



A Montrose Environmental Company

Surface Water Impact Assessment

Graymont

Calliope Limestone Quarry Approvals

Calliope

BAA250025.01

3 July 2025



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EXECUTIVE SUMMARY

Epic Environmental Pty Ltd (Epic) has been engaged by Graymont (NSW) Pty Ltd (Graymont) to provide ongoing environmental approvals support for the Calliope Limestone Quarry (the Project). This assessment has been prepared to satisfy an information request from the QLD Department of Environment, Tourism, Science and Innovation (DETSI), to assess potential surface water impacts associated with proposed landform changes over the life of mine.

Potential impacts associated with progressive disturbance throughout the life of mine and final landform have been assessed through a catchment and stormwater flow analysis. The existing sediment basin was also reviewed to confirm its capacity to capture sediment-laden runoff under both current and maximum disturbance scenarios.

The surface water impact assessment concludes that the potential risk of downstream surface water and receiving environment impacts associated with the proposed maximum disturbance landform is low, based on the following key findings:

- The site operates effectively as a closed surface water system, with all disturbed areas draining internally to site water storages
- Catchment changes in the maximum disturbance scenario are minimal, with the most notable change being the amalgamation of the Pit 3, Pit 4, and Farm Dam catchments
- The stormwater flow assessment undertaken indicates that the predicted changes in peak discharge between current and maximum disturbance scenarios are minimal
- Water balance modelling undertaken by Graymont (2025) suggests overtopping from site water storages is unlikely, even during extreme rainfall events
- An assessment of the sediment basin confirms that the current basin is adequately sized to capture runoff during both current and maximum disturbance, minimising the potential risk for uncontrolled releases to the receiving environment

The existing mitigation and management measures detailed in the site's Sediment and Erosion Management Plan are considered appropriate to manage the risks to the receiving surface water environment throughout the life of mine.

1 INTRODUCTION

Epic Environmental Pty Ltd (Epic) has been engaged by Graymont (NSW) Pty Ltd (Graymont) to provide ongoing environmental approvals support for the Calliope Limestone Quarry (the Project). This assessment has been prepared to support the preparation of a Progressive Closure and Rehabilitation Plan (PRCP) for the Project.

1.1 Project Location

The Project is located in Taragoala, approximately 11 kilometres (km) south of the township of Calliope and 30 km south of Gladstone in Central Queensland within the Gladstone Local Government Area (LGA) (see **Figure 1**). For the purpose of this report the Project refers to the Mining Leases (MLs) approved under the existing EA which comprise: ML3594, ML3595, ML3596, ML3597, ML3598, ML3599, ML3600, ML3602, ML3603, ML3604, ML3605, ML3606, ML3608, ML3609, ML80036, ML80189, ML80190, ML80191, and ML80192 (the MLs). The Project area comprises the current and proposed maximum disturbance areas within the MLs, as displayed in **Figure 2** and **Figure 3**.

1.2 Objectives

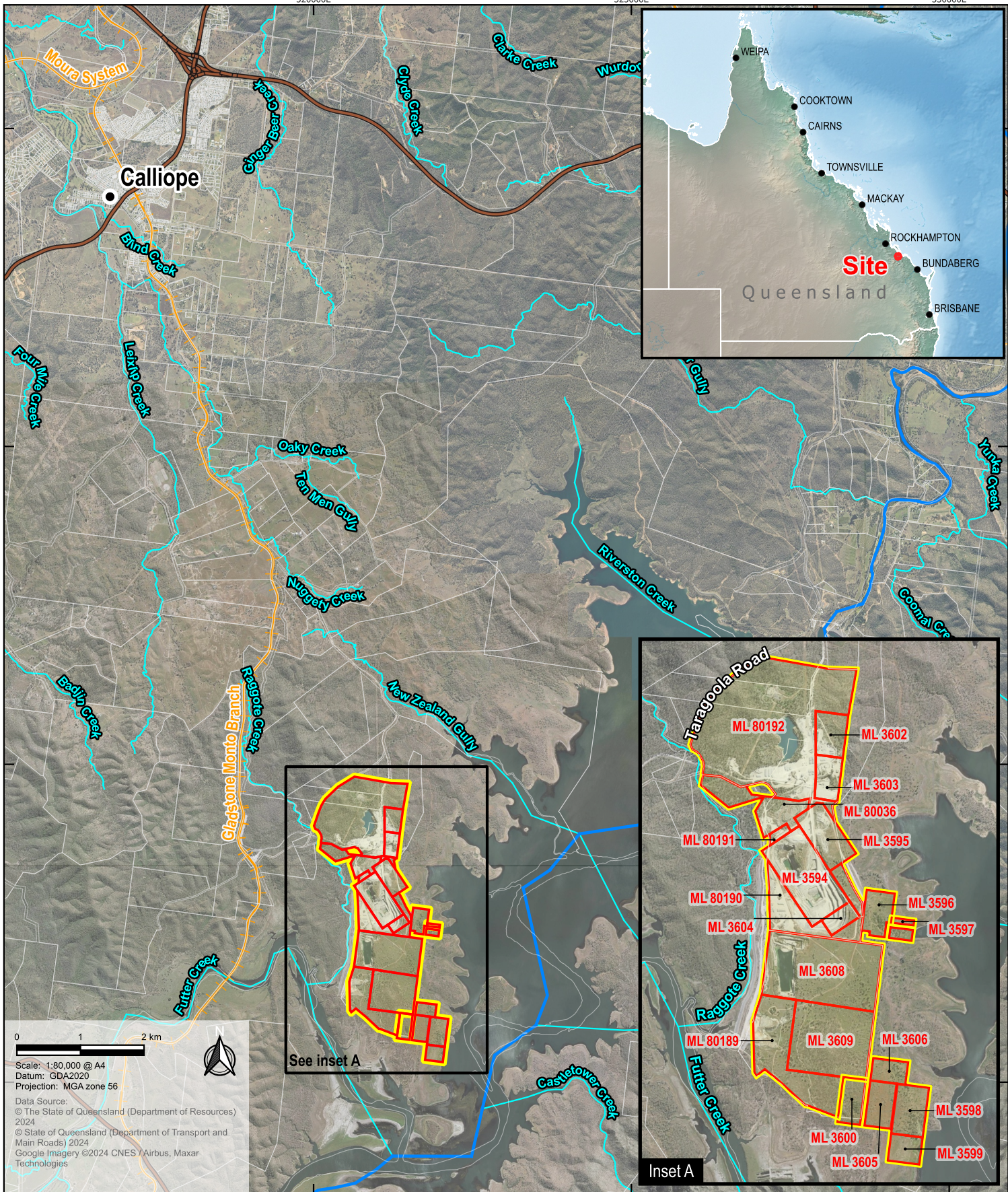
The objective of this report is to assess potential impacts on surface water due to the proposed changes in land disturbance over the life of mine.

1.3 Scope of Works

The stated objectives have been achieved through the following scope of works undertaken by Epic:

- Desktop assessment including a summary of the following:
 - Regional and local geographic and climatic setting
 - Local hydrological conditions, including a description of:
 - Catchments and watercourses within the project area
 - Available existing water quality data
 - Flow conditions for watercourses
 - Relevant Environmental Values
- Hydrological assessment to determine the expected changes to the hydrological regime due to the proposed changes in landform, including:
 - Stormwater quantity assessment to predict the change in peak discharge of stormwater runoff, using the empirical rational method
 - Assessment of predicted changes to flow paths
 - Assessment of potential impacts to the Great Barrier Reef
 - Assessment of changes to sediment basin catchment and its capacity to limit sediment releases

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Scale: 1:80,000 @ A4
Datum: GDA2020
Projection: MGA zone 56

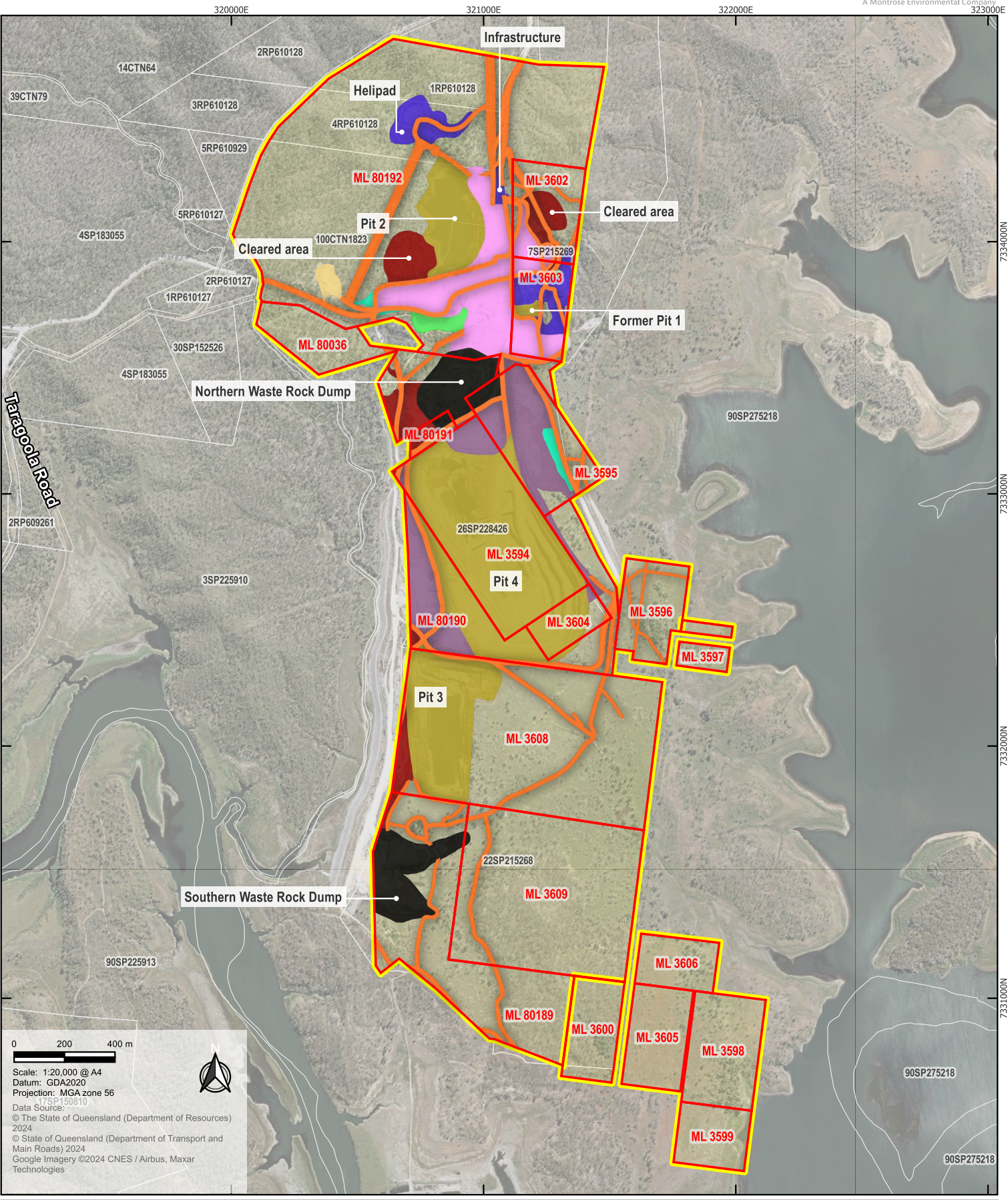
Data Source:
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- Legend**
- Site boundary
 - Mining leases
 - Cadastre (DCDB)
 - State controlled roads
 - Railways
 - Watercourses**
 - Major
 - Minor












**Graymont
Calliope Limestone Quarry
Surface Water Impact Assessment**

Figure 1
Regional location

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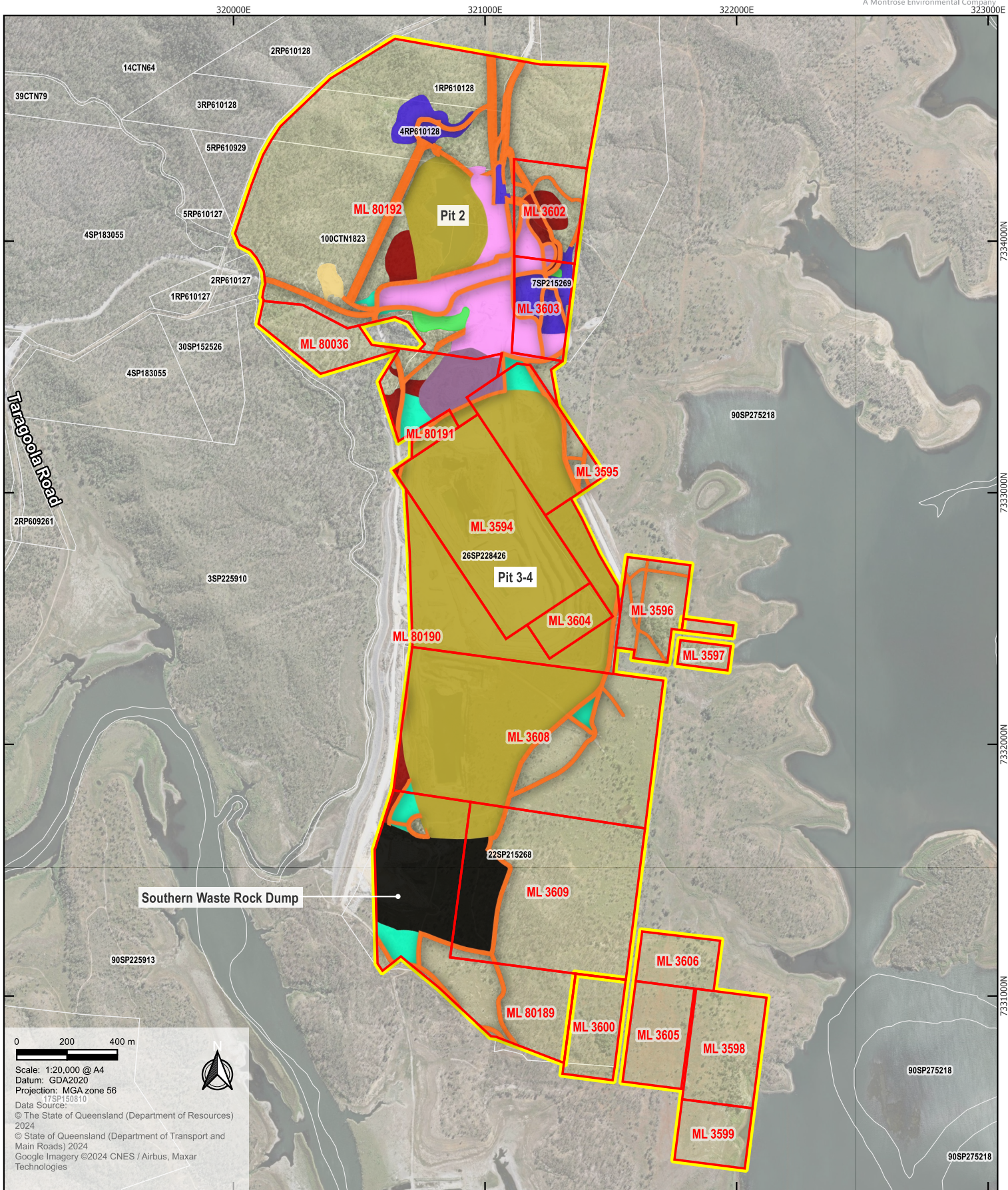


Legend

- | | |
|---|--|
|  Site boundary |  Pit |
|  Mining Leases |  ROM processing area |
|  Cadastre (DCDB) |  Silt dump |
| Current disturbance |  Temporary spoil storage area |
|  Access tracks |  Topsoil stockpile |
|  Cleared areas and laydowns |  Waste rock dump |
|  Infrastructure and plant | |
| Sediment pond | |

**Graymont
Calliope Limestone Quarry
Surface Water Impact Assessment**

Figure 2
Current disturbance area



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- Legend**
- Site boundary
 - Cadastre (DCDB)
 - Mining Leases
 - Maximum disturbance**
 - Access tracks
 - Cleared areas and laydowns
 - Infrastructure and plant
 - Sediment pond
 - Pit
 - ROM processing area
 - Silt dump
 - Temporary spoil storage area
 - Topsoil stockpile
 - Waste rock dump

**Graymont
Calliope Limestone Quarry
Surface Water Impact Assessment**

Figure 3
Maximum disturbance extent

2 PROJECT DESCRIPTION AND BACKGROUND

Graymont holds a site-specific Environmental Authority (EA) (reference: EPML00969013), enabling limestone mining activities to be undertaken at the Project. Limestone mining has been ongoing at Calliope since 1967, with Graymont managing operations since 2019. The Project produces approximately 0.8 million tonnes per annum of limestone products.

The Project area covers 429.6 hectares (ha) and includes four open cut pits. The Project area includes 152.9 ha of existing disturbance (i.e. operational areas, pits etc) and 211.9 ha of proposed disturbance areas. Two non-operational pits (Pit 1 and Pit 2) are located in the northern end of the mine site. Pit 1 has recently been backfilled and Pit 2 is utilised for on-site water storage. Water from Pit 2 is primarily utilised at the wash plant. Pit 3 and Pit 4 are located to the southern extent of the mine MLs. The Project adjoins land owned and operated by the Gladstone Area Water Board (GAWB), with some access tracks in the area used by both Graymont and the GAWB.

Other infrastructure located on site includes the main office, weighbridge, run of mine (ROM) stockpile, access roads, crushing and screening plant, wash plant, main stockpile area of final product, silt ponds and spoil areas located in the northern portion of the Project.

Mining operations have remained consistent throughout the life of mine (LOM) and consists of conventional open cut benching methods which begins with topsoil stripping and removal of clay rich overburden and waste rock. Limestone ore is extracted by drilling and blasting, then crushed, screened and washed onsite before being loaded by a 120 tonne (t) excavator serviced by two 100 t and one 85 t off road dump trucks. There is a second 75 t excavator on site which is utilised as a backup for the open cut operations. Material is hauled either to:

- The ROM pad for crushing
- Stockpile for screening or placement in the designated spoil dumps

Extractive activities are also conducted following a similar process where limestone of different grades and suitable physical properties are mined for the production of road base and aggregates. Extractive activities are authorised and conducted under EA EPPR00881913.

The current Project schedule includes limestone ore to be mined exclusively from the existing open cut mining pit (Pit 4), which is located centrally within the Project area. Lateral and vertical expansion of Pit 4 is projected to occur over the next 70 years, with amalgamation of Pit 3 expected to occur during southern expansion. All future disturbance until end of mine life (EOML) will be authorised by, and undertaken in accordance with, an amended EA (to be amended in the future). Limestone ore will continue to be processed onsite utilising pre-existing purpose-built infrastructure in the crushing and screening plant and wash plant, with a rate of production of 10-20,000 t a week. Mine closure is scheduled for about 2100.

3 ASSESSMENT METHODOLOGY

3.1 Project Area

For the purposes of this assessment, the Project area is defined as the current and maximum disturbance areas within the MLs, as shown in **Figure 2** and **Figure 3**, respectively. The Project area includes both existing disturbances (i.e. operational areas, pits) and proposed disturbance areas. Some existing disturbance areas, including cleared areas, access tracks, waste rock dump, and spoil pile areas, will be overlapped by the proposed Pit 3-4 footprint, resulting in changes to the classification of disturbance by activity type.

The proposed new disturbance areas will be confined within the existing MLs for the Project (specifically ML80192, ML3594, ML3595, ML80190, ML3604, ML3608, ML80189, and ML3609), and will primarily occur within the land parcel described as Lot 22 on SP15268. Some minor additional disturbance will occur on land parcels described as Lot 4 on RP610128, Lot 100 on CTM1823, Lot 7 on SP215269, and Lot 26 on SP228426.

Existing disturbed areas will be preferentially used for alternative activities as the pit expands into adjacent areas. This approach will minimise additional environmental harm from new disturbance; however it will thereby require disturbed land to be used for operations until EOML.

3.2 Methodology

The methodology for this surface water impact assessment includes:

- Description of the existing environment relevant to the study area, through a desktop review of publicly available and client provided data and information
- Assessment of potential impacts on surface water associated with the proposed changes in Project disturbance

3.3 Relevant Legislation and Guidelines

This report has been prepared with reference to the applicable legislation and policies as below:

3.3.1 Environmental Protection Act 1994

The objective of the *Environmental Protection Act 1994* (EP Act) is to protect Queensland's environment and to promote ecologically sustainable development. The EP Act defines a General Environmental Duty under which all persons in Queensland have a responsibility not to carry out an activity that causes or is likely to cause environmental harm, and to take all reasonable and practicable measures to prevent or minimise the harm.

The EP Act provides the key legislative framework for environmental management and protection in Queensland. The objective of the EP Act is to: "Protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains ecological processes on which life depends" (Section 3 of the EP Act).

Under the EP Act, Graymont must comply with the general environmental duty not to undertake an: "Activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm are taken" (Section 319 of the EP Act).

The Project requires an Environmental Authority and Progressive Rehabilitation and Closure (PRC) Plan to be approved under the EP Act.

3.3.2 Best Practice Erosion and Sediment Control (IECA, 2008)

The Best Practice Erosion and Sediment Control (IECA, 2008) guidelines contain the necessary strategies and techniques to assist erosion and sediment control practitioners to reduce the degradation of land and water from uncontrolled erosion and sedimentation. Erosion and Sediment Control is a primary pathway for contamination from the site and therefore this guideline is relevant to the Project.

3.3.3 Reef Discharge Standards for Industrial Activities (DESI, 2024)

This guideline outlines information an applicant should include in an environmental authority application to address section 41AA of the *Environmental Protection Regulation 2019*, where the proposed activity involves the discharge of fine sediment or dissolved inorganic nitrogen to the Great Barrier Reef (GBR) catchment waters. The Project is within the Boyne River Basin, which is located in the GBR catchment and therefore these standards are relevant to the Project.









3.3.4 Environmental Protection (Water and Wetland Biodiversity) Policy 2019





The purpose of the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* (EPP (Water)) is to determine the environmental values (EVs) and associated water quality objectives (WQOs) for Queensland waters. Under the EPP (Water and Wetland Biodiversity), the Project is located within the Curtis Island, Calliope River and Boyne River Basins.

3.3.4.1 Environmental Values

Identification of environmental values (EVs) has been undertaken in accordance with the *Application requirements for activities with impacts to water guideline* (DESI 2024c). The EVs for the Project’s receiving surface water environment has been defined as WQ13131— Boyne River in Schedule 1 of the *Environmental Protection Policy (Water and Wetland Biodiversity) 2019* (EPP (Water and Wetland Biodiversity)). The specific EVs applicable to the Project are detailed in the supporting EPP (Water and Wetland Biodiversity) document, *Curtis Island, Calliope River and Boyne River Basins Environmental Values and Water Quality Objectives* (EPP 2014) and have been summarised in **Table 1**.

Table 1. EVs of Project receiving surface waters

Value	Icon	Discussion	Pathway/ Receptor Linkage
Aquatic Ecosystems		The Project is adjacent to Lake Awoonga, a tributary to Boyne River. Areas downstream may support aquatic ecosystems.	Possible
Irrigation		The Project is in proximity to a few groundwater bores that may be used for irrigation, however, the Project is not expected to impact irrigation use of Lake Awoonga.	Low
Farm Supply Use		The Project has a farm dam which does not support farming activities, and is therefore not expected to impact on water used for farming.	Low
Stock Water		The Project is not expected to impact on the water used for livestock on Lake Awoonga or Boyne River.	Low
Aquaculture		The Project is not located in proximity to any aquaculture facilities.	Unlikely
Human Consumer		Areas downstream from the Project may be utilised for the consumption of aquatic foods, including fish.	Possible
Primary Recreation		Recreational activities, including swimming and diving, occur in areas adjacent to the Project. Discharges from the Project are only expected to pose a potential contamination risk to Lake Awoonga during flood events associated with elevated dam levels.	Unlikely
Secondary Recreation		Lake Awoonga supports recreational fishing and boating activities.	Unlikely

Value	Icon	Discussion	Pathway/ Receptor Linkage
Visual Recreation		The Project is located approximately 7km south west of the Lake Awoonga lookout, boat ramp, and camping area, and is not clearly visible from this location. Potential contamination at the Project is unlikely to be contributing to deterioration of the aesthetics of Lake Awoonga.	Low
Drinking Water		Lake Awoonga supplies raw water that is processed at water treatment plants for potable use.	Low
Cultural and Spiritual Values		The Project is not considered to impact on the cultural and spiritual values of Lake Awoonga.	Low
Groundwaters (aquatic ecosystems, irrigation, farm supply/use, stock water, drinking water)		Mining activities occur above the groundwater table so any discharges to groundwater are unlikely.	Unlikely

3.3.4.2 Water Quality Objectives

Water Quality Objectives (WQOs) for the Boyne River Basin have been defined within the *Curtis Island, Calliope River and Boyne River Basins Environmental Values and Water Quality Objectives* (EPP (Water) 2014). The WQOs for the water areas relevant to the Project have been summarised in **Table 2** below. Lowland fresh waters considered relevant are Raggotte Creek and Futter Creek, which are tributaries of Lake Awoonga, and which have elevations less than 150 m.

Table 2. Boyne River Basin WQOs relevant to the Project (EPP (Water) 2014)

Water area/ type	Management Intent / level of protection	Amm (N) (µg/L)	Oxid N (µg/L)	Total N (µg/L)	FRP (µg/L)	Total P (µg/L)	Chl-a (µg/L)	DO (% sat)	Turb (NTU)	SS (mg/L)	pH
Lake Awoonga	Moderately Disturbed (MD)	-	-	<700	-	<40	-	85-105	<4.7	-	7.75-8.4
Lowland fresh <150m (other waters)	MD	<20	<60	<500	<20	<50	<5	85-110	<50	<10	6.5-8.0

The site is within the Boyne River Basin which is within the GBR catchment for which the GBR Water Quality Protection Plan (the Reef Plan) applies. The Reef Plan sets targets for improved water quality in terms of load reduction and land management practices which are implemented through each water quality improvement plan (WQIP).

3.3.5 Environmental Authority

The Project operates under Environmental Authority EPML00969013. The EA lists authorised surface water release points from the Project, as detailed in **Table 3**. The defined contaminant release limits for the release points are detailed in

Table 3. Contaminant release points, sources and receiving waters (EPM00969013, Table 2)

Release Point (RP)	Easting (GDA94)	Northing (GDA94)	Contaminant Source and Location	Monitoring Point	Receiving waters
F1	321 432	733 2026	Pit 3 and Pit 4	End of pipe F1 (Discharge Monitoring Point)	Lake Awoonga Dam
F2	320 399	733 1469	Undisturbed natural flow and/or Pit 3	Raggote Ck at F2 (Downstream Monitoring Point)	Farmers Dam
C1	320 757	733 3601	Pit 1, Pit 2 and Pit 4	C1 dam spillway (Discharge Monitoring Point)	Pit 2 and/or Recycled Water Storage Dam
C2	320 102	733 3854	Undisturbed natural stormwater flow	C2 creek adjacent to rail siding road (Upstream Monitoring Point)	Raggote Creek

Table 4. Contaminant release limits (EPM00969013, Table 3)

Quality Characteristic	Release Limits	Monitoring Frequency
Electrical conductivity ($\mu\text{S}/\text{cm}$)	900	Weekly during discharge
pH (pH Unit)	6.5 (minimum) 8.5 (maximum)	Weekly during discharge
Total Suspended Solids (mg/L)	100 (maximum) Or when measured at C1, F2 or F1 not more than 110% of value at monitoring point C2	Weekly during discharge

3.4 Data Sources

The following data sources have been used in preparation of this technical report:

- Climate data: SILO (Scientific Information for Land Owners)
- Topographic data (provided by Graymont)
- Water quality data (provided by Graymont)
- Sediment and Erosion Control Plan (prepared by Graymont)
- Water Management Plan (prepared by Graymont)
- Calliope Hydrogeology Report (prepared by Graymont)

4 EXISTING ENVIRONMENT

4.1 Topography

The topography surrounding the Project area is hilly, with elevations ranging from 40 to 100 mAHD. The land surface generally slopes to the east, south, and west towards Lake Awoonga. The land surrounding the Project is classified as low intensity cattle grazing. The topography of the Project is shown in **Figure 4**.

Two earthen bunds (Eastern and Western) have been constructed at the Project. A 1,900 m long earth and rock wall is located adjacent to Raggote Creek on the western side of the Project, and a smaller wall exists along the eastern perimeter of the Project area. Both bunds also function as access tracks with a crest elevation of approximately 52 mAHD.

4.2 Climate

The Project is located within Queensland’s sub-tropical climatic zone which is characterised by high summer temperatures, warm dry winters, and distinct wet and dry seasons. It lies within the southeast trade wind belt but is too far south to experience monsoonal influence from the northwest and too far north to benefit from higher altitude cold fronts (Bureau of Meteorology (BoM) 2025a).

Median monthly rainfall and evaporation data are summarised in **Table 5**, based on data from SILO database (SILO, 2025), using data from the BOM station at Gladstone Radar (no. 39123). Median annual evaporation (1,855.5 mm) exceeds median annual rainfall (808.3 mm) by approximately 130% and evaporation is greater than rainfall on average in all months.

Table 5. Summary of climate data, 1957 – 2025 (SILO data set from BOM station 39123)

Month	Median Monthly Rainfall (mm)	Median Monthly Evaporation (mm)
January	106.5	207.8
February	85.6	170.2
March	61.2	172
April	32.7	136.1
May	29.7	108.2
June	18.4	89.5
July	21.9	97.1
August	20.8	119.2
September	13.1	150.7
October	54.8	188.6
November	65.8	199.5
December	86.5	213.4
Annual Total	808.3	1855.5

4.3 Hydrology

4.3.1 Catchment Overview

The Project is located within the Fitzroy catchment within the Boyne River Basin, which covers an area of approximately 2,590 km². The area is bound by Many Peaks Range to the east, Dawes Range to the south, Calliope Range to the south-west and Boyne Range to the west. The terrain of the bounding ranges is relatively steep with heights ranging from 600 to 850 m above sea level. Several towns are also located within the catchment including Nagoorin, Ubobo, and Builyan. The Boyne River Basin Plan area comprises a single catchment with one major river system (the Boyne River) and a number of tributaries (including Ridler, Degalgil, Marble and Diglum Creeks) that drain to Gladstone Harbour and the Great Barrier Reef (GBR).

4.3.2 Watercourses

The Project is located adjacent to Lake Awoonga which bounds the site in the east, south, and southwest. Raggote Creek, located to the west of the site, is a tributary of Lake Awoonga. The hydrology of the site is shown in **Figure 4**.

4.3.3 Wetlands

Lake Awoonga is mapped as a lacustrine wetland (QGlobe, 2025), as shown in **Figure 5**. The existing farm dam adjacent to the Southern WRD is mapped as a hydrologically modified or artificial lacustrine wetland. There are no internationally important wetlands within the vicinity of the Project area; the closest internationally Important Wetland is located greater than 1,000 km away. There are no MSES - High ecological significance wetlands mapped within the Project area. The closest of which is approximately 15 km northwest of the Project area.

4.4 Lake Awoonga Water Quality

Water quality data from Lake Awoonga is collected by Gladstone Regional Council as part of their annual Drinking Water Service Report (Gladstone Regional Council, 2024). The latest report presents data from 2023 – 2024, as summarised in **Table 6** and shows that there were no exceedances of the drinking water guideline values.

Table 6. Lake Awoonga Water Quality

Parameter	Unit	Australian Drinking Water Guideline Value	Min	Average	Max
Aluminium - Total	mg/L		0.02	0.06	0.08
Antimony - Total	mg/L	0.003	<	<	<
Arsenic - Total	mg/L	0.01	<	<	<
Barium - Total	mg/L	2	0.012	0.01	0.017
Boron - Total	mg/L	4	<	<	<
Bromate	mg/L	0.02	<	<	<
Bromide	mg/L		<	0.02	0.064
Bromodichloromethane	µg/L	250	<	25	41
Bromoform	µg/L	250	<	<	14
Cadmium - Total	mg/L	0.002	<	<	<
Chlorate	mg/L	0.8 [^]	0.022	0.14	0.41
Chloride	mg/L		27	40	52
Chlorine (free)	mg/L	5	<	<	2.5
Chloroform	µg/L	250	6	30	60
Chromium - Total	mg/L	0.05	<	<	0.003
Copper - Total	mg/L	2	<	0.003	0.019
Dibromochloromethane	µg/L	250	8	18	28
<i>E. coli</i> (Colilert)	MPN/100mL	0	<	<	<
Electrical Conductivity	µS/cm		306	363	468
Fluoride	mg/L	1.5	<	<	0.1
HPC (22°C)	CFU/mL		<	15	>300
Iron - Total	mg/L		<	<	0.22
Lead - Total	mg/L	0.01	<	<	<
Manganese - Dissolved	mg/L	0.5	<	<	0.007
Manganese - Total	mg/L	0.5	<	<	0.008
Mercury - Total	mg/L	0.001	<	<	<
Molybdenum - Total	mg/L	0.05	<	<	<
Nickel - Total	mg/L	0.02	<	<	<
Nitrate as NO ₃ ⁻	mg/L	50	0.03	0.09	0.16
Nitrite NO ₂	mg/L	3	<	0.006	0.07
pH	pH units		6.8	7.4	8.6
Phosphate PO ₄	mg/L		<	0.007	0.08

Parameter	Unit	Australian Drinking Water Guideline Value	Min	Average	Max
Selenium - Total	mg/L	0.01	<	<	<
Sulfate as SO ₄	mg/L		23	28	37
Temperature	°C		17.7	25.6	35.5
Total Alkalinity (as CaCO ₃)	mg/L		70	82	107
Total Coliforms (Colilert)	MPN/100mL		<	<	<
Total Hardness (as CaCO ₃)	mg/L		82	95	112
Trihalomethanes Total	µg/L	250	25	73	125
True Colour	HU		<	<	3
Turbidity (NTU)	NTU		<	0.15	1.2
Zinc - Total	mg/L		<	<	0.009

4.5 Existing Water Quality

There is limited available water quality data for the Project. Water quality samples are collected from the monitoring points defined in the EA during releases from the Project area. Monitoring point C1 is the discharge point for releases from the sediment basin. Available data from discharge point C1 during 2025 is summarised in **Table 7**, along with the site targets and EA limits. This shows that there have been no exceedances of the EA limits in 2025.

Monitoring point F1 is the discharge point for controlled releases from Pit 4. There is only one water quality sample available in 2025 for F1, as shown in **Table 8**. Water quality during this release was below the EA limits.

Table 7. C1 discharge water quality data – 2025

Parameter	Site Target	EA Limit	Minimum Recorded Value	Maximum Recorded Value
pH	6.5 – 8.5	6.5 – 8.5	7.64	7.84
EC	450	900	157	488
TSS	50	100	<5	10

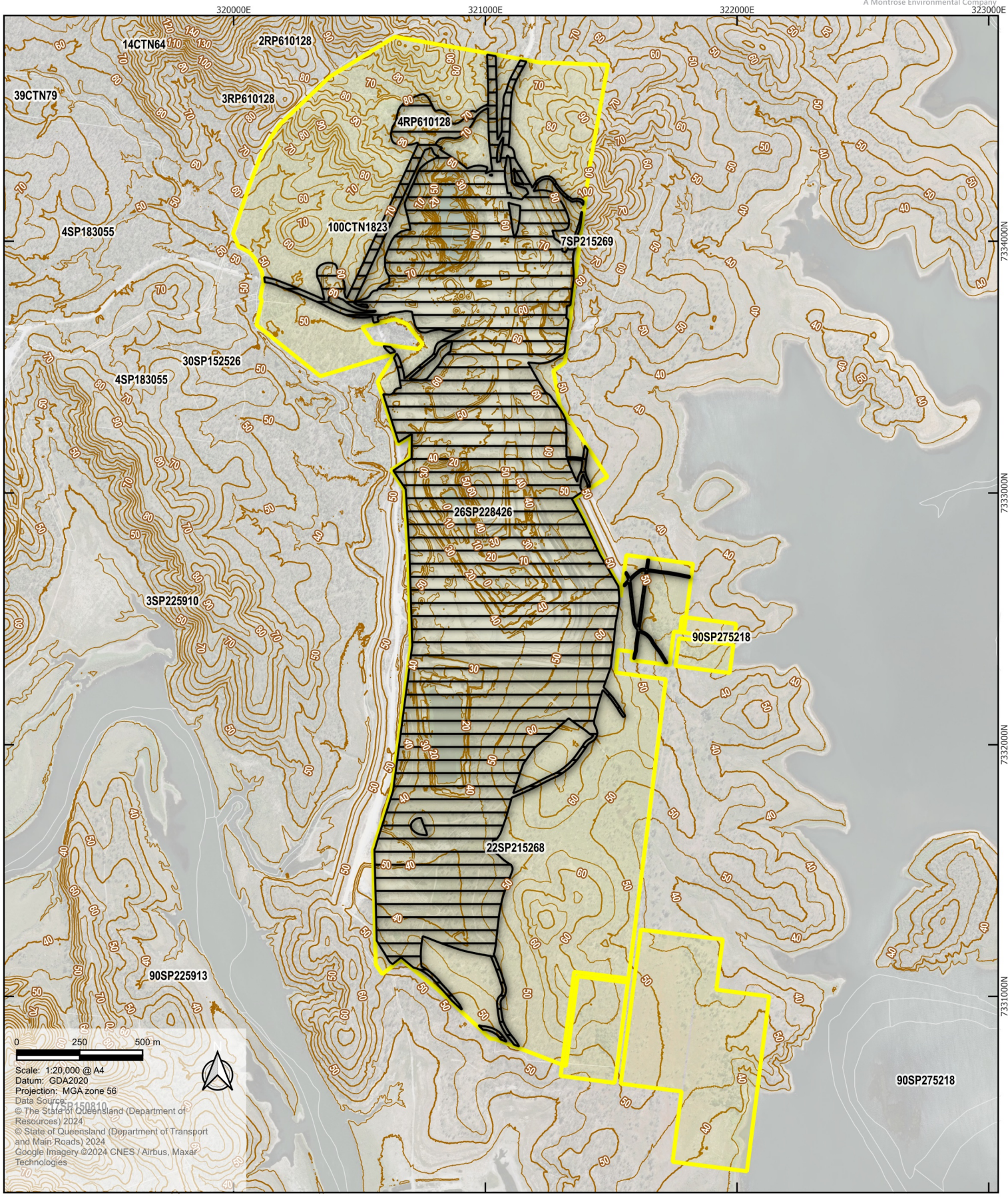
Table 8. F1 discharge water quality data - 2025

Parameter	Site Target	EA Limit	Recorded Value (13/03/25)
pH	6.5 – 8.5	6.5 – 8.5	7.85
EC	450	900	721
TSS	50	100	6

Water quality data from samples collected in March 2025 from Pit 3 and Pit 4 have been summarised in **Table 9**, along with the relevant water quality guidelines. This data shows that recorded water quality does not exceed guideline values.

Table 9. Pit water quality (collected 19/03/25)

Parameter	Units	Australian drinking water guideline	ANZECC stock watering guideline	Pit 3 Seepage	Pit 3	Pit 4
pH	pH units	6.5 - 8.5	6 - 8.5	8.1	8.1	8.2
Electrical Conductivity	µS/cm	-	5970	1144	733	472
Dissolved Oxygen	mg/l	-	-	6.5	5.7	3.9
Turbidity	NTU	-	-	24.1	9.59	5.7
Suspended Solids	mg/L	-	-	<5	<5	<5
Total Alkalinity as CaCO ₃	mg/L	-	-	242	89	116
Sulfate as SO ₄ - Turbidimetric	mg/L	-	-	55	37	47
Chloride	mg/L	-	-	143	142	18
Calcium - Dissolved	mg/L	-	-	126	60	50
Magnesium - Dissolved	mg/L	-	-	7	7	7
Sodium - Dissolved	mg/L	-	-	87	59	24
Potassium - Dissolved	mg/L	-	-	<1	<1	<1
Calcium - Total	mg/L	-	-	137	63	58
Magnesium - Total	mg/L	-	-	8	8	8
Sodium - Total	mg/L	-	-	94	64	26
Potassium - Total	mg/L	-	-	<1	<1	<1
Aluminium - Dissolved	mg/L	-	-	<0.01	<0.01	<0.01
Arsenic - Dissolved	mg/L	-	-	<0.001	<0.001	<0.001
Cadmium - Dissolved	mg/L	-	-	<0.0001	<0.0001	<0.0001
Chromium - Dissolved	mg/L	-	-	<0.001	<0.001	<0.001
Copper - Dissolved	mg/L	-	-	<0.001	0.001	<0.001
Nickel - Dissolved	mg/L	-	-	<0.001	<0.001	<0.001
Lead - Dissolved	mg/L	-	-	<0.001	<0.001	<0.001
Zinc - Dissolved	mg/L	-	-	0.007	0.01	<0.005
Iron - Dissolved	mg/L	-	-	<0.05	<0.05	<0.05
Aluminium - Total	mg/L	0.1	5	0.03	0.04	0.06
Arsenic - Total	mg/L	0.01	0.5	<0.001	<0.001	<0.001
Cadmium - Total	mg/L	0.002	0.01	<0.0001	<0.0001	<0.0001
Chromium - Total	mg/L	0.05	1	<0.001	<0.001	<0.001
Copper - Total	mg/L	2	1	<0.001	<0.001	<0.001
Nickel - Total	mg/L	0.02	1	<0.001	<0.001	<0.001
Lead - Total	mg/L	0.01	0.1	<0.001	<0.001	<0.001
Zinc - Total	mg/L	3	20	<0.005	<0.005	<0.005
Iron - Total	mg/L	-	-	<0.05	<0.05	0.06
Mercury - Dissolved	mg/L	-	-	<0.0001	<0.0001	<0.0001
Mercury - Total	mg/L	-	-	<0.0001	<0.0001	<0.0001



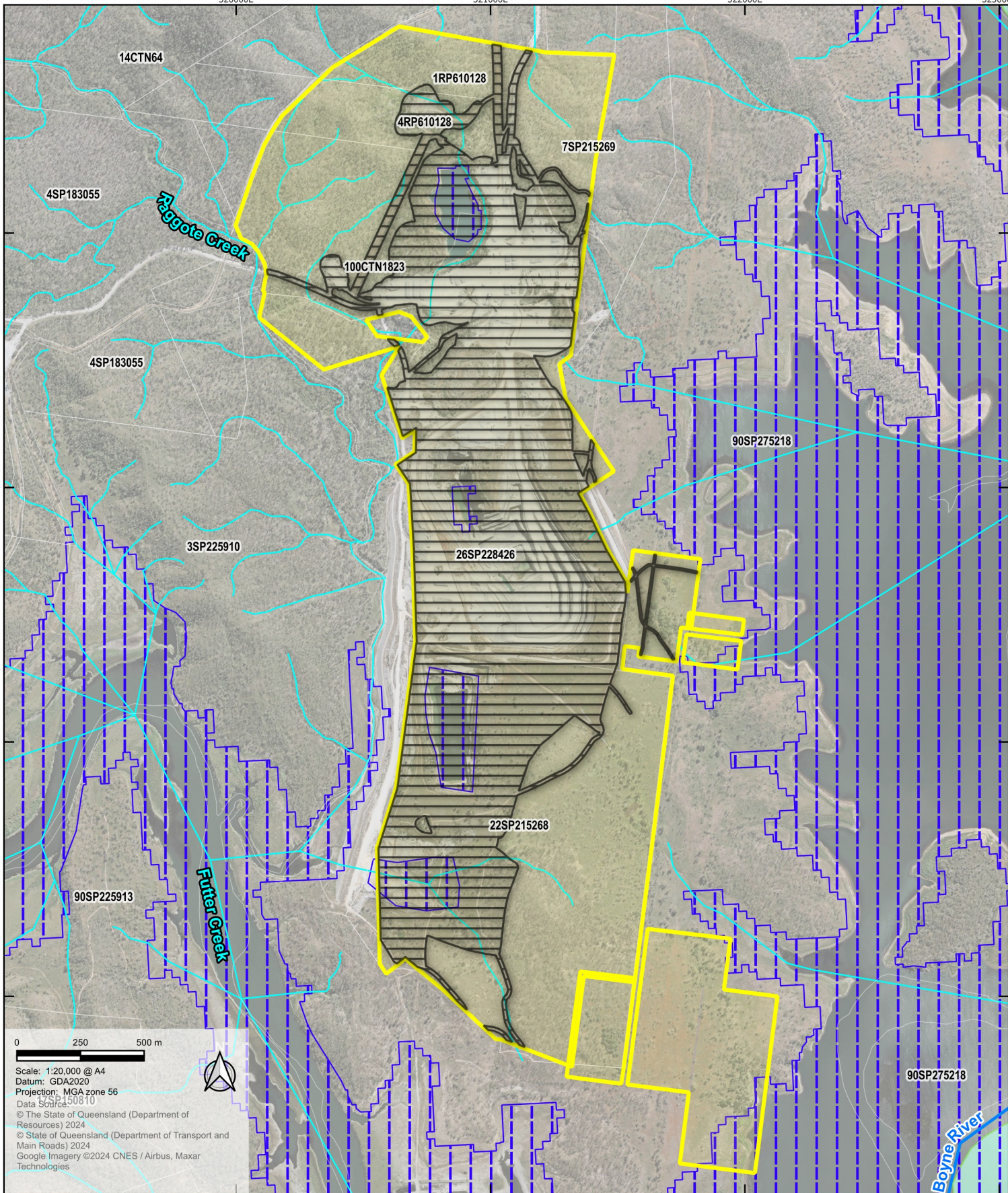
Filepath: -BAA\BAA220011.01 Graymont Calliope PRCP Stage 2\Workspaces\BAA250025.01 Surface Water Impact Assessment\Rev A\Figure 4 Topography.qgz

- Legend**
- Site boundary
 - Maximum disturbance extent
- Elevation contours**
- 5m intervals
 - 10m intervals

**Graymont
 Calliope Limestone Quarry
 Surface Water Impact Assessment**

Figure 4
 Topography

320000E 321000E 322000E



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Scale: 1:20,000 @ A4
 Datum: GDA2020
 Projection: MGA zone 56
 Data Source: 50810
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 Google Imagery ©2024 CNES / Airbus, Maxar Technologies

Legend

- Site boundary
- Cadastre (DCDB)
- Maximum disturbance extent
- MSES - Regulated vegetation (100m from wetland)
- Wetland areas (Qld Wetland Mapping v5.0)**
- Lacustrine
- Watercourses**
- Major
- Minor

Graymont Calliope Limestone Quarry Surface Water Impact Assessment

Figure 5 Hydrology

5 IMPACT ASSESSMENT

5.1 Catchment Analysis

Catchment analysis has been undertaken using available topographic data to assess changes between the existing and final (maximum disturbance) landform. The following sections detail the current and final catchments, as well as the changes in catchment area and water flow paths.

5.1.1 Current Disturbance

The surface water catchments within the current Project disturbance are detailed in **Table 10** and shown in **Figure 6**. These catchments have been derived using topographic survey data (2024 & 2025) provided to Epic by Graymont. Former Pit 1 has recently been backfilled, and surface runoff from this area now reports to the sediment basin catchment.

The current Project catchment has a naturally occurring north-south surface water divide located to the east of the Project, which prevents runoff discharging from that direction. The construction of a bund wall to the west of the Project has created another north-south surface water divide, similarity preventing runoff from leaving the Project to the west. Together, these surface water features form a closed surface water system within the Project with surface water runoff retained within the Project area and reporting to onsite water storages.

Table 10. Current Disturbance Catchments

Catchment	Description	Area (ha)
Pit 2	Includes: <ul style="list-style-type: none"> Main site entrance Contractor truck waiting area Main office Plant stockpile storage areas Helipad 	49.2
Sediment basin	Includes: <ul style="list-style-type: none"> ROM processing area Wash-plant and screening area Backfilled Pit 1 	18.1
Pit 3	Includes: <ul style="list-style-type: none"> Northern portion of southern waste rock dump Cleared areas and laydowns Undisturbed area to the east of Pit 3 	59.7
Pit 4	Includes: <ul style="list-style-type: none"> Northern waste rock dump Topsoil stockpile Temporary spoil storage area 	86.7
Farm Dam	Includes: <ul style="list-style-type: none"> Southern waste rock dump Undisturbed area previously draining into Raggotte Creek 	56.8
Total		270.5

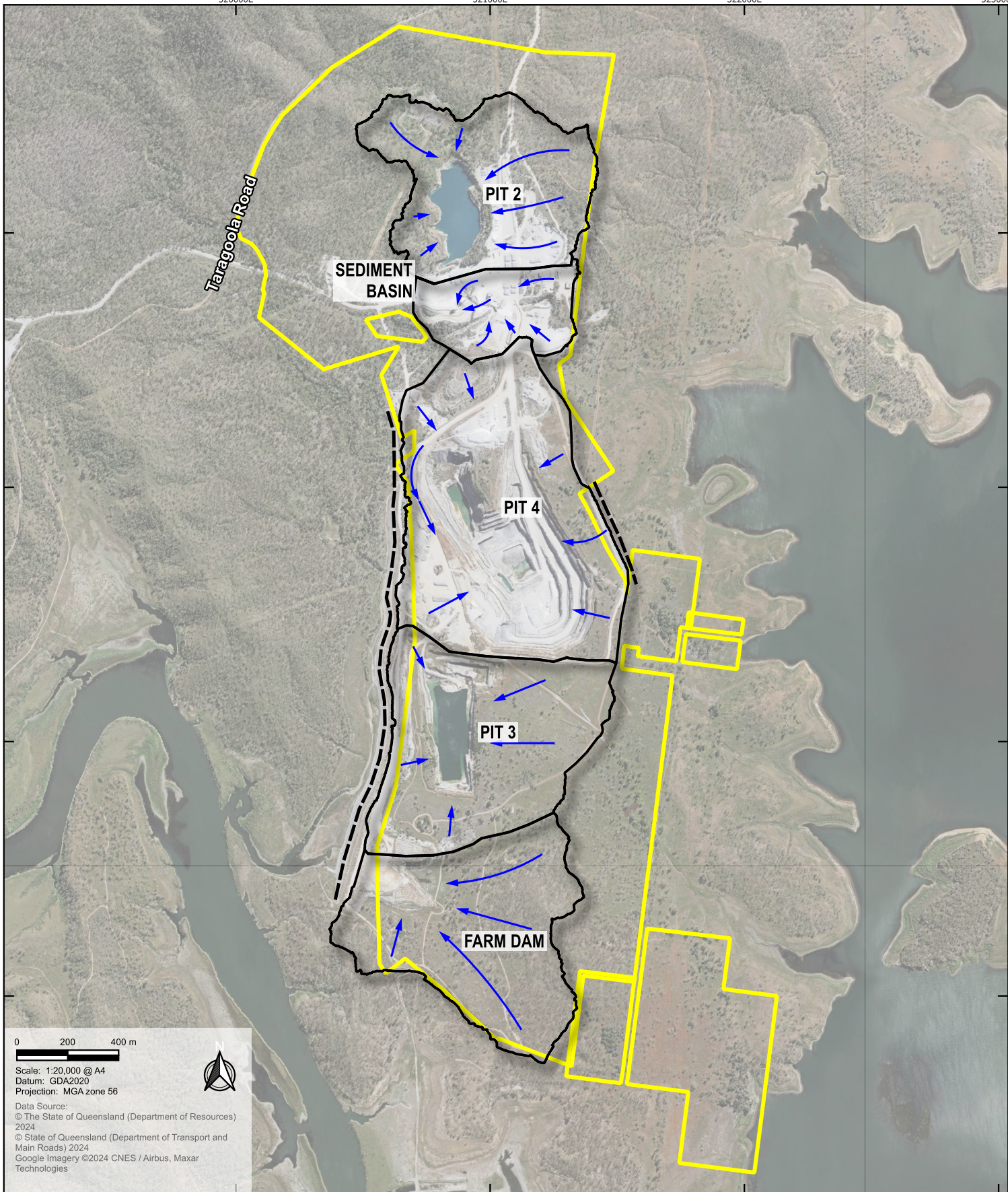
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Scale: 1:20,000 @ A4
Datum: GDA2020
Projection: MGA zone 56

Data Source:
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Legend

-  Site boundary
-  Current disturbance catchment areas
-  Bund wall
-  Flow path

**Graymont
Calliope Limestone Quarry
Surface Water Impact Assessment**

Figure 6
Current disturbance catchment areas

5.1.2 Maximum Disturbance

The surface water catchments associated with the maximum Project disturbance extent are detailed in **Table 11** and shown in **Figure 7**. These catchments have been derived from the maximum disturbance surface data, provided to Epic by Graymont.

The expanded disturbance area associated with the final development of Pit 3-4 will result in the removal of the existing Farm Dam. Under the maximum disturbance scenario, the existing farm dam catchment will flow into Pit 3-4. As a result the catchment area for Pit 3-4 in the maximum disturbance will encompass the current catchments for Pit 3, Pit 4, and the Farm Dam.

No changes are anticipated to the catchment areas for Pit 2 and the Sediment Basin in the maximum disturbance landform. Additionally, the existing natural and constructed surface water divides to the east and the west of the Project remain unchanged, maintaining a closed surface water system in which all runoff is contained within the Project area.

Table 11. Maximum Disturbance Catchments

Catchment	Description	Area (ha)
Pit 2	Includes: <ul style="list-style-type: none"> Main site entrance Contractor truck waiting area Main office Plant stockpile storage areas Helipad 	49.2
Sediment basin	Includes: <ul style="list-style-type: none"> ROM processing area Wash-plant and screening area Backfilled former Pit 1 	18.1
Pit 3 - 4	Includes: <ul style="list-style-type: none"> Previous Pit 3 catchment Previous Pit 4 catchment Previous Farm Dam catchment, including southern waste rock dump and undisturbed area previously draining into Raggotte Creek 	203.2
Total		270.5

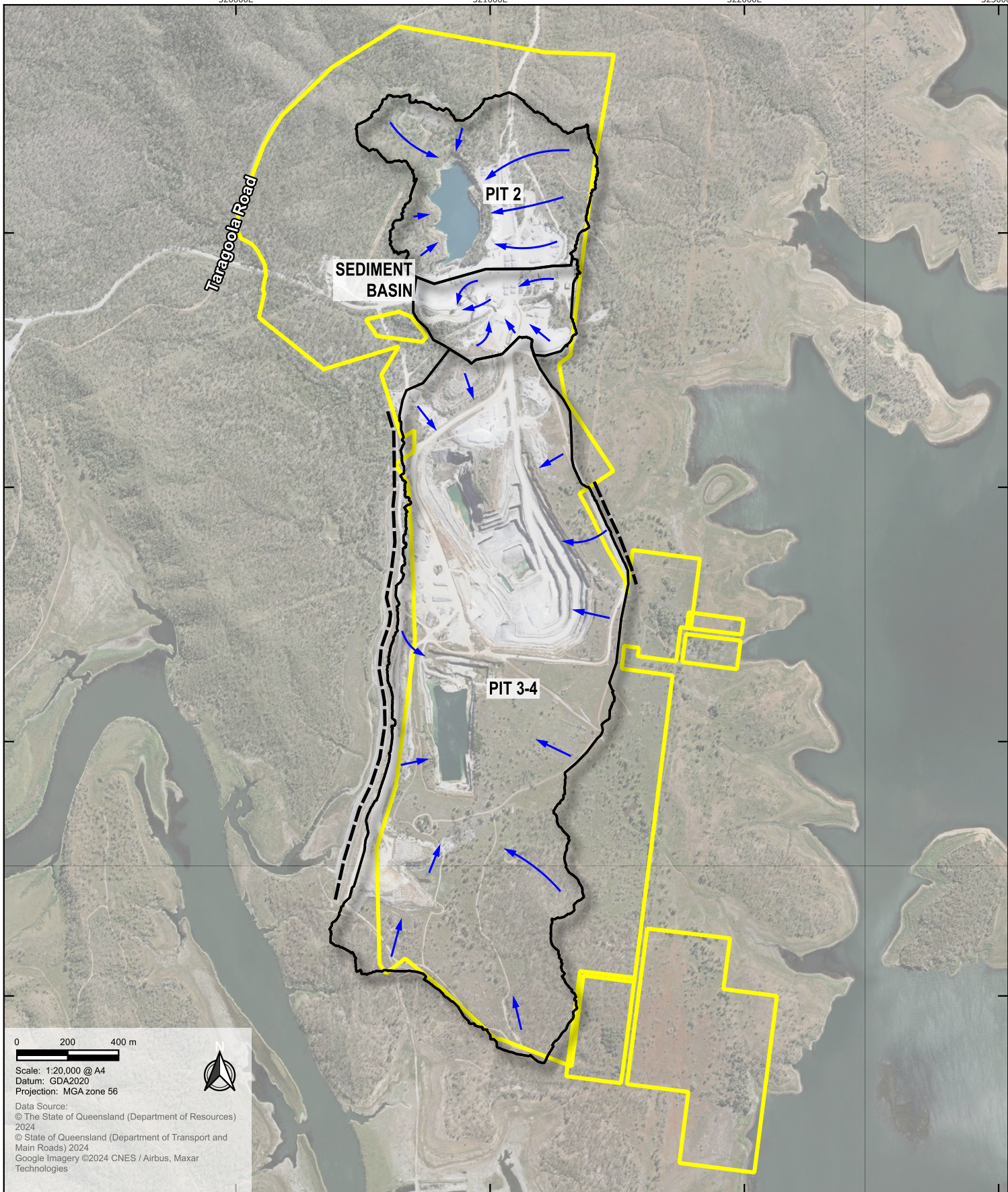
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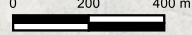
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Filepath: ~BAA\BAA220011.01 Graymont Calliope PRCP Stage 2\Workspaces\BAA250025.01 Surface Water Impact Assessment\Rev A\Figure 7 Maximum disturbance catchment areas.qgz




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 Datum: GDA2020
 Projection: MGA zone 56

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- Legend**
- Site boundary
 - Maximum disturbance catchment areas
 - Bund wall
 - ➔ Flow path

**Graymont
 Calliope Limestone Quarry
 Surface Water Impact Assessment**

Figure 7
 Maximum disturbance catchment areas

5.2 Stormwater Flow Assessment

A stormwater flow assessment has been completed to quantify potential changes in peak stormwater discharge from the site under the maximum disturbance scenario across a range of design rainfall events.

The Rational Method was used to estimate peak discharge rates for each catchment under both current and maximum disturbance conditions. This approach was selected in accordance with the Queensland Urban Drainage Manual (QUDM, 2016). Input parameters used in the calculations are summarised in **Table 12**, **Table 13**, and **Table 14**. The relative areas of land use within each catchment have been calculated based on topographic survey data provided by Graymont.

Table 12. Rational Method input parameters

Parameter	Value	Source
Site catchment area – Ha	See Table 10 and Table 11	Calculated from topographic data (provided by Graymont)
Fraction impervious - unitless	Natural/Undisturbed = 0 Disturbed = 0.9 Pit/Pond = 1 Infrastructure/Buildings = 1	QUDM (dependent on land use)
Composite Runoff Coefficient (C) – unitless	See Table 13 and Table 14	Calculated
Frequency factors (Fy)	QUDM table 4.5.2	QUDM
Time of concentration (t _c) – minutes	5	QUDM
Rainfall intensity - 1 hour, 10% AEP (I ₁₀) – mm/hr	61.5	BOM IFD design rainfall (BOM, 2024)

Table 13. Current disturbance catchment areas and runoff coefficients

Catchment	Site catchment area per land use (ha)				Composite Runoff Coefficient (C) – unitless
	Natural/Undisturbed	Disturbed	Pit/Pond	Infrastructure/Buildings	
Pit 2	19.60	20.27	8.51	0.82	0.81
Sediment basin	0.67	12.25	1.91	3.27	0.87
Pit 3	36.15	7.82	15.74	0.00	0.77
Pit 4	11.93	32.61	42.15	0.00	0.86
Farm Dam	50.44	6.37	0.00	0.00	0.72

Table 14. Maximum disturbance catchment areas and runoff coefficients

Catchment	Site catchment area per land use (ha)				Composite Runoff Coefficient (C) – unitless
	Natural/Undisturbed	Disturbed	Pit/Pond	Infrastructure/Buildings	
Pit 2	17.91	19.00	11.47	0.82	0.82
Sediment basin	0.42	12.26	1.42	4.00	0.88
Pit 3-4	38.93	54.59	109.69	0.00	0.85

Table 15, **Table 16**, and **Table 17** show the estimated peak discharge for a range of design rainfall events under both current and maximum disturbance scenarios. As the total catchment areas remain largely unchanged, with the exception of Pit 3-4, the primary influence on peak discharge is the change in land use within the catchments. These modelling results show that the predicted changes in peak discharge are minimal, with a <1% change expected within the sediment basin catchment.

Table 15. Peak discharge – Sediment basin

AEP %	ARI (1 in x years)	Peak Discharge (m ³ /s)		Change in peak discharge (m ³ /s)	% change
		Current Disturbance	Maximum Disturbance		
39%	1 in 2 years	0.38	0.39	0.00	0%
18%	1 in 5 years	0.57	0.57	0.00	0%
10%	1 in 10 years	0.70	0.70	0.00	0%
5%	1 in 20 years	0.83	0.84	0.00	0%
2%	1 in 50 years	1.05	1.06	0.00	0%
1%	1 in 100 years	1.21	1.21	0.00	0%

Table 16. Peak discharge – Pit 2

AEP %	ARI (1 in x years)	Peak Discharge (m ³ /s)		Change in peak discharge (m ³ /s)	% change
		Current Disturbance	Maximum Disturbance		
39%	1 in 2 years	0.97	0.98	0.01	+1%
18%	1 in 5 years	1.44	1.45	0.01	+1%
10%	1 in 10 years	1.76	1.77	0.02	+1%
5%	1 in 20 years	2.10	2.12	0.02	+1%
2%	1 in 50 years	2.65	2.68	0.03	+1%
1%	1 in 100 years	3.05	3.08	0.03	+1%

Table 17. Peak discharge – Pit 3 and Pit 4

AEP %	ARI (1 in x years)	Current Disturbance Peak Discharge (m ³ /s)				Maximum Disturbance Peak Discharge (m ³ /s)	Change in peak discharge (m ³ /s)	% change
		Farm Dam	Pit 3	Pit 4	Total	Pit 3-4		
39%	1 in 2 years	0.99	1.82	1.13	3.93	4.22	0.28	+7%
18%	1 in 5 years	1.48	2.70	1.67	5.85	6.27	0.42	+7%
10%	1 in 10 years	1.80	3.30	2.04	7.14	7.66	0.52	+7%
5%	1 in 20 years	2.16	3.94	2.44	8.54	9.16	0.62	+7%
2%	1 in 50 years	2.73	4.98	3.09	10.80	11.58	0.78	+7%
1%	1 in 100 years	3.13	5.72	3.55	12.40	13.30	0.90	+7%

5.3 Sediment Basin Capacity Assessment

An assessment of the existing sediment basin was undertaken to determine whether it provides sufficient capacity to prevent sediment-laden runoff from discharging to the receiving environment under the maximum disturbance scenario.

The sediment basin dimensions were estimated using topographic survey data collected in March 2025 (provided by Graymont). Based on this data, the existing sediment basin is estimated to have a surface area of approximately 4,950 m², and an available volume of approximately 5,330 m³.

The sediment basin sizing calculations presented in the existing Sediment and Erosion Management Plan (Graymont, 2023) are based on a catchment size of 7.2 ha. However, catchment analysis undertaken as part of this assessment has redefined the sediment basin catchment area to be 18.1 ha for both the current and maximum disturbance scenarios.

The minimum required sediment basin sizing for this updated catchment area has been calculated using the methodology for a C-type basin as outlined in 'Best Practice Erosion and Sediment Control' (IECA, 2018).

The following assumptions were adopted in the absence of site-specific data to support the sediment basin sizing calculations:

- Runoff for the Q-3 month (0.5 x 1 year ARI) was applied
- Approximately 90% of the sediment is larger than 0.05 mm diameter
- Bulk density of limestone used was 28 kN/m³
- Clean out frequency of basin is once per year

The minimum required dimensions for the sediment basin are as follows:

- Surface area = 532.2 m²
- Volume = 470.9 m³
- Width = 13.2 m, Length = 39.6 m

The existing sediment basin size (Surface area of approximately 4,950 m², and volume of approximately 5,330 m³) is significantly larger than the calculated minimum requirements and is therefore considered adequate to manage runoff and sediment loads under both the current and maximum disturbance scenarios.

5.4 Impacts to Great Barrier Reef

The catchment analysis completed as part of this assessment confirms that the surface water catchments within the Project area effectively act as a closed system under both the current and maximum disturbance conditions. A natural surface water divide is present to the east of the Project area, while a man-made bund aligned approximately north-south is located to the west of the Project area. These surface water divides prevent runoff from exiting the site, with surface water flows reporting internally to site water storages.

The site water balance included in the Hydrogeological report (Graymont, 2025) indicates that the storage capacities of Pit 2 and Pit 3-4 are sufficient under the maximum disturbance scenario. No uncontrolled releases are predicted to occur, even under extreme rainfall events.

The discharge of sediment laden water from mining operations is expected to have a negligible impact on the receiving environment, including the EVs of Raggote Creek and Lake Awoonga (as a lacustrine wetland). Waste characterisation studies undertaken by RGS (2023) and Epic (2024) confirm the absence of acid and metalliferous drainage (AMD) materials in waste rock. Therefore in the unlikely event of uncontrolled releases, potential impacts to water quality are expected to be limited to localised increases of turbidity, suspended solids and nutrients.

The potential residual impact of suspended solids and nutrients to the downstream Great Barrier Reef is also considered to be low. This assessment has confirmed that the sediment basin is adequately sized to capture sediment laden runoff from the processing areas, with no increase in catchment area expected under the maximum disturbance scenario. Water quality data from releases at discharge point C1 from the sediment basin during 2025 show that discharge water was within the release limits specified in the EA, and within the recorded historic range of water quality for Lake Awoonga in 2023-24. Therefore, it is expected that any releases into the receiving environment are unlikely to negatively impact the water quality of the receiving watercourses.

The Sediment and Erosion Management Plan outlines mitigation measures that are to be undertaken at the site, including regular visual inspections of the sediment basin, and cleaning as required. Monitoring of any water discharged from the site will continue to be undertaken to ensure compliance with EA conditions. These measures will be continued to be implemented throughout the life of mine.

6 CONCLUSIONS

This surface water impact assessment concludes that the potential impact to downstream surface water and the receiving environment under the maximum disturbance landform is considered low based on the following factors:

- The site functions as a closed surface water system, with all disturbed areas draining internally into site water storages
- Changes to the current catchments are minimal in the maximum disturbance, with the primary change being the amalgamation of the Pit 3, Pit 4, and Farm Dam catchments
- The stormwater flow assessment undertaken demonstrates that the predicted changes in peak discharge between current and maximum disturbance scenarios are minor
- Water balance (Graymont,2025) indicates that overtopping of site water storages is unlikely, even during extreme rainfall events
- An assessment of the sediment basin indicates that the existing dam has sufficient capacity to manage runoff under both current and maximum disturbance conditions, thereby minimising the potential for uncontrolled releases into the receiving environment

In addition, existing mitigation and management measures, as outlined in the Sediment and Erosion Management Plan, are considered appropriate and will continue to minimise the risks to the receiving surface water environment throughout the life of mine.

7 REFERENCES

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RGS, 2023. Mine Waste Characterisation Report- Calliope Limestone Mine.

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