

Hanson Construction Materials Pty Ltd



Sediment and Erosion Control Plan: Hanson's Somersby Quarry Project

ENVIRONMENTAL



WATER



WASTEWATER



GEOTECHNICAL



CIVIL



PROJECT
MANAGEMENT



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1 Overview

1.1 Background

The purpose of this report is to provide a Sediment and Erosion Control Plan (SECP) for Hanson's Somersby Quarry (Central Coast Sands) located at Reserve Road, Somersby, NSW. The report was completed to form part of an Environmental Assessment (EA) which was completed to accompany an application for a boundary adjustment and expansion of the resource extraction operations of the existing quarry into an adjacent proposed expansion site. This SECP should be read in conjunction with the Surface Water and Hydrology Assessment that was completed for the site (Martens and Associates, 2009).

1.2 Scope

Scope of the SECP is as follows:

1. Review sediment generation characteristics under both existing and proposed site conditions.
2. Review adequacy of existing SECP measures.
3. Assess SECP requirements as the proposed development progresses.
4. Size and locate necessary sediment and erosion control structures (SECS's).
5. Provide recommendations relating to sediment and erosion control for on-going site management.
6. Prepare engineering plan-set that outlines the location and management of required sediment and erosion control structures.

2 Site and Proposal Description

2.1 Proposed Development

Proposed development involves the following:

1. A boundary adjustment between the existing quarry and the adjoining subject site (part of Lot 10, DP1090880) for the purposes of adding additional area to the existing quarry; and
2. Expansion of the resource extraction operations of the existing quarry into the subject site to extend the life of operations (note annual output will remain unchanged).
3. Extraction within the subject site (existing quarry and proposed lateral expansion area) to 190 mAHD being a level capable of forming an ultimately free-draining surface.

2.2 Existing Quarry Site

The existing quarry site (Central Coast Sands) and proposed expansion site are depicted in Figure 1.

2.3 Proposed Expansion Site

The proposed expansion site (Figure 1) is identified as part of Lot 10 DP 1090880, Keighley Road, Somersby within the Gosford City Council local government area (LGA) and is zoned as 1 (a) Non-Urban. The site has a total area of approximately 8 ha and is currently used for intensive agriculture including:

- Cultivation of avocados,
- Cultivation of oranges, and
- Poultry farming.



Figure 1: Existing quarry site and proposed expansion site (Source: Google Maps, 2009).

3 Site Description

3.1 Field Investigations

A site inspection was undertaken on July 30, 2009. This inspection involved inspecting and documenting existing sediment and erosion control measures on the site. Particular attention was given to the site discharge points.

3.2 Drainage

Review of the 1:25 000 topographic map (Figure 2), reveals an existing drainage line ('Unnamed Tributary 1') traversing the active quarry site from east to west. As shown in Figure 2, Unnamed Tributary 1 commences at the overflow of a dam on the eastern neighbouring property and enters the quarry site through a constructed bund. It then flows into the existing extraction area.

Evidence of the original watercourse exiting the site at the western boundary was observed. However, there is now reduced flow in this depression due to interception of flow by the existing extraction pit.

In simplified terms water either drains to the invert of quarry pits or towards the middle of the western site boundary where 2 formal discharge points are located.

The existing quarry drainage management scheme is depicted in Attachment A.

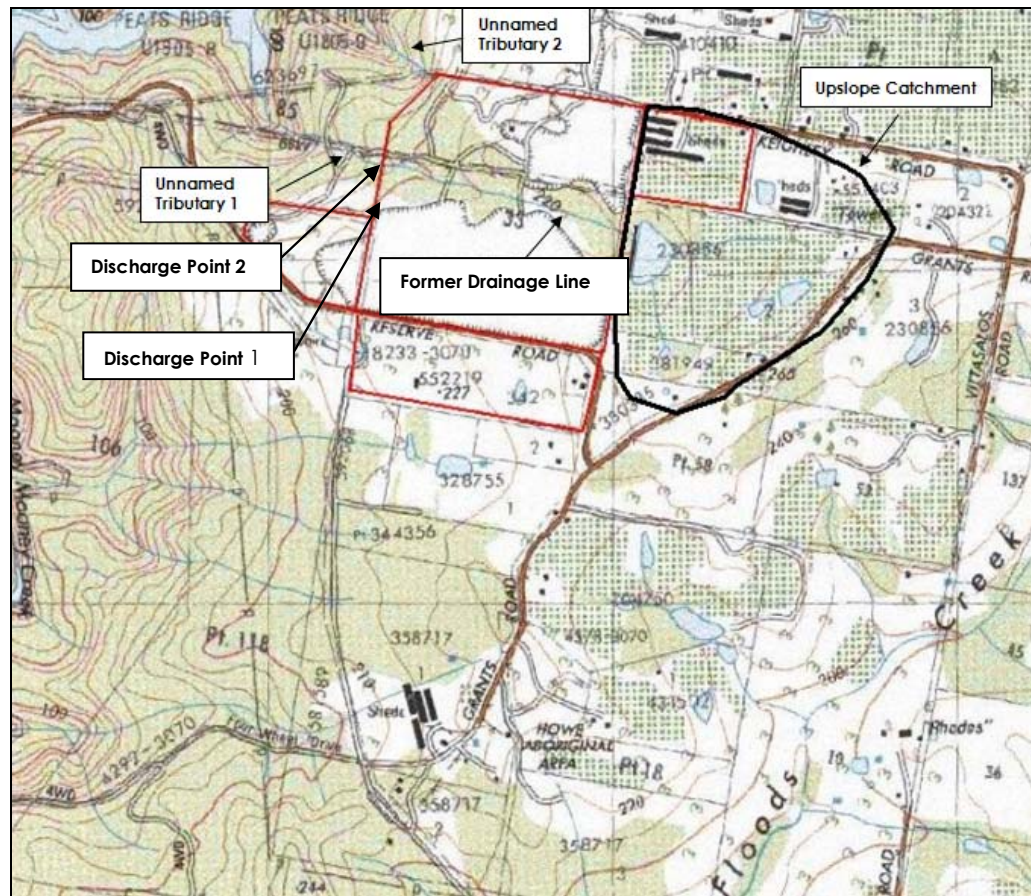


Figure 2: 1:25,000 topographic map extract showing site and drainage lines.

3.3 Topography

The existing quarry has levels (outside of excavation influence) ranging from approximately 240 to 230 mAHd at the eastern site boundary. Levels at the western site boundary range from approximately 210 to 211 mAHd (outside of excavation influence). Excavations within the site have lowered the active working extraction pit to a level of approximately 200 mAHd.

The proposed expansion site has levels at its western boundary which coincide with the quarry's eastern site boundary levels (the proposed site is immediately adjacent to the existing quarry). Levels at the eastern boundary of the proposed expansion site range from approximately 253 to 249 mAHd whilst grades are approximately 3 to 5% and generally orientated to the south west.

3.4 Lithology and Geology

3.4.1 Soil

5 shallow boreholes were excavated on the proposed expansion site on the 21st August, 2009. These extended to extremely/moderately weathered rock (rock sufficiently strong to slow downward auger progression) (depths ranging from 0.7 to 1.5 mBGL). Boreholes indicated that the soil profile is comprised of sands, silty sands, clayey sands and sandy clays overlying weathered sandstone.

One borehole (BH2) drilled in the vicinity of a man made drainage channel had water at the soil/rock interface. Based on the proximity of the borehole to the drainage channel the observed water is not expected to be representative of a perched water table but rather is a direct result of the drainage channel.

3.4.2 Rock

Deep boreholes drilled on the site to a maximum depth of 60 mBGL and rockcoring to 87 mBGL indicate that the site is underlain by Hawkesbury Sandstone with interbedded lenses of shale/siltstone and in some cases minor clay lenses. These observations are in line with the Sydney 1:250,000 Geological Sheet S1 56-5 (NSW Dept. Mines, 1966) which indicates that the site is underlain by Hawkesbury Sandstone. Refer to the Hydrogeological or Geotechnical Assessments for the site for more detailed information relating to the site's geology (Martens and Associates, 2009).

3.5 Groundwater

Based on observations within existing piezometers, groundwater has a minimum level approximately equal to the invert of the quarry's extraction pit (approximately 200 mAHD). This level is likely to be localised to within the immediate vicinity of the extraction pit as this groundwater level is a response to dewatering of the extraction pit. Groundwater levels are expected to increase with distance from the extraction pit as drawdown decreases.

Groundwater levels within piezometers located on the proposed expansion site range from approximately 27.5 mBGL (221 mAHD) to 12 mBGL (239 mAHD). The large range in levels is due to drawdown associated with dewatering of the quarry pit decreasing with distance from the extraction pit.

Ephemeral groundwater is likely to collect at the soil/rock interface above this after periods of substantial or prolonged rainfall.

4 Sediment and Erosion Control Assessment

4.1 NSW EPA Environmental Protection License (EPL)

The site currently has two approved discharge points. The NSW EPA EPL for the site requires that discharge is of a certain water quality standard and that it is monitored annually. Review of the client's most recent EPL has indicated that the following water quality parameter concentration limits are required.

Table 1: Water Quality Parameter Limits for Somersby Quarry; NSW EPA

Discharge Point ID	Pollutant	Units	100 percentile Concentration Limit
1	Oil and Grease	mg/L	10
	pH	pH	6.5 - 8.5
	Total Suspended Solids (TSS)	mg/L	50
2	Oil and Grease	mg/L	10
	pH	pH	6.5 - 8.5
	Total Suspended Solids (TSS)	mg/L	50

Review of the last 8 years of annual return information indicates that non-compliance with water quality parameter limits has occurred 6 times. In recent years this has been caused by TSS levels exceeding concentration limits after periods of heavy rainfall.

4.2 Sediment Generation and Adequacy of Existing SECS's

Based on Section 4.1 the existing SECS's are not sufficient to satisfy site NSW EPA EPL license conditions. Given that water balance assessment undertaken in the Surface Water and Hydrology Assessment for the site (Martens and Associates, 2009) indicates that the site's annual water balance will increase from 800.4 to 919.7 ML/yr as a result of the proposed development, current SECS's will not adequately sustain the proposed developed.

4.3 Required SECS's

4.3.1 Sediment Basin

Given the total amount of water surplus onsite is predicted to increase, and the recent excessive total suspended solids concentration and discharge Point 2, it is recommended a sedimentation basin be incorporated into the water management plan to allow fines (to a size of 75 µm) to settle out prior to discharge.

In accordance with volume 2 of the *Constructed Wetlands Manual* (DLWC, 1998), the proposed sedimentation basin has been designed as a 'deep water zone' whose function is to allow separation of suspended impurities from stormwater.

According to the Manual, the surface area required for sedimentation within such a basin can be calculated by dividing the design flow (m^3/s) by the product of the desired sedimentation efficiency (in this case 75 μm is equivalent to an efficiency of 47%) and its associated settling velocity.

Water balance annual excess of 919.7 ML/yr is equivalent to a flow rate of 0.029 m^3/s . Based on this, and using Table 16-6 of the *Constructed Wetlands Manual*, a sedimentation basin with a surface area of 1364 m^2 (approximately 21.3m wide x 64m long) and depth of 2.0 m is required to capture fines to a size of 75 μm . This can be accommodated on the site. This can be accommodated within the existing make up dam.

To enhance the removal of colloidal clays and other sub 75 μm material, the construction of a macrophyte zone at the outlet of the dam is proposed. The macrophyte zone is to extend 50m from the outlet pipes as shown on the attached plans. The macrophyte zone is to be regraded to provide a water depth of approximately 500 mm and have an area of approximately 2500 m^2 .

4.3.2 Rip-Rap

The predicted discharge volume is equivalent to a discharge rate of 0.029 m^3/s . Using Figure 5.10 of *Managing Urban Stormwater* (Landcom, 2000), for a discharge rate of 0.04 m^3/s (allowing a F.O.S. of 1.4) and a pipe size of 450mm (existing pipe) an average rip rap size of 0.1 m is required to adequately protect the channel. Given the outlet of existing discharge 'Point 2' is protected by rip rap with an average diameter of approximately 0.3 m, therefore the outlet is considered to be adequately armoured to withstand these increase discharge rates and will therefore continue protecting the creek from erosion and scour.

It is therefore considered that the existing rip rap works are adequate and may be maintained as part of the proposal.

4.3.3 Hay-Bales

Two rows of hay-bales are currently located immediately upslope of Discharge Point 2 and are held in position with start pickets. Observations from the site inspection indicate that these hay-bales are

working satisfactorily at trapping sediment. However, this solution is short-term, requires maintenance and is not addressing the source of the problem. It is therefore recommended that the hay-bales be replaced with a more permanent measure. Consequently, it is recommended that the area upslope of the pipe be revegetated with fast growing vegetation and lined with Jute Matting. The hay-bales should remain operational until the vegetation and Jute Matting is established. After this the hay-bales can be decommissioned.

5 Recommendations

5.1 Sediment Basin Maintenance

The following procedures will take place to ensure the proper operation and maintenance of the sediment basin:

- The basin will be inspected weekly and following a rain events of greater than 20 mm.
- The accumulated sediment depth will be checked to ensure remaining storage capacity is adequate for storm water and sediment deposition.
- Sediment shall be removed and the basin restored to its original dimensions when the sediment has accumulated to 1/2 the design depth of the basin. The removed sediment shall be deposited on the site outside of concentrated flow paths, be allowed to dewater and then be used in site rehabilitation works.

5.2 Jute Matting/Vegetation Maintenance

The recommended area of Jute Matting/vegetation should be inspected monthly or following heavy rainfall. Vegetation should be replaced as required.

5.3 Contingency

If NSW EPA EPL conditions are not met with the revised SECP measures then sediment and erosion control management at the site is to be reviewed and changes are to be made to ensure license conditions are met.

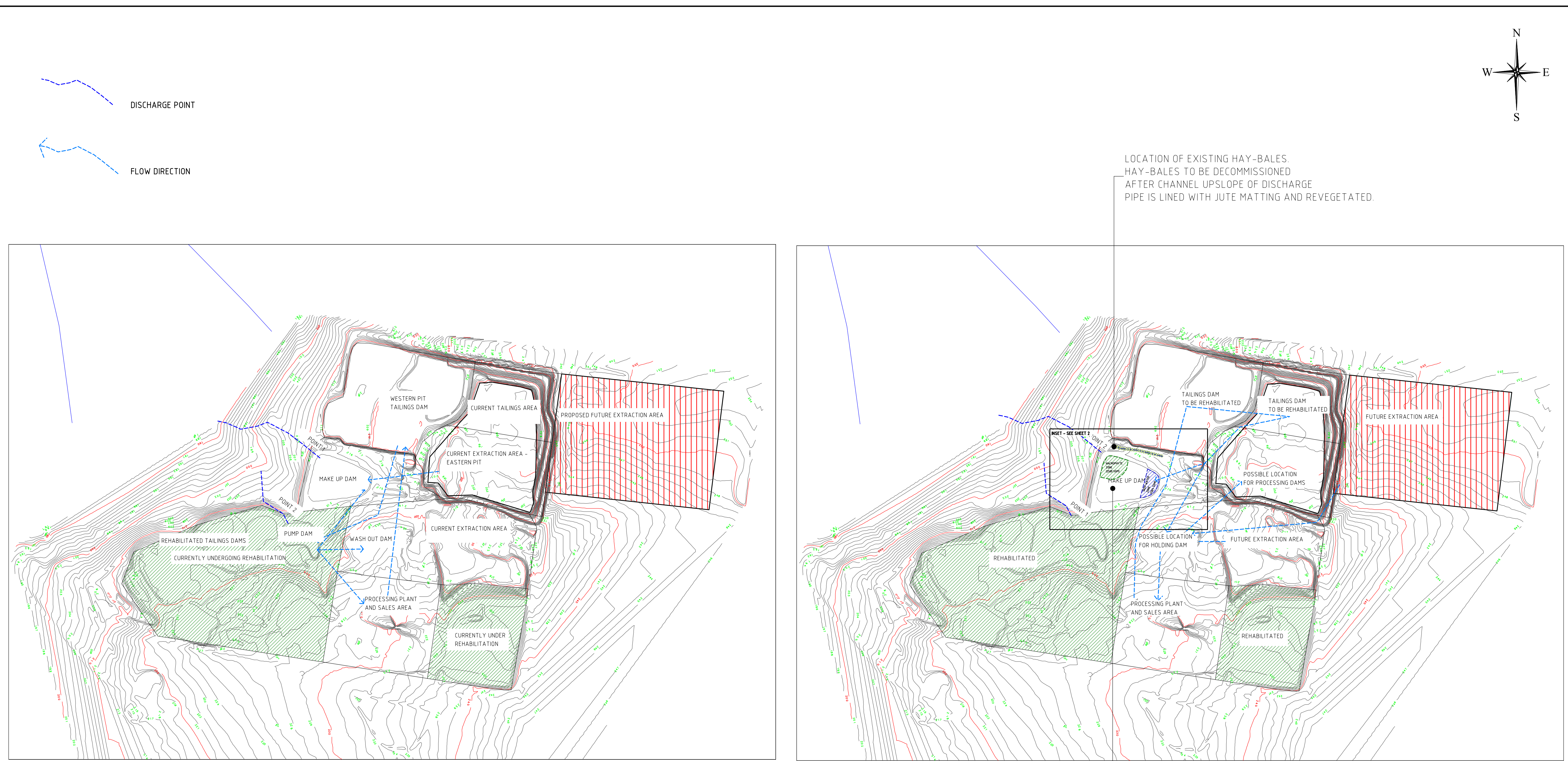
6 **References**

Landcom (2004) Soils and Construction: Managing Urban Stormwater.

Martens and Associates (2009), Surface Water Hydrology Assessment and Management.

NSW Department of Lands and Water Conservation (DLWC) (1998) The Constructed Wetlands Manual: Volume 2

7 Attachment A – Sediment and Erosion Control Plan



EXISTING WATER CYCLE MANAGEMENT PLAN

PROPOSED WATER CYCLE MANGEMENT PLAN

PROPOSED LOCATION FOR SEDIMENT BASIN.
BASIN TO BE INCORPORATED INTO EXISTING
MAKE-UP DAM. BASIN INCLUDES 1364 SQM DEEP
WATER ZONE WITH 2500 SQM MACROPHYTE ZONE

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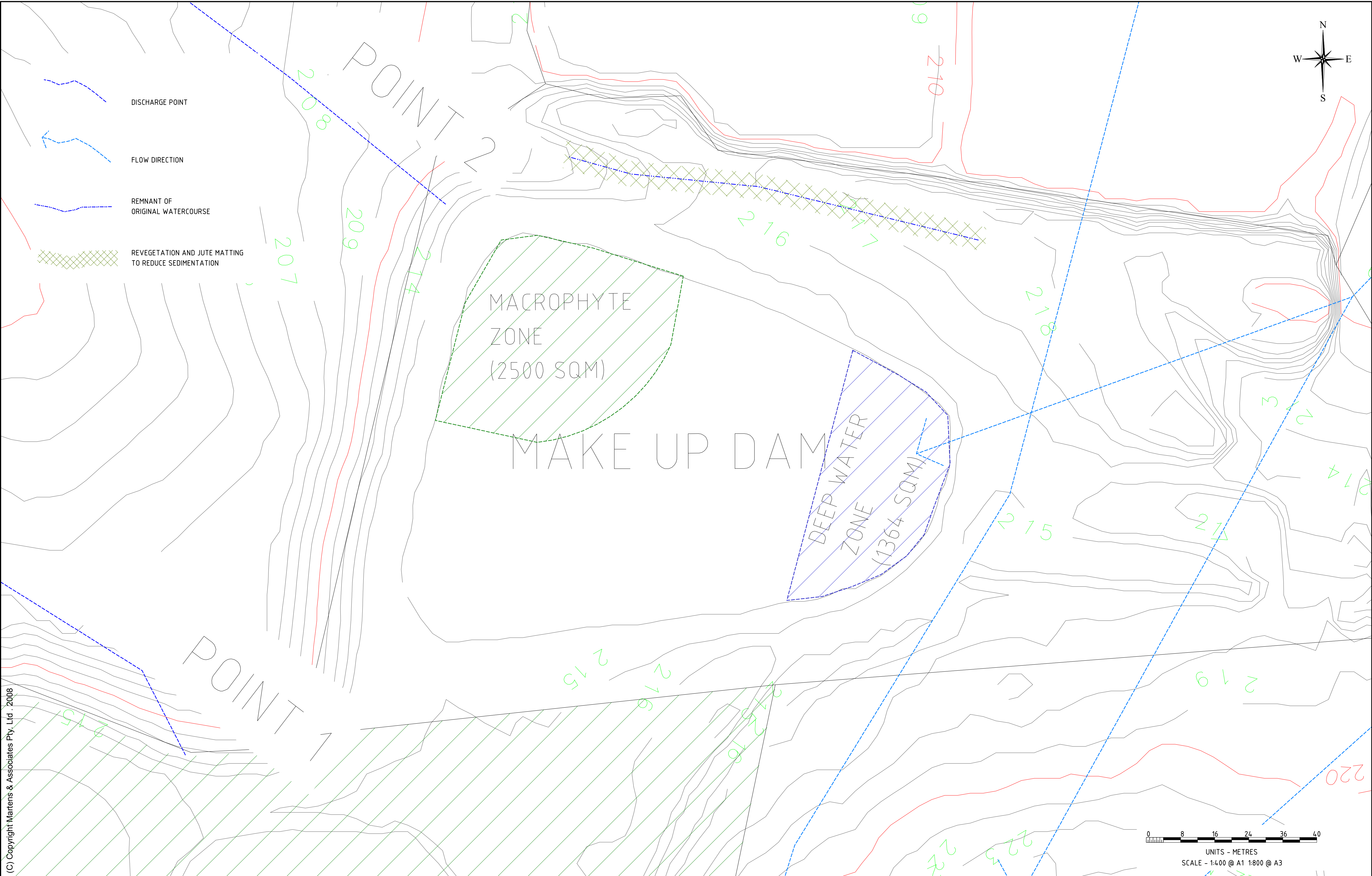
TITLE
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