Environmental Assessment

Menangle Quarry Extension | 15 Menangle Road, Menangle

Prepared for Menangle Sand and Soil Pty Limited | 23 May 2017

EMM

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Environmental Assessment

Final

Report J14139RP1 | Prepared for Menangle Sand and Soil Supplies | 23 May 2017

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Position	Associate Planner	Position	Associate Director
Signature		Signature	
Date	23 May 2017	Date	23 May 2017

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ENVIRONMENTAL IMPACT STATEMENT CERTIFICATION

For submission of an Environmental Assessment (EA) under Section 75W of the NSW *Environmental Planning and Assessment Act 1979.*

EA prepared by

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BSc (Hons), PhD

Proponent

Menangle Sand and Soil Pty Limited

Proposed modification

Menangle Sand and Soil Supplies are proposing to modify Development Consent 85/2865 to extend the extraction of sand and soil into a new area known as the Stage 8 area. The extension will increase the life of the quarry by 15 years.

The saleable resource in the Stage 8 area is estimated to be 760,000 tonnes.

The extracted material will be transported by conveyor to the existing Menangle Sand and Soil processing area.

Land to be developed

15 Menangle Road, Menangle, NSW, Lot 202 DP590247
Moreton Park Road, Menangle, NSW, Lot 203 DP590247

Certification

In relation to this EA (17.01 2017) we certify that:

- it has been prepared in accordance with Schedule 2, Clauses 6 and 7 of the NSW Environmental Planning and Assessment Regulation 2000;
- it has been prepared with all available information that is relevant to the environmental assessment of the development to which this EA relates; and
- the information contained in this EA is neither false nor misleading.

Liz Rankin
Associate Planner

Philip Towler
Associate Director

Executive Summary

Menangle Sand and Soil Pty Ltd operate the Menangle Sand and Soil Quarry at 15 Menangle Road Menangle. Quarrying has been undertaken in the location for over 40 years by a number of operators and at varying rates of production. Extraction, processing and rehabilitation activities have been successfully undertaken by Menangle Sand and Soil since 1978.

Sand and soil deposits from the Nepean system have long been recognised as one of the significant landscaping and construction resources in the Sydney region. In fact, the sand used to construct the Sydney Harbour Bridge was extracted from the site at Menangle. The current operations have ensured the provision of competitively priced sand and soil products contributing to the local and regional economy both directly and indirectly. Reliance on this resource is greater now the Penrith Lakes Scheme has ceased production, with the Menangle quarry supplying greater than 70% of Sydney's approved topsoil resource.

Current extractive activities were approved in 1989 and have involved the construction and operation of a quarry in seven stages. Sand and soil has been extracted from Stages 1 to 2 and 4 to 6 and is currently being extracted from Stage 7. While approved, sand and soil extraction from Stage 3 of the quarry is yet to be extracted.

Due to increasing demand, largely driven by the growth of Western Sydney, Menangle Sand and Soil is seeking development consent to modify the existing operation to extend the life of quarrying activities and substituting quarrying activities from an approved area to a new area directly south-east of the current quarrying site. Specifically, the extension project proposes to increase the life of the quarry by 15 years, and replace the resource in the approved Stage 3 area with the resource in the proposed Stage 8 area. The total extraction area will increase by approximately 11%, however the amount of saleable resource extracted is only marginally greater.

Additional components to support the extension area will include a haul road to convey materials to a conveyor head and a conveyor. The conveyor will then transport the extracted material to the existing Stage 7 processing area. There are no proposed changes to current licensed processing operations.

Quarrying in the Stage 8 extension area will require unavoidable vegetation clearing prior to extraction of the resource. Approval for the extension will be dependent on the provision of biodiversity offsets. A two part compensatory offset package is proposed. Firstly, offsets are proposed to be provided immediately adjacent to the Stage 8 extraction area in a proposed restoration area. This provides an opportunity for the bank upslope of the extraction area to be restored, including the removal of extensive invasive weeds and their soil seedbank. The proposed rehabilitation and restoration process for the extension incorporating this offsetting will return the entire river bank to a sustainable high quality ecosystem. Secondly some biodiversity offsetting is proposed for the approved Stage 3 extraction area.

The site is considered suitable for the proposed activities given that it is an extension of an existing quarry, it has existing site access and infrastructure, and it is distant from any residences. Extraction operations will not be visible from any public locations or private residences and it provides an opportunity to restore a degraded ecosystem. The proposal is essentially extending the life of the current operations, albeit at a new adjoining site, within an existing quarry that has been in operation without complaint for decades. Menangle Sand and Soil's successful rehabilitation of other parts of the quarry, indicate that long-term environmental outcomes will be positive.

The current approval was granted by the Minister under Section 101 of the *Environmental Planning and Assessment Act 1979 (*EP&A Act). As such the proposed modification may be considered under the now repealed Section 75W of the EP&A Act, and this EA has been prepared to support the application for the modification.

A range of detailed technical assessments were prepared by leading professional specialists in accordance with relevant legislation, policies and guidelines. This EA describes the assessment methods used, the existing environment (particularly within the extension area), the predicted impacts of the extension project and the proposed management measures that will be implemented by Menangle Sand and Soil.

A range of environmental mitigation, management and monitoring measures are and will continue to be implemented at the quarry. This EA found that subject to continued implementation of these measures, the proposal would not result in any significant adverse environmental impact. Further, the extension project will enable the provision of a high quality ecosystem through the restoration of an existing weed infested community and rehabilitation of the extraction area.

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1 Introduction

1.1 Overview

Menangle Sand and Soil Pty Limited (Menangle Sand and Soil, a subsidiary of Benedict Industries) currently operate the Menangle Sand and Soil Quarry (the quarry) at 15 Menangle Road, Menangle, in Wollondilly Shire Council (WSC) local government area (Figure 1.1). The quarry extracts sand and soil and blends this with imported recycled material to produce specialty sand and soil mixes for a range of uses including landscaping and construction.

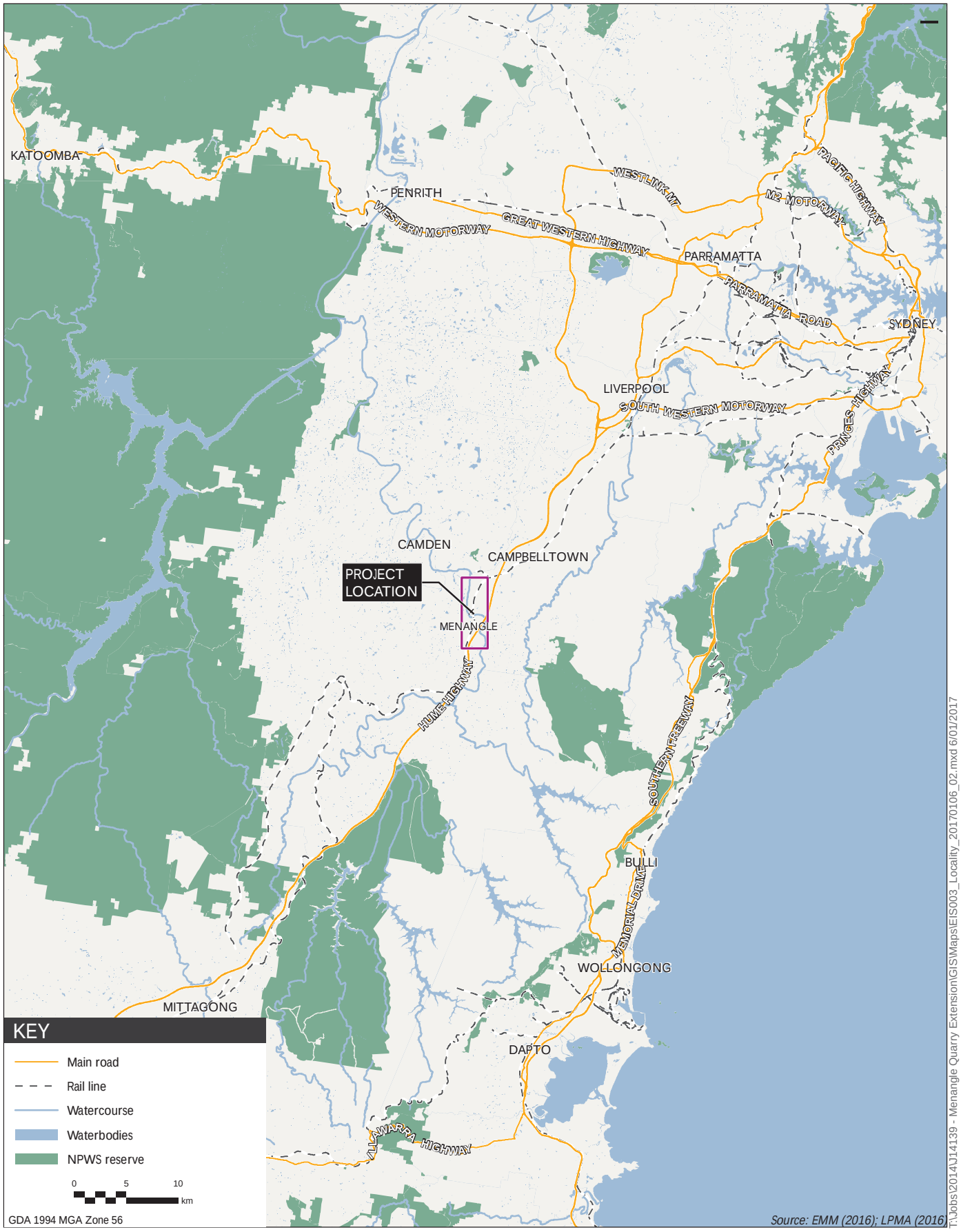
The Nepean River sand deposits have long been considered to play an important role in supplying the Sydney region with sand. Prior to the 1950s, when the Penrith Lakes Scheme came into production, the Nepean-Hawkesbury river course was the major source of medium to coarse sand in the Sydney region. In fact, the sand at Menangle was specifically mined in the 1920s for the Sydney Harbour Bridge construction. After 1950, the Nepean River deposits were recognised as the only significant sand source supplementary to that of the Penrith Lakes Scheme. The Penrith Lakes Scheme has now ceased production.

In considering the role of the Nepean River sand deposits in the 1980s, the Department of Mineral Resources acknowledged that unless approval was granted for extraction from the Nepean region, the material needed to supplement the Penrith Lakes Scheme would have to be imported from outside the region. The additional cost of importing this sand from more remote regions would ultimately be borne by the community.

Extractive operations have been undertaken at the quarry for more than 40 years, by a number of operators and at varying production rates. The present operators, Menangle Sand and Soil have extracted sand and soil resources from the quarry since 1978. This represents over 30 years of experience in extraction works and rehabilitation in this locality.

Approval for the Menangle Sand and Soil Quarry (Development Consent 85/2865) was granted by the Minister for Planning on 15 November 1989 (see Appendix A). The approval allows the extraction of sand and soil from flood plain areas adjacent to the Nepean River in seven stages (Figure 1.2). Some stages involve dredging of the river bed, although no dredging has occurred in nearly 20 years. Development Consent 85/2865 requires the applicant to complete all stages of the development by 2020. Sand and soil has been extracted from Stage 1 to 2 and 4 to 6 and is currently being extracted from the Stage 7 area. While approved, the sand and soil resources associated with Stage 3 of the quarry are yet to be extracted.

The resource in the existing Stage 7 area is being gradually extracted and the area rehabilitated, and rather than returning to the Stage 3 area, Menangle Sand and Soil is proposing to continue operations by extracting sand and soil from a new area (the Stage 8 area), on land that it owns to the east of the Hume Motorway (the project).



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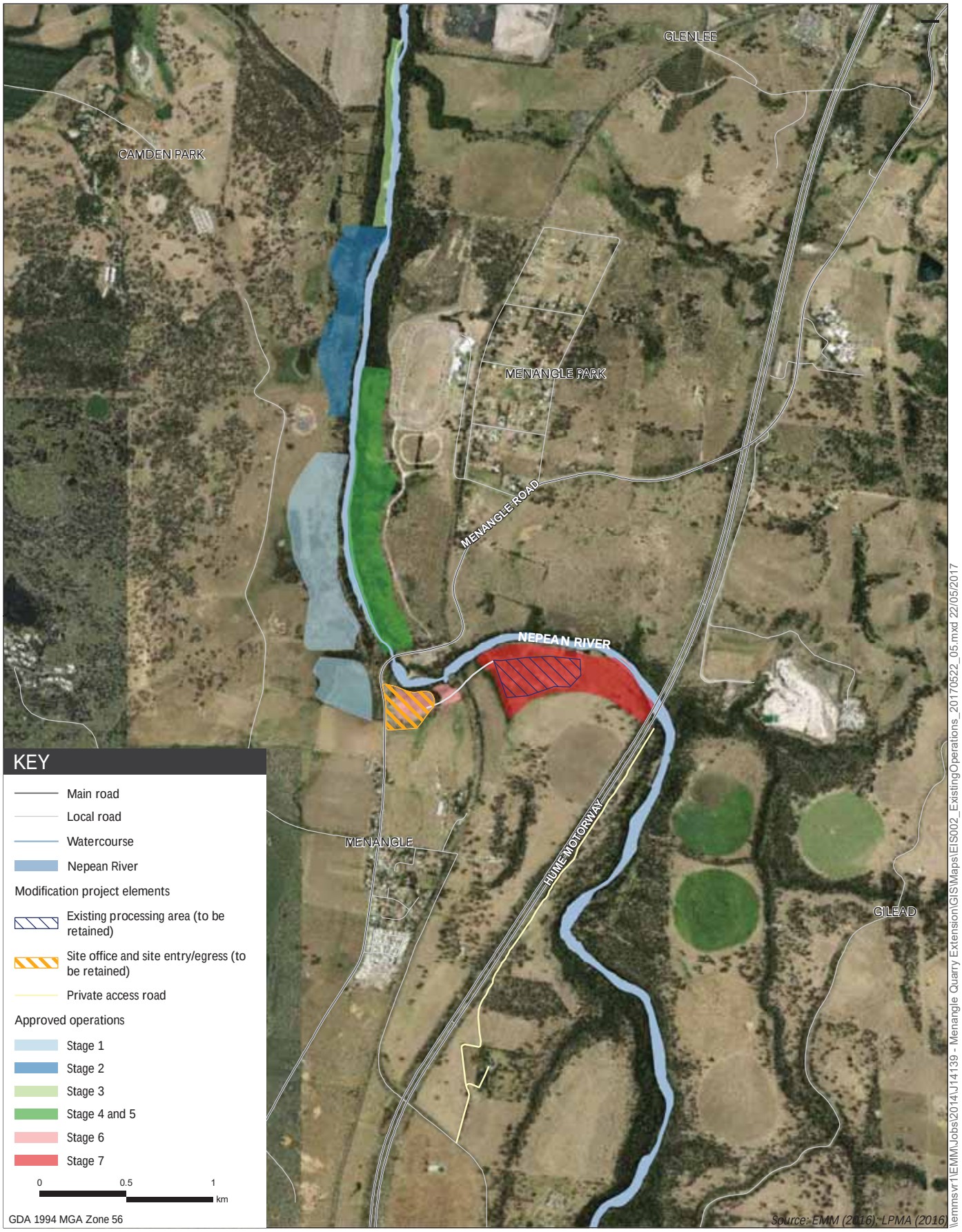
Project location

Menangle Quarry Extension
Environmental Assessment

Figure 1.1



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Current approved operations

Menangle Quarry Extension
Environmental Assessment
Figure 1.2

This Environmental Assessment (EA) accompanies an application by Menangle Sand and Soil for the proposed modification to Development Consent 85/2865, in accordance with Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The EA provides information to allow NSW government authorities to assess the merits of the proposed modification and make a determination as to whether or not to grant approval.

1.2 The extension project

Menangle Sand and Soil seek a modification to Development Consent 85/2865 under Section 75W of the EP&A Act to extend the life of the quarry by 15 years while removing the need to re-establish quarrying activities, clear vegetation, and extract sand and soil from the approved Stage 3 area.

The applicant seeks to modify Development Consent 85/2865 to:

- substitute the approved resource to be extracted from Stage 3 by allowing sand and soil extraction in a proposed new Stage 8 area;
- install and operate a conveyor between the existing processing area and the Stage 8 area;
- remove weeds and restore the river bank west of the Stage 8 extraction area;
- include Stage 3 area as part of the offset strategy for the extension project; and
- extend the life of the quarry to 2035.

The Stage 8 area is along the Nepean River within Lot 203 DP590247, on the eastern side of the Hume Motorway (Figure 1.3). The Stage 8 area extends approximately 2.8 km to the south of the Stage 7 area. The modified quarry plan shows the new Stage 8 extraction area and the Stage 3 area as off-set area (Figure 1.4).

The Stage 8 area contains woodland, with large areas of exotic weed-dominated understorey (Photograph 1.1).

Photograph 1.1 **Privet woodland within the Stage 8 area**

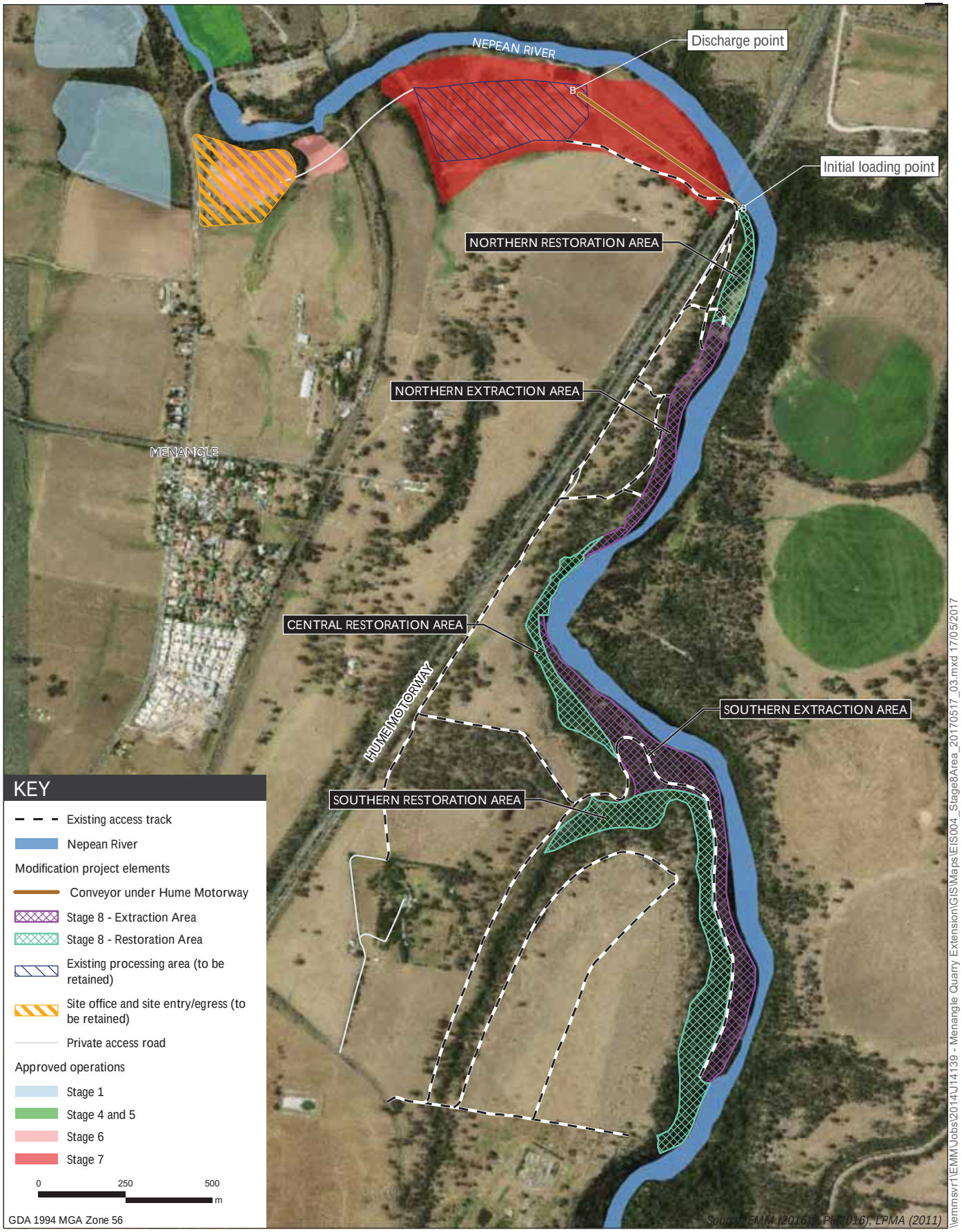
Photograph 1.2 **Riparian Forest in poor condition - southern section of the Stage 8 area**

Sand and soil will be extracted from the lower parts of the Stage 8 area (ie the eastern side) where they are deposited during floods. The extraction area will be set back 10 m from the 64 m Australian Height Datum (AHD) Contour.

The extraction area will be progressively rehabilitated to restore the pre-existing native vegetation community with upper, mid and lower storeys. Weed establishment will be the greatest threat to successful rehabilitation given the current dominance of weeds in the Stage 8 area. Therefore it is proposed to undertake extensive weed removal in the upper parts of the Stage 8 area (ie the western side). This will include removal and burial of the topsoil in this area which contains the weed-seed bank.

Therefore the Stage 8 area will comprise of the Stage 8 extraction area and the Stage 8 restoration area (Figure 1.3). These areas will contain a conveyor and access road while the quarry is operating. The conveyor will pass under the Hume Motorway, traversing the approved Stage 7 area and terminate at the existing processing area. The progression of the quarry and details of the location of quarry infrastructure is detailed in Chapter 3 of this report.

The conveyor will require the clearing of some exotic vegetation (large Privet trees) under the bridge, however this will be done as part of the restoration (offset) program. The conveyor will be a temporary structure that will be removed upon completion of the project. It will require a 1 m wide corridor and will be constructed on the edge of the existing access tracks through the proposed restoration area and extraction area (Figures 3.2–3.7), and therefore will not require additional vegetation clearing or offsets. The conveyor is 1 m wide, painted green in colour and will be sited 1 m off the ground. The conveyor route will be selected such that no native trees are cleared. Reliance will be on existing tracks to access the extractions site and a new temporary haul road will be established to haul extracted sand and soil to the conveyor loading point and to access rehabilitation and restoration areas, (see Section 3.1.5).



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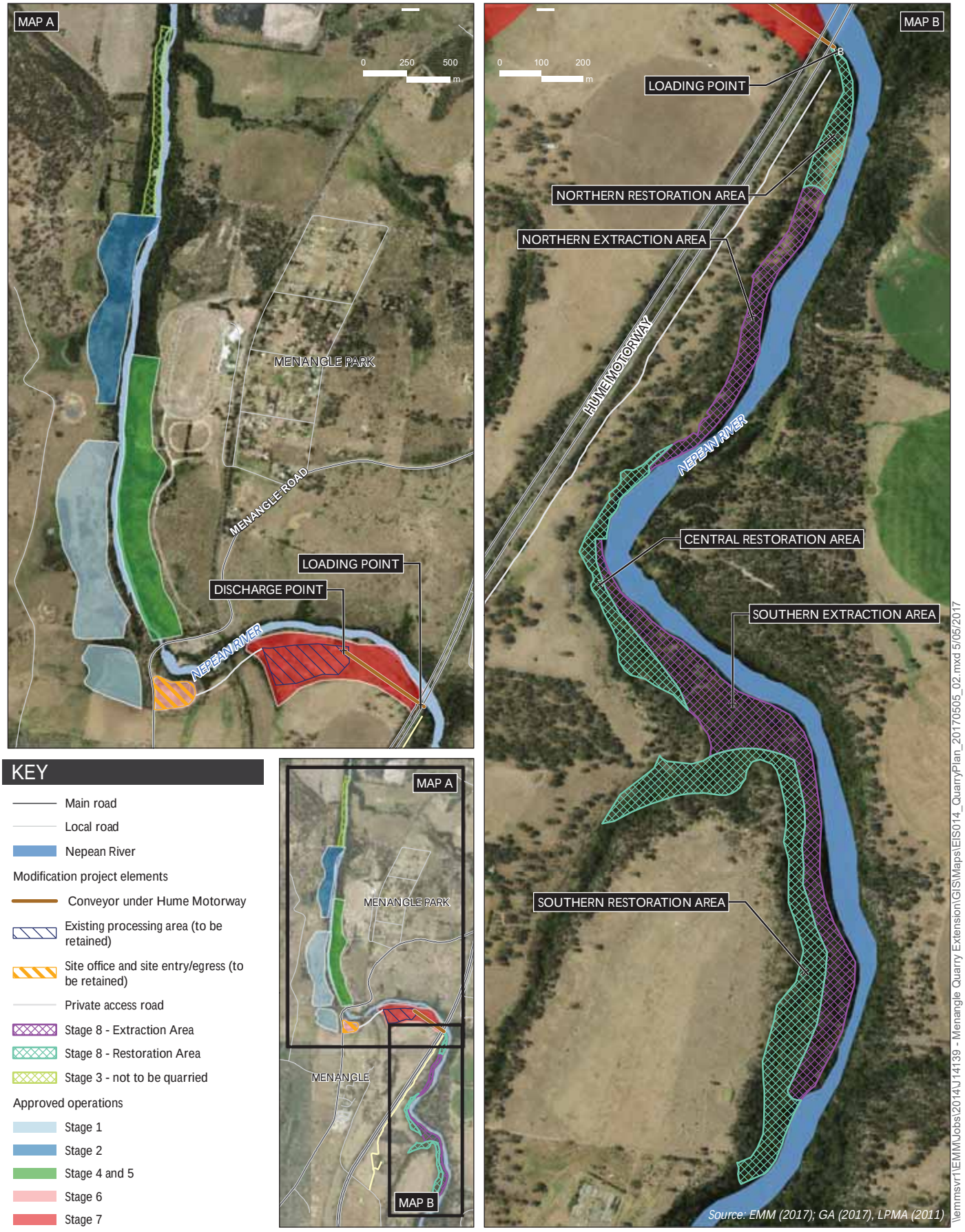
Stage 8 area
Menangle Quarry Extension
Environmental Assessment
Figure 1.3



Modified quarry plan

Menangle Quarry Extension
Environmental Assessment
Figure 1.4

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The saleable resource in the Stage 8 area is estimated to be 760,000 tonnes. About 15% of the material extracted is 'scalps' (roots and particles with a diameter greater than 4 mm), because of this, about 890,000 tonnes (about 500,000 m^3) of material will need to be extracted in total. This will be extracted over 15 years, with an average annual extraction rate of about 59,000 tonnes. However, extraction rates will vary depending on customer demand. For the purposes of a conservative impact assessment it has been assumed that up to 150,000 tonnes of material could be extracted in a given year.

Sand and soil will be extracted from an area setback a minimum of 10 m from the 64 m (AHD) contour (ie 3 m above the level of the Nepean River). No dredging is proposed.

The development will include:

- installation of a conveyor from the Stage 8 area, under the Hume Motorway, to the existing Menangle Sand and Soil processing area;
- progressive clearing of the Stage 8 extraction area;
- sand and soil extraction in the Stage 8 area leaving the Nepean River bank intact (other than to remove exotic trees such as willows);
- progressive rehabilitation following sand and soil extraction. The project would include removal of extensive weeds upslope of the extraction area allowing restoration of the entire river bank to a high quality ecosystem;
- excluding the Stage 3 area from approved extractive operation and instead incorporate Stage 3 as part of the offset strategy for the extension project; and
- it is proposed to restore and protect habitat adjacent to the resource which will provide an off-set for the unavoidable clearing portions associated with the project.

The Stage 8 restoration areas are proposed to be protected under an appropriate legally binding mechanism, within 12 months of project approval (should approval be granted). The offsets would be secured under a:

- voluntary conservation agreement, in accordance with Section 69B of the NSW *National Parks and Wildlife Act 1979;* or
- BioBanking agreement, in accordance with Part 7A Division 2 of the NSW *Threatened Species Conservation Act 1995,* if the offset package is finalised prior to the June 2017 enactment of the *Biodiversity Conservation Act 2016*; or
- Biodiversity stewardship agreement, in accordance with the Part 5 Division 2 Section 5.5 of the *Biodiversity Conservation Act 2016* if the offset package is finalised after June 2017 when the legislation is enacted.

The extension project will result in an improved environmental outcome with the extraction providing the opportunity to restore the adjoining degraded areas and protecting the vegetation in Stage 3 that will otherwise be cleared as approved. The method for processing will remain unchanged except that the source of the extracted material will be the Stage 8 extension area.

A summary of the modification is provided in Table 1.1.

Table 1.1 Project description

Project element	Currently approved	Proposed modification
Resource	The currently approved extractable resource is 7.7 million tonnes Of this amount, approximately 700,000 tonnes was approved to be extracted from the Stage 3 area	The extractable saleable resource in the Stage 8 area is estimated to be 760,000 tonnes.
Disturbance area	123 ha	136 ha assuming there is no quarrying in the stage 3 area.
Quarry life	Up to 2020	Up to 2035 (ie 15 years from 2020).
Extraction method	Dry extraction, dredging	Dry extraction only.
Infrastructure	As outline in Section 2.8	Addition of a conveyor from the Stage 8 area to the Stage 7 processing area. Refer to Chapter 3.
Extraction rate	Maximum of 350,000 – 400,000 tpa This includes 50,000 – 100,000 tpa of dredged material However average extraction for the last 3 years has been 176,000 tpa	Nominal 59,000 – 150,000 tpa average. Extraction rates will vary depending on customer need and it has been assumed that up to 150,000 tonnes of material could be extracted in a given year. No dredging proposed.
Approved volume of extractable resource	Approximately 700,000 tonnes in Stage 3	Approximately 760,000 tonnes in Stage 8.
Production rate	400,000 tpa	Production rate has been on average 260,000 tpa for the last three years. No change is proposed to the currently approved production rate. Rather, production of saleable product is relying more and more upon recycled material being imported, stockpiled, and blended with the extracted material. This accounts for the difference between the proposed extraction rate and the production rate. Environment Protection Licence (EPL) 3991 lists the type of wastes that can be accepted by the facility and the limits and conditions imposed on the acceptance and stockpiling of this waste.
Product transport	Up to 84 car movements per weekday and up to 248 truck movements per weekday	The proposal will not lead to an increase in truck movements above the approved amount.
Operational workforce	16 full-time on-site employees Contractors operating trucks plus staff employed by the company, temporarily transferred when production rates require	No change
Hours of operation	6.00 am to 5.00 pm Monday to Friday 6.00 am to 12.00 pm Saturdays	No change

1.3 The applicant

Menangle Sand and Soil is a subsidiary of Benedict Industries Pty Ltd. Benedict Industries is a Sydney based group of companies which manages a range of quarrying, recycling and resource operations. Menangle Sand and Soil is Sydney's largest supplier of soils, specialty sands and garden mixes.

1.4 Site and surrounds

The Menangle Sand and Soil Quarry is located at 15 Menangle Road, Menangle, approximately 2 km north-east of the village of Menangle, within the Wollondilly Shire Council local government area (LGA).

Development consent 85/2865 applies to the following allotments:

- Lots 201-203 DP 590247;
- Lot 1 DP 168893;
- Lot 11 DP531897;
- Lot 4 DP5951181;
- Lot 3 DP 593211;
- Lot 2 DP 236059; and
- Lot 2 DP 116069.

The Stage 8 area is within Lot 203 DP590247, which adjoins the approved quarry site to the south-east.

The Menangle Sand and Soil site office and compound is located on Menangle Road, on the western side of the Hume Motorway. Access is directly from Menangle Road. The sand and soil stockpile and processing area is located approximately 500 m north-east of this compound, also on the western side of the Hume Motorway.

Land surrounding the quarry is predominately used for farming and comprises a range of rural landholdings. The Hume Motorway and the main Southern Railway are located to the west of the Stage 8 area, and separate the area from the Village of Menangle. Ellel Ministries Rural Retreat is approximately 750 m west at its closest point to the Stage 8 area. This property has long-term living accommodation.

1.5 Project justification

The sand and soil deposits in the Nepean system have long been recognised as one of the significant landscaping and construction resources in the Sydney region. In considering the role of the Nepean River sand deposits in the 1980s, the Department of Mineral Resources in conjunction with the Department of Environment and Planning prepared the *Sydney Extractive Industry Regional Environmental Study* in 1984. The purpose of the study was to develop a framework for the planning and management of extractive resources within the Sydney metropolitan region.

The broader strategic justification for the project is well established through the 1984 study. Further justification for the project, particularly its scale and duration, is outlined below. The proposal is essentially swapping one area of extraction for another whilst at the same time extending the duration of the quarrying activities.

- The consent to extract the Stage 3 area lapses in 2020, and extraction in that area has not commenced.

- Whilst Menangle Sand and Soil has consent to extract from the Stage 3 area, the proposal represents an opportunity to substitute this approved area with the Stage 8 lands that it controls. This is rather than on the NSW government's Elizabeth MacArthur Agricultural Institute (EMAI) lands which are used for less compatible uses. EMAI, whilst recognizing the consent, would prefer to retain the landscape as it is. This proposal presents an opportunity to suit all parties whilst giving the best environmental outcome. See Appendix E for EMAI's confirmation of it preference.

- Stage 3 is a dredging and bank extraction operation. The dredging operation commences downstream of the Stage 2 dry extraction area and continuing downstream for 1,160 metres to within 200 metres of Bergins Weir. The program was proposed to be subject to more detailed analysis of coal sludge known to lie on the bed of the river some distance upstream of the Weir (*EIS Proposed Sand and Soil Extraction Nepean River and Environs* (Planning Workshop 1987). Dredging is not the preferred extraction method and has stopped occurring in other parts of the quarry. Should Stage 3 proceed the river will be widened to 50 metres while the bend near the end of Stage 2 will be straightened, giving a short length of river about 60 metres wide. New banks will be constructed by dredging and dozing sand.

- The duration of extraction operations, regardless of whether it is stage 3 or 8 needs to be extended. This is justified by the fact that the proportion of extracted resource in the saleable product has been decreasing over time with the market demand for a product with recycled content (eg wood waste, mature compost, ash and manure), increasing. This reliance on blended product increases the duration of extraction activities as lower volumes are being extracted per year than in the earlier years of the quarry.

- Production of saleable product relies more and more upon recycled material being imported, stockpiled, and blended with the extracted material. By increasing the amount of imported recycled material, the operation is in alignment with the NSW's *Waste Less, Recycle More Initiative* (EPA 2013) by providing further opportunities to utilise recycled product.

- By extending the life of quarrying activities, the proposal, will make the most significant contribution to meeting existing and likely future demand for sand and soil resources in the Sydney growth region.

- The total tonnage of extractable material is 894,000 tonnes However of this, the total tonnage of saleable resource is 760,000 tonnes assuming 15% of the extractable material is scalps, which will be returned to the site as part of the rehabilitation process.

- The volume of extracted saleable resource in Stage 8 therefore is only marginally greater than the volume of approved resource it is proposed to replace in the Stage 3 area.

- All of the soil resources in the Sydney area are along the Nepean River. This was recognised by the *Sydney Extractive Industry Regional Environmental Study*. The deposits at the Menangle site contain a large proportion of the region's current and potential sources of approved extracted soil and are currently meeting 70% of Sydney's existing soil requirements. In one to three years this will be depleted, unless the extension is approved. The proposed extension will represent the bulk of Sydney's approved topsoil after 2020.

- The *Sydney Extractive Industry Regional Environmental Study* identified the Hawkesbury Nepean River as the only supplementary source to the Penrith Lakes Scheme. This resource is now even more significant as extraction in the Penrith lakes system has ceased. If an extension to quarrying activities is not permitted from the Menangle site the material needed to supply the Sydney region will have to be fully imported from deposits outside the region, (such as those on the Newnes or Somersby Plateau). The greater costs of transporting sand from these more remote sites will ultimately be borne by the community.

- Other remaining reserves within the region's existing extraction sites are small and will also be exhausted in the near future. Consents for quarrying activities at other quarries in the region eg Spring Farm Quarry (7 ha) and Wallacia are due to expire in 2019-2020.

- Some of the alternative sources in the region eg Lower Nepean, Agnes Banks, Freemans Reach and Windsor area, contain extensive turf farms and soil extraction is prohibited under the zoning controls.

- The proposal will provide continuing employment for an existing long term local workforce as well as a range of contractors and casuals.

- The post rehabilitation of the quarry site will enhance the amenity of the whole area consistent with the restored environment in the previous stages of the quarry. This will make the locality a more pleasant environment for the growth and residential development occurring in the broader locality.

- With rehabilitation and restoration the proposal will halt the spread of invasive species that currently dominate the banks and terraces adjoining the Nepean River.

- With the proposed restoration works in Stage 8 and the retention of the highly sensitive and significant community in Stage 3, the overall impact of the development on flora and fauna will, on balance, be a positive impact.

A range of commitments are provided in this EA to avoid impacts, and to minimise, mitigate or compensate for unavoidable impacts. The proposed measures will be further detailed in Menangle Quarry environmental management system (EMS) that will be updated should the project be approved.

1.6 Approvals pathway and environmental assessment requirements

The current approval was granted by the Minister under Section 101 of the EP&A Act. Because of this, it may be considered under the now repealed Section 75W of the EP&A Act.

Specifically, advice received from the Department of Planning and Environment was to the effect that a potential assessment pathway for the project is:

A modification under Section 75W of the EP&A Act as the extant development consent was issued under Section 101 of the Act (refer to Clause 12 of Schedule 6A of the Act for transitional arrangements), which would be assessed by the Department.

If the quarry was a new development, it would meet the definition of designated development under Schedule 2 of the Environmental Planning and Assessment Regulation 2000 as it would extract more than 30,000 m^3 a year and is within 40 m of a natural waterbody. However, as a modification to an existing approval the project is not deemed to be 'designated development'.

The extension project is not State significant development as it is not identified in Schedule 1 or 2 of the State Environmental Planning Policy (State and Regional Development) 2011 as it would not extract more than 500,000 tpa, or extract from a total resource of more than 5 million tonnes, or extract from an environmentally sensitive area of State significance.

This EA has been prepared to address specific requirements provided by the DPE and other relevant agencies. The DPE advised of its environmental assessment requirements via email on 21 January 2016. These requirements, and where they have been addressed in the EA, are summarised in Table 1.2 below.

Table 1.2 DPE requirements

Issue	EA reference
Surface water impacts, including flooding, river hydrodynamics, hydrology, bed and bank stability and water quality	Section 6.2 and Appendix F
Biodiversity impacts, including flora, fauna and aquatic ecology focussing on critical habitats, threatened species, population or ecological communities, or their habitats	Section 6.7 and Appendix K
Groundwater impacts	Section 6.2
Heritage, including Aboriginal and non-Aboriginal culture	Section 6.5 and 6.6, and Appendices G and H
Rehabilitation	Section 3.3 and Appendix K
Cumulative impacts	Sections 6.3 and 6.4, and Appendices E and F
The application of contemporary environmental management and monitoring requirements	Management and monitoring measures are summarised in Section 6 of this EA and contained in Appendices D-I
Noise impacts	Section 6.4 and Appendix H
Air quality impacts	Section 6.3 and Appendix G
Traffic impacts (including river navigation)	Section 6.8
Visual impacts	Section 6.8
Social and economic impacts	Section 6.8

1.7 Project definitions

The terms used to describe the areas referred to in this EA are summarised in Table 1.3

Table 1.3 Project definitions

Name	Definition
Approved quarry area	Stages 1–7 areas
Current operations area	Site office lot, processing area and the Stage 7 area
Stage 3 area	Approved Stage 3 extraction area
Stage 8 area	Includes the Stage 8 extraction area, the Stage 8 restoration area, the part of the conveyor corridor to the east of the motorway, and haul roads within the Stage 8 area
Stage 8 extraction area	The part of the Stage 8 area where sand and soil will be extracted. This will be rehabilitated following extraction
Stage 8 restoration area	The part of the Stage 8 area that will be restored and used as an offset
Processing area	The existing processing area within the Stage 7 area
Conveyor corridor	The area within the Stages 7 and 8 areas and under the Hume Motorway, that will accommodate a conveyor to transport excavated material from the Stage 8 area to the discharge point at the processing area.

1.8 Purpose of report

Following consultation with the DPE, Menangle Sand and Soil is seeking a modification to Development Consent 85/2865 under Section 75W of the EP&A Act.

This EA accompanies an application for a modification to the development consent in accordance with the EP&A Act. The NSW Minister for Planning is the decision maker, although the Minister's determination role for the project is currently delegated to the Planning Assessment Commission or the Secretary of DPE.

The EA's first purpose is to provide information on the proposed extension activities to allow NSW government agencies to assess the extension project's merits and to make recommendations to decision makers as to whether or not to approve the project and if so, what conditions should be attached to the approval.

The EA's second purpose is to inform the public about the proposed quarry activities so that they can make submissions on its merits or impacts. Such submissions are an important information source for the governmental assessment process.

The study team for the EA is provided in Appendix B.

2 Existing operations

2.1 Introduction

This chapter describes the existing approved Menangle Sand and Soil Quarry operations (Figure 1.2).

2.2 Resource

2.2.1 Geology and soils

The published geological maps show the Woronora Plateau continuing over the quarry as Hawkesbury Sandstone and Wianamatta Group shales (Liverpool Sub Group, Ashfield Shale), forming a thin cap (about 10 m thick) over the Hawkesbury sandstone. A body of quaternary alluvium is mapped along the areas already quarried (Stages 1–7) which is likely to correlate with the broader open valleys of the Cumberland Lowlands.

The sand and soil deposits within the approved extraction areas are described in the *Environmental Impact Statement Proposed Sand and Soil Extraction Nepean River & Environs Menangle NSW* (Planning Workshop 1987). This EIS indentifies four distinct sediment types within distinct parts of the Nepean Valley floodplain, each with different particle size distribution and sedimentary structures:

- lagoonal muds and clays – fine sandy medium clays and heavy clays;
- floodplain sandy clay soils – mainly fine sandy clay soils;
- bedded levee sands, sandy soils and soily sands – finer grained consisting of interbedded sands and sandy soils on the left and right banks of the river, with significantly coarser grained on the left bank mainly below 2 m; and
- channel bank and bench sands and soily sands – sands overlain by 1–2 m of soils on both right and left banks.

2.2.2 Quantity of material being extracted

The total resource in the approved area is approximately 7.7 million tonnes made up of 5.9 million tonnes of soil and 1.8 million tonnes of sand. The area of extraction is approximately 123 ha (Table 2.1). The current approved extraction rates are up to 350,000–400,000 tpa of soil and bank sand.

However, extraction for the last 3 years has been 176,000 tpa, on average.

To date, all but Stage 3 (approximately 300,000 tonnes soil and 400,000 tonnes sand) and the remainder of Stage 7 has been depleted.

Table 2.1 Approved extraction areas

Extraction Area	Area (ha)
Stage 1	38.14
Stage 2	20.61
Stage 3	5.69
Stage 4 & 5	30.27
Stage 6 (including site office and compound)	3.51
Stage 7 (including processing area)	24.82
Total	**123.04**

2.3 Quarry components

Key components of the existing quarry include:

- extraction areas;
- a wheel wash and weighbridge;
- a site office and amenity building;
- a workshop west of the site office;
- fuel supply tanks north of the storage shed;
- sand and soils storage and processing area; and
- other minor infrastructure.

2.4 Quarrying

2.4.1 Quarry progression

Development Consent 85/2865 allows for up to 350,000–400,000 tpa to be extracted and processed at the quarry.

Quarrying progressed from south to north (Stages 1-2) and from west to east (Stages 4-7). Quarrying activities in the Stage 7 area are progressing from west to east.

2.4.2 Vegetation clearing

An excavator is currently used to clear vegetation, rocks and other material prior to extraction. Trees removed from the area are cut and sold as firewood, with other material stored and eventually buried within the worked area once extraction has taken place.

2.4.3 Topsoil removal

Once the land has been cleared, topsoil is stripped from the area to be worked and is buried in the previously extracted area.

2.4.4 Soil and sand extraction

An excavator is currently used to dig the soil and sand to be extracted and loads onto an off-road haul truck that carts the material to the processing area.

2.4.5 Processing

A power screen within the processing area is used to remove roots and coarse material (>4 mm) 'scalps'. The mobile stacker attached to the screen discharges screened soil into a stockpile for sale or blending.

Some material is further screened to create specific soil products using a mobile screening plant and a washing plant.

The wastes from the washing plant consist of organics such as roots and fines (very fine sand, silt, clay particles) in water. These wet fines are gravity fed to the settling pond in the processing area and are mostly recovered from the pond and blended into products. The remaining silts are use to rehabilitate the site.

2.4.6 Blending

Extracted material is currently blended, where necessary with imported materials, to produce a premium product.

These imported, screened fines are produced under the NSW EPA's Resource Recovery Order (RRO). These are brought to the site and stockpiled prior to blending.

Environment Protection Licence (EPL) 3991 lists the type of wastes that can be accepted by the facility and the limits and conditions imposed on the acceptance and stockpiling of this waste.

2.4.7 Stockpiling

Very little material is stockpiled in the extraction areas. Stockpiles are mainly kept in the processing area.

2.4.8 Dispatch

Trucks containing soil or sand products pass over a wheel wash and weighbridge and have weight recorded before departing the site at Menangle Road. All vehicles enter and exit the site from the Menangle Road access point located on the sites south-west, near the site office.

2.4.9 Dredging

Historically dredging has been used to extract sand from the Nepean River. Dredging has consent but is no longer occurring.

2.4.10 Product transport

All products and materials are brought onto the site and taken off the site by road transport. The main access gate is located south of the Menangle Road river crossing. Menangle Road is an arterial road which provides sub-regional access. Regional movement is mainly carried on the Hume Motorway that generally runs parallel to Menangle Road.

Menangle Road is generally a two-lane undivided carriageway with geometric alignment limitations in the vicinity of the site restricting the speed of travel. It has a sealed carriageway width of about 7.4 m, except on the bridge over the Nepean River, where the carriageway width is 5.0 m.

2.5 Access

Access to the site is from Menangle Campbelltown Road. The main access gate is beside the bridge over the Nepean River. Access to Stages 6 and 7 are approximately 300 metres south of the main access gate, on the Menangle Road.

2.6 Quarry life

Development Consent 85/2865 requires all stages of the quarry to be completed by 2020.

2.7 Rehabilitation and decommissioning

The rehabilitation objectives of the extraction operations are:

- to rehabilitate the land such that it may be returned to a natural form;
- to rehabilitate the land such that the soil surface is stable and erosion and pollution is minimised; and
- to develop stable attractive river banks in keeping with the surrounding area.

The EA prepared to support Development Consent 85/2865 outlined practices and procedures to achieve these rehabilitation objectives. Subsequent to consent being issued, Menangle Sand and Soil prepared *A Blueprint for Post-Extractive Rehabilitation at Menangle* June 1995 (the Blueprint Appendix C). A supplement to the Blueprint provides further information regarding the rehabilitation. The detailed processes for post-extractive rehabilitation include: a works program, weed control, species selection and maintenance.

Rehabilitation has been consistent with the procedures outlined in the Blueprint. The rehabilitation of the historic and Menangle Sand and Soil Quarry area has been very successful in restoring a high quality vegetation community. Ecohort 2009a, *Final Report for Rehabilitation Works Carried out on the Menangle Sand and Soil Extraction Site, Menangle*, within the Campbelltown LGA, Glenhaven, certified that the work completed at both sites was easily compliant with the requirements of the *Vegetation Management Plan*.

2.8 Site infrastructure and services

2.8.1 Site buildings

There is a compound containing the administrative offices and allied buildings immediately east of Menangle Road (Figure 1.2). The compound comprises:

- a site office and amenities building, housing offices, kitchen amenities and soil laboratory;
- a wheel wash and weighbridge are located at the top of an elevated bank, level with the floor level of the main building;
- a large workshop housing equipment and machinery; and
- fuel supply tanks.

2.8.2 Water supply

The quarry currently holds a DPI Water approval for water supply works and water use (10WA116934) to extract water from the Nepean River. This approval was extended by 10 years in July 2014. The water is used for dust suppression and sand washing within the processing area.

2.8.3 Electricity

Mains electricity is available to the site.

2.9 Waste management

Workshop wastes are removed from site by an appropriately licensed contractor. Wastes from the amenities are directed to a septic system.

2.10 Environmental management

The site operates under the following consents, licences and permits:

- EPL 3991;
- Development Consent 85/2865; and
- Water use approval 10WA104627.

2.11 Hours of operation

The existing development consent allows the quarry to operate over the following hours:

- 6 am to 5 pm Monday to Friday;
- 6 am to 12 pm Saturday; and
- with no operations on Sundays or public holidays.

2.12 Employment

The current operations employ 16 people. These include six management/administration/sales staff, eight production and two maintenance staff. In addition, there are several subcontractors delivering and dispatching material. When there is an additional demand for production, staff from other Benedict sites are brought in to assist. In addition, Benedict and contract truck drivers deliver materials to the site and products to customers.

The current operation has provided ongoing employment since 1978. The operation adds value to the broader local and regional economy via horizontal and vertical linkages with other landscaping and construction industries dependent on the raw product to be extracted.

3 Proposed operations

3.1 Resource

3.1.1 Geology and soils

The resource in the Stage 8 area is similar to that in the approved quarry areas. Detailed cross sections of the proposed extraction areas are shown in Figure 1.2.

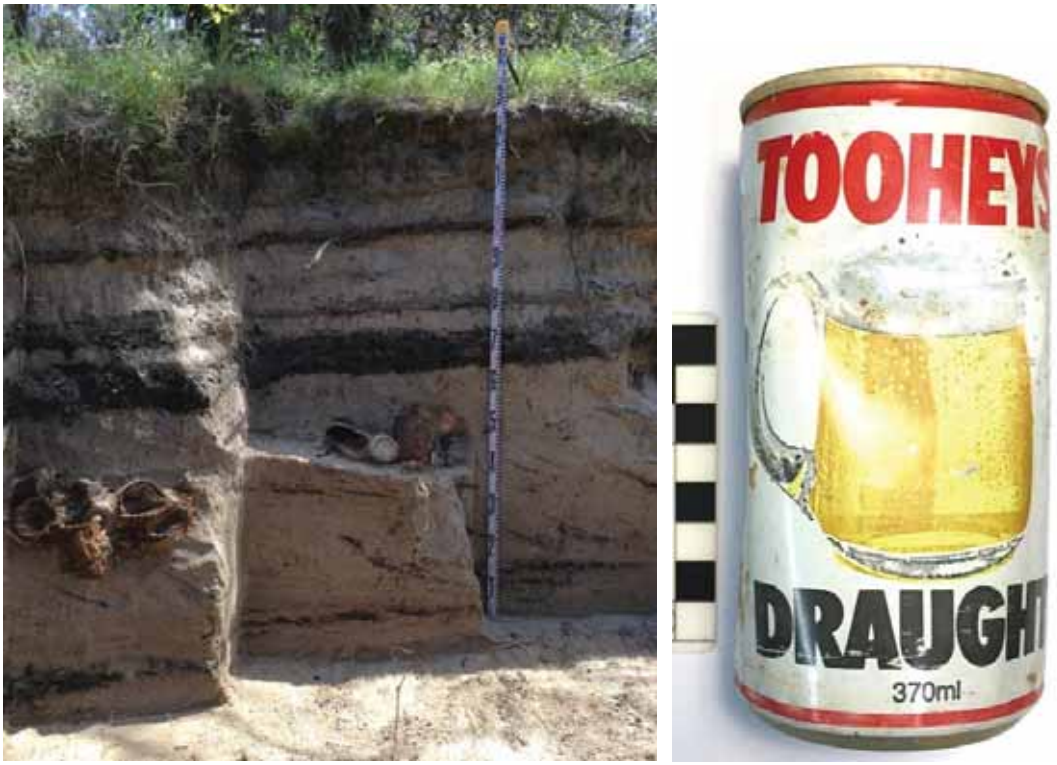
In the Stage 8 area the landform comprises an incised plateau with steep-sided river bank rising to an undulating to steep plateau area. An undulating flat sandy bank runs along the western edge of the river.

Within the Nepean River valley, soils vary according to parent geology and elevation. The soil types in and around the Stage 8 area comprise:

- red podsolics, generally located on steeper hills either side of the Stage 8 area;
- podsols, derived from a mixture of shale and sandstone, including yellow podsolics; located on the hill system to the west and south-west of the Stage 8 area; and
- watercourses.

The alluvial sediments in the Stage 8 area would have derived from the Hawkesbury Sandstone of the Woronora Plateau (see Appendix C of Appendix I). Swamps that store significant quantities of sediment are known to occur in the uplands of the plateau (Tomkins et al. 2006) and are likely to be immediate source for alluvial deposits the Stage 8 area that are downstream. The stratigraphies of those swamps show evidence of cut and fill episodes occurring continuously since initial formation (Tomkins et al 2006), which began up to approximately 17,000 years before present (BP) (Young 1982; Young 1986).

Deposition is rapid in parts of the Stage 8 area as demonstrated by the occurrence of a beer can manufactured between 1965 and 1983 at a depth of about 80 cm (Photograph 3.1) in the southern part of the Stage 8 area.



Photograph 3.1 **Tooheys Draught beer cans found eroding out of the bank in the southern zone on the lower terrace.**

3.1.2 Proposed disturbance area

Extraction will occur across two areas in the Stage 8 area, a northern and a southern extraction area (Figure 1.3). In addition, it is proposed to restore the bank upslope of the extraction area. This will include the removal of extensive exotic vegetation in the restoration area, allowing restoration of the entire bank, back to a sustainable high quality native ecosystem.

A conveyor will be installed (with diesel generator) under the Hume Motorway, to minimise truck movements in the vicinity of the motorway. It is proposed that this conveyor will be progressively extended south as the extraction moves south (see section 3.1.5) The conveyor will require the clearing of some exotic vegetation (large Privet trees) under the bridge, however this will be done as part of the restoration (offset) program. The conveyor will be a temporary structure that will be removed upon completion of the project. It will require a 1 m wide corridor and will be constructed on the edge of the existing access track through the proposed restoration area and proposed extraction area, and therefore will not require additional vegetation clearing or offsets. The conveyor route will be selected such that no native trees are cleared.

Proposed extraction and restoration areas are shown in Table 3.1.

The saleable resource in the Stage 8 area is estimated to be 760,000 tonnes. Extraction will occur at a minimum of 10 m setback from the 64 m AHD height contour (ie 3 m above the level of the Nepean River, 61 m AHD as defined by the downstream weir). This will leave the existing river bank intact (except where exotic non-native trees should be removed).

Table 3.1 Stage 8 extraction and restoration areas

Site area	Area (ha)
Northern extraction area	3.17
Southern extraction area	9.82
Total Stage 8 extraction area	**12.99**
Northern restoration area	1.50
Central restoration area	2.62
Southern restoration area	9.16
Total Stage 8 restoration area	**13.28**
Total Stage 8 area	**26.33**

3.1.3 Available resource

The volumes of available extractable resource have been calculated using GIS spatial analysis of selected cross sections at 4 different locations in Stage 8 (Figure 3.1). Volumes were then translated into a mass measurement as per the methodology outlined below and as shown in Table 3.2 and Table 3.3.

The total volume of material within the defined Stage 8 extraction area is 751,000 m^3 assuming:

- the water table in the alluvium is at the same elevation as the surface of the Nepean River; and
- that base of the pit is 1 m above the water table; and
- pit faces are vertical.

The total volume of the extractable resource is 497,000 m^3 assuming:

- weed bearing topsoil is removed, buried and not processed; and
- the extractable resource is 80% of the total volume below the topsoil, allowing for batters and pockets of material that cannot be extracted.

The total tonnage of extractable resource is 894,000 tonnes assuming a bulk density of 1.8 tonnes/m^3.

The total tonnage of saleable resource is 760,000 tonnes assuming 15% of the extractable resource is scalps. Development Consent 85/2865 allows for up to 350,000 tpa to be extracted at the quarry. The upper limit of raw materialextraction in stage 8 will be 150,000 tpa.

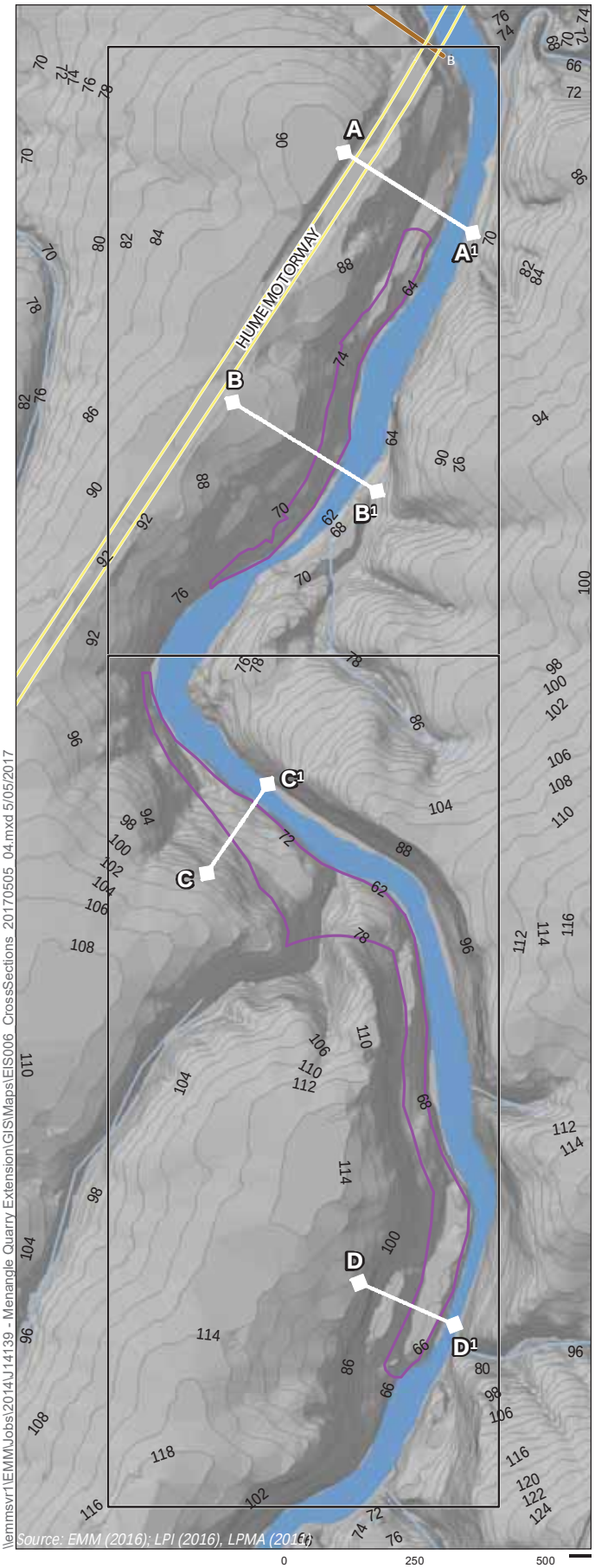
The above analysis is summarised in Tables 3.2 and 3.3 below.

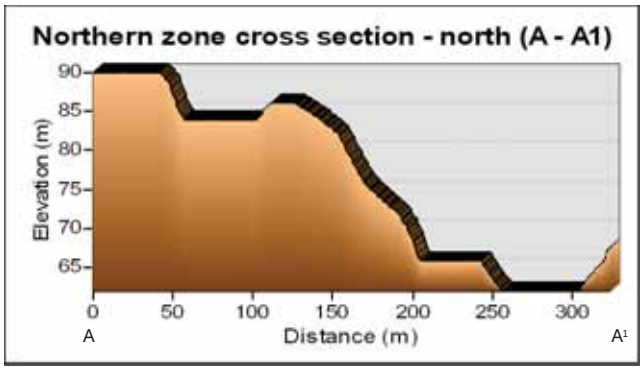
Table 3.2 Volume of resource by area

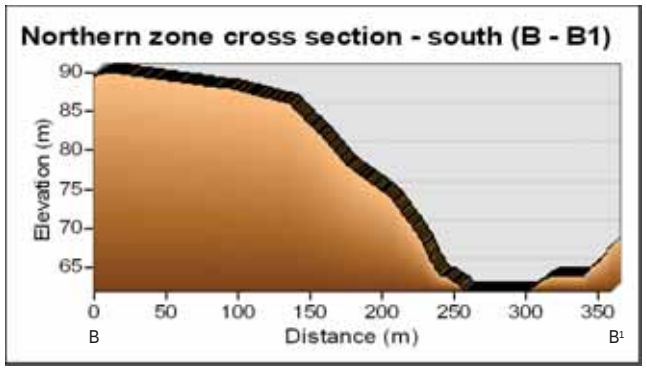
Project element	Volume
Northern extraction area volume	119, 938 m^3
Southern extraction area volume	630, 781 m^3
Total	**750,719 m^3**
Top soil area (1 m depth)	
Northern extraction area	31,700 m^3
Southern extraction area	98,200 m^3
Total	**129,900 m^3**

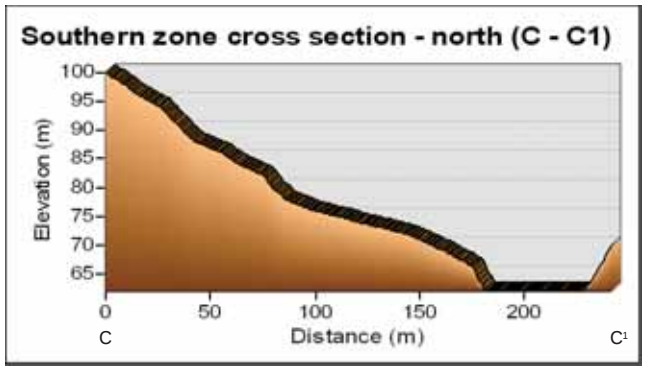
Table 3.3 Summary of volumes and tonnage by area

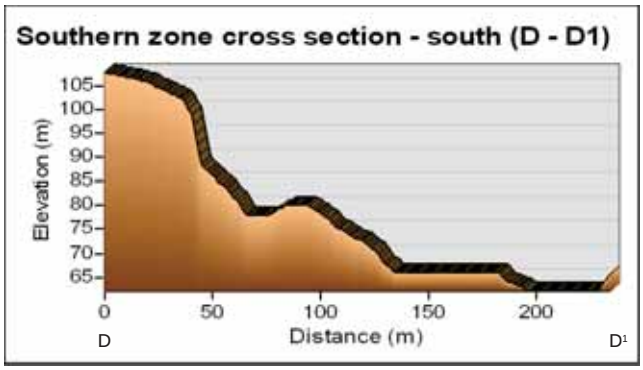
Summary	Volumes
Total volume above 64 mAHD	750,719 m^3
Topsoil volume (1 m depth)	129,900 m^3
Total volume of resource	**620,819 m^3**
Unextractable material (batters, difficult pockets, etc)	20%
Total volume of extractable resource	496,655 m^3
Bulk density	1.8 tonnes/m^3
Tonnes	
Total volume of resource (ROM)	893,979 tonnes
Scalps	15%
Total volume of saleable resource	**759,882 tonnes**











KEY

Project elements

- Conveyor under Hume Motorway
- Stage 8 - Proposed Extraction Area
- Hume Motorway
- 2 m contour
- Drainage line
- Nepean River

Cross sections used to calculate volume of resource

Menangle Quarry Extension
Environmental Assessment
Figure 3.1

\\emmsvr1\EMM\Jobs\2014\J144139 - Menangle Quarry Extension\GIS\Maps\EIS006_CrossSections_20170505_04.mxd 5/05/2017

3.1.4 Modification components

Key components of the existing quarry will include:

- Stage 8 extraction and restoration areas;
- a conveyor; and
- a haul road.

The indicative equipment to be employed in the Stage 8 extractive operations are listed in Table 3.4

Table 3.4 Indicative equipment

Item	Activity
Excavator (35 t) such as a Komatsu PC350 or equivalent	Sand and soil excavation
	Loading haul truck
	Tree removal and non-native/weed clearing
	Moving and stacking logs
	Replacing scalps and rehabilitation landform construction
Off-road haul truck (40 t) such as a Volvo A40G	Hauling sand and soil from extraction area to power screen at conveyor head
	Hauling scalps from power screen to extraction area
Front end loader such as a Volvo L150G	Loading sand and soil to power screen
	Loading scalps to haul truck
Power screen such as a Powerscreen Commander 1400	Screening scalps and feeding sand and soil onto conveyor
Conveyor (about 50 tonne/hour capacity) (See photographs 3.2 and 3.3)	Transporting sand and soil from Stage 8 area to processing area
Diesel generator (about 150 kVA)	Powering the conveyor
Portable timber mill	Use in campaigns once sufficient timber is stockpiled

Photograph 3.2 Example of the type of lightweight conveyor to be used on site

3.1.5 Quarry progression

Quarry staging/progression and quarrying activities are illustrated in Figures 3.2-3.9, and explained in further detail in Sections 3.1.5–3.1.8.

Vegetation clearing (pre-stripping), sand and soil extraction, reprofiling and rehabilitation associated within proposed Stage 8 will begin immediately to the east of approved Stage 7 extraction works.

Extraction will take place along the river over approximately 13, 1 ha stages, (stages 8a-8m), as shown on Figure 3.2. Each of the 1 ha areas represents a basic operating cell and will take approximately 1 year to complete extraction, depending on demand for product. Each sub-stage (8a-8m) will be progressively rehabilitated, including the restoration of the areas corresponding to the extraction sites.

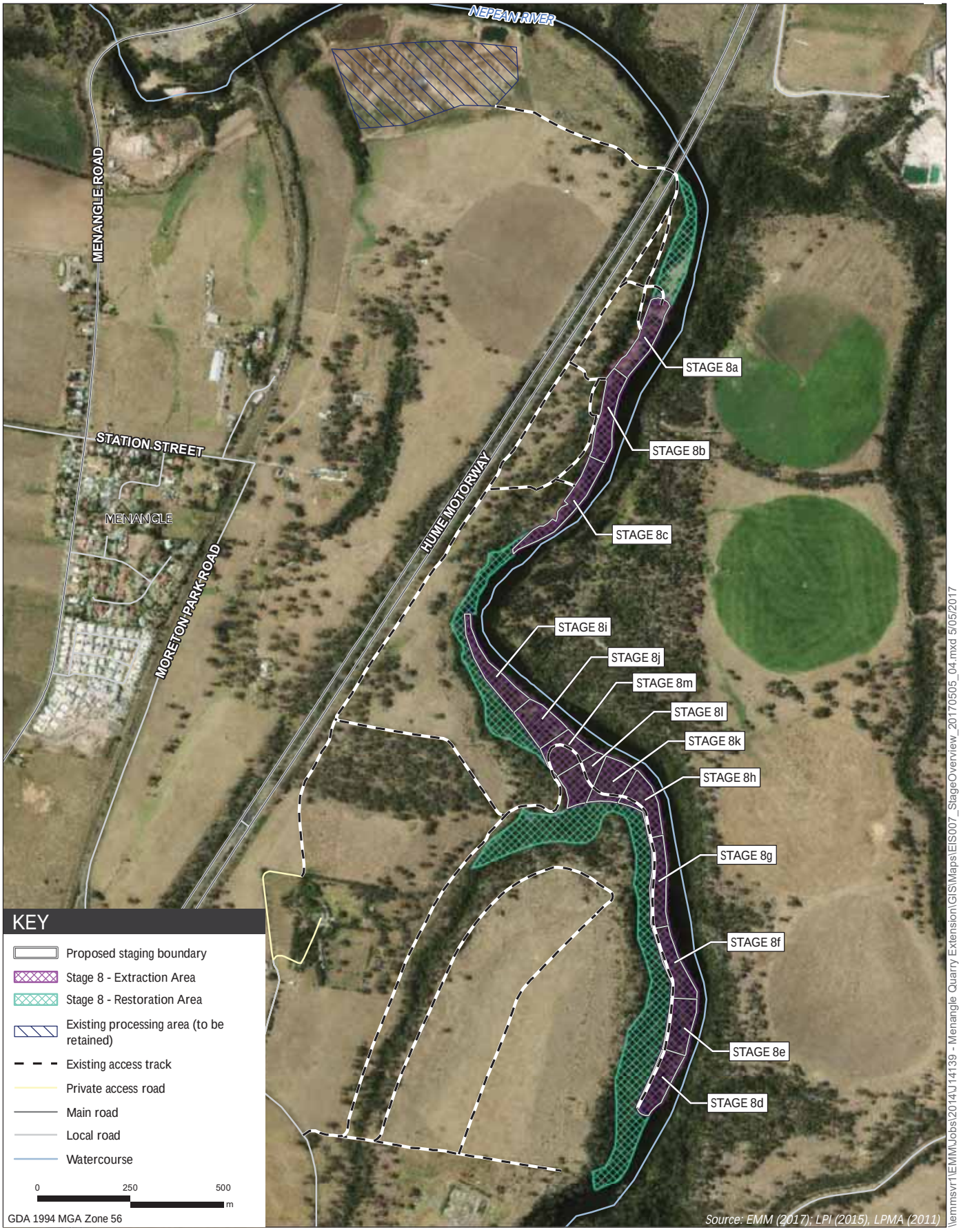
The sequencing and progression of extraction has been designed to ensure the efficient use of haulage roads, the placement of the conveyor and to take advantage of existing access tracks. Extraction activities will progress in accordance with the staging plans at Figures 3.3-3.7 and outlined in Table 3.5

Table 3.5 Quarry progression

Stages	Direction of operations
8a-8c	Quarrying in the northern section of Stage 8 will commence at 8a and extend southwards to stage 8c (Figure 3.3)
8d-8h	The next stages will commence at the southern most point of the southern extraction area and progress north to stage 8h (Figure 3.4)
8i-8j	Operations will then shift to the northern tip of the southern extraction area and move south from 8i to 8j (Figure 3.5)
8k-8m	Quarry operations for the last phase of extraction will commence mid-way in the southern extraction area at 8k and move northwards to 8m (Figure 3.6). The rehabilitation of this area will complete the final stage of the quarrying operation (Figure 3.7).

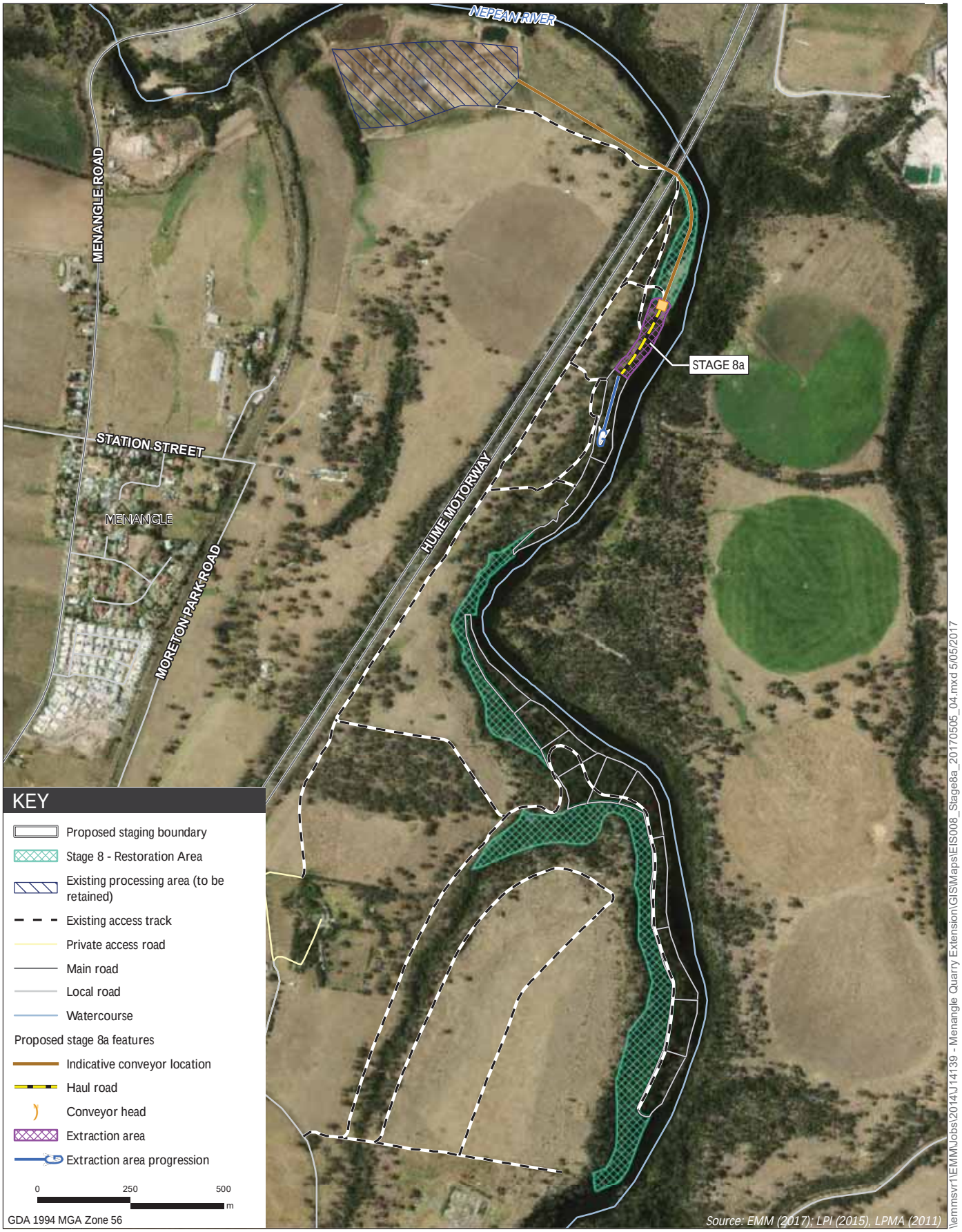
The main infrastructure within each stage including internal haulage roads, access tracks and conveyor line and conveyor head location are shown on each of the staging figures. To minimise impacts, haulage roads and conveyor lines are located along the edge of the extraction areas where practical. Materials will be transferred from the southern end of the site to north in accordance with each of the staging plans and using the access tracks and haulage roads shown.

Vegetation clearing, extraction, reprofiling and rehabilitation will be consistently undertaken for each operating cell generally in accordance with Figure 3.8.

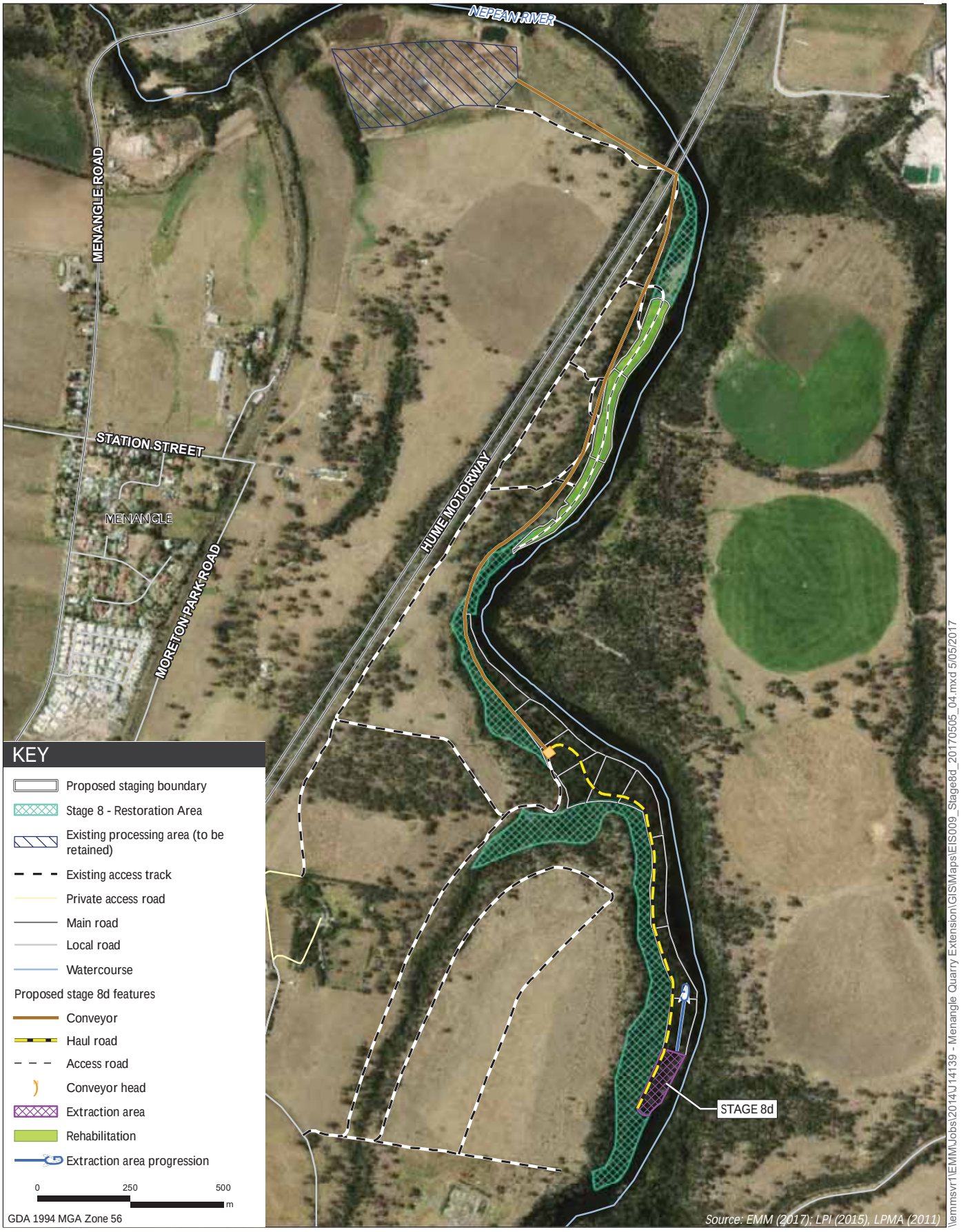


Overall staging plan for Stage 8

Menangle Quarry Extension
Environmental Assessment
Figure 3.2

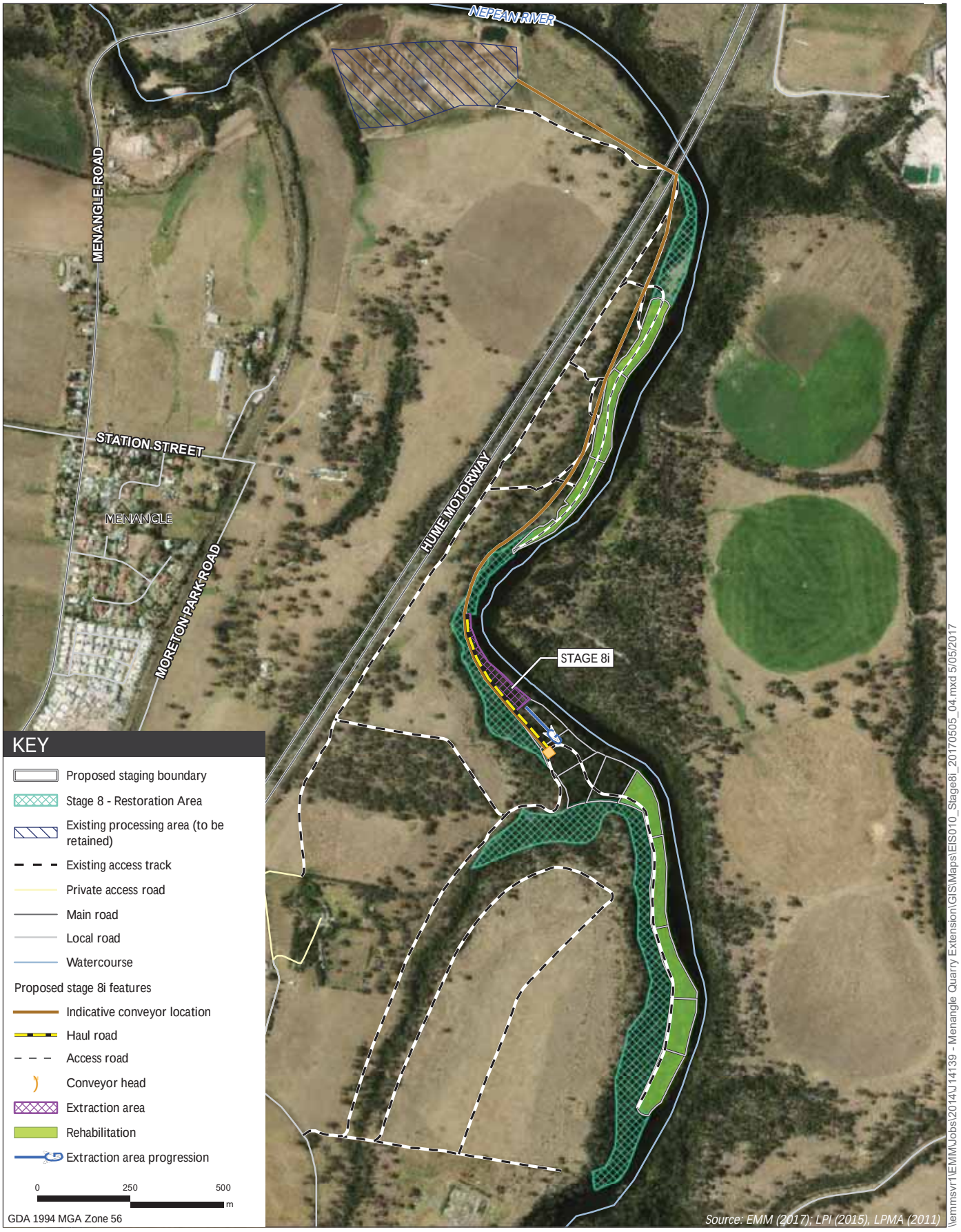


Proposed stage 8a
Menangle Quarry Extension
Environmental Assessment
Figure 3.3



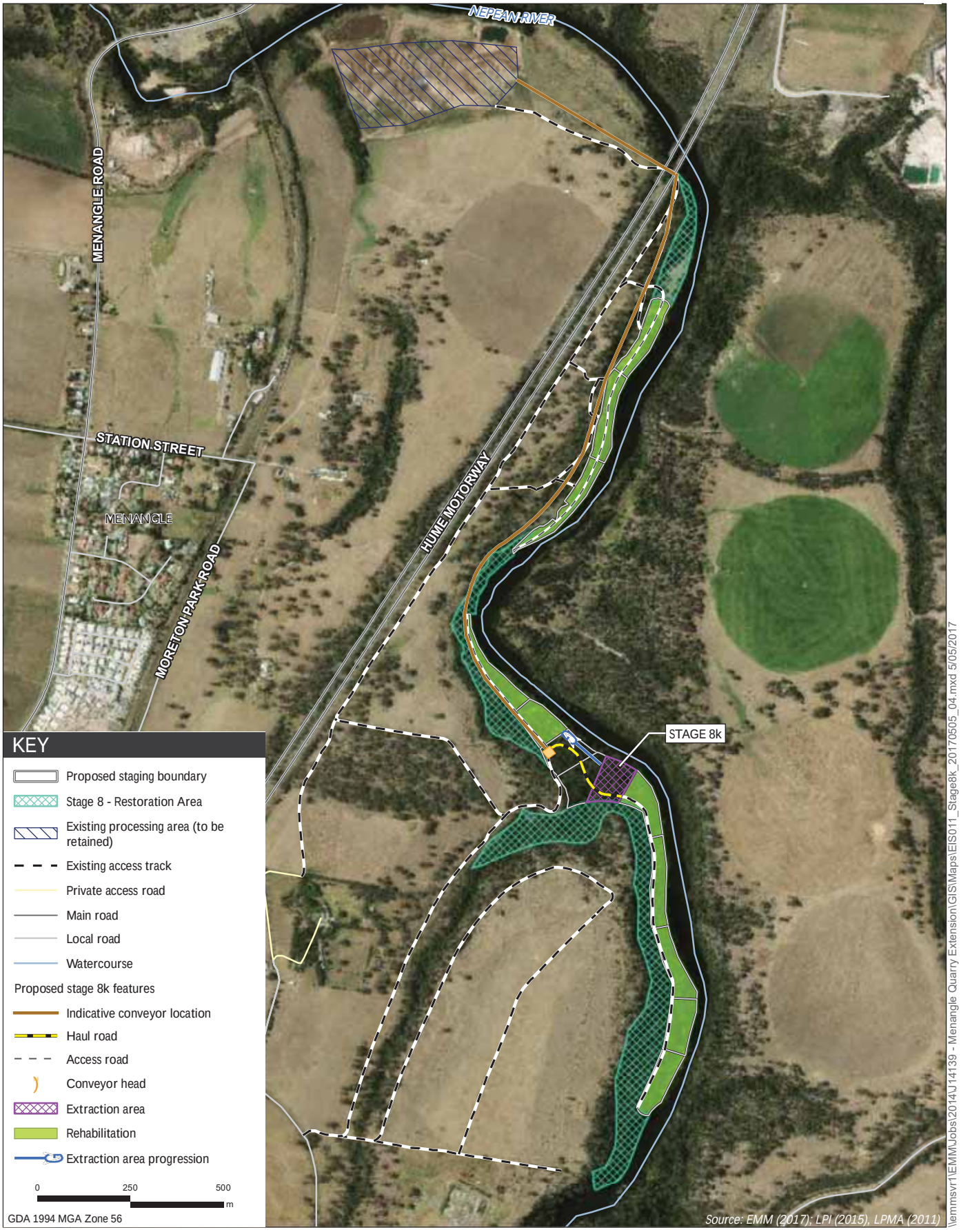
EMM

Proposed stage 8d
Menangle Quarry Extension
Environmental Assessment
Figure 3.4



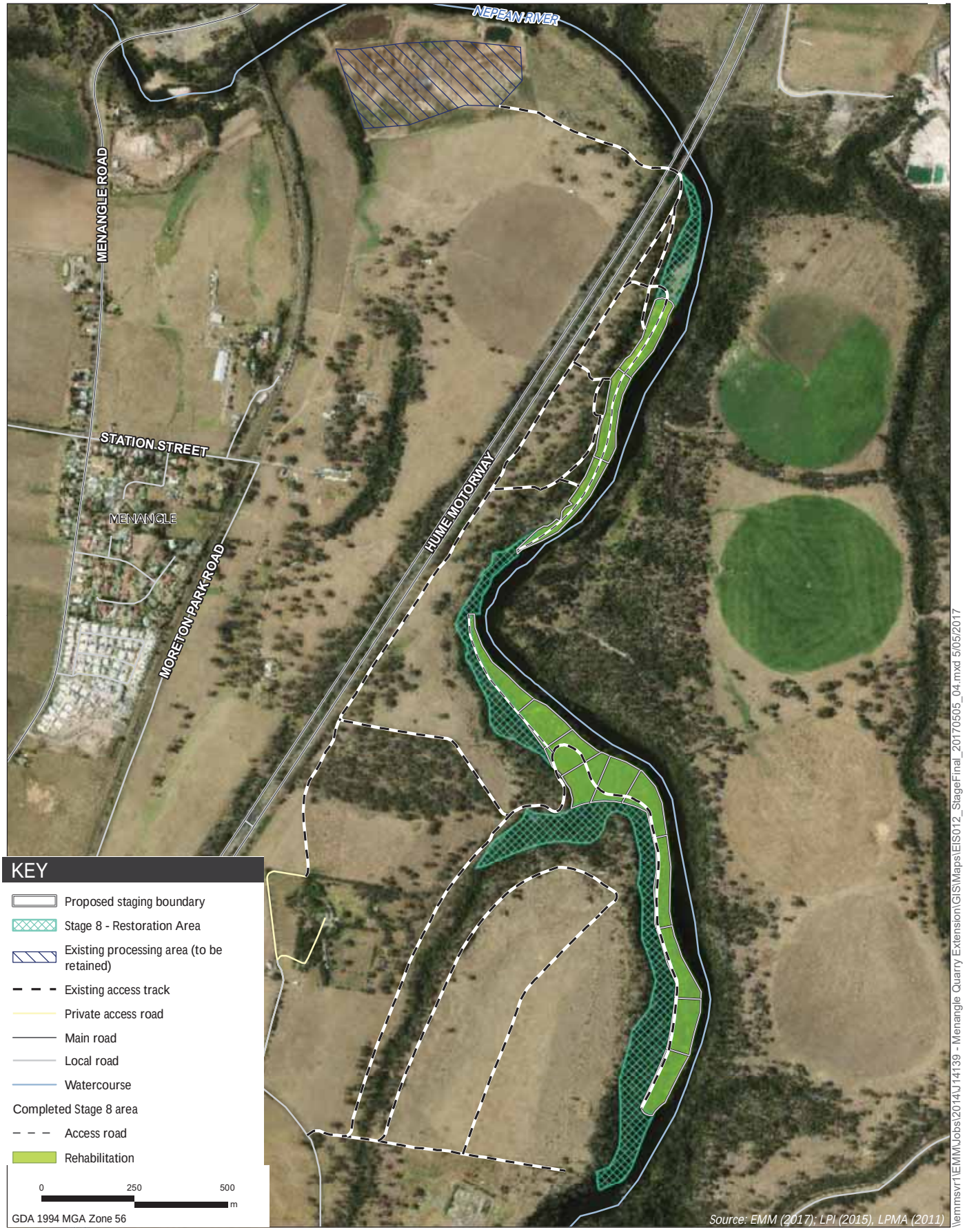
EMM

Proposed stage 8i
Menangle Quarry Extension
Environmental Assessment
Figure 3.5



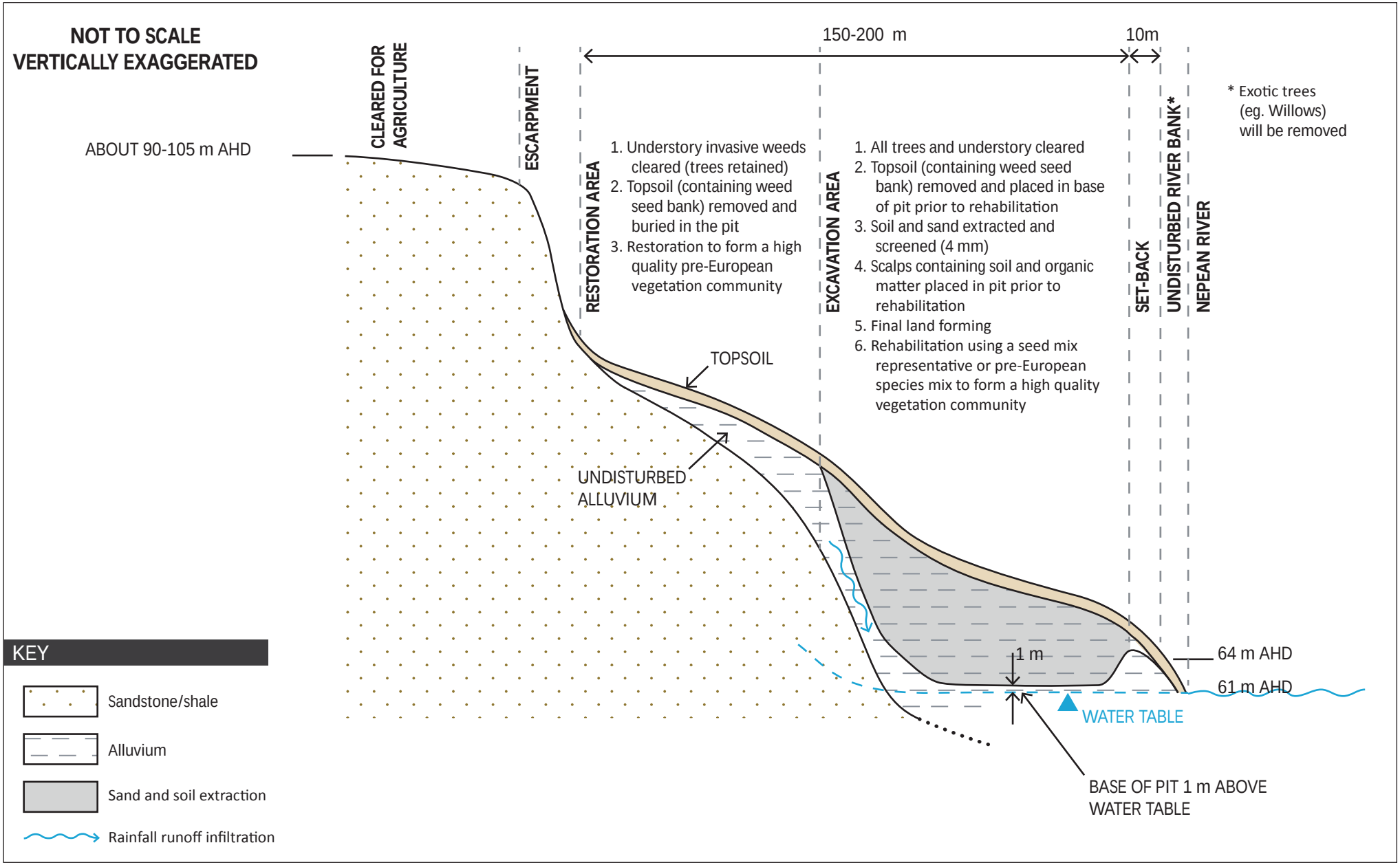
EMM

Proposed stage 8k
Menangle Quarry Extension
Environmental Assessment
Figure 3.6



EMM

Completed Stage 8 area
Menangle Quarry Extension
Environmental Assessment
Figure 3.7



Schematic cross-section
Menangle Quarry Extension
Environmental Assessment
Figure 3.8

3.1.6 Erosion and sediment control

Water management infrastructure and soil and erosion controls are shown in Figure 3.9.

During extraction, erosion and sediment control works would be implemented to conform to the industry best management practices as detailed in the "Blue Book". The proposed controls would consist of the following onsite water management measures.

- a bund formed by the undisturbed river bank (refer Figure 3.8) and swale along the river edge to divert runoff to the sedimentation basin;
- a bund and swale along the landward boundary of the extraction area to divert clean runoff from the escarpment around the extraction area and into the river;
- check dams along swales to trap sediment prior to discharge to the sedimentation basin;
- sedimentation basin sized to trap runoff and allow treatment in accordance with risk management approach in the Blue Book;
- pumpout of water from the sediment basin when total suspended solids (TSS) is 50 mg/L or less (although there has never been a need to pump in the history of extraction operations at the quarry);
- regular maintenance of the erosion and sediment control measures; and
- use of stored water in the sedimentation basin for dust suppression on the site if needed.

The sediment control measures will maximise the removal of the suspended sediment in runoff before discharging to the sediment basin. Water in the sediment basin would be stored until the suspended solids concentration is 50 mg/L, or less. Based on the risk management approach in the "Blue Book", the stored runoff needs to be pumped out within 5 days so that storage is available for the next storm. Pumping of the sedimentation basin has never been required in the history of extraction activities at the Menangle Sand and Soil quarry. Flocculation may be necessary at times to reduce the suspended sediment concentration below 50 mg/L to permit pump out of the stored water.

The risk management approach in the Blue Book is based on a design storm and as such, it predicts that larger storms will cause overflow of the basin approximately 2 to 4 times per year on average.

The extraction will occur in stages along the river in areas of approximately 1 ha. Given the typical width of the terraces, these stages will have dimensions of approximately 50 m x 200 m. The sediment erosion and control plan (ESCP) will progressively advance with these stages and be self-contained for each stage.

The total size of the sedimentation basin required for each 1 ha stage is 273 m^3 (see Appendix F). This includes allowance for the settling volume and storage of sediment. The basin would be constructed as either one, two or three basins depending on the operational features. The basins will be approximately 1 m deep and as such would have typical dimensions of:

- one basin – 8 m x 35 m;
- two basins – each 6 m x 23 m; and
- three basins – each 5 m x 18 m.

For each stage, the vegetation and topsoil would be cleared around the location of the proposed first basin and the basin installed. Then the remainder of the first component of the stage would be cleared of vegetation and topsoil. The bund and swale would be installed along the river and landward boundaries of the stage including the check dams at regular intervals along the swale.

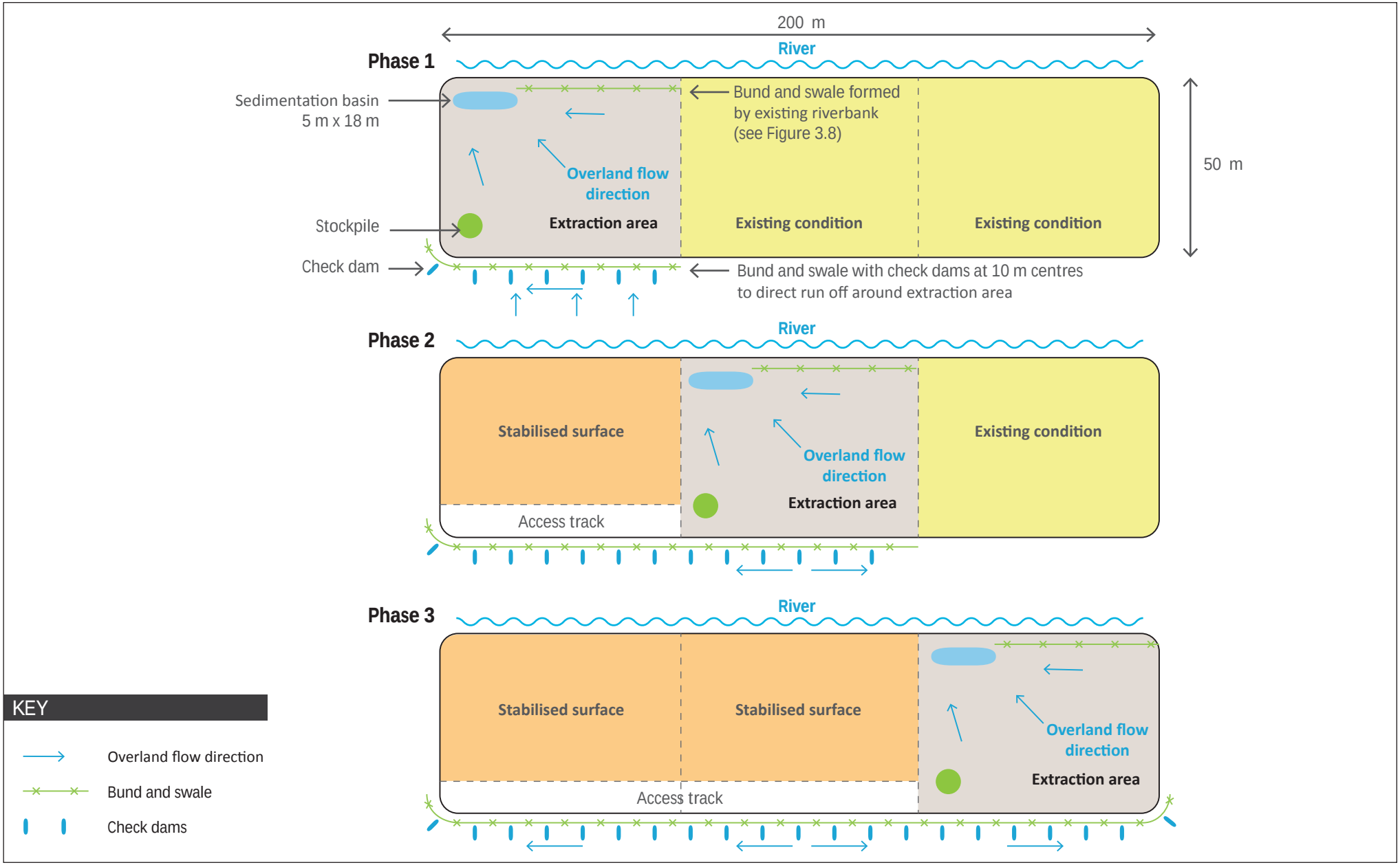
The second and following components of each stage would be progressed in the same way accompanied with sediment control measures as depicted in the ESCP. After each storm, the sediment control measures would be checked and where necessary repaired or sediment removed.

The annual water balance for the extraction area is presented in Attachment B of Appendix F for a stage broken into three separate component areas (three sediment basins). In this scenario, 3,300 m^2 of the stage would be cleared and disturbed at any one time with one sedimentation basin to capture runoff.

Monitoring of the ESCP will include recording:

- daily rainfall from Menangle Bridge gauge;
- daily water level in the sedimentation basin;
- turbidity values in the basin after each storm if there is the potential requirement to pump out the basin; and
- monthly check and record of depth of sediment accumulation in sediment basin.

The accumulated sediment in the sediment basin should be removed when the sediment depth reaches 0.3 m. This will restore the full allowance for water and sediment storage.



Erosion and sediment control plan

Menangle Quarry Extension
Environmental Assessment

Figure 3.9

3.1.7 Vegetation clearing

Quarrying in the Stage 8 area will require unavoidable vegetation clearing (of mainly exotic species) prior to extraction of the resource. Approval for the extension will be dependent on the provision of biodiversity offsets. The offsets are proposed to be provided immediately adjacent to the Stage 8 extraction area in the Stage 8 restoration area. Menangle Sand and Soil also propose to modify the consent so there is no quarrying in the Stage 3 area thereby permanently protecting that vegetation from the clearing permitted under the current consent.

Vegetation will be cleared using the site excavator. The timber will be stored on site, prior to being periodically milled onsite using a portable mill. The milled timber will be used for fencing adjacent properties as part of their re-development. This will include on "The Creamery" lands for which a rezoning application is currently being determined that will permit a tourist venue with a brewery, restaurants, function centre and accommodation. If this development does not proceed, fence posts will be supplied to alternative areas in the region.

Vegetation will be cleared in 'campaigns' ahead of sand and soil extraction. The area cleared at any one time will be minimised, but will provide sufficient area to allow safe operations in the extraction area (allowing for the height of standing trees). Some of the trees that will be used for timber may be selectively felled ahead of the extraction area to allow efficient on-site milling of the timber in batches. The maximum extent of the cleared, but un-rehabilitated, extraction area will be 1 ha.

3.1.8 Topsoil removal

Topsoil removal and stockpiling will be consistent with current practices where, once the land has been cleared, topsoil is stripped to a depth of approximately 0.5 m. However, given that the topsoil in the Stage 8 area contains the seedbank for the noxious weeds infesting the area, this material must be placed in the bottom of the pit (Figure 3.8).

3.1.9 Sand and soil extraction

Excavation activities will be setback a minimum of 10 m from the 64 m AHD height contour (ie 3 m above the level of the Nepean River, 61 m AHD, as defined by the downstream weir) to leave the existing river bank intact, except where exotic trees need to be removed (Figure 3.8).

Sand and soil will be extracted using a 35 t excavator (or similar) and loaded to a 40 t off-road haul truck (or similar). The material will be hauled to a conveyor head area and tipped. It will then be loaded into a self-powered screen which will remove the oversized material (>4 mm scalps). These scalps will be hauled back to the open excavation for use in rehabilitation (Figure 3.10). The screen will discharge sand and soil onto the conveyor which will transport the material under the Hume Motorway to the existing processing area.

Initially, the conveyor loading point will be located at the northern end of the Stage 8 area. The conveyor will be lengthened and conveyor loading point moved south as the extraction area moves further south. (See Figures 3.3-3.7 for conveyor length and conveyor head location).

Proposed Stage 8 works include the progressive construction of a haul road within the proposed stage 8 area. (See Figures 3.3-3.7 for location of haul road). This haul road will follow the existing cleared tracks

The use of the conveyor will minimise the need for haul roads within the extraction areas. Overland conveyors have a much smaller operational footprint than mobile equipment.

3.1.10 Stockpiling, processing and blending

There will be no changes to the stockpiling, processing and blending procedures at the site. To extend the life of the soil resource, Menangle Sand and Soil are influencing the market towards quality blended products incorporating increasing amounts of recycled product.

3.1.11 Dispatch and product transport

No change to the dispatch or number of trucks travelling to and from the quarry on public roads is proposed.

3.2 Quarry life

The proposed modification to the existing consent for the quarry will extend the approved life of the quarry for 15 years from 2020 to 2035.

3.3 Rehabilitation and restoration

The Stage 8 extraction area will be progressively rehabilitated and restored using similar methods to those as successfully implemented in the Stage 1–2 and Stage 4–5 areas (see Section 2.7). The company's rehabilitation of cleared and extracted land has been widely accepted as highly successful. Rehabilitation and restoration activities at the Menangle Quarry have been generally guided by *A Blueprint for Post-Extractive Rehabilitation* (Fraser 1995). This document was prepared for Menangle Sand and Soil as a basis for undertaking restoration works when extraction began in Stage 4, the Campbelltown/trotting track section of the quarry. (see Appendix D).

Rehabilitation of previous extraction stages has resulted in the restoration of the area to its pre-European condition. To illustrate the rehabilitation methods currently employed in the other parts of the quarry, Vegetation Management Plans (VMPS) for Stage 7 have been included in Appendix C.

Rehabilitation works were undertaken in completed historic quarrying areas between 1995 and 2008. Rehabilitation works were undertaken in completed Menangle Sand and Soil Quarry areas between 2003 and 2007. The *Final Report for Rehabilitation Works Carried out on the Menangle Sand and Soil Extraction Site, Menangle, within the Wollondilly LGA* (Ecohort 2009b) documented a final audit of quarry rehabilitation areas west of Menangle Road to confirm the very successful rehabilitation of these areas.

As part of the rehabilitation program, native seeds were collected from the site and also sourced from local nurseries with a maximum provenance of 15–20 km from the site. A variety of revegetation methods were used including the spreading of stored topsoil from the sites, hydroseeding and planting advanced trees, tubestock and virocells. Sixty nine different species representative of the endangered ecological community at the sites (River Flat Eucalypt Forest) were used. Protective fencing was installed around the rehabilitation areas. A high overall success rate was observed at rehabilitation sites, with the extent and density of native vegetation across the site found to be in excess of the requirements outlined in the VMPs for previous stages.

Ecohort attributes the success of the rehabilitation program to regeneration from the re-spread topsoil from the site and hydroseeding. A total of 53 species representative of River Flat Eucalypt Forest self-regenerated following topsoil re-spreading, including the Brown Pomaderris (*Pomaderris brunnea*), listed as a vulnerable species under the TSC Act. The post-rehabilitation native species diversity is much higher than observed in most remnant patches of River Flat Eucalypt Forest across its range, as many of these patches are in a highly disturbed condition. The rehabilitation of the historic and Menangle Sand and Soil Quarry area has been very successful in restoring a high quality vegetation community. Ecohort certified that the work completed at both sites was compliant with the requirements of the VMPs.

The bank upslope of the extraction area will also be restored, including the removal of extensive invasive weeds and their soil seedbank. This will assist in returning the entire river bank to a sustainable high quality ecosystem. This is in Menangle sand and Soil long term interest as entities associated with it own the land.

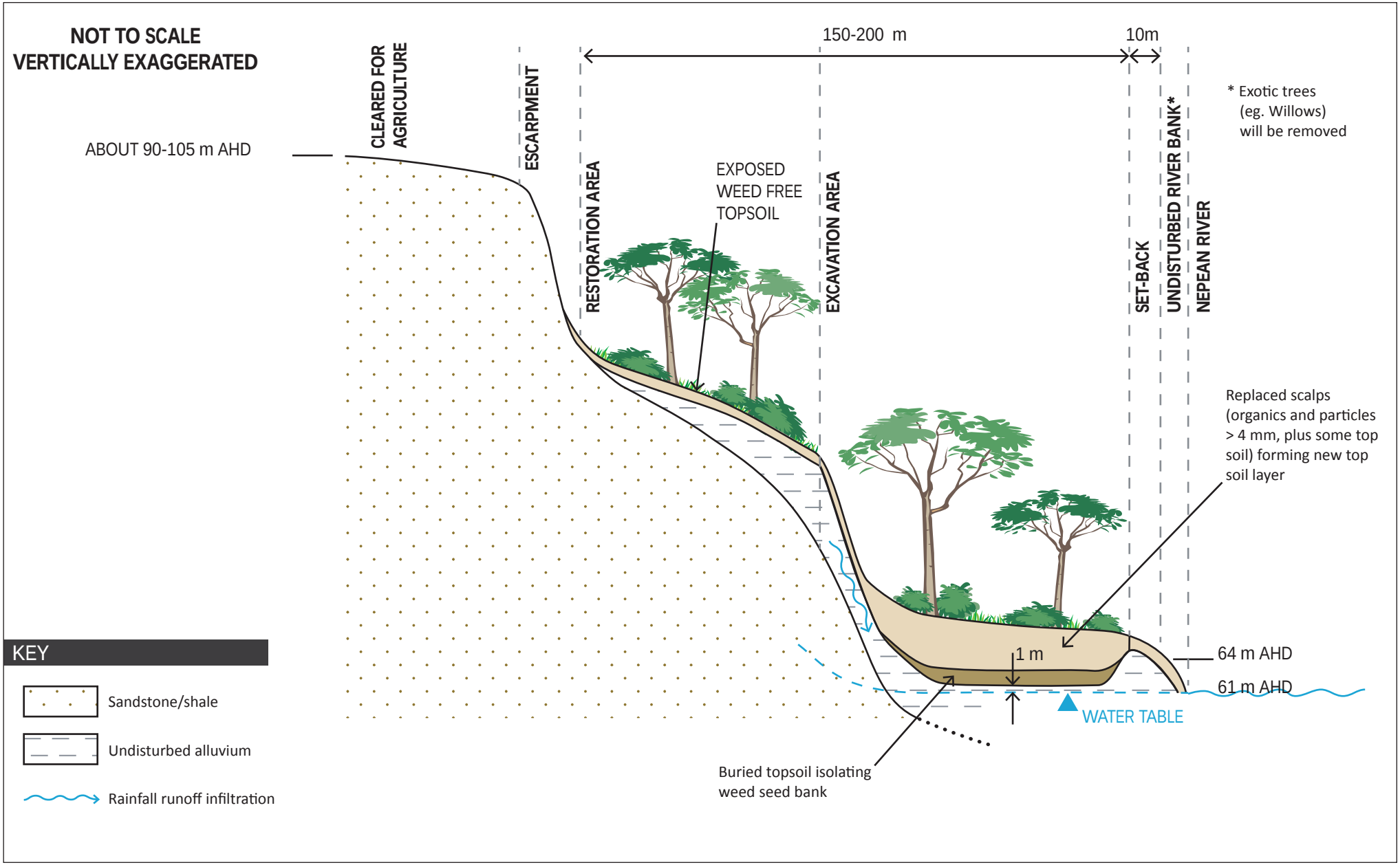
Restoration will occur in accordance with the staging of operations illustrated in Figure 3.2. Clearing of the understorey and invasive weeds in the restoration areas adjoining each active extraction area will occur after extraction to minimise risk of weed seed spreading into exposed parts of the quarry.

Restoration will also be undertaken in accordance with a Stage 8 VMP similar to those prepared for previous stages of the quarry (see Appendix C). The Stage 8 VMP will set out the necessary regeneration and reconstruction works, planting regimes and maintenance.

A schematic cross-section outlining the post rehabilitation and restoration landform is presented in Figure 3.10. As per previous stages, progressive rehabilitation of the Stage 8 area will include (in order):

- placing stripped soil from weed infested parts of the extraction area into the base of the pit;
- placing soil removed from weed infested parts of the restoration area into the base of the pit;
- placing scalps (including soil clumps >4 mm, as well as some soil fines and organic matter such as roots) into the pit - there will be sufficient scalps that the pit will be filled to the level of the berm formed by the undisturbed lower river bank;
- forming the final land surface so that there is a minimum slope of 1:50 (vertical:horizontal) to ensure that it is free draining; and
- installing controls as required to slow the velocity upslope runoff.

The rehabilitation area will be fenced and hydro seeded using a seed mix representative of pre-European species mix to form a high quality vegetation community. The main ongoing management actions will be the prevention of erosion and the control of weeds within the rehabilitation areas. The conveyor will be removed from the Stage 8 area following completion of extractive activities leaving a high quality ecosystem along the Nepean River.



Schematic final landform cross-section

Menangle Quarry Extension
Environmental Assessment

Figure 3.10

EMM

3.4 Site infrastructure and services

3.4.1 Site buildings

No changes to site buildings and infrastructure are required.

3.4.2 Water supply

The site will continue to employ the current infrastructure to extract water from the Nepean River. An automatic irrigation system and a polymer will continue to be used for dust suppression.

3.4.3 Lighting

No lighting will be required in the Stage 8 area.

3.5 Access

Access to the site will remain from Menangle—Campbelltown Road. The main access gate is beside the bridge over the Nepean River. Maintenance access to stage 8 will be via stage 7, following existing tracks under the Hume Motorway and into the restoration and extraction areas. The existing access tracks and proposed new haul roads will be used to haul the extracted sand and soil to the conveyor loading point and to access the restoration areas (Figure 3.3-Figure 3.6).

Preliminary advice from the Roads and Maritime Service (RMS) is that the access under Menangle Bridge will need to be restricted to light vehicles only, and will need to be sealed and comply with RMS drainage and pavements standards.

The earthmoving equipment, haul truck and other plant to service the site will access the Stage 8 area via Moreton Park Road. Major plant will remain on-site through-out the duration of the quarrying operations.

3.6 Hours of operation

No changes are proposed to the approved hours of operation.

3.7 Employment

The current workforce of 16 will not change as a result of the Stage 8 extraction operations. Development of stage 8 will allow continued employment for an additional 15 years at the quarry, without the need to extract material from the approved Stage 3 area.

3.8 Environmental management

Should the modification be approved, a variation to the EPL 3991 would be required to extend the EPL to include Lot 203 DP590247.

A Stage 8 Post Extractive Rehabilitation and Restoration Plan will be prepared detailing measures to be implemented in the Stage 8 area including: soil stripping and vegetation clearance protocols; erosion and sediment control measures; rehabilitation of the extraction area and adjacent restoration activities.

3.9 Project alternatives

An assessment of potentially extracting from alternative sites including the permitted Stage 3 area, alternative sites within the region and the alternative of do nothing, is provided below.

3.9.1 The previous proposal – Stage 3

An alternative to proceeding with quarrying the Stage 8 area is to proceed with quarrying in the approved Stage 3 area. This has the following disadvantages:

- Stage 3 is a dredging and bank extraction operation at the northern end of the quarry (Figure 1.2). The dredging operation commences downstream of the Stage 2 dry extraction area and continuing downstream for 1,160 m to within 200 m of Bergins Weir. The program was proposed to be subject to more detailed analysis of coal sludge known to lie on the bed of the river some distance upstream of the Weir, (Planning Workshop 1987). Dredging is not the preferred extraction method and is no longer used in other parts of the quarry. Should Stage 3 proceed, the river will be widened to 50 m while the bend near the end of Stage 2 will be straightened, giving a short length of river about 60 m wide. New banks will be constructed by dredging and dozing sand.

- The consent to extract the Stage 3 area lapses in 2020, and extraction in that area has not commenced. Regardless, the consent to quarry Stage 3 would need to be extended given the short time frame left on the consent.

- Despite Menangle having the rights and consent to quarry the sand and soil from the Stage 3 area, given its environmental sensitivity and significance, the EMAI and the DPI (owners of the land) would like to see the Stage 3 area protected from further quarrying operations.

- Whilst Menangle Sand and Soil has consent to extract from the Stage 3 area, the proposal represents an opportunity to substitute this approved area with the Stage 8 lands that it controls. This is rather than on the NSW government's Elizabeth MacArthur Agricultural Institute (EMAI) lands which are used for less compatible uses. EMAI, whilst recognizing the consent, would prefer to retain the landscape as it is. This proposal presents an opportunity to suit all parties whilst giving the best environmental outcome. See Appendix E for EMAI's confirmation of it preference.

3.9.2 Extraction from sites elsewhere in the region

Another alternative would be to extract sand and soil from other sites located elsewhere in the Sydney region.

Sites in the region with a potential for soil extraction have been documented in the department of Mineral Resources, *Sydney Extractive Industry Regional Environmental Study* 1984. Some of the implications associated with extracting these resources are:

- Remaining reserves within the region's existing extraction sites are small and will also be exhausted in the near future. Consents for quarrying activities at other quarries in the region eg Spring Farm Quarry (7 ha) and Wallacia are due to expire in 2019–2020.

- Some of the alternative sources in the region eg Lower Nepean, Agnes Banks, Freemans Reach and Windsor area contain extensive turf farms and soil extraction are prohibited under the zoning controls.

- It is uncertain to what extent, if any, extraction will be permitted from the other potential sources within the region. The strategic justification for extraction in the region still relies upon the 1984 Study referred to previously.

- A number of sites with known sand and soil deposits are environmentally sensitive and unsuited to extraction.

- The growth of Sydney is encroaching into the region surrounding and adjoining traditional extraction areas, which is putting pressure on activities due to potential for land use conflicts.

3.9.3 No extraction

Consideration has been given to not extracting soil from the Stage 8 area and not proceeding with Stage 3 as follows. Not extending extraction activities at the Menangle site is not a viable alternative.

- All of the soil resources in the Sydney area are along the Nepean River. This was recognised by the *Sydney Extractive Industry Regional Environmental Study* 1984.The deposits at the Menangle site contain a large proportion of the region's current and potential sources of approved extracted soil and are currently meeting 70% of Sydney's existing soil requirements. In one to three years this will be depleted, unless the extension is approved. The proposed extension will represent the bulk of Sydney's approved topsoil after 2020.

- *The Sydney Extractive Industry Regional Environmental Study* 1984, identified the Hawkesbury Nepean River as the only supplementary source to the Penrith Lakes Scheme. This resource is now even more significant as extraction in the Penrith lakes system has ceased. If an extension to quarrying activities is not permitted from the Menangle site the material needed to supply the Sydney region will have to be fully imported from deposits outside the region, (such as those on the Newnes or Somersby Plateaux). The greater costs of transporting sand and soil from these more remote sites will ultimately be borne by the community.

- The opportunity to maintain the current workforce of 16, and other jobs associated with the quarry for another 15 years will be lost.

- The opportunity to restore 26.27 ha of weed-infested community along the Nepean River to a high quality ecosystem will be foregone, together with the opportunity to provide for an integrated system of plantings as part of the restoration works within the Menangle quarry site;

- Alternative less suitable sites would need to be found to make up the shortfall in known demand for sand and soil resources in the region. Related to this, the loss of this area for sand and soil extraction would exacerbate the already serious undersupply of resources in the region.

4 Planning and statutory framework

4.1 NSW Legislation

This section describes the relevant provisions of NSW legislation, including NSW Environmental Planning and Assessment Regulation 2000 (EP&A Regulation), environmental planning instruments (EPIs) and development control plans (DCPs). No proposed instruments, planning agreements or coastal zone management plans are relevant to the proposed modification.

4.1.1 Environmental Planning and Assessment Act 1979

The EP&A Act and the NSW Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) provide the assessment and approvals framework for development in NSW. They are administered by the DPE and the Minister for Planning.

i Section 75W of the EP&A Act

It is proposed to modify Development Consent 85/2865 under Section 75W of Part 3A of the *EP&A Act*.

The subject consent 85/2865 was issued under Section 101 of the Act. Clause 8J(8) of the EP&A Regulation state:

> "(8) For the purposes only of modification, the following development consents are taken to be approvals under Part 3A of the Act and section 75W of the Act applies to any modification of such a consent:
>
> (a) a development consent granted by the Minister under section 100A or 101 of the Act,"

The current approval was granted by the Minister under Section 101 of the EP&A Act. Because of this, it may be considered under the now repealed Section 75W of the EP&A Act.

Specifically, advice received from the DPE was to the effect that a potential assessment pathway for the project is:

> A modification under Section 75W of the EP&A Act as the extant development consent was issued under Section 101 of the Act (refer to Clause 12 of Schedule 6A of the Act for transitional arrangements), which would be assessed by the Department.

The Minister's power to deal with a modification under Section 75W is broad, and it is for the Minister to determine what constitutes a modification.

ii Justification for modification request

The subject proposal is a modification because it will have limited environmental consequences beyond those taken into account in the original project assessment. This EA has assessed the potential environmental impacts of the proposed modification, including what are considered to be the key issues of surface water, biodiversity, air quality, noise impacts, heritage and rehabilitation. In each case it is considered that the proposed modification will have limited environmental impacts beyond what have already been assessed and approved in Development Consent 85/2865 (see Chapter 6).

The request for the modification is further justifiable having regard to the factors outlined below:

- Nature of the proposal – the activity is the same activity as that approved under consent 85/2865. The proposal is to swap one area of extraction for another on land contiguous with existing extraction areas along the Nepean River. Extraction activities will be undertaken consistent with preceding stages together with successful and best practice on-site water management, rehabilitation and restoration. In particular the proposal will create the opportunity to restore 26.27 ha of weed infested community along the Nepean River to a high quality ecosystem together with the opportunity to provide for an integrated system of plantings as part of the restoration works generally within the Menangle quarry site.

- Scale – the tonnes of extracted resource in Stage 8 is only slightly larger than what is approved for Stage 3 (see Table 1.1). With regard to area however, Stage 8 is actually a larger area than stage 3 given the topography of the site. Development Consent 85/2865 involved the construction and operation of a quarry in seven stages. The consent allows the extraction of a total of 7.7 million tonnes within an area of about 123 ha. The net change in volume of extractable material is 0.8%, whilst the net change in area is approximately 6%.

- Intensity – Although the activity is proposed to be undertaken in a new area, the intensity of activity in the Stage 8 area will generally be less than the activity proposed for Stage 3 should it proceed. Stage 3 relies upon the re-instatement of access roads and dredging, and the approved removal of a native vegetation community, currently being successfully managed by the EMAI. The number of persons employed, processing operations and the number of truck movements will not change. The intensity of extraction operations will be consistent with extraction operations in preceding stages of the quarry. Essentially, the intensity of activity will not increase but rather the activity will occur in an alternative location contiguous with existing extraction activity.

- Duration – It is proposed to extend quarrying activities for a further 15 years. However, increased reliance on blending recycled imported material with the extracted material has meant the rate of extraction is lower than the extraction rates proposed in the 1987 EIS, this has resulted in an extended quarry life.

If the quarry was a new development, it would meet the definition of designated development under Schedule 2 of the Environmental Planning and Assessment Regulation 2000 as it would extract more than 30,000 m^3 a year and is within 40 m of a natural waterbody. However, as a modification to an existing approval the project is not deemed to be 'designated development'.

4.1.2 Environmental Planning and Assessment Regulation 2000

The extension project would meet the definition of designated development under Schedule 2 of the Environmental Planning and Assessment Regulation 2000 if it were a new application, as it would extract more than 30,000 m^3 a year and is within 40 m of a natural water body. However, it is not designated development as it is a modification to an existing approval.

4.1.3 Protection of the Environment Operations Act 1997

The POEO Act is the principle NSW environmental protection legislation. It is administered by the EPA. The POEO Act requires that scheduled activities, which are defined in Schedule 1 of the Act, operate under an EPL.

Menangle Sand and Soil currently hold EPL 3991 which authorises the carrying out of the proposed activities. This EPL will need to be extended to include Lot 203 DP590247.

4.1.4 Threatened Species Conservation Act 1995

The NSW *Threatened Species Conservation Act 1995* (TSC Act) aims to conserve biological diversity in NSW through the protection of threatened and endangered flora and fauna species and ecological communities. The project requires an increase in the area of disturbance for quarrying activities. This may impact upon threatened or endangered species. All potential impacts of the extension project on threatened species are assessed in the *Terrestrial Ecology Assessment* (K) and are summarised in Section 6.7.

4.1.5 Native Vegetation Act 2003

The *Native Vegetation Act 2003* (NV Act) provides for the management of native vegetation in NSW by preventing broadscale clearing unless it improves or maintains environmental outcomes.

Section 12 of the NV Act states:

> Native vegetation must not be cleared except in accordance with:
>
> (a) a development consent granted in accordance with this Act, or
>
> (b) a property vegetation plan.

The proposal will extend the quarry into the new Stage 8 area and will require some vegetation to be removed. However, an approval under Section 12 of the *NV Act* is not required for projects assessed under S75W of the EP&A Act.

All potential impacts of the extension project on threatened flora are assessed in the *Terrestrial Ecology Assessment* (Appendix K) and are summarised in Section 6.7.

4.1.6 National Parks and Wildlife Act 1974

The NSW *National Parks and Wildlife Act 1974* (NPW Act) provides for nature conservation in NSW including the conservation of places, objects and features of significance to Aboriginal people. Under Section 90 of the Act, a person must not harm or desecrate an Aboriginal object or place without an Aboriginal Heritage Impact Permit (AHIP).

The extension into the Stage 8 area will require an increase in the area of disturbance for excavation and restoration. However, an AHIP is not required for projects assessed under Section 75W of the EP&A Act. The potential impacts to Aboriginal heritage are assessed in the Aboriginal Cultural Heritage Assessment (ACHA, Appendix I), and are summarised in Section 6.5.

4.1.7 Water Management Act 2000

The NSW *Water Management Act 2000* (WM Act) regulates the use and interference with surface and groundwater in NSW where a water sharing plan has been implemented.

The WM Act applies to licences to use water once a water sharing plan for that water source has commenced. The WM Act regulates water via granting of licences/approvals for taking and using water, and trading of both groundwater and surface water.

The quarry holds a licence to extract surface water from the Nepean River (see Section 6.2), and this would continue to be used to source water for dust suppression and processing.

Under the WM Act, a Controlled Activity Approval is required if works are proposed in, on or under waterfront land, which is defined as being within 40 m of a river or stream bank. As the extension project involves works within 40 m of the Nepean River, a Controlled Activity Approval will be required.

4.1.8 Mine Subsidence Compensation Act 1961

The extension project is within a Mine Subsidence district. Approval is required to alter or erect improvements pursuant to Section 15 of the *Mine Subsidence Compensation Act 1961*.

The stage 8 area will contain a conveyor while the quarry is operating. The conveyor will pass under the Hume Motorway, traversing the approved Stage 7 area and terminate at the existing processing area. The conveyor is deemed an improvement and as a result approval is required from Subsidence Advisory NSW.

4.1.9 Rural Fires Act 1997

The NSW *Rural Fires Act 1997* (RF Act) aims to prevent, mitigate, and suppress bush and other fires in local government areas of the State. Section 63(2) of the Act requires the owners of land to prevent the ignition and spread of bushfires on their land.

The site is partially mapped as bushfire prone according to Wollondilly Shire Council mapping. No structures capable of accommodating people or materials which may contribute to a bushfire (eg hydrocarbons) are proposed on the bushfire prone land. Therefore, a bushfire hazard assessment has not been prepared.

4.1.10 Roads Act 1993

The *Roads Act 1993* (Roads Act) regulates activities that may impact on public roads. Under Section 138 of the Act, approval is required to carry out works in, or over, a public road and for works in a road reserve or that require the closure of roads.

The extension project includes vehicular and conveyor access under the twin bridges known as the Menangle Bridges. On 9 September 2016, RMS provided in-principle support for the extension project subject to the following:

- RMS is open to the proposal to run a conveyor under the bridge next to the Nepean River provided it still has full and free access to do both routine and emergency maintenance on Menangle Bridge whenever necessary.
- The access under Menangle Bridge will need to be restricted to light vehicles only, and will need to be sealed and comply with RMS drainage and pavements standards.
- The applicant will be required to manage the flood risk associated with the conveyor being so close to the Nepean River.
- The proposed conveyor and access under the bridge will need to be the subject of a license agreement drawn up by RMS's lawyers at no cost to RMS.

More detailed information will be sent to RMS following approval of this modification seeking approval under Section 38 of the Roads Act.

4.2 State Environmental Planning Policies

State Environmental Planning Policies (SEPPs) are environmental planning instruments that address planning issues significant to NSW. The following SEPPs have been considered in the assessment of the extension project:

- State Environmental Planning Policy (Mining, Petroleum and Extractive Industries) 2007;
- Sydney Regional Environmental Plan No. 20 – Hawkesbury-Nepean River (No 2-1997);
- State Environmental Planning Policy No.33 – Hazardous and Offensive Development;
- State Environmental Planning Policy No. 44 – Koala Habitat Protection; and
- State Environmental planning Policy No 55 – Remediation of land.

4.2.1 State Environmental Planning Policy (Mining, Petroleum and Extractive Industries) 2007

State Environmental Planning Policy (Mining, Petroleum and Extractive Industries) 2007 (Mining SEPP) aims to provide for the proper management and development of mineral, petroleum and extractive material resources for the social and economic welfare of the state.

The aims of the Mining SEPP are as follows:

> The aims of this Policy are, in recognition of the importance to New South Wales of mining, petroleum production and extractive industries:
>
> (a) to provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State, and
>
> (b) to facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources, and
>
> (b1) to promote the development of significant mineral resources, and
>
> (c) to establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources, and
>
> (d) to establish a gateway assessment process for certain mining and petroleum (oil and
>
> gas) development:
>
> (i) to recognise the importance of agricultural resources, and
>
> (ii) to ensure protection of strategic agricultural land and water resources, and
>
> (iii) to ensure a balanced use of land by potentially competing industries, and
>
> (iv) to provide for the sustainable growth of mining, petroleum and agricultural industries.

Part 3 of the Mining SEPP identifies matters that are to be considered in development applications. Of relevance to the extension project are clauses 12, 14, 15 and 16. Consideration of the matters relevant to the extension project is given in Table 4.1.

Table 4.1 Consideration of Part 3 of the Extractive Industries SEPP

Matter	Comment
12. Compatibility of proposed mine, petroleum production or extractive industry with other land uses	
Before determining an application for consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must: (a) consider: (i) the existing uses and approved uses of land in the vicinity of the development, and (ii) whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development, and (iii) any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses, and (b) evaluate and compare the respective public benefits of the development and the land uses referred to in paragraph (a) (i) and (ii), and (c) evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a) (iii).	The Stage 8 area incorporates sections of the banks of the Nepean River, which are inaccessible for any recreational or other uses, as they are privately owned. Menangle Village is approximately 800 m west of the Stage 8 area. The Camden Coal Seam Gas(CSG) Plant is located on the western side of the Nepean River, west of Stage 7 area. The closest sensitive receiver to the Stage 8 area is a church-run rural retreat east of the Hume Motorway at 750 m from the Stage 8 area at its closest point. The impact of the proposed development on surrounding land uses is discussed in Section 6. With environmental safeguards in place, the extension project will not significantly impact any surrounding land uses. The extension project will allow for the continuation of a quarry which has been in operation since 1978. The sand and soil produced by the quarry provide materials which have state-wide importance.
14 Natural resource management and environmental management	
(1) Before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider whether or not the consent should be issued subject to conditions aimed at ensuring that the development is undertaken in an environmentally responsible manner, including conditions to ensure the following: (a) that impacts on significant water resources, including surface and groundwater resources, are avoided, or are minimised to the greatest extent practicable, (b) that impacts on threatened species and biodiversity, are avoided, or are minimised to the greatest extent practicable, (c) that greenhouse gas emissions are minimised to the greatest extent practicable. (2) Without limiting subclause (1), in determining a development application for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider an assessment of the greenhouse gas emissions (including downstream emissions) of the development, and must do so having regard to any applicable State or national policies, programs or guidelines concerning greenhouse gas emissions.	An assessment of the impacts on water resources, biodiversity, and greenhouse gas emissions are summarised in Section 6 of this EA.

Table 4.1 Consideration of Part 3 of the Extractive Industries SEPP

Matter			Comment
15. Resource recovery			
(1)	Before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider the efficiency or otherwise of the development in terms of resource recovery.		The extension project will ensure the efficiency of the quarry in providing high quality sand and soil products. The extension project will provide certainty for the recovery of the sand and soil resource. Blending the extracted screened material with recycled material brought to the quarry will ensure the most efficient use of the limited sand and soil resource.
(2)	Before granting consent for the development, the consent authority must consider whether or not the consent should be issued subject to conditions aimed at optimising the efficiency of resource recovery and the reuse or recycling of material.		
(3)	The consent authority may refuse to grant consent to development if it is not satisfied that the development will be carried out in such a way as to optimise the efficiency of recovery of minerals, petroleum or extractive materials and to minimise the creation of waste in association with the extraction, recovery or processing of minerals, petroleum or extractive materials.		
17. Rehabilitation			
(1)	Before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider whether or not the consent should be issued subject to conditions aimed at ensuring the rehabilitation of land that will be affected by the development.		The rehabilitation of the extraction area will be undertaken in accordance with the quarry's rehabilitation plan... Rehabilitation of Stages 1–2 and 3–4 areas has resulted in improvements to what were disturbed and degraded environments. Similar rehabilitation methods will be applied in the Stage 8 area. Any sand or soil by-products will be stockpiled for use in rehabilitation. Trees removed will be milled onsite and used to produce for timber for fencing and other uses. The extension project will not require the remediation of any contaminated soils. Rehabilitation of the land will not jeopardise public safety.
(2)	In particular, the consent authority must consider whether conditions of the consent should:		
	(a)	require the preparation of a plan that identifies the proposed end use and landform of the land once rehabilitated, or	
	(b)	require waste generated by the development or the rehabilitation to be dealt with appropriately, or	
	(c)	require any soil contaminated as a result of the development to be remediated in accordance with relevant guidelines (including guidelines under section 145C of the Act and the Contaminated Land Management Act 1997), or	
	(d)	require steps to be taken to ensure that the state of the land, while being rehabilitated and at the completion of the rehabilitation does not jeopardise public safety.	

Accordingly, the extension project is consistent with the aims and controls of this policy.

4.2.2 Sydney Regional Environmental Plan No. 20 – Hawkesbury-Nepean River (No 2-1997)

Sydney Regional Environmental Plan No 20 – Hawkesbury-Nepean River (No 2-1997) (SREP 20) applies to land in the Greater Metropolitan region within the Wollondilly LGA. The aim of SREP 20 is to protect the environment of the Hawkesbury-Nepean River system by ensuring that the impacts of future land uses are considered in a regional context.

Further, Part 3 of SREP 20 identifies matters for consideration specific to the type of development. The matters for consideration for quarry activities or works include:

Reports on the following:

(a) whether sufficient attention has been given by the consent authority to the effect of extraction on river dynamics, instream structures and, in particular, the effect on water clarity and turbidity, water velocity, river enlargement and light penetration,

(b) the desirability of maintaining river shallows to protect and support the aquatic habitat,

(c) the likely effect of extraction on recreational opportunities available in the region,

(d) the advantages of using cutter-suction methods as against drag-line methods in carrying out the extraction,

(e) the likely effect of the proposed development on attached aquatic plant colonisation and, in particular, the desirability of:

- confining extractive operations to small sections of the Hawkesbury-Nepean River which do not contain those colonies, and
- not permitting extractive operations in large sections of those rivers, and
- re-establishing attached aquatic plants if destroyed by the development,

(f) the need to protect fish breeding grounds, commercial and recreational fishing areas and oyster farming,

(g) whether the proposed development is appropriate to mitigate the problem necessitating the development without creating a similar problem elsewhere in the Hawkesbury or Nepean River,

(h) any alternative means of undertaking the works which would reduce the need for extraction,

(i) the necessity to permanently remove materials from those rivers rather than relocating them within those rivers, especially for the purpose of rehabilitating areas of former extractive operations,

(j) the potential for dredging to bring to the surface pollutants or anoxic sediment that may result in the formation of acid sulphate soils,

(k) whether, in the circumstances, sufficient understanding exists of the likely impact of the works on the river,

(l) any representations made by a public authority.

The quarry has been extracting sand and soil from areas adjacent to the Nepean River since 1978. These activities have not degraded the river.

No dredging is proposed as part of the extension project.

The Stage 8 extraction area will be set back from the Nepean River and will continue to apply the environmental management measures that are currently applied.

The environmental assessments (see Section 6) found that, with the proposed environmental safeguards in place, the extension project will not have significant impacts on the Hawkesbury-Nepean River.

4.2.3 State Environmental Planning Policy – No. 33 Hazardous and Offensive Development

State Environmental Planning Policy No 33 – Hazardous and Offensive Development (33) applies to development for the purpose of a potentially hazardous or offensive industry.

Under the SEPP, potentially hazardous industry is defined as:

> ... a development for the purposes of any industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk in relation to the locality:
>
> (a) to human health, life or property, or
>
> (b) to the biophysical environment,
>
> and includes a hazardous industry and a hazardous storage establishment.

Potentially offensive industry is defined as:

> ... a development for the purposes of an industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would emit a polluting discharge (including for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment.

Extractive industries are not classified as industry under the Wollondilly LEP. The definition of extractive industries in the LEP states:

> **Note.** Extractive industries are not a type of *industry*—see the definition of that term in this Dictionary.

Under the Wollondilly LEP, industry is defined as:

> ... any of the following:
>
> (a) general industry,
>
> (b) heavy industry,
>
> (c) light industry,
>
> but does not include:
>
> (d) rural industry, or
>
> (e) extractive industry, or
>
> (f) mining.

Therefore, extractive industries cannot, by definition, be potentially hazardous or offensive industries.

Notwithstanding this, extractive industries can be potentially offensive if they significantly impact the local area and environment by way of noise, dust and water pollution. Assessments for each of these potentially offensive aspects of the project found that with the proposed environmental safeguards in place, the extension project will meet relevant safeguards and standards and will not have any significant impact on the local area and environment. Therefore, the project is not potentially offensive.

4.2.4 State Environmental Planning Policy No. 44 – Koala Habitat Protection

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline. The policy applies to each local government area listed in Schedule 1 of SEPP 44.

The policy applies to the project as it is located in the Wollondilly local government area, which is listed in Schedule 1 of SEPP 44. In accordance with Part 2 of SEPP 44, before a council may grant consent to an application, it must determine whether the land contains potential or core koala habitat.

Potential koala habitat comprises areas of native vegetation where the trees of the types listed in Schedule 2 of SEPP 44 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. Core koala habitat comprises an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.

Some vegetation removal will be required for the project. The vegetation to be cleared for the project contains Forest Red Gum (*Eucalyptus tereticornis*), a feed tree species listed in Schedule 2 of SEPP 44. However, this species occurs infrequently and comprises less than 15% of canopy cover in the community, which is dominated by a hybrid of Bangalay (*Eucalyptus botryoides*) and Sydney Blue Gum (*Eucalyptus saligna*) which are not listed feed trees (Section 6.7). In addition, no Koalas or evidence of their presence was recorded during surveys. Therefore, the Stage 8 area does not contain potential or core koala habitat.

Forest Red Gum (*Eucalyptus tereticornis*) and Grey Gum (*Eucalyptus punctata*) are present adjacent to the project area and comprise greater than 15% of canopy cover in the two vegetation communities in this area (Section 6.7) and classifies as potential Koala habitat. No Koalas or evidence of their presence was recorded in these areas and therefore they do not represent core koala habitat. The project design has been optimised to avoid the clearing of these areas.

4.2.5 State Environmental Planning Policy No 55 – Remediation of land

State Environmental planning Policy No 55 – Remediation of land (SEPP 55) provides for a state-wide planning approach to the remediation of contaminated land and aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human and environmental health. Clause 7(1) of SEPP 55 requires contamination and remediation to be considered in determining development applications.

The subject land is comprised of alluvial soil that has not been the subject of any potentially contaminating activities. The site is constrained by its topography and historically would have only been used for grazing purposes. The likelihood of contamination resulting from this use is considered very low.

It is noted that extractive industries are listed as a potentially contaminating activity (*Managing Land Contamination Planning Guidelines, SEPP 55–Remediation of Land* Department of Urban Affairs and Planning, and EPA 1998). However, the likelihood of contamination resulting from the existing quarry operations is considered low as quarrying predominately removes sand and soil from the site, without introducing new material.

4.3 Other plans and policies

4.3.1 Wollondilly Local Environmental Plan

The Stage 8 area is within the Wollondilly LGA. The land is zoned RU1 Primary Production under the Wollondilly LEP 2011. Development for the purpose of extractive industries is permissible with consent within the RU1 zone. The extension project is consistent with the objectives of the sites land use zones and both the Wollondilly LEP and Mining SEPP.

4.4 Commonwealth Legislation

4.4.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), actions that may have a significant impact on a matter of national environmental significance (MNES) are 'controlled actions' and require approval from the Commonwealth. MNES include world heritage properties, wetlands of international importance, and listed threatened species and ecological communities.

The proposal will not have any significant impacts on any MNES and, accordingly, a referral to the Commonwealth Minister for the Environment has not been made.

5 Consultation

5.1 Stakeholder engagement process

In January 2016, representatives of Benedict Industries and EMM met onsite with officers from DPE and Wollondilly Council to discuss the proposed modification to Development Consent 85/2685. As an outcome of the meeting and further correspondence from the DPE, EMM were advised that Secretary's Environmental Assessment Requirements (SEARs) were not required for this the modification application.

Menangle Sand and Soil and EMM have undertaken consultation on the proposed modification with relevant stakeholders, including government agencies, Wollondilly Shire Council (WSC) and local landowners. Consultation with the Registered Aboriginal Parties (RAPs) was undertaken by EMM Consulting as part of the Aboriginal cultural heritage assessment.

Consultation was not undertaken with the Commonwealth Department of the Environment and Energy (DoEE) as the extension project will not impact on any matters of national environmental significance (MNES) listed under the EPBC Act, including EPBC Act listed threatened species.

Infrastructure and service providers were not consulted because no infrastructure will be impacted by the extension project and no additional services will be required.

The matters raised during consultation with the relevant stakeholders are detailed in the following sections.

5.1.1 Stakeholder engagement

The stakeholder engagement activities are presented in Table 5.1. A range of formal and informal stakeholder engagement tools were used including phone calls, emails and face-to-face meetings.

Table 5.1 Stakeholders and engagement activities

Stakeholder	Engagement activities	Date
State government agencies	• project briefing and site inspection • letters	15 January 2016 30 May and 4 August 2016
Wollondilly Shire Council	• project briefing and site inspection • letter	15 January 2016 4 August 2016
Landowners	• face-to-face meetings • letter	
Aboriginal groups	• field surveys • on-site meetings • test excavation • letters	Refer to Appendix I (ACHA) and Section 6.5

5.2 Government consultation

5.2.1 Agency correspondence

A DPE briefing and site inspection was held on 15 January 2016.

A letter was sent to the following state agencies on August 4 2016:

- NSW Office of Environment and Heritage (OEH);
- NSW Local Land Service (LLS);
- Sydney Catchment Authority (SCA);
- Elizabeth Macarthur Agricultural Institute (EMAI);
- NSW Environment Protection Authority (EPA);
- NSW Department of Industry – Division of Resources and Energy (DRE);
- WaterNSW;
- NSW Department of Primary Industries – Water (DPI Water);
- NSW Roads and Maritime Services (RMS); and
- Wollondilly Shire Council (WSC).

The letter provided the agencies with a briefing on the project and sought their comments and/or assessment requirements for consideration in the preparation of the EA

5.2.2 Matters raised

Key matters raised during consultation with government agencies regarding the proposed extension project are summarised in Table 5.2, together with a reference identifying where each matter is addressed in the EA.

Table 5.2 Matters raised during agency consultation

Agency	Matters raised	EA reference
OEH	No response received to letter of 4 August 2016	
LLS	No response received to letter of 4 August 2016	
SCA	No response received to letter of 4 August 2016	
EMAI	EMAI response dated 13 February 2017 identifies its support for the proposal to modify the consent and include the land as part of the offset strategy.	See Appendix E response from EMAI.

Table 5.2 Matters raised during agency consultation

Agency	Matters raised	EA reference
EPA	A letter received from EPA on 12 September 2016 provided input into matters to be considered in the EA. These included: • air quality; • water quality; • noise; • waste management; and • contaminated land management.	This EA has been prepared in accordance with EPA comments included in the letter. These matters have been addressed in Sections 3 and the technical assessments contained in Appendices G, H and F
Department of Industry - Resources & Energy	A letter received from DRE on 11 August 2016 provided input into matters to be considered in the EA. DRE requested a geological assessment of the resource that is to be extracted.	An estimate of the resource and geological assessment is provided in Sections and 3.1.3
Water NSW	A letter received from Water NSW on 12 September 2016, provided input into matters to be considered in the EA. Water NSW requests that the environmental assessment addresses the Menangle Weir and associated fish ladder, located downstream of the subject site.	The extension project will not impact Menangle Weir or the associated fish ladder (see Section 6.2).
DPI Water	A letter received from DPI Water on 16 August 2016, provided input into matters to be considered in the EA. DPI Water requested information on:	
	• the water proposed to be taken and any volumetric water licensing requirements; • water supply and a site water balance;	The quarry holds a licence to extract surface water from the Nepean River (Section 6.2), and this would continue to be used to source water for dust suppression and processing.
	• an assessment against the NSW Aquifer Interference Policy (2012);	This was not assessed, as incidental groundwater that may inflow during times of high rainfall, is expected to be less than 3 ML per year. It is understood that there is an exemption to hold a licence for volumes less than 3 ML per year when the water is not being used for water supply or use
	• assessment impacts on surface and ground water sources (both quality and quantity); • details of surface and groundwater modelling, and an independent peer review; • proposed surface and groundwater monitoring; • proposed management and disposal of produced or incidental water; • the final landform; • assessment of any potential cumulative impacts; and • consideration of relevant policies and guidelines.	Given the proximity of the alluvial deposits to the river and the permeability of the deposits, it is considered that the extension project will have a negligible impact on groundwater. Assessment of the impacts on surface water and groundwater, including final landform and cumulative impacts are contained in Appendix F and Section 6.2

Table 5.2 Matters raised during agency consultation

Agency	Matters raised	EA reference
RMS	A letter received from RMS on 9 September 2016 provided input into matters to be considered in the EA. RMS noted that: • it is open to the proposal to run a conveyor under the bridge nest to the Nepean River provided it still has full and free access to do both routine and emergency maintenance on Menangle Bridge whenever necessary. • the access under Menangle Bridge will need to be restricted to light vehicles only, and will need to be sealed and comply with RMS drainage and pavements standards. • the applicant will be required to manage the flood risk associated with the conveyor being so close to the Nepean River. • the proposed conveyor and access under the bridge will need to be the subject of a license agreement drawn up by RMS's lawyers at no cost to RMS. • a concept design will need to be submitted showing the concept for the proposed works.	Details of the conveyor are contained in Section 1.2 and 3.1.

5.3 Wollondilly Shire Council requirements

A letter received from Wollondilly Shire Council (14 March 2016) assessment of the modification to Development Consent 85/2685.

A letter from WSC was received on the 14 March 2016 lists the issues to be addressed in an assessment of the extension project. At the time, submission of a new designated development application was being considered. This would have been assessed by WSC and possibly determined by the relevant Joint Regional Planning Panel. It was subsequently decided to submit an application to DPE to modify Development Consent 85/2865 under Section 75W of the EP&A Act. The original WSC requirements have been considered in this EA.

Table 5.3 Wollondilly Shire Council requirements

Assessment requirement	Reference in EA
Relevant Legislation, EPI's and DCP's including:	
Environmental Planning and Assessment Act 1979;	Section 4.1
Environmental Planning and Assessment Regulations 2000;	Section 4.1
Rural Fires Act 1997;	Section 4.1
Threatened Species Conservation Act 1995;	Section 4.1
Water Management Act 2000;	Section 4.1
Mine Subsidence Compensation Act 1961;	Section 4.1
Protection of the Environment and Operations Act 1997;	Section 4.1
SEPP (Mining, Petroleum Product ion and Extractive Industries) 2007;	Section 4.2
SEPP 33 Hazardous and Offensive Development;	Section 4.2
SEPP 44 Koala Habitat Protection;	Section 4.2
SEPP 55 Remediation of Land;	Section 4.2

Table 5.3 Wollondilly Shire Council requirements

Assessment requirement	Reference in EA
SEPP 20 Hawkesbury-Nepean River;	Section 4.2
Wollondilly LEP 2011;	Section 4.3
Wollondilly DCP 2016 (Volume 1 and 7); and	
Designated development – the extension project does not constitute designate development as it is a modification to an existing approval.	
Integrated development:	Section 4.1.2
Approval from the Mine Subsidence Board (MSB) is required to alter or erect improvements within a mine subsidence district;	Section 4.1.8
Development requires a licence under clause 47 of the POEO Act;	Section 4.1.3
Approval from RMS is required under Section 38 of the Roads Act for works proposed under a classified road (Hume Motorway).	Section 4.1.10
A controlled activity approval required from the Department of Primary Industries (DPI) for works within 40 m of a riverbank.	Section 4.1.6
Heritage and Archaeology Impact Assessment – including a Heritage Impact Statement and an Archaeological Assessment	Section 6.5 and 6.6and Appendices I and J
Flora and Fauna report – addressing the offsetting mechanism process to be adopted Due to the removal of a significant proportion of vegetation, including an EEC	Section 6.8 and Appendix K
Bushfire Hazard Assessment report prepared in accordance with NSW RFS *Planning for Bushfire Protection 2006.*	Section 6.8
Hazard and risk assessment report providing a brief description of procedures involving dangerous goods; a comprehensive identification of possible causes of potentially hazardous incidents and their consequences to public safety or the environment from the storage or use of hazardous chemicals and an outline of all operational and organisational safety controls.	Not required as dangerous goods are not stored on site
Traffic report – addressing traffic impacts, truck and vehicle movements and operation times.	No changes proposed to current traffic access and movement
Noise Impact Assessment – in accordance with Council's Environmental Noise Policy.	Section 6.4 and Appendix H

5.4 Aboriginal stakeholders consultation

Consultation with Aboriginal stakeholders was undertaken as part of preparing the ACHA in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* 2010 (DECCW 2010a).

Seven Aboriginal parties registered their interest in the project. The Registered Aboriginal Parties (RAPs) were consulted on:

- the test excavation method and assessment; and
- the draft Aboriginal cultural heritage assessment.

A consultation meeting and site inspection was held with five of these RAPs at the quarry on 23 September 2016. The current operations and rehabilitation were inspected and the proposed extension project described. The RAPs were invited to provide any cultural information of relevance to the extension project.

During archaeological test excavations from 4 to 10 October 2016, three Aboriginal site officers accompanied the EMM archaeologists each day.

Details of Aboriginal stakeholders' consultation are provided in Appendix A of the ACHA (Appendix I).

5.5 Community consultation

The adjoining land owners most likely to be affected by the extension project were consulted. The nearest privately owned residential use is the Ellel Ministries Limited located approximately 750 m from the closest part of the Stage 8 area. This property has long-term living accommodation onsite.

Consultation with Ellel Ministries included a letter dated 13 July 2016, followed by an on-site meeting between Menangle Sand and Soil, the land owner and Ellel Ministries. Both the letter and the meeting were uses to explain the proposed extension to the quarrying into the Stage 8 area. The representative from Ellel Ministries advised he was comfortable with the extension project as described and had no objections.

Other adjoining and surrounding uses are recreational and industrial and will not be impacted by the extension project. The surrounding industrial uses include the Camden CSG plant, which is approximately 300 m to the north-east of the Stage 8 area, and the Hi Quality Rosalind Park Quarry located 1.5km to the east of the Stage 8 area. The Menangle River Reserve is approximately 1.3 km to west of Stage 8 operations.

There are no recorded complaints to date regarding the ongoing extraction and processing activities at Menangle Sand and Soil.

5.6 Ongoing stakeholder consultation

Menangle Sand and Soil will continue its stakeholder engagement program to ensure matters raised by the community and other stakeholders are understood and addressed.

5.7 Consultation outcomes

This EA has considered the key matters raised during consultation with a range of stakeholders including government agencies, and potentially affected landowners.

6 Impact assessment

6.1 Introduction

This chapter provides an assessment of the potential environmental impacts of the extension project as required by Section 79(c) of the EP&A Act. Further details of the existing environment, assessment methods, assessment criteria, predicted impacts and proposed management measures are provided in:

- Appendix F: water assessment;
- Appendix G: air quality assessment;
- Appendix H: noise assessment;
- Appendix I: Aboriginal cultural heritage assessment;
- Appendix J: non-Aboriginal heritage impact assessment; and
- Appendix K: ecology assessment.

6.2 Water

6.2.1 Water assessment

A flooding, geomorphology and onsite water management report was prepared for the extension project by National Projects Consultants Pty Ltd (NPC) (see Appendix F). The soil and water management practices at the quarry will continue to be based on the:

- *Managing Urban Stormwater - Soils and Construction, Vol.1, 4th edition* (Landcom 2004), the 'Blue Book'; and
- *Managing Urban Stormwater - Soils and Construction, Vol.2E Mines and Quarries* (DECC 2008).

The groundwater and surface water characteristics of the site are described below. The potential impacts on groundwater and surface water have been assessed and are outlined in Sections 6.2.2 and 6.2.3.

i Hydrogeology

The Stage 8 area contains undulating and thin Quaternary alluvial deposits (the resource) immediately adjacent to, and underlying, the Nepean River. The Triassic Wianamatta Group Ashfield Shale outcrops away from these deposits and the river (Wollongong 1:250,000 Geological Series Sheet, NSW Department of Mines 1966).

The Wianamatta Group shales form a thin cap (up to 20 m thick) over the Triassic Hawkesbury Sandstone. In some locations, the Nepean River has eroded the Wianamatta Group entirely and the alluvium directly overlies the Hawkesbury Sandstone (Parsons Brinckerhoff 2014). These Wianamatta Group shales generally have low permeability and groundwater yields, and act as a regional aquitard (Parsons Brinckerhoff 2015). Rainfall recharge is typically low to this unit; with the majority of rainfall that falls on the shale running off to creeks and rivers (McKibbin and Smith 2000).

The Hawkesbury Sandstone forms an extensive confined to semi-confined regional aquifer within the Sydney Basin sequence (Ross 2014). Recharge to the Hawkesbury Sandstone is greatest where it outcrops. However, this does not occur in the vicinity of the Stage 8 area. Within the Stage 8 area, the Hawkesbury Sandstone is likely to be receiving the majority of groundwater via lateral through flow from up-gradient areas of sandstone.

The alluvial deposits support local, discontinuous and unconfined local groundwater systems in direct connection with the Nepean River. The alluvial groundwater system is permeable and is recharged via direct rainfall and runoff and may be recharged through connection with the river (Parsons Brinckerhoff 2016). Where underlain by Wianamatta Group shale, the alluvial systems are unlikely to be connected with the regional groundwater table. Where underlain directly by the Hawkesbury Sandstone, these systems may be hydraulically connected with the regional groundwater table, although their contribution is considered minor given their inherent discontinuity and small extent.

A review of DPI Water's registered groundwater bore database (DPI Water 2016) confirms the presence of shale as the surficial geological unit, intersected 2–22 m below ground level (mBGL) in a bore 1 km from the Stage 8 area and approximately 500 m from the Nepean River. At the AGL Camden Gas Project groundwater monitoring site (which is approximately 2.5 km north-west of the northern end of the Stage 8 area (Figure 6.1), the alluvium directly overlies the Hawkesbury Sandstone and the Wianamatta Group has generally been eroded (Parsons Brinckerhoff 2014). At this site, groundwater levels have been typically observed to closely reflect the river level height, within 1–3 m.

When the Nepean River floods, groundwater levels in the shallow alluvium will also rise and may become indistinguishable from the flood water. This has been observed at AGL's groundwater monitoring bores downstream of Stage 8 (Parsons Brinkerhoff 2015).

ii River geomorphology

The basic principle of river behaviour is that the river formation is ongoing in an attempt to reach an equilibrium condition in which the flow energy and sediment carrying capacity is offset by the flow energy losses. These energy losses are mainly induced by channel bed friction and the sinuosity of the river.

In the case of the Nepean River, in the vicinity of the subject site,the main behavioural patterns are as follows:

- Location 1: 1km upstream of Hume Highway bridge (Figure 2 of Appendix F)
    - this is on a straight section of the river and there is less potential for slowing river flows and deposition of sediment;
    - therefore the deposition extent is less than for Location 2 which is located on the inside of a bend; and
    - there is deposition on both sides of the river because there is little differential in the flow velocities to induce more deposition on one side of the river.

- Location 2:1.5 km stretch upstream of Location 1 (Figure 2 of Appendix F).

    - the western side of the channel is located on the inside of a bend and hence is a depositional area, resulting in deposition of river sediment to form a high terrace up to the likely extent of flood levels;

    - the eastern side of the river is characterised by a rock escarpment which slows the outside of the bend eroding towards the east;

    - once floods could not regularly deposit sediment on the higher terrace and river flows could not erode the rocky eastern shoreline, another depositional terrace started to gradually grow in height east of the high terrace; and

    - this lower terrace will continue to grow in height and extent until the flow area is reduced significantly such that the flow velocities are too high to permit further deposition of sediments.

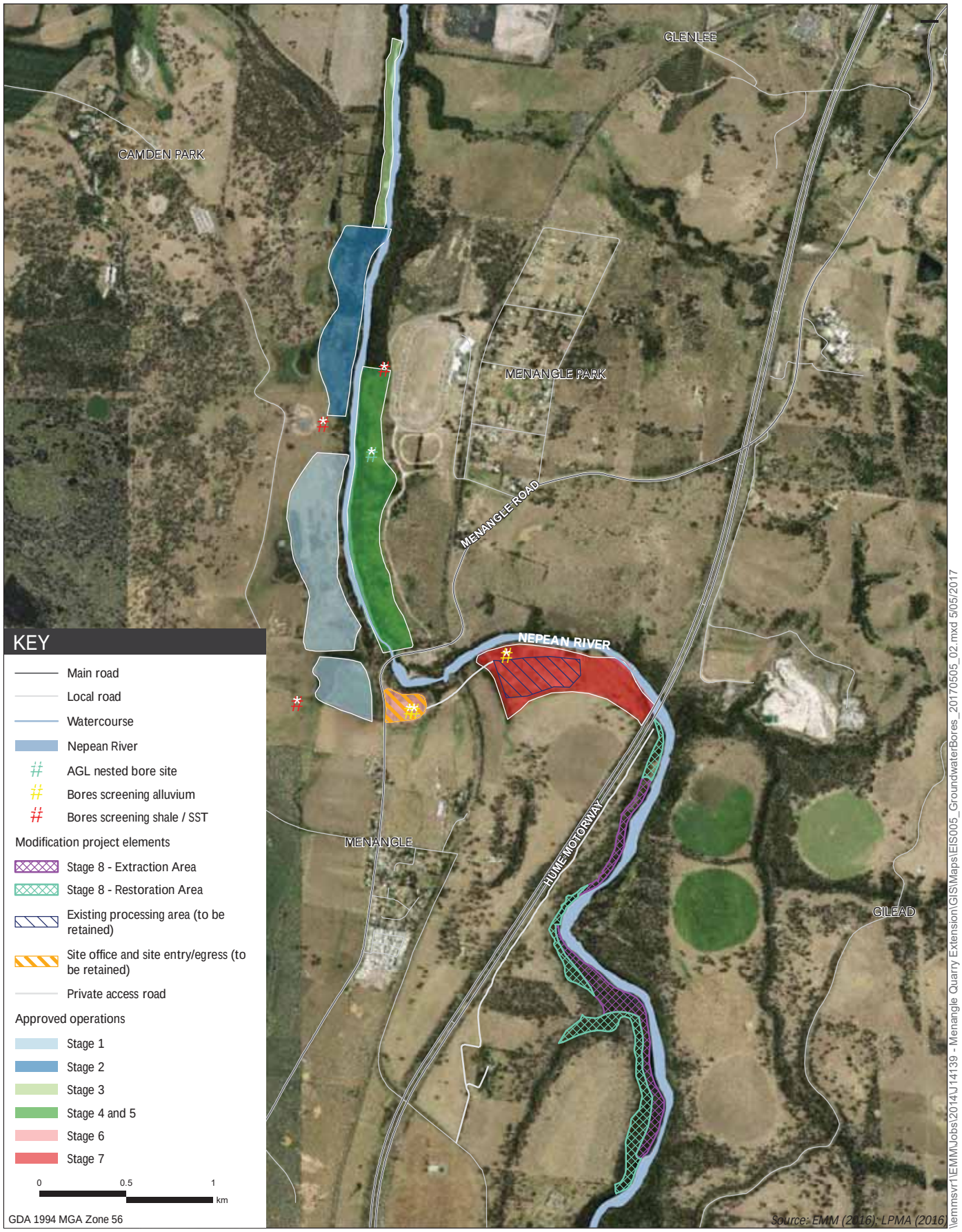
- Menangle Weir (Figure 2 of Appendix F).

    - the Menangle Weir would be having a minor local impact on the depositional behaviour of the Nepean River;

    - the weir has created significant energy losses in the river promoting a higher depositional capacity, as a result, the flow velocities would have reduced overall in the area;

    - the above processes described for Locations 1 and 2 above would be continuing with a minor increased rate of deposition within the upstream area;

    - this would have caused a minor reduction in the rate of sediment supply to the immediate downstream areas of the river for a short period of time until sediment accumulated to fill behind the weir.



EMM

Groundwater bores

Menangle Quarry Extension
Environmental Assessment
Figure 6.1

iii Flooding

Based on the flood levels established in the Nepean River Flood Study (Camden Council 2015), the 20 year and 100 year flood level on the downstream side of the Hume Highway bridge are approximately RL 77.5 and RL 79.5 m AHD respectively.

The estimated flood levels over the study area based on these 2015 levels would be:-

- 20 year flood - RL 79–80m AHD.
- 100 year flood - RL 81–82m AHD.

During low flows, the water level in the Nepean River adjacent to the Stage 8 area (61 m AHD) is controlled by the Menangle Weir, approximately 1.4 km downstream from the northern end of the Stage 8 area.

The extraction area is between 64 and 92 m AHD.

6.2.2 Management measures

i Groundwater

The existing groundwater management controls implemented on the site for the approved operations will be continued, including:

- the base of the quarry pit will be no deeper than 62 m AHD, ie 1 m above the alluvial water table (Figure 6.2); and
- if groundwater enters the pit, for example during extended high flow in the Nepean River, it will be allowed to infiltrate back into the alluvial groundwater system once the alluvial water table drops. This has proven to be effective during numerous flood events over the last nearly 40 years of Menangle Sand and Soil operations.

ii Surface water

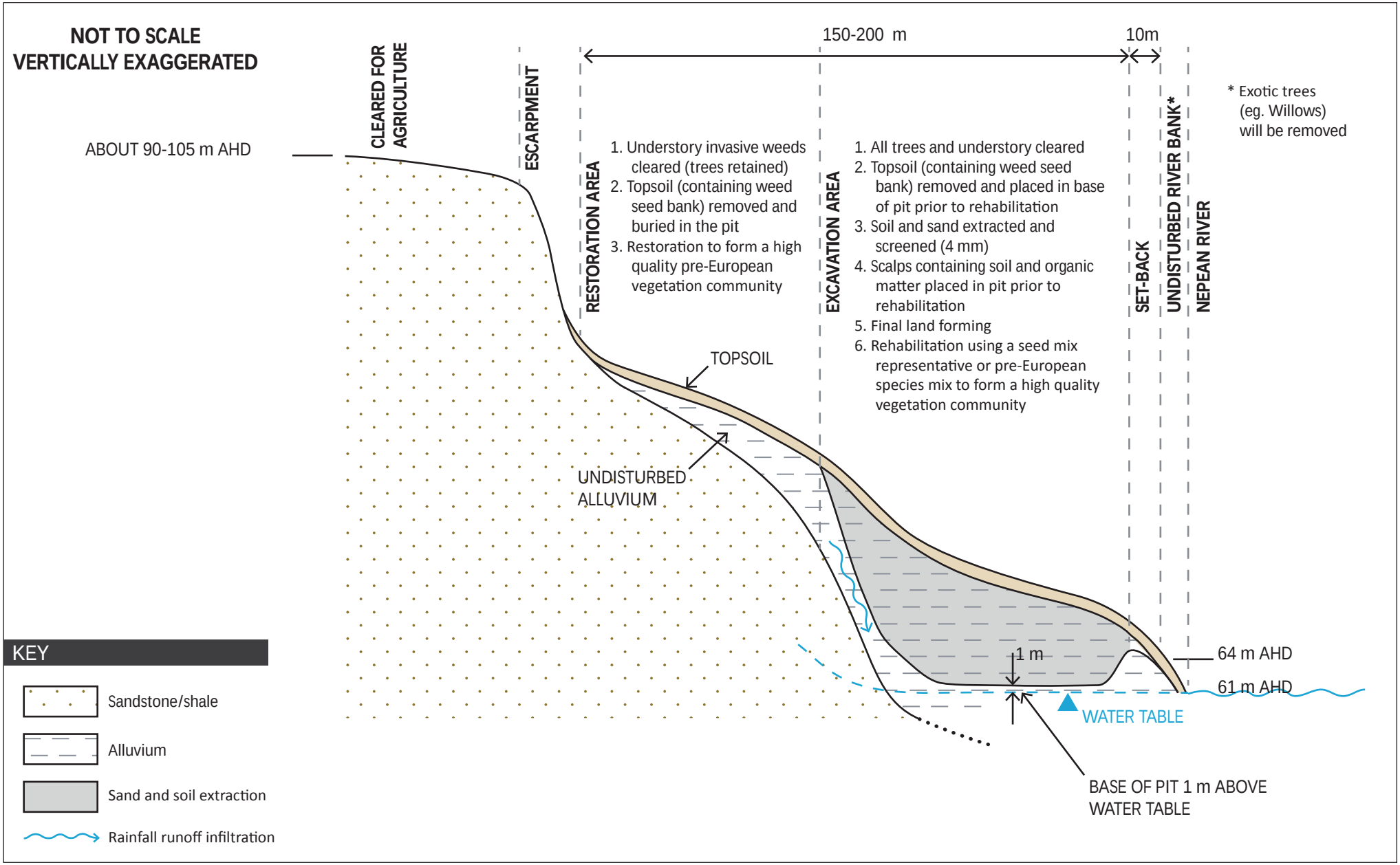
During extraction, erosion and sediment control works would be implemented to conform to the industry best management practices as detailed in the Office of Environment & Heritage Managing Urban Stormwater (the “Blue Book”). These are explained in Section 3.1.6 and illustrated in Figure 3.9 of this report, and will include the following:

- the extraction area will be set back from the river (a minimum of 10 m from the 64 m AHD contour) leaving the lower portion of the river bank undisturbed, forming a bund between the extraction area and the river, (Figures 3.8 and 3.9);
- flow diversions and check dams will be constructed to direct runoff from the extraction area to a sedimentation basin; which will be sized to trap and treat runoff;
- surface water in the sedimentation basin would only be discharged when the total suspended solids (TSS) concentration is 50 mg/L or less. However, given the permeability of the alluvium, water has never needed to be discharged in this manner; and
- the erosion and sediment control measures will be regularly maintained.

iii Flooding

The extraction areas will be influenced by flood levels. The higher terraces would be influenced less regularly and only for floods more severe than a 20 year Annual Recurrence Interval (ARI) event. The lower terraces would likely be affected by 5 year ARI and greater floods.

For the safety of onsite personnel, a flood response plan would be implemented based on flood alerts which would initiate movement of personnel and equipment to higher ground prior to flood levels overtopping the works areas. There has been ample flood warning time historically and the river rises slowly giving enough time for the quarry workforce to attend site and move critical plant and equipment to flood-free ground.



Schematic cross-section
Menangle Quarry Extension
Environmental Assessment
Figure 6.2

6.2.3 Impacts

i Groundwater

The sand and soil forming the alluvial deposits will be extracted only from above the water table using an excavator. No chemicals will be used in the extraction area (or processing area) and extraction will not result in the liberation of any pollutants. Therefore, the extension project will not impact groundwater quality.

The alluvial deposits are confined to an area within close proximity of the river. Regionally, the Wianamatta Group shale is the outcropping surface geology. In general, the alluvial deposits overlie this low permeability shale except in some locations where the Nepean River has eroded the shale and the alluvial deposits directly overly the Hawkesbury Sandstone. The alluvial deposits are much more permeable than the Wianamatta Group shale; in fact, the Wianamatta Group shales regionally restrict groundwater flow and act as an aquitard. As such, groundwater within the alluvial deposits is essentially isolated perched groundwater and likely to be disconnected from the regional groundwater system, expect in some locations where the alluvial deposits directly overly the Hawkesbury Sandstone. Groundwater recharge to the alluvial deposits is expected to be high compared to the surrounding outcropping shale. Groundwater in the alluvial deposits is expected to discharge mainly to the river rather than to the underlying shale.

As such, given the regionally minor extent of the alluvial deposits and likely disconnection from the regional water table, it is considered that the extension project will not impact on groundwater levels.

The extent of the proposed works is shown in Figure 1.3. The proposed extraction will occur in stages such that only a small portion of the overall Stage 8 area will be undergoing excavation at any one time. Interception of groundwater during extraction is not anticipated as the base of the quarry pit will remain higher than 1 m above the defined groundwater table of 61 m AHD (Figure 6.2). If groundwater enters the pit, for example during extended high flow in the Nepean River, it will be allowed to infiltrate back into the alluvial groundwater system once the alluvial water table drops. This has proven to be effective for water management during numerous flood events over the past (nearly) 40 years, thus pumping has not been necessary.

With implementation of the proposed management measures, it is not anticipated that dewatering of groundwater from the pit will be required and there will be no groundwater ‘take’ as a result of the extension project. As such a detailed groundwater assessment or Water Access Licence and Approval under the *Water Management Act 2000* are not required. However, if groundwater accumulates in the pit and does not infiltrate, or infiltrates too slowly impeding operations, a water access licence will be sought to allow pumping of groundwater from the pit. This has never been necessary in nearly 40 years of operation.

It is considered there will be noimpact on local groundwater receivers if dewatering is required. The volume of dewatering would likely be minor (less than 3 ML) compared to that which is stored deeper within the alluvial aquifer. As the operations will be managed for extraction to occur at least 1 m above the groundwater table, groundwater that enters the pit would be from a temporarily elevated groundwater table (as a result of climatic conditions and high flow in the Nepean River) and inflow would unlikely be sustained over long periods. Given local groundwater receivers would experience the same climatic conditions also resulting in an elevated water table, temporary effects on the local groundwater level as a result of dewatering would be negligible.

Given there is considered to be negligible impact to groundwater quality and groundwater level as a result of the extension project, no effect on ecosystems dependent or potentially dependent on groundwater is expected.

ii Water quality and run-off

As stated above, no pollutants will be used or liberated as a result of the extension project. Surface water runoff from disturbed areas may contain elevated suspended solid concentrations. This runoff will be captured in the sedimentation pond. The majority of the water in the sedimentation pond will infiltrate to groundwater, leaving the sediment in the basin. Water from the pond will only be pumped out if the TSS concentration is 50 mg/L or less. However, due to the nature of the alluvium, this has not been necessary in nearly 40 years of operation.

The proposed works incorporating the proposed water management and erosion and sediment control measures would not have a significant adverse impact on runoff volume, site erosion or the water quality in the Nepean River adjacent to the Stage 8 area. Given that there is no likely impact to surface water levels and water quality levels as a result of the proposal, no effect on aquatic ecosystems dependent or potentially dependent on the river is expected.

iii Geomorphology

With the extraction of sediment from the depositional terraces, the existing active overall river behaviour will continue at the subject site. As the extraction provides increased flow area, the rate of deposition will increase in proportion to the reduction in flow velocities. Over a long period of time (depending on the regularity of flood events), the river over the subject site will re-establish the terraces over a geological timeframe on its way to an equilibrium position.

These reduced flow velocities would have a beneficial effect immediately downstream of the subject site by reducing the potential for bank erosion. This beneficial effect would diminish quickly moving downstream.

The proposed works would have no significant adverse impact on the in-river active processes because the extraction would not occur within the active region of the river in non-flood conditions. The longer term depositional behaviour forming the upper terraces will continue which will gradually rebuild these terraces over 100s of years. Deposition is rapid in parts of the Stage 8 area as demonstrated by the occurrence of a beer can manufactured between 1965 and 1983 at a depth of about 80 cm (Photograph 3.1) in the southern part of the Stage 8 area.

The major influences on geomorphologic behaviour at the level of the proposed extraction (sea level, flood flows and occurrence, dams and weirs) will remain unaffected.

iv Flooding

The extraction works would have no significant adverse impacts on flood behaviour or flood levels because it would provide more flood conveyance area. This would reduce flood levels in the area. If the flood flow remains the same but the cross-sectional area increases, then the flood depth must decrease along with the velocity. Therefore there will be no increase in flood depth in this situation.

The cross-sections in Figure 6.3 depict the increase in cross sectional areas at two key sites within and adjacent to the Stage 8 area caused by the proposed extraction. This demonstrates that the proposed extraction would not cause increases in flood levels but would cause a beneficial, if small, effect by reducing flood levels. This beneficial effect would not extend beyond the weir in a downstream direction because the weir causes a major disruption to flows.

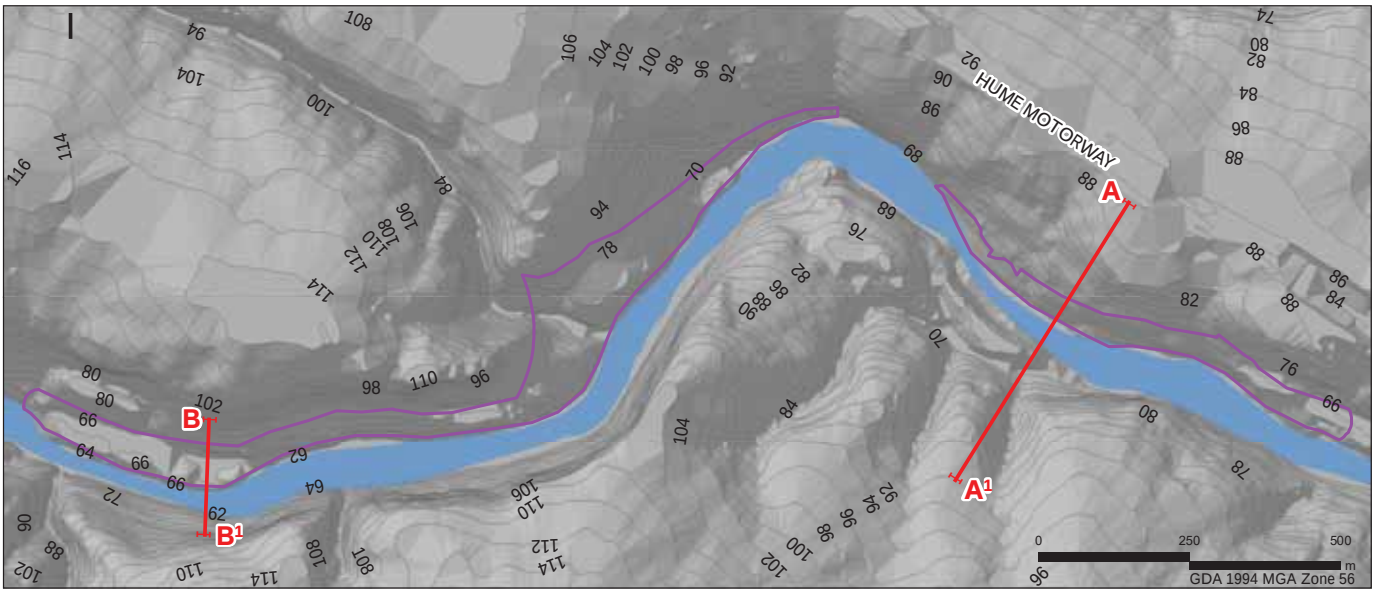
The extraction areas are areas where sand and soil is deposited during flooding. Deposition rates in these areas will increase in proportion to the reduction in flow velocities. These reduced flow velocities will also have a beneficial effect immediately downstream by reducing the potential for bank erosion.

Flood modelling is not required for this relatively simple flow behaviour in a narrow river valley without complex two dimensional flows over wide flood plains.

The river behaviour during low to medium flows (up to 3 m above the base flow level) will not change as the lower portion of the river bank will not be disturbed.

Whilst the ground level will be lowered in the extraction area, following extraction, the base of the pit will be filled with material (largely scalps) so that the slope (at least 1:50, vertical:horizontal) is free-draining and contiguous with the top of the retained lower river bank (Figure 3.10).

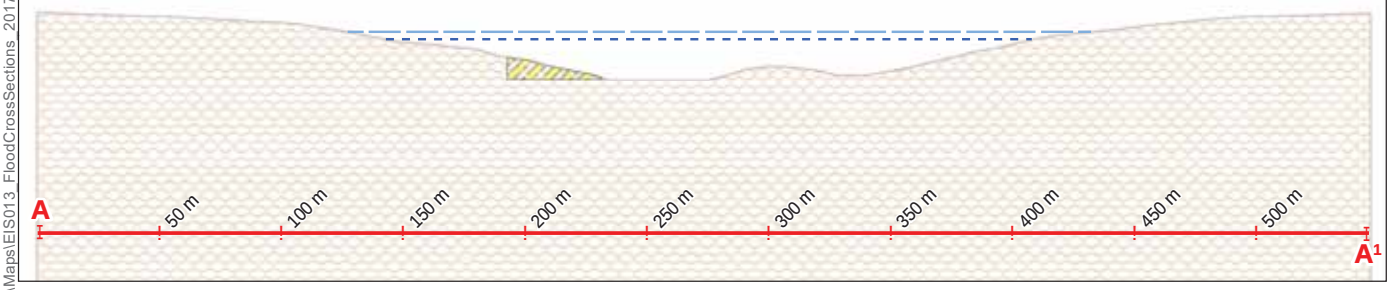
Therefore, the extraction works will not have adverse impacts on flood behaviour or flood levels due to the increased flood conveyance area.



INDICATIVE EXTRACTION AREA = 216.86 m²

PRE-EXTRACTION:
20-YEAR FLOOD (79 mAHD) AREA = 2,708.15 m²
100-YEAR FLOOD (82 mAHD) AREA = 3,575.00 m²

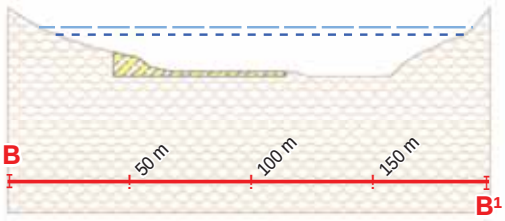
POST-EXTRACTION:
20-YEAR FLOOD (79 mAHD) AREA = 2,925.01 m²
100-YEAR FLOOD (82 mAHD) AREA = 3,791.86 m²



INDICATIVE EXTRACTION AREA = 235.08 m²

PRE-EXTRACTION:
20-YEAR FLOOD (79 mAHD) AREA = 1,971.60 m²
100-YEAR FLOOD (82 mAHD) AREA = 2,490.65 m²

POST-EXTRACTION:
20-YEAR FLOOD (79 mAHD) AREA = 2,206.68 m²
100-YEAR FLOOD (82 mAHD) AREA = 2,725.73 m²



KEY

Source: EMM (2017); LPI (2014)

- Proposed Extraction Area
- Nepean River
- 20-year flood level (79 mAHD)
- 100-year flood level (82 mAHD)
- 2 m contour
- Cross section chainage
- Cross section
- Indicative extraction area
- Cross section profile

Note: calculation assumes that the buffer between the extraction area and the river is part of the extraction area (ie marginally overestimates the area)

\\emmsvr1\EMMJobs\2014\J14139 - Menangle Quarry Extension\GIS\Maps\EIS013_FloodCrossSections_20170427_02.mxd 27/04/2017

Flood cross sections
Menangle Quarry Extension
Environmental Assessment
Figure 6.3

6.3 Air quality and greenhouse gas

6.3.1 Air quality assessment

An air quality assessment was prepared for the extension project by Ramboll Environ Australia Pty Ltd (see Appendix G). The assessment considered the potential air quality impacts (including dust and cumulative impacts) of the extension project on nearby properties (residential and recreational). Impacts were determined based on consideration of potential sensitive receptors, prevailing meteorological conditions, existing sources of air emissions, and potential air emission at full production of the quarrying operation.

Impacts to 12 representative receptors (10 residential and 2 non-residential uses) were assessed against the relevant NSW EPA ambient air quality criteria.

The nearest privately owned residential assessment locations are presented in Figure 2.2 of Appendix G. Ellel Ministries Limited is the closest receptor at approximately 700 m to the closest point of the Stage 8 extraction area. This property has long-term living accommodation onsite and has therefore been conservatively assessed as a residential receiver.

Surrounding industrial uses include the Camden Coal Seam Gas (CSG) plant/Hi-Quality Menangle Park Quarry, which is approximately 300 m to the north-east of Stage 8 operations. Menangle River Reserve is approximately 1.3 km west of Stage 8 operations.

Emissions inventories were developed for existing and proposed operations scenarios. Emissions were quantified based on a maximum approved production rate of 350,000 tonnes per annum (tpa), consistent with the current consent. However production rate has been on average 260,000 tpa for the last three years. No change is proposed to the currently approved production rate.

The proposed Stage 8 extraction area is located along the Nepean River to the south of the existing processing area. The topography of the Stage 8 extraction area is more severe than the existing quarry operation, with a pronounced cutting following the Nepean River on the eastern side of the Hume Highway. A three-dimensional representation of the local topographic features is illustrated in Figure 2.1 of Appendix G.

6.3.2 Air quality management measures

The National Pollution Inventory (NPI) provides dust control factors of 50% and 75% for Level 1 and Level 2 water spraying respectively. The generic description provided for Level 1 is 2 L/m^2/hour, while level 2 is greater than 2 L/m^2/hour.

Management measures to suppress dust and emissions consistent with current operations will be continued:

- level 2 water spraying for hauling on unpaved roads;
- water spraying where screening occurs; and
- water spraying at conveyor transfer points.

Given the negligible air quality impacts predicted for the extension project, no air quality management measures additional to those described above are warranted. Further there has not been a complaint regarding dust in nearly 40 years of operation.

6.3.3 Impacts

The results of the dispersion modelling conducted for the quarry highlight the following:

- Increment only (excluding ambient background) particulate concentrations and deposition levels from the Quarry are low, relative to applicable assessment criteria and ambient air quality levels at surrounding receptors for current and proposed operations;
- the predicted change in impacts at all surrounding receptors is minor; and
- taking background ambient air quality concentrations into account, 24-hour average and annual average total suspended particulates (TSP), particulate matter with an aerodynamic diameter 10 microns or less (PM_{10}) and particulate matter with an aerodynamic diameter 2.5 microns or less ($PM_{2.5}$) concentrations are predicted to comply with applicable assessment criterion at all surrounding receptors.

The predicted annual average concentrations from emissions plus ambient background are presented in Table 6.1. The results show that all cumulative annual average concentrations and deposition levels are below the applicable impact assessment criteria for all modelling scenarios across all sensitive receptor location.

Table 6.1 Predicted cumulative annual average impacts – TSP, PM_{10} $PM_{2.5}$ and dust deposition

Receptor ID	TSP	PM10	PM2.5
Unit		**µg/m³**	
Criteria	**90**	**30**	**8**
Scenario 1			
1	39.8	23.7	6.9
2	35.9	22.5	6.8
3	34.2	22.0	6.8
4	33.1	21.3	6.6
5	33.2	21.1	6.6
6	32.8	21.2	6.6
7	32.8	20.9	6.5
8	32.6	20.8	6.5
9	32.5	20.8	6.5
10	32.4	20.8	6.5
11	32.5	20.8	6.5
12	32.9	21.1	6.6
Scenario 2			
1	39.8	23.7	6.9
2	35.9	22.5	6.8
3	34.2	21.9	6.7
4	33.4	21.4	6.6
5	33.1	21.2	6.6
6	33.2	21.2	6.6
7	32.8	21.1	6.5
8	32.6	20.9	6.5

Table 6.1 Predicted cumulative annual average impacts – TSP, PM_{10} $PM_{2.5}$ and dust deposition

Receptor ID	TSP	PM10	PM2.5
Unit		**µg/m³**	
9	32.5	20.9	6.5
10	32.4	20.8	6.5
11	32.5	20.8	6.5
12	32.9	21.1	6.6

It can be seen from the results in Table 6.1 for Scenario 1 and Scenario 2 that the predicted cumulative concentrations, combining quarry predictions for current and proposed future operations with impacts from the neighbouring RPQ and recorded baseline concentrations, are below the applicable impact assessment criteria and goals for TSP, PM_{10} and $PM_{2.5}$ across all receptors.

The potential for cumulative annual impacts above the applicable criteria in the surrounding environment is therefore considered low.

6.3.4 Greenhouse gas management measures

Management measures that will be implemented during operations to minimise greenhouse gas emissions will include:

- on-site equipment will be regularly maintained and serviced to maximise fuel efficiency;
- vehicle kilometres travelled on site will be minimised due to the use of the conveyor;
- travel distances and therefore truck movements to markets are reduced as growth areas of south west Sydney approaches the locality;
- travel distances, truck movements and therefore gas emissions are saved due to more distant sources of sand and soil not being relied upon; and
- energy efficiency will be progressively reviewed and implemented throughout the life of the facility.

6.3.5 Impacts

There will be no significant change in fuel or electricity annual usage, and therefore no increase in greenhouse gas emissions as a result of the extension project.

6.4 Noise

6.4.1 Noise assessment

A noise assessment was prepared for the extension project by EMM (see Appendix H). The noise assessment has been completed with reference to the following guidelines and policies:

- *NSW Industrial Noise Policy* (EPA 2000) (INP); and

- Australian Standard AS 1055-1997 Acoustics – Description and measurement of environmental noise.

The assessment considered impacts to 12 representative assessment locations most likely to be affected by the extension project. Surrounding privately owned residences and other noise sensitive locations are referred to as assessment locations

The nearest privately owned residential assessment locations are presented in Figure 3.1 of Appendix H. Ellel Ministries Limited is the closest receptor at approximately 700 m to the closest point of the Stage 8 extraction area. This property has long-term living accommodation onsite and has therefore been conservatively assessed as a residential receiver.

Surrounding industrial uses include the Camden Coal Seam Gas (CSG) plant/Hi-Quality Menangle Park Quarry, which is approximately 300 m to the north-east of Stage 8 operations. Menangle River Reserve is approximately 1.3 km west of Stage 8 operations.

Four different phases of operations in the Stage 8 area were modelled to assess the impacts of the extraction area progressing from north to south. The phases were selected to represent the likely worst-case operating positions from a noise perspective (ie where noise sources were most exposed or closest to the assessment locations). The portable timber mill will be the loudest equipment used in the Stage 8 area. However, it will be only be used occasionally (once a year), during timber milling campaigns. Given this is the case, each phase was modelled with and without the portable timber mill running. Existing operations in the processing area were included in the noise model.

6.4.2 Noise management measures

The current management measures to minimise noise emissions will continue to be implemented including:

- regular reinforcement of the need to minimise noise;
- regular identification of noisy activities and adoption of improvement techniques;
- working in shielded areas when possible (ie below the top of the bank of the Nepean River);
- avoiding the use of portable radios, public address systems or other methods of site communication that may unnecessarily impact upon nearby residents;
- developing routes for the delivery of materials and parking of vehicles to minimise noise;
- where possible, avoiding the use of equipment that generates impulsive noise;
- minimising the need for vehicle reversing for example, by arranging for one-way site traffic routes;
- minimising the movement of materials and plant and unnecessary metal-on-metal contact; and
- scheduling respite periods for intensive works (such as timber milling).

Given the negligible noise impacts predicted for the extension project no noise management measures other than those described above are warranted. Further no noise related complaints have ever been made in relation to operations at the quarry in nearly 40 years.

6.4.3 Impacts

Noise levels from the extension project without the portable timber mill operating are predicted to satisfy project specific noise levels (PSNLs) at all assessment locations for all modelled phases of Stage 8 during both calm and adverse weather conditions. With the portable timber mill running, a negligible exceedance of up to 1 dB is predicted at assessment locations 10 and 11 during adverse weather conditions (Table 6.1). The most recent published qualitative guidance on noise impacts is in the Voluntary Land Acquisition and Mitigation Policy (VLAMP) (NSW Government 2014). The VLMAP characterises a 1 dB exceedance as negligible given that a noise level 1 dB above noise criteria would not be discernible by the average listener and therefore would not warrant receiver based treatments or controls. The INP also states that a level of up to 2 dB above noise criteria is considered compliant. Furthermore, the portable timber mill will only run in campaigns once a certain amount of timber is stockpiled. It is not part of daily activities and therefore it is considered that the noise levels from its use will be very infrequent and temporary.

Table 6.2 Predictor noise levels

Assessment location	Period	Criteria, dB, $L_{Aeq\ (15\ min)}$	Predicted noise level, dB, $L_{Aeq\ (15\ min)}$ (with/without portable mill operating)							
		PSNL	Stage 8a		Stage 8i		Stage 8k		Stage 8d	
			Calm	Adverse[2]	Calm	Adverse[2]	Calm	Adverse[2]	Calm	Adverse[2]
1	Day	50[1]	47/47	50/50	47/47	50/50	47/47	50/50	47/47	50/50
	Morning Shoulder	50[1]	(N/A)[3]/47	(N/A)[3]/50	(N/A)[3]/47	(N/A)[3]/50	(N/A)[3]/47	(N/A)[3]/50	(N/A)[3]/47	(N/A)[3]/50
2	Day	45	<35/<35	<35/<35	<35/<35	<35/<35	<35/<35	<35/<35	<35/<35	<35/<35
	Morning Shoulder	45	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35
3	Day	45	40/40	43/43	41/41	44/44	43/42	45/45	41/41	44/44
	Morning Shoulder	45	(N/A)[3]/40	(N/A)[3]/43	(N/A)[3]/41	(N/A)[3]/44	(N/A)[3]/42	(N/A)[3]/45	(N/A)[3]/41	(N/A)[3]/44
4	Day	54	<35/<35	36/35	36/36	39/39	39/39	42/42	36/36	39/39
	Morning Shoulder	52	(N/A)[3]/<35	(N/A)[3]/36	(N/A)[3]/36	(N/A)[3]/39	(N/A)[3]/39	(N/A)[3]/42	(N/A)[3]/37	(N/A)[3]/39
5	Day	45	37/37	40/40	40/38	43/41	41/39	43/42	38/38	41/41
	Morning Shoulder	45	(N/A)[3]/37	(N/A)[3]/40	(N/A)[3]/38	(N/A)[3]/41	(N/A)[3]/39	(N/A)[3]/42	(N/A)[3]/38	(N/A)[3]/41
6	Day	45	<35/<35	<35/<35	37/35	40/38	39/39	42/42	40/40	43/43
	Morning Shoulder	45	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/35	(N/A)[3]/38	(N/A)[3]/39	(N/A)[3]/42	(N/A)[3]/40	(N/A)[3]/43
7	Day	45	<35/<35	<35/<35	<35/<35	<35/<35	<35/<35	<35/<35	36/36	39/38
	Morning Shoulder	45	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/36	(N/A)[3]/38
8	Day	45	<35/<35	<35/<35	<35/<35	<35/<35	<35/<35	<35/<35	35/35	38/38
	Morning Shoulder	45	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/35	(N/A)[3]/38
9	Day	45	<35/<35	<35/<35	<35/<35	<35/<35	<35/<35	<35/<35	<35/<35	<35/<35
	Morning Shoulder	45	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35
10	Day	35	<35/<35	<35/<35	<35/<35	<35/<35	<35/<35	<35/<35	<35/<35	**36**/<35
	Morning Shoulder	35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35
11	Day	35	<35/<35	**37**/<35	<35/<35	**36**/35	<35/<35	**36**/35	<35/<35	35/35
	Morning Shoulder	35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/<35	(N/A)[3]/35	(N/A)[3]/<35	(N/A)[3]/35	(N/A)[3]/<35	(N/A)[3]/35
12	Day	70[1]	37/37	40/39	35/35	38/38	35/35	37/37	<35/<35	37/37
	Morning Shoulder	70[1]	(N/A)[3]/37	(N/A)[3]/40	(N/A)[3]/36	(N/A)[3]/38	(N/A)[3]/35	(N/A)[3]/38	(N/A)[3]/35	(N/A)[3]/37

Notes: *1. This is an $L_{Aeq\ (period)}$ value.*

2. Morning shoulder adverse weather results are the higher of prevailing winds and temperature inversion.

3. Not applicable as the portable mill will not operate during the morning shoulder period.

The extension project is predicted to have a negligible impact on the existing ambient acoustic environment (in isolation and cumulatively with other development) and is not predicted to increase noise levels above the relevant amenity criteria.

It is unlikely that noise levels generated by the extraction activities associated with the extension project will be noticeable at assessment locations.

6.5 Aboriginal cultural heritage assessment

An Aboriginal cultural heritage assessment (ACHA) was prepared for the extension project by EMM (see Appendix G). The ACHA was completed that comprised of the following components with reference to the relevant guidelines and policies:

- Aboriginal consultation in accordance with the *Aboriginal Consultation Requirements for Proponents 2010* (DECCW 2010c);
- an archaeological survey, geoarchaeological survey and test excavation program, guided by the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010a); and
- an assessment of archaeological, socio-cultural and historical values (significance to the Aboriginal community); and an assessment of the impacts of the project on the identified Aboriginal cultural heritage values using the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (DECCW 2010b).

Field investigation involved three stages of assessment:

- a preliminary survey of the Stage 8 area on 26 April 2016 following the guidelines stipulated in the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010);
- a geoarchaeological assessment including a preliminary survey on 17 June 2016, and borehole testing on 29 July 2016; and
- test excavation within the Stage 8 area from 4 to 10 October 2016 addressing requirements 14–17 stipulated in the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010).

No Aboriginal objects were identified during these assessments and the Stage 8 area is deemed to have low archaeological potential. Five rock shelters were identified on the escarpment immediately to the west of the Stage 8 area. They were assessed as of moderate to low significance and are sufficiently outside the Stage 8 area so as not to be impacted by quarrying.

6.5.1 Management measures

Following consultation with RAPs, the following management measures are proposed:

- a pre-clearance survey to ensure that any scarred trees in the Stage 8 area are identified and recorded;
- implementation of procedures to ensure there no inadvertent harm to buried rock shelters;
- procedures to be implemented if human skeletal remains are discovered;

- management measures will be implemented so that the quarry machinery avoids impacting buried sandstone features; and
- if new Aboriginal sites are discovered during soil extraction or revegetation of the Stage 8 area, they will be assessed by an archaeologist and any new sites will be recorded on AHIMS.

6.5.2 Impacts

The Stage 8 area is an area of low Aboriginal archaeological potential and sand and soil extraction will not harm any known Aboriginal objects or sites.

No modified trees were identified during the archaeological survey, but there is a riparian community of Bangalay crossed with Sydney Blue Gum trees associated with the upper terrace that was not fully inspected because of survey access constraints. Conservatively, these trees may be of suitable age to feature Aboriginal scarring or carving. While culturally modified trees are relatively uncommon in the local area, a pre-clearance survey will enable identification of culturally modified trees (if any) in the Stage 8 area.

There is a possibility that rock shelters or expanses of sandstone with engravings are buried at the western border of the Stage 8 restoration area where the escarpment continues beneath the ground. However, the quarry targets only sand and soil and not sandstone bedrock or other sandstone features.

6.6 Non-Aboriginal heritage impact assessment

A statement of heritage impact (SoHI) was prepared for the extension project by EMM (see Appendix J. The SoHI was completed with reference to the following guidelines and policies:

- *The Australian International Council on Monuments and Sites, Charter for Places of Cultural Significance* (also known as the Burra Charter, Australian ICOMOS 2013) and the *NSW Heritage Manual* (Heritage Office 1996 and 2006);
- *Statements of Heritage Impact Guidelines* (Heritage Office 2006);
- *Investigating Heritage Significance* (Heritage Office 2004); and
- *Assessing Significance for Historical Archaeological Sites and 'Relics'* (Heritage Branch Department of Planning 2009).

Relevant statutory heritage registers were searched on 13 April 2016. No heritage listed items are situated within the Stage 8 area. However, heritage items listed in the Wollondilly Local Environment Plan (LEP) and on the State Heritage Register (SHR) occur in the vicinity. The Menangle Conservation Area is centred on the historic village of Menangle, encompassed by the Menangle Landscape Conservation Area. None of Stage 8 extension area is within these conservation areas.

On 26 April 2016, EMM archaeologists conducted a pedestrian field survey of the Stage 8 area in which a storage container on stilts was identified on the lower terrace in the northern zone, possibly associated with Menangle Sand Company operations in the 1920s and 1930s (Photograph 6.1). During subsequent test excavation as part of the Aboriginal cultural heritage assessment (4–10 October), an additional item was identified on the bank of the river (Photograph 6.2).

Photograph 6.1 Storage container west elevation

Photograph 6.2 Industrial equipment on the west bank of the Nepean River

6.6.1 Management measures

Extraction in the northern-most part of the Stage 8 extraction area will avoid the storage container if possible. If this is not possible, local historical societies will be consulted regarding relocation of the item prior to commencement of sand extraction. This will allow the item to be conserved and accessible for research. Information about their provenance, physical context and history will be recorded.

The industrial equipment on the west bank of the Nepean River is in the Stage 8 restoration area and will not be disturbed.

6.6.2 Impacts

The two unlisted items identified during field work are not assessed as having local significance. However, they may be of interest to the local historical society or to people who have an association with operations connected with the Menangle Sand Company. These items are on private property and have not been accessible to the public. The storage container will be left in situ if possible or will be moved to a location that potentially provides increased access. The industrial equipment will be left in situ.

6.7 Terrestrial Ecology

6.7.1 Terrestrial ecology assessment

A terrestrial ecology assessment was prepared for the extension project by EMM (see Appendix I). The assessment was completed with reference to the following guidelines:

- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (DEC 2004);
- *Threatened Species Assessment Guidelines: The assessment of significance* (DECC 2007);
- *BioBanking Assessment Methodology* (OEH 2014); and
- *Matters of National Environmental Significance: Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (DoE 2013).

The terrestrial ecology assessment consisted of a detailed desktop assessment, field surveys, impact assessment and the development of management measures and an offset strategy.

The desktop assessment comprised reviewing biodiversity databases and previous local studies to identify the threatened species, populations and communities that may be present in the Stage 8 and Stage 3 areas, and to guide the scope of field surveys. A preliminary site visit was also conducted on 9 October 2014 to inform field survey methods.

Field surveys were completed in the Stage 8 area from 1 to 4 December 2014 and from 21 to 22 July in 2015 the proposed restoration areas. The study area comprises the Stage 8 area (proposed extraction and restoration areas) and the Stage 3 area (where development consent is proposed to be modified so there is no quarrying in this area). An additional site visit was undertaken on 10 March 2017 for further survey of the Stage 3 area.

Field surveys comprised:

- identification and mapping of vegetation communities;
- targeted threatened flora searches;
- targeted threatened fauna surveys, comprising:
    - timed diurnal bird surveys;
    - microbat surveys using harp traps and ultrasonic detectors;
    - spotlighting, call playback and active searches for nocturnal birds, mammals and frogs; and
    - recording of opportunistic sightings, habitat assessment and searches for scats, tracks and other signs.

Existing rehabilitation areas at Menangle Sand and Soil were also inspected to provide an indication of future rehabilitation potential in the Stage 8 area.

Field surveys were completed by EMM ecologists with the assistance of Gingra Ecological Surveys during flora quadrats in the Stage8 area.

i Stage 8 area

The Stage 8 area was found to contain 10.65 ha of Bangalay x Sydney Blue Gum (*Eucalyptus boytryoides x saligna*) Tall Riparian Forest. The midstorey of the community was found to be heavily infested by weeds and mainly comprised Lantana (*Lantana camara*) and Large-leaved Privet (*Ligustruam lucidum*). The northern part (2.79 ha) of the proposed extraction area was found to be in moderate to good condition, while the southern part (7.86 ha) was in low quality condition.

The Bangalay X Sydney Blue Gum Tall Riparian Forest represents an endangered ecological community listed under the TSC Act namely River Flat Eucalypt Forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions as it contains representative tree species of the community and is located on a river terrace.

The Stage 8 area also contains 2.35 ha of cleared vegetation. Cleared vegetation comprises exotic species, and mainly contains Couch (*Cynodon dactylon*) or Lantana. Cleared vegetation does not represent any listed ecological community.

Two other vegetation types were recorded west of the Stage 8 area that represent listed ecological communities, namely Shale/Sandstone Transition Forest in the Sydney Basin Bioregion and Cumberland Plain Woodland in the Sydney Basin Bioregion. These vegetation types are listed as critically endangered ecological communities under the TSC Act and EPBC Act. The project design was optimised such that these listed communities would not be impacted.

One threatened bat species, the Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), was recorded during surveys in the study area. The Stage 8 area also provides potential habitat for a range of threatened fauna species previously recorded within 10 km of the Stage 8 area that were not recorded:

- woodland birds: Brown Treecreeper (*Climacteris picumnus victoriae*), Diamond Firetail (*Stagnopleura guttata*), Varied Sittella (*Daphoenositta chrysoptera*), and Little Lorikeet (*Glossopsitta pusilla*);

- raptors: Little Eagle (*Hieraeetus morphnoides*), Masked Owl (*Tyto novaehollandiae*), Barking Owl (*Ninox connivens*) and Powerful Owl (*Ninox strenua*);

- microbats: Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*), Eastern Freetail Bat (*Mormopterus norfolkensis*) Greater Broadnosed Bat (*Scoteanax rueppellii*), Large-eared Pied Bat (*Chalinolobus dwyeri*), and Little Bentwing Bat (*Miniopterus australis*) and Southern Myotis (*Myotis macropus*); and

- the Grey-headed Flying-fox (*Pteropus poliocephalus*).

One migratory species listed under the TSC Act, namely the Black-faced Monarch (*Monarcha melanopsis*), was recorded in the Bangalay x Blue Gum Tall Riparian Forest in the Stage 8 area.

ii Stage 3 area

The Stage 3 area contains disturbed native vegetation, with tall remnant trees underlain by a mainly exotic understorey. Appendix B provides a full list of native and introduced flora species recorded within Stage 3 area.

The Stage 3 area also contains one noxious weed listed under the (NW Act, Honey Locust *(Gleditsia triacanthos).*

One native vegetation community, Bangalay x Blue Gum Tall Riparian Forest was recorded in the Stage 3 area Riparian Forest.

The Bangalay x Blue Gum Tall Riparian Forest within the Stage 3 area also represents River Flat Eucalypt Forest, given its location on a river terrace and the presence of representative canopy species. As in the Stage 8 area, the structure of River Flat Eucalypt Forest in the Stage 3 area comprises remnant canopy trees, It has limited native vegetation in the understorey, due to invasion by weeds (notably Large-leaved Privet). It occurs as a partially fragmented remnant due to clearing of adjacent vegetation for agriculture. One representative species, Forest Red Gum (*E. tereticornis*) and a hybrid of another representative species, Bangalay (*E. botryoides*) were recorded in low abundances in the Stage 3 area. The community is in poor condition as the mid storey is heavily infested with Large-leaved Privet, which has greatly reduced native ground cover and species diversity.

Although it is degraded, the riparian forest is considered to have high habitat and connectivity value for fauna given its large remnant trees, dense shrubs and fallen timber which provide potential shelter and foraging habitat for a range of native tree frogs, reptiles, birds, microbats and mammals.

The riparian forest contains large and very large hollow-bearing living trees and stags that provide potential foraging, shelter and nesting habitat for a range of vertebrate species including frogs, reptiles, birds and arboreal mammals. Hollow entrances were observed to be of varying size and are likely to accommodate a range of species from microbats to birds, with some hollows of substantial size to accommodate forest owl nesting. Red-rumped Parrot (*Psephotus haematonotus*) was observed to be nesting in tree hollows within this habitat type. The hollow bearing trees within this riparian forest habitat are likely to be important as they provide habitat within a highly cleared agricultural landscape. However, the lack of recruitment of the Eucalyptus species within the Stage 3 area is a long term threat to hollow availability for hollow-dependent species.

Other species recorded opportunistically within the Stage 3 area riparian habitat include Eastern Brown Snake (*Pseudonaja textilis*), Swamp Wallaby (*Wallabia bicolour*), Eastern Whipbird (*Psophodes olivaceus*) and Bell Miner (*Manorina melanophrys).*

6.7.2 Management measures

Measures to minimise the project's biodiversity impacts followed this hierarchy:

1. Avoid - avoidance of direct impacts on critically endangered ecological communities, namely Shale/Sandstone Transition Forest in the Sydney Basin Bioregion and Cumberland Plain Woodland in the Sydney Basin Bioregion. The development consent would also be modified so there is no quarrying in the Stage 3 area, avoiding the approved clearing of 5.68 ha of an endangered ecological community, River Flat Eucalypt Forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions that will otherwise occur.

2. Minimise - clearing of vegetation in 'campaigns' ahead of sand and soil extraction, and minimising the area disturbed to approximately 1 ha at any one time. Staged vegetation clearing will minimise impacts on fauna when compared with clearing all vegetation in a single event.

3. Mitigate - measures have been proposed to mitigate the clearing of native vegetation, loss of hollow-bearing trees, fauna injury and mortality and erosion and sedimentation (Table 4.1 in Appendix I).

4. Offset - the proposed offset strategy is described in Section 6.7.4.

6.7.3 Impacts

i Native vegetation

The project requires the removal of 10.65 ha of Bangalay x Blue Gum Tall Riparian Forest, comprising 2.79 ha in moderate to good condition and 7.86 ha in poor condition. The clearing of 10.65 ha has been mitigated by avoiding for vegetation clearing in the Stage 3 area, which contains 5.68 ha of the same vegetation type. These areas both represent River Flat Eucalypt Forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions, an endangered ecological community. Accordingly, the residual impact to this endangered ecological community has been reduced to 4.97 ha. An assessment of significance was completed for this community in accordance with Section 5a of the EP&A Act. The assessment concluded that the project was unlikely to result in a significant impact on the community considering the progressive clearing and rehabilitation that will occur for the project and the removal of large areas of weed infestation and weed-infested soils, which would provide an opportunity to improve the future condition and viability of the community in the locality.

The project will also remove 10.65 ha known habitat for the Eastern False Pipistrelle, which is listed as a vulnerable species under the TSC Act, which will be mitigated by the avoidance of clearing 5.68 ha of similar habitat in the Stage 3 area by modifying the development consent so there is no quarrying in this area. An assessment of significance was completed for the species in accordance with Section 5a of the EP&A Act. The assessment concluded that the project was unlikely to result in a significant impact on the Eastern False Pipistrelle as the habitat is considered to be suboptimal given the high level of weed invasion in the midstorey which would increase the difficulty of flight and foraging. Additionally, impacts of the project on the species will be minimised through staged clearing and rehabilitation and the placement of nest boxes in the proposed restoration area.

ii Hollow bearing trees

The hollow-bearing trees and stags within the extraction area provide potential shelter and nesting habitat for a range of vertebrate species including frogs, reptiles, birds and arboreal mammals. Hollow entrances were observed to be of varying size and are likely to accommodate a range of species including microbats, birds and mammals, with some hollows of substantial size to accommodate forest owl nesting. Red-rumped parrot (Psephotus haematonotus) was observed to be nesting in tree hollows in proximity to the study area.

Threatened bird species that are considered to have potential to occur within the study area that utilise tree hollows for breeding habitat include the Little Lorikeet, Barking Owl, Masked Owl, and Powerful Owl. Threatened microbat species that are considered to have potential to occur within the study area that utilise tree hollows for breeding and roosting habitat include the Eastern Freetail Bat, Yellow-bellied Sheathtail-bat, Eastern False Pipistrelle, Greater Broad-nosed Bat and Southern Myotis.

To compensate for any loss of hollow bearing trees, nest boxes will be placed in the potential offset areas prior to clearing of the proposed extraction area. Hollows will also be salvaged from clearing operations for use in the potential offset areas, if possible. Any hollow bearing trees in the Stage 3 area will be retained.

iii Fragmentation

The project will cause temporary fragmentation of the River Flat Eucalypt Forest along the Nepean River. Fragmentation will be minimised through clearing a discrete area for quarrying, followed by progressive rehabilitation. The area cleared at any one time will be minimised and the maximum extent of the cleared but un-rehabilitated extraction area will be about 1 ha. This progressive rehabilitation has been successfully implemented at the quarry site (see Section 3.3).

The Vegetation Management Plans (VMPs) for Stage 7 (see Appendix C) prescribe detailed regeneration programs including primary weeding, erosion control, revegetation, rubbish removal and disposal, fencing, seed collection, fauna habitat considerations, management and maintenance and monitoring and assessment. This includes many details on how connectivity will be managed during the VMP works program. The VMP provides advice particularly related to fauna habitat and connectivity, which will be followed in the Stage 8 area including:

- artificial habitat for local fauna; and
- designing any future reconstruction planting/seeding schedules to replicate elements of the structure and floristics of the local native plant communities and to maximise habitat for local native fauna.

Rehabilitation and regeneration of the Stage 8 area will be consistent with the practices of preceding stages.

Assessments of significance were also completed in accordance with Section 5a of the *EP&A Act* and the *EPBC Act* for species that were not recorded, however potential habitat was present in the Stage 8 area. These included four woodland bird species, four raptor species, five microbat species, the Grey-headed Flying-fox and Black-faced Monarch. The assessment concluded that the project is unlikely to result in significant impacts for these threatened species.

The project's residual impacts will be compensated through the implementation of an offset strategy.

6.7.4 Offsets

i Proposed offset strategy

Development Consent 85/2865 approves the extraction of sand and soil from the Stage 3 area. This includes the clearing of 5.68 ha of the overlying vegetation as well as Stage 3 area access. Menangle Sand and Soil propose to accept a condition permanently prohibiting quarrying in the Stage 3 area, replacing the resource in this area with the resource in the Stage 8 area. It is proposed that clearing the vegetation in the Stage 3 area is included as part of the offset strategy for the extension project.

When a threatened community is to be cleared, a larger area of the same community (in equal or greater condition) is identified as an offset. This vegetation is then protected in perpetuity via agreement. However, in the absence of such an agreement, the area could not have been cleared without approval under the EP&A Act and/or the VM Act. The Stage 3 area that forms part of the offset strategy does not reflect such a situation as it is already approved to be cleared. Therefore, protecting it in perpetuity will provide a greater benefit than protecting an area that could not be cleared without approval. In recognition of this, the proposed compensation package has two components:

1. replacing the area approved to be cleared in the Stage 3 area with the same area within the Stage 8 extraction area; and

2. providing offsets for the remaining area to be cleared within the Stage 8 extraction area based on the BioBanking Credit Calculator.

ii Replacement component

Extraction of sand and soil from the Stage 3 area would require the unavoidable removal of 5.68 ha of low condition River Flat Eucalypt Forest (Plot 6 on Figure 4.1, Appendix K). It is proposed to replace this with 5.68 ha of the same vegetation type in the Southern Stage 8 extraction area.

The Stage 8 extraction area contains 7.86 ha of low condition River Flat Eucalypt Forest. It is proposed to replace 5.68 ha of low condition River Flat Eucalypt Forest from the Stage 3 area with 5.68 ha of the 7.86 ha low condition River Flat Eucalypt Forest in the Stage 8 extraction area. Accordingly, the replacement will result in a like for like swap of biodiversity values.

Offsets will be provided for the residual 2.18 ha of low condition River Flat Eucalypt Forest.

iii Offset component

Offsets will be provided for the following parts of the Stage 8 extraction area:

- the residual clearing of 2.18 ha of low condition River Flat Eucalypt Forest; and

- the clearing of 2.79 ha of moderate to good condition River Flat Eucalypt Forest.

The restoration areas have been assessed as potential offset areas to compensate for the project's impacts. The biodiversity credit report is provided in Chapter 6 of Appendix K and summarised below.

iv Offset security

The Stage 8 restoration areas are proposed to be protected under an appropriate legally binding mechanism, within 12 months of project approval (should approval be granted). The offsets would be secured under a:

- voluntary conservation agreement, in accordance with Section 69B of the NSW *National Parks and Wildlife Act 1979;* or
- BioBanking agreement, in accordance with Part 7A Division 2 of the NSW *Threatened Species Conservation Act 1995,* if the offset package is finalised prior to the June 2017 enactment of the *Biodiversity Conservation Act 2016*; or
- Biodiversity stewardship agreement, in accordance with the Part 5 Division 2 Section 5.5 of the *Biodiversity Conservation Act 2016* if the offset package is finalised after June 2017 when the legislation is enacted.

v Biodiversity credit report

The impacts of the project were quantified informally using the BioBanking Credit Calculator. This method allows for impacts on native vegetation and threatened flora and fauna to be quantified, so that a suitable and proportionate offset can be identified. The method details the offset requirements in terms of ecosystem and species credits.

Two vegetation zones with site value scores of >17 were identified for within the Stage 8 extraction area:

- Zone 1: 2.79 ha of River Flat Eucalypt Forest in moderate to good condition; and
- Zone 2: 7.86 ha of River Flat Eucalypt Forest in low condition. The extent of River Flat Eucalypt Forest in the Stage 3 area (5.68 ha) has been subtracted from the total area of Zone 2 as the development consent would be modified so there is no quarrying in this area. Accordingly, the final area of Zone 2 entered into the BioBanking Credit Calculator is 2.18 ha.

The BioBanking Credit Calculator predicted 24 ecosystem credit species that are associated with River Flat Eucalypt Forest. The calculations assume that the vegetation to be impacted contains potential suitable habitat for these ecosystem credit species. The species associated with River Flat Eucalypt Forest with the highest threatened species multiplier was the Powerful Owl, Barking Owl and Masked Owl at 3.0. Although not recorded during surveys, these species have been assumed to utilise habitat in the Stage 8 area at times. Therefore, alterations have been made to the list of ecosystem credit species or the threatened species offset multiplier on the base ecosystem credits for River Flat Eucalypt Forest.

A total of 131 ecosystem credits are required to compensate for the project's impacts on River Flat Eucalypt Forest and threatened species habitat (Table 6.3). A full Biodiversity Credit Report is provided at Appendix E of Appendix K.

Table 6.3 Ecosystem credits required

Vegetation zone	BVT	Area (ha)	TEC?	Loss in site value score	Ecosystem credit species with the highest multiplier	Credits required to offset impact
1	HN526	2.79	Yes	28.12	Powerful Owl, Barking Owl and Masked Owl - 3.0	73
2	HN526	2.18	Yes	28.65	-	58
Total		**4.97**				**131**

Note: HN526 denotes River Flat Eucalypt Forest.

The BioBanking Credit Calculator also predicted that 15 species credit species may occur in the Stage 8 area. Targeted surveys were completed for 14 of the predicted species, with none of them recorded during surveys.

A habitat assessment was completed for the Squirrel Glider (*Petaurus norfolcensis*) and Eastern Pygmy Possum (*Cercartetus nanus*) as these species were predicted by the BioBanking Credit Calculator to be associated with habitat features in the project area. Records on the Atlas of NSW Wildlife were interrogated to determine if the Squirrel Glider or Eastern Pygmy Possum have been recorded in the locality. Records of these mammal species are associated with extensively vegetated lands in Dharawal National Park, to the east of Nepean River and Georges River. There are no records near the Stage 8 area. The Stage 8 area has a long history of agricultural disturbance and therefore is considered unlikely that they would occur. Habitat is considered to be present for the Large-eared Pied Bat which has been recorded in the area, and therefore 65 species credits have been generated for the species.

vi Biobanking credit report

Calculations were undertaken in the BioBanking Credit Calculator to quantify the number of credits generated by the proposed restoration areas. These potential offset areas contain:

- Zone 1: 9.66 ha of River Flat Eucalypt Forest in low condition; and
- Zone 2: 2.99 ha of River Flat Eucalypt Forest in moderate to good condition.

In addition, the Large-eared Pied Bat has been previously recorded in this area (reported on Atlas of NSW Wildlife). The BioBanking Credit Report for the proposed restoration areas is provided in Table 6.4

Table 6.4 Ecosystem credits generated by proposed restoration areas

Vegetation zone	BVT	Condition	Area (ha)	TEC?	Gain in site value score	Averted loss in site value	Number of ecosystem credits created
1	HN526	Low	9.66	Yes	19.96	1.74	110
2	HN526	Moderate to good	2.99	Yes	17.71	0.52	32
Total			**12.65**				**142**

A total of 142 ecosystem credits are created by the proposed restoration areas. Accordingly, the restoration areas exceed the project's ecosystem credit requirements (ie 131 ecosystem credits). A total of 90 species credits are also created by the proposed restoration areas for the Large-eared Pied Bat, which exceeds the 65 species credits required.

6.8 Other matters

6.8.1 Traffic

There have been no recorded impacts of the quarry traffic on the efficiency, safety or amenity of the surrounding areas. Development consent 85/2865 approved up to 84 car movements per weekday and up to 248 truck movements per weekday. The proposal will not lead to an increase in vehicle movements above the approved amount.

The site has an improved access intersection currently with a 90m southbound left turn deceleration lane and a 120m northbound passing lane. These are shown in the aerial image in Photograph 6.3.

A range of photographs were taken for a road condition survey in 2014. These are provided below. Photograph 6.4 shows both the deceleration and passing lanes as being in good condition. This intersection improvement was a requirement of the original consent.

Photographs 6.5-6.7 show Menangle Road, in the vicinity of the quarry, remains in a good condition.

Photograph 6.3 Quarry entrance intersection with Menangle Road

Photograph 6.4 Menangle road looking south in vicinity of quarry entrance, on the left

Photograph 6.5 Menangle Road 1 km north of Station Street looking north

Photograph 6.6 **Menangle Road 1.5 km north of Station Street looking north**

Photograph 6.7 **Menangle Road 3.5 km north of Station Street looking north**

6.8.2 Visual amenity

The relatively flat to undulating Nepean Valley floodplain contrasts with the surrounding hills and escarpments to the west, north and south. Within the floodplain the landscape has a broad open character, broken only by stands of vegetation in the main running along parts of the riverbank areas.

The visual impact assessment undertaken for Development Consent 85/2685, evaluated the impact of the extraction operations in each of the proposed 7 stages on key areas such as Menangle Road, Hume Motorway, public reserves and other areas. It concluded that the cleared parts of the floodplain possess a low overall visual quality, with better vegetated areas along the river and surrounding site having low to medium visual quality.

The lot containing the Stage 8 area (Lot 203 DP590247) also contains the Nepean River. There is no public access to the river adjacent to the Stage 8 area.

There are fleeting views of the trees at the northern-most section of the Stage 8 area from vehicles travelling south along the Hume Motorway. These trees will be retained within the Stage 8 restoration area so there will be no visual impacts from this public viewpoint.

The rest of the Stage 8 area is within the incised Nepean River valley and not visible from public viewpoints. Similarly, the extraction activities will be screened from view from the Ellel Christian Ministries retreat by the upper part of the river valley.

Therefore, there will be no impacts to visual amenity as a result of the extension project.

The final landform and high quality ecosystem resulting from rehabilitation and restoration activities in the Stage 8 area will provide an aesthetically positive environment, particularly in the context of the adjoining Nepean Rive and areas of rock outcrops. These areas will be accessible following the likely long-term further residential development on the Menangle area.

6.8.3 Socio-economic assessment

The direct socio-economic benefits of the extension include the continued full time employment of 16 people in the quarrying and processing facility and potentially more for ancillary activities. These employees are from the local area.

The extension project has wider socio-economic benefits as part of the broader landscape supply, road construction, and housing and allied construction industries.

Contractors will continue to transport products from the site. These contractors are generally from the south-west Sydney region providing an economic multiplier effect in the local and regional economy.

Other socio-economic benefits of the continued extraction will be:

- Improved environmental outcomes through rehabilitation and restoration of degraded natural environment. In providing for extensive restoration along the banks of the Nepean River the overall attractiveness of the area will be improved. This will be of benefit to future users of the area.

- Stronger regional industrial activity and utilisation of suitable extractive resources. The continued extraction of sand and soil from the Menangle site will ensure a significant proportion of the demand for this resource can be met. The proximity of this resource to the rapidly growing south west region of Sydney enables improved accessibility, shorter travelling times and lower haulage costs. As well, the location of the proposed extraction area together with the conveyance system means little to no disruption to local road traffic flows and safety.

The project will allow Menangle Sand and Soil to continue to provide competitively priced products, including sand and soil supplies, contributing to the wider economy.

Potential social amenity impacts of the extension project, including noise, air quality, and visual impacts, are discussed in the preceding sections.

6.8.4 Bush fire

The majority of the Stage 8 area and part of the conveyor corridor (approximately 135 m) in the Stage 7 area, will be in areas of Bushfire Prone Vegetation Category 1 according to the Wollondilly Council Bushfire Prone Land Map. In addition, part of the conveyor corridor (approximately 216 m) will be in the 100 m buffer surrounding the bushfire prone vegetation. This vegetation will be cleared in the Stage 8 extraction area. There will be Bushfire Prone Vegetation Category 1 adjacent to the extraction area.

No structures capable of accommodating people or materials which may contribute to a bushfire (eg fuel tanks) are proposed on the bushfire prone land (the mobile equipment, including the generator powering the conveyor, will have self-contained fuel tanks). Therefore, a bushfire hazard assessment in accordance with the NSW Rural Fire Service (RFS) and Department of Planning's (2006), Planning for Bush Fire Protection – A Guide for Councils, Planners, Fire Authorities and Developer has not been conducted.

i Fire management

The Stage 8 area is in the Southern Highlands RFS district, with the nearest brigade being at Menangle. Menangle Sand and Soil will participate with RFS in bushfire risk assessments for the area and will contribute to bushfire risk reduction works in the area.

As with all rural settings, there is a risk that bushfires could occur in the area.

A fire in the Stage 8 area could initiate a bushfire. The risk of this occurring will be reduced by implementation of the following measures:

- vehicle refuelling will be confined to designated refuelling areas (there will not be any vegetation in these areas);
- fire extinguishers will be provided in vehicles; and
- there will be no smoking in the Stage 8 area.

In addition, the severity of a fire if it occurs will be reduced by implementing the following:

- risk reduction, such as slashing, will be undertaken where appropriate;
- all mobile plant will be moved to a cleared area if there is a danger that a bushfire will enter the Stage 8 area and during catastrophic fire danger periods;

- the work areas to remain fitted with fire fighting hoses; and
- the Rural Fire Service (RFS) will be contacted if there is a fire.

Management measures will be used to prevent a fire in the Stage 8 area initiating a bushfire and reduce the severity of an existing bushfire through fire breaks and by fighting fires with project resources. Therefore, the project is unlikely to be damaged by, initiate or contribute to the severity of a bushfire.

7 Statement of commitments

7.1 Introduction

This chapter summarises the commitments in this EA to manage potential environmental impacts from the extension project.

7.2 Environmental management plan

Menangle Sand and Soil implements a wide range of site-specific environmental management programs for its existing quarry operations.

A variation to the current EPL 3991 would be required to extend the EPL to include Lot 203 DP590247.

A Stage 8 Post Extractive Rehabilitation and Restoration Plan will be prepared detailing measures to be implemented in the Stage 8 area including: soil stripping and vegetation clearance protocols; erosion and sediment control measures; rehabilitation of the extraction area and adjacent restoration activities.

7.3 Summary of commitments

A summary of the environmental management and mitigation measures described for specific aspects of the project are provided in Table 7.1.

Table 7.1 Summary of commitments

Aspect	Commitment
Air quality	Management measures to suppress dust and emissions consistent with current operations will be continued: • level 2 water spraying for hauling on unpaved roads; • water spraying where screening occurs; and • water spraying at conveyor transfer points.
Noise & vibration	The current management measures to minimise noise emissions will continue to be implemented including: • regular reinforcement of the need to minimise noise; • regular identification of noisy activities and adoption of improvement techniques; • working in shielded areas when possible (ie below the top of the bank of the Nepean River); • avoiding the use of portable radios with external speakers, public address systems or other methods of site communication that may unnecessarily impact upon nearby residents; • developing routes for the delivery of materials and parking of vehicles to minimise noise; • where possible, avoiding the use of equipment that generates impulsive noise; • minimising the need for vehicle reversing for example, by arranging for one-way site traffic routes; • minimising the movement of materials and plant and unnecessary metal-on-metal contact; and • scheduling respite periods for intensive works (such as timber milling).

Table 7.1 Summary of commitments

Aspect	Commitment
Aboriginal heritage	*Aboriginal sites* • A pre-clearance survey will be undertaken to ensure that any scarred trees in the Stage 8 area are identified and recorded; • Procedures will be implemented to ensure there is no inadvertent harm to buried rock shelters; • Procedures to be implemented if human skeletal remains are discovered; • Management measures will be implemented so that the quarry machinery avoids impacting buried sandstone features; and • If new Aboriginal sites are discovered during soil extraction or revegetation of the Stage 8 area, they will be assessed by an archaeologist and any new sites will be recorded on AHIMS.
Biodiversity, Restoration and rehabilitation	Measures to minimise the project's biodiversity impacts will be: • Avoid - avoidance of direct impacts on critically endangered ecological communities, namely Shale/Sandstone Transition Forest in the Sydney Basin Bioregion and Cumberland Plain Woodland in the Sydney Basin Bioregion. The development consent for the Stage 3 area would also be modified so there is no quarrying in this area, avoiding the approved clearing of 5.68 ha of an endangered ecological community, River Flat Eucalypt Forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions that would have otherwise occurred. • Minimise - clearing of vegetation in 'campaigns' ahead of sand and soil extraction, and minimising the area disturbed to approximately 1 ha at any one time. Staged vegetation clearing will minimise impacts on fauna when compared with clearing all vegetation in a single event. • Mitigate - measures have been proposed to mitigate the clearing of native vegetation, loss of hollow-bearing trees, fauna injury and mortality and erosion and sedimentation (Table 4.1 in Appendix I). • Offset - the proposed offset strategy is described in Section 6.7.4. Restoration and rehabilitation will be undertaken in accordance with a post extractive rehabilitation and vegetation management plan similar to those contained in Appendix C that will: • provide details of the conceptual final landform, soil stripping and vegetation clearing protocols, erosion and sediment control measures, rehabilitation of the extraction area and adjacent restoration activities; • describe how the implementation of the biodiversity offset strategy would be integrated with the overall rehabilitation of the site; and • detail how connectivity will be managed during the VMP works program.
Groundwater	The existing groundwater management controls implemented on the site for the approved operations will be continued, including: • the base of the quarry pit will be no deeper than 62 m AHD, ie 1 m above the alluvial water table; and • if groundwater enters the pit, for example during extended high flow in the Nepean River, it will be allowed to infiltrate back into the alluvial groundwater system once the alluvial water table drops.

Table 7.1 Summary of commitments

Aspect	Commitment
Surface water	The existing soil and surface water management controls implemented on the site for the approved operations will be continued. These measures include: • the extraction area will be setback from the river (a minimum of 10 m from the 64 m AHD contour) leaving the lower portion of the river bank undisturbed, forming a bund and swale between the extraction area and the river; • flow diversions and check dams will be constructed to direct runoff from the extraction area to a sediment basin; • a sedimentation basin, sized to trap and treat runoff, will be excavated within the pit; • surface water in the sedimentation basin will only be discharged when the total suspended solids (TSS) concentration is 50 mg/L or less; and • the erosion and sediment control measures will be regularly maintained. The sedimentation basin will be formed in the base of the pit and will be relocated as the extraction area progresses.
Traffic and transport	*Road upgrades* • No road upgrades will be required as a result of the extension. *Traffic management plan* • The existing traffic management plan will be monitored and reviewed.
Social	*Local employment, training and engagement* Menangle Sand and Soil will ensure that preference is given to local employees. As well, they will use local or regional contractors and suppliers where this presents a cost effective and feasible option.
Visual	*Visual amenity* Menangle Sand and Soil will continue to consult with surrounding landowners regarding the visual amenity of the quarry and will implement any reasonable additional controls to further reduce their visual impact, if necessary.
Historic heritage	Extraction in the northern-most part of the Stage 8 extraction area will avoid the storage container if possible. The industrial equipment on the west bank of the Nepean River in the Stage 8 restoration area will not be disturbed.

8 Project justification and conclusions

8.1 Introduction

This chapter provides justification for the carrying out of the extension project against the principles of ecologically sustainable development (ESD). It also discusses the suitability of the site, any submissions made and whether the extension project is in the public interest as required by Section 79C(1)(c)–(e) of the EP&A Act.

Justification for the extension project based on biophysical, economic and social considerations is provided in Section 1.5.

8.2 Principles of ecologically sustainable development

The principles of ESD are defined in Clause 7(4) of Schedule 2 to the EP&A Regulation and include the following:

(a) the precautionary principle, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:

  (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

  (ii) an assessment of the risk-weighted consequences of various options,

(b) inter-generational equity, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,

(c) conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,

(d) improved valuation, pricing and incentive mechanisms, namely, those environmental factors should be included in the valuation of assets and services, such as:

  (i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

  (ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

  (iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

Consideration of the extension project against the four principles of ESD is given below.

8.2.1 The precautionary principle

Consideration of the precautionary principle requires two things. First, that the proponent properly assesses all potential impacts using plausible worst case assumptions and, either, avoids them in project planning or incorporates effective safeguards into the project design. Second, that the relevant authorities make a well-informed decision about the project based on a sound knowledge of the project's implications and impacts, including any limitations on the accuracy of impact predictions.

There are no "threats of serious or irreversible damage" from the extension project and the project's planning and design meets the first test above. These design and management measures are described in Chapters 3 and 6 of this EA. The Statement of Commitments (Chapter 7) highlights the main measures that will be implemented under the extension project to avoid, manage or mitigate predicted environmental impacts.

The second test will be satisfied by the comprehensive decision-making processes to be followed by the State government.

8.2.2 Inter-generational equity

The extension project will extract sand and soil that would otherwise not be extracted. However, it will enable the restoration of degraded vegetation into a sustainable high quality ecosystem. The extension project will, therefore, extend the benefits for current and future generations. The extracted material will largely be used in landscaping and construction projects that will benefit current and future generations.

8.2.3 Conservation of biological diversity and ecological integrity

The ecological integrity of the site is poor given its location and the dominance and pervasiveness of exotic vegetation along the river bank. Large amounts of this exotic vegetation will be removed thereby enabling the return of the area to its rightful pre-existing vegetation community.

8.2.4 Improved valuation, pricing and incentive mechanisms

The extension project will blend extracted sand and soil with recycled materials imported to the site to produce landscaping and construction materials. This will avoid the economic (and environmental) cost of disposing of the imported materials to landfill and extend the use of the natural resource. It therefore incorporates improved valuation, pricing and incentive mechanisms.

8.3 Suitability of the site

As described in Section 1.5 the site is considered suitable for the proposed activities given that it is an extension of an existing quarry, it has existing site access and infrastructure, and it is distant from any residences. Extraction operations will not be visible from any public locations or private residences and it provides an opportunity to restore a degraded ecosystem.

8.4 Submissions made

The EA for the proposal will be placed on public exhibition for a determined period of time. During this period the public will be invited to provide submissions on the proposal. These submissions will be considered by determining authority in their determination of whether to approve the extension project.

8.5 Public interest

The extension project is considered to be in the public's interest for the following reasons:

- the project provides a better alternative to the extraction of sand and soil from the approved Stage 3 area;
- the project will extend the quarry's socio-economic benefits through employment and ongoing regional industrial activity;
- the products will continue to blend recycled materials with extracted sand and soil, reusing the imported materials while extending the natural resources;
- the project's environmental and social amenity impacts will be negligible with the implementation of the recommended mitigation and management measures; and
- the extension project will lead to a better environmental outcome post extraction and as a result of proposed rehabilitation and restoration activities.

8.6 Conclusion

Extractive operations have been ongoing around this site since the 1930s. The current operators have worked the location since the 1970s. There is an ongoing and growing demand for sand and soil products due to the growth of the Sydney metropolitan area. Nepean River sand and soil deposits at Menangle are the only approved significant soil resource which currently supplies greater than 70% of Sydney's market. This proposed extension will represent the bulk of Sydney's approved topsoil after 2020.

The site is zoned RU1 rural under the Wollondilly Local Environmental Plan (LEP) and development for the purpose of extractive industries is permissible with consent within the RU1 zone. The extension project is consistent with the objectives of the sites land use zones and both the Wollondilly LEP and the Mining SEPP.

There have been no complaints regarding current and historic operations at the quarry over the 30 plus years of operation.

The site is ideally suited for extraction because it is an extension of an existing operation, it is distant from residences; and will result in improved environmental outcomes longer term. Swapping of quarrying into Stage 8 area will provide an ongoing economic and social benefit from a site that contains an important and regionally significant resource due to its suitability for use in the construction and other industries.

This EA has been prepared in accordance with the advice received from the DPE and WSC. It describes the existing environment, the quarry extension project, the legislative and policy context, proposed environmental management measures and the impacts of the project. Given the location and condition of the site, the proposed activities will not only have minor environmental impacts, but long-term environmental benefits.

It is therefore recommended that the quarry extension project is approved subject to the implementation of the mitigation measures outlined in this EA.

Abbreviations

CSP	Concept Stormwater Plan
DCP	Development Control Plan
DoP	Department of Planning
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
DP&I	Department of Planning and Infrastructure
EAR	Environmental Assessment Requirements
EEC	Endangered Ecological Community
EA	Environmental Impact Statement
EMP	Environmental Management Plan
EMM	EMM Consulting Pty Ltd
EPA	Environment Protection Authority
EP&A Act	Environmental Planning & Assessment Act 1979
EPL	Environment Protection Licence
FBA	Framework for Biodiversity Assessment
LEP	Local Environmental Plan
MSB	Mine Subsidence Board
POEO Act	Protection of the Environment Operations Act 1997
RF Act	Rural Fires Act 1997
RMS	Road and Maritime Services
SEARs	Secretary's Environmental Assessment Requirements
SAP	Site Analysis Plan
TSC Act	Threatened Species Conservation Act 1995
WM Act	Water Management Act 2000
WMP	Waste Management Plan
WSC	Wollondilly Shire Council

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