Surface Water Assessment
Johns River Quarry – Extension Project Modification 3

Report Prepared for: Boral Resources (NSW) Pty Ltd
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1.0 INTRODUCTION

1.1. Background

Boral Resources (Country) Pty Ltd (Boral) owns and operates the Johns River Quarry at Bulleys Road, Johns River (the quarry or the site), a long-standing hard rock quarry that extracts and transports high quality hard rock aggregates for use as road base and in the construction industry. The quarry operates under development consent no. DA 93/31 (as amended) from the (former) Greater Taree Council. DA 93/31 is due to expire in July 2026.

The quarry is located at the northern end of Bulleys Road, approximately 2 km north of the village of Johns River and 500 m north-west of the Pacific Highway. The regional city of Taree is located approximately 38 km south-west of the quarry.

The existing quarry operations area is approximately 16.46 ha and incorporates the extraction area, haul roads, plant area, stockpile and loading area, weighbridge and truck staging area, noise bunds and water management structures, car parking and amenities.

The existing layout of the quarry is shown in Figure 1.1.

Due to the ongoing demand for high quality hard rock quarry products, Boral is seeking consent from the MidCoast Council to modify DA 93/31 to extend the life of the quarry through a minor extension of the quarry operations area, the details of which are outlined in Section 1.3.

The site has existing surface water management infrastructure designed to manage water quality from the existing quarry. As detailed further in Section 2.1, the quarry also has an Environmental Protection License (EPL) 4812 that allows for water discharged up to certain parameter thresholds.

The Quarry is zoned RU1 Primary Production under the G*reater Taree Local Environmental Plan 2010.* Extractive industries are permissible in this zone with consent. The land uses immediately surrounding Johns River Quarry include rural residential, agricultural and conservation.

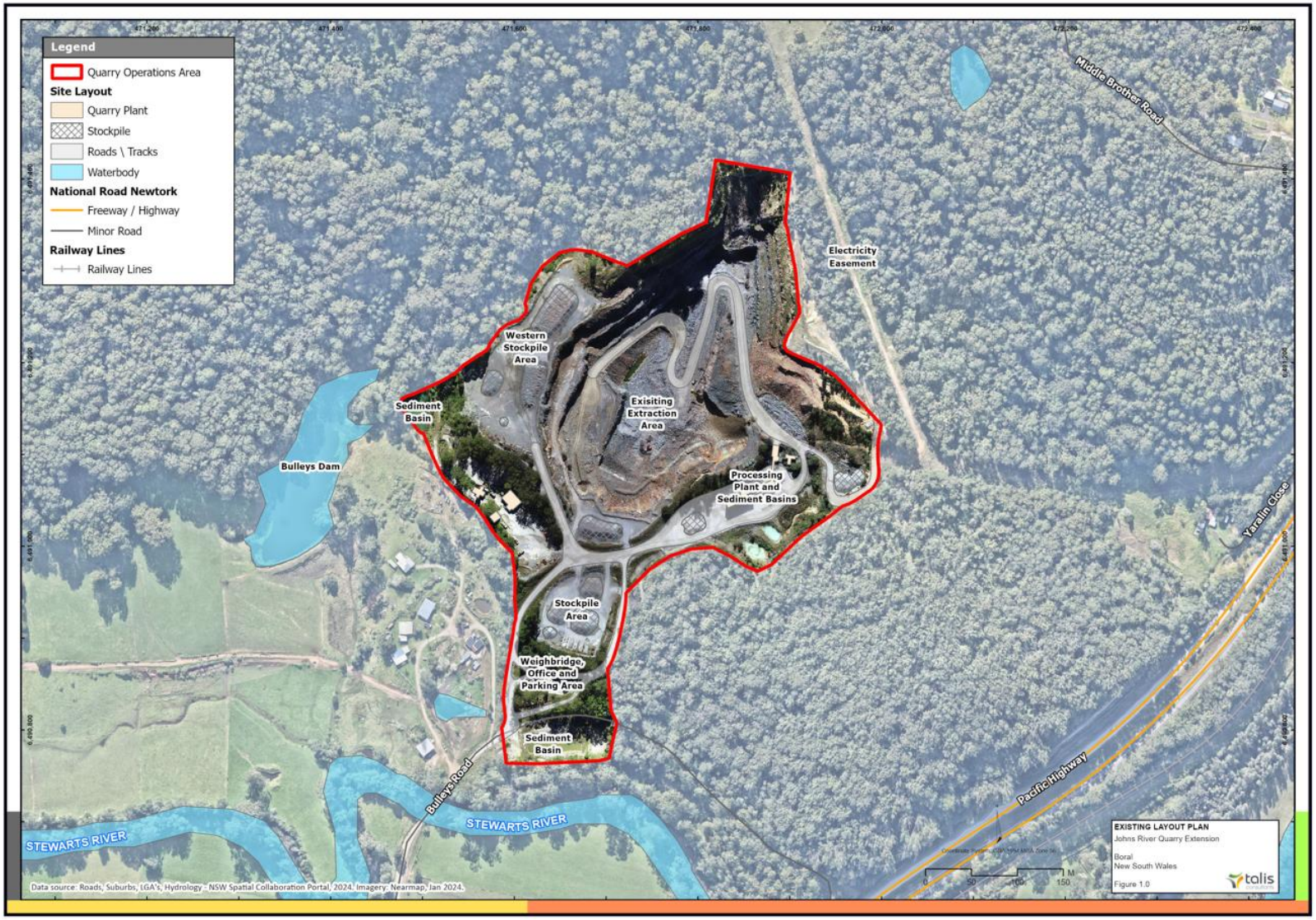


Figure 1.1 Existing quarry layout

1.2. Site Description

1.2.1. Climate

Records from the Taree Airport weather station (060141) indicate that the climate over the site is temperate with annual average rainfall of 1,155 millimetres per year (mm/y) skewed towards late summer and early autumn (Figure 1.2). Annual areal actual evapotranspiration is estimated at about 780mm/y and areal potential is 1314mm/y. Median rainfall exceeds actual evapotranspiration and is slightly less than areal potential evapotranspiration, suggesting the site could be a net importer of rainfall to groundwater depending on the groundwater interface and exposure.

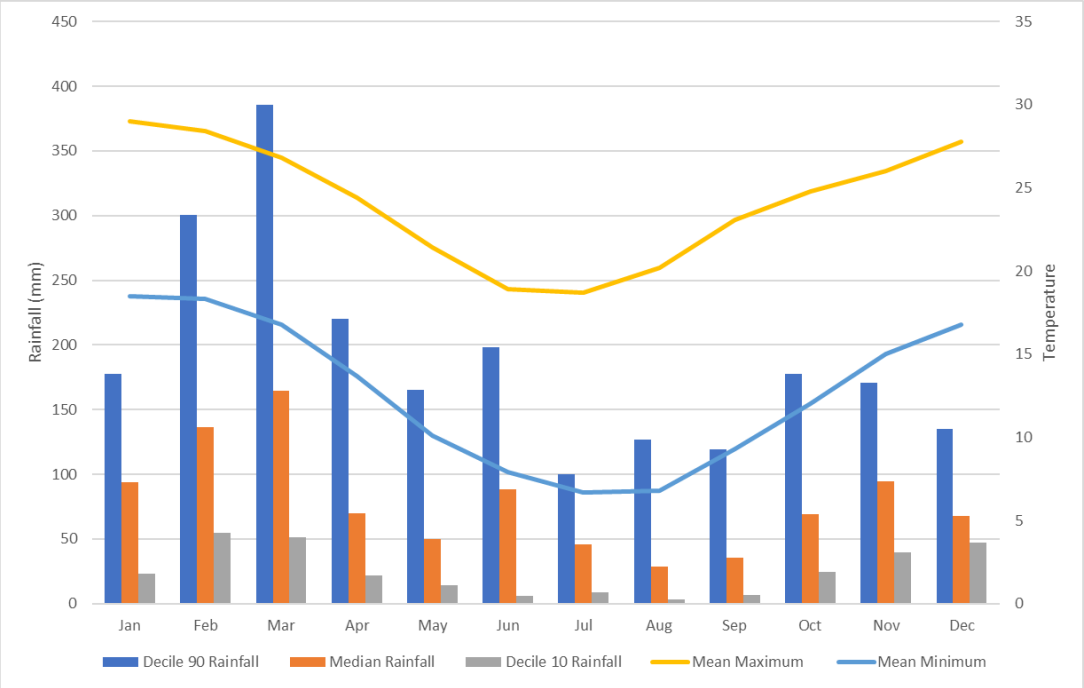


Figure 1.2 Monthly rainfall and temperature

1.2.2. Locality

Johns River Quarry is a partially owned and partially leased site. The Quarry is located at Bulleys Road, Johns River on the mid-north coast of New South Wales.

Johns River Quarry is located at the Northern end of Bulleys Road, around 2km north of the village of Johns River and 500m northwest of the Pacific Highway. The regional city of Taree is located approximately 38km southwest of the site (Figure 1.3).

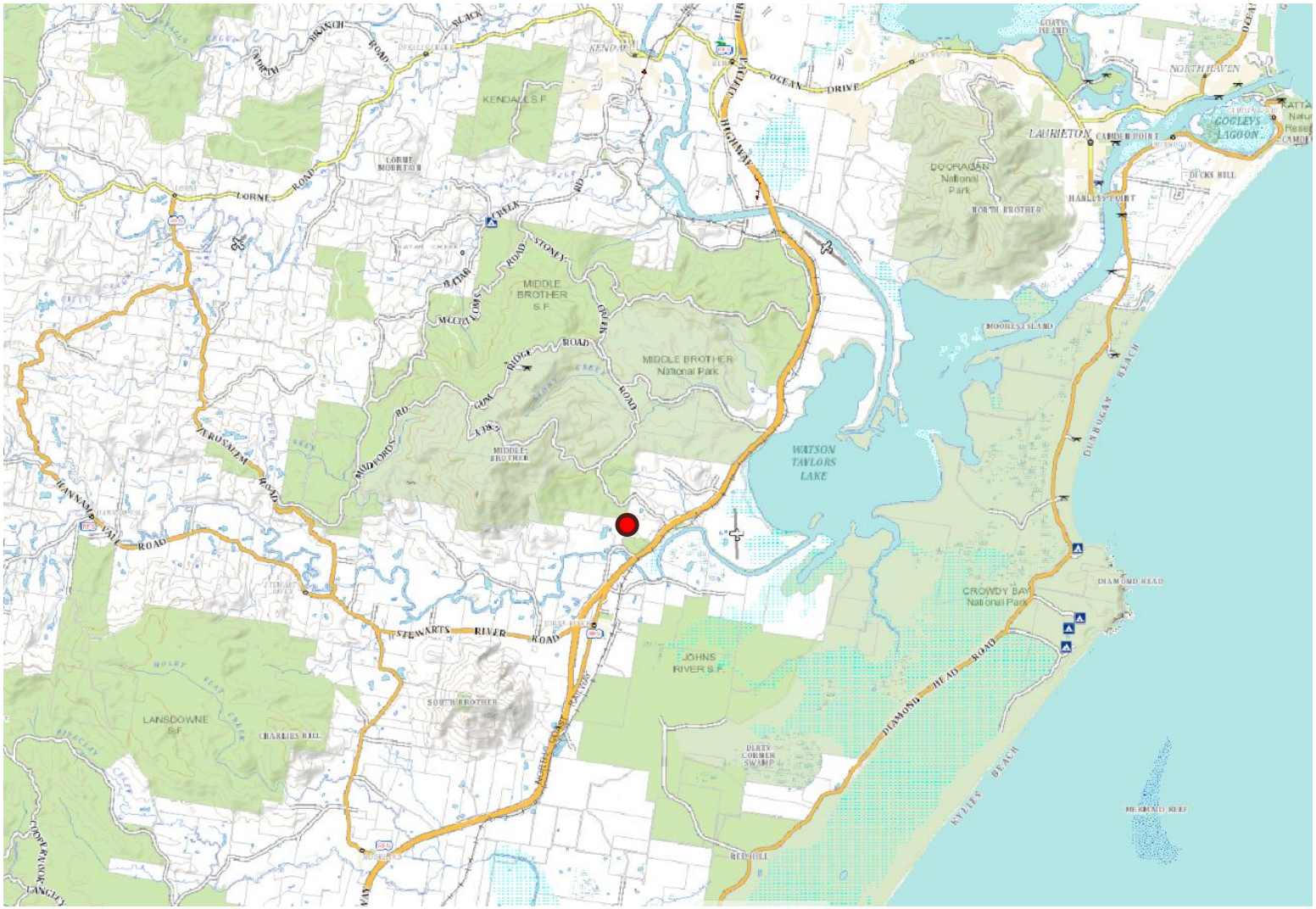


Figure 1.3 Quarry locality

1.2.3. Landscape and geology

The quarry is located over what was once a lower hillside of the Middle Brother Mountain. The site geology is primarily a granitic intrusion, hence the quarry location. Surface soils, where remaining, are generally sandy loams to about 250mm above sandy clays to about 1m above granite bedrock. Soils are generally highly erodible with the potential for high dispersibility. External slopes adjacent to the quarry are relatively steep, and range between 20 to 50% and are well vegetated. Within the quarry itself, stockpile areas and the processing area are between 2 to 5%, with steep internal slopes outside of the excavation footprint retaining much of their vegetation (Figure 1.4). The quarry pit itself generates a stepped landscape of steep rock faces and platforms, changing in shape with excavation patterns (Figure 1.5). The base of the main quarry pit is currently at about 3.0m AHD, expanding and deepening as the quarry is excavated to the final currently approved elevation of 0m AHD (Figure 1.6).

Figure 1.4 Quarry landscape 1

Figure 1.5 Quarry landscape 2

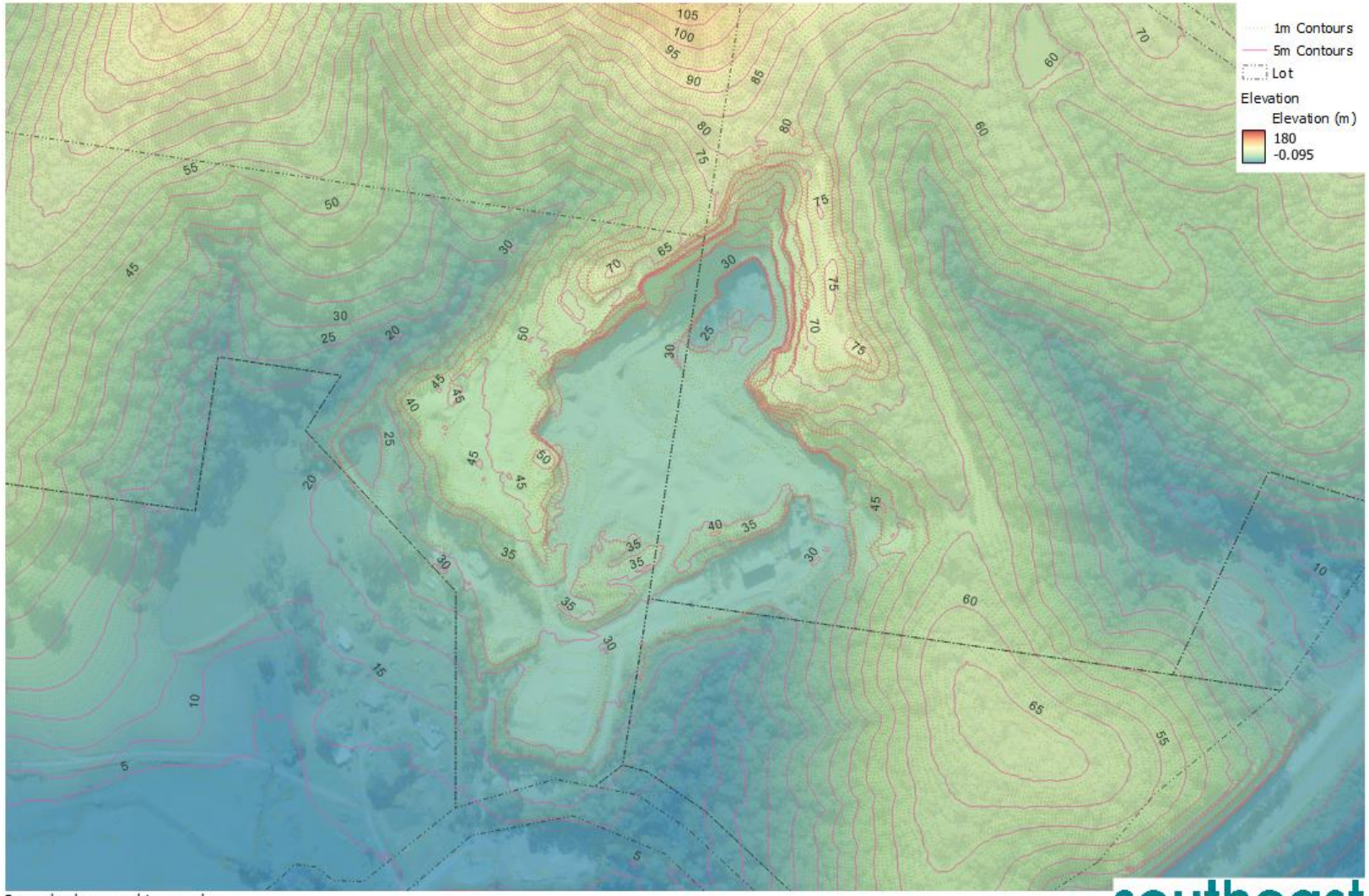


Figure 1.6 Site landscape and topography

1.2.1. Flooding hazards

The quarry is located adjacent to the Stewarts River, about 250m upstream of the Princes Highway. The *Camden Haven River and Lakes System Flood Study* (Worley Parsons, 2013) considered flooding up to the quarry site. Mapping sourced from Port Macquarie Council's web site (Figure 1.7), shows the quarry beyond the 1% AEP flood extents, and therefore the flood planning area. As such, assessment of flood risk to the site is not a necessary consideration for this modification.

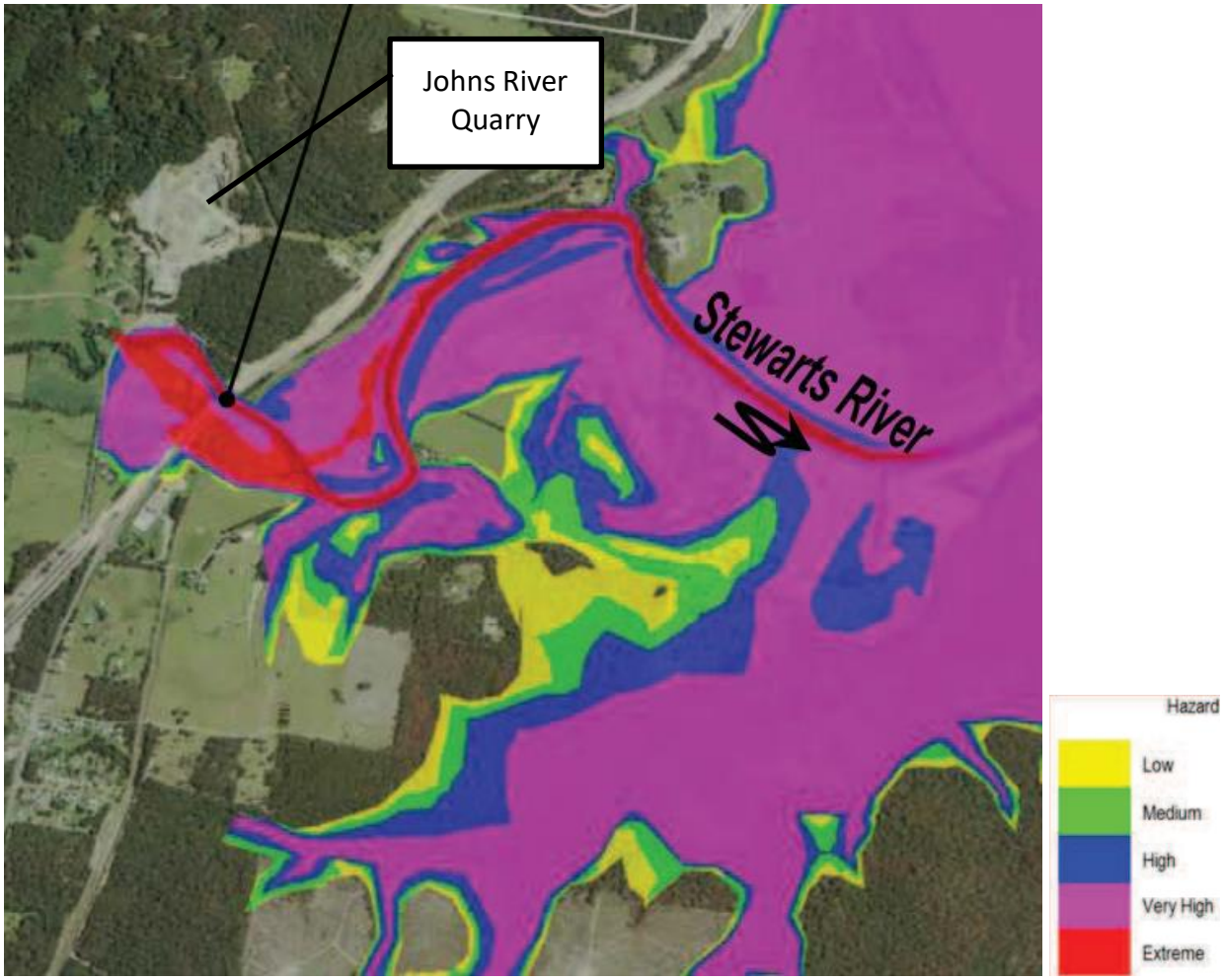


Figure 1.7 Mapped 1% AEP flood extents (Worley Parsons, 2013)

1.3. Project description

The key components of the Johns River Quarry Extension – Modification 3 (the proposed modification) include:

- continuing existing operations for an additional 15 years (until 2041); and
- extending the quarry operations area by 2.03 ha to the north-east to provide access to approximately 2.3 million tonnes (Mt) of additional resource.

There would be no other changes, noting that the proposed modification does not seek to modify:

- the approved rate of extraction;
- the depth of extraction;
- the type of product being extracted;
- existing drill and blast extraction methods;
- truck types or the number of movements;
- hours of operation;
- the number of employees;
- existing site office, amenities, weighbridge and parking area; and
- existing stockpile areas, crushing and screening plant, and mobile machinery.

The proposed layout of the quarry is shown in Figure 1.8.

The following table provides a comparison of the main components of the proposed modification with the original and existing (as modified) consents.

Table 1.1 Comparison of the main components of the proposed modification

Component	Original consent	Existing (as modified) consent	The proposed modification
Life of the quarry	July 2018	July 2026	July 2041
Quarry operations area	15 ha	16.46 ha	18.49 ha
Depth of extraction	35 m AHD	0 m AHD	No change
Approved annual production	100,000 tonnes per annum (tpa)	300,000 tpa[1]	No change
Truck routes	Southbound through Johns River Village and Northbound on Pacific Highway via Bulleys Road / Stewarts River interchange	No change	No change
Truck movements	60 per day	120 per day (60 each way)	No change
Operating hours (including stockpiling, processing, truck loading and dispatch)	Monday to Friday: 6.30 am to 5.30 pm Saturday: 6.30 am to 1.30 pm Sunday: No works	Monday to Friday: 7 am to 6 pm Saturday: 7 am to 1.30 pm Sunday: No works	No change
Blasting hours	Monday to Friday: 11 am to 3 pm	Monday to Friday: 9 am to 3 pm	No change

Component	Original consent	Existing (as modified) consent	The proposed modification
		Saturday: 9 am to 1.30 pm	

Note 1: DA 93/31 allows for an increase in the annual production rate to 450,000 tpa for approved special projects.

An extension of the quarry is required to provide additional resources for road base and for concrete and bituminous sealing aggregates. The extended quarry activities will continue to be operated with the same high level of competency and commitment to satisfying the interests of the community and regulatory authorities.

As detailed in Section 2.1 the site is licensed under EPL 4812. The EPL authorises the Fee Based Activity of the following:

- Crushing, grinding or separating > 100000 – 500000 tonnes processed
- Land-based extractive activity > 100000 – 500000 tonnes extracted, processed or stored. .

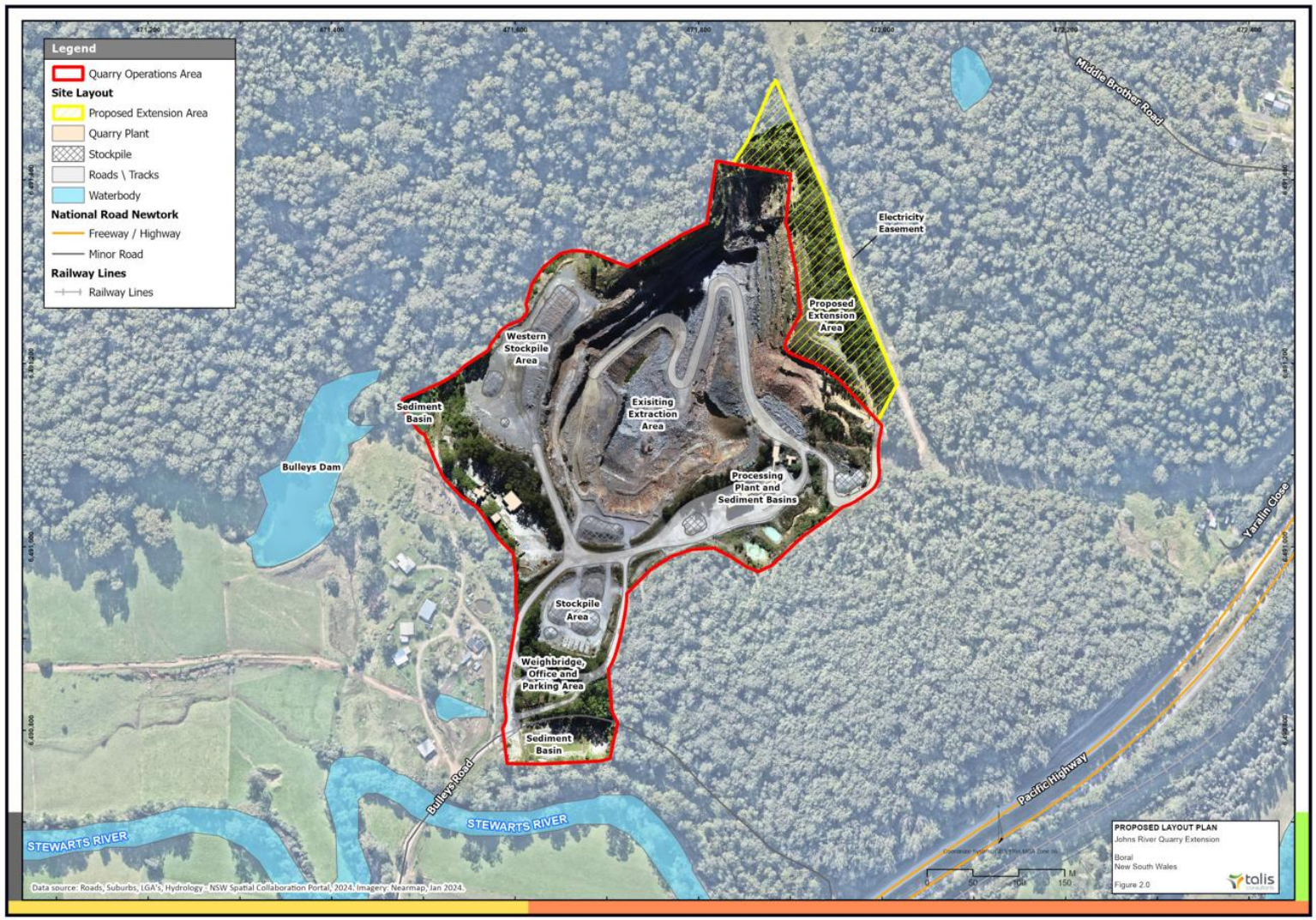


Figure 1.8 Proposed quarry extension

2.0 SURFACE WATER RELATED LEGISLATION, POLICY AND GUIDELINES

2.1. Legislation

2.1.1. Environmental Planning and Assessment Act 1979

The application is for a modification to an existing approved operation. The modification to the existing consent is applied for under Section 4.55(2)of the EP&A Act.

2.1.2. Protection of the Environment Operations Act 1997

The NSW *Protection of the Environment Operations Act 1997* (PoEO Act) and the NSW Protection of the Environment Operations (General) Regulation 2009 set out the general obligations for environmental protection. In relation to surface and groundwater management, Section 120 prohibits the pollution of waters.

The existing operation has an Environment Protection License (EPL), which specifies the water quality levels that must be achieved for discharge of waters to the environment, along with allowances for uncontrolled discharge associated with rainfall depths and durations.

2.1.3. State Environmental Planning Policy (Resilience and Hazards) 2021

The State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP) has broad objectives to manage development within the coastal zone and provide protection to the environmental assets of the coast. Coastal areas have been mapped to clearly identify areas impacted by this SEPP.

The existing quarry is partially located within the Coastal Use Area and the Coastal Environment Area, with the expansion located beyond the Coastal Use Area and partially within the Coastal Environment Area (Figure 2.1) and upstream of Watsons Taylor Lake, listed in Schedule 1 of the SEPP.

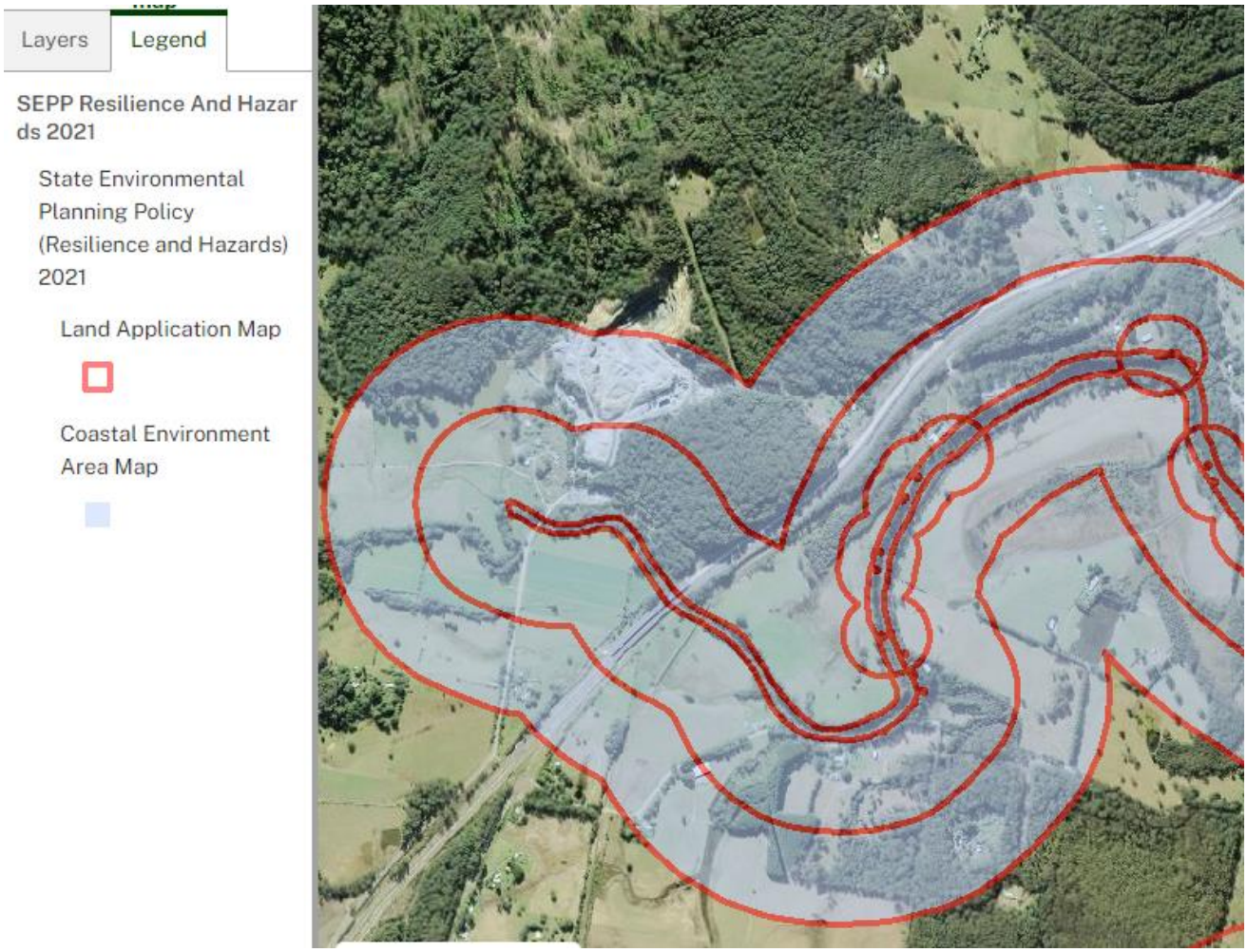


Figure 2.1 Quarry location in relation to the Coastal use and Coastal environment area.

Of relevance to the proposed modification is Clause 2.10 of the SEPP (quoted below) which outlines considerations prior to the approval of the development, and levels of satisfaction required of the consent authority in relation to how the proposed development avoids, minimises and/or mitigates potential impacts.

2.10 Development on land within the coastal environment area

(1) Development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following—

(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,

(b) coastal environmental values and natural coastal processes,

(c) the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,

(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,

(e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,

(f) Aboriginal cultural heritage, practices and places,

(g) the use of the surf zone.

(2) Development consent must not be granted to development on land to which this section applies unless the consent authority is satisfied that—

(a) the development is designed, sited and will be managed to avoid an adverse impact referred to in subsection (1), or

(b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or

(c) if that impact cannot be minimised—the development will be managed to mitigate that impact.

2.1.4. Greater Taree Local Environmental Plan 2010

Clause 5.21 of the *Greater Taree LEP 2010* includes provisions for development in flood planning areas. The site is located adjacent to Stewarts River, however it is beyond the influence of the 1% AEP flood event, and therefore Clause 5.21 does not apply. No other water related LEP controls relate to the site.

2.2. Guidelines and Policies

2.2.1. MidCoast Council – Stormwater management policy and Stormwater assessment procedure.

MidCoast Council has provided the following suggested targets as part of the DA Pre-lodgement meeting in relation to water quality and quantity:

1. Control the hydrological impacts of development on the hydrological regime of the receiving surface and groundwater systems including the frequency, magnitude and duration of flows to preserve, as far as practical the predevelopment groundwater and surface water regimes and interactions
2. Achieve the neutral or beneficial effect (NorBE) water quality targets. Refer to Midcoast Council's Stormwater Policy and Procedure to understand the water quality targets outlined

MidCoast Council has a stormwater management policy with the objective to:

maintain or improve the quality of stormwater runoff from a development

the proposed modification must demonstrate how it meets this policy objectives, in particular the water quality targets.

In this case, Council's stormwater assessment procedure requires that the development should achieve the target of a Neutral or Beneficial Effect (NorBE) in relation to sediment and nutrient loads.

This is demonstrated through a comparison of pre-development, conditions, to the proposed condition. The pre -development condition is based on the predominant land use over the previous five years in accordance with MidCoast Council's *Guidelines for Water Sensitive Design Strategies (MidCoast Council, 2019)*. The quarry has been operating based on its original approval, and in its most current approved modification form for well over five years

2.2.2. National Water Quality Management Strategy, Water Quality Objectives and ANZECC guidelines

The National Water Quality Management Strategy (NWQMS) provides guidance on water quality planning and management at a federal level. From that framework, the NSW government has set out policies and objectives for water quality management over the state. Water Quality Objectives (WQOs) have been established for catchments throughout NSW, using the Australian and New Zealand Environment and Conservation Council (ANZECC) guidelines to set trigger values for a range of parameters, based on the water use, for example; protecting aquatic ecosystems or providing drinking water.

The NSW Water Quality Objectives (WQOs) include a range of suggested numerical water quality criteria for a waterway that can help identify the condition of that waterway. The water quality requirements also provide supporting information outlining how to use the WQOs as a tool to assess what an exceedance of these values might mean when undertaking water quality monitoring.

The ANZECC guidelines and NSW WQOs are not specific regulatory criteria as noted in ; *Using the ANZECC Guideline and Water Quality Objectives in NSW (DEC, 2006)* which states:

> The NSW WQOs are the environmental values and long-term goals for consideration when assessing and managing the likely impact of activities on waterways. They are not intended to be applied directly as regulatory criteria, limits or conditions but are one factor to be considered by industry, the community, planning authorities or regulators when making decisions affecting the future of a waterway

The existing quarry operation has an approved surface water management system to limit sediment and nutrient loads discharged from the site that was upgraded in 2016 to improve performance and meet EPA licence requirements. The existing operation has an approved EPL which specifies the intensity and depth of rainfall that must be retained on site along with discharge concentration requirements. The EPL allows for the development to discharge to the environment with controls on the quality and timing of discharge based on the depth of rainfall to be retained. This EPL requirement is applied to this modification.

2.2.3. Erosion and sediment control guidelines

The Managing Stormwater: Soils and Construction, Volume 2E – Mines and Quarries (DECC, 2008) – provides guidelines to specifically address requirements for erosion and sediment control on mines and quarries based on the principles set out in Managing Stormwater: Soils and Construction, Volume 1 (Landcom 2004)

Sediment control is managed using basins, sized in accordance with the above guidelines and the EPL for the site.

3.0 SURFACE WATER MANAGEMENT

3.1. Existing

3.1.1. Environmental Protection Licence – Surface Water

The quarry is licenced under EPL 4812 to carry out extractive activities and crushing, grinding and separating of up to 500,000 Tonnes per year. EPL 4812 has the following water management requirements that allow for pollutants to be discharged:

1. Exceedance of a quality limit specified in this licence for the discharge of total suspended solids from Point 1, 2 or 3 is permitted if the discharge from Point 1, 2 or 3 occurs solely as a result of rainfall at the premises exceeding a total of 55.9 millimetres over any consecutive 5 day period.
2. The site has four discharge points for water into the receiving environment, points 1, 2, 3 and 23 (Figure 3.1 and Figure 3.2).
3. Quality limits are:
    - Oil and grease – 5mg/L &/or none visible
    - pH – 6.5 to 8.5
    - TSS – 40mg/L (Point 1, 3 and 23), 50mg/L (Point 2).

The quarry can discharge water from licenced discharge points 1, 2 or 3 at or below the quality limits outlined above for rainfall less than 55.9mm over any consecutive 5-day period. For rainfall depths above that amount, the quarry may discharge water that exceed these limits.

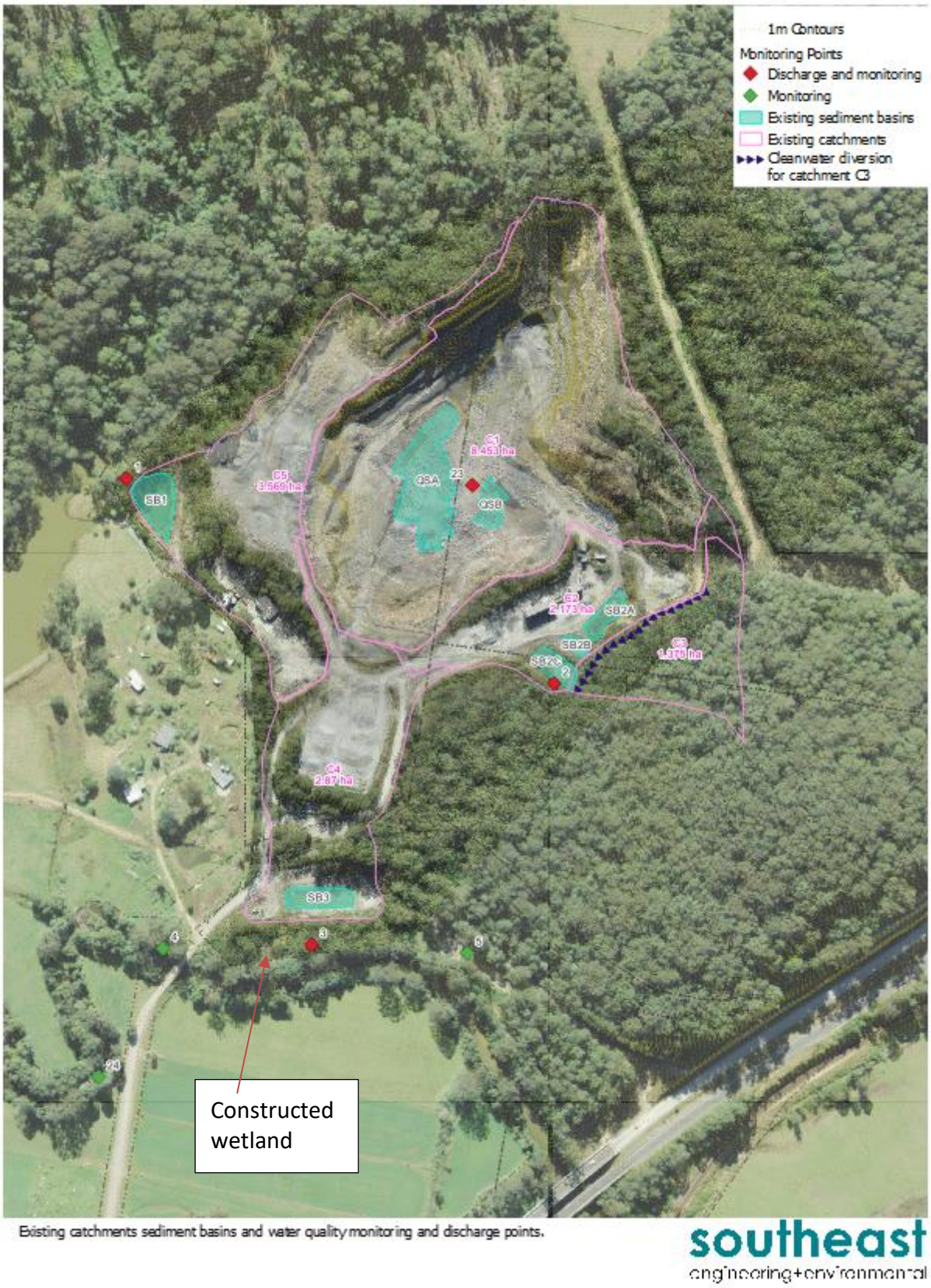


Figure 3.1 EPL Discharge and monitoring points

Figure 3.2 Quarry sump EPL discharge and monitoring point 23

3.1.1. Surface runoff management

Surface runoff from the site is currently managed via three constructed sediment basins (SB1, SB2 (a, b and c) and SB3, the main quarry pit as a sump and a constructed wetland, refer to Figure 3.1

In 2015, a modification to the quarry consent to allow for an additional stockpile area, changes to operation hours and an additional sediment basin for the site was approved.

The existing *John's River Quarry Water Management Plan* (existing WMP) (Groundwork Plus, 2016) was developed for the site as a requirement of the 2015 approval. The existing WMP included a check of existing sediment basin capacity against the EPL 4812 rainfall runoff storage requirements as well as the sizing and design of a new sediment basin (SB3) to control runoff from the new stockpile area.

The sediment basin sizing was carried out using the sediment basin storage sizing for fine or dispersive soils outlined in *Managing Urban Stormwater – Soils and Construction Vol 1 (*Landcom, 2004) using the 5-day rainfall depth of 55.9mm, as specified in EPL 4812.

Since the existing WMP was prepared, the internal quarry shape has been modified, changing catchment areas draining to sediment basins, with the main change being the increase in catchment draining to the main pit sump, and an associated reduction in the area draining to the SB2 basins (Figure 3.4).

Change in catchments from 2016 to current

Figure 3.3 Change to catchment areas since 2016

The sediment basin upgrades designed as part of the 2016 modification have been completed. The internal catchment areas have changed slightly since those upgrades, associated with the change in quarry pit shape, particularly the boundary between C1 and C2 as the main pit has expanded eastward. Catchment C3 will continue to be diverted away from the quarry pit as clean water diversion.

Further changes to catchment areas will occur as the quarry expands as proposed in this modification.

Given the change to catchment areas since the 2016 modification and basin upgrades, a revision of sediment basin sizing has been undertaken. A summary of the required sediment basin volumes based on EPL design requirements, in accordance with the sediment basin sizing techniques outlined in Managing Urban Stormwater Soils and Construction Vol 1 (Landcom 2004) is shown in Table 3.1 below, with calculation summaries contained in Appendix A

Table 3.1 Sediment basin sizing for current operation

Basin	**Type F Basin calculation (m^3)**		**Available volume* (m^3)**
	Sediment storage	**Total volume**	
SB1	275	1532	1804
SB2	112	876	2016
SB3	192	1203	1260
Quarry Sump	2287	5272	As required

*Pyramidal volume assuming 3.5m depth

A MUSIC model has also been prepared for the site which incorporates catchments draining to sediment basins external to the pit; SB1, SB2, SB3 and the quarry sump to provide an estimate of sediment loads discharged from the site to provide a benchmark for testing the Neutral or Beneficial Effect (NorBE) test as recommended by Council. The MUSIC model incorporates the sediment basin sizes that exist on the site currently and allows for discharge from these basins at concentrations up to the EPL limits for the rainfall depth specified in the EPL. For rainfall in excess of the EPL depth, and the associated flow rate, pollutants are discharged at the levels generated in the model

Conversion of the rainfall depth (55.9mm) to a flow rate assumes this depth is delivered over a 24h event.

Results for the existing condition are listed in ~~Table 3.2~~ showing the current pollutant loads generated by the quarry, and the treatment effectiveness of the existing pollution control systems, i.e. the pre-development situation. Assumptions used in the MUSIC model are contained in Appendix B.

Table 3.2 MUSIC estimated pollutant loads for predevelopment (existing conditions)

Parameter	Generated	Discharged	Reduction (%)
Flow (ML/yr)	84.5	73.3	13.3
Total Suspended Solids (kg/yr)	1.03E+05	1.18E+04	88.6
Total Phosphorus (kg/yr)	47.1	15.9	66.3
Total Nitrogen (kg/yr)	195	137	29.9

3.1.2. Water quality monitoring

In accordance with the EPL issued for the site operations, water quality monitoring is undertaken at licenced discharge points; 1, 2, 3 and 23, along with external water quality monitoring points 4, 5 and 24 (Figure 3.1). No change to water quality monitoring is proposed.

3.1.3. Water use and supply

3.1.3.1. Water use

Water is extracted from the quarry base sump as well as the other sediment basins around the site for use around the site as outlined below. This assists in creating the available storage volumes within the basins when rainfall occurs.

Processing plant

Water is extracted from the quarry base sump, and is transferred to 4 x 20kL storage tanks. Processing including quarry crushing and screening operations, uses approximately 20kL/day. Process water either evaporates, is retained in product stockpiles where further evaporation takes place, leaves as moisture content of material when trucked from site or is discharged from the site via the SB2 sequence of sediment basins. Based on 20kL/d, the total water use for processing is estimated at 6000kL/y.

Water use = 50wk/y x 6 days/wk x 20kL/d = 6000 kL/y

Dust suppression

A 10kL watercart is used over the site. In dry and windy conditions, up to 5 cart loads per day (50kL) is used around the site. On other non-rain days, an average of 3 cart load per day (30kL) is used. Based on an average year with 100 rain days (Taree Airport AWS), equating to 82 days over quarry operation days and assuming dry and windy conditions over 25% of the remaining days based on months with an average wind speed of > 20km/h, 7630kL of water is used for dust suppression around the site.

Water use:

Windy days = (300-82) days x 25%x 50kL/d = 2725 kL

Non windy days = (300-82) days x 75% x 30kL/d = 4905 kL

Total = 7630kL/annum

Office amenities

The existing quarry amenities comprise 5 toilets, 1 urinal, 1 shower and kitchen facility, serviced by 2 x 10kL rainwater tanks.

Wastewater is treated via an enviro-cycle septic system that is serviced 3 monthly. No change is proposed to this part of the operation.

Total water use

The total estimated water use, excluding amenities, is approximately 13.63ML/y.

3.1.3.2. Collected runoff

Average annual rainfall is approximately 1400mm/y generating between 50 to 100ML/y of collected runoff within the main quarry pit, depending on rainfall intensity and losses associated with the pit landscape (slopes and depressions) and pit material (rock or gravel and sand). Some of this collected surface runoff is re-used throughout the site via pumping from the quarry sump and reuse either in the processing plant or as dust suppression the remainder is discharged in accordance with the EPL.

3.1.3.3. Water Access Licence and allocation

The quarry has a Water Access Licence (WAL42101) with an allocation of 5 shares (generally 1ML each) from the Lorne Aquifer. 118 shares have been allocated from the Lorne Aquifer as of June 2024, and the Long Term Average Extraction Limit (LTAEL) is 9500ML/y after allowing for environmental flows, as outlined in the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*. As such, there is a large amount of unallocated water within the Lorne Aquifer.

3.1.3.4. Water Balance

Total annual water use over the site is estimated at 13.63ML/y supplied from a combination of collected surface water draining into the quarry sump and the Water Access Licence (WAL42101), which can provide an allocation of up to 5ML/y from the Lorne Aquifer.

3.2. Proposed

3.2.1. Runoff management

There are no changes to the management of surface water within the quarry apart from the change to the quarry footprint and associated catchment boundaries. The current catchment boundaries are slightly different to those outlined for the previous modification in 2016 (Figure 3.3), with further modifications associated with the ultimate footprint outlined in Figure 3.4. Essentially the main change in hydrologic impact is an increase in catchment area draining to the quarry sump and a small reduction to the catchment area draining to sediment basin SB2.

No change to basin sizing is required for the catchments that drain to SB1, SB2 and SB3. A change to the management of accumulated water within the main quarry sump (only) will be necessary to accommodate the ultimate additional 1.407ha of catchment associated with the extension draining to this area and associated increase in sediment load. This water will continue to be discharged from the quarry sump area in accordance with the existing EPL.

Updated sediment basin sizing designed in accordance with Managing Urban Stormwater Soils and Construction Vol 1 (Landcom 2004) are summarised in Table 3.3. The catchment draining to the sequence of sediment basins SB2 will reduce slightly as the main quarry pit expands slightly to the east directing runoff into the main quarry sump. Catchments draining to sediment basins SB1 and SB3 will not change. The catchment draining to the quarry pit will increase in size by approximately 1.407ha. The result of this will be increased runoff into the pit, and an increase in the area and volume required to achieve sediment removal in accordance with the EPL.

The additional volume is easily achievable within the proposed quarry main quarry pit. An indicative area of approximately 3500m^2 is shown in the southeast corner (Figure 3.4) of the future expanded footprint, as a possible area to be used.

Maintaining sufficient operational sump volume within the pit will need to be incorporated into the updated water management plan to ensure that sufficient volume is available to achieve sediment settling for sediment load removal to meet NorBE and the concentration levels necessary to achieve the EPL requirements.

Table 3.3 Sediment basin sizing for proposed modification

Basin	**Type F Basin calculation (m^3)**		**Available volume* (m^3)**
	Sediment storage	**Total volume**	
SB1	275	1532	1804
SB2	105	862	2016
SB3	192	1203	1260
Quarry Sump	2661	6133	As required

*Pyramidal volume assuming 3.5m depth

As required by Council, a MUSIC model of the modification to the development has been prepared that takes into consideration the change to catchment areas on the site.

As discussed above, the change in catchment area is focused on the main quarry sump, with an increase in catchment draining to the sump of 1.407ha associated with the extension, and slight reduction draining to sediment basin SB2. The increase in catchment area draining to the sump requires an additional volume to achieve the sediment removal necessary to meet the load requirements associated with a NorBE.

The active sediment basin volume required to achieve NorBE within the MUSIC model is 2200m^2 with a maximum storage depth of 2m. This is consistent with the estimated active sediment basin volume using the Managing Urban Stormwater: Soils and Construction technique (Table 3.3).

Table 3.4 shows that, with a volume allowance in accordance with the sediment basin sizing as shown in Table 3.3, loads discharged from the quarry are below existing conditions, achieving Council's water quality target of a NorBE test for water quality. This is discussed further in Section 4.4.

Table 3.4 MUSIC estimated pollutant load reduction and NorBE comparison.

Parameter	**Generated**	**Post development load discharged to environment**	**Reduction from generated. (%)**	**Pre Development loads discharged to environment**
Flow (ML/yr)	90.7	75.4	16.9	73.3
Total Suspended Solids (kg/yr)	1.10E+05	1.14E+04	89.6	1.18E+04
Total Phosphorus (kg/yr)	50.6	15.8	68.7	15.9
Total Nitrogen (kg/yr)	209	135	35.4	137

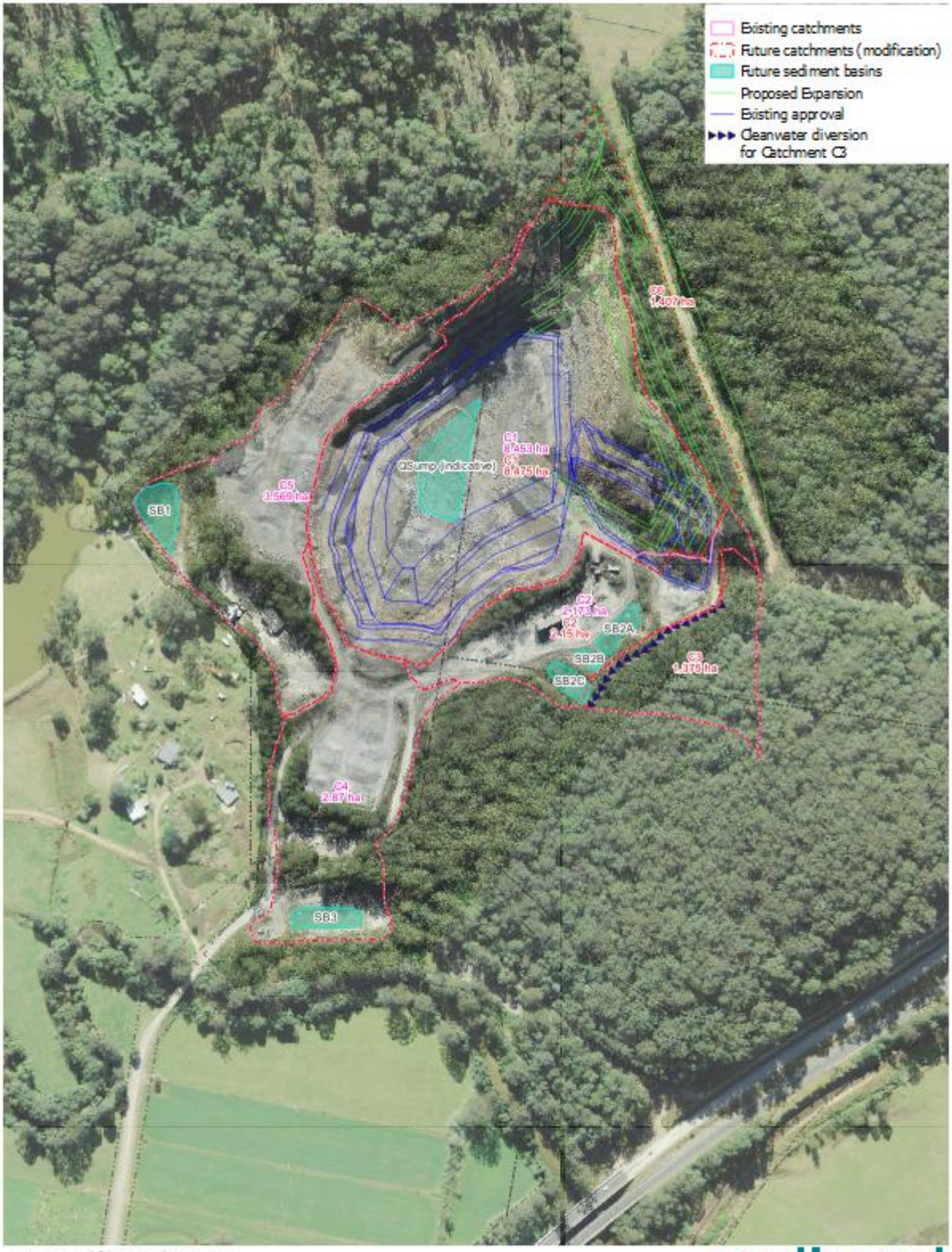


Figure 3.4 Change to quarry catchment areas

3.2.2. Processing

There would be no change to the approved extraction volumes as a result of the proposed modification., Therefore, there would be no change to water use associated with processing at the site, with continued use of approximately 20kL/d for the processing plant.

3.2.3. Dust suppression

The proposed modification will extend the pit area . However, the haul road area and haul road use is likely to remain similar given the pit shape and access. For this reason, water use associated with dust suppression is assumed to remain the same.

3.2.4. Water Balance

Total water use, excluding amenities is expected to remain the same at 13.63ML/y and supplied from a combination of collected surface water draining into the quarry sump and the

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1. Legislative requirements

Table 4.1 provides a summary of relevant water related legislation and comment on how objectives are met

Table 4.1 Summary of legislation objectives

Legislation	**Comment**
The NSW *Protection of the Environment Operations Act 1997* (PoEO Act) and the NSW Protection of the Environment Operations (General) Regulation 2009 set out the general obligations for environmental protection. In relation to surface and groundwater management, Section 120 prohibits the pollution of waters.	The development must continue to comply with the Environmental Protection Licence (EPL) which applies at the site, in particular discharge requirements. There is no change required to the EPL, the modification can achieve a NorBE test with the current water related EPL requirements.
State Environmental Planning Policy (Resilience and Hazards) 2021. *(a) the development is designed, sited and will be managed to avoid an adverse impact referred to in subsection (1), or* *(b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or* *(c) if that impact cannot be minimised—the development will be managed to mitigate that impact.*	The existing quarry is already located within the Coastal Environment Zone. Adverse impacts on the coastal environment, including Watsons Taylor Lake are avoided through the use of water management systems within the site, particularly existing sediment basins and allowance for sediment accumulation within the quarry sump. This is demonstrated through achieving a NorBE test when comparing existing and proposed pollutant loads. Further, an EPL exists for the development which controls pollution from the site.

4.2. Sediment basin volumes

The water management plan should be updated to incorporate the necessary sediment basin volumes required in accordance with the EPL. There are no changes required to the existing volumes provided in SB1, SB2 or SB3, the quarry sump will need to expand to accommodate the volume required (Table 4.2). Allowance should be made within the main quarry sump, as it expands, to incorporate sufficient area and volume as specified in this assessment to ensure required sediment loads are retained in the quarry sump as the catchment draining to it increases.

The Water Management Plan should be updated to incorporate these volumes, in particular the volume required within the quarry pit, and how this volume will be managed in conjunction with the quarry excavation operations and the associated machinery located within the pit.

It is not recommended to have a sediment marker in the quarry sump due to the ongoing extraction activities.

Table 4.2 Sediment basin volumes

Basin	**Type F Basin calculation (m^3)**		**Current available volume (m^3)**
	Sediment storage	**Minimum Total volume**	
SB1	275	1532	1804
SB2	105	862	2016
SB3	192	1203	1260
Quarry Sump	2661	6133	As required

4.3. Water quality monitoring

Water quality monitoring should continue at the licenced monitoring and discharge locations and data collected and recorded in accordance with the quarry's water management plan and EPL.

4.4. Compliance with MidCoast Council Stormwater Management Targets

4.4.1. Hydrology

Surface runoff from the external catchments of the quarry area will not increase as these areas will not increase.

The catchment draining to the quarry pit will increase. Water will be discharged from this area via the existing sump and pump arrangement.

As the catchment area has been increased, the volume discharged from the site may increase slightly, although this will depend on reuse at the site and groundwater interaction.

Peak flows discharging from this area are controlled by the pump rate, and as such will remain at a similar rate to the existing condition. The overall discharge volume from the site is modelled to increase slightly from 73.3ML/y to 75.4ML/y as a result of the increased catchment draining to the quarry sump, although this will vary as outlined above. The frequency and duration of this flows will be very similar to the existing conditions and defined by the quarry operations and EPL. The size of the quarry pit allows for significant storage volume, and therefore provides a buffer against frequent discharge to allow the quarry to meet its EPL requirements.

The frequency, magnitude and duration of discharge from the site change slightly (an estimated increase of approximately 2ML/y). The contribution of flows from the quarry to the Stewart River is very small, compared to its broader contributing catchment of over 100 square kilometres. The existing surface water regimes and interactions Stewart River are preserved as far as practical, which is in line with Council's hydrology target provided at the pre-DA meeting.

There are no changes required to the existing EPL discharge requirements.

4.4.2. Neutral or Beneficial Effect (Water quality)

Council's suggested water quality target provided at the pre-DA meeting is to achieve a Neutral or Beneficial Effect (NorBE) in accordance with the Council's stormwater policies and procedures. The generally accepted approach to test whether a NorBE is achieved is to compare estimated pollutant loads from an existing (pre development) condition with the proposed condition.

Based on Council's *Guideline for Water Sensitive Design Strategies (MidCoast, 2019)* the pre development condition shall be based on the predominant land use over the previous five years, in this case, the current quarry operation as approved in 2016.

The proposed expansion of the quarry to the north east will increase the catchment area draining to the existing main quarry pit.

Post development pollutant loads can be maintained at or below current pollutant loads generated at the site by ensuring the recommended sediment basin area and volume within the quarry sump is created, maintaining existing sediment basin sizing outside of the quarry pit, and maintaining discharge from the site in accordance with the EPL.

Of primary importance is to make an allowance for the required volumes within the sediment basins on the site, in particular, the storage volume within the quarry pit. The required volumes and existing sediment basin sizes are listed in Table 4.2. In all cases there is sufficient volume in these basins to meet the storage requirements as listed in the EPL.

4.4.3 Management and mitigation

The existing WMP (Groundworks Plus, 2016) will be updated to ensure that the operational sump volume maintains sufficient available volume to achieve sediment settling for sediment load removal and meet NorBE and the concentration levels necessary to achieve EPL 4812 water quality requirements.

All other mitigation measures contained within the WMP and outlined below will continue to apply.

- Monitor water quality in accordance with the approved WMP
- Reuse water for dust suppression in accordance with the approved WMP.
- Measure pH and suspended solids for all discharges of water.
- Installation of erosion and sediment control measures prior to commencement of earthworks
- Submit details of proposed control measures to Council and EPA as required.
- Obtain approval for control measures from Council and EPA as required.
- Soil erosion and sediment control measures must ensure that no sediment is transported into the vegetation located between stockpile area and Stewarts River.
- The site must comply with section 120 of the POEO Act 1997 (not to pollute waters).
- Water monitoring at discharge points 1, 2, 3 & 23:
    - O&G – Visible inspection
    - pH – grab sample
    - TSS- grab sample
- Ambient water quality monitoring at discharge points 4 & 5
    - O&G – Visible inspection
    - pH – grab sample
    - TSS- grab sample
- Update basin maintenance schedule.

REFERENCES

Department of Environment and Climate Change (NSW), (2008), *Managing Urban Stormwater: soils and construction, Volume 2A: Installation of services, Volume 2C: Unsealed roads Volume 2D: main road construction and Volume 2E Mines and Quarries* (DECC 2008)

Groundwork Plus, (2016) *John's River Quarry Water Management Plan*

Landcom, (2004), *Managing Urban Stormwater Soils and Construction,* 2004.

MidCoast Council, (2019), *Guidelines for Water Sensitive Design Strategies, 2019*

NSW Department of Primary Industries (DPI) (2016). *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources*

APPENDIX A.
SEDIMENT BASIN CALCULATIONS

1. Site Data Sheet

Site Name: Johns River Quarry

Site Location: Johns River Quarry

Precinct:

Description of Site: Quarry

Site area	Site						Remarks
	QS1	SB1	SB2	SB3	SB2_P	QS1_P	
Total catchment area (ha)	8.475	3.569	2.17	2.87	2.15	9.86	
Disturbed catchment area (ha)	8.475	2.85	1.89	2	1.78	9.86	
Soil analysis							
% sand (faction 0.02 to 2.00 mm	30	30	30	30	30	30	Soil texture should be assessed through
% silt (fraction 0.002 to 0.02 mm)	60	60	60	60	60	60	mechanical dispersion only. Dispersing
% clay (fraction finer than 0.002 mm)	10	10	10	10	10	10	agents (e.g. Calgon) should not be used
Dispersion percentage	10.0	10.0	10.0	10.0	10.0	10.0	E.g. enter 10 for dispersion of 10%
% of whole soil dispersible	4	4	4	4	4	4	See Section 6.3.3(e)
Soil Texture Group	F	F	F	F	F	F	See Section 6.3.3(c), (d) and (e)
Rainfall data							
Design rainfall depth (days)	5	5	5	5	5	5	See Sections 6.3.4 (d) and (e)
Design rainfall depth (percentile)	90	90	90	90	90	90	See Sections 6.3.4 (f) and (g)
x-day, y-percentile rainfall event	55.9	55.9	55.9	55.9	55.9	55.9	See Section 6.3.4 (h)
Rainfall intensity: 2-year, 6-hour storm	13.2	13.2	13.2	13.2	13.2	13.2	See IFD chart for the site
RUSLE Factors							
Rainfall erosivity (*R*-factor)	3780	3780	3780	3780	3780	3780	Automatic calculation from above data
Soil erodibility (*K*-factor)	0.03	0.03	0.03	0.03	0.03	0.03	
Slope length (m)	200	150	150	200	150	200	
Slope gradient (%)	30	12	8	10	8	30	RUSLE data can be obtained from
Length/gradient (*LS*-factor)	14	5	3.07	4.97	3.07	14	Appendixes A, B and C
Erosion control practice (*P*-factor)	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (*C*-factor)	1	1	1	1	1	1	
Calculations							
Soil loss (t/ha/yr)	2064	737	453	733	453	2064	
Soil Loss Class	7	5	4	5	4	7	See Section 4.4.2(b)
Soil loss (m^3/ha/yr)	1588	567	348	564	348	1588	
Sediment basin storage volume, m^3	2287	275	112	192	105	2661	See Sections 6.3.4(i) and 6.3.5 (e)

4. Volume of Sediment Basins, *Type D* and *Type F* Soils

Basin volume = settling zone volume + sediment storage zone volume

Settling Zone Volume

The settling zone volume for *Type F* and *Type D* soils is calculated to provide capacity to contain all runoff expected from up to the y-percentile rainfall event. The volume of the basin's settling zone (V) can be determined as a function of the basin's surface area and depth to allow for particles to settle and can be determined by the following equation:

$V = 10 \times C_v \times A \times R_{x\text{-day, y-\%ile}}$ (m^3)

where:

10 = a unit conversion factor

C_v = the volumetric runoff coefficient defined as that portion of rainfall that runs off as stormwater over the x-day period

$R_{x\text{-day, y-\%ile}}$ = is the x-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events. (See Sections 6.3.4(d), (e), (f), (g) and (h)).

A = total catchment area (ha)

Sediment Storage Zone Volume

In the detailed calculation on Soil Loss Classes 1 to 4 lands, the sediment storage zone can be taken as 50 percent of the settling zone capacity. Alternately designers can design the zone to store the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(ii)). However, on Soil Loss Classes 5, 6 and 7 lands, the zone must contain the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(iii).

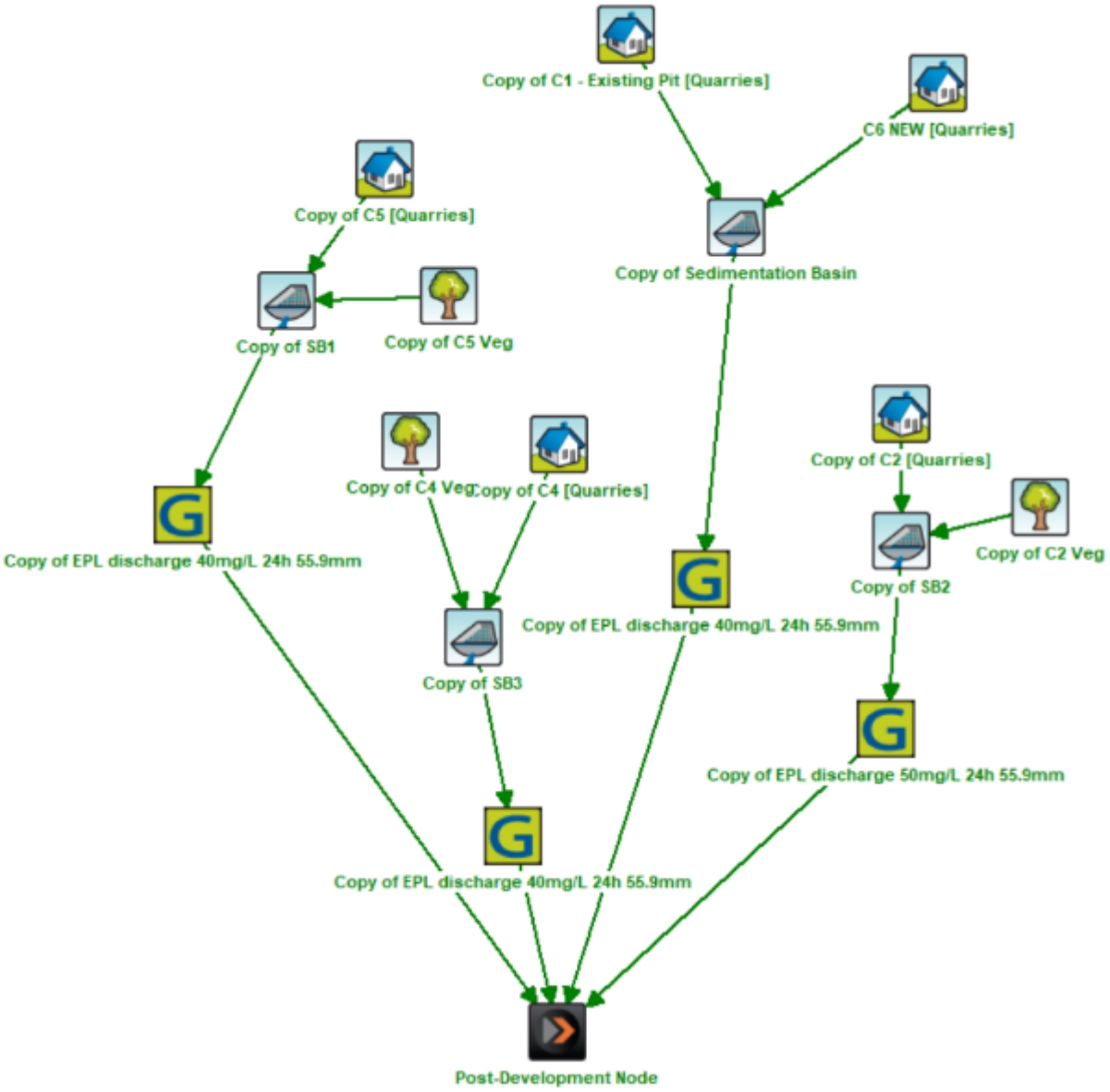
Place an "X" in the box below to show the sediment storage zone design parameters used here:

	50% of settling zone capacity,
x	2 months soil loss calculated by RUSLE

Total Basin Volume

Site	C_v	$R_{x\text{-day, y-\%ile}}$	Total catchment area (ha)	Settling zone volume (m^3)	Sediment storage volume (m^3)	Total basin volume (m^3)
QS1	0.63	55.9	8.475	2984.64075	2287	5271.64075
SB1	0.63	55.9	3.569	1256.89473	275	1531.89473
SB2	0.63	55.9	2.17	764.2089	112	876.2089
SB3	0.63	55.9	2.87	1010.7279	192	1202.7279
SB2_Prop	0.63	55.9	2.15	757.1655	105	862.1655
QS1_Prop	0.63	55.9	9.86	3472.3962	2661	6133.3962

APPENDIX B.
MUSIC MODEL CONFIGURATION AND RESULTS


Copy of C1 - Existing Pit [Quarries]
C6 NEW [Quarries]
Copy of C5 [Quarries]
Copy of Sedimentation Basin
Copy of SB1
Copy of C5 Veg
Copy of C4 Veg
Copy of C4 [Quarries]
Copy of C2 [Quarries]
Copy of EPL discharge 40mg/L 24h 55.9mm
Copy of C2 Veg
Copy of SB2
Copy of EPL discharge 40mg/L 24h 55.9mm
Copy of SB3
Copy of EPL discharge 50mg/L 24h 55.9mm
Copy of EPL discharge 40mg/L 24h 55.9mm
Post-Development Node