Air Quality Management Plan

Menangle Sand and Soil Quarry

Prepared for Menangle Sand and Soil Pty Ltd
March 2022

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Menangle Sand and Soil Quarry

Air Quality Management Plan

Report Number

J190166 RP30

Client

Menangle Sand and Soils Pty Ltd

Date

31 March 2022

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v1	31/11/20	S. Fishwick	F. Manansala	Internal draft
v2	13/12/20	S. Fishwick	F. Manansala	Internal draft
v3	13/12/20	S. Fishwick	F. Manansala	Internal draft
v4	24/2/21	S. Fishwick	F. Manansala	Draft addressing DPE comments of 20/1/21
v5	2/4/21	S. Fishwick	F. Manansala	Draft addressing DPE comments of 24/3/21
v6	12/4/21	S. Fishwick	F. Manansala	Draft addressing DPE comments of 9/4/21
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v8	25/3/22	P. Towler	P. Towler	Correcting a typo
v9	31/3/22	P. Towler	P. Towler	Update addressing DPE comment of 30/3/22

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1 Introduction

1.1 Background

Menangle Sand and Soil Pty Ltd (Menangle Sand and Soil) operates the Menangle Sand and Soil Quarry at 15 Menangle Road, Menangle (Figure 1.1). 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 undertaken by Menangle Sand and Soil since 1978.

The quarry, located in the Wollondilly and Campbelltown local government areas, extracts sand and soil along the Nepean River as approved by Development Consent 85/2865, granted by the Minister for Planning on 15 November 1989.

To date, sand and soil has been extracted from Stages 1 to 2 and 4 to 7 (Figure 1.2). While previously approved, sand and soil will not be extracted from Stage 3.

On 10 September 2020, the NSW Land and Environment Court (LEC) approved the Menangle Quarry Extension – Modification 1 (MOD1) to Development Consent 85/2865. Consent Conditions are provided in the Notice of Orders for LEC 2018/342158.

On 5 November 2021, the Minister for Planning and Public Spaces approved the Menangle Quarry Extension – Modification 2 (MOD2). Changes to the Consent conditions are provided in the Notice of Modification for Development Consent DA 85/2865.

The Consolidated Consent ('the Consent') allows the extraction of sand and soil in a new area, the Stage 8 area, that is about 13 ha, and extends about 2 kilometres (km) along the Nepean River south of the Stage 7 area (Figure 1.3). The quarry is approved to extract sand and soil from the Stage 8 area at a rate of up to 150,000 tpa.

The extracted material will be transported to the processing area where it will be stockpiled, processed and blended with materials imported to the site, prior to being dispatched from the quarry. Operations (but not extraction) will continue in the Stage 6 and Stage 7 areas.

Modification 2 removed the requirement for an overland conveyor and replaced it with the operation of an off-road haul truck for the transfer of extracted materials from the Stage 8 area to the processing area using existing roads.

This air quality management plan (AQMP) has been prepared to address the requirements of the Consent.

1.2 Project overview

The quarry has consent to extract the sand and soil resource in the Stage 8 area to 2035. Stage 8 has been split up into 15 sub-stages (Figure 1.3) which have been further categorised into seven extraction phases (Table 1.1).

Source: EMM (2022); DFSI (2017); GA (2011); ASGC (2006)

0 5 10 km

GDA 1994 MGA Zone 56

N

\\emmsvr1\EMMJobs\2019\J190166 - Menangle Quarry LEC\GIS\02_Maps\G035_RegionalContext_20220112_01.mxd 24/02/2022

KEY

- Rail line
- Major road
- Named watercourse
- Named waterbody
- NPWS reserve
- Local government area

INSET KEY

- Main road
- State forest

Regional context

Menangle Sand and Soil Quarry
Figure 1.1

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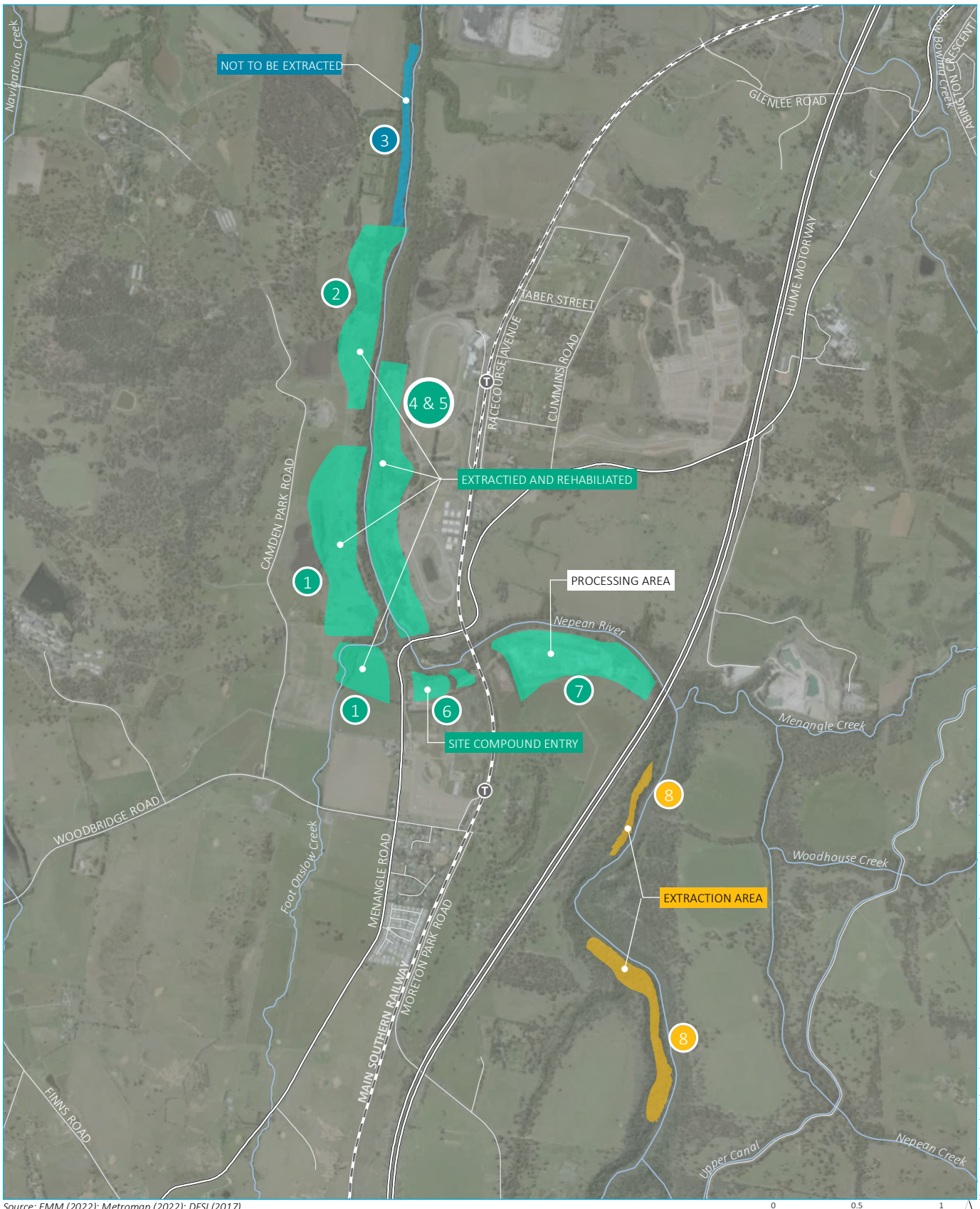

Source: EMM (2022); Metromap (2022); DFSI (2017)

0 0.5 1 km

GDA 1994 MGA Zone 56

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KEY

- Train station
- Rail line
- Main road
- Local road
- Named watercourse
- Extractive operations (approved)
- Extractive operations (approved but not extracted)
- Stage 8 - extraction/rehabilitation area

Menangle Quarry stages 1 to 8

Menangle Sand and Soil Quarry
Figure 1.2

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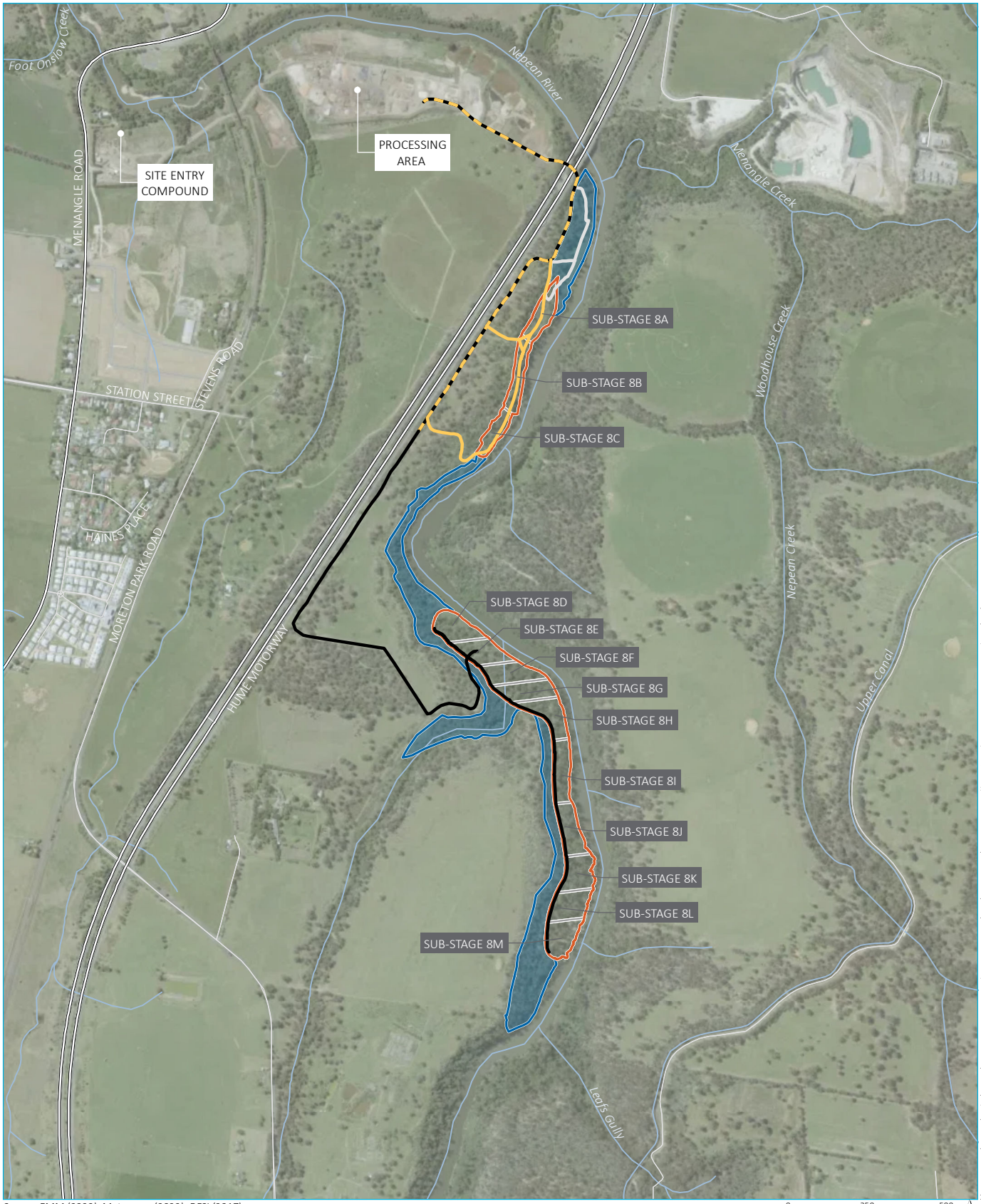

Source: EMM (2022); Metromap (2022); DFSI (2017)

0 250 500 m

GDA 1994 MGA Zone 56

N

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KEY

- Stage 8 - extraction/rehabilitation area
- Stage 8 - restoration area (no extraction)
- Main road
- Local road
- Watercourse/drainage line
- Access track

Haul roads

- Substage 8A-8M
- Substage 8A-8C
- Substage 8D-8M

- Substage boundary

Phase 1 Sub-stages 8A - 8B
Phase 2 Sub-stage 8C
Phase 3 Sub-stages 8D - 8E
Phase 4 Sub-stages 8F - 8G
Phase 5 Sub-stages 8H - 8I
Phase 6 Sub-stages 8J - 8K
Phase 7 Sub-stages 8L - 8M

Stage 8 area

Menangle Sand and Soil Quarry
Figure 1.3

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Table 1.1 Stage 8 phases

Phase	Substage
1	8A–8B
2	8C
3	8D–8E
4	8F–8G
5	8H–8I
6	8J–8K
7	8L–8M

As well as the extraction areas, key components of the quarry include:

- 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;
- materials stockpiling and processing area; and
- other minor infrastructure.

These components will be used to support activities in the Stage 8 area which include:

- extraction in the Stage 8 extraction area followed by rehabilitation;
- restoration of areas adjacent to the extraction areas; and
- internal haul roads.

1.3 Operations

1.3.1 Activities

Operations at the quarry comprises the following activities:

- vegetation management and clearance;
- sand and soil excavation;
- material transport by off-road haul truck;
- sorting and screening of excavated material;
- processing of excavated material;

- blending of excavated material with imported materials;
- stockpiling;
- loading of product into trucks; and
- product dispatch via trucks.

1.3.2 Plant and equipment

Condition A33 of the development consent states:

> All plant and equipment used on site, or to monitor the performance of the development must be:
>
> (a) maintained in a proper and efficient condition; and
>
> (b) operated in a proper and efficient manner.

Regular maintenance of all plant and equipment will be logged and stored on site available for review at any time.

1.4 Quarry life

The Stage 8 Operations may be carried out on the site until 31 December 2035.

1.5 Operating hours

The quarry will operate during the approved hours in accordance with development consent Table 1, Condition A26 (see Table 1.2 below).

Table 1.2 Operating hours

Activity	Permissible hours
Construction work	• 7 am to 5 pm Monday to Friday • 7 am to 1 pm Saturday • At no time on Sundays or public holidays
Quarrying operations including loading and dispatch of laden trucks	• 6 am to 5 pm Monday to Friday • 6 am to 12 noon Saturday • At no time on Sundays or public holidays
Maintenance, security, office work, cleaning, etc	• May be conducted at any time, provided that these activities are not audible at any residence on privately-owned land

Condition A27 of the development consent states that where police or other public authorities request that deliveries or dispatching of materials are to be carried out outside operating hours and emergency work to avoid the loss of lives, property or to prevent environmental harm is required, then these activities are permitted outside the normal operating hours. In such circumstances, the Applicant must notify the Department and affected residents prior to undertaking the activities, or as soon as is practical thereafter.

1.6 Access

1.6.1 Site access

The main access to the site is from Menangle Road. Menangle Road is an arterial road which provides sub-regional access.

1.6.2 Access to the Stage 8 area

The existing access under the Hume Motorway was retained when the Road Transport Authority (now Transport for NSW, TfNSW) bisected the lands when acquiring the corridor for the original Hume Highway in 1969. The existing access road under the bridge will be sealed and will comply with TfNSW drainage and pavements standards.

Material will be transported beneath the Hume Motorway Menangle Bridge by off-road haul truck using existing tracks.

The earthmoving equipment, off-road haul truck and other plant to service the Stage 8 area may also access the area via Moreton Park Road. Major plant is expected to remain onsite through-out the duration of the quarrying operations except for major servicing or replacement.

1.6.3 Product dispatch

Truck movements at the site (ie combined inbound and outbound movements) will not exceed an average of:

- 147 per day on Monday to Friday; and
- 80 per day on Saturday.

1.7 Purpose and objectives

EMM Consulting Pty Limited (EMM) has been engaged by Menangle Sand and Soil to prepare an air quality management plan (AQMP) as required by development consent conditions (DA 85/2865) prior to commencing Stage 8 quarrying operations.

This AQMP addresses operations across the quarry for phases 1–7 (see Table 1.1).

The final AQMP approved by the Planning Secretary will be implemented.

1.8 Report preparation

This AQMP has been prepared by EMM's National Technical Leader for air quality, Scott Fishwick. Scott has over 15 years' experience as a senior air quality consultant, specialising in atmospheric dispersion modelling, air quality impact assessments, meteorological processes, ambient air quality and meteorological monitoring.

1.9 Consultation

1.9.1 AQMP preparation

There is a requirement of the Consent that this AQMP be prepared in consultation with the EPA.

A letter was sent via email to the NSW Environmental Protection Authority (EPA) on 14 October 2020 inviting input to the contents of this AQMP (Appendix A). The EPA responded via a letter on 26 November that the documents

appear appropriate to manage activities at the site and that the EPA supports the development of Environmental Management Plans (EMPs) as part of good environmental management but does not generally approve specific EMPs for industry operations. The letter is attached in Appendix B.

The draft AQMP was provided to the EPA for their review and the EPA had no comments.

Following Department of Planning, Industry and Environment (now Department of Planning and Environment, DPE) review of the draft AQMP, the final AQMP (version 6, 12 April 2021) was approved by the Planning Secretary on 14 April 2021 (Appendix C).

1.9.2 AQMP update

Agencies, including EPA were consulted during the MOD2 application process. Their comments were considered by Menangle Sand and Soil during the application process and by DPE on behalf of the Minister in approving the application and amending the Consent conditions.

There have only been small changes to this plan to reflect changed wording in Consent. Therefore, EPA were not consulted during the update of this plan.

2 Environmental requirements

2.1 Legislation

The AQMP provides recommended air quality emission management measures for the quarry. The AQMP has been prepared to address the requirements of the development consent conditions, guided by the following guidelines and policies:

- Australian Standard AS 3580.14-2011 *Methods for sampling and analysis of ambient air Part 14: Meteorological monitoring for ambient air quality monitoring applications*;
- NSW Land and Environment Court 2020, Development Consent DA 85/2865 (approved 10 September 2020);
- NSW Department of Environment and Conservation (DEC) 2007, *Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales*; and
- NSW Environment Protection Authority (EPA) 2016, *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*.

2.2 Project consent conditions

Table 2.1 lists the requirements of the development consent conditions and references the section of the report where each of these requirements has been addressed.

Table 2.1 Quarry development consent conditions and relevant section of the report

Condition Number	Condition	Relevant report section
A26	The Applicant must comply with the operating hours set out in Table 1.	1.4
A27	The following activities may be carried out outside the hours specified in Table 1.	1.4
	a) delivery or dispatch of materials as requested by Police or other public authorities; and	
	b) emergency work to avoid the loss of lives, property or to prevent environmental harm.	
	In such circumstances, the Applicant must notify the Department and affected residents prior to undertaking the activities, or as soon as is practical thereafter.	
A33	All plant and equipment used on site, or to monitor the performance of the development must be:	5.1
	a) maintained in a proper and efficient condition; and	
	b) operated in a proper and efficient manner.	
B10	The Applicant must ensure that no offensive odours (as defined under the POEO Act) are emitted by the development.	4.3
B11	The Applicant must ensure that particulate matter emissions generated by the development do not cause exceedances of the criteria in Table 3 at any residence on privately-owned land.	3 and 5.2
B12	The air quality criteria in Table 3 do not apply if the Applicant has an agreement with the owner/s of the relevant residence to exceed the air quality criteria, and the Applicant has advised the Department in writing of the terms of this agreement.	3
B13	The Applicant must:	-
	a) take all reasonable steps to:	5.1
	i. minimise odour, fume, greenhouse gas and dust (including PM_{10} and $PM_{2.5}$) emissions of the development;	
	ii. minimise any visible off-site air pollution generated by the development; and	
	iii. minimise the extent of potential dust generating surfaces exposed in the Stage 8 Area at any given point in time;	
	b) minimise the air quality impacts of the development during adverse meteorological conditions and extraordinary events (see Note c to Table 3 above);	6.3
	c) carry out regular air quality monitoring to determine whether the development is complying with the relevant conditions of Schedule 2; and	6.2
	d) regularly assess meteorological and air quality monitoring data and relocate, modify or stop operations on the site to ensure compliance with the relevant conditions of Schedule 2.	6.2
B13A	The Applicant must construct and maintain all haul roads to minimise:	-
	a) excessive dust emissions by (including but not limited to):	5.1
	i. sealing the road surface with a clean coarse aggregate or equivalent, and minimising the surface silt content of the roads or implementing other surface treatment options such as chemical suppressants or paving; and	
	ii. watering the haul roads at the appropriate water rate when in use.	
B14	The Applicant must prepare an Air Quality Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:	This document
	a) be prepared by a suitably qualified and experienced person/s;	1.6

Table 2.1 Quarry development consent conditions and relevant section of the report

Condition Number	Condition	Relevant report section
	b) be prepared in consultation with the EPA;	1.7
	c) describe the measures to be implemented to ensure: i. compliance with the air quality criteria and operating conditions in this Schedule; ii. best practice air quality management is being employed; and iii. air quality impacts of the development are minimised during adverse meteorological conditions and extraordinary events; and	5.1
	d) include an air quality monitoring program that: i. is capable of evaluating the performance of the development against the air quality criteria; and ii. includes a protocol for identifying any air quality-related exceedance, incident or non-compliance and for notifying the Department and relevant stakeholders of these events.	6.2
B15	The Applicant must not commence Quarrying Operations in the Stage 8 Area until the Air Quality Management Plan is approved by the Planning Secretary.	1.9
B16	The Applicant must implement the Air Quality Management Plan as approved by the Planning Secretary.	1.7
B17	Prior to the commencement of Quarrying Operations in the Stage 8 Area, and for the life of the development, the Applicant must ensure that there is a suitable meteorological station operating in close proximity to the site that: a) complies with the requirements in the Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales (DEC, 2007); and b) is capable of measuring meteorological conditions in accordance with the NSW Industrial Noise Policy (EPA, 2000), unless a suitable alternative is approved by the Planning Secretary following consultation with the EPA	6.2
C1	As soon as practicable and no longer than 7 days after obtaining monitoring results showing an exceedance of any noise or air quality criterion in PART B of Schedule 2 following the date of commencement of Quarrying Operations in the Stage 8 Area, the Applicant must provide details of the exceedance to any affected landowners/tenants if the Applicant has not otherwise reached an agreement to exceed the relevant criteria with the affected landowner pursuant to condition B5 or B12. For any exceedance of any air quality criterion in PART B of this consent, the Applicant must also provide to any affected land owners and tenants a copy of the fact sheet entitled "Mine Dust and You" (NSW Health, 2017).	EMS Section 8.3.2
C2	If, at any time following the date of commencement of Quarrying Operations in the Stage 8 Area, a landowner considers the development to be exceeding any noise or air quality criterion in PART B of Schedule 2, they may ask the Planning Secretary in writing for an independent review of the impacts of the development on their land.	EMS Section 8.3.3

n/a – not applicable
EMS – see Environmental Management System

3 Air quality criteria

The primary air pollutants generated by the quarry are particulate matter, including the following:

- total suspended particulate matter (TSP);
- particulate matter less than 10 microns in aerodynamic diameter (PM_{10}); and
- particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$).

Condition B11 of the development consent conditions states:

> The Applicant must ensure that particulate matter emissions generated by the development do not cause exceedances of the criteria Table 3 at any residence on privately-owned land.

The specific criteria from Table 3 of the development consent conditions are listed in Table 3.1.

Table 3.1 Development consent air quality criteria

PM metric	Averaging period	Impact assessment criteria
TSP	Annual	90 µg/m^3 [a,c]
PM_{10}	24 hour	50 µg/m^3 [b]
	Annual	25 µg/m^3 [a,c]
$PM_{2.5}$	24 hour	25 µg/m^3 [b]
	Annual	8 µg/m^3 [a,c]
Dust deposition [d]	Annual	2 g/m^2/month [b]
		4 g/m^2/month [a]

Notes: µg/m^3: micrograms per cubic meter; g/m^2/month: grams per square metre per month.

a. total impact (ie incremental increase in concentrations due to the development plus background concentrations due to all other sources).
b. incremental impact (ie incremental increase in concentrations due to the development on its own).
c. excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary.
d. deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter – Gravimetric Method.

In accordance with condition B12 of the development consent conditions, the air quality criteria in Table 3.1 do not apply if the Menangle Sand and Soil has an agreement with the owner/s of the relevant residence to exceed the air quality criteria, and the Menangle Sand and Soil has advised DPE in writing of the terms of this agreement.

4 Quarry emission sources

4.1 Dust emissions sources

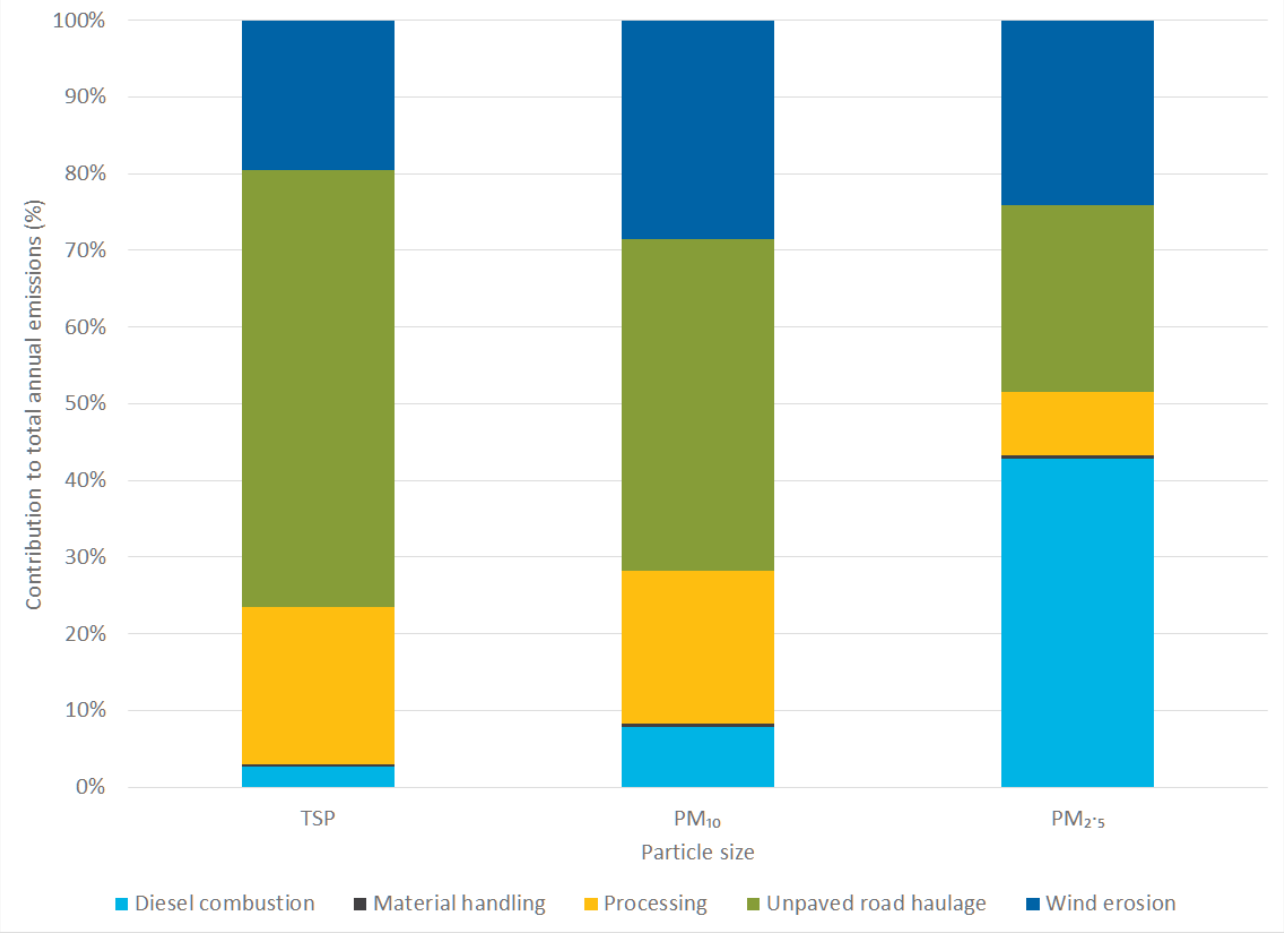
A detailed air quality impact assessment (AQIA) for the quarry including the operation of the proposed Stage 8 area was completed by Ramboll Environ (2016). The AQIA quantified annual emissions from the quarry and identified the following sources of air pollutant emissions:

- removal of topsoil and overburden material;
- extraction of raw material from quarrying areas and loading to trucks;
- unloading of raw material to conveyor hopper;
- overland conveying of raw material to stockpiling area;
- loading of raw material to haul trucks;
- transfer of raw material by haul trucks to processing plant area;
- unloading of material to the processing plant area (raw material and imported material);
- screening and conveying of material;
- final product stockpile loading;
- loading to product dispatch trucks;
- haulage of product material to quarry exit;
- wind erosion of exposed areas and stockpiles; and
- diesel combustion by trucks and quarrying equipment.

The *Menangle Sand and Soil Modification 2 Comparative Air Quality Impact Assessment* (EMM 2021) was prepared as part of the MOD1 application.

4.2 Source significance

Based on the emissions inventory presented in the AQIA (Ramboll Environ 2016), a summary of the significance of emission source type by particle size is presented in Figure 4.1.



Source: Ramboll (2016).

Figure 4.1 Emission source significance by particle size – AQIA inventory

The following notes are made in relation to site emissions presented in Figure 4.1:

- the movement of trucks along unpaved haul routes is the primary contributor to emissions of TSP and PM_{10};
- material processing and wind erosion emissions are moderate contributors to annual emissions of all size fractions; and
- the significance of diesel combustion emissions increases with decreasing particle size.

4.3 Odour emissions sources

The quarry does not feature significant odour generating emission sources.

5 Mitigation measures

5.1 Air emission mitigation measures

Conditions B13 and B13A of the Consent (listed in Table 2.1) relate to the management of air emissions from the quarry. The following mitigation measures will be continued for Stage 8 operations:

- the use of wet suppression by water cart along all unpaved transport routes on site;
- the use of water sprays to exposed surfaces and material storage stockpiles during periods of hot, dry and windy conditions;
- the use of water sprays along the haul road between the site entrance and the processing area;
- ongoing active rehabilitation of completed quarrying areas;
- application of water sprays at all screens at the processing plant;
- application of water sprays at conveyor transfer points at the processing plant; and
- use of amenity bunds at the processing plant and quarrying areas to reduce the potential for wind-blown dust generation.

The following mitigation measures will be implemented during the use of the Stage 8 area haul road to meet the requirements of condition B13A:

- the quarry's 20 km/h speed limit will apply along the Stage 8 area haul road;
- excessive dust emissions will be prevented through:
    - fixed irrigation installed along the part of the haul road that is being used for the active substage;
    - use of a water cart to supplement the fixed irrigation if additional water is required to control dust emissions;
    - sealing the road surface with a clean coarse aggregate or equivalent;
    - minimising the surface silt content of the roads; and/or
    - implementing other surface treatment options such as chemical suppressants or paving.

The measures described in Section 7.2 of the *Menangle Sand and Soil Quarry Soil and Water Management Plan* will be implemented, with regard to *A Field Guide for Erosion and Sediment Control Maintenance Practices* (OEH 2012) or latest version, to prevent erosion and sedimentation, drying of eroded material and the subsequent formation dust that could become windblown.

For diesel combustion emissions, the following measures will be implemented:

- any new equipment purchased for site will meet the US-EPA Tier 2 emission standards;
- all plant and equipment will be regularly serviced and maintained to meet manufacturers emissions specifications, with all maintenance to be logged and stored on site available for review at any time; and

- idling of trucks, plant and equipment on site will be minimised wherever practicable to do so.

5.2 Risk of adverse impacts

The AQIA (Ramboll Environ 2016) and *Modification 2 Comparative Air Quality Impact Assessment* (EMM 2021) presented the results of atmospheric dispersion modelling conducted for particulate matter emissions generated from proposed Stage 8 operations at the quarry, including processing within the Stage 7 area. The dispersion modelling accounted for the mitigation measures detailed in Section 5.1.

The results of the dispersion modelling indicated that the proposed Stage 8 operations at the quarry would not result in exceedances of applicable NSW EPA assessment criteria at any of the surrounding sensitive receptors.

The risk of adverse air quality impacts in the surrounding environment from the quarry with the documented dust mitigation measures in place, is considered to be low.

6 Monitoring and incident reporting

6.1 Dust mitigation performance monitoring and responsibilities

Quarry personnel are responsible for monitoring the performance of onsite air pollution mitigation measures on a day-to-day basis. Responsibilities for air pollutant emission management are as set as follows:

The quarry foreman is responsible for:

- regular visual monitoring of the dust levels at the quarry;
- managing vehicle speed movements;
- restricting operations during periods of strong wind;
- utilising spray systems where applicable;
- cleaning of the material storage/processing areas;
- completion of a complaint form if dust complaint is received; and
- coordinating with the Quarry Manager to ensure the complaint is investigated.

The Quarry Manager is responsible for:

- implementing this procedure;
- auditing the site on a regular basis to ensure compliance with conditions B13 and B13A for air pollutant emissions;
- coordinating investigation of the dust with the quarry foreman;
- documenting the results of the investigation and actions taken;
- maintaining the records of any dust complaints;
- liaison with the complainant regarding the steps to be taken to minimise further air pollution emissions where appropriate; and
- ensuring that the nominated personnel have been trained in the requirements of this procedure.

Quarry personnel, including the off-road haul truck driver, will visually monitor for any visible dust generation along the Stage 8 haul road. The boundary of the quarry and the Hume Motorway road corridor is about 5 m from the track at its closest point and about 25 m from the closest traffic lane on the Motorway. If any dust generated by the haul truck is visible at the boundary between the quarry and the road corridor, dust control measures listed in Section 5.1 will be reviewed and additional measures implemented (eg increasing the level of watering). If dust remains visible at the site boundary, truck movements will be restricted until the required dust controls are implemented.

6.2 Ambient air quality monitoring

The development consent conditions do not feature any specific requirement for routine ambient air quality monitoring at the quarry (ie location, method or frequency). Condition B14d states the AQMP must:

> B14(d) - include an air quality monitoring program that:
>
> (i) is capable of evaluating the performance of the development against the air quality criteria; and
>
> (ii) includes a protocol for identifying any air quality-related exceedance, incident or non-compliance and for notifying the Department and relevant stakeholders of these events.

As identified in Section 5.2, the risk of adverse air quality impacts in the surrounding environment from the quarry is predicted to be low. In order to provide a measure of environmental management performance, Menangle Sand and Soil propose to install three dust deposition gauges (DDG) in the vicinity of the quarry. The proposed DDG locations, illustrated in Figure 6.1, are as follows:

- DDG1 – to the east of the site entry compound;
- DDG2 – near groundwater monitoring location BH2; and
- DDG3 – near groundwater monitoring location BH4.

Dust deposition monitoring will be conducted in accordance with AS/NZS 3580.10.1:2016: *Methods for sampling and analysis of ambient air - Method 10.1: Determination of particulate matter - Deposited matter - Gravimetric method*. As far as practicable and taking site constraints into consideration, the siting of dust deposition gauges will be conducted in accordance with AS/NZS 3580.1.1:2016: *Methods for sampling and analysis of ambient air - Part 1.1: Guide to siting air monitoring equipment*.

Monthly samples will be collected and sent to a laboratory for analysis. Results from the sampling will be reviewed as they are received from the laboratory with results compared against the applicable NSW EPA assessment criterion of 4 g/m^2/month.

As highlighted in Section 5.2, the risk of dust impacts from the operation of the quarry is low. The dust deposition gauges will be used to track the performance of dust mitigation practices at the quarry.

At the end of a 12-month period, demonstrated compliance with the development consent criterion of 4 g/m^2/month (Table 3.1) will represent a dust control key performance indicator for the quarry.

Following a completed period of 12 months of monitoring, the need to continue the dust deposition monitoring will be reviewed in conjunction with DPE.

Condition B17 relates to the establishment of a meteorological monitoring station in the vicinity of the quarry and states the following:

> Prior to the commencement of Quarrying Operations in the Stage 8 Area, and for the life of the development, the Applicant must ensure that there is a suitable meteorological station operating in close proximity to the site that:
>
> (a) complies with the requirements in the Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales (DEC, 2007); and
>
> (b) is capable of measuring meteorological conditions in accordance with the NSW Industrial Noise Policy (EPA, 2000),
>
> unless a suitable alternative is approved by the Planning Secretary following consultation with the EPA.

To supplement the DDG monitoring network, Menangle Sand and Soil will use two real-time particulate matter monitoring units at the quarry, initially for two separate four-week campaigns. Each monitoring unit will feature the following specifications:

- laser particle counter style continuous monitoring;
- ability to record multiple particulate matter size fractions (ie PM_{10} and $PM_{2.5}$) at the same time;
- powered by solar panels to accommodate limited mains power supply; and
- have the ability to be relocated as required.

It is envisaged that the real-time particulate matter monitoring will be completed at the site of DDG1 and DDG2 (Figure 6.1), however the monitoring locations will be finalised following confirmation of the monitoring unit and land access.

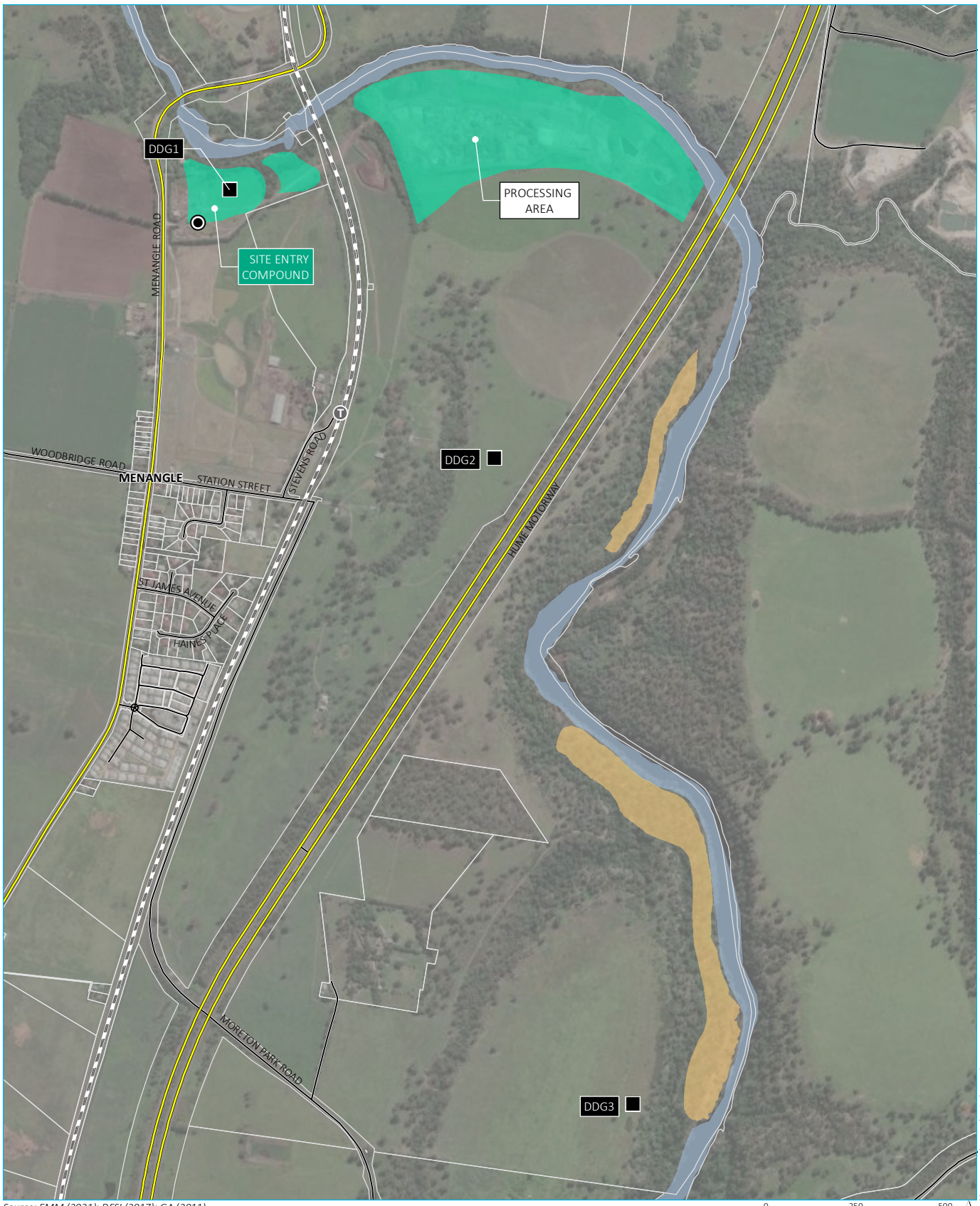
The closest sensitive residential properties are located to the west of the quarry and would therefore be downwind of quarry emission sources during periods of easterly winds. As illustrated in Appendix A (Figure A1.2) of the AQIA (Ramboll Environ 2016), winds from the east typically only occur at the quarry during spring and summer months. Real-time monitoring would therefore initially be conducted on two separate four-week campaigns between September and November and between December and February.

Data from the real-time particulate matter monitoring equipment will compared with concurrent real-time meteorological monitoring data from the quarry (see below) to assist to determine the source of recorded concentrations. Further, real-time particulate matter monitoring data will be compared with regional resources (DPE air quality monitoring stations at Campbelltown West and Camden) to determine if regional scale events (eg bush fires, dust storms) are influencing ambient concentration.

The need to continue the real-time particulate matter monitoring campaigns will be reviewed in conjunction with DPE after the completion of two monitoring campaigns.

The meteorological station at the quarry will be located to the east of the site entry compound (see Figure 6.1) and will be in compliance with the Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales (DEC 2007), specifically;

- AS/NZS 3580.1.1:2016: *Methods for sampling and analysis of ambient air - Part 1.1: Guide to siting air monitoring equipment*; and
- Australian Standard AS 3580.14-2014 *Methods for sampling and analysis of ambient air Part 14: Meteorological monitoring for ambient air quality monitoring applications*.



Source: EMM (2021); DFSI (2017); GA (2011)

0 250 500 m

GDA 1994 MGA Zone 56

N

KEY

- Meteorological station
- Dust deposition gauge
- Train station
- Rail line
- Main road
- Local road
- Nepean River
- Cadastral boundary
- Extractive operations
- Stage 8

Dust deposition gauge and meteorological station locations

Menangle Sand and Soil
Air quality management plan
Figure 6.1

EMM creating opportunities

\\emmsvr1\EMMJobs\2019\J190166 - Menangle Quarry LEC\GIS\02_Maps_AQMP\AQ001_DustGaugeAndMeteorologicalLocations_20210412_03.mxd 28/02/2022

6.3 Actions during adverse weather conditions

From the perspective of dust emissions from the quarry, adverse meteorological conditions are considered to be sustained periods of hot and dry weather and/or high wind speeds. A key environmental management responsibility of quarry personnel is the visual monitoring of dust emissions.

In the event of adverse weather conditions, the Quarry Manager is required to maintain vigilance for visual dust emissions leaving quarry boundary and implement appropriate additional mitigation strategies. Additional mitigation measures will include the targeted use of water sprays at the quarry to the identified contributing dust emissions sources or the temporary restriction and/or cessation of the activity until adverse weather conditions have eased.

6.4 Complaints reporting

A complaint management system to engage in active community consultation and maintain positive relations with local residents will be implemented for the site. The purpose of this system is to minimise complaints by addressing their concerns upfront and monitor the environmental performance of the site.

6.4.1 Registering complaints

Any enquiries or complaints made by members of the public to site personnel will be directed to the Quarry Manager.

Complaints may be made to the quarry's direct line during business hours (02 4633 8239) or to the Quarry Manager's mobile phone (up-to-date number provided at www.benedict.com.au/locations/menangle) outside of business hours or for emergencies. These numbers will be provided on a sign at the site entrance.

6.4.2 Complaint response

Any complaint received by Menangle Sand and Soil regarding air quality impacts from the quarry will be acted on within 24-hours in the following manner:

- details of the complaint (date, time, specifics, complainants contact details) will be recorded;
- activities occurring during the complaint period will be investigated;
- findings of operations during the complaint period will be recorded in the complaints register;
- relevant management practices will be reviewed as necessary; and
- findings of the review will be communicated to the complainant.

6.4.3 Complaints register

The details of any complaint will be logged in the complaints register, with investigation findings and actions noted. The record of a complaint will be kept for at least 4 years after the complaint was made. The record will be produced to any authorised officer of the EPA who asks to see them.

The complaints register will be available on the project website and will be updated monthly.

Should the complaint be relevant to any of the conditions of the Consent, it will be handled as per the Consent conditions relevant to that environmental aspect.

6.5 Air quality incident and non-compliance definitions and response

For the purpose of this AQMP, a verified complaint that is deemed to be the direct result of operational emissions from the quarry will be classified as an air quality incident. As soon as Benedict becomes aware of an air quality incident, notification must be made to DPE and any other relevant agencies.

Further, a non-compliance is defined as an exceedance of applicable assessment criterion detected by the proposed air quality monitoring network (see Section 6.2) that is attributable to quarry operations.

6.5.1 Incident notification

On becoming aware of an air quality incident, Benedict will notify DPE via the Major Projects Website immediately after the Applicant becomes aware of an incident. Notification requirements are outlined in the EMS in the incident notification section.

Within 24-hours of an air quality incident, an initial letter report outlining basic details of the incident will be sent to the EPA's Regional Manager Planning Section. Within 14 days of an incident, a detailed report will be prepared and submitted to the EPA's Regional Manager Planning Section documenting incident investigation findings, causes of the incident and additional mitigation measures proposed to prevent a reoccurrence.

A register of verified incidents will be maintained by Menangle Sand and Soil and made available for review on request.

6.5.2 Non-compliance notification

Within seven days of becoming aware of a non-compliance, the Applicant will notify DPE in writing via the Major Projects Website. The Application will identify the non-compliance, the reasons for non-compliance and what actions that will be undertaken to address the non-compliance.

As soon as practicable, and no longer than 7 days after obtaining monitoring results showing an exceedance of any air quality criterion in Part B of Schedule 2 (listed in Table 3.1) following the date of commencement of Quarrying Operations in the Stage 8 Area, the Applicant will provide details of the exceedance to any affected landowners/tenants if the Applicant has not otherwise reached an agreement to exceed the relevant criteria with the affected landowner pursuant to condition B12.

For any exceedance of any air quality criterion presented in Table 3.1, the Applicant will provide a copy of the fact sheet entitled "Mine Dust and You" (NSW Health 2017) to any affected landowners and tenants.

6.5.3 Independent review

If, at any time following the date of commencement of Quarrying Operations in the Stage 8 Area, a landowner considers the development to be exceeding any air quality criterion in Part B of Schedule 2 (listed in Table 3.1), they may ask the Planning Secretary in writing for an independent review of the impacts of the development on their land.

If the Planning Secretary is satisfied that an independent review is warranted, then within 3 months of the Planning Secretary's decision, or as otherwise agreed by the Planning Secretary and the landowner, the Applicant will:

a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Planning Secretary, to:

   i) consult with the landowner to determine their concerns;

ii) conduct monitoring to determine whether the developmentis complying with the relevant criteria in Part B of Schedule 2;

iii) if the development is not complying with that criteria, identify measures that could be implemented to ensure compliancewith the relevant criteria; and

b) give the Planning Secretary and landowner a copy of the independent review; and

c) comply with any written requestsmade by the Planning Secretary to implement any findings of the review.

6.6 Key performance indicators

Menangle Sand and Soil commits to the following key performance indicators (KPIs) to demonstrate the performance of ongoing dust control management practices at the quarry:

- successful implementation of the control measures in accordance with B13 of the development consent conditions (see Table 2.1);
- no exceedance due to quarry operations of the annual dust deposition criterion of 4 g/m^2/month at the end of a 12-month period at any of the three DDG locations (see Section 6.2); and
- no exceedance due to quarry operations of the 24-hour average PM_{10} criterion of 50 $\mu g/m^3$ or 24-hour average $PM_{2.5}$ criterion of 25 $\mu g/m^3$; and
- no confirmed air quality-related complaints from the operation of the quarry.

In the event that KPIs are not met, dust mitigation measures and maintenance practices will be reviewed and amended as necessary.

6.7 Review of AQMP

A comprehensive review of the complaint and incident records will be completed as part of the project annual review of operations, and each year thereafter, and will be provided to DPE.

The air quality monitoring program will be reviewed at least every three years, when updates to the plan are required, or as directed by the Secretary in consultation with other agencies. The review process is to reflect changes in environmental legislation and guidelines, and changes in technology or operational procedures.

Review of this AQMP will also take place if monitoring records indicate that it is warranted or in the event of any significant change to air quality management procedures at the facility. Any modifications to the AQMP will be undertaken in consultation with the appropriate government agencies.

The EMS addresses all the development approval related requirements for plan reviews.

References

Australian Standard 2014, *AS 3580.14-2014 Methods for sampling and analysis of ambient air Part 14: Meteorological monitoring for ambient air quality monitoring applications.*

EMM 2021. *Menangle Sand and Soil Modification 2 Comparative Air Quality Impact Assessment.*

NSW Department of Environment and Conservation 2007, A*pproved Methods for Sampling and Analysis of Air Pollutants in New South Wales.*

NSW Land and Environment Court 2020, *Development Consent DA 85/2865* (approved 10 September 2020).

NSW Environment Protection Authority 2016, *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW.*

OEH 2012, *A Field Guide for Erosion and Sediment Control Maintenance Practices*. NSW Office for Water.

Ramboll Environ 2016, *Menangle Quarry Extension Project - Air Quality Impact Assessment*.

Appendix A

Letter to NSW EPA (October 2020)

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St Leonards NSW 2065
PO Box 21
St Leonards NSW 1590

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E info@emmconsulting.com.au

www.emmconsulting.com.au

12 October 2020

Mr Chris Kelly
NSW Environment Protection Authority

planning.matters@epa.nsw.gov.au

Re: Menangle Sand and Soil Quarry - Air Quality and Noise Management Plans

Dear Chris,

Menangle Sand and Soil Pty Ltd operates the Menangle Sand and Soil Quarry (the 'Quarry') at 15 Menangle Road Menangle. A modification to the Quarry's approval has recently been approved. The updated approval requires that air quality and noise management plans are prepared in consultation with the Environment Protection Authority (EPA).

This letter seeks the EPA's input to these plans.

1 Quarry overview

Menangle Sand and Soil Pty Ltd operates 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 undertaken by Menangle Sand and Soil since 1978.

Current extractive activities were approved in 1989 (DA 85/2865) and have involved the construction and operation of the 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 previously approved, sand and soil will not be extracted from Stage 3.

In September 2020, the NSW Land and Environment Court approved 'Menangle Quarry Extension – Modification 1' (MOD1). This allows the extraction of sand and soil in a new area, the Stage 8 area, that is about 13 ha, and extends about 2 kilometres along the Nepean River south of the Stage 7 area. The extension will increase the life of the quarry by 15 years. The extracted material will be transported to the existing processing area where it will be stockpiled, processed and blended with materials imported to the site, prior to being dispatched from the quarry.

A description of the quarry, including MOD1, is provided in Appendix A. The Notice of Orders Made by the Land and Environment Court (the 'consent') is provided in Appendix B.

2 Previous assessments

The preparation of the environmental assessment for the modification application included the preparation of air quality and noise assessments addressing the matters the NSW Environment Protection Agency (EPA) requested be considered in the Environmental Assessment (EMM 2017).

In summary, the assessment found that the proposed modified operations at the Quarry are unlikely to result in exceedances of the applicable NSW EPA assessment criteria or NEPM assessment goals for any of the assessed pollutants at the surrounding sensitive receptors and that cumulative noise is predicted to satisfy the relevant amenity criteria.

These reports are available on the Major Projects website:
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8531

3 Management plans

EMM Consulting Pty Limited (EMM) is preparing:

- a Noise Management Plan (NMP) in accordance with Part B, Condition B7 (b) of the consent.
- an Air Quality Management Plan (AQMP) in accordance with Part B, Condition B14 (b) of the consent.

The NMP and AQMP will address the matters raised in the conditions and Menangle Sand and Soil's Summary of Commitments provided in Table 3.1 of Appendix A.

3.1 Noise Management Plan

The NMP will include the following:

- overview of noise mitigation and management;
- relevant noise criteria;
- monitoring method(s);
- location, frequency and duration of monitoring;
- record keeping;
- response mechanisms;
- compliance reporting; and
- review and improvement.

3.2 Air Quality Management Plan

The AQMP will include the following:

- overview of emission sources and ranking by emissions magnitude;
- review of mitigation measures;
- key performance indicator(s);
- monitoring method(s);
- location, frequency and duration of monitoring;
- record keeping;

- response mechanisms; and
- compliance reporting.

This letter seeks your input on the contents and preparation of the NMP and AQMP. We will also provide the draft management plans to you for your review and comment. We would welcome the opportunity to meet, via teleconference, to discuss the plan.

It is requested that any comments you may have are provided by 26 October 2020 to allow them to be considered during preparation of the plan.

Should you wish to discuss anything specific please call me on the below number.

Please do not hesitate to contact me if you have any questions.

Yours sincerely

Jeremy Slattery
Associate, Environmental Management
Phone: 0421 827 231
jslattery@emmconsulting.com.au

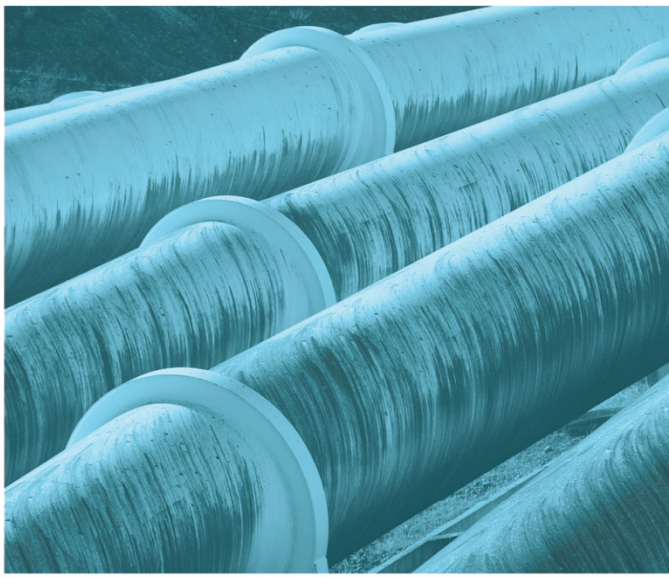
Appendix A

Project description


Land and Environment Court Proceedings 342158 of 2018

Applicant's Description of Amended Project

Menangle Sand & Soil Pty Limited v Minister for Planning
24 August 2020

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Land and Environment Court Proceedings 342158 of 2018

Applicant's Description of Amended Project

Prepared for Menangle Sand & Soil Pty Limited v Minister for Planning
24 August 2020

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Land and Environment Court Proceedings 342158 of 2018

Applicant's Description of Amended Project

Report Number

J190166 RP#4

Menangle Sand & Soil Pty Limited v Minister for Planning

Date

24 August 2020

Version

v7 Final

Approved by

Dr P. Towler
Associate Director
24 August 2020

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1 Introduction

Menangle Sand and Soil Pty Ltd (Menangle Sand and Soil) seek a modification to Development Consent 85/2865 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 Menangle Sand and Soil Quarry Extension Project, the 'extension project'). It is proposed to forego approved land extraction (as well as dredging rights to another 200,000 tonnes) of 500,000 tonnes of sand and soil in the Stage 3 area and instead extend their current operations to extract sand and soil from an additional stage of the quarry (Stage 8). The Stage 8 area will extend approximately 2.8 km along the Nepean River on Company-controlled lands, within Lot 203//Deposited Plan 590247 on the eastern side of the Hume Highway. Approximately 760,000 tonnes of sand and soil will be extracted from the Stage 8 area land over about 15 years. Extraction will be in sequential substages so the active extraction area will be a small proportion of the total Stage 8 extraction area at any given time. No riverine extraction is proposed.

A modification application and accompanying environmental assessment (EA) report for the extension project was lodged in May 2017 and subsequently refused by the Department of Planning and Environment on 25 October 2018. The application is before the NSW Land and Environment Court (2018/342158).

An amended application was placed on public exhibition between 19 February 2020 and 4 March 2020. Amendments to the proposed modification are summarised in *NSW Land and Environment Court (2018/342158) Menangle Quarry - Project Amendments and Information Summary* (EMM [Towler] 2019a).

Given the application's history, the currently proposed modification is described in a range of documents.

This consolidated project description report provides a description of the currently approved quarry, based on Chapter 2 of the *Menangle Quarry Extension Environmental Assessment* (EA) (EMM 2017a), and the currently proposed modification (as amended) as described in Chapter 3 of the EA and subsequently amended in:

- *Supplementary Biodiversity Assessment* (EMM [Ward] 2019b);
- *Menangle Quarry - Amended Extraction Area and Setback* (EMM [Towler] 2019c);
- *Restoration Area Weed Strategy* (EMM [Grant] 2019d);
- *Groundwater Management* (EMM [Webb] 2019e); and
- *Flood Mitigation* (EMM [Towler] 2019f).

No modification amendments were proposed in the *Menangle Quarry Extension Response to Submissions* (RTS) (EMM 2017b).

The allotments subject to the development application modification, 'the site', are provided in Appendix A.

This consolidated project description report outlines the current proposal incorporating all of the changes to the project made since the Refusal and presents an updated statement of commitments.

2 Approved and proposed operations

2.1 Introduction

The extension project will increase the quarry life by 15 years (to 2035) by extracting the sand and soil resource in the Stage 8 area. The Stage 8 area extends approximately 2.8 km upstream of the currently active Stage 7 area. The project will require installation and operation of a conveyor between the existing processing area and the Stage 8 area. Menangle Sand and Soil will relinquish the approved extraction of resource (as well as its perpetual right to the resource located on the Elizabeth Macarthur Agricultural Institute land) from the approved Stage 3 area as part of the extension project.

The layout of the approved and proposed quarry is presented in Figure 2.1.

As well as the extraction areas, key components of the quarry include:

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

These components will be used to support activities in the Stage 8 area which will also include:

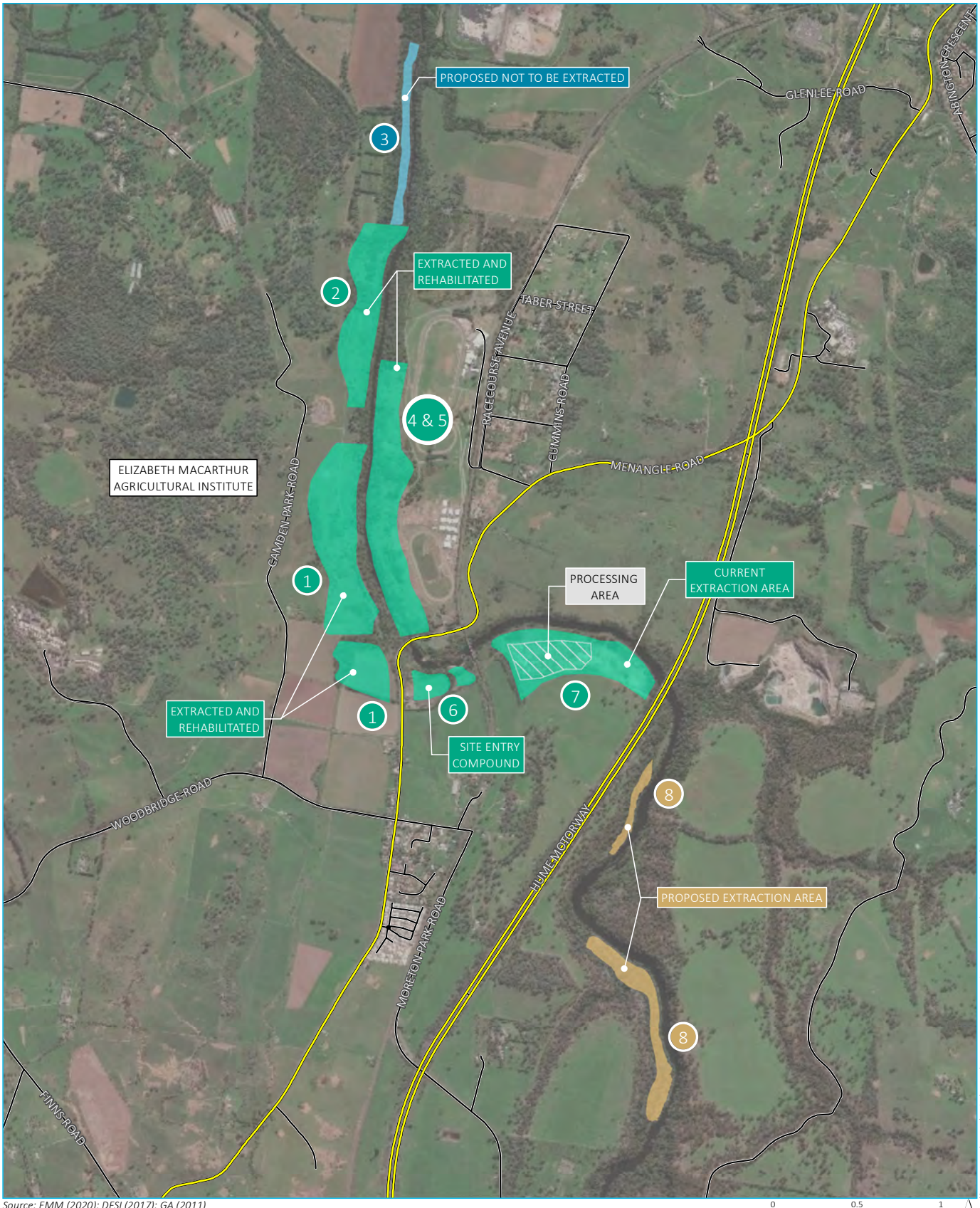
- extraction in the Stage 8 extraction area followed by rehabilitation;
- restoration of areas adjacent to the extraction areas;
- a conveyor; and
- a haul road.

These are described below.

2.2 Resource

The total resource in the 1989-approved quarry is approximately 7.7 million tonnes, made up of approximately 5.9 million tonnes of soil and 1.8 million tonnes of sand. The approved extraction area is approximately 123 ha. An extraction rate of up to 350,000–400,000 tonnes per annum (tpa) of soil and sand is approved. To date, the resource has been extracted in all but the Stage 3 (approximately 300,000 tonnes soil and 400,000 tonnes sand) and the remaining part of the of Stage 7 area.

It is proposed to extract 760,000 tonnes of sand and soil from the Stage 8 area at a rate of no more than 150,000 tpa.



Source: EMM (2020); DFSI (2017); GA (2011)

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GDA 1994 MGA Zone 56

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KEY

- Main road
- Local road
- Existing processing area (to be retained)
- Extractive operations (approved)
- Extractive operations (approved but not extracted)
- Stage 8 - extraction/rehabilitation area

Menangle Quarry Stages 1 to 8

Menangle Quarry Extension
Figure 2.1

EMM
creating opportunities

It is proposed to extract sand and soil from the Stage 8 extraction area (Figure 2.2) which has a total area of 13.22 ha.

Given that the width of horizontal setback area (see Section 2.3.2i) is variable and to ensure that any biodiversity impacts are fully compensated for, the 'extraction area' is defined as including the horizontal setback area, although extraction will not occur within this setback. This also reflects the previous intent to grade parts of the horizontal setback area where there are no trees. However, it is now proposed to leave the entire horizontal setback area undisturbed, save for hand weeding of the extensive existing noxious weeds.

The 'active extraction area' is the area where the overlying vegetation will be cleared (removing extensive understory weeds and mature native trees) and the sand and soil resource extracted.

2.3 Quarrying

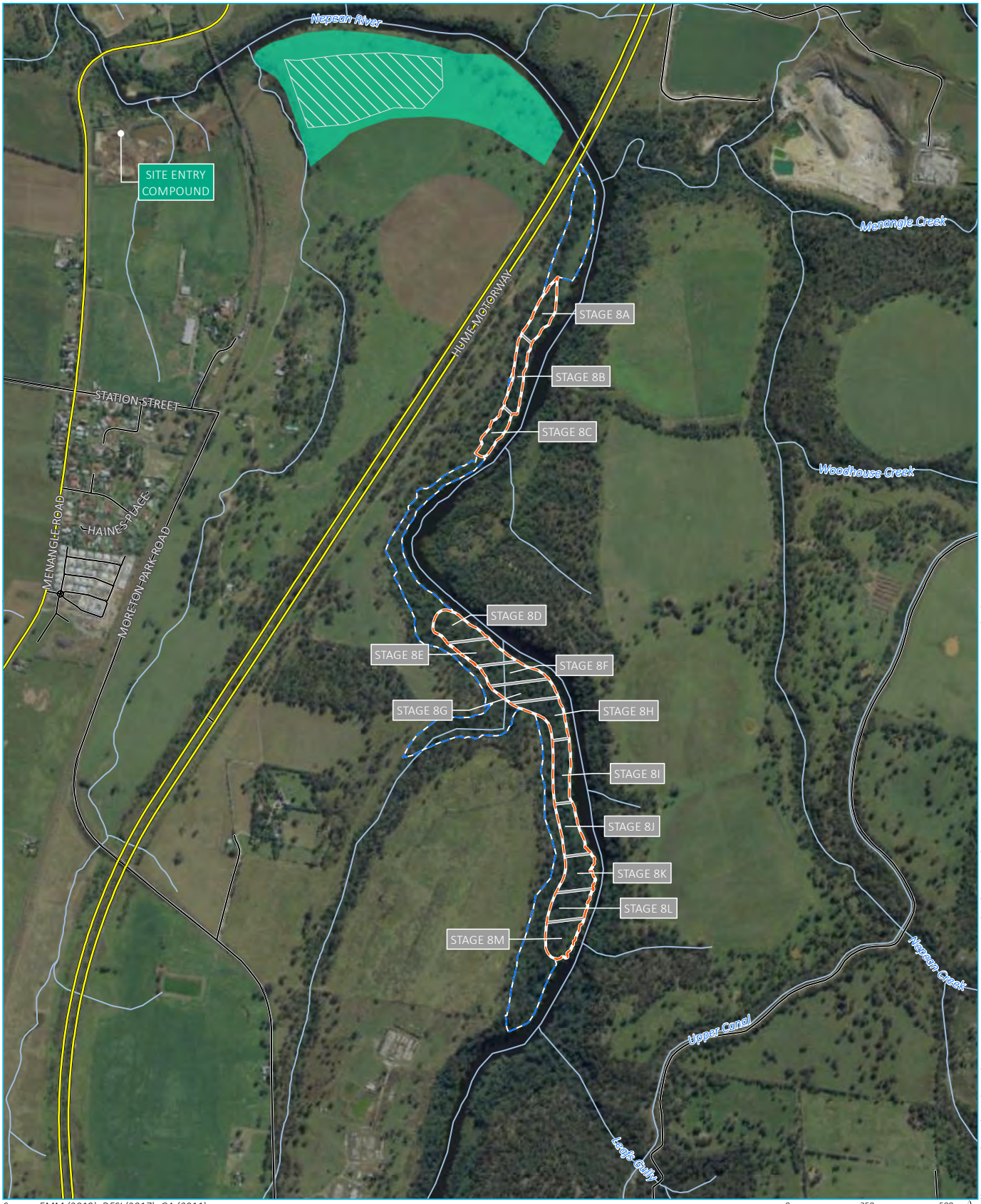
2.3.1 Quarry progression

Historically, quarrying has 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. Extraction in the Stage 8 area will occur in sub-stages such that only a small portion of the overall Stage 8 area will be the active excavation area at any one time. Extraction will progressively move upstream in thirteen sub-stages, with each sub-stage each covering about 1 ha (Figures 2.2 to 2.4). Each of these sub-stages will be a basic operating cell and will take approximately 1 year to complete, depending on demand for product. Each sub-stage will be progressively rehabilitated using similar methods to those as implemented in the Stage 1–2 and Stage 4–5 areas but with a more intensively managed native planting regime implemented.

The maximum area of each substage is provided in Table 2.1.

Table 2.1 Maximum area of each substage

Substage	Area (ha)
8a	0.93
8b	0.93
8c	0.69
8d	1.07
8e	1.07
8f	1.07
8g	1.07
8h	1.07
8i	1.07
8j	1.07
8k	1.07
8l	1.07
8m	1.07
Total	**13.25**



Source: EMM (2019); DFSI (2017); GA (2011)

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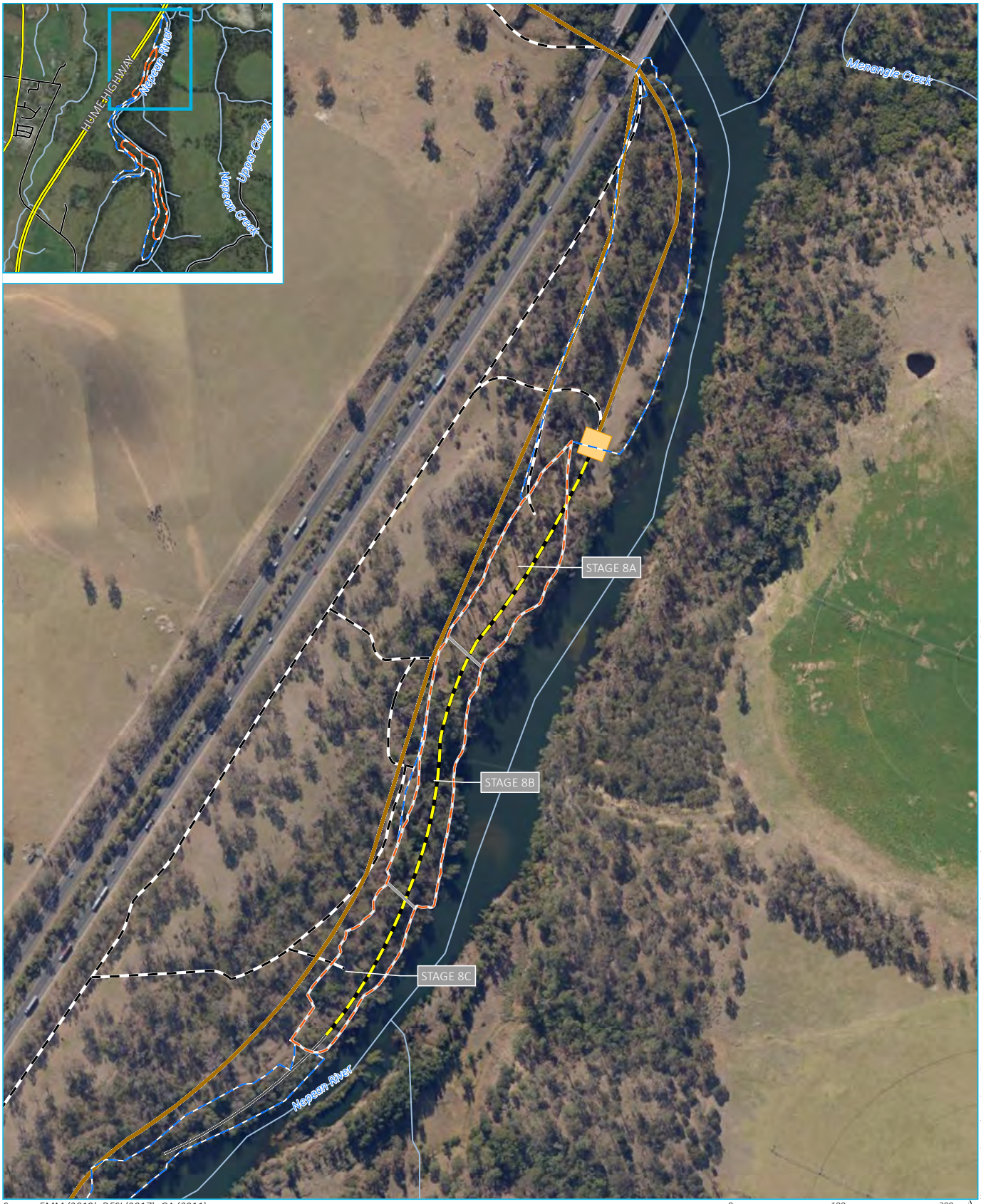
KEY

- Processing area (to be retained)
- Stage 7 - current extractive operations
- Stage 8 - extraction/rehabilitation area
- Stage 8 - restoration area (no extraction)
- Main road
- Local road
- Watercourse/drainage line

Overall staging plan

Menangle Quarry Extension
Figure 2.2

EMM creating opportunities



Source: EMM (2019); DFSI (2017); GA (2011)

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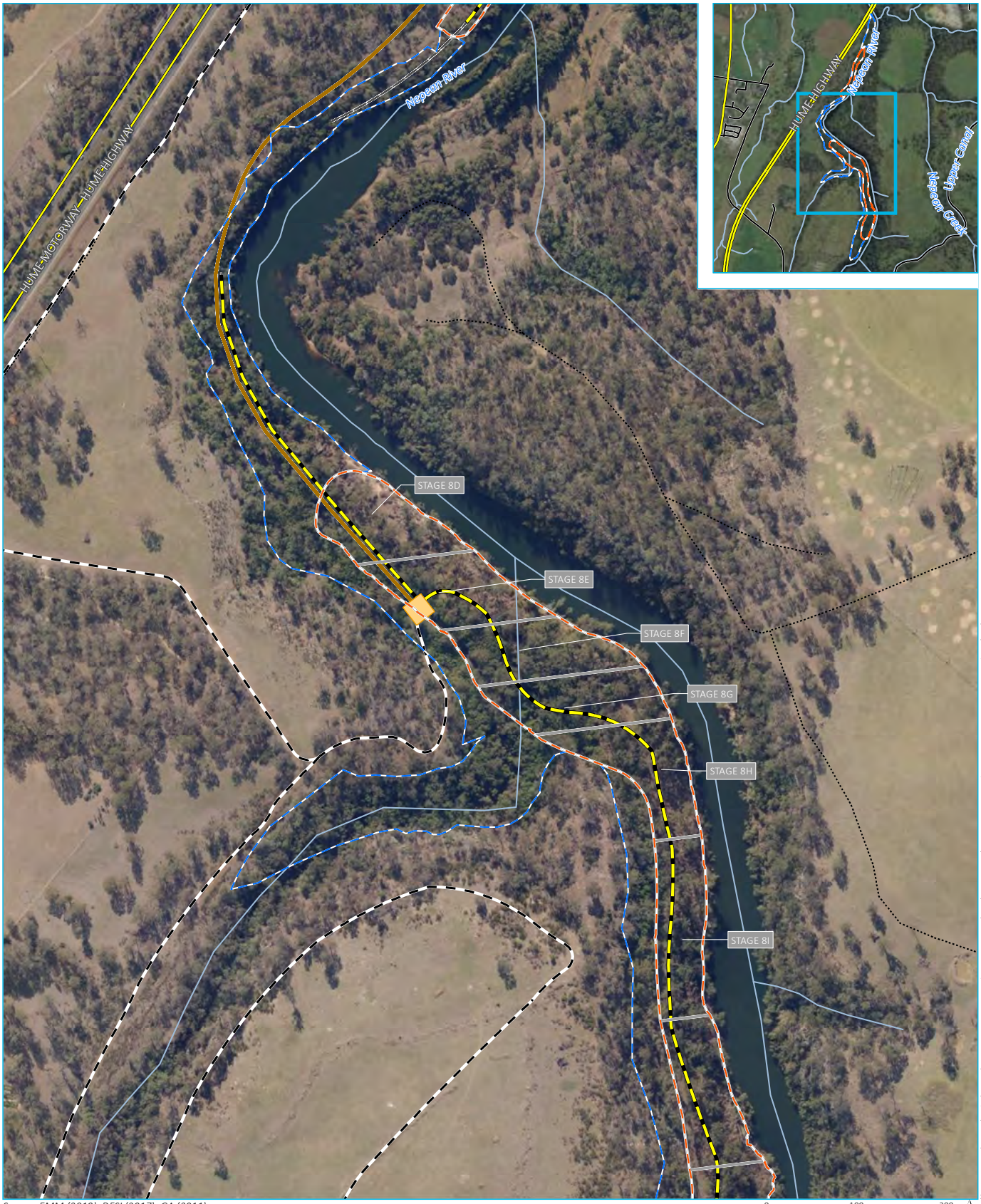
KEY

- Stage 8 - extraction/rehabilitation area
- Stage 8 - restoration area (no extraction) boundary
- Substage boundary
- Conveyor head
- Indicative conveyor location
- Haul road
- Access road
- Existing access track
- Watercourse/drainage line

Stage 8 Extraction and restoration areas Stage 8A to 8C

Menangle Quarry Extension
Figure 2.3

EMM creating opportunities



Source: EMM (2019); DFSI (2017); GA (2011)

0 100 200 m

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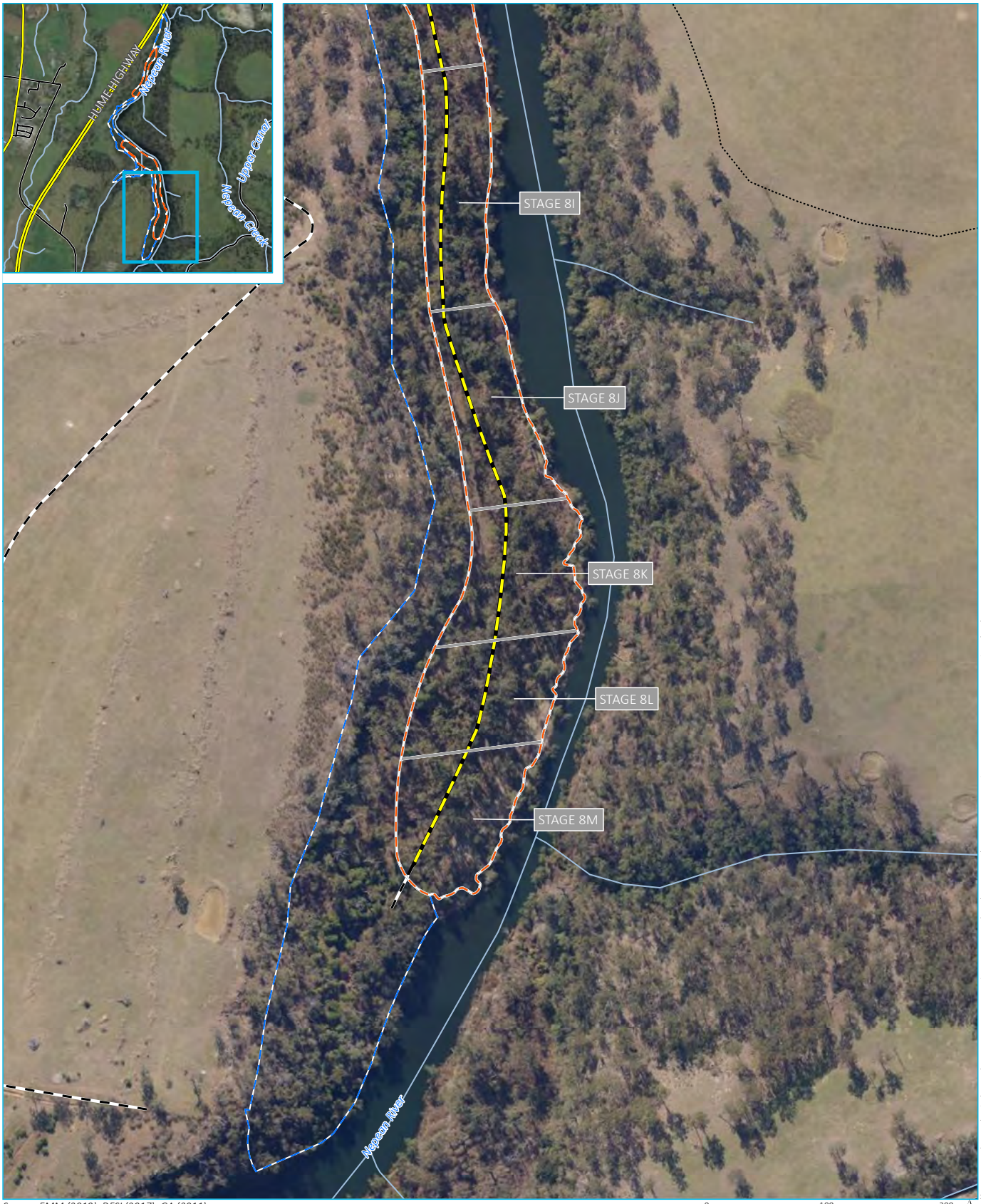
KEY

- Stage 8 - extraction/rehabilitation area
- Stage 8 - restoration area (no extraction) boundary
- Substage boundary
- Conveyor head
- Indicative conveyor location
- Haul road
- Access road
- Existing access track
- Main road
- Vehicular track
- Watercourse/drainage line

Stage 8 extraction and restoration areas – Stages 8D–8I

Menangle Quarry Extension
Figure 2.4

EMM
creating opportunities



Source: EMM (2019); DFSI (2017); GA (2011)

0 100 200 m

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KEY

- Stage 8 - extraction/rehabilitation area
- Stage 8 - restoration area (no extraction) boundary
- Substage boundary
- Haul road
- Existing access track
- Local road
- Vehicular track
- Watercourse/drainage line

Stage 8 extraction and restoration areas – Stages 8I–8M

Menangle Quarry Extension
Figure 2.5

EMM
creating opportunities

2.3.2 Stage 8 area quarry design

The Stage 8 quarry design is presented in Chapter 3 of the EA. Subsequently, the design has been amended to incorporate changes made since the Refusal. The amened proposed quarry design is summarised below.

Schematics showing the quarry progression in plan-view and in cross-section are is presented in Figure 2.6 and Figure 2.7 respectively. An indicative cross-section perpendicular to the bank is presented in Figure 2.8 and Figure 2.9.

i Lower riverbank and horizontal setback retention

The level of the Nepean River adjacent to the Stage 8 area is controlled by the downstream Menangle Weir so as to be about 61 mAHD during normal low flow.

During extraction of the resource from the previous quarry stages, the lower riverbank was retained and a horizontal setback from a contour approximately 3 m above the normal river level was provided. For example, in the Stage 7 area, the lower riverbank (below 64 mAHD) was retained and a horizontal setback of 10 m from the 64 mAHD contour on the natural riverbank (ie 3 m above the normal level of the Nepean River) was provided.

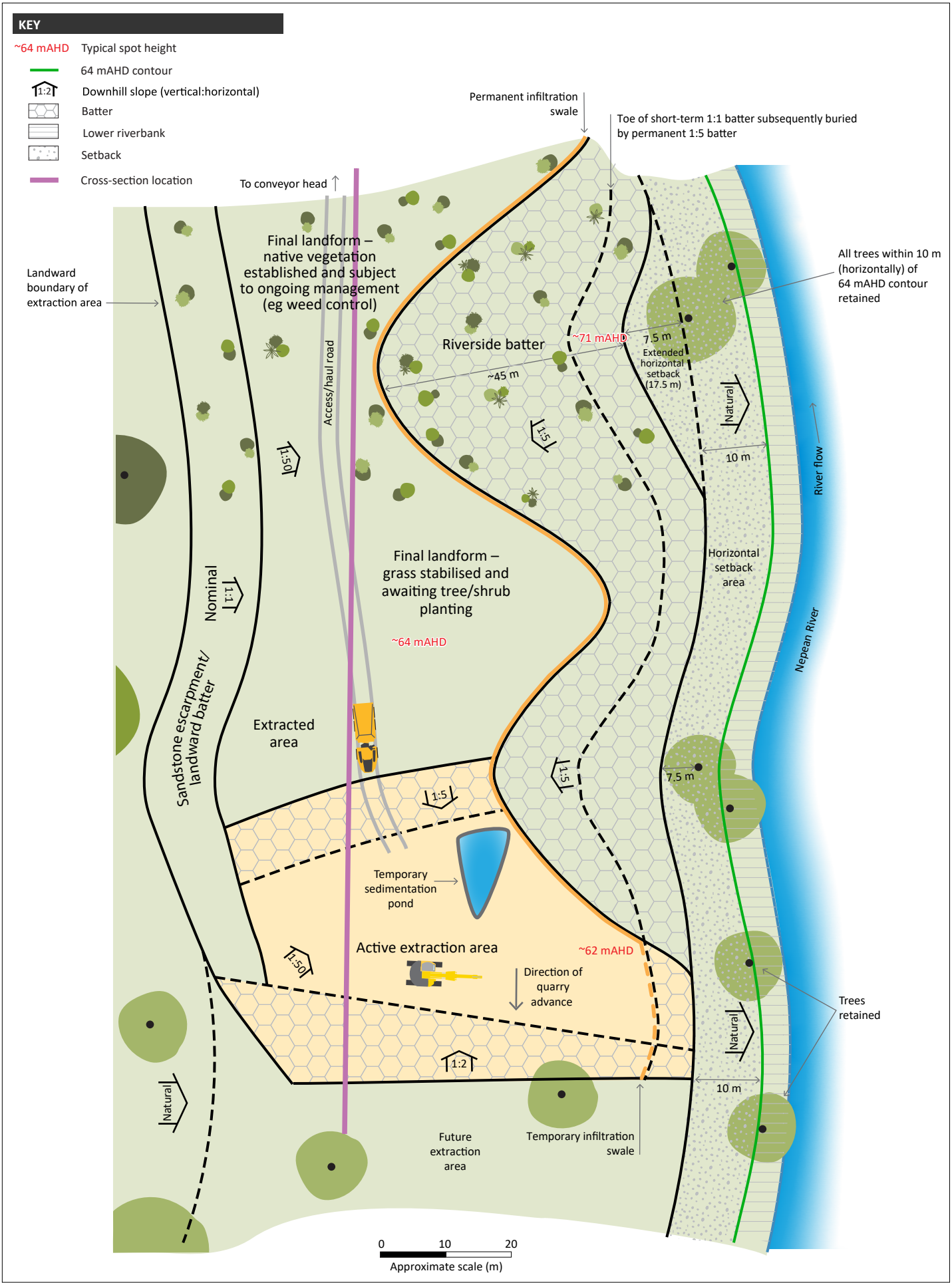
A similar setback was proposed for the Stage 8 area. However, the proposed setback method has since been amended to protect all native trees in the 10-m wide horizontal setback area as follows:

- The lower riverbank will be retained below the 64 mAHD contour and remain untouched (except for hand removal of weeds, felling of non-native trees leaving the roots in place, and very selective herbicide application).
- The riverbank will also be retained in a horizontal setback that extends at least 10 m (measured horizontally) inland from the 64 mAHD contour up the bank (referred to as the '10-m-wide horizontal setback area')[1].
- Where there are native trees[2] within the 10-m-wide horizontal setback area, the width of the setback will be increased so that edge of the setback area/start of extraction area is at least 7.5 m (measured horizontally) from the trunk of these trees.

Therefore, the active extraction area will be separated from the river by the lower riverbank (ie between 61 mAHD and 64 mAHD) and additionally by the horizontal setback that will be between 10 and 17.5 m wide. The undisturbed bank (ie the combined lower riverbank and horizontal setback) will vary in height but will be at least 3 m above the low-flow river level where the bank slope is shallow but will be higher where the bank slope is steeper.

[1] It was previously proposed to grade the horizontal setback to a slope of 1:50 where there are no native trees within the horizontal setback area. This is no longer proposed and the existing landform within the horizontal setback area will be retained, including where there are no trees.

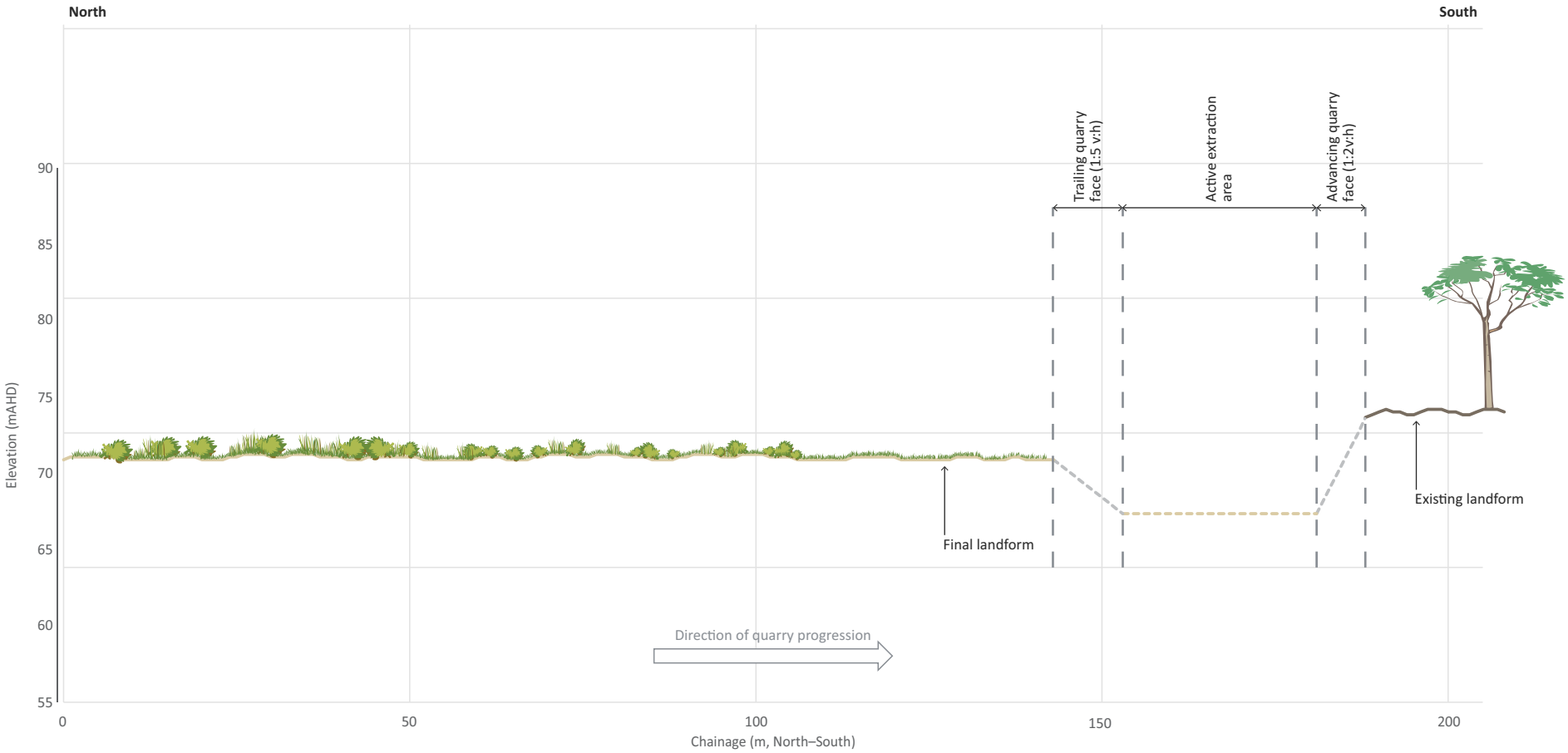
[2] Native trees with a trunk diameter of >0.1 m diameter at breast height (DBH).



Quarry progression schematic

Menangle Quarry Extension

Figure 2.6



Quarry progression cross-section

Menangle Quarry Extension

Figure 2.7

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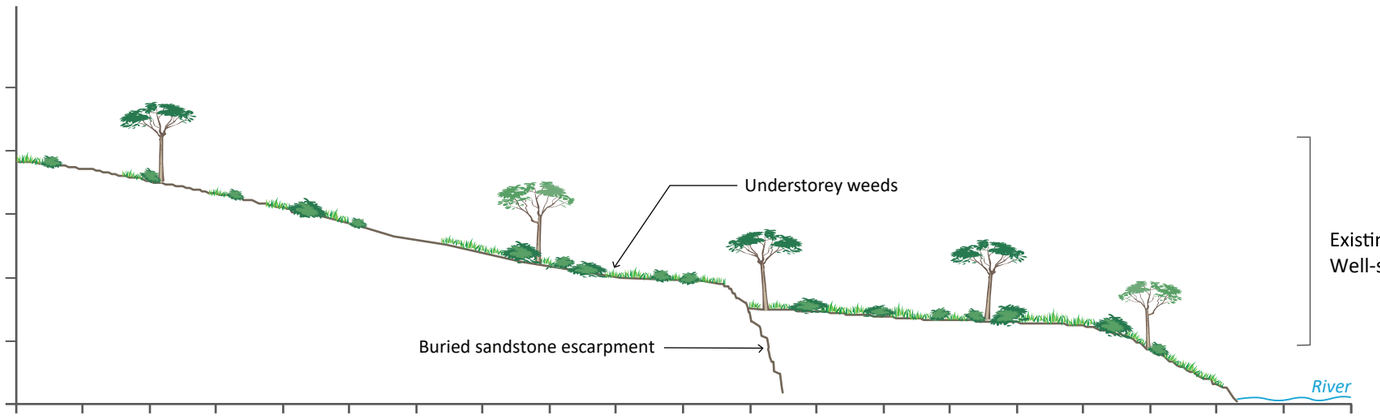
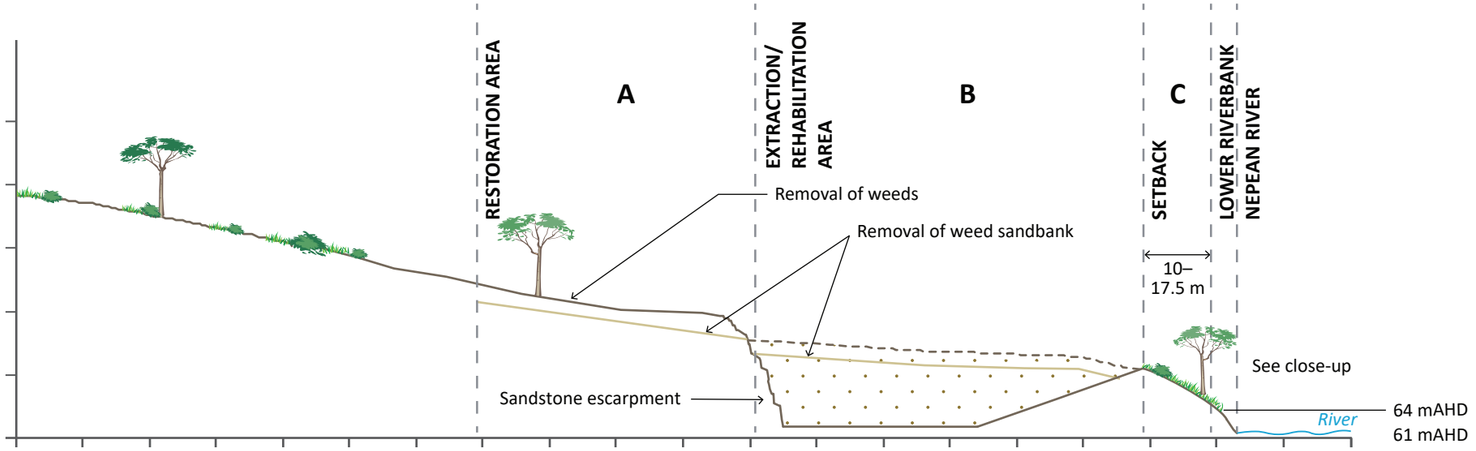
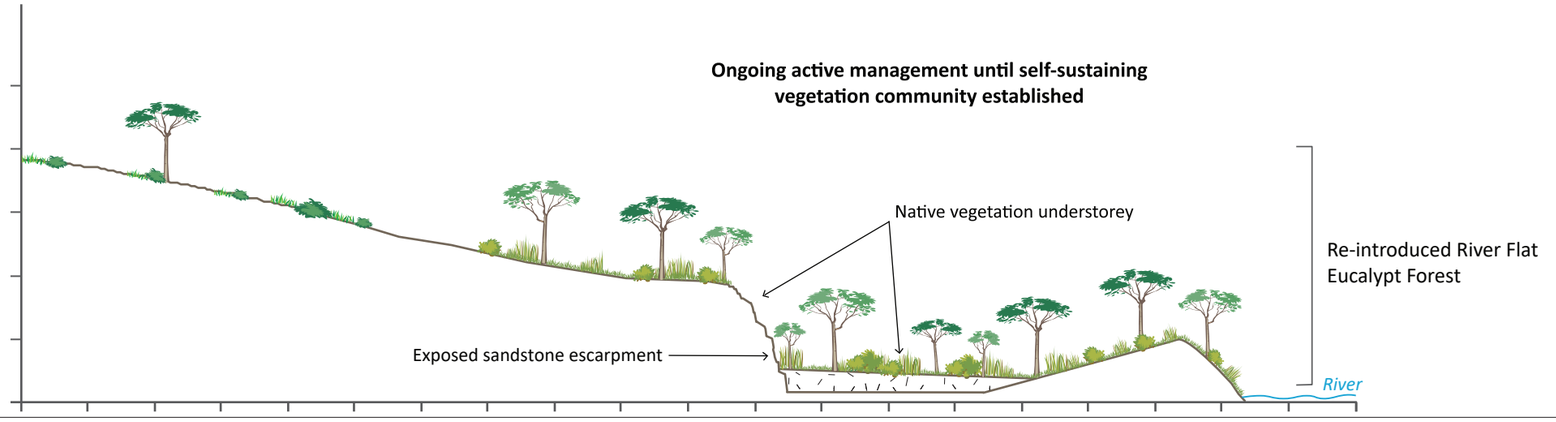
EXISITNG LANDFORM



EXTRACTION



FINAL LANDFORM



A. Restoration area

1. Understorey invasive weeds cleared
2. Large trees retained
3. Topsoil (containing weed seedbank) and weeds removed and buried in base of pit
4. Revegetation using species to form a high-quality vegetation community
5. Ongoing active management for years until self-sustaining vegetation community established

B. Extraction and rehabilitation

1. Clear vegetation
2. Topsoil (containing weed seedbank) removed and buried in base of pit
3. Extract sand and soil resource, remaining 1 m above water table
4. Place weed-infested soil in base of the pit followed by scalps to form final landform self-draining slope (≤1:50)
5. Revegetate final landform to form high-quality River Flat Eucalypt Forest
6. Ongoing active management until self-sustaining vegetation community established

C. Setback and lower river bank

1. Survey outer edge of buffer bank (64 m AHD contour)
2. Provide 10–17.5 m setback from 64 m AHD contour
3. Remove exotic trees and weeds from lower bank by hand
4. Ongoing active management for years until self-sustaining vegetation community established

KEY

Resource to be extracted including weed seed bed to be buried

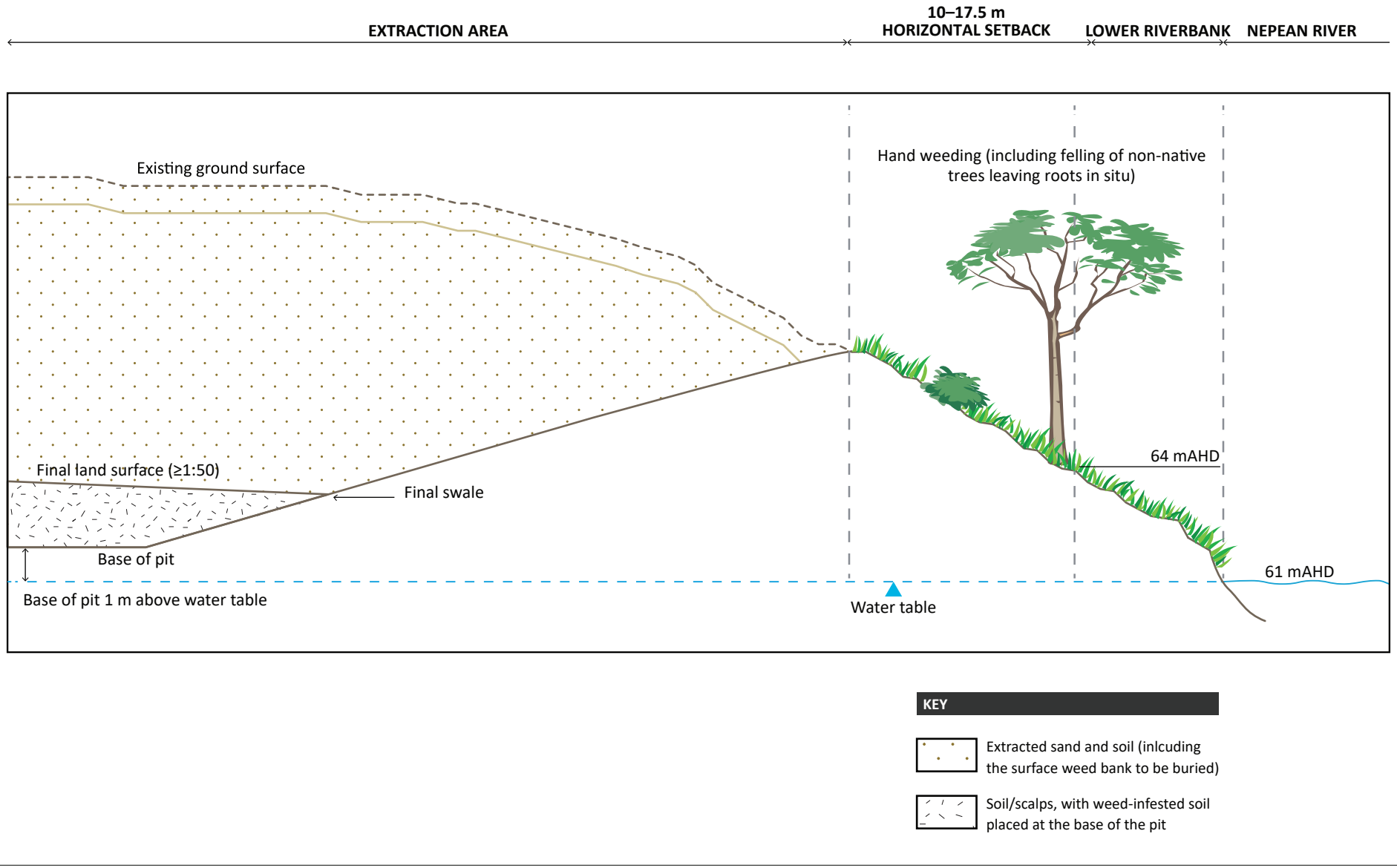
Soil/scalps with weed infested soil placed at base of pit

EMM
creating opportunities

Indicative cross-section

Menangle Quarry Extension

Figure 2.8



Indicative cross-section – close-up

Menangle Quarry Extension

Figure 2.9

EMM
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ii Riverside batter

The riverside batter will be inland of the horizontal setback area (Figure 2.6).

It is proposed that:

- a temporary riverside batter with a maximum slope of 1:1 m (vertical: horizontal)[3], will be used during sand and soil extraction – this will allow the efficient extraction of the resource;
- following extraction of the resource above this batter, the batter will be then built up with suitable site material to give a permanent slope of 1:5 – this will provide additional assurance that the bank will be stable if the active extraction area is flooded during extraction;
- the maximum length of the riverside batter that has a slope between 1:1 and 1:5 will be restricted to 30-m long so that it can be returned to a 1:5 batter within 12 hours if flooding is predicted;
- regardless of the amount of material required, the maximum length of the riverside batter that has a slope between 1:1 and 1:5 will be restricted to 30 m, measured parallel along the river;
- in the final landform, the riverside batter will have a permanent slope of 1:5 – this will provide additional assurance that the bank will be stable in the long term; and
- if over the life of the quarry, activities temporarily cease in the extraction area such that the excavator is relocated from the Stage 8 area, the riverside batter will be always left as a 1:5 batter.

iii Advancing quarry face

The quarry will progressively advance upstream at an average rate of about 150 m/year. The advancing quarry face will face downstream.

During large floods, river water may overtop the lower riverbank and horizontal setback area and flow into the active extraction area or may overtop the riverbank upstream of the active extraction area and flow along the bank to enter the active extraction area over the advancing face. A maximum batter angle of 1:2 will be applied to the advancing face so as to minimise any scour occurring as the water initially flows down the batter, until the water level in the extraction area is at the same level as the river.

iv Trailing quarry face

The trailing quarry face, between the active extraction area and backfilled extracted area, will face upstream.

A maximum landward batter angle of 1:5 is proposed for this face as it will face upstream in a flood. As for the riverside batter, this will mitigate the scour risk.

v Landward batter

The landward, or inland, batter is on the side of the extraction area furthest from the river (Figure 2.6).

A maximum landward batter angle of 1:1 is proposed as it will be exposed to far lower flood current speeds and peak shear stress than the riverside batter. There may be a steeper angle on the landward side of the extraction area where it is formed by the natural sandstone rock escarpment, which in places, may be vertical.

[3] All slopes in this report are expressed as vertical:horizontal.

vi Base of the extraction area

Bores will be installed in the base of the active extraction area prior to the commencement of extraction in each successive substage and the water level will be recorded daily during active operations. The resource will be extracted in a manner that ensures that the base of the extraction area is always at least 1 m above alluvial water table resulting from the normal low flow water level in the Nepean River.

2.3.3 Pre-extraction surveys

Prior to any extraction occurring in each substage area, a qualified surveyor will:

- mark the boundary of the extraction area closest to the river as defined by the 64 m AHD contour;
- mark the extent of the 10-m-wide horizontal setback area;
- mark all living native trees with their trunk within the 10-m-wide horizontal setback area;
- place a peg 7.5 m horizontally landward of each tree within the 10-m-wide horizontal setback area – marking the extent to which the existing bank will be retained, ie forming the 10-m to 17.5-m-wide horizontal setback area;
- mark all other boundaries of the extraction area such that the area of each substage does not exceed the area in Table 2.1; and
- mark the boundaries of the adjacent restoration (no resource extraction) area.

2.3.4 Vegetation clearing

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). The maximum extent of the cleared, but un-rehabilitated, extraction area will be 1 ha, but it is expected that a smaller portion will actually be cleared at any one time.

The timber will be stored onsite, prior to being periodically milled onsite using a portable mill. The milled timber will be used for fencing and other construction in the local area. Through a related entity, Menangle Sand and Soil control about 600 hectares in the local area where this milled timber will be used.

2.3.5 Topsoil removal

Topsoil will be stripped to a depth of approximately 0.2–0.3 m. Given that the topsoil in the Stage 8 area contains the seedbank for the noxious weeds infesting the area, this weed-infested material will be placed in the bottom of the preceding extraction area, following resource extraction, and will be covered by material returned as part of creating the final landform (see Section 2.8.1). It is important to bury these weed-infested soils deeply to prevent weed re-emergence.

2.3.6 Resource extraction

The sand and soil resource in the Stage 8 area will be extracted using an excavator and off-road haul truck. It will only be extracted to within 1 m above the water table (see Section 2.3.1). The excavator will load the haul truck, which will then transport the sand and soil to the conveyor head (see Section 2.4.1).

2.3.7 Dredging

Historically dredging has been used to extract sand from the Nepean River and is permitted in the existing Consent. Dredging is not proposed as part of the extension project (Stage 8).

2.4 Onsite material transport and processing

2.4.1 Stage 8 area material transport

Proposed Stage 8 works include the progressive construction of a haul road within the proposed Stage 8 area (see Figures 2.3 to 2.5). This haul road will follow existing cleared tracks.

An off-road haul truck will be used to transport excavated sand and soil from the active extraction area to the start of the conveyor, where it will be tipped.

At the conveyor head, sand and soil will 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. The screen will discharge sand and soil onto a conveyor.

The conveyor will be progressively extended south as the extraction moves south (see Figures 2.3 to 2.5). The conveyor will be a temporary structure (approximately 1.5-m high and 1-m wide) that will be removed upon completion of the project.

2.4.2 Processing

Mobile screens within the processing area are 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 blended soil products using mobile screening plants and a washing plant.

The wastes from the washing plant consist of organics such as pebbles, roots and fines (very fine sand, silt, and 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 used to rehabilitate the site.

No changes to material processing are proposed.

2.4.3 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. Extracted material is currently blended with these imported materials, where necessary.

No changes to material blending are proposed.

2.4.4 Stockpiling

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

No changes to material stockpiling are proposed.

2.5 Access

2.5.1 Site access

The main access to the site is from Menangle Road. Menangle Road is an arterial road which provides sub-regional access. It is not proposed to change the site access for inbound materials or outbound materials.

2.5.2 Access to the Stage 8 area

Light vehicles accessing to the Stage 8 area will use the existing access under the Hume Motorway. The existing access was retained when the RMS bisected the lands when acquiring the corridor for the original Hume Highway in 1969. The existing access road under the bridge will be sealed and will comply with RMS drainage and pavements standards.

The earthmoving equipment, off-road haul truck and other plant to service the Stage 8 area will access the area via Moreton Park Road. Major plant is expected to remain onsite through-out the duration of the quarrying operations except for major servicing or replacement.

2.5.3 Product dispatch

No changes to product dispatch are proposed. Truck movements at the site (ie combined inbound and outbound movements) will not exceed an average of:

- 147 per day on Monday to Friday; and
- 80 per day on Saturday.

2.6 Quarry life

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

2.7 Biodiversity protection

A land 'swap' is proposed, surrendering the approval to extract sand and soil from the Stage 3 area (5.68 ha) for the same area (in hectares) of the Stage 8 extraction area on a 1:1 basis.

In addition, it is proposed to restore areas upstream, downstream and upslope of the extraction areas. These restoration areas are shown in Figures 2.3 to 2.5 and will form biodiversity offsets to compensate for the clearing of vegetation in the Stage 8 area that is not part of the land swap. Management of the restoration areas will include the removal of the extensive exotic vegetation in the restoration area, allowing restoration of the entire bank, back to a sustainable, high-quality, native ecosystem.

A Stage 8 area vegetation management plan will be prepared that:

- provides 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;
- describes how the implementation of the biodiversity offset strategy will be integrated with the overall rehabilitation of the site; and
- details how connectivity will be managed during the rehabilitation program.

A full-time rehabilitation specialist will be employed as part of the Stage 8 area operations.

2.8 Rehabilitation and closure

2.8.1 Progressive rehabilitation of the Stage 8 area

Following completion of resource extraction, any weed-infested topsoil will be placed in the base of the extracted area followed by scalps and fines. These will used to build up the base of the extracted area to about 64 mAHD. Following construction of the final landform, the area will be immediately planted with grasses to stabilise the surface. Native vegetation will then be established through planting and seeding. There will be ongoing active management of the rehabilitated extraction area, including weed control.

2.8.2 Final landform

The extraction area design (see Section 2.3.2), as amended to incorporate changes made since the Refusal, will result in the following final landform:

- the lower riverbank (below 64 mAHD) landform will be unchanged;
- the landform in the 10-m to 17.5-m wide horizontal setback will be unchanged;
- the land will slope down at 1:5 from the landward edge of the horizontal setback to 64 mAHD (the riverside batter);
- the infiltration swale along the toe of the riverside batter will be retained to prevent runoff from the final landform flowing overland to the river;
- a nearly-level area at about 64 mAHD gently sloping (1:50) down to the infiltration swale at the toe of the riverside batter;
- a 1:1 slope, or the exposed sandstone escarpment, down to the western edge of the extracted area; and
- the landform in the restoration area and outside of the extraction area will be unchanged.

The rate and volume of extraction will be monitored to ensure that a final landform can meet these design parameters.

Conceptual final landforms are provided in Figures 2.10 to 2.13.

As described in Section 2.3.2i, the horizontal setback area will vary between 10-m and 17.5-m wide along the length of the extraction areas, depending on the exact locations of trees within the 10-m wide horizontal setback. Conceptual final landforms are presented for a 10-m wide horizontal setback and a 17.5-m wide horizontal setback. The actual final landform will be a mixture between these two conceptual final landforms.

The accuracy of the existing contours is limited by the digital elevation model accuracy. It is not currently possible to improve this accuracy through a detailed topographic survey of the entire Stage 8 area given the density of woody weeds in much of the area. These weeds need to be cleared prior to a detailed survey which would compromise the stability of the land surface if undertaken in a single campaign across the entire Stage 8 extraction area. A qualified surveyor will survey each substage area prior to any extraction occurring in the substage and a detailed final landform for the substage will be prepared.

The base of the ephemeral creek in the southern part of the extraction area will be left at its present elevation below 64 mAHD.

The inland batter of the extraction area will be a 1:1 (vertical:horizontal) sand and soil slope or the currently buried sandstone escarpment. The exact location and slope of the buried sandstone escarpment will vary along the extraction areas. A nominal, 1:1 (vertical:horizontal) has been assumed in the conceptual final landform. Some of this area may be low exposed sandstone cliffs as currently occur upslope of the extraction area.

Over the coming decades, ongoing sand and soil deposition from the river's floods will fill the low areas, eventually recreating the current terraced benches.

2.9 Site infrastructure and services

2.9.1 Site buildings

There is a compound containing the administrative offices and allied buildings immediately at the site entrance on Menangle Road. The compound comprises:

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

No changes to site buildings and infrastructure are proposed.

2.9.2 Lighting

There will be no changes to lighting in the processing and site entry areas.

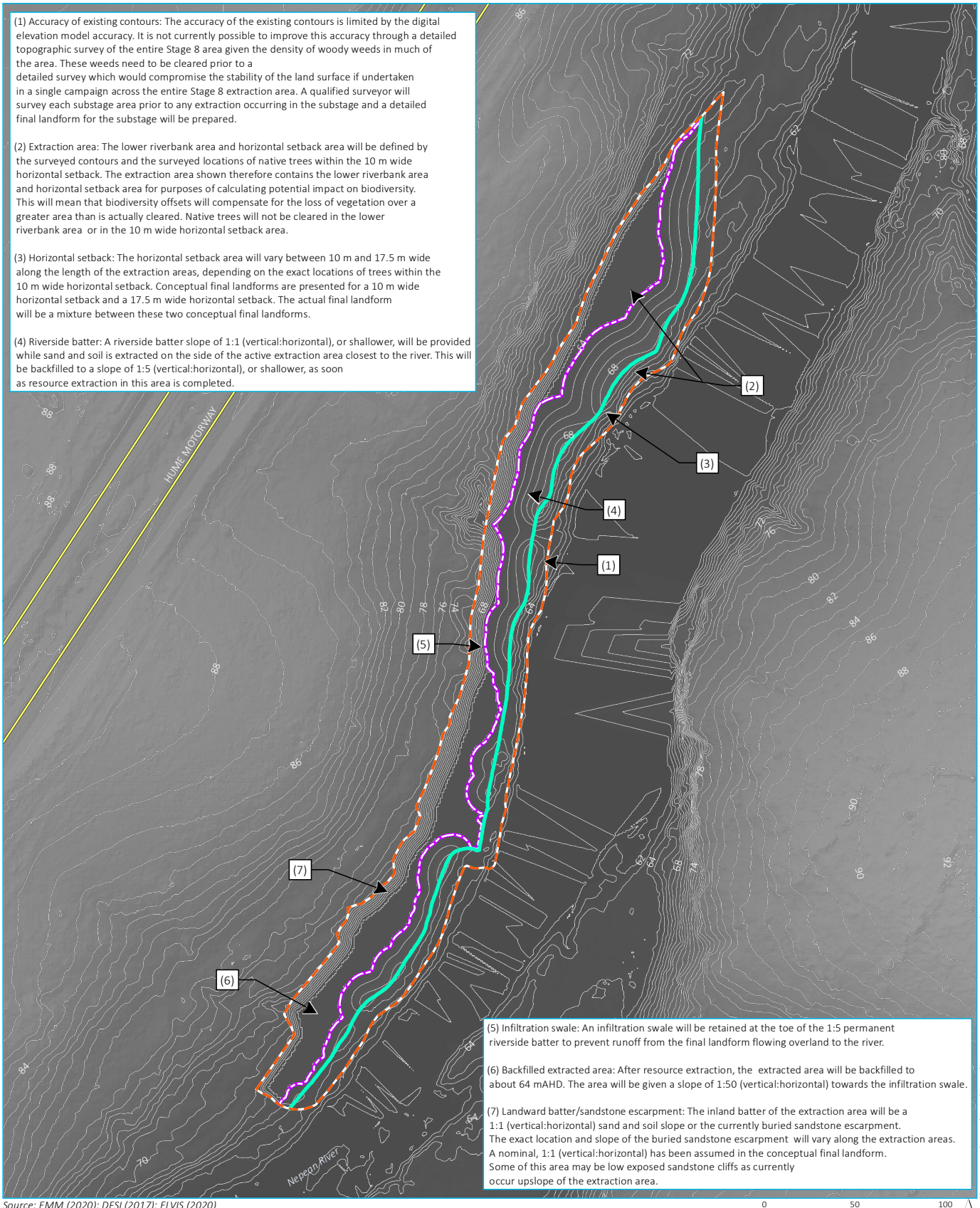
No fixed lighting will be required in the Stage 8 area as extraction will only occur in daylight hours.

2.10 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.

No changes to the approved hours of operation are proposed.



(1) Accuracy of existing contours: The accuracy of the existing contours is limited by the digital elevation model accuracy. It is not currently possible to improve this accuracy through a detailed topographic survey of the entire Stage 8 area given the density of woody weeds in much of the area. These weeds need to be cleared prior to a detailed survey which would compromise the stability of the land surface if undertaken in a single campaign across the entire Stage 8 extraction area. A qualified surveyor will survey each substage area prior to any extraction occurring in the substage and a detailed final landform for the substage will be prepared.

(2) Extraction area: The lower riverbank area and horizontal setback area will be defined by the surveyed contours and the surveyed locations of native trees within the 10 m wide horizontal setback. The extraction area shown therefore contains the lower riverbank area and horizontal setback area for purposes of calculating potential impact on biodiversity. This will mean that biodiversity offsets will compensate for the loss of vegetation over a greater area than is actually cleared. Native trees will not be cleared in the lower riverbank area or in the 10 m wide horizontal setback area.

(3) Horizontal setback: The horizontal setback area will vary between 10 m and 17.5 m wide along the length of the extraction areas, depending on the exact locations of trees within the 10 m wide horizontal setback. Conceptual final landforms are presented for a 10 m wide horizontal setback and a 17.5 m wide horizontal setback. The actual final landform will be a mixture between these two conceptual final landforms.

(4) Riverside batter: A riverside batter slope of 1:1 (vertical:horizontal), or shallower, will be provided while sand and soil is extracted on the side of the active extraction area closest to the river. This will be backfilled to a slope of 1:5 (vertical:horizontal), or shallower, as soon as resource extraction in this area is completed.

(5) Infiltration swale: An infiltration swale will be retained at the toe of the 1:5 permanent riverside batter to prevent runoff from the final landform flowing overland to the river.

(6) Backfilled extracted area: After resource extraction, the extracted area will be backfilled to about 64 mAHD. The area will be given a slope of 1:50 (vertical:horizontal) towards the infiltration swale.

(7) Landward batter/sandstone escarpment: The inland batter of the extraction area will be a 1:1 (vertical:horizontal) sand and soil slope or the currently buried sandstone escarpment. The exact location and slope of the buried sandstone escarpment will vary along the extraction areas. A nominal, 1:1 (vertical:horizontal) has been assumed in the conceptual final landform. Some of this area may be low exposed sandstone cliffs as currently occur upslope of the extraction area.

Source: EMM (2020); DFSI (2017); ELVIS (2020)

0 50 100 m

GDA 1994 MGA Zone 56

N

KEY

- Stage 8 - extraction/rehabilitation area
- Inland extent of horizontal setback (10 m)
- Infiltration swale/toe of riverside 1:5 permanent batter
- Contour (1 m)
- Major road

Conceptual final landform 10 m setback
Northern extraction/rehabilitation area

Menangle Quarry Extension
Figure 2.10

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