Gunnedah Shire Council

Water Balance Assessment: Bolgers Pit - 809 Oakey Creek Road, Piallaway NSW

P2209205JR01V02
January 2023

martens consulting engineers

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Document and Distribution Status

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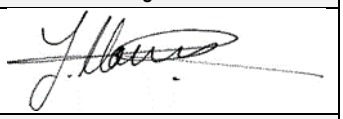
Sayana Sorourian Ramin Kolahdoozha	A. van Gogh	Terry Harvey	

Revision No.	Description	Status	Release Date	Document Location			
				File Copy	Outline Planning Consultants		
1	Development Application	Draft	13/12/2022	1P, 1E, 1 H	1P		
2	Minor edits	Final	31/01/2023	1P, 1E, 1 H	1P		
3							

Distribution Types: F = Fax, H = hard copy, P = PDF document, E = Other electronic format. Digits indicate number of document copies.

All enquiries regarding this project are to be directed to the Project Manager.

Contents

1 Introduction

1.1 Overview

This report has been prepared to support a development application (DA) for the expansion of an existing quarry at 809 Oakley Creek Road, Piallaway, New South Wales.

This report provides evidence of compliance with Secretary's Environmental Assessment Requirements (SEAR's) 1674 as they relate to the requirements for sediment and erosion control and a water balance assessment and the documentation of the results of the assessment.

1.2 Relevant Planning Controls and Design Principles

The following planning and engineering controls and design principles have been used:

- Gunnedah Shire Council (GSC) (2012) Development Control Plan (DCP).
- Gunnedah Shire Council GSC (2013) Engineering Guidelines for Subdivisions and Developments.

2 Site Description

2.1 Site Description and Location

Site description is provided in Table 1.

Table 1: Site description summary.

Element	Site Details
Site Address	809 Oakey Creek Road, Piallaway, New South Wales
Legal Identifier	Lot 139 DP 751012 and Lot B DP 432415
Local Government Area	Gunnedah Council
Quarry Area	Approximately 2.71 ha
Existing Site Development	Mostly undeveloped, vegetated land. A quarry operates in the north west of the site.
Neighbouring Environment	To the south and west of the quarry is clear and cultivated land and forested land to the east and north. Oakey Creek Road is located to the west of the site.
Site Topography	Topography of the site is undulating, with slopes of up to approximately 11%. Site elevation ranges between approximately 350 mAHD (in the north east corner) to 325 mAHD (in the south west).
Site Drainage	West via overland flow through unnamed drainage depressions.
Vegetation	Largely grassed with pockets of trees

Figure 1 shows the existing quarry and the extent of the proposed expansion.

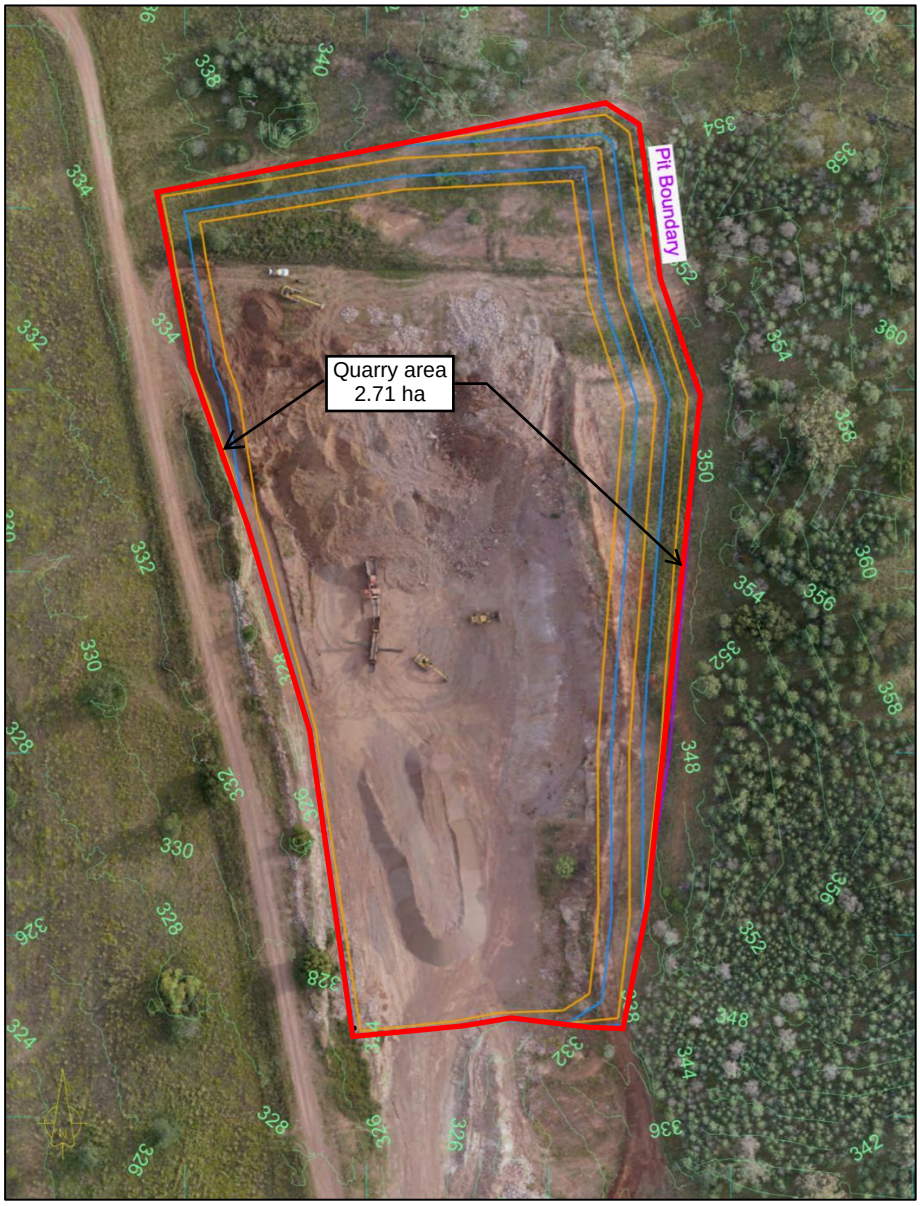


Figure 1 the extents of the expansion of the quarry (picture provided by Outline Planning Consultants)

2.2 Proposed Development

The development will include:

- Construction of a sediment basin.
- Expansion of the existing quarry.

3 Sediment and Erosion Control

A sediment basin is proposed to be constructed to collect and treat runoff from the disturbed areas of the site.

The sediment basin is to be constructed prior to any quarry expansion works to allow all dirty water generated on site to be collected and treated. Water collected in the sediment basin will be used for process water and dust suppression on the haul road, refer to Section 4 for the water balance assessment of the site including the sediment basin.

3.1 Sediment Basin Sizing

The minimum capacity of the proposed sediment basin to control expected sediment loads was determined using guidelines provided in Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom, 2004) and Volume 2E Mines and Quarries (DECC, 2008).

Consistent with Section 6.1 of Volume 2E Mines and Quarries (DECC, 2008) the following parameters were adopted:

- Type D soil classification
- Soil hydrologic group D
- Erodibility (K-factor) of 0.05

Based on these parameters a sediment basin for Type D soil classification can be sized from Volume 1 (Landcom, 2004) as follows:

Basin Volume= Settling Zone + Sediment Storage Zone

Settling Zone = $10 \times C_v \times A \times R$

Where:

C_v = volumetric runoff coefficient

= 0.74 (from Table F2 for soil hydrologic group D and rainfall depth 51-60 mm)

A = catchment area (in hectares)

= 2.71 ha

R = 5 day 95th percentile rainfall depth

= 53.0 mm (from Table 6.3a for Gunnedah)

Settling Zone = 10 x 0.74 x 2.71 x 53

= 1063 m³

Sediment Storage Zone = 50 % of the Settling Zone (from Table 6.1)

= 0.5 x 1062

= 531 m³

Basin Volume= 1063 + 531

= 1594 m³ ≈ 1600 m³

The calculated minimum sediment basin storage required for sediment and erosion control is approximately 1600 m³.

4 MUSIC Water Balance Assessment

4.1 Methodology

4.1.1 Overview

The Model for Urban Stormwater Improvement Conceptualisation (*MUSIC*, Version 6.3) developed by the CRC for Catchment Hydrology was used to undertake the site water balance assessment to detail potable and non-potable water supply and demands for the development.

Modelling has been undertaken in accordance with NSW MUSIC Modelling Guidelines (2015) with the developed site based on design briefs.

4.1.2 Approach

The water balance is assessed considering the following components:

1. Site Water Demand: Consideration of quarry operational water demands.

2. Site Water Supply: Assessment of site water supply (surface water runoff).

3. Site Water Balance: The balance of supply and demand is assessed based on a range of climatic conditions to determine the need for additional supply or to detail the excess water released to the environment.

The details of the MUSIC model inputs are presented in Attachment A.

4.1.3 Climate Data

The water balance is to assess the following range of rainfall scenarios:

1. Average year – with annual rainfall equal to average rainfall of all years (637.2 mm).

2. Dry year – with annual rainfall equal to 10th percentile rainfall of all years to assess 'severe' water deficit (411.6 mm).

3. Wet year – with annual rainfall equal to 90th percentile rainfall of all years to assess 'severe' water surplus (869.4 mm).

Rainfall climate data was sourced from the Bureau of Meteorology (BOM) weather station located at Breeza (the Park) (Station No. 055065). The data for the following years was used as a proxy for the three different scenarios listed above:

- Average year (1997): recorded rainfall 639.8 mm
- Dry year (1938): recorded rainfall 422.6 mm
- Wet year (1963): recorded rainfall 868.1 mm

4.1.4 Input Parameters

Refer to Attachment A for listed input parameters. The sediment basin volume was based on the minimum basin size calculated in Section 3.

4.1.5 Model Parameters

Base and storm flow concentration inputs were adopted based on NSW MUSIC Modelling Guidelines (2015) and MUSIC defaults for the proposed quarry.

4.1.6 Catchment Area

The catchment size that drains to the proposed sediment basin is 2.71 ha based on information provided by Outline Planning Consultants Pty Ltd.

4.2 Site Water Demand

Water demands for the quarry are summarised in Table 2.

Table 2: Summary of site water demand / losses for stage 1.

Activity	Water Demand ML/year
Dust suppression	0.70
Production	4.00
Staff amenities	0.03
Total non-potable water demand	**4.70**
Total potable demand	**0.03**

The non-potable water demands for the site are based on the water required for quarry operations and dust suppression, the estimates above have been provided by Outline Planning Consultants Pty Ltd.

The potable water demand for the site is estimated as 27 L/person/day (based on NSW Health (2012) guidelines for industrial use). Based on information provided by Outline Planning Consultants Pty Ltd, up to 4

employees will be on site for 6 days a week (excluding public holidays) providing an annual demand of 0.03 ML/yr.

4.3 Site Water Supply

Non-potable water supply is to reuse stormwater runoff which is captured in the sediment basin. Water supply is based on the MUSIC modelling using the climate data detailed in Section 4.1.3.

The site is not serviced by town water supply therefore, potable water can be provided via collected roof water and/or water tanker delivery.

4.4 Site Water Balance Results

The site water balance for the proposed quarry at Stage 1 is summarised in Table 3 (average year); Table 4 (dry year) and Table 5 (wet year).

Table 3: Summary of site water balance – average year.

Supply	ML/year	Demand	ML/year
NON-POTABLE			
Runoff to sediment basin	14.36	Road dust suppression	0.70
Storage (evaporative & seepage) losses	-3.12	Production	4.00
Non-Potable Balance			6.54
POTABLE			
		Staff amenities	0.03
Potable Balance			-0.03

Notes:
Positive number demotes a surplus / negative number denotes a deficit.

Table 4: Summary of site water balance – dry year.

Supply	ML/year	Demand	ML/year
NON-POTABLE			
Runoff to sediment basin	9.13	Road dust suppression	0.70
Storage (evaporative & seepage) losses	-3.28	Production	4.00
Non-Potable Balance			1.15
POTABLE			
		Staff amenities	0.03
Potable Balance			-0.03

Notes:
Positive number demotes a surplus / negative number denotes a deficit.

Table 5: Summary of site water balance – wet year.

Supply	ML/year	Demand	ML/year
NON-POTABLE			
Runoff to sediment basin	19.27	Road dust suppression	0.70
Storage (evaporative & seepage) losses	-3.28	Production	4.00
Non-Potable Balance			11.29
POTABLE			
		Staff amenities	0.03
Potable Balance			-0.03

Notes:
Positive number demotes a surplus / negative number denotes a deficit.

5 Conclusion

The minimum volume required for a sediment basin for the proposed quarry expansion has been sized and found to be 1600 m³. A sediment basin of this size has been modelled in a water balance analysis to assess the adequacy of water supply at the site for site operations. The water balance assessment demonstrates that for all modelled years (average, dry and wet) the site shall generate, capture and store sufficient runoff within the basin to provide for all non-potable water demands (4.7ML/year).

A potable water deficit is estimated based on the requirements for site staff in the order of 30 kL/year which can be provided via collected roof water and/or water tanker delivery.

6 References

BMT WBM (2015) *NSW MUSIC Modelling Guidelines*.

Gunnedah Shire Council (GSC) (2012) *Development Control Plan* (DCP).

Gunnedah Shire Council GSC (2013) Engineering Guidelines for Subdivisions and Developments.

Department of Environment & Climate Change (2008) *Managing urban stormwater: Soils and construction, Volume 2E Mines and quarries.*

Landcom (2004) *Managing urban stormwater: Soils and construction, Volume 1*.

NSW Health (2012) *Septic Tank and Collection Well Accreditation Guideline*.

7 Attachment A – MUSIC Model Inputs

Table 6: Treatment node inputs.

Element	Factor	Input	Source
Setup	Climate File	Breeza (the Park) mlb file	BOM
Source Nodes	Rainfall Threshold	Based on surface type specified in Table 5-4	BMT WBM (2015)
	Base & Stormflow Properties	As per Table 5-6 & 5-7	BMT WBM (2015)
	Estimation Method	Stochastically generated	BMT WBM (2015)
Proposed Sediment Basin	Low Flow By-Pass	0 m^3/s	Assumed no bypass
	High Flow By-Pass	100 m^3/s	Assumed no bypass
	Extended Detention Depth	0.01 m	Nominally zero (no extended detention depth modelled)
	Surface Area	800 m^2	By design, basin assumed to be approximately 2m deep
	Permanent Volume	1600 m^3	By design
	Initial Volume	1600 m^3	By design
	Exfiltration Rate	0.36 mm/hr	Based on site soil profile
	Evaporative Loss	75%	MUSIC default
	Outlet Pipe	300 mm	MUSIC default (no extended detention depth modelled)
	Overflow Weir	2.5 m	MUSIC default