Appendix Q – Rehabilitation

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January 2023

Rehabilitation Management Plan for Razorback Quarry, Running Stream

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Revision Table

Date	Version	Author	Reviewed	Approved
9/12/2022	D0	TO	GVT/SS	TO
23/01/2023	F0	TO	SS	TO

Razorback Quarry Rehabilitation Management Plan	
Name of Quarry	Razorback Quarry
Name of Applicant	Plantation Pine Products Pty Ltd
Contact Details of the Applicant	Shaun Smith Principal Environmental Planner
Author of Report	Tara O'Brien
Signature	
Date	23/01/2023
Approved by	Shaun Smith
Signature	

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1 Introduction

1.1 CONTEXT

This Rehabilitation Management Plan (RMP) has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued to Plantation Pine Products Australia Pty Ltd (PPPA) on the 2nd of March 2021 in response to a development proposal for a gravel and sand quarry located at Running Stream, NSW. This plan will be incorporated into the Environmental Impact Statement to be submitted to Mid-Western Regional Council, as the consent authority.

1.2 BACKGROUND

The proposed gravel quarry (Site) is accessed via a private gravel road within Lot 2 DP 569979, Parish of Warrangunia, County Roxburgh, located at 39 Razorback Road Running Stream, approximately 60 kilometres north of Lithgow, off the Castlereagh Highway. *Figure One* shows the site location regionally and locally.

The quarry would extract up to 200,000 tonnes per annum over a period of up to 30 years and will include access roads, a site office, workshop and weighbridge. The quarry will be progressively rehabilitated to pasture and pine plantation with potential future use of the facilities area for forestry related activities.

1.3 CONSULTATION

The proponent sought the Planning Secretary's Environmental Assessment Requirements (SEARs), in which were prepared in consultation with relevant government agencies. Relevant requirements from the SEARs are reproduced below.

1.3.1 Secretary's Requirements

Table 1. SEARs Requirements for the Environmental Impact to Land Resources

SEARs Requirements	Where Addressed in this Report
Rehabilitation -including;	
• a detailed description of the proposed rehabilitation measures that would be undertaken throughout the development and during quarry closure;	Section 5, Section 6, Section 7
• a detailed rehabilitation strategy, including justification for the proposed final landform and consideration of the objectives of any relevant strategic land use plans or policies; and	Section 4, Section 5, Section 6, Section 7
• the measures that would be undertaken to ensure sufficient financial resources are available to implement the proposed rehabilitation strategy, recognising that a rehabilitation bond will likely be required as a condition of any future development consent.	Section 9

1.3.2 Biodiversity, Conservation and Science Directorate Requirements

Table 2. SEARs Requirements from Biodiversity, Conservation and Science Directorate

SEARs Requirements	Where Addressed in this Report
The Proposal All components of the proposed development must be clearly describe, including:	
• the location of the proposed development and its context in the locality; • the rationale for the project; • the size, scale and type of the proposed development; • the pre-construction, construction, operational, and, where relevant, decommissioning and rehabilitation phases of the proposed development, and the methods proposed to implement these phases; • plans and maps of the proposed development showing the locations of relevant phases and infrastructure; • the staging and timing of the proposed development; and • the proposed development's relationship to any other proposals and developments	Section 1, Section 4, Section 5, Section 6, Section 7

1.3.3 Department of Primary Industries Requirements

Table 3. Department of Primary Industries Requirements for the Environmental Impact for Land Resources

SEARs Requirements	Where Addressed in this Report
Land Stewardship	
• Describe the final proposed land use and landform.	Section 4 Figure Fourteen
• Detail the proposed rehabilitation and decommissioning /closure measures to achieve this landuse including the expected timeline for the rehabilitation program.	Section 4, Section 5, Section 6, Section 7
• Outline the monitoring and mitigation measures to be adopted for rehabilitation remedial actions.	Section 8

1.3.4 Crown Lands Consultation

DPIE Crown Lands had no comment with regards to the proposal (see *Appendix A*).

1.3.5 Community Consultation

Community consultation has commenced and it logged (see community consultation section of the EIS).

1.4 PURPOSE AND OBJECTIVES

The purpose of this report is to describe the proposed rehabilitation management system for the Site and to clarify how potential impacts generated by the development will be managed.

Plan of:	**Rehabilitation Management Plan for Razorback Quarry, Running Stream - Site Location**	**Location:**	39 Razorback Road, Running Stream, NSW	**Source:**	Google Earth 25/10/2021, Google OpenStreet Map & NSW Clip & Ship Accessed October 2022 Zone MGA 55	**Plan By:**	JD
Figure:	**ONE**	**Council:**	Mid-Western Regional Council	**Survey:**	Not Applicable	**Project Manager:**	TO
Version/Date:	V0 25/11/2022	**Tenure:**	Not Applicable	**Projection:**	GDA2020/MGA Zone 55 EPSG:7855	**Office:**	Thornton
Our Ref:	12455_SU_RBQ_EIS_RMP_Q001_V2_F1	**Client:**	Space Urban Pty Ltd	**Contour Interval:**	Not Applicable		

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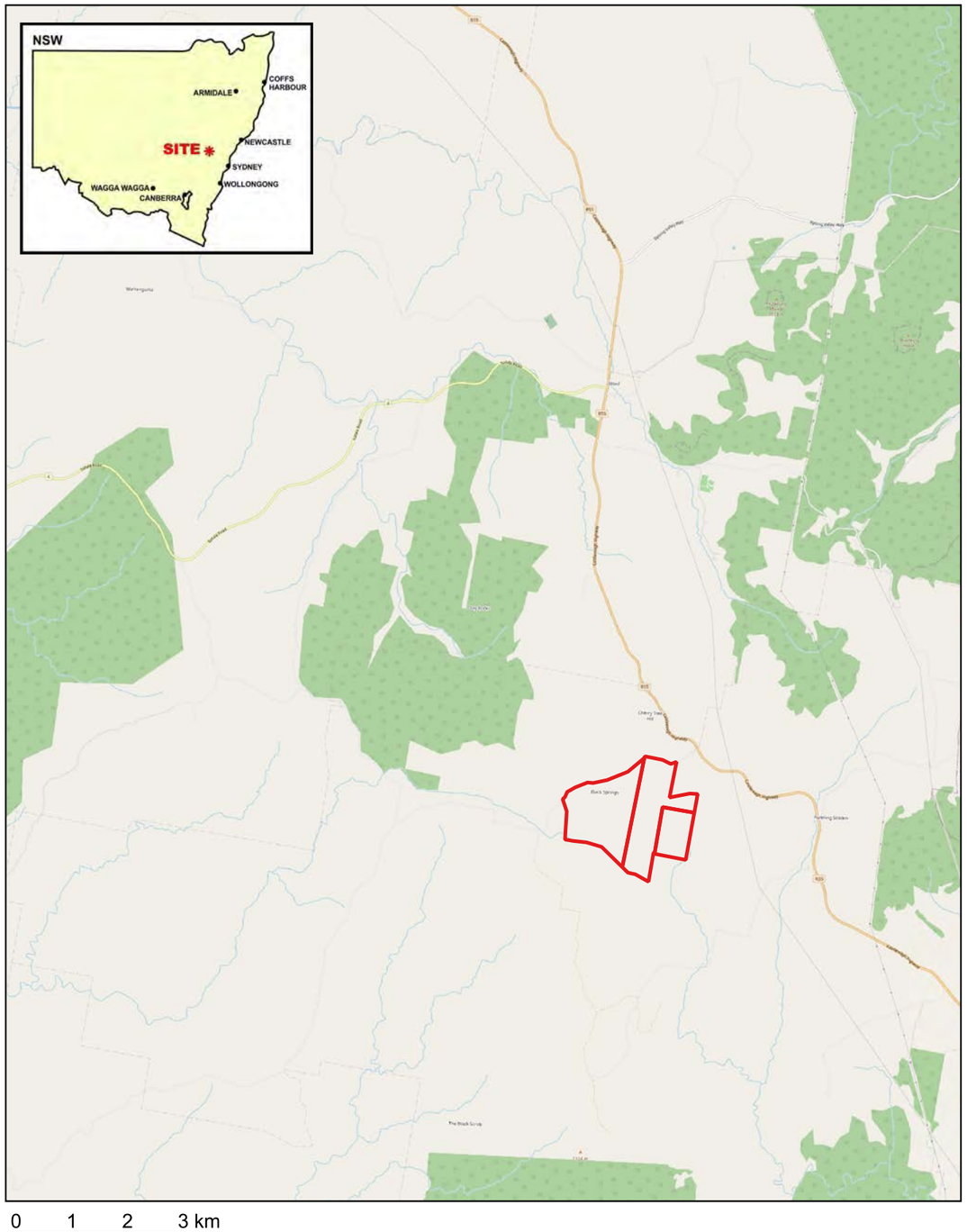

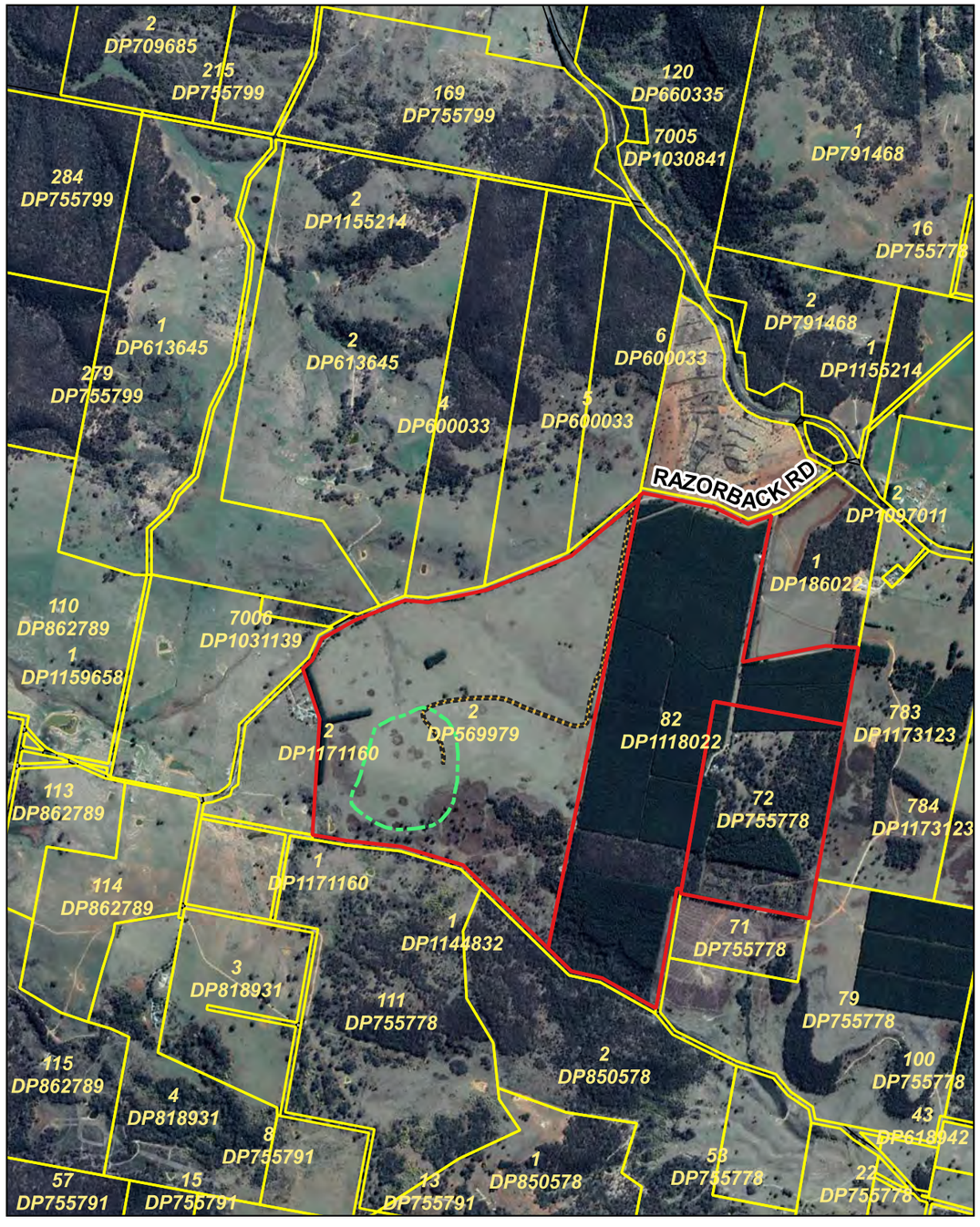

Plan of:	**Rehabilitation Management Plan for Razorback Quarry, Running Stream - Site Layout**	**Location:**	39 Razorback Road, Running Stream, NSW	**Source:**	Google Earth 25/10/2021 & NSW Clip & Ship Accessed October 2022 Zone MGA 55	**Plan By:**	TO/JD
Figure:	**TWO**	**Council:**	Mid-Western Regional Council	**Survey:**	NSW Government Spatial Services, October 2012 Survey, Accessed Through Elvis & Clip & Ship October 2022	**Project Manager:**	TO
Version/ Date:	V2 25/11/2022	**Tenure:**	Not Applicable	**Projection:**	GDA2020/MGA Zone 55 EPSG:7855		
Our Ref:	12455_SU_RBQ_EIS_RMP_Q002_V2_F2	**Client:**	Space Urban Pty Ltd	**Contour Interval:**	1 Metre		

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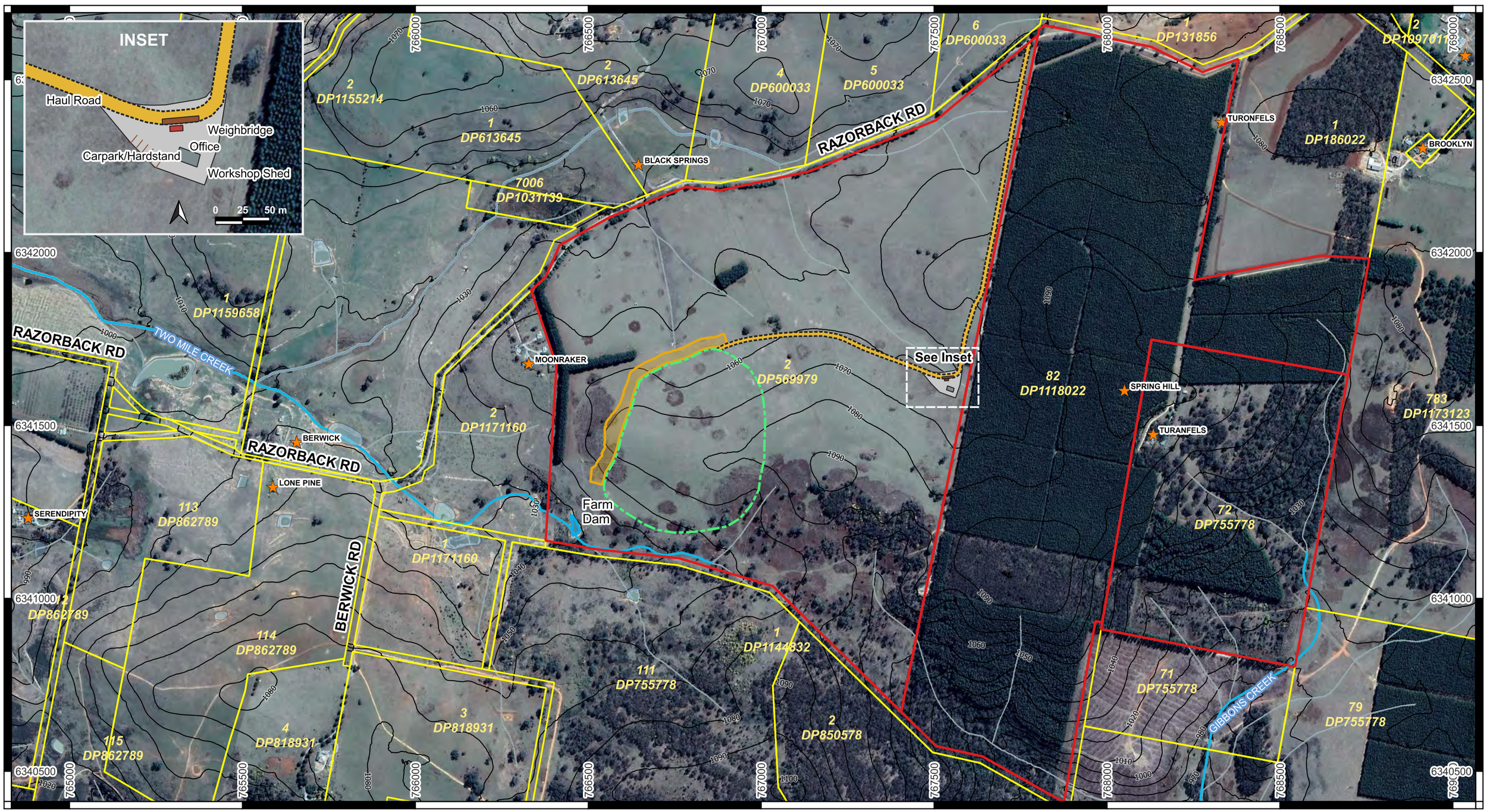

Legend

Site Features

- Property Boundary
- Lot Boundary (Cadastral)
- Road Corridor
- 1m Contour
- 5m Contour

Quarry Features

- Extraction Boundary
- Bund
- Office, Crib Room & Toilets
- Weighbridge
- Workshop Shed (20 x 12m)
- Haul Road
- Hardstand & Carpark

Water Management Features

- Existing Site Dam
- Creek/Main Drainage Line

2 Legislative Requirements

2.1 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979 (EP&A ACT)

The proposal will be subject to the provisions of the EP&A Act. Additionally, the operations will need to be able to demonstrate compliance against any Conditions of Approval issued under the provisions of the EP&A Act.

2.2 PROTECTION OF THE ENVIRONMENT OPERATIONS ACT 1997 (POEO ACT)

At the proposed extraction rate of up to 200,000 tonnes of material per annum, the operations are a Scheduled Activity under the PoEO Act. As such, an Environmental Protection Licence (EPL) will be required.

2.3 STATE ENVIRONMENTAL PLANNING POLICY (RESILIENCE AND HAZARDS) 2021

Chapter 4 of the policy (Remediation of Land) is to provide a state-wide approach to the remediation of contaminated land for the purpose of minimising the risk to human health and the environment.

No contaminated lands have been identified within the project area (Ref 1) that would be disturbed by mining or for mining associated purposes.

Should contaminated sites be encountered during construction and operation of the extended mine area these sites would be assessed and treated as required.

2.4 GUIDELINES AND STANDARDS

2.4.1 Agricultural Land Classification (DPI)

As referenced by the SEARs, Agricultural Land Classification, or otherwise known as Agriculture Land Suitability, is a historical five class system classifying land in terms of its suitability for general agricultural use. Agricultural land is classified by evaluating biophysical, social and economic factors in terms of constraint. The mapping ceased in 2000 but is still being used by local government and other industry representatives involved in land assessment and evaluation.

2.4.2 Important Agricultural Land (DPI)

Important Agriculture Land (IAL) is the existing or future location of local or regionally important agricultural industries or resources. It includes a combination of biophysical resources and socio-economic (infrastructure, proximity to processing facilities, markets etc) requirements for local or regionally important agricultural industries. Importantly, this includes those industries not primarily or solely dependent on productive soils such as poultry or protected cropping.

Mapping is still being undertaken by the DPI and the site is not currently designated IAL.

2.4.3 Rural Land Capability Mapping (OEH)

As referenced by the SEARs, Land and Soil Capability maps are classified into 8 classes based on a range of agricultural practices that can be sustained, ease of management and risk of degradation. The limitations to agricultural use are determined by factors including, but not limited to soil properties and climate. The more limitations for agricultural practices, the higher the classification and the lower the agricultural versatility or value.

The Land and Soil Capability Assessment Scheme has replaced the Rural Land Capability Assessment maps.

2.4.4 Land and Soil Capability (DPI)

Land and Soil Capability maps are classified into 8 classes based on a range of agricultural practices that can be sustained, ease of management and risk of degradation. The limitations to agricultural use are determined by factors including, but not limited to soil properties and climate. The more limitations for agricultural practices, the higher the classification and the lower the agricultural versatility or value.

The LSC Assessment Scheme has replaced the Rural Land Capability Assessment maps. According to the mapping, the most limiting LSC for the site is *4- Moderate to severe limitations*.

2.4.5 Soil and Landscape Issues in Environmental Impact Assessment (NOW)

This guideline is principally concerned with land degradation impacts such as soil erosion and sedimentation, but also give information on other land-related impacts such as mass movement impacts (e.g. slope failure), pollution impacts (e.g. soil and water contamination) and hydrological impacts (e.g. flooding).

2.4.6 Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC)

The guideline is aimed at providing a systematic framework for the prevention, assessment, clean-up and management of existing and future contaminated sites. A risk assessment conducted during the initial scoping of the project, including a review of historical imagery, found negligible risk of any potentially contaminated land on the project site.

2.4.7 Guidelines for Consultants Reporting on Contaminated Sites (EPA)

The purpose of the guideline is to ensure that reports prepared by consultants on the investigation and remediation of contaminated land contain sufficient and appropriate information to enable efficient review by regulators, the Site Auditor and other interested parties.

No potentially contaminated land has been identified on the project site.

2.4.8 Agricultural Issues for Extractive Industry Development Factsheet (DPI)

The Factsheet sets out the relevant agricultural issues for consent authorities to consider when assessing a proposal to develop rural land for extractive industries. It provides a checklist to assist in the assessment of the merit of a rural based extractive industry proposal.

2.4.9 Acid Sulphate Soils Planning Maps

The site does not lie in within an identified risk area for Acid Sulphate Soils (NSW SEED portal https://www.seed.nsw.gov.au).

2.4.10 Mine Rehabilitation- Leading Practice Sustainable Development Program for the Mining Industry

The handbook outlines the key principles and procedures now recognised as leading practice for planning, implementing and monitoring rehabilitation outlined below:

- understanding the importance of rehabilitation and its business case for the mining sector;
- establishing rehabilitation objectives, targets and success criteria;
- planning to rehabilitate through engaging with stakeholders, setting objectives and completion criteria, and establishing rehabilitation baselines;
- integrating and implementing rehabilitation plans during the life of the operation; and
- monitoring and reporting mine-site rehabilitation performance.

2.4.11 Mine Closure and Completion- Leading Practice Sustainable Development Program for the Mining Industry

This handbook addresses mine closure, one of the themes in the Leading Practice Sustainable Development (LPSD) Program. In particular, the handbook focuses on the life of mine (LoM) issues to accommodate longer term considerations for managing post-decommissioning conditions en-route to relinquishment.

2.4.12 Strategic Framework for Mine Closure

The Strategic Framework is designed to cover a broad range of mining and mining related activities. The focus of the Strategic Framework is primarily on improving closure related activities at operating mines. It is structured around a set of objectives and principles grouped under six key areas (stakeholder involvement, planning, financial provision, implementation, standards and relinquishment).

2.4.13 Managing Urban Stormwater: Soils and Construction Vol 1 and Vol 2E (Mines and Quarries)

Design details for stormwater and sediment control structures for mine and quarry sites are detailed in Volume 1 of the Managing Urban Stormwater: Soils and Construction Guidelines (the Blue Book). Additional measures are outlined within Managing Urban Stormwater, Soils and Construction, Volume 2E Mines and Quarries (DECC, 2008).

2.4.14 ANZECC (2000) Guidelines for Fresh and Marine Water Quality

Water Quality Objectives will be consistent with the indicators and trigger values/criteria, for the identified environmental values, outlined in the ANZECC (2000) Guidelines for Fresh and Marine Water Quality.

3 Existing Environment

3.1 LAND USE

3.1.1 Previous Site Land Use

Aerial imagery from 1964, 1973, 1982, 1989, 1993, 2003, 2007, 2012, 2018 and present have been reviewed in the *Razorback Quarry Scoping Report* (BORG 2020) to determine past land use history. The report states:

> *'The subject land is within the Parish of Warrangunia. Land appears to have been originally granted in the mid to late 1800s, as Portion 232, that included lands now divided into separate properties to the north and west. The land to the east is within the Hearn Parish and appears likely to have been under the same ownership. Properties to the north and west are now under separate ownership with their own dwellings.*
>
> *The land is within the Turon River Gold Field area that was proclaimed on 25 July 1896. Common within the local area are names such as Spring Hill (locality) and Black Springs (property on the northern boundary of the land), this may suggest the frequent occurrence of springs, no springs have been identified on the property, however, being at the headwaters of several catchments it may be possible.*
>
> *Aerial imagery shows that in the 1960s the Subject Land was already cleared over essentially the same area that is currently cleared, being the more gentle slopes on the north and west of the property with the steeper slopes on the south eastern corner left as what appears to be an open native woodland. Imagery shows evidence of clearing in the way of 60-70m spaced rows of clearing, which topographically is still visible on LIDAR imagery, perhaps due to the pushup and burning of cleared timber.*
>
> *Pasture improvement has occurred on the land, however, there appears to be only portions of the land subject to potential cropping as shown on the 1973 aerial image. As of 1 January 1990, (the date on which regrowth vegetation is based) the land appears to have been subject to negligible changes in farm and vegetation management.'*

3.1.2 Current Agricultural Operations

The 327 hectare property is currently comprised of the following land uses:

- 68 % or 222 ha is planted out as pine plantation at various stages of progression, from recently planted tubestock to mature plantations through to areas that have been recently harvested and not yet re-planted.
- 19 % or 61 ha is other wooded or remnant vegetation, comprising both native and non-native species and includes the dwelling and yard area.
- 13 % or 44 ha is comprised of access tracks and grassland areas through and surrounding the plantation area that are not planted as plantation. This includes a former pasture area around the area of the proposed quarry and the plantation firebreaks.

3.1.3 Surrounding Land Use

A description of the land uses surrounding the quarry has been reproduced from the *Razorback Quarry Scoping Report* (BORG 2020) below.

Table 4. Surrounding Land Use Within 2km of the Proposed Quarry

Direction	Land Use Description
North	North of the site is a newly planted pine plantation within the Subject Land extending out over 450m north of the quarry before meeting Razorback Road. Land beyond the Subject Land is predominantly cleared and appears to be used for grazing. A dwelling is located just over 1km to the north, in the neighbouring Dog Rock Creek catchment that is orientated to the north away from the proposed quarry.
East	East of the development area, pine plantation extends over 1km east to the dwelling on the Subject Land. The Castlereagh Highway is just over 2km to the north east. Three dwellings not associated with the Subject Land are located approximately 2km to the north east. Lands outside the subject land are predominantly cleared and likely used for grazing, with some of the slopes remaining vegetated.
South	Approximately 60 m of the site pit edge is Two Mile Creek, located just within the southern boundary of the Subject Land. South east of the site is pine plantation extending into native vegetation within the Gibbons Creek catchment the land is steeper with a large portion under native timber. The remaining lands are substantially cleared and used for grazing. There are four dwellings south of the proposed quarry, the nearest is just over 1200 m from the proposed quarry operations.
West	Pine plantation extends for over 170m from the proposed quarry, before the Subject Land boundary that is just over 220 m from the proposed quarry pit edge. Beyond the subject land the majority of the area is within the Two Mile Creek catchment and is cleared and used predominantly for grazing. There are three dwellings located to the west of the property. The nearest is 250 m from the proposed quarry pit edge and is a cluster of buildings previously used as an accommodation facility called Moonraker.

Dwellings within 2km are shown in *Figure Three*.

Plan of:	**Rehabilitation Management Plan for Razorback Quarry, Running Stream -Surrounding Land Ownership & Land Use**	**Location:**	39 Razorback Road, Running Stream, NSW	**Source:**	Google Earth 25/10/2021 & NSW Clip & Ship Accessed October 2022 Zone MGA 55	**Plan By:**	TO/JD
Figure:	**THREE**	**Council:**	Mid-Western Regional Council	**Survey:**	Not Applicable	**Project Manager:**	TO
Version/ Date:	V2 25/11/2022	**Tenure:**	Not Applicable	**Projection:**	GDA2020/MGA Zone 55 EPSG:7855		
Our Ref:	12455_SU_RBQ_EIS_RMP_Q003_V2_F3	**Client:**	Space Urban Pty Ltd	**Contour Interval:**	Not Applicable		

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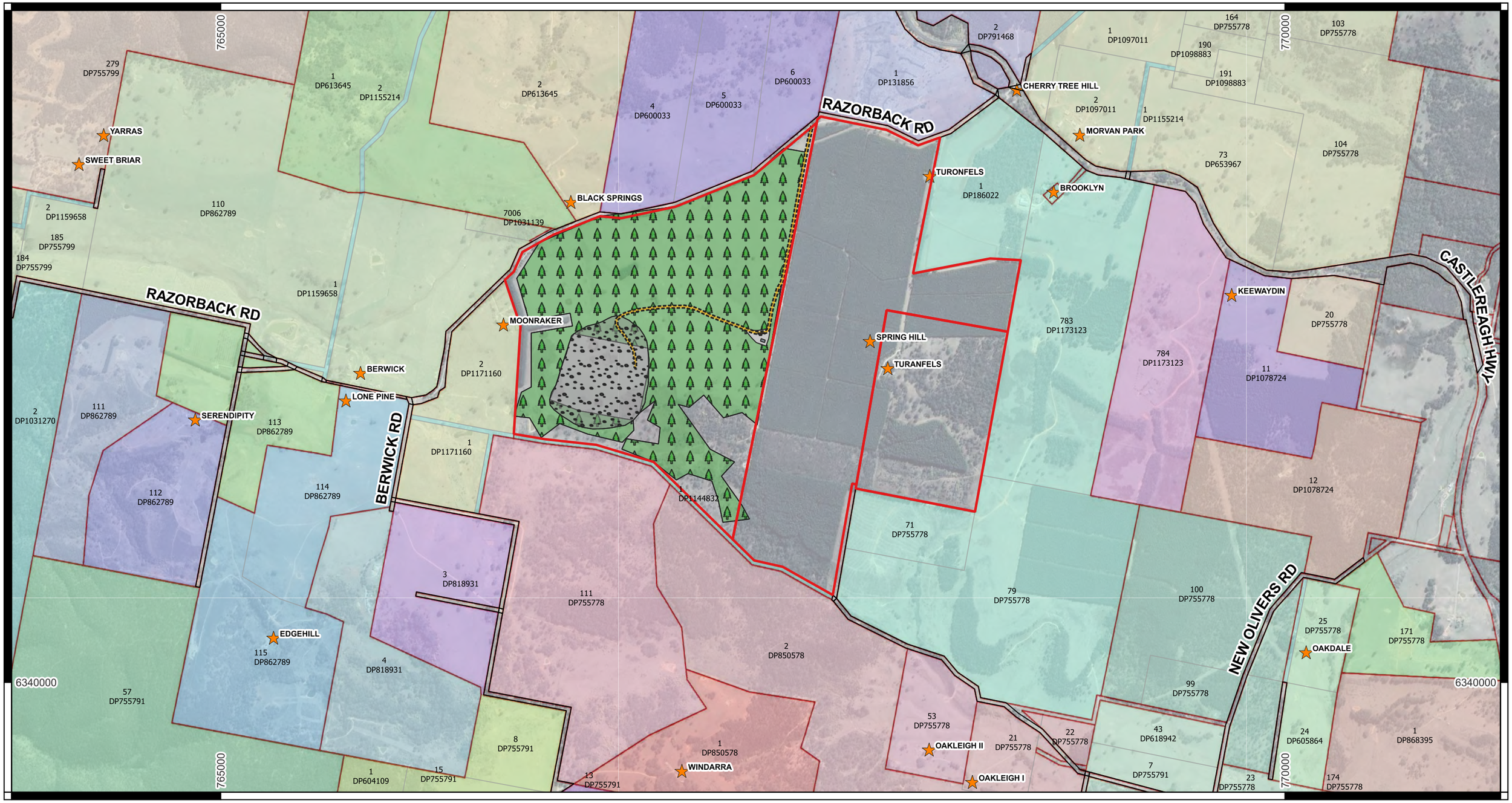

Legend

Site Features

- Property Boundary
- RoadCorridor
- Point of Interest

Quarry Features

- Office, Crib Room & Toilet
- Workshop Shed (20 x 12m)
- Weighbridge
- Hardstand & Carpark
- Haul Road

Landuse

- Extraction Boundary
- Pine Plantation (Planted 2020)

Property Parcels

- 1

Plan of:	**Rehabilitation Management Plan for Razorback Quarry, Running Stream - Sensitive Receptors**	**Location:**	39 Razorback Road, Running Stream, NSW	**Source:**	Google Earth 25/10/2021 & NSW Clip & Ship Accessed October 2022 Zone MGA 55	**Plan By:**	TO/JD
Figure:	**FOUR**	**Council:**	Mid-Western Regional Council	**Survey:**	Not Applicable	**Project Manager:**	TO
Version/ Date:	V3 30/11/2022	**Tenure:**	Not Applicable	**Projection:**	GDA2020/MGA Zone 55 EPSG:7855		
Our Ref:	12455_SU_RBQ_EIS_RMP_Q004_V3_F4	**Client:**	Space Urban Pty Ltd	**Contour Interval:**	Not Applicable		

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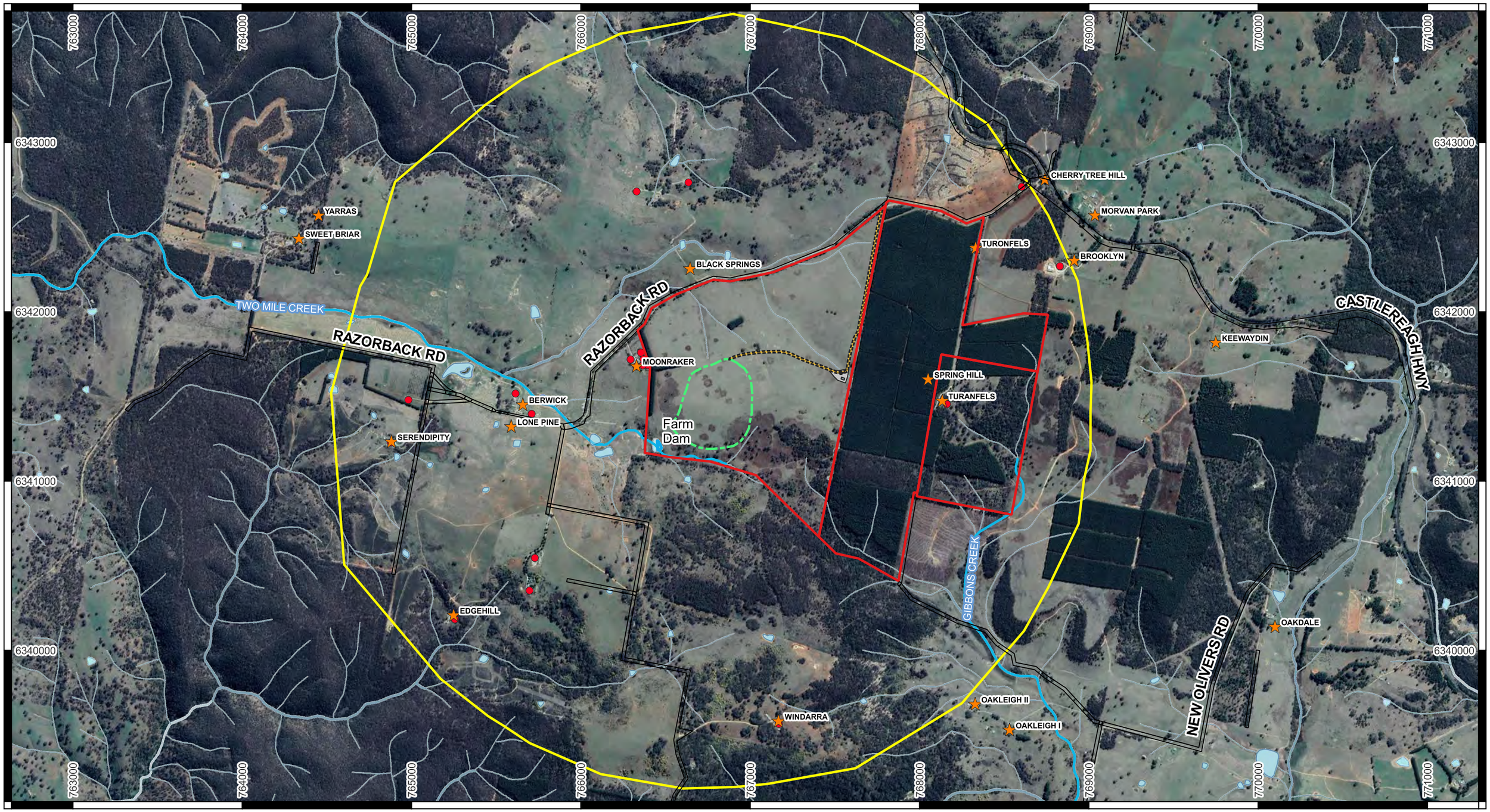

Legend

Site Features
- Property Boundary
- Road Corridor
- Points of Interest

Water Management Features
- Existing Site Dam
- Creek/Main Drainage Line

Quarry Features
- Office, Crib Room &Toilet
- Workshop Shed (20 x 12m)
- Hardstand & Carpark
- Weighbridge
- Haul Road

Sensitive Receptor
- Dwelling

- 2km Buffer from Quarry

3.2 GEOLOGY AND SOILS

3.2.1 Regional Geology

The site is situated west and on the foothills of the Blue Mountains Range west of Sydney, NSW. The Contact between the Triassic and Permian aged suites is approximately 500 west of the site (Source Minview 3).

The Triassic Suite of rocks occurs approximately between 200 and 250 million years ago and the Permian 250 to 300 million years. The Triassic suite of rocks includes sandstone, claystone and conglomerates and was formed in large flood plains and the outcrop of these materials stretch across the Sydney Basin from around Moss Vale (south), Lithgow (west) and Morisset to the north. The underlying Permian which contain coal, sandstone and claystones, these outcrops reach as far south as South Durras, north to Nobbies Head at Newcastle and northwest to Ulan, near Mudgee. There is also overlying Cenozioc Basalts to the north, south and east of the site.

3.2.2 Site Geology

The local geology is the lower most portion of the Narrabeen Group, of which is most likely to be part of the Caley Formation which is Claystone, Shale and Quartz Lithic Sandstone (source Western Coalfield (Southern Part) 1:100,000 NSW Mines Department Geological Sheet. The surface exposures are sparse and small farm borrow pits show poorly consolidated conglomerates, with sandstone and clay matrix.

3.2.3 Soil Landscape

The soils on the Site are identified as Turonfels on the Environment NSW eSpade online data (https://www.environment.nsw.gov.au/eSpade2WebApp#). This soil landscape comprises undulating to rolling low hills with the dominant soils being red earths on mid to upper slopes, and yellow podzolic soils and yellow earths on lower slopes. Chocolate soils and skeletal sands and loams also occur on upper slopes.

Topsoils run to a depth of approximately 20cm are dull yellowish-brown loam, fine sandy with weak polyhedral peds; the pH is approximately 6.5. Subsoils show a sharp change to dull yellow orange fine sandy clay loam with weak structure; pH 6.0. They are moderately permeable, have a moderate to high erodibility and a moderate erosion hazard. Below the soil layers run sandstone, shale, conglomerate and siltstones, which are much lighter in colour.

Photoplate 1. Typical Soil Profile on the Site

3.2.4 Soil Erosion Characterisation

The likely soil loss is calculated with the Revised Universal Soil Loss Equation (RUSLE). The values of the other RUSLE factors are: P of 1.3 and the C is assumed to be 1.0 for bare soil. Calculations can be found in *Appendix A*.

The potential soil loss of the site has been calculated using *Managing Urban Stormwater, Soil and Construction, Volume 2E Mines and* Quarries for a 90th percentile, 5-day rainfall event assuming a non-sensitive receiving environment. Important site physical characteristics and assumptions are identified in the table below.

Table 5. Soil Constraints and Characteristics

Constraint/Opportunity	Value
IFD:2 year, 6 hour storm	5.91 (from the BOM IFD data)
Slope Gradients	Low to Moderate (Average 6-20%)
Potential Erosion Hazard	Moderate
Soil Erodiblity	Moderate to High
Calculated Soil Loss	Up to 1,300 tonnes/Ha/yr depending on particular mine slopes.
Soil Loss Class	1 to 6 (Steeper slopes within the pit are at higher risk of erosion)
Soil Texture Group	Type D
Soil Hydrological Group	D The Soil Hydrological Group for the soil materials is assumed to be D, very high run-off potential. Water moves into and through these soils very slowly when thoroughly wetted. They regularly shed run-off from most rainfall events.
Runoff Coefficient	0.64 (Soil Hydrological Group D)

3.3 TOPOGRAPHY

The Site is undulating to rolling low hills with elevations from 1,040–1,090 m. Slopes range from 6–20%, with slope lengths from 400–900 m. Drainage lines are few and variably spaced.

Plan of:	**Rehabilitation Management Plan for Razorback Quarry, Running Stream - Existing Topography & Drainage**	**Location:**	39 Razorback Road, Running Stream, NSW	**Source:**	Google Earth 25/10/2021 & NSW Clip & Ship Accessed October 2022 Zone MGA 55	**Plan By:**	TO/JD
Figure:	**FIVE**	**Council:**	Mid-Western Regional Council	**Survey:**	Not Applicable	**Project Manager:**	TO
Version/ Date:	V2 25/11/2022	**Tenure:**	Not Applicable	**Projection:**	GDA2020/MGA Zone 55 EPSG:7855		
Our Ref:	12455_SU_RBQ_EIS_RMP_Q005_V2_F5	**Client:**	Space Urban Pty Ltd	**Contour Interval:**	Not Applicable		

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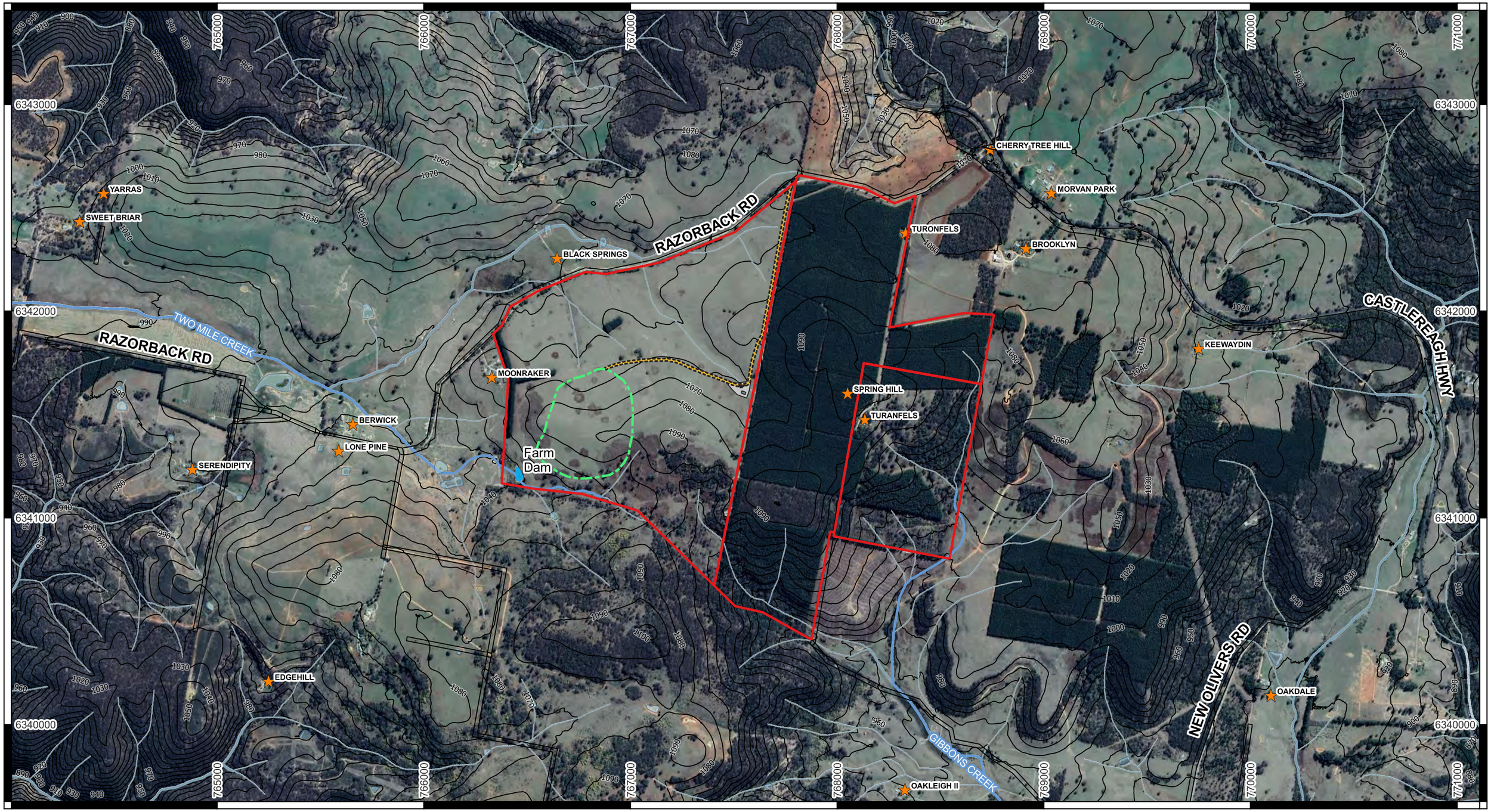

Legend

Site Features

- Property Boundary
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- 1m Contour
- 5m Contour

Water Management Features

- Existing Site Dam
- Creek/Main Drainage Line

Quarry Features

- Extraction Boundary
- Office, Crib Room &Toilet
- Workshop Shed (20 x 12m)
- Hardstand & Carpark
- Weighbridge
- Haul Road

3.4 LAND AND SOIL CAPABILITY

The LSC mapping describes the site's most limiting factor as *4- Moderate to severe limitations* (see *Figure Six*).

A site-specific assessment has been undertaken using the Land and Soil Capability Assessment Scheme.

The current and proposed final landform has been assessed using the OEH *The Land and Soil Capability Assessment Scheme (second approximation) - A General Rural Land Evaluation System for NSW* (LSCAS). The scheme defines LSC classes based on the biophysical features of the land. These biophysical features determine the on-site and off-site limitations and hazards of the land and include soil type, slope, landform position, acidity, salinity, drainage, rockiness and climate.

The landform assessment in the extension area prior to disturbance is summarised in the table below. The final LSC class of the land is based on the most limiting factor.

Table 6. Land Capability Assessment of Existing Extension Area

Aspect	Details	Land Capability Classification
Water Erosion Hazard	Slope along the proposed quarry site east to west and north south ranges from 5-10% (Table 4 of LSCAS). (The site is assumed to lie in the Eastern and Central Division)	Class 3
Wind Erosion Hazard	Soil texture is considered to most closely resemble a fine sandy loam with 6-13% clay, therefore the Wind erodibility class of surface soil is 'moderate' (Table 5 of LSCAS). Annual average rainfall is around 800mm per annum and the site lies within a Moderate Wind Erosive Power area (Figure 6 of LSCAS). The exposure to wind is high due to the ridgeline topography.	Class 4
Soil Structure Decline Hazard	Soils most closely resemble fine sandy loam soils with no texture modifiers such as sodicity i.e. fragile light textured soil	Class 3
Soil Acidification Hazard	The soils most closely resemble Red Earth/Yellow Earths/chocolates soils (Table 9 of LSCAS). These soils have a medium buffering capacity. Annual average rainfall is around 800mm per annum.	Class 3
Salinity Hazard	Recharge potential is considered low due to the ridgeline setting. Discharge potential is considered low as the site is well above the groundwater table. The salt store is considered Low.	Class 1
Water Logging Hazard	The soils rapidly drain and are moderately well drained	Class 2
Shallow Soil and Rockiness Hazard	The extension area has nil rocky outcrops (Table 15 of LSCAS).	Class 1
Mass Movement Hazard	No mass movement of soil has been noted.	Class 1
Final LCS Class		**Class 4**

Class 4 land is described as:

Moderate capability land: *Land has moderate to high limitations for high-impact land uses. Will restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology.*

Plan of:	**Rehabilitation Management Plan for Razorback Quarry, Running Stream - Land & Soil Capability Map**	**Location:**	39 Razorback Road, Running Stream, NSW	**Source:**	Google Earth 25/10/2021, NSW Clip & Ship Accessed October 2022 Zone MGA 55 & Environment NSW Land Capability WMS	**Plan By:**	TO/JD		
Figure:	**SIX**	**Council:**	Mid-Western Regional Council	**Survey:**	Not Applicable	**Project Manager:**	TO		
Version/ Date:	V2 25/11/2022	**Tenure:**	Not Applicable	**Projection:**	GDA2020/MGA Zone 55 EPSG:7855				
Our Ref:	12455_SU_RBQ_EIS_RMP_Q006_V2_F6	**Client:**	Space Urban Pty Ltd	**Contour Interval:**	Not Applicable				

N

0 1 2 km

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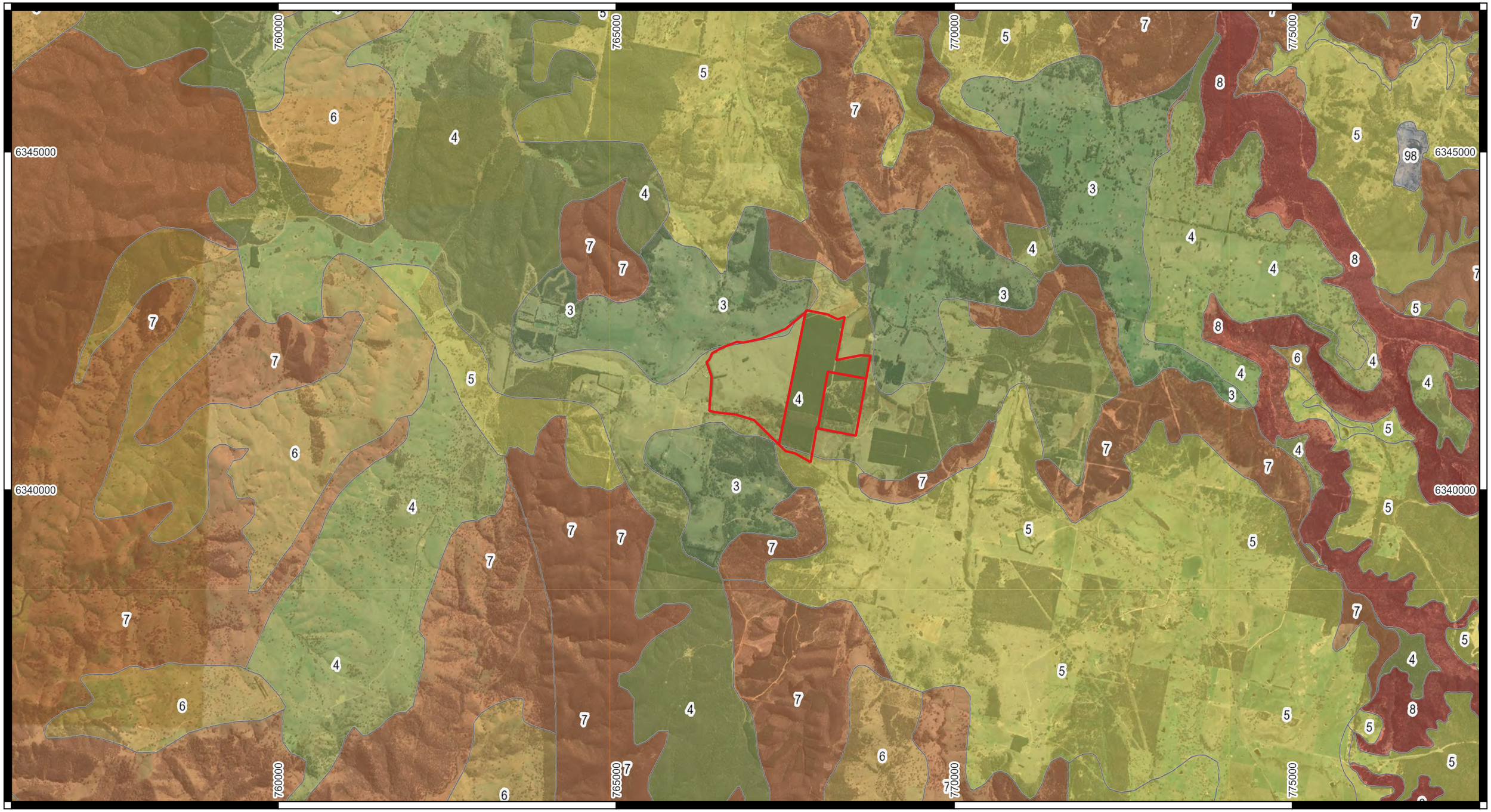

Legend

Site Features

Property Boundary

Soil & Land Classification - Most Limiting LSC

1 - Very Slight to Negligible Limitations
2 - Slight But Significant Limitations
3 - Moderate Limitations
4 - Moderate to Severe Limitations
5 - Severe Limitations
6 - Very Severe Limitations
7 - Extremely Severe Limitations
8 - Extreme Limitations

3.5 HYDROLOGY

3.5.1 Regional Hydrology

The Site is located near the north-eastern watershed of the Macquarie River Catchment. Drainage lines on the site flow either into Two Mile Creek to the west of the Site or into Gibbons Creek to the southeast of the Site (see ***Figure Seven***).

Two Mile Creek flows in the Crudine River and thence the Turon River some 20 kilometres to the west of the Site eventually meeting the Macquarie River. Gibbons Creek enters Running Stream and thence Round Swamp Creek and eventually the Turon River in the south.

3.5.2 Site Drainage and Water Courses

There are no defined drainage lines within the footprint of the proposed quarry due to the elevated ridgeline (see Figure Eight). Several drainage lines are located to the north of the quarry and flow into an unnamed creek to the north that joins Two Mile Creek. A drainage line in the south west of the quarry flows south to directly join Two Mile Creek and another in the south east joins Gibbons Creek lying further to the east. The ridgeline setting for the proposed quarry ensures that clean surface water can be directed around the disturbed area of the quarry and the dirty water catchment is restricted to the quarry footprint.

There is one farm dam located on the Site in the south west corner within the Two Mile Creek drainage line.

3.5.3 Flooding

The site is not identified as affected by flooding according to the NSW Government GIS planning services spatial data. It is located on an elevated setting and the risk of flooding is negligible.

Plan of:	**Rehabilitation Management Plan for Razorback Quarry, Running Stream - Regional Drainage**	**Location:**	39 Razorback Road, Running Stream, NSW	**Source:**	Google Earth 25/10/2021 & NSW Clip & Ship Accessed October 2022 Zone MGA 55	**Plan By:**	TO/JD
Figure:	**SEVEN**	**Council:**	Mid-Western Regional Council	**Survey:**	Not Applicable	**Project Manager:**	TO
Version/ Date:	V2 25/11/2022	**Tenure:**	Not Applicable	**Projection:**	GDA2020/MGA Zone 55 EPSG:7855		
Our Ref:	12455_SU_RBQ_EIS_RMP_Q007_V2_F7	**Client:**	Space Urban Pty Ltd	**Contour Interval:**	Not Applicable		

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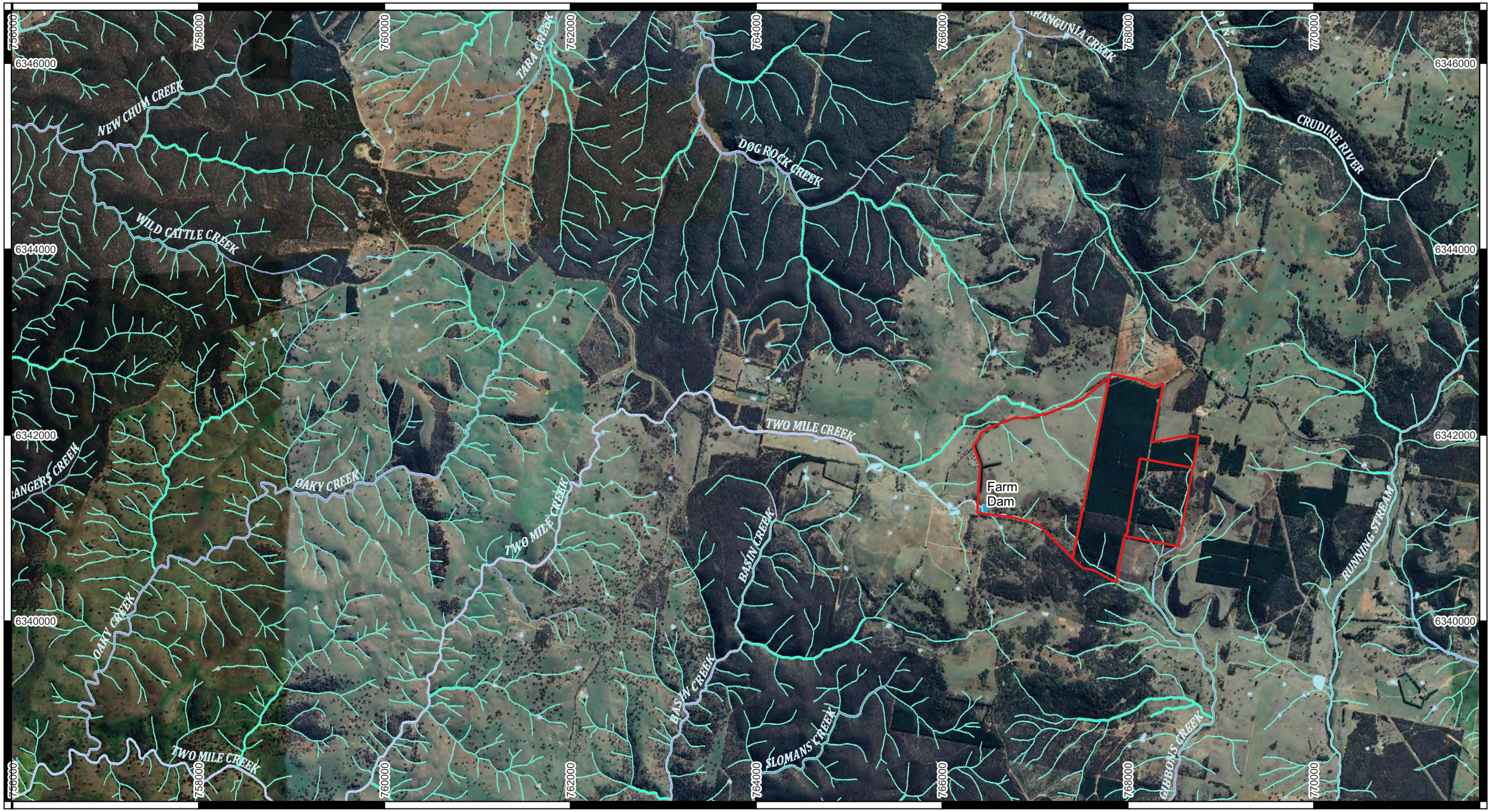

Legend

Site Features

- Property Boundary

Water Management Features

- Existing Site Dam
- Hydro Area
- Named Watercourse
- Creek/Watercourse

Plan of:	**Rehabilitation Management Plan for Razorback Quarry, Running Stream - Site Drainage**	**Location:**	39 Razorback Road, Running Stream, NSW	**Source:**	Google Earth 25/10/2021 & NSW Clip & Ship Accessed October 2022 Zone MGA 55	**Plan By:**	TO/JD
Figure:	**EIGHT**	**Council:**	Mid-Western Regional Council	**Survey:**	NSW Government Spatial Services, October 2012 Survey, Accessed Through Elvis & Clip & Ship October 2022	**Project Manager:**	TO
Version/ Date:	V2 25/11/2022	**Tenure:**	Not Applicable	**Projection:**	GDA2020/MGA Zone 55 EPSG:7855		
Our Ref:	12455_SU_RBQ_EIS_RMP_Q008_V2_F8	**Client:**	Space Urban Pty Ltd	**Contour Interval:**	1 Metre		

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0 250 500 750 m

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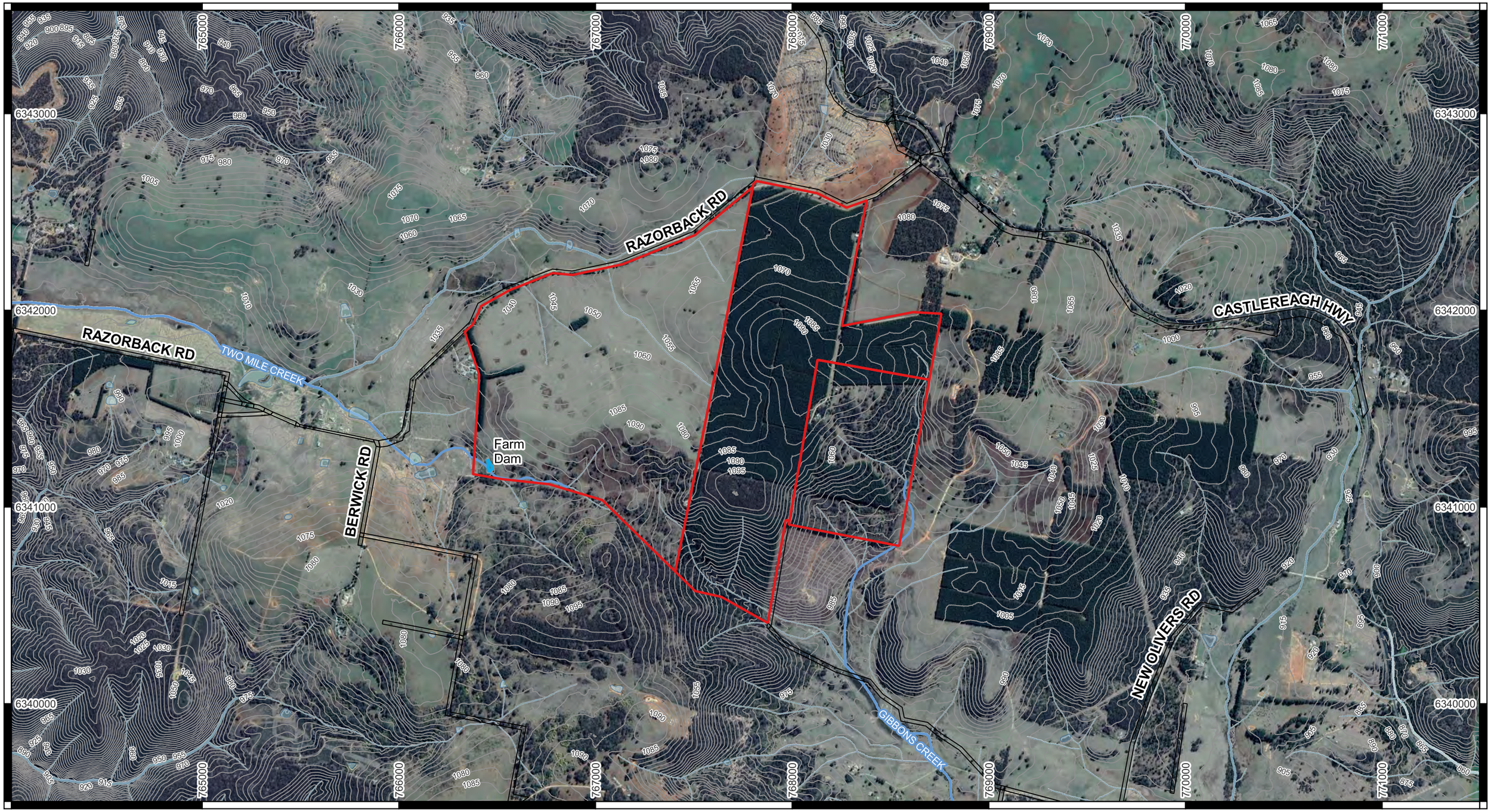

Legend

Site Features

- Property Boundary
- Road Corridor
- 5m Contour

Water Management Features

- Existing Site Dam
- Creek/Main Drainage Line

3.5.4 Surface Water Quality

No surface water has been tested to date.

3.5.5 Water Quantity

The Maximum Harvestable Right Dam Capacity has been calculated using the Water NSW online calculator tool and estimates that the MHRDC is 26.4ML, for the property described as 39 Razorback Road, Running Stream (330ha). The site contains one farm dam that has an estimated area of 800 metres squared. If the depth is assumed to be approximately 2 metres, the maximum volume of water that could be held by the farm dam is 1,600 cubic metres, of 1.6ML. Estimated volumes of the proposed dams are shown in *Table 7.*

Table 7. Total Sediment Estimated Proposed Dam Volumes

Dam Identification/ Catchment	Dam Area (m^2)	Estimated Depth (m)	Estimated Volume (m^3)	Estimated Volume (ML)
Dam 1 (proposed)	2,185	2	4,370	4.37
Dam 2 (proposed)	3,733	2	7,470	7.47
Existing Dam	800	2	1,600	1.60
Total Volume			13,440	13.44

*Note: Area estimated from QGIS Google Earth satellite imagery.

Thus, the site could potentially retain up to 24.8ML before a WAL is required.

3.5.6 Groundwater

The nearest groundwater bore is located some 4 kilometres north of the site and does not provide any quality data on the Water NSW online data page (https://realtimedata.waternsw.com.au/water.stm). It is not located within the same watershed and is therefore not comparable to the Site.

A piezo was established in BH7, located centrally within the proposed quarry, where groundwater was encountered at approximately 1049m RL. This is some 6 metres below the proposed base of the quarry.

Due to the site being situated on the source of the local watershed, and the maximum depth of the proposed quarry (1,055m RL), it is unlikely that groundwater will be intercepted.

3.6 VEGETATIVE COMMUNITIES

According to the Biodiversity Assessment for the EIS (MJD Environmental- 2022), the majority of the vegetation observed within the subject site exists in a high disturbed state due to the mass plantation of pine trees for plantation purposes throughout the Study Area.

Small patches of vegetated areas do exist within the southern extent towards the creek, this area (0.25 Ha) has been identified as remnant *PCT 1191 - Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion*. The extent of PCT 1191 has been classified as being in 'Low' condition due to the high disturbance within the area, with predominantly all the understorey vegetation consisting of weeds with scattered natives. Native trees species occurring within this area were limited to old, mature Eucalyptus rubida (Candle Bark) comprising of multiple hollows. Other tree age cohorts were limited to saplings and juveniles due to past land use. Other tree species observed included Eucalyptus viminalis (Ribbon Gum) and Eucalyptus pauciflora (Snow Gum) and Eucalyptus dives (Broad-leaved Peppermint). The shrub layer is limited to Cassinia sifton, Acacia melanoxylon, Hibbertia obtusifolia and Acacia dealbata (Silver Wattle). Native groundcover species detected include Chrysocephalum apiculatum (Common Everlasting), Pteridium esculentum, Craspedia variabilis (Common Billy Button), Lomandra filiformis subsp. coriacea, Veronica plebeia (Trailing Speedwell) and Ranunculus lappaceus (Common Buttercup). Exotic species were also abundant, including Rubus fruiticosus (Blackberry), Hypochaeris radicata (Catsear), Brassica rapa (Field Mustard), Conyza canadensis (Conyza), Atriplex prostrata, Cirsium vulgare (Spear Thistle), Senecio jacobaea (Ragwort), Trifolium, repens (White Clover) and Dactylis glomerata (Cocksfoot).

The remainder of the vegetation community on the subject site is described as *Pine Plantation/ Disturbed Grassland* and comprises of some native grasses, however, the mass pine plantings throughout this area have led to significant dieback and large areas of bare ground. No native trees exist within this area. Native species include Cassinia sifton (Sifton Bush), Hibbertia obtusifoliaHoary Guinea Flower), Panicum effusum (Hairy Panic), Anthosanche scabra (Wheatgrass), Poa sieberiana (Snow Grass), Rytidosperma pallidum (Red Anther Wallaby Grass), Microlaeana stipoides (Weeping Grass), Austrostipa densiflora, Lomandra filiformis subsp. coriacea and Oxalis perrenans. Exotic species were also abundant, including Rubus fruiticosus (Blackberry), Hypochaeris radicata (Catsear), Brassica rapa (Field Mustard), Conyza canadensis (Conyza), Atriplex prostrata, Cirsium vulgare (Spear Thistle), Senecio jacobaea (Ragwort), Trifolium, repens (White Clover) and Dactylis glomerata (Cocksfoot).

Neither vegetation community described are associated with Threatened Ecological Communities.

Plan of:	**Rehabilitation Management Plan for Razorback Quarry, Running Stream - Vegetative Communities from Biodiversity Assessment**	**Location:**	39 Razorback Road, Running Stream, NSW	**Source:**	Google Earth 25/10/2021,NSW Clip & Ship Accessed October 2022 Zone MGA 55 & Biodiversity Assessment (MJD Environmental)	**Plan By:**	TO/JD
Figure:	**NINE**	**Council:**	Mid-Western Regional Council	**Survey:**	Not Applicable	**Project Manager:**	TO
Version/ Date:	V2 28/11/2022	**Tenure:**	Not Applicable	**Projection:**	GDA2020/MGA Zone 55 EPSG:7855		
Our Ref:	12455_SU_RBQ_EIS_RMP_Q009_V2_F9	**Client:**	Space Urban Pty Ltd	**Contour Interval:**	Not Applicable		

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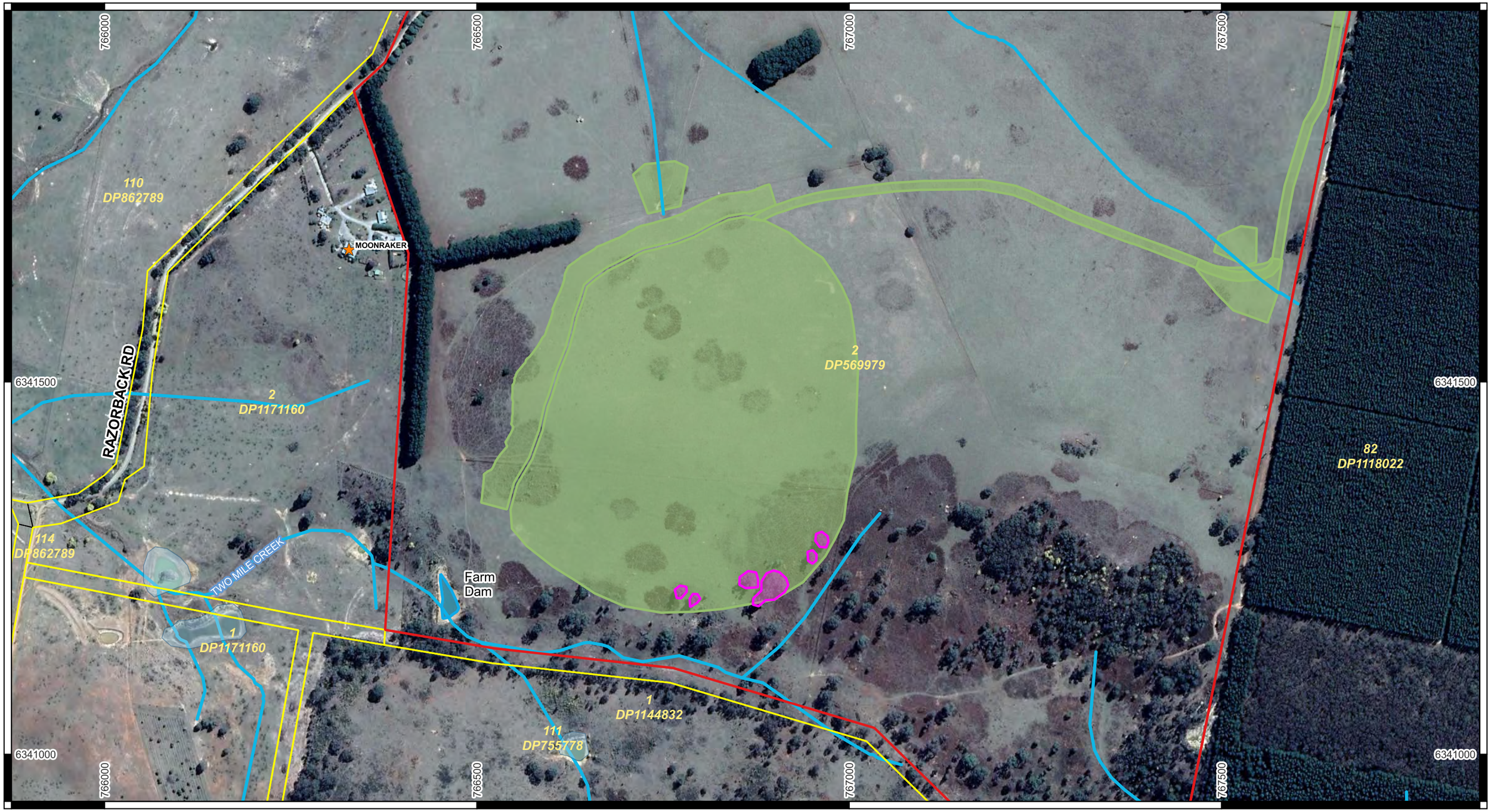


Legend

Site Features
- Property Boundary
- Lot Boundary (Cadastral)
- Road Corridor
- Point of Interest

Water Management Features
- Existing Site Dam
- Creek/Main Drainage Line

Vegetation Communities
- Snow Gum - Mountain Gum Tussock Grass-herb Forest of the SE Highlands Bioregion
- Pine Plantation/ Disturbed Grassland

3.7 LAND CONTAMINATION

3.7.1 EPA Contaminated Land Register

A search of the NSW EPA Contaminated Land Register shows that the site has not been notified to the EPA. The proponent advises that there are no dangerous goods held on site.

3.7.2 Contaminants of Potential Concern

Table 8. Site Use Summary and Associate Potential Contaminants

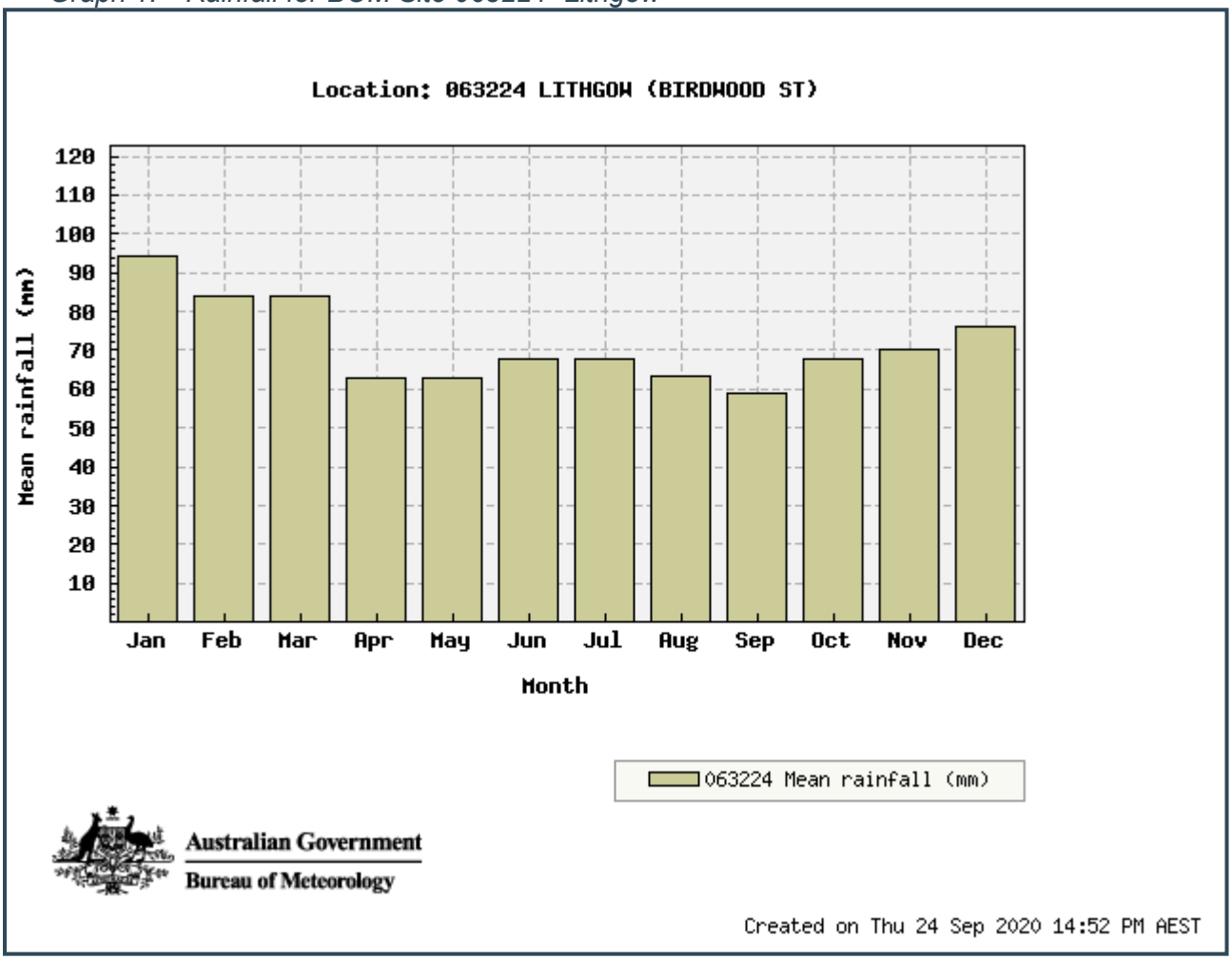
Site Use/ Contaminant Source	Potential Contaminants	Volumes Held/ Control Methods
Weed and pest spraying	Herbicides and Pesticides (OCP's and OPP's)	Weed and Pest control is undertaken by licenced contractors. Chemicals are not stored on site and only minor amounts are used.
Fuel Storage	Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethyl benzene, Xylene (BTEX), Polycyclic Aromatic Hydrocarbons (PAHs)	No Fuel is stored permanently on site. Refuelling is conducted off site or within the pit floor by transportable fuel tanks. Contractors carry spill kits at all times.
Oils/Solvents/Lubricants in production and maintenance	Hydrocarbons	No oils/solvents or lubricants are stored in site. All vehicle and machine maintenance is conducted in off site. Contractors carry spill kits at all times.

3.8 CLIMATE

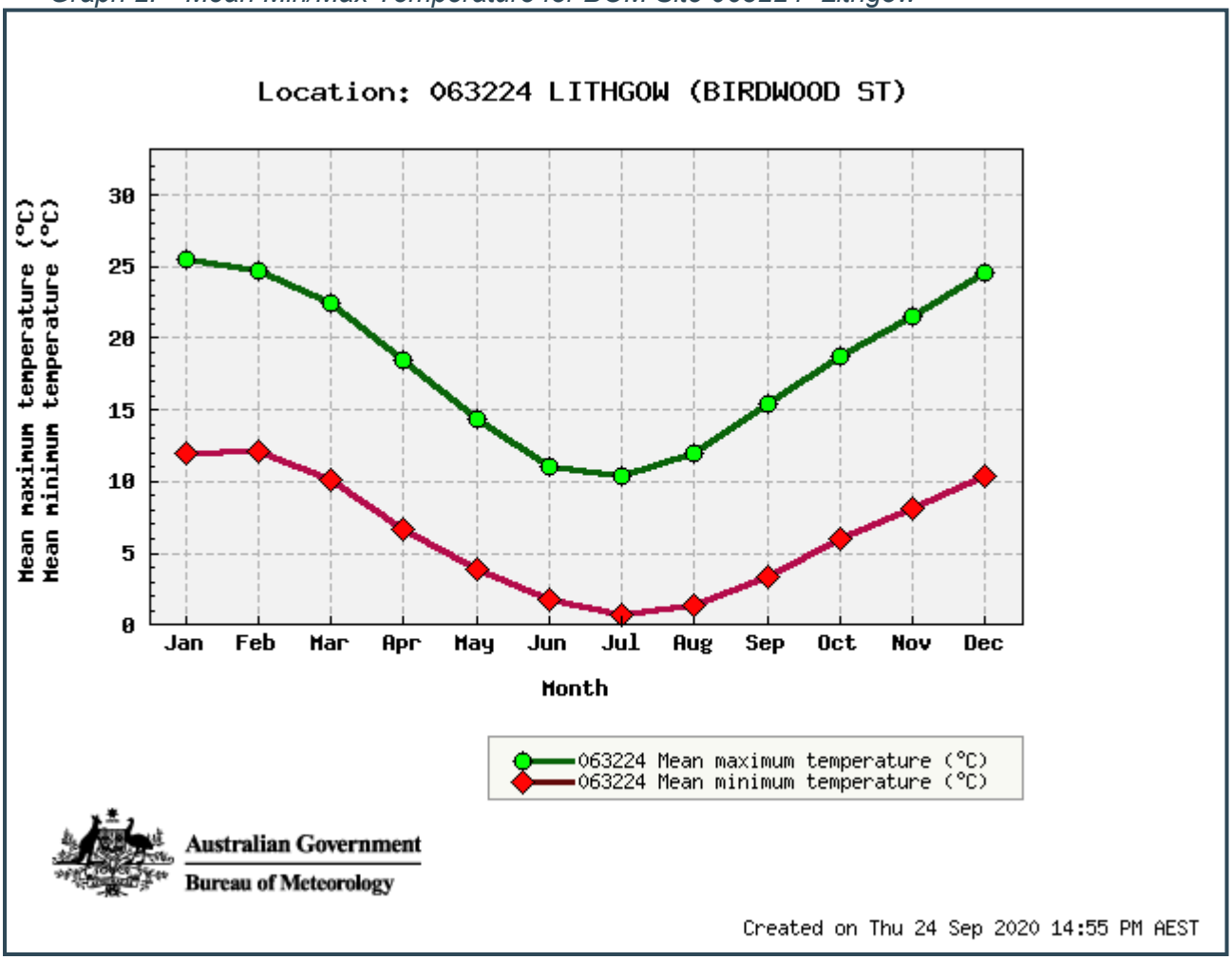
Climatic conditions at Running Stream are considered to be Cfb according to the Köppen-Geiger climate classification i.e. warm and temperate with significant rainfall.

Rainfall data sourced from the Bureau of Meteorology (Lithgow- site 063224) records an average annual rainfall of 862mm with higher rainfall experienced during the summer months. The mean annual average temperature is 18.5ºC and the mean annual minimum temperature is 6.4ºC. Morning winds are predominately westerly with a smaller component of north westerly and south westerly winds. Afternoon winds are similar in direction but stronger.

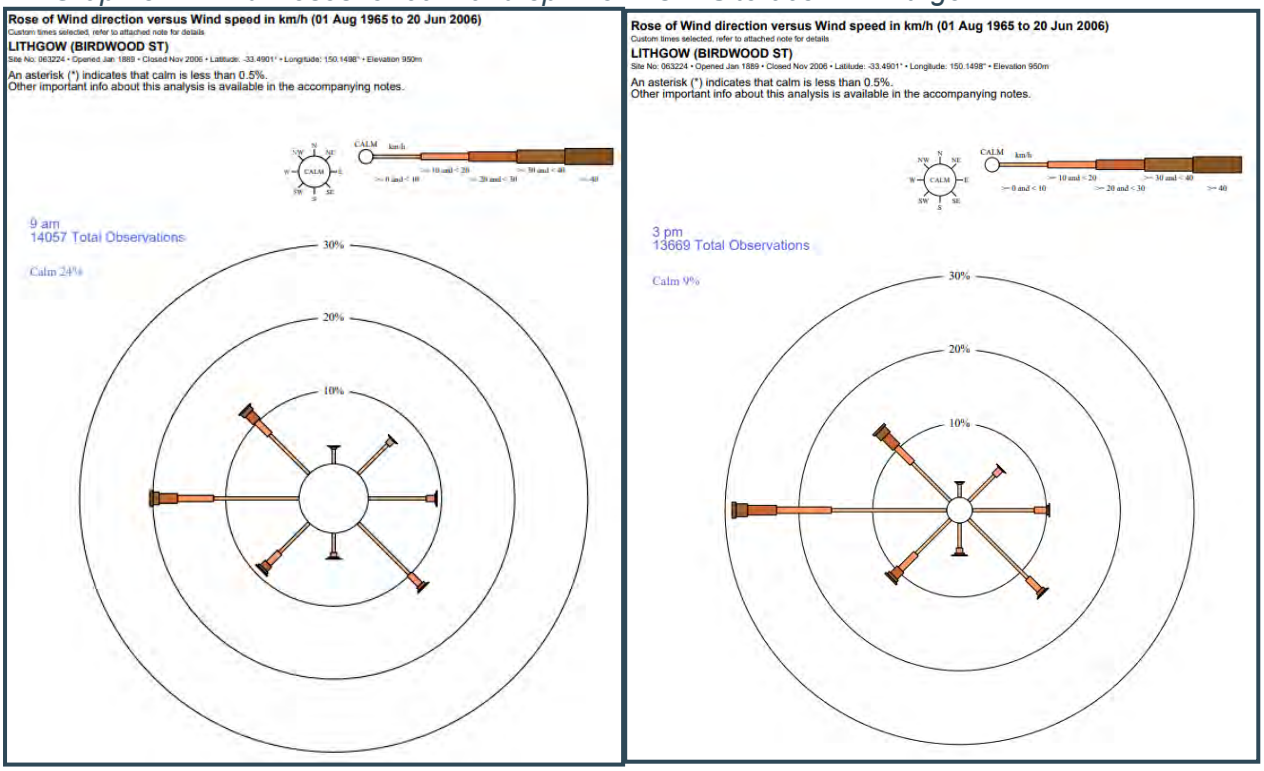
Graph 1. Rainfall for BOM Site 063224- Lithgow



Graph 2. Mean Min/Max Temperature for BOM Site 063224- Lithgow



Graph 3. Wind Roses for 9am and 3pm for BOM Site 063224- Lithgow



4 Final Landform

4.1 POST MINING LAND USE

The quarry will be progressively rehabilitated to pasture and pine plantation with potential future use of the facilities area for forestry related activities, consistent with surrounding land uses.

4.2 CONCEPTUAL FINAL LANDFORM

Final landform for the quarry is intended to be a deepened saddle along the existing ridge (see *Figure Fourteen*). Batter slopes will be generally no greater than 3 Horizontal to 1 Vertical. Vegetation will consist of pasture grasses initially to improve soil stability and then planted with pine consistent the adjacent pine plantation.

5 Proposed Rehabilitation Planning and Management

This section describes a program of progressive rehabilitation of disturbed areas as they become available for rehabilitation. The rehabilitation program will be monitored and reviewed according to *Section 8* and any changes or updates to the program will be facilitated in accordance with *Section 10.*

The rehabilitation program will focus on rehabilitation of disturbed areas.

Strategies and measures for the rehabilitation of the site are discussed in more detail in the following sub-sections.

5.1 MINE STAGING AND PROGRESSIVE REHABILITATION

The quarry will have an annual extraction rate of up to 200,000 tonnes, measured in tonnage transported from the site.

5.2 CONSTRUCTION

Construction will occur over an estimated 12-week period during construction hours consistent with the Interim Construction Noise guidelines and will include the following works:

- Bitumen sealing of Razorback Road to entrance of private haul road.
- Construction of private haul road.
- Construction of workshop and crib pad.
- Construction of the weigh bridge.
- Construction of the sediment dams and clean water dams.
- Construction of water management features such as drains and diversions.
- Initial topsoil stripping and placement and planting of topsoil stockpiles as a noise bund along the western boundary of the quarry.

Quarry operations will commence once the above actions are completed or when product is first transported from the site.

5.3 STAGE ONE

Extraction operations will commence in the eastern portion of the extraction envelope. Stripped topsoil and overburden will be placed in separate stockpiles along the western edge of the envelope creating the western bund wall. Commencing the extraction operation in the eastern portion of the site, is the furthest from the nearest sensitive receptor, Moonraker. The building of the western acoustic and visual bund will reduce noise, dust and visual impacts as the quarry develops. Extraction will concentrate more on the northern flank to progress down to the proposed floor of 1055 metres RL as soon as possible to reduce the haulage up the northern flank and to topographically shield the operations. During Stage One, the floor of 1075m RL will be reached.

The extraction batter is 4 horizontal: 1 vertical on the eastern side, creating the final landform contours (see *Figure Ten*). The active extraction faces to the west and south are 2 horizontal: 1 vertical, the western face is 6 metres high.

These works would take place in years 0-2 i.e., up to 2 years in duration.

Rehabilitation works will focus on establishing temporary vegetation on the topsoil and overburden stockpiles/bundwalls.

5.4 STAGE TWO

Extraction operations will continue extraction north and south of the eastern face and to the west, lowering the floor to 1066 m RL. This exposes the underlying sandstone as soon as practicable to ensure both the conglomerate and sandstone can be utilised for varying products. Haulage will be undertaken upon the northern flank to the proposed floor of 1066 metres RL. The active faces will be battered 2 horizontal: 1 vertical with 40 metre benches in the west (see *Figure Eleven*). In the east the extraction batter continues at 4 horizontal: 1 vertical. The western bundwall will continue to be constructed and revegetated.

Final landform contours established on the uppermost portions of the eastern face will be battered using overburden materials. As this face increases in depth, catch drains will be developed to slow the flow of surface water and reduce erosion impacts. Topsoil will be placed on these sections and vegetation established as part of the progressive rehabilitation.

These works would take place in years 2-6 i.e., up to 4 years in duration.

5.5 STAGE THREE

Benched extraction will continue in the west to lower the floor to 1055 m RL, which exposes a significant portion of the site.

Extraction will occur on the topmost bench to the western extraction boundary at a 2 Horizontal: 1 Vertical batter, this will be back filled with overburden in the final landform stage (see *Figure Twelve*). Haulage will be undertaken on to the proposed floor of 1055 metres RL.

Overburden and then topsoil will continue to be placed on the eastern flank and the final quarry floor, not required for stockpiling, as part of the progressive rehabilitation.

These works would take place in years 6-24.

5.6 STAGE FOUR

Continued extraction of the benches in the western side of the operation will create final landform slopes (see *Figure Thirteen*). Stockpiled overburden and topsoil will be emplaced on final landform. Rehabilitation will continue to occur on eastern flank from the topmost benches down to the floor. All topsoiled areas will be revegetated.

These works would take place in years 24-30.

Plan of:	**Rehabilitation Management Plan for Razorback Quarry, Running Stream - Stage One**	**Location:**	39 Razorback Road, Running Stream, NSW	**Source:**	Google Earth 25/10/2021, NSW Clip & Ship Accessed October 2022 Zone MGA 55 & 12D Modelling	**Plan By:**	TO/JD
Figure:	**TEN**	**Council:**	Mid-Western Regional Council	**Survey:**	NSW Government Spatial Services, October 2012 Survey, Accessed Through Elvis & Clip & Ship October 2022	**Project Manager:**	TO
Version/ Date:	V2 26/11/2022	**Tenure:**	Not Applicable	**Projection:**	GDA2020/MGA Zone 55 EPSG:7855		
Our Ref:	12455_SU_RBQ_EIS_RMP_Q010_V2_F10	**Client:**	Space Urban Pty Ltd	**Contour Interval:**	1 Metre		

N

0 50 100 150 m

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Legend

Site Features
- Property Boundary
- Road Corridor

Quarry Features
- Extraction Boundary
- Bund
- Office, Crib Room & Toilets
- Weighbridge
- Workshop Shed (20 x 12m)
- Haul Road (Stage One)
- Hardstand & Carpark

Water Management Features
- Existing Site Dam
- Poposed Sediment Dam
- Creek/Main Drainage Line

Quarry Stages
- Stage One
- 1m Contour (Stage One & Bund)
- 5m Contour (Stage One & Bund)

Plan of:	**Rehabilitation Management Plan for Razorback Quarry, Running Stream - Stage Two**	**Location:**	39 Razorback Road, Running Stream, NSW	**Source:**	Google Earth 25/10/2021, NSW Clip & Ship Accessed October 2022 Zone MGA 55 & 12D Modelling	**Plan By:**	TO/JD
Figure:	**ELEVEN**	**Council:**	Mid-Western Regional Council	**Survey:**	NSW Government Spatial Services, October 2012 Survey, Accessed Through Elvis & Clip & Ship October 2022	**Project Manager:**	TO
Version/ Date:	V2 26/11/2022	**Tenure:**	Not Applicable	**Projection:**	GDA2020/MGA Zone 55 EPSG:7855		
Our Ref:	12455_SU_RBQ_EIS_RMP_Q011_V2_F11	**Client:**	Space Urban Pty Ltd	**Contour Interval:**	1 Metre		

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Legend

Site Features
- Property Boundary
- Road Corridor

Quarry Features
- Extraction Boundary
- Bund
- Office, Crib Room & Toilets
- Weighbridge
- Workshop Shed (20 x 12m)
- Haul Road (Stage Two)
- Hardstand & Carpark

Water Management Features
- Existing Site Dam
- Poposed Sediment Dam
- Creek/Main Drainage Line

Quarry Stages
- Stage Two
- 1m Contour (Stage Two & Bund)
- 5m Contour (Stage Two & Bund)

Plan of:	**Rehabilitation Management Plan for Razorback Quarry, Running Stream - Stage Three**	**Location:**	39 Razorback Road, Running Stream, NSW	**Source:**	Google Earth 25/10/2021, NSW Clip & Ship Accessed October 2022 Zone MGA 55 & 12D Modelling	**Plan By:**	TO/JD
Figure:	**TWELVE**	**Council:**	Mid-Western Regional Council	**Survey:**	NSW Government Spatial Services, October 2012 Survey, Accessed Through Elvis & Clip & Ship October 2022	**Project Manager:**	TO
Version/ Date:	V2 26/11/2022	**Tenure:**	Not Applicable	**Projection:**	GDA2020/MGA Zone 55 EPSG:7855		
Our Ref:	12455_SU_RBQ_EIS_RMP_Q012_V2_F12	**Client:**	Space Urban Pty Ltd	**Contour Interval:**	1 Metre		

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Legend

Site Features
- Property Boundary
- Road Corridor

Quarry Features
- Extraction Boundary
- Bund
- Office, Crib Room & Toilets
- Weighbridge
- Workshop Shed (20 x 12m)
- Haul Road (Stage Three)
- Hardstand & Carpark

Water Management Features
- Existing Site Dam
- Poposed Sediment Dam
- Creek/Main Drainage Line

Quarry Stages
- Stage Three & Four
- 1m Contour (Stage Three & Bund)
- 5m Contour (Stage Three & Bund)

Plan of:	**Rehabilitation Management Plan for Razorback Quarry, Running Stream - Stage Four**	**Location:**	39 Razorback Road, Running Stream, NSW	**Source:**	Google Earth 25/10/2021, NSW Clip & Ship Accessed October 2022 Zone MGA 55 & 12D Modelling	**Plan By:**	TO/JD
Figure:	**THIRTEEN**	**Council:**	Mid-Western Regional Council	**Survey:**	NSW Government Spatial Services, October 2012 Survey, Accessed Through Elvis & Clip & Ship October 2022	**Project Manager:**	TO
Version/ Date:	V2 26/11/2022	**Tenure:**	Not Applicable	**Projection:**	GDA2020/MGA Zone 55 EPSG:7855		
Our Ref:	12455_SU_RBQ_EIS_RMP_Q013_V2_F13	**Client:**	Space Urban Pty Ltd	**Contour Interval:**	1 Metre		

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Legend

Site Features
- Property Boundary
- Road Corridor

Quarry Features
- Extraction Boundary
- Bund
- Office, Crib Room & Toilets
- Weighbridge
- Workshop Shed (20 x 12m)
- Haul Road (Stage Four)
- Hardstand & Carpark

Water Management Features
- Existing Site Dam
- Poposed Sediment Dam
- Creek/Main Drainage Line

Quarry Stages
- Stage Four
- 1m Contour (Stage Four & Bund)
- 5m Contour (Stage Four & Bund)

Plan of:	**Rehabilitation Management Plan for Razorback Quarry, Running Stream - Final Landform**	**Location:**	39 Razorback Road, Running Stream, NSW	**Source:**	Google Earth 25/10/2021, NSW Clip & Ship Accessed October 2022 Zone MGA 55 & 12D Modelling	**Plan By:**	TO/JD
Figure:	**FOURTEEN**	**Council:**	Mid-Western Regional Council	**Survey:**	NSW Government Spatial Services, October 2012 Survey, Accessed Through Elvis & Clip & Ship October 2022	**Project Manager:**	TO
Version/ Date:	V2 28/11/2022	**Tenure:**	Not Applicable	**Projection:**	GDA2020/MGA Zone 55 EPSG:7855		
Our Ref:	12455_SU_RBQ_EIS_RMP_Q014_V2_F14	**Client:**	Space Urban Pty Ltd	**Contour Interval:**	1 Metre		

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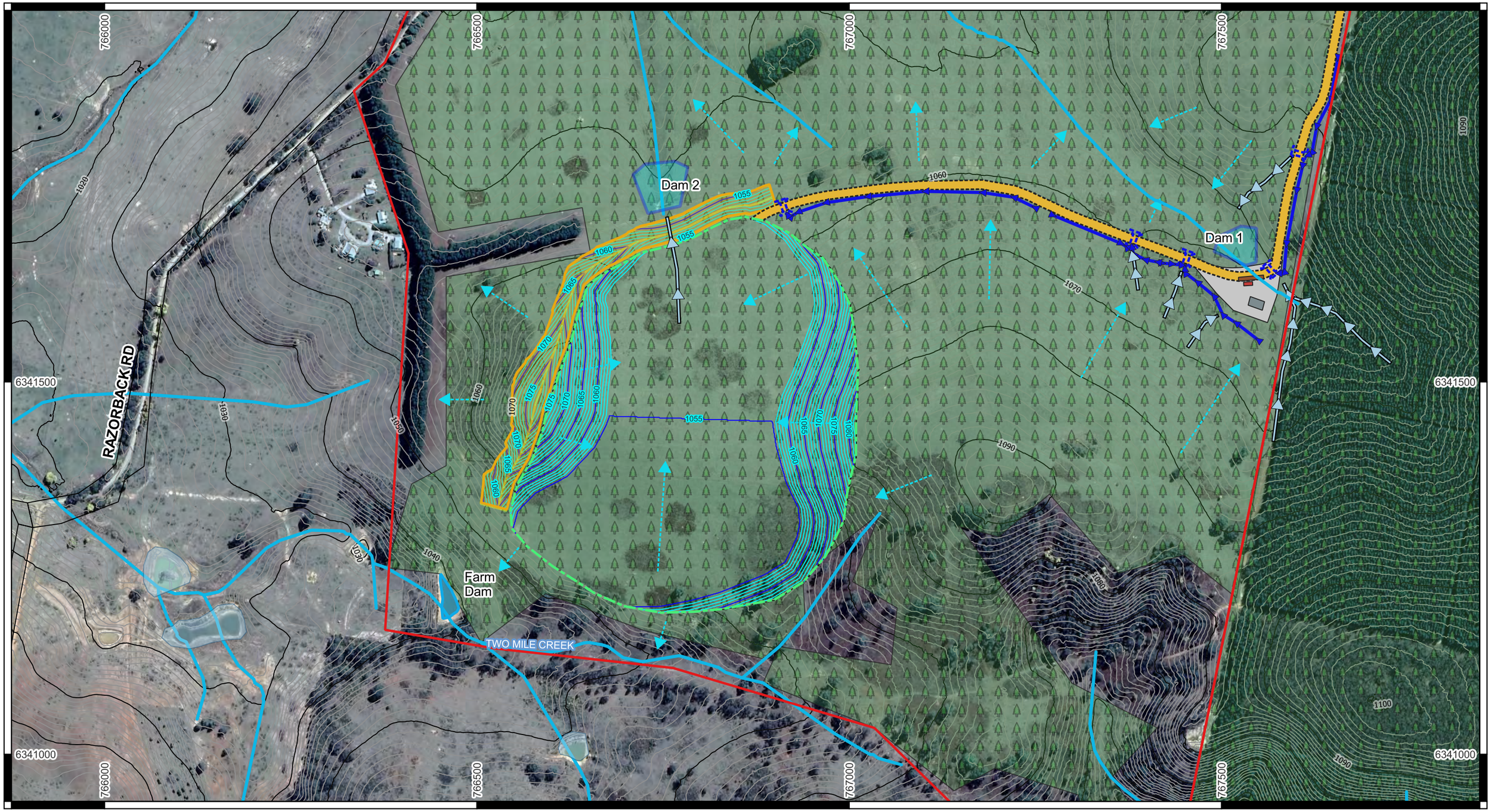

Legend

Site Features
- Property Boundary
- Road Corridor

1m Contour
5m Contour

Quarry Features
- Extraction Boundary
- Office, Crib Room and Toilets
- Weighbridge
- Workshop Shed (20 x 12m)
- Haul Road (Final)
- Hardstand & Carpark
- Bund

Water Management Features
- Existing Site Dam
- Poposed Sediment Dam
- Creek/Main Drainage Line
- Drainage Line
- Culvert
- Catch Drain
- Clean Water Flow

Final Landuse
- Pine Plantation

Final Contours
- 1m Contour (Final)
- 5m Contour (Final)

6 Rehabilitation Objectives and Rehabilitation Completion Criteria

6.1 REHABILITATION OBJECTIVES AND REHABILITATION COMPLETION CRITERIA

Rehabilitation Objective Category	Proposed Rehabilitation Objectives	Indicator	Proposed Completion Criteria	Validation Method, Monitoring or Record
Retention of infrastructure	All infrastructure that is to remain as part of the final land use is safe and does not pose any hazard to the community.	Tracks suitable for private access or pedestrian usage.	Slopes of major tracks <10° or have cross drains/banks installed. Where unsuitable soils are present, tracks to be stabilised with gravel or similar	Survey on completion by registered surveyor.
		Infrastructure is in a condition (e.g. structural, other hazards) that is suitable for the intended final land use.	Formal acceptance from the subsequent landowner that infrastructure is in a condition that is suitable for the intended final land use in accordance with formal agreement.	Formal acceptance from landowner.
Surface Water	Runoff water quality from quarry site is similar to, or better than the pre-disturbance runoff water quality.	Water Quality meets the objective of Section 120 of the Protection of the Environment Operations Act 1997. In particular, 'downstream' water quality monitoring will record total suspended solids <50mg/L or within 30% of 'upstream' levels (which is the greater).	Downstream water to be monitored for TSS and comply with required criteria.	Water quality monitoring reports.
Water Approvals	Structures that take or divert water such as final voids, dams, levees etc. are appropriately licensed (e.g. under the Water Management Act 2000) and where required ensure sufficient licence shares are held in the water source(s) to account for water take.	Final landform considers advice from relevant Government Agency whether sufficient licence shares are available in the water source to account for water stored in voids and dams in the proposed final landform	Water approvals / licences are granted by relevant NSW Government Agency.	Confirmation from relevant Government Agency that relevant water approvals / licences are able to be granted.
Removal of Infrastructure	All infrastructure that is not to be used as part of the final land use is removed to ensure the site is safe and free of hazardous materials.	Removal of all services (power, water, communications) that have been connected on the site as part of the operation.	All utility infrastructure removed.	Statement provided, utility service disconnection record / notification.
		Removal of all plant, equipment and associated infrastructure including processing facilities, stockpile areas, loading facilities, office complex, portable offices, exploration core samples, camp facilities, storage racks, samples.	Infrastructure removed.	As-constructed final landform plan, photos, decommissioning reports etc
		Removal of all water management infrastructure (including pumps, pipes and power).	Infrastructure removed.	Statement provided and before/after photos.
Land Contamination	There is no residual soil contamination on site that is incompatible with the final land use or that poses a threat of environmental harm.	Waste material and/or visible contamination areas on site surface.	There are no visible signs of contamination following the removal of plant, equipment and materials. All rubbish/ waste materials removed from site.	Statement provided and before/after photos.
		If residual contamination is suspected, soil testing for contaminants of concern as listed by Health Investigation Level of the National Environment Protection (Assessment of Site Contamination) Measure (1999) applicable to land use type.	Contamination will be appropriately remediated so that appropriate guidelines for land use are met, e.g. Health Investigation Level of the National Environment Protection (Assessment of Site Contamination) Measure (1999). Excess sludge/material has been removed from surface water dams.	Contamination Remediation Report prepared by Land Contamination Consultant Site Contamination Audit Report and Site Audit Statement prepared by EPA Accredited Auditor (where required).

Rehabilitation Objective Category	Proposed Rehabilitation Objectives	Indicator	Proposed Completion Criteria	Validation Method, Monitoring or Record
Landform Stability	The final landform is stable for the long-term and does not present a risk of environmental harm downstream/downslope of the site or a safety risk to the public/stock/native fauna. Landform that is commensurate with surrounding natural landform and where appropriate, incorporates geomorphic design principles.	Visual - indicators of erosion and land instability. Visual - indicators that surface water management structure are functioning as designed. Measured - survey of rehabilitated landform to verify final landform construction in accordance with Final Landform and Rehabilitation Plan. Measured – survey/monitoring of rehabilitated landform to specifically monitor settlement (Subsidence) and/or material loss via erosion.	Visual- minimal erosion that would not require moderate to significant ongoing management and maintenance works. Visual – no signs of land instability such as mass movement. Visual - no areas of active gully erosion. Visual - no evidence of tunnel erosion. Visual – no evidence of active scour likely to compromise surface water management structure. Survey verifies final landform complies with final landform construction in accordance with Final Landform and Rehabilitation Plan. Survey verifies that settlement (subsidence) and/or material loss is within predicted limits and will not compromise final landform drainage via differential settlement. Total projected foliage cover is greater than or equal to 70% (Blue Book C -factor equivalent of 0.05)	Before and after photos, rehabilitation monitoring reports, as-constructed surveys, erosion surveys, and independent geotechnical reports (where required) that indicate long-term stability of rehabilitated landform. Stability will continue to be evaluated over 5 years.
			Significant surface water management structures (e.g. spillways, drop structures, major drains and creek diversions) have been constructed in accordance with Managing Urban Stormwater ‘Blue Book’ DECC 2008 requirements.	An engineering assessment undertaken by a suitably qualified person concludes that significant surface water management structures (e.g. spillways, drop structures, and major drains) have been constructed in accordance with Managing Urban Stormwater ‘Blue Book’ DECC 2008 requirements.
			High risk landforms (such as steep slopes, high walls) have been constructed in accordance with geotechnical design.	An engineering assessment undertaken by a suitably qualified person concludes that high risk landforms (such as steep slopes, high walls) have been constructed in accordance with geotechnical design.
Bushfire	The risk of bushfire and impacts to the community, environment and infrastructure has been addressed as part of rehabilitation.	Appropriate bushfire hazard controls (where required) have been implemented on the advice from the NSW Rural Fire Service.	Bushfire controls implemented.	Statement provided and before/after photos.
Agricultural Revegetation	The vegetation composition of the rehabilitation is recognisable as the target vegetation community (agricultural-grazing)	Routine Soil Test (bulked soil samples 0-10 cm) Includes: Total Carbon (TC), Total Nitrogen (TN), Organic Matter, TC/TN Ratio; Bray I and II Phosphorus; Colwell Phosphorus; Available cations (Calcium, Magnesium, Potassium, Ammonium, Nitrate, Phosphate, Sulphur); Available Micronutrients (Zinc, Manganese, Iron, Copper,	Land and Soil Capability classification or Agricultural Land Classification criteria met. The re-established topsoil / subsoil substrate is capable of supporting the targeted pasture / pine plantation regime on a sustained basis.	Rehabilitation monitoring reports, independent soil reports, environmental monitoring records, independent agronomist reports. Achievement of criteria to be evaluated over a period of 5 years.

Rehabilitation Objective Category	Proposed Rehabilitation Objectives	Indicator	Proposed Completion Criteria	Validation Method, Monitoring or Record
		Boron, Silicon); Exchangeable (Sodium, Potassium, Calcium, Magnesium, Hydrogen, Aluminium, Cation Exchange Capacity); pH and EC (1:5 water); Basic Colour, Basic Texture.	Pasture establishment is consistent with the range of species utilised within the region. Pasture establishment is in good health and provides adequate cover. Visual- presence of trees confirmed.	
		No further active weed control required beyond that considered necessary at analogue sites.	Monitoring confirms the non-target species (weeds) represent less than 10% of projected foliage cover or equivalent to surrounding vegetation not disturbed by mining activities.	

7 Impacts and Mitigation

7.1 TOPOGRAPHY AND GEOTECHNICAL STABILITY

7.1.1 Topography and Geotechnical Stability Impacts

The elevation of the land within the project area ranges from 1057 to 1062 m AHD along the access road with quarrying occurring between 1083 and 1055 m AHD. Out of pit bunding and emplacement is likely to extend down to approximately 1053 m AHD. Dams are proposed at 1049 m AHD and 1058m AHD. The office and workshop area is at approximately 1062 m AHD. The existing topography and drainage are illustrated within *Figure Five.* The final quarry topography and drainage is shown in *Figure Fourteen* and will be commensurate with the surrounding land.

Geotechnical risks related from ground movement include such hazards as subsidence, landslips, toppling, settlement, heave, slumping and fracturing are minimal. No underground activities are undertaken on the site and there is no history of underground working the risk of subsidence is considered negligible. The site is located in the 'Turonfels- Erosional' landscape which are described in the Environment NSW eSpade online data (https://www.environment.nsw.gov.au/eSpade2WebApp#) as having a low mass movement hazard.

The risk of dewatering or heave is also considered negligible given the site will not intersect groundwater nor are there any underground workings on the site. The weathered conglomerate and sandstone are not prone to swelling when wet, the prime cause of heaving. The strata do not contribute chemical leachates harmful to rehabilitation or environment.

7.1.2 Topography and Geotechnical Stability Mitigation

Material will be won by dozer ripping and excavator working in an east to west direction over two benches maintaining a batter between the quarry operations and the dwelling to the west. Active faces will generally be no greater than 2 horizontal: 1 vertical. Batter slopes will be generally no greater than 3 horizontal to 1 Vertical. These slopes are expected to be stable during extraction operations and within the final landform. No stockpiles will be stored on unstable slopes. Clean water diversions upslope will minimise the risk of water infiltration into the batter slopes.

The final landform will be a vegetated, stable, free draining bowl with the Dams 1 and 2 being retained (see *Figure Fourteen*). This will be compatible with surrounding landuses of forestry and agriculture.

7.2 LAND CAPABILITY

7.2.1 Impact of Final Landform on Land Capability

Table 9. Land Capability Assessment of Final Landform

Aspect	Details	Land Capability Classification
Water Erosion Hazard	The quarry slopes within the rehabilitated landform will approximate 20 to 33% on the batters with the floor approximating 5%-10%. (The site is assumed to lie in the Eastern and Central Division)	Class 6 on quarry batters Class 3 on the pit floor
Wind Erosion Hazard	Soil texture is considered to most closely resemble a fine sandy loam with 6-13% clay, therefore the Wind erodibility class of surface soil is 'moderate' (Table 5 of LSCAS). Annual average rainfall is around 800mm per annum and the site lies within a Moderate Wind Erosive Power area (Figure 6 of LSCAS). The exposure to wind will be moderate due to the protection of the depression of the remaining void.	Class 3
Soil Structure Decline Hazard	Topsoils stripped during land clearing will be emplaced on the final landform. There is expected to be an increase in coarseness of the material as subsoils and overburden may have some degree of mixing in the topsoil material.	Class 4
Soil Acidification Hazard	The soils most closely resemble Red Earth/Yellow Earths/chocolates soils (Table 9 of LSCAS). These soils have a medium buffering capacity. Annual average rainfall is around 800mm per annum. The acidification risk is not expected to change in the final landform.	Class 3
Salinity Hazard	Recharge potential is considered low due to the ridgeline setting. Discharge potential is considered low as the site is well above the groundwater table. The salt store is considered Low.	Class 1
Water Logging Hazard	The soils rapidly drain and are moderately well drained	Class 2
Shallow Soil and Rockiness Hazard	The rehabilitated landform will not contain any rocky outcrops as the landform will be battered with overburden material and then topsoiled (Table 15 of LSCAS).	Class 1
Mass Movement Hazard	No mass movement of soil will be expected due to the minimum batters of 3H:1V to 4H:1V.	Class 1
Final LCS Class		**Class 6**

The Land and Soil Capability class in the rehabilitated landform is expected to drop from LCS class 4 to Class 6 on the quarry final batters, primarily due to the increase in batter slopes within the final void. The pit floor will remain as Class 4 land. Class 6 land is described as:

> *'**Low capability land:** Land has very high limitations for high-impact land uses. Land use restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation.'*

This land capability is suited to the proposed uses of low-level grazing and forestry.

7.2.2 Mitigation Measures for Land Capability of Final Landform

No mitigation measures are proposed for the final landform as the land will be suitable for low level grazing and forestry.

7.3 SOILS AND EROSION

7.3.1 Soil Impacts

Impacts of soil erosion comprise two components, loss of soil from the site and entrainment of sediment to the downstream environment. Loss of soil from the site has a localised impact, predominately to the maintenance of vegetation and agricultural productivity over the affected area. Erosion that results in the entrainment of sediment may potentially impact the downstream environment if released.

7.3.2 Soil Mitigation

7.3.2.1 Topsoil Stripping and Storage

Prior to topsoil stripping all water management features will be constructed which include earth banks (Stormwater Collection Drains) to divert as much clean water as possible and capture the dirty water within the proposed quarry sump. Prior to stripping the vegetation should be sprayed for weeds to assist in reducing the weed content in topsoil that may be transferred to new rehabilitation areas.

When a new area is required to be extracted, topsoil will be stripped and where possible emplaced on previously ripped completed faces.

Stripping should not occur in either excessively dry or wet conditions. Grading or pushing soil into windrows with graders or dozers for loading into rear dump trucks by front-end loaders are examples of preferential less aggressive soil handling systems. This minimises compression effects of the heavy equipment that is often necessary for economical transport of soil material.

Where immediate reuse of the topsoil is not possible it will be stored appropriately on the perimeter of the site. That is, stockpiles of topsoil to be located at least five metres from areas of likely concentrated or high velocity flows, especially drainage lines and access roads. The surface of soil stockpiles should be left in as coarsely structured a condition as possible in order to promote infiltration and minimise erosion until vegetation is established, and to prevent anaerobic zones forming.

Topsoil stockpiles are not to exceed 2m in height with a minimum crest width of 2m and are to be seeded with a temporary vegetation cover if stockpiles are to remain longer than 12 months. If necessary, earth banks or drains will be constructed to divert localised surface water run-off.

Topsoil to a depth of 10 to 15cm will be stripped first with the subsoils, if found, to a depth of a further 20 to 30cm stripped and stored separately. The actual depth of stripping of each layer will be recorded and a total volume of topsoil and subsoils estimated and an inventory kept. Each stockpile location will be mapped. Barrier fencing will be installed to limit access to rehabilitated areas or the stockpiles. Management practices will be carried out to minimise areas being affected by wind and water erosion.

7.3.2.2 Topsoil Quality

Topsoil will be sampled and analysed prior to respreading to determine if amelioration measures are required such as lime, fertilisers or other nutrients to make the soil suitable for the species to be planted.

7.3.2.3 Topsoil Re-Spreading

Prior to re-spreading stockpiled topsoil onto reshaped overburden, an assessment of weed infestation on stockpiles should be undertaken to determine if individual stockpiles require herbicide application and / or "scalping" of weed species prior to topsoil spreading.

Where topsoil resources allow, topsoil should be spread to a nominal depth of 100 mm on all re-graded subsoils. Subsoils will be emplaced first over the battered overburden material used to create the final landform. The depth of subsoils should aim to replicate that of the original soil profile.

Topsoil should be spread, treated with fertiliser and seeded in one consecutive operation, to reduce the potential for topsoil loss to wind and water erosion.

7.3.2.4 Seedbed Preparation

Thorough seedbed preparation should be undertaken to ensure optimum establishment and growth of vegetation. All areas to be topsoiled should be lightly contour ripped to create a "key" between the soil and the spoil. Ripping should be undertaken on the contour. Best results will be obtained by ripping when soil is moist and when undertaken immediately prior to sowing. The respread topsoil surface should be scarified prior to, or during seeding, to reduce run-off and increase infiltration. This can be undertaken by contour tilling with a fine-tyned plough or disc harrow.

7.3.2.5 Topsoil Balance

The topsoil resource has been estimated for the site using site survey prior to quarry commencement (see *Table 10*). Site observations, during the Resources Assessment by VGT, indicates topsoil/subsoil ranges in thickness from 20 centimetres on the ridge to 50 centimetres on the flanks Actual topsoil volumes won will be recorded and a topsoil balance will be developed and maintained. This will permit identification of any topsoil deficits in attaining the final landform rehabilitation. Overburden or VENM material may be suitable to assist in making up any shortfall of soils. Options to improve the quality and quantity of topsoil is the addition of mulch or composted organics to 'create' topsoil. These options will be investigated further as required during the life of the quarry.

Table 10. Estimated Topsoil and Subsoil Volumes

Soil Description	Estimated Stripping depth (m)	Area (m^2)	Volume Estimates (m^3)
Overburden Bund Area	0.20	20,600	4,120
Stage 1 Topsoil	0.20	17,000	3,400
Stage 2 Topsoil	0.20	58,700	11,700
Stage 3 Topsoil	0.20	112,000	22,400
Total Estimated Topsoil Available			**41,620**
Subsoil from Stage 1	0.30	17,000	5,100
Subsoil from Stage 2	0.30	58,700	17,600
Subsoil from Stage 3	0.30	112,000	33,600
Total Estimated Subsoil Available			**56,300**

7.3.2.6 Overburden

Estimates of overburden volumes to be generated, as calculated in the VGT Resource Review, are as follows:

Table 11. Estimated Overburden

Item	Thickness (metres)	Area (metres^2)	Volume (metres^3)
Stage One			
Overburden	0.5	17,000	8,500
Bund Wall Construction	Length 142 metres	27	3,830
Stage One Overburden Surplus / Deficit			4,670
Stage Two			
Overburden	0.5	58,600	29,300
Stage One and Two Overburden Surplus / Deficit			34,000
Stage Three			
Overburden	0.5	113,000	56,400
Stage One, Two and Three Overburden Surplus / Deficit			90,400

Overburden won, and not required to construct the acoustic and visual bundwall, will be used to batter final slopes, or if not used immediately, will be temporarily stored on the pit floor.

7.3.2.7 Erosion Control

Generally, the site is prone to moderate erosion, but this will be limited to the exposed worked areas of the quarry. Eroded soils and sediment are captured within the quarry sump and do not leave the site. Slopes are kept moderate where possible in the pit to reduce the erosion hazard.

7.3.2.7.1 General Instructions

The control of erosion and sedimentation at the site will focus on source reduction measures. In general, these measures will include:

- Reading any Surface Water Management Plan with any engineering plans and any other plans or written instructions issued in relation to development at the subject site;
- Ensuring contractors undertake all soil and water management works as instructed in this specification and constructed following the guidelines stated in the "Blue Book"; and
- Inform all subcontractors of their responsibilities in minimising the potential for soil erosion and pollution to downslope areas.

7.3.2.7.2 Works Sequence

All works are to be undertaken in the following sequence:

- Topsoil in new areas will be surveyed, mapped and the texture, thickness and quality described prior to stripping. Topsoil and overburden not for immediate use will be stockpiled in appropriate areas and limited to 2 metres in height and revegetated with temporary ground cover species, mulching or chemical stabilisers or binders if they are to remain in place for more than 30 days. A minimum of 70 percent cover is required for both mulch and vegetative covers;

- Construct earth banks (Stormwater Collection Drains) to divert as much clean water as possible and capture the dirty water in the extraction area;
- Undertake extraction activities in the new area;
- Rehabilitate lands in exhausted areas with overburden then topsoil and revegetate;
- Install barrier fencing to limit access to rehabilitated areas; and
- Ensure management practices are carried out to minimise areas being affected by wind and water erosion.

7.3.2.7.3 Access Limitations

The soil erosion hazard on the site will be kept as low as practicable by minimising disturbance. Limiting access to certain areas of the operation during various stages is one way of reducing the erosion hazard and are outlined in *Table 12.*

Table 12. Limitations to Access

Landuse	Access Limitations	Comments
Extraction	• Land disturbances beyond five (preferably two) metres from the edge of the operations are prohibited. • Extraction will take place within a defined work area and materials will be transported only within the site for stockpiling or rehabilitation. • Entry to land not involved directly in the extraction process will be prohibited and will be managed as natural grassland.	All site workers should clearly recognise these areas and they should be clearly marked — suitable materials include barrier mesh, sediment fencing, etc. The project manager will determine their actual location on site. They can vary in position to conserve existing vegetation best while being considerate of the needs of efficient works activities.
Access Roads	• Roads and tracks are limited to a width that are the minimum necessary to allow safe operation of heavy equipment. • Limit vehicular access to the site to that essential for extraction or rehabilitation work.	
Remaining Lands	Land disturbances are prohibited except for essential management works.	

7.3.2.7.4 Soil Stabilisation

Soil stabilisation is primarily achieved through the rehabilitation of exposed areas. Here, rehabilitation means achieving a C-factor (Revised Universal Soil Loss Equation) of less than 0.1 (equivalent of 60% groundcover) and the program that ensures it will drop permanently, by reducing the risk of erosion by vegetation, paving, armouring, etc. as soon as practicable after activities cease.

NOTE: The cover factor, C, is the ratio of soil loss from land under specified crop or mulch conditions to the corresponding loss from continuously tilled, bare soil. A C-factor of 1.0 corresponds to that of bare soil.

While C-factors are likely to rise to 1.0 during the life of the mine, they should not exceed those given in *Table 13* within the specified times.

Table 13. Maximum acceptable C-factors at nominated times during life of mine

Lands	Maximum C-Factor	Remarks
Waterways and other areas subjected to concentrated flows, post construction.	0.05 (70% groundcover)	Applies after ten working days from completion of formation and before they are allowed to carry any concentrated flows. Flows are limited to those indicated in "Blue Book". Foot and vehicular traffic are prohibited in these areas.
Topsoil/ Subsoil/Overburden Stockpiles stored out of the pit	0.1 (60% groundcover)	Applies after ten working days from completion of formation.
All other lands outside of the extraction area	0.15 (50% groundcover)	Applies after 20 working days of inactivity, even though works might continue later.

Note: *working days* does not include public holidays, weekends or days when work is not possible due to wet weather.

The required C factors can be achieved in the short term (temporary protection for up to six months) with such techniques as:

- a suitable soil binder in areas of sheet flow, e.g. topsoil stockpiles; or
- anionic bitumen emulsion sprayed over hessian cloth (at 0.5 L/m2) in areas of concentrated flow, e.g. diversion banks and waterways; or
- a temporary vegetative cover.

Application of any soil binders employed should follow the manufacturer's instructions.

A suggested listing of suitable plant species is shown in *Table 14*. Before sowing, additional tests should be undertaken to assess the requirements of ameliorants such as lime to help plant growth.

Table 14. Plant Species for Temporary Cover

Sowing Season	Seed Mix
Autumn/Winter	Oats @ 40kg/Ha Japanese Millet @ 10kg/Ha
Spring/Summer	Oats @ 20kg/Ha Japanese Millet @ 20kg/Ha

While ever the C-factor is higher than 0.1, maintain the lands in a condition that resists removal by wind. This can be achieved by keeping the soil moist (not wet) by sprinkling with water or where practicable, leaving the surface in a cloddy state.

Notwithstanding the above, schedule works so that the duration from the conclusion of land shaping to completion of final stabilisation is less than:

- 10 days on slopes steeper than 30 per cent
- 20 days on slopes less steep than 30 per cent.

Lands planted recently with grass species will be watered regularly until an effective cover has properly established and plants are growing vigorously. Follow-up seed and fertiliser will be applied as necessary in areas of minor soil erosion and/or inadequate vegetative protection.

All waterways, drains, spillways and outlets will be constructed to be stable in accordance with the "Blue Book" for soils with high erodibilities.

7.3.2.8 Cumulative Impacts

The downstream environment is not affected at present by any other extractive industry or land disturbing activity other than agriculture or forestry. As the operations, utilising the above management procedures, will release negligible volumes of sediment off-site, the operations are expected to have a similar impact on the downstream environment as is currently experienced due to agricultural activities. That is, the cumulative impacts due to potential erosion of soils resulting in sediment entering the downstream environment are considered negligible.

7.4 GEOCHEMICAL CONSTRAINTS

7.4.1 Geochemical Impacts

The site geochemistry provides a minor risk of pH levels below optimum levels for rehabilitation. The risk of acid mine drainage is considered to be negligible. There is almost negligible risk of spontaneous combustion due to the absence of carbonaceous material at the site.

The geochemistry is not expected to present any difficulties with regard to overburden and topsoil management. The soils are somewhat dispersive and will be stored appropriately to minimise erosion if they cannot be immediately utilised.

The site is located in the 'Turonfels- Erosional' landscape (Environment NSW eSpade online data (https://www.environment.nsw.gov.au/eSpade2WebApp#)). These landscapes are described as having a low risk that salinity issues will occur. The soils are described as having low fertility and a known nutrient deficiencies for Nitrogen and Phosphorus.

There will be no tailings generated from the extraction process. Any weathered gravel or sandstone material exposed in the active faces of the quarry are considered chemically stable and do not constitute a risk to the environment during extraction or rehabilitation. Topsoil and overburden will be managed appropriately as described in *Section 7.3*

Soil chemistry will be investigated prior to revegetation to determine if ameliorants are required.

7.4.2 Geochemical Mitigation Measures

As described in *Section 3.2* and *Section 7.4.1* the soils on the site are slightly acidic and low to moderately saline. Appropriate amelioration measures may include liming and fertilising of the topsoil and any subsoils during rehabilitation activities.

Soil chemistry will in any case, be investigated prior to revegetation to determine if ameliorants are required and the appropriate application rates.

7.4.3 Cumulative Impacts

The proposal is not expected to contribute any cumulative impacts to the geochemistry that cannot be managed by soil amelioration measures.

7.5 FLORA AND FAUNA

7.5.1 Impacts to Flora and Fauna

The Biodiversity Assessment made the following determinations:

*'**Direct Impacts***

The ecological field assessment found that the proposal will remove up to:

- *24 ha of Pine Plantation/Disturbed Grassland, and*

0.25 ha of PCT 1191: Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes, South Eastern Highlands Bioregion (Low Condition)

Flora

No threatened flora was detected during field surveys.

Fauna

Up to seven (7) hollow bearing trees were recorded within the subject site and may be removed for the proposed development. The proposal will also remove multiple wombat burrows observed within the subject site during the field survey.

Indirect Impacts

The proposal may result in the following indirect impacts associated with the construction and operation of the quarry:

- *Introduction and dispersal of exotic flora species from machinery.*
- *Potential for increased sediment flows in the event insufficient erosion and sediment control are installed throughout the duration of construction of the proposed development.'*

7.5.2 Mitigation of Impacts to Flora and Fauna

Clearing of vegetation in terms of sediment and erosion control is discussed in Section 7.3.2 and control of exotic flora species are discussed in Section 7.7.

Recommendations for mitigation measures from the Biodiversity Assessment specific to flora and fauna are reproduced below.

7.5.2.1 General Mitigation Measures for the Construction Phase

- All contractors will be specifically advised of the designated work area. The following activities are not to occur outside of designated work areas to minimise environmental impacts:
    - Storage and mixing of materials;
    - Liquid disposal;
    - Machinery repairs and/or refuelling;
    - Combustion of any material; and
    - Any filling or excavation including trenching, topsoil skimming and/or surface excavation.
- All construction vehicles/machinery are to use the designated access from main roads;
- Vehicle and machinery speeds will be limited to reduce the potential of fauna strike and to reduce dust generation;
- Plant and machinery will be cleaned of any foreign soil and seed prior to being transported to the subject site to prevent the potential spread of weeds and Phytophthora cinnamomic;

- If machinery is transported from an area of confirmed infection of Phytophthora cinnamomi to the subject site, stringent wash down must be completed before leaving the area, removing all soil and vegetative material from cabins, trays, and under carriages;
- All liquids (fuel, oil, cleaning agents, etc.) will be stored appropriately and disposed of at suitably licensed facilities. Spill management procedures will be implemented as required;
- Ensure the extent of clearing is clearly marked in the field prior to the commencement of vegetation clearing; and
- Ensure that only the minimum vegetation clearing required is undertaken.

7.5.2.2 Pre-clearance Survey

The proponent is to engage a suitably qualified ecologist to undertake pre-clearance surveys prior to any vegetation clearing works occurring on site.

- Prior to the commencement of any vegetation removal, a preclearance survey will be conducted by the Project Ecologist to identify significant habitat features, which include but are not limited to:
    - Tree hollows;
    - Nests;
    - Arboreal termite terraria; and
    - Any areas observed to be currently utilised by BC Act or EPBC Act listed threatened fauna.
- During the pre-clearance survey, any significant habitat features or trees that are known to have resident fauna present and all hollow-bearing trees will be:
    - Marked around the trunk of the tree at approximately 1.5 metres high with a ‘H’ marked several sides of the trunk using fluorescent spray marking paint; and/ or
    - Marked with highly visible flagging tape.
- Prior to any earth works within the subject site, it is recommended that an exclusion management procedure be created by a suitably experienced ecologist to exclude the Common Wombats (Vombatus ursinus) that currently live within the proposed development footprint. Tasks within this plan should include;
    - A survey over the entirety of the subject site to detect all burrows;
    - Observations of current or recent usage (i.e., presence of recent scats, recent diggings);
    - A nocturnal survey event to ensure wombats enter/leave the burrows;
    - If wombats are seen exiting the burrows, large rubber mats should be placed over the burrows hindering the wombats from entering again. The rubber mats will also allow any wombats remaining within the burrows to escape. This survey should be conducted within the days leading up to earthworks to ensure the integrity of the rubber mats; and
    - A qualified ecologist be present and supervise the removal/digging of the burrows by suitable machinery such as an excavator.

7.5.2.3 Hollow Bearing Tree Felling and Removal

- Tree removal is to be strictly limited to the extent of vegetation approved for removal under the relevant consent;
- Where generated, mulch/tub grindings generated from the removal of vegetation on the subject site is to be reused on the subject site;
- Felled trees must be stockpiled and processed within marked clearing boundaries;
- All removal of hollow-bearing trees or significant habitat features is to be supervised by the Project Ecologist;

- Hollow bearing trees or trees containing significant habitat features are to be knocked with an excavator bucket followed by a waiting and observation period to alert any resident fauna that have not moved on from the tree and to encourage the fauna to vacate;
- All trees are to be slowly lowered (soft felled) where possible - machinery will ease the tree down to ground level by controlling the speed at which the tree descends to the ground, this will reduce impact to tree hollows and any potential fauna that may still be present during the removal process. Alternatively, trees may be sectionally dismantled or a similar technique that involves slowly lowering potential habitat (hollow limbs, termitaria) to the ground;
- Following felling and when safe, the supervising Project Ecologist shall inspect the tree and hollows for displaced fauna;
- The Project Ecologist is to confirm and record the number and size class of 'potential' hollows previously identified during pre-clearance surveys;
    - In the case of any displaced fauna, Project Ecologist is to contact local wildlife carer;
    - Trees must be left in situ for a minimum of one night before being removed, mulched or stockpiled, to allow any displaced fauna not observed during the post felling inspection to safely escape under the cover of darkness;
    - Felled trees must be stockpiled and processed within marked clearing boundaries; and
    - Tree hollows are to be salvaged and stockpiled for reuse as fauna habitat wherever possible.

7.5.3 Revegetation

7.5.3.1 Planting Methods

After the surface is stabilised and topsoiled, direct seeding/spreading of pre-treated seed grass species endemic to the area will be undertaken. Prior to planting, the area will be ripped along the contours of the slope. The revegetated area will be watered regularly, if required, for the first six months after planting to assist in the establishment of the grassland.

If possible, sowing should be undertaken during Spring or Autumn as favourable conditions for germination and establishment of vegetation exist.

Trials may be conducted as rehabilitation areas progress to assess which species and planting methods prove to be the most successful.

7.5.3.2 Species Mix

The site is located in what is considered to be the Central Tablelands area of NSW within a high rainfall zone (>750mm per annum). The Department of Primary Industries (DPI) recommended the following species and sowing rates for long-term pasture.

Table 15. Recommended Species for Long-Term Pasture in the Central Tablelands (High Rainfall)

Species	Sowing Rate
Phalaris	2 kg/ha
Tall Fescue	4 - 5 kg/ha
Perennial Ryegrass	1 - 2 kg/ha
Sub Clover	4 kg/ha
White Clover	0.5 - 1 kg/ha

7.6 LAND CONTAMINATION

7.6.1 Land Contamination Impacts

Potential contaminants such as hydrocarbons, herbicides and pesticides are likely to be used during site operations and may impact the land and surface water on the site. There is no other history of potential contaminated land as discussed in Section 3.7.

7.6.2 Land Contamination Mitigation

- Weed and Pest control is undertaken by licenced contractors. Chemicals are not stored on site and only minor amounts are used.
- No Fuel is stored permanently on site. Refuelling is conducted off site or within the pit floor by transportable fuel tanks. Contractors carry spill kits at all times.
- No oils/solvents or lubricants are stored in site. All vehicle and machine maintenance is conducted in off site. Contractors carry spill kits at all times.

7.6.3 Cumulative Impacts

Use of fuels and herbicides and pesticides are typical in rural areas but there will be minimal volumes held on site. It is unlikely that the site operations will contribute to any significant cumulative impacts.

7.7 WEEDS AND PESTS

Weed and pest inspections and control will be undertaken on a regular basis. Weed control will be undertaken by licenced contractors and reports supplied to the Proponent describing weed identification, numbers and control measures.

7.8 WASTE

The quarrying operations will not directly produce domestic or industrial waste. Domestic wastes will be placed in bins and removed by licenced contractors to a licenced waste facility. Effluent will be collected direct from an on-site port-a-loo and disposed of at an EPA licenced facility.

7.9 BUSHFIRE

The risk of bushfire is low within the disturbed area due to lack of fuel. However, equipment use may be an ignition source. Mitigation measures include:

- Refuelling to be undertaken in hardstand areas.
- Fire extinguishers to be carried by plant and equipment.

Emergency procedures for the site will be developed.

7.10 SURFACE WATER

Surface water impacts are generally mitigated by ensuring sediment and erosion controls are installed prior to disturbance which are described in *Section 7.3*.

Surface water management also is discussed in more detail in the Surface Water Assessment within the EIS.

7.11 COMPATIBILITY WITH OTHER LAND USERS

The majority of the Subject Land is used for pine plantations. Surrounding land are primarily larger agricultural holdings practising mixed grazing, along with a scattering of pine plantations and other uses. The operation of the quarry is permissible within the RU1- Primary Production zoned land within the Mid-Western Regional Council Local Government Area (LGA) and is compatible with the surrounding rural land uses. Sensitive receptors are generally located at least 1 kilometre from the project site and are not likely to be significantly impacted. The closest residence is located some 250 metres to the west of the site but the Land Use Compatibility Assessment (see the *Land Resources Assessment* within the EIS) has determined that the risk of potential impacts to the surrounding land users can be satisfactorily managed.

The quarry will be progressively rehabilitated to pasture and pine plantation with potential future use of the facilities area for forestry related activities, consistent with surrounding land uses.

7.12 REHABILITATION TRIALS AND RESEARCH

Future rehabilitation research will likely involve selection of suitable species and when final surfaces become available, undertaking trials to determine the best approach to establishing revegetation. The results of any trial will be used to address any knowledge gaps in relation to:

- the development and further refinement of rehabilitation completion criteria and
- the achievement of rehabilitation objectives and rehabilitation completion criteria.

This report will be updated as the development of research, modelling and trials are investigated.

8 Monitoring and Maintenance

The Quarry Manager (or delegate) will undertake at least Quarterly inspections of the site. During these inspections the site condition and environmental controls will be observed and recorded. More specifically, observations and inspections of the implementation measures of the RMP cited in *Section 6* are to be undertaken. Records will include details of any maintenance of controls required and an implementation priority. Site assessments will continue until such time as the completion criteria in *Section 6* have been achieved.

8.1 GENERAL REHABILITATION MONITORING

Rehabilitation progress will be monitored at least annually and includes initiating upgrading or repair as appropriate. Items to be monitored will include, but not limited to:

- Inspection (including photography) for unacceptable visual impacts to sensitive receptors;
- Weed and pest inspections to be undertaken at least annually and engage contractors if required;
- Inspections to determine that the total foliage cover in rehabilitated areas is on a trajectory to be greater than or equal to 70% (Blue Book C -factor equivalent of 0.05);
- Determining if the Land and Soil Capability classification or Agricultural Land Classification criteria are on a trajectory to be met;
- Pasture establishment is consistent with the range of species utilised within the region and in good health;
- Pine Plantation establishment has commenced; and
- Monitoring confirms the non-target species (weeds) represent less than 10% of projected foliage cover (or equivalent to surrounding vegetation not disturbed by mining activities).

Monitoring of the soil erosion, sediment and water quality, to determine if rehabilitated lands have effectively reduced the erosion hazard, is detailed in the Surface Water Assessment and is undertaken at least quarterly and recorded. Items relevant to rehabilitation are reproduced below.

8.2 SURFACE WATER MANAGEMENT MONITORING

8.2.1 Erosion and Sediment Controls

- Topsoil stripping to be visually monitored to check moisture content of soil and depth of stripping;
- Stockpiles to be visually assessed at time of forming to check they do not exceed two metres high;
- Removal of spilled soil or other materials from hazard areas, including lands closer than five metres from areas of likely concentrated or high velocity flows, especially waterways and access roads;
- Barrier fencing will be installed to limit access to rehabilitated areas or the stockpiles.
- Visual inspection of the mine batters and slopes to determine if areas of instability are apparent and undertake works to stabilise the landform as required; and
- Constructing additional erosion and/or sediment control works as might become necessary to ensure the desired water control is achieved.

8.2.2 Surface Water Flows

- Visual check of stability and operation of all banks, ponds, channels and spillways, effecting any necessary repairs;
- Visually check the discharge point to ensure that the discharge does not cause erosion or scouring of the creeks. Effecting any necessary repairs;
- Drains and culverts for both clean water and dirty water will be examined for vegetation cover and blockages and maintenance will be performed to ensure they are working as designed;
- Diversion bund walls will be inspected regularly to assess the integrity and effectiveness. Maintenance will be performed when required;

- Removal of spilled materials from hazard areas, including lands closer than five metres from areas of likely concentrated or high velocity flows, especially waterways and access roads;
- Ensuring that rehabilitated lands have effectively reduced the erosion hazard and initiate upgrading or repair as appropriate; and
- Constructing additional erosion and /or sediment control works as might become necessary to ensure the desired water quality control is achieved

8.2.3 Surface Water quality

Samples, if required, are collected and tested by a NATA Accredited Facility in accordance with the EPL conditions.

Analytes tested and concentration limits will be those listed in the EPA licence and are expected to be as follows:

- pH is to be between 6.5 to 8.5; and
- TSS is <50mg/L; or
- Turbidity <150 µS/cm.

Monitoring of the surface water outside the EPL Licence Points may be undertaken from time to time such as the other sediment dams in and out of the pit.

The results of all monitoring are recorded to the EPA in the Annual Return.

8.2.4 Contaminated Water

- No waste (including sewerage) will be stored on-site unless adequately bunded and stored;
- Regular visual monitoring will be undertaken to ensure no leaks, spills or other sources of contamination have entered the water management system; and
- Should a spill or leak occur, contractors will proceed as per their Spill and Leaks procedures.

8.2.5 Sediment Dam Management and Maintenance

- Level indicators will be installed in dams with relevant marks located on the peg to indicate the amount of sediment load in the dam;
- All sediment basins will be maintained by de-silting when the capacity is diminished;
- Sediment dams and clean water dams will be visually assessed for water quality and volumes on a regular basis or as required after high rainfall events;
- If discharge is required, the visual assessment will be followed by sampling and testing of the water quality prior to discharge to ensure water quality criteria are met;
- The limit of TSS of less than 50mg/L or turbidity less than 150µS/cm in the discharged water will be adopted (unless modified by the EPA);
- Ensuring that rehabilitated lands have effectively reduced the erosion hazard and initiate upgrading or repair as appropriate; and
- Constructing additional erosion and /or sediment control works as might become necessary to ensure the desired water quality control is achieved.

9 Security Bond

A security bond will be calculated for the site using the Rehabilitation Cost Estimate Tool published by the Resources Regulator. This will provide a best practice estimation of the cost of rehabilitation that may be required under any consent conditions that may be imposed.

10 Review and Improvement

10.1 CONTINUOUS IMPROVEMENT

Continuous improvement of this RMP will be achieved through the ongoing evaluation of environmental management performance against environmental policies, objectives and targets.

The continuous improvement process is designed to:

- identify areas of opportunity for improvement of environmental management and performance;
- determine the cause or causes of non-conformances and deficiencies;
- develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies;
- verify the effectiveness of the corrective and preventative actions;
- document any changes in procedures resulting from process improvement; and
- make comparisons with objectives and targets.

10.2 RMP UPDATE AND AMENDMENT

The processes described above may result in the need to update or revise this Plan. The approval of updates or revisions to the RMP will need to be considered in accordance with any consents, leases, licences or direction from relevant authorities.

Notwithstanding the above, the rehabilitation strategy will be reviewed every five years as stipulated in Section 5.3 of the EIS.

10.3 TRAINING

Employees and contractors working on-site will undergo site induction training, which will cover rehabilitation management, including:

- Existence and requirements of this Plan;
- Relevant legislation;
- Access restrictions and disturbance limitations;
- Internal speed limits;
- Biodiversity management measures (see BMP);
- Injured wildlife response procedures; and
- Emergency and spill response procedures.

11 Conclusion

The majority of the Subject Land is used for pine plantations. Surrounding lands are primarily larger agricultural holdings practising mixed grazing, along with a scattering of pine plantations and other uses. The procedures outlined within this report will ensure that progressive rehabilitation will mitigate the impacts to the neighbouring sensitive receptors and environment.

In conclusion the land proposed to be disturbed can be progressively rehabilitated to permit the final land use of grazing and pine plantation consistent with surrounding land uses.

12 References

Ref 1 Borg (2020) *Razorback Quarry Scoping Report*

Ref 2 DECC (2008) Managing Urban Stormwater Soils and Construction V1

Ref 3 DECC (2009) Managing Urban Stormwater Soils and Construction V2E Mines and Quarries

Ref 4 Department of Primary Industries-Pasture Mixes website accessed 24/11/2022 Central Tablelands (nsw.gov.au)

Ref 5 Minter Ellison (2021) *Correspondence- Updated Advice: Razorback Quarry project- BDAR Issues (10/9/2021)*

Ref 6 MJD Environmental (2022) *Biodiversity Assessment- 39 Razorback Road, Running Stream*

Ref 7 VGT Environmental Compliance Solutions Pty Ltd (2020) *Geological Review and Staged Quarry Assessment for Running Stream Quarry.*

Ref 8 Planning, Industry and Environment (2021) *Planning Secretary's Environmental Assessment Requirements*

Appendix A: SEARs

Planning and Assessments
Energy and Resource Assessments

Contact: Joel Herbert
Phone: 8289 6614
Email: Joel.herbert@planning.nsw.gov.au

Mr Mark Daniels
Planning and Development Manager
Borg Manufacturing Pty Ltd

Via email: danielsm@borgs.com.au

Dear Mr Daniels,

Planning Secretary's Environmental Assessment Requirements
Razorback Quarry (EAR 1523)

I refer to your request for the Planning Secretary's Environmental Assessment Requirements (SEARs) for the above development, which is designated local development under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Please find attached a copy of the SEARs for the Environmental Impact Statement (EIS) for the proposed development. These requirements have been prepared in consultation with relevant government agencies based on the information your company has provided to date. The agencies' comments are attached for your information (see Attachment 2). You must have regard to these comments in the preparation of the EIS.

In your request for SEARs, you have also indicated that the proposal is classified as integrated development under section 4.46 of the EP&A Act as it requires additional statutory authorisations. You are encouraged to consult with the relevant agencies with respect to licence/approval requirements. If further integrated approvals are required, you must undertake your own consultation with the relevant public authorities, and address their requirements in the EIS.

The Department wishes to emphasise the importance of effective and genuine community consultation during the preparation of the EIS. This process should provide the community with a clear understanding of the proposal and its potential impacts and include active engagement with the community regarding key issues of concern. The development application (DA) for the proposed development must be accompanied by clear evidence of the consent to the lodgement of the DA of all owners of land directly subject to the DA.

Please contact the consent authority at least two weeks before you propose to submit your DA. This will enable the consent authority to:

- confirm the applicable fees; and
- determine the number of copies (hard-copy and digital) of the EIS that will be required for reviewing purposes.

If your proposal is likely to have a significant impact on matters of National Environmental Significance, it will also require separate approval under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). This approval would be in addition to any approvals required under NSW legislation and it is your responsibility to contact the Commonwealth Department of the Environment and Energy to determine if an approval under the EPBC Act is required (http://www.environment.gov.au or 6274 111).

You should contact the Mine Safety branch of the NSW Resources Regulator in regard to this and other matters relating to compliance with the *Work Health and Safety (Mines and Petroleum* Sites*) Act 2013.*

If you have any enquiries about these requirements, please contact Joel Herbert on the details listed above.

Yours sincerely,

02/03/2021

Matthew Sprott
Director
Resource Assessments
as delegate for the Planning Secretary

Planning Secretary's Environmental Assessment Requirements

Section 4.12(8) of the *Environmental Planning and Assessment Act 1979* and Schedule 2 of the *Environmental Planning and Assessment Regulation 2000.*

Designated Development

EAR Number	EAR 1523
Proposal	Extraction and processing of up to 200,000 tonnes of sand and gravel per annum over a 30 year period from a total resource of 4,000,000 million tonnes.
Location	39 Razorback Road, Running Stream, NSW 2850 (Lot 2 DP 569979)
Applicant	Plantation Pine Products Australia Pty Ltd
Date of Issue	2 March 2021
Date of Expiry	2 March 2023
General Requirements	The Environmental Impact Statement (EIS) for the development must comply with the requirements in Clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000.* In particular, the EIS must include: • an executive summary; • a comprehensive description of the development, including: - a detailed site description and history of any previous quarrying on the site, including a current survey plan; - identification of the resource, including the amount, type, composition; - the layout of the proposed works and components (including any existing infrastructure that would be used for the development); - an assessment of the potential impacts of the development, as well as any cumulative impacts, including the measures that would be used to minimise, manage or offset these impacts; - a detailed rehabilitation plan for the site; - any likely interactions between the development and any existing/approved developments and land uses in the area, paying particular attention to potential land use conflicts with nearby residential development; - a list of any other approvals that must be obtained before the development may commence; - the permissibility of the development, including identification of the land use zoning of the site; - identification of sensitive receivers likely to be affected by the development using clear maps/plans, including key landform areas, such as conservation areas and waterways; • a suitable monitoring and reporting procedure to ensure that the total resource extracted by the development does not exceed 5 million tonnes; • a conclusion justifying why the development should be approved, taking into consideration: - alternatives; - the suitability of the site; - the biophysical, economic and social impacts of the project, having regard to the principles of ecologically sustainable development; and - whether the project is consistent with the objects of the Environmental Planning and Assessment Act 1979; and • a signed declaration from the author of the EIS, certifying that the information contained within the document is neither false nor misleading.
Consultation	In preparing the EIS for the development, you should consult with relevant local, State or Commonwealth Government authorities, infrastructure and service providers and any surrounding landowners that may be impacted by the development. The EIS must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these issues have been addressed in the EIS.
Key Issues	The EIS must assess the potential impacts of the proposal at all stages of the development, including the establishment, operation and decommissioning of the development.

	The EIS must address the following specific issues: • **Water** – including: - a detailed site water balance and an assessment of any volumetric water licensing requirements, including a description of site water demands, water disposal methods (inclusive of volume and frequency of any water discharges), water supply infrastructure and water storage structures; - identification of any licensing requirements or other approvals required under the *Water Act 1912* and/or *Water Management Act 2000*; - demonstration that water for the construction and operation of the development can be obtained from an appropriately authorised and reliable supply in accordance with the operating rules of any relevant Water Sharing Plan (WSP) - a description of the measures proposed to ensure the development can operate in accordance with the requirements of any relevant Water Sharing Plan or water source embargo; - a detailed consideration of the need to maintain an adequate buffer between all excavations and the highest predicted groundwater table; - an assessment of activities that could cause erosion or sedimentation issues, and the proposed measures to prevent or control these impacts; - an assessment of any likely flooding impacts of the development; - an assessment of potential impacts on the quality and quantity of existing surface and ground water resources, including a detailed assessment of proposed water discharge quantities and quality against receiving water quality and flow objectives; and - a detailed description of the proposed water management system, water monitoring program and other measures to mitigate surface and groundwater impacts; • **Noise** – including a quantitative assessment of potential: - construction and operational noise and off-site transport noise impacts of the development in accordance with the *Interim Construction Noise Guideline, NSW Noise Policy for Industry and NSW Road Noise Policy* respectively; - reasonable and feasible mitigation measures to minimise noise emissions; and - monitoring and management measures; • **Air** – including an assessment of the likely air quality impacts of the development in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*. The assessment is to give particular attention to potential dust impacts on any nearby private receivers due to construction activities, the operation of the quarry and/or road haulage; • **Biodiversity** – including: - accurate predictions of any vegetation clearing on site; - a detailed assessment of the potential biodiversity impacts of the development, paying particular attention to threatened species, populations and ecological communities and groundwater dependent ecosystems undertaken in accordance with Sections 7.2 and 7.7 of the *Biodiversity Conservation Act 2016*; and - a detailed description of the proposed measures to maintain or improve the biodiversity values of the site in the medium to long term, as relevant. • **Heritage** – including: - an assessment of the potential impacts on Aboriginal heritage (cultural and archaeological), including evidence of appropriate consultation with relevant Aboriginal communities/parties and documentation of the views of these stakeholders regarding the likely impact of the development on their cultural heritage; and - identification of Historic heritage in the vicinity of the development and an assessment of the likelihood and significance of impacts on heritage items, having regard to the relevant policies and guidelines listed in Attachment 1; • **Traffic &Transport** – including: - accurate predictions of the road traffic generated by the construction and operation of the development, including a description of the types of vehicles likely to be used for transportation of quarry products; - an assessment of potential traffic impacts on the capacity, condition, safety and efficiency of the local and State road networks, detailing the nature of the traffic generated, transport routes, traffic volumes and potential impacts on local and regional roads; - a description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road network (particularly the proposed transport routes) over the life of the development; - evidence of any consultation with relevant roads authorities, regarding the establishment of agreed contributions towards road upgrades or maintenance; and - a description of access roads, specifically in relation to nearby Crown roads and fire trails; • **Land Resources**– including an assessment of: - potential impacts on soils and land capability (including potential erosion and land contamination) and the proposed mitigation, management and remedial measures (as appropriate);

	- potential impacts on landforms (topography), paying particular attention to the long-term geotechnical stability of any new landforms (such as overburden dumps, bunds etc); and - the compatibility of the development with other land uses in the vicinity of the development, in accordance with the requirements of Clause 12 of *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*; • **Waste** – including estimates of the quantity and nature of the waste streams that would be generated or received by the development and any measures that would be implemented to minimise, manage or dispose of these waste streams; • **Hazards** – including an assessment of the likely risks to public safety, paying particular attention to potential bushfire risks and the transport, storage, handling and use of any hazardous or dangerous goods; • **Visual** – including an assessment of the likely visual impacts of the development on private landowners in the vicinity of the development and key vantage points in the public domain, including with respect to any new landforms; • **Social & Economic** – an assessment of the likely social and economic impacts of the development, including consideration of both the significance of the resource and the costs and benefits of the project; and • **Rehabilitation** – including: - a detailed description of the proposed rehabilitation measures that would be undertaken throughout the development and during quarry closure; - a detailed rehabilitation strategy, including justification for the proposed final landform and consideration of the objectives of any relevant strategic land use plans or policies; and - the measures that would be undertaken to ensure sufficient financial resources are available to implement the proposed rehabilitation strategy, recognising that a rehabilitation bond will likely be required as a condition of any future development consent.
Environmental Planning Instruments	The EIS must take into account all relevant State Government environmental planning instruments, guidelines, policies, and plans. While not exhaustive, Attachment 1 contains a list of some of the environmental planning instruments, guidelines, policies and plans that may be relevant to the environmental assessment of this development. During the preparation of the EIS you must also consult the Department's EIS Guideline – Extractive Industries – Quarries. This guideline is available at http://www.planning.nsw.gov.au/~/media/Files/DPE/Guidelines/extractive-industries-quarries-eis-guideline-1996-10.ashx. In addition, the EIS must assess the development against the Mid-Western Regional Local Environmental Plan 2012 and any relevant development control plans/strategies.

ATTACHMENT 1

The following guidelines may assist in the preparation of the Environmental Impact Statement. This list is not exhaustive and not all of these guidelines may be relevant to your proposal.

Many of these documents can be found on the following websites:
http://www.planning.nsw.gov.au
http://www.bookshop.nsw.gov.au
http://www.publications.gov.au

Environmental Planning Instruments, Policies, Guidelines & Plans

Environmental Planning Instruments - General	
	State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007
	State Environmental Planning Policy (State and Regional Development) 2011
	State Environmental Planning Policy (Infrastructure) 2007
	Mid-Western Regional Local Environmental Plan 2012
Risk Assessment	
	AS/NZS 4360:2004 Risk Management (Standards Australia)
	HB 203: 203:2006 Environmental Risk Management – Principles & Process (Standards Australia)
Land	
	State Environmental Planning Policy No. 55 – Remediation of Land
	Agricultural Land Classification (DPI)
	Rural Land Capability Mapping (OEH)
	Soil and Landscape Issues in Environmental Impact Assessment (NOW)
	Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC)
	Guidelines for Consultants Reporting on Contaminated Sites (EPA)
	Agricultural Issues for Extractive Industry Development (DPI)
Water	
Groundwater	NSW Aquifer Interference Policy 2012 (NOW)
	NSW State Groundwater Policy Framework Document (NOW)
	NSW State Groundwater Quality Protection Policy (NOW)
	NSW State Groundwater Quantity Management Policy (NOW)
	Australian Groundwater Modelling Guidelines 2012 (Commonwealth)
	National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC)
	Guidelines for the Assessment & Management of Groundwater Contamination (EPA)
Surface Water	NSW State Rivers and Estuary Policy (NOW)
	NSW Government Water Quality and River Flow Objectives (EPA)
	Using the ANZECC Guideline and Water Quality Objectives in NSW (EPA)
	National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ)
	National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ)
	Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (EPA)
	Managing Urban Stormwater: Soils & Construction (Landcom) and associated Volume 2E: Mines and Quarries (DECC)
	Managing Urban Stormwater: Treatment Techniques (EPA)
	Managing Urban Stormwater: Source Control (EPA)
	Technical Guidelines: Bunding & Spill Management (EPA)
	A Rehabilitation Manual for Australian Streams (LWRRDC and CRCCH)
	NSW Guidelines for Controlled Activities (NOW)
	Guidelines for Controlled Activities on Waterfront Land 2018 (NRAR)
Flooding	Floodplain Development Manual (OEH)
	Floodplain Risk Management Guideline (OEH)
Biodiversity	

	Biodiversity Assessment Method (OEH 2017)
	Guidance and Criteria to assist a decision maker to determine a serious and irreversible impact (OEH 2017)
	Ancillary rules: Biodiversity conservation actions
	Ancillary rules: Reasonable steps to seek like-for-like biodiversity credits for the purpose of applying variation rules
	NSW Guide to Surveying Threatened Plants (OEH 2016)
	Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECC 2009)
	Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DEC 2004)
	Threatened Species Assessment Guideline – The Assessment of Significance (DECC 2007)
	OEH principles for the use of biodiversity offsets in NSW
	NSW State Groundwater Dependent Ecosystem Policy (NOW)
Heritage	
	The Burra Charter (The Australia ICOMOS charter for places of cultural significance)
	Guide to investigation, assessing and reporting on Aboriginal cultural heritage in NSW (OEH) 2011
	Aboriginal Cultural Heritage Consultation Requirements for Proponents (OEH)
	Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (OEH)
	Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (OEH)
	NSW Heritage Manual (OEH)
	Statements of Heritage Impact (OEH)
Noise	
	NSW Noise Policy for Industry (EPA)
	Interim Construction Noise Guideline (EPA)
	NSW Road Noise Policy (EPA)
Air	
	Protection of the Environment Operations (Clean Air) Regulation 2002
	Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA)
	Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (EPA)
	Assessment and Management of Odour from Stationary Sources in NSW (DEC)
	National Greenhouse Accounts Factors (Commonwealth)
Transport	
	Guide to Traffic Generating Development (RTA)
	Road Design Guide (RMS) & relevant Austroads Standards
Hazards	
	State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
	Hazardous and Offensive Development Application Guidelines – Applying SEPP 33
	Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis
	Planning for Bushfire Protection 2019 (RFS)
Resource	
	Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves 2012 (JORC)
Waste	
	Waste Classification Guidelines (EPA)
	Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes 1999 (EPA)
Rehabilitation	
	Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth)
	Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth)
	Strategic Framework for Mine Closure (ANZMEC-MCA)

ATTACHMENT 2

AGENCIES' CORRESPONDENCE

Our ref: DOC21/20631

Mr Joel Herbert
Environmental Assessment Officer
Energy and Resource Assessments
Department of Planning, Industry and Environment
joel.herbert@planning.nsw.gov.au

Dear Mr Herbert

Razorback Quarry – Request for Environmental Assessment Requirements

I refer to your email dated 12 January 2021 seeking input into the Department of Planning, Industry and Environment's Environmental Assessment Requirements (EARs) for the preparation of an Environmental Impact Assessment (EIS) for Razorback Quarry.

The Biodiversity, Conservation and Science Directorate (BCS) has considered your request and provides EARs for the proposed development in **Attachments A** and **B**.

BCS recommends the EIS needs to appropriately address the following:

1. Biodiversity and offsetting
2. Water and soils
3. Flooding

Please note the following;

1. The Biodiversity Assessment Method 2020 came into effect on 22 October 2020. There are transitional arrangements in place to minimise the impacts that amendments to the BAM may have on proponents and landholders. **Attachment A** provides details of the transitional arrangements.

If you have any questions about this advice, please do not hesitate to contact Michelle Howarth, A/Senior Team Leader Planning North West, via michelle.howarth@environment.nsw.gov.au or (02) 6883 5339.

Yours sincerely,

[redacted]

Michelle Howarth
A/Senior Team Leader Planning North West
Biodiversity, Conservation and Science Directorate

15 January 2021

Attachment A - Environmental Assessment Requirements

Attachment B - Guidance Material

BCS's Recommended Environmental Assessment Requirements (EARs) for Razorback Quarry

OEH	Office of Environment and Heritage (now Biodiversity, Conservation and Science Directorate)
BCS	Biodiversity, Conservation and Science Directorate of the NSW Department of Planning, Industry and Environment, formerly OEH
The Department	NSW Department of Planning, Industry and Environment
NPWS	National Parks and Wildlife Service

1. The Proposal

All components of the proposed development must be clearly described, including:

- the location of the proposed development and its context in the locality
- the rationale for the project
- the size, scale and type of the proposed development
- the pre-construction, construction, operational, and, where relevant, decommissioning and rehabilitation phases of the proposed development, and the methods proposed to implement these phases
- plans and maps of the proposed development showing the locations of relevant phases and infrastructure
- the staging and timing of the proposed development
- the proposed development's relationship to any other proposals and developments

2. Environmental Impacts of the Proposal

The proponent must consider, assess, quantify and report on the likely environmental impacts of the proposal if applicable, particularly:

- Biodiversity
- National Park estate: land reserved or acquired under the *National Parks and Wildlife Act 1974*
- Flooding, floodplain issues and coastal erosion
- Cumulative impacts

The Secretary's Environmental Assessment Requirements should address the specific requirements outlined under each heading below and assess impacts in accordance with the relevant guidelines mentioned. A full list of guidelines and reference material is presented in **Attachment B**. Appropriate justification should be provided in instances where the matters below are not addressed.

3. Biodiversity

Biodiversity Assessment Methodology for the Biodiversity Offsets Scheme (BOS)

The EIS should include an assessment of the following:

a. The EIS must assess the impact of the proposed development on biodiversity values to determine if the proposed development is "likely to significantly affect threatened species" for the purposes of Section 7.2 of the Biodiversity Conservation Act 2016 (BC Act), as follows:

   a. The EIS must demonstrate and document how the proposed development exceeds, or does not exceed, the biodiversity offsets scheme threshold as set out in Section 7.4 of the BC Act 2016 and Clause 7.1 of the Biodiversity Conservation Regulation 2017 (BC Regulation) by determining whether the proposed development involves:

      i. **The clearing of native vegetation exceeding the thresholds** listed under Clause 7.23 of the BC Regulation, **or**

      ii. The clearing of native vegetation, or other action, **on land included on the Biodiversity Values Map** published under Clause 7.23 of the BC Regulation (this map includes areas of outstanding biodiversity value, as declared under Section 3.1 of the BC Act).

   b. If the proposal does not trigger any of the criteria in (a) above, then the EIS must determine whether the proposed development is likely to have a significant impact based on '*the test for determining whether proposed development likely to significant affect threatened species or ecological communities'* in Section 7.3 of the BC Act.

   c. Where there is reasonable doubt regarding potential impacts, or where information is not available, then a significant impact upon biodiversity should be considered likely when applying the test in Section 7.3 of the BC Act. Where it is concluded that there is no significant impact, the EIS must justify how the conclusion has been reached.

   d. If the development exceeds the thresholds in (a) or (b), then the EIS must be accompanied by a biodiversity development assessment report (BDAR) prepared in accordance with Part 6 of the BC Act. That is, the Biodiversity Assessment Methodology applies.

Required Information

Where development is considered "likely to significantly impact on threatened species" and a Biodiversity Development Assessment Report is required, the following requirements apply:

- Biodiversity impacts related to the proposal are to be assessed in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the *Biodiversity Conservation Act 2016* (s6.12), Biodiversity Conservation Regulation 2017 (s6.8) and Biodiversity Assessment Method.
- The BDAR must document the application of the avoid, minimise and offset hierarchy including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method.
- The BDAR must include details of the measures proposed to address the offset obligation as follows:
  - The total number and classes of biodiversity credits required to be retired for the proposal.
  - The number and classes of like-for-like biodiversity credits proposed to be retired.
  - The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules.
  - Any proposal to fund a biodiversity conservation action.
  - Any proposal to make a payment to the Biodiversity Conservation Fund.

- If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.

The BDAR must be prepared by a person accredited to apply the Biodiversity Assessment Method under s6.10 of the *Biodiversity Conservation Act 2016*.

Where a BDAR is not required and a threatened species assessment is prepared to support a conclusion of "no significant impact", the EIS must include a field survey of land identified as native vegetation and/or native species habitat inclusive of non-vegetative habitat, namely, karst, caves, crevices, cliffs, rocky outcrops and other features of geological significance and habitat associated with human made structures. This should be conducted and documented in accordance with the relevant guidelines including the Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECCW, 2009), Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - Working Draft (DEC, 2004) and Guidelines for Threatened Species Assessment (Dept Planning, July 2005). The approach should also reference the field survey methods and assessment information on the Department of Planning, Industry and Environment website including the BioNet Atlas, Threatened Species Profiles, taxon specific survey guidelines and BioNet Vegetation Classification (see Attachment 2).

Transitional arrangements for the *Biodiversity Assessment Method 2020*

Clause 6.31 of the *Biodiversity Conservation Regulation 2017* provides that when the BAM is amended, a BAR may be prepared based on the prior version of the BAM for the following designated periods;

- 12 months for a BDAR in respect of SSD/SSI or standard biocertification,
- 12 months or longer if approved by the Minister for a BDAR in respect of strategic biocertification,
- 6 months for BARs in respect of all other development or stewardship applications

A BAR prepared under these arrangements must state that it has been prepared based on the prior version.

This means that from 22 October 2020 until the end of the relevant designated transition period a BAR may be prepared using **either** the BAM 2017 **or** the BAM 2020, but not a combination of both.

If an Accredited Assessor has commenced preparing a BAR in accordance with the BAM 2017, it is recommended that they discuss the transition options with the proponent/landholder. If opting to continue using the BAM2017, the BAR must be prepared within the relevant designated period and must include a statement that it has been prepared based on the BAM 2017. In addition, because BOAMs has been updated to reflect the BAM 2020 settings, an assessor continuing to prepare a BAR under the BAM 2017 should consult the Release Notes (attached) to ensure the correct BAM-C settings are applied.

Where an assessor proposes to apply BAM 2017 to a scattered tree (formerly paddock tree) or small area streamlined assessment, the assessor must contact BAM Support for guidance on how to use the BAM Calculator to apply the transitional arrangements. However, if the applicant or assessor proposes to apply BAM 2017 to a BSSAR, the applicant or assessor must contact the Biodiversity Conservation Trust to discuss use of this option.

4. NPWS Managed Estate

Land reserved or acquired under the *National Parks and Wildlife Act 1974* (NPW Act)

If the proposed development is within, adjacent to, or in close proximity to, NPWS managed conservation estate (e.g. a national park, nature reserve, state conservation area, land which is declared wilderness under the *Wilderness Act 1987*), or is within, adjacent to, or in close proximity to, a watercourse that flows directly into NPWS managed conservation estate, then the EIS must address impacts upon such area/s.

Where NPWS managed estate is likely to be impacted, the EIS should include:

- The following (as appropriate):
  - Evidence that the proponent has consulted with BCS on the legal permissibility of the proposal under the NPW Act.
  - In the case of proposals on land declared as wilderness under the *Wilderness Act 1987*, evidence that the proponent has consulted with BCS on the appropriateness of the proposal. That is, whether it is consistent with the objects of the *Wilderness Act 1987* (section 3) and the management principles for wilderness areas (section 9).
  - Alternative options that have been explored to avoid impacts on the NPWS managed estate (on-park) and a clear justification of any on-park components of the proposal.
  - If on-park impacts are considered unavoidable, consideration of the issues, including details of any compensation proposal, consistent with the Department's *Revocation, Recategorisation and Road Adjustment Policy* (2012) for proposals that are located wholly or partly in a National Park or other land acquired or reserved under the *National Parks and Wildlife Act 1974*.
- Consideration of the matters identified in the *Guidelines for consent and planning authorities for Developments adjacent to National Parks and Wildlife Service Land* (NPWS, 2020) where a proposal adjoins or is immediate vicinity of NPWS managed estate, or is upstream of NPWS managed estate, which include:
  - The nature of the impacts, including direct and indirect impacts
  - The extent of the direct and indirect impacts
  - The duration of the direct and indirect impacts
  - The objectives of the reservation of the land
- A description of the mitigation and management options that will be used to prevent, control, abate or minimise identified direct and indirect impacts associated with the proposal. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.

5. Water

- The EIS must map features relevant to water, including:
  - Rivers, streams, estuaries (as described in s4.2 of the Biodiversity Assessment Method).
  - Wetlands (as described in s4.2 of the Biodiversity Assessment Method).
  - Groundwater.
  - Groundwater dependent ecosystems.
- The EIS must describe background conditions for any water resource likely to be affected by the proposal, including:
  - Existing surface and groundwater.
  - Hydrology

- Water Quality Objectives (as endorsed by the NSW Government) including groundwater as appropriate that represent the community's uses and values for the receiving waters. Indicators and trigger values/criteria for the identified environmental values in accordance with the ANZECC (2000) *Guidelines for Fresh and Marine Water Quality* and / or local objectives, criteria or targets endorsed by the NSW Government
- *Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions* (OEH/EPA, 2017).

- The EIS must assess the impacts of the proposal on water quality, including:
  - The nature and degree of impact on receiving waters for both surface and groundwater, demonstrating how the proposal protects the Water Quality Objectives where they are currently being achieved, and contributes towards achievement of the Water Quality Objectives over time where they are currently not being achieved. This should include an assessment of the mitigating effects of proposed stormwater and wastewater management during and after construction.
  - Identification of proposed monitoring of water quality.
  - Consistency with any relevant certified Coastal Management Program (or Coastal Zone Management Plan).
- The EIS must assess the impact of the proposal on hydrology, including:
  - Water balance including quantity, quality and source.
  - Effects upon rivers, wetlands, estuaries, marine waters and floodplain areas.
  - Effects upon water-dependent fauna and flora including groundwater dependent ecosystems.
  - Impacts to natural processes and functions within rivers, wetlands, estuaries and floodplains that affect river system and landscape health such as nutrient flow, aquatic connectivity and access to habitat for spawning and refuge (e.g. river benches).
  - Changes to environmental water availability, both regulated / licensed and unregulated / rules-based sources of such water.

6. Flooding

- The EIS must map the following features relevant to flooding as described in the Floodplain Development Manual 2005 (NSW Government 2005) including:
  - Flood prone land (ie land susceptible to the probable maximum flood event).
  - Flood planning area, the area below the flood planning level.
  - Hydraulic categorisation (floodway and flood storage areas).
  - Flood hazard.
- The EIS must describe flood assessment and modelling undertaken in determining the design flood levels for events, including a minimum of the 10% Annual Exceedance Probability (AEP), 1% AEP flood levels and the probable maximum flood, or an equivalent extreme event.
- The EIS must model the effect of the proposal (including fill) on the current flood behaviour for a range of design events as identified above, and the 0.5% AEP and 0.2% AEP year flood events as proxies for assessing sensitivity to an increase in rainfall intensity of flood producing rainfall events due to climate change.
- All site drainage, stormwater quality devices and erosion / sedimentation control measures should be identified in the EIS and the onsite treatment of stormwater and effluent runoff and predicted stormwater discharge quality from the proposal should be detailed.
- Modelling in the EIS must consider and document:
  - Existing council flood studies in the area and examine consistency to the flood behaviour documented in these studies.

- The impact on existing flood behaviour for a full range of flood events including up to the probable maximum flood (PMF), or an equivalent extreme flood.
- Impacts of the proposal on flood behaviour resulting in detrimental changes in potential flood affection of other developments or land. This may include redirection of flow, flow velocities, flood levels, hazard categories and hydraulic categories.
- Impacts of earthworks and stockpiles within the flood prone land up to the PMF level. The assessment should be based on understanding of cumulative flood impacts of construction and operational phases.
- Relevant provisions of the NSW Floodplain Development Manual 2005.

- The EIS must assess the impacts on the proposal on flood behaviour, including:
  - Whether there will be detrimental increases in the potential flood affectation of other properties, assets and infrastructure.
  - Consistency with Council floodplain risk management plans.
  - Consistency with any Rural Floodplain Management Plans.
  - Compatibility with the flood hazard of the land.
  - Compatibility with the hydraulic functions of flow conveyance in floodways and storage in flood storage areas of the land.
  - Whether there will be adverse effect to beneficial inundation of the floodplain environment, on, adjacent to or downstream of the site.
  - Whether there will be a direct or indirect increase in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.
  - Appropriate mitigation measures to offset potential flood risk arising from the proposal. Any proposed mitigation work should be modelled and assessed on the overall catchment basis in order to ensure it fits its purpose and meets the criteria of the Council where it is located, and to ensure it has no adverse impact to surrounding areas.
  - Any impacts the proposal may have upon existing community emergency management arrangements for flooding. These matters are to be discussed with the NSW SES and Council.
  - Whether the proposal incorporates specific measures to manage risk to life from flood. These matters are to be discussed with the NSW SES and Council.
  - Emergency management, evacuation and access, and contingency measures for the proposal during both construction and operational phases considering the full range of flood risk (based upon the probable maximum flood or an equivalent extreme flood event). These matters are to be discussed with and have the support of Council and the NSW SES.
  - Any impacts the proposal may have on the social and economic costs to the community as a consequence of flooding.

ATTACHMENT B

Guidance Material

Title	Web address
Relevant Legislation	
Biodiversity Conservation Act 2016	https://www.legislation.nsw.gov.au/view/html/inforce/current/act-2016-063
Commonwealth Environment Protection and Biodiversity Conservation Act 1999	https://www.legislation.gov.au/Details/C2014C00140/Download
Environmental Planning and Assessment Act 1979	https://www.legislation.nsw.gov.au/view/html/inforce/current/act-1979-203
Fisheries Management Act 1994	https://www.legislation.nsw.gov.au/view/html/inforce/current/act-1994-038
National Parks and Wildlife Act 1974	https://www.legislation.nsw.gov.au/view/html/inforce/current/act-1974-080
Protection of the Environment Operations Act 1997	https://www.legislation.nsw.gov.au/view/html/inforce/current/act-1997-156
Water Management Act 2000	https://www.legislation.nsw.gov.au/view/html/inforce/current/act-2000-092
Wilderness Act 1987	https://www.legislation.nsw.gov.au/view/html/inforce/current/act-1987-196
Biodiversity	
Biodiversity Values Map	https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap
Biodiversity Assessment Method (OEH, 2020)	https://www.environment.nsw.gov.au/research-and-publications/publications-search/biodiversity-assessment-method-2020
BAM 2020 Operational Manual Stage 1	https://www.environment.nsw.gov.au/research-and-publications/publications-search/biodiversity-assessment-manual-2020-operational-manual-stage-1
BAM Operational Manual Stage 2	https://www.environment.nsw.gov.au/research-and-publications/publications-search/biodiversity-assessment-method-operational-manual-stage-2
BAM 2020 Operational Manual Stage 3	https://www.environment.nsw.gov.au/research-and-publications/publications-search/biodiversity-assessment-method-operational-manual-stage-3
BAM Calculator User Guide	https://www.environment.nsw.gov.au/research-and-publications/publications-search/biodiversity-assessment-method-user-guide
Serious and irreversible impacts of development on biodiversity	https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/biodiversity-offsets-scheme/serious-and-irreversible-impacts
Practice Note - Guidance for assessors and decision makers in applying modified benchmarks to assessments of vegetation integrity: Biodiversity Assessment Method	https://www.environment.nsw.gov.au/research-and-publications/publications-search/guidance-assessors-decision-makers-applying-modified-benchmarks-to-assessments-vegetation-integrity

Title	Web address
Guidance and Criteria to assist a decision maker to determine a serious and irreversible impact (OEH, 2017)	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/guidance-decision-makers-determine-serious-irreversible-impact-190511.pdf
Accreditation Scheme for Application of the Biodiversity Assessment Method Order 2017	https://www.legislation.nsw.gov.au/view/pdf/asmade/sl-2017-471
Ancillary rules: Biodiversity conservation actions	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/ancillary-rules-biodiversity-conservation-actions-170496.pdf
Ancillary rules: Reasonable steps to seek like-for-like biodiversity credits for the purpose of applying the variation rules	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/ancillary-rules-reasonable-steps-like-for-like-biodiversity-credits-170498.pdf
Ancillary rules: Impacts on threatened species and ecological communities excluded from application of variation rules	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/ancillary-rules-impacts-on-threatened-entities-excluded-from-variation-170497.pdf?la=en&hash=C38840BFF49F012433532DF72E3D90C741E4DAC1
The Department's Threatened Species Website	https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species
NSW BioNet (Atlas of NSW Wildlife)	www.bionet.nsw.gov.au/
Surveying Threatened Plants and their Habitats - NSW Survey Guide For The Biodiversity Assessment Method (DPIE 2020).	https://www.environment.nsw.gov.au/research-and-publications/publications-search/surveying-threatened-plants-and-their-habitats-survey-guide-for-the-biodiversity-assessment-method
Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities - November 2004	https://www.environment.nsw.gov.au/surveys/BiodiversitySurveyGuidelinesDraft.htm
Threatened species survey and assessment guidelines: field survey methods for fauna – amphibians	https://www.environment.nsw.gov.au/research-and-publications/publications-search/threatened-species-field-survey-methods-for-fauna-amphibians
NSW Survey Guide for Threatened Frogs	https://www.environment.nsw.gov.au/research-and-publications/publications-search/nsw-survey-guide-for-threatened-frogs
Surveying 'species credit' threatened bats and their habitats – NSW survey guide for the Biodiversity Assessment Method	https://www.environment.nsw.gov.au/research-and-publications/publications-search/species-credit-threatened-bats-nsw-survey-guide-for-biodiversity-assessment-method
Bat calls of NSW - region-based guide to the echolocation calls of Microchiropteran bats	https://www.environment.nsw.gov.au/surveys/Batcalls.htm
Community Biodiversity Survey Manual	https://www.environment.nsw.gov.au/surveys/CommunityBiodiversitySurveyManual.htm
BioNet Vegetation Classification - NSW Plant Community Type (PCT) database	www.environment.nsw.gov.au/research/Vegetationinformationsystem.htm
The Departments Data Portal (access to online spatial data)	http://data.environment.nsw.gov.au/

Title	Web address
Fisheries NSW policies and guidelines	https://www.dpi.nsw.gov.au/fishing/habitat/publications/pubs/fish-habitat-conservation
National Park Estate	
Guidelines for consent and planning authorities for Developments adjacent to National Parks and Wildlife Service Land (NPWS, 2020)	https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Parks-reserves-and-protected-areas/Development-guidelines/developments-adjacent-npws-lands-200362.pdf
List of national parks	https://www.nationalparks.nsw.gov.au/conservation-and-heritage/national-parks
Revocation, recategorisation and road adjustment policy (OEH, 2012)	http://www.environment.nsw.gov.au/policies/RevocationOfLandPolicy.htm
List of aquatic reserves	www.dpi.nsw.gov.au/fisheries/habitat/protecting-habitats/mpa
Water	
Water Quality Objectives	http://www.environment.nsw.gov.au/ieo/index.htm
ANZECC & ARMCANZ (2000) Water Quality Guidelines	https://www.waterquality.gov.au/anz-guidelines/resources/previous-guidelines/anzecc-armcanz-2000
Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions	http://www.environment.nsw.gov.au/research-and-publications/publications-search/risk-based-framework-for-considering-waterway-health-outcomes-in-strategic-land-use-planning
Applying Goals for Ambient Water Quality Guidance for Operations Officers – Mixing Zones	http://deccnet/water/resources/AWQGuidance7.pdf
Approved Methods for the Sampling and Analysis of Water Pollutant in NSW (2004)	http://www.environment.nsw.gov.au/resources/legislation/approvedmethods-water.pdf
Flooding	
Floodplain development manual	http://www.environment.nsw.gov.au/floodplains/manual.htm
Floodplain Risk Management Guidelines	http://www.environment.nsw.gov.au/topics/water/coasts-and-floodplains/floodplains/floodplain-guidelines
NSW Climate Impact Profile	http://climatechange.environment.nsw.gov.au/
Climate Change Impacts and Risk Management	https://www.environment.gov.au/climate-change/adaptation/publications/climate-change-impact-risk-management

Joel Herbert

From: Lindsay Dunstan <Lindsay.Dunstan@midwestern.nsw.gov.au>
Sent: Friday, 18 December 2020 3:10 PM
To: Joel Herbert
Subject: RE: Request for Requirements - EARs 1523 - Razorback Quarry

Hi Joel,

As per our phone discussion earlier in the week, thank you for providing Mid-Western Regional Council (Council) with the opportunity to provide input into the Secretary's Environmental Assessment Requirements (SEARs) for the proposed Razorback Quarry (EAR 1523). Council has reviewed the requirements for EAR 1523 and requests the following issues to be specifically addressed as part of the Environmental Impact Assessment (EIS).

Road Reserve
From the aerial imagery and cadastral mapping available to Council, it appears that Razorback Road does not sit entirely within the associated road reserve. The misalignment is minimal and it does not appear likely to cause issues for the proposal. However, Council requests that the proponent be made aware of this and address this in their proposal.

Crown Road
The section of Razorback Road along the northern boundary of Lot 2 DP 569979 is Crown land. The proponent has not addressed this in the Scoping Report and if any work is required on this section of road, the consent of Crown will need to be obtained.

Operating Hours
There is an inconsistency in the Scoping Report regarding operating hours. One section (pg. 9) states that quarrying will only occur on weekdays from 8am to 3:30pm. However, another section (pg.17) states extraction will occur on Saturday 8am to 1pm in addition to the above weekday hours, whilst haulage will be from Monday to Saturday 8am to 3:30pm. This inconsistency will need to be clarified by the applicant.

Should you have any further enquiries in relation to this matter, please contact Council on (02) 6378 2850.

Regards

Lindsay Dunstan
Manager Statutory Planning
Mid-Western Regional Council

t 02 6378 2850
f 02 6378 2815 | e lindsay.dunstan@midwestern.nsw.gov.au
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w www.midwestern.nsw.gov.au
facebook | twitter | youtube

From: Joel Herbert <Joel.Herbert@planning.nsw.gov.au>
Sent: Friday, 20 November 2020 1:30 PM
To: Council <Council@midwestern.nsw.gov.au>; Angela Stewart <development.western@rms.nsw.gov.au>; 'records@rfs.nsw.gov.au' <records@rfs.nsw.gov.au>; OEH HD Heritage Mailbox <HERITAGEMailbox@environment.nsw.gov.au>; DPI Landuse Ag Mailbox <landuse.ag@dpi.nsw.gov.au>; Resources

Regulator <nswresourcesregulator@service-now.com>; EPA Planning Matters Mailbox <planning.matters@epa.nsw.gov.au>; DPI AHP Central Mailbox <ahp.central@dpi.nsw.gov.au>; Lands Ministerials <lands.ministerials@industry.nsw.gov.au>; DPI Cabinet Mailbox <dpi.cabinet@dpi.nsw.gov.au>; DRG RO Assessment Coordination Mailbox <assessment.coordination@planning.nsw.gov.au>; DPI Landuse Enquiries Mailbox <landuse.enquiries@dpi.nsw.gov.au>
Subject: Request for Requirements - EARs 1523 - Razorback Quarry

Caution: This email originated from outside the organisation.

Good afternoon,

Proposal – Razorback Quarry
EAR ID No. 1523

Borg Manufacturing Pty Ltd on behalf of Plantation Pine Products Australia Pty Ltd (the Applicant) has requested the requirements of the Secretary of the Department of Planning and Environment for the preparation of an Environmental Impact Statement (EIS) for the above local designated development located in the Mid-Western local government area.

I have attached a copy of the Applicant's request for your reference.

Under Schedule 2 of the *Environmental Planning and Assessment Regulation 2000,* the Secretary is requesting your requirements for the EIS.

It would be greatly appreciated if we could receive your advice by **Friday 3 December 2020.**

Please note that the proposal seeks to extract weathered conglomerate and sandstone from a total resource of 4,000,000 million tonnes at a maximum rate of 200,000 tonnes per annum for up to 30 years.

If you have any queries, please contact me on the details below.

Joel Herbert
Environmental Assessment Officer
Energy and Resource Assessments
4 Parramatta Square, 12 Darcy Street Parramatta NSW 2150
Locked Bag 5022, Parramatta NSW 2124

T 02 8289 6614 | E Joel.Herbert@planning.nsw.gov.au

NSW GOVERNMENT | Planning, Industry & Environment

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Joel Herbert

From: Lands Ministerials Mailbox
Sent: Tuesday, 1 December 2020 2:12 PM
To: Joel Herbert
Subject: Re: Request for Requirements - EARs 1523 - Razorback Quarry

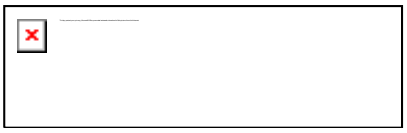
Good afternoon Joel

DPIE Crown Lands has no comment with regards to this proposal.

Lands Stakeholder Relations

Team telephone numbers: Rebecca Johnson, Principal Project Officer, 4920 5040; Kirstyn Goulding, Administration Officer - Customer Liaison, 4920 5058; Kim Fitzpatrick, Senior Project Officer, 4920 5015, Deb Alterator, Project Support Officer 4920 5172

Crown Lands | Department of Planning, Industry and Environment
E lands.ministerials@dpie.nsw.gov.au
Level 4, 437 Hunter Street Newcastle NSW 2295
www.dpie.nsw.gov.au



Our Vision: Together, we create thriving environments, communities and economies.

The Department of Planning, Industry and Environment acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

From: Joel Herbert <Joel.Herbert@planning.nsw.gov.au>
Sent: Friday, 20 November 2020 1:30 PM
To: OLG - Mid Western Regional Council <council@midwestern.nsw.gov.au>; Angela Stewart <development.western@rms.nsw.gov.au>; 'records@rfs.nsw.gov.au' <records@rfs.nsw.gov.au>; OEH HD Heritage Mailbox <HERITAGEMailbox@environment.nsw.gov.au>; DPI Landuse Ag Mailbox <landuse.ag@dpi.nsw.gov.au>; Resources Regulator <nswresourcesregulator@service-now.com>; EPA Planning Matters Mailbox <planning.matters@epa.nsw.gov.au>; DPI AHP Central Mailbox <ahp.central@dpi.nsw.gov.au>; Lands Ministerials <lands.ministerials@industry.nsw.gov.au>; DPI Cabinet Mailbox <dpi.cabinet@dpi.nsw.gov.au>; DRG RO Assessment Coordination Mailbox <assessment.coordination@planning.nsw.gov.au>; DPI Landuse Enquiries Mailbox <landuse.enquiries@dpi.nsw.gov.au>
Subject: Request for Requirements - EARs 1523 - Razorback Quarry

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EAR ID No. 1523

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It would be greatly appreciated if we could receive your advice by **Friday 3 December 2020.**

Please note that the proposal seeks to extract weathered conglomerate and sandstone from a total resource of 4,000,000 million tonnes at a maximum rate of 200,000 tonnes per annum for up to 30 years.

If you have any queries, please contact me on the details below.

Joel Herbert
Environmental Assessment Officer
Energy and Resource Assessments
4 Parramatta Square, 12 Darcy Street Parramatta NSW 2150
Locked Bag 5022, Parramatta NSW 2124

T 02 8289 6614 | E Joel.Herbert@planning.nsw.gov.au


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OUT20/15214

Mr Joel Herbert
Environmental Assessment Officer
Energy and Resource Assessments

Email: Joel.Herbert@planning.nsw.gov.au

Dear Joel

Environmental Assessment Requirements– EAR 1523 – Razorback Quarry

Thank you for your correspondence dated 20 November 2020 requesting Environmental Assessment Requirements (EARs) for the above proposal.

The NSW Department of Primary Industries (NSW DPI) Agriculture is committed to the protection and growth of agricultural industries, and the land and resources upon which these industries depend. Important issues for extractive industries are the potential impact on limited agricultural resources and the ability to rehabilitate the land to enable continued agricultural investment.

NSW DPI Agriculture provides EARs (Attachment 1) and a range of publications to assist consent authorities, proponents and the community in addressing the recommended EARs (Attachment 2). We do recognise that the site is dedicated to forestry use, and rehabilitation will also be directed to this end use (and if not may be agricultural). However, the impacts of the operation on surrounding agricultural enterprises and resources require attention, as does the end of use land conditions.

Should you require clarification on any of the information contained in this response, please contact me Mary Kovac, Agricultural Land Use Planning Officer, on 0427949987 or by email at landuse.ag@dpi.nsw.gov.au

Yours sincerely

[redacted]

Mary Kovac
2 December 2020
Agricultural Land Use Planning Officer

Attachment 1: Environmental Assessment Requirements for the Proposed Razorback Quarry (EARs 1532)

Issue	Environmental Assessment Requirements for the Environmental Impact Statement
Site Suitability	• Include a Land Use Conflict Risk Assessment (LUCRA) to identify potential land use conflict with sensitive receptors including surrounding agricultural land uses. The LUCRA is to address separation distances and management practices to minimise odour, dust and noise impacts on sensitive receptors including surrounding agricultural land uses. A LUCRA is described in the DPI Land Use Conflict Risk Assessment Guide. • Include a map, to scale, showing the above operational and infrastructure details including separation distances from sensitive receptors including surrounding agricultural land uses.
Consideration of impacts on agricultural resources and land	**Characteristics of the Land** • Describe the soil, slope, and land capability of the site • Describe the current and historical agricultural land uses on surrounding land in the locality including the land capability and agricultural productivity of the surrounding land. **Impacts on Agricultural Land, Resources and Land Uses** • Detail the potential impacts from the proposed extractive industry on agricultural land and agricultural land uses in the locality. • Consider possible cumulative impacts on surrounding agricultural enterprises and landholders. **Measures to Mitigate Impacts on Agricultural Land** • Demonstrate that all significant impacts on current and potential agricultural developments and resources can be reasonably avoided or adequately mitigated. • Detail the expected life span of the proposed development.
Suitable and secure water supply	• Detail the estimated water demand and water availability and the source of water and any sanitisation methods proposed. • Outline any impacts to water use for agriculture and measures to mitigate against these impacts.
Biosecurity	• Include a biosecurity (pests, weeds and disease) risk assessment outlining the likely plant, animal and community risks. The relevant weed or pest animals for a region are addressed in the regional plans or strategies issued by NSW Local Lands Services. • Include details of how the proposal will deal with identified biosecurity risks as well as contingency plans for any failures. Include monitoring and mitigation measures for weed and pest management.
Traffic movements	• Detail the volume and route of traffic movements for the proposed development and how potential impacts on surrounding agricultural land uses are proposed to be mitigated (e.g. noise, dust, volume of traffic). This should include consideration of Travelling Stock Reserves (TSR) and the movement of livestock or farm vehicles along / across the affected roads.

Land stewardship	• Describe the final proposed land use and landform. • Detail the proposed rehabilitation and decommissioning/closure measures to achieve this land use including the expected timeline for the rehabilitation program. • Outline the monitoring and mitigation measures to be adopted for rehabilitation remedial actions.
Community Consultation	• Consult with the owners / managers of affected and adjoining agricultural operations in a timely and appropriate manner about the proposal, the likely impacts and suitable mitigation measures or compensation.
Emergency Management	• The proposal is to detail contingency plans to enable the operation to deal with emergency situations. The proposal is to detail Emergency Management procedures and responsibilities for responding to bushfire threats

Attachment 2: Guidelines for assessment

Title	Location
Land Use Conflict Risk Assessment Guide	https://www.dpi.nsw.gov.au/agriculture/lup/development-assessment2/lucra
Agricultural Issues for Extractive Industry Development	https://www.dpi.nsw.gov.au/agriculture/lup/development-assessment2/extractive-industries

Mr Joel Herbert
Environmental Assessment Officer
Department of Planning, Industry and Environment

Via: Compliance and Referral Portal

Notice Number	1603270
Date	25-Nov-2020

Dear Mr Herbert

RAZORBACK QUARRY - SEAR ID NO. 1523

I refer to your email to the Environment Protection Authority (EPA), dated 20 November 2020, seeking Secretary Environmental Assessment Requirements (SEARs) for an Environmental Impact Statement (EIS) for the proposed Razorback Quarry located at 39 Razorback Road, Running Stream.

The EPA has reviewed the Scoping Report that accompanied the above mentioned e-mail. The EPA has identified the information it requires to adequately assess the proposal which is contained in Attachment A.

In summary, the EPA's key information requirements for the proposal include an adequate assessment of;

- Air quality impacts;
- Noise impacts; and
- Water management.

In carrying out the assessment, the proponent should refer to the relevant guidelines as listed in Attachment B and any relevant industry codes of practice and best practice management guidelines.

The activity as proposed will be a schedule Activity (extractive Industry and Crushing Grinding and Separating) under the Protection of the Environment Operations Act 1997 and therefore will be Integrated Development application for the purposes of the EPA, requiring an environment protection licence should development consent be granted.

The proponent should be made aware that any commitments made in the EIS may be formalised as approval conditions and may also be placed as formal licence conditions.

Yours sincerely

[redacted]

Regional Manager

Regional South - Bathurst

(by Delegation)

ATTACHMENT A: EPA EIS Requirements

Air quality

The EIS should include a detailed air quality impact assessment (AQIA). The AQIA should:

1. Identify all potential discharges of fugitive and point source emissions of pollutants including dust for all stages of the proposal and assess the risk associated with those emissions. All processes that could result in air emissions must be identified and described. Sufficient detail to accurately communicate the characteristics and quantity of all emissions must be provided. Assessment of risk relates to environmental harm, risk to human health and amenity.

2. Justify the level of assessment undertaken on the basis of risk factors, including but not limited to:
    a. proposal location;
    b. characteristics of the receiving environment;
    c. type and quantity of pollutants emitted.

3. Describe the receiving environment in detail. The proposal must be contextualised within the receiving environment (local, regional and inter-regional as appropriate). The description must include but need not be limited to:
    a. meteorology and climate;
    b. topography;
    c. surrounding land-use;
    d. ambient air quality.

4. Include a consideration of 'worst case' emission scenarios and impacts at proposed emission limits.

5. Account for cumulative impacts associated with existing emission sources as well as any currently approved developments linked to the receiving environment.

6. Include air dispersion modelling where there is a risk of adverse air quality impacts, or where there is sufficient uncertainty to warrant a rigorous numerical impact assessment. Air dispersion modelling must be conducted in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (2005)*. http://www.environment.nsw.gov.au/resources/air/ammodelling05361.pdf.

7. Demonstrate the proposal's ability to comply with the relevant regulatory framework, specifically the *Protection of the Environment Operations (POEO) Act (1997)* and the *POEO (Clean Air) Regulation (2010)*.

8. Detail emission control techniques/practices that will be employed by the proposal. Consideration should be given to dust management techniques where water is unavailable or limited and the development of a Trigger Action Response Plan (TARP).

Noise and Vibration

In relation to noise impacts, the following matters should be addressed (where relevant) as part of the Environmental Impact Statement.

1. Construction noise associated with the proposed development.

2. Operational noise from all industrial activities proposed (including private haul roads) to be undertaken on the premises should be assessed.

3. Noise from existing or upgraded or new public roads from increased road traffic should be assessed in accordance with the *NSW Road Noise Policy* (DECCW, 2011).

In relation to blasting and vibration, the following matters should be address (where relevant) as part of the Environmental Assessment

- Vibration from all activities (including construction and operation) to be undertaken on the premises should be assessed using the guidelines contained in the *Assessing Vibration: a technical guideline* (DEC2006).
- If blasting is required for any reasons during the construction or operational stage of the proposed development, blast impacts should be demonstrated to be capable of complying with the guidelines contained in *Australian and New Zealand Environment Council – Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZEC, 1990).

Water

The EIS should;

1. Describe water usage for the proposal including the position of any intakes and discharges, volumes, water quality and frequency of all water discharges.

2. Describe existing surface and groundwater quality. An assessment needs to be undertaken for any water resource likely to be affected by the proposal.

3. State the Water Quality Objectives for the receiving waters relevant to the proposal. These refer to the community's agreed environmental values and human uses endorsed by the NSW Government as goals for ambient water. http://www.environment.nsw.gov.au/ieo/index.htm. Where groundwater may be impacted the assessment should identify appropriate groundwater environmental values.

4. State the indicators and associated trigger values or criteria for the identified environmental values. This information should be sourced from the ANZECC (2000) Guidelines for Fresh and Marine Water Quality. http://www.environment.gov.au/water/quality/publications/australian-and-new-zealand-guidelines-fresh-marine-water-quality-volume-1.

5. State any locally specific objectives, criteria or targets which have been endorsed by the NSW Government.

6. Provide a water balance for the development including water requirements (quantity, quality and source(s)) and proposed storm and wastewater disposal, including type, volumes, proposed treatment and management methods and re-use options.

7. Demonstrate that all practical options to avoid discharge have been implemented and environmental impact minimised where discharge is necessary.

8. Describe the nature and degree of impact that any proposed discharges will have on the receiving environment.

9. Assess impacts against the relevant ambient water quality outcomes. Demonstrate how the proposal will be designed and operated to:

   - protect the Water Quality Objectives for receiving waters where they are currently achieved; and
   - contribute towards achievement of the Water Quality Objectives over time where they are not currently being achieved.

10. Where a discharge is proposed that includes a mixing zone, the proposal should demonstrate how wastewater discharged to waterways will ensure the ANZECC (2000) water quality criteria for relevant chemical and non-chemical parameters are met at the edge of the initial mixing zone of the discharge, that any impacts in the initial mixing zone are demonstrated to be reversible.

11. Describe how predicted impacts will be monitored and assessed over time.

12. Assess potential impacts on groundwater and groundwater dependent ecosystems.

13. Detail the erosion and sediment controls to be implemented to minimise erosion and sediment mobilisation at the site which have been designed in accordance with the requirements of the publication *Managing Urban Stormwater: Soils and Construction* (Landcom 2004) and . The EIS should show the location of each measure to be implemented for the construction and operational phases of the project. The measures to be considered include:

    - Sediment traps
    - Diversion banks
    - Sediment fences
    - Bunds (earth, hay, mulch)
    - Geofabric liners
    - Other control measures as appropriate

Waste and Stockpile Management

The EIS should;

1. Identify, characterise and classify all waste that will be generated onsite through excavation, demolition or construction activities, including proposed quantities of the waste. All waste must be classified in accordance with EPA's *Waste Guidelines*.

2. Identify, characterise and classify all waste that is proposed to be disposed of to an offsite location, including proposed quantities of the waste and the disposal locations for the waste. This includes waste that is intended for re-use or recycling. All waste must be classified in accordance with the EPA's *Waste Guidelines*.

3. Provide details of how waste and product stockpiles will be handled and managed onsite to minimise pollution, including:

    - Labelling of stockpiles for identification, ensuring that all waste is in clearly identified stockpiled from other types of material (especially the separation of contaminated and non-contaminated waste).
    - Proposed height limits for all waste and product stockpiles to reduce the potential for dust.
    - Procedures for minimising the movement of waste and products around the site to avoid the need for double handling.
    - Where relevant, measures to minimise leaching from stockpiles into the surrounding environment, such sediment fencing, geofabric liners etc.

4. Provide details of how any waste will be handled and managed during transport to a lawful facility. If the waste possesses hazardous characteristics, the Proponent must provide details of how the waste will be treated or immobilised to render it suitable for transport and disposal.

ATTACHMENT B: Guidance Material

Title	Web address
Relevant Legislation	
Contaminated Land Management Act 1997	http://www.legislation.nsw.gov.au/#/view/act/1997/140
Environmentally Hazardous Chemicals Act 1985	http://www.legislation.nsw.gov.au/#/view/act/1985/14
Environmental Planning and Assessment Act 1979	http://www.legislation.nsw.gov.au/#/view/act/1979/203
Protection of the Environment Operations Act 1997	http://www.legislation.nsw.gov.au/#/view/act/1997/156
Water Management Act 2000	http://www.legislation.nsw.gov.au/#/view/act/2000/92
Licensing	
Guide to Licensing	www.epa.nsw.gov.au/licensing/licenceguide.htm
Air Issues	
Air Quality	
Approved methods for modelling and assessment of air pollutants in NSW (2016)	http://www.epa.nsw.gov.au/air/appmethods.htm
POEO (Clean Air) Regulation 2010	http://www.legislation.nsw.gov.au/#/view/regulation/2010/428
Noise and Vibration	
NSW Noise Policy for Industry	http://www.epa.nsw.gov.au/your-environment/noise/industrial-noise/noise-policy-for-industry-(2017)
Interim Construction Noise Guideline (DECC, 2009)	http://www.epa.nsw.gov.au/noise/constructnoise.htm
Assessing Vibration: a technical guideline (DEC, 2006)	http://www.epa.nsw.gov.au/noise/vibrationguide.htm
NSW Road Noise Policy (DECCW, 2011)	http://www.epa.nsw.gov.au/your-environment/noise/transport-noise
NSW Rail Infrastructure Noise Guideline (EPA, 2013)	http://www.epa.nsw.gov.au/your-environment/noise/transport-noise

Human Health Risk Assessment	
Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards (enHealth, 2012)	http://www.eh.org.au/documents/item/916
Waste, Chemicals and Hazardous Materials and Radiation	
Waste	
Environmental Guidelines: Solid Waste Landfills (EPA, 2016)	http://www.epa.nsw.gov.au/waste/landfill-sites.htm
Draft Environmental Guidelines - Industrial Waste Landfilling (April 1998)	http://www.epa.nsw.gov.au/resources/waste/envguidlns/industrialfill.pdf
EPA's Waste Classification Guidelines 2014	http://www.epa.nsw.gov.au/wasteregulation/classify-guidelines.htm
Resource recovery orders and exemptions	http://www.epa.nsw.gov.au/wasteregulation/orders-exemptions.htm
European Unions Waste Incineration Directive 2000	http://ec.europa.eu/environment/archives/air/stationary/wid/legislation.htm
EPA's Energy from Waste Policy Statement	http://www.epa.nsw.gov.au/wastestrategy/energy-from-waste.htm
NSW Waste Avoidance and Resource Recovery Strategy 2014-2021	http://www.epa.nsw.gov.au/wastestrategy/warr.htm
Chemicals subject to Chemical Control Orders	
Chemical Control Orders (regulated through the EHC Act)	http://www.epa.nsw.gov.au/pesticides/CCOs.htm
National Protocol - Approval/Licensing of Trials of Technologies for the Treatment/Disposal of Schedule X Wastes - July 1994	Available in libraries
National Protocol for Approval/Licensing of Commercial Scale Facilities for the Treatment/Disposal of Schedule X Wastes - July 1994	Available in libraries
Water and Soils	
Acid sulphate soils	
Coastal acid sulfate soils guidance material	http://www.environment.nsw.gov.au/acidsulfatesoil/ and http://www.epa.nsw.gov.au/mao/acidsulfatesoils.htm
Acid Sulfate Soils Planning Maps	http://www.environment.nsw.gov.au/acidsulfatesoil/riskmaps.htm
Contaminated Sites Assessment and Remediation	
Managing land contamination: Planning Guidelines – SEPP 55 Remediation of Land	http://www.epa.nsw.gov.au/clm/planning.htm

Guidelines for Consultants Reporting on Contaminated Sites (EPA, 2000)	http://www.epa.nsw.gov.au/resources/clm/20110650consultantsglines.pdf
Guidelines for the NSW Site Auditor Scheme - 2nd edition (DEC, 2006)	http://www.epa.nsw.gov.au/resources/clm/auditorglines06121.pdf
Sampling Design Guidelines (EPA, 1995)	http://www.epa.nsw.gov.au/resources/clm/95059sampgdlne.pdf
National Environment Protection (Assessment of Site Contamination) Measure 1999 (or update)	http://www.scew.gov.au/nepms/assessment-site-contamination
Soils – general	
Managing land and soil	http://www.environment.nsw.gov.au/soils/landandsoil.htm
Managing urban stormwater for the protection of soils	http://www.environment.nsw.gov.au/stormwater/publications.htm
Managing urban stormwater: soils and construction, vol. 1 (Landcom 2004) and vol. 2 (E. Mines and quarries) (DECC 2008) Vol 1 - Vol 2e -	http://www.environment.nsw.gov.au/resources/water/BlueBookVol1.pdf http://www.environment.nsw.gov.au/resources/stormwater/08208soilsconststorm2e.
Landslide risk management guidelines	http://australiangeomechanics.org/admin/wp-content/uploads/2010/11/LRM2000-Concepts.pdf
Site Investigations for Urban Salinity (DLWC, 2002)	http://www.environment.nsw.gov.au/resources/salinity/booklet3siteinvestigationsforurbansalinity.pdf
Local Government Salinity Initiative Booklets	http://www.environment.nsw.gov.au/salinity/solutions/urban.htm
Water	
Water Quality Objectives	http://www.environment.nsw.gov.au/ieo/index.htm
ANZECC (2000) Guidelines for Fresh and Marine Water Quality	http://www.environment.gov.au/water/publications/quality/nwqms-guidelines-4-vol1.html
Applying Goals for Ambient Water Quality Guidance for Operations Officers - Mixing Zones	Contact the EPA on 131555
Approved Methods for the Sampling and Analysis of Water Pollutant in NSW (2004)	http://www.environment.nsw.gov.au/resources/legislation/approvedmethods-water.pdf

Our ref: DOC20/965111

Mr Joel Herbet
Department of Planning, Industry and Environment
4 Parramatta Square, 12 Darcy Street
PARRAMATTA NSW 2150

By email: Joel.Herbert@planning.nsw.gov.au

Dear Mr Herbet

Request for Secretary's Environmental Assessment Requirements (SEARS) for Designated Development Proposal – Razorback Quarry (EAR ID No. 1523)

Thank you for your referral dated 20 November 2020 inviting SEARS input from the Heritage Council of NSW on the above designated development proposal.

The subject site is not listed on the State Heritage Register (SHR), nor is it in the immediate vicinity of any SHR items. Further, the site does not contain any known historical archaeological deposits. Therefore, no heritage comments are required. The Department does not need to refer subsequent stages of this proposal to the Heritage Council of NSW.

If you have any questions regarding the above advice, please contact Colleen Klingberg, A/Customer Strategies Officer, at Heritage NSW via on 9873 8566 or Colleen.klingberg@environment.nsw.gov.au

Yours sincerely

[redacted]

Anna London
A/Senior Team Leader Customer Strategies
Heritage NSW
Department of Premier and Cabinet
As Delegate of the Heritage Council of NSW
2 December 2020

DOC21/119488

MINING, EXPLORATION & GEOSCIENCE ADVICE RESPONSE

Joel Herbert
Energy, Resources & Compliance Division
Department of Planning, Industry and Environment
GPO Box 39
SYDNEY NSW 2001

joel.herbert@planning.nsw.gov.au

Dear Joel

Project: Razorback Quarry – Environmental Assessment Requirements 1523
Stage: Secretary's Environmental Assessment Requirements
Development Application: EARs 1523

I refer to your correspondence dated 9 February 2021 inviting the Department of Regional NSW – Mining, Exploration & Geoscience (MEG) to provide comments on the *Addendum to Scoping Report for Razorback Quarry* dated 5 February 2021 submitted by BORG on behalf of Plantation Products Australia Pty Ltd (the Proponent).

MEG has reviewed the addendum report and notes that no clay products will be generated by the proposed operation. MEG is now satisfied that the Project does not involve a Scheduled Mineral requiring regulation under the *Mining Act 1992.*

Accordingly, MEG withdraws the SEARs response issued on 4 December 2020 and provides the following advice.

Resource management of construction materials

Sandstone and conglomerate are not prescribed minerals under the *Mining Act 1992*. While MEG has no statutory role in authorising or regulating the extraction of these commodities, MEG is the principal government authority responsible for assessing the state's resources of construction materials and for advising state and local government on their planning and management.

The Environmental Impact Statement (EIS) should include a resource assessment which:

- documents the size and quality of the resource and demonstrate that both have been adequately assessed; and
- documents the methods used to assess the resource and its suitability for the intended applications.

If deemed commercial-in-confidence, the resource assessment summary included in the EIS should commit to providing MEG with full resource assessment documentation separately.

Data collection requirements for construction materials

MEG collects data on the quantity of construction materials produced annually throughout the

state. Forms are sent to all operating quarries at the end of each financial year for this purpose.

The statistical data collected is of great value to government and industry in planning and resource management, particularly as a basis for analysing trends in production and for estimating future demand for particular commodities or in particular regions.

Production data may be published in aggregated form, however production data for individual operations is kept strictly confidential. In order to assist in the collection of construction material production data, the proponent should be required to provide annual production data for the subject site to MEG as a condition of consent.

Biodiversity offsets - Mineral resource and construction resource considerations

MEG understands that the Project is not expected or likely to require biodiversity offsets. However, MEG would appreciate the opportunity for early consultation in relation to the proposed location of any biodiversity offset areas (both on and off site) or any supplementary biodiversity measures (if required) to ensure there is no consequent reduction in access to prospective land for mineral exploration, or potential for sterilisation of mineral or extractive resources.

Stakeholder consultation requirements

Coal Exploration Licence (EL)7432 – Centennial Inglenook Pty Ltd

MEG advises that the project area is located within Coal Exploration Licence (EL) 7432 held by Centennial Inglenook Pty Ltd. MEG recommends consultation with Centennial, including a record of consultation included in the EIS.

Contact details that the Department currently has on record for Centennial Inglenook is as follows:
Technical Manager EL7432: Thomas Dubos
Phone: 02 63557965
Email: thomas.dubos@centennialcoal.com.au

Geological Survey of NSW

Specific queries regarding the above requirements should be directed to the GSNSW - Land Use team at landuse.minerals@geoscience.nsw.gov.au.

For general advice concerning this letter, please contact the Assessment Coordination Unit on 02 4063 6534 or assessment.coordination@planning.nsw.gov.au.

Yours sincerely

[redacted]

Scott Anson
Manager Assessment Coordination
Resource Operations
Department of Regional NSW – Mining, Exploration & Geoscience
25 February 2021

for
Stephen Wills
Executive Director Resource Operations
Department of Regional NSW – Mining, Exploration & Geoscience

Natural Resources Access Regulator

Contact: Natural Resources Access Regulator
Phone: 1800 633 362
Email: nrar.enquiries@nrar.nsw.gov.au

Our Ref: V15/2812-5#36
SEARs Ref: SEAR 1523

23 February 2021

Joel Herbert
NSW Department of Planning, Industry and Environment
4 Parramatta Square, 12 Darcy St
PARRAMATTA NSW 2150

Emailed: Joel.Herbert@planning.nsw.gov.au

Dear Sir/Madam

Re: Request for Environmental Assessment Requirements - V15/2812-5#36
Reference Number: SEAR 1523
Description: Razorback Quarry
Location: Lot 2 DP 569979, 39 Razorback Road RUNNING STREAM

Thank you for your email on the 20th November 2020 seeking input into the Secretary's Environmental Assessment Requirements (SEARs) for the above development. The Natural Resources Access Regulator (NRAR) has reviewed the supporting documentation accompanying the request for SEARs and recommends the Environmental Impact Statement (EIS) be required to include the following;

- The identification of an adequate and secure water supply for the life of the project. This includes details of water sources that water will be taken from, and demonstration that appropriate licences and approvals are held or can be obtained under the *Water Management Act 2000*, or any relevant exemptions that apply under Schedule 4 of the *Water Management (General) Regulation 2018*.
- A detailed and consolidated site water balance.
- Assessment of impacts on surface and ground water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land, and groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts.
- Proposed surface and groundwater monitoring activities and methodologies.
- Consideration of relevant legislation, policies and guidelines, including the NSW Aquifer Interference Policy (2012), the Guidelines for Controlled Activities on Waterfront Land (2018) and the relevant Water Sharing Plans (available at https://www.industry.nsw.gov.au/water).
- Before commencing any proposed works on waterfront land, an application under the Water Management Act 2000 for controlled activity approval (CAA) must be submitted to Natural Resources Access Regulator. Works cannot commence until a CAA has been issued, unless an exemption applies under Schedule 4 of the *Water*

Management (General) Regulation 2018, please refer to NRAR's Exemption Factsheet (available at https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/172093/Controlled-activity-approval-exemptions-fact-sheet.pdf)

Any questions regarding this correspondence should be directed to nrar.servicedesk@dpie.nsw.gov.au

Yours sincerely

[redacted]

For
Alison Collaros
Manager Licensing & Approvals
Water Regulatory Operations
Natural Resources Access Regulator

DOC20/992750
MAAG0009196

Joel Herbert
Environmental Assessment Officer
Energy & Resource Assessments

Via: Email joel.herbert@planning.nsw.gov.au

Dear Mr Herbert

Re. Request for Requirements - Razorback Quarry - EARs 1523

I refer to your request of 24 November 2020 for advice regarding Razorback Quarry. The Resources Regulator has reviewed the request.

Assessment
Based on the review of the application form and scoping report, the Resources Regulator advises that the quarry does not propose to extract a scheduled mineral under the *Mining Act 1992* and the operation's rehabilitation is therefore not regulated by the Resources Regulator.

Whilst the activity is not regulated by the Resources Regulator under the Mining Act the mine operator is reminded of their obligations under the *Work Health and Safety Act 2011* and *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and associated regulations.

Regulatory requirements if approved
The Resources Regulator may undertake assessments of the mine operators' proposed mining activities under the Work Health and Safety (Mines and Petroleum Sites) Act 2013 and Regulation as well as other WHS regulatory obligations.

Background
The Mining Act Inspectorate within the Resources Regulator has responsibility for providing strategic advice on environmental issues as they relate to or affect mine rehabilitation.

The Mine Safety Inspectorate within the Resources Regulator is responsible for ensuring the mine operators' compliance with the Work Health and Safety (WHS) legislation, in particular the effective management of risks associated with the principal hazards as specified in the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*.

Contact
Should you require any further information or clarification, please contact the Office of the Executive Director (ED.ResourcesRegulator@planning.nsw.gov.au)

[redacted]

Executive Officer
Office of the Executive Director, Resources Regulator

4 December 2020

10 December 2020

SF2020/220070; WST20/00413/01

The Manager
Industry Assessments
Department of Planning, Industry and Environment
PO Box 39
Sydney NSW 2001
(By email only)

Attn: Joel Herbert, Environmental Assessment Officer

Dear Mr Herbert,

EAR 1523: Lot 2 DP 569979; 39 Razorback Road, Running Stream
'Razorback Quarry' extractive industry producing up to 200 ktpa

Thank you for the above referral dated 20 November 2020 inviting comments for the Secretary's Environmental Assessment Requirements (SEARs) from Transport for NSW (TfNSW).

From review of the submitted documentation TfNSW notes that:

- The proposal is for a quarry producing a maximum of 200,000 tonnes per annum (200 ktpa) of quartz, sand and clay products, with two full time equivalent staff and a total site area of 24.7 ha including workshop, office and weighbridge facilities. It is noted that the quarry material is loosely consolidated and will be extracted and processed without use of explosives, rock breakers or onsite crushers.

- The proposal would be required to be referred to TfNSW pursuant to Section 16 of the *SEPP (Mining, Petroleum Production and Extractive Industries) 2007*.

- The consent is proposed to be limited to a duration of 30 years.

- Transport of products by road is proposed to be limited to 1,500 tonnes per day, or up to 5 truckloads per hour (10 movements in and out combined). At peak annual extraction of 200 ktpa, transport is expected to average around 650 tonnes per day or 20 truck-and-dog loads (40 movements). Transport hours of 8am to 3:30pm Monday to Friday are proposed, with no haulage on weekends or public holidays.

TfNSW offers the following project-specific comments to assist in preparation of the application:

- A key concern is the apparent lack of available Safe Intersection Sight Distance (SISD) and Minimum Gap Sight Distance (MGSD) between State highway traffic and laden trucks turning right from Razorback Road onto the State highway.

51-55 Currajong Street PARKES NSW 2870 | PO Box 334 PARKES NSW 2870 DX20256
P 6861 1449 | **W** development.western@rms.nsw.gov.au | ABN 18 804 239 602

- These distances are to be assessed in accordance with the Austroads *Guide to Road Design* as part of any application.

- If the application submits that this turning movement can be performed safely, this is to be demonstrated by diagrams representing the sight distances relative to highway horizontal and vertical curve geometry. If the movement cannot be performed safely, alternative safe haulage routes or infrastructure upgrades (such as a southbound climbing lane) may need to be considered.

More generally, TfNSW requests that the Environmental Impact Statement be supported by an Integrated Transport Assessment (ITA) prepared by a suitably qualified person in accordance with the *Austroads Guide to Traffic Management Part 12*, TfNSW *Supplements to Austroads* and the *RTA Guide to Traffic Generating Developments*. The ITA is to address the following.

- Project schedule:
    - Hours and days of work, number of shifts and start and end times,
    - Transport considerations at each phase and stage of the project, including construction, operation and decommissioning,

- Traffic volumes:
    - Existing background traffic,
    - Project-related traffic for each phase or stage of the project,
    - Projected cumulative traffic at commencement of operation, and a 10-year horizon post-commencement,

- Traffic characteristics:
    - Number and ratio of heavy vehicles to light vehicles,
    - Peak times for existing traffic,
    - Peak times for project-related traffic including commuter periods,
    - Proposed hours for transportation and haulage,
    - Interactions between existing and project-related traffic,

- A description of all over size and over mass vehicles and the materials to be transported

- The origins, destinations and routes for:
    - Commuter (employee and contractor) light vehicles and pool vehicles,
    - Heavy (haulage) vehicles,
    - Over size and over mass vehicles,

- Road safety assessment of key haulage route/s,

- The impact of traffic generation on the public road network and measures employed to ensure traffic efficiency and road safety during construction, operation and decommissioning of the project,

- The need for improvements to the road network, and the improvements proposed such as road widening and intersection treatments, to cater for and mitigate the impact of project related traffic,

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- Proposed road facilities, access and intersection treatments are to be identified and be in accordance with Austroads Guide to Road Design including provision of Safe Intersection Sight Distance (SISD),

- Local climate conditions that may affect road safety during the life of the project (e.g. fog, wet and dry weather, icy road conditions),

- Impact on public transport (public and school bus routes),

- Identification and assessment of potential impacts of the project, such as lighting, visual, noise, dust and drainage on the function and integrity of all affected public roads,

- Propose a Traffic Management Plan (TMP) to be developed following approval of the EIS, in consultation with relevant Councils and TfNSW. The TMP would need to identify strategies to manage the impacts of project related traffic, including any community consultation measures for peak haulage periods.

- Propose a Driver Code of Conduct for haulage operations which could include, but not be limited to:
    - Safety initiatives for haulage through residential areas and/or school zones.
    - An induction process for vehicle operators and regular toolbox meetings.
    - A public complaint resolution and disciplinary procedure.

TfNSW appreciates the opportunity to contribute to the SEARs and requests that a copy be forwarded to TfNSW at the same time it is sent to the applicant. If you wish to discuss this matter further, please contact Bevan Crofts, Development Assessment Officer on (02) 6861 1449.

Yours faithfully

Ainsley Bruem
A/Manager Land Use Assessment
Region West

cc General Manager
Mid-Western Regional Council
PO Box 156
Mudgee NSW 2850

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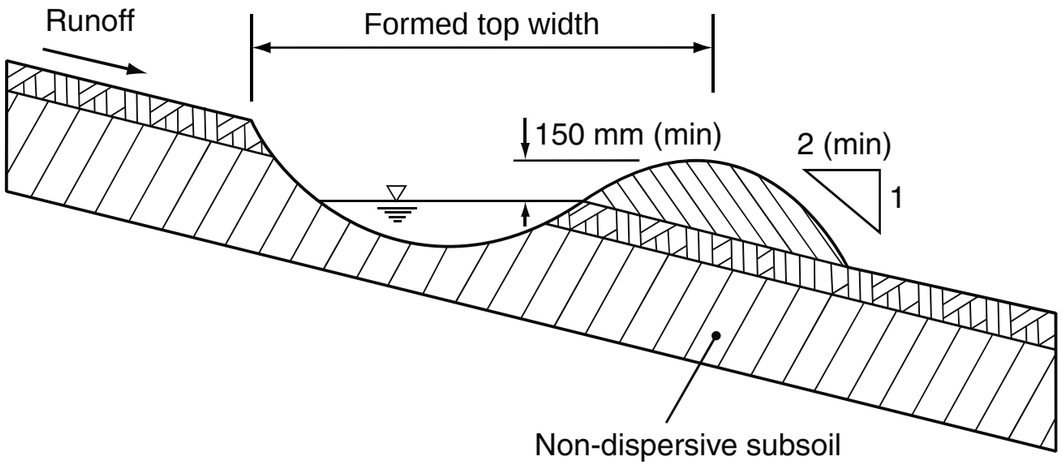
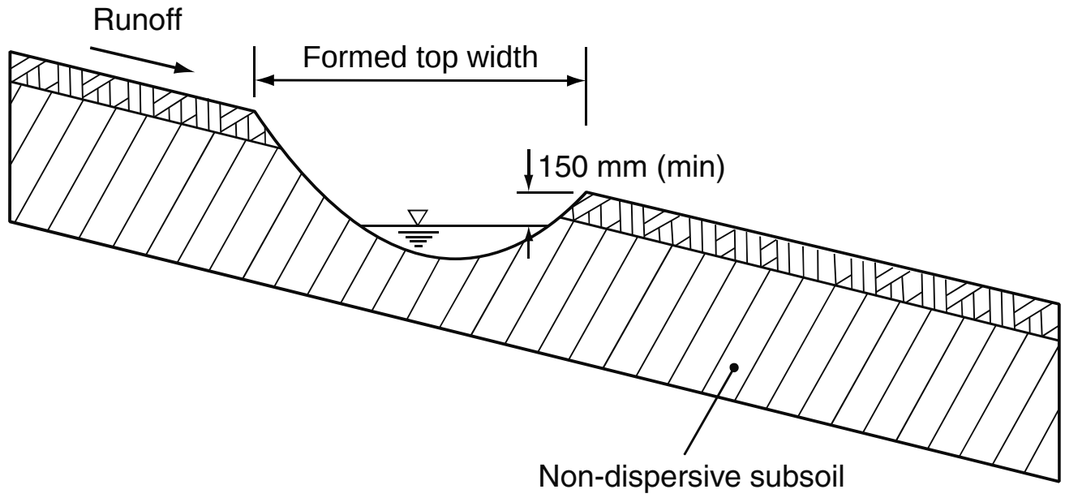
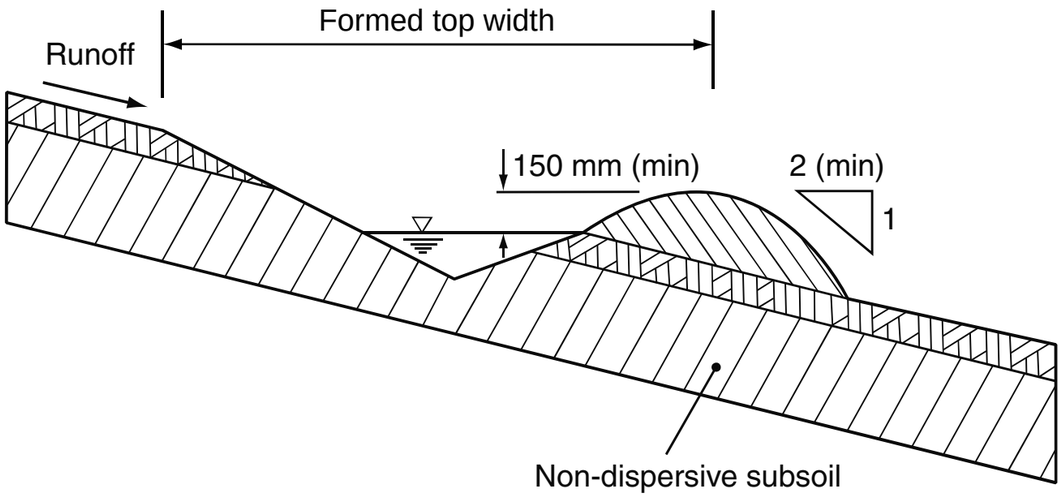
Appendix B: Blue Book Calculations and Standard Drawings



(a) Parabolic catch drain with down-slope bank



(c) Parabolic catch drain without bank



(b) Triangular V-drain with down-slope bank

Constructed dimensions of parabolic catch drains		
Drain type	Formed top width with or without bank	Formed depth with or without bank
Type-A	1.6 m	0.30 m
Type-B	2.4 m	0.45 m
Type-C	3.6 m	0.65 m

Constructed dimensions of triangular V-drains		
Drain type	Formed top width with or without bank	Formed depth with or without bank
Type-AV	2.0 m	0.30 m
Type-BV	2.7 m	0.45 m
Type-CV	3.9 m	0.65 m

NOT TO SCALE

Drawn:	Date:		
GMW	Dec-09	Catch Drains	CD-01

INSTALLATION (EARTH-LINED)

1. REFER TO APPROVED PLANS FOR LOCATION, EXTENT, AND CONSTRUCTION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, EXTENT, OR METHOD OF INSTALLATION, CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. CLEAR THE LOCATION FOR THE CATCH DRAIN, CLEARING ONLY WHAT IS NEEDED TO PROVIDE ACCESS FOR PERSONNEL AND EQUIPMENT FOR INSTALLATION.

3. REMOVE ROOTS, STUMPS, AND OTHER DEBRIS AND DISPOSE OF THEM PROPERLY. DO NOT USE DEBRIS TO BUILD THE BANK.

4. GRADE THE DRAIN TO THE SPECIFIED SLOPE AND FORM THE ASSOCIATED EMBANKMENT WITH COMPACTED FILL. NOTE THAT THE DRAIN INVERT MUST FALL 10cm EVERY 10m FOR EACH 1% OF REQUIRED CHANNEL GRADIENT.

5. ENSURE THE SIDES OF THE CUT DRAIN ARE NO STEEPER THAN A 1.5:1 (H:V) SLOPE AND THE EMBANKMENT FILL SLOPES NO STEEPER THAN 2:1.

6. ENSURE THE COMPLETED DRAIN HAS SUFFICIENT DEEP (AS SPECIFIED FOR THE TYPE OF DRAIN) MEASURED FROM THE DRAIN INVERT TO THE TOP OF THE EMBANKMENT.

7. ENSURE THE DRAIN HAS A CONSTANT FALL IN THE DESIRED DIRECTION FREE OF OBSTRUCTIONS.

8. ENSURE THE DRAIN DISCHARGES TO A STABLE OUTLET SUCH THAT SOIL EROSION WILL BE PREVENTED FROM OCCURRING. SPECIFICALLY, ENSURE THE DRAIN DOES NOT DISCHARGE TO AN UNSTABLE FILL SLOPE.

MAINTENANCE

1. INSPECT ALL CATCH DRAINS AT LEAST WEEKLY AND AFTER RUNOFF-PRODUCING STORM EVENTS AND REPAIR ANY SLUMPS, BANK DAMAGE, OR LOSS OF FREEBOARD.

2. ENSURE FILL MATERIAL OR SEDIMENT IS NOT PARTIALLY BLOCKING THE DRAIN. WHERE NECESSARY, REMOVE ANY DEPOSITED MATERIAL TO ALLOW FREE DRAINAGE.

3. DISPOSE OF ANY SEDIMENT OR FILL IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

REMOVAL

1. WHEN THE SOIL DISTURBANCE ABOVE THE CATCH DRAIN IS FINISHED AND THE AREA IS STABILISED, THE TEMPORARY DRAIN AND ANY ASSOCIATED BANKS SHOULD BE REMOVED, UNLESS IT IS TO REMAIN AS A PERMANENT DRAINAGE FEATURE.

2. DISPOSE OF ANY SEDIMENT OR EARTH IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

3. GRADE THE AREA AND SMOOTH IT OUT IN PREPARATION FOR STABILISATION.

4. STABILISE THE AREA BY GRASSING OR AS SPECIFIED WITHIN THE APPROVED SITE REHABILITATION PLAN.

Drawn:	Date:		
GMW	Dec-09	Catch Drains - Earth Lined	CD-02

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION, EXTENT, AND CONSTRUCTION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, EXTENT, OR METHOD OF INSTALLATION, CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. ENSURE ALL NECESSARY SOIL TESTING (e.g. SOIL pH, NUTRIENT LEVELS) AND ANALYSIS HAS BEEN COMPLETED, AND REQUIRED SOIL ADJUSTMENTS PERFORMED PRIOR TO PLANTING.

3. CLEAR THE LOCATION FOR THE CATCH DRAIN, CLEARING ONLY WHAT IS NEEDED TO PROVIDE ACCESS FOR PERSONNEL AND EQUIPMENT FOR INSTALLATION.

4. REMOVE ROOTS, STUMPS, AND OTHER DEBRIS AND DISPOSE OF THEM PROPERLY. DO NOT USE DEBRIS TO BUILD THE BANK.

5. GRADE THE DRAIN TO THE SPECIFIED SLOPE AND FORM THE ASSOCIATED EMBANKMENT WITH COMPACTED FILL. NOTE THAT THE DRAIN INVERT MUST FALL 10cm EVERY 10m FOR EACH 1% OF CHANNEL GRADIENT.

6. ENSURE THE SIDES OF THE CUT DRAIN ARE NO STEEPER THAN A 1.5:1 (H:V) SLOPE AND THE EMBANKMENT FILL SLOPES NO STEEPER THAN 2:1.

7. ENSURE THE COMPLETED DRAIN HAS SUFFICIENT DEEP (AS SPECIFIED FOR THE TYPE OF DRAIN) MEASURED FROM THE DRAIN INVERT TO THE TOP OF THE EMBANKMENT. WHERE NECESSARY, CUT THE DRAIN SLIGHTLY DEEPER THAN THAT SPECIFIED ON THE PLANS SUCH THAT THE CORRECT CHANNEL DIMENSIONS ARE ACHIEVED FOLLOWING PLACEMENT OF THE TURF.

8. ENSURE THE DRAIN HAS A CONSTANT FALL IN THE DESIRED DIRECTION FREE OF OBSTRUCTIONS.

9. TURF SHOULD BE USED WITHIN 12-HOURS OF DELIVERY, OTHERWISE ENSURE THE TURF IS STORED IN CONDITIONS APPROPRIATE FOR THE WEATHER CONDITIONS (e.g. A SHADED AREA).

10. MOISTENING THE TURF AFTER IT IS UNROLLED WILL HELP MAINTAIN ITS VIABILITY.

11. TURF SHOULD BE LAID ON A MINIMUM 75mm BED OF ADEQUATELY FERTILISED TOPSOIL. RAKE THE SOIL SURFACE TO BREAK THE CRUST JUST BEFORE LAYING THE TURF.

12. DURING THE WARMER MONTHS, LIGHTLY IRRIGATE THE SOIL IMMEDIATELY BEFORE LAYING THE TURF.

13. ENSURE THE TURF IS NOT LAID ON GRAVEL, HEAVILY COMPACTED SOILS, OR SOILS THAT HAVE BEEN RECENTLY TREATED WITH HERBICIDES.

14. FOR WIDE DRAINS AND HIGH VELOCITY CHUTES, LAY THE FIRST ROW OF TURF IN A STRAIGHT LINE DIAGONAL TO THE DIRECTION OF FLOW. STAGGER SUBSEQUENT ROWS IN A BRICK-LIKE (STRETCHER BOND) PATTERN. THE TURF SHOULD NOT BE STRETCHED OR OVERLAPPED. USE A KNIFE OR SHARP SPADE TO TRIM AND FIT IRREGULARLY SHAPED AREAS.

15. FOR NARROW DRAINS, LAY THE TURF ALONG THE DIRECTION OF THE DRAIN, ENSURING, WHEREVER PRACTICABLE, THAT A LONGITUDINAL JOINT BETWEEN TWO STRIPS OF TURF IS NOT POSITIONED ALONG THE INVERT OF THE DRAIN.

16. ENSURE THE TURF EXTENDS UP THE SIDES OF THE DRAIN AT LEAST 100mm ABOVE THE ELEVATION OF THE CHANNEL INVERT, OR AT LEAST TO A SUFFICIENT ELEVATION TO FULLY CONTAIN EXPECTED CHANNEL FLOW.

17. ON CHANNEL GRADIENTS OF 3:1(H:V) OR STEEPER, OR IN SITUATIONS WHERE HIGH FLOW VELOCITIES (i.e. VELOCITY >1.5m/s) ARE LIKELY WITHIN THE FIRST 2-WEEKS FOLLOWING PLACEMENT, SECURE THE INDIVIDUAL TURF STRIPS WITH WOODEN OR PLASTIC PEGS.

18. ENSURE THAT INTIMATE CONTACT IS ACHIEVED AND MAINTAINED BETWEEN THE TURF AND THE SOIL SUCH THAT SEEPAGE FLOW BENEATH THE TURF IS AVOIDED.

19. WATER UNTIL THE SOIL IS WET 100mm BELOW THE TURF. THEREAFTER, WATERING SHOULD BE SUFFICIENT TO MAINTAIN AND PROMOTE HEALTHY GROWTH.

20. ENSURE THE DRAIN DISCHARGES TO A STABLE OUTLET SUCH THAT DOWN-SLOPE SOIL EROSION WILL BE PREVENTED FROM OCCURRING. ENSURE THE DRAIN DOES NOT DISCHARGE TO AN UNSTABLE FILL SLOPE.

MAINTENANCE

1. INSPECT ALL CATCH DRAINS AT LEAST WEEKLY AND AFTER RUNOFF-PRODUCING STORM EVENTS AND REPAIR ANY SLUMPS, BANK DAMAGE, OR LOSS OF FREEBOARD.

2. ENSURE FILL MATERIAL OR SEDIMENT IS NOT PARTIALLY BLOCKING THE DRAIN. WHERE NECESSARY, REMOVE ANY DEPOSITED MATERIAL TO ALLOW FREE DRAINAGE.

3. DISPOSE OF ANY SEDIMENT OR FILL IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

REMOVAL

1. WHEN THE SOIL DISTURBANCE ABOVE THE CATCH DRAIN IS FINISHED AND THE AREA IS STABILISED, THE DRAIN AND ANY ASSOCIATED BANKS SHOULD BE REMOVED, UNLESS IT IS TO REMAIN AS A PERMANENT DRAINAGE FEATURE.

2. DISPOSE OF ANY SEDIMENT OR EARTH IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

3. GRADE THE AREA AND SMOOTH IT OUT IN PREPARATION FOR STABILISATION.

4. STABILISE THE AREA BY GRASSING OR AS SPECIFIED WITHIN THE APPROVED PLAN.

Drawn:	Date:		
GMW	Dec-09	Catch Drains - Grass Lined	CD-03

INSTALLATION (DRAIN FORMATION)

1. REFER TO APPROVED PLANS FOR LOCATION, EXTENT, AND CONSTRUCTION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, EXTENT, OR METHOD OF INSTALLATION, CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. CLEAR THE LOCATION FOR THE CATCH DRAIN, CLEARING ONLY WHAT IS NEEDED TO PROVIDE ACCESS FOR PERSONNEL AND EQUIPMENT FOR INSTALLATION.

3. REMOVE ROOTS, STUMPS, AND OTHER DEBRIS AND DISPOSE OF THEM PROPERLY. DO NOT USE DEBRIS TO BUILD THE BANK.

4. GRADE THE DRAIN TO THE SPECIFIED SLOPE AND FORM THE ASSOCIATED EMBANKMENT WITH COMPACTED FILL. NOTE THAT THE DRAIN INVERT MUST FALL 10cm EVERY 10m FOR EACH 1% OF CHANNEL GRADIENT.

5. ENSURE THE SIDES OF THE CUT DRAIN ARE NO STEEPER THAN A 1.5:1 (H:V) SLOPE AND THE EMBANKMENT FILL SLOPES NO STEEPER THAN 2:1.

6. ENSURE THE COMPLETED DRAIN HAS SUFFICIENT DEEP (AS SPECIFIED FOR THE TYPE OF DRAIN) MEASURED FROM THE DRAIN INVERT TO THE TOP OF THE EMBANKMENT.

7. ENSURE THE DRAIN HAS A CONSTANT FALL IN THE DESIRED DIRECTION FREE OF OBSTRUCTIONS.

8. ENSURE THE DRAIN DISCHARGES TO A STABLE OUTLET SUCH THAT SOIL EROSION WILL BE PREVENTED FROM OCCURRING. ENSURE THE DRAIN DOES NOT DISCHARGE TO AN UNSTABLE FILL SLOPE.

INSTALLATION (MAT PLACEMENT)

THE METHOD OF MAT INSTALLATION VARIES WITH THE TYPE OF MAT. INSTALLATION PROCEDURES SHOULD BE PROVIDED BY THE MANUFACTURER OR DISTRIBUTOR OF THE PRODUCT. A TYPICAL INSTALLATION PROCEDURE IS DESCRIBED BELOW, BUT SHOULD BE CONFIRMED WITH THE PRODUCT MANUFACTURER OR DISTRIBUTOR.

1. EROSION CONTROL MATS MUST BE STORED AWAY FROM DIRECT SUNLIGHT OR COVERED WITH ULTRAVIOLET LIGHT PROTECTIVE SHEETING UNTIL THE SITE IS READY FOR THEIR INSTALLATION.

2. VEHICLES AND CONSTRUCTION EQUIPMENT MUST NOT BE PERMITTED TO MANOEUVRE OVER THE GEOTEXTILE UNLESS IT HAS BEEN COVERED WITH A LAYER OF SOIL OR GRAVEL AT LEAST 150mm THICK. FILL MATERIAL SHALL NOT BE MIXED OVER THE GEOTEXTILE.

3. IF THE CHANNEL IS TO BE GRASSED, PREPARE A SMOOTH SEED BED OF APPROXIMATELY 75mm OF TOPSOIL, SEED, FERTILISE, WATER AND RAKE TO REMOVE ANY REMAINING SURFACE IRREGULARITIES.

4. EXCAVATE A 300mm DEEP BY 150mm WIDE ANCHOR TRENCH ALONG THE FULL WIDTH OF THE UPSTREAM END OF THE AREA TO BE TREATED.

5. AT LEAST 300mm OF THE MAT MUST BE ANCHORED INTO THE TRENCH WITH THE ROLL OF MATTING RESTING ON THE GROUND UP-SLOPE OF THE TRENCH.

6. STAPLE THE FABRIC WITHIN THE TRENCH AT 200 TO 250mm SPACING USING 100mm WIDE BY 150mm PENETRATION LENGTH U-SHAPED, 8 TO 11 GAUGE WIRE STAPLES. NARROWER U-SECTIONS MAY EASILY TEAR THE MATTING WHEN PLACED UNDER STRESS.

7. WHEN ALL MATS HAVE BEEN ANCHORED WITHIN THE TRENCH ACROSS THE FULL WIDTH OF THE TREATED AREA, THEN THE TRENCH IS BACKFILLED AND COMPACTED. THE MATS ARE THEN UNROLLED DOWN THE SLOPE SUCH THAT EACH MAT COVERS AND PROTECTS THE BACKFILLED TRENCH.

8. WHEN SPREADING THE MATS, AVOID STRETCHING THE FABRIC. THE MATS SHOULD REMAIN IN GOOD CONTACT WITH THE SOIL.

9. IF THE CHANNEL CURVES, THEN SUITABLY FOLD (IN A DOWNSTREAM DIRECTION) AND STAPLE THE FABRIC TO MAINTAIN THE FABRIC PARALLEL TO THE DIRECTION OF CHANNEL FLOW.

10. STAPLE THE SURFACE OF THE MATTING AT 1m CENTRES. ON IRREGULAR GROUND, ADDITIONAL STAPLES WILL BE REQUIRED WHEREVER THE MAT DOES NOT INITIALLY CONTACT THE GROUND SURFACE.

11. AT THE END OF EACH LENGTH OF MAT, A NEW TRENCH IS FORMED AT LEAST 300mm UP-SLOPE OF THE END OF THE MAT SUCH THAT THE END OF THE MAT WILL BE ABLE TO FULLY COVER THE TRENCH. A NEW ROLL OF MATTING IS THEN ANCHORED WITHIN THIS TRENCH AS PER THE FIRST MAT. AFTER THIS NEW MAT HAS BEEN UNROLLED DOWN THE SLOPE, THE UP-SLOPE MAT CAN BE PINNED IN PLACE FULLY COVERING THE NEW TRENCH AND AT LEAST 300mm OF THE DOWN-SLOPE MAT. THE PROCESS IS CONTINUED DOWN THE SLOPE UNTIL THE DESIRED AREA IS FULLY COVERED.

12. IN HIGH-VELOCITY CHANNELS, INTERMEDIATE ANCHOR SLOTS ARE USUALLY REQUIRED AT 10M INTERVALS DOWN THE CHANNEL.

13. ANCHOR THE OUTER MOST EDGES (TOP AND UPPER MOST SIDES) OF THE TREATED AREA IN A 300mm DEEP TRENCH AND STAPLE AT 200 TO 250mm CENTRES.

14. IF THE CHANNEL WAS GRASS SEEDED PRIOR TO PLACEMENT OF THE MATS, THEN THE MATS SHOULD BE ROLLED WITH A SUITABLE ROLLER WEIGHING 60 TO 90kg/m, THEN WATERED.

15. THE INSTALLATION PROCEDURE MUST ENSURE THAT THE MAT ACHIEVES AND RETAINS GOOD CONTACT WITH THE SOIL.

16. DAMAGED MATTING MUST BE REPAIRED OR REPLACED.

ADDITIONAL INSTRUCTIONS FOR THE INSTALLATION OF JUTE MESH (NOT JUTE BLANKETS):

1. ENSURE THE JUTE MESH IS LAID ON A FIRM EARTH SURFACE THAT HAS BEEN TRIMMED, TOPSOILED, WATERED, SOWN WITH SEED AND FERTILISER.

2. THE JUTE MESH IS THEN EITHER TAMPED OR ROLLED FIRMLY ONTO THE PREPARED SURFACE, AVOIDING STRETCHING, WATERED TO ENCOURAGE THE PENETRATION OF THE BITUMEN EMULSION, AND FINALLY SPRAYED WITH A TOP LAYER OF BITUMEN AT 1 TO 3 LITRES PER SQUARE METRE.

3. THE RATE OF EMULSION APPLICATION SHOULD BE ADJUSTED SUCH THAT THE EMULSION JUST STARTS TO POND IN THE MESH SQUARES.

MAINTENANCE

1. INSPECT ALL CATCH DRAINS AT LEAST WEEKLY AND AFTER RUNOFF-PRODUCING STORM EVENTS AND REPAIR ANY SLUMPS, BANK DAMAGE, OR LOSS OF FREEBOARD.

2. ENSURE FILL MATERIAL OR SEDIMENT IS NOT PARTIALLY BLOCKING THE DRAIN. WHERE NECESSARY, REMOVE ANY DEPOSITED MATERIAL TO ALLOW FREE DRAINAGE.

3. DISPOSE OF ANY SEDIMENT OR FILL IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

REMOVAL

1. WHEN THE SOIL DISTURBANCE ABOVE THE CATCH DRAIN IS FINISHED AND THE AREA IS STABILISED, THE DRAIN AND ANY ASSOCIATED BANKS SHOULD BE REMOVED, UNLESS IT IS TO REMAIN AS A PERMANENT DRAINAGE FEATURE.

2. DISPOSE OF ANY SEDIMENT OR EARTH IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

3. GRADE THE AREA AND SMOOTH IT OUT IN PREPARATION FOR STABILISATION.

4. STABILISE THE AREA BY GRASSING OR AS SPECIFIED WITHIN THE APPROVED PLAN.

Drawn:	Date:		
GMW	May-10	Catch Drains - Geotextile Lined	CD-04

MATERIALS

ROCK:
(i) ALL ROCK MUST BE HARD, WEATHER RESISTANT, AND DURABLE AGAINST DISINTEGRATION UNDER CONDITIONS TO BE MET IN HANDLING, PLACEMENT AND OPERATION.

(ii) ALL ROCK MUST HAVE ITS GREATEST DIMENSION NOT GREATER THAN 3 TIMES ITS LEAST DIMENSIONS.

(iii) THE ROCK USED IN FORMATION OF THE DRAIN MUST BE EVENLY GRADED WITH 50% BY WEIGHT LARGER THAN THE SPECIFIED NOMINAL ROCK SIZE AND HAVE SUFFICIENT SMALL ROCK TO FILL THE VOIDS BETWEEN THE LARGER ROCK. DIRT, FINES, AND SMALLER ROCK MUST NOT EXCEED 5% BY WEIGHT.

(iv) THE DIAMETER OF THE LARGEST ROCK SIZE SHOULD BE NO LARGER THAN 1.5 TIMES THE NOMINAL ROCK SIZE. SPECIFIC GRAVITY TO BE AT LEAST 2.5.

(v) THE COLOUR OF THE RIPRAP SHALL BE [INSERT] AND MUST BE APPROVED BY THE ENGINEER. ONCE APPROVED, THE COLOUR SHALL BE KEPT CONSISTENT THROUGH THE PROJECT.

GEOTEXTILE FABRIC: HEAVY-DUTY, NEEDLE-PUNCHED, NON-WOVEN FILTER CLOTH, MINIMUM BIDIM A24 OR EQUIVALENT.

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION, EXTENT, AND CONSTRUCTION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, EXTENT, OR METHOD OF INSTALLATION, CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. PRIOR TO PLACEMENT, ALL ROCKS MUST BE VISUALLY CHECKED FOR SIZE, ELONGATION, CRACKS, DETERIORATION AND OTHER VISIBLE. THE DEGREE AND THOROUGHNESS OF SUCH CHECKING MUST BE APPROPRIATE FOR THE POTENTIAL CONSEQUENCES ASSOCIATED WITH FAILURE OF THE STRUCTURE OR PURPOSE FOR WHICH THE MATERIAL WILL BE USED.

3. CLEAR THE LOCATION FOR THE CATCH DRAIN, CLEARING ONLY WHAT IS NEEDED TO PROVIDE ACCESS FOR PERSONNEL AND EQUIPMENT FOR INSTALLATION.

4. REMOVE ROOTS, STUMPS, AND OTHER DEBRIS AND DISPOSE OF THEM PROPERLY. DO NOT USE DEBRIS TO BUILD THE BANK.

5. REMOVE ALL SOFT, YIELDING MATERIAL; REPLACE WITH SUITABLE ON-SITE MATERIAL; COMPACT TO SMOOTH FIRM SURFACE.

6. EXCAVATE THE DRAIN TO THE LINES AND GRADES SHOWN ON THE APPROVED PLANS. OVER-CUT THE DRAIN TO A DEPTH EQUAL TO THE SPECIFIED DEPTH OF ROCK PLACEMENT SUCH THAT THE FINISHED TOP SURFACE WILL BE AT THE ELEVATION OF THE SURROUNDING LAND. PLACEMENT OF THE ROCK LINING MUST NOT REDUCE THE DRAIN'S TOP WIDTH AND DEPTH AS SPECIFIED WITHIN THE APPROVED PLANS.

7. GRADE THE DRAIN TO THE SPECIFIED SLOPE AND FORM THE ASSOCIATED EMBANKMENT WITH COMPACTED FILL. NOTE THAT THE DRAIN INVERT MUST FALL 10CM EVERY 10m FOR EACH 1% OF CHANNEL GRADIENT.

8. ENSURE THE SIDES OF THE CUT DRAIN ARE NO STEEPER THAN A 1.5:1 (H:V) SLOPE AND THE EMBANKMENT FILL SLOPES NO STEEPER THAN 2:1.

9. IF THE DRAIN IS CUT INTO A DISPERSIVE (SODIC) SOIL, THEN PRIOR TO PLACING FILTER CLOTH, THE EXPOSED DISPERSIVE SOIL MUST BE COVERED WITH A MINIMUM 200mm THICK LAYER OF NON-DISPERSIVE SOIL PRIOR TO PLACEMENT OF FILTER CLOTH OR ROCKS.

10. IF A FILTER CLOTH UNDERLAY IS SPECIFIED, PLACE THE FILTER FABRIC DIRECTLY ON THE PREPARED FOUNDATION. IF MORE THAN ONE SHEET OF FILTER CLOTH IS REQUIRED TO OVER THE AREA, OVERLAP THE EDGE OF EACH SHEET AT LEAST 300mm, AND SECURE ANCHOR PINS AT MINIMUM 1M SPACING ALONG THE OVERLAP.

11. ENSURE THE FILTER CLOTH IS PROTECTED FROM PUNCHING OR TEARING DURING INSTALLATION OF THE FABRIC AND THE ROCK. REPAIR ANY DAMAGE BY REMOVING THE ROCK AND PLACING WITH ANOTHER PIECE OF FILTER CLOTH OVER THE DAMAGED AREA OVERLAPPING THE EXISTING FABRIC A MINIMUM OF 300mm.

12. PLACEMENT OF ROCK SHOULD FOLLOW IMMEDIATELY AFTER PLACEMENT OF THE FILTER LAYER. PLACE ROCK SO THAT IT FORMS A DENSE, WELL-GRADED MASS OF ROCK WITH A MINIMUM OF VOIDS.

13. PLACE ROCK LINING TO THE EXTENT AND DEPTH INDICATED WITHIN THE APPROVED PLANS.

14. ENSURE THE ROCK IS PLACED IN AN APPROPRIATE MANNER TO AVOID DISPLACING UNDERLYING MATERIALS OR PLACING UNDUE IMPACT FORCE ON THE BEDDING MATERIALS.

15. ENSURE THE ROCK IS PLACED WITH A MINIMUM THICKNESS OF 1.5 TIMES THE NOMINAL ROCK SIZE (D50).

16. ENSURE MATERIALS THAT ARE D50 AND LARGER ARE POSITIONED FLUSH WITH THE TOP SURFACE WITH FACES AND SHAPES MATCHED TO MINIMISE VOIDS.

17. ENSURE PROJECTIONS ABOVE OR DEPRESSIONS UNDER THE SPECIFIED TOP SURFACE ARE LESS THAN 20% OF THE ROCK LAYER THICKNESS. THE AVERAGE SURFACE PLANE OF THE FINISHED ROCK IS DEFINED AS THE PLANE WHERE 50% OF THE TOPS OF ROCKS WOULD CONTACT.

18. ENSURE THE COMPLETED DRAIN HAS SUFFICIENT DEEP (AS SPECIFIED FOR THE TYPE OF DRAIN) MEASURED FROM THE DRAIN INVERT (AVERAGE SURFACE PLANE ALONG CHANNEL INVERT) TO THE TOP OF THE EMBANKMENT. THE AVERAGE SURFACE PLANE OF THE FINISHED ROCK IS DEFINED AS THE PLANE WHERE 50% OF THE TOPS OF ROCKS WOULD CONTACT.

19. TO THE MAXIMUM DEGREE PRACTICABLE, THE MATERIAL BETWEEN LARGER ROCK MUST NOT BE LOOSE OR EASILY DISPLACED BY THE EXPECTED FLOW.

20. AFTER PLACEMENT OF THE ROCK LINING, ENSURE THE DRAIN HAS A CONSTANT FALL IN THE DESIRED DIRECTION FREE OF OBSTRUCTIONS.

21. ENSURE THE DRAIN DISCHARGES TO A STABLE OUTLET SUCH THAT SOIL EROSION WILL BE PREVENTED FROM OCCURRING. ENSURE THE DRAIN DOES NOT DISCHARGE TO AN UNSTABLE FILL SLOPE.

MAINTENANCE

1. INSPECT ALL CATCH DRAINS AT LEAST WEEKLY AND AFTER RUNOFF-PRODUCING STORM EVENTS AND REPAIR ANY SLUMPS, BANK DAMAGE, OR LOSS OF FREEBOARD.

2. CLOSELY INSPECT THE OUTER EDGES OF THE ROCK PROTECTION. ENSURE WATER ENTRY INTO THE ROCK-LINED AREA IS NOT CAUSING EROSION ALONG THE EDGE OF THE ROCK PROTECTION.

3. CAREFULLY CHECK THE STABILITY OF THE ROCK LOOKING FOR INDICATIONS OF PIPING, SCOUR HOLES, OR BANK FAILURES.

4. REPLACE OR REPOSITION THE SURFACE ROCK SUCH THAT THE DRAIN FUNCTIONS AS REQUIRED AND THE DRAIN'S REQUIRED HYDRAULIC CAPACITY IS NOT REDUCED.

5. REPLACE ANY DISPLACED ROCK WITH ROCK OF A SIGNIFICANTLY (MINIMUM 110%) LARGER SIZE THAN THE DISPLACED ROCK.

6. ENSURE SEDIMENT IS NOT PARTIALLY BLOCKING THE DRAIN. WHERE NECESSARY, REMOVE ANY DEPOSITED MATERIAL TO ALLOW FREE DRAINAGE.

7. DISPOSE OF ANY SEDIMENT OR FILL IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

Drawn:	Date:		
GMW	Dec-09	Catch Drains - Rock Lined	CD-05

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION, EXTENT, AND CONSTRUCTION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, EXTENT, OR METHOD OF INSTALLATION, CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. ENSURE ALL NECESSARY SOIL TESTING (e.g. SOIL pH, NUTRIENT LEVELS) AND ANALYSIS HAS BEEN COMPLETED, AND REQUIRED SOIL ADJUSTMENTS PERFORMED PRIOR TO PLANTING.

3. CLEAR THE LOCATION FOR THE CHANNEL, CLEARING ONLY WHAT IS NEEDED TO PROVIDE ACCESS FOR PERSONNEL AND CONSTRUCTION EQUIPMENT.

4. REMOVE ROOTS, STUMPS, AND OTHER DEBRIS AND DISPOSE OF THEM PROPERLY. DO NOT USE DEBRIS TO BUILD ANY ASSOCIATED EMBANKMENTS.

5. EXCAVATE THE DIVERSION CHANNEL TO THE SPECIFIED SHAPE, ELEVATION AND GRADIENT. THE SIDES OF THE CHANNEL SHOULD BE NO STEEPER THAN A 2:1 (H:V) IF CONSTRUCTED IN EARTH, UNLESS SPECIFICALLY DIRECTED WITHIN THE APPROVED PLANS.

6. STABILISE THE CHANNEL AND BANKS IMMEDIATELY UNLESS IT WILL OPERATE FOR LESS THAN 30 DAYS. IN EITHER CASE, TEMPORARY EROSION PROTECTION (MATTING, ROCK, ETC.) WILL BE REQUIRED AS SPECIFIED WITHIN THE APPROVED PLANS OR AS DIRECTED.

7. ENSURE THE CHANNEL DISCHARGES TO A STABLE AREA.

ADDITIONAL REQUIREMENTS FOR TURF PLACEMENT:

1. TURF SHOULD BE USED WITHIN 12 HOURS OF DELIVERY, OTHERWISE ENSURE THE TURF IS STORED IN CONDITIONS APPROPRIATE FOR THE WEATHER CONDITIONS (e.g. A SHADED AREA).

2. MOISTENING THE TURF AFTER IT IS UNROLLED WILL HELP MAINTAIN ITS VIABILITY.

3. TURF SHOULD BE LAID ON A MINIMUM 75mm BED OF ADEQUATELY FERTILISED TOPSOIL. RAKE THE SOIL SURFACE TO BREAK THE CRUST JUST BEFORE LAYING THE TURF.

4. DURING THE WARMER MONTHS, LIGHTLY IRRIGATE THE SOIL IMMEDIATELY BEFORE LAYING THE TURF.

5. ENSURE THE TURF IS NOT LAID ON GRAVEL, HEAVILY COMPACTED SOILS, OR SOILS THAT HAVE BEEN RECENTLY TREATED WITH HERBICIDES.

6. ENSURE THE TURF EXTENDS UP THE SIDES OF THE DRAIN AT LEAST 100mm ABOVE THE ELEVATION OF THE CHANNEL INVERT, OR AT LEAST TO A SUFFICIENT ELEVATION TO FULLY CONTAIN EXPECTED CHANNEL FLOW.

7. ON CHANNEL GRADIENTS OF 3:1(H:V) OR STEEPER, OR IN SITUATIONS WHERE HIGH FLOW VELOCITIES (i.e. VELOCITY >1.5m/s) ARE LIKELY WITHIN THE FIRST TWO WEEK FOLLOWING PLACEMENT, SECURE THE INDIVIDUAL TURF STRIPS WITH WOODEN OR PLASTIC PEGS.

8. ENSURE THAT INTIMATE CONTACT IS ACHIEVED AND MAINTAINED BETWEEN THE TURF AND THE SOIL SUCH THAT SEEPAGE FLOW BENEATH THE TURF IS AVOIDED.

9. WATER UNTIL THE SOIL IS WET 100mm BELOW THE TURF. THEREAFTER, WATERING SHOULD BE SUFFICIENT TO MAINTAIN AND PROMOTE HEALTHY GROWTH

MAINTENANCE

1. DURING THE SITE'S CONSTRUCTION PERIOD, INSPECT THE DIVERSION CHANNEL WEEKLY AND AFTER ANY INCREASE IN FLOWS WITHIN THE CHANNEL. REPAIR ANY SLUMPS, WHEEL TRACK DAMAGE OR LOSS OF FREEBOARD.

2. ENSURE FILL MATERIAL OR SEDIMENT IS NOT PARTIALLY BLOCKING THE CHANNEL. WHERE NECESSARY, REMOVE ANY DEPOSITED MATERIAL TO ALLOW FREE DRAINAGE.

3. DISPOSE OF ANY COLLECTED SEDIMENT OR FILL IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

REMOVAL

1. WHEN THE CONSTRUCTION WORK ABOVE A TEMPORARY DIVERSION CHANNEL IS FINISHED AND THE AREA IS STABILISED, THE AREA SHOULD BE APPROPRIATELY REHABILITATED.

2. DISPOSE OF ANY COLLECTED SEDIMENT OR FILL IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

3. GRADE THE AREA AND SMOOTH IT OUT IN PREPARATION FOR STABILISATION.

4. STABILISE THE AREA AS SPECIFIED IN THE APPROVED PLAN.

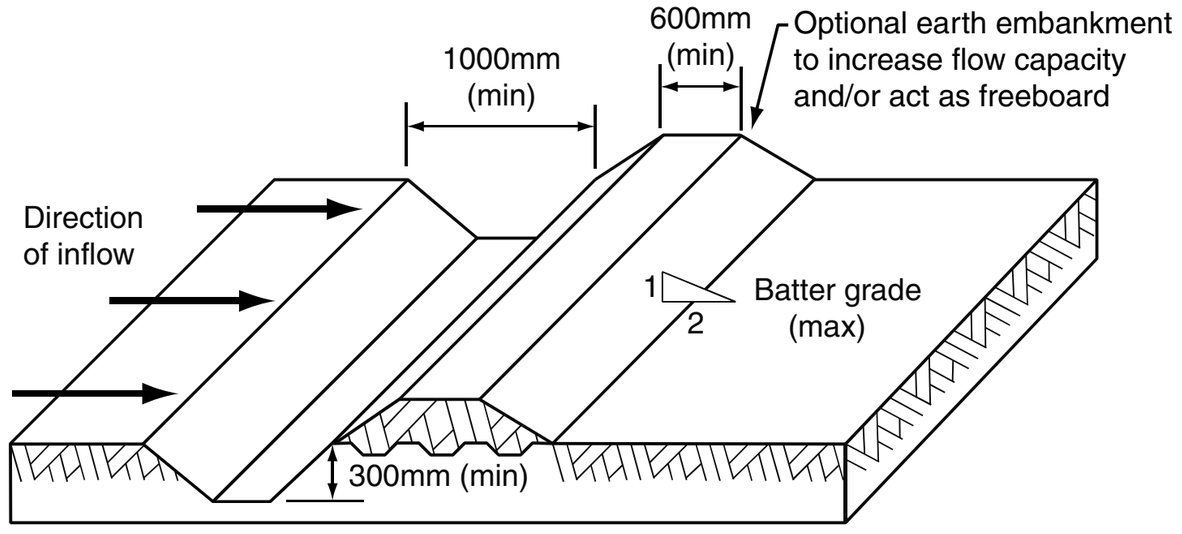


Figure 1 - Typical profile of diversion channel with bank

Drawn:	Date:		
GMW	Dec-09	Diversion Channels	DC-01

CONSTRUCTION

1. THE SPILLWAY MUST BE EXCAVATED AS SHOWN ON THE PLANS, AND THE EXCAVATED MATERIAL IF CLASSIFIED AS SUITABLE, MUST BE USED IN THE EMBANKMENT, AND IF NOT SUITABLE IT MUST BE DISPOSED OF INTO SPOIL HEAPS.

2. ENSURE EXCAVATED DIMENSIONS ALLOW ADEQUATE BOXING-OUT SUCH THAT THE SPECIFIED ELEVATIONS, GRADES, CHUTE WIDTH, AND ENTRANCE AND EXIT SLOPES FOR THE EMERGENCY SPILLWAY WILL BE ACHIEVED AFTER PLACEMENT OF THE ROCK OR OTHER SCOUR PROTECTION MEASURES AS SPECIFIED IN THE PLANS.

3. PLACE SPECIFIED SCOUR PROTECTION MEASURES ON THE EMERGENCY SPILLWAY. ENSURE THE FINISHED GRADE BLENDS WITH THE SURROUNDING AREA TO ALLOW A SMOOTH FLOW TRANSITION FROM SPILLWAY TO DOWNSTREAM CHANNEL.

4. IF A SYNTHETIC FILTER FABRIC UNDERLAY IS SPECIFIED, PLACE THE FILTER FABRIC DIRECTLY ON THE PREPARED FOUNDATION. IF MORE THAN 1 SHEET OF FILTER FABRIC IS REQUIRED, OVERLAP THE EDGES BY AT LEAST 300mm AND PLACE ANCHOR PINS AT MINIMUM 1m SPACING ALONG THE OVERLAP. BURY THE UPSTREAM END OF THE FABRIC A MINIMUM 300mm BELOW GROUND AND WHERE NECESSARY, BURY THE LOWER END OF THE FABRIC OR OVERLAP A MINIMUM 300mm OVER THE NEXT DOWNSTREAM SECTION AS REQUIRED. ENSURE THE FILTER FABRIC EXTENDS AT LEAST 1000mm UPSTREAM OF THE SPILLWAY CREST.

5. TAKE CARE NOT TO DAMAGE THE FABRIC DURING OR AFTER PLACEMENT. IF DAMAGE OCCURS, REMOVE THE ROCK AND REPAIR THE SHEET BY ADDING ANOTHER LAYER OF FABRIC WITH A MINIMUM OVERLAP OF 300mm AROUND THE DAMAGED AREA. IF EXTENSIVE DAMAGE IS SUSPECTED, REMOVE AND REPLACE THE ENTIRE SHEET.

6. WHERE LARGE ROCK IS USED, OR MACHINE PLACEMENT IS DIFFICULT, A MINIMUM 100mm LAYER OF FINE GRAVEL, AGGREGATE, OR SAND MAY BE NEEDED TO PROTECT THE FABRIC.

7. PLACEMENT OF ROCK SHOULD FOLLOW IMMEDIATELY AFTER PLACEMENT OF THE FILTER FABRIC. PLACE ROCK SO THAT IT FORMS A DENSE, WELL-GRADED MASS OF ROCK WITH A MINIMUM OF VOIDS. THE DESIRED DISTRIBUTION OF ROCK THROUGHOUT THE MASS MAY BE OBTAINED BY SELECTIVE LOADING AT THE QUARRY AND CONTROLLED DUMPING DURING FINAL PLACEMENT.

8. THE FINISHED SLOPE SHOULD BE FREE OF POCKETS OF SMALL ROCK OR CLUSTERS OF LARGE ROCKS. HAND PLACING MAY BE NECESSARY TO ACHIEVE THE PROPER DISTRIBUTION OF ROCK SIZES TO PRODUCE A RELATIVELY SMOOTH, UNIFORM SURFACE. THE FINISHED GRADE OF THE ROCK SHOULD BLEND WITH THE SURROUNDING AREA. NO OVERFALL OR PROTRUSION OF ROCK SHOULD BE APPARENT.

9. ENSURE THAT THE FINAL ARRANGEMENT OF THE SPILLWAY CREST WILL NOT PROMOTE EXCESSIVE FLOW THROUGH THE ROCK SUCH THAT THE WATER CAN BE RETAINED WITHIN THE SETTLING BASIN AN ELEVATION NO LESS THAN 50mm ABOVE OR BELOW THE NOMINATED SPILLWAY CREST ELEVATION.

MAINTENANCE

1. DURING THE CONSTRUCTION PERIOD, INSPECT THE SPILLWAY PRIOR TO FORECAST RAINFALL, DAILY DURING EXTENDED PERIODS OF RAINFALL, AFTER SIGNIFICANT RUNOFF PRODUCING STORM EVENTS, OR OTHERWISE ON A WEEKLY BASIS. MAKE REPAIRS AS NECESSARY.

2. CHECK FOR MOVEMENT OF, OR DAMAGE TO, THE SPILLWAY'S LINING, INCLUDING SURFACE CRACKING.

3. CHECK FOR SOIL SCOUR ADJACENT THE SPILLWAY. INVESTIGATE THE CAUSE OF ANY SCOUR, AND REPAIR AS NECESSARY.

4. WHEN MAKING REPAIRS, ALWAYS RESTORE THE SPILLWAY TO ITS ORIGINAL CONFIGURATION UNLESS AN AMENDED LAYOUT IS REQUIRED.

REMOVAL

1. TEMPORARY SPILLWAYS SHOULD BE REMOVED WHEN AN ALTERNATIVE, STABLE, DRAINAGE SYSTEM IS AVAILABLE.

2. REMOVE ALL MATERIALS AND DEPOSITED SEDIMENT, AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

3. GRADE THE AREA IN PREPARATION FOR STABILISATION, THEN STABILISE THE AREA AS SPECIFIED IN THE APPROVED PLAN.

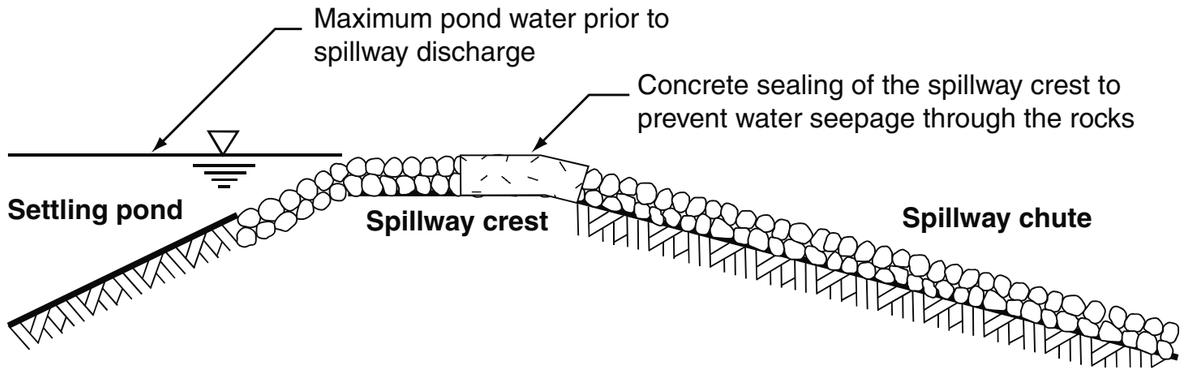


Figure 1 - Example of seepage control on the spillway crest

Drawn:	Date:		
GMW	Dec-09	Emergency Spillways	ES-1

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION, DIMENSIONS AND CONSTRUCTION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, DIMENSIONS, OR METHOD OF INSTALLATION CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. WHEREVER PRACTICAL, LOCATE THE LEVEL SPREADER ON UNDISTURBED, STABLE SOIL.

3. ENSURE FLOW DISCHARGING FROM THE LEVEL SPREADER WILL DISPERSE ACROSS A PROPERLY STABILISED SLOPE NOT EXCEEDING 10:1 (H:V) AND SUFFICIENTLY EVEN IN GRADE ACROSS THE SLOPE TO AVOID CONCENTRATING THE OUTFLOW.

4. THE OUTLET SILL OF THE SPREADER SHOULD BE PROTECTED WITH EROSION CONTROL MATTING TO PREVENT EROSION DURING THE ESTABLISHMENT OF VEGETATION. THE MATTING SHOULD BE A MINIMUM OF 1200mm WIDE EXTENDING AT LEAST 300mm UPSTREAM OF THE EDGE OF THE OUTLET CREST AND BURIED AT LEAST 150mm IN A VERTICAL TRENCH. THE DOWNSTREAM EDGE SHOULD BE SECURELY HELD IN PLACE WITH CLOSELY SPACED HEAVY-DUTY WIRE STAPLES AT LEAST 150mm LONG.

5. ENSURE THAT THE OUTLET SILL (CREST) IS LEVEL FOR THE SPECIFIED LENGTH.

6. IMMEDIATELY AFTER CONSTRUCTION, TURF, OR SEED AND MULCH WHERE APPROPRIATE, THE LEVEL SPREADER.

MAINTENANCE

1. INSPECT THE LEVEL SPREADER AFTER EVERY RAINFALL EVENT UNTIL VEGETATION IS ESTABLISHED.

2. AFTER ESTABLISHMENT OF VEGETATION OVER THE LEVEL SPREADER, INSPECTIONS SHOULD BE MADE ON A REGULAR BASIS AND AFTER RUNOFF-PRODUCING RAINFALL.

3. ENSURE THAT THERE IS NO SOIL EROSION AND THAT SEDIMENT DEPOSITION IS NOT CAUSING THE CONCENTRATION OF FLOW.

4. ENSURE THAT THERE IS NO SOIL EROSION OR CHANNEL DAMAGE UPSTREAM OF THE LEVEL SPREADER, OR SOIL EROSION OR VEGETATION DAMAGE DOWNSTREAM OF THE LEVEL SPREADER.

5. INVESTIGATE THE SOURCE OF ANY EXCESSIVE SEDIMENTATION.

6. MAINTAIN GRASS IN A HEALTH CONDITION WITH NO LESS THAN 90% COVER UNLESS CURRENT WEATHER CONDITIONS REQUIRE OTHERWISE.

7. GRASS HEIGHT SHOULD BE MAINTAINED AT A MINIMUM 50mm BLADE LENGTH WITHIN THE LEVEL SPREADER AND DOWNSTREAM DISCHARGE AREA, AND A MAXIMUM BLADE LENGTH NO GREATER THAN ADJACENT GRASSES.

REMOVAL

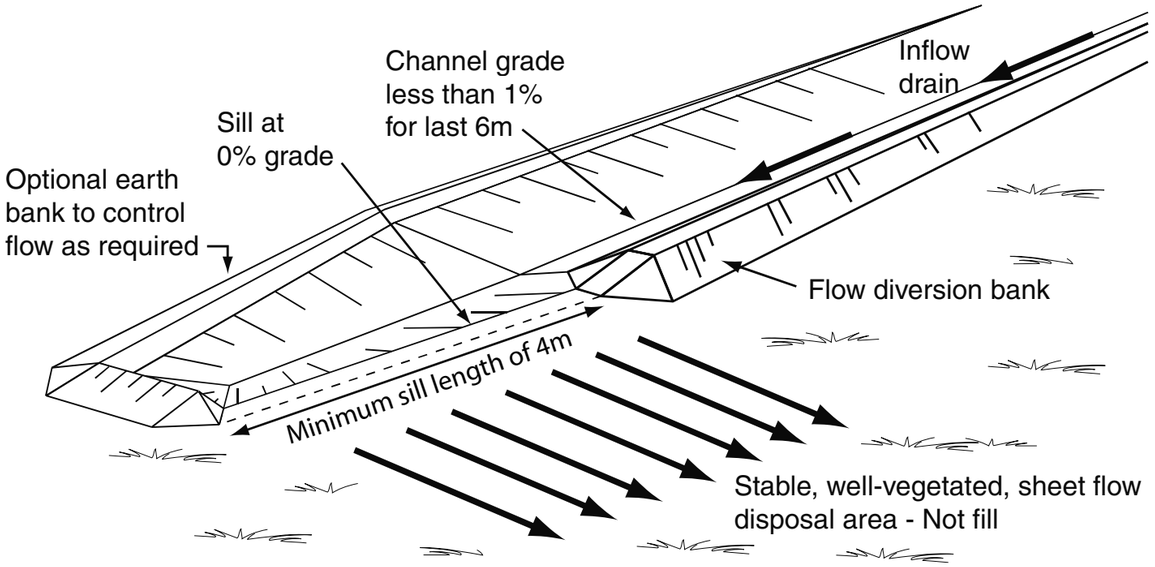
1. TEMPORARY LEVEL SPREADERS SHOULD BE DECOMMISSIONED ONLY AFTER AN ALTERNATIVE STABLE OUTLET IS OPERATIONAL, OR WHEN THE INFLOW CHANNEL IS DECOMMISSIONED.

2. REMOVE COLLECTED SEDIMENT AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

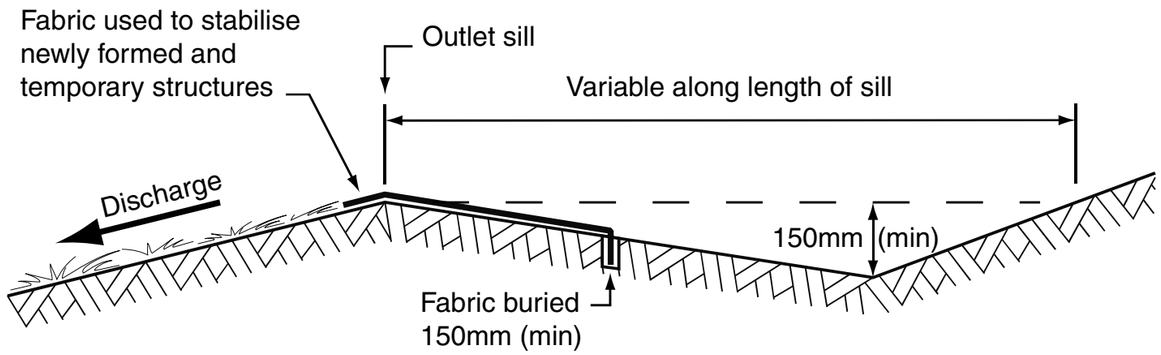
3. REMOVE AND APPROPRIATELY DISPOSE OF ANY EXPOSED GEOTEXTILE.

4. GRADE THE AREA AND SMOOTH IT OUT IN PREPARATION FOR STABILISATION.

5. STABILISE THE AREA AS SPECIFIED ON THE APPROVED PLAN.

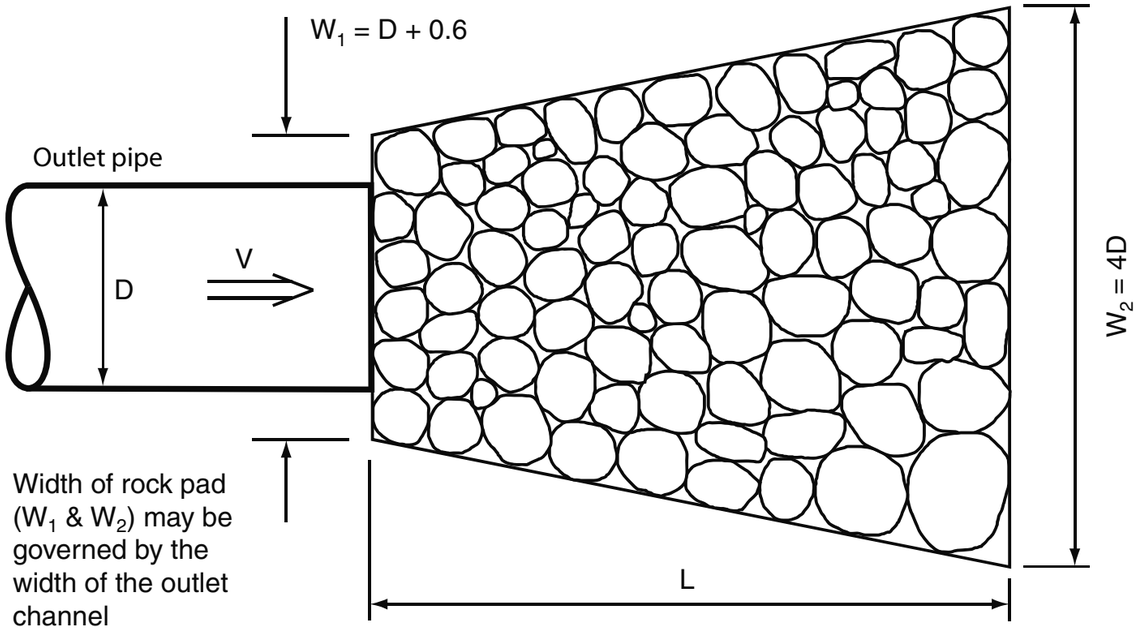


(a) Typical layout of level spreader

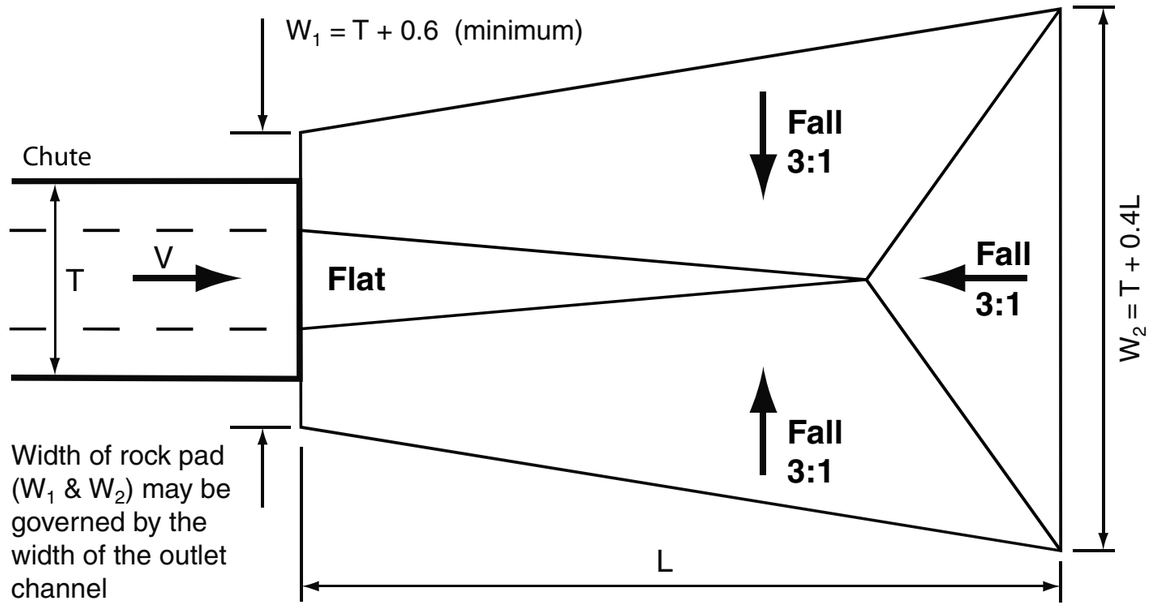


(b) Typical profile of the the outlet weir

Drawn:	Date:		
GMW	Dec-09	Level Spreaders	LS-01

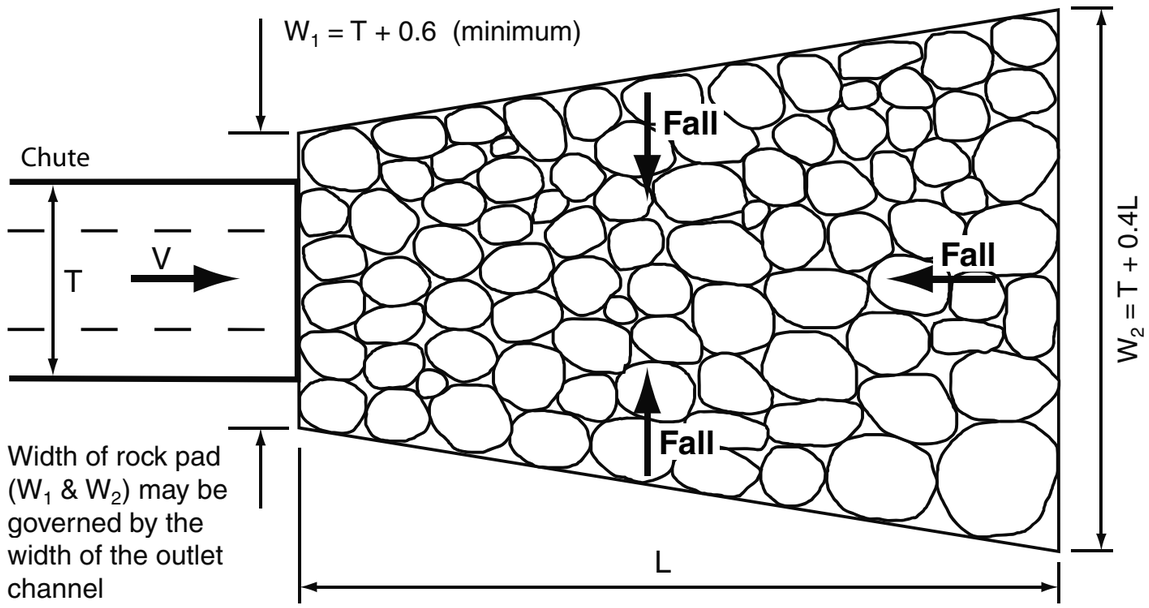


(a) Typical layout of a rock pad outlet structure for a pipe outlet

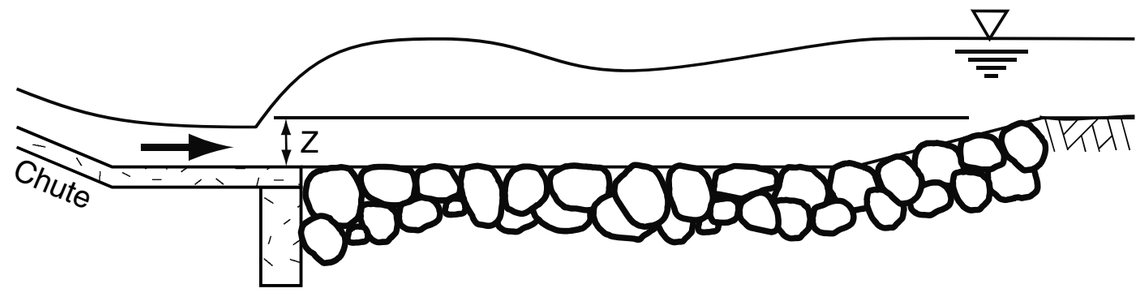


T = Maximum top width of flow at base of chute

(b) Typical form of a rock pad outlet structure for a drainage chute



(c) Typical layout of a rock pad outlet structure for a drainage chute



(d) Typical profile of a rock pad outlet structure for a drainage chute

Notes:

1. Drawings applicable to temporary drainage chutes and slope drains.
2. Rock pad outlet structures for slope drains usually are not required to be recessed below natural ground level as is the case for chute outlets (see Figure B).

Drawn:	Date:		
GMW	Dec-09	Outlet Structures	OS-01

MATERIALS (ROCK PADS)

ROCK: HARD, ANGULAR, DURABLE, WEATHER RESISTANT AND EVENLY GRADED WITH 50% BY WEIGHT LARGER THAN THE SPECIFIED NOMINAL ROCK SIZE AND SUFFICIENT SMALL ROCK TO FILL THE VOIDS BETWEEN THE LARGER ROCK. THE DIAMETER OF THE LARGEST ROCK SIZE SHOULD BE NO LARGER THAN 1.5 TIMES THE NOMINAL ROCK SIZE. SPECIFIC GRAVITY TO BE AT LEAST 2.5.

GEOTEXTILE FABRIC: HEAVY-DUTY, NEEDLE-PUNCHED, NON-WOVEN FILTER CLOTH, MINIMUM BIDIM A24 OR EQUIVALENT.

INSTALLATION (ROCK PADS)

1. REFER TO APPROVED PLANS FOR LOCATION AND CONSTRUCTION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, DIMENSIONS OR METHOD OF INSTALLATION CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. THE DIMENSIONS OF THE OUTLET STRUCTURE MUST ALIGN WITH THE DOMINANT FLOW DIRECTION.

3. EXCAVATE THE OUTLET PAD FOOTPRINT TO THE SPECIFIED DIMENSION SUCH THE WHEN THE ROCK IS PLACED IN THE EXCAVATED PIT THE TOP OF THE ROCKS WILL BE LEVEL WITH THE SURROUNDING GROUND, UNLESS OTHERWISE DIRECTED.

4. IF THE EXCAVATED SOILS ARE DISPERSIVE, OVER-EXCAVATED THE ROCK PAD BY AT LEAST 300mm AND BACKFILL WITH STABLE, NON-DISPERSIVE MATERIAL.

5. LINE THE EXCAVATED PIT WITH GEOTEXTILE FILTER CLOTH, PREFERABLY USING A SINGLE SHEET. IF JOINTS ARE REQUIRED, OVERLAP THE FABRIC AT LEAST 300mm.

6. ENSURE THE FILTER CLOTH IS PROTECTED FROM PUNCHING OR TEARING DURING INSTALLATION OF THE FABRIC AND THE ROCK. REPAIR ANY DAMAGE BY REMOVING THE ROCK AND PLACING WITH ANOTHER PIECE OF FILTER CLOTH OVER THE DAMAGED AREA OVERLAPPING THE EXISTING FABRIC A MINIMUM OF 300mm.

7. ENSURE THERE ARE AT LEAST TWO LAYERS OF ROCKS. WHERE NECESSARY, REPOSITION THE LARGER ROCKS TO ENSURE TWO LAYERS OF ROCKS ARE ACHIEVED WITHOUT ELEVATING THE UPPER SURFACE ABOVE THE PIPE INVERT.

8. ENSURE THE ROCK IS PLACED IN A MANNER THAT WILL ALLOW WATER TO DISCHARGE FREELY FROM THE PIPE.

9. ENSURE THE UPPER SURFACE OF THE ROCK PAD DOES NOT CAUSE WATER TO BE DEFLECTED AROUND THE EDGE OF THE ROCK PAD.

10. IMMEDIATELY AFTER CONSTRUCTION, APPROPRIATELY STABILISE ALL DISTURBED AREAS.

MAINTENANCE

1. WHILE CONSTRUCTION WORKS CONTINUE ON THE SITE, INSPECT THE OUTLET STRUCTURE PRIOR TO FORECAST RAINFALL, DAILY DURING EXTENDED PERIODS OF RAINFALL, AFTER SIGNIFICANT RUNOFF PRODUCING RAINFALL, AND ON AT LEAST A WEEKLY BASIS.

2. REPLACE ANY DISPLACED ROCK WITH ROCK OF A SIGNIFICANTLY (MINIMUM 110%) LARGER SIZE THAN THE DISPLACED ROCK.

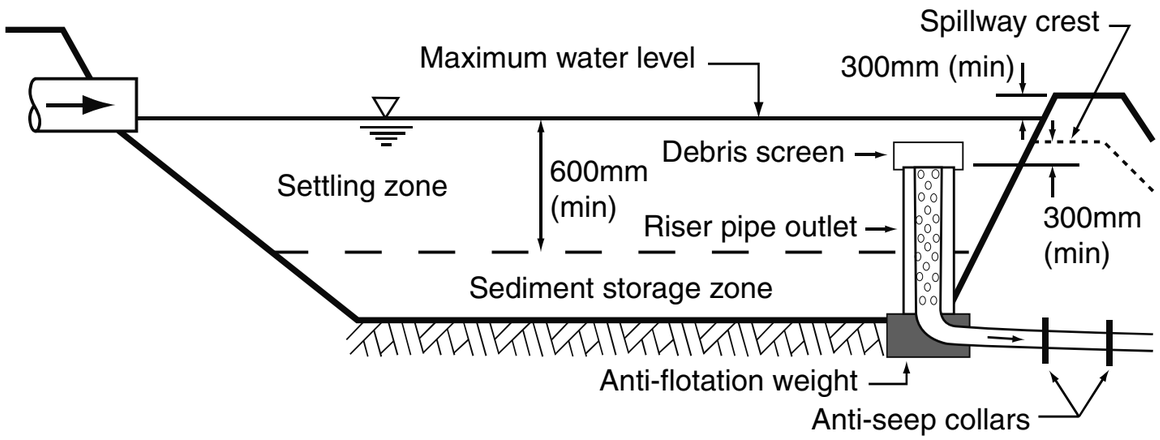
REMOVAL

1. TEMPORARY OUTLET STRUCTURES SHOULD BE COMPLETELY REMOVED, OR WHERE APPROPRIATE, REHABILITATED SO AS NOT TO CAUSE ONGOING ENVIRONMENTAL NUISANCE OR HARM.

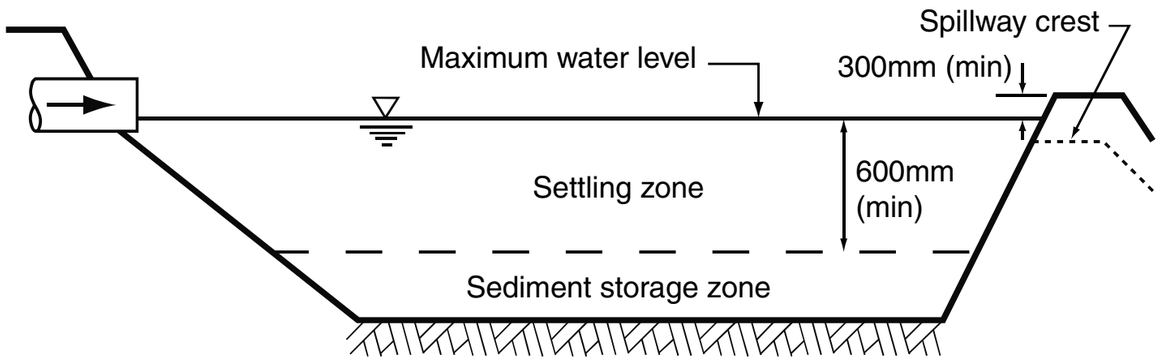
2. FOLLOWING REMOVAL OF THE DEVICE, THE DISTURBED AREA MUST BE APPROPRIATELY REHABILITATED SO AS NOT TO CAUSE ONGOING ENVIRONMENTAL NUISANCE OR HARM.

3. REMOVE MATERIALS AND COLLECTED SEDIMENT AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

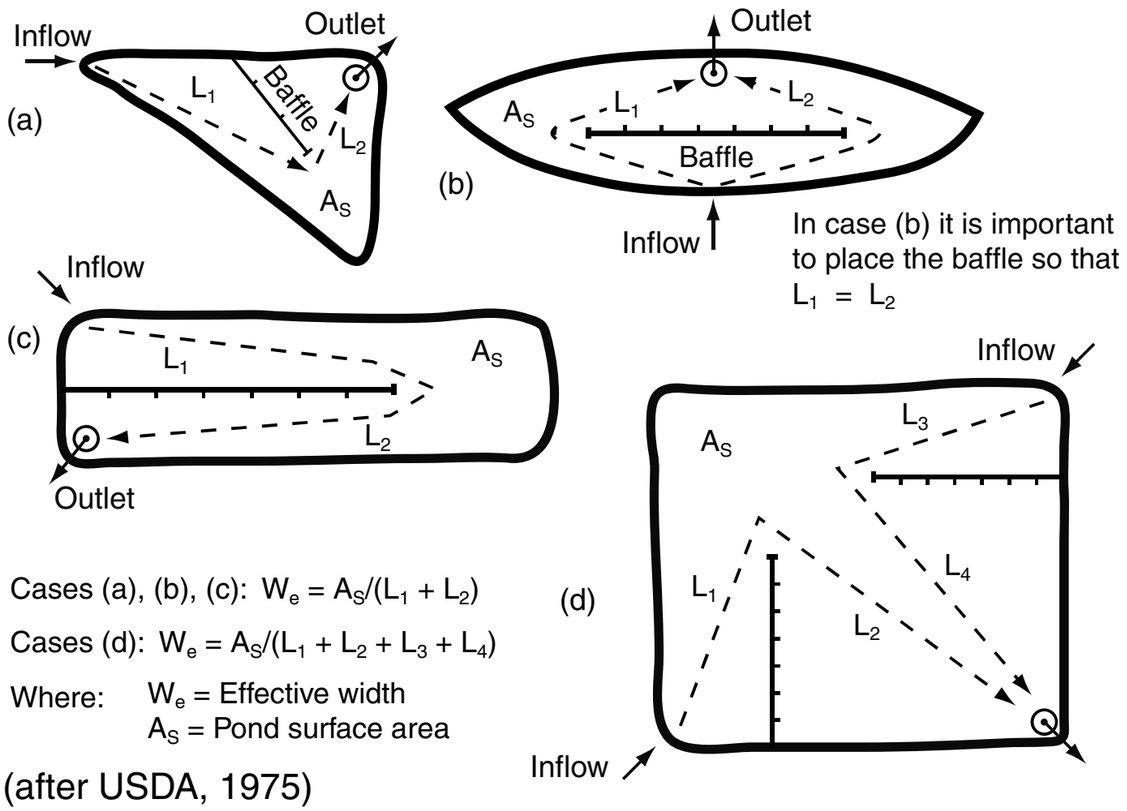
Drawn:	Date:		
GMW	Dec-09	Outlet Structure - Rock Pad	OS-02



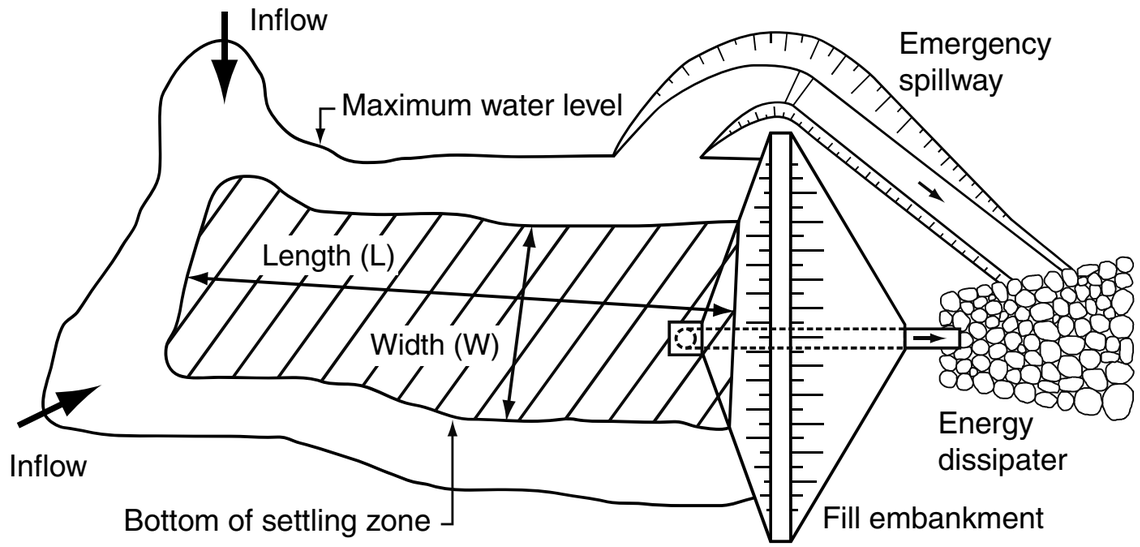
(a) Type C (dry) basin with riser pipe outlet system



(b) Typical profile of Type F/D (wet) basin

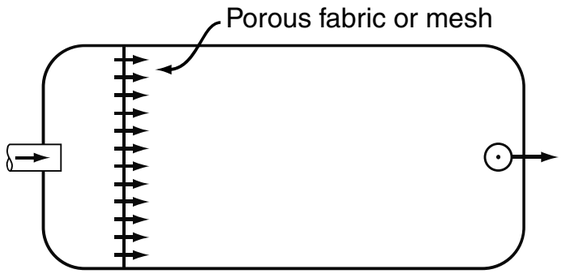


(c) Typical arrangement of internal flow control baffles

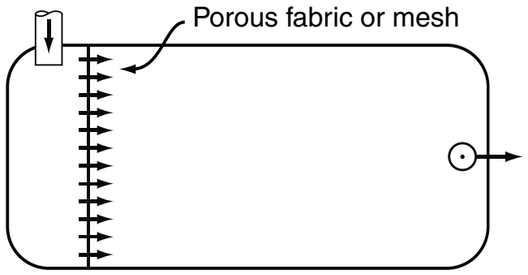


(d) Type C (dry) basin with riser pipe outlet system (plan view)

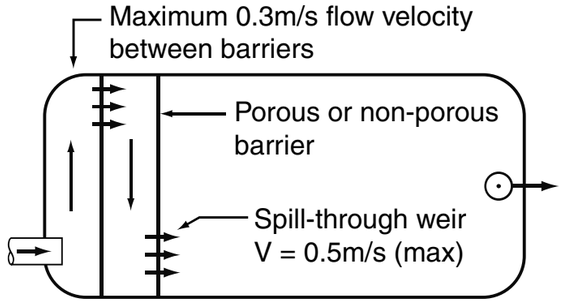
Drawn:	Date:		
GMW	Feb-10	Sediment Basins	SB-01



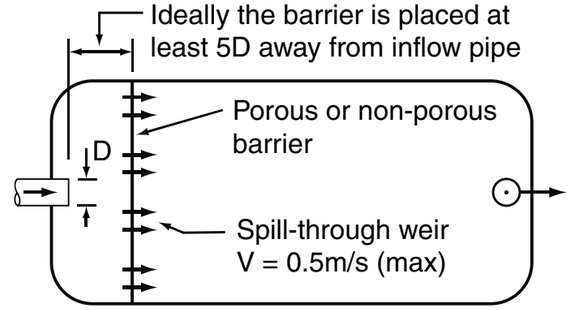
(a1) Porous barrier inlet chamber (plan view)



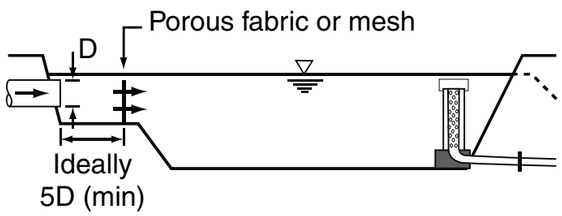
(b1) Porous barrier inlet chamber (plan view)



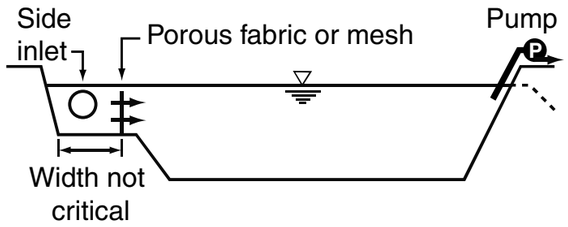
(c1) Alternative inlet chamber (plan view)



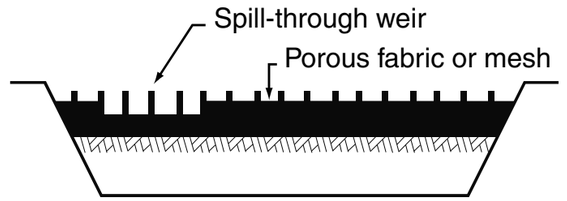
(d1) Alternative inlet chamber (plan view)



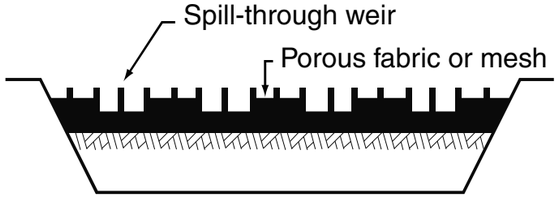
(a2) Typical layout of inlet chamber (long-section)



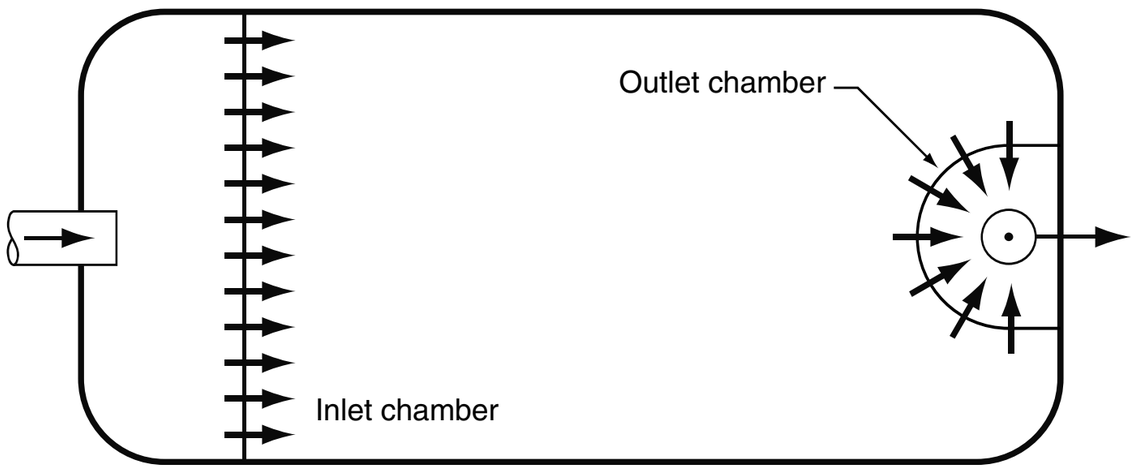
(b2) Typical layout of inlet chamber (long-section)



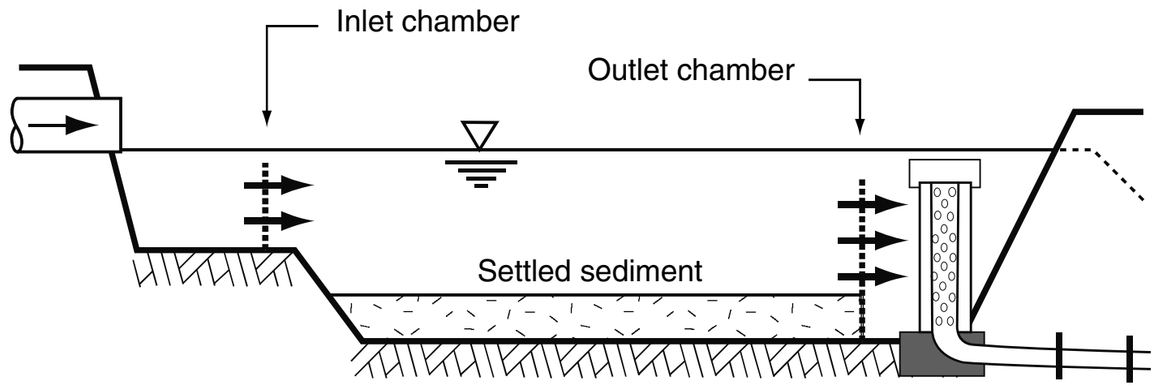
(c2) Single spill-through weir per barrier



(d2) Multiple spill-through weirs per barrier

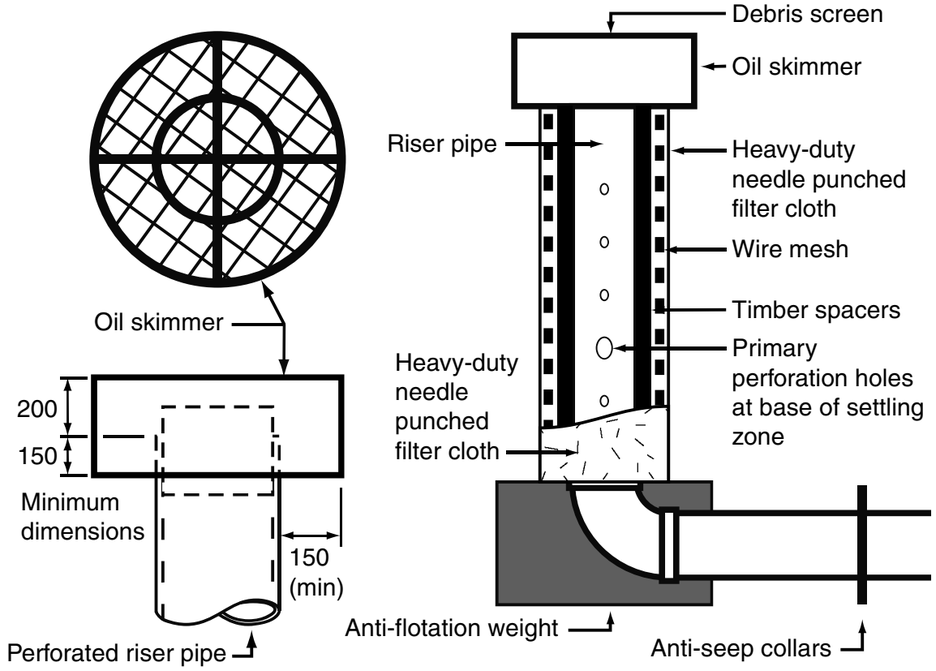


(e) Typical arrangement of inlet and outlet chambers (plan view)

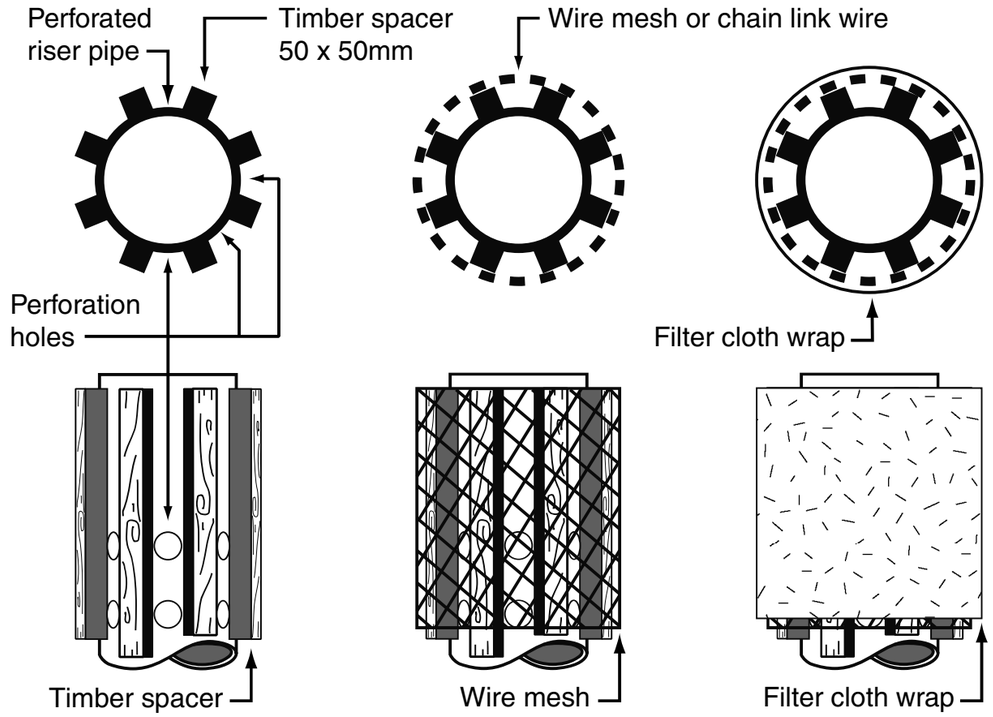


(f) Typical arrangement of inlet and outlet chambers (long-section)

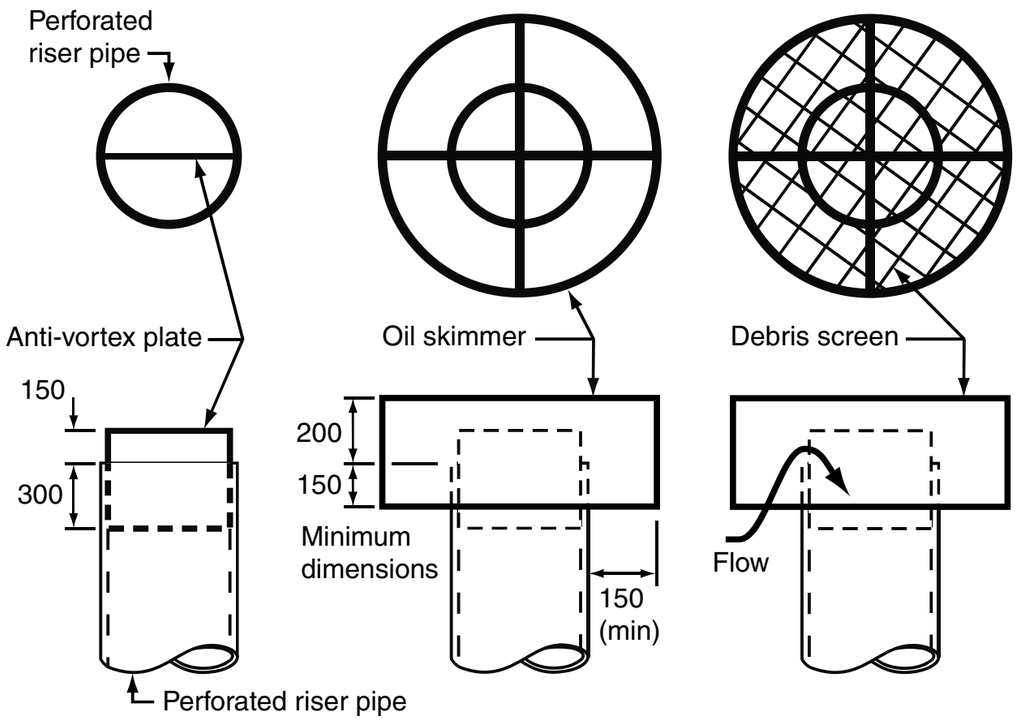
Drawn:	Date:		
GMW	Feb-10	Sediment Basins - Inlet Chambers and Outlet Chambers	SB-02



(a) Riser pipe outlet with geofabric filtration system



(b) Typical assembly of riser pipe with geotextile filter



(c) Anti-vortex plate, oil skimmer and debris screen

Drawn:	Date:		
GMW	Feb-10	Sediment Basins - Riser Pipe Primary Outlet System	SB-03

INSTALLATION OF RISER PIPE

1. DRILL DE-WATERING HOLES IN THE RISER AS SPECIFIED ON THE PLAN.

2. EXCAVATE ANTI-FLOTATION PIT.

3. SECURELY ATTACH THE RISER TO THE CONDUIT OR CONDUIT STUB TO MAKE A WATERTIGHT STRUCTURAL CONNECTION. SECURE ALL CONNECTIONS BETWEEN CONDUIT SECTIONS BY APPROVED WATERTIGHT ASSEMBLIES.

4. ATTACH THE ANTI-SEEP COLLARS TO THE CONDUIT AS SHOWN ON THE APPROVED PLAN, OR OTHERWISE AS SPECIFIED.

5. PLACE THE CONDUIT AND RISER ON A FIRM, SMOOTH FOUNDATION OF IMPERVIOUS SOIL. DO NOT USE PERVIOUS MATERIAL SUCH AS SAND, GRAVEL, OR CRUSHED ROCK AS BACKFILL AROUND THE CONDUIT OR ANTI-SEEP COLLARS.

6. PLACE FILL MATERIAL AROUND THE CONDUIT IN 100mm LAYERS AND COMPACT AROUND THE PIPE TO AT LEAST THE SAME DENSITY AS THE ADJACENT EMBANKMENT. ENSURE APPROPRIATE CARE IS TAKEN NOT TO RAISE THE PIPE FROM FIRM CONTACT WITH ITS FOUNDATION WHEN COMPACTING UNDER THE PIPE HAUNCHES.

7. PLACE A MINIMUM DEPTH OF 600mm OF LIGHTLY COMPACTED BACKFILL OVER THE CONDUIT BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT.

8. ANCHOR THE RISER IN PLACE BY CONCRETE OR OTHER SATISFACTORY MEANS TO PREVENT FLOTATION. ENSURE THE ANTI-FLOTATION MASS IS AT LEAST 110% OF WATER MASS DISPLACED BY THE RISER PIPE OUTLET SYSTEM, INCLUDING THE VOLUME DISPLACED BY THE ANTI-FLOTATION WEIGHT.

9. IN NO CASE SHOULD THE CONDUIT BE INSTALLED BY CUTTING A TRENCH THROUGH THE DAM AFTER THE EMBANKMENT IS COMPLETED.

10. ATTACH ANTI-VORTEX DEVICE AND TRASH GUARD TO RISER AND AS REQUIRED (REFER TO SPECIFICATIONS SHOWN ON THE APPROVED PLANS).

MAINTENANCE

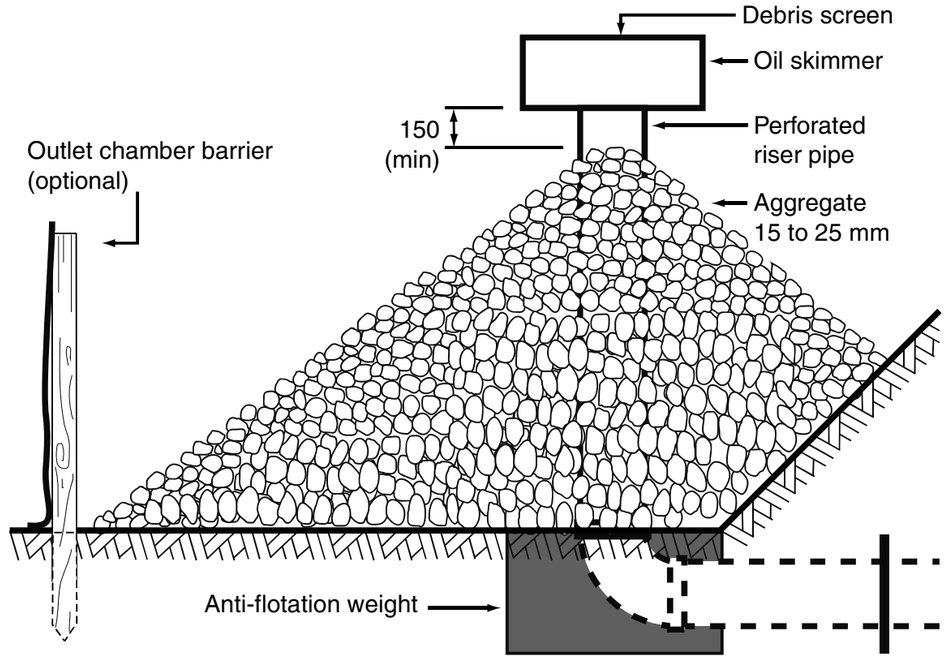
1. CHECK ALL VISIBLE PIPE CONNECTIONS FOR LEAKS, AND REPAIR AS NECESSARY.

2. REMOVE ALL TRASH AND OTHER DEBRIS FROM THE BASIN AND RISER.

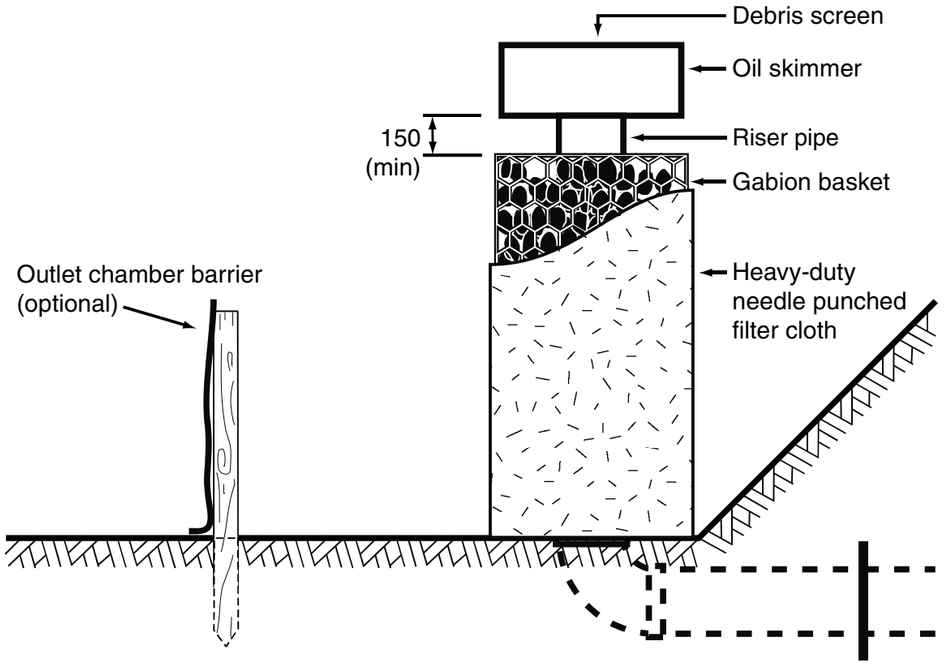
3. SUBMERGED INFLOW PIPES MUST BE INSPECTED AND DE-SILTED (AS REQUIRED) AFTER EACH INFLOW EVENT.

REMOVAL

1. DISPOSE OF ALL MATERIALS IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.



(a) Riser pipe outlet with aggregate filtration system



(b) Riser pipe outlet with rock-filled gabion basket filter system

Drawn:	Date:		
GMW	Feb-10	Sediment Basins - Riser Pipe Primary Outlet System	SB-04

MATERIALS

EARTH FILL: CLEAN SOIL WITH EMERSON CLASS 2(1), 3, 4, OR 5, AND FREE OF ROOTS, WOODY VEGETATION, ROCKS AND OTHER UNSUITABLE MATERIAL. SOIL WITH EMERSON CLASS 4 AND 5 MAY NOT BE SUITABLE DEPENDING ON PARTICLE SIZE DISTRIBUTION AND DEGREE OF DISPERSION. CLASS 2(1) SHOULD ONLY BE USED UPON RECOMMENDATION FROM GEOTECHNICAL SPECIALIST. THIS SPECIFICATION MAYBE REPLACED BY AN EQUIVALENT STANDARD BASED ON THE EXCHANGEABLE SODIUM PERCENTAGE.

RISER PIPE: MINIMUM 250mm DIAMETER.

SPILLWAY ROCK: HARD, ANGULAR, DURABLE, WEATHER RESISTANT AND EVENLY GRADED ROCK WITH 50% BY WEIGHT LARGER THAN THE SPECIFIED NOMINAL (d50) ROCK SIZE. LARGE ROCK SHOULD DOMINATE, WITH SUFFICIENT SMALL ROCK TO FILL THE VOIDS BETWEEN THE LARGER ROCK. THE DIAMETER OF THE LARGEST ROCK SIZE SHOULD BE NO LARGER THAN 1.5 TIMES THE NOMINAL ROCK SIZE. THE SPECIFIC GRAVITY SHOULD BE AT LEAST 2.5.

GEOTEXTILE FABRIC: HEAVY-DUTY, NEEDLE-PUNCHED, NON-WOVEN FILTER CLOTH, MINIMUM 'BIDIM' A24 OR EQUIVALENT.

CONSTRUCTION

1. NOTWITHSTANDING ANY DESCRIPTION CONTAINED WITHIN THE APPROVED PLANS OR SPECIFICATIONS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR SATISFYING THEMSELVES AS TO THE NATURE AND EXTENT OF THE SPECIFIED WORKS AND THE PHYSICAL AND LEGAL CONDITIONS UNDER WHICH THE WORKS WILL BE CARRIED OUT. THIS SHALL INCLUDE MEANS OF ACCESS, EXTENT OF CLEARING, NATURE OF MATERIAL TO BE EXCAVATED, TYPE AND SIZE OF MECHANICAL PLANT REQUIRED, LOCATION AND SUITABILITY OF WATER SUPPLY FOR CONSTRUCTION AND TESTING PURPOSES, AND ANY OTHER LIKE MATTERS AFFECTING THE CONSTRUCTION OF THE WORKS.

2. REFER TO APPROVED PLANS FOR LOCATION, DIMENSIONS, AND CONSTRUCTION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, DIMENSIONS, OR METHOD OF INSTALLATION, CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

3. BEFORE STARTING ANY CLEARING OR CONSTRUCTION, ENSURE ALL THE NECESSARY MATERIALS AND COMPONENTS ARE ON THE SITE TO AVOID DELAYS IN COMPLETING THE POND ONCE WORKS BEGIN.

4. INSTALL REQUIRED SHORT-TERM SEDIMENT CONTROL MEASURES DOWNSTREAM OF THE PROPOSED EARTHWORKS TO CONTROL SEDIMENT RUNOFF DURING CONSTRUCTION OF THE BASIN.

5. THE AREA TO BE COVERED BY THE EMBANKMENT, BORROW PITS AND INCIDENTAL WORKS, TOGETHER WITH AN AREA EXTENDING BEYOND THE LIMITS OF EACH FOR A DISTANCE NOT EXCEEDING FIVE (5) METRES ALL AROUND MUST BE CLEARED OF ALL TREES, SCRUB, STUMPS, ROOTS, DEAD TIMBER AND RUBBISH AND DISPOSED OF IN A SUITABLE MANNER. DELAY CLEARING THE MAIN POND AREA UNTIL THE EMBANKMENT IS COMPLETE.

6. ENSURE ALL HOLES MADE BY GRUBBING WITHIN THE EMBANKMENT FOOTPRINT ARE FILLED WITH SOUND MATERIAL, ADEQUATELY COMPACTED, AND FINISHED FLUSH WITH THE NATURAL SURFACE.
CUT-OFF TRENCH:

7. BEFORE CONSTRUCTION OF THE CUT-OFF TRENCH OR ANY ANCILLARY WORKS WITHIN THE EMBANKMENT FOOTPRINT, ALL GRASS GROWTH AND TOPSOIL MUST BE REMOVED FROM THE AREA TO BE OCCUPIED BY THE EMBANKMENT AND MUST BE DEPOSITED CLEAR OF THIS AREA AND RESERVED FOR TOPDRESSING THE COMPLETING THE EMBANKMENT.

8. EXCAVATE A CUT-OFF TRENCH ALONG THE CENTRE LINE OF THE EARTH FILL EMBANKMENT. CUT THE TRENCH TO STABLE SOIL MATERIAL, BUT IN NO CASE MAKE IT LESS THAN 600mm DEEP. THE CUT-OFF TRENCH MUST EXTEND INTO BOTH ABUTMENTS TO AT LEAST THE ELEVATION OF THE RISER PIPE CREST. MAKE THE MINIMUM BOTTOM WIDTH WIDE ENOUGH TO PERMIT OPERATION OF EXCAVATION AND COMPACTION EQUIPMENT, BUT IN NO CASE LESS THAN 600mm. MAKE THE SIDE SLOPES OF THE TRENCH NO STEEPER THAN 1:1 (H:V).

9. ENSURE ALL WATER, LOOSE SOIL, AND ROCK ARE REMOVED FROM THE TRENCH BEFORE BACKFILLING COMMENCES. THE CUT-OFF TRENCH MUST BE BACKFILLED WITH SELECTED EARTH-FILL OF THE TYPE SPECIFIED FOR THE EMBANKMENT, AND THIS SOIL MUST HAVE A MOISTURE CONTENT AND DEGREE OF COMPACTION THE SAME AS THAT SPECIFIED FOR THE SELECTED CORE ZONE.

10. MATERIAL EXCAVATED FROM THE CUT-OFF TRENCH MAY BE USED IN CONSTRUCTION OF THE EMBANKMENT PROVIDED IT IS SUITABLE AND IT IS PLACED IN THE CORRECT ZONE ACCORDING TO ITS CLASSIFICATION.

EMBANKMENT:

11. SCARIFY AREAS ON WHICH FILL IS TO BE PLACED BEFORE PLACING THE FILL.

12. ENSURE ALL FILL MATERIAL USED TO FORM THE EMBANKMENT MEETS THE SPECIFICATIONS CERTIFIED BY A SOIL SCIENTIST OR GEOTECHNICAL SPECIALIST.

13. THE FILL MATERIAL MUST CONTAIN SUFFICIENT MOISTURE SO IT CAN BE FORMED BY HAND INTO A BALL WITHOUT CRUMBLING. IF WATER CAN BE SQUEEZED OUT OF THE BALL, IT IS TOO WET FOR PROPER COMPACTION. PLACE FILL MATERIAL IN 150 TO 250mm CONTINUOUS LAYERS OVER THE ENTIRE LENGTH OF THE FILL AREA AND THEN COMPACT BEFORE PLACEMENT OF FURTHER FILL.

14. PLACE RISER PIPE OUTLET SYSTEM, IF SPECIFIED, IN APPROPRIATE SEQUENCE WITH THE EMBANKMENT FILLING. REFER TO SEPARATE INSTALLATION SPECIFICATIONS.

15. UNLESS OTHERWISE SPECIFIED ON THE APPROVED PLANS, COMPACT THE SOIL AT ABOUT 1% TO 2% WET OF OPTIMUM AND TO 95% MODIFIED OR 100% STANDARD COMPACTION.

16. WHERE BOTH DISPERSIVE AND NON-DISPERSIVE CLASSIFIED EARTH-FILL MATERIALS ARE AVAILABLE, NON-DISPERSIVE EARTH-FILL MUST BE USED IN THE CORE ZONE. THE REMAINING CLASSIFIED EARTH-FILL MATERIALS MUST ONLY BE USED AS DIRECTED BY [INSERT TITLE].

17. WHERE SPECIFIED, CONSTRUCT THE EMBANKMENT TO AN ELEVATION 10% HIGHER THAN THE DESIGN HEIGHT TO ALLOW FOR SETTLING; OTHERWISE FINISHED DIMENSIONS OF THE EMBANKMENT AFTER SPREADING OF TOPSOIL MUST CONFORM TO THE DRAWING WITH A TOLERANCE OF 75mm FROM THE SPECIFIED DIMENSIONS.

18. ENSURE DEBRIS AND OTHER UNSUITABLE BUILDING WASTE IS NOT PLACED WITHIN THE EARTH EMBANKMENT.

19. AFTER COMPLETION OF THE EMBANKMENT ALL LOOSE UNCOMPACTED EARTH-FILL MATERIAL ON THE UPSTREAM AND DOWNSTREAM BATTER MUST BE REMOVED PRIOR TO SPREADING OF TOPSOIL.

20. TOPSOIL AND REVEGETATE/STABILISED ALL EXPOSED EARTH AS DIRECTED WITHIN THE APPROVED PLANS.

(continued on SB-06)

Drawn:	Date:		
GMW	Feb-10	Sediment Basins	SB-05

SPILLWAY CONSTRUCTION:

21. THE SPILLWAY MUST BE EXCAVATED AS SHOWN ON THE PLANS, AND THE EXCAVATED MATERIAL IF CLASSIFIED AS SUITABLE, MUST BE USED IN THE EMBANKMENT, AND IF NOT SUITABLE IT MUST BE DISPOSED OF INTO SPOIL HEAPS.

22. ENSURE EXCAVATED DIMENSIONS ALLOW ADEQUATE BOXING-OUT SUCH THAT THE SPECIFIED ELEVATIONS, GRADES, CHUTE WIDTH, AND ENTRANCE AND EXIT SLOPES FOR THE EMERGENCY SPILLWAY WILL BE ACHIEVED AFTER PLACEMENT OF THE ROCK OR OTHER SCOUR PROTECTION MEASURES AS SPECIFIED IN THE PLANS.

23. PLACE SPECIFIED SCOUR PROTECTION MEASURES ON THE EMERGENCY SPILLWAY. ENSURE THE FINISHED GRADE BLENDS WITH THE SURROUNDING AREA TO ALLOW A SMOOTH FLOW TRANSITION FROM SPILLWAY TO DOWNSTREAM CHANNEL.

24. IF A SYNTHETIC FILTER FABRIC UNDERLAY IS SPECIFIED, PLACE THE FILTER FABRIC DIRECTLY ON THE PREPARED FOUNDATION. IF MORE THAN ONE SHEET OF FILTER FABRIC IS REQUIRED, OVERLAP THE EDGES BY AT LEAST 300mm AND PLACE ANCHOR PINS AT MINIMUM 1m SPACING ALONG THE OVERLAP. BURY THE UPSTREAM END OF THE FABRIC A MINIMUM 300mm BELOW GROUND AND WHERE NECESSARY, BURY THE LOWER END OF THE FABRIC OR OVERLAP A MINIMUM 300mm OVER THE NEXT DOWNSTREAM SECTION AS REQUIRED. ENSURE THE FILTER FABRIC EXTENDS AT LEAST 1000mm UPSTREAM OF THE SPILLWAY CREST.

25. TAKE CARE NOT TO DAMAGE THE FABRIC DURING OR AFTER PLACEMENT. IF DAMAGE OCCURS, REMOVE THE ROCK AND REPAIR THE SHEET BY ADDING ANOTHER LAYER OF FABRIC WITH A MINIMUM OVERLAP OF 300mm AROUND THE DAMAGED AREA. IF EXTENSIVE DAMAGE IS SUSPECTED, REMOVE AND REPLACE THE ENTIRE SHEET.

26. WHERE LARGE ROCK IS USED, OR MACHINE PLACEMENT IS DIFFICULT, A MINIMUM 100mm LAYER OF FINE GRAVEL, AGGREGATE, OR SAND MAY BE NEEDED TO PROTECT THE FABRIC.

27. PLACEMENT OF ROCK SHOULD FOLLOW IMMEDIATELY AFTER PLACEMENT OF THE FILTER FABRIC. PLACE ROCK SO THAT IT FORMS A DENSE, WELL-GRADED MASS OF ROCK WITH A MINIMUM OF VOIDS. THE DESIRED DISTRIBUTION OF ROCK THROUGHOUT THE MASS MAY BE OBTAINED BY SELECTIVE LOADING AT THE QUARRY AND CONTROLLED DUMPING DURING FINAL PLACEMENT.

28. THE FINISHED SLOPE SHOULD BE FREE OF POCKETS OF SMALL ROCK OR CLUSTERS OF LARGE ROCKS. HAND PLACING MAY BE NECESSARY TO ACHIEVE THE PROPER DISTRIBUTION OF ROCK SIZES TO PRODUCE A RELATIVELY SMOOTH, UNIFORM SURFACE. THE FINISHED GRADE OF THE ROCK SHOULD BLEND WITH THE SURROUNDING AREA. NO OVERFALL OR PROTRUSION OF ROCK SHOULD BE APPARENT.

29. ENSURE THAT THE FINAL ARRANGEMENT OF THE SPILLWAY CREST WILL NOT PROMOTE EXCESSIVE FLOW THROUGH THE ROCK SUCH THAT THE WATER CAN BE RETAINED WITHIN THE SETTLING BASIN AN ELEVATION NO LESS THAN 50mm ABOVE OR BELOW THE NOMINATED SPILLWAY CREST ELEVATION. ESTABLISHMENT OF SETTLING POND:

30. THE AREA TO BE COVERED BY THE STORED WATER OUTSIDE THE LIMITS OF THE BORROW PITS MUST BE CLEARED OF ALL SCRUB AND RUBBISH. TREES MUST BE CUT DOWN STUMP HIGH AND REMOVED FROM THE IMMEDIATE VICINITY OF THE WORK.

31. ESTABLISH ALL REQUIRED INFLOW CHUTES AND INLET BAFFLES, IF SPECIFIED, TO ENABLE WATER TO DISCHARGE INTO THE BASIN IN A MANNER THAT WILL NOT CAUSE SOIL EROSION OR THE RE-SUSPENSION OF SETTLED SEDIMENT.

32. INSTALL A SEDIMENT STORAGE LEVEL MARKER POST WITH A CROSS MEMBER SET JUST BELOW THE TOP OF THE SEDIMENT STORAGE ZONE (AS SPECIFIED ON THE APPROVED PLANS). USE AT LEAST A 75mm WIDE POST FIRMLY SET INTO THE BASIN FLOOR.

33. IF SPECIFIED, INSTALL INTERNAL SETTLING POND BAFFLES. ENSURE THE CREST OF THESE BAFFLES IS SET LEVEL WITH, OR JUST BELOW, THE ELEVATION OF THE EMERGENCY SPILLWAY CREST.

34. INSTALL ALL APPROPRIATE MEASURES TO MINIMISE SAFETY RISK TO ON-SITE PERSONNEL AND THE PUBLIC CAUSED BY THE PRESENCE OF THE SETTLING POND. AVOID STEEP, SMOOTH INTERNAL SLOPES. APPROPRIATELY FENCE THE SETTLING POND AND POST WARNING SIGNS IF UNSUPERVISED PUBLIC ACCESS IS LIKELY OR THERE IS CONSIDERED TO BE AN UNACCEPTABLE RISK TO THE PUBLIC.

MAINTENANCE OF SEDIMENT BASIN

1. INSPECT THE SEDIMENT BASIN DURING THE FOLLOWING PERIODS:

(i) DURING CONSTRUCTION TO DETERMINE WHETHER MACHINERY, FALLING TREES, OR CONSTRUCTION ACTIVITY HAS DAMAGED ANY COMPONENTS OF THE SEDIMENT BASIN. IF DAMAGE HAS OCCURRED, REPAIR IT.

(ii) AFTER EACH RUNOFF EVENT. INSPECT THE EROSION DAMAGE AT FLOW ENTRY AND EXIT POINTS. IF DAMAGE HAS OCCURRED, MAKE THE NECESSARY REPAIRS.

(iii) AT LEAST WEEKLY DURING THE NOMINATED WET SEASON (IF ANY) OTHERWISE AT LEAST FORTNIGHTLY.

(iv) PRIOR TO, AND IMMEDIATELY AFTER, PERIODS OF 'STOP WORK' OR SITE SHUTDOWN.

2. CLEAN OUT ACCUMULATED SEDIMENT WHEN IT REACHES THE MARKER BOARD/POST, AND RESTORE THE ORIGINAL STORAGE VOLUME. PLACE SEDIMENT IN A DISPOSAL AREA OR, IF APPROPRIATE, MIX WITH DRY SOIL ON THE SITE.

3. DO NOT DISPOSE OF SEDIMENT IN A MANNER THAT WILL CREATE AN EROSION OR POLLUTION HAZARD.

4. CHECK ALL VISIBLE PIPE CONNECTIONS FOR LEAKS, AND REPAIR AS NECESSARY.

5. CHECK ALL EMBANKMENTS FOR EXCESSIVE SETTLEMENT, SLUMPING OF THE SLOPES OR PIPING BETWEEN THE CONDUIT AND THE EMBANKMENT; MAKE ALL NECESSARY REPAIRS.

6. REMOVE ALL TRASH AND OTHER DEBRIS FROM THE BASIN AND RISER.

7. SUBMERGED INFLOW PIPES MUST BE INSPECTED AND DE-SILTED (AS REQUIRED) AFTER EACH INFLOW EVENT.

REMOVAL OF SEDIMENT BASIN

1. WHEN GRADING AND CONSTRUCTION IN THE DRAINAGE AREA ABOVE A TEMPORARY SEDIMENT BASIN IS COMPLETED AND THE DISTURBED AREAS ARE ADEQUATELY STABILISED, THE BASIN MUST BE REMOVED OR OTHERWISE INCORPORATED INTO THE PERMANENT STORMWATER DRAINAGE SYSTEM. IN EITHER CASE, SEDIMENT SHOULD BE CLEARED AND PROPERLY DISPOSED OF AND THE BASIN AREA STABILISED.

2. BEFORE STARTING ANY MAINTENANCE WORK ON THE BASIN OR SPILLWAY, INSTALL ALL NECESSARY SHORT-TERM SEDIMENT CONTROL MEASURES DOWNSTREAM OF THE SEDIMENT BASIN.

3. ALL WATER AND SEDIMENT MUST BE REMOVED FROM THE BASIN PRIOR TO THE DAM'S REMOVAL. DISPOSE OF SEDIMENT AND WATER IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

4. BRING THE DISTURBED AREA TO A PROPER GRADE, THEN SMOOTH, COMPACT, AND STABILISE AND/OR REVEGETATE AS REQUIRED TO ESTABLISH A STABLE LAND SURFACE.

Drawn:	Date:		
GMW	Feb-10	Sediment Basins	SB-06

1. Erosion Hazard and Sediment Basins

Site Name: Running Stream

Site Location:

Precinct/Stage:

Other Details:

Site area	Sub-catchment or Name of Structure						Notes
	Dam	CWD	Pit S1	Pit S2	Pit S3		
Total catchment area (ha)	1	33.5	1.7	7.57	18.8		
Disturbed catchment area (ha)	1		1.7	7.57	18.8		

Soil analysis (enter sediment type if known, or laboratory particle size data)

Sediment Type (C, F or D) if known:	D	D	D	D	D		From Appendix C (if known)
% sand (fraction 0.02 to 2.00 mm)							Enter the percentage of each soil fraction. E.g. enter 10 for 10%
% silt (fraction 0.002 to 0.02 mm)							
% clay (fraction finer than 0.002 mm)							
Dispersion percentage							E.g. enter 10 for dispersion of 10%
% of whole soil dispersible							See Section 6.3.3(e). Auto-calculated
Soil Texture Group	D	D	D	D	D		Automatic calculation from above

Rainfall data

Design rainfall depth (no of days)	5	5	5	5	5		See Section 6.3.4 and, particularly, Table 6.3 on pages 6-24 and 6-25.
Design rainfall depth (percentile)	90	90	90	90	90		
x-day, y-percentile rainfall event (mm)	31.4	31.4	31.4	31.4	31.4		
Rainfall R-factor (if known)							Only need to enter one or the other here
IFD: 2-year, 6-hour storm (if known)	5.91	5.91	5.91	5.91	5.91		

RUSLE Factors

Rainfall erosivity (*R* -factor)	1000	1000	1000	1000	1000		Auto-filled from above
Soil erodibility (*K* -factor)	0.05	0.05	0.05	0.05	0.05		
Slope length (m)	50	300	300	300	300		
Slope gradient (%)	10	5	20	20	20		RUSLE LS factor calculated for a high rill/interrill ratio.
Length/gradient (*LS* -factor)	2.04	2.53	20.02	20.02	20.02		
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	

Sediment Basin Design Criteria (for Type D/F basins only. Leave blank for Type C basins)

Storage (soil) zone design (no of months)	2	2	2	2	2	2	Minimum is generally 2 months
Cv (Volumetric runoff coefficient)	0.64	0.64	0.64	0.64	0.64		See Table F2, page F-4 in Appendix F

Calculations and Type D/F Sediment Basin Volumes

Soil loss (t/ha/yr)	132	164	1301	1301	1301		
Soil Loss Class	1	2	6	6	6		See Table 4.2, page 4-13
Soil loss (m^3/ha/yr)	102	126	1001	1001	1001		Conversion to cubic metres
Sediment basin storage (soil) volume (m^3)	17		284	1263	3136		See Sections 6.3.4(i) for calculations
Sediment basin settling (water) volume (m^3)	201	6732	342	1521	3778		See Sections 6.3.4(i) for calculations
Sediment basin total volume (m^3)	218		626	2784	6914		

NB for sizing of Type C (coarse) sediment basins, see Worksheet 3 (if required).

Appendix C.: NSW Water Harvestable Rights Calculation

Maximum Harvestable Right Dam Capacity

Information you provided

1. The approximate mid-point location of the landholding is:

- Latitude: **-33.032044**
- Longitude: **149.862423**

2. Total landholding area is **330 Hectares**

Result

The combined maximum dam capacity of all harvestable right dams on your landholding is **26.4** ML (megalitres).

Date

12/10/2022

Important information

Location of dams

The maximum harvestable right capacity calculator does not verify that the location of the proposed dam is lawful. It is up to the landholder to ensure the proposed dam site complies with the location requirements set out in the harvestable rights order.

Information on determining stream order and where dams can be built can be found in the Harvestable rights dams - where can they be built? fact sheet and on the DPE website frequently asked questions.

Harvestable rights dams cannot be constructed on or within three kilometres of a Ramsar wetland site, listed at the time of construction or first use of the dam. There are currently 12 Ramsar wetlands in NSW.

Overall dam capacity on a landholding

The calculator determines the combined maximum dam capacity for all potential harvestable rights dams on a landholding.

The calculator does not take into account the capacity of existing dams on your landholding. If you have existing harvestable rights dams on your landholding, you must take the capacity of

these dams into account when constructing new dams or enlarging existing dams, up to the calculated maximum dam capacity for your landholding. See the department's frequently asked questions for further information.

Maximum dam capacity in the coastal-draining catchments

For landholdings in the coastal-draining catchments harvestable rights area, the calculator will provide two dam capacity values, referencing 10% **and** 30% of rainfall runoff.

The **maximum dam capacity for the landholding is the volume with reference to 30% of the rainfall runoff** only and **is not** the combined total of the 10% and 30% of rainfall runoff values.

Further assessment in the coastal-draining catchment areas

The department will commence more detailed assessments in each catchment in 2022 to determine the appropriateness of the coastal harvestable right limit increase from 10% to 30% of rainfall runoff. Adjustments could be made to harvestable rights limits in certain coastal-draining catchments following the assessments.

Landholders who choose to construct a new dam or enlarge an existing dam to access the additional harvestable right greater than 10% from 13 May 2022, but before the catchment assessments have been completed, do so at their own risk. Any dams built or enlarged within this timeframe will need to be resized at a later date if the harvestable rights limit is reduced and a lower limit is determined in the catchment.

Dams on landholdings that straddle the central inland-draining and coastal-draining catchments harvestable rights areas

Each of the harvestable rights areas have different maximum dam capacity limits. Harvestable rights dams may only be constructed up to the maximum dam capacity in the relevant harvestable rights area on the landholding.

For example, the calculator may estimate that the maximum dam capacity of all harvestable right dams within the central inland-draining catchments harvestable rights area of a landholding is 10 ML, while the maximum dam capacity (with reference to 30% of rainfall runoff) of all harvestable right dams within the coastal-draining catchment of the same landholding is 30 ML. In this example, any harvestable rights dam(s) constructed within the inland-draining catchment area of this landholding can have a combined capacity no greater than 10 ML. Harvestable rights dam(s) constructed within the coastal-draining catchment area of this landholding can have a combined capacity no greater than 30 ML.

Default one megalitre dams on small landholdings

If a landholding resulted from a subdivision approved by a relevant planning authority (for example, local councils) before 1 January 1999 and the maximum dam capacity for the landholding is less than 1 megalitre, the maximum dam capacity for that landholding is taken to be 1 megalitre.

No further harvestable right dams may be constructed on the landholding and any new dams above one megalitre must be licensed.

vgt environmental compliance solutions and laboratories

Beyond Compliance

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