



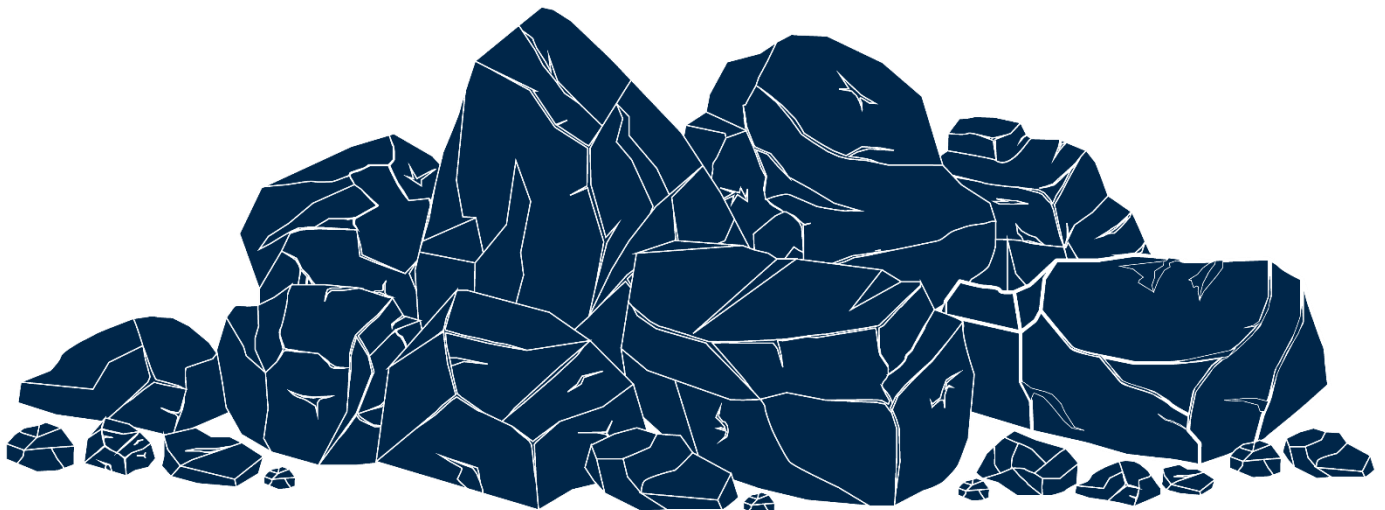
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Karuah Hard Rock Quarry

# Site Water Management Plan

December 2024



## Revision History

Version	Date Reviewed	Author	Status	Amendment Details
1A	June 2006	GSSE	Draft	Original draft Site Water Management Plan developed to satisfy the requirements of the Development Consent: <ul style="list-style-type: none"> <li>Condition 26 (Site Water Management Plan)</li> <li>Condition 27 (Erosion and Sediment Control Plan); and</li> <li>Condition 28 (Surface Water Monitoring Program).</li> </ul>
1B	August 2006	GSSE	Approved	Original approved Site Water Management Plan to satisfy the requirements of the Development Consent.
2	August 2008	GSSE	Approved	Comprehensive review following variations to the original mining plan presented in the 2004 EIS.
3	January 2012	SLR	Approved	Comprehensive review of Karuah Hard Rock Quarry Environmental Management Strategy and associated Management Plans.
4	June 2014	SLR	Approved	Comprehensive review of Karuah Hard Rock Quarry Environmental Management Strategy and associated Management Plans.
5	March 2015	SLR	Approved	Review following 2014 Independent Environmental Audit.
6	March 2016	SLR	Approved	Review following consultation with NSW Department of Planning and Environment.
7	July 2020	SLR	Approved	Comprehensive review of Karuah Hard Rock Quarry Environmental Management Strategy and associated Management Plans.
8A	June 2023	IEMA	Draft for Consultation	Draft following comprehensive review of Karuah Hard Rock Quarry Environmental Management Strategy and associated Management Plans.
8B	August 2023	IEMA	Draft for Submission	Update for new Hunter Quarries document template.
8C	September 2023	IEMA	Approved	Updated for DPE comments.
8D	December 2024	HQPL	–	Administrative update only, with application of revised Hunter Quarries' document template and standardised structure.

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## Terms, Definitions and Abbreviations

Abbreviation / Term	Meaning
AEMR	Annual Environmental Management Report
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
DA	Development Application
DEC	Former NSW Department of Environment and Conservation (now NSW EPA)
EA	Environmental Assessment
EC	Electrical Conductivity usually measured in $\mu\text{S}/\text{cm}$ .
EIS	Environmental Impact Statement
ESC	Erosion and Sediment Control
EPL	NSW Environment Protection Licence
Ha	Hectare
HQPL	Hunter Quarries Pty Ltd
km	kilometre
L	Litre
LDP	Licensed Discharge Point
MCC	MidCoast Council
NSW Planning	NSW Department of Planning, Housing and Infrastructure.
NTU	Nephelometric Turbidity Unit
POEO Act	NSW <i>Protection of the Environment Operations Act 1997</i>
SDS	Safety Data Sheet
SWMP	Site Water Management Plan
TSS	Total Suspended Solids measured in mg/L.
tpa	tonnes per annum

## 1.0 Introduction

Mountain Industries obtained approval to operate the Karuah Quarry in 1997, with the site subsequently purchased by Hunter Quarries Pty Ltd (HQPL) in 2002. In October 2004, HQPL applied to the then Department of Infrastructure, Planning and Natural Resources (now known as the Department of Planning, Housing and Infrastructure, NSW Planning) for approval to expand the quarry into adjoining lands (the Stage 2 extraction area) to allow the exploitation of further hard rock resources.

Development Consent was granted by the Minister for Infrastructure, Planning and Natural Resources on 3 June 2005, under DA 265-10-2004, with the approved development including:

- implementing the remainder of the approved Stage 1 quarry operation;
- extending the quarry operations into the Stage 2 area;
- upgrading and using existing infrastructure on site;
- rehabilitating the site by re-contouring and revegetating exposed surfaces; and
- producing up to 500,000 tonnes of andesite product a year over the next 22 years.

HQPL contributes materials to the construction industries in the Greater Newcastle, Hunter Valley and Mid-North Coast regions. The site is located approximately four kilometres north-east of the town of Karuah, NSW. HQPL encompasses Lot 21 DP 1024564, Lot 11 DP 1024564 and part of Lot 12 DP 1024564. Quarrying activities take place on Lot 21 and Lot 11 (staged workings) and a conservation offset area has been established on part Lot 12. The overall site covers an area of approximately 78.5 Ha, with the active quarrying area encompassing approximately 11 Ha.

HQPL holds and maintains an Environment Protection Licence 11569 (EPL 11569) with the fee-based licence comprising of:

- crushing, grinding, or separating works (>100,000-500,000 t annual processing capacity); and
- extractive activities (>100,00-500,000 t annually extracted or processed).

The regional setting and site layout are shown in **Figure 1**.

This Site Water Management Plan (SWMP) has been prepared to manage surface water and erosion and sediment control associated with the operation of HQPL.

### 1.1 Agency Consultation for this Management Plan

Schedule 3, Condition 26 of the Development Consent states that the SWMP preparation and implementation is to be undertaken in consultation with the NSW Department of Environment and Conservation (or NSW Environment Protection Authority, EPA).

- A copy of this updated 2023 SWMP has been issued to NSW Planning for review and consultation on 02 June 2023.
- A copy of this updated 2023 SWMP has not been supplied to the EPA for comment as only minor changes have been made. Previous consultation with the EPA indicates that they do not review Management Plan documents but rather set the overarching designated environmental objectives.

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**LEGEND**  
 Site Boundary

0 70 140 210 280  
 Scale: 1:10,000

GDA 1994 MGA Zone 56  
 18/05/2023

**Karuah Hard Rock Quarry**

**Site Water Management Plan**

**FIGURE 2 - Regional and Local Context Plan**

## 2.0 Regulatory Requirements

### 2.1 Requirements of the Development Consent (DA 265-10-2004)

The requirements of the Development Consent are summarised by **Table 1**.

**Table 1 Summary of Relevant Conditions of the Project Approval.**

No	Requirements	Section
<b>Schedule 3 – Specific Environmental Conditions</b>		
Condition 24	<p><b><u>Pollution of Waters</u></b>  <i>Except as may be expressly provided by an Environment Protection License, the Applicant shall comply with section 120 of the ‘Protection of the Environment Operations Act 1997’ during the carrying out of the development.</i></p>	Section 8.1
Condition 25	<p><b><u>Water Discharge Limit</u></b>  <i>The Applicant shall only discharge water from the development in accordance with the provisions of a DEC Environment Protection License.</i></p>	Section 8.2
Condition 26	<p><b><u>Site Water Management Plan</u></b>  <i>Within 12 months of the date of this consent, the Applicant shall prepare, and subsequently implement, a Site Water Management Plan for the development, in consultation with the DEC, and to the satisfaction of the Director-General. The plan shall detail how site water management on site will be integrated with existing surface water management and erosion and sediment control systems and address surface water management and erosion and sediment control at both the construction and operation phases of the development. This plan must include:</i></p>	This Document
	a) <i>an Erosion and Sediment Control Plan;</i>	Section 7.0
	b) <i>a Surface Water Monitoring Program;</i>	Section 8.0
	c) <i>a site water balance</i>	Section 9.0
Condition 27	<p><b><u>Erosion and Sediment Control</u></b>  <i>The Erosion and Sediment Control Plan must:</i></p>	Section 7.0
	a) <i>be consistent with the requirement so the Department of Housing’s Managing Urban Stormwater Soils and Construction manual;</i>	Section 7.0
	b) <i>identify activities that could cause soil erosion and generate sediment;</i>	Section 7.0
	c) <i>describe what measures would be implemented to minimise soil erosion and off-site sediment transport from the following locations:</i> <ul style="list-style-type: none"> <li>■ <i>the active quarry face and pit;</i></li> <li>■ <i>product and top soil stockpile sites;</i></li> <li>■ <i>haul roads;</i></li> <li>■ <i>workshop areas;</i></li> <li>■ <i>rehabilitation areas; and</i></li> <li>■ <i>all other exposed and disturbed surfaces within the site.</i></li> </ul>	Section 7.0
	d) <i>describe the location and function of erosion and sediment control structures and their capacity to contain runoff in relation to above average rainfall events;</i>	Section 7.0
	e) <i>describe what measures would be implemented to maintain the structures over time; and</i>	Section 7.0
f) <i>describe how the effectiveness of the Erosion and Sediment Control Plan will be measured and monitored.</i>	Section 7.0	

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No	Requirements	Section
Condition 28	<p><b><u>Surface Water Monitoring</u></b>  <i>The Applicant shall:</i></p> <p>a) <i>measure:</i></p> <ul style="list-style-type: none"> <li>■ <i>the volume of water discharged from the site via licensed discharge points;</i></li> <li>■ <i>water use on the site;</i></li> <li>■ <i>water transfers across the site; and</i></li> <li>■ <i>dam and water structure storage levels.</i></li> </ul>	<b>Section 8.3</b>
	<p>b) <i>regularly monitor the quality of the surface water discharged from the licensed discharge points on the site;</i>  <i>to the satisfaction of the DEC and the Director-General.</i></p>	<b>Section 8.3</b>

## 2.2 Requirements of the Environment Protection Licence (EPL 11569)

The EPA regulates the operations at the site through an Environment Protection Licence (EPL 11569) issued under the NSW *Protection of the Environment Operations Act 1997* (POEO Act).

There are several conditions relating to water management in the EPL that have been addressed in this SWMP. Specific EPL conditions are summarised in **Table 2** together with the relevant sections of the SWMP indicating where the requirements have been addressed.

**Table 2** *Requirements of the Environment Protection Licence (EPL 11569).*

Condition	Summary of Condition	Section
P1.1	Monitoring Location of Licenced Discharge Point.	Section 4.0
L1	Pollution of Waters.	Section 8.1
L2	Concentration limits.	Section 8.1

### 3.0 Surface Water Management Principles

The principal objective of surface water management for the site is to ensure that there is no uncontrolled discharge of water from the site and that the water quality leaving the site meets the appropriate quality standards. This objective is intrinsic to erosion and sedimentation designs and controls for the quarry.

As such, the following specific objectives of this SWMP have been established:

- Conducting best practice land clearing procedures for all approved disturbance areas;
- Separating undisturbed runoff from disturbed runoff where possible to minimise and isolate the amount of disturbed or “dirty water” runoff;
- Directing sediment-laden runoff into designated sediment control dams;
- Diverting clean runoff from areas upstream of the operation into natural depressions and creeks;
- Constructing the haul road and working pit face with effective surface drainage thereby reducing roadside erosion and sedimentation;
- Allowing sediments to settle in sediment control dams so that the water can be re-used for on-site dust depression, thereby maintaining dam capacities for subsequent rainfall events;
- Maintaining sediment control structures to ensure that the designed capacities are maintained for optimum settling of sediments; and
- Implementing an effective revegetation and maintenance program for the site.

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## 4.0 Surface Water Management

### 4.1 Dirty Water Management

The total catchment area of the dirty water system is estimated to be around 23 Ha. The system is primarily treated through Sediment Dam 2. A small amount of clean and dirty water (from Stage 1 Extraction Area) is collected in Sediment Basin 4, which drains to Sediment Dam 2 via a gravity fed pipeline. There previously were three additional temporary small sediment basins (SB1, SB2 and SB3), but these have since filled with sediment and have become part of the drainage system.

Surface water collected within the Stage 2 Extraction Area now drains to an in-pit sump located within the north-west area of the extraction pit. The floors of the workings will generally be graded at 0.5 – 1% towards the sump. When required, water will be pumped through a pipeline from within the sump to a location where it can freely drain to Sediment Dam 2. This will ensure that the floor areas are kept dry and will enable a quick return to production following rainfall.

The in-pit de-watering sump will also provide an opportunity for water supply close to the pit workings. This will minimise turnaround times for water carts and enhance the dust control strategy for the site.

**Figure 2** shows the general location of the in-pit de-watering sump and approximate location of the pipeline.

In addition, the existing Sediment Dam 2 will continue to treat dirty water runoff from the southern areas of the quarry footprint, access roads and haul road. Roads within the southern section of the product stockpile area will be re-graded to convey runoff to the table drain which runs along the western side of the haul road and reports to Sediment Dam 2. This will maximise the catchment area reporting to Sediment Dam 2 which has substantial capacity.

Sediment Dam 2 has been designed according to the guidelines provided in the ‘Blue Book’ as detailed in **Section 7.0**.

### 4.2 Clean Water Management

The current active extraction area located Lot 11 involves quarrying to the top of a ridge; therefore, there is minimal catchment above the site. This limits the likelihood of clean water from the undisturbed areas flowing into the ‘dirty’ site water management system. Clean water diversion drains or bunding has been used on the north-eastern and south-eastern section of the Stage 2 Extraction Area to minimise any clean water running into the site.

A small amount of clean water from the west of the Stage 1 Extraction Area follows a natural drainage line, with this water being captured by Sediment Basin 4, which is then directed to Sediment Dam 2 by a gravity fed pipeline. Any discharges would therefore occur through LDP1.

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### 4.3 Site Water Transfer and Discharge

LDP1 is located on the southern side of Sediment Dam 2. As discussed in **Section 7.0**, the capacity of the existing sediment dam is sufficient by Blue Book standards to ensure that water is adequately treated prior to any discharge.

Discharge volume is recorded from the discharge pipe can be recorded by HQPL as LDP1 has discharge valve and capacity indicator fitted. All discharge will be in accordance with EPL requirements detailed in **Section 8.0**.

### 4.4 Dam Storages

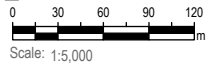
As part of monthly site inspections, dam storage levels will be visually inspected by HQPL staff, with all findings reported back to the Quarry Manager and the Environment & Development Manager for review.

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**LEGEND**

- Lot Boundary
- Inpit Sump
- Licensed Discharge apoint 1 (EPL 11569)
- Bund
- Culvert / Gravity Fed Pipeline
- Dirty Water Drain
- Sediment Dam or Basin
- Site Office / Workshop



GDA2020 MGA Zone 56  
30/05/2023

**Karuah Hard Rock Quarry**

**Site Water Management Plan**

**FIGURE 2 - Water Management Layout Plan**

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## 5.0 Legislative Requirements and Guidelines

The POEO Act is relevant to the site as it contains requirements relating to the prevention of the pollution of waters. In this regard, the discharge of water from the site will need to be controlled to an agreed standard to reduce the potential for pollution of the receiving waters. HQPL has an existing Environment Protection Licence (EPL 11569) under the POEO Act for the discharge of ‘dirty’ water from site.

The Water Act 1912 and Water Management Act 2000 contain provisions for the licensing of water capture and use. If any dams are proposed as part of the water management, consideration must be given to whether the dams need to be licensed. No clean water dams are necessary to be built and therefore no licences need to be obtained.

Whilst controlled activity approval under the Water Management Act 2000 is typically not required for quarrying activities, the general standards used by DPI-Water in implementing the Water Management Act 2000 still need to be adhered to. In this regard, any guidelines referred to by the DPI-Water and any feedback provided by departmental officers will be considered.

### 5.1 Development Consent (DA 265-10-2004)

As noted in Table 1, this SWMP has been prepared in accordance with the following conditions of the Development Consent:

- Schedule 3, Condition 26 – Site Water Management Plan;
- Schedule 3, Condition 27 – Erosion and Sediment Control; and
- Schedule 3, Condition 28 – Surface Water Monitoring.

In accordance with Condition 27, this SWMP has been prepared to be consistent with the requirements of the Department of Housing’s Managing Urban Stormwater: Soils and Construction Manual (DoH, 2004 – ‘Blue Book’) and Volume 2E of the Blue Book (Mines and Quarries - 2008). All erosion and sediment control structures described in this plan have been constructed or erected in accordance with the recommendations identified in the relevant standard drawing and construction notes of the ‘Blue Book’.

### 5.2 Environment Protection Licence

HQPL operates under EPL 11569 which contains conditions relating to water management at the quarry. In particular, the licence allows for one Licenced Discharge Point, LDP1, that specifies water quality limits and monitoring requirements.

The Location of the discharge point is included in **Figure 2**.

### 5.3 Guidelines

In NSW, the most relevant and comprehensive guidelines for the design of stormwater and erosion and sediment controls are contained in the ‘Blue Book’ Many of the prescriptive guidelines are not specifically relevant to this site; however, the principles of surface water control have been adopted.

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## 6.0 Potential Impacts and Key Issues

### 6.1 Water Pollutions Sources and Controls

#### Sedimentation

Runoff from disturbed areas of the site will be the primary source of sediment. The disturbed areas that will generate sediment laden runoff include:

- Ground disturbed ahead of material excavation (e.g., topsoil stripping areas);
- Active quarry working face and pit area;
- Associated haul road infrastructure;
- Product stockpile areas;
- Overburden and topsoil stockpile areas;
- Workshop areas; and
- Rehabilitated areas.

Runoff from these areas will be collected in catch drains and directed to Sediment Dam 2. The principal elements of the Drainage and Sediment and Erosion Control Plan are detailed in **Figure 2**.

The following control measures are employed at the HQPL in order to ensure an appropriate level of protection to surface water on and around the quarry site:

- Source separation in order to separate water of differing quality (clean water diversions);
- In-pit sump with de-watering capabilities;
- Use of sediment control fencing; and
- Collection and containment of quarry water for dust suppression.

These control measures are described further in **Appendix 7.0**.

#### Hydrocarbons

Wherever significant volumes of hydrocarbons are being stored and used, the potential for accidental spillage is high. HQPL have undertaken a number of control measures to ensure that hydrocarbon spillages and off-site environmental impacts are avoided.

A bulk fuel storage facility consisting of a double lined tank is in use at the quarry. The storage facility has been installed in accordance with the requirements of the EPA and the MidCoast Council (MCC). In addition, all hydrocarbons are stored and handled in accordance with the NSW Dangerous Goods Act, AS1940 (Storage and Handling of Flammable and Combustible Liquids) and other relevant Australian Standards to minimise the risk of any spills.

Servicing of mobile equipment is undertaken by contractors or site personnel who complete all service work on site. Waste oil is removed from the site at the completion of the equipment service. Where major works are required the plant and equipment will be taken off site to an appropriate workshop facility.

The bunded washdown/maintenance area next to the workshop includes a dangerous goods container and a covered bunded area, complete with oil sump to capture potential hydrocarbons during routine maintenance of mobile and fixed plant equipment. The collected waste oil is removed from site by a licensed waste contractor.

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## Sewage and Bathhouse

A bathhouse facility and lunchroom has been installed at the quarry and consists of showers and toilet facilities. A pump-out septic system has been installed and inspected by the MCC to manage sewerage effluent from the bathhouse and is serviced by a licenced contractor.

## Other Chemicals

A dangerous goods container is already in use for the storage and delivery of all chemicals required for the Stage 2 extraction area. It should be noted that only a limited amount of chemicals are required for operations.

Safety Data Sheets (SDS) are kept in the site safety system for all chemicals used on the site. SDS' contain information on the environmental impacts of the use of certain chemicals and includes detail on emergency response, clean up and disposal should the unlikely event of a spill occur.

Chemicals are stored and handled onsite in accordance with the NSW Dangerous Goods Act, AS1940 (Storage and Handling of Flammable and Combustible Liquids) and other relevant Australian Standards to minimise the risk of any spills.

## 6.2 Topography, Drainage and Receiving Waters

The quarry area is located on the mid/upper slope on the southwestern side of a hill system that rises to a height of 150 m (AHD). The Stage 2 Extraction Area extends uphill from the stockpile area to approximately 140 m (AHD).

The site is located within a catchment that drains towards the southwest and into Yalimbah Creek and coastal wetlands mapped under SEPP (Resilience and Hazards) 2021.

The coastal wetlands on Yalimbah Creek is located approximately 620 m to the southwest of the quarry. Water discharged from the site would flow under the Pacific Highway into these wetlands. Water quality controls have been implemented to ensure that the quarry does not impact on the wetland area as discussed in **Section 4.0**.

## 6.3 Groundwater and Aquifer Interception

As identified in the 2004 EIS, no groundwaters will be intercepted by the operations of Stage 2. To date, no groundwaters have been intercepted during exploration drilling, blast drilling and operational excavation and quarrying activity.

## 6.4 Acid Sulphate Soils

There were no potential acid sulphate soils identified in the 2004 EIS. HQPL is above RL60 (AHD) and is free draining; therefore, there is no potential for acid sulphate soil or flooding (2004 EIS).

The low-lying wetland area south of the Pacific Highway has been identified as a potential acid sulphate soils zone. This area is associated with the Yalimbah Creek and is separate from the quarry operation.

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## 7.0 Erosion and Sediment Control Plan

### Internal Clearing Permit

An internal site clearance permit is issued by the Environment and Development Manager prior to the commencement of any clearing activity. It should be noted that the disturbance limit of the quarry (i.e. vegetation clearing) has generally been reached.

### Quarry Haul Roads

The quarry haul road has been constructed to ensure surface drainage is optimised and the road surface stabilised, thereby reducing roadside erosion and sedimentation. Cross-fall drainage techniques such as crowning, in-fall and outfall drainage have been implemented for the entire length of the haul road.

Crowning is generally implemented on the steeper sections of the haul road. Outfall drainage has been constructed where the road traverses small fill batter areas and in-fall drainage will occur where the road traverses larger fill batter areas.

The upper section of the haul road near the workshop region, along with the roads within the southern section of the product stockpile area has been in place to ensure water travels into Sediment Dam 2.

Where runoff from the haul road cannot be directed into Sediment Dam 2, a series of mitre drains have been constructed to take water from the shoulders or table drains away from the haul road. The runoff will be split at regular intervals to keep the volume of water in each mitre drain to a minimum. This will be achieved by spacing the drains as close together as practicable. The spacing will not exceed fifty (50) metres and the drains will be spaced closer together where gradient increases.

### Sediment Control

Runoff from the extraction pit, southern product stockpile area, majority of the haul road and areas surrounding the recent rehabilitation area report to Sediment Dam 2. The maximum contributing dirty water catchment to this dam is approximately 17 Ha as the quarry footprint has reached its approval limit. Sediment Dam 2 will be responsible for optimising the retention of sediment carried in stormwater runoff before water is discharged into the natural drainage system. A by-wash has also been constructed in the sediment dam.

In the original SWMP, a conservative design capacity for sediment control on the site was adopted for Sediment Dam 2 (Total disturbance area of the overall quarry footprint x 0.5 ML) which has been derived from guidelines provided in the 'Blue Book'. The required capacity of Sediment Dam 2 is now 7.5 ML using the same conservative guideline. It has been calculated according to the revised total catchment area of Sediment Dam 2 at the end of mine life and anticipated volume of generated runoff. The volume of Sediment Dam 2 has been estimated at 20 ML which provides a significant buffer.

Sediment Basin 4 captures a small amount of runoff from the Stage 1 and 2 Extraction Areas, with this water directed to Sediment Dam 2 by a gravity fed pipeline. There previously were three additional temporary small sediment basins (SB1, SB2 and SB3), but these have since filled with sediment and have become part of the drainage system. The mitigation measures for erosion and sediment control are outlined in **Table 3**.

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**Table 3** *ESC Mitigation Measures.*

Mitigation ID	Measure / Requirement	Reference Document	When Required	Responsibility
MM1	The Environmental Officer will conduct an inspection of all water management controls as part of environmental inspections completed every two months, in accordance with the site Environmental Management Strategy (EMS) and ensure that any contractor's onsite are operating within the environmental controls as required for their activities	SWMP (Existing Commitment)	Inspection after 20mm of rain within 24-hour period, and monthly inspections.	Environment & Development Manager (or suitable delegate)
MM2	The haul roads will be visually inspected to ensure that the appropriate mitigation measures are functioning to convey the surface flows from the road and work areas without causing erosion to the road or work areas on the adjacent land. Where significant erosion is observed to be occurring on a regular basis, additional controls would be constructed such as additional mitre drains, scour protection of road drainage, and re-grading of the road surface. Haul roads are regularly inspected as this is a safety requirement of the site.	SWMP (Existing Commitment)	Inspection after 20mm of rain within 24-hour period, and monthly inspections.	Environment & Development Manager (or suitable delegate)
MM3	The pipeline from the in-pit sump will be inspected to ensure that there are no leaks or blockages to flow. Any signs of erosion at the points of discharge would be noted and remedial works undertaken as required. Where significant erosion is observed additional erosion controls would be constructed such as new rock scour protection at the discharge locations.	Best practice to dewater pit	As required.	Environment & Development Manager (or suitable delegate)
MM4	Site drainage and sediment control structures will be inspected regularly after runoff events to check for scouring of diversion drains and sedimentation of sediment traps (e.g., silt fences & hay bales) and sediment dams. Sediment control structures will be de-silted when the design capacity of the structure has been reduced by 30% (or as necessary). All scouring of drains will be stabilised as soon as possible.	SWMP (Existing Commitment)	Inspection after 20mm of rain within 24-hour period, and monthly inspections.	Environment & Development Manager (or suitable delegate)

Mitigation ID	Measure / Requirement	Reference Document	When Required	Responsibility
MM5	Regular visual checks will be made of the sediment dams to ensure that there is no noticeable increased periods of discoloration or excessive sediment build up in the dams, and that dams are in a stable condition. Sediment Dam 2 has been conservatively designed to significantly exceed 'Blue Book' requirements and ensure a discharge does not occur. In the unlikely event a discharge should occur, the drainage line downstream of the overflow weir will be inspected for scouring and repaired and stabilised as required.	SWMP (Existing Commitment)	Inspection after 20mm of rain within 24-hour period, and monthly inspections.	Environment & Development Manager (or suitable delegate)
MM6	Sediment filter fencing, straw bale sediment filters and revegetation will be employed. Temporary sediment controls will be constructed to intercept sediment laden runoff prior to discharge into the natural drainage system.	SWMP (Existing Commitment)	Inspection after 20mm of rain within 24-hour period, and monthly inspections.	Environment & Development Manager (or suitable delegate)
MM7	Sediment filter fencing has been installed adjacent to the road into the front entrance to manage erosion and sediment from trucks leaving site. Maintenance to continue.	SWMP (Existing Commitment)	Inspection after 20mm of rain within 24-hour period, and monthly inspections.	Environment & Development Manager (or suitable delegate)
MM8	Where required straw bale sediment filters will be used during the construction of drainage and road works. Their use will be limited however to situations where erosion and sediment control is required for a short period (i.e., maximum of three (3) months). Note, no further clearance is necessary.	SWMP (Existing Commitment)	As required.	Environment & Development Manager (or suitable delegate)
MM9	The sediment control techniques used during this project will generally include, but not be limited to, the following: <ul style="list-style-type: none"> <li>Strategically placing silt fencing, straw bales or similar.</li> <li>Removing accidental spills of soil or other materials on access roadways or gutters before each day's work is complete; and</li> <li>Minimising on-site vehicle activity during wet weather or when the site is muddy.</li> </ul>	SWMP (Existing Commitment)	As required.	Environment & Development Manager (or suitable delegate)

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Mitigation ID	Measure / Requirement	Reference Document	When Required	Responsibility
MM10	Stripped topsoil material will be placed directly onto the disturbed areas and spread immediately if excavation sequences, equipment scheduling, and weather conditions permit. However, if longer term stockpiling (i.e., greater than 6 months) is required, a maximum stockpile depth of three (3) metres will be maintained to preserve viability and reduce soil deterioration.	SWMP (Existing Commitment)	As required.	Environment & Development Manager (or suitable delegate)
MM11	Diversion banks will be utilised where possible to ensure clean water originating from un-disturbed catchments are not mixed with 'dirty' water from within the quarry footprint.	SWMP (Existing Commitment)	Inspection after 20mm of rain within 24-hour period, and monthly inspections.	Environment & Development Manager (or suitable delegate)
MM12	Land disturbance will be minimised by clearing the smallest practical area of land for the shortest possible times.	SWMP (Existing Commitment)	As required.	Environment & Development Manager (or suitable delegate)
MM13	Sediment fencing or sandbags will control the sediment at the end of the mitre drains.	SWMP (Existing Commitment)	As required.	Environment & Development Manager (or suitable delegate)

## 8.0 Surface Water Monitoring Program

### 8.1 Impact Assessment Criteria

Surface water impact assessment criteria applying to discharges from the licensed discharge point (outlet of Sediment Dam 2) at Karuah Hard Rock Quarry are prescribed in L2.4 of the EPL. The concentration of a pollutant discharged must not exceed these concentration limits in **Table 4** below.

**Table 4** *Impact Assessment Criteria (EPL 11569).*

Pollutant	Units of Measure	Limit
Oil and Grease	Visibility or mg/L	5 &/or non-visible
pH	pH	6.5 – 8.5
Total Suspended Solids	mg/L	50

All water quality results from discharge events will be compared to the criteria detailed in **Table 5** to ensure levels are within the specified EPL limits and will be reported in the AEMR.

There is a requirement in the EPL to monitor the concentration of the pollutants during a discharge at LDP1 using the sampling method, units of measure and sample at the frequency specified in **Table 5**.

**Table 5** *Monitoring Requirements at LDP1 (EPL 11569).*

Pollutant	Units of Measure	Frequency	Sampling Method
Nitrogen (total)	mg/L	Daily during any discharge	Grab Sample
Phosphorous (total)	mg/L	Daily during any discharge	Grab Sample
Total Suspended Solids	mg/L	Daily during any discharge	Grab Sample
pH	pH	Daily during any discharge	Grab Sample
Oil Grease	visible	Daily during any discharge	Visual Inspection

The monitoring records must be kept by HQPL based on conditions laid out in the EPL.

### 8.2 Historical Water Data

A summary of three (3) key parameters for samples collected since the commencement of the consent (2005 until January 2023) are detailed below in **Table 6**.

**Table 6** *Summary of Key Water Quality Parameters.*

Sample Site	Highest Sample Value			Lowest Sample Value		
	pH	EC (uS/cm)	Turbidity (NTU)	pH	EC (uS/cm)	Turbidity (NTU)
Sediment Dam 2	8.1	590	680	8.1	590	38

When compared with the ANZECC (2000) Water Quality Guidelines for lowland rivers, as detailed by **Table 7** below, the water quality data for samples collected from Sediment Dam 2 are generally consistent with the trigger values for in slightly disturbed ecosystems and as such would be considered as a satisfactory quality for discharge from the site.

However, it is noted that whilst maximum turbidity may exceed the upper default trigger of 50 NTU, and during these periods while turbidity is above the ANZECC guidelines, all water from Sediment Dam 2 has been retained for on-site uses as process water and in dust suppression systems. In the event that site discharge is required, additional treatment measures such as flocculation will be added to ensure turbidity is within the relevant guideline criteria.

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Additionally, it should be noted the maximum turbidity of 680 NTUs was recorded in 2022 when the NSW Hunter & Mid-North Coast regions were experiencing an active La Niña event.

**Table 7 ANZECC (2000) Ranges of default triggers for Lowland Rivers.**

Ecosystem type	pH	EC (µS/cm)	Turbidity (NTU)
Lowland Rivers	6.5 – 8.5	125 – 2,200	6 – 50

### 8.3 Surface Water Monitoring Program

The surface water monitoring program for HQPL is detailed below in **Table 8** below.

**Table 8 Surface Water Monitoring Program.**

Monitoring Type	Frequency	Other Comment
Surface Water Quality	<p><b>Surface Water Quality will be monitored every six months in Sediment Dam 2</b>, with samples analysed for Total Suspended Solids (TSS), pH and Electrical Conductivity (EC).</p> <p>In addition to the six-monthly samples, more regular visual checks would be made to ensure that there is no noticeable increased discoloration or sediment build up in the sediment dams. Water quality sampling would be undertaken where visual impacts were observed.</p> <p>The depth of the dams will also be reviewed at least <b>once a month</b> to determine if the storage capacity of the dams has been reduced.</p> <p>The Quarry Supervisor (or suitable delegate) completes a daily inspection of all components of the site.</p>	<p>The collection and review of the water quality data over time will allow a benchmark TSS figure to be set. Where sediment dam water quality exceeds this benchmark, flocculation would be undertaken to assist sediment removal.</p> <p>Where the storage capacity has been reduced by thirty (30) percent or more the dam will be desilted.</p> <p>Water samples at Sediment Dam 2 are taken from the edge of the dam, adjacent to the pump. Water quality bottles are sent to a NATA accredited laboratory for testing.</p>
Water Discharge	<p>The water level in Sediment Dam 2 is monitored via an electronic height sensor.</p> <p>Sediment Dam 2's water level is <b>inspected weekly</b>, or after 20mm of rain with a 24-hour period by HQPL staff.</p>	<p>The dam has been previously surveyed so that estimated volumes can be calculated.</p> <p>There are no volume limits specified in the EPL for this licensed discharge point. However, it is a requirement of <b>DA 265-10-2004</b> that the volume of water discharged from the site via a licensed discharge point be measured. The flow of water can be estimated based on the flow through the discharge pipeline.</p>
Opportunistic	<p>Opportunistic Grab Samples may also be taken during significant rainfall events. These samples will be analysed for TSS, pH, Oil and Grease, and EC.</p>	<p>Significant rainfall events are defined as receiving more than 20 mm of rain in a 24-hour period.</p>

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Monitoring Type	Frequency	Other Comment
Water Use	Flow metre readings will be recorded by the Quarry Supervisor or E&D Manager during the environmental inspection completed every two months.	Water for dust suppression by water cart, and sprays on the crushing facility is sourced from Sediment Dam 2. Water usage will therefore be measured via a flow metre to be installed on the pump in Sediment Dam 2.



## 9.0 Site Water Balance

### 9.1 Assumptions

The following assumptions were used in forecasting the water balance for the proposed development:

- The disturbance footprint for the end of mine life has been estimated to be consistent with the mine plans made in the original EIS (Co- Resources Pty Ltd; Figures 5 - 12) for the Stage 2 development;
- No Allowance was made for runoff from ‘undisturbed’ areas as this will be directed away from the site and as such will not be managed as part of the ‘closed loop’ water management system;
- The runoff reporting to Sediment Dam 2 and the in-pit sump is the only source of water used on site for processing and dust suppression;
- Evaporation was constant for each year of the project proposal. The average annual evaporation for Williamtown was used; and
- The “Production Plant” water usage is predicted to remain constant for each year of the project proposal.

### 9.1 Inputs

#### **Rainfall and Runoff**

The water balance considers rainfall and runoff generated by low (annual 10th percentile), average (annual 50th percentile) and high (annual 90th percentile) rainfall years for Williamtown. Rainfall data is provided by the Bureau of Meteorology (station number 61078).

Rainfall is as follows:

- Annual 10th percentile (dry year): 788 mm;
- Annual 50th percentile (average year): 1,088 mm; and
- Annual 90th percentile (wet year): 1,498 mm.

Rainfall is reasonably well distributed throughout the year, although there is a peak in summer and early autumn, with the lowest rainfall months being in winter and spring.

To determine the annual average runoff generated that reports to either Sediment Dam 2 or the in-pit sump, HQPL has been divided into three catchments, including:

1. Extraction Pit Area;
2. Stockpile areas; and
3. Other Disturbed Areas within Dirty Water Catchment (haul roads, workshop etc).

The following key assumptions have been made in estimating the runoff from these catchment areas and in developing the water balance.

- A runoff coefficient of 0.4 has been applied to the Extraction Pit area given that it is bare and slightly compacted. It is also assumed that there is runoff lost to groundwater based on past observations.
- A runoff coefficient of 0.4 has been applied to the stockpile areas given that there is bare and slightly compacted areas with very limited storage capacity within the stockpiles.

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- A runoff coefficient of 0.25 has been applied to the other disturbed areas within the dirty water catchment. A lower coefficient has been applied to this area to reflect the areas of rehabilitation and existing bushland. A higher coefficient than a natural catchment has been chosen due to the catchment area having haul roads and other compacted areas.

A summary of the estimated current annual runoff generated at Karuah during average, wet and dry years based on the above assumptions is given in **Table 9**.

**Table 9** *Current Surface Water Runoff Estimates.*

Catchment	Current Area (Ha)	Runoff Coefficient	Captured Runoff (ML)		
			Dry Year	Average Year	Wet Year
Extraction Pit	4.0	0.40	12.3	17.0	23.4
Stockpile Areas	4.0	0.40	12.3	17.0	23.4
Other Disturbed Areas	3.0	0.25	5.9	8.2	11.2
<b>TOTAL:</b>			<b>30.5</b>	<b>42.1</b>	<b>58.0</b>

### Groundwater Seepage

As discussed in **Section 6.4** of this SWMP, to date there has been no groundwater intercepted during exploration drilling, blast drilling or operational excavation / quarrying activity. It was therefore assumed that there would be no groundwater seepage into the excavation pit and was not included in the water balance.

## 9.2 Outputs

### Evaporation

The annual water loss due to evaporation from Sediment Dam 2 and the In-pit sump is estimated at 7.6 ML/year. The assumptions used in calculation this evaporation loss are as follows;

- Average annual pan evaporation is estimated to be 1715.5 mm/year. This has been derived from data obtained by the Bureau of Meteorology station 61078 at Williamstown.
- The average annual pan evaporation has been multiplied by a factor of 0.7 to account for the 'pan' evaporation and the fact that the sediment dam and in-pit sump are not always full.
- The combined surface area of Sediment Dam 2 and the in-pit sump has been estimated at approximately 0.65 Ha.

### Dust Suppression

The current dust suppression water usage at is around 5 ML/year based on water flow meter data and water cart haul sheet records.

### Production Plant

Based on recent data from the sites flow meter reading, it is estimated that 25 ML/year, is used for plant processing.

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## 9.3 Water Balance Results

The site water balance is summarised in **Table 10** below. It has been calculated based on the end of mine life disturbance footprint (current footprint) that ultimately reports to Sediment Dam 2.

**Table 10** Water Balance Results.

Disturbance Area (Ha)	Total Demand	Total Make (ML/Year)	Net surplus (ML/Year)
<b><i>Dry Year (10% Chance)</i></b>			
14.1 (end mine life)	33	41	8
<b><i>Average Rainfall Year (Based on Bureau of Meteorology data for Williamstown)</i></b>			
14.1 (end mine life)	33	56	24
<b><i>Wet Year (10% Chance)</i></b>			
14.1 (end mine life)	33	78	45

Sediment Dam 2 will provide a suitable water storage capacity so that water is available to support the operational requirements during those years where the rainfall is less than average.

A similar analysis was undertaken for a 10% chance dry & wet year scenario. As would be expected, during an extended dry period the site may be required to import a small amount of water based on the current disturbance footprint that reports to Sediment Dam 2 or the in-pit sump. Conversely, during a wet year the water from the site would be directed through a series of sediment control structures and retained in Sediment Dam 2. During extended wet periods and in the unlikely event that the capacity of Sediment Dam 2 is reached, water can be discharged from the licensed discharge point at the Dam.

## 10.0 Reporting

In accordance with Schedule 4, Condition 5 of the Development Consent, an assessment of water management and erosion and sediment control on the quarry site will be included within the AEMR to be submitted to the DPE.

This SWMP will be reviewed at a minimum of every five (5) years to assess its effectiveness. This plan will be reviewed if there is a significant variation to the quarry plan.

Where any changes are recommended as a result of review, the SWMP will be revised to increase its effectiveness. Any major amendments to the SWMP will be undertaken in consultation with the EPA as per Schedule 3 Condition 26 of the Development Consent.

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## 11.0 Roles and Responsibilities

It is the responsibility of Quarry Manager for the implementation of the SWMP. **Table 11** outlines the responsible positions and accountable tasks.

**Table 11** *Roles & Responsibilities.*

Position	Responsibility
Quarry Manager	<ul style="list-style-type: none"> <li>■ Implementation of this Plan.</li> </ul>
Quarry Supervisor	<ul style="list-style-type: none"> <li>■ Have a working knowledge of this SWMP.</li> <li>■ Be aware of the environmental legislative requirements associated with the HQPL and take measures to ensure compliance.</li> </ul>
Environment & Development Manager (or suitable delegate)	<ul style="list-style-type: none"> <li>■ Coordinate the site water monitoring requirements of this plan.</li> <li>■ Evaluate and report monitoring results as required.</li> <li>■ Coordinate water related incident investigations and reporting as required by legislation and internal standards and guidelines.</li> <li>■ Assist with the review of this plan.</li> </ul>
All employees and contractors.	<ul style="list-style-type: none"> <li>■ Comply with all requirements of this SWMP.</li> <li>■ Report all potential environmental incidents immediately.</li> <li>■ Seek approval from the Environment &amp; Development Manager and Quarry Manager prior to making changes to infrastructure/processes which may result in increased site water impacts.</li> </ul>

## 12.0 References

- Asquith and deWitt Pty Ltd (2004) Environmental Impact Statement, Application for an existing Hard Rock Quarry
- DECC 2008 Managing Urban Stormwater – Soils and Construction, Volume 2E: Mines & Quarries
- Department of Housing (December 2004) Managing Urban Stormwater: Soils and Construction Manual.
- SLR Consulting (2011-2020) 2011-2019 Annual Environmental Management Reports for Hard Rock Quarry, Karuah.
- Hunter Quarries Pty Ltd 2021 and -2022 Annual Environmental Management Reports for Hard Rock Quarry, Karuah
- Hunter Quarry Pty Ltd (May 2023), Environmental Monitoring Plan for Hard Rock Quarry (DRAFT), Karuah.
- SLR Consulting (July 2020), Environmental Management Strategy for Hard Rock Quarry, Karuah.
- SLR Consulting (July 2020), Rehabilitation and Closure Plan for Karuah Hard Rock Quarry.

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## Appendix A: Correspondence with NSW Planning

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Isaac Daley  
Environmental Officer  
Karuah Hard Rock Quarry  
PO Box 23  
Karuah NSW 2324 AUS

DATEWILLBEINSERTEDHERE

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Subject: Karuah Hard Rock Quarry – Site Water Management Plan

Dear Mr Daley

I refer to the Site Water Management Plan submitted in accordance with condition 26 of Schedule 3 of the approval for the Karuah Quarry Project (DA265-10-2004). I also acknowledge your response to the Department's request for additional information.

The Department has carefully reviewed the document and is satisfied that it meets the requirements of the relevant conditions in consent.

Accordingly, as nominee of the Planning Secretary, I approve the Site Water Management Plan (version 8C, dated September 2023).

You are reminded that if there are any inconsistencies between the Plan and the conditions of approval, the conditions prevail.

Please ensure you make the document publicly available on the project website at the earliest convenience.

If you wish to discuss the matter further, please contact Kristina Robinson on 02 9860 1543.

Yours sincerely



James McDonough  
Team Leader  
Resource Assessments

As nominee of the Planning Secretary