Surface Water Impact Assessment

Proposed Continuation & Expansion Assessment of Sand Extraction Operations

552 Larbert Road, Larbert NSW 2622

For:

Lentro Earthworks Pty Ltd
C/- Outline Planning Consultants Pty Ltd

7 November 2025

Strategic Environmental and Engineering Consulting
PO Box 1098, Bowral NSW 2576
Phone: (02) 4862 1633 •
Email: reception@seec.com.au •
Web: www.seec.com.au

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Strategic Environmental & Engineering Consulting

Document Certification

This document has been developed based on agreed requirements as understood by SEEC at the time of investigation. It applies only to a specific task on the nominated lands. Other interpretations should not be made, including changes in scale or application to other projects.

Any recommendations contained in this report are based on an honest appraisal of the opportunities and constraints that existed at the site at the time of assessment, subject to the limited scope and resources available. Within the confines of the above statements and to the best of my knowledge, this report does not contain any incomplete or misleading information.

Jason Armstrong
Director
SEEC
7 November 2025

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Version Register

Version	Date	Author	Reviewer	Notes	Other
Rev A	21/10/25	RJ	JA	Issue as Rev A for review	
Rev B	24/10/25	RJ	Client	Issue as Rev B for review	
Rev 01	07/11/25	RJ	B.J / J.A	Issue as Rev 01 for Submission	

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1 INTRODUCTION

1.1 Project Terminology

- Braidwood Sand and Gravel and Lentro Earthworks Pty Ltd (the proponent)
- Proposed Continuation & Expansion of Sand Extraction Operations (the Project)
- Braidwood Sand and Gravel Sand Extraction Operation (the Quarry)

1.2 Project Overview

Braidwood Sand and Gravel and Lentro Earthworks Pty Ltd (the proponent) operates a Sand Extraction Operation (the Quarry) from a sand pit covering 1.92ha on Lot 332 in Deposited Plan 755915, at No. 552 Larbert Road, Larbert.

The currently approved sand extraction operations and internal access back to Larbert Road lie wholly within Lots 331 and 332 in Deposited Plan (DP) 755915, at No. 552 Larbert Road, Larbert.

The approved operational area and surrounds is substantially clear of tree vegetation and is not impacted by any major watercourses or dams. The southern boundary of Lot 332 DP 755915 adjoins Durran Durra Creek.

Development consent DA.2022.1181 dated 20 July 2023 was issued for the following:

- The extraction of up to 25,000 tonnes per annum of sand, being 800 tonnes per week over 48 weeks.
- Sand extraction area of 1.92ha approximately.
- Material extracted with an excavator and front-end loader and processed on site.
- Access to and from the sand pit back to Larbert Road, with sand products transported via Larbert Road and the Kings Highway heading towards Canberra only. Intersection of site access with Larbert Road upgraded, in accordance with the consent.
- Approved hours of operation of the facility being 7.00am to 5.00pm Monday to Friday and 7.00am to 1.00pm on Saturdays with truck movements associated with the delivery of the material during these hours. No work undertaken on Sunday's or Public Holidays.
- Extraction to occur on a staged basis.

The site locality is shown in Figure 1.

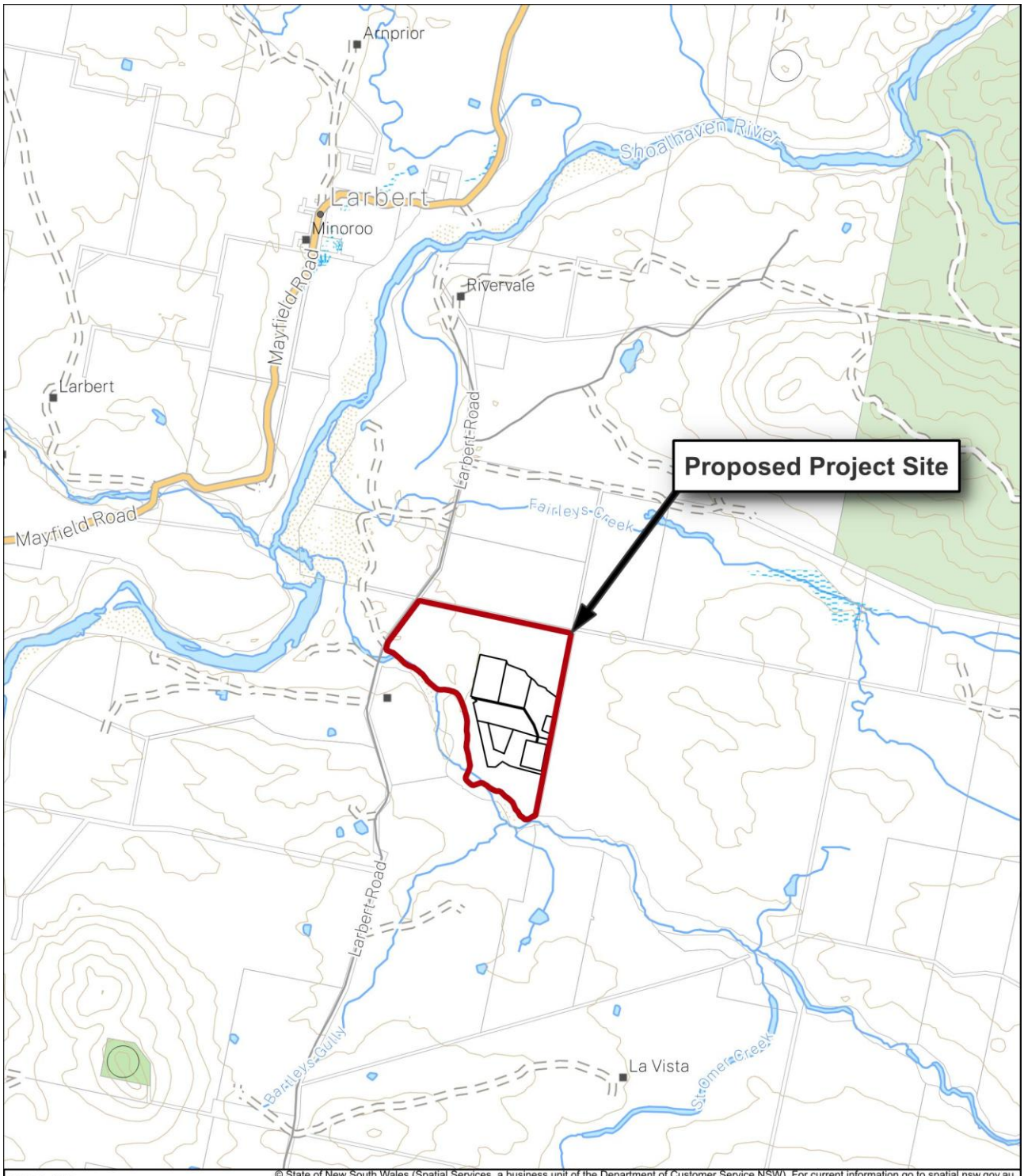

Figure 1
Site Location

Plot Date: 17/09/2025 Project Path: X:\Projects\25-033 552 Larbert Rd, Larbert\GIS\25000033_GIS.qgz

1.3 The Proposal

Braidwood Sand and Gravel and Lentro Earthmoving (the Proponent) propose to continue extraction, processing and product transport operations within an expanded area at the existing approved sand quarry (the Project).

The Project would comprise an expansion into an additional extraction area over Lots 332 and 333 DP 755915 of approximately 18.1ha, with a resource of approximately 1.23 million tonnes. This is expected to increase the annual production rate from the currently approved 25,000 tonnes per annum to 200,000 tonnes per annum. Extraction to a depth of 5-6 metres is planned, consistent with the current approval.

The proposed extraction area is located on the eastern side of Larbert Road and located approx. 5.5km north of the Kings Highway intersection and approximately 14kms to the north-west of Braidwood.

The Project would enable the Proponent to continue the efficient supply of sand and gravel resource to clients in the Canberra region for use in a range of construction projects, infrastructure development and the supply of sand for concrete manufacture.

The Proponent's objectives in expanding the operations at the existing Larbert sand quarry include the following:

- Continue to provide a source of high-quality sand products to meet the needs of housing and construction markets in the Canberra region.
- Maximise the efficient recovery of the natural sand resource.
- To develop and operate the sand quarry in a manner that is environmentally responsible and complies with all statutory requirements.
- Achieve the above objectives in a cost effective manner to ensure the Project is viable.

In summary, the Project elements include the following:

- The staged, progressive expansion of the existing sand extraction area by an additional 18.1 ha approximately. Refer to Figure 2.
- An increase in the rate of sand extraction, to 200,000 tonnes per annum.
- Reliance on existing approved access to and from the sand pit back to Larbert Road.
- No change in the currently approved hours of operation of the facility.
- An increase in loaded truck volumes, equivalent to an average of 20 loaded trucks per day, with a maximum of up to about 50 loaded trucks per day.
- Avoidance of stand of trees located to the north of the currently approved extraction area.
- Rehabilitation as each sand extraction stage is completed.
- Increase the number of jobs within extractive industry sectors in the region.
- Updated Operational Management Plan.

Based on the current overall scope of the Project and understanding of environmental issues, the Project would require the following Approvals :

- Approval of the Southern Regional Planning Panel and the issue of a Development Consent from Council.
- Approval from the Environment Protection Authority (EPA) and issue of EPL for extraction in excess of 30,000 tonnes per annum.
- Approval from Water NSW allowing extraction intercepting with groundwater under s89 and s90 of the Water Management Act 2000.
- Approval from Heritage NSW if Aboriginal sites/relics found.
- No apparent concurrence from WaterNSW for Sydney Drinking Water Catchment.

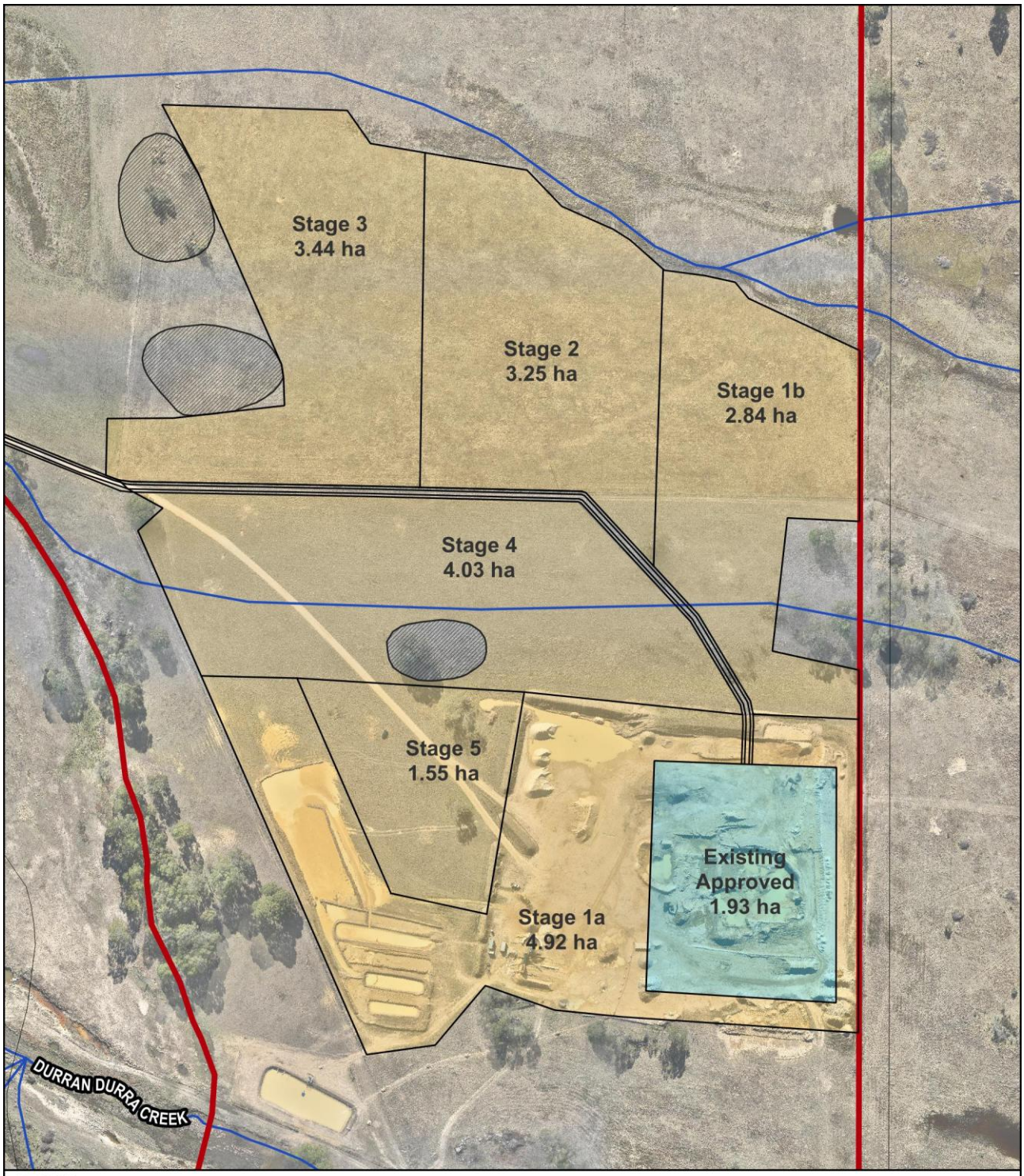

Figure 2
Existing and Proposed Extraction Limits

Plot Date: 16/10/2025 Project Path: X:\Projects\25-033 552 Larbert Rd, Larbert\GIS\25000033_GIS.qgz

1.4 Purpose of Report

This report has been prepared for Lentro Earthworks Pty Ltd by Strategic Environmental and Engineering Consulting (SEEC). The purpose of this report is to assist in the application for SEARs and the EIS.

The assessment will also enable an update to the site water management system to account for the extended areas of disturbance and demonstrate a neutral or beneficial effect on water quality.

1.5 Summary of Relevant EARs

The requirement to prepare this Surface Water Impact Assessment along with environmental performance conditions and monitoring the Quarry are covered by the SEARs.

Table 1 below references the report section where the SEARs are discussed.

Table 1: Secretary's Environmental Assessment Requirements related to this assessment.

Relevant SEARs	Report Section
Department of Planning, Housing and Infrastructure	
• a detailed site water balance;	Section 5
• an assessment of any water licensing requirements or other approvals required under the Water Act 1912 and/or Water Management Act 2000;	Section 3
• 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;	Section 3
• 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	Section 6
• a detailed description of the proposed water management system, water monitoring program, and other measures to mitigate surface and groundwater impacts.	Sections 4 & 7

Table 2 presents the agency advice from CPHR and NSW DCCEEW relevant to the project and where they are addressed.

Table 2: Conservation Programs, Heritage and Regulation Group (CPHR) of the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) Environmental Assessment Requirements.

Relevant EARs	Report Section
Attachment A – Standard Environmental Assessment Requirements	
Water and Soils	
8. The EIS must map the following features relevant to water and soils including: a. Acid sulfate soils (Class 1, 2, 3 or 4 on the Acid Sulfate Soil Planning Map) b. Rivers, streams, wetlands, estuaries (as described in s4.2 of the Biodiversity Assessment Method) c. Wetlands as described in s4.2 of the Biodiversity Assessment Method. d. Groundwater e. Groundwater dependent ecosystems f. Proposed intake and discharge locations	Section 6
9. The EIS must describe background conditions for any water resource likely to be affected by the development, including: a. Existing surface and groundwater b. Hydrology, including volume, frequency and quality of discharges at proposed intake and discharge locations	Section 6

Relevant EARs	Report Section
c. Water Quality Objectives (as endorsed by the NSW Government http://www.environment.nsw.gov.au/ieo/index.htm) including groundwater as appropriate that represent the community's uses and values for the receiving waters. Where locally derived indicators and guideline values are not available for the relevant Water Quality Objectives, the EIS must refer to the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018).	
10.The EIS must assess the impacts of the development on water quality, including: a. The nature and degree of impact on receiving waters for both surface and groundwater, demonstrating how the development 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, using the Risk-based framework for considering waterway health outcomes in strategic land use planning decisions. b. Identification of proposed monitoring of water quality or required changes to existing monitoring programs c. How the development meets the objects of the Coastal Management Act 2016 and management objectives of relevant Coastal Management Areas defined under this Act d. Consistency with any relevant certified Coastal Management Program (or Coastal Zone Management Plan)	Section 6
11. EIS must assess the impact of the development on hydrology, including: a. Water balance including quantity, quality and source b. Effects to downstream rivers, wetlands, estuaries, marine waters (including marine protected areas) and floodplain areas c. Effects to downstream water-dependent fauna and flora including groundwater dependent ecosystems d. 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) e. Changes to environmental water availability, both regulated/licensed and unregulated/rules-based sources of such water f. Mitigating effects of proposed stormwater and wastewater management during and after construction on hydrological attributes such as volumes, flow rates, management methods and re-use options g. Identification of proposed monitoring of hydrological attributes	Section 6
Flooding and coastal hazards	
12. The EIS shall include a flood impact and risk assessment (FIRA). As a minimum the FIRA must: a. Consider the relevant provisions of the NSW Flood Risk Management Manual (2023) and associated guides, and existing council and government studies, information and requirements b. Identify and describe existing flood behaviour on the site and its surrounding areas for the full range of events, including 5% AEP, 1% AEP, PMF and 0.5% AEP or 0.2% AEP and provide an assessment of the compatibility of the development and its users with flood behaviour. This may require flood modelling where existing flood information is not available c. Determine and describe changes in post development flood behaviour, impacts of flooding on existing community and on the development and its future community for full range of events, 5% AEP, 1% AEP, PMF and 0.5% AEP or 0.2% AEP. This will typically require flood modelling d. Consider impacts of climate change due to both sea level rise and increase in rainfall intensities considering relevant Council and government advice. The 0.5% AEP or 0.2% AEP events can be used to provide an understanding of the scale of change of flood behaviour relative to the 1% AEP event e. Propose and assess the effectiveness of management measures required to minimise the impacts and risks of flooding to the development and its users and existing community Note: • The scope of a FIRA is intended to be consistent with the Draft EHG FIRA Guide, which is being finalised currently. • The FIRA will need to be tailored to suit the project being considered, whilst maintaining consistency with the FIRA guide	Sections 5 & 6
Attachment B – Project-specific Environmental Assessment Requirements	
Water Quality and Hydrology	
19. Large or high risk proposals with heightened potential to impact on water quality and hydrology. EARs for inclusion if this scenario applies depend on the nature, scale and/or risk of the proposal. Example EARs are as follows:	Section 7

Relevant EARs	Report Section
The description of existing water quality/hydrology in the EIS must be based on suitable data (meaning data collection may be required) and must include: a. Relevant water quality objectives b. Water chemistry c. A description of receiving water processes, circulation and mixing characteristics and hydrodynamic regimes d. Lake or estuary flushing characteristics. e. Sensitive ecosystems or species conservation values f. Specific human uses and values (e.g. fishing, proximity to recreation areas) g. A description of any impacts from existing industry or activities on water quality h. A description of the condition of the local catchment e.g. erosion, soils, vegetation cover i. An outline of baseline groundwater information, including, for example, depth to water table, flow direction and gradient, groundwater quality, reliance on groundwater by surrounding users and by the environment j. Historic river flow data A. The assessment of the development on water quality and hydrology in the EIS must include: a. Water circulation, current patterns, water chemistry and other appropriate characteristics such as clarity, temperature, nutrient and toxicants, and potential for erosion b. Changes to hydrology (including drainage patterns, surface runoff yield, flow regimes, and groundwater) c. Disturbance of acid sulphate soils and potential acid sulfate soils d. Stream bank stability and impacts on macro invertebrates e. Water quality and hydrology modelling and/or monitoring, where necessary B. The proposed monitoring of water quality must be undertaken in accordance with the *Approved Methods for the Sampling and Analysis of Water Pollutant in NSW 2022* The EIS must include a water quality and aquatic ecosystem monitoring program that includes: a. Adequate data for evaluating maintenance, or progress towards achieving, the relevant Water Quality Objectives b. measurement of pollutants identified or expected to be present	

Table 3 presents the agency advice from NSW EPA relevant to the project and where they are addressed.

Table 3: NSW Environmental Protection Authority's (EPA) Environmental Assessment Requirements.

Relevant EARs	Report Section
Water	
The EIS surface water quality assessment must: 7.1 Demonstrate that all practical measures to prevent, control, abate or mitigate water pollution have been implemented, including a description of options that were explored (such as reuse to avoid a discharge or treatment). 7.2 Provide details of the proposal that are essential for predicting and assessing potential impacts to receiving waters. This could include (but is not limited to): a. Site layout, including details of the existing and proposed water management system. b. Drainage map for the entire site identifying sub-catchments, flow paths, drainage infrastructure, design sizing of structures, water storages, discharge points, and any potential flow paths to receiving waters. c. How stormwater will be managed in all phases of the project. Information should include, where appropriate, measures to avoid or minimise erosion, leachate generation, and sediment mobilisation at the site. d. Any in-water activities (such as piling or dredging). 7.3 Include water balance(s) for ground and surface water, including any intake and discharge locations, volumes, frequency and duration. 7.4 Identify and estimate the quality and quantity of all pollutants that may be introduced into the water cycle by source and discharge point, including residual discharges after mitigation measures are implemented. This should be undertaken for construction and operational phases. 7.5 Include a water pollution impact assessment undertaken consistent with the guidance available at https://www.epa.nsw.gov.au/your-environment/water/managing-water-pollutionin-	Sections 3, 4 & 7

nsw/environment-protection-licensing/water-pollution-discharge-assessments. The level of assessment should be commensurate with the risk to the environment and human health. 7.6 Describe any surface water quality monitoring programs, including proposed monitoring locations, frequency and indicators of surface water quality. Analytical limits of reporting should have regard to any identified guideline values. Water quality monitoring should be undertaken in accordance with the *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW* (2004) available at: Approved methods for the sampling and analysis of water pollutants in NSW | EPA 7.7 The EIS must describe how stormwater will be managed in all phases of the project, including details of how stormwater and runoff will be managed to minimise pollution. Information should include measures to be implemented to minimise erosion, leachate and sediment mobilisation at the site. The EIS should consider the guidelines *Managing urban stormwater: soils and construction,* vol. 1 (Landcom 2004) and vol. 2 (A. Installation of services; C. Unsealed roads; D. Main Roads; E. Mines and quarries) (DECC, 2008)	

Table 2 presents the agency advice from NSW DCCEEW Water Group relevant to the project and where they are addressed.

Table 4: NSW DCCEEW Water Group Environmental Assessment Requirements.

Relevant EARs	Report Section
It is recommended the Environmental Assessment consider the following: **Controlled Activities on Waterfront land** For projects which are located within waterfront land as defined in the *Water Management Act 2000.* • A Waterfront land Assessment should be prepared which undertakes the identification and assessment of all watercourses and/or wetlands on the subject site and the broader vicinity based on the NSW Hydroline layer. This includes the identification of the "top of bank" from which waterfront land is measured. • Identification of all works located on waterfront land and assessment of impacts on surface water sources, watercourses and riparian land, and measures proposed to reduce and mitigate these impacts. • Assessment of the project against relevant policy and guidelines including the Guidelines for Controlled Activities on Waterfront Land. This should consider: o applying the recommended corridors and buffers for the respective stream order without excessive use of the guidelines "averaging rule". Where encroachments are proposed offsets should be located where they contribute to riparian value and function. o that riparian corridors/buffers are fully vegetated when assessing other constraints such as flooding and asset protection zones. o that asset protection zones, water quality treatments, detention o basins/structures etc should be located outside of the designated riparian corridors. o where works in watercourses are required then designs and rehabilitation should seek to provide naturalised outcomes for the watercourse and vegetated riparian zones. • The departments guidelines for works on waterfront land can be found at https://water.dpie.nsw.gov.au/licensing-and-trade/controlled-activityapprovals Identification of required Controlled Activity Approvals or assessment of the project's compliance with any exemptions or exclusions to requiring these under the *Water Management Act 2000*. Information on exemptions can be found https://water.dpie.nsw.gov.au/our-work/licensing-and-trade/controlled-activityapprovals/controlled-activity-exemptions. • Approvals under the *Water Management Act 2000* must be obtained prior to the commencement of activities **Water Licensing** The responsibility to issue water supply works, flood works, and water access licences is shared between the Water Group and WaterNSW. For information on how to determine the relevant authority see: https://water.dpie.nsw.gov.au/our-work/licensing-and-trade/governance	Section 7

Relevant EARs	Report Section
Where the applicant would apply to WaterNSW, it is recommended that WaterNSW is consulted as a part of the SEARs process. Where the applicant is required to submit applications to the Water Group, the following should be considered. • Assessment of the project against relevant policy and guidelines. e.g. Water Sharing Plans, Floodplain Management Plans, NSW Aquifer Interference Policy • The identification and quantification of all water take/demands for the project, including a secure water supply, groundwater interference, take from streams, dams or groundwater. Include details of water sources, held entitlement (including WAL references) or assessment on the ability to obtain sufficient entitlement or an applicable exemption. • 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, groundwater dependent ecosystems, and measures proposed to reduce and mitigate these impacts. • Identification of required licences and/or approvals and assessment of the project's compliance with any exemptions or exclusions to requiring these under the *Water Management Act 2000*. Approvals under the *Water Management Act 2000* must be obtained prior to the commencement of activities. These may include a Water Supply Work Approval, Water use approval, Water Access Licence or Flood work approval. Information on exemptions can be found https://water.dpie.nsw.gov.au/our-work/licensing-and-trade/water-accesslicences-and-approvals	

1.6 Potential Surface Water Impacts

The Project has the potential to have the following impacts on surface water resources:

- A reduction in Durran Durra Creek and Shoalhaven River catchment yield due to the capture of surface runoff within the Project Water Management System (WMS).
- Degradation of downstream water quality as a result of:
    - ground disturbing activities leading to erosion and transport of sediment to downstream water users and watercourses.
    - controlled and/or uncontrolled discharges from the Project WMS.
- Changes in catchment hydrology resulting in changes to receiving watercourse flow regimes.

The potential surface water impacts and measures to manage the impacts of the Project are detailed in Section 6.

2 EXISTING ENVIRONMENT AND CONSTRAINTS

2.1 Climate

Bureau of Meteorology (BoM) rainfall statistics are available for the nearby rainfall station at Braidwood Racecourse (station 069132). The BOM data for this station indicates an annual average rainfall of 689mm. A summary of the data is provided in Table 5.

Table 5: Monthly rainfall statistics at Braidwood Racecourse (station 069132) (BoM, sourced 12/09/2025).

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann-ual
Mean Rainfall (mm)	67.2	67.7	63.3	43.9	44.3	56.3	33.1	53.6	48.6	57.7	83.8	68.0	689.0
Mean no of days with rain >1mm	7.1	5.9	7.2	4.8	4.7	5.6	4.8	5.1	5.9	6.6	7.7	6.6	72.0

BoM data accessed 12 September 2025.

The variance in annual rainfall at the site is provided in Figure 3 below.

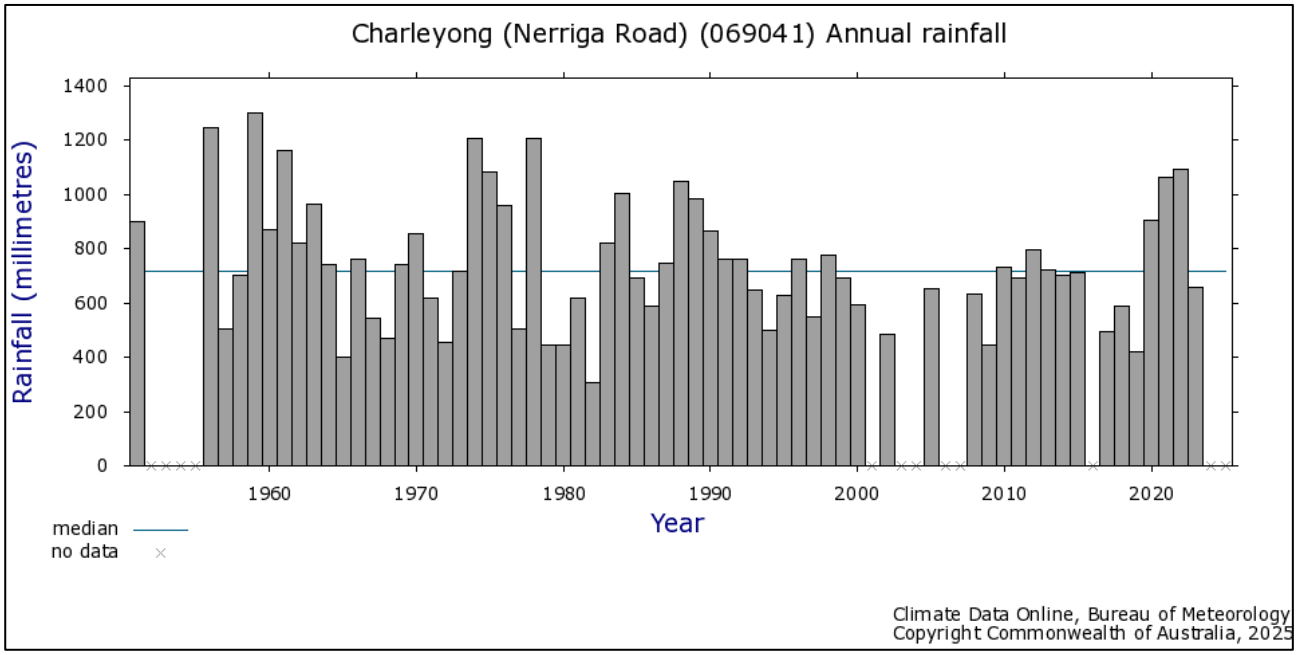

Figure 3: Annual rainfall 1951 to 2024 Braidwood Racecourse (Source: BoM, 2025).

2.2 Topography and Drainage

The Project is situated with the floodplains of the Durran Durra Creek, which flows along the south-western boundary of the site. Durran Durra Creek joins Shoalhaven River to the north of the Project, which forms part of the Sydney drinking water catchment area. The Project intersects an unnamed 1st order stream which discharges to the west into the 4th order Durran Durra Creek, and then into the Shoalhaven River approximately 1,100 m downstream of the Project boundary. An unnamed 3rd order watercourse flows parallel to the northern extent of the proposed expansion, which flows west into Fairleys Creek, which drains to the Shoalhaven River (Figure 4).

The topography of the Project area ranges from approximately 590 mAHD along the eastern Quarry boundary to 580 mAHD in the south-western region of the Quarry, with an average slope of 1-3%. The local site catchment gradient falls in a predominantly easterly direction, draining from a ridge line located west of the Project Area, towards the Shoalhaven River.

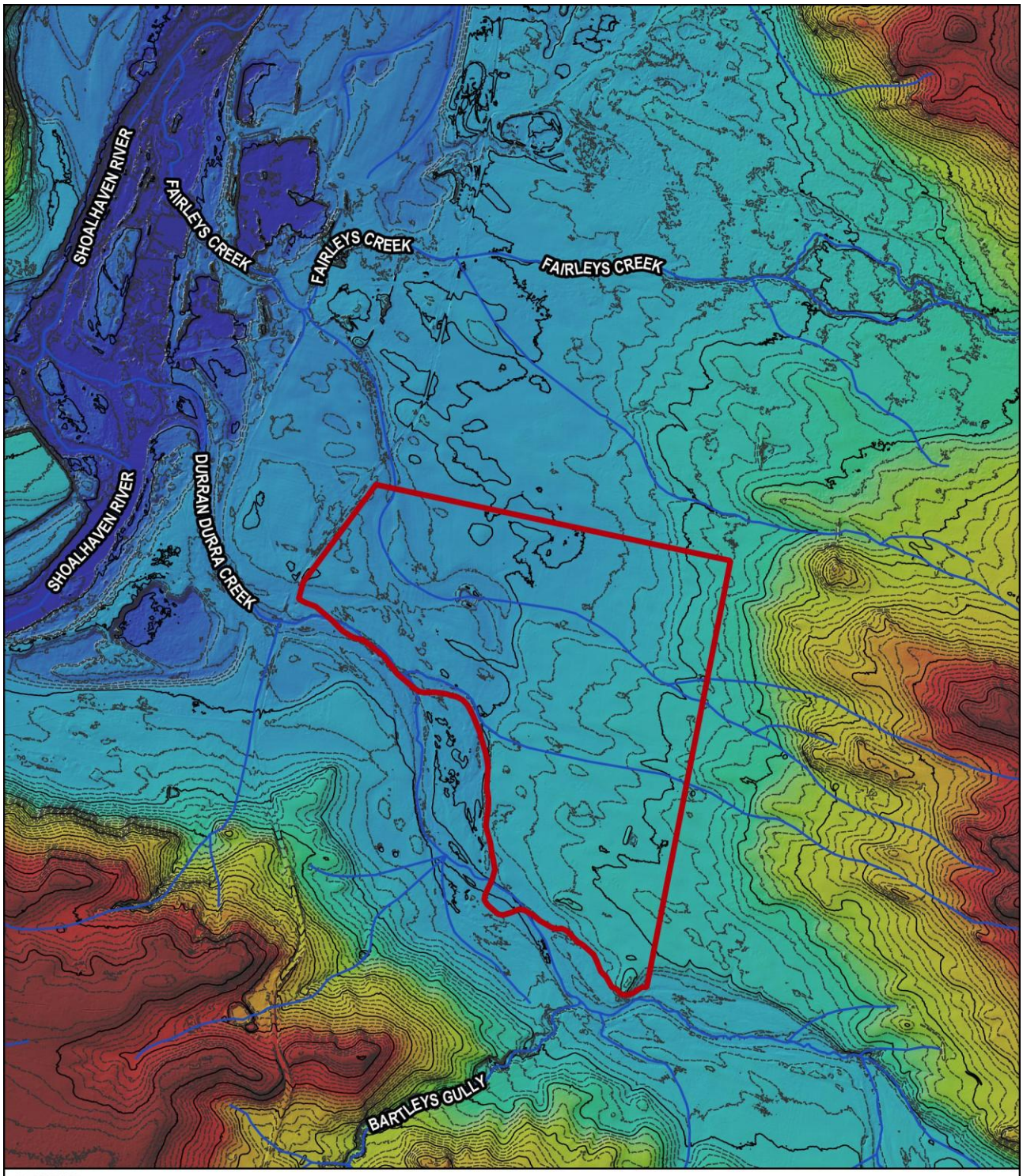

Figure 4
Topography and Drainage

Plot Date: 18/09/2025 Project Path: X:\Projects\25-033 552 Larbert Rd, Larbert\GIS\25000033_GIS.qgz

2.3 Flooding

No flood studies were identified for Durran Durra Creek, but it is understood that an assessment was undertaken previously of the Shoalhaven River for the adjoining Shoalhaven Sands development located to the north of the Project. It is noted that the southern boundary of the Project area is potentially within the floodplain for Durran Durra Creek and overland flows are also expected from tributaries to the west and will need to be managed to minimise localised flooding.

2.4 Soils

Soil Landscape Mapping from the Soil Landscapes of Central and Eastern NSW, Sydney 1:100,000 map sheet reveals that the project lies on several different soil types (DCCEEW, 2024).

Table 6 contains a summary of soil landscape descriptions, key features and potential constraints that might influence erosion and sediment control during construction.

Figure 5 shows the soil landscapes with the extent of the works.

Table 6: Soil landscape summary (DCCEEW, 2024).

Soil landscape name	Soil landscape description	Key landscape and soil constraints for erosion and sediment control
Larbert Variant b	Flat to gently undulating floodplains on Quaternary alluvium. Moderately deep to deep, alluvial coarse sand over coarse sandy loam.	• High soil permeability • Low soil fertility • Low available water-holding capacity
Oorong	Undulating aeolian sand dunes and sheets overlying granitic rock. Moderately deep, rapidly drained loamy sand over sand	• High organic matter content • Extremely low wet bearing strength • High permeability • Low fertility • Low available water-holding capacity • Strong acidity

Acid Sulfate Soil Risk Mapping (DLWC, 1997) did not identify the project site as having a risk of acid sulfate soils (confirmed via the NSW Government eSpade portal, 2021). Site observations did not identify any landscape indicators that suggest acid sulfate soils might be present within the project boundaries.

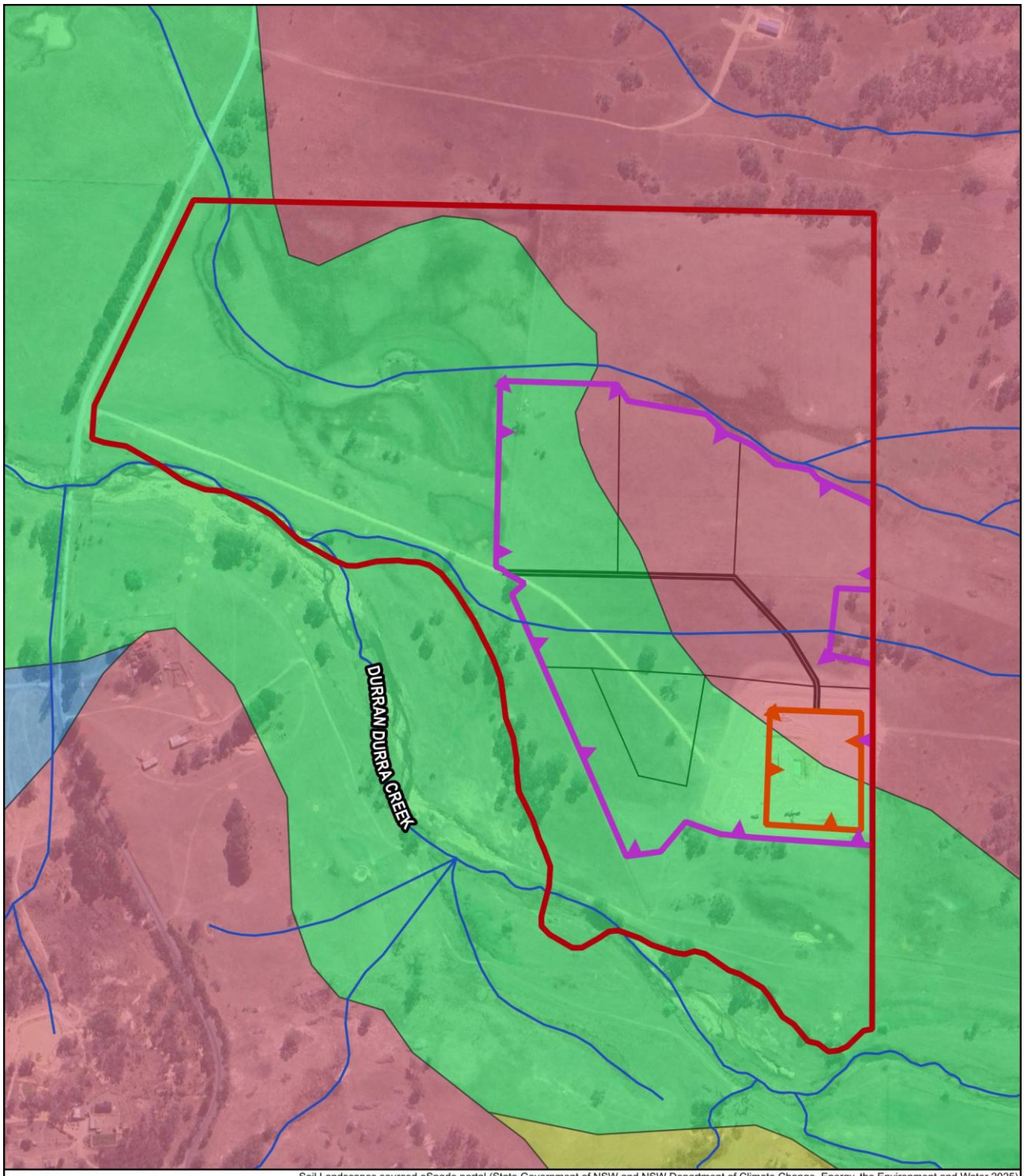

Figure 5
Soil Landscapes

2.5 Surface Water Quality

2.5.1 Environmental Values

Environmental values are those values or uses of water that are desired by the community to be protected. These include, but are not limited to, protection of aquatic ecosystems, drinking water, primary and secondary recreation, visual amenity, and agricultural water for irrigation, livestock and growing aquatic foods.

The National Water Quality Management Strategy (NWQMS) including the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000 and ANZG, 2018) provides guidance on water quality planning and management. It highlights the need to adopt locally established community values were provided by the relevant authorities. In NSW, interim water quality objectives have been established in consultation with the community. They help decision makers consider water quality in both big picture strategic planning such as State Strategic Plans and Regional Strategies and at the local level when assessing impacts of development.

Environmental values for each catchment in NSW are provided by the NSW Department of Planning, Industry and Environment (Environment, Energy and Science) (available at: https://www.environment.nsw.gov.au/ieo/). The quarry lies within the Shoalhaven River catchment which does not have WQOs listed, and reference is provided below to the default trigger values, for upland rivers in southeast Australia, of the ANZECC (2000) guidelines for the protection of aquatic ecosystems as outlined in Table 7.

Table 7: Relevant indicators for aquatic ecosystems - upland rivers.

Indicator	Numerical criteria (trigger values)
Total phosphorus	20 µg/L
Total nitrogen	250 µg/L
Turbidity	2–25 NTU
Salinity (electrical conductivity)	30–350 µS/cm
Dissolved oxygen	90–110%
pH	6.5–8.0

2.5.2 Neutral or Beneficial Effect on Water Quality

The Project is located within the Sydney drinking water catchment (i.e. Shoalhaven River) and as such must have a Neutral or Beneficial Effects (NorBE) on water quality.

Neutral or Beneficial Effect on Water Quality Assessment Guideline (WaterNSW, 2022) indicates that a neutral or beneficial effect on water quality is satisfied if the development:

- has no identifiable potential impact on water quality, or
- will contain any water quality impact on the development site and prevent it from reaching any watercourse, waterbody or drainage depression on the site, or
- will transfer any water quality impact outside the site where it is treated and disposed of to standards approved by the consent authority.

3 WATER SHARING PLAN & ACCESS LICENSING

3.1 Water Sharing Plan

The Project lies within the Mid Shoalhaven Water Source, managed under the Water Sharing Plan for the Greater Metropolitan Region Unregulated and Rivers Water Sources 2023 (the Water Sharing Plan).

3.2 Harvestable Rights

In accordance with Part 3, Division 1, Clause 14 of the Water Sharing Plan, the Applicant is entitled to capture and store water sources pursuant to the harvestable rights order made under Part 1, Division 2, Section 53 of the Water Management Act 2000 (WM Act).

Section 53 of the WM Act permits landholders to harvest and use a portion of the total runoff from their land without requiring licence(s), provided that the total capacity of the harvestable rights water storages are less than the capacity permitted under the right and that all storages are constructed either off-line or on first or second order, non-spring fed streams.

The Department of Climate Change, Energy, the Environment and Water (DCCEEW) states that harvestable rights dams can be located on;

- non-permanent minor streams
- hillsides
- gullies

but cannot be located:

- within 40 metres of a third-order or higher order stream
- within 3 kilometres upstream of a wetland of international importance (listed under the Ramsar Convention).

The Maximum Harvestable Right Dam Capacity (MHRDC) based on the Project site area of 71.3 ha, is 4.99 ML. The MHRDC has been calculated using the Maximum harvestable right calculator maintained by the Department of Primary Industries — Office of Water (DPI-Water) *Maximum Harvestable Rights Calculator - WaterNSW*.

3.3 Water Users

The site falls within the Mid Shoalhaven River Water Source sub-catchment of the Water Sharing Plan. A review of the Water NSW water register indicated the sub-catchment has a total of 17 Water Access Licences (WAL), including a total share component of 1,768.5 ML (based on a WaterNSW, 2025/26 financial year, available at https://waterregister.waternsw.com.au, accessed *September 2025*). There are no WALs allocated within the Mid Shoalhaven Water Source on the land in which the project is located or immediately downstream of the Project.

4 WATER MANAGEMENT

4.1 Water Management System

4.1.1 Water Management System

A plan of the key water management infrastructure and a schematic of the proposed water management system (WMS) are presented in Figure 6 and Figure 10, respectively. The WMS aims to maintain separation of clean water from externally draining catchments and dirty water from internally draining catchments.

As discussed in Section 2.2, the Project intersects a 1st order stream and is located between Durran Durra Creek to the south and an unnamed 2nd order stream to the north. At the commencement of Stage 1b, the Quarry will intersect the 1st order stream and a clean water diversion will need to be constructed, as shown in Figure 6. All extraction area stages are proposed to have a 2-3m bund surrounding them, to significantly reduce any instance of clean water ingress and any potential flood waters from Durran Durra Creek.

Current operations including pumping from the current extraction pit to the Farm Dam. Water is then sourced from the Farm Dam for use in the processing area. The processing area overflows to the settlement ponds, where sediment is settled and the clean water flows back to the Farm Dam for reuse. A schematic showing the current WMS is provided in Figure 7.

Currently no flocculent has been required, as water entering the Farm Dam is clean enough for use in the processing area. If additional settlement is required, the settlement pond is opened allowing water to flow around a bund for additional settlement. Settlement Ponds are regularly desilted, to maintain capacity

The WMS for the Project is similar to the current operations however the current pit sump within mine area E1 will become the Clean Water Dam (CWD) and essentially replaces the Farm Dam. The Farm Dam is to be retained but will not be used for any of the mining operations. Water is sourced from the CWD for use in sand processing. Overflow from sand processing is piped into the Settlement Ponds (SPs). Once sediment is settled, the clean water in the SPs will then be pumped back into CWD for re-use. Runoff from within the processing area is directed to the processing area sediment basin (SB1).

Each progressive extraction area stage will contain rainfall run-off within the extraction area, although a temporary sediment basin maybe required during the initial stages if topsoil is stripped over the whole stage area. Any preliminary sediment basins are to be sized for the 5-day 95th percentile rainfall, noting that any initial sediment basin if required would be temporary and would ultimately become part of the extraction area. Water from the active extraction areas is to be pumped to the CWD for re-use as required.

Once each stage is completed, the extraction area will be rehabilitated via back-filling of excavated pits with a dozer using stockpiled topsoil and overburden from soil stockpiles or bunding, supplemented by imported fill, once extraction is completed in each sand pit stage/cell. Once each stage of sand extraction is completed the decommissioned area will be rehabilitated and shaped to stable, post-extraction landforms, using clean ENM and VENM fill when available.

Table 8: Site catchments and receiving storage.

Storage	Catchment Area (ha)	Estimated Capacity (ML)	Inflows	Outflows
CWD	2.74	17.5	Runoff Pumped from SBs	Evaporation Seepage Water Use (Processing/Dust) Overflow
SB1	2.2	3	Runoff from Processing Area	Evaporation Seepage Water use (Dust Supp.) Controlled Release[4] Overflow
SPs	1.9	7.5[3]	Runoff Groundwater Excess process water	Evaporation Seepage Pumped to CWD Controlled Release[4]
SB2/3/4/5[1]	1.6-4.3	[2]	Runoff Groundwater	Evaporation Seepage Pumped to CWD Controlled Release[4]
Farm Dam	-	3	No longer active.	

[1] Each staged extraction area will contain its own water run-off within the void. A temporary Sediment basin maybe required for each stage if topsoil is stripped over the whole stage extent, as discuss in Section 4.4.1.
[2] The minimum sizing for each temporary sediment basin is provided in Table 10. However, the sediment basins will ultimately become part of the extraction area.
[3] Settlement pond volume includes an estimate of the overflow/evaporation area to the north.
[4] Included in model but release rate set to 0 L/min (i.e. no release at this stage).

Captured water is unlikely to be discharged from site due to the highly permeable nature of the site soils. Additionally, water is unlikely to be discharged from any on-site extraction areas, as they have significant storage volume for larger events. In the event of a discharge, controlled releases (i.e. pumped discharges after 5 days treatment to achieve the desired water quality) may occur from the sediment basins (SB1, SB1B, SB2, etc.), however, they will be reduced by the extraction of stored water to meet process water requirements such as product wetting and haul road dust suppression.

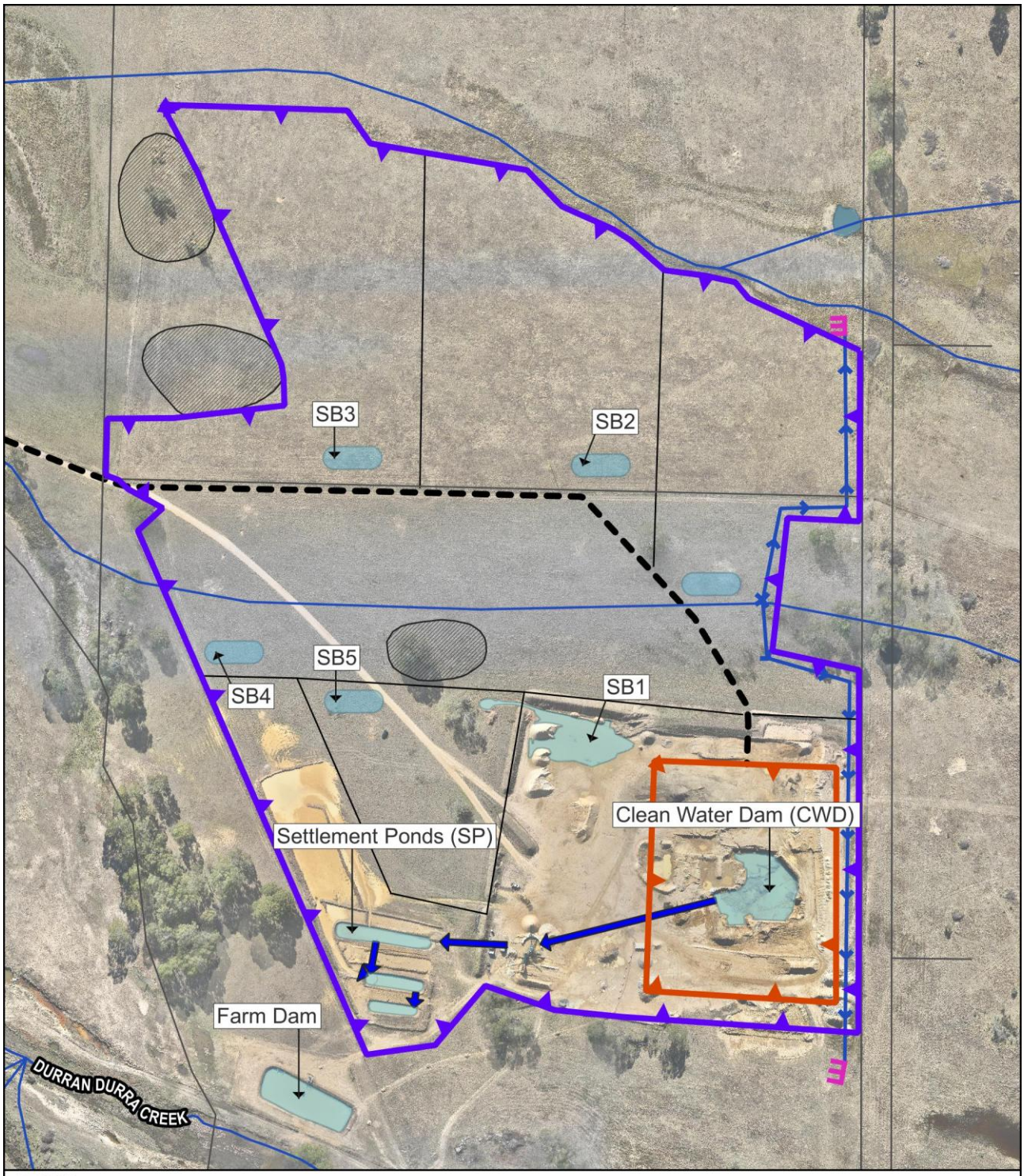

Figure 6
Water Management Layout

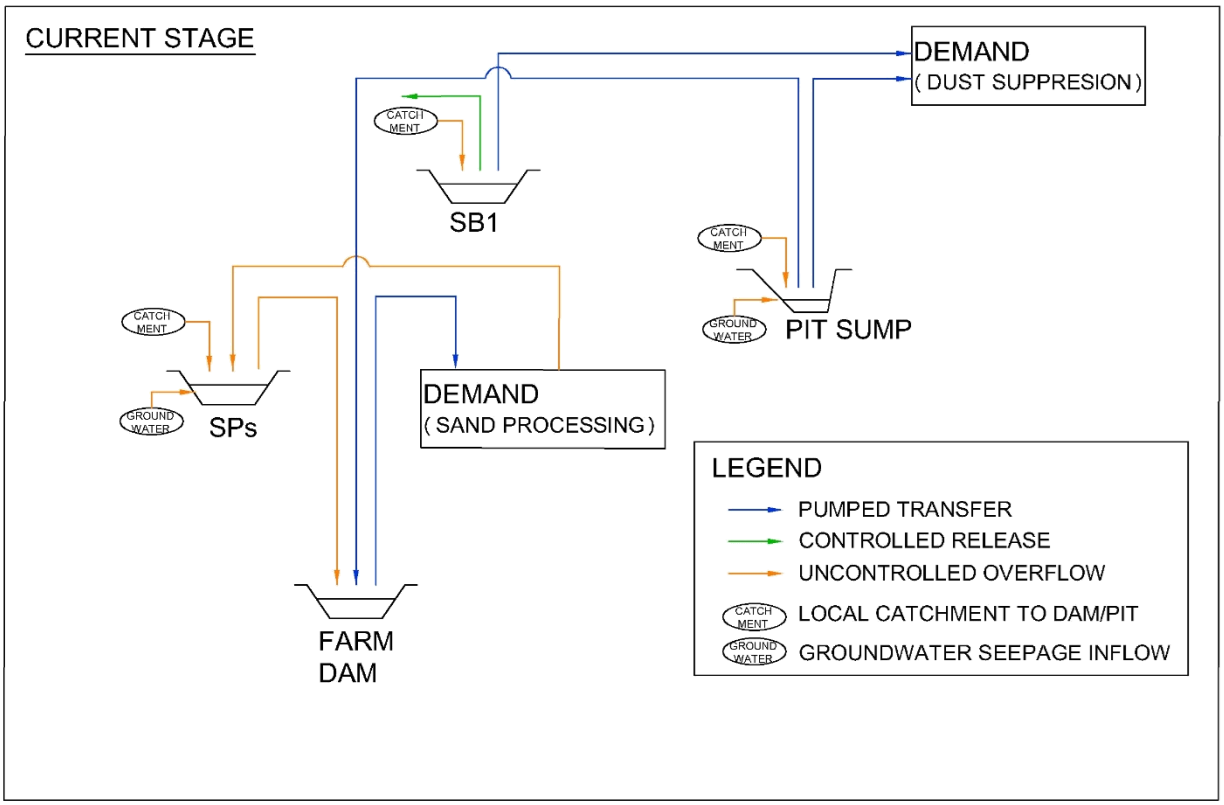

Figure 7: Current water management system schematic. (Not Modelled)

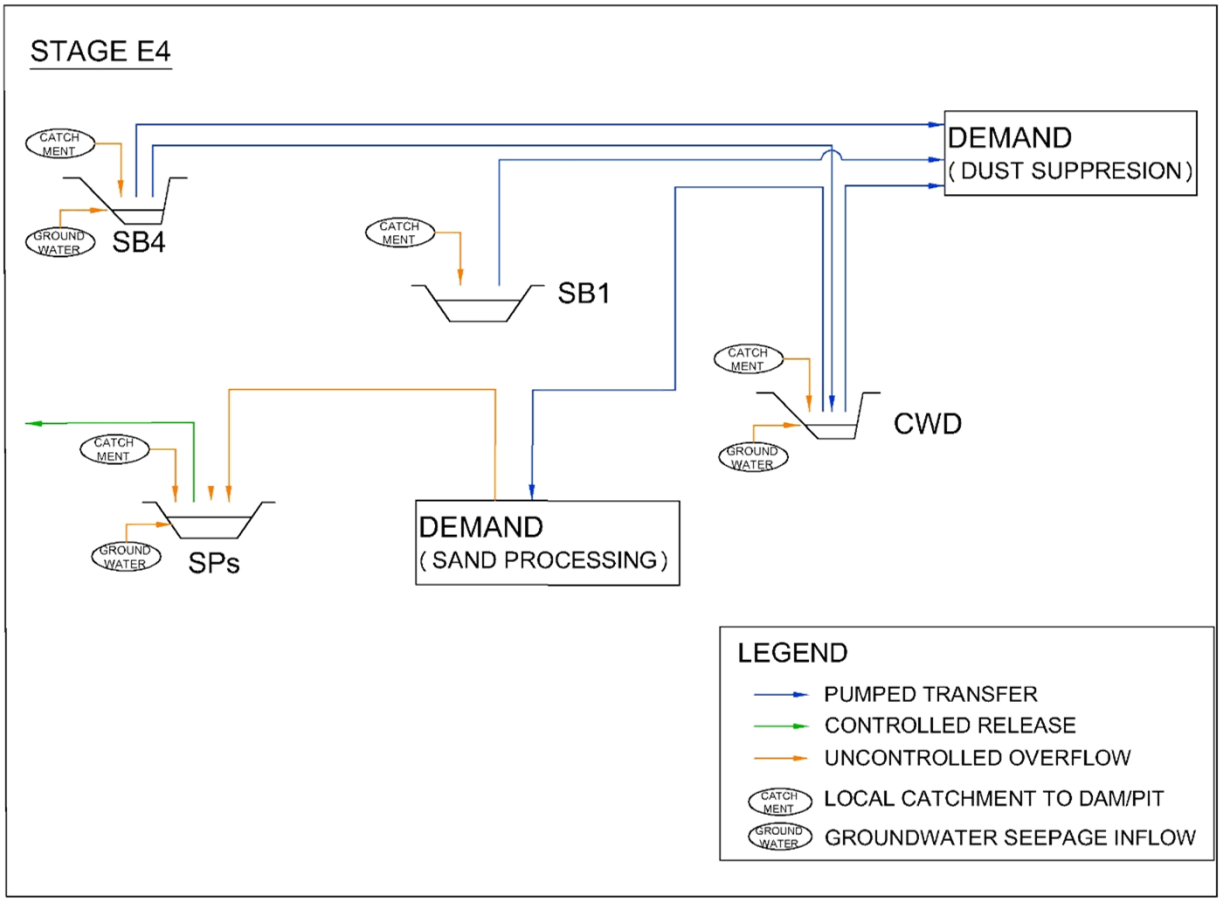

Figure 8: Proposed water management system schematic.

4.1.2 Amenities Water Supply and Disposal

- Potable water for amenities is to be supplied by an external provider and delivered to site and stored in a holding tank.
- Wastewater from the amenities is to be collected in a tank and removed from site by license contracted as required.

4.2 Erosion And Sediment Control

4.2.1 Erosion Hazard Assessment

Erosion and sediment control recommendations are provided in the Soil and Water Management Plan (SWMP) (Appendix A). This section outlines the key controls.

An evaluation of the erosion hazard for each catchment was made using the Revised Universal Soil Loss Equation (RUSLE) as follows:

$$A = R \times K \times LS \times P \times C$$

The calculated soil loss is used to determine the appropriate sediment control standard in each affected catchment. Table 9 details the definition of each of the factors considered in the RUSLE, and the values adopted for each.

Table 9: Erosion hazard (based on Landcom, 2004)

Parameter	Definition	Adopted value
A	Total calculated soil loss (t/yr)	Varies, depending on LS-factor in each catchment.
R	Rainfall erosivity factor (annual)	1500*
K	Soil erodibility factor	0.019 (Based on the Oorong Soil Landscape).
LS	Slope length and gradient factor	Varies. In each catchment, the natural slope and slope length was taken into account, as was the proposed design slope and slope length (e.g. of any large batters). A composite LS-factor was used when assessing erosion hazard in each catchment. This ranges from 0.41 (30 m at 3 %) to 3.59 (50 m at 15 %).
P	Conservation practice factor	1.3 (compacted and smooth)
C	Ground cover factor	1.0 (no ground cover).

* Based on R-factor map for Project locality (from Landcom, 2004).

It is recognised that topsoils and subsoils have differing erosion hazards owing to a number of factors. While rain drop impact responsible for mobilising sediment, is minimised with the presence of vegetative or soil surface cover, uncompacted topsoil's generally allow for the infiltration of rainfall resulting in lower instances of scour and soil erosion.

Subsoils are generally more compacted, and while they may not have the same degree of sediment mobilised by rain drop impact, they allow for very little infiltration resulting in a higher potential for overland flow. This has an associated effect of high flow concentration, scour potential and mobilisation of bulk sediments.

4.2.2 Sediment Basins (If Required)

In accordance with *Managing Urban Stormwater* (the Blue Book) Volumes 1 and 2E (Landcom, 2004 and DECC, 2008), sediment basins are required where the erosion hazard in any disturbed catchment exceeds the threshold of 150 m^3 (200 tonnes of saturated sediment) per year.

The basins are designed to capture runoff from disturbed catchments and store the runoff for a sufficient period of time to allow the sediment to settle out of suspension prior to discharging water of suitable quality to receiving environments.

A conceptual Surface Water Management Plan (SWMP) was prepared by SEEC (Appendix A). In addition to numerous other erosion and sediment controls, the SWMP shows several temporary sediment basins to be used during construction to temporarily detain dirty onsite water generated when rainfall runs off disturbed areas.

Construction-phase sediment basins have been sized based on the following criteria (Landcom, 2004 and DECC, 2008):

- Design rainfall depth: 33mm (5-day, 90th percentile for Queanbeyan);
- Basins designed for Type F/D (dispersible) sediment;
- Volumetric runoff coefficient (Cv): 0.51 (Hydrologic Group C) for all areas.

The minimum basin sizing to meet ESC requirements of each dirty water catchment are listed in Table 10. Note that these are minimum sizes based on the largest catchment area that drains to them throughout the expected design life. These basins will ultimately become part of each extraction area any water captured to provide additional water storage on-site as identified by the water balance in Section 5.

The basins should be maintained within 5 days of the rain event with captured runoff treated and discharged ready to accept the settling volume listed in the table below. Should water be required for on-site use, the water can be retained, however the basins must be capable of capturing the nominated settling volume prior to a rain event. Note that if rain occurs within the 5-day maintenance period, the 5-day treatment period resets. Note that for this site, discharge after treatment is unlikely given the increased volume provided within the extraction areas and site water demands.

Table 10: Minimum Sediment Basin Sizing Requirements as per ESC Requirements.

Structure	Catchment (ha)	Minimum Capacity for ESC (ML)		
		Settling Zone Volume	Sediment Storage Zone Volume	Total Basin Volume[1]
SB1	2.2	0.37	0.04	0.41
SB1b	2.8	0.47	0.05	0.52
SB2	3.2	0.54	0.05	0.59
SB3	3.4	0.57	0.06	0.63
SB4	4.3	0.72	0.07	0.80
SB5	4.6	0.77	0.08	0.85

[1] The minimum sizing for each sediment basin, noting, the sediment basins will be within the extraction pits and therefore will likely have extended capacity within the extraction area and are unlikely to spill.

4.2.3 Coagulants and Flocculants

Although currently not being used, Chemical coagulants and/or flocculants might be required in the future to treat detained surface water and achieve the discharge limits determined in an EPL.

Residual coagulants and/or flocculants in discharge waters will not be included in this assessment because it is assumed that:

- Only coagulants and/or flocculants with known low-toxicity or well-established low-risk ecotoxicity data would be used (e.g. gypsum); and
- Procedures for the use of those coagulants and/or flocculants would minimise the risk of residual active coagulant and/or flocculant being present in discharge waters (i.e. the coagulant and/or flocculant has been detained onsite because it is bonded onto the settled sediment).

4.2.4 Management of Detained Water

The flow chart in Figure 9 shows how surface water management would occur on the Project site. This demonstrates how the Project aims to avoid discharge, if at all possible, through:

- Beneficial re-use of detained surface water from sediment basins, sumps and excavations; or
- Land application of detained surface water onto vegetated or rehabilitation areas.

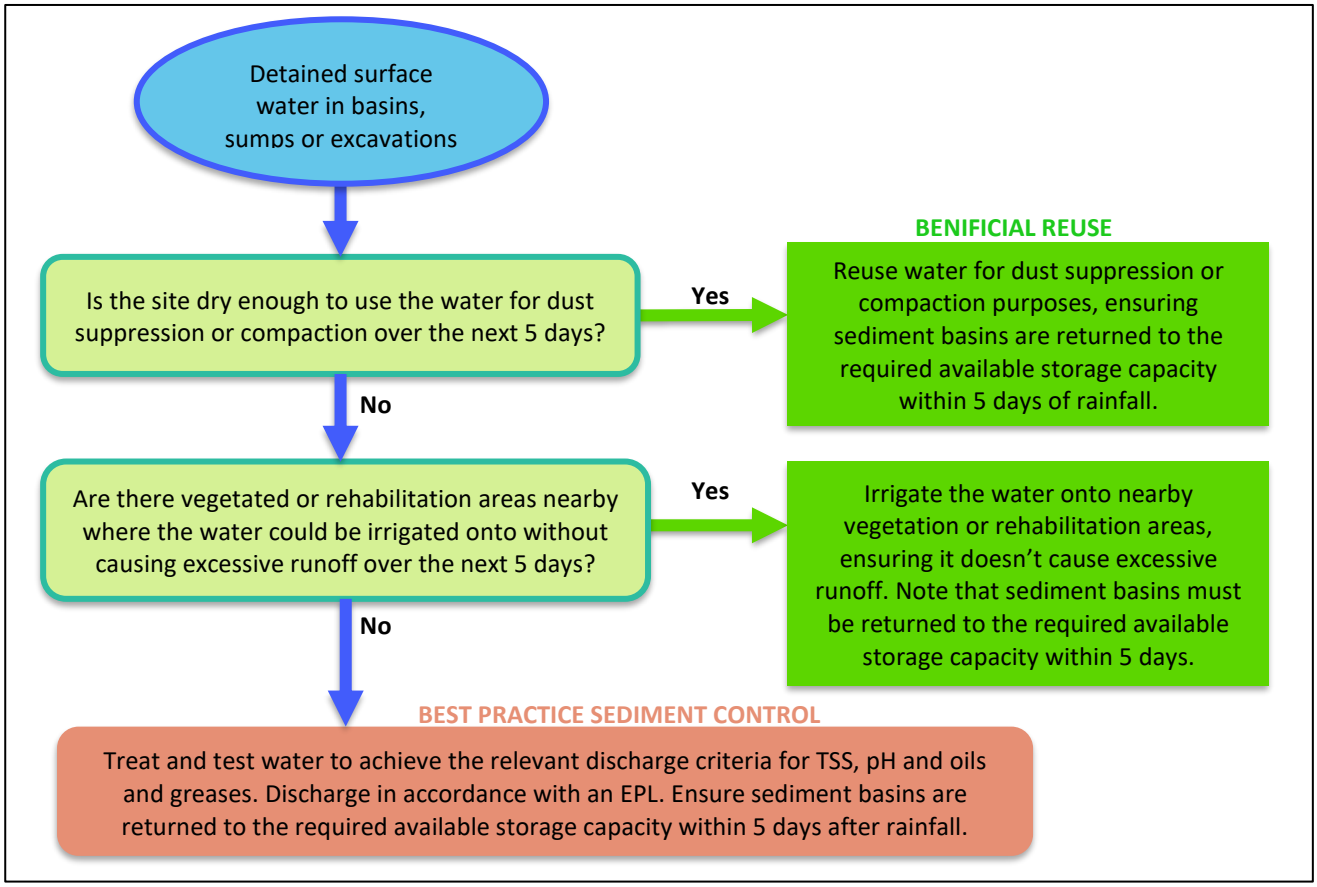

Figure 9: Flow chart for management of surface water on the project.

A discharge from the Project would only occur when the above options are exhausted. This typically occurs when:

- Heavy rainfall has made the site too wet for beneficial onsite re-use such as dust suppression; and/or
- The volume of detained surface water exceeds what can be feasibly re-used onsite prior to the next rainfall event; and/or
- Heavy rainfall has made land application onto nearby vegetated or revegetation areas impossible; and/or
- There are no suitable onsite re-use options available in reasonable proximity to the detained body of surface water.

Consequently, the capture and retention of sediment on site using the best practice management principles outlined in the Blue Book (Landcom, 2004 and DECC, 2008) decreases the potential for a range of other pollutants degrading the receiving environment.

4.2.5 Supplementary Erosion and Sediment Controls

Other erosion and sediment control measures would be installed as required to reduce the velocity of flows and capture sediments. Additional sediment protection may include the use of one or more of the controls outlined in Table 11.

Table 11: Supplementary Erosion and Sediment Controls.

Control	Description
Sediment Fencing	Sediment (silt) fencing consisting of geotextile filter fabric supported by wire and posts will be utilised in areas where: • the area draining to the fence is 0.6ha or less; • the maximum slope gradient behind the fence is 1:2 (V:H); and • the maximum slope length behind the fence is 60m. Sediment fences will generally be installed prior to disturbance activities (e.g. down slope of soil stockpiles) or downslope of areas being rehabilitated and maintained until stabilisation of the area.
Coir Log Filters and Check Dams	If additional erosion control is required at the outlet of a drain or across a swale or channel of a diversion bund, a temporary barrier of anchored coir logs laid end to end across the direction of flow may be utilised to reduce the water velocity and capture sediments. Check dams may also be utilised consisting of rock material. Check dams would primarily be utilised to reduce the velocity of water to prevent erosion rather than as a sediment retention structure.
Rock Armouring and Jute Mesh	In the event additional erosion controls are required, other options that will be considered include the use of rock armouring, whereby a channel or outlet is effectively lined with appropriately sized aggregate material to provide a physical barrier to erosion. Similar to rock armouring, jute mesh, a biodegradable erosion control blanket, may be installed, particularly where vegetation growth is preferable.
Supplementary Planting / Sowing of Cover Crop	Where a vegetated outcome is required but establishment has not been successful, following any corrective earthworks or soil amelioration, a fast growing, non-persistent cover crop should be sown for short term stabilisation together with the native species required for long-term ecosystem establishment. This measure may need to be undertaken in conjunction with other control measures.

These additional measures are applicable to water management structures, active disturbance areas and future areas to be rehabilitated.

5 SITE WATER BALALNCE

5.1 Model Approach

A site water balance model was developed for the Quarry, based on the proposed water management strategy outlined in Section 4. The water balance schematic is shown in Figure 8. This section details the modelling approach and assumptions. The objectives of the water balance are to:

- Estimate the process water demands and water source volumes over the life of the Project for a full range of climatic conditions (dry year, median year and wet year).
- Demonstrate the ability of the proposed surface water management system to manage surface water runoff that would occur during periods of prolonged or extreme wet weather.
- Assess the drought security of the operation and identify the risk of process water shortages.
- Assist in the approvals process.

As we cannot predict long term future rainfall accurately, the adopted approach is to undertake the water balance using a long-term historical rainfall record with the assumption that it will include a range of high, medium and low rainfall periods that could be expected at the site in the future. Model results are presented for the historical average, a dry year (10^{th} percentile), median year (50^{th} percentile) and a wet year (90^{th} percentile).

The impact of climate change could be modelled by increasing the peak rainfalls and the number of dry days. However, there is limited information on appropriate data sets for water balance modelling unlike flood modelling where the rainfall data can be increased by a factor. This assessment has adopted the recorded historical data. An increased allowance for any make-up water should be included to account for potential climate change impacts. Model results are presented in Section5.6.

5.2 GoldSim

GoldSim was used to undertake a water balance of the Quarry. GoldSim is a powerful and flexible platform for visualizing and dynamically simulating complex systems in engineering. It is a "visual spreadsheet" that allows you to graphically create and manipulate data and equations. GoldSim allows you to create realistic models of surface water management systems for a range of development types in order to carry out risk analyses, evaluate potential environmental impacts, support strategic planning, and optimize operations.

GoldSim can incorporate the Australian Water Balance Model (AWBM) developed in the early 1990s by Walter Boughton for estimating runoff from industrial developments, mine sites and for other projects that simulate rainfall runoff in a watershed. AWBM relates daily rainfall and evapotranspiration to runoff and calculates losses from rainfall for flood hydrograph modelling. The model contains five stores; three surface stores to simulate partial areas of runoff, a base flow store and a surface runoff routing store. AWBM operates at a daily time-step.

The model will be used to estimate runoff into the water stores, using historical rainfall. This allows for a wide range of potential climatic events (high, low and median rainfall periods). It is assumed that the average water yields will be representative of what could be achieved during the life of the quarry.

A schematic of the AWBM runoff model is provided in Figure 10.

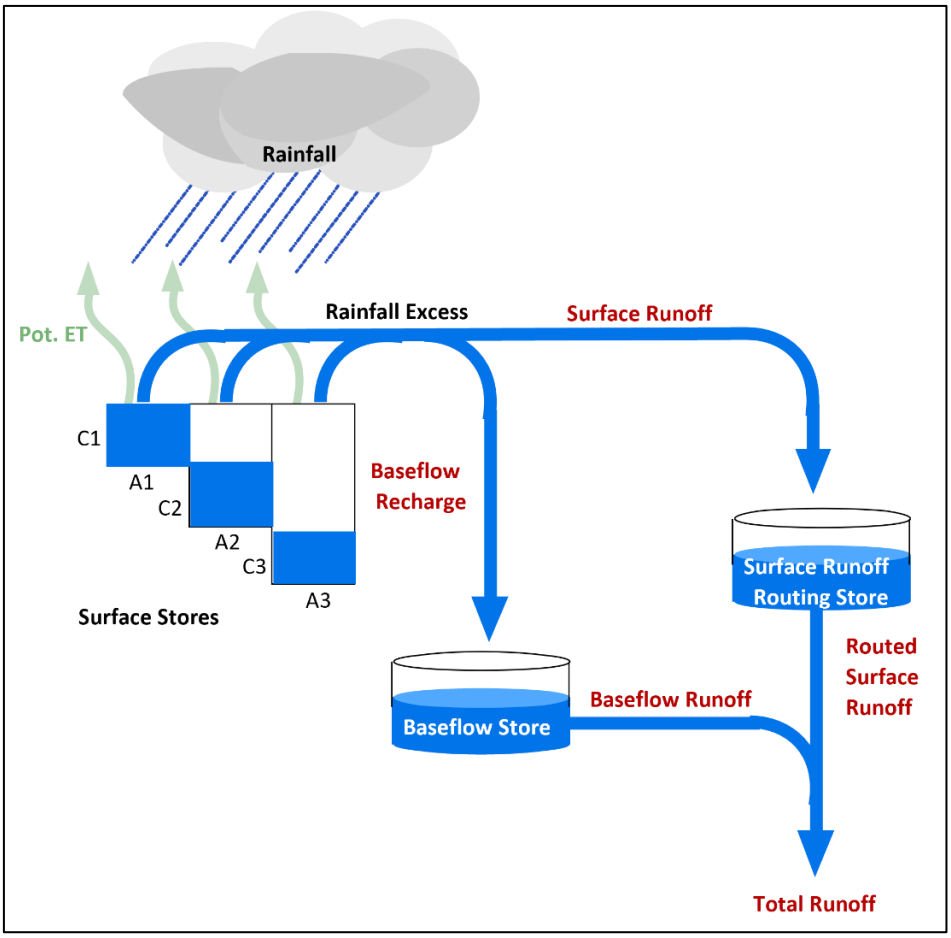

Figure 10: Australian Water Balance Model (AWBM) schematic (GoldSim).

Ideally AWBM parameters would be calibrated for each land use, however, adequate flow data is not available for this site. As such the assumed AWBM parameters used within this water balance are outlined in Table 12 below.

Table 12: AWBM parameters for each land use.

AWBM Parameters	Land Use	
	Natural	Hardstand
A1	0.134	0.134
A2	0.433	0.433
BFI	0.2	0
Kb	0.82	0.7
Ks	0.17	0.1
C1	20	6
C2	75	18
C3	120	35

5.3 Climate Data

Rainfall data has been sourced from the SILO (Scientific Information for Land-Owners) database for the closest available grid location to site (Latitude -35.30, Longitude 149.80) for the period 1 January 1900 to 31 December 2024.

The annual rainfall totals are provided in Figure 11. The highest annual rainfall of 1,217 mm occurred in 1959, while the lowest rainfall of 294 mm occurred in 1982. The median rainfall of 627 mm occurred in 1995.

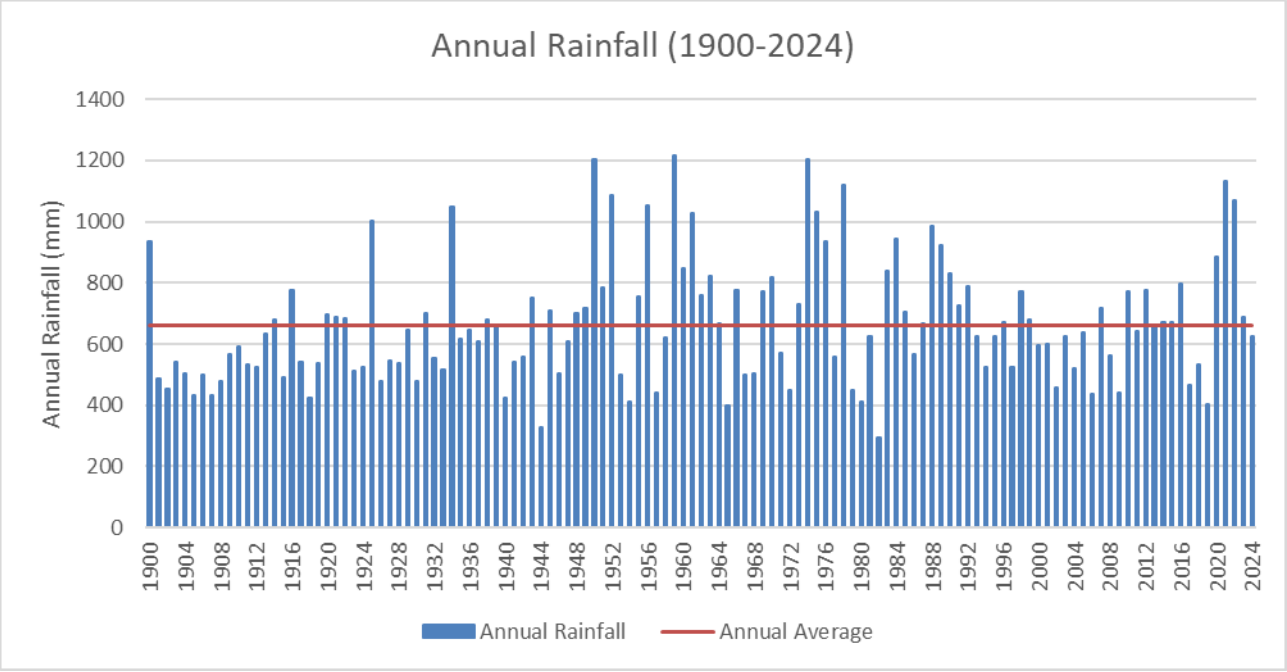

Figure 11: Annual rainfall for the site.

Evapotranspiration (Morton's potential evapotranspiration) and Class A Pan Evaporation data has also been obtained from the same dataset.

Table 13 present long-term mean climate statistics at the site, along with annual values for selected reference years. The years represent the minimum, the 10th, 50th and 90th percentile annual rainfall years, and the maximum rainfall year.

Table 13: Rainfall and ET statistics for the site.

Statistic	Long-term Mean	Min Rainfall Year (1982)	10%ile Rainfall Year (1957)	50%ile Rainfall Year (1995)	90%ile Rainfall Year (1988)	Max Rainfall Year (1959)
Precipitation (mm)	663	294	441	627	987	1217
Evapotranspiration (mm)	1424	1597	1632	1377	1506	1395
Pan Evaporation (mm)	1291	1603	1315	1257	1335	1314

5.4 Water Sources

The water stores adopted in the water balance are listed in Table 8 in Section 4.1.1. Each store has operating rules that define how water is distributed between the stores to efficiently manage excess water to prevent spills and provide sufficient water to limit demand on external water supplies.

5.4.1 Groundwater

The active pit sumps/sediment basins and the CWD will include a portion of the dam below the water table and will likely have groundwater inflow, when water is drawn below that level. The WBM allows for groundwater inflows at a rate of 0.04 ML/d, when water is drawn down below the groundwater level (assumed at -3m from the surface elevation).

5.4.2 Losses

All dams would lose water through infiltration and evaporation. Infiltration is assumed to be 5 mm/d. Evaporation from each dam is a function of the dam's surface area at a given timestep and daily Class A Pan Evaporation, as sourced from SILO.

5.5 Water Demands

Water would be used primarily for sand production and the suppression of dust generated from the exposed and trafficked areas. Water for use in dust suppression and production will be primarily sourced from the CWD. Water can also be directly from sediment basins and settlement ponds for dust suppression; however, all water is sourced only from the CWD in the WBM.

5.5.1 Process Water

Process water refers to water used in the extraction and processing of sand. The current quarry operation is 25,000 tpa and the proposal intends to increase this to 200,000 tpa.

It has been estimated that approximately 200 L of water will be required to wash every tonne of sand, however, between 50-75% of the total volume of water added will be recovered and available for re-use. Therefore, an estimated demand for process water of 10 ML/yr has been adopted.

5.5.2 Dust Suppression

The adopted methodology for estimating watering requirements for trafficked areas is based on Buonicore & Davis (1992), which considers local evaporation rates, exposed (trafficked) areas, periods of operation and application cycling time. The formula is provided below.

$$C = 100 - \frac{0.8pdt}{i}$$

The variable definitions and adopted values for both areas requiring dust suppression are outlined in Table 14.

Table 14: Dust suppression formula parameters.

Variable	Definition	Adopted Value
C	average control efficiency (%)	90%
p	potential average hourly daytime evaporation rate (mm/h)	Based on daily pan evaporation data and pan coefficient
d	average hourly daytime traffic (per hour)	4 veh/hr
t	time between applications (hr)	4 hr
i	application intensity (L/m^2)	Calculated
A	Haul road area (ha)	1.5 ha

The estimated annual average use for dust suppression based on an application area of 1.5 ha is 2.9 ML/yr.

5.6 Water Balance Results

Water balance results are outlined below. Results are presented for the average of all years and the individual results for a dry (10th percentile), median (50th percentile) and wet (90th percentile) rainfall year.

The results relate to the proposed site surface water management system described in Section 4, during extraction stage 4. Table 15 highlights the water balance results.

Table 15: Water balance model results summary.

Quarry Year	Demand Request (ML/a)	Demand Shortfall (ML/a)	Uncontrolled Overflow Events[1] (num/a)	Uncontrolled Overflow Volume[2] (ML/a)	Controlled Release Volume (ML/a)	Reliability (%)
Entire Run (1900-2024)	12.9	1	0.3	0.5	-	94
1957 (10%ile)	13.2	0	0.0	0.0	-	100
1995 (50%ile)	12.9	0	0.0	0.0	-	100
1984 (90%ile)	13.1	0	0.0	0.0	-	100

[1] Number of cumulative uncontrolled overflow events that leave the site.
[2] Total uncontrolled overflow volume from the site.

The estimated process water demand is typically 10 ML/a. Dust suppression demand can vary from 1.7 - 4.2 ML/a depending on the amount of rainfall, resulting in an average annual demand request of 12.9 ML/a.

The water balance model results indicate that the quarry's process water requirements will be primarily met by extraction from the water management dams. Noting that this assessment is based on assumptions outlined above, of which the model is significantly sensitive to the required water demands and groundwater inflows.

Modelling indicated no uncontrolled overflows in the 10, 50 and 90%ile rainfall years, however, during extreme rainfall events on rare occasions spills may occur from the settlement ponds and CWD.

6 IMPACT ASSESSMENT

6.1 Surface Water Quality

6.1.1 NorBE

The proposed Project is located within the Sydney Water drinking water catchment and therefore requires the proponent to undertake a Neutral of Beneficial Effects (NorBE) assessment. The NorBE analysis demonstrates whether the post-development pollutant loads discharged from the Project are equal to or less than the pollutant loads discharging from the pre-developed site.

As the Project is not expected to result in controlled or uncontrolled discharges (refer to Section 5) in typical rainfall conditions up to and including a 90%ile rainfall year, it is considered to have a neutral effect on the Shoalhaven River catchment water quality.

6.2 Surface Water Quantity

6.2.1 Catchment Yield

The Project site area is a total of approximately 71 ha within the Shoalhaven River catchment which accounts for less than 0.001% of the 7,300 km^2 catchment area of the Shoalhaven River. As such, it is unlikely that the loss in catchment yield associated with the Project will have an impact to the total catchment yield.

6.2.2 Water Security

Water balance modelling indicates that rainfall, runoff and groundwater seepage inflows will provide an adequate and reliable supply of water to meet operational water demands for the Project (refer to Section 5) in most rainfall scenarios, including the 10, 50 and 90%ile rainfall years.

While the Quarry is considered to have a secure source of water, the Quarry will reduce production as required during persistent dry periods and where water allocation assignments from the groundwater source are reduced by WaterNSW.

6.2.3 Flow Regimes and Stream Stability

Runoff from the undisturbed catchment, east of the Project, will be diverted around the Project via a clean water drain/diversion bund. Level spreaders (or similar energy dissipation discharge structure) will be installed at either end of the clean water drain and will discharge runoff south towards Durran Durra Creek and north towards the unnamed tributary, both of which then flow into the Shoalhaven River. The diversion of runoff from the undisturbed upslope catchment is unlikely to result in increased flows in minor streams and therefore no impacts on receiving watercourse stream stability are expected.

6.2.4 Flood Risk

It is understood that a previous flood assessment of the Shoalhaven River was undertaken for the adjoining Canberra Sands Quarry development located to the north of the Project area *(Umwelt 2023 – Surface water Impact Assessment 2023 - Section 5.2.4).* This assessment predicted potential flood depths around 2m and velocities of 2m/s through that project area. Although a 1%AEP flood level was not provided, it was estimated to be approximately RL 580 m AHD which is outside the extent of this Project Area. It is not clear if flood depths within Durran Durra Creek would achieve similar depths, however it is proposed to construct 2 - 3m high bunds around each working stage of the development (including Stage 1A). These bunds would provide significant immunity to the site during large flooding events.

The bunds are expected to result in an increase in flood levels during events where water reaches the bunds. However, given their relatively short length, any changes to flood behaviour are anticipated to be localised to Durran Durra Creek adjacent to the Project site.

6.3 Groundwater

A groundwater assessment has been undertaken by Ground Doctor (Ground Doctor, 2025). The report concludes that the groundwater impacts associated with the Project are acceptable and would not exceed the “minimum impact considerations” outlined in the NSW Aquifer Interference Policy (NSW DPI, 2012).

7 LICENSING, MONITORING AND REPORTING

7.1 Licensing

7.1.1 Environmental Protection Licence

The quarry will be required to hold an Environment Protection Licence (EPL) as they will be carrying out a premises-based activity listed in Schedule 1 of the POEO Act, i.e. Activity 19. Extractive activities, >30,000 tonnes/year.

7.1.2 Surface Water

Licencing Exemptions
All surface water runoff will be captured within the Quarry WMS dams to prevent the contamination of a water source and therefore all Project dams/water storages are considered as excluded works under Schedule 1 of the Water Management (General) Regulation 2018 and are exempt from requiring a Water Access Licence under Schedule 4 Clause 12 of the Water Management (General) Regulation 2018. As such, a WAL to account for surface water take is not required for the Project.

Harvestable Rights
All proposed dams are for water quality purposes and therefore do not fall under the harvestable rights requirement.

7.1.3 Groundwater

As discussed in the Groundwater Impact Assessment by Ground Doctor (Ground Doctor, 2025), the proposed quarry excavations will need to be registered as a groundwater supply work. BSG will need to obtain a Water Access License (WAL) for groundwater taken from the "*Lachlan Fold Belt – Greater Metropolitan Groundwater Source*" groundwater management unit for commercial use.

7.2 Monitoring

7.2.1 Surface Water Quality

Controlled and uncontrolled discharges are unlikely to occur during the operation of the Project (as demonstrated by the WBM in Section 5 which indicated no discharges in 90% of the modelled rainfall years), however monitoring locations have been developed for due diligence. Table 16 presents the proposed surface water quality monitoring program and Figure 12 shows the surface water monitoring locations.

Table 16: Surface water quality monitoring program.

ID	Description	Parameters	Units	Frequency
RW1	Upstream receiving water reference site – Durran Durra Creek	pH EC TSS Turbidity Oil and Grease	- uS/cm mg/L NTU Visual	Quarterly
RW2	Downstream receiving water reference site – Durran Durra Creek			

Long term impact assessment criteria for receiving water quality monitoring locations downstream of the Project (i.e., RW2) will be developed generally in accordance with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra, 2018) (ANZG 2018) based on RW1 water quality results. In the interim, the water quality guideline values for pH, EC and Turbidity indicated in Table 7 will be applied as trigger values that will guide the implementation of a water quality Trigger Action Response Plan (TARP) that will be included in the Project SWMP.

7.2.2 Amenities Potable Water

The Project will implement an inspection and water quality testing program for potable water stored in tanks on site (delivered by water tanker) to ensure amenities water quality meets the *Australian Drinking Water Guidelines – Version* 3.8 (ADWG) (National Health and Medical Research Council, 2022).

7.3 Reporting

7.3.1 Environmental Protection License

The applicant must provide an annual return to the EPA in relation to the development as required by any licence under the Protection of the Environment Operations Act 1997 in relation to the development. In the return the applicant must report on the annual monitoring undertaken (where the activity results in pollutant discharges), provide a summary of complaints relating to the development, report on compliance with licence conditions and provide a calculation of licence fees (administrative fees and, where relevant, load based fees) that are payable. If load based fees apply to the activity the applicant will be required to submit load-based fee calculation worksheets with the return.

Figure 12
Surface Water Monitoring Locations

Plot Date: 22/10/2025 Project Path: X:\Projects\25-033 552 Larbert Rd, Larbert\GIS\25000033_GIS.qgz

8 CONCLUSION

An assessment of the potential impacts on surface water resources associated with the Project was undertaken and the following conclusions have been drawn from the assessment outcomes:

- The Project is unlikely to have controlled or uncontrolled discharges to the receiving surface water environment and as a result the Project is considered to have a NorBE on water quality as required for developments within the Sydney Drinking Water catchment.
- Given that there is unlikely to be expected controlled or uncontrolled discharges to the receiving surface water environment, there is a low risk of impacts to surface water environmental values are anticipated.
- The Project is expected to have an adequate and reliable water source (i.e. rainfall runoff captured in storage dams and groundwater inflows to the CWD and SB's).
- It is considered that the estimated loss of catchment yield of less than 0.001% to the Shoalhaven River will a negligible impact on flow regimes and water availability to downstream water users.
- The impacts of the proposed bunding on local flood regimes will be considered (future modelling maybe required). However, it is expected that any impacts on flood regimes would be localised to the Durran Duarra Creek adjacent to the Project Site.

9 REFERENCES

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OEH (2018). *Floodplain Risk Management Guide Incorporating 2016 Australian Rainfall and Runoff in studies*. Office of Environment and Heritage. November 2018.

10 SCOPE AND LIMITATIONS

This report has been prepared by Strategic Environmental and Engineering Consulting (SEEC) Pty Ltd for Lentro Earthworks Pty Ltd and may only be used and relied on by Lentro Earthworks Pty Ltd for the purpose agreed between SEEC and Lentro Earthworks Pty Ltd as set out in Section 1.3 of this report.

SEEC otherwise disclaim responsibility to any person other than Lentro Earthworks Pty Ltd arising in connection with this report. SEEC also exclude implied warranties and conditions, to the extent legally permissible.

The services undertaken by SEEC in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. SEEC have no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by SEEC described in this report. SEEC disclaim liability arising from any of the assumptions being incorrect.

SEEC have prepared this report on the basis of information provided by Lentro Earthworks Pty Ltd and others who provided information to SEEC (including Government authorities), which SEEC have not independently verified or checked beyond the agreed scope of work. SEEC do not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

11 APPENDIX A – SOIL AND WATER MANAGEMENT PLAN

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PROPOSED SAND QUARRY

552 LARBERT ROAD, LARBERT NSW

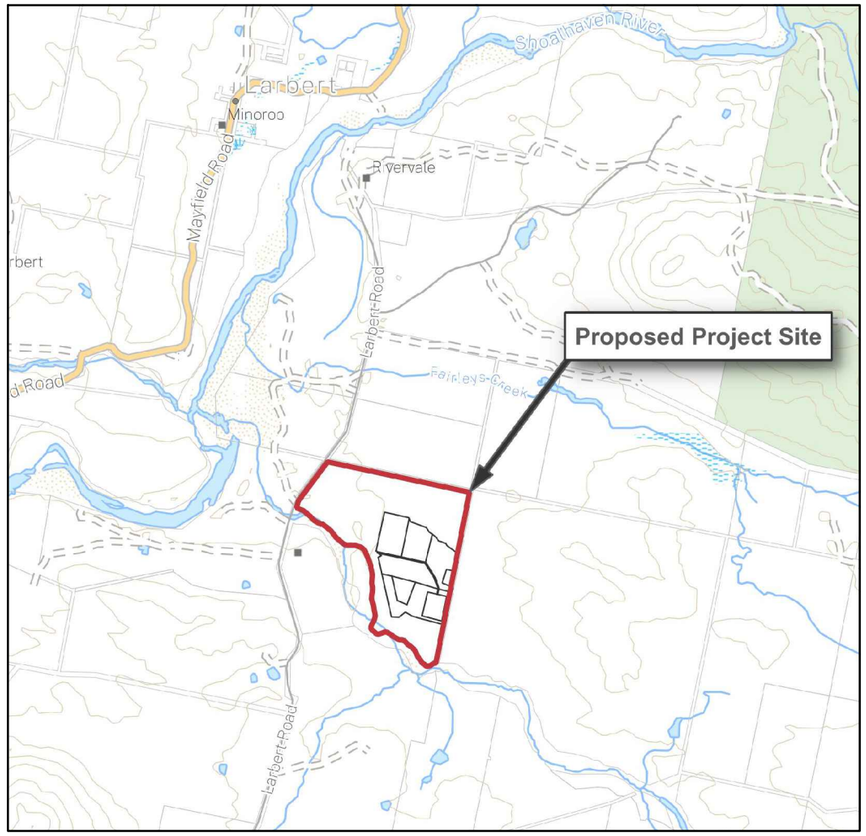
SOIL AND WATER MANAGEMENT PLAN

FINAL

NOVEMBER 2025

DRAWING SCHEDULE

DRAWING TITLE	DRAWING TITLE
SWMP00	SWMP - TITLE SHEET, LOCALITY PLAN AND DRAWING SCHEDULE - SHEET 1 OF 5
SWMP01	SWMP - SOIL AND WATER MANAGEMENT PLAN - SHEET 2 OF 5
SWMP02	SWMP - BLUE BOOK STANDARD DETAILS SHEET 3 OF 5
SWMP03	SWMP - BLUE BOOK STANDARD DETAILS - SHEET 4 OF 5
SWMP04	SWMP - ACESS TRACK DETAIL 1 - SHEET 5 OF 5



LOCALITY PLAN
N.T.S.

DOCUMENT CERTIFICATION

This plan has been developed based on agreed requirements as understood by SEEC at the time of engagement. It applies only to a specific task on the nominated lands. Other interpretations should not be made, including changes in scale or application to other projects. Changes to the project scope or extent might impact on the validity of this plan.

Any recommendations contained in this plan are based on an honest appraisal of the opportunities and constraints that existed at the site at the time of investigation, or as advised to us. Such recommendations are potentially subject to the limited scope and resources available. Within the confines of the above statements and to the best of my knowledge, this plan does not contain any incomplete or misleading information.

REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
01	07/11/25	R.J.	R.J.	B.J.	FINAL ISSUE
A	20/10/25	R.J.	L.W.	B.J.	DRAFT ISSUE

DRAWING STATUS	
DESIGN BY	R.J.
DRAWN BY	R.J.
FINAL APPROVAL	B.J.
SCALE: (on A3 Original)	N.T.S.

FINAL

North

CLIENT

LENTRO EARTHWORKS

SEEC
Suites 7 & 8, 68-70 Station Street
PO Box 1098, Bowral NSW 2576.
(t) 02 4862 1633
(f) 02 4862 3088
email: reception@seec.com.au
WWW.SEEC.COM.AU

PROJECT TITLE
PROPOSED SAND QUARRY
LOTS 331 & 332 DP 755915
No. 552 LARBERT ROAD
LARBERT, NSW

DRAWING TITLE
SWMP – TITLE SHEET, LOCALITY PLAN AND DRAWING SCHEDULE SHEET 1 OF 5

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
25000033	P01	SWMP00	01

Plot Date: Friday, 7 November 2025 12:53:39 PM CAD File Name: I:\25000033 552 Larbert Rd, Larbert\Drawings\25000033_P01_SWMP_REV 01.dwg

BACKGROUND

This is a Soil and Water Management Plan (SWMP). This plan is to be read in cojuction with the SEEC Surface Water Impact Assessment (25000033_P01_SWIA). This plan shows the locations for erosion and sediment controls to be implemented for the proposed extension to the sand quarry and associated access track only.

This SWMP has been prepared following the guidelines and standards in the NSW Blue Book Volume 1 and 2e (Landcom, 2004 and DECC, 2008).

EROSION HAZARD ASSESSMENT

An erosion hazard assessment has been completed for all areas within the proposed work areas. The predicted soil loss across the work areas have been determined in accordance with the following:

A = R x K x LS x C x P

Where

- A = 1,500
- K = 0.019 (Based on the Oorong Soil Landscape)
- LS = ranges from 0.41 (30m, 3%)(existing surface) to 3.59 (50m, 15%)(quarry batter)
- C = 1.0 (Construction stage - i.e. no soil surface protection or ground cover applied)
- P = 1.3 (For general construction areas)

Based on the above data, the potential soil loss for the access track is approx. 7 t/ha/yr. Therefore sediment basins are not required for the proposed access track works.

Based on the above data, the potential soil loss for a typical quarry excavation area is is approx. 133 t/ha/yr. A sediment basin would be installed to manage water within each extraction area. Minimum sizing for each stages sediment basin is provided in the accompanying report (25000033_P01_SWIA). If de-watering of the area is required it will be via irrigation over adjacent well vegetated lands at least 100m from Durran Durra Creek and within the property boundary in a manner that does not cause runoff.

EROSION AND SEDIMENT CONTROL INSTRUCTIONS

Before commencement of clearing, grubbing, topsoil stripping and earthworks in each area/section of works, the site is to be secured and the following erosion and sediment control measures installed in order, except for 7 to 12, which are to be undertaken progressively as required throughout all stages of works. Works necessary to establish the erosion and sediment controls are permitted but must be kept to a minimum.

1. Minimise disturbance at any one time to only what is necessary for safe and efficient construction. Do not disturb new areas when rain is imminent unless appropriate controls can be implemented prior to rain occurring.
2. Weather forecasts are to be monitored daily and the site prepared to minimise erosion, control drainage, and maximise sediment capture during rain events. Erosion and sediment controls removed or damaged during construction are to be repaired or reinstated prior to forecast rain.
3. Design and construct the quarry access track and associated drainage in accordance with Detail 1 on SWMP04, including a stabilised access at the site entry point in accordance with Blue Book Standard Drawing SD 6-14 on SWMP03.
4. During initial topsoil stripping of the quarry area windrow topsoil along the lower perimeter of the work area to create a vegetated bund (min. 0.5m high) to minimise the risk of dirty water egress. Note the windrow/bund downslope of the quarry area of disturbance is only required until the quarry is internally draining.
   - 4.1. Alternatively install a sediment fence. Ensure returns are installed at max. 20m intervals. Refer to Blue Book Standard Drawing SD 6-8 on SWMP03.
5. During topsoil stripping of the quarry area windrow topsoil along the upper perimeter of the work area to create a vegetated bund (min. 1m high) to direct upslope clean water around the quarry work area.
   - 5.1. Bund to be seeded and watered to establish a suitable ground cover.
6. Install respective sediment basins as each extraction stage begins (locations shown are indicative only). Refer to Blue Book Standard Drawing SD 6-4 and minimum sizing requirements in Table 1 and accompanying Surface Water Impact Assessment (25000033_P01_SWIA). Direct all dirty water runoff to sediment basins.
7. Establish stockpile areas in accordance with Blue Book Standard Drawing SD 4-1 on SWMP02. Exact locations TBC onsite.
8. Undertake dust suppression as required to minimise dust rise.
9. Regular site inspections are to be conducted by the site supervisor (or their representative) of temporary controls and general site conditions and records of all such inspections are to be retained onsite. Inspections are to be undertaken:
   - 9.1. At least weekly during normal construction hours; and
   - 9.2. Prior to forecast rainfall (>50% chance of 10mm or more in 24 hours); and
   - 9.3. Daily during rain events (if safe to do so); and
   - 9.4. Within 24 hours of the cessation of a rain event that causes runoff (if safe to do so).
10. Undertake progressive stabilisation of lands as final earthworks are completed in each area (rather than waiting until the completion of works).
    - 10.1. Final rehabilitation is to achieve the C-factors (ground cover) detailed below:
      - 10.1.1. C-factor of 0.1 (>= 60% ground cover) within 20 days; and
      - 10.1.2. C-factor of 0.05 (70% ground cover) within 2 months/at completion of works.
    - 10.2. Areas to be revegetated are to be topsoiled first. Refer to Blue Book Standard Drawing SD 4-2 on SWMP02.
    - 10.3. Appropriate seedbed preparation should be carried out when revegetating lands. Refer to Blue Book Standard Drawing SD 7-1 on SWMP03.
11. As areas are completed (i.e. at least 90% of any finished area has at least 70% final ground cover), temporary sediment and drainage controls can be decommissioned and removed.
12. This plan is to be updated as required to ensure it is relevant to the on-ground works being undertaken.

LEGEND:

- PROPOSED EXTRACTION AREA
- EXISTING EXTRACTION AREA
- DIVERSION BUND
- STORAGE DAM
- WATERCOURSE
- PIPE/PUMPLINE
- SITE BOUNDARY
- ACCESS TRACK
- CLEAN WATER DIVERSION
- CONTOUR (1m INTERVAL)
- ARCHAEOLOGICAL DEPOSITS
- LEVEL SPREADER OUTLET

NOTE

- WATER BALANCE MODELLING INDICATES THAT THE PROPOSED QUARRY OPERATIONS ARE UNLIKELY TO RESULT IN CONTROLLED OR UNCONTROLLED DISCHARGES, AS WATER IS LIKELY TO BE USED ON SITE OR STORED WITHIN LARGE EXCAVATION AREAS.
- SEDIMENT BASINS CAN BE DECOMMISSIONED ONCE 90% OF ANY FINISHED AREA ACHIEVES AT LEAST 70% FINAL GROUND COVER.

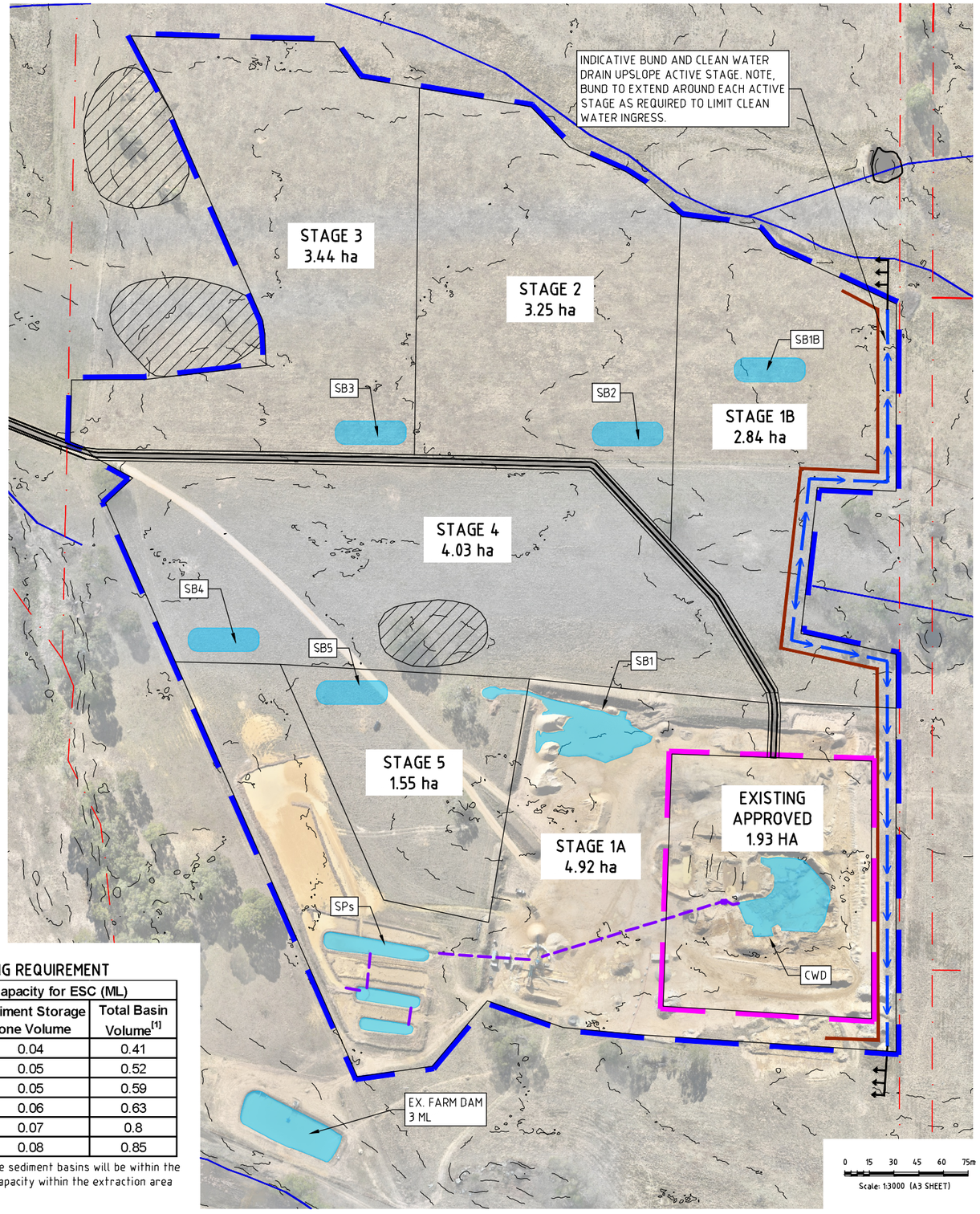


TABLE 1 TYPE D BASIN MINIMUM SIZING REQUIREMENT

Structure	Catchment (ha)	Minimum Capacity for ESC (ML)		
		Settling Zone Volume	Sediment Storage Zone Volume	Total Basin Volume[1]
SB1	2.2	0.37	0.04	0.41
SB1b	2.8	0.47	0.05	0.52
SB2	3.2	0.54	0.05	0.59
SB3	3.4	0.57	0.06	0.63
SB4	4.3	0.72	0.07	0.8
SB5	4.6	0.77	0.08	0.85

[1] The minimum sizing for each sediment basin, noting, the sediment basins will be within the extraction pits and therefore will likely have extended capacity within the extraction area and are unlikely to spill.

REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
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DRAWN BY	R.J.
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FINAL

North

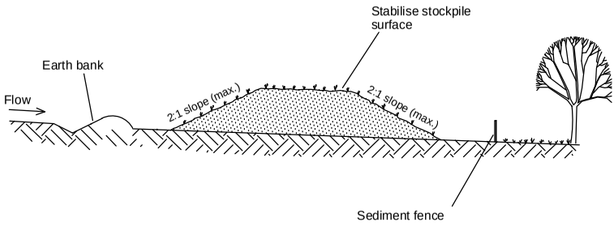
CLIENT: LENTRO EARTHWORKS

SEEC
Suites 7 & 8, 68-70 Station Street
PO Box 1098, Bowral NSW 2576.
(t) 02 4862 1633
(f) 02 4862 3088
email: reception@seec.com.au
WWW.SEEC.COM.AU

PROJECT TITLE: PROPOSED SAND QUARRY
LOTS 331 & 332 DP 755915
No. 552 LARBERT ROAD
LARBERT, NSW

DRAWING TITLE: SOIL AND WATER MANAGEMENT PLAN SHEET 2 OF 5

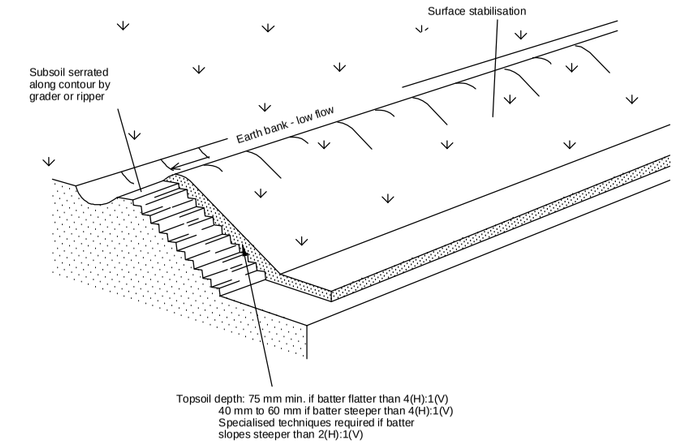
PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
25000033	P01	SWMP01	01



Construction Notes

1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

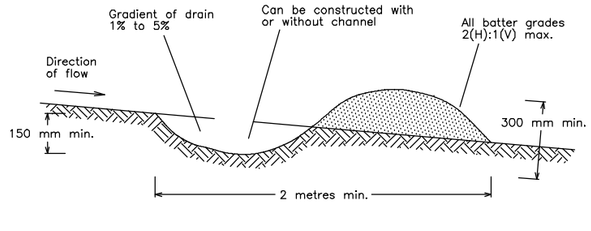
STOCKPILES SD 4-1



Construction Notes

1. Scarify the ground surface along the line of the contour to a depth of 50 mm to 100 mm to break up any hardsetting surfaces and to provide a good bond between the respread material and subsoil.
2. Add soil ameliorants as required by the ESCP or SWMP.
3. Rip to a depth of 300 mm if compacted layers occur.
4. Where possible, replace topsoil to a depth of 40 to 60 mm on lands where the slope exceeds 4(H):1(V) and to at least 75 mm on lower gradients.

REPLACING TOPSOIL SD 4-2

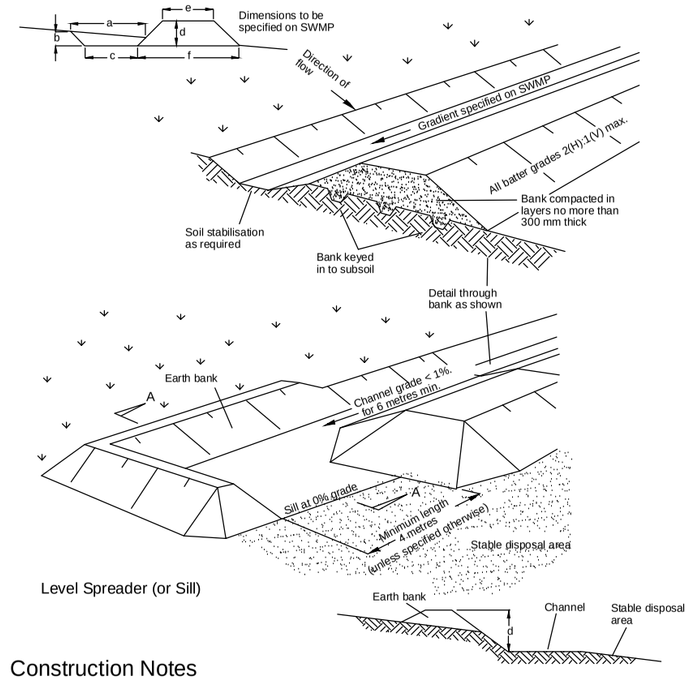


NOTE: Only to be used as temporary bank where maximum upslope length is 80 metres.

Construction Notes

1. Build with gradients between 1 percent and 5 percent.
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V shaped.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction.

EARTH BANK (LOW FLOW) SD 5-5



Construction Notes

1. Construct at the gradient specified on the ESCP or SWMP, normally between 1 and 5 percent
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V-shaped, at the dimensions shown on the SWMP.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction following Table 5.2 in Landcom (2004).
7. Where discharging to erodible lands, ensure they outlet through a properly constructed level spreader.
8. Construct the level spreader at the gradient specified on the ESCP or SWMP, normally less than 1 percent or level.
9. Where possible, ensure they discharge waters onto either stabilised or undisturbed disposal sites within the same subcatchment area from which the water originated. Approval might be required to discharge into other subcatchments.

EARTH BANK (HIGH FLOWS) SD 5-6

DRAWING TITLE: SWMP – BLUE BOOK STANDARD DETAILS SHEET 3 OF 5

PROJECT NO. 25000033 | SUB-PR NO. P01 | DRAWING NO. SWMP02 | REV 01

PROJECT TITLE: PROPOSED SAND QUARRY LOTS 331 & 332 DP 755915 No. 552 LARBERT ROAD LARBERT, NSW

Suites 7 & 8, 88-70 Station Street
PO Box 1098, Bowral NSW 2576.
(t) 02 4862 1633
(f) 02 4862 3088
email: reception@seec.com.au
WWW.SEEC.COM.AU

CLIENT: ENIRO EARTHWORKS

North

DRAWING STATUS: DESIGN BY R.J. | DRAWN BY R.J. | FINAL APPROVAL B.J.

SCALE: 1:2000 (on A3 Original)

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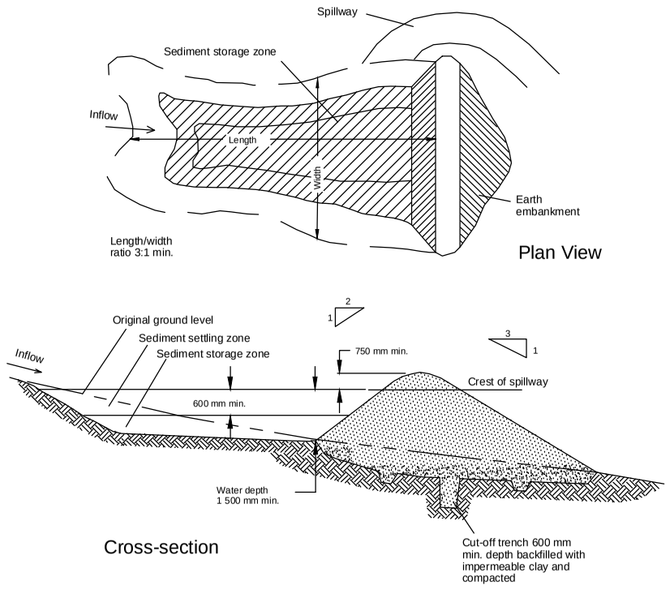


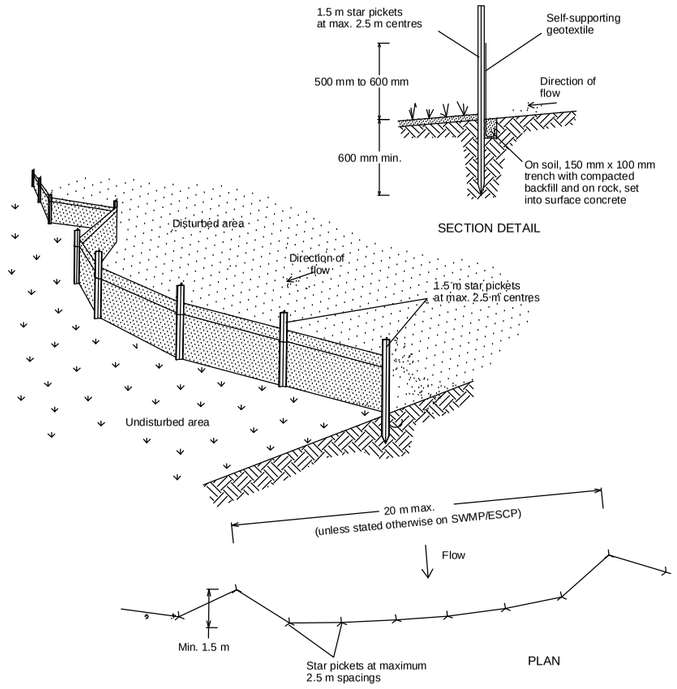
Construction Notes

1. Remove all vegetation and topsoil from under the dam wall and from within the storage area.
2. Construct a cut-off trench 500 mm deep and 1,200 mm wide along the centreline of the embankment extending to a point on the gully wall level with the riser crest.
3. Maintain the trench free of water and recompact the materials with equipment as specified in the SWMP to 95 per cent Standard Proctor Density.
4. Select fill following the SWMP that is free of roots, wood, rock, large stone or foreign material.
5. Prepare the site under the embankment by ripping to at least 100 mm to help bond compacted fill to the existing substrate.
6. Spread the fill in 100 mm to 150 mm layers and compact it at optimum moisture content following the SWMP.
7. Construct the emergency spillway.
8. Rehabilitate the structure following the SWMP.

EARTH BASIN - WET

(APPLIES TO 'TYPE D' AND 'TYPE F' SOILS ONLY)

SD 6-4

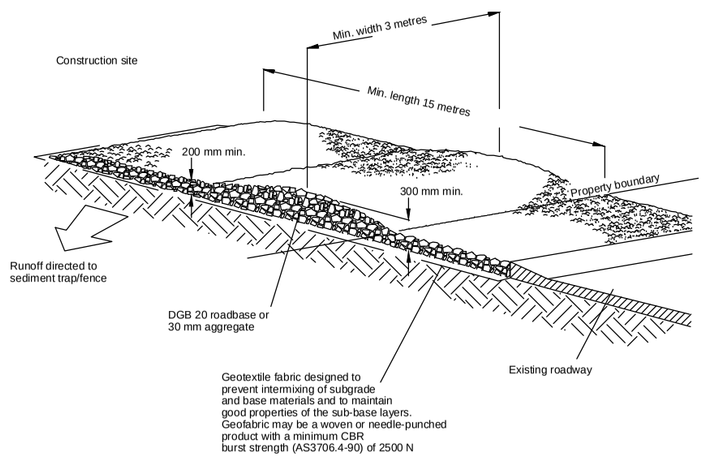


Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

SEDIMENT FENCE

SD 6-8

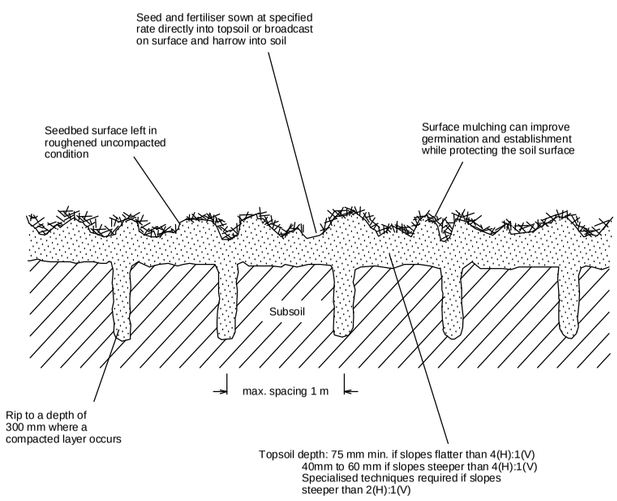


Construction Notes

1. Strip the topsoil, level the site and compact the subgrade.
2. Cover the area with needle-punched geotextile.
3. Construct a 200 mm thick pad over the geotextile using road base or 30 mm aggregate.
4. Ensure the structure is at least 15 metres long or to building alignment and at least 3 metres wide.
5. Where a sediment fence joins onto the stabilised access, construct a hump in the stabilised access to divert water to the sediment fence

STABILISED SITE ACCESS

SD 6-14



Construction Notes

1. Loosen compacted soil before sowing any seed. If necessary, rip the soil to a depth of 300 mm. Avoid rotary hoe cultivation.
2. Work the ground only as much as necessary to achieve the desired tilth and prepare a good seedbed.
3. Avoid cultivation in very wet or very dry conditions.
4. Cultivate on or close to the contour where possible, not up and down the slope.

SEEDBED PREPARATION

SD 7-1

DRAWING TITLE: SWMP – BLUE BOOK STANDARD DETAILS SHEET 4 OF 5

PROJECT NO. 25000033 | SUB-PR NO. P01 | DRAWING NO. SWMP03 | REV 01

PROJECT TITLE: PROPOSED SAND QUARRY LOTS 331 & 332 DP 755915 No. 552 LARBERT ROAD LARBERT, NSW

SEEC
Suites 7 & 8, 68-70 Station Street
PO Box 1098, Bowral NSW 2576.
(t) 02 4862 1633
(f) 02 4862 3088
email: reception@seec.com.au
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CLIENT: ENIRO EARTHWORKS

North

DRAWING STATUS

DESIGN BY	R.J.
DRAWN BY	R.J.
FINAL APPROVAL	B.J.

SCALE: 1:2000 (on A3 Original)

FINAL

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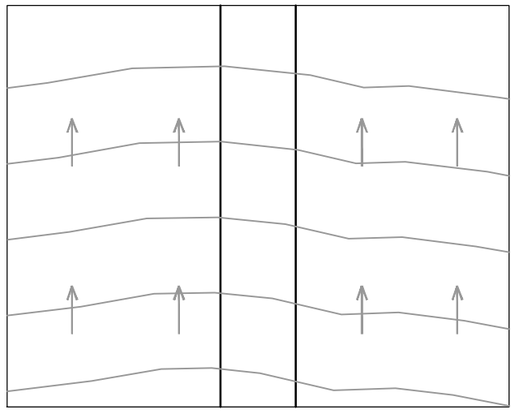
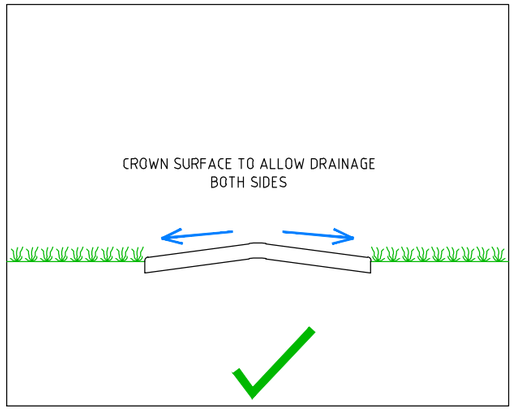
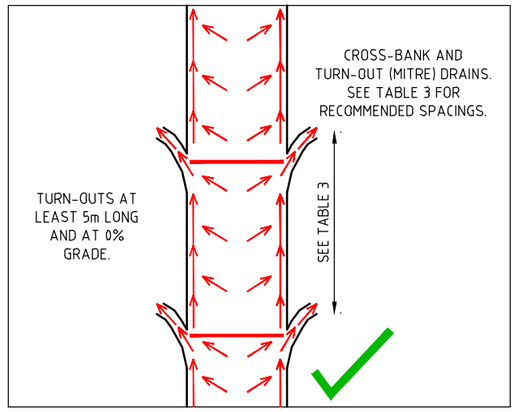
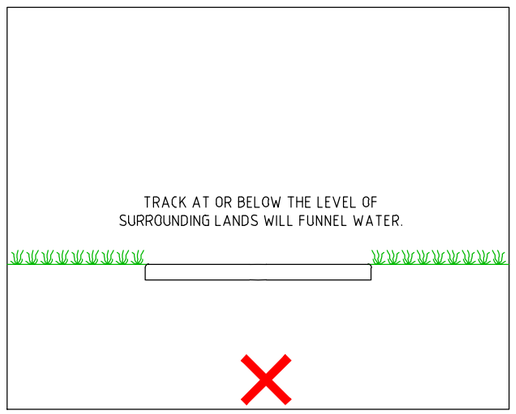
DETAIL 1

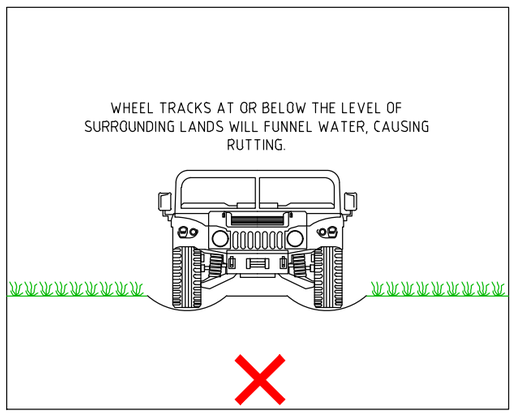
FOR ACCESS TRACKS RUNNING UP OR DOWN
(i.e. PERPENDICULAR TO) THE NATURAL SLOPE











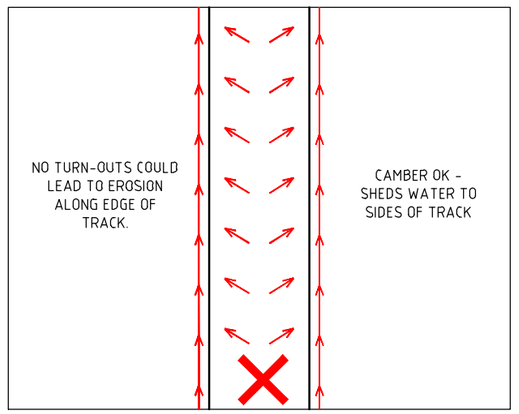


TABLE 1	
GRADE	MAX. CROSS-BANK SPACINGS
up to 8° (14%)	20-30m
SOURCED FROM TABLE 2b OF EROSION AND SEDIMENT CONTROL ON UNSEALED ROADS '*A FILED GUIDE FOR EROSION AND SEDIMENT CONTROL MAINTENANCE PRACTICE*'.	

DISTURBANCE SHOULD BE MINIMISE TO ONLY WHAT IS REQUIRED.

UNSEALED ACCESS TRACKS DO NOT HAVE A PROTECTIVE HARD SEAL, AND, AS SUCH, ARE HIGHLY SUSCEPTIBLE TO EROSION. THE KEY TECHNIQUES TO MINIMISE EROSION AND DAMAGE TO UNSEALED ROADS AND TRACKS ARE:

- GOOD SHAPING (CROWNING, CAMBER, SUPER-ELEVATION ETC); AND
- GOOD DRAINAGE.

GOOD DRAINAGE IS PARTICULARLY IMPORTANT ON UNSEALED ACCESS DRIVEWAYS, EVEN MORE SO THAN FOR A SEALED ROAD.

TRACK AT OR BELOW THE LEVEL OF
SURROUNDING LANDS

USE TURN-OUT (MITRE) DRAINS TO MOVE
WATER AWAY FROM TRACK
TURN-OUTS TO BE AT LEAST 5m LONG AND AT
0% GRADE.

SEDIMENT FENCES ARE NOT REQUIRED IN
TURN-OUT DRAINS IF THEY ARE
CONSTRUCTED PROPERLY.

NOTE THAT THE TRACK AVOIDS EXISTING VEGETATION
AND IS WELL BUILT-UP, ALTHOUGH REQUIRES
ADEQUATE DRAINAGE TO MINIMISE THE RISK OF EROSION
ON THE UPLSOPE EDGE.

REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
01	07/11/25	R.J.	R.J.	B.J.	FINAL ISSUE
A	20/10/25	R.J.	L.W.	B.J.	DRAFT ISSUE

DRAWING STATUS	
DESIGN BY	R.J.
DRAWN BY	R.J.
FINAL APPROVAL	B.J.
SCALE: (on A3 Original)	N.T.S.

FINAL

North

CLIENT

LENTRO EARTHWORKS

SEEC
Suites 7 & 8, 68-70 Station Street
PO Box 1098, Bowral NSW 2576.
(t) 02 4862 1633
(f) 02 4862 3088
email: reception@seec.com.au
WWW.SEEC.COM.AU

PROJECT TITLE
PROPOSED SAND QUARRY
LOTS 331 & 332 DP 755915
No. 552 LARBERT ROAD
LARBERT, NSW

DRAWING TITLE
SWMP
ACCESS TRACK DETAIL 1
SHEET 5 OF 5

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
25000033	P01	SMWP04	01

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