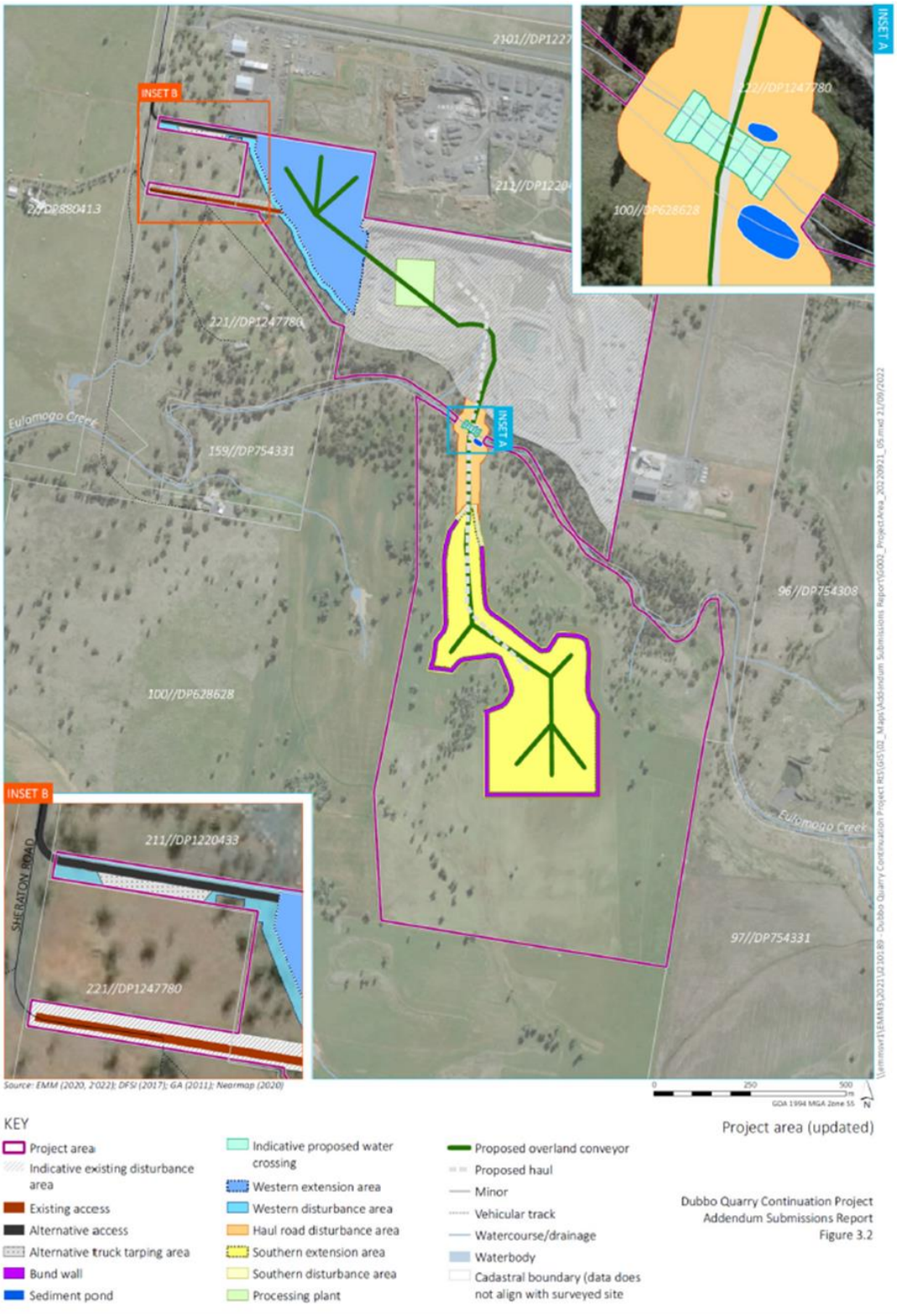

Figure 2: Dubbo Quarry project approval area (Source: SSD 10417)

2.2 Annual Review Requirements

This Annual Review has been prepared in accordance with Condition D9 (Annual Review) of the Development Consent and in accordance with the Annual Review Guideline: Post Approvals Requirements for State Significance Mining Developments (October 2015). The Annual Review requirements and the section where they have been addressed in this document have been provided in **Table 4**.

Table 4: Annual Review requirements and structure of this Annual Review

Condition	Section in Annual Review
REPORTING AND AUDITING Annual Review D9. By the end of March in each year after the commencement of development, or other timeframe agreed by the Planning Secretary, a report must be submitted to the Department reviewing the environmental performance of the development, to the satisfaction of the Planning Secretary. This review must: a) describe the development (including any rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year;	**Sections 4** and **8**
b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, including a comparison of these results against the: (i) relevant statutory requirements, limits, or performance measures/criteria; (ii) requirements of any plan or program required under this consent; (iii) monitoring results of previous years; and (iv) relevant predictions in the documents listed condition A2;	**Section 6**
c) identify any non-compliance or incident which occurred in the previous calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence;	**Sections 1** and **12**
d) evaluate and report on: (i) the effectiveness of the noise and air quality management systems; and (ii) compliance with the performance measures, criteria, and operating conditions in this consent;	**Sections 6.2** and **6.3** **Section 6**
e) identify any trends in the monitoring data over the life of the development;	**Sections 6, 7, 8** and **9**
f) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and	**Sections 6, 7** and **9**

Condition	Section in Annual Review
g) Describe what measures will be implemented over the current calendar year to improve the environmental performance of the development.	**Sections 6** and **9**

2.3 Key Personnel

Table 5 details the names and contact details of key Dubbo Quarry personnel responsible for the environmental management of the operation.

Table 5: Contact details for Dubbo Quarry key personnel

Staff Member and Position	Contact Details
Quarry Manager Leeroy Wall	Mob: 0447 523 471 Email: leeroy.wall@holcim.com
Area Manager Aggregates – NSW North Chris Hamilton	Work: 02 6656 8620 Mob: 0429 790 213 Email: chris.hamilton@holcim.com
Environment Manager - NSW Dozie Egeonu	Mob: 0429 557 493 Email: dozie.egeonu@holcim.com

3 Approvals

The site operates under the approvals listed in **Table 6.**

Table 6: Approvals for Dubbo Quarry operations

Approval	Regulatory Authority
SSD 10417	Department of Planning, Housing and Infrastructure (DPHI)
EPL No. 2212	NSW Environmental Protection Authority (EPA)
Water Access Licence (WAL) No. 29524	WaterNSW
WAL No. 34573	WaterNSW
WAL No. 43440	WaterNSW

In 2024 Dubbo Quarry submitted a Modification application (Modification 1) to the DPHI seeking to change the design of the surface water diversion, reduce the height of the Southern Extraction Area safety bund, and increase the quantity of fly ash and concrete waste imported to the site. At the end of 2024, Modification 1 was under assessment with the DPHI.

4 Operations Summary

4.1 Exploration

No exploration activities were completed during the reporting period.

4.2 Land Preparation

39.0 hectares (ha) of land was disturbed within the approved extraction areas during the reporting period in preparation for extraction. No clearing of vegetation was conducted within the reporting period.

4.3 Construction Activities

There was no construction undertaken at the Quarry during the reporting period.

4.4 Quarry Operations

In April 2024, operations progressed into the western area of the Continuation Project approval boundary.

Table 7 includes a summary of the operations undertaken during the reporting period against the Development Consent conditions regarding product transported from the Quarry.

Table 7: Total product distributed

Material	Approved Limit (SSD 10417) (Tonnes (T))	Product Distributed (T)		
		2023	2024	2025 (forecast)
Transportation Limit Condition A9	500,000	0	243, 158.6	261, 874.0
Receival of Fly Ash Condition A10	3000	0	116.5	3000.0
Receival of Concrete Washout Materials Condition A11	3000	0	968.6	1,500.0

4.5 Next Reporting Period

Development activities proposed to be carried out at the Quarry in the next reporting period (January to December 2025), include:

- Stripping of topsoil and overburden within the existing extraction limit boundary;
- Drill, blast, load and haul activities; and
- Crushing, screening and stockpiling of product.

5 Actions Required from Previous Annual Review

5.1 Actions Required From Previous Annual Review – DPHI Review

The 2023 Annual Review was the initial Annual Review report for the project. It was provided to DPHI on 30 September 2024 and DPHI acknowledged its submission on 3 October 2024. DPHI acknowledged the three non-compliances in the report. DPHI had no further comment on the content of the report for Holcim to address in this 2024 Annual Review.

5.2 Actions From Previous Annual Review – Holcim Proposed

See **Table 8** below for the planned activities or improvement actions proposed for 2024 in the previous Annual Review.

Table 8: Current status on actions proposed in the previous Annual Review

Topic	Description of Activities or Improvement Measures	Current Status
Council Consent	Surrender the Council Consent as required under Conditions A15 of the Development Consent.	The Council Consent was surrendered in 2024.
Surface Water Diversions	Install a clean water diversion (East Pit surface water diversion) as per Condition B33.	Due to delays in the Water Management Plan and planning phase of the project, the clean water diversion will be constructed in 2025. It should be noted, a Modification has been submitted to DPHI which includes design changes to the surface water diversion drain location.
IEA	Engagement of the initial IEA for the project as per Condition D11.	The IEA was engaged and the site inspection component organised for November 2024.
Environmental Management Plans	Update of the Water Management Plan to reflect installation of the East Pit surface water diversion.	An update of the Water Management Plan commenced in 2024. Holcim continues to consult with DPHI on environmental management plans for the continuation project.

6 Environmental Performance

6.1 Meteorological Monitoring

A summary of monthly temperature readings and rainfall was retrieved from the onsite meteorological station on the south-western boundary of the existing pit. The site uses this meteorological monitoring data to inform daily operations as per the Development Consent. A summary of meteorological results for the reporting period is outlined in **Table 9** below.

Table 9: Meteorological monitoring results

Month	Total Rainfall (mm)	Minimum Temperature (°C)	Maximum Temperature (°C)
January	-	-	-
February	-	-	-
March	-	-	-
April	0	11.9	17.9
May	2.4	10.9	19.5
June	9.6	9.6	18.3
July	0	8.9	18
August	0	10.4	20.7
September	4.8	10	19.9
October	38.4	13.1	20.6
November	74.4	18.6	29.1
December	55.2	20.6	30.3
Annual TOTAL	184.8		

From January to March 2024 there were issues in setting up the meteorological station which resulted in missed monitoring data. DPHI was notified of the missed monitoring data on 13 November 2024. The total rainfall during the reporting period was 184.8 millimetres (mm). The minimum recorded temperature during the reporting period was 8.9°C, with the maximum being 30.3°C.

6.2 Noise

6.2.1 EIS Predictions

A noise and vibration impact assessment (NVIA) in the Environmental Impact Statement (EIS) (2021) considered the potential operational noise, construction noise, and road traffic noise impacts of the proposed extension on nearby sensitive receiver locations.

The EIS (2021) stated the project will generate noise during construction of the Eulomogo Creek crossing and the proposed access road. Construction noise management levels (NMLs) will be exceeded at two of the closest noise sensitive receivers. However, noise generating construction work will be relatively short in nature (up to eight weeks) and during standard hours (day) only.

During operation of the project, NMLs will be exceeded at several assessment locations. Significant noise generating operational work will occur during stripping activities which will last up to four weeks per stripping event. Outside of stripping events, during general quarry operations, noise levels will decrease significantly.

6.2.2 Approved Criteria

Criteria for each of the receivers R1 – R23 for quarry operations are provided in **Table 10** as per Condition B1 of the Development Consent. The noise monitoring locations are shown in **Figure 3**.

Table 10: Operational noise criteria dB(A)

Noise Assessment Location	Daytime - Stripping ($LA_{eq(15min)}$)	Daytime - all other quarrying operation[1] ($LA_{eq(15min)}$)	Night ($LA_{eq(15min)}$)	Night LA_{max}
R1[2]	49	49	40	52
R2	46	44	35	52
R3	43	43	37	52
R4	41	41	35	52
R5	40	41	35	52
R23[3]	42	42	37	52
All other non-project related privately owned residences	40	40	35	52

Notes:
[1]Day period is 7 am to 6 pm Monday to Saturday; night period is 10:00 pm to 7:00 am Monday to Saturday.
[2] Holcim currently has a negotiated agreement in place with the landowner of this residential property.
[3]No residence currently exists at this location (i.e., vacant land).

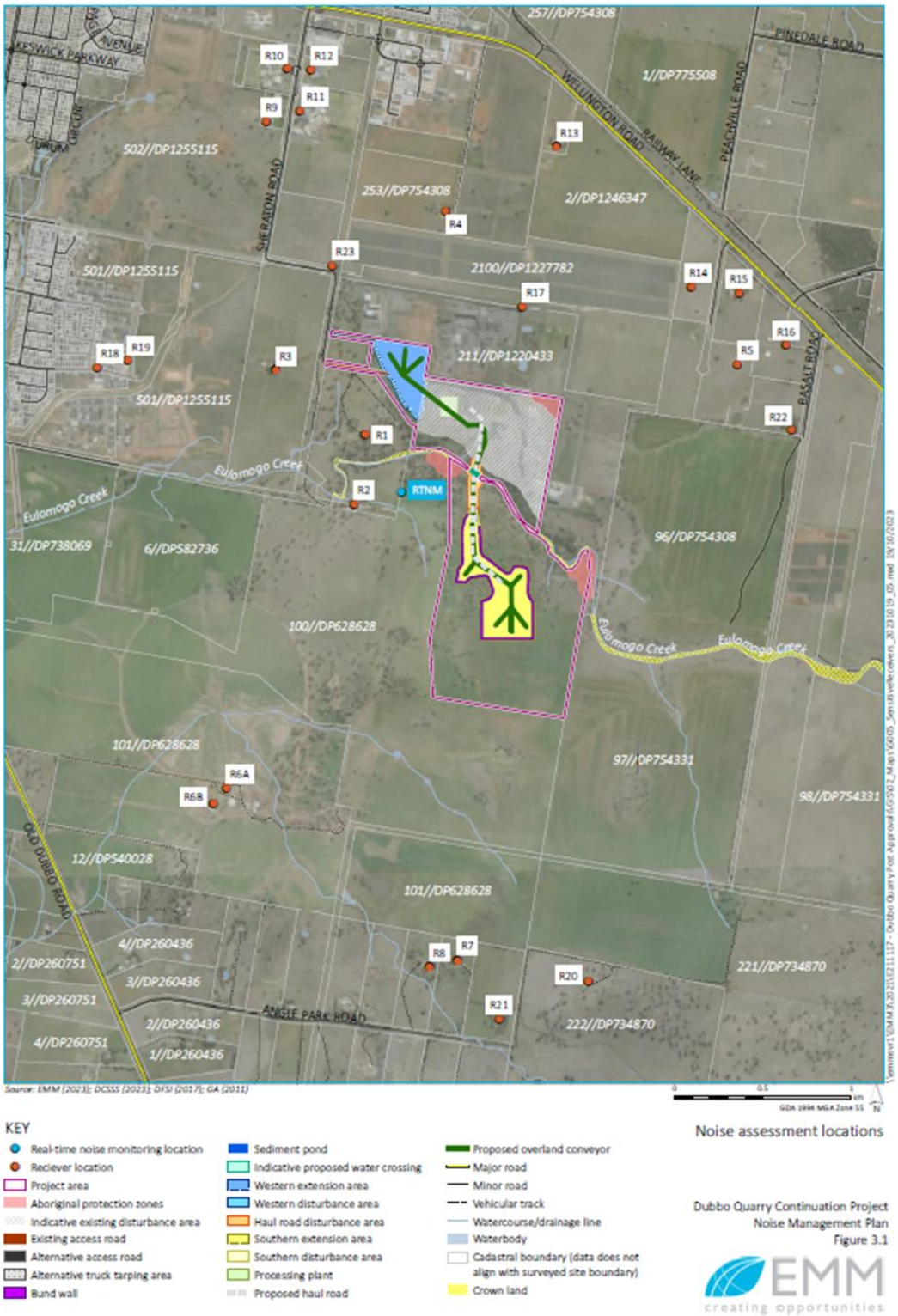

Figure 3: Noise monitoring locations (source: Noise Management Plan 2023)

6.2.3 Key Environmental Performance

Annual noise monitoring was taken in 2024 in accordance with the requirements of Schedule 2 Condition B4. Monitoring was completed at five locations by Ramboll Australia Pty Ltd on Tuesday 22 October 2024 and Wednesday 23 October 2024.

Noise results were all within the approved performance criteria. The annual noise monitoring results are shown in **Table 11**.

Table 11: Annual Noise Monitoring

Assessment Period	Receiver No.	Quarry Noise Contribution LAeq(15min) (dBA)	Compliance Status
Day[1]	R1[3]	N/A	Compliant
	R2	<20[5]	Compliant
	R3	<25	Compliant
	R4	<26	Compliant
	R5	<30	Compliant
	R23[4]	<25	Compliant
Night[2]	R1[3]	N/A	Compliant
	R2	<39	Compliant
	R3	<30	Compliant
	R4	n/a[6]	Compliant
	R5	n/a[6]	Compliant
	R23[4]	n/a[6]	Compliant

Notes: [1] 7am-6pm Monday to Saturday
[2] 10pm-7am Monday to Saturday
[3] Holcim currently has a negotiated agreement in place with the landowner of this residential property, therefore, the monitoring criteria do not apply.
[4] No residence exists at this location (vacant land)
[5] Value estimated based on sound exposure level calculation in Appendix 1 of the 2024 Annual Noise Monitoring Report.
[6] Quarry not operational

During the 2024 annual monitoring, the quarry was audible during the day and night at receiver R2 but remained well below the maximum criteria. The quarry was inaudible at all other monitoring locations. Other recorded noise sources included birds, insects, animals, motorway hum, tree removal activities, and trains.

Long-term Trends

There are no long-term trends to report from noise monitoring, as the site only commenced operations on 20 November 2023. The first occurrence of annual monitoring took place in 2024.

Comparison to EIS Predictions

At the time of reporting, noise monitoring is within the precited limits of the EIS. Holcim did not receive any complaints relating to noise during the reporting period.

6.2.4 Management Measures

Management measures relating to noise are outlined within Section 4 of the Dubbo Quarry *Noise Management Plan* and the EIS. These include:

- Defined operating hours as per Condition A12 of the Development Consent;
- Monitoring for noise and meteorological conditions;
- Staff and contractor inductions and regular reinforcement (such as at toolbox talks);
- Minimising the use of portable radios, public address systems or other noisy methods of site communication when operating close to nearby residents;
- Utilise appropriate travel routes for the delivery of materials and parking of vehicles;
- Minimise the use of equipment that generates impulsive noise;
- Notify potentially affected residents prior to the commencement of works;
- Operate plant and equipment in the quietest and most efficient manner possible; and
- Regular inspections and maintenance of plant and equipment.

6.2.5 Proposed Improvements

There are no proposed improvements related to noise management for the next reporting period.

6.3 Air quality

6.3.1 EIS Predictions

An air quality impact assessment (AQIA) was prepared by EMM as part of the EIS, documenting the existing air quality and meteorological environment, applicable impact assessment criteria, air pollutant emission calculations, dispersion modelling of calculated emissions and assessment of predicted impacts relative to criteria (including cumulative impacts).

Emissions generated by the project will principally consist of particulate matter emissions from loading and unloading materials (topsoil, subsoil and rock), conveying and transfer of rock, rock sizing, hauling materials and wind erosion of exposed areas.

Three emission scenarios (existing and two future scenarios) were considered to quantify particulate matter impacts from the project and to understand the significance of the proposed operations compared to current operations.

The results of the dispersion modelling show that the predicted concentrations and deposition rates for incremental particulate matter (TSP, PM10, PM2.5 and dust deposition) are below the applicable impact assessment criteria at all assessment locations for both the existing and proposed scenarios. Cumulative impacts were assessed by combining modelled impacts with recorded ambient background levels. The cumulative results showed that compliance with applicable impact assessment criteria is predicted at all assessment locations for all pollutants and averaging periods.

6.3.2 Approved Criteria

Air quality monitoring is required to be undertaken in accordance with the following criteria in **Table 12** in accordance with Condition B19 of the Development Consent. The air quality monitoring locations are shown in **Figure 4**.

Table 12**: Air quality criteria**

Pollutant	Averaging period	Criterion
Particulate matter <10 µm (PM_{10})	Annual	[a, c] 25 µg/m^3
	24-hour	[b] 50 µg/m^3
Particulate matter <2.5 µm ($PM_{2.5}$)	Annual	[a, c] 8 µg/m^3
	24-hour	[b] 25 µg/m^3
Total suspended particulate (TSP) matter	Annual	[a, c] 90 µg/m^3

Notes: a Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).
b Incremental impact (i.e. incremental increase in concentrations due to the development on its own).
c Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary.

Figure 4: Air quality monitoring locations (source: Air Quality Management Plan 2023)

6.3.3 Key Environmental Performance

PM_{10} / $PM_{2.5}$

PM_{10} and $PM_{2.5}$ monitoring was undertaken via HVAS units ER1019009 (north-eastern boundary) and ER1021003 (south-western boundary) during the reporting period (see **Figure 4**).

Table 13 below displays a summary of the PM_{10} and $PM_{2.5}$ monitoring results at ER1019009 and ER1021003, respectfully. The full air quality monitoring dataset can be found in **Appendix A**.

Table 13**: Particulate matter and Total suspended solids monitoring results summary**

Parameter	ER1019009 (NE Monitor) µg/m³			ER1021003 (SW Monitor) µg/m³		
	$PM_{2.5}$	PM_{10}	TSP	$PM_{2.5}$	PM_{10}	TSP
Annual Average	3.74	10.24	13.69	3.8	11.35	13.75
Annual Average Compliance	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant
Number of Samples	265	265	265	254	254	254
Maximum	16.46	43.59	59.9	16.78	246.73	158.16
Minimum	0.38	0.88	0.66	0.16	0.4	0.33
24hr Exceedances	0	0	N/A	0	3	N/A

From January to March 2024 there were issues in setting up the air quality monitors. This resulted in missed monitoring, with 265 valid samples from the NE monitor taken and 254 valid samples from the SW monitor taken in 2024.

There were no invalidated samples from the air quality monitoring in 2024.

There were five PM10 exceedances of the 24-hour criteria at the SW Monitor during the 2024 reporting period. These include:

- 100.25 µg/m³ on 6 May 2024
- 62.29 µg/m³ on 24 June 2024, and
- 54.71 µg/m³ on 18 December 2024.

Dubbo Quarry notified the DPHI of four PM10 exceedances (those falling within January to August 2024) and missed sampling events in 2024 in one notification dated 13 November 2024. DPHI responded to this notification on 22 November 2024, acknowledging that between January and October 2024 there were exceedances of the 24-hour average criteria for PM10 at one location and at both locations there were periods where no measurements were recorded due to inconsistent power supply. DPHI assessed these events as a non-compliance with Part B, Condition B19 of SSD-10417.

On 16 June 2024 and 18 August 2024, the SW Monitor recorded PM10 results of 246.73 µg/m³ and 58.93 µg/m³ respectively. The 16 June 2024 and 18 August 2024 were Sundays. Dubbo Quarry does not operate on Sundays. On investigating these results, it was determined that Dubbo Quarry would not have

contributed to the elevated PM10 results on these days.

Long-term Trends

There are no long-term trends to report on yet as the site has only recently commenced this monitoring program under the Air Quality Management Plan. Dubbo will discuss trends in future Annual Review reports.

Comparison to EIS Predictions

Valid air quality monitoring results were outside the predicted limits of the EIS predictions in five instances in 2024.

6.3.4 Management Measures

Management measures relating to air quality are outlined within Section 4 of the Dubbo Quarry Air Quality Management Plan. These include:

- Discussion of the weather conditions and dust considerations at daily pre-shift meetings;
- Modifying or suspending the planned activities, as appropriate, to minimise dust impacts;
- Quarry design, including progressive rehabilitation, use of gravel roads and paving the access road; and
- Water sprays on stockpiles and exposed areas.

The Air Quality Management Plan was approved by DPHI on 26 September 2023.

6.3.5 Proposed Improvements

The Quarry will continue to implement their Air Quality Management Plan to meet the requirements outlined in the Development Consent.

6.4 Blasting

6.4.1 EIS Predictions

A NVIA in the EIS (2021) considered the potential blasting (vibration) impacts of the proposed extension on nearby sensitive receiver locations.

The EIS (2021) stated 'no exceedance of the relevant sleep disturbance screening criteria is predicted due to site operations. Potential impacts of blasting were also assessed in the NVIA, with permissible maximum instantaneous charges (MICs) recommended for each project area to ensure compliance with the relevant air blast overpressure and ground vibration criteria. Road traffic noise levels under a worst-case maximum production scenario are predicted to satisfy the relevant criteria'.

6.4.2 Approved Criteria

The blasting criteria for the Quarry is shown in **Table 14**. This criterion is taken from the blasting criteria in Table 4 of Condition B8 of the Development Consent.

Table 14**: Blasting criteria for the Quarry**

Location	Airblast overpressure (dB (Lin Peak))	Ground vibration (mm/s)	Allowable exceedance
Any residence on privately-owned land	120	10	0%
	115	5	5% of the total number of blasts over a calendar year

6.4.3 Key Environmental Performance

Results of the blast monitoring undertaken within the reporting period are shown below in **Table 15**. All blasts were compliant with airblast overpressure and ground vibration limits.

Table 15**: 2024 Blast monitoring results**

Blast Number	Date	Result	
		Overpressure (dBL)	Ground Vibration (mm/s)
1	21/02/2024	104.3	1.47
2	26/04/2024	109.8	4.96
3	13/05/2024	105.4	1.27

Blast Number	Date	Result	
		Overpressure (dBL)	Ground Vibration (mm/s)
4	07/06/2024	109.9	2.62
5	01/08/2024	111.4	2.00
6	11/09/2024	98.18	1.02
7	10/10/2024	104.2	2.93

Long-term Trends

There are no long-term trends related to blast monitoring to report on yet. Future Annual Reviews will identify long term trends when trends emerge.

Comparison to EIS Predictions

The results for blasting were within the limits of the EIS predictions.

6.4.4 Management Measures

Management measures relating to blasting are outlined within Section 4 of the Dubbo Quarry Air Quality Management Plan. These include:

- Carrying out blasting within the operating hours outlined in Condition A12 of the Development Consent;
- Conducting blasts in accordance with Condition B17 of the Development Consent;
- Delaying blast shots during unfavourable weather (where practical); and
- Designing blast areas to minimise the number of blasts needed per year.

6.4.5 Proposed Improvements

There are no proposed improvements regarding blasting for the next reporting period.

6.5 Traffic Management

6.5.1 EIS Predictions

A Traffic Impact Assessment (TIA) was completed for the EIS (2021), which describes the existing local and regional traffic network surrounding the existing site and assesses the impacts of the project on that network.

The EIS (2021) stated 'project-related heavy vehicles during the project will have no significant impact to the capacity of the local or regional road network and will not significantly impact the performance of the intersection of Sheraton Road and Mitchell Highway. The Mitchell Highway and Sheraton Road in proximity to the Quarry are considered to have good local traffic safety conditions currently given the low number of reported crashes (one crash per year), which is expected to continue through project operation. However, a road safety audit was prepared for the project as requested by the SEARs. The audit identified several potential safety items, most of are the result of school bus and light vehicle traffic movements on Sheraton Road'.

6.5.2 Approved Criteria

The site is required to operate traffic and manage transport through compliance with the requirements of the conditions from the Development Consent listed below:

Extraction, Importation and Transportation Limits

A11. The Applicant must limit heavy vehicles leaving the site to:
(a) 20 laden trucks per hour; and
(b) 121 laden trucks per day.

Note: *Heavy vehicle movements to and from the site are also controlled by the operating hours specified in condition A12 and provisions in condition B44.*

Transport

Monitoring of Product Transport

B42. The Applicant must keep accurate records of all laden heavy vehicle movements from the site (including hourly heavy vehicle movements) and provide a summary of these records to the Department on request.

Road Upgrades

B43. The Applicant is required to enter into a Works Authorisation Deed (WAD) with Council before finalising the design or undertaking any construction work within or connecting to the road reserve of Sheraton Road.

Transport Operating Conditions

B44. The Applicant must:

(a) adhere to the approved haulage route shown in Appendix 4, unless otherwise agreed by the Planning Secretary in consultation with Council;

(b) ensure that all laden heavy vehicles entering or exiting the site have their loads covered;

(c) ensure that no heavy vehicles arrive at the site prior to 4:00 am;

(d) take all reasonable steps to minimise traffic safety issues and disruption to local road users; and

(e) take all reasonable steps to ensure that appropriate signage is displayed on all heavy vehicles used to transport quarry products from the development so they can be easily identified by other road users.

6.5.3 Key Environmental Performance

Dubbo Quarry undertook monitoring of truck movements daily throughout 2024 to ensure compliance with movements and volume requirements discussed above. A copy of these monitoring results has been included in **Table 16**.

Table 16: Monthly Truck movements for 2024

Month of 2024	Total Number of Laden Truck Movements
January	658
February	770
March	802
April	632
May	979
June	660
July	626
August	494
September	793
October	951
November	1066
December	739
Total	**9170**

There was a total of 9,170 laden loads exported from Dubbo Quarry in 2024. There were no reportable transport incidents or exceedances.

6.5.4 Management Measures

Management measures relating to traffic are outlined within Section 4 of the Dubbo Quarry Traffic Management Plan. These include:

- Following procedures outlined in the Driver's Code of Conduct (Appendix A of the Traffic Management Plan);
- Adhere to the relevant conditions in the Development Consent;
- Use appropriate site access;
- Vehicle parking in designated parking areas;
- Following all signposted speed limits within and outside of the site; and
- Initial induction and regular staff training thereafter including toolbox talks and staff meetings.

The Traffic Management Plan was approved by DPHI on 22 September 2023.

6.5.5 Proposed Improvements

There are no proposed improvements related to traffic management for the next reporting period.

6.6 Biodiversity

6.6.1 EIS Predictions

A Biodiversity Development Assessment Report (BDAR) was prepared as part of the EIS (2021).

The EIS (2021) stated 'the project has been designed to avoid significant clearing and to minimise the impacts to biodiversity values. Efforts were made to avoid those woodland areas with larger patch size and greater connectivity to other areas of habitat outside of the disturbance area.

Most vegetation within the project area is highly degraded and of low quality. The project will require clearance of 5.82 ha of native vegetation that will be cleared for the project. This will require an offset to be provided to retire 132 ecosystem credits. The disturbance area has low importance for threatened flora or fauna species. Targeted surveys did not detect any threatened species, and no species credits are required. Additionally, there will be no significant impacts to Matters of National Environmental Significance (MNES)'.

6.6.2 Approved Criteria

There are no specific criteria relating to biodiversity within the Development Consent. However, Condition B48 outlines the requirement to complete a Biodiversity Offset Strategy and Condition B49 outlines the requirement to complete a Biodiversity Management Plan.

6.6.3 Key Environmental Performance

Dubbo Quarry implemented the Biodiversity Management Plan during the reporting period. In 2024, Dubbo Quarry was in an early phase of the continuation project, with management measures from pre-

quarrying and disturbance phases triggered.

Long-term Trends

There are no long-term trends related to biodiversity to report on yet. Future Annual Reviews will identify long term trends when trends emerge.

Comparison to EIS Predictions

There was no comparison to be made to the EIS predictions as no biodiversity monitoring was carried out within the reporting period.

6.6.4 Management Measures

Management measures relating to biodiversity are outlined within Section 3 of the Dubbo Quarry Biodiversity Management Plan. These include:

- Weed and pest management;
- Salvaging of habitat trees and other resources;
- Marking disturbance boundaries through fencing or flagging;
- Bushfire management;
- Rehabilitation and biodiversity offset area monitoring;
- Erosion and sedimentation control; and
- Retainment and/or establishment of vegetation screening surrounding the Project area.

6.6.5 Proposed Improvements

There are no proposed improvements related to biodiversity for the next reporting period.

6.7 Aboriginal Heritage

6.7.1 EIS Predictions

A preliminary Aboriginal cultural heritage assessment (ACHA) was conducted as part of the EIS (2021) which assessed the potential Aboriginal cultural heritage impacts associated with the project.

The EIS (2021) stated ‘a search of the Aboriginal Heritage Information Services (AHIMS) database identified 78 sites within a 10 km x 10 km search area centered on the project area. There are no AHIMS sites recorded within the project area. During a site visit, four Aboriginal sites were identified within the project area. No modified trees, ceremonial sites, Aboriginal stone arrangements, rock art or burials were identified within the project area.

The project will require the removal of one identified Aboriginal site, DQ-IF1, which consists of an isolated artefact and is assessed as a site of low archaeological significance. The design of the current project

avoids impact on all remaining identified Aboriginal sites. Relocation by a qualified archaeologist is proposed for Aboriginal site DQ-IF1. All other identified sites within the project area will be conserved under the project'.

6.7.2 Approved Criteria

The site is required to manage heritage through compliance with the requirements of the conditions from the Development Consent listed below:

HERITAGE

Protection of Aboriginal Heritage

B52. The Applicant must ensure that the development does not cause any direct or indirect impact on any identified Aboriginal object located outside the approved disturbance areas, beyond those predicted in the document/s listed in condition A2(c).

B53. If any previously unknown Aboriginal object or Aboriginal place is discovered on the site, or suspected to be on the site:

- *a) all work in the immediate vicinity of the object or place must cease immediately;*
- *b) a 10-metre buffer area around the object or place must be cordoned off; and*
- *c) Heritage NSW and the Department must be contacted immediately.*

B54. Work in the immediate vicinity of any newly discovered Aboriginal object or place may only recommence if:

- *a) the potential Aboriginal object or place is confirmed by Heritage NSW in consultation with the Registered Aboriginal Parties, not to be an Aboriginal object or Aboriginal place; or*
- *b) The Planning Secretary is satisfied as to the measures to be implemented in respect of the Aboriginal object or place and makes a written direction in that regard.*

B55. The Applicant must ensure:

- *a) salvage of known Aboriginal objects within the disturbance footprint occurs in accordance with the procedures and commitments detailed in the document/s listed in condition A2(c);*
- *b) that all known Aboriginal objects or Aboriginal places on the site are properly recorded, those records are kept up to date and are reported to the Aboriginal Heritage Information Management System;*
- *c) all workers receive suitable Aboriginal cultural heritage training/inductions prior to carrying out any activities which may cause impacts to Aboriginal objects or places, and that suitable records are kept of these inductions;*
- *d) that the Applicant facilitates ongoing consultation and involvement of Registered Aboriginal Parties in the conservation and management of Aboriginal cultural heritage on the site; and*

e) *the appropriate care, control and storage of Aboriginal objects salvaged on the site, both during the life of the development and in the long-term occurs in consultation with Registered Aboriginal Parties.*

6.7.3 Key Environmental Performance

There were no issues relating to Aboriginal Heritage during the reporting period.

6.7.4 Management Measures

Management measures relating to Aboriginal heritage are outlined within the Dubbo Quarry Aboriginal Cultural Heritage Management Plan (2023). These include:

- Consultation with Aboriginal stakeholders during the preparation of the Dubbo Quarry Aboriginal Cultural Heritage Management Plan;
- Records of known sites of Aboriginal heritage significance;
- The Quarry Manager or delegate will undertake monthly inspections of the known Aboriginal and cultural heritage sites;
- Training of staff and contractors; and
- Procedure for impacts of unexpected finds.

6.7.5 Proposed Improvements

There are no proposed improvements related to heritage management for the next reporting period.

6.8 Waste Minimisation

6.8.1 Approved Criteria

The site is required to manage waste minimisation through compliance with the requirements of the conditions from the Development Consent listed below:

WASTE

B66. The Applicant must:

a) *manage onsite sewage treatment and disposal in accordance with the requirements of an applicable EPL and/or Council approval;*

b) *classify all waste in accordance with the Waste Classification Guidelines (EPA, 2014);*

c) *minimise the waste generated by the development;*

d) *ensure that the waste generated by the development is appropriately stored, handled, and disposed of; and*

e) *monitor and report on waste minimisation and management in the Annual Review referred to in condition D9.*

6.8.2 Key Environmental Performance

A summary of the waste generated by the Quarry is shown below in **Table 17**.

Table 17**: Waste Summary**

Waste Type	2024 (approximate volumes)	2023 (approximate volumes)
Scrap Steel	2 m^3	24 m^3
General Waste - Rubbish	36 m^3	45 m^3
General Waste - Cardboard	16.5 m^3	10.5 m^3
Industrial Waste	Nil	Nil
Waste Oil	8,000 L	16,000 L
Septic	Nil	Nil
Oily Water	Nil	Nil

Compared to the 2023 Annual Review, the volume of scrap steel, general rubbish, and waste oil generated by the site declined in 2024.

6.8.3 Management Measures

Waste generated at the Quarry include general waste and recyclable products produced at the administration building, and processing and maintenance areas. These wastes are then collected by a licensed contractor. Dubbo Quarry will continue to separate waste into the appropriate waste streams for disposal.

6.8.4 Proposed Improvements

There are no proposed improvements to waste management for 2025, however the Quarry will continue to look for opportunities to reduce waste where possible.

7 Water Management

This section provides an overview of water management at the site. For a detailed review into the water results for 2024, refer to the Annual Water Management Review in **Appendix B**.

7.1 EIS Predictions

The EIS states 'the water balance modelling completed for the proposed water management system predicts that the project will effectively reduce discharges to Eulomogo Creek. This will beneficially impact the natural water quality and flow Eulomogo Creek. This is consistent with objectives for uncontrolled streams and major regulated rivers stipulated in NSW Water Quality and River Flow Objectives (DECCW 2006).

The key outcomes of the proposed water management system include:

- Groundwater inflows into new and existing quarry pits will be minimised (from approximately 191 ML/year to 27 ML/year in a dry year scenario); and
- The frequency and magnitude of discharges from the East Pit and sedimentation dams will be substantially reduced (with minor discharges predicted only from sediment basin overflows during dry years and median years, and discharge volumes during wet years decreasing from 411 ML/year to 169 ML/year)'.

7.2 Approved Default Guideline Values

The Quarry monitors water quality according to the approved *Water Management Plan* and use the default guideline values (DGVs) derived from the *Australian & New Zealand Guidelines for Fresh & Marine Water Quality (ANZG 2018)*. These DGVs are shown in **Table 18** below. The water monitoring locations are shown in **Figure 5**.

Table 18**: Water quality monitoring guideline values (ANZG 2018)**

Analyte	Units	DGV (Source - ANZG (2018))
Turbidity	NTU	<20
pH	pH units	7.0-8.0
Electrical Conductivity (EC)	(µs/cm)	504
Total Suspended Solids (TSS)	mg/L	-
Total Dissolved Solids (TDS)	µg/L	-
Total Hardness (caCO3)	mg/L	-
Total Phosphorus	mg/L	<0.035
Reactive Phosphorus	mg/L	0.035
Total Nitrogen	mg/L	<0.6
Ammonia	mg/L	0.013

Analyte	Units	DGV (Source - ANZG (2018))
Oxidised Nitrogen (Nox)	mg/L	0.6
Total Kjeldahl Nitrogen (TKN)	mg/L	-
Aluminium (Al)	mg/L	0.055
Copper (Cu)	mg/L	0.0014
Iron (Fe)	mg/L	0.3
Nickel (Ni)	mg/L	0.011
Zinc (Zn)	mg/L	0.008

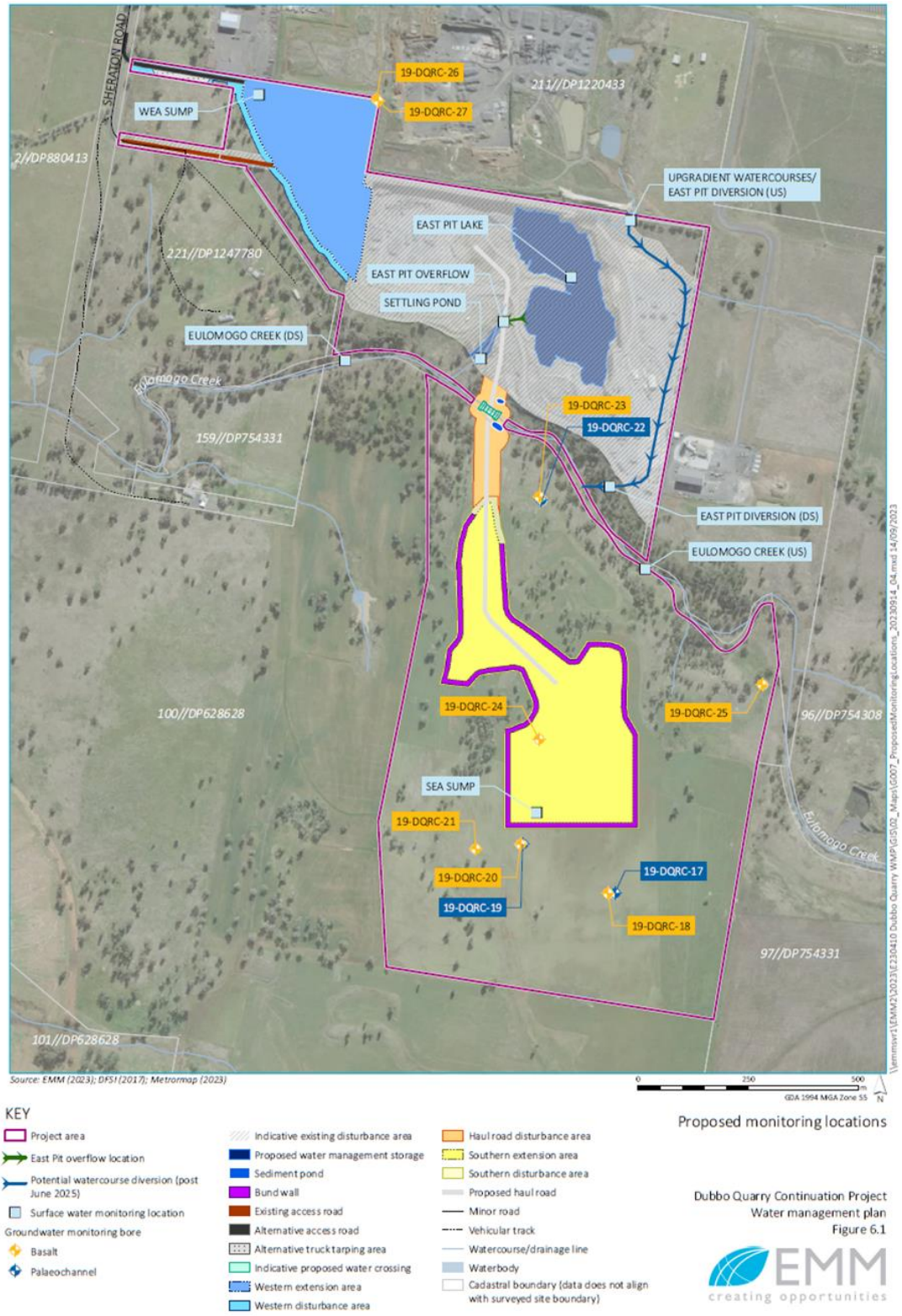

Figure 5: Water monitoring locations (source: Water Management Plan 2024)

7.3 Surface Water Results

Dubbo is required to conduct surface water monitoring across the site on a six-monthly basis. The surface water monitoring results for the 2024 reporting period are shown below in **Table 19** to **Table 21**. When reviewing these results, it should be noted that the Upgradient Watercourses were dry during the October monitoring. In addition, while the WEA Sump and SEA Sump are stipulated in the Water Management Plan, these points did not exist in 2024 due to the stage of the quarry expansion and therefore do not have associated monitoring results.

Table 19: Summary of Results Surface Water 2024 - Physio-chemical parameters

Sample ID	EC (µs/cm)		pH		Turbidity (NTU)		TSS (mg/L)		TDS (µg/L)		Total Hardness (caCO3) (mg/L)	
	11/4/24	22/10/24	11/4/24	22/10/24	11/4/24	22/10/24	11/4/24	22/10/24	11/4/24	22/10/24	11/4/24	22/10/24
Upgradient Watercourses	623	dry	7.1	Dry	**25.51**	Dry	59	Dry	405,000	Dry	120	Dry
Eulomogo Creek (US)	**1176**	**5200**	7.9	**8.2**	1.1	7.4	6.3	14	764,000	3,280,000	310	1600
Eulomogo Creek (DS)	**1125**	**779**	7.7	**8.6**	7.81	**1000**	42	180	731,000	499,000	310	330
Settling Pond	450		7.8	-	**159**		110	7.8	293,000	-	98	290
East Pit Lake	**1006**	792	**8.3**	**8.6**	**21.4**	4.3	7	9.2	654,000	508,000	280	330

*Note: exceedances of the Default Guideline Values (shown in **Table 18**) are highlighted in **BOLD.***

Table 20: Summary of Results Surface Water 2024 - Physio-chemical parameters continued

Sample ID	Ammonia (mg/L)		Oxidized Nitrogen (Nox) (mg/L)		Total Kjeldahl Nitrogen (TKN) (mg/L)		Total Nitrogen (mg/L)		Reactive Phosphorus (mg/L)		Total Phosphorus (mg/L)	
	11/4/24	22/10/24	11/4/24	22/10/24	11/4/24	22/10/24	11/4/24	22/10/24	11/4/24	22/10/24	11/4/24	22/10/24
Upgradient Watercourses	**0.76**	Dry	0.05	Dry	1.8	Dry	**1.8**	Dry	**0.14**	Dry	**0.4**	Dry
Eulomogo Creek (US)	**0.14**	**0.27**	**9.2**	0.05	2.3	1.7	**12**	**1.7**	**0.05**	**0.08**	**0.05**	**0.22**
Eulomogo Creek (DS)	**0.05**	0.01	0.18	**0.91**	0.9	1.0	**1.1**	**1.9**	**0.05**	**0.06**	**0.13**	**0.66**
Settling Pond	**0.05**	0.01	**0.78**	0.16	1.0	0.6	**1.8**	**0.8**	**0.08**	**0.05**	**0.14**	**0.07**
East Pit Lake	**0.02**	0.01	0.41	**0.7**	0.4	0.5	**0.8**	**1.2**	**0.05**	**0.05**	**0.05**	0.03

*Note: exceedances of the Default Guideline Values (shown in **Table 18**) are highlighted in **BOLD**.*

Table 21: Summary of Results Surface Water 2024 - Metals

Sample ID	Aluminium (Al) (mg/L)		Copper (Cu) (mg/L)		Iron (Fe)		Nickel (Ni) (mg/L)		Zinc (Zn) (mg/L)	
	11/4/24	22/10/24	11/4/24	22/10/24	11/4/24	22/10/24	11/4/24	22/10/24	11/4/24	22/10/24
Upgradient Watercourses	0.05	Dry	0.004	Dry	0.09	Dry	0.004	Dry	**0.017**	Dry
Eulomogo Creek (US)	0.05	0.05	**0.002**	0.001	0.05	0.24	0.001	0.003	**0.019**	0.005
Eulomogo Creek (DS)	0.05	0.05	0.001	**0.05**	0.05	0.05	0.002	0.001	**0.009**	0.005
Settling Pond	0.05	0.05	**0.002**	0.001	0.05	0.05	0.001	0.001	0.01	0.005
East Pit Lake	0.05	0.05	0.001	0.001	0.05	0.05	0.001	0.001	**0.015**	0.005

*Note: exceedances of the Default Guideline Values (shown in **Table 18**) are highlighted in **BOLD**.*

Long-term Trends

There are no long-term trends related to surface water monitoring to report on as site only commenced operations on 20 November 2023.

Comparison to EIS Predictions

Majority of the annual average values for the water quality targets exceeded the EIS predictions. Holcim did not receive any complaints relating to surface water during the reporting period.

7.4 Groundwater Results

Monthly groundwater water level was monitored in 2024. These results are presented in **Table *22***.

Table 22: Well Pump Level Monitoring

Month	Sample Date	Water Level (m)
January	30/01/2024	4.2
February	28/02/2024	4
March	27/03/2024	3.82
April	29/04/2024	3.9
May	29/05/2024	1.2
June	27/06/2024	0.4
July	29/07/2024	0.4
August	28/08/2024	0.2
September	27/09/2024	0.6
October	28/10/2024	1.5
November	27/11/2024	1.2
December	18/12/2024	0.2

There are currently no long-term trends as the monitoring program for the Continuation Project has only recently been approved. As part of the Annual Water Review and the Annual Review, Holcim will identify long term trends when they emerge.

7.4.1 Water Take

The water entitlements at Dubbo Quarry are summarised in **Table 23** below. Holcim took a combined 4.16 megalitres (ML) during the 2024 reporting period. Therefore, Holcim are compliant with their combined entitlements under the WALs.

Table 23: Water licenses and entitlements

Water License	Water Sharing Plan, Source and Management Zone (as applicable)	Entitlement
WAL29524	MDB Porous Rock Groundwater 2020: Gunnedah-Oxley Water Source	5 units (ML)
WAL34573	MDB Porous Rock Groundwater 2020: Gunnedah-Oxley Water Source	90 units (ML)

7.5 Water Use and Storage

Effective control of erosion and sediment movement at the site is carried out in accordance with Section 4.2 of the Dubbo Quarry Water Management Plan. All management measures were developed in accordance with Managing Urban Stormwater: Volume 1 (Landcom 2004) and Volume 2E (DECC 2008). These measures include:

- Sedimentation basins;
- Minimisation of disturbed areas;
- Drainage works to divert runoff from disturbed areas to a pit sump;
- Diversion of clean water from undisturbed areas around working areas; and
- Effective general management of surface water during operations.

7.6 Proposed Improvements

Dubbo Quarry is currently in the process of reviewing the Water Management Plan in accordance with its review and revision requirements.

8 Rehabilitation Management

8.1 Rehabilitation Performance During the Reporting Period

There was no rehabilitation completed during the reporting period.

8.2 Summary of the Current Rehabilitation and Disturbance

A summary of the rehabilitation and disturbance status is outlined in **Table 24**.

Table 24**: Rehabilitation and Disturbance Status**

Quarry Area Type	2023 (ha)	2024 (ha)	2025 (Predicted) (ha)
A. Total Quarry Footprint[1]	36.1	39.0	41.3
B. Total Active Disturbance[2]	36.1	39.0	41.3
C. Land Being Prepared for Rehabilitation[3]	0	0	0
D. Land Under Active Rehabilitation[4]	0	0	0
E. Completed Rehabilitation[5]	0	0	0

Note: Areas are based on a review of GIS.
[1]Total disturbance and rehabilitation.
[2]Total disturbance within the Development Consent boundary
[3]Rehabilitation being shaped in a phase of decommissioning, landform establishment and growth medium development.
[4]Rehabilitation under a phase of ecosystem and land use establishment or ecosystem and land use sustainability
[5]This refers to rehabilitation that has been signed off from the Resources Regulator.

8.3 Actions for the Next Reporting Period

The DPHI 2015 Annual Review Guidelines require the Annual Review to outline the rehabilitation actions proposed during the next reporting period. A Rehabilitation Management Plan for Dubbo Quarry has been submitted to the DPHI but is not yet approved. Therefore, due to the early stage of the project, there are currently limited opportunities for rehabilitation actions.

9 Summary of Environmental Performance

A summary of the performance of environmental management measures and sampling results are detailed in **Table 25**.

Table 25**: Environmental performance summary for 2024**

Aspect	Approval Criteria/EIS Prediction	Performance During the Reporting Period	Trend/Key Management Implications	Implemented/Proposed Management Actions
Noise	The EIS stated: Construction noise management levels (NMLs) will be exceeded at two of the closest noise sensitive receivers. However, noise generating construction work will be relatively short in nature (up to eight weeks) and during standard hours (day) only. During operation of the project, NMLs will be exceeded at several assessment locations.	All noise monitoring results were compliant in 2024.	Holcim will continue to refer to the management measures outlined in the approved Noise Management Plan.	No additional actions proposed for 2025.
Air Quality	The EIS stated: Predicted concentrations and deposition rates for incremental particulate matter will be below the applicable impact assessment criteria at all assessment locations.	There were five exceedances in PM10 in 2024. Power supply to monitors was resolved in 2024.	Holcim will continue to refer to the management measures outlined in the approved Air Quality Management Plan.	Holcim will continue to implement the air quality monitoring program.
Blasting	The EIS predicted no exceedance in overpressure and vibration.	All blasts were compliant in 2024.	Holcim will continue to refer to the management measures outlined in the approved Air Quality Management Plan.	No additional actions proposed for 2025.
Water Management	The EIS stated: “There will be no significant change to the amount of operational water used, apart from additional water used for dust suppression purposes.”	Water monitoring was completed as per the Water Management Plan. Holcim remained within	Holcim will identify trends in future Annual Reviews as they emerge in the monitoring data. Holcim will	No additional actions proposed for 2025.

Aspect	Approval Criteria/EIS Prediction	Performance During the Reporting Period	Trend/Key Management Implications	Implemented/Proposed Management Actions
	"There will be no impact to local groundwater users, both landowners and potential groundwater dependent ecosystems, as there will be no groundwater take or change to groundwater levels or quality as a result of the project."	allocations for water take in the reporting period. There were no reportable incidents for water in 2024.	continue to refer to the management measures outlined in the approved Water Management Plan.	
Rehabilitation	The project area will be progressively rehabilitated during operation of the project, where possible.	No rehabilitation occurred in the reporting period.	Holcim will continue to refer to the management measures outlined in the EIS and the Rehabilitation Management Plan once approved.	No additional actions proposed for 2025.
Biodiversity	The majority of vegetation within the project area is highly degraded and of low quality.	There were no biodiversity issues identified in the reporting period.	Holcim will continue to refer to the management measures outlined in the approved Biodiversity Management Plan.	No additional actions proposed for 2025.
Heritage	The EIS identified one aboriginal heritage site (DQ-IF1) in the project footprint. This find was relocated.	There were no additional heritage finds in 2024. There were no heritage issues identified in the reporting period.	Holcim will continue to refer to the management measures outlined in the EIS and the approved Aboriginal Cultural Heritage Management Plan.	No additional actions proposed for 2025.

10 Community

10.1 Community Engagement Activities

Holcim has maintained community engagement measures during the reporting period by undertaking the following activities in accordance with Condition D15 of the Development Consent:

- Maintenance of a website (containing publicly available documents);
- A telephone number, email and postal address (on the website) for community complaints and feedback;
- A copy of the Complaints Register is maintained on the company website; and
- All documents and items displayed on the website are regularly updated by Holcim staff.

Dubbo Quarry is required to have a Community Consultative Committee (CCC). In 2024, the CCC met on 12 February and 26 November. The CCC meeting minutes are made publicly available on the Dubbo Quarry website.

10.2 Community Contributions

Dubbo Quarry made a contribution to the Newtown Cricket Club in 2024, supporting local sport.

10.3 Complaints

A review of the Holcim Complaints Register did not identify any complaints from external stakeholders during the reporting period. The monthly reports for the complaints register are available to the public on the Holcim website.

Information to contact the site or to make a complaint is available on the Quarry site webpage (https://www.holcim.com.au/dubbo-quarry).

11 Independent Environmental Audit

Holcim was required to undertake an IEA within 12 months of the date of commencement of operations in accordance with Condition D11 of the Development Consent. The IEA site inspection component was completed in December 2024. Findings from this IEA will be included in the next Annual Review.

12 Incidents and Non-Compliances

Table 26 summarises the incidents and non-compliances at the Quarry in the reporting period.

Table 26: Summary of incidents and non-compliances

Date	Incident/Non-Compliance	Measurement	Description
6 May 2024	Non-Compliance with SSD-10417 Condition B19 (Air Quality Criteria), which states: The Applicant must ensure that particulate matter emissions generated by the development do not cause exceedances of the criteria in Table 5 at any residence on privately-owned land.	100.25 µg/m³	During daily activities on this day whilst conducting stripping activities within the approved Western Extension Area, quarry vehicles were hauling material directly past (within 5 metres) the SW monitor, although air quality controls were in place, an elevated PM10 result was recorded and reported to the EPA. This was notified to the department on 22-11-2024 when Holcim became aware of the result.
24 June 2024		62.29 µg/m³	During the review of the 2024 AEMR report in March 2025, Holcim became aware of the PM10 result recorded by the SW monitor, during an investigation of the result it was identified that a historic power supply issue (previously reported to the department) was a contributing factor to the result, this influenced the average to a much shorter (8hr) period. These rectifications have now been addressed
18 December 2024		54.71 µg/m³	During an independent environmental audit, a draft was received on March 11, 2025, it was discovered that the SW monitor had recorded a PM10 result of 54.71 ug/m3. Upon investigation of this, it was apparent that the site had failed to receive an alert from the Air Quality software which delayed the reporting of the result to the department. A letter of notification was issued on 19-03-2025 when Holcim became aware of the result.

13 Activities to be Completed in the Next Reporting Period

Holcim staff will undertake the following works and improvement measures and projects in 2024 to ensure compliance with the consent and to ensure that effective environmental management controls are operating in accordance with the requirements of the Consent. **Table 27** outlines the activities planned for the 2025 calendar year, the next reporting period.

Table 27**: Planned activities or improvement measures for 2025**

Topic	Description of Activities or Improvement Measures
Air Quality Monitoring	Holcim will continue to review the function of air quality monitors as the Continuation Project progresses.
IEA	Holcim will continue to address the Audit Action Plan following the 2024 IEA.

APPENDIX A – Air Quality Monitoring Results 2024

Date	SW Monitor		
	PM2.5 (µg/m³)	PM10 (µg/m³)	TSP (µg/m³)
22/03/2024	1.40	2.19	2.57
26/03/2024	5.92	12.83	16.1
27/03/2024	7.22	17.47	22.18
29/03/2024	6.59	14.53	18.49
3/04/2024	6.21	17.39	22.96
5/04/2024	5.79	8.15	9.05
9/04/2024	1.83	4.49	5.77
10/04/2024	3.09	6.74	8.52
11/04/2024	3.65	10.51	14.09
12/04/2024	4.99	9.65	11.95
13/04/2024	3.93	8.30	10.55
14/04/2024	3.20	8.12	10.84
15/04/2024	3.06	8.27	11.16
16/04/2024	3.91	8.66	11.23
17/04/2024	3.68	7.43	9.35
18/04/2024	7.48	12.77	15.58
19/04/2024	2.94	5.52	6.81
20/04/2024	2.52	5.93	7.4
21/04/2024	6.90	24.14	33.04
22/04/2024	2.53	7.64	10.17
23/04/2024	2.08	7.51	10.47
24/04/2024	3.39	8.07	10.53
25/04/2024	4.72	16.72	23.6
26/04/2024	3.26	8.04	10.37
27/04/2024	2.53	5.75	7.31
28/04/2024	3.18	9.86	13.36
29/04/2024	2.71	6.59	8.5
30/04/2024	4.84	20.99	30.03
1/05/2024	6.05	34.90	55.97
2/05/2024	4.26	25.92	37.86
3/05/2024	1.44	1.60	1.77
4/05/2024	2.13	2.77	3.17

Date	SW Monitor		
	PM2.5 (µg/m³)	PM10 (µg/m³)	TSP (µg/m³)
5/05/2024	6.35	41.62	62.28
6/05/2024	11.89	100.25	158.16
7/05/2024	5.00	40.36	61.98
8/05/2024	1.97	6.47	9.2
9/05/2024	0.16	0.56	0.91
10/05/2024	0.49	0.90	1.04
11/05/2024	2.09	2.59	2.87
12/05/2024	0.24	0.49	0.57
13/05/2024	1.12	2.15	2.69
14/05/2024	2.59	4.42	5.45
15/05/2024	5.78	18.56	25.6
16/05/2024	3.15	4.04	4.53
17/05/2024	1.79	2.71	3.1
18/05/2024	1.78	3.63	4.44
19/05/2024	1.48	2.85	3.42
20/05/2024	2.20	5.95	8.02
21/05/2024	1.48	4.30	5.79
22/05/2024	2.21	5.83	7.74
23/05/2024	3.79	8.85	11.49
24/05/2024	6.75	9.34	10.61
25/05/2024	12.28	15.21	16.57
26/05/2024	3.44	8.33	11.05
27/05/2024	4.76	19.90	28.55
28/05/2024	4.03	11.68	15.81
29/05/2024	4.08	15.12	21.15
31/05/2024	1.45	2.76	3.18
1/06/2024	1.71	3.00	3.47
2/06/2024	2.98	4.20	4.68
3/06/2024	3.45	8.11	10.39
4/06/2024	2.10	5.19	6.8
5/06/2024	4.30	6.56	7.81
6/06/2024	0.89	1.66	2.08
7/06/2024	1.34	2.57	3.18
8/06/2024	4.30	5.68	6.35
9/06/2024	0.79	1.59	1.96
10/06/2024	1.70	7.66	10.94
11/06/2024	3.20	7.34	9.09
12/06/2024	2.61	4.64	5.45

Date	SW Monitor		
	PM2.5 (µg/m³)	PM10 (µg/m³)	TSP (µg/m³)
13/06/2024	7.96	32.31	46.04
14/06/2024	0.59	0.40	0.33
15/06/2024	0.57	1.12	1.47
16/06/2024	1.26	246.73[1]	6.48
17/06/2024	3.38	5.89	6.99
18/06/2024	16.78	24.78	28.42
19/06/2024	3.53	12.56	17.51
20/06/2024	2.08	4.02	4.88
21/06/2024	1.68	2.79	3.29
22/06/2024	1.54	3.02	3.65
23/06/2024	4.16	11.37	15.05
24/06/2024	12.28	62.29	90.63
25/06/2024	2.64	6.12	7.88
26/06/2024	2.75	7.23	9.53
27/06/2024	2.88	11.90	17
28/06/2024	3.10	6.14	7.61
29/06/2024	0.30	0.70	0.93
30/06/2024	1.87	4.99	6.68
1/07/2024	1.35	4.56	6.14
2/07/2024	1.00	2.96	4.14
3/07/2024	4.98	21.33	30.33
4/07/2024	3.16	18.51	27.78
5/07/2024	1.79	4.17	5.27
6/07/2024	1.51	3.22	3.81
8/07/2024	0.51	0.86	1.08
9/07/2024	1.54	2.88	3.47
10/07/2024	1.78	3.06	3.58
11/07/2024	0.89	1.74	2.11
12/07/2024	1.16	1.62	1.85
13/07/2024	2.21	4.30	5.2
14/07/2024	1.11	2.11	2.52
16/07/2024	3.54	5.18	5.83
17/07/2024	1.13	2.10	2.51
18/07/2024	2.09	5.75	7.51
19/07/2024	6.51	13.94	16.88

[1] Quarry was not operational on this day (Sunday).

Date	SW Monitor		
	PM2.5 (µg/m³)	PM10 (µg/m³)	TSP (µg/m³)
20/07/2024	6.76	14.96	18.18
21/07/2024	5.36	11.43	13.85
22/07/2024	4.19	8.63	10.36
23/07/2024	4.35	11.55	15.09
24/07/2024	4.68	12.49	16.35
25/07/2024	1.60	3.17	3.84
27/07/2024	1.58	3.49	4.28
28/07/2024	2.09	4.38	5.26
29/07/2024	1.31	2.97	3.65
30/07/2024	1.47	3.76	4.77
31/07/2024	2.52	8.73	11.88
1/08/2024	3.95	17.34	25.25
2/08/2024	1.87	4.38	5.46
4/08/2024	9.09	13.85	16.41
5/08/2024	0.62	1.32	1.63
6/08/2024	0.67	1.52	1.89
8/08/2024	4.83	10.43	13.07
9/08/2024	2.35	4.35	5.2
11/08/2024	5.42	21.31	30.38
12/08/2024	5.02	24.95	36.48
14/08/2024	2.34	3.94	4.92
16/08/2024	2.21	4.56	5.51
18/08/2024	12.09	58.93[2]	84.96
27/08/2024	2.96	7.04	9.02
28/08/2024	7.48	15.90	19.45
29/08/2024	4.87	10.51	13.21
30/08/2024	7.16	14.09	17.15
31/08/2024	4.28	7.24	8.46
1/09/2024	5.25	11.49	14.2
2/09/2024	6.49	13.07	15.74
3/09/2024	9.90	23.23	30.1
4/09/2024	8.59	17.05	20.9
5/09/2024	8.73	16.04	19.49
6/09/2024	4.36	8.37	10.2
7/09/2024	2.28	3.80	4.46

[2] Quarry was not operational on this day (Sunday).

Date	SW Monitor		
	PM2.5 (µg/m³)	PM10 (µg/m³)	TSP (µg/m³)
8/09/2024	2.78	6.53	8.25
9/09/2024	2.57	5.12	6.39
10/09/2024	4.63	8.61	10.62
11/09/2024	2.41	4.61	5.73
12/09/2024	1.69	3.60	4.5
13/09/2024	2.20	4.69	5.86
14/09/2024	1.28	2.82	3.6
15/09/2024	1.93	4.64	5.94
16/09/2024	2.21	5.75	7.49
17/09/2024	2.19	5.80	7.76
18/09/2024	1.54	4.09	5.4
19/09/2024	3.58	8.29	10.45
20/09/2024	2.43	5.65	7.16
21/09/2024	2.18	4.37	5.42
22/09/2024	3.70	7.62	9.75
23/09/2024	3.86	9.24	12.18
24/09/2024	11.95	26.02	33.71
25/09/2024	6.22	6.14	5.93
26/09/2024	2.46	11.32	16.13
27/09/2024	1.21	1.90	2.07
28/09/2024	1.63	1.64	1.64
29/09/2024	2.37	4.21	4.96
30/09/2024	3.21	5.92	6.99
1/10/2024	5.00	15.75	21.59
2/10/2024	9.81	37.46	53.06
3/10/2024	6.20	12.00	14.71
4/10/2024	2.59	2.67	2.46
5/10/2024	2.76	4.44	5.1
7/10/2024	3.28	4.50	4.92
8/10/2024	3.70	6.49	7.77
9/10/2024	1.83	7.34	10.29
10/10/2024	1.67	4.80	6.99
11/10/2024	2.24	4.57	6.04
12/10/2024	4.68	9.52	11.71
13/10/2024	4.64	8.31	9.42
14/10/2024	5.74	27.10	39.96
15/10/2024	2.81	5.65	7.63
16/10/2024	3.00	2.74	2.54

Date	SW Monitor		
	PM2.5 (µg/m³)	PM10 (µg/m³)	TSP (µg/m³)
17/10/2024	5.34	9.83	12.13
18/10/2024	3.91	6.77	8.39
19/10/2024	0.99	2.86	3.93
20/10/2024	1.40	2.74	3.58
21/10/2024	6.17	13.87	17.65
22/10/2024	4.19	7.64	8.93
23/10/2024	4.03	8.54	10.75
24/10/2024	3.72	8.28	10.39
25/10/2024	2.39	6.18	7.97
26/10/2024	3.20	8.06	10.24
27/10/2024	3.17	7.98	10.1
28/10/2024	2.55	7.10	9.32
29/10/2024	4.15	10.35	13.22
30/10/2024	5.63	12.44	15.6
31/10/2024	3.53	9.51	12.51
1/11/2024	1.79	5.04	6.72
2/11/2024	4.24	10.08	12.99
3/11/2024	4.24	10.03	12.78
4/11/2024	4.80	12.17	15.83
5/11/2024	7.44	13.56	16.35
6/11/2024	6.90	12.75	15.38
7/11/2024	4.37	10.13	12.9
8/11/2024	2.71	6.10	7.66
9/11/2024	2.57	6.56	8.39
10/11/2024	2.48	6.74	8.85
11/11/2024	9.91	20.59	25.39
12/11/2024	8.60	20.01	26.17
13/11/2024	4.41	10.68	13.94
14/11/2024	2.95	7.28	9.53
15/11/2024	8.83	26.37	35.98
16/11/2024	3.18	7.67	9.95
17/11/2024	3.63	9.81	12.89
18/11/2024	2.90	7.25	9.27
19/11/2024	4.37	11.85	15.35
20/11/2024	7.43	25.81	35.29
21/11/2024	8.21	38.02	54.2
22/11/2024	4.75	20.25	28.57
23/11/2024	1.70	5.98	8.24

Date	SW Monitor		
	PM2.5 (µg/m³)	PM10 (µg/m³)	TSP (µg/m³)
24/11/2024	1.93	6.05	8.16
25/11/2024	4.42	18.31	25.79
26/11/2024	6.07	27.63	39.76
27/11/2024	3.70	10.91	14.56
28/11/2024	3.94	11.63	15.58
29/11/2024	4.88	7.27	8.41
30/11/2024	2.39	3.57	4.14
1/12/2024	1.38	3.48	4.56
2/12/2024	1.44	4.41	5.95
3/12/2024	2.26	5.73	7.4
4/12/2024	2.52	6.78	8.96
5/12/2024	8.25	20.82	27.31
6/12/2024	4.09	9.62	12.3
7/12/2024	2.14	4.81	6.04
8/12/2024	1.28	3.36	4.42
9/12/2024	3.28	8.63	11.45
10/12/2024	2.77	6.07	7.53
11/12/2024	4.67	10.26	12.64
12/12/2024	1.93	6.49	8.81
13/12/2024	2.18	7.98	11.01
14/12/2024	3.20	11.82	16.26
15/12/2024	2.23	6.74	9.08
16/12/2024	10.85	30.49	40.83
17/12/2024	2.79	30.44	13.47
18/12/2024	11.68	54.71	78.03
19/12/2024	6.71	21.10	28.21
20/12/2024	5.63	14.88	19.08
21/12/2024	4.30	10.81	13.93
22/12/2024	7.92	13.83	16.58
23/12/2024	5.45	13.31	17.35
24/12/2024	2.84	7.32	9.48
25/12/2024	3.06	7.40	9.34
26/12/2024	3.73	9.60	12.29
27/12/2024	4.85	12.83	16.51
28/12/2024	3.12	7.51	9.51
29/12/2024	1.87	5.86	7.85
30/12/2024	5.37	11.43	14.17
31/12/2024	4.44	9.76	12.15

Date	SW Monitor		
	PM2.5 (µg/m³)	PM10 (µg/m³)	TSP (µg/m³)
Annual Average	3.80	11.35	13.75
Annual Average Compliance	Compliant	Compliant	Compliant
Number of Samples	254	254	254
Maximum	16.78	246.73	158.16
Minimum	0.16	0.40	0.33
24hr Exceedances	0	3	N/A

APPENDIX B – Annual Water Management Review (4Pillars Environmental Consulting, 2025)

Holcim (Australia) Pty Ltd

Dubbo Quarry Continuation Project, Dubbo, NSW

Annual Water Management Review (1 Jan 2024 - 31 Dec 2024)

March 25

Document Information

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Statement of capacity

4Pillars is an independent, professional consulting firm, providing expert advice on environmental matters to clients from a range of business sectors. This document has been approved by a certified environmental practitioner (CEnvP), with extensive experience in environmental management, impact assessment, monitoring, sampling and analysis. The performance and professional integrity of CEnvPs are independently verified by the Environment Institute of Australia and New Zealand (www.cenvp.org). For further information, please visit www.4Pillars.com.au.

Acknowledgement of Country

4Pillars acknowledges the Traditional Owners of the land on which this site is located, the people of the Wiradjuri Nation. We acknowledge their continuing connection to land and sea Country, and we pay our respects to their Elders past, present and emerging.

Disclosure statement

This document has been prepared by 4Pillars in their capacity as independent environmental professionals. The statements and conclusions of this document are based on an objective evaluation of the available facts and data.

No incentive or deterrence has been proffered to 4Pillars, any employee or shareholder of 4Pillars in relation to reaching a particular conclusion or achieving a particular outcome in relation to this matter.

Declaration and limitations of this document

To the best of our knowledge and (in part) based on information provided to us by the client or their representatives, the information contained in this document is accurate at the date of issue. Where feasible, 4Pillars has verified the accuracy of information provided to us by the client or their representatives. To the best of our knowledge, no statement or material in this document is false or intentionally misleading.

In carrying out this assessment and preparing this report, 4Pillars has used a degree of care and skill ordinarily exercised in environmental impact assessments by reputable members of the environmental profession in Australia.

No other warranty, expressed or implied, is made or intended. The opinions and judgements expressed in this report should not be construed as legal opinions or advice. 4Pillars is also not responsible or liable for any third-Party use or reliance on this report.

Enquiries and requests for further information should be directed to 4Pillars via hello@4Pillars.com.au.

Document control

<table>
<tr><th>Version</th><th>Status</th><th colspan="2">Date</th></tr>
<tr><td>0.1</td><td>Draft</td><td colspan="2">March 17, 2025</td></tr>
<tr><td>0.2</td><td>Final Draft</td><td colspan="2">March 19, 2025</td></tr>
<tr><td>1.0</td><td>Final</td><td colspan="2">March 21, 2025</td></tr>
<tr><td>1.1</td><td>Final (incl. WBM)</td><td colspan="2">March 28, 2025</td></tr>
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CEnvP Seal: 1718</td><td>March 28, 2025</td><td>  </td><td>  </td></tr>
</table>

Table of Contents

1. Introduction

1.1 Overview

4Pillars Environmental Consulting Pty Ltd (4Pillars) was engaged by Holcim (Australia) Pty Ltd (Holcim, the Client, or the Proponent) to conduct an Annual Water Management Review (AWMR) for the Dubbo Quarry (the Quarry or the Site), located within the Dubbo Regional Council Local Government Area (LGA) on Sheraton Road, Dubbo, NSW 2830, approximately 1.9 km west of Dubbo, NSW.

This AWMR has been prepared in accordance with the requirements outlined in Section 6.3.1 of the Site's Water Management Plan (WMP), prepared by EMM Consulting Pty Ltd in 2023 (reference number: E230410). This report presents the findings of the water monitoring conducted at the Site from 1 January 2024 to 31 December 2024 (annual review period), in line with the monitoring protocols specified in the WMP. This is the first AWMR prepared for the 2023 WMP.

1.2 Purpose of this report

The purpose of this report is to provide information on the specific requirements of Section 6.3.1 of the WMP. These are presented in Table 1, below, along with section references.

Table 1: Contents of report, and references.

Requirement	Location within report
All data from water monitoring completed over the annual review period and assessed against relevant DGVs and compared to historic trends (where available).	Section 6
Water level hydrographs for all continuous surface and groundwater level data collected within the annual reporting period.	Section 6.1.1 and 6.3.1
An updated site water balance model informed by measured groundwater level, pit inflow and surface water data.	Section 4, Appendix 3
The outcomes from the stream and riparian condition monitoring.	Section 6.5, Location 1 to Location 9
Calculated water take volumes for each water year.	Section 6.4
Information on any East Pit overflows that occurred over the period.	Section 3.3
Assessment of the trigger thresholds in the trigger action plan.	Section 6.6
Any proposed actions.	Section 7

2. Site Context Summary

Holcim operates the Quarry, which produces various products, including high-quality basalt aggregates for use in the construction industry in concrete, asphalt, road base and other applications. The Site also produces other specialist materials, such as precoated sealing aggregates, which are treated with a hydrocarbon (bitumen) emulsion.

The Quarry has been operating since 1980 under a local development consent granted by the former Talbragar Shire Council, now the Dubbo Regional Council. This approval did not specify a production rate; however, production was capped at the maximum output of the approved processing infrastructure, which had a theoretical throughput of 500,000 tonnes per annum. The Quarry had operated at an average production rate of around 350,000 tonnes per annum. In 2020/21, the resources within the approved extraction area were almost exhausted, and an application to expand the quarry was lodged. Under the relevant planning thresholds and rules at the time, the proposed extension/continuation project triggered the 'State Significant Development' pathway under the *Environmental Planning*

and Assessment Act 1979 (**EP&A Act**). The SSD application was approved and the Consent, SSD 10417 was determined on 2 March 2023. The Site details are provided in Table 2.

Table 2: Site overview.

<table>
<tr><th colspan="2">Site and Existing Development Overview</th></tr>
<tr><td>Site Common Name</td><td>Dubbo Quarry</td></tr>
<tr><td>Street Address</td><td>Sheraton Road, Dubbo, NSW 2830</td></tr>
<tr><td>Lot/Section/DP</td><td>• 222/-/DP1247780 (formerly Lot 1 DP 623367 and part Lot 22 DP 793541)
• Part Lot 100 DP 628628
• Part Lot 221 DP 1247780 (formerly Lot 1 DP 623367)
• A portion of crown land</td></tr>
<tr><td>Local Government Area</td><td>Dubbo Regional Council</td></tr>
<tr><td>Zoning</td><td>• RU1: Primary Production
• E5: Heavy Industrial
• RE2: Private Recreation
(Dubbo Regional Local Environmental Plan 2022)</td></tr>
<tr><td>Local Environmental Plan and Development Control Plan</td><td>• Dubbo Regional Local Environmental Plan 2022 (LEP)
• Dubbo Development Control Plan 2013 (DCP)</td></tr>
<tr><td>Current Site Use</td><td>Extractive activities</td></tr>
<tr><td colspan="2">Active Approvals</td></tr>
<tr><td>Active Development Consent(s)</td><td>
<table>
<tr><th>Development consent ID</th><th>Date determined</th><th>Purpose</th></tr>
<tr><td>SSD 10417</td><td>2/03/2023</td><td>Dubbo Quarry Continuation Project</td></tr>
<tr><td>DA280</td><td>18/03/1980</td><td>Establish Basalt Quarry</td></tr>
</table>
SSD 10417 is the current consent and is referred to as the ‘Consent’ throughout this report.
</td></tr>
<tr><td>Environment Protection Licence (EPL)</td><td>• Environment Protection Licence number: 2212
• Scheduled activities: Extractive activities</td></tr>
<tr><td>Total Permitted Waste Received Per Annum</td><td>• > 100000 - 500000 tonnes (T) annual capacity to extract, process or store.</td></tr>
<tr><td>Waste Permitted at the Site</td><td>
<table>
<tr><th>Waste type</th><th>Description</th><th>Activity</th><th>Limit</th></tr>
<tr><td>General or Specific exempted waste</td><td>Waste that meets all the conditions of a resource recovery exemption under Clause 92 of the Protection of the Environment Operations (Waste) Regulation 2014</td><td>Resource recovery</td><td>NA</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td>Water Access Licences (WALs)</td><td>
<table>
<tr><th>Licence number</th><th>Associated approval works</th><th>Description</th></tr>
<tr><td>WAL 29524- Groundwater/Aquifer</td><td>80WA707515 (Well)</td><td>Relates to the MDB Porous Rock Groundwater 2020: Gunnedah-Oxley Water Source and carries an entitlement of 5 ML.</td></tr>
<tr><td>WAL 34573 – Groundwater/Aquifers</td><td>80WA716742 (Excavation)</td><td>Relates to the MDB Porous Rock Groundwater 2020: Gunnedah-Oxley Water Source and carries an entitlement of 90 ML.</td></tr>
<tr><td>WAL 44946- Groundwater/Aquifers</td><td>No known linked works</td><td>Relates to the MDB Porous Rock Groundwater 2020: Gunnedah-Oxley Water Source and carries an entitlement of 140 ML.</td></tr>
<tr><td>WAL 43440 – Surface Water</td><td>80WA726133 (Excavation)</td><td>Relates to the Macquarie Bogan Unregulated Rivers 2012: Maryvale Geurie Water Source and carried an entitlement of 136 ML</td></tr>
</table>
</td></tr>
<tr><td colspan="2">Site Features</td></tr>
<tr><td>Total Site Area</td><td>• Entire Site: 141.35 hectares (ha)
• Extractive activities: 28.49 ha</td></tr>
<tr><td>Infrastructure on Site (Current)</td><td>• Crushing plant and ancillary processing equipment
• Site administration/office building with a separate amenities block
• Pre-coat plant
• Site workshop shed
• Light vehicle and truck parking areas
• Internal haul road
• Laydown areas
• Culvert under the quarry access road
• Stockpile areas
• On-site water management system
• diesel and bitumen storage.</td></tr>
<tr><td colspan="2">Site Environmental Features</td></tr>
<tr><td>Soil Landscape</td><td>Wongarbon: SI5504wg (eSpade 2013).</td></tr>
<tr><td>Underlying Geology</td><td>• Physiographic Unit: Tertiary Volcanics
• Geological Unit: Tertiary Basalt (Czb)
• Parent Rock: Olivine basalt
• Parent Materials: In situ and colluvial material</td></tr>
<tr><td>Watercourse(s) Present</td><td>Eulomogo Creek is located along the southern boundary of the Site.</td></tr>
<tr><td>Topography</td><td>Low undulating hills and rises with some stony hillocks. Elevations between 280- 360 m above sea level. Slopes gently inclined (3- 8%) and 1000- 4000 m long. Local relief ranges between 20- 60 m. Drainage lines are 400- 1500 m apart.</td></tr>
<tr><td>Vegetation</td><td>Vegetation on Site is mapped as following Plant Community Types:
• Western Slopes Grassy Woodlands,</td></tr>
</table>

	• Floodplain Transition Woodlands, • Riverine Plain Grasslands, • Floodplain Transition Woodlands, and • Not Native Vegetation.
Constraints	
Indigenous Heritage	• No Aboriginal sites or places identified on Site. • 33 Aboriginal places have been recorded within 1 km of the Site, but no Aboriginal sites have been recorded within 1 km (Aboriginal Heritage Information Management System (AHIMS), 06/03/2025).
Built and European Heritage	No built or European heritage identified on Site.
Biodiversity Values	Biodiversity value land is located along the southern boundary of the Site.
Hazards	
Bushfire Prone Land	The Site is identified as bush fire prone land containing: • Vegetation Buffer • Vegetation Category 3
Flood Prone Land	Not identified on Site or within 1km of the Site.
Landslide Risk	Not identified on Site or within 1 km of the Site.
Contaminated Land	Contaminated land was not identified on Site or within 1 km of the Sites (according to the EPA's Contaminated Land Register, 06/03/2025).
Protection	
Acid Sulphate Soil	Not identified on Site or within 1 km of the Site.
Drinking Water Catchment	Not identified on Site or within 1 km of the Site.
Mineral and Resource Land	Not identified on Site or within 1 km of the Site.
Natural Resource – Groundwater Vulnerability	Identified on the Site.
Riparian Land and Watercourses	Identified within the southern boundary of the Site.
Scenic Land Protection	Not identified on Site or within 1 km of the Site.
Terrestrial Biodiversity	Identified on the southern, western and northwestern side of the Site.
Environmentally Sensitive Land	Not identified on Site or within 1 km of the Site.
Applicable SEPPS	*State Environmental Planning Policy (SEPP) (Biodiversity and Conservation) 2021* *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* *State Environmental Planning Policy (Housing) 2021* *State Environmental Planning Policy (Industry and Employment) 2021* *State Environmental Planning Policy (Planning Systems) 2021* *State Environmental Planning Policy (Primary Production) 2021* *State Environmental Planning Policy (Resilience and Hazards) 2021* *State Environmental Planning Policy (Resources and Energy) 2021* *State Environmental Planning Policy (Sustainable Buildings) 2022* *State Environmental Planning Policy (Transport and Infrastructure) 2021*

3. Background

3.1 Overview

This section describes 4Pillars' understanding of the Site's water management system and water quality monitoring program.

3.2 Water management system

3.2.1 Surface water system

Eulomogo Creek Catchment

The Quarry is located within the Eulomogo Creek catchment, which spans an area of 52 km² to the east of the Site. Eulomogo Creek experiences an intermittent flow regime, meaning that, in a typical rainfall year, the streamflow is generally present for most of the year but may halt for weeks or even months, especially during late summer or early autumn. Flow in the creek is also likely to cease for extended periods during dry weather conditions.

Upgradient Watercourses

Two first-order watercourses, the Eastern and Northern Watercourses, flow into the East Pit of the Quarry. These watercourses are referred to as the upgradient watercourses in this AWMR. The Eastern Watercourse has a catchment area of 227 hectares to the east of the quarry, while the Northern Watercourse drains an area of 270 hectares to the north. The total combined catchment area for both watercourses is 497 hectares, or approximately 5 km². These catchments are primarily made up of cleared agricultural land. Additionally, the South Keswick Solar Farm and the South Keswick Quarry, operated by Maas Group, are situated within the Northern Watercourse catchment.

Both watercourses exhibit an ephemeral flow regime, meaning they only carry water following significant rainfall events. A water level logger was installed upstream of the East Pit in December 2022. However, during this review period, it was reported that the water level logger at the East Pit was frequently found on the ground beside the pit, resulting in the absence of recorded water level data during this time.

East Pit

The East Pit forms a major part of the Site's water management system, with its water cycle influenced by:

- Paleochannel inflows
- Inflows from upgradient watercourses
- Surface water runoff from the quarry area
- Water extraction for operational sue
- Dewatering of the East Pit Lake

3.2.2 Groundwater system

Basalt system

The basalt system is recharged by rainfall, which infiltrates through specific fractures in the rock. These fractures have limited storage capacity, as evidenced by the quick response of groundwater levels following recharge events. The system then discharges into the paleochannel, regional watercourses, and alluvial groundwater systems.

Paleochannel system

The paleochannel system is considered to be a confined aquifer with a northern flow direction. It has a high storage capacity and is highly transmissive. The groundwater's response to rainfall is slower and less pronounced due to the overlying confining layer (the basalt).

3.3 Summary of Site operations

Key project activities that were carried out during the annual review period included:

- Continued extraction and stockpiling in the existing disturbance area.
- Stripping of topsoil and overburden in the Western Extension Area.

- Blasting and commencement of extraction in the Western Extension Area.
- Continued stockpiling of aggregates and pre-treatment in the dispatch area in the east of the Site.

Holcim has advised that during the annual review period:

- No discharges were observed to occur from the East Pit to Eulomogo Creek (i.e. there were no East Pit overflows).
- Transfer of water from the East Pit Lake for Quarry's operational use was undertaken for dust suppression and truck washout.
- East Pit loggers were not able to be downloaded in October due to malfunctions with the older loggers and these were subsequently replaced with new loggers in December 2024.
- No continuous water level data for the upgradient watercourses for the annual review period was available.
- No field data was available for the Settling Pond for the sampling event occurred on 23/10/2024 due to a logger malfunction.
- East Pit logger used to monitor continuous water level was commonly found on the ground beside the East Pit, hence no water level data was recorded.
- WEA Sump, SEA Pump and East Pit Diversion (DS) are not yet present and expect to be constructed during the Quarry expansion post June 2025.

3.4 Water quality monitoring program

A water quality monitoring program was developed as part of the WMP for the Quarry. The monitoring program, including the locations for monitoring, is detailed in Table 3 and presented in Figure 5. The following sections outline the specifics of the program.

3.4.1 Water level

In December 2020, pressure transducers (data loggers) were installed in the eight groundwater monitoring bores. Of the eight bores:

- Two bores are screened in the paleochannel (DQRC-17 and DQRC-22). DQRC-17 is located approximately 1200 m upgradient while DQRC-22 is approximately 400 m upgradient of the East Pit.
- Four bores are screened in the saturated fractured basalt (DQRC-18, DQRC-21, DQRC-23, and DQRC-24).
- DQRC-20 is screened in the fractured basalt but has consistently remained dry.
- DQRC-19 has been deemed unreliable due to a suspected bore construction issue.

Three additional bores were drilled in 2019 (DQRC-25, DQRC-26, and DQRC-27).

East Pit Lake and the upgradient watercourses were installed with loggers to measure continuous water level in December 2022.

3.4.2 Water take

There are two pumps located within the East Pit and one in the Settling Pond area (a total of three pumps). These pumps are fitted with water meters to record the volume of water pumped out of the system for various operational purposes.

3.4.3 Water Quality

The water quality monitoring program includes biannual (six-monthly) testing and analysis of both groundwater (paleochannel) and surface water. Specific analytes to be tested and analysed within each location are outlined in Table 4.

3.4.2 Water monitoring locations

In accordance with the WMP, the water monitoring program includes the following specification (refer to Figure 5 for location):

Table 3: Water monitoring plan.

Monitoring	Locations	Purpose
Water level monitoring		
Paleochannel • Continuous water level monitoring (water level loggers) • Six-monthly monitoring (manual measurements)	• DQRC-17 • DQRC-22	• Monitor the groundwater level regime in the paleochannel • Collect data that can be used to assess connectivity with the East Pit
Surface water • Continuous water level monitoring (water level loggers)	• East Pit Lake • Upgradient watercourses	• East Pit Lake • Monitor changes in lake levels • Collect data that can be used to calculate groundwater and surface water take volumes and overflow durations and volumes Upgradient watercourses • Identify periods that runoff occurs
Basalt • Six-monthly monitoring (manual measurements)	• DQRC- 18, 20, 21, 23, 24, 25, 26, 27 • Monitoring at bores within the pit extraction areas can be discontinued once the bores are removed.	• Monitor the groundwater level
Water metering		
Operational water use • Water extracted from the East Pit for operational water use	• Water meter with the reticulation line between the extraction and use points.	• To measure the volume of water extracted from the East Pit for operational use (plant and dust suppression).

Water quality		
Surface Water and paleochannel (baseline) • Six-monthly water quality monitoring that is preferentially undertaken shortly after wet weather that results in surface water runoff.	**Paleochannel** • DQRC-17 • DQRC-22 **Surface water (if water is present)** • East Pit Lake • WEA Sump • SEA Sump • Settling Pond • Upgradient watercourses / East Pit Diversion (US)[1] • East Pit Diversion (DS) • Eulomogo Creek (US) • Eulomogo Creek (DS)	• To characterise the water quality in the paleochannel, at key locations in the water management system and in Eulomogo Creek.
Surface water (during East Pit overflows) • Monthly water quality monitoring undertaken when overflows from the East Pit occur. When an overflow event[2] commences, initial monitoring is to occur within three days followed by monthly monitoring until the overflow event ceases.	• East Pit overflow • Eulomogo Creek (US) • Eulomogo Creek (DS)	• To characterise the quality of overflows from the East Pit and any changes to the water quality in Eulomogo Creek.

[1]Monitoring location applies to after to the construction of the East Pit surface water diversion

[2] An overflow event could comprise overflows that occur intermittently for an extended period of time during wet conditions.

3.4.3 Analytes

The analytical suite for the surface and groundwater monitoring program is detailed in Table 4. All parameters were analysed at a laboratory accredited by the National Association of Testing Authorities (NATA), with the exception of pH, turbidity, and electrical conductivity. These parameters were monitored in the field using a calibrated water quality meter in line with the WMP.

Table 4: Surface and groundwater quality analytes.

Category	Analytes	Analysis Method
Physio-chemical parameters	• pH • Turbidity • Electrical conductivity	Analysis to be undertaken using a calibrated water quality meter OR by a NATA certified laboratory.
	• Total suspended solids • Total dissolved solids • Total hardness (as CaCO3) • Ammonia • Oxidised nitrogen (NOx) • Total kjeldahl nitrogen (TKN) • Total nitrogen Reactive • Total phosphorus	Analysis to be undertaken by a NATA-certified laboratory.
Metals (field filtered)	• Aluminium (Al) • Copper (Cu) • Iron (Fe) • Nickel (Ni) • Zinc (Zn)	Analysis to be undertaken by a NATA-certified laboratory. Samples field filtered using a 0.45 µm filter.

4. Water Balance

A predictive water balance model (WBM) developed to simulate the functionality of the Quarry's water management system for three scenarios was developed by EMM Consulting Pty Ltd and presented in Appendix B of the WMP. As part of the AWMR, an updated site water balance model informed by measured groundwater level, pit inflow and surface water data was required. This updated water balance was developed by Reditus Consulting Pty Ltd using updated climate and field data - including rainfall data from 1 January 1924 to 31 December 2024 - and is presented in Appendix 3.

5. Water Quality Monitoring

5.1 Monitoring overview

The following monitoring activities were conducted during the annual review period:

5.1.1 Water Level Monitoring:

- Continuous water level monitoring was carried out for the paleochannel at bores DQRC-17 and DQRC-22.
- No continuous water level data were available for the East Pit or the upgradient watercourses.

- Two six-monthly groundwater level monitoring events (covering both basalt and paleochannel) were conducted on 11 April 2024 and 23 October 2024.

5.1.2 *Water Metering:*

- Monthly water meter readings were recorded for the water extracted from East Pit Lake for operational activities.

5.1.3 *Water Quality Monitoring:*

- Two six-monthly groundwater (paleochannel) quality monitoring events were conducted on 11 April 2024 and 23 October 2024.
- Two six-monthly surface water quality monitoring events were conducted on 11 April 2024 and 23 October 2024. As the WEA Sump and East Pit DS have not yet been constructed, no sampling was conducted at these locations.
- No discharges were observed from the East Pit to Eulomogo Creek during the monitoring period.

6. Completed monitoring

The following sections describe the completed monitoring and field observations.

6.1 *Paleochannel*

Groundwater level measurements in the paleochannel were conducted on a six-monthly basis at two monitoring bores, in accordance with the requirements outlined in the WMP (refer to Table 3). The data collected from these monitoring events has been used to assess the connectivity with the East Pit.

A summary of the water levels measured at the bores throughout the reporting period is provided below in Table 5, and presented graphically in Figure 1. Continuous measurements determined from the logger output are presented in Figure 2 and Figure 3, with the conversion into depth values discussed below. During the monitoring rounds, it was noted that the water in the paleochannel was clear, colourless, and odourless at all locations, except for DQRC-17 on 23/10/2024.

Table 5: Groundwater depth in paleochannel system.

Monitoring location	Date of monitoring	Groundwater depth (m)	Well depth (m)	Standing water level (mAHD)
DQRC-17	11/04/2024	26.71	31.73	278.66
	23/10/2024	25.92	32.27	279.45
DQRC-22	11/04/2024	21.48	25.34	274.65
	23/10/2024	20.92	26.39	275.21

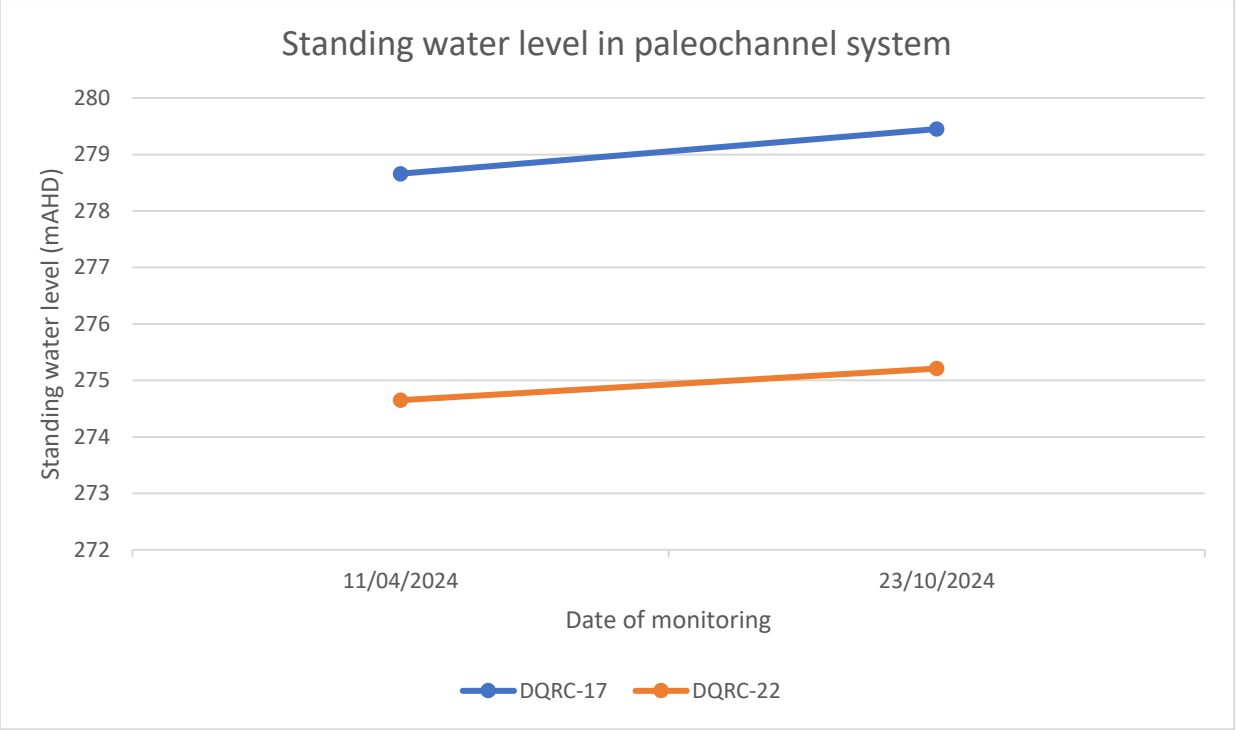


Figure 1: Standing water level in paleochannel system (six monthly manual monitoring).

Logger output

The continuous data loggers installed in the groundwater bores record pressure (cmH_2O) and temperature (°C) values every 12 hours. Specifications for each logger as presented in their data output files are provided in Table 6. Continuous groundwater level data was available for DQRC-22 from 1 January 2024 to 22 October 2024, and for DQRC-17 from 1 April 2024 to 22 October 2024. 4Pillars were advised that the loggers are set up in a way such that data is only extracted on a six-monthly cycle.

Table 6: Continuous logger specifications.

Continuous groundwater level loggers		
Monitoring location	**DQRC-17**	**DQRC-22**
Instrument type	TD-Diver=19	TD-Diver=19
Serial number	..07-DB035 219.	..07-DB371 219.
Sample period	H12	H12
Reference level (pressure)	400.00 cm	400.000 cm
Range (pressure)	5750.00 cm	2750.000 cm
Master level	400 CMH_2O	400 CMH_2O
Reference level (temperature)	-20.000 °C	-20.000 °C
Range (temperature)	100.000 °C	100.000 °C

The data collected from the continuous data loggers, which recorded the pressure and temperature were converted into groundwater levels for comparison with real-world data, with the following comments:

- The known standing water level depths from the 11/04/2024 manual measurements (Table 5) for each bore were used to determine a baseline conversion from the pressure data.
    - For DQRC-17 the 23:00* measurement was used, 1120.09 cmH_2O.
    - For DQRC-22 the 10:00 measurement was used, 1461.133 cmH_2O.
- *For DQRC-17, the pressure value recorded at 11:00 on 11/04/2024 was significantly different to other values (1005.86 cmH_2O). It was assumed that this was recorded prior to installation or at a different depth. As such the value from 23:00 was used.
- The displacement is calculated as the logger value minus the baseline data value, for pressure.
- The groundwater depth is therefore determined as the difference between the baseline standing water level (SWL) and the displacement reading.
    - SWL mbgl: Baseline SWL in m bgl minus the displacement.
    - SWL mAHD: Baseline SWL in mAHD plus the displacement.

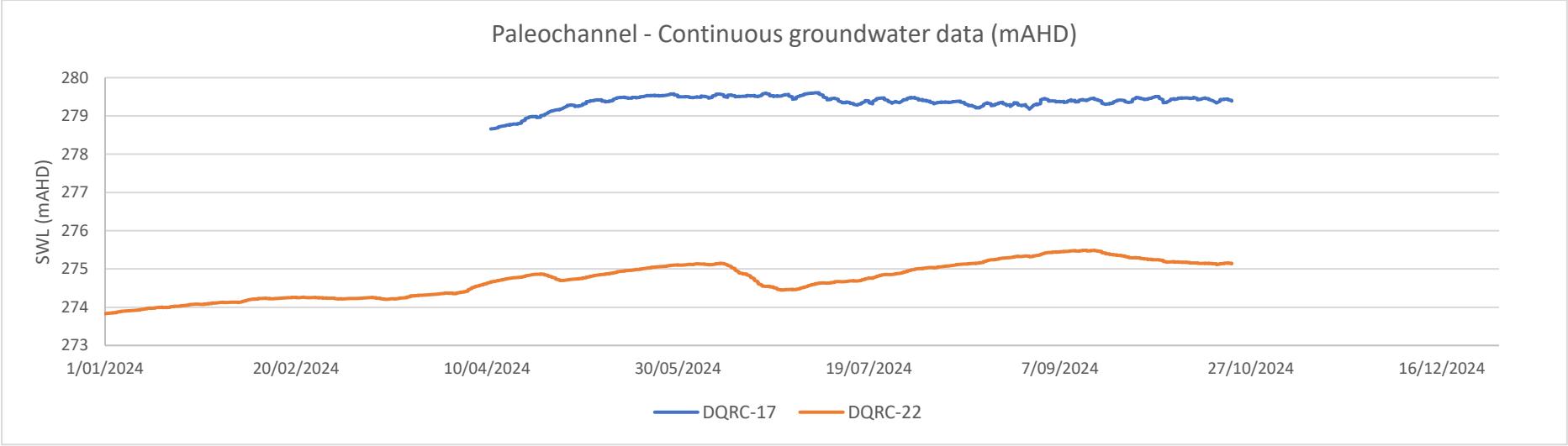


Figure 2: Continuous groundwater level in paleochannel system, presented in elevation in metres with respect to the Australian Height Datum (mAHD).

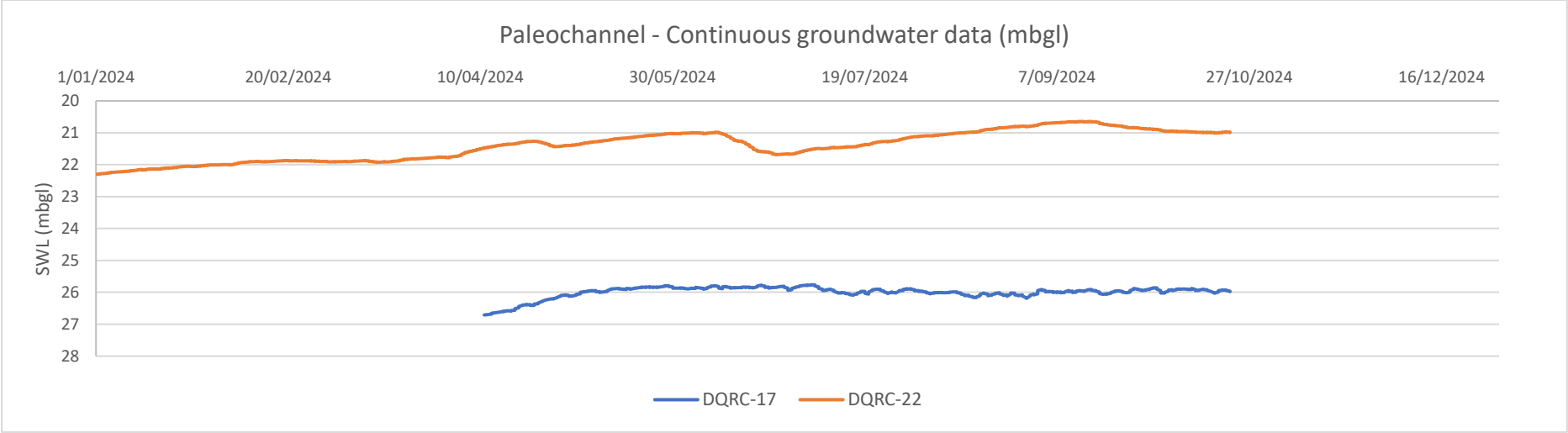


Figure 3: Continuous groundwater level in paleochannel system, presented in metres below ground level (mbgl).

6.1.1 Water quality

Two monitoring rounds within the paleochannel were conducted on 11 April 2024 and 23 October 2024 by Ramboll Australia Pty Ltd. The samples collected were tested and analysed at a NATA-accredited laboratory except for the physical parameters whose measurements were taken in the field using a water quality meter, with the results provided in Appendix 1. Key observations and results from the monitoring events are presented in Table 7.

Table 7: Summary of water quality results in paleochannel.

Indicator	Result Summary
Available data	Data is available from two samples collected as part of the 2024 sampling program. The samples were collected from two monitoring bores DQRC-17 and DQRC-22.
DQRC-17	
pH	The pH ranged from 7.89 to 9.5, relative to a DGV range of 7 to 8.
Electrical conductivity	The electrical conductivity ranged between, 615 to 1310 µS/cm, averaging 962.5 µS/cm. The electrical conductivity was above the DGV of 504 µS/cm (median range) in all samples.
Nutrients	• Total nitrogen concentrations ranged from 5.4 to 18 mg/L (averaging 11.7 mg/L). The nitrogen is predominately in oxidised form (Appendix 1). The total nitrogen was above the DGV of 0.6 mg/L in all samples. • Total phosphorus concentrations ranged from 0.046 to 0.04 mg/L (averaging 0.043mg/L). The total phosphorus was above the DGV of 0.035 mg/L in all samples.
Metals	• Copper exceeded the DGV of 0.0014 mg/L in all samples. • Zinc exceeded the DGV of 0.008 mg/L in one sample on 11/04/2024. • Concentrations of all other metals were consistently below the DGVs.
DQRC-22	
pH	• The pH ranged from 7.49 to 8.9, relative to a DGV range of 7 to 8.
Electrical conductivity	• The electrical conductivity ranged between, 427 to 463 µS/cm, averaging 445 µS/cm. The electrical conductivity was below the DGV of 504 µS/cm (median range) in all samples.
Nutrients	• Total nitrogen concentrations ranged from 6 to 6.6 mg/L (averaging 6.3 mg/L). The nitrogen is predominately in oxidised form. The total nitrogen was above the DGV of 0.6 mg/L in all samples. • Total phosphorus ranged from 0.02 to 0.15 mg/L, which was below the DGV of 0.035 mg/L. • Reactive phosphorus concentrations was 0.05 mg/L in both samples and above the DGV of 0.0358 mg/L in all samples.
Metals	• Copper exceeded the DGV of 0.0014 mg/L in one sample collected on 23/10/2024. • Zinc exceeded the DGV of 0.008 mg/L in one sample on 11/04/2024. • Concentrations of all other metals were consistently below the DGVs.

6.2 Basalt

6.2.1 Water level

Measurement of groundwater level in the basalt system was carried out six monthly at eight monitoring bores as per the requirements of the WMP.

During the monitoring round, it was observed that the water in the basalt was clear, colourless and odourless. A summary of water level for the bores measured throughout the reporting period has been presented below in Table 8 and Figure 4.

Table 8: Basalt six-monthly monitoring results.

Monitoring location	Date of monitoring	Groundwater depth (metres)	Well depth (metres)	Standing water level (mAHD)
DQRC-18	11/04/2024	18.56	20.54	286.63
	23/10/2024	17.76	-	287.43
DQRC-20	11/04/2024	-	22.49	-
	23/10/2024	22.51	-	282.09
DQRC-21	11/04/2024	26.87	40.11	277.4
	23/10/2024	26.68	-	277.59
DQRC-23	11/04/2024	10.15	18.91	285.71
	23/10/2024	15.82	-	280.04
DQRC-24	11/04/2024	17.17	21.04	286.82
	23/10/2024	19.75	-	284.24
DQRC-25	11/04/2024	15.46	16.97	276.74
	23/10/2024	14.77	-	277.43
DQRC-26	11/04/2024	-	23.71	-
	23/10/2024	23.72	-	276.08
DQRC-27	11/04/2024	13.92	16.6	285.89
	23/10/2024	15.85	-	283.96

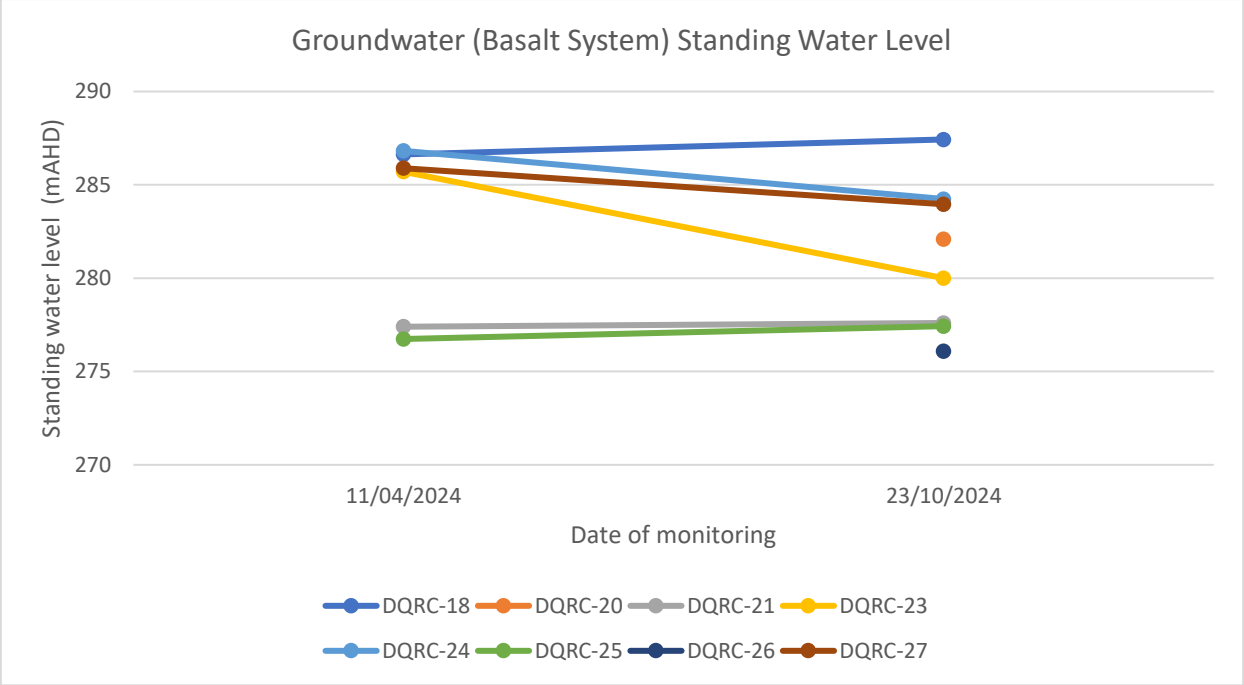


Figure 4: Standing water level in basalt system (DQRC-26 was observed to be dry on 11/04/2024).

6.3 Surface water

6.3.1 Water level

As discussed in Section 3.3, the logger intended to monitor water levels in the East Pit Lake was frequently observed as being out of the water during the annual review period. As such, no continuous water level data was available, and no changes of the levels of the East Pit Lake could be assessed. This is considered to be a non-compliance with the WMP.

6.3.2 Water quality

Water quality monitoring was also conducted within the surface water system, with results provided in Appendix 2. Key observations from monitoring events are presented in Table 9.

Table 9: Summary of water quality results in surface water.

Indicator	Result Summary
Available data	Data is available from two samples collected as part of the 2024 sampling program. The samples were collected from five surface water monitoring locations.
East Pit Lake	
pH	The pH ranged from 8.3 to 8.6 (averaging 8.45), relative to a DGV range of 7 to 8.
Turbidity	The turbidity ranged from 4.3 to 21.4 NTU (averaging 12.85 NTU). Turbidity levels were above the DGV of 20 NTU in one sample collected on 11/04/2024.
Electrical conductivity	The electrical conductivity ranged between 792 to 1006 µS/cm, averaging 899 µS/cm. The electrical conductivity was above the DGV of 504 µS/cm (median range) in all samples.
Nutrients	• Total nitrogen concentrations ranged from 0.8 to 1.2 mg/L (averaging 1 mg/L). The nitrogen is predominately in oxidised form. The total nitrogen was above the DGV of 0.6 mg/L in all samples. • Total phosphorus concentrations ranged from 0.03 to 0.05 mg/L (averaging 0.04 mg/L). The total phosphorus was above the DGV of 0.035 mg/L in one sample collected on 11/04/2024.
Metals	• Zinc exceeded the DGV of 0.008 mg/L in all samples. • Concentrations of all other metals were consistently below the DGVs.
Comments	The data indicates that the water quality is variable but can contain elevated pH, electrical conductivity, and nutrients, which are primarily in the form of oxidised nitrogen. Comparison to the paleochannel groundwater quality suggests that the groundwater inflows from the paleochannel are the primary source of the elevated salinity and nutrients in East Pit Lake.
Settling Pond	

pH	• The pH was 7.8 in one sample, however not available for the sample collected on 23/10/2024. The collected sample was within the DGV of 7 to 8 pH units.
Turbidity	• The turbidity was 159 NTU in one sample, however not available for sample collected in 23/10/2024. Turbidity level was above the DGV of 20 NTU in the tested sample.
Electrical conductivity	• The electrical conductivity in one sample was 450 µS/cm, but it was not tested for the sample collected on 23/10/2024. The tested sample was below the DGV of 504 µS/cm (median range).
Nutrients	• Total nitrogen concentrations ranged from 0.8 to 1.8 mg/L (averaging 1.3 mg/L). The nitrogen is predominately in oxidised form. The total nitrogen was above the DGV of 0.6 mg/L in all samples. • Total phosphorus concentrations ranged from 0.14 to 0.07 mg/L (averaging 0.105 mg/l). The total phosphorus was above the DGV of 0.035 mg/L in all samples.
Metals	• Copper exceeded the DGV of 0.0014 mg/L in one sample collected on 11/04/2024. • Concentrations of all other metals were consistently below the DGVs.
Comment	The Settling Pond water quality is similar to the East Pit Lake water quality which is expected given the East Pit Lake has been dewatered into the Settling Pond.
Upgradient watercourses/ East Pit Diversion (US)	
pH	• The pH was 7.1, within the DGV of 7 to 8 pH units. During the second monitoring event, the location was dry, preventing the collection of a sample.
Turbidity	• The turbidity was 25.5 NTU, slightly above the DGV of 20 NTU. During the second monitoring event, the location was dry, preventing the collection of a sample.
Electrical conductivity	• The electrical conductivity was 623 µS/cm, slightly above the DGV of 504 µS/cm (median range). During the second monitoring event, the location was dry, preventing the collection of a sample.

Nutrients	• Total nitrogen concentration was 1.8 mg/L, above the DGV of 0.6 mg/L. The nitrogen was predominately in ammonia form. During the second monitoring event, the location was dry, preventing the collection of a sample. • Total phosphorus concentration was 0.4 mg/L, above the DGV of 0.035 mg/L. During the second monitoring event, the location was dry, preventing the collection of a sample.
Metals	• Copper exceeded the DGV of 0.0014 mg/L in the sample. • Concentrations of all other metals were below the DGVs.
Comments	Upgradient watercourses showed slightly elevated electrical conductivity, nutrients and one metal.
Eulomogo Creek (US)	
pH	• The pH ranged from 7.9 to 8.2 (averaging 8.05), relative to a DGV range of 7 to 8.
Turbidity	• The turbidity ranged between 1.1 to 7.4 NTU, averaging 4.25 NTU. The turbidity was below the DGV of 20 NTU in all samples.
Electrical conductivity	• The electrical conductivity ranged between 1,176 to 5,200 µS/cm, averaging 3,188 µS/cm. The electrical conductivity was above the DGV of 504 µS/cm (median range) in all samples.
Nutrients	• Total nitrogen concentrations ranged from 1.7 to 12 mg/L (averaging 6.85 mg/L). The nitrogen is predominately in oxidised and TKN form. The total nitrogen was above the DGV of 0.6 mg/L in all samples. • Total phosphorus concentrations ranged from 0.05 to 0.22 mg/L (averaging 0.135 mg/L). The total phosphorus was above the DGV of 0.035 mg/L in all samples.
Metals	• Copper exceeded the DGV of 0.0014 mg/L in one sample collected on 11/04/2024. • Zinc exceeded the DGV of 0.008 mg/L in one sample collected on 11/04/2024. • Concentrations of all other metals were consistently below the DGVs.

Comments	The Eulomogo Creek water quality upstream of the Quarry is variable but contain electrical conductivity and concentrations of nutrients that are significantly above DGVs. These characteristics are typical for an intermittent watercourse that receives some groundwater inflows and has a catchment comprising mostly cleared agricultural land.
Eulomogo Creek (DS)	
pH	• The pH ranged from 7.7 to 8.6 (averaging 8.15), relative to a DGV range of 7 to 8.
Turbidity	• The turbidity ranged from 7.7 to 1000 NTU (averaging 503.85 NTU). Turbidity level was significantly above the DGV of 20 NTU in one sample collected on 23/10/2024.
Electrical conductivity	• The electrical conductivity ranged between 779 to 1125 µS/cm, averaging 952 µS/cm. The electrical conductivity was above the DGV of 504 µS/cm (median range) in all samples.
Nutrients	• Total nitrogen concentrations ranged from 1.1 to 1.9 mg/L (averaging 1.5 mg/L). The nitrogen is predominately in TKN form. The total nitrogen was above the DGV of 0.6 mg/L in all samples. • Total phosphorus concentrations ranged from 0.13 to 0.66 mg/L (averaging 0.395 mg/L). The total phosphorus was above the DGV of 0.035 mg/L in all samples.
Metals	• Copper exceeded the DGV of 0.0014 mg/L in all samples. • Zinc exceeded the DGV of 0.008 mg/L in one sample collected on 11/04/2024. • Concentrations of all other metals were consistently below the DGVs.
Comments	The Eulomogo Creek water quality downstream of the quarry is similar to the upstream water quality except total nitrogen concentrations were higher upstream and one downstream sample had significantly higher turbidity.

6.4 Water take

Throughout the year, data on water extraction from the East Pit was collected. Three pumps are employed to draw water from the East Pit Lake and Settling Pond for various operational purposes. Pump 1 is dedicated to dust suppression, while Pumps 2 and 3 are used for washing trucks and other operational needs. The water volumes utilised for these activities during the annual review period are detailed in Table 10.

Table 10: Water uptake volume from East Pit for operational purposes in 2024.

Month	Pump 1: East Pit Lake used for dust suppression				Pump 1: Standpipe for operational activities				Pump 2: Water to trucks and wash plant			
	Start litres	End litres	Month total	Cumulative total for year	Start litres	End litres	Month total	Cumulative total for year	Start litres	End litres	Month total	Cumulative total for year
January	1,261,778	1,282,667	20,889	20,889	5,294,676	5,451,099	156,423	156,423	21,411,142	21,428,704	17,562	17,562
February	1,282,667	1,325,233	42,566	63,455	5,451,099	5,669,934	218,835	375,258	21,428,704	21,444,190	15,486	33,048
March	1,325,233	1,344,189	18,956	82,411	5,669,934	6,292,920	622,986	998,244	21,444,190	21,457,456	13,266	46,314
April	1,344,189	1,362,421	18,232	100,643	6,292,920	6,480,960	188,040	1,186,284	21,457,456	21,472,557	15,101	61,415
May	1,362,421	1,373,753	11,332	111,975	6,480,960	6,631,803	150,843	1,337,127	21,472,557	21,485,167	12,610	74,025
June	1,373,753	1,413,418	39,665	151,640	6,631,803	6,724,808	93,005	1,430,132	21,485,167	21,495,021	9,854	83,879
July	1,413,418	1,418,543	5,125	156,765	6,724,808	6,767,869	43,061	1,473,193	21,495,021	21,503,710	8,689	92,568

August	1,418,543	1,443,954	25,411	182,176	6,767,869	6,881,188	113,319	1,586,512	21,503,710	21,522,965	19,255	111,823
September	1,443,954	2,649,519	1,205,565	1,387,741	6,881,188	7,114,652	233,464	1,819,976	21,522,965	21,551,928	28,963	140,786
October	2,649,519	2,692,086	42,567	1,430,308	7,114,652	7,308,592	193,940	1,780,452	21,551,928	21,577,816	25,888	166,674
November	2,692,086	2,757,975	65,889	1,496,197	7,308,592	7,577,713	269,121	2,049,573	21,577,816	21,609,960	32,144	198,818
December	2,757,975	2,774,090	16,115	1,512,312	7,577,713	7,712,101	134,388	2,183,961	21,609,960	21,636,789	26,829	225,647
Total	**1,512,312**				**2,417,425**				**225,647**			

6.5 Streamline and Riparian Corridor

Section 6.1.2 of the WMP requires a review of the streamline and riparian corridor of the watercourses that could potentially be affected by the quarry. The DPHI has advised that this condition can be addressed through photographic evidence of the watercourses at key locations where impacts may occur.

Photographs presented in Location 1 to Location 9 include baseline and annual review photographs taken at seven locations along Eulomogo Creek and at one location each on the Eastern and Northern Watercourses (near the site boundary). The monitoring locations are provided in Figure 6. Although the second photographs were obtained outside of the annual review period (taken in January 2025), this is consistent with the commitments in the WMP to inspect and photograph the riparian condition at each location every year, and the observations are appropriate to inform this report.

From the review of the photo monitoring of the locations, no significant impacts were identified within the riparian corridor from the quarrying operation during the annual review period.

6.6 Assessment of trigger action response plan

Section 6.2 of the WMP stipulates that the AWMR must outline any Trigger Action Response Plans (TARPs) that were triggered during the review period, along with the actions taken in response. The TARP assessment is detailed in Table 11. TARP 7, regarding material increases in the concentrations of key monitoring analytes between Eulomogo Creek upstream and downstream monitoring locations was triggered for total phosphorus and copper.

*Table 11: Assessment of trigger threshold. Triggered TARPs have been marked in **bold**.*

ID	Trigger	Assessment
1	If future monitoring data identifies that the East Pit equilibrium level exceeds the estimated equilibrium level range (274 to 279 m AHD).	The equilibrium level of the East Pit could not be determined, as no data was available for the annual review period due to the logger being positioned outside the East Pit water surface. However, it was noted that no discharges were observed from the East Pit to Eulomogo Creek, indicating that this TARP item was not triggered during the annual review period.
2	If, following the construction of the East Pit surface water diversion, overflows from the East Pit occur during periods that are not characterised by: • extended wet periods, such as a 90th percentile rainfall year or a contiguous period that contains greater than 90th percentile rainfall, or • a significant rainfall event, such as a 1 in 10-year event.	The East Pit diversion (downstream) is scheduled for construction after the quarry expansion, which is expected to occur post-June 2025. As a result, this TARP item was not triggered, and no further action was required.
3	If the East Pit surface water diversion is not constructed.	No overflow from the East Pit Lake occurred during the annual review period. Therefore, this TARP item was not triggered, and no further action was required.
4	If a third-party water supply work is identified as being potentially impacted by the quarry operation.	No potential impact to a third-party water supply was identified during the annual review period, hence this TARP item was not triggered, and no further action required.
5	If, following the cessation of dewatering the East Pit (Measure 1.2) and allowing 1 year for the system to re-equilibrise, the groundwater level at bore DQRC-22 (which is screened in the paleochannel approximately 400 m upgradient of the East Pit) is lower than 272.5 m AHD. This level is approximately 1.0 m lower than the minimum level recorded between December 2020 and July 2023 – see Figure 3.4 of the WMP.	The cessation of dewatering the East Pit did not occur during the annual review period. Therefore, this TARP item was not triggered, and no actions were required.

6	If, following the cessation of dewatering the East Pit (Measure 1.2) and allowing 1 year for the system to re-equilibrise, the total dissolved solids concentration in the East Pit Lake exceeds 1,500 mg/L.	The cessation of dewatering the East Pit did not occur during the annual review period. Therefore, this TARP item was not triggered, and no actions were required.
7	If there is a material increase in the concentration or levels of key monitoring analytes between Eulomogo Creek upstream and downstream monitoring locations in two consecutive samples. Table 6.4 lists the key monitoring analytes and provides a definition for a material increase for each analyte.	The samples from Eulomogo Creek upstream and downstream were assessed against the definitions for a material increase for each analyte provided in Table 6.4 of the WMP, as presented in Table 12 and Table 13. Although some analytes met the criteria for material increases during a single sampling event, only total phosphorus and copper met the criteria over two consecutive samples (Table 14). Action to be taken – Holcim to investigate the source of an identified potential water quality impact. Additional monitoring may be required to confirm the impact or a suspected source. If a source is identified, Holcim to implement any practical measures to mitigate the issue.
8	If the East Pit Lake level increases by 2 m or more during or shortly after a wet weather event where significant runoff from the upgradient watercourses was observed to enter the pit.	Since no East Pit water level data was available during the review period, this could not be assessed. Therefore, it was not possible to determine whether this TARP item was triggered.
9	If the stream and riparian condition monitoring identifies that the quarry's infrastructure and/or operation is potentially impacting the riparian condition or geomorphic stability of a watercourse.	The photographic evidence closely resembles the reference photo and shows no significant impact to the surrounding stream and riparian corridor. Therefore, this TARP item was not triggered.

Table 12: Assessment of material increase in analytes between Eulomogo Creek upstream and downstream on sample collected on 11/04/2024. For simplicity, units have not been presented in the table.

Analytes	Material increases requirement as per WMP	Eulomogo Creek (US)	Eulomogo Creek (DS)	Comments	Material increase met?
pH	± 1 change in pH	7.9	7.7	Material increase does not apply as the pH at Eulomogo Creek (DS) is within the DGV of 7-8.	No
Electrical conductivity	25% increase	1176	1125	4.3% decrease	No
Turbidity	100% increase	1.1	7.81	Material increase does not apply as the turbidity at Eulomogo Creek (DS) is below the DGV of 20 NTU.	No
Total suspended solids	25% increase	6.3	42	Material increase does not apply as the TSS at Eulomogo Creek (DS) is below 50 mg/L.	No
Total Nitrogen	25% increase	12	1.1	90.8% decrease	No
Total Phosphorus	100% increase	0.05	0.13	160% increase.	Yes
Aluminium (Al)	100% increase	0.05	0.05	Material increase does not apply as the aluminum at Eulomogo Creek (DS) is below the DGV of 0.055 mg/L.	No
Copper (Cu)	100% increase	0.002	0.009	350% increase	Yes
Iron (Fe)	100% increase	0.05	0.001	Material increase does not apply as the iron at Eulomogo Creek (DS) is below the DGV of 0.3 mg/L.	No
Nickel (Ni)	100% increase	0.001	0.001	Material increase does not apply as the nickel at Eulomogo Creek (DS) is below the DGV of 0.0011 mg/L.	No
Zinc (Zn)	100% increase	0.0019	0.009	373.7% increase	Yes

Table 13: Assessment of material increase in analytes between Eulomogo Creek upstream and downstream on sample collected on 23/10/2024. For simplicity, units have not been presented in the table.

Analytes	Material increases requirement as per WMP	Eulomogo Creek (US)	Eulomogo Creek (DS)	Comments	Material increase met?
pH	± 1 change in pH	8.2	8.6	4.8% increase.	No
Electrical conductivity	25% increase	5200	779	567% decrease.	No
Turbidity	100% increase	7.4	1000	13413.5% increase	Yes
Total suspended solids	25% increase	14	180	1185.7% increase.	Yes
Total Nitrogen	25% increase	1.7	1.9	11.8% increase	No
Total Phosphorus	100% increase	0.22	0.66	200% increase.	Yes
Aluminium (Al)	100% increase	0.05	0.05	Material increase does not apply as the aluminum at Eulomogo Creek (DS) is below the DGV of 0.055 mg/L.	No
Copper (Cu)	100% increase	0.001	0.05	4900% increase	Yes
Iron (Fe)	100% increase	0.24	0.05	Material increase does not apply as the iron at Eulomogo Creek (DS) is below the DGV of 0.3 mg/L.	No
Nickel (Ni)	100% increase	0.003	0.002	Material increase does not apply as the nickel at Eulomogo Creek (DS) is below the DGV of 0.0011 mg/L.	No
Zinc (Zn)	100% increase	0.005	0.005	Material increase does not apply as the zinc at Eulomogo Creek (DS) is below the DGV of 0.008 mg/L.	No

Table 14: Assessment of material increases over consecutive samples.

Analytes	Material increase met – 11/04/2024	Material increase met – 23/10/2024	Material increase – two consecutive samples
pH	No	No	No
Electrical conductivity	No	No	No
Turbidity	No	Yes	No
Total suspended solids	No	Yes	No
Total Nitrogen	No	No	No
Total Phosphorus	Yes	Yes	Yes
Aluminium (Al)	No	No	No
Copper (Cu)	Yes	Yes	Yes
Iron (Fe)	No	No	No
Nickel (Ni)	No	No	No
Zinc (Zn)	Yes	No	No

7. Actions

Based on the findings of this review, the following actions are proposed:

- Conduct further investigation into the sources of elevated total phosphorus and copper, as per TARP 7. If consecutive sampling results continue to show elevated levels, targeted mitigation measures, such as the introduction of diatoms, could be considered to help lower nutrient levels in the surface water system, to achieve compliance with the DGVs.
- Inspections of the riparian and streamline corridor should be conducted ahead of the annual review period. This will help identify any potential issues early and ensure the ongoing health of the ecosystem. While the annual frequency of inspections is compliant with the requirements of the WMP, one monitoring round will always be outside of the annual review period.
- Monthly site inspections shall be carried out at both groundwater and surface water locations to ensure that water loggers are properly positioned. This will enable accurate data collection throughout the year. Adjustments should be made as necessary to maintain the accuracy of measurements and ensure consistent monitoring.
- For any future monitoring events where monitoring is unsuccessful (e.g. the logger malfunction for the October Settling Pond sampling event), a supplementary sampling event should be organised, to ensure that regular data can be obtained.

8. Conclusion

The requirements of the Water Management Plan were generally complied with during the annual review period. Where any actions are required, these have been presented in the previous section of this report.

A thorough assessment of Trigger Action Response Plans during the annual review period was conducted as part of the preparation of this report, which found that the majority of items were not triggered. Action is required for one item (TARP 7) and should be implemented.

The requirements of the Water Management Plan are considered suitable for ongoing management of water quality at Site, and monitoring should be continued, with regular assessments to be conducted to ensure that any potential triggers are identified promptly, rather than only during the annual reporting.

Additionally, once the East Pit diversion and other planned activities occur post-expansion, a review of the TARP items associated with these changes should be undertaken to ensure compliance with relevant management plans.

No changes to the Water Management Plan are proposed at this stage.

9. References

- Water Management Plan, Holcim Dubbo Quarry, EMM Consulting Pty Ltd, 2023

10. List of Appendices

Appendix 1. Groundwater Quality Results

Appendix 2. Surface Water Quality Results

Appendix 3. Updated Site Water Balance Report

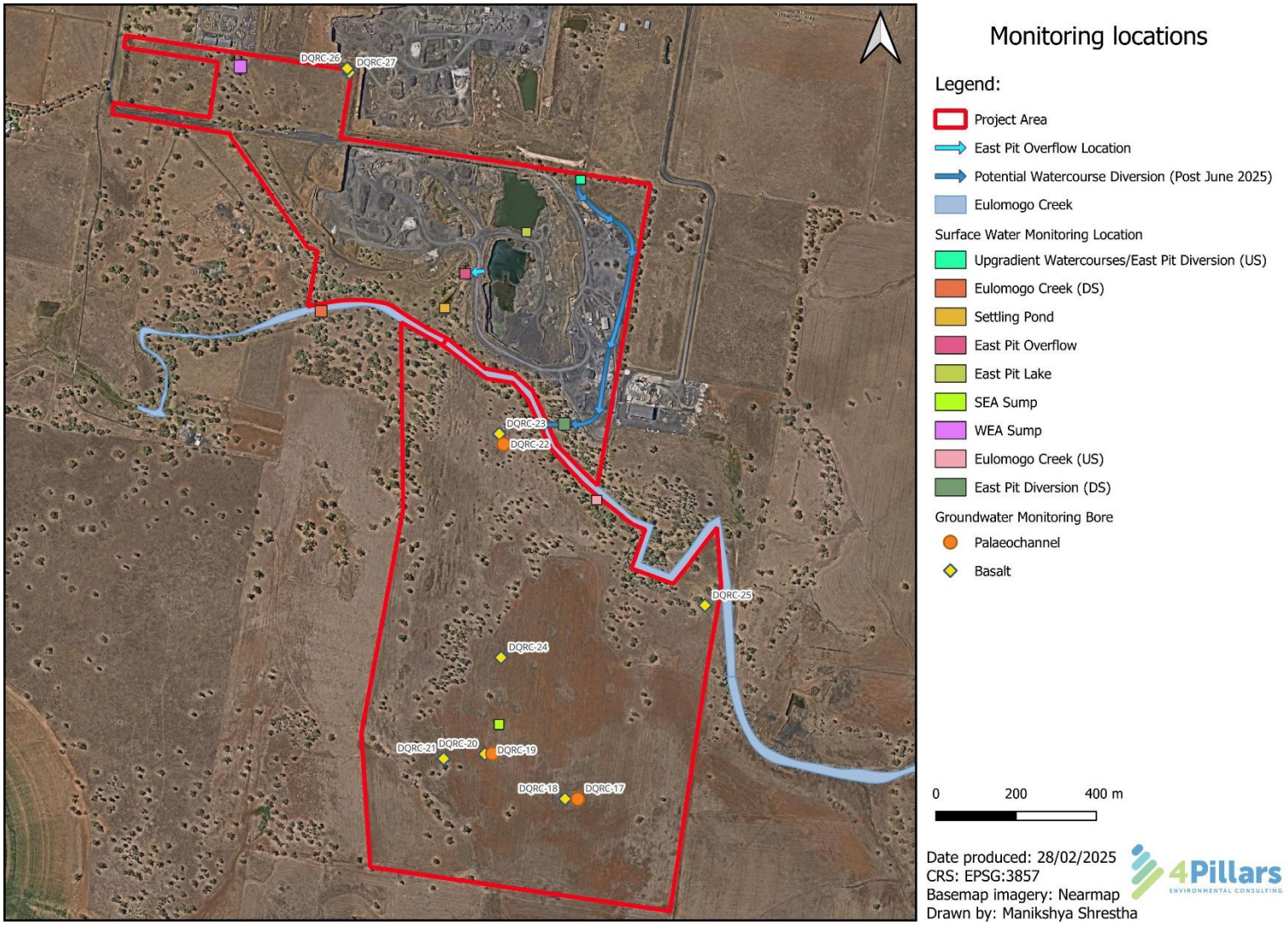


Figure 5: Water Quality Monitoring locations.

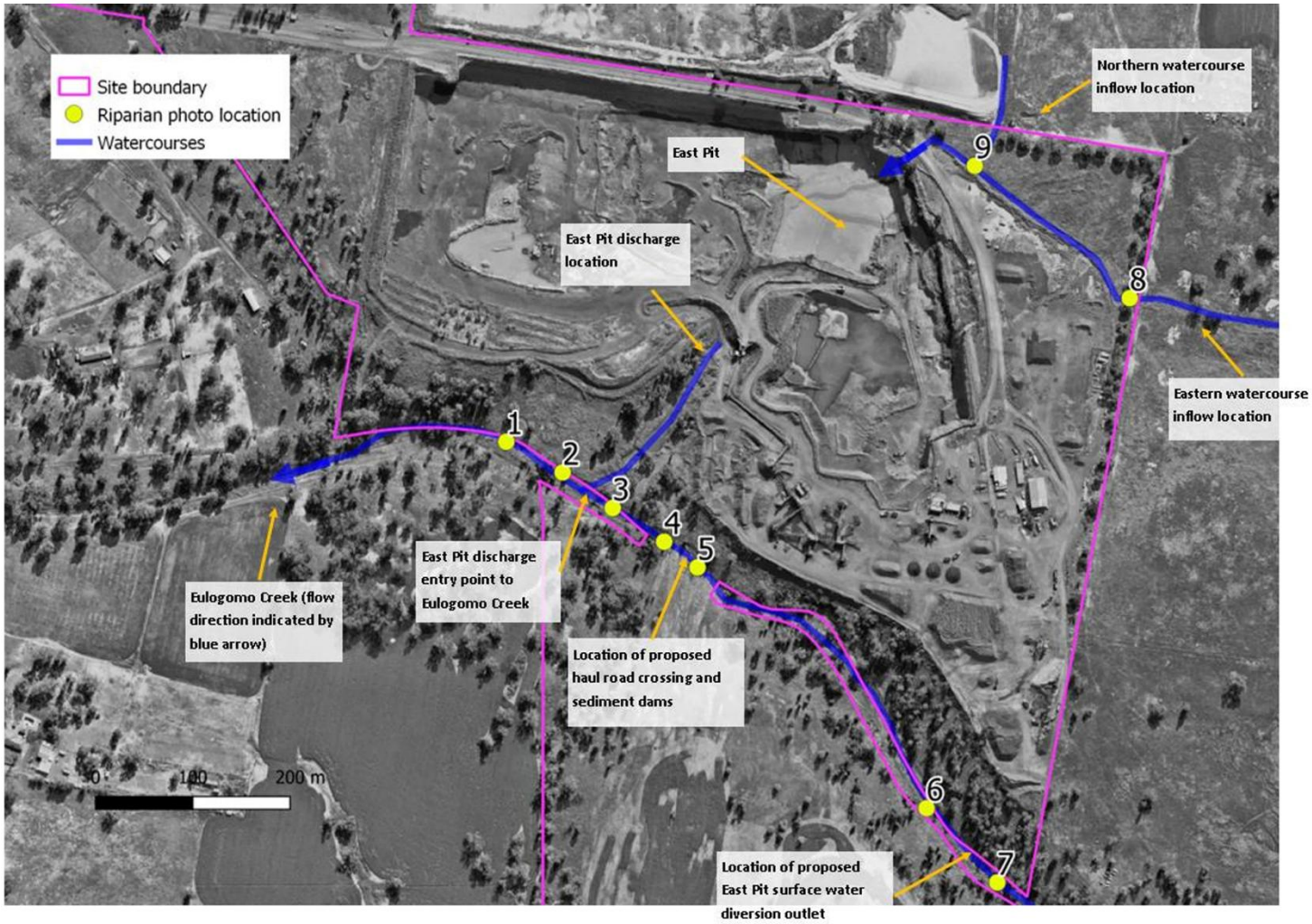
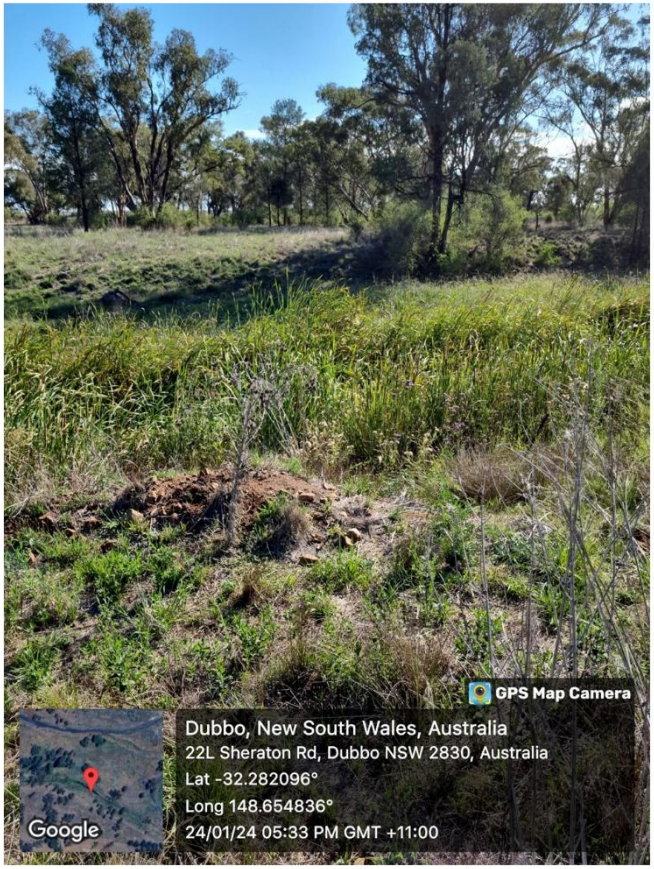
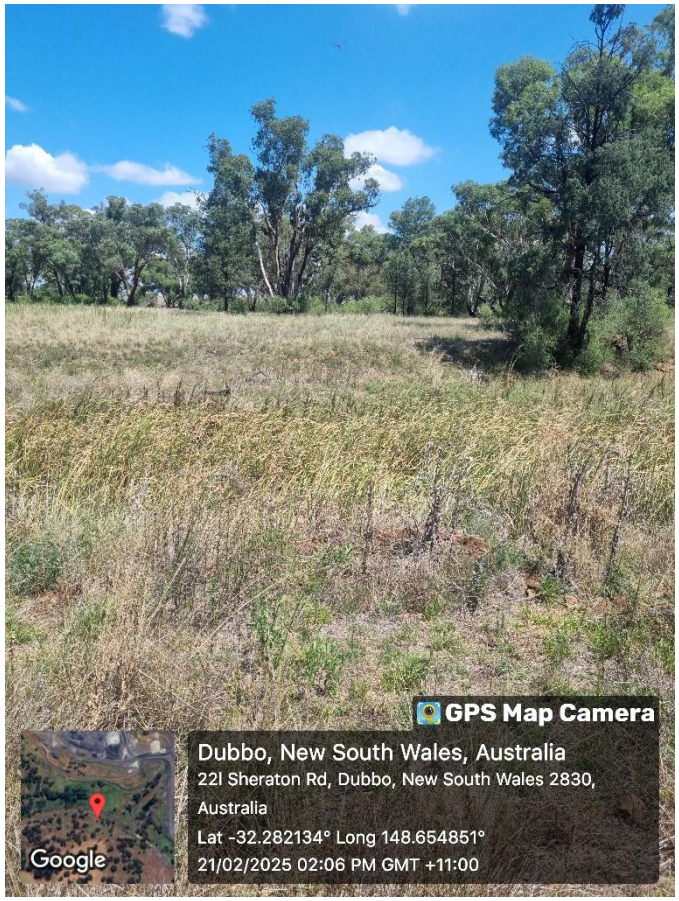
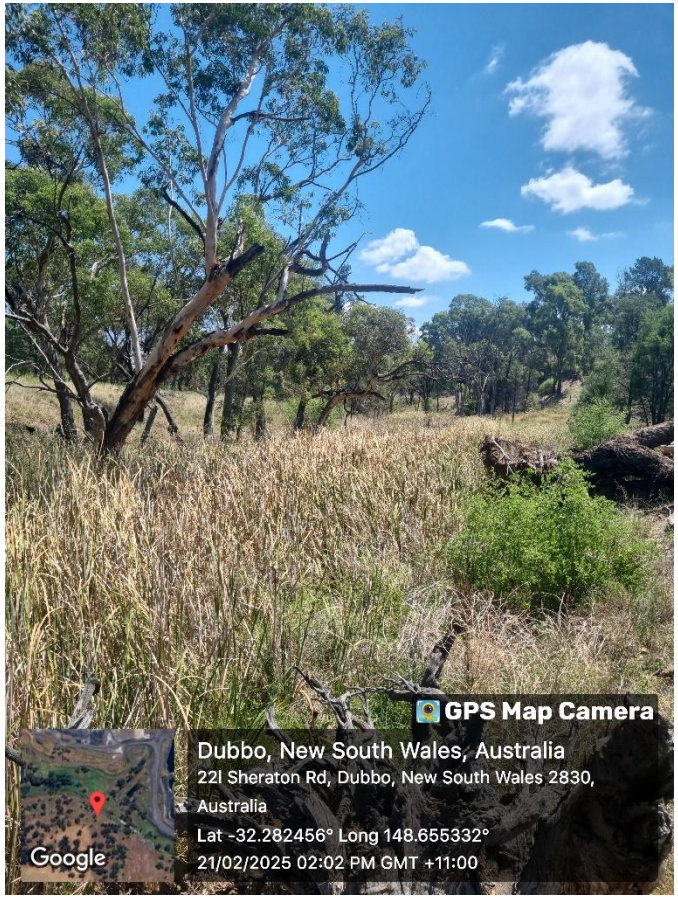


Figure 6: Streamline and riparian photo monitoring location.

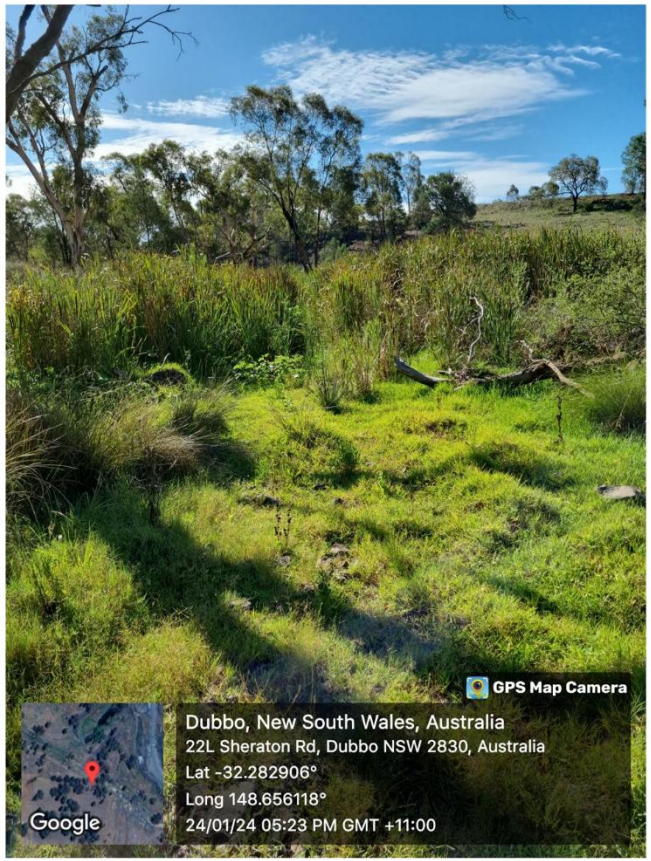




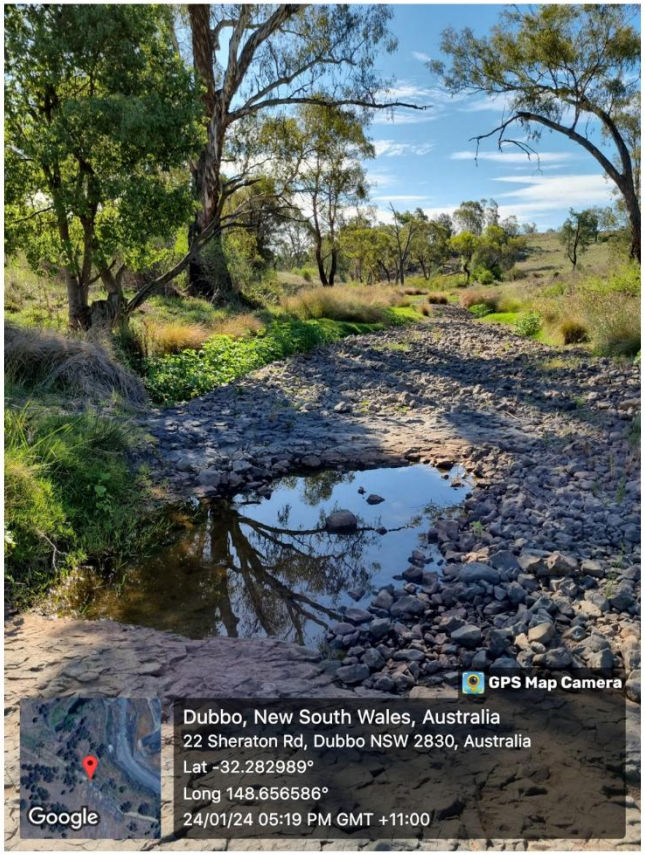
Location 1: Eulomogo Creek, downstream of Haul Road culverts and all discharge locations (reference image on the left and monitoring photo on the right).

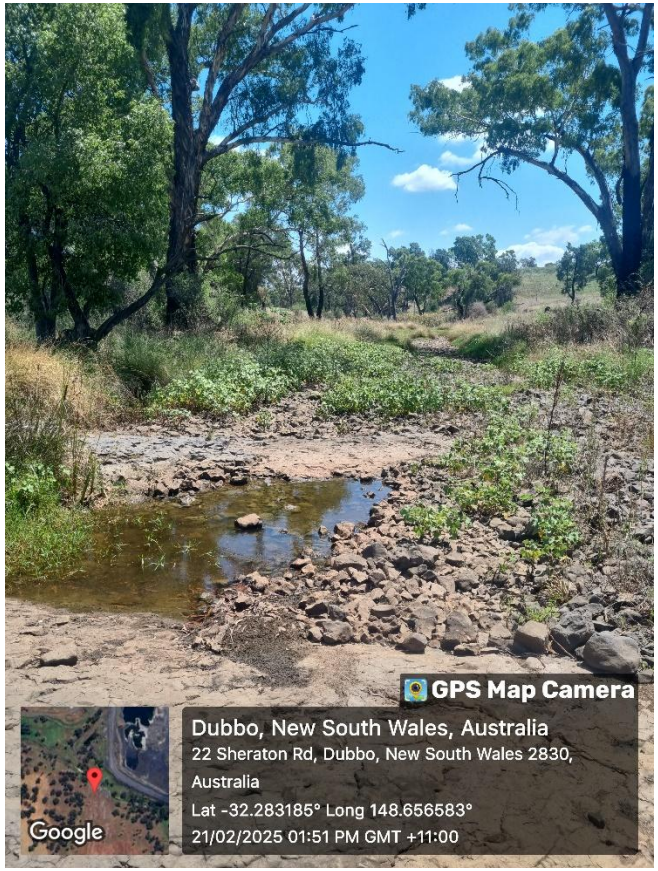


Location 2: Eulomogo Creek, downstream of Haul Road culverts and immediately downstream of where East Pit discharges enter Eulomogo Creek (reference image on the left and monitoring photo on the right).



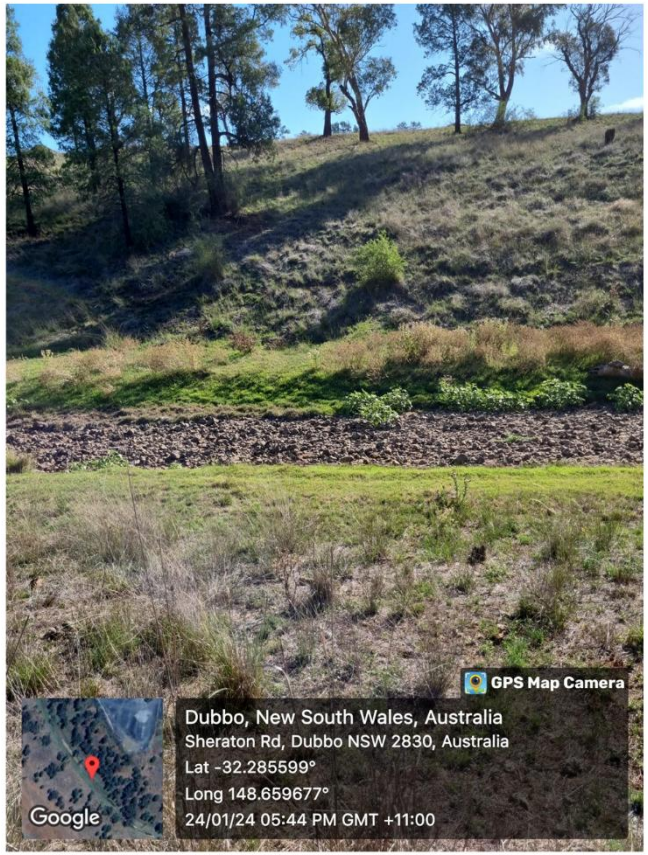
Location 3: Eulomogo Creek, downstream of the proposed Haul Road culverts and immediately upstream of where East Pit discharges enter Eulomogo Creek (reference image on the left and monitoring photo on the right).

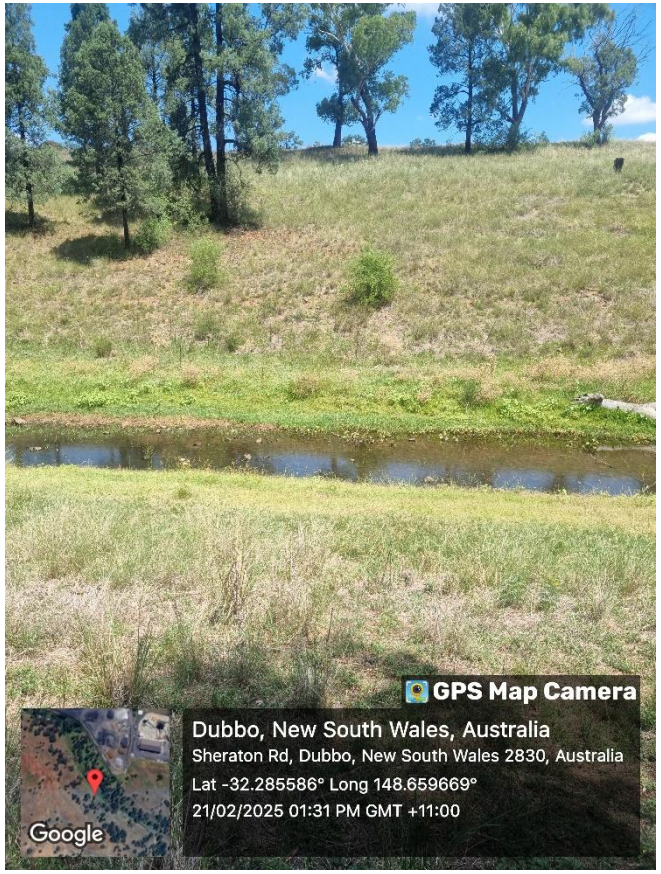




Location 4: Eulomogo Creek, immediately downstream of the proposed Haul Road culverts (reference image on the left and monitoring photo on the right).

Location 5: Eulomogo Creek, downstream of the proposed Haul Road culverts and immediately upstream of where East Pit discharges enter Eulomogo Creek (reference image on the left and monitoring photo on the right).





Location 6: Eulomogo Creek, immediately downstream of the proposed Haul Road culverts (reference image on the left and monitoring photo on the right).

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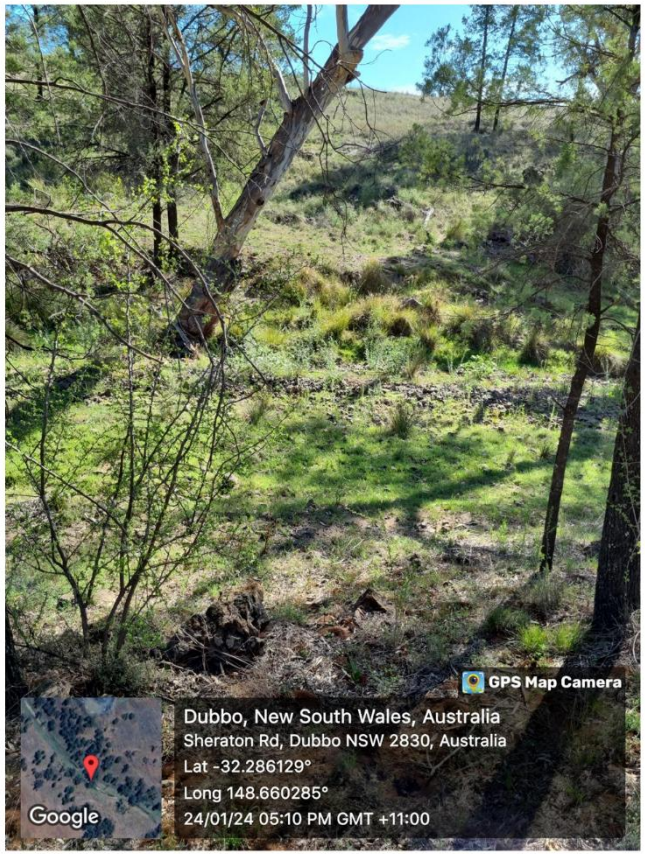
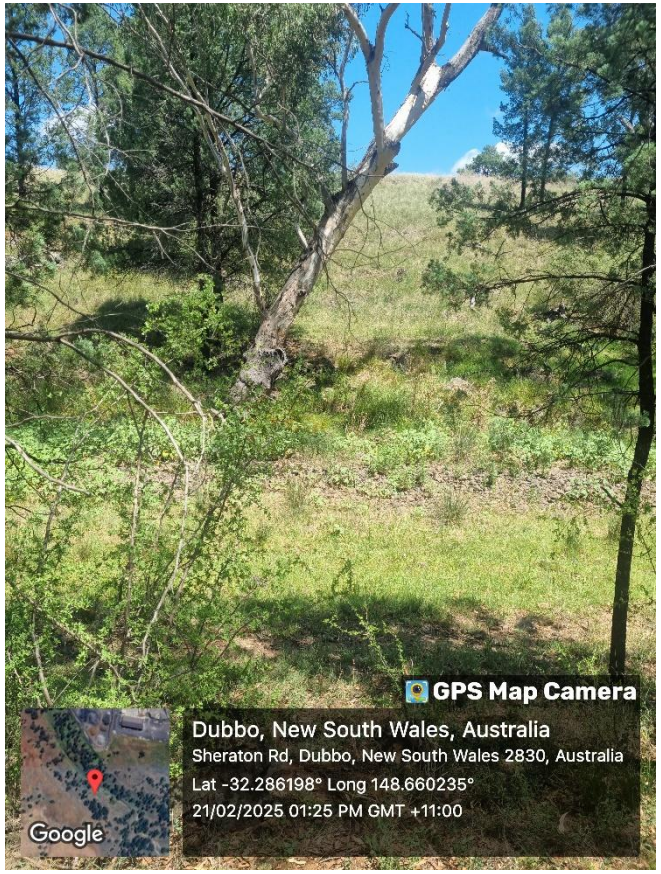
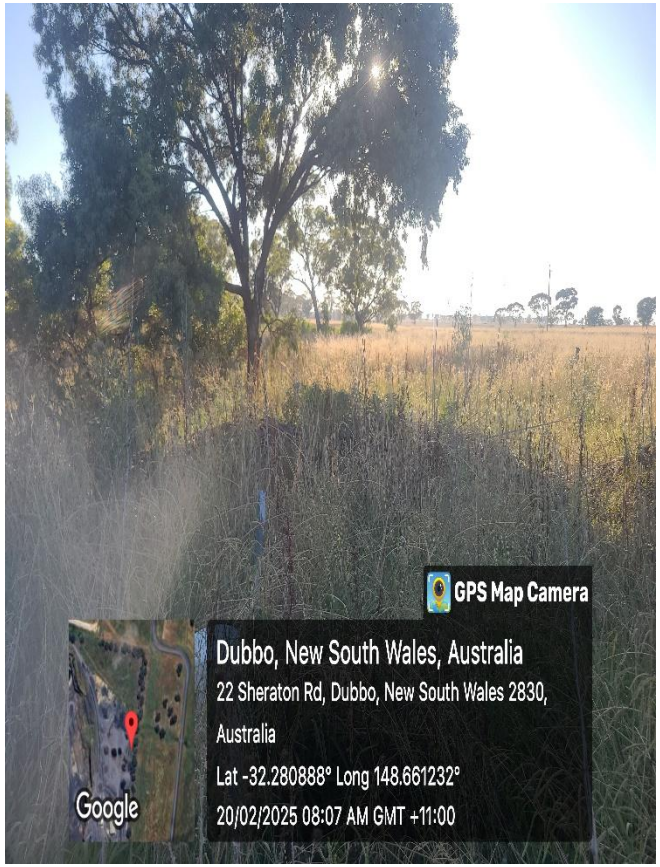




Location 7: Eulomogo Creek, downstream of the proposed Haul Road culverts and immediately upstream of where East Pit discharges enter Eulomogo Creek (reference image on the left and monitoring photo on the right).



Location 8: Eastern Watercourse near the site boundary (reference image on the left and monitoring photo on the right).

Location 9: Northern Watercourse near the site boundary (reference image on the left and monitoring photo on the right).

Appendix 1 Paleochannel Quality Results

*Table 15: Paleochannel six monthly monitoring (Exceedances of DGVs are noted in **bold**).*

Analytes	Units	DGVs[3]	Monitoring location DQRC-17		Monitoring location DQRC-22	
			11/04/2024	23/10/2024	11/04/2024	23/10/2024
pH	pH units	7.0-8.0	7.89	**9.5**	7.49	**8.9**
Turbidity	NTU	20[4]	1.9	162	2.4	159
Electrical conductivity	µS/cm	504[5] or 744[6]	**1310**	615	463	427
Total suspended solids	mg/L	-	5	79	5.1	6.2
Total dissolved solids	mg/L	-	658	394	132	278
Total hardness (as CaCO3)	mg/L	-	220	200	220	210
Ammonia	mg/L	0.013	0.01	0.01	0.01	0.01
Oxidised nitrogen (Nitrate +Nitrite)	mg/L	0.6[7]	**4.2**	**16**	**5.2**	**6.2**
Total Kjeldahl Nitrogen (TKN)	mg/L	-	1.2	1.7	0.8	0.4
Total Nitrogen (TN)	mg/L	0.6	**5.4**	**18**	**6**	**6.6**
Reactive phosphorus	mg/L	0.035[8]	**0.05**	0.02	**0.05**	**0.05**
Total phosphorus	mg/L	0.035	**0.04**	**0.046**	0.02	0.15
Aluminium (Al)	mg/L	0.055	0.05	0.05	0.05	0.05
Copper (Cu)	mg/L	0.0014	**0.002**	**0.072**	0.001	**0.015**
Iron (Fe)	mg/L	0.3[9]	0.05	0.05	0.05	0.05
Nickel (Ni)	mg/L	0.011	0.001	0.001	0.001	0.001
Zinc (Zn)	mg/L	0.008	**0.014**	0.005	**0.015**	0.005

[3] The DGV for physico-chemical parameters and nutrients refer to the values for water quality targets developed for the Murray Darling Basin Plan (NSW DoI 2018). The DGV for toxicants refer to the values for slightly – moderately disturbed freshwater ecosystems that are reported in ANZG (2018).

[4] Turbidity DGV relevant for surface waters only.

[5] Median value.

[6] 80th percentile value.

[7] TN DGV adopted.

[8] TP DGV adopted.

[9] Refers to a low reliability DGV or an indicative working level sourced from ANZECC/ARMCANZ (2000) Volume 2.

Appendix 2 Surface Water Quality Results

*Table 16: Analytical results of surface water sampling round occurred in 11/04/2024 (Exceedances of DGVs are noted in **bold**).*

Analytes	Units	DGV	East Pit Lake	WEA Sump	Settling Pond	Upgradient watercourses/ East Pit Diversion (US)	SEA Sump	East Pit Diversion (DS)	Eulomogo Creek (US)	Eulomogo Creek (DS)
pH	pH units	7.0-8.0	**8.3**	Sample location does not yet exist until quarry expansion occurs.	7.8	7.1	Sample location does not yet exist until quarry expansion occurs.	Sample location does not yet exist until quarry expansion occurs.	7.9	7.7
Turbidity	NTU	20	**21.4**		**159**	**25.51**			1.1	7.81
Electrical conductivity	µS/cm	504 or 744	**1006**		450	**623**			**1176**	**1125**
Total suspended solids	mg/L	-	7		110	59			6.3	42
Total dissolved solids	mg/L	-	654000		293000	405000			764000	731000
Total hardness (as CaCO3)	mg/L	-	280		98	120			310	310
Analytical results – nutrients (as N or P)										
Ammonia	mg/L	0.013	**0.02**	Sample location does not yet exist until quarry expansion occurs.	**0.05**	**0.76**	Sample location does not yet exist until quarry expansion occurs.	Sample location does not yet exist until quarry expansion occurs.	**0.14**	0.01
Oxidised nitrogen (Nitrate +Nitrite)	mg/L	0.6	0.41		**0.78**	0.05			**9.2**	**0.91**
Total Kjeldahl Nitrogen (TKN)	mg/L	-	0.4		1	1.8			2.3	0.9
Total Nitrogen (TN)	mg/L	0.6	**0.8**		**1.8**	**1.8**			**12**	**1.1**
Reactive phosphorus	mg/L	0.035	**0.05**		**0.08**	**0.14**			**0.05**	**0.05**
Total phosphorus	mg/L	0.035	**0.05**		**0.14**	**0.4**			**0.05**	**0.13**
Analytical results – metals										
Aluminium (Al)	mg/L	0.055	0.05	Sample location does not yet exist until quarry expansion occurs.	0.05	0.05	Sample location does not yet exist until quarry expansion occurs.	Sample location does not yet exist until quarry expansion occurs.	0.05	0.05
Copper (Cu)	mg/L	0.0014	0.001		**0.002**	**0.004**			**0.002**	**0.009**
Iron (Fe)	mg/L	0.3	0.05		0.05	0.09			0.05	0.001
Nickel (Ni)	mg/L	0.011	0.001		0.001	0.004			0.001	0.001
Zinc (Zn)	mg/L	0.008	**0.015**		0.01	**0.017**			**0.0019**	**0.009**

*Table 17: Analytical results of surface water sampling round occurred in 23/10/2024 (Exceedances of DGVs are noted in **bold**).*

Analytes	Units	DGV	East Pit Lake	WEA Sump	Settling Pond	Upgradient watercourses/ East Pit	SEA Sump	East Pit Diversion (DS)	Eulomogo Creek (US)	Eulomogo Creek (DS)
pH	pH units	7.0-8.0	**8.6**	Sample location does not yet exist until quarry expansion occurs.	No data available due to the water meter reading malfunction	Sample location dry	Sample location does not yet exist until quarry expansion occurs.	Sample location does not yet exist until quarry expansion occurs.	**8.2**	**8.6**
Turbidity	NTU	20	4.3						7.4	**1000**
Electrical conductivity	uS/cm	504 or 744	**792**						**5200**	**779**
Total suspended solids	mg/L	-	9.2		7.8				14	180
Total dissolved solids	mg/L	-	508000		-				3280000	499000
Total hardness (as CaCO3)	mg/L	-	330		290				1600	330
Analytical results – nutrients (as N or P)										
Ammonia	mg/L	0.013	0.01	Sample location does not yet exist until quarry expansion occurs.	0.01	Sample location dry	Sample location does not yet exist until quarry expansion occurs.		**0.27**	**0.05**
Oxidised nitrogen (Nitrate +Nitrite)	mg/L	0.6	**0.7**		0.16				0.05	0.18
Total Kjeldahl Nitrogen (TKN)	mg/L	-	0.5		0.6				1.7	1
Total Nitrogen (TN)	mg/L	0.6	**1.2**		**0.8**				**1.7**	**1.9**
Reactive phosphorus	mg/L	0.035	**0.05**		**0.05**				**0.08**	0.06
Total phosphorus	mg/L	0.035	0.03		**0.07**				**0.22**	**0.66**
Analytical results – metals										
Aluminium (Al)	mg/L	0.055	0.05	Sample location does not yet exist until quarry expansion occurs.	0.05	Sample location dry	Sample location does not yet exist until quarry expansion occurs.		0.05	0.05
Copper (Cu)	mg/L	0.0014	0.001		0.001				0.001	**0.05**
Iron (Fe)	mg/L	0.3	0.05		0.05				0.24	0.05
Nickel (Ni)	mg/L	0.011	0.001		0.001				0.003	0.002
Zinc (Zn)	mg/L	0.008	**0.015**		0.005				0.005	0.005

Appendix 3 Updated Site Water Balance Report

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REDITUS

Dubbo Quarry Water Balance Model

22L Sheraton Road
Dubbo NSW

Project No. 25015
Version 1

27 March 2025

Reditus Consulting Pty Ltd
ABN: 34 631 168 502

Dubbo Quarry Water Balance Model

22L Sheraton Road, Dubbo, NSW

DOCUMENT CONTROL

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Executive Summary

Reditus Consulting Pty Ltd (Reditus) were engaged by 4Pillars Environmental Consulting ('4Pillars') to complete a water balance model for Dubbo Quarry, operated by Holcim (Australia) Pty Ltd ('Holcim'), located on 22L Sheraton Road, Dubbo (the Site). A State Significant Development (SSD 10417) application was submitted for the Site to continue operations and expand to the Western Extension Area (WEA) and Southern Extension Area (SEA), which was approved on 02 March 2023. Two conditions of the approval pertaining to this proposal include:

- Development of a Surface Water Diversion Channel to divert surface water runoff from upgradient catchments to drain around the East Pit into Eulomogo Creek, known herein as the East Pit surface water diversion.
- Development of an annual Water Management Review, which includes an annual water balance model presenting the inflows and outflows of the Site.

This report forms the water balance model for the Site. Three model scenarios were developed to align with the scenarios presented in Table 1.1 in Dubbo Quarry Water Management Plan (EMM, 2024), and include:

- Historic Operations – This was simulated to reflect operations that took place before the start of the Continuation Project. It involves dewatering the East Pit to ensure continued access for quarrying activities.
- Continuation Project (no East Pit surface water diversion(SWD)) – This simulation reflects the transitional phase from the historic operations, to the Continuation project (with East Pit SWD). The simulations also include the development of the Western Extension Area (WEA), Southern Extension Area (SEA) and rehabilitation of the East Pit.
- Continuation Project (with East Pit SWD) – This simulation reflects the ongoing quarry operations following development of the continuation project. It includes cessation of East Pit dewatering, development of the SEA and WEA, and development of the East Pit Surface Water Diversion.

Additionally, each model was simulated to account for the 10th percentile (%ile), 50%ile and 90%ile rainfall runoff values. Rainfall runoff values are parameterised using SIMHYD model within the Rainfall Runoff Library to meet the runoff coefficients within *Managing Urban Stormwater Soils and Construction: Volume 1* (Landcom 2004) default volumetric runoff coefficient and the DPIE maximum harvestable rights calculator. The results of the simulations are following:

- Inflows range from:
  - 345 ML/year to 932 ML./year during the Historic Operations simulations.
  - 156 ML/year to 859 ML/year for the Continuation Scheme (no East Pit SWD)
  - 82 ML/year to 263 ML/year for the Continuation Scheme (with East Pit SWD)
- Outflows range from:
  - 558 ML/year to 970 ML./year during the Historic Operations simulations.
  - 134 ML/year to 599 ML/year for the Continuation Scheme (no East Pit SWD)
  - 95 ML/year to 198 ML/year for the Continuation Scheme (with East Pit SWD)
- East Pit overflows range from:
  - 527 ML/year to 937 ML./year during the Historic Operations simulations.
  - 0 ML/year to 372 ML/year for the Continuation Scheme (no East Pit SWD)
  - 0 ML/year to 1 ML/year for the Continuation Scheme (with East Pit SWD)

A review of the model and available data found uncertainties with the following:

- Paleochannel interaction with the East Pit can influence the inflows and outflows within the model. The average flow exchange curve was used for the models, though the estimated equilibrium range is approximately 5 m.

- Initial water volumes can influence the inflows and outflows of the model as a direct relationship with the paleochannel flow exchange curve. No pit water level data was available, and as such, initial volumes were assumed.
- Safe spill levels provide sensitivities within the model, as marginal changes in culvert height can change the volumes of overflow to Eulomogo Creek.
- Rainfall runoff values are parameterised using SIMHYD within the Rainfall Runoff Library to meet the runoff coefficients within *Managing Urban Stormwater Soils and Construction: Volume 1* (Landcom 2004) default volumetric runoff coefficient and the DPIE maximum harvestable rights calculator. Rainfall runoff coefficients can vary significantly, which can influence the inflows and outflows of the models.

Based on the model uncertainties, the following recommendations are made:

- Daily East Pit water levels should be collected to establish East Pit overflow rates, East Pit initial volumes, and to further define the paleochannel / East Pit flow exchange curve. As dewatering has ceased, the relationship between the East Pit and the paleochannel can be defined to a greater accuracy.
- Upgradient watercourse creek flow data should be collected to provide data for calibration of the rainfall runoff models used for each water storage.

1 Introduction

1.1 Preamble

Reditus Consulting Pty Ltd (Reditus) were engaged by 4Pillars Environmental Consulting ('4Pillars') to complete a water balance model for Dubbo Quarry, operated by Holcim (Australia) Pty Ltd ('Holcim'), located on 22L Sheraton Road, Dubbo (the Site). A State Significant Development (SSD 10417) application was submitted for the Site to continue operations and expand to the Western Extension Area (WEA) and Southern Extension Area (SEA), which was approved on 02 March 2023. Two conditions of the approval pertaining to this proposal include:

- Development of a Surface Water Diversion Channel to divert surface water runoff from upgradient catchments to drain around the East Pit into Eulomogo Creek, known herein as the East Pit surface water diversion.
- Development of an annual Water Management Review, which includes an annual water balance model presenting the inflows and outflows of the Site.

The Site Location Is presented In **Figure A1** In **Appendix A**. The Site details are summarised in **Table 1-1** below.

Table 1-1 Site Characteristics

SITE CHARACTERISTICS	DETAIL
Site Address	22L Sheraton Rd, Dubbo NSW 2830
Lot and Deposited Plan	Lot 222 DP1247780
Local Government Area	Dubbo Regional Council
Site Coordinates (approximate centre of the site (GDA2020-MGA-55))	Easting: 656157 Northing: 6427189
Site Area	Approximately 139.4 ha
Site Locality Map	**Figure A1** in **Appendix A**
Zoning	E5 - Heavy Industrial RE2 - Private Recreation RU1 - Primary Production
Current Land Use	The site currently operates as a hard rock quarry, producing basalt aggregates.

1.2 Background

Holcim own and operate the Dubbo Quarry which is a State Significant Development (SSD 10417, formerly under SPR79-22). The SSD was prepared for the continued operations at Dubbo Quarry that included the additional areas known as Western Extension Area (WEA) and the Southern Extension Area). The SSD application was approved by the Minister of Planning on 02 March 2023. Transition to the continued operations at the quarry is presented as three stages with the Water Management Plan (EMM, 2024):

- Historic Operations – representative of operations prior to development at the Site
- Continuation Project (No East Pit surface water diversion (SWD)) – Representative of the transition period between Historic Operations and the Continuation Project (With East Pit SWD). This period includes the development of the

Western Extension Area (WEA), Southern Extension Area (SEA) and rehabilitation of the East Pit. Rehabilitation of the East Pit includes the cessation of dewatering.

- Continuation Project (with East Pit SWD) – Representative of the final stage of development. It includes cessation of East Pit dewatering, development of the SEA and WEA, and development of the East Pit Surface Water Diversion.

Reditus understand that the Site is currently operating under the continuation scheme (no East Pit SWD). This report forms part of the ongoing water management plan currently being updated by 4Pillars.

1.3 Objectives

The primary objectives of the investigation are to update the water balance model to quantify the inflows, outflows and storage changes within the water cycle, including surrounding catchments and reservoirs.

1.4 Scope of Works

Reditus propose the following scope of works:

- Development a conceptual water balance for the Site. The conceptual water balance will include hydrological, meteorological and topographical data.
- Creation of a water balance model in the proprietary software GoldSim. Model inputs will include data obtained during development of the conceptual water balance, as well as system boundaries, and initial conditions. Once the model is completed, three simulations will be executed, which include:
  - Historic Operations
  - Continuation Project (no East Pit SWD)
  - Continuation Project (with East Pit SWD)
- Each simulation was run for rainfall runoff using the 10th Percentile (%ile), 50%ile and 90%ile.
- Prepare a Water Balance Model report which outlines the model set up, data sources, and results.

1.5 Limitations

A detailed statement of limitations for this report is provided in **Section 6**.

This report is based on the Scope of Work outlined in **Section 1.4**. Reditus prepared this report in a manner consistent with the normal level of care and expertise exercised by members of the environmental and hydrogeological assessment profession.

This report relates only to the objectives stated and does not relate to any other work undertaken for the Client (4Pillars Environmental Consulting). It is a report based on the information reported in previous geotechnical and environmental assessments by others, and data made available to Reditus. These conditions stated in this report may change with time and space.

All conclusions regarding the Site are the professional opinions of Reditus, subject to the qualifications in the report. Whilst normal assessments of data reliability have been made, Reditus assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Reditus, or developments resulting from situations outside the scope of this project. The client acknowledges that this report is for the exclusive use of the client.

All water balance models include some degree of uncertainty in their predictions as they are, by necessity, simplifications of complex real-world systems. Whilst every effort is made to ensure that the primary model reflects the most-likely case and conservative worse-case understanding of site conditions, this cannot be guaranteed and any model result presented as a single number should be viewed with a degree of caution.

2 Water Balance Model

2.1 Model Selection

The water balance model was simulated using the 'GoldSim' proprietary software, version 15. GoldSim is a modelling tool used to simulate the movement and storage of water within the water cycle, incorporating environmental parameters such as precipitation, evapotranspiration, runoff, infiltration, and storage. GoldSim is a dynamic simulation software which allows users to build models that represent both surface and groundwater flow processes. By using predefined elements, such as reservoirs, input/output flows, and modules to model natural and anthropogenic processes, the system's water dynamics can be visualized over time, accounting for variability in climate conditions, land use, and other factors. The model is designed to calculate water inputs, outputs, and storage balances, and it can be adjusted to simulate different environmental conditions and scenarios.

In GoldSim, the water balance is represented as an interconnected network of modules, where each component (e.g., precipitation, evaporation, runoff) is treated as a distinct element that influences the overall water system. GoldSim's stochastic capabilities allow for the integration of uncertainty and variability in input data, enabling simulations under different scenarios. The model helps in understanding the system's behaviour under various conditions, supporting decision-making for water resource management, environmental impact assessments, and sustainability planning

The model scenarios were simulated using daily time-steps, with the input parameters discussed below.

2.2 Model Scenarios

Three model scenarios were developed to align with the scenarios presented in Table 1.1 in Dubbo Quarry Water Management Plan (EMM, 2024), and include:

- Historic Operations – This was simulated to reflect operations that took place before the start of the Continuation Project. It involves dewatering the East Pit to ensure continued access for quarrying activities.
- Continuation Project (no East Pit SWD) – This simulation reflects the transitional phase from the historic operations, to the Continuation project (with East Pit SWD). The simulations also include the development of the Western Extension Area (WEA), Southern Extension Area (SEA) and rehabilitation of the East Pit.
- Continuation Project (with East Pit SWD) – This simulation reflects the ongoing quarry operations following development of the continuation project. It includes cessation of East Pit dewatering, development of the SEA and WEA, and development of the East Pit Surface Water Diversion.

Additionally, each model was simulated to account for the 10&ile, 50%ile and 90%ilee rainfall runoff values (discussed in **Section 2.4.1** below).

2.3 Water Storages

The water storages simulated within the model are summarised in **Table 2-1** below. The two primary inflow systems in the model include rainfall runoff (discussed further in **Section 2.4.1**), and inflows from the Paleochannel (discussed further in **Section 2.4.6**). Rainfall runoff has been simulated for all water storages. The additional function of each storage for each simulation is discussed below.

Historic operations of the East Pit included dewatering from the East Pit to the Settlement Pond which occurs when the pit water level was above 273 mAHD. Additionally, overflows to the Settlement Pond pit occur when water elevation reaches 286mAHD. During both continuation projects, dewatering has ceased, and increases in water storage are now discharged to Eulomogo Creek following the installation of a Culvert at the safe spill level of 280.2 mAHD. The overflow to the settlement pond still occurs at 286 mAHD, though no overflows were reported in 2024.

Historic operations of the Settlement Pond include overflows from the East Pit during dewatering operations and / or overflows above the safe spill level which are then discharged to Eulomogo Creek. During the Continuation Project phase, it is understood that the water from the Settlement Pond is pumped back into the East Pit.

Table 2-1 Water Storages, inflows and outflows

STORAGE	SIMULATION	INFLOWS	OUTFLOWS
East Pit (24.4 Ha)	Historic Operation	• Rainfall runoff • Upgradient water courses. • Paleochannel	• Evaporation • Operational water demands • Paleochannel • Dewatering above 273 mAHD • Overflows to the settling pond when the pit water level reaches 286 mAHD.
	Continuation Project (no East Pit SWD)	• Rainfall runoff • Upgradient water courses. • Paleochannel • Settling Pond • Haul Road Sedimentation Basin • WEA / SEA	• Evaporation • Operational water demands • Paleochannel • Dewatering is ceased, flows now a result of a culvert to Eulomogo Creek at the safe spill level of 280.2 mAHD
	Continuation Project (with East Pit SWD)	• Rainfall runoff • Paleochannel • Settling Pond • Haul Road Sedimentation Basin • WEA / SEA	• Evaporation • Operational water demands • Paleochannel • Dewatering is ceased, flows now a result of a culvert to Eulomogo Creek at the safe spill level of 280.2 mAHD
Settlement Pond (6.7 Ha)	Historic Operation	• Rainfall runoff • Overflows and dewatering from the East Pit.	• Evaporation • Eulomogo Creek
	Continuation Project (no East Pit SWD)	• Rainfall runoff	• Evaporation • Eulomogo Creek • Pumped into East Pit

STORAGE	SIMULATION	INFLOWS	OUTFLOWS
	Continuation Project (with East Pit SWD)	• Rainfall runoff	• Evaporation • Eulomogo Creek • Pumped into East Pit
Upgradient water courses (497 Ha)	Historic Operation	• Rainfall runoff	• Creek discharge to the East Pit
	Continuation Project (no East Pit SWD)	• Rainfall runoff	• Creek discharge to the East Pit
	Continuation Project (with East Pit SWD)	• Rainfall runoff	• Diverted to Eulomogo Creek
SEA (17.3 Ha)	Historic Operation	• Not in operation.	• Not in operation (not included in the water balance)
	Continuation Project (no East Pit SWD)	• Rainfall runoff.	• Evaporation • East Pit
	Continuation Project (with East Pit SWD)	• Rainfall runoff.	• Evaporation • East Pit
WEA (8.7 Ha)	Historic Operation	• Not in operation.	• Not in operation (not included in the water balance)

STORAGE	SIMULATION	INFLOWS	OUTFLOWS
	Continuation Project (no East Pit SWD)	• Rainfall runoff.	• Evaporation • East Pit
	Continuation Project (with East Pit SWD)	• Rainfall runoff.	• Evaporation • East Pit
Haul Road Sedimentation Basin (0.6 Ha)	Historic Operation	• Not in operation	• Not in operation
	Continuation Project (no East Pit SWD)	• Rainfall Runoff	• Evaporation • East Pit • Overflows to Eulomogo Creek when rainfall is above 0.2 ML/day
	Continuation Project (with East Pit SWD)	• Rainfall Runoff	• Evaporation • East Pit • Overflows to Eulomogo Creek when rainfall is above 0.2 ML/day
Eulomogo Creek	Historic Operation	• Overflows from Settling Pond	• Out of the model
	Continuation Project (no East Pit SWD)	• Culvert discharge from East Pit • Overflows from Sedimentation Basin	• Out of the model
	Continuation Project (with East Pit SWD)	• Culvert discharge from East Pit • Overflows from Sedimentation Basin • Upgradient Water Courses	• Out of the model

2.4 Model Assumptions

2.4.1 RAINFALL RUNOFF

Rainfall runoff was calculated based on the 10%ile, 50%ile and 90%ile of rainfall from the period of 1 January 1924, to 31 December 2024 (101 years of data). Rainfall runoff in each other catchments was parameterised using the Rainfall-Runoff Library (RRL). RRL is a tool used to simulate the rainfall runoff across a range of hydrological models. The model is used to predict the amount of surface water that will flow into rivers, streams, and other bodies of water after rainfall, accounting for factors such as infiltration, evaporation, and storage. The rainfall-runoff models can be used in both simple and complex simulations, depending on the level of detail required and the specific characteristics of the watershed being modelled.

For the water balance model, the SIMple HYDrological (SIMHYD) was used. SIMHYD is a conceptual rainfall-runoff model used to simulate the response of a catchment to rainfall. It is a simplified, parameter-based model designed to estimate streamflow from rainfall inputs based on observed data. SIMHYD is widely used due to its simplicity and ability to work in a variety of hydrological environments. The model represents a catchment using a series of interconnected tanks or storage elements to simulate the processes of rainfall interception, infiltration, and runoff generation.

As there was no creek flow data available, no calibration was conducted, and results are based on assumed input parameters. The runoff coefficient for each water storage area is calculated as a ratio of the volumetric runoff values divided by the volumetric rainfall.

The upgradient water course runoff values are expected to be lower than the quarry areas due to a reduction in impervious areas, as well as an increase in soil moisture capacity. Additionally, runoff across the percentiles is expected to increase due to similar soil properties that account for greater infiltration during lower rainfall years, and higher overland flow during high rainfall years. SIMHYD input parameters for the upgradient watercourses were based on the maximum harvestable rights calculator (DPIE) for an average annual runoff coefficient of 0.1 for the upgradient water sources, and the quarry water storage areas were determined based on the *Managing Urban Stormwater: Volume 1* (Landcom 2004) for a runoff coefficient of 0.5.

2.4.2 EVAPORATION

Average Pan Evaporation losses from the water storages was calculated from the SILO enhanced climate database (QLD DES, 2021). Daily pan evaporation was calculated using a Pan Coefficient of 0.7, which is recommended for class US Class A Pan Evaporation (Stanhill, 1976).

Daily evaporation rates were applied to the water storage surface areas, with the surface area for the East Pit being interpolated based on the East Pit Water Level to surface area rates presented in Table 7.5 in the Dubbo Quarry Water Management Plan (EMM, 2024). Evaporation was not calculated for the SEA and WEA as they are assumed to be pumped dry following an influx of water.

2.4.3 PROCESS WATER DEMANDS

Process water use was supplied to Reditus and included as outflows in the WBM and was calculated as a monthly outflow. As these values were supplied based on recorded data, process water was consistent across all simulations. Dust suppression volumes for the haul road were calculated in line with the Dubbo Quarry Water Management Plan (EMM, 2024) as a daily time step based on the following equation:

$$DSupp(t) = \Big(\big(Evap(t) - Rain(t)\big) + LossFactor\Big)\, xArea$$

Dust suppression demands were applied when daily rainfall exceeded daily evaporation, and a loss factor of 2mm/day was used. For historic operations, and the continuation scheme, an area of 0.6 Ha and 0.98 Ha was applied, respectively.

2.4.4 FLOW TRANSFERS

Flow transfers between the storages was assumed to be at a pumping rate of 50 l/s. Flow transfers operate on a daily time step period meaning that if the 'pumping-on' trigger is met at the beginning of each daily time step period then pumping will be activated for the entirety of the time step period. For example, if the 'pumping-on' trigger in the East Pit water level is equal to or above 273 mAHD, then pumping will be activated for the entirety of the time step period when the trigger is met (12:00am-11.59pm).

2.4.5 INITIAL VOLUMES

Initial volume of each storage were assumed based on the available data. Each water storage included in the model were assumed to be dry at the beginning of the modelled timeline with the exception of the East Pit. For the Historic Operations scenario, the assumed initial water volume of the East Pit was at the historically maintained dewatering level of 273 mAHD which was approximately equivalent to an East Pit volume of 163 ML. For both Continuation Project scenarios, the assumed initial water volume of the East Pit was within the estimated East Pit / paleochannel exchange equilibrium level (277 mAHD) which was approximately equivalent to an East Pit volume of 245 ML.

2.4.6 GROUNDWATER / SURFACE WATER INTERACTION

The East Pit has been developed into an underlying paleochannel and the relationship between the East Pit water level, and the groundwater pressure within the paleochannel has been described in the Dubbo Quarry Water Management Plan (EMM, 2024). The flow exchange between the paleochannel and the East Pit as reported in the Water Management Plan is presented in **Figure 2-1** below. It is noted that the interaction between the East Pit and the paleochannel can be more accurately defined using the groundwater levels and the East Pit water levels following the cessation of dewatering, though due to a data management error, no water levels for the East Pit were recorded. As such, the interaction between the two units was defined using the average East Pit flow exchange curve presented in the Water Management Plan. (EMM, 2024)

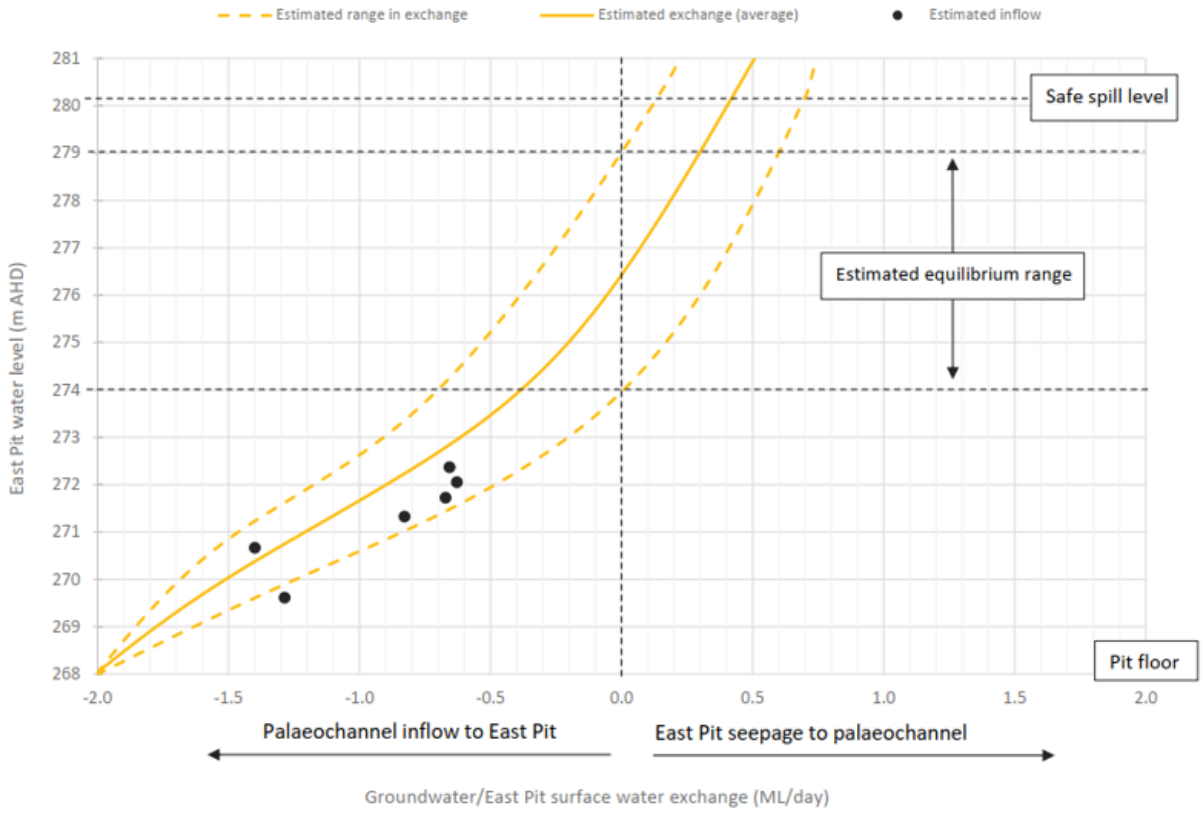

Figure 2-1 Paleochannel exchange with the east pit as presented in EMM (2024)

3 Results

A summary of the results for the Historical Operations, Continuation Scheme (no East Pit SWD) and Continuation Scheme (with East Pit SWD) are presented in **Table 3-1** below. Flow diagrams for each simulation are presented in **Figure B1** to **Figure B9** in **Appendix B**. A summary of the outflows are as follows:

- Inflows range from:
  - 345 ML/year to 932 ML./year during the Historic Operations simulations.
  - 156 ML/year to 859 ML/year for the Continuation Scheme (no East Pit SWD)
  - 82 ML/year to 263 ML/year for the Continuation Scheme (with East Pit SWD)
- Outflows range from:
  - 558 ML/year to 970 ML./year during the Historic Operations simulations.
  - 134 ML/year to 599 ML/year for the Continuation Scheme (no East Pit SWD)
  - 95 ML/year to 198 ML/year for the Continuation Scheme (with East Pit Creek SWD)
- East Pit overflows range from:
  - 527 ML/year to 937 ML./year during the Historic Operations simulations.
  - 0 ML/year to 372 ML/year for the Continuation Scheme (no East Pit SWD)
  - 0 ML/year to 1 ML/year for the Continuation Scheme (with East Pit SWD)

Increased inflows within the Historic Operations are likely a result of the dewatering operations, as they lead to increased paleochannel inflows due to maintaining a pit water level below the paleochannel / East Pit equilibrium level. Removing the dewatering requirement within the continuation scheme leads to greater outflows of the model, but reduced overflows to Eulomogo Creek. Additionally, the development of the East Pit creek diversion will lead to significantly reduced overflows to Eulomogo Creek, with a maximum overflow value simulated for the 90%ile simulation of 1ML which is likely only to occur during a significant rain event.

Table 3-1 Results Summary for the Water Balance Model

		Quarry Catchments	Upgradient Watercourses	Paleochannel Inflows	Total Inflows	Operational Use	Evaporation	Discharges			Total Outflows	Change in Storage
								Sediment Basin Overflow	East Pit Dewatering / Overflows	East Pit Seepage to Paleochannel		
Historic	**10th**	42	76	227	**345**	13	17	-	527	0	**558**	**-213**
	50th	83	212	223	**519**	13	17	-	575	0	**605**	**-86**
	90th	141	596	195	**932**	13	19	-	937	0	**970**	**-38**
Continuation (no diversion)	**10th**	79	76	1	**156**	19	51	0	0	64	**134**	**22**
	50th	155	212	0	**367**	19	72	0	305	133	**529**	**-162**
	90th	263	596	0	**859**	19	73	0	372	135	**599**	**260**
Continuation (with diversion)	**10th**	79	0	3	**82**	19	44	0	0	32	**95**	**-13**
	50th	155	0	1	**156**	19	51	0	0	64	**134**	**22**
	90th	263	0	0	**263**	19	65	0	1	113	**198**	**65**

4 Model Limitations

Water balance models inherently include model sensitivity and uncertainty due to the complex and variable nature of hydrological processes. They models rely on numerous input parameters, such as rainfall, evaporation rates, soil characteristics, and land use data, each of which can be influenced by inaccuracies in measurement, spatial variability, or temporal fluctuations. Simplifications and assumptions made during model formulation, such as discharge rates can further amplify uncertainties. As a result, even the most sophisticated water balance models carry a degree of uncertainty, emphasizing the need for sensitivity analyses and cautious interpretation of results. Despite these challenges, such models remain invaluable tools for water resource management and planning.

The following sensitivities and uncertainties were encountered within the model and may have significant impacts on the site water balance:

- Paleochannel interaction with the East Pit was modelled using the estimated average exchange curve presented by EMM in the Water Management Plan (EMM, 2024). The estimated equilibrium range within the conceptual flow curve has a range of 5 m, between 279 mAHD and 274 mAHD. Changes in this equilibrium range can have a number of flow on effects for the water cycle. Within the continuation model, a higher equilibrium may lead to increased baseflow to the East Pit and higher discharges to Eulomogo Creek, and conversely, a smaller equilibrium will lead to reduced baseflow and lower discharges to Eulomogo Creek. Recommendations within the Water Management Plan were to continue monitoring following cessation of dewatering to further define this flow relationship, though no East Pit water levels have been recorded.
- Initial water volumes within the East Pit can impact volumes of water discharged to Eulomogo Creek. As there were no pit water levels recorded, initial water volumes were assumed. The assumptions for the initial water volumes are presented in **Section 2.4.5**. The 50%ile continuation model (no East Pit water diversion) was simulated using a variety of initial volumes and are presented in **Table 4-1** below. An initial volume based on a water level of 273 mAHD (the dewatering level) reduces the discharge to Eulomogo Creek, whereas a water level of 280.2 mAHD (the height of the culvert) increases discharge to Eulomogo Creek.

Table 4-1 Overflows to the creek with variable initial levels in the 50%ile continuation simulation (no East Pit Diversion)

BASIS	INITIAL LEVEL (MAHD)	OVERFLOWS TO EULOMOGO CREEK (ML)
Dewatering level	273	266
Paleochannel Equilibrium	276	300
Safe Spill Level	280.2	336

- Safe spill levels also provide sensitivities within the model, which may arise from installation of the culvert, which can influence the volume of water discharged to Eulomogo Creek. **Table 4-2** below modelled changes in the safe spill level to reflect these influences, with simulations for the 50%ile continuation scheme (no East Pit SWD) run for safe spill level variations around the culvert level, as well as the safe spill level of the historic operations (286 mAHD). These results show that there are significant reductions in the overflows to Eulomogo Creek should the culvert be marginally above the safe spill level.

Table 4-2 Overflow volumes in relation to safe spill levels

SAFE SPILL LEVEL (MAHD)	OVERFLOWS TO EULOMOGO CREEK (ML)
280.2	305
281	236
279	414
286	0

- Rainfall runoff models have been parameterised using the SIMHYD model to align with *Managing Urban Stormwater Soils and Construction: Volume 1* (Landcom 2004) default volumetric runoff coefficient and the DPIE maximum harvestable rights calculator. The following uncertainties are noted:
  - If rainfall runoff coefficients within the quarry areas is higher, then discharges from the East Pit to Eulomogo Creek, and the paleochannel will increase. Conversely reduced rainfall coefficients will lead to reduced outflows to Eulomogo Creek and the paleochannel.
  - If rainfall runoff coefficients within the upgradient watercourses increase then inflows to the East Pit will increase, and thus, increased outflows to the paleochannel and Eulomogo Creek will occur. Conversely, if rainfall runoff coefficients are reduced, then inflows into the East Pit, and thus outflows to the paleochannel and Eulomogo Creek will occur. It is noted that these changes would not occur within the Continuation Project (with East Pit diversion) scenario, as the upgradient water courses are re-routed around the quarry.

5 Conclusions

A water balance model was developed using GoldSim version 15 for the Dubbo Quarry using updated climate and field data. Three schemes were modelled to represent the continued operations scheme to allow the client to expand into the SEA and WEA, as part of the SSD application (SSD10417). The schemes are as follows:

- Historic Operations – This was simulated to reflect operations that took place before the start of the Continuation Project. It involves dewatering the East Pit to ensure continued access for quarrying activities.
- Continuation Project (No East Pit SWD) – This scheme reflects the transitional phase from the Historic Operations to the Continuation project (with East Pit SWD). The scheme also includes the development of the Western Extension Area (WEA), Southern Extension Area (SEA) and rehabilitation of the East Pit.
- Continuation Project (with East Pit SWD) – This simulation reflects the ongoing quarry operations following development of the continuation project. It includes cessation of East Pit dewatering, development of the SEA and WEA, and development of the East Pit Surface Water Diversion.

Each scheme was simulated with a 10%ile, 50%ile and 90%ile rainfall runoff values based on 101 years' worth of data (01 January 1924 to 31 December 2024). Model results indicate that the East Pit diversion scheme will significantly reduce the East Pit overflows to Eulomogo Creek. The results of the simulations are following:

- Inflows range from:
  - 345 ML/year to 932 ML./year during the Historic Operations simulations.
  - 156 ML/year to 859 ML/year for the Continuation Scheme (no East Pit Creek diversion)
  - 82 ML/year to 263 ML/year for the Continuation Scheme (East Pit Creek diversion)
- Outflows range from:
  - 558 ML/year to 970 ML./year during the Historic Operations simulations.
  - 134 ML/year to 599 ML/year for the Continuation Scheme (no East Pit Creek diversion)
  - 95 ML/year to 198 ML/year for the Continuation Scheme (East Pit Creek diversion)
- East Pit overflows range from:
  - 527 ML/year to 937 ML./year during the Historic Operations simulations.
  - 0 ML/year to 372 ML/year for the Continuation Scheme (no East Pit Creek diversion)
  - 0 ML/year to 1 ML/year for the Continuation Scheme (East Pit Creek diversion)

A review of the model and available data found uncertainties with the following:

- Paleochannel interaction with the East Pit can influence the inflows and outflows within the model. The average flow exchange curve was used for the models, though the estimated range is approximately 5 m.
- Initial water volumes can influence the inflows and outflows of the model as a direct relationship with the paleochannel flow exchange curve. No pit water level data was available, and as such, initial volumes were assumed.
- Safe spill levels provide sensitivities within the model, as marginal changes in culvert height can change the volumes of overflow to Eulomogo Creek.
- Rainfall runoff values are parameterised using SIMHYD (RRL) to meet the runoff coefficients within *Managing Urban Stormwater Soils and Construction: Volume 1* (Landcom 2004) default volumetric runoff coefficient and the DPIE maximum harvestable rights calculator. Rainfall runoff coefficients can vary significantly, which can influence the inflows and outflows of the models.

Based on the model uncertainties, the following recommendations are made:

- Daily East Pit water levels should be collected to establish East Pit overflow rates, East Pit initial volumes, and to further define the paleochannel / East Pit flow exchange curve. As dewatering has ceased, the relationship between the East Pit and the paleochannel can be defined to a greater accuracy.

- Upgradient watercourse flow data should be collected to provide data for calibration of the rainfall runoff models used for each water storage.

6 Limitations

The report or document does not purport to provide legal advice, and any conclusions or recommendations made should not be relied upon as a substitute for such advice. The report does not constitute a recommendation by Reditus for the client (Holcim (Australia) pty ltd c/o 4Pillars Consulting Pty Ltd) or any other party to engage in any commercial or financial transaction and any decision by the client or other party to engage in such activities is strictly a matter for the client.

The report relies upon data, surveys, measurements and results taken at or under the site at particular times and conditions specified herein. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the client. Furthermore, the report has been prepared solely for use by the client and Reditus accepts no responsibility for its use by other parties. The client agrees that Reditus' report or associated correspondence will not be used or reproduced in full or in part for promotional purposes and cannot be used or relied upon by any other individual, party, group or company in any prospectus or offering. Any individual, party, group or company seeking to rely on this report cannot do so and should seek their own independent advice.

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Reditus is not engaged in environmental auditing and/or reporting of any kind for the purpose of advertising sales promoting, or endorsement of any client's interests, including raising investment capital, recommending investment decisions, or other publicity purposes. Reditus assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Reditus, or developments resulting from situations outside the scope of this project.

Information relating to groundwater in this document is considered to be accurate at the date of issue. Subsurface conditions can vary across a particular site or region, which cannot be wholly defined by investigation. As a result, it is unlikely that the results and estimations presented in this report will represent the extremes of conditions within the site that may exist. Subsurface conditions can change in a limited period of time and typically have a high level of spatial heterogeneity.

From a technical perspective, there is a high degree of uncertainty associated with the assessment of subsurface, aquatic and atmospheric environments. They are prone to be heterogeneous, complex environments, in which small subsurface features or changes in geologic conditions or other environmental anomalies can have substantial impact on water, air and chemical movement.

All water balance models include some degree of uncertainty in their predictions as they are, by necessity, simplifications of complex real-world systems. Whilst every effort is made to ensure that the primary model reflects the 10^{th} percentile, 50^{th} percentile and 90^{th} percentile understanding of site conditions, this cannot be guaranteed and any model result presented as a single number should be viewed with a degree of caution.

Reditus' professional opinions are based upon its professional judgment, experience, and training. These opinions are also based upon data derived from the limited testing and analysis described in this report or reports reviewed. It is possible that additional testing and analysis might produce different results and/or different opinions or other opinions. Reditus has limited its investigation(s) to the scope agreed upon with its client. Reditus believes that its opinions are reasonably supported by the testing and analysis that has been undertaken (if any), and that those opinions have been developed according to the professional standard of care for the environmental consulting profession in this area at this time. Other opinions and interpretations may be possible. That standard of care may change and new methods and practices of exploration, testing and analysis may develop in the future, which might produce different results.

7 References

EMM (2024). *Dubbo Quarry – Water Management Plan*, prepared for Holcim (Australia) Pty Ltd, Ref: E230410RP01

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A

Site Layout

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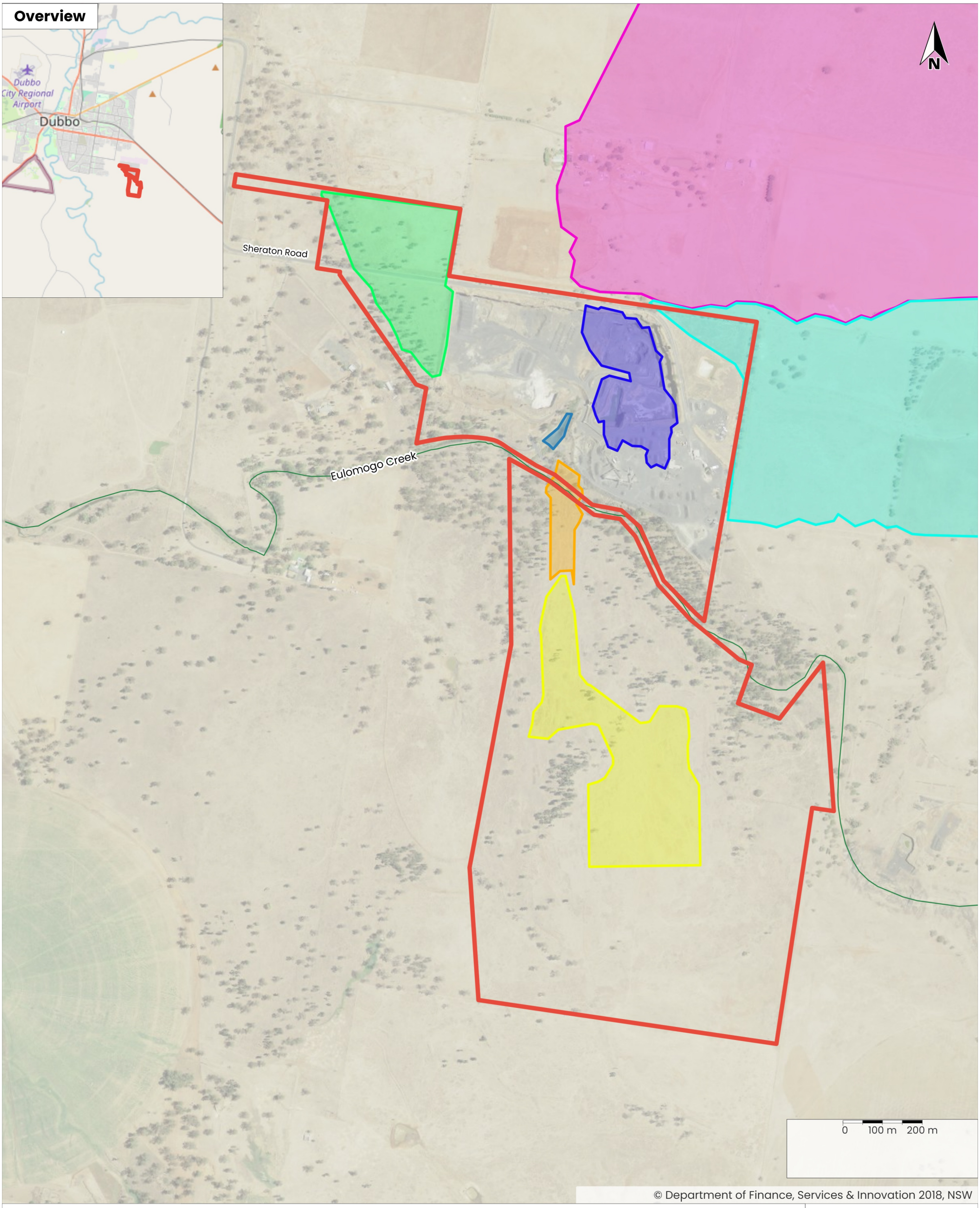
Dubbo Quarry - Water Balance Model

4Pillars Environmental Consulting

Figure A1 - Site Layout

Sheraton Road, Dubbo NSW, Australia



Legend

- Site
- East Pit
- Eastern Watercourse Catchment
- WEA Pit
- Northern Watercourse Catchment
- Settling Pond
- Haul Road Area
- SEA Pit

Project No: 25015	
Scale: 1:9250	**Date:** 25-03-2025
Author: TG	**Approver:** SM
Data Source: © Department of Finance, Services & Innovation 2018, NSW Government	

B

Water Balance Model Flow Charts

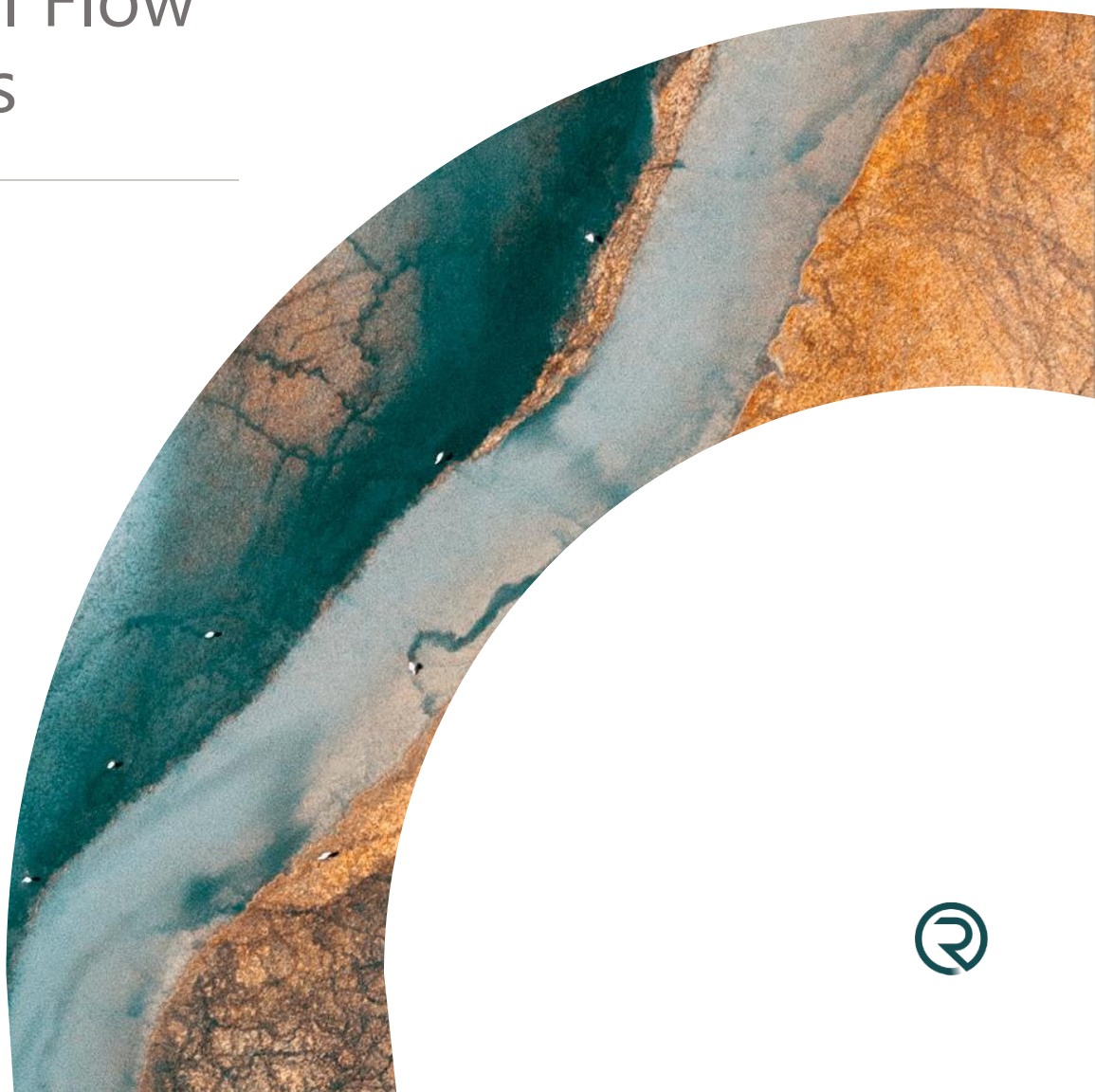


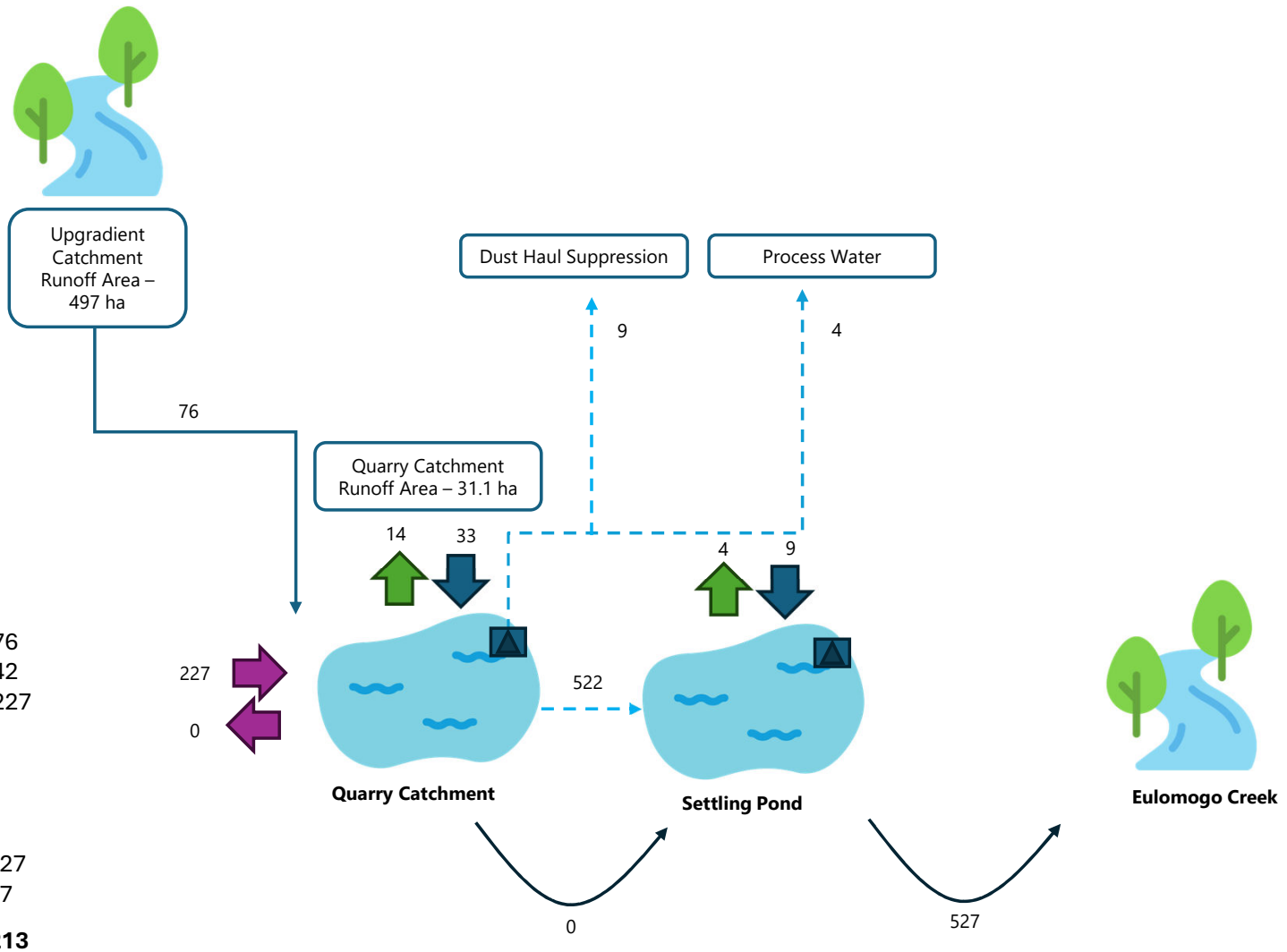
Figure B1

10th Percentile Annual Rainfall Conditions

Annual Rainfall: 350.3 mm

Legend

- Runoff
- Evaporation
- Paleochannel/east pit water exchange
- Pump Transfer
- Overflow



Results (ML)

Inflows	
Upgradient Watercourse	76
Quarry	42
Paleochannel/East Pit Exchange	227
Outflows	
Process Water	4
Haul Road Dust Suppression	9
Overflows	527
Evaporation	17
Water Balance:	**-213**

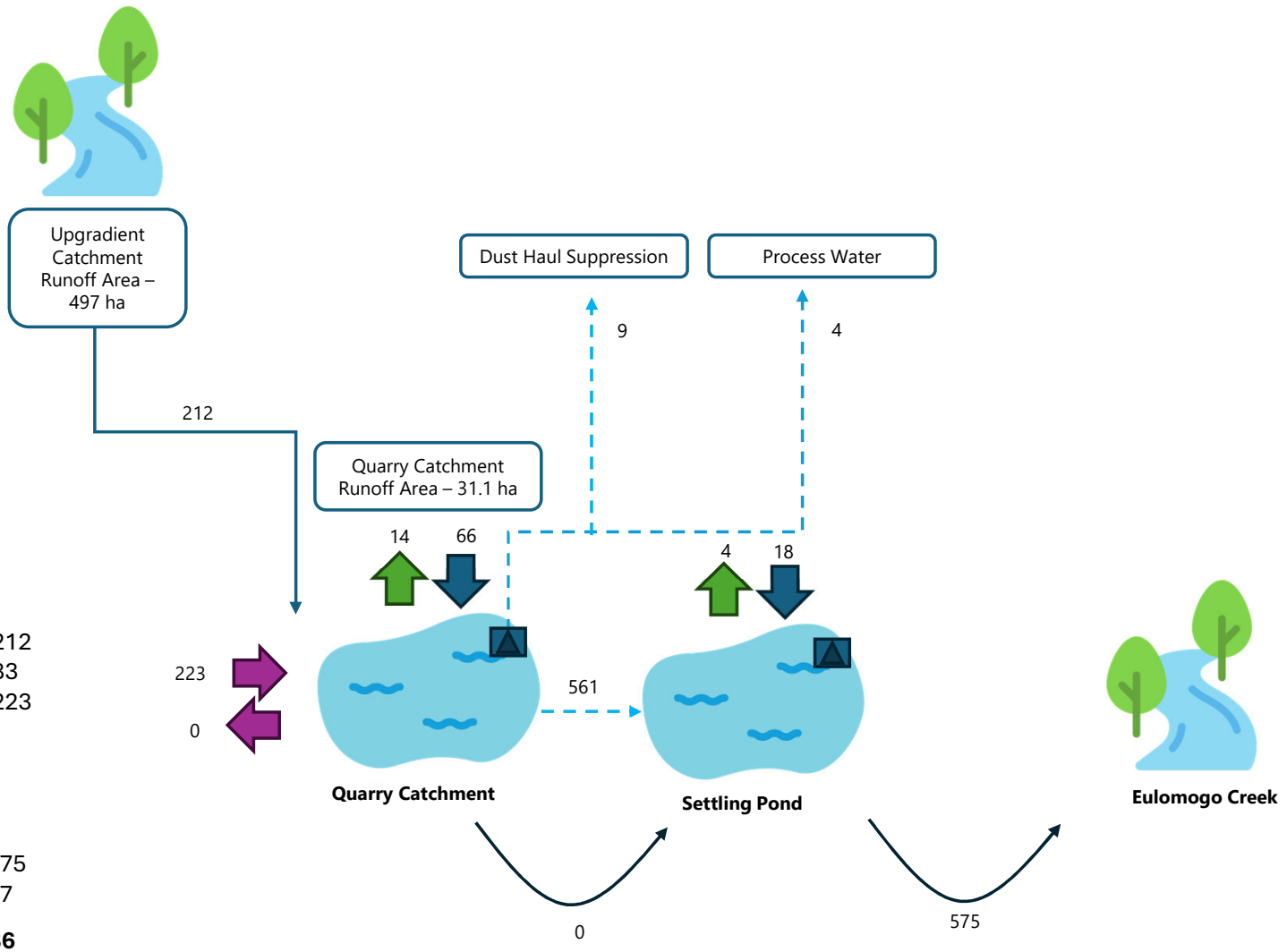
Figure B2

50th Percentile Annual Rainfall Conditions

Annual Rainfall: 580.4 mm

Legend

- Runoff
- Evaporation
- Paleochannel/east pit water exchange
- Pump Transfer
- Overflow



Results (ML)

Inflows	
Upgradient Watercourse	212
Quarry	83
Paleochannel/East Pit Exchange	223
Outflows	
Process Water	4
Haul Road Dust Suppression	9
Overflows	575
Evaporation	17
Water Balance:	**-86**

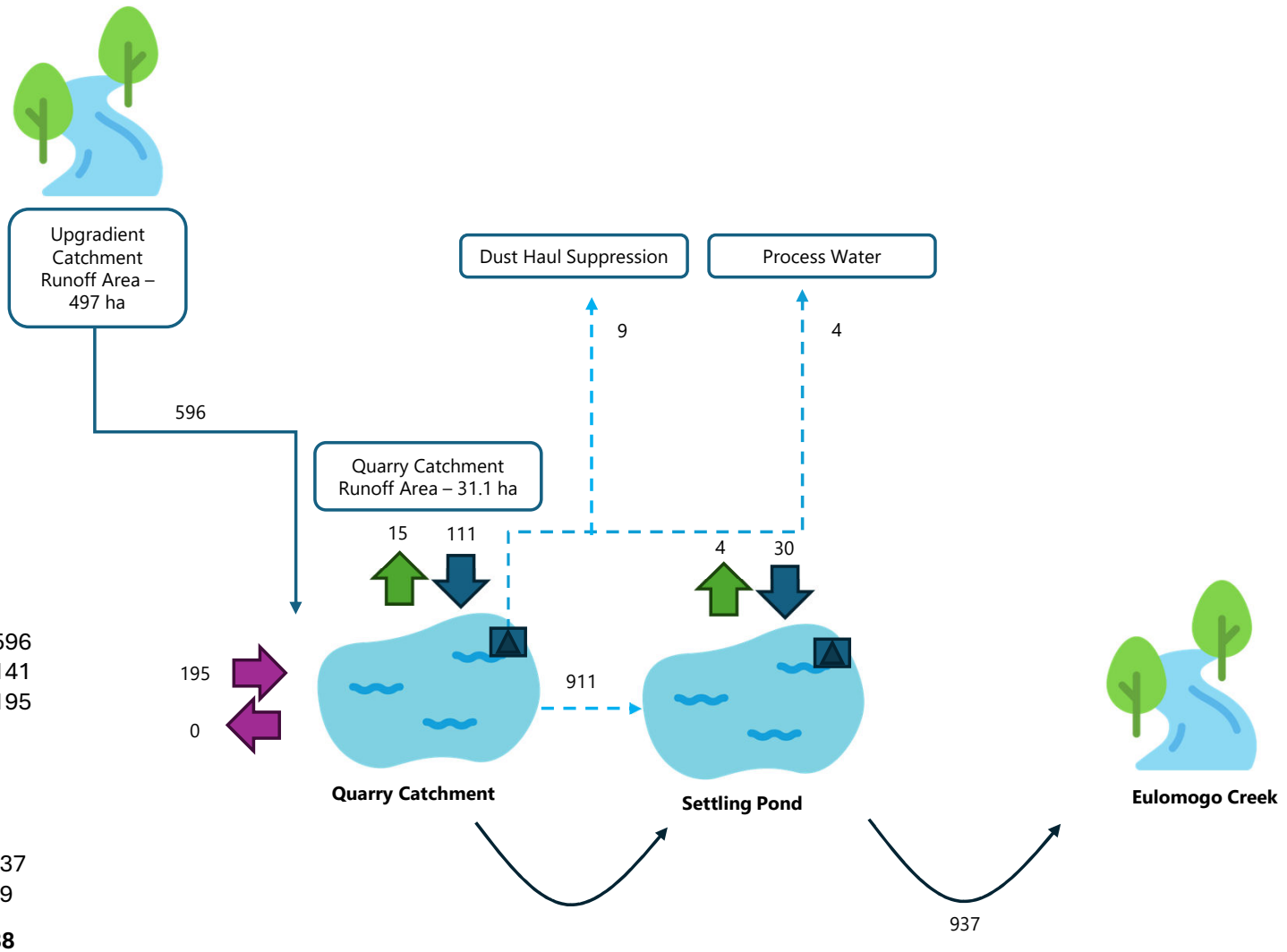
Figure B3

90th Percentile Annual Rainfall Conditions

Annual Rainfall: 848.6 mm

Legend

- Runoff
- Evaporation
- Paleochannel/east pit water exchange
- Pump Transfer
- Overflow



Results (ML)

Inflows	
Upgradient Watercourse	596
Quarry	141
Paleochannel/East Pit Exchange	195
Outflows	
Process Water	4
Haul Road Dust Suppression	9
Overflows	937
Evaporation	19
Water Balance:	**-38**

Figure B4

10th Percentile Annual Rainfall Conditions

Annual Rainfall: 350.3 mm

Legend

- Runoff
- Evaporation
- Paleochannel/east pit water exchange
- Pump Transfer
- Overflow

Results (ML)

Inflows	
Upgradient Watercourse	76
Quarry	42
Paleochannel/East Pit Exchange	2
WEA + SEA	35
Outflows	
Process Water	4
Haul Road Dust Suppression	15
Discharge via Culvert	0
Evaporation	51
Water Balance:	**22**

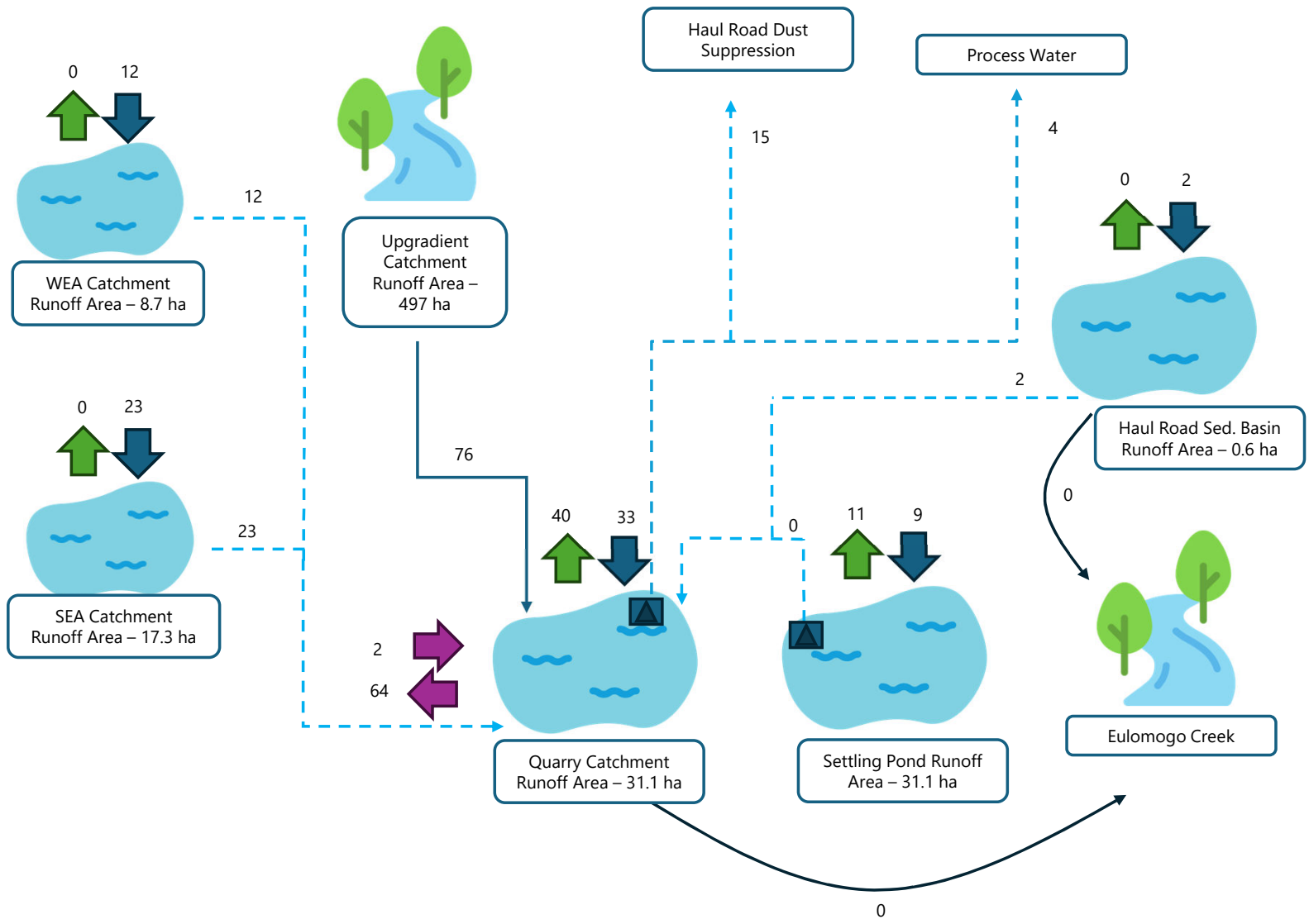


Figure B5

50th Percentile Annual Rainfall Conditions

Annual Rainfall: 580.4 mm

Legend

- Runoff
- Evaporation
- Paleochannel/east pit water exchange
- Pump Transfer
- Overflow

Results (ML)

Inflows	
Upgradient Watercourse	212
Quarry	83
Paleochannel/East Pit Exchange	0
WEA + SEA	69
Outflows	
Process Water	4
Haul Road Dust Suppression	15
Discharge via Culvert	305
Evaporation	72
Water Balance:	**-162**

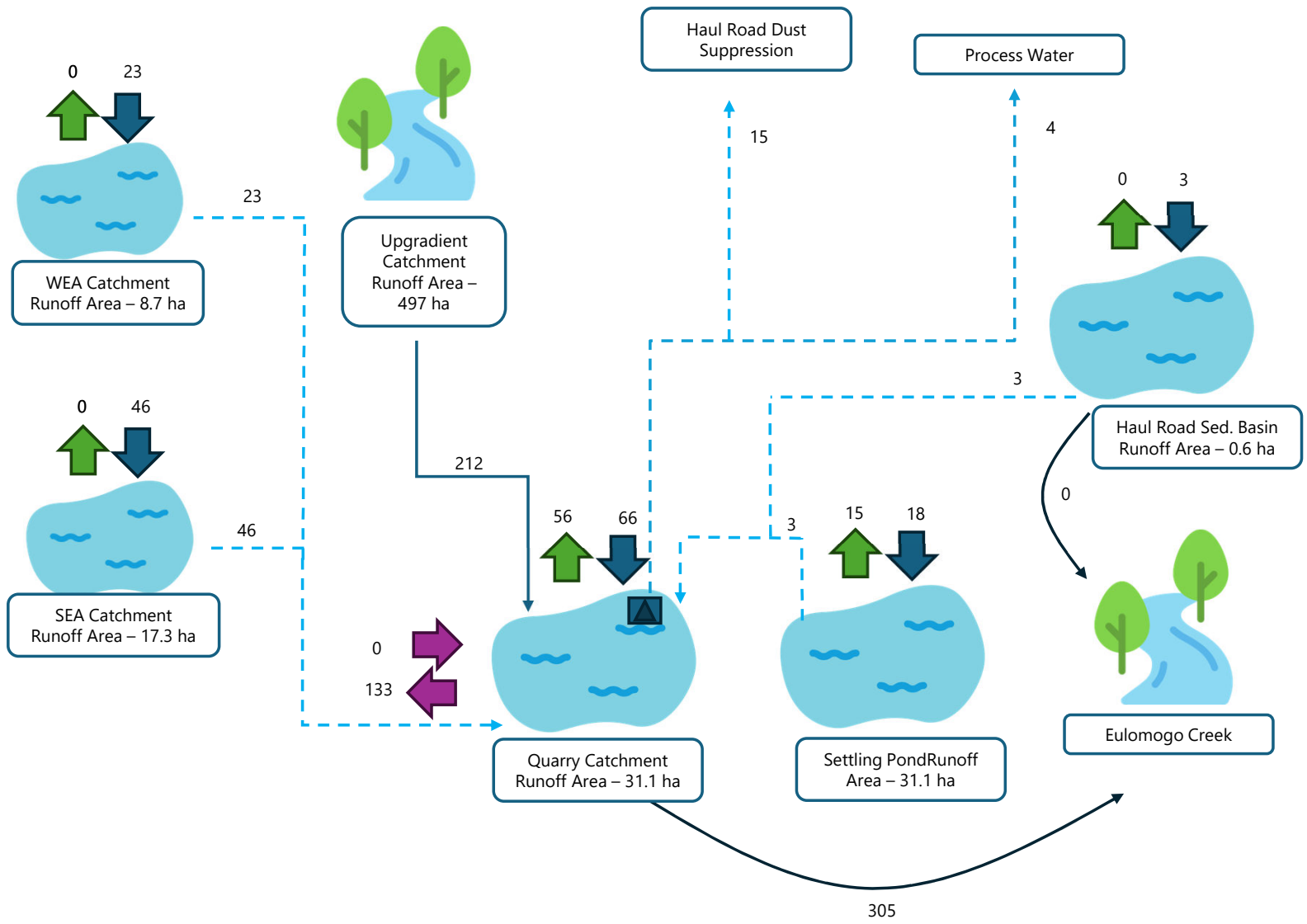


Figure B6

90th Percentile Annual Rainfall Conditions

Annual Rainfall: 848.6 mm

Legend

- Runoff
- Evaporation
- Paleochannel/east pit water exchange
- Pump Transfer
- Overflow

Results (ML)

Inflows	
Upgradient Watercourse	596
Quarry	141
Paleochannel/East Pit Exchange	0
WEA + SEA	118
Outflows	
Process Water	4
Haul Road Dust Suppression	15
Overflows (Via Culvert)	372
Evaporation	73
Water Balance:	**260**

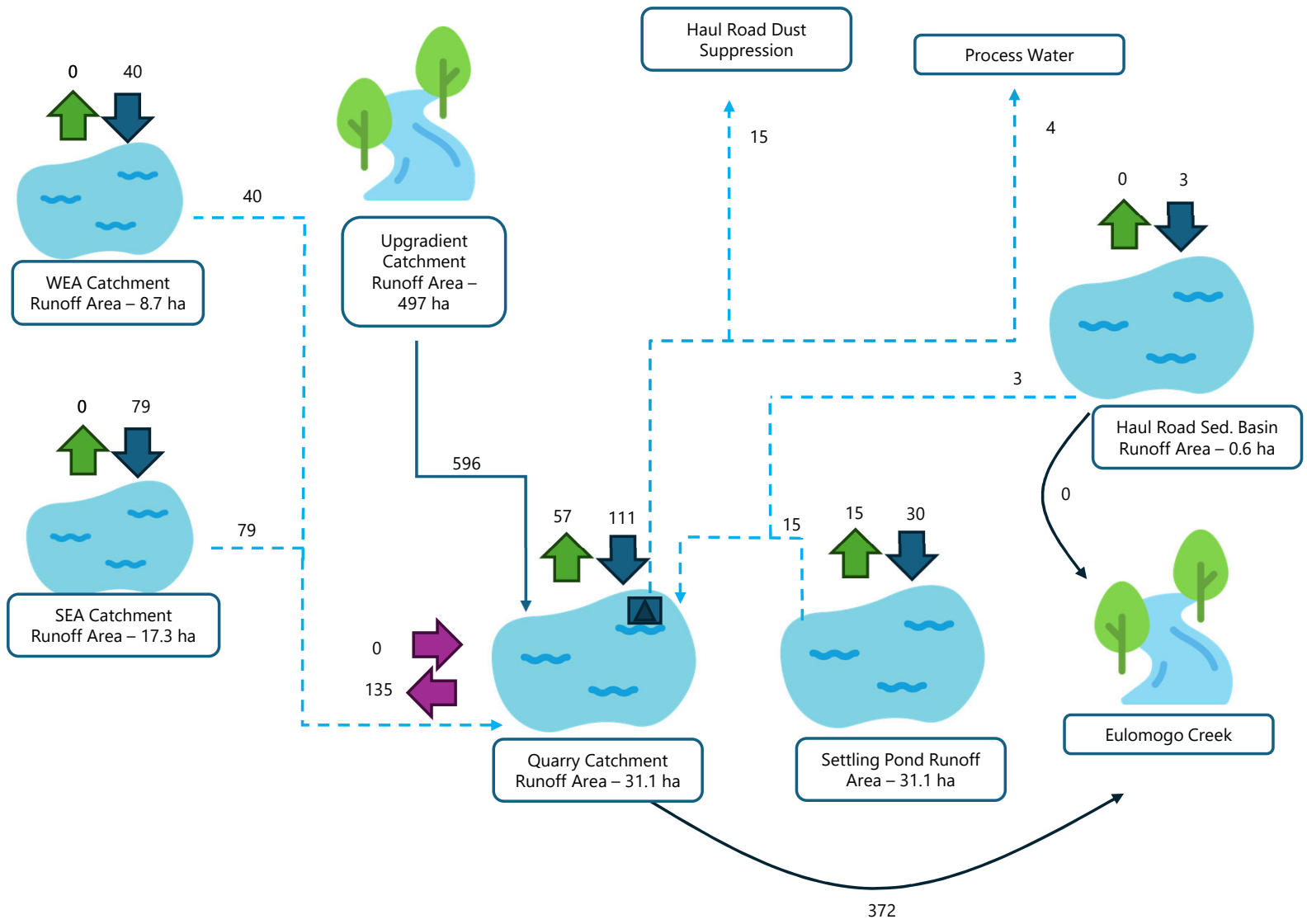


Figure B7

10th Percentile Annual Rainfall Conditions

Annual Rainfall: 350.3 mm

Legend

- Runoff
- Evaporation
- Paleochannel/east pit water exchange
- Pump Transfer
- Overflow

Results (ML)

Inflows	
Upgradient Watercourse	0
Quarry	42
Paleochannel/East Pit Exchange	0
WEA + SEA	35
Outflows	
Process Water	4
Haul Road Dust Suppression	15
Overflows (Via Culvert)	0
Evaporation	44
Water Balance:	**-13**

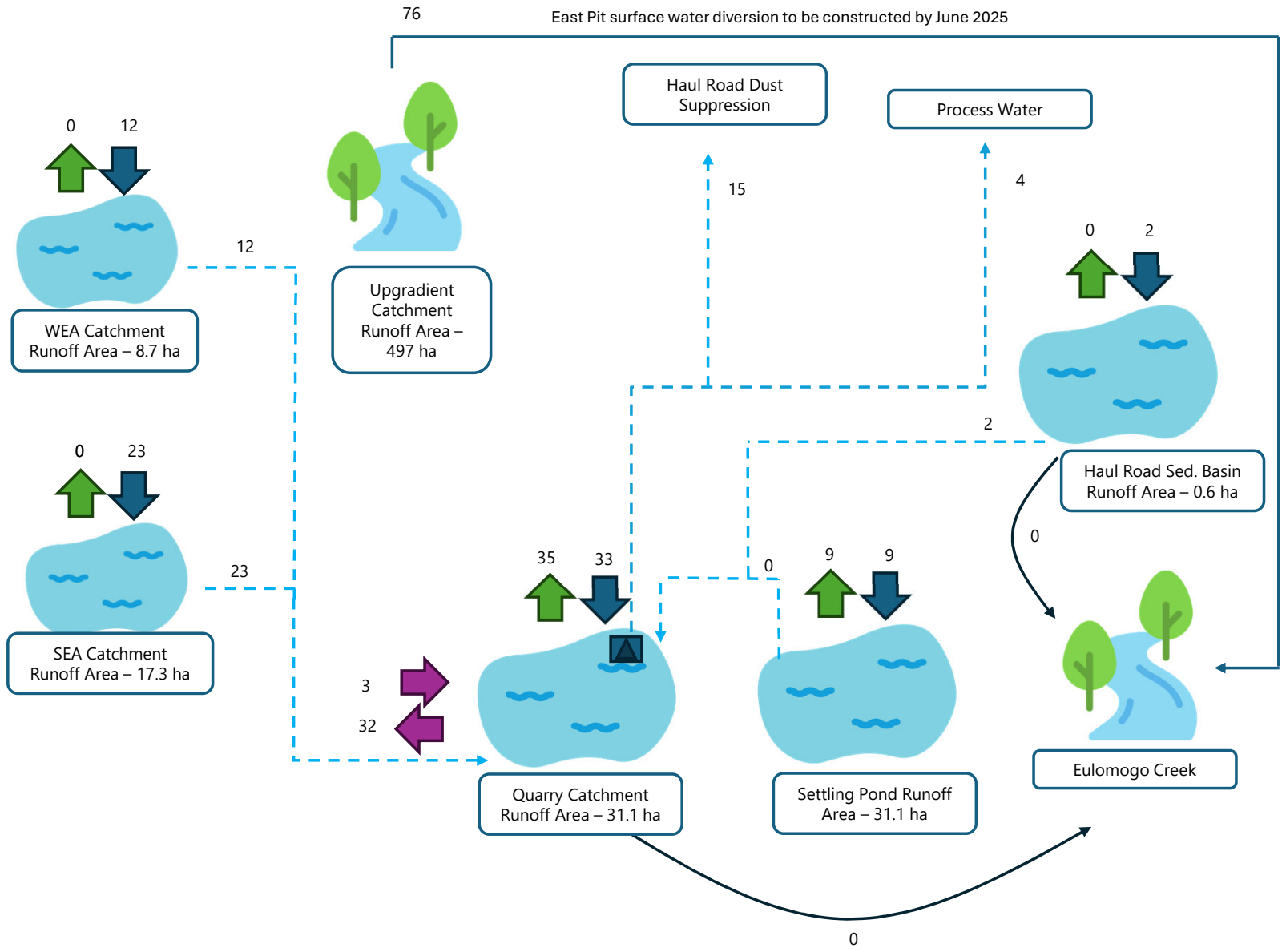


Figure B8

50th Percentile Annual Rainfall Conditions

Annual Rainfall: 580.4 mm

Legend

- Runoff
- Evaporation
- Paleochannel/east pit water exchange
- Pump Transfer
- Overflow

Results (ML)

Inflows	
Upgradient Watercourse	0
Quarry	83
Paleochannel/East Pit Exchange	1
WEA + SEA	69
Outflows	
Process Water	4
Haul Road Dust Suppression	15
Overflows (Via Culvert)	0
Evaporation	51
Water Balance:	**22**

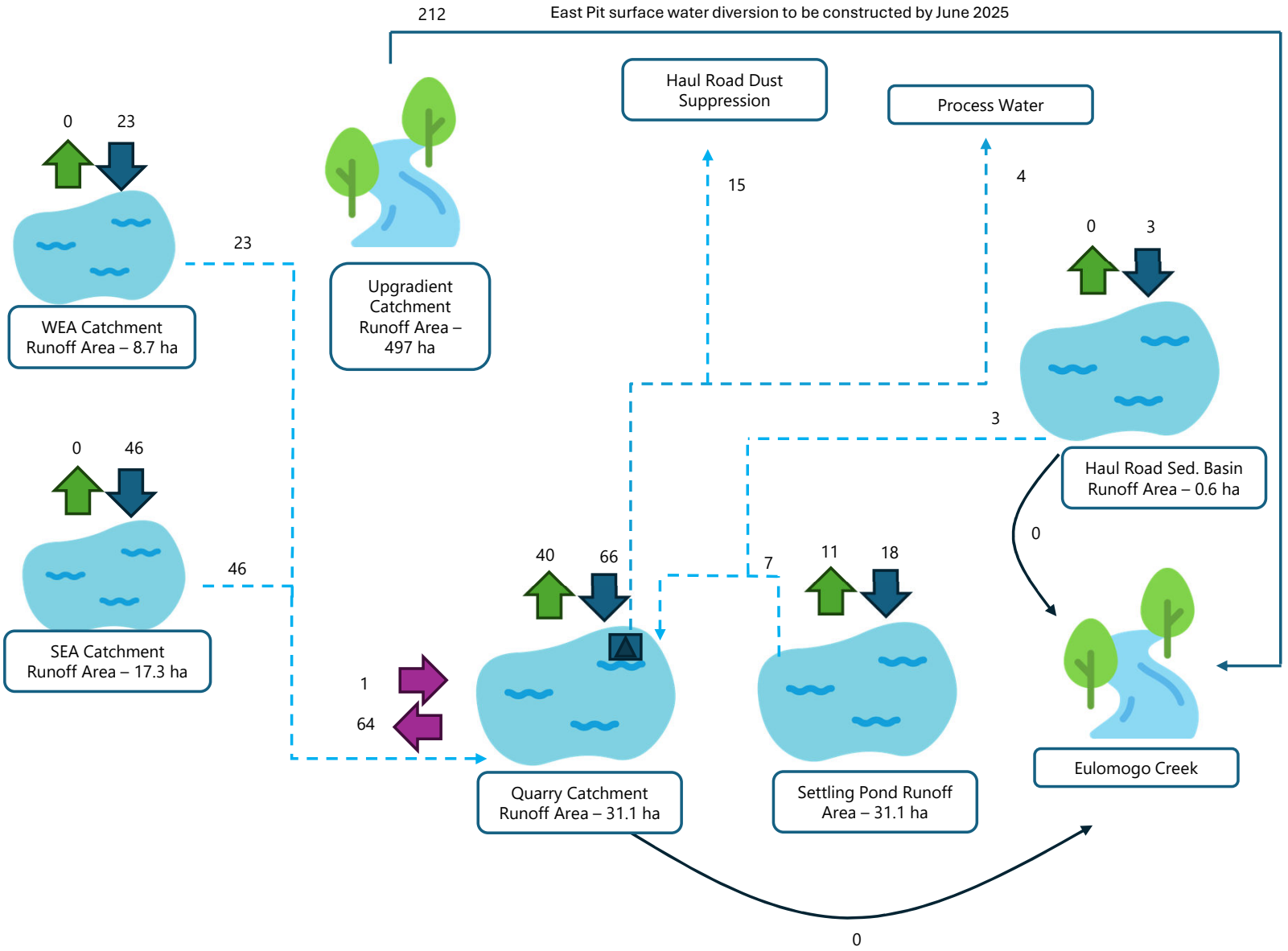


Figure B9

90th Percentile Annual Rainfall Conditions

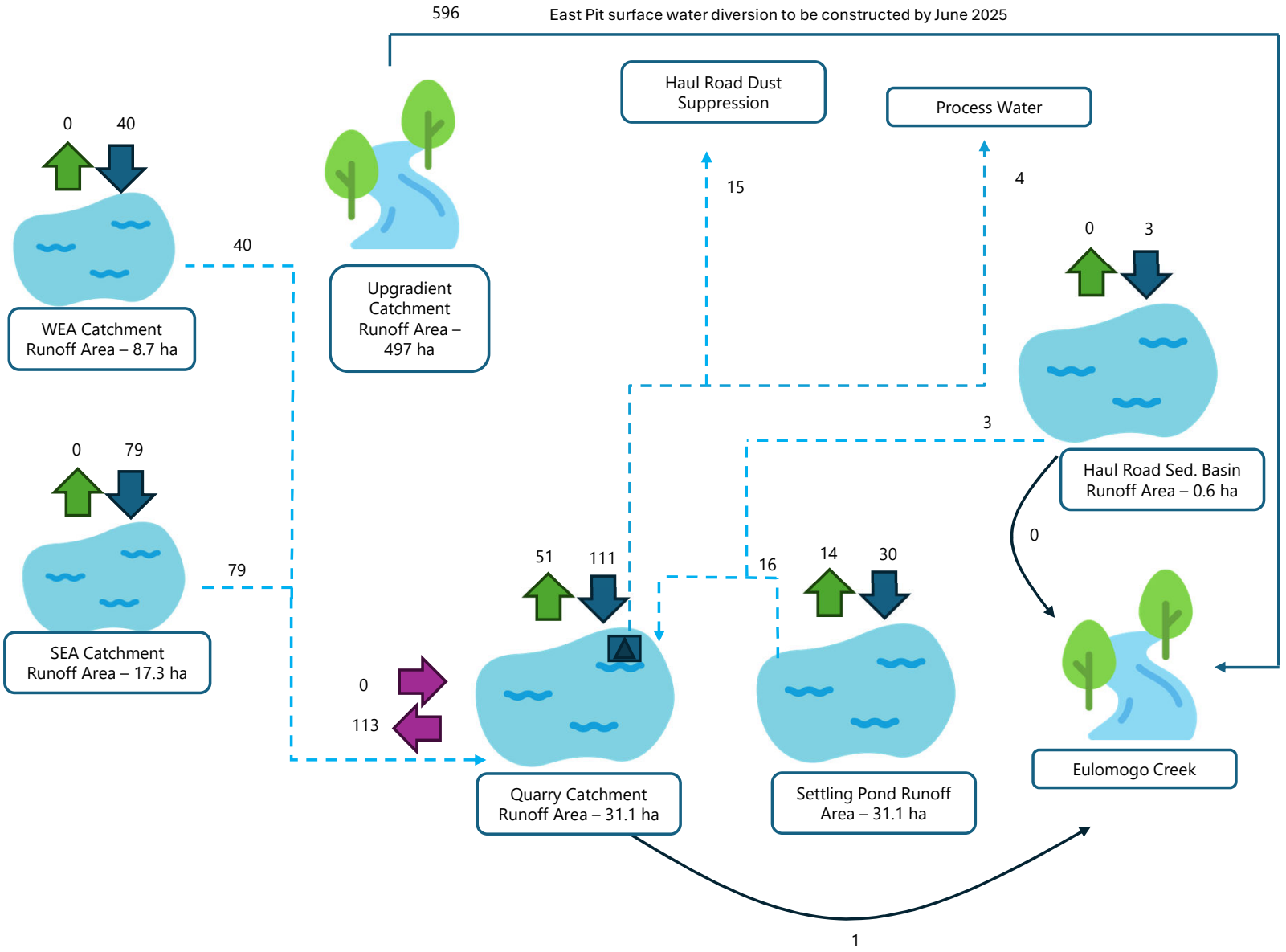
Annual Rainfall: 848.6 mm

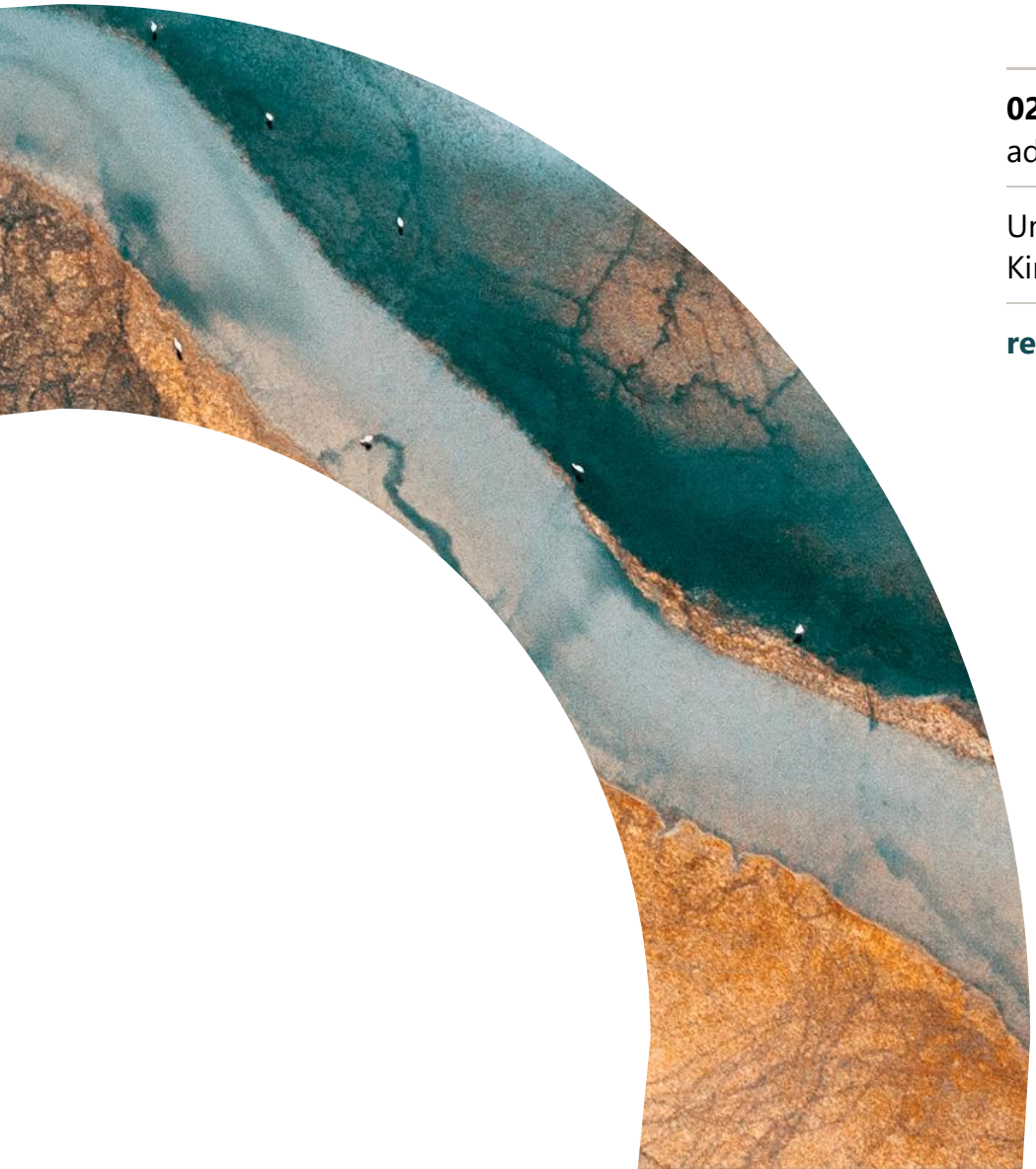
Legend

- Runoff
- Evaporation
- Paleochannel/east pit water exchange
- Pump Transfer
- Overflow

Results (ML)

Inflows	
Upgradient Watercourse	0
Quarry	141
Paleochannel/East Pit Exchange	0
WEA + SEA	118
Outflows	
Process Water	4
Haul Road Dust Suppression	15
Overflows (Via Culvert)	1
Evaporation	65
Water Balance:	**65**





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