





See notes on Conceptual final landform - Northern extraction/rehabilitation area figure

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

**KEY**

-  Stage 8 - extraction/rehabilitation area
-  Inland extent of horizontal setback (17.5 m)
-  Infiltration swale/toe of riverside 1:5 permanent batter
-  Contour (1 m)

Conceptual final landform 17.5 m setback  
Southern extraction/rehabilitation area

Menangle Quarry Extension  
Figure 2.13

## 2.11 Employment

The quarry employs 16 people, most of whom are employees of long standing. When there is an additional production demand, staff from other Benedict sites are brought to site to assist. In addition, Benedict and contracted truck drivers deliver materials to the site and products to customers.

In addition, a full-time rehabilitation specialist will be employed as part of the Stage 8 area operations.

# 3 Statement of commitments

## 3.1 Introduction

The commitments to manage potential environmental impacts from the extension project are described in Chapter 7 of the EA (EMM 2017b). This includes a summary of commitments in EA Table 7.1. An updated statement of commitments is provided in Chapter 6 of the RTS (EMM 2017b).

## 3.2 Summary of commitments

A summary of the environmental management and mitigation measures, as amended to incorporate the changes made since the Refusal, is provided in Table 3.1. Additional commitments made following submission of the RTS are highlighted in bold.

**Table 3.1 Summary of commitments**

<b>Aspect</b>	<b>Commitment</b>
Air quality	Management measures to suppress dust and emissions consistent with current operations will be continued: <ul style="list-style-type: none"><li>• level 2 water spraying for hauling on unpaved roads;</li><li>• water spraying where screening occurs; and</li><li>• water spraying at conveyor transfer points.</li></ul>
Noise and vibration	The current management measures to minimise noise emissions will continue to be implemented including: <ul style="list-style-type: none"><li>• regular reinforcement of the need to minimise noise;</li><li>• regular identification of noisy activities and adoption of improvement techniques;</li><li>• working in shielded areas when possible (ie below the top of the bank of the Nepean River);</li><li>• 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;</li><li>• developing routes for the delivery of materials and parking of vehicles to minimise noise;</li><li>• where possible, avoiding the use of equipment that generates impulsive noise;</li><li>• minimising the need for vehicle reversing for example, by arranging for one-way site traffic routes;</li><li>• minimising the movement of materials and plant and unnecessary metal-on-metal contact; and</li><li>• scheduling respite periods for intensive works (such as timber milling).</li></ul> The following measures will be taken as part of the campaign use of the portable timber mill: <ul style="list-style-type: none"><li>• campaigns will be scheduled to avoid the winter period;</li><li>• a noise measurement trial will be conducted during worst case meteorological conditions at the start of the first campaign and if noise levels are above the noise criteria, mobile noise barriers and/ or noise curtains will be installed.</li></ul>

**Table 3.1 Summary of commitments**

Aspect	Commitment
Aboriginal heritage	<p data-bbox="408 443 560 465"><i>Aboriginal sites</i></p> <ul data-bbox="408 483 1394 775" style="list-style-type: none"> <li data-bbox="408 483 1394 533">• A pre-clearance survey will be undertaken to ensure that any scarred trees in the Stage 8 area are identified and recorded.</li> <li data-bbox="408 551 1394 573">• Procedures will be implemented to ensure there is no inadvertent harm to buried rock shelters.</li> <li data-bbox="408 591 1394 613">• Procedures will be implemented if human skeletal remains are discovered.</li> <li data-bbox="408 631 1394 680">• Management measures will be implemented so that the quarry machinery avoids impacting buried sandstone features.</li> <li data-bbox="408 698 1394 775">• 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 Aboriginal Heritage Information Management System (AHIMS).</li> </ul>
Biodiversity, restoration and rehabilitation	<p data-bbox="408 792 1078 815"><b>A full-time rehabilitation specialist will be employed by the quarry.</b></p> <p data-bbox="408 833 1031 855">Measures to minimise the project's biodiversity impacts will be:</p> <ul data-bbox="408 873 1394 1456" style="list-style-type: none"> <li data-bbox="408 873 1394 1061">• 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. It is proposed that the development consent for the Stage 3 area is 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.</li> <li data-bbox="408 1079 1394 1267">• Minimise: <ul data-bbox="437 1115 1394 1267" style="list-style-type: none"> <li data-bbox="437 1115 1394 1169">– each substage will be less than 1.07 ha and the active extraction area will be about 0.33 ha; and</li> <li data-bbox="437 1187 1394 1267">– once extraction in each part of the sub-stage is complete, the area will be progressively rehabilitated so about 33% of the sub-stage will be bare sand and soil and about 66% will be a combination of existing vegetation and the area being rehabilitated.</li> </ul> </li> <li data-bbox="408 1285 1394 1393">• 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 EA Appendix I and Section 6.5 in the Supplementary Biodiversity Assessment (EMM [Ward] 2019b)).</li> <li data-bbox="408 1411 1394 1456">• Offset – biodiversity offsets will be provided in accordance with the Supplementary Biodiversity Assessment (EMM [Ward] 2019b).</li> </ul> <p data-bbox="408 1473 922 1496">Extraction will be setback from the river as follows:</p> <ul data-bbox="408 1514 1394 1753" style="list-style-type: none"> <li data-bbox="408 1514 1394 1590">• 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).</li> <li data-bbox="408 1608 1394 1662">• The riverbank will also be retained in a horizontal setback that extends at least 10 m (measured horizontally) inland from the 64 mAHD contour (the horizontal setback area).</li> <li data-bbox="408 1680 1394 1753">• Where there are trees within the 10-m wide setback, the width of the setback will be further 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.</li> </ul>

**Table 3.1 Summary of commitments**

Aspect	Commitment
	<p><b>All native trees in the 10-m-wide horizontal setback will be retained.</b></p> <p>Restoration and rehabilitation will be undertaken in accordance with a post extractive rehabilitation and vegetation management plan similar to those contained in EA Appendix C. This plan will:</p> <ul style="list-style-type: none"> <li>• 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;</li> <li>• describe how the implementation of the biodiversity offset strategy would be integrated with the overall rehabilitation of the site; and</li> <li>• detail how connectivity will be managed during the vegetation management plan works program.</li> </ul> <p><b>Woody debris and logs from areas to be cleared will be retained and placed in the offset area, extraction area, and lower riverbank.</b></p> <p><b>A weed-control strategy will be prepared and implemented in the Stage 8 areas.</b></p> <p><b>Menangle Sand and Soil will ensure the vegetation maintenance in the Stage 8 area is fully funded.</b></p>
Groundwater	<p><b>The following groundwater monitoring and management measures will be implemented:</b></p> <ul style="list-style-type: none"> <li>• <b>A conceptual locally-specific groundwater model will be prepared based on local site data.</b></li> <li>• <b>A water monitoring and modelling plan will be prepared.</b></li> <li>• <b>Install nested monitoring bores will be installed at four locations along the stage 8 area.</b></li> <li>• <b>In-bore aquifer tests (slug tests) will be conducted.</b></li> <li>• <b>Piezometers/loggers will be installed in each bore and water levels recorded.</b></li> <li>• <b>The ‘water take’ in the pit predicted as a result of elevated groundwater levels during flooding will be calculated.</b></li> </ul> <p><b>Sufficient water access licences (WALs) will be purchased to account for the ‘intercepted’ groundwater, if required.</b></p> <p>The existing groundwater management controls implemented on the site for the approved operations will be continued, including:</p> <ul style="list-style-type: none"> <li>• the base of the quarry pit will be no deeper than 62 mAHD, ie 1 m above the alluvial water table; and</li> <li>• 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 and extraction not recommenced until the water subsides.</li> </ul>

**Table 3.1 Summary of commitments**

Aspect	Commitment
Surface water	<p>The existing soil and surface water management controls implemented on the site for the approved operations will be continued. These measures include:</p> <ul style="list-style-type: none"> <li>• the extraction area will be setback from the river (see above);</li> <li>• flow diversions and check dams will be constructed to direct clean runoff around the extraction area;</li> <li>• a sedimentation basin (or basins), sized to trap and treat runoff, will be excavated within the pit; and</li> <li>• the erosion and sediment control measures will be regularly maintained.</li> </ul> <p>The sedimentation basin will be formed in the base of the pit and will be relocated as the extraction area progresses.</p> <p>Only commercially available non-toxic flocculants will be used at the site.</p> <p>Any water in the pit will not be dewatered using a pump. Rather, it will flow to a sedimentation basin or will be allowed to infiltrate to the water table under gravity.</p> <p>If the water level in the pit rises to a level where operations need to cease, operations will only recommence when the water level has dropped sufficiently to be safe (no operations within standing water are required).</p> <p><b>The following actions will be taken when flooding of the Nepean River above 64 m AHD in the Stage 8 area is predicted:</b></p> <ul style="list-style-type: none"> <li>• any riverside batter that has a batter angle of less than 1:5 will be built up so that it has a maximum 1:5 slope;</li> <li>• exposed batters and the base of the pit will be flattened so that there are no isolated highpoints susceptible to scour;</li> <li>• all exposed sand and soil will be smoothed such that there are no rapid changes in slopes, particularly at the intersections of different batters; and</li> <li>• unattended earthmoving equipment will not be left within the Stage 8 area below the 1% annual exceedance probability flood level while a flood warning is current.</li> </ul> <p><b>These measures will be detailed in a flood preparedness plan that will be part of the site’s operational environmental management plan.</b></p>
Traffic and transport	<p><i>Road upgrades</i></p> <ul style="list-style-type: none"> <li>• No road upgrades will be required as a result of the extension.</li> </ul> <p><i>Traffic management plan</i></p> <ul style="list-style-type: none"> <li>• The existing traffic management plan will be monitored and reviewed.</li> </ul> <p><i>Access beneath the Hume Highway/Menangle Bridges</i></p> <ul style="list-style-type: none"> <li>• There will be no clearing of native vegetation, excavation or stockpiles placed within 50 m of the Hume Highway/Menangle Bridges or within 30 m of the edge of the boundary of the Hume Highway road corridor within the Stage 8 area.</li> <li>• Menangle Sand and Soil will continue to provide Transport for NSW (TfNSW) access to the Hume Highway/Menangle Bridges structure and associated facilities at all times, including for routine and emergency maintenance.</li> <li>• Access under the Hume Highway/Menangle Bridges will be restricted to light vehicles only.</li> <li>• Access under the Hume Highway/Menangle Bridges will be sealed and comply with RMS drainage and pavements standards.</li> <li>• The piers of the Hume Highway/Menangle Bridges, as well as any other part of the bridge structure and associated facilities, will be protected from any potential damage as a result of the construction or operations of the Menangle Sand and Soil Quarry.</li> </ul>

**Table 3.1 Summary of commitments**

Aspect	Commitment
	<ul style="list-style-type: none"> <li>• The conveyor and access under the bridges will be the subject of a license agreement drawn up by TfNSW's lawyers at no cost to TfNSW. This will be in place prior to starting any works under and adjacent to the Menangle Bridges and Hume Highway.</li> <li>• Any detritus associated with the construction and use of the access road under Hume Highway/Menangle Bridges will be removed by Menangle Sand and Soil.</li> </ul> <p>There will be no access to or from the Hume Highway road reserve area from the Menangle Sand and Soil Quarry site (specifically between Lot 202 and Lot 203 DP 590247) other than to travel beneath the Hume Highway/Menangle Bridges.</p> <p>A Drivers Code of Conduct will be prepared that applies to all employee and contractor drivers.</p>
Social	Menangle Sand and Soil will continue to 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	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.
Historical heritage	Extraction in the northern-most part of the Stage 8 extraction area will avoid the storage container. The industrial equipment on the west bank of the Nepean River in the Stage 8 restoration area will not be disturbed.

# References

EMM 2017a, *Menangle Quarry Extension Environmental Assessment*, prepared for Menangle Sand and Soil Pty Limited by EMM Consulting Pty Limited. 23 May 2017.

EMM 2017b, *Menangle Quarry Extension Response to Submissions*, prepared for Menangle Sand and Soil Pty Limited by EMM Consulting Pty Limited. 14 September 2017.

EMM [Towler] 2019a, NSW Land and Environment Court (2018/342158) *NSW Land and Environment Court (2018/342158) Menangle Quarry - Project Amendments and Information Summary*. Letter prepared by EMM Consulting Pty Limited for Minter Ellison. 20 December 2019.

EMM [Ward] 2019b, *Menangle Sand and Soil Pty Ltd v Minister for Planning, LEC 2018/342158 Supplementary Biodiversity Assessment*. Report prepared by EMM Consulting Pty Limited for Minter Ellison. Version 2. 6 September 2019.

EMM [Towler] 2019c, NSW Land and Environment Court (2018/342158) *Menangle Quarry - Amended Extraction Area and Setback*. Letter prepared by EMM Consulting Pty Limited for Minter Ellison. 16 August 2019.

EMM [Grant] 2019d, NSW Land and Environment Court (2018/342158) *Menangle Sand and Soil - Restoration Area Weed Strategy*. Letter prepared by EMM Consulting Pty Limited for Minter Ellison. 9 September 2019.

EMM [Webb] 2019e, NSW Land and Environment Court (2018/342158) *Menangle Sand and Soil - Groundwater Management*. Letter prepared by EMM Consulting Pty Limited for Minter Ellison. 16 August 2019.

EMM [Towler] 2019f, NSW Land and Environment Court (2018/342158) *Menangle Sand and Soil – Flood Mitigation*. Letter prepared by EMM Consulting Pty Limited for Minter Ellison. 9 September 2019.



---

Appendix A

# Development Application Land

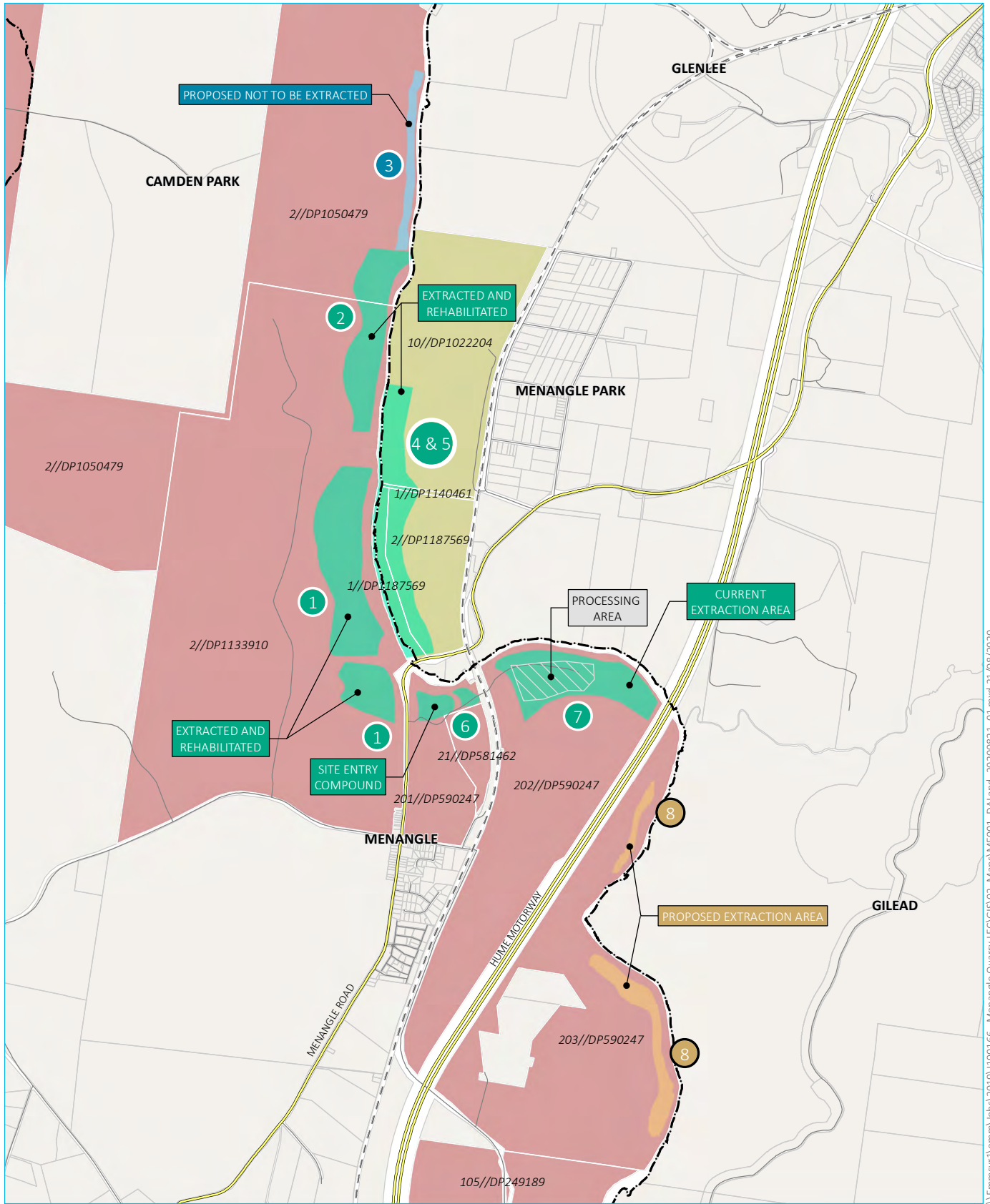
---

## A.1 Development Application Land

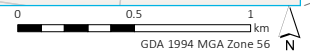
The allotments subject to the development application modification are listed in Table A.1 and shown in Figure A.1.

**Table A.1** Development application land

<b>Lot</b>	<b>Deposited plan</b>
Lot 10	DP1022204
Lot 2	DP1050479
Lot 2	DP1133910
Lot 1	DP1140461
Lot 1	DP1187569
Lot 2	DP1187569
Lot 105	DP249189
Lot 21	DP581462
Lot 201	DP590247
Lot 202	DP590247
Lot 203	DP590247



Source: EMM (2020); DFSI (2020)



**KEY**

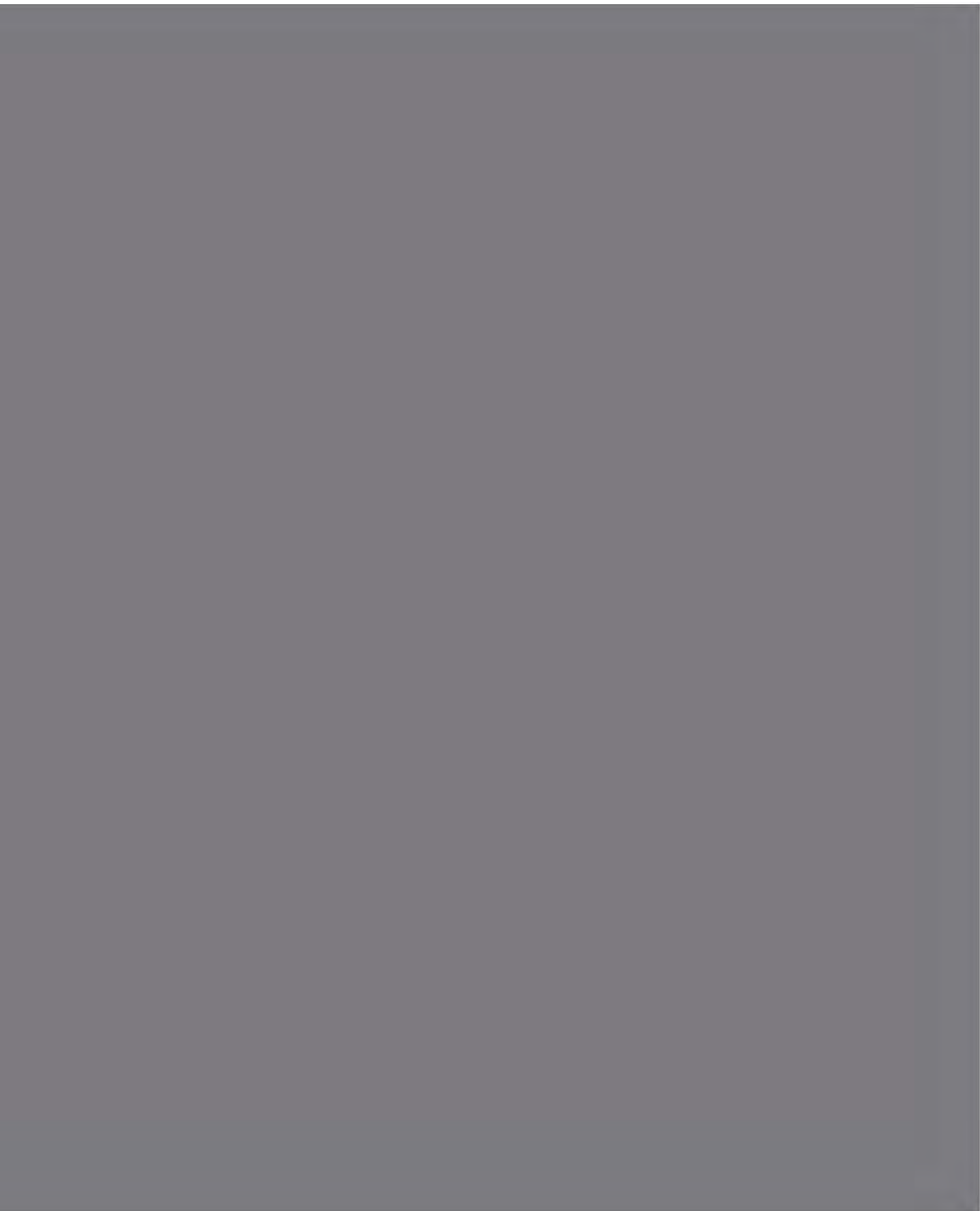
- — Rail line
- Major road
- Minor road
- ▭ Cadastral boundary
- ▭ Local government area boundary
- ▭ Campbelltown impacted lots
- ▭ Wollondilly impacted lots
- ▭ Existing processing area (to be retained)
- ▭ Extractive operations (approved)
- ▭ Extractive operations (approved but not extracted)
- ▭ Stage 8 - extraction/rehabilitation area

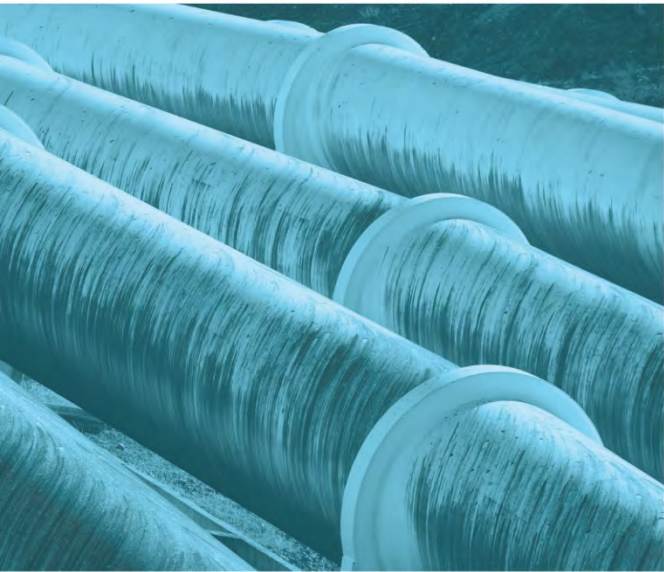
Development Application Land

Menangle Quarry Extension  
Figure A.1



\\Emmsvr1\emmm\jobs\2019\190166 - Menangle Quarry LEC\GIS\02 - Maps\MFC001\_DALand\_20200821\_01.mxd 21/08/2020





---

Appendix B

# Notice of Orders Made (LEC 2018/00342158)

---



**Land and Environment  
Court**  
of New South Wales

Level 4 225 Macquarie Street SYDNEY NSW 2000  
Level 4 GPO Box 3565 SYDNEY NSW 2001  
DX 264, Sydney

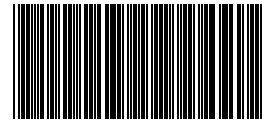
Telephone: 02 9113 8200  
Facsimile: 02 9113 8222  
02 91138208

Email: [lecourt@justice.nsw.gov.au](mailto:lecourt@justice.nsw.gov.au)  
Website: <http://www.lec.justice.nsw.gov.au>

ABN: 52 659 114 436

Luke Anthony James Walker  
[luke.walker@minterellison.com](mailto:luke.walker@minterellison.com)

Your Ref:



D0001BMPSE

10 September 2020

### **NOTICE OF ORDERS MADE**

Case number      2018/00342158  
Case title        Menangle Sand and Soil Pty Limited v Minister for Planning

---

On 10 September 2020 the following orders (and/or directions) were made:

The Court orders that:

- (1) The appeal is upheld.
- (2) Modification to development application DA 85/2865 "Menangle Quarry Extension – Modification 1" (MOD1) lodged by the Applicant on 22 May 2017 with the Minister for Planning, which includes (amongst other things) extending the life of the quarry by 15 years until 2035 by developing a new 13 ha, 2.8 kilometre (km) long southern extraction area (Stage 8) within Lot 203 DP 590247, is approved subject to the conditions set out in 'Annexure A' attached hereto.

For the Registrar

*Menangle Sand and Soil Pty Limited v Minister for Planning (LEC 2018/342158)*

**Annexure "A"**

**Modifications**

*Note: Amendments to existing conditions of approval are shown in tracked changes (**bold and underlined** and where relevant ~~strikeout font~~)*

1. **Amend the Schedule heading on page 2 as follows:**

Schedule 1

2. **Delete condition 5 and 6.**

3. **Add additional condition 5A. as follows:**

**The Applicant must not carry out any Quarrying Operations or extraction in Stage 3.**

4. **Amend condition 14(a) as follows:**

a. ~~Stages 2-3~~ **Stage 2** (Western Bank)

5. **Amend condition 28 as follows:**

Breach of Consent

In the event of a breach of any of the conditions of consent by the applicant, the Campbelltown City and the Wollondilly Shire Council reserve the right to enter and rectify any such breach and recover the costs of such rectification from the amount of the guarantee **required under condition 25 of this Schedule.**

6. **Amend condition 30 as follows:**

Completion of Extraction

The applicant shall ensure that all extraction in Stage 1 and Stage 2 is completed by 30 June, 1995; and ~~all stages~~ **Stages 4 to 7** of the development by **31 December** 2020.

7. **Amend condition 31 as follows:**

Levy for Implementation of Management Plan

The applicant or its assigns shall pay the Director a levy on all sand and soil removed or carried from, the site from Stages ~~1, 2 and 3~~ **1 and 2**, within the Shire of Wollondilly, such levy being paid into a Trust Fund to be administered by the Director for the purpose of providing public facilities on the land subject to this consent in accordance with the requirements of the Camden Park Estate Management Plan which is to be prepared by the Department of Planning. The levy shall be paid at a rate of 8 cents per tonne of sand and soil and shall be adjusted annually on the Index Review Date in accordance with the formula contained in Condition 26.



*Menangle Sand and Soil Pty Limited v Minister for Planning (LEC 2018/342158)*

8. **Insert Schedule 2 as follows:**

*Menangle Sand and Soil Pty Limited v Minister for Planning (LEC 2018/342158)***SCHEDULE 2****TABLE OF CONTENTS**

<b>DEFINITIONS .....</b>	<b>4</b>
<b>PART A ADMINISTRATIVE CONDITIONS .....</b>	<b>8</b>
Application of this Schedule.....	8
Notification of Commencement (Stage 8).....	8
Obligation to Minimise Harm to the Environment.....	8
Terms of Consent.....	8
Limits of Consent.....	8
Evidence of Consultation.....	10
Staging, Combining and Updating Strategies, Plans or Programs .....	10
Protection of Public Infrastructure.....	11
Operation of Plant and Equipment.....	11
Compliance.....	11
Applicability of Guidelines.....	11
Production Data.....	11
Other Statutory Approvals, Licences and Consents .....	11
<b>PART B SPECIFIC ENVIRONMENTAL CONDITIONS.....</b>	<b>12</b>
Early Works .....	12
Noise .....	12
Air Quality .....	13
Meteorological Monitoring.....	14
Soil and Water .....	14
Transport .....	17
Heritage.....	19
Biodiversity and Rehabilitation.....	20
Visual.....	24
Waste .....	24
Liquid Storage .....	24
Dangerous Goods.....	24
Bushfire Management.....	24
<b>PART C ADDITIONAL PROCEDURES .....</b>	<b>25</b>
Notification of Exceedances .....	25
Independent Review .....	25
<b>PART D ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING .....</b>	<b>26</b>
Environmental Management.....	26
Revision of Strategies, Plans and Programs .....	26
Reporting and Auditing .....	27
Access to Information .....	28
<b>APPENDIX 1 DEVELOPMENT LAYOUT .....</b>	<b>29</b>
<b>APPENDIX 2 EXCLUSION AREAS.....</b>	<b>34</b>
<b>APPENDIX 3 RECEIVER LOCATIONS.....</b>	<b>36</b>
<b>APPENDIX 4 NOISE COMPLIANCE ASSESSMENT .....</b>	<b>37</b>
<b>APPENDIX 5 MONITORING LOCATIONS.....</b>	<b>38</b>
<b>APPENDIX 6 ADDITIONAL STAGE 6 AND 7 BIODIVERSITY AND REHABILITATION REQUIREMENTS .....</b>	<b>39</b>
<b>APPENDIX 7 STAGE 8 OPERATIONS BIODIVERSITY AND REHABILITATION .....</b>	<b>42</b>
<b>APPENDIX 8 INCIDENT NOTIFICATION AND REPORTING REQUIREMENTS .....</b>	<b>45</b>

*Menangle Sand and Soil Pty Limited v Minister for Planning (LEC 2018/342158)*

**DEFINITIONS**

<b>Aboriginal object</b>	Has the same meaning as the definition of the term in section 5 of the NP&W Act
<b>Aboriginal place</b>	Has the same meaning as the definition of the term in section 5 of the NP&W Act
<b>Active extraction area</b>	The area of exposed sand or soil within each Substage which is not subject to rehabilitation
<b>AHD</b>	Australian Height Datum
<b>AEP</b>	Annual Exceedance Probability
<b>Annual Review</b>	The review required by condition D9
<b>Applicant</b>	Menangle Sand and Soil Pty Ltd, or any person carrying out any development under this consent
<b>Approved disturbance area</b>	The area identified as such on the development layout figures in Appendix 1, as amended by the conditions of this consent
<b>Amended Project Summary</b>	<p>The amended project as described in:</p> <ul style="list-style-type: none"> <li>• correspondence prepared by EMM dated 20 December 2019, including: <ul style="list-style-type: none"> <li>○ Amended Extraction Area and Setback Letter dated 16 August 2019, prepared by EMM Consulting;</li> <li>○ Groundwater Management Letter dated 16 August 2019, prepared by EMM Consulting;</li> <li>○ Aquatic Ecology Assessment of Significance Letter regarding Sydney Hawk Dragonfly dated 2 September 2019, prepared by Marine Pollution Research Pty Ltd;</li> <li>○ Fluvial Geomorphology Assessment for Menangle Quarry Modification to Development Consent 85/2865 dated 5 September 2019, prepared by Fluvial Systems Pty Ltd;</li> <li>○ Stage 8 Area Weed Control Strategy Letter dated 9 September 2019, prepared EMM Consulting;</li> <li>○ Flood Mitigation Letter dated 9 September 2019, prepared by EMM Consulting;</li> <li>○ Supplementary Biodiversity Assessment Report dated 16 September 2019, prepared by EMM Consulting;</li> <li>○ Menangle Quarry Extension – Flood Impact Sensitivity Assessment dated September 2019, prepared by Advisian; and</li> <li>○ Additional Flood Impact Sensitivity Assessment dated 17 December 2019, prepared by Advisian; and</li> </ul> </li> <li>• the Consolidated Project Description</li> </ul>
<b>BAM</b>	Biodiversity Assessment Method
<b>BC Act</b>	<i>Biodiversity Conservation Act 2016</i>
<b>BCD</b>	Biodiversity and Conservation Division within the Department
<b>BCT</b>	NSW Biodiversity Conservation Trust
<b>Calendar year</b>	A period of 12 months from 1 January to 31 December
<b>Conditions of this consent</b>	Conditions contained in Schedules 2 and 3
<b>Consolidated Project Description</b>	The document titled <i>Applicant's Description of Amended Project for Case Management Conference 23 July 2020</i> prepared by EMM Consulting dated 24 August 2020
<b>Construction</b>	All physical works to enable Quarrying Operations to be carried out, including demolition and removal of buildings or works, and erection of buildings and other infrastructure permitted by this consent
<b>Council</b>	Wollondilly Shire Council

*Menangle Sand and Soil Pty Limited v Minister for Planning (LEC 2018/342158)*

<b>Day</b>	The period from 7 am to 6 pm on Monday to Saturday, and 8 am to 6 pm on Sundays and Public Holidays
<b>DBH</b>	Diameter at breast height
<b>Decommissioning</b>	The deconstruction or demolition and removal of works installed as part of the development
<b>Demolition</b>	The deconstruction and removal of buildings, sheds and other structures on the site
<b>Department</b>	NSW Department of Planning, Industry and Environment
<b>Development</b>	The development described in the document/s listed in condition A7(c), as modified by the conditions of this consent
<b>Development Layout</b>	The figures in Appendix 1, as amended by the conditions of this consent
<b>DPIE Water</b>	Water Group within the Department
<b>EA (Mod 1)</b>	The EA titled <i>Environmental Assessment Menangle Quarry Extension</i> , prepared by EMM and dated 23 May 2017, the associated Response to Submissions titled <i>Response to Submissions Menangle Quarry Extension</i> , prepared by EMM and dated 14 September 2017, and additional information provided by the Applicant in support of the application including <i>Flood Impact Assessment</i> prepared by Advisian and dated May 2018, <i>Review of Fluvial Geomorphology</i> prepared by Fluvial Systems and dated May 2018, and correspondence prepared by EMM dated 27 August 2017 and 21 February 2018
<b>Early Works</b>	Means clearing for and construction of the linear infrastructure (being conveyors, access roads and haul roads) located between Stage 7 and Stage 8, but does not include Quarrying Operations within the Substage 8A.
<b>EIS</b>	The Environmental Impact Statement titled <i>Proposed Sand &amp; Soil Extraction Nepean River &amp; Environs Menangle NSW</i> , prepared by Planning Workshop and dated December 1987, submitted with the application for consent for the development.
<b>Environment</b>	Includes all aspects of the surroundings of humans, whether affecting any human as an individual or in his or her social groupings
<b>EPA</b>	NSW Environment Protection Authority
<b>EP&amp;A Act</b>	<i>Environmental Planning and Assessment Act 1979</i>
<b>EPL</b>	Environment Protection Licence under the POEO Act
<b>Exclusion Areas</b>	Means those areas with 1% AEP peak flow velocities greater than 4 metres/second as identified in the figures in Appendix 2 and the plan required under condition A15.
<b>Feasible</b>	Means what is possible and practical in the circumstances
<b>Final determination</b>	River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions - endangered ecological community final determination (as amended in 2011)
<b>GPS</b>	Global Positioning System
<b>Heritage item</b>	An Aboriginal object, an Aboriginal place, or a place, building, work, relic, moveable object, tree or precinct of heritage significance that is listed under any of the following: <ul style="list-style-type: none"> <li>• the State Heritage Register under the <i>Heritage Act 1977</i>;</li> <li>• a state agency heritage and conservation register under section 170 of the <i>Heritage Act 1977</i>;</li> <li>• a Local Environmental Plan under the EP&amp;A Act;</li> <li>• the World Heritage List;</li> <li>• the National Heritage List or Commonwealth Heritage List under the EPBC Act; or</li> <li>• anything identified as a heritage item under the conditions of this consent</li> </ul>
<b>Heritage NSW</b>	Heritage NSW within the Department of Premier and Cabinet

*Menangle Sand and Soil Pty Limited v Minister for Planning (LEC 2018/342158)*

<b>Incident</b>	An occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance
<b>Laden trucks</b>	Trucks transporting quarry products from the site and/or trucks transporting waste and other blending material to the site
<b>Land</b>	Has the same meaning as the definition of the term in section 1.4 the EP&A Act, except for where the term is used in the noise and air quality conditions in PART B of Schedule 2 of this consent where it is defined to mean the whole of a lot, or contiguous lots owned by the same landowner, in a current plan registered at the Land Titles Office at the date of determination of Modification 1
<b>Material harm</b>	<p>Is harm that:</p> <ul style="list-style-type: none"> <li>• involves actual or potential harm to the health or safety of human beings or to the environment that is not trivial; or</li> <li>• results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding \$10,000, (such loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment)</li> </ul> <p>This definition excludes "harm" that is authorised under either this consent or any other statutory approval'</p>
<b>MEG</b>	Mining, Exploration and Geoscience within Regional NSW
<b>m</b>	Metres
<b>Minimise</b>	Implement all reasonable and feasible mitigation measures to reduce the impacts of the development
<b>Nepean River Buffer Zone</b>	A horizontal setback area extending landward from the 64 m AHD contour of the western low bank of the Nepean River, as defined under condition A10 of Schedule 2
<b>Non-compliance</b>	An occurrence, set of circumstances or development that is a breach of this consent
<b>Phase 1</b>	Substages 8A – 8B as shown in the figures in Appendix 1
<b>Phase 2</b>	Substage 8C as shown in the figures in Appendix 1
<b>Phase 3</b>	Substages 8D – 8E as shown in the figures in Appendix 1
<b>Phase 4</b>	Substages 8F to 8G as shown in the figures in Appendix 1
<b>Phase 5</b>	Substages 8H to 8I as shown in the figures in Appendix 1
<b>Phase 6</b>	Substages 8J to 8K as shown in the figures in Appendix 1
<b>Phase 7</b>	Substages 8L to 8M as shown in the figures in Appendix 1
<b>Planning Secretary</b>	Planning Secretary under the EP&A Act, or nominee
<b>POEO Act</b>	<i>Protection of the Environment Operations Act 1997</i>
<b>Processing Areas</b>	Any areas used for processing (including blending with waste material), stockpiling and transportation of extractive materials during Stage 8 Operations, including any disturbed areas within Stages 6-7 required to facilitate Quarrying Operations in the Stage 8 Area
<b>Protected Trees</b>	Any native trees identified as such in a native vegetation identification report prepared in accordance with condition A10(b) of Schedule 2
<b>Public infrastructure</b>	Linear and related infrastructure that provides services to the general public, such as roads, railways, water supply, drainage, sewerage, gas supply, electricity, telephone, telecommunications, etc
<b>Quarrying Operations</b>	The extraction, processing (including blending with waste material), stockpiling and transportation of extractive materials carried out on the site and the associated removal of vegetation, topsoil and overburden

*Menangle Sand and Soil Pty Limited v Minister for Planning (LEC 2018/342158)*

<b>Quarry products</b>	Includes all saleable quarry products, but excludes tailings and other wastes and rehabilitation material
<b>Reasonable</b>	Means applying judgement in arriving at a decision, taking into account: mitigation benefits, costs of mitigation versus benefits provided, community views, and the nature and extent of potential improvements
<b>Registered Aboriginal Parties</b>	As described in the <i>National Parks and Wildlife Regulation 2009</i>
<b>Rehabilitation</b>	The restoration of land disturbed by the development to a good condition, to ensure it is safe, stable and non-polluting
<b>Residence</b>	Existing or approved dwelling at the date of determination of Modification 1
<b>Restoration Area</b>	The area shown as "Amended stage 8 – restoration area" in the figures in Appendix 1
<b>RFS</b>	NSW Rural Fire Service
<b>River-Flat Eucalypt Forest EEC</b>	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions endangered ecological community, as listed under the <i>Biodiversity Conservation Act 2016</i> and described in the Final Determination
<b>TfNSW</b>	Transport for New South Wales
<b>Site</b>	The land identified as: Lot 10 DP1022204 Lot 2 DP1050479 Lot 2 DP1133910 Lot 1 DP1140461 Lots 1-2 DP1187569 Lot 105 DP249189 Lot 21 DP581462 Lots 201-203 DP590247
<b>Stage 3 Area</b>	The area labelled Stage 3 and shown in blue in Figure 1 in Appendix 1
<b>Stage 8 Area</b>	The area labelled Stage 8 and shown in brown in Figure 1 in Appendix 1, comprising the 13 Substages labelled Stages 8A-8M and associated infrastructure including the conveyor and haul roads, shown in Figures 2-5 of Appendix 1
<b>Stage 8 Operations</b>	Quarrying Operations associated with extraction within the Stage 8 Area, including the operation of the Processing Areas identified in the figures in Appendix 1 and any private access roads or haul roads necessary for the carrying out of the development
<b>Substage</b>	Each of the 13 extraction areas labelled Stages 8A-8M and identified in the figures in Appendix 1, as amended by conditions of this consent
<b>V:H</b>	Vertical to horizontal
<b>Waste</b>	Has the same meaning as the definition of the term in the Dictionary to the POEO Act
<b>Weed</b>	Any weed specified by the Department of Primary Industries as being a weed on the website NSW WeedWise (or any successor websites or policies). For the avoidance of doubt, privet and lantana are weeds for the purposes of this definition.

## **PART A ADMINISTRATIVE CONDITIONS**

### **APPLICATION OF THIS SCHEDULE**

- A1. The conditions in this Schedule have no effect until the Applicant provides notification of the commencement of construction activities associated with Stage 8 Operations, as required under condition A5(a) of this Schedule.
- A2. The conditions in this Schedule do not apply retrospective requirements in relation to Quarrying Operations undertaken in Stages 1 to 7 of the development that have been completed prior to 31 December 2020 (inclusive).
- A3. From the commencement date of construction activities associated with Stage 8 Operations, as notified under condition A5(a) of this Schedule, the obligations in Schedule 1 of this development consent will continue to apply in relation to Stages 1 to 7 of the development, except in so far as they are specifically amended by the conditions of this Schedule.
- A4. In the event of an inconsistency, ambiguity or conflict between the conditions in Schedules 1 and 2 of this development consent, as they relate to the Stage 8 Operations, the conditions in Schedule 2 prevail to the extent of the inconsistency, ambiguity or conflict.

### **NOTIFICATION OF COMMENCEMENT (STAGE 8)**

- A5. The Applicant must notify the Department in writing of the date of commencement of any of the following phases of the development, at least two weeks before that date:
- (a) construction activities associated with Stage 8 Operations;
  - (b) Quarrying Operations in each of Phases 1 to 7;
  - (c) cessation of Quarrying Operations (i.e. quarry closure); and
  - (d) any period of suspension of Quarrying Operations (i.e. care and maintenance).

### **OBLIGATION TO MINIMISE HARM TO THE ENVIRONMENT**

- A6. In addition to meeting the specific performance measures and criteria in this consent, all reasonable and feasible measures must be implemented to prevent, and if prevention is not reasonable and feasible, minimise, any material harm to the environment that may result from the operation of the development, and any rehabilitation required under this Schedule.

### **TERMS OF CONSENT**

- A7. The development (as modified) may only be carried out:
- (a) in compliance with the conditions of this consent;
  - (b) in accordance with all written directions of the Planning Secretary; and
  - (c) generally in accordance with the EIS, EA (Mod 1), Amended Project Summary and the Development Layout.
- A8. Consistent with the requirements in this consent, the Planning Secretary may make written directions to the Applicant in relation to:
- (a) the content of any strategy, study, system, plan, program, review, audit, notification, report or correspondence submitted under or otherwise made in relation to this consent, including those that are required to be, and have been, approved by the Planning Secretary; and
  - (b) the implementation of any actions or measures contained in any such document referred to in condition A8(a) of Schedule 2.
- A9. The conditions of this consent and directions of the Planning Secretary prevail to the extent of any inconsistency, ambiguity or conflict between them and a document/s listed in condition A7(c) of Schedule 2. In the event of an inconsistency, ambiguity or conflict between any of the document/s listed in condition A7(c) of Schedule 2, the most recent document prevails to the extent of the inconsistency, ambiguity or conflict.

### **LIMITS OF CONSENT**

#### **Nepean River Buffer Zone**

- A10. The Applicant must establish and maintain a Nepean River Buffer Zone during Quarrying Operations in the Stage 8 Area. This buffer zone must:
- (a) include a minimum horizontal setback of 10 m extending landward from the 64 m AHD contour on the western side of the Nepean River;
  - (b) be informed by a native vegetation identification report, which must:
    - (i) be prepared by a suitably qualified and experienced botanist or ecologist, whose appointment has been endorsed by the Planning Secretary;
    - (ii) include detailed site surveys to identify the DBH of all native trees that occur within the 10 m horizontal setback from the 64 m AHD contour referred to in sub-paragraph (a);

- (iii) classify all native trees identified in subparagraph (b)(ii) with a DBH of greater than or equal to 0.1 m as Protected Trees and provide their GPS coordinates; and
  - (iv) include a map illustrating a 7.5 m setback (measured at the outside of the native tree trunk) around each of the identified Protected Trees;
  - (v) the map required under subparagraph (iv) must overlay high-resolution ortho-photographs, with supporting digital terrain data files provided in spatial format for GIS and as high-resolution JPEG files; and
- (c) be amended to include the findings of the native vegetation identification report, such that it is widened to include areas where the Protected Tree setbacks extend beyond the minimum 10 m horizontal setback referred to in subparagraph (a).

- A11. The Applicant must submit a copy of the native vegetation identification report and associated survey plans, GPS coordinates and data files required under condition A10(b) of Schedule 2 and associated final landform plans to the Planning Secretary for each of Phases 1 to 7 of the development prior to commencing any vegetation clearing or Quarrying Operations in the relevant phase.
- A12. With the written agreement of the Planning Secretary, the Applicant may seek to reduce the minimum 7.5 m horizontal setback distance for Protected Trees to an appropriate distance recommended by a consulting arborist assessment. Any variation request must be supported by an expert report prepared by the consulting arborist and will be determined by the Planning Secretary on a case by case basis.
- A13. The Applicant must retain and manage the minimum Nepean River Buffer Zone in accordance with the commitments in the documents listed in condition A7(c) of Schedule 2 (as may be amended by the conditions of this consent).

#### **General Limits on Extraction and Processing**

- A14. Prior to undertaking Quarrying Operations in Substage 8G, the Applicant must update the TUFLOW hydrodynamic model used to generate the flood sensitivity analysis in the Additional Flood Impact Sensitivity Assessment dated 17 December 2019, prepared by Advisian in the Amended Project Summary, to include the post extraction topography for Substages 8G-M, using hydraulic roughness Scenario B, and simulate the 1% AEP flood.
- A15. Prior to undertaking Quarrying Operations in Substage 8G, the Applicant must provide the Planning Secretary with a copy of the model required under condition A14 and a plan depicting any areas identified as having a post extraction 1% AEP peak flow velocity of 4 metres/second or greater.
- A16. The Applicant must not carry out construction works or Quarrying Operations or locate any ancillary infrastructure within the Exclusion Areas.
- A17. The Applicant must not:
- (a) carry out Quarrying Operations or regrading; and/or
  - (b) remove vegetation, except where necessary for Weed control,
- within the Nepean River Buffer Zone, without the prior written agreement of the Planning Secretary.
- The written agreement of the Planning Secretary may be provided in circumstances where those activities are necessary for environmental management purposes.
- A18. The Applicant must ensure that any Weed control activities undertaken within the Nepean River Buffer Zone:
- (a) are limited to Weed removal techniques that use hand-held tools; and
  - (b) minimise ground disturbance to the greatest extent practicable.
- A19. The Applicant must not undertake extraction within 7.5 m of any Protected Trees without the written agreement of the Planning Secretary under condition A12 of Schedule 2.
- A20. The Applicant must maintain a minimum 7.5 m setback between Quarrying Operations and any native trees<sup>a</sup> located in the Restoration Area, except where a reduced setback is supported by an assessment by a suitably qualified and experienced arborist, and evidence of this assessment has been provided to the Planning Secretary.
- <sup>a</sup> *In this condition, the setback is to be measured from the outside of the tree trunk.*
- A21. The Applicant must not carry out any extraction:
- (a) in Stages 1, 2, 4, 5, 6 or 7 after the date specified in condition 30 of Schedule 1; or
  - (b) in Stage 3 at any time.

#### **Identification of Approved Disturbance Area**

- A22. Prior to the commencement of Quarrying Operations in each of Phases 1 to 7, the Applicant must:
- a) engage a registered surveyor to mark out the boundaries of the approved limits of extraction for the relevant Substages in each phase (as set out conceptually in the Appendix 1 and as amended by the conditions of this consent);



- b) submit a survey plan of these boundaries and their GPS coordinates to the Planning Secretary; and
- c) ensure that these boundaries are clearly marked at all times during the life of the development in a manner that allows operating staff and inspecting officers to clearly identify those limits.

### Quarrying Operations

A23. Stage 8 Operations may be carried out on the site until 31 December 2035.

**Note:** *Under this consent, the Applicant is required to decommission and rehabilitate the site and carry out other requirements in relation to Quarrying Operations. Consequently, this consent will continue to apply in all respects other than to permit the carrying out of Quarrying Operations until the rehabilitation of the site and other requirements have been carried out to the required standard.*

A24. A maximum of 150,000 tonnes of extractive material may be extracted from the site in any calendar year.

### Quarry product transport

A25. Truck movements at the site (ie inbound combined with outbound movements) must not exceed:

- (a) a maximum of 248 movements on any given weekday;
- (b) an average of 148 movements per weekday, averaged on a weekly basis; and
- (c) a maximum of 80 movements per day on Saturdays.

### Hours of Operation

A26. The Applicant must comply with the operating hours set out in Table 1.

Table 1: Operating Hours

<b>Activity</b>	<b>Permissible Hours</b>
Construction work	<ul style="list-style-type: none"> <li>• 7 am to 5 pm Monday to Friday</li> <li>• 7 am to 1 pm Saturday</li> <li>• At no time on Sundays or public holidays</li> </ul>
Quarrying Operations including loading and dispatch of laden trucks	<ul style="list-style-type: none"> <li>• 6 am to 5 pm Monday to Friday</li> <li>• 6 am to 12 noon Saturday</li> <li>• At no time on Sundays or public holidays</li> </ul>
Maintenance, security, office work, cleaning, etc	<ul style="list-style-type: none"> <li>• May be conducted at any time, provided that these activities are not audible at any residence on privately-owned land</li> </ul>

A27. The following activities may be carried out outside the hours specified in Table 1.

- (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.

### EVIDENCE OF CONSULTATION

A28. Where conditions of this consent require consultation with an identified party, the Applicant must:

- (a) consult with the relevant party prior to submitting the subject document; and
- (b) provide details of the consultation undertaken including:
  - (i) the outcome of that consultation, matters resolved and unresolved; and
  - (ii) details of any disagreement remaining between the party consulted and the Applicant and how the Applicant has addressed the matters not resolved.

### STAGING, COMBINING AND UPDATING STRATEGIES, PLANS OR PROGRAMS

A29. The Applicant may prepare and submit the Soil and Water Management Plan and/or Biodiversity and Rehabilitation Management Plan required under conditions B36 and B73 of Schedule 2 on a staged basis, prior to the commencement of Quarrying Operations in each of Phases 1 to 7. Quarrying Operations must not commence in any phase until a management plan has been approved by the Planning Secretary for that phase.

A30. With the approval of the Planning Secretary, the Applicant may:

- (a) prepare and submit any strategy, plan or program required by this consent on a staged basis (if a clear description is provided as to the specific stage and scope of the development to which the strategy, plan or

program applies, the relationship of the stage to any future stages and the trigger for updating the strategy, plan or program);

- (b) combine any strategy, plan or program required by this consent (if a clear relationship is demonstrated between the strategies, plans or programs that are proposed to be combined); and
- (c) update any strategy, plan or program required by this consent (to ensure the strategies, plans and programs required under this consent are updated on a regular basis and incorporate additional measures or amendments to improve the environmental performance of the development).

A31. If the Planning Secretary agrees, a strategy, plan or program may be approved, staged or updated without consultation being undertaken with all parties required to be consulted in the relevant condition in this consent.

#### **PROTECTION OF PUBLIC INFRASTRUCTURE**

A32. Unless the Applicant and the applicable authority agree otherwise, the Applicant must:

- (a) repair, or pay the full costs associated with repairing, any public infrastructure that is damaged by carrying out the development; and
- (b) relocate, or pay the full costs associated with relocating, any public infrastructure that needs to be relocated as a result of the development.

**Note:** *This condition does not apply to any damage to roads caused as a result of general road usage or otherwise addressed by contributions required by condition 26 of Schedule 1.*

#### **OPERATION OF PLANT AND EQUIPMENT**

A33. 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.

#### **COMPLIANCE**

A34. The Applicant must ensure that all of its employees, contractors (and their sub-contractors) are made aware of, and are instructed to comply with, the conditions of this consent relevant to activities they carry out in respect of the development.

#### **APPLICABILITY OF GUIDELINES**

A35. References in the conditions of this consent to any guideline, protocol, Australian Standard or policy are to such guidelines, protocols, Standards or policies in the form they are in as at the date of this consent.

A36. However, consistent with the conditions of this consent and without altering any limits or criteria in this consent, the Planning Secretary may, when issuing directions under this consent in respect of ongoing monitoring and management obligations, require compliance with an updated or revised version of such a guideline, protocol, Standard or policy, or a replacement of them.

#### **PRODUCTION DATA**

A37. Each year, from the date of commencement of Quarrying Operations in the Stage 8 Area, the Applicant must provide calendar year quarry production data to MEG by no later than 30 January.

A38. The data must be provided using the relevant standard form and a copy of the data must be included in the Annual Review.

#### **OTHER STATUTORY APPROVALS, LICENCES AND CONSENTS**

A39. The Applicant must obtain all necessary approvals, licences and consents required for the carrying out of the development, including but not limited to, approvals under the *Roads Act 1993*, the *Water Management Act 2000* and the POEO Act.

## PART B SPECIFIC ENVIRONMENTAL CONDITIONS

### EARLY WORKS

- B1. The Applicant may prepare an Early Works Construction Environmental Management Plan for the Early Works, to the satisfaction of the Planning Secretary. This plan must:
- describe measures to be implemented to minimise construction-related impacts on biodiversity, including:
    - specific measures to minimise impacts on tree hollows, termite mounds and fauna; and
    - detailed procedures for pre-clearance surveys and supervision (by an appropriately qualified person) of the felling of habitat trees within disturbance areas associated with the Early Works;
  - describe measures to be implemented to manage sediment and erosion risks, including:
    - a detailed description of the surface water management measures to be implemented in relation to the Early Works; and
    - appropriate clean water diversion systems and construction of appropriate erosion and sediment controls for the management of disturbed areas associated with the Early Works;
  - include a Trigger Action Response Plan which outlines actions to be undertaken to rectify impacts associated with erosion and sedimentation during the Early Works (to the extent that these actions are not addressed by other management plans required to be in place prior to the commencement of Early Works); and
  - describe detailed procedures to be implemented to receive, record, handle and respond to complaints associated with the Early Works construction.
- B2. If the Applicant opts to seek approval for Early Works, the Applicant must not commence Early Works until the Early Works Construction Environmental Management Plan is approved by the Planning Secretary.
- B3. If the Planning Secretary approves an Early Works Construction Environmental Management Plan, the Applicant must implement that plan as approved by the Planning Secretary.

### NOISE

#### Operational Noise Criteria

- B4. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 2 at any Residence on privately-owned land.

Table 2: Operational Noise Criteria dB(A)

Residences <sup>a</sup>	Day	Shoulder Period 6.00 am to 7.00 am Monday to Saturday	
	<i>L<sub>Aeq</sub> (15 minute)</i>	<i>L<sub>Aeq</sub> (15 minute)</i>	<i>L<sub>A(max)</sub></i>
2, 3, 5 <sup>b</sup> , 6, 7, 8, 9	45	45	55
4	54	52	62
10, 11	35	35	45
All other Residences	35	35	45

<sup>a</sup> Residence locations are shown as "Assessment Locations" in Figure 6 in Appendix 3.

<sup>b</sup> Receiver location 5 is representative of Residences in Menangle Village as identified in the red polygon on Figure 6 in Appendix 3.

Noise generated by the development must be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the *NSW Industrial Noise Policy* (EPA, 2000). Appendix 4 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

- B5. The noise criteria in condition B4 do not apply if the Applicant has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

#### Noise Operating Conditions

- B6. The Applicant must:
- take all reasonable steps to minimise all noise from operational activities, including low frequency noise and other audible characteristics, as well as road noise associated with the development;
  - take all reasonable steps to minimise the noise impacts of the development during noise-enhancing meteorological conditions, particularly when the noise criteria in this consent do not apply (see Appendix 4);
  - carry out regular attended noise monitoring (every three months unless otherwise agreed with the Planning Secretary) to determine whether the development is complying with the relevant conditions of Schedule 2; and

- (d) regularly assess the noise monitoring data and modify or stop operations on the site to ensure compliance with the relevant conditions of Schedule 2.

### Noise Management Plan

- B7. The Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
- be prepared by a suitably qualified and experienced person/s;
  - be prepared in consultation with the EPA;
  - describe the measures to be implemented to ensure:
    - compliance with the noise criteria and operating conditions in this consent;
    - best practice noise management is being employed; and
    - noise impacts of the development are minimised during noise-enhancing meteorological conditions; under which the noise criteria in this consent do not apply (see Appendix 4); and
  - include a monitoring program that:
    - is capable of evaluating the performance of the development against the noise criteria;
    - monitors noise at the nearest and/or most affected residences; and
    - includes a protocol for identifying any noise-related exceedance, incident or non-compliance and for notifying the Department and relevant stakeholders of these events.
- B8. The Applicant must not commence Quarrying Operations in the Stage 8 Area until the Noise Management Plan is approved by the Planning Secretary.
- B9. The Applicant must implement the Noise Management Plan as approved by the Planning Secretary.

### AIR QUALITY

#### Odour

- B10. The Applicant must ensure that no offensive odours (as defined under the POEO Act) are emitted by the development.

#### Air Quality Criteria

- 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.

Table 3: Air Quality Criteria

<b>Pollutant</b>	<b>Averaging period</b>	<b>Criterion</b>
Particulate matter < 10 µm (PM <sub>10</sub> )	Annual	<sup>a, c</sup> 25 µg/m <sup>3</sup>
	24 hour	<sup>b</sup> 50 µg/m <sup>3</sup>
Particulate matter < 2.5 µm (PM <sub>2.5</sub> )	Annual	<sup>a, c</sup> 8 µg/m <sup>3</sup>
	24 hour	<sup>b</sup> 25 µg/m <sup>3</sup>
Total suspended particulate (TSP) matter	Annual	<sup>a, c</sup> 90 µg/m <sup>3</sup>
<sup>d</sup> Deposited dust	Annual	<sup>b</sup> 2 g/m <sup>2</sup> /month <sup>a</sup> 4 g/m <sup>2</sup> /month

#### Notes:

<sup>a</sup> Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).

<sup>b</sup> Incremental impact (i.e. incremental increase in concentrations due to the development on its own).

<sup>c</sup> Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary.

<sup>d</sup> 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

- 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.

#### Air Quality Operating Conditions

- B13. The Applicant must:

- (a) take all reasonable steps to:
  - (i) minimise odour, fume, greenhouse gas and dust (including PM<sub>10</sub> and PM<sub>2.5</sub>) 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);
- (c) carry out regular air quality monitoring to determine whether the development is complying with the relevant conditions of Schedule 2; and
- (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.

#### **Air Quality Management Plan**

- B14. The Applicant must prepare an Air Quality Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
- (a) be prepared by a suitably qualified and experienced person/s;
  - (b) be prepared in consultation with the EPA;
  - (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
  - (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.
- 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.
- B16. The Applicant must implement the Air Quality Management Plan as approved by the Planning Secretary.

#### **METEOROLOGICAL MONITORING**

- 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.

#### **SOIL AND WATER**

- B18. The Applicant must ensure that diesel spills and the like are cleaned up immediately so as not present a risk to water quality if the relevant Substage is inundated by floodwaters.

#### **Groundwater Monitoring and Management**

- B19. The Applicant must monitor groundwater levels at Groundwater Bores BH01\_S, BH01\_D, BH02, BH03 and BH04 as shown in Figure 7 in Appendix 5, using continuous data loggers, for the duration of Quarrying Operations in the Stage 8 Area.
- B20. The Applicant must ensure that Quarrying Operations do not compromise the integrity of the monitoring bores identified in condition B19 of Schedule 2.
- B21. The Applicant must:
- (a) collect groundwater quality samples at each of the monitoring locations identified in condition B19; and
  - (b) analyse collected groundwater quality samples for all major anions and cations and field parameters;
- on an annual basis for the duration of Quarrying Operations in the Stage 8 Area.
- B22. The Applicant must ensure that:

- (a) temporary bores are drilled or augered progressively in each Substage to determine the local water table position immediately prior to commencing extraction in each Substage; and
- (b) the pit floor in each Substage remains at least 1 metre above the measured water table level averaged over a seven-day period following the date of drilling or augering.

### **Water Supply and Licensing**

- B23. The Applicant must ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of the development to match its available water supply.
- B24. The Applicant must develop a groundwater model using a variant of Modflow standard software, or equivalent software, to quantify the progressive takes from water sources during Quarrying Operations in the Stage 8 Area.
- B25. The Applicant must:
- (a) initially construct the groundwater model required under condition B24 of Schedule 2 using the first three months of groundwater monitoring data collected from 17 June 2020 to 16 September 2020;
  - (b) update the groundwater model following collection of the first 12 months of data collected from 17 June 2020 to 16 June 2021; and
  - (c) incorporate the outputs of the groundwater model into the Site Water Balance as required under condition B36(c)(i) of Schedule 2.
- B26. If a potential flood event (equivalent to a level of 64 m AHD at Menangle Weir, which represents the approximate height of overtopping of the Nepean River bank) does not occur between 17 June 2020 to 16 June 2021, then the Applicant must update the groundwater model required under condition B24 of Schedule 2 following the first flood event equivalent to or greater than this level when it occurs.
- B27. The Applicant must obtain any necessary Water Access Licences for the development under the *Water Act 1912* and/or the *Water Management Act 2000*.
- B28. When making an application for any necessary Water Access Licence, the Applicant must specify the annual take of water from each affected water source, as estimated by the groundwater model required under condition B24 of Schedule 2.
- B29. Should the maximum annual water take as calculated by the groundwater model increase due to subsequent revisions of the groundwater model, as required under conditions B25 and B26 of Schedule 2, the Applicant must acquire the necessary additional licence shares to account for the maximum predicted annual volume.
- B30. The Applicant must report on any water captured, intercepted or extracted from the site each year (directly and indirectly) in the Annual Review, including water taken under each Water Access Licence as applicable.

### **Soil Erosion**

- B31. The Applicant must install and maintain suitable erosion and sediment control measures in the Stage 8 Area. These measures must be designed and implemented having regard to the guidance series *Managing Urban Stormwater: Soils and Construction*, and be detailed in the Soil and Water Management Plan required under condition B36 of Schedule 2.

### **Flood Management**

- B32. The Applicant must prepare a Flood Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
- (a) be prepared by suitably qualified and experienced person/s;
  - (b) identify measures to:
    - (i) proactively prepare for, and respond to, any flood event in which the active extraction area is likely to be inundated by floodwaters emanating from the Nepean River;
    - (ii) ensure the safety of site personnel;
    - (iii) minimise, to the greatest extent practicable, the areas of exposed ground on the site that would be susceptible to flood risks (including scour and erosion and potential transport of sediment to downstream waters);
    - (iv) ensure that the active extraction area in any Substage does not exceed 0.33 hectares at any one time;
    - (v) ensure that the batter adjacent to the Nepean River Buffer Zone does not exceed:
      - a maximum slope of 1:1 at any time; and
      - a maximum slope of 1:5 in preparation for flood events;
    - (vi) ensure that no more than a 30 metres length of the batter adjacent to the Nepean River Buffer Zone (measured in total) has a slope exceeding 1:5 at any one time; and
    - (vii) rectify any flood-related damage to areas undergoing rehabilitation; and

- (c) include a Trigger Action Response Plan which outlines actions to be undertaken in preparation for, and immediately following, a flood event including detailed protocols and timeframes for:
- (i) backfilling the active extraction area to achieve a maximum batter slope of 1:5 adjacent to the Nepean River Buffer Zone in preparation for flood events;
  - (ii) avoiding the downstream movement of debris from the site;
  - (iii) recommencing Quarrying Operations following a flood event; and
  - (iv) rectifying any damage to areas undergoing rehabilitation following a flood event.
- B33. The Applicant must not commence Quarrying Operations in the Stage 8 Area until the Flood Management Plan is approved by the Planning Secretary.
- B34. The Applicant must implement the Flood Management Plan as approved by the Planning Secretary.
- B35. The Applicant must ensure that the flood storage capacity of the final rehabilitated landform is no less than the pre-existing flood storage capacity at all stages of the development, unless otherwise approved in writing by the Planning Secretary. Details of the available flood storage capacity must be reported in the Annual Review.

### **Soil and Water Management Plan**

- B36. The Applicant must prepare a Soil and Water Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
- (a) be prepared by suitably qualified and experienced person/s;
  - (b) be prepared in consultation with EPA and DPIE Water; and
  - (c) include a:
    - (i) **Site Water Balance** that:
      - includes details of:
        - sources and security of water supply;
        - water use and management on the site;
        - reporting procedures, including the annual preparation of a site water balance; and
      - minimises clean and potable water use on the site;
      - incorporates the outputs of the groundwater water model required under condition B24 of Schedule 2;
    - (ii) **Surface Water Management Plan**, that includes:
      - detailed baseline data on surface water flows and quality in watercourses and/or water bodies that could potentially be affected by the development;
      - surface water impact assessment criteria, including trigger levels for investigating any potentially adverse impacts, and surface water management performance measures;
      - a detailed description of the surface water management system on the site, including the:
        - clean water diversion system;
        - erosion and sediment controls (including the construction of bunds and swales within each Substage); and
        - water storages (including a description of measures to maintain the storage capacity of sediment basins);
      - a program to monitor and report on:
        - any surface water discharges;
        - the effectiveness of the water management system;
        - surface water quality in sediment basins; and
        - water levels and quality in the Nepean River both upstream and downstream of the site; and
      - a protocol for identifying and investigating any exceedances of the surface water impact assessment criteria and for notifying the Department and relevant stakeholders of these events;
    - (iii) **Groundwater Management Plan** that includes:
      - all available baseline data for the site;
      - groundwater performance criteria, including trigger levels for investigating any potentially adverse groundwater impacts, particularly with respect to aquatic habitat and regional groundwater systems;
      - a protocol to ensure that Quarrying Operations do not exceed the extraction depth limit specified in condition B22(b) of Schedule 2;

- measures to ensure that the integrity of the groundwater monitoring network is not compromised by Quarrying Operations;
- a clear description of the reporting processes and procedures to be adopted for the routine collation, analysis and provision of monitoring data as required under conditions B21 and B22 of Schedule 2; and
- a protocol for identifying and investigating any exceedances of the groundwater performance criteria and for notifying the Department and relevant stakeholders of these events.

- B37. Subject to condition A29, the Applicant must not commence Quarrying Operations in the Stage 8 Area until the Soil and Water Management Plan is approved by the Planning Secretary.
- B38. The Applicant must implement the Soil and Water Management Plan approved by the Planning Secretary.
- B39. The Applicant must ensure that all surface discharges from the site comply with the relevant provisions of the POEO Act.

#### **Ephemeral Creek Management Plan**

- B40. The Applicant must prepare an Ephemeral Creek Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
- be prepared by suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;
  - describes the measures that would be implemented to manage and control soil erosion and bank stabilisation (if required) and limit the risk of impacts on downstream receiving environments;
  - provide details of the methods and timing of extraction within Substages 8E, 8F or 8G that demonstrate the integrity of the ephemeral creek (shown conceptually in Figure 4 of Appendix 1) would be maintained for as long as practicable during operations;
  - provide for construction and stabilisation of appropriate diversion channels to divert surface water flows around the disturbance area, unless otherwise approved by the Planning Secretary;
  - provide final designs for the road crossing and realigned section of creek that are supported by hydrological modelling and meet the rehabilitation objectives in Table 4; and
  - describe the methods and timing for rehabilitation of the final realigned section of creek channel.
- B41. The Applicant must not undertake any construction activities or Quarrying Operations within Substages 8E, 8F or 8G until the Ephemeral Creek Management Plan is approved by the Planning Secretary.
- B42. The Applicant must implement the Ephemeral Creek Management Plan approved by the Planning Secretary.

#### **TRANSPORT**

##### **Works within Hume Highway Motorway Road Reserve**

- B43. Prior to commencing Quarrying Operations in the Stage 8 Area, the Applicant must make an application to TfNSW under Section 138 of the *Roads Act 1993* for any proposed works within the Hume Highway Motorway Road Reserve (including the area under the Menangle Bridges).
- B44. The Applicant must enter into a legally binding agreement with TfNSW (eg a licence, not a lease or an easement), for the construction, operation and decommissioning of the conveyor within the Hume Highway Motorway Road Reserve (including under the Menangle Bridges). The legally binding agreement must be executed prior to any construction within the road reserve. All TfNSW legal costs associated with drafting and executing the legally binding agreement must be borne by the Applicant.
- B45. The Applicant must:
- provide a sealed access under and adjacent to the Menangle Bridges and comply with TfNSW drainage and pavement standards;
  - restrict vehicular access under Menangle Bridge to light vehicles only;
  - provide unrestricted access to TfNSW to undertake maintenance on the Menangle Bridges and associated facilities at all times;
  - remove any detritus associated the construction and use of the access road under and adjacent to the Menangle Bridges;
  - protect the piers of the Menangle Bridges, as well as any other part of the bridge structure and associated facilities from any potential damage as a result of the development;
- B46. In making the application to TfNSW required under condition B43, the Applicant must provide:



- (a) details demonstrating how the requirements in condition B45 will be met during the early establishment phase of the development, including:
  - (i) sealing and drainage design details for the access road under and adjacent to the Menangle Bridges; and
  - (ii) anchoring details for any structure(s) associated with the development that may become floating debris during flood events; and
- (b) details demonstrating how the compliance with the requirements in condition B45 will be maintained over the life of the development.

B47. The Applicant must ensure that works undertaken within the Hume Highway Motorway Road Reserve do not in any way destabilise the foundations of the Hume Highway, including the Menangle Bridges. Should rectification works be required as a result of the development, they must be undertaken by the Applicant in accordance with TfNSW requirements and standards, and at no expense to TfNSW.

B48. The Applicant must not undertake any works within the Hume Highway Motorway Road Reserve (including the area under the Menangle Bridges) without the consent of TfNSW under Section 138 of the *Roads Act 1993*.

#### **Road Safety and Condition Audit**

B49. Within 12 months of commencing Quarrying Operations in the Stage 8 Area, and every five years thereafter until the conclusion of Quarrying Operations, the Applicant must undertake a Road Safety and Condition Audit for the development, to the satisfaction of the Planning Secretary. This Audit must:

- (a) be undertaken by a suitably qualified independent expert/s whose appointment has been endorsed by the Planning Secretary;
- (b) be prepared in consultation with Council;
- (c) assess the safety, performance and condition of the site's vehicular access onto Menangle Road, including the associated acceleration and deceleration lanes;
- (d) identify any road works that are required to ensure compliance with relevant Austroads standards or relevant Council requirements;
- (e) be documented in a Road Safety and Condition Audit Report which must be submitted to Council and the Planning Secretary for approval within three months of commencing the Audit.

B50. Within 12 months of completing each Road Safety and Condition Audit required under condition B49 of this Schedule, unless otherwise agreed by the Planning Secretary, the Applicant must complete any road works recommended in the Audit, to the satisfaction of Council. If there is a dispute regarding the implementation of any recommendations contained in the Audit, the Applicant may refer the matter to the Planning Secretary for resolution.

#### **Continuation of Rehabilitation Levy**

B51. For the duration of the Stage 8 Operations, the Applicant must continue to pay Council a rehabilitation levy on all sand and soil removed from the Stage 8 Area in accordance with the existing rates, calculation methods and indexation required under condition 26 of Schedule 1. The first instalment of these payments is to be made based on the most recent Index Review Date under Schedule 1.

#### **Monitoring of Product Transport**

B52. The Applicant must keep accurate records of all truck movements to and from the site (including time of arrival and dispatch) and publish a summary of records on its website every 6 months.

#### **Transport Operating Conditions**

B53. No direct access to or from the development via the Hume Highway is permitted.

B54. The Applicant must:

- (a) ensure that all laden trucks entering or exiting the site have their loads covered;
- (b) ensure that all laden trucks exiting the site are cleaned of material that may fall from vehicles, before leaving the site;
- (c) take all reasonable steps to minimise traffic safety issues and disruption to local road users; and
- (d) take all reasonable steps to ensure that appropriate signage is displayed on all trucks used to transport quarry products from the development so they can be easily identified by other road users.

#### **Traffic Management Plan**

B55. The Applicant must prepare a Traffic Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:

- (a) be prepared by suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;

- (b) be prepared in consultation with TfNSW and Wollondilly Shire and Campbelltown Councils;
- (c) include details of all transport routes and traffic types to be used for development-related traffic;
- (d) describe the processes in place for the control of truck movements entering and exiting the site;
- (e) include details of the measures to be implemented to minimise traffic safety issues and disruption to local road users;
- (f) include a Drivers' Code of Conduct that includes procedures to ensure that drivers:
  - (i) adhere to posted speed limits or other required travelling speeds;
  - (ii) adhere to designated transport routes; and
  - (iii) implement safe and quiet driving practices;
- (g) describe the measures to be put in place to ensure compliance with the Drivers' Code of Conduct; and
- (h) describe measures to minimise the transmission of dust and tracking of material onto the surface of public roads from vehicles exiting the site.

B56. The Applicant must not commence Quarrying Operations in the Stage 8 Area until the Traffic Management Plan is approved by the Planning Secretary.

B57. The Applicant must implement the Traffic Management Plan as approved by the Planning Secretary.

## HERITAGE

### Heritage Operating Conditions

- B58. The Applicant must ensure that the development does not cause any direct or indirect impact on any identified heritage item located outside the approved disturbance area.
- B59. If suspected human remains are discovered on site, then all work surrounding the area must cease, and the area must be secured. The Applicant must immediately notify NSW Police and Heritage NSW, and work must not recommence in the area until authorised by NSW Police and Heritage NSW.
- B60. If any previously unknown Aboriginal object or Aboriginal place is discovered in the Stage 8 Area:
  - (a) all work in the immediate vicinity of the object or place must cease immediately;
  - (b) a 10 metre buffer area around the object or place must be cordoned off; and
  - (c) Heritage NSW must be contacted immediately.
- B61. Work in the immediate vicinity of an object or place subject to condition B60 may only recommence if:
  - (a) the potential Aboriginal object or Aboriginal place is confirmed by Heritage NSW upon consultation with the Registered Aboriginal Parties not to be an Aboriginal object or Aboriginal Place; or
  - (b) an Aboriginal Heritage Impact Permit is obtained under section 90 of the *National Parks and Wildlife Act 1974*, and the Aboriginal Cultural Heritage Management Plan is revised to include appropriate measures in respect the Aboriginal object or Aboriginal place, to the satisfaction of the Planning Secretary.

### Aboriginal Cultural Heritage Management Plan

- B62. The Applicant must prepare an Aboriginal Cultural Heritage Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:
  - (a) be prepared by suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;
  - (b) be prepared in consultation with Heritage NSW and Registered Aboriginal Parties;
  - (c) describe the measures to be implemented within the Stage 8 Area, Nepean River Buffer Zone and Restoration Area to:
    - (i) ensure all workers on the site receive suitable Aboriginal cultural heritage inductions prior to carrying out any activities which may cause impacts to Aboriginal objects or Aboriginal places, and that suitable records are kept of these inductions;
    - (ii) protect, monitor and manage Aboriginal objects and Aboriginal places;
    - (iii) protect Aboriginal objects and Aboriginal places located outside the approved disturbance area from impacts of the development;
    - (iv) manage any new Aboriginal objects or Aboriginal places discovered during the life of the development;
    - (v) maintain and manage reasonable access for relevant Aboriginal stakeholders to Aboriginal objects and Aboriginal places (outside of the approved disturbance area); and
    - (vi) facilitate ongoing consultation and involvement of Registered Aboriginal Parties in the conservation and management of Aboriginal cultural heritage on the site.

- B63. The Applicant must not commence Quarrying Operations in the Stage 8 Area until the Aboriginal Cultural Heritage Management Plan is approved by the Planning Secretary.
- B64. The Applicant must implement the Aboriginal Cultural Heritage Management Plan approved by the Planning Secretary.

## **BIODIVERSITY AND REHABILITATION**

### **Construction of Linear Infrastructure**

- B65. Prior to commencing construction of any linear infrastructure required for the carrying out of the development (including conveyors, access roads and haul roads), the Applicant must:
- determine the final alignment of the linear infrastructure by survey;
  - minimise the environmental impacts of the alignment of this infrastructure, where practicable;
  - map the final vegetation clearance, excluding any vegetation within the approved disturbance area as identified under condition A22 of Schedule 2;
  - submit a survey plan of the disturbance boundaries for linear infrastructure and their respective GPS coordinates to the Planning Secretary; and
  - identify relevant ecosystem and species credits required to compensate for the clearance identified in subparagraph (c), to the satisfaction of BCD.
- B66. The Applicant must retire the ecosystem and species credits identified under condition B65(e) in accordance with the Biodiversity Offsets Scheme of the BC Act, to the satisfaction of the BCT.

### **Biodiversity Offset Strategy**

- B67. Prior to commencing Quarrying Operations in the Stage 8 Area, or other timeframe agreed by the Planning Secretary, the Applicant must make suitable arrangements for the long-term protection of the Restoration Area as described in the documents listed in condition A7(c) of Schedule 2, to the satisfaction of the Planning Secretary.
- B68. If the Restoration Area does not meet the listing criteria of the targeted communities or the completion criteria in Table 6 in Appendix 7, within the timeframes established in the Biodiversity and Rehabilitation Management Plan, then the Applicant must retire the relevant deficient biodiversity credits in accordance with the Biodiversity Offsets Scheme of the BC Act, to the satisfaction of the BCT.
- B69. The Applicant may satisfy condition B67 of Schedule 2 by establishing a positive covenant on title under section 88E of the *NSW Conveyancing Act 1919*. If the Applicant seeks to establish a positive covenant on title:
- the positive covenant must stipulate that the Applicant will manage the Restoration Area and all rehabilitated Substages in accordance with the Biodiversity and Rehabilitation Management Plan required under condition B73 of Schedule 2; and
  - the Applicant must establish a trust with sufficient funds (calculated in accordance with the total fund deposit requirements for a biodiversity stewardship site in accordance with BC Act) to provide for the ongoing management of the Restoration Area and all rehabilitated Substages in accordance with the Biodiversity and Rehabilitation Management Plan,
- to the satisfaction of the Planning Secretary.

### **Rehabilitation Objectives**

- B70. The Applicant must rehabilitate all areas impacted by the Stage 8 Operations to the satisfaction of the Planning Secretary. This rehabilitation must be consistent with the final rehabilitation plans submitted to the Planning Secretary under condition A11 of Schedule 2 and must comply with the objectives in Table 4, to the satisfaction of the Planning Secretary.

Table 4: Rehabilitation objectives

<b>Feature</b>	<b>Objective</b>
<i>Stage 8 Area</i>	<ul style="list-style-type: none"> <li>Safe (both within the site and in relation to downstream environs, including under flood conditions)</li> <li>Hydraulically, geotechnically and geomorphologically stable</li> <li>Non-polluting</li> <li>Fit for the intended post-Quarrying Operations land use(s)</li> <li>Final landform integrated with surrounding natural landforms as far as is reasonable and feasible, and minimising visual impacts when viewed from surrounding land or the Hume Highway</li> </ul>

<i>Surface infrastructure</i>	<ul style="list-style-type: none"> <li>• Conveyor decommissioned and removed, unless otherwise agreed by TfNSW and the Planning Secretary</li> <li>• All other surface infrastructure decommissioned and removed, unless otherwise agreed by the Planning Secretary</li> </ul>
<i>Quarry Substages</i>	<ul style="list-style-type: none"> <li>• Pit floor partially backfilled with sufficient and appropriate material to promote establishment of River-Flat Eucalypt Forest EEC</li> <li>• Substages progressively landscaped and vegetated to meet the objectives, performance and completion criteria in Table 6 in Appendix 7</li> <li>• Batters to be established to a maximum slope of 1:1 (V:H) along the landward edge of each Substage and 1:5 (V:H) adjacent to the Nepean River Buffer Zone</li> </ul>
<i>Final Landform</i>	<ul style="list-style-type: none"> <li>• No reduction in flood storage capacity, compared with pre-development conditions, unless otherwise agreed by the Planning Secretary</li> <li>• Designed to incorporate geomorphological features to allow for the free draining discharge of clean water from the site</li> <li>• Minimise sediment laden run-off into the Nepean River</li> </ul>
<i>Water Quality</i>	<ul style="list-style-type: none"> <li>• Water discharged from the site is suitable for receiving waters and capable of supporting existing aquatic ecology and riparian vegetation</li> </ul>
<i>Community</i>	<ul style="list-style-type: none"> <li>• Ensure public safety</li> </ul>

### **Progressive Rehabilitation**

B71. The Applicant must rehabilitate the Substages progressively, to the satisfaction of the Planning Secretary.

B72. Unless otherwise agreed by the Planning Secretary, the Applicant must ensure that:

- (a) no more than two Substages are opened, excavated or worked at any one time without the written approval of the Planning Secretary;
- (b) the active extraction area in all combined Substages does not exceed 0.33 hectares at any one time;
- (c) the area of exposed ground at any one time is minimised as far as reasonable and feasible, for the life of the development;
- (d) Quarrying Operations do not progress from one phase of the development to another unless the progressive rehabilitation performance criteria in the Biodiversity and Rehabilitation Management Plan have been met (with the exception of in the active extraction area) for the previous phase (see condition B73(d) of Schedule 2); and
- (e) the post-extraction batter along the landward edge of each Substage does not exceed a maximum slope of 1:1 (V:H) or the natural underlying sandstone profile.

### **Biodiversity and Rehabilitation Management Plan**

B73. The Applicant must prepare a Biodiversity and Rehabilitation Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:

- (a) be prepared by suitably qualified and experienced person/s;
- (b) be prepared in consultation with BCD and Council;
- (c) describe the short, medium, and long-term measures to be undertaken to:
  - (i) ensure compliance with the biodiversity objectives outlined in Table 6 in Appendix 7;
  - (ii) ensure compliance with the rehabilitation objectives outlined in Table 4 of Schedule 2; and
  - (iii) prevent impacts on aquatic biodiversity, including through the stabilisation of riverbanks and the prevention of sediment-laden runoff;
- (d) include detailed progressive rehabilitation performance criteria that must be met for each phase of the development before extraction can progress into subsequent phases;
- (e) include detailed performance and completion criteria for the Restoration Area and the final rehabilitation of the Stage 8 Area (including timeframes for the achievement of the listing criteria of the targeted communities) based on the performance and completion criteria in Table 6 in Appendix 7;
- (f) include a program to monitor, independently audit and report on progress against the criteria in subparagraphs (d) and (e), including reporting in the Annual Review;
- (g) include an evaluation of the performance of the Restoration Area and the progressive rehabilitation of the Stage 8 Area against the performance and completion criteria required under paragraph (d) above;

- (h) include triggers for remedial action (including additional planting or seeding), where the performance or completion criteria required under (d) and (e) above are not met;
  - (i) describe management measures to ensure that Quarrying Operations do not encroach on the Nepean River Buffer Zone and Exclusion Areas;
  - (j) include a detailed description of the measures to be implemented to:
    - (i) demonstrate compliance with conditions B76 and B78;
    - (ii) manage the collection and propagation of seed;
    - (iii) trial methods of extraction of seed resources on site and implement the most effective method of seed recovery;
    - (iv) minimise impacts on tree hollows and termite mounds where reasonable and feasible;
    - (v) minimise impacts on fauna, including undertaking pre-clearance surveys and supervision (by an appropriately qualified person) of the felling of habitat trees;
    - (vi) protect native vegetation and fauna habitat outside the approved disturbance area, including in the Restoration Area;
    - (vii) implement the *Stage 8 Area Weed Control Strategy* in the Amended Project Summary, except where varied by condition A18 of Schedule 2;
    - (viii) control feral pests;
    - (ix) control erosion;
    - (x) control unrestricted access;
    - (xi) manage bushfire hazards;
    - (xii) rehabilitate any areas of the Nepean River that are materially harmed by the development (including indirect or incidental impacts); and
    - (xiii) progressively rehabilitate the site and reasonably and feasibly minimise disturbance areas; and
    - (xiv) ensure the successful rehabilitation and protection of Stages 6 and 7 until the completion of Quarrying Operations in the Stage 8 Area;
  - (k) include an annual program to monitor and report on:
    - (i) the effectiveness of the measures required under (j) above;
    - (ii) progress against the detailed performance and completion criteria required under (d) and (d) above;
    - (iii) any progressive improvements that could be implemented to improve biodiversity outcomes; and
    - (iv) any additional or remedial actions required over the next 12 months;
  - (l) identify the potential risks to the successful rehabilitation of the Stage 8 Area, particularly where rehabilitation is damaged or delayed by flooding, and include a detailed description of the contingency measures to be implemented to mitigate against these risks; and
  - (m) include details of who would be responsible for monitoring, reviewing, and implementing the plan.
- B74. Subject to condition A29, the Applicant must not commence Quarrying Operations in the Stage 8 Area until the Biodiversity and Rehabilitation Management Plan is approved by the Planning Secretary.
- B75. The Applicant must implement the Biodiversity and Rehabilitation Management Plan as approved by the Planning Secretary.
- B76. The Applicant must place or create a minimum of 106 nest boxes or tree hollows within the Restoration Area within 12 months of commencing Quarrying Operations in the Stage 8 Area.
- B77. The Applicant must, to the greatest extent practicable, maximise the salvage of resources within the Stage 8 Area, including retention of:
- (a) nut and seed resources from native trees; and
  - (b) leaf and small branch material for mulching,
- for beneficial reuse on the site, including in rehabilitated Substages and in the Restoration Area.
- B78. Following the conclusion of extraction in each Substage, the Applicant must actively place logs and woody debris salvaged from the approved disturbance area within the completed Substage at the following ratios:
- (a) logs and woody debris at least 10 cm in diameter and greater than 0.5 m in length are to be placed in a configuration that reflects natural systems, such that there is overall at least 400 m of this woody debris per hectare for all completed Substages; and
  - (b) large woody debris at least 50 cm in diameter and greater than 0.5 m in length, such that there is overall at least 100 m of this large woody debris per hectare for all completed Substages.

### **Disposal of Vegetation (Stage 8)**

B79. The Applicant may undertake timber milling in Stage 8, provided this timber milling occurs outside of the Nepean River Buffer Zone and the Exclusion Areas, and that the Applicant can demonstrate ongoing compliance with condition B78 of this Schedule.

### **Additional Rehabilitation Requirements for Stages 6 and 7**

B80. The Applicant must rehabilitate 1.22 ha within Stage 6 and 3.44 ha within Stage 7 of the development in accordance with the objectives and the performance and completion criteria in Table 6 in Appendix 6.

B81. By the end of December 2020, or other timing as agreed by the Planning Secretary, the Applicant must submit a Vegetation Management Plan for Stages 6 and 7 to the Planning Secretary for approval. This plan must:

- (a) satisfy the relevant requirements of condition 13 of Schedule 1;
- (b) clearly define the extent and scope of Stage 6 vegetated lands;
- (c) clearly define the extent and scope of Stage 7 vegetated lands and identifies that the diversity of species established via retention of current species, tubestock planting or direct seeding is to be raised to deliver the native plant species diversity identified in Table 5 in Appendix 6;
- (d) establish baseline data for the existing habitat in the Stage 6 and 7 areas;
- (e) describe how the Stage 6 and 7 vegetated lands would be managed and how habitat would be established and retained; and
- (f) include detailed biodiversity objectives and performance and completion criteria for Stages 6 and 7 of the development, based on the general objectives and performance and completion criteria in Table 5 in Appendix 6,

to the satisfaction of the Planning Secretary.

B82. The Applicant must implement the Vegetation Management Plan for Stages 6 and 7 to the satisfaction of the Planning Secretary.

### **Rehabilitation Bond**

B83. Within 6 months of the approval of the Biodiversity and Rehabilitation Management Plan, the Applicant must lodge a Rehabilitation Bond with the Department to ensure that rehabilitation of the Stage 8 Area is implemented in accordance with the performance and completion criteria set out in the plan and the relevant conditions in Schedule 2 of this consent. The sum of the bond must be an amount agreed by the Planning Secretary and determined by:

- (a) calculating the cost of rehabilitating all disturbed areas of the site at third party rates (other than land acquisition costs), taking into account the likely surface disturbance over the next 3 years of Quarrying Operations; and
- (b) employing a suitably qualified, independent and experienced person to verify the calculated costs.

B84. The calculation of the Rehabilitation Bond must be submitted to the Department for approval at least 2 months prior to the lodgement of the bond.

B85. The Rehabilitation Bond must be reviewed and if required, an updated bond must be lodged with the Department within 3 months following:

- (a) any update or revision to the Biodiversity and Rehabilitation Management Plan;
- (b) the completion of an Independent Environmental Audit in which recommendations relating to the implementation of the Biodiversity and Rehabilitation Management Plan have been made; or
- (c) in response to a request by the Planning Secretary.

B86. If rehabilitation is completed generally in accordance with the relevant performance and completion criteria, to the satisfaction of the Planning Secretary, the Planning Secretary will release the bond.

B87. If rehabilitation is not completed generally in accordance with the relevant performance and completion criteria, the Planning Secretary will call in all, or part of, the bond, and arrange for the completion of the relevant works.

B88. If the Applicant establishes a positive covenant on title under section 88E of the *NSW Conveyancing Act 1919* under condition B69, then the Planning Secretary may waive the requirement for all or part of the Rehabilitation Bond required under conditions B83 to B87.

### **Weed Management**

B89. The Applicant must manage noxious weeds on the site in accordance with the Biodiversity and Rehabilitation Management Plan, and subject to the restrictions in condition A18 of this Schedule, to the satisfaction of the Planning Secretary.

**VISUAL**

B90. The Applicant must:

- (a) take all reasonable steps to minimise the visual and off-site lighting impacts of the development, including potential lighting impacts on the Hume Highway;
- (b) ensure that the visual appearance of all new structures, facilities or works (including paint colours and specifications) is aimed at blending as far as possible with the surrounding landscape; and
- (c) take all reasonable steps to:
  - (i) shield views of Quarrying Operations and associated equipment from users of public roads and at privately-owned residences; and
  - (ii) direct any on-site lighting downwards to avoid lighting impacts on the Hume Highway.

**WASTE**

B91. The Applicant must:

- (a) manage on-site sewage treatment and disposal in accordance with the requirements of an applicable EPL, and to the satisfaction of EPA and Council;
- (b) minimise the waste generated by the development;
- (c) ensure that the waste generated by the development is appropriately stored, handled, and disposed of; and
- (d) report on waste minimisation and management in the Annual Review.

B92. Except as expressly permitted in an applicable EPL, specific resource recovery order or exemption under the *Protection of the Environment Operations (Waste) Regulation 2014*, the Applicant must not receive waste at the site for storage, treatment, processing, reprocessing or disposal.

**LIQUID STORAGE**

B93. The Applicant must ensure that all tanks and similar storage facilities (other than for water) are protected by appropriate bunding or other containment, in accordance with the relevant Australian Standards.

**DANGEROUS GOODS**

B94. The Applicant must ensure that the storage, handling, and transport of dangerous goods is done in accordance with the latest version of the Australian Standards, particularly *AS 1940-2004 The storage and handling of flammable and combustible liquids* (Standards Australia, 2004) and *AS/NZS 1596:2014 The storage and handling of LP Gas* (Standards Australia, 2014), and the *Australian Dangerous Goods Code*.

**BUSHFIRE MANAGEMENT**

B95. The Applicant must:

- (a) ensure that the development:
  - (i) provides for asset protection in accordance with the relevant requirements in *the Planning for Bushfire Protection* (RFS, 2006) guideline; and
  - (ii) ensure that there is suitable equipment to respond to any fires on the site; and
- (b) assist the RFS and emergency services to the extent practicable if there is a fire in the vicinity of the site.

## PART C ADDITIONAL PROCEDURES

### NOTIFICATION OF EXCEEDANCES

- 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).

### INDEPENDENT REVIEW

- 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.
- C3. If the Planning Secretary is not satisfied that an independent review is warranted, the Planning Secretary will notify the landowner in writing of that decision, and the reasons for that decision, within 21 days of the request for a review.
- C4. 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 must:
- (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 development is complying with the relevant criteria in PART B of Schedule 2; and
    - (iii) if the development is not complying with that criteria, identify measures that could be implemented to ensure compliance with the relevant criteria; and
  - (b) give the Planning Secretary and landowner a copy of the independent review; and
  - (c) comply with any written requests made by the Planning Secretary to implement any findings of the review.



## PART D ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING

### ENVIRONMENTAL MANAGEMENT

#### Environmental Management Strategy

- D1. An Environmental Management Strategy must be prepared for the development to the satisfaction of the Planning Secretary. This strategy must:
- (a) provide the strategic framework for environmental management of the development;
  - (b) identify the statutory approvals that apply to the development;
  - (c) set out the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the development;
  - (d) set out the procedures to be implemented to:
    - (i) keep the local community and relevant agencies informed about the operation and environmental performance of the development;
    - (ii) receive record, handle and respond to complaints;
    - (iii) resolve any disputes that may arise during the course of the development;
    - (iv) respond to any non-compliance and any incident;
    - (v) respond to emergencies; and
  - (e) include:
    - (i) references to any strategies, plans and programs approved under the conditions of this consent; and
    - (ii) a clear plan depicting all the monitoring to be carried out under the conditions of this consent.
- D2. The Applicant must not commence Quarrying Operations in the Stage 8 Area until the Environmental Management Strategy is approved by the Planning Secretary.
- D3. The Applicant must implement the Environmental Management Strategy as approved by the Planning Secretary.

#### Management Plan Requirements

- D4. Management plans required under this Schedule must be prepared in accordance with relevant guidelines, and include:
- (a) a summary of relevant background or baseline data;
  - (b) details of:
    - (i) the relevant statutory requirements (including any relevant approval, licence or lease conditions);
    - (ii) any relevant limits or performance measures and criteria; and
    - (iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;
  - (c) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;
  - (d) a program to monitor and report on the:
    - (i) impacts and environmental performance of the development; and
    - (ii) effectiveness of the management measures set out pursuant to condition D4(c);
  - (e) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;
  - (f) a program to investigate and implement ways to improve the environmental performance of the development over time;
  - (g) a protocol for managing and reporting any:
    - (i) incident, non-compliance or exceedance of the impact assessment criteria or performance criteria;
    - (ii) complaint; or
    - (iii) failure to comply with statutory requirements; and
  - (h) a protocol for periodic review of the plan.

**Note:** *The Planning Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.*

### REVISION OF STRATEGIES, PLANS AND PROGRAMS

- D5. Within three months of:
- (a) the submission of an incident report under condition D7;
  - (b) the submission of an Annual Review under condition D9;

- (c) the submission of an Independent Environmental Audit under condition D11;
- (d) the approval of any modification to the conditions of this consent; or
- (e) the issue of a direction of the Planning Secretary under condition A8 which requires a review,

the suitability of existing strategies, plans and programs required under this consent must be reviewed by the Applicant.

- D6. If necessary, to either improve the environmental performance of the development, cater for a modification or comply with a direction, the strategies, plans and programs required under this consent must be revised, to the satisfaction of the Planning Secretary and submitted to the Planning Secretary for approval within six weeks of the review.

**Note:** *This is to ensure strategies, plans and programs are updated on a regular basis and to incorporate any recommended measures to improve the environmental performance of the development.*

## REPORTING AND AUDITING

### Incident Notification

- D7. The Applicant must immediately notify the Department and any other relevant agencies immediately after it becomes aware of an incident. The notification must be in writing to [compliance@planning.nsw.gov.au](mailto:compliance@planning.nsw.gov.au) and must comply with the requirements specified in Appendix 8.

### Non-Compliance Notification

- D8. Within seven days of becoming aware of a non-compliance, the Applicant must notify the Department of the non-compliance. The notification must be in writing to [compliance@planning.nsw.gov.au](mailto:compliance@planning.nsw.gov.au) and identify the development (including the development application number and name), set out the condition of this consent that the development is non-compliant with, the way in which it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance.

**Note:** *A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.*

### Annual Review

- D9. By the end of March in each year after the commencement of Quarrying Operations in the Stage 8 Area, or other timeframe agreed by the Planning Secretary, a report must be submitted to the Department reviewing the environmental performance of the development, to the satisfaction of the Planning Secretary. This review must:
- (a) describe the development (including any rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year;
  - (b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, including a comparison of these results against the:
    - (i) relevant statutory requirements, limits or performance measures/criteria;
    - (ii) requirements of any plan or program required under this consent;
    - (iii) monitoring results of previous years; and
    - (iv) relevant predictions in the documents listed condition A7(c).
  - (c) identify any non-compliance or incident which occurred in the previous calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence;
  - (d) evaluate and report on:
    - (i) the effectiveness of the noise and air quality management systems; and
    - (ii) compliance with the performance measures, criteria and operating conditions in this consent, as they relate to the Stage 8 Area;
  - (e) identify any trends in the monitoring data over the life of the development;
  - (f) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and
  - (g) describe what measures will be implemented over the next calendar year to improve the environmental performance of the development.
- D10. Copies of the Annual Review must be submitted to Council and made available to any interested person upon request.

### Independent Environmental Audit

- D11. Within one year of the commencement of Quarrying Operations in the Stage 8 Area, and every three years after, unless the Planning Secretary directs otherwise, the Applicant must commission and pay the full cost of an Independent Environmental Audit of the development. The audit must:
- (a) be led and conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Planning Secretary;

- (b) be carried out in consultation with the relevant agencies;
- (c) assess the environmental performance of the development and whether it is complying with the relevant requirements in this consent, water licences and mining leases for the development (including any assessment, strategy, plan or program required under these approvals);
- (d) review the adequacy of any approved strategy, plan or program required under the abovementioned approvals and this consent;
- (e) recommend appropriate measures or actions to improve the environmental performance of the development and any assessment, strategy, plan or program required under the abovementioned approvals and this consent; and
- (f) be conducted and reported to the satisfaction of the Planning Secretary.

D12. Within three months of commencing an Independent Environmental Audit, or within another timeframe agreed by the Planning Secretary, the Applicant must submit a copy of the audit report to the Planning Secretary, and any other NSW agency that requests it, together with its response to any recommendations contained in the audit report, and a timetable for the implementation of the recommendations. The recommendations must be implemented to the satisfaction of the Planning Secretary.

**Note:** *The audit team must be led by a suitably qualified auditor and include experts in any fields specified by the Planning Secretary.*

### **Monitoring and Environmental Audits**

D13. Any condition of this consent that requires the carrying out of monitoring or an environmental audit, whether directly or by way of a plan, strategy or program, is taken to be a condition requiring monitoring or an environmental audit under Division 9.4 of Part 9 of the EP&A Act. This includes conditions in respect of incident notification, reporting and response, non-compliance notification, compliance report and independent audit.

**Note:** *For the purposes of this condition, as set out in the EP&A Act, "monitoring" is monitoring of the development to provide data on compliance with the consent or on the environmental impact of the development, and an "environmental audit" is a periodic or particular documented evaluation of the development to provide information on compliance with the consent or the environmental management or impact of the development.*

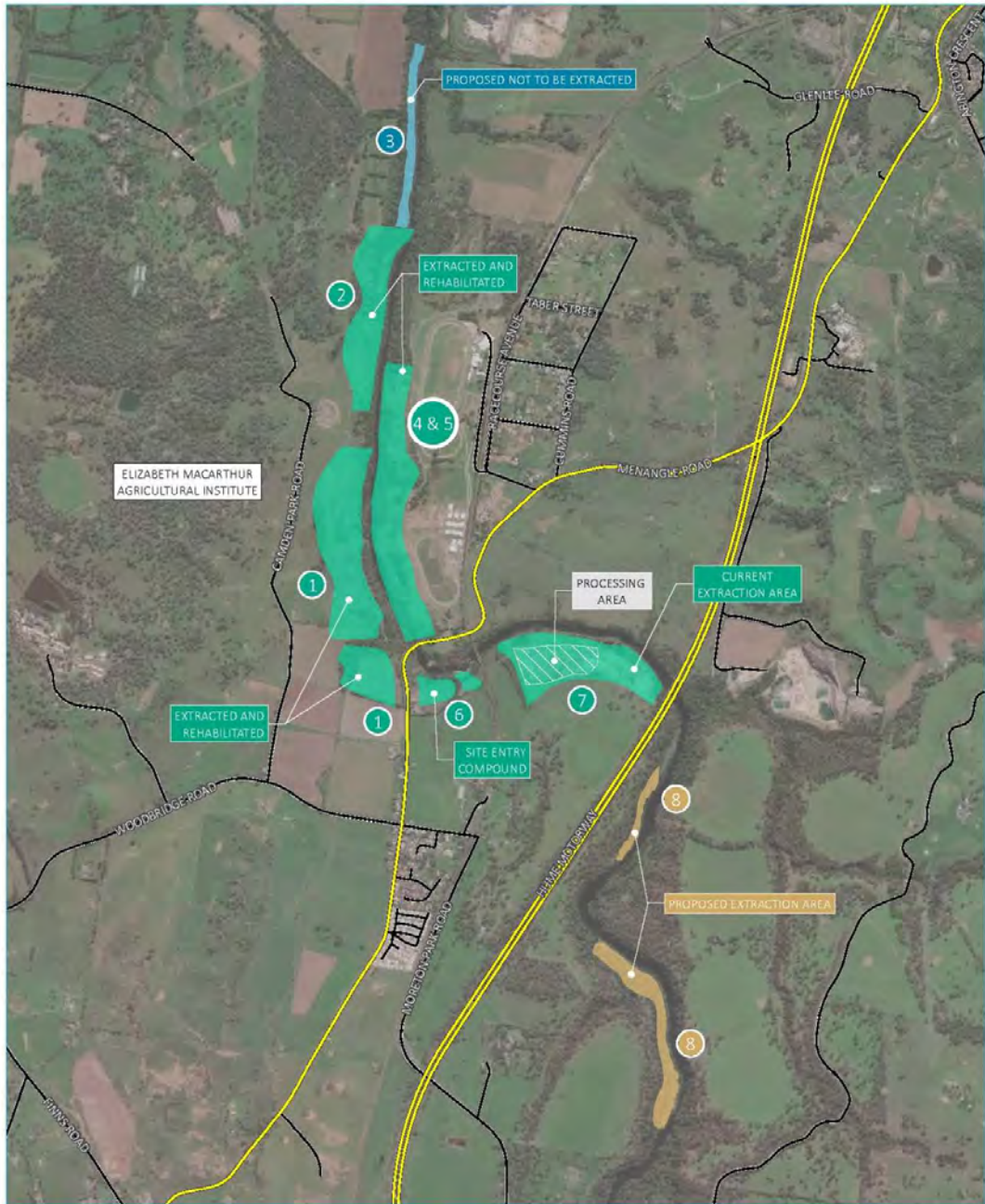
D14. Noise and air quality monitoring under Part B of this Schedule is not required at all privately-owned residences and the use of representative monitoring locations can be used to demonstrate compliance with criteria.

### **ACCESS TO INFORMATION**

D15. Prior to commencing Quarrying Operations in the Stage 8 Area, the Applicant must:

- (a) make the following information and documents (as they are obtained, approved or as otherwise stipulated within the conditions of this consent) publicly available on its website:
  - (i) the document/s listed in condition A7(c);
  - (ii) all current statutory approvals for the development;
  - (iii) all approved strategies, plans and programs required under the conditions of this consent;
  - (iv) regular reporting on the environmental performance of the development in accordance with the reporting requirements in any plans or programs approved under the conditions of this consent;
  - (v) a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs;
  - (vi) a summary of the current stage and progress of the development;
  - (vii) contact details to enquire about the development or to make a complaint;
  - (viii) a complaints register, updated monthly;
  - (ix) the Annual Reviews of the development;
  - (x) audit reports prepared as part of any Independent Environmental Audit of the development and the Applicant's response to the recommendations in any audit report;
  - (xi) any other matter required by the Planning Secretary; and
- (b) keep such information up to date for the life of the development and to the satisfaction of the Planning Secretary.

Appendix 1 Development Layout



Source: EMM (2020), DFSI (2017), GA (2013)

- 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



Figure 1 - Overall Development Layout Plan (Stages 1 to 8)



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

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

Overall staging plan

Menangle Quarry Extension  
Figure 2.2



Figure 2 – Overall Staging Plan



Figure 3 - Substages 8A to 8C

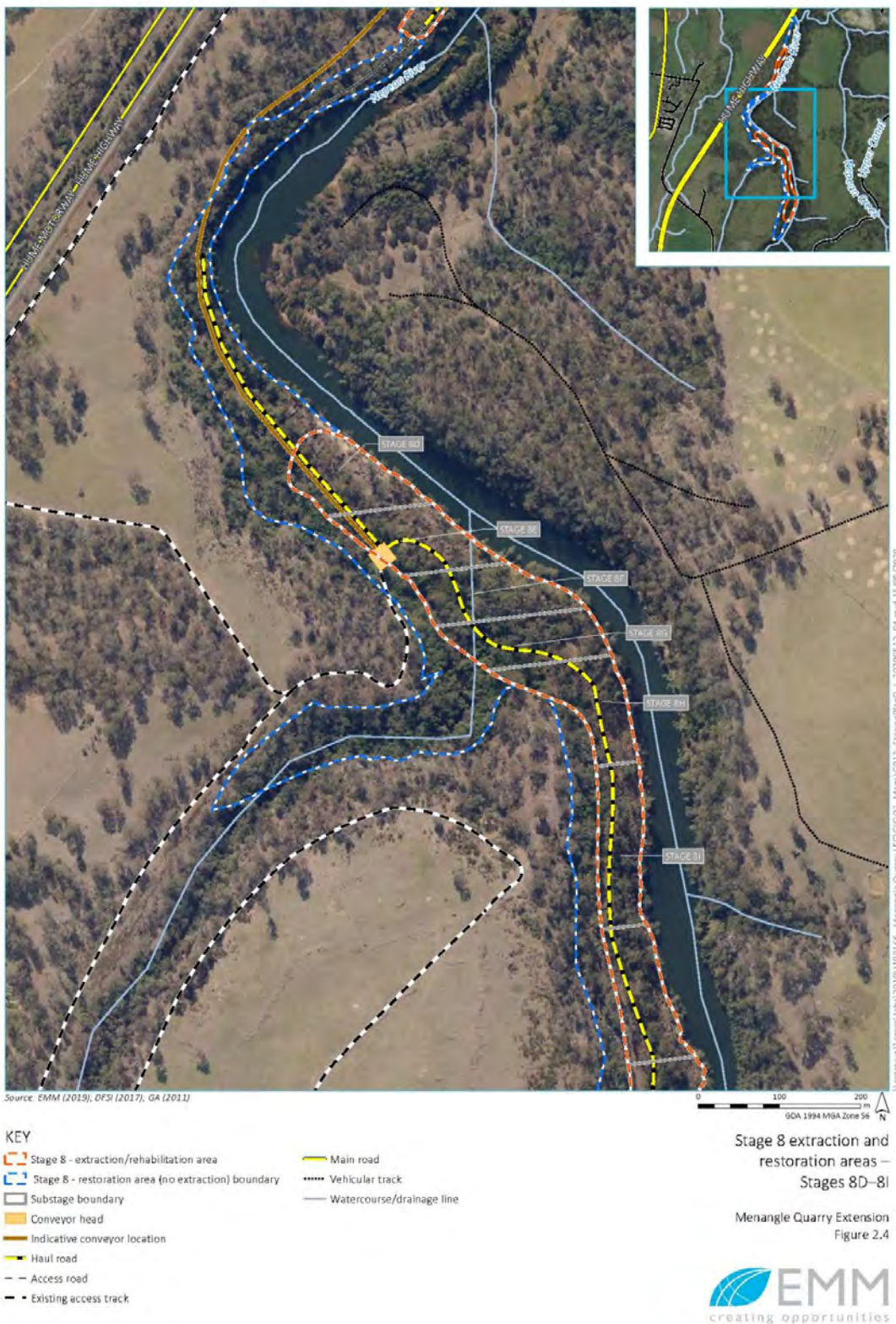
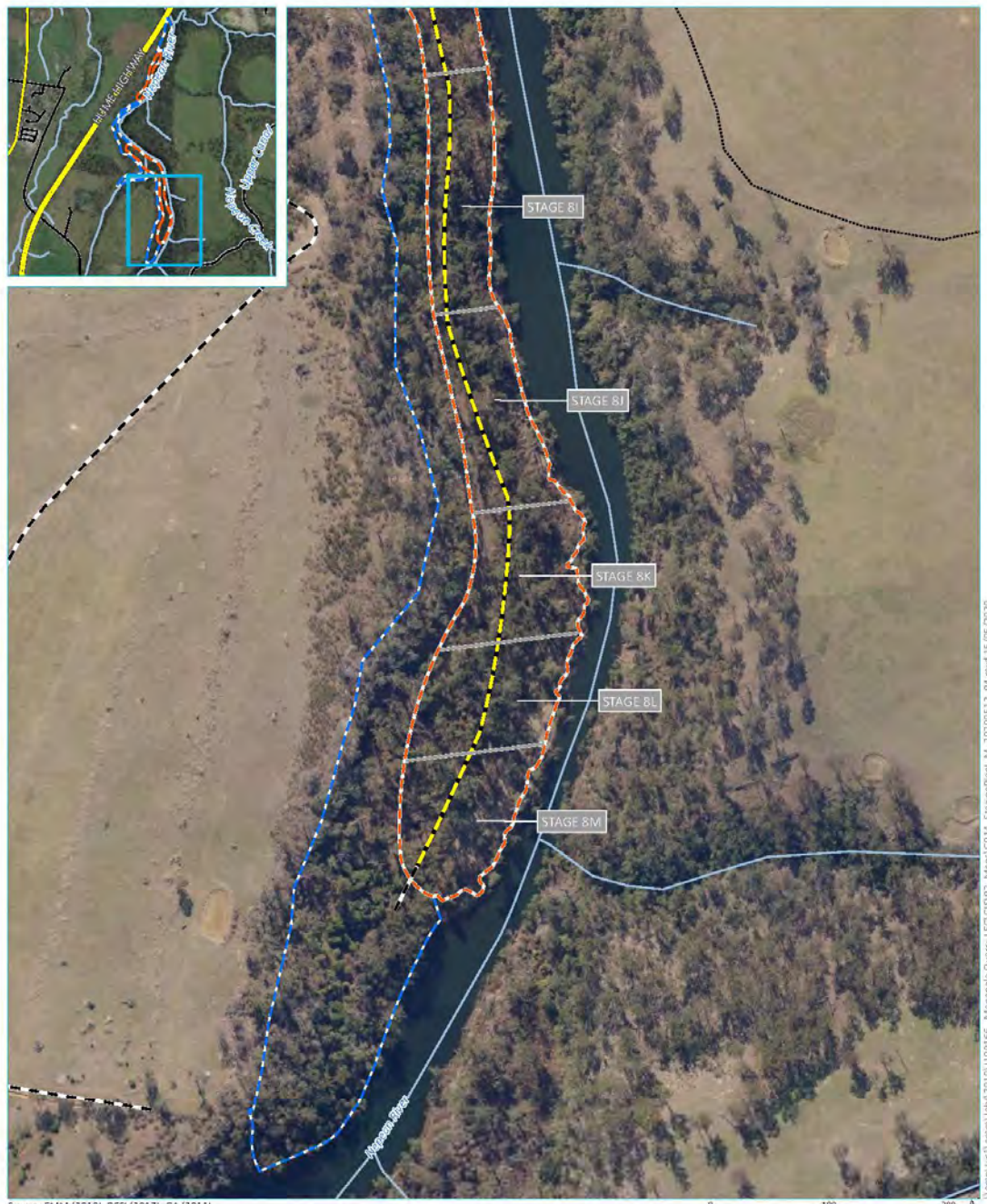


Figure 4 - Substages 8D to 8I



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

- 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



Figure 5 - Substages 8I to 8M



Appendix 2 Exclusion Areas

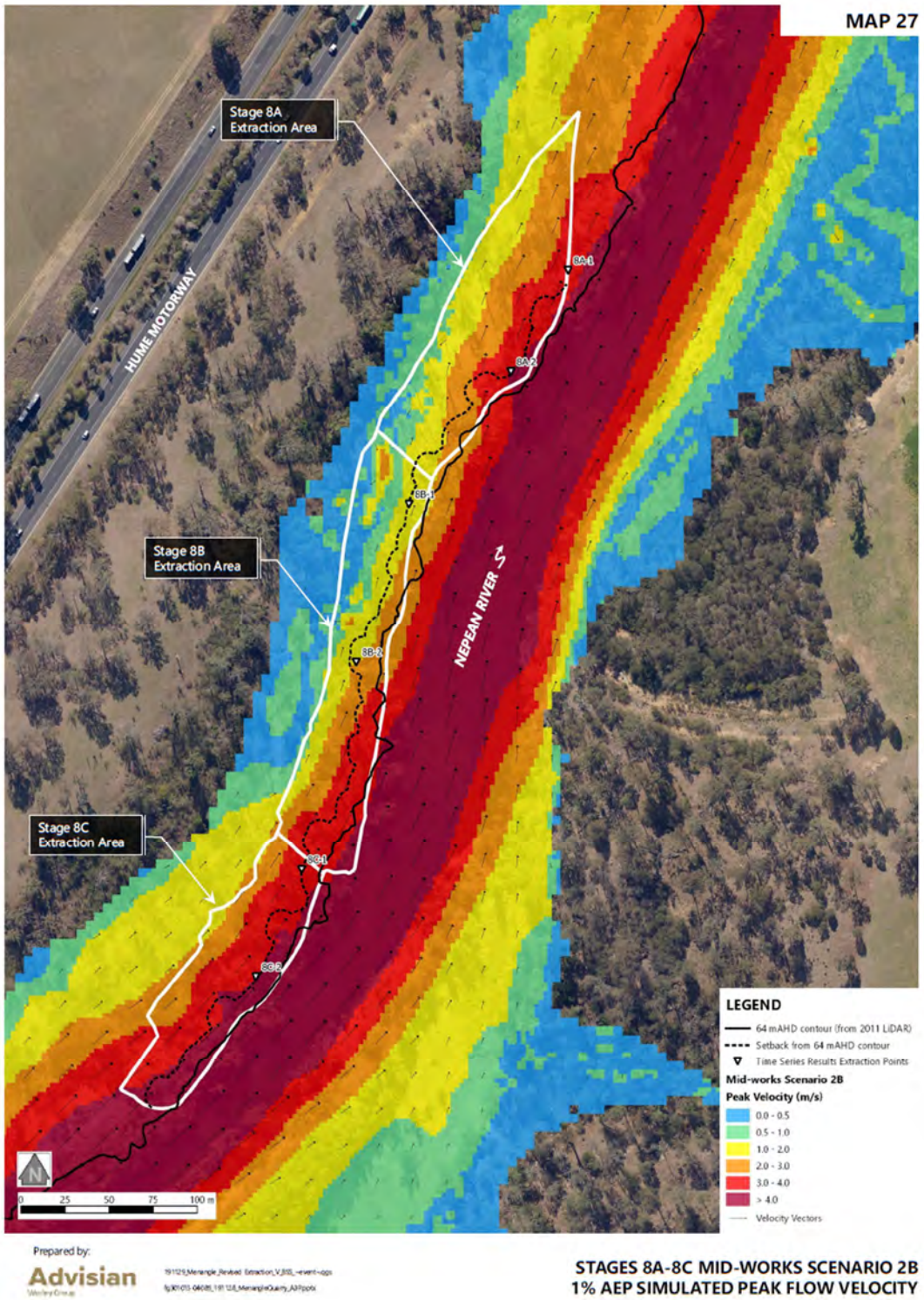


Figure 1 – Exclusion Areas Map Stages 8A-8C

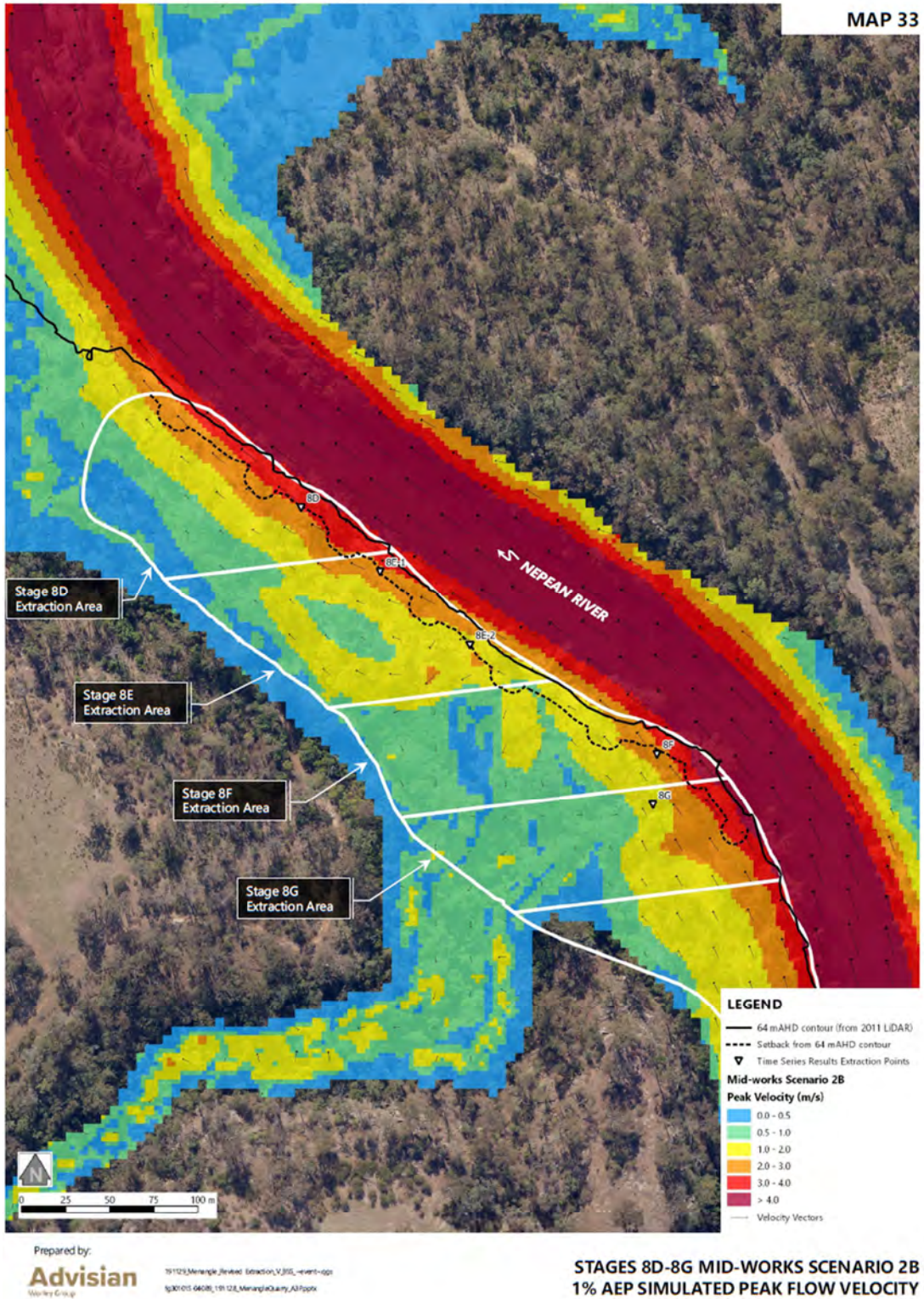
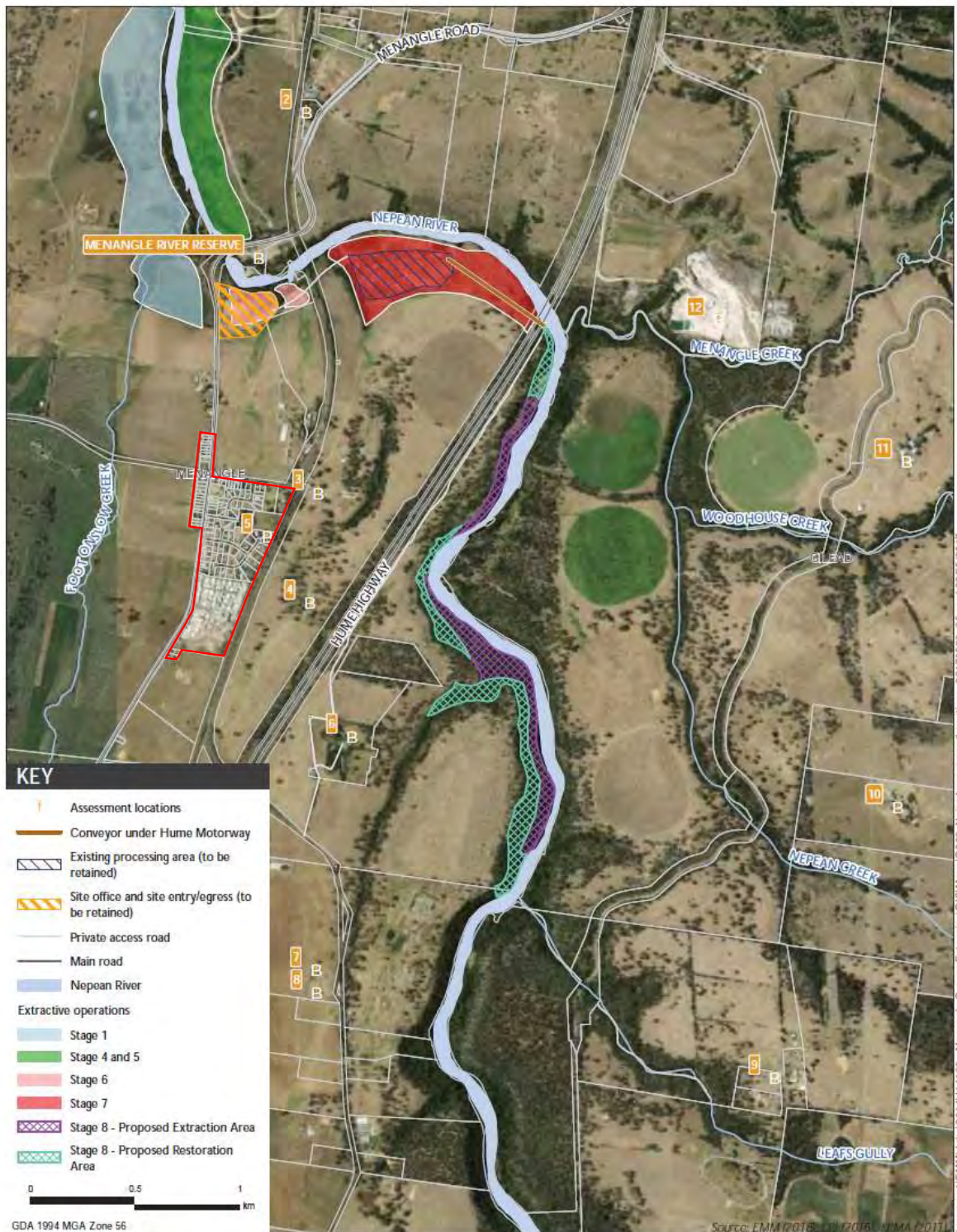


Figure 2 – Exclusion Areas Map Stages 8D-8F

Appendix 3 Receiver Locations



Assessment locations and surrounding land uses  
Menangle Sand & Soil Continuation Project  
Noise Impact Assessment

Figure 3.1

Figure 6 - Noise Receiver Locations

## Appendix 4 Noise Compliance Assessment

### Applicable Meteorological Conditions

1. The noise criteria in condition B4 of Schedule 2 are to apply under all meteorological conditions except the following:
  - (a) where 3°C/100 metres (m) lapse rates have been assessed, then:
    - (i) wind speeds greater than 3 metres/second (m/s) measured at 10m above ground level;
    - (ii) temperature inversion conditions between 1.5°C and 3°C/100m and wind speeds greater than 2m/s measured at 10m above ground level; or
    - (iii) temperature inversion conditions greater than 3°C/100m.
  - (b) where Pasquill Stability Classes have been assessed, then:
    - (i) wind speeds greater than 3m/s at 10m above ground level;
    - (ii) stability category F temperature inversion conditions and wind speeds greater than 2m/s at 10m above ground level; or
    - (iii) stability category G temperature inversion conditions.

### Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions shall be that recorded by the meteorological station required under condition B17 of Schedule 2.

### Compliance Monitoring

3. A noise compliance assessment must be undertaken within two months of commencement of Quarrying Operations in the Stage 8 Area. The assessment must be conducted by a suitably qualified and experienced acoustical practitioner and must assess compliance with noise criteria in this consent. A report must be provided to EPA within 1 month of the assessment.
4. Unless otherwise agreed by the Planning Secretary, attended compliance monitoring must be carried out in accordance with the relevant requirements for reviewing performance set out in the *NSW Industrial Noise Policy* (EPA, 2000), in particular the requirements relating to:
  - (a) monitoring locations for the collection of representative noise data;
  - (b) meteorological conditions during which collection of noise data is not appropriate;
  - (c) equipment used to collect noise data, and conformity with Australian Standards relevant to such equipment; and
  - (d) modifications to noise data collected, including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration,
  - (e) modifying factors apart from adjustments for duration,

with the exception of applying appropriate modifying factors for low frequency noise during compliance testing. This should be undertaken in accordance with Fact Sheet C of the *NSW Noise Policy for Industry* (EPA, 2017).

Appendix 5 Monitoring Locations



Figure 7 - Groundwater Monitoring Locations

**Appendix 6 Additional Stage 6 and 7 Biodiversity and Rehabilitation Requirements**

Table 5: Additional Biodiversity Objectives and Performance and Completion Criteria for Stage 6 and 7 Vegetated Areas

Rehabilitation Objective	Performance Indicator	Completion Criteria	Example Justification/validation methods	Performance Guidance
<b>Composition Objective</b>				
The vegetation composition of Stages 6 and 7 are recognisable as River-flat Eucalypt Forest EEC.	Native plant species are characteristic of River-flat Eucalypt Forest EEC as described in the Final Determination. <i>HN526 benchmark for native plant species richness is ≥24 species.</i> <i>It is noted that Eucalyptus botryoides x saligna is not listed in the River-flat Eucalypt Forest EEC Final Determination, but is to count as one species towards the benchmark value.</i>	Presence of a suitable number or proportion of species listed in the Final Determination.  This is considered to be ≥24 species, across all monitoring plots, that are aligned with the species list in the Final Determination.	Use of standard 20 x 20 m floristic sampling plot(s) where all flora species present are recorded.	This criterion should be met early (i.e. at 5 years post-establishment), otherwise it is unlikely to be met in the long-term.
<b>Structure Objectives</b>				
The vegetation structure of Stages 6 and 7 are recognisable as, or is trending towards, the target BVT HN526, which provides a suitable surrogate for River-flat Eucalypt Forest EEC	Cover and abundance of plant growth forms are characteristic of, or are trending towards, the target BVT benchmarks, which are provided in the completion criteria.	Total foliage cover of species allocated to Tree (TG) growth form is trending towards the benchmark range of 27.5– 32.5	Use of BAM where all flora species present in a 20 x 20 m plot are recorded, with foliage cover and abundance of each species.	Foliage cover of Tree (TG) growth form is trending towards target value.
		Total foliage cover of species allocated to Shrub (SG) growth form is trending towards the benchmark range of 21-31		Foliage cover of Shrub (SG) growth form is trending towards target value.

Rehabilitation Objective	Performance Indicator	Completion Criteria	Example Justification/validation methods	Performance Guidance
		Total foliage cover of species allocated to Grass and Grass-like (GG) growth form is trending towards the benchmark range of 24.45-30.45		Foliage cover of Grass and Grass-like (GG) growth form is trending towards target value.
		Total foliage cover of species allocated to Forb (FG) growth form is trending towards the benchmark range of 24.45-30.45		Foliage cover of Forb (FG) growth form is trending towards target value.
<b>Function Objectives</b>				
Levels of ecosystem function have been established that demonstrate that Stages 6 and 7 are self-sustainable, or is trending towards self-sustainability	Evidence of plant reproduction and regeneration is present	The cover and species richness of the groundcover, including grasses and forbs, is stable or increasing, and is within the benchmark ranges	The ongoing persistence of groundcover species, which are relatively short lived and for which recruitment is not straightforward to measure, is regarded as evidence of reproduction and regeneration of these species	An initial decline in species richness and cover may occur, however a stabilisation in observed cover and richness should be observed by 5 to 10 years post-establishment.
		Second generation individuals of shrubs and trees are present	Presence of second-generation canopy species is evident within the rehabilitation domain (i.e. not limited to the plot, but present within rehabilitation of the same target community and age).	No performance guidance. The presence of second-generation trees and shrubs may not be evident for many years post-establishment.

Rehabilitation Objective	Performance Indicator	Completion Criteria	Example Justification/validation methods	Performance Guidance
	Cover of exotic species is low	Cover of 'high threat exotic' (HTE) and 'priority weeds' is no more than 2%.	Data collected in accordance with BAM. Sum foliage cover of species identified as 'high threat exotic' under the BAM and 'priority weeds' as identified by the Local Land Services (LLS) in the relevant strategic weed management plan for the region.	Cover of HTE and priority weed species are declining towards target value. Given the very high weed loads it is expected that it will take some time for weed growth to be brought under control and will require ongoing maintenance.
	Indicators of nutrient cycling are suitable for sustaining the target plant community type	Litter cover is within the benchmark range. There is no biometric benchmark, and thus the BAM benchmark of 40 for PCT835 is adopted	Data collected in accordance with BAM via five 1 m <sup>2</sup> subplots within the 20 m <sup>2</sup> floristic plot	Litter cover is increasing towards target value.
<p><b>Notes:</b></p> <p><i>Achieving biometric vegetation type (BVT) HN526 and/or plant community type (PCT) in the NSW Bionet Vegetation Information System (PCT835), can be used as a suitable surrogate for the EEC. BVT benchmarks are more specific (to vegetation type level, usually with lower and upper thresholds), whereas PCT benchmarks are to a broader vegetation class level (which is a grouping of similar vegetation types). For this reason, BVT benchmarks have generally been utilised in this table as being the best available.</i></p> <p><i>The Completion Criteria column refers to the desired end goal, with the Performance Guidance column providing broad guidance on how the completion criteria should be interpreted in terms of producing future performance criteria in relevant Vegetation Management Plan(s). It is noted that the completion criteria and performance indicators in Table 5 will need to be resolved with more specific performance criteria relevant to different areas of the site.</i></p> <p><i>It is also noted that stochastic events such as flood or fire might affect the achievement of performance standards and criteria, and whilst the intent will still be to achieve restoration and rehabilitation of the River-flat Eucalypt Forest EEC in the long-term, such events will need to be taken into account on a case by case basis for specific performance standards.</i></p>				



**Appendix 7 Stage 8 Operations Biodiversity and Rehabilitation**

Table 6: Biodiversity Objectives and Performance and Completion Criteria

Rehabilitation Objective	Performance Indicator	Completion Criteria	Example Justification/validation methods	Performance Guidance
<b>Composition Objective</b>				
The vegetation composition of the Restoration Area and rehabilitated substages are recognisable as River-flat Eucalypt Forest EEC.	Native plant species are characteristic of River-flat Eucalypt Forest EEC as described in the Final Determination. <i>HN526 benchmark for native plant species richness is ≥24 species.</i> <i>It is noted that Eucalyptus botryoides x saligna is not listed in the River-flat Eucalypt Forest EEC Final Determination, but is to count as one species towards the benchmark value.</i>	Presence of a suitable number or proportion of species listed in the Final Determination. This is considered to be ≥24 species, across all monitoring plots, that are aligned with the species list in the Final Determination.	Use of standard 20 x 20 m floristic sampling plot(s) where all flora species present are recorded.	This criterion should be met early (i.e. at 5 years post-establishment), otherwise it is unlikely to be met in the long-term.
<b>Structure Objectives</b>				
The vegetation structure of the Restoration Area and rehabilitated substages are recognisable as, or is trending towards, the target BVT HN526, which provides a suitable surrogate for River-flat Eucalypt Forest EEC	Cover and abundance of plant growth forms are characteristic of, or are trending towards, the target BVT benchmarks, which are provided in the completion criteria.	Total foliage cover of species allocated to Tree (TG) growth form is trending towards the benchmark range of 27.5– 32.5	Use of BAM where all flora species present in a 20 x 20 m plot are recorded, with foliage cover and abundance of each species.	Foliage cover of Tree (TG) growth form is trending towards target value.
		Total foliage cover of species allocated to Shrub (SG) growth form is trending towards the benchmark range of 21-31		Foliage cover of Shrub (SG) growth form is trending towards target value.

Rehabilitation Objective	Performance Indicator	Completion Criteria	Example Justification/validation methods	Performance Guidance
		Total foliage cover of species allocated to Grass and Grass-like (GG) growth form is trending towards the benchmark range of 24.45 - 30.45		Foliage cover of Grass and Grass-like (GG) growth form is trending towards target value.
		Total foliage cover of species allocated to Forb (FG) growth form is trending towards the benchmark range of 24.45 - 30.45		Foliage cover of Forb (FG) growth form is trending towards target value.
<b>Function Objectives</b>				
Levels of ecosystem function have been established that demonstrate the Restoration Area and rehabilitated substages are self-sustainable, or is trending towards self-sustainability	Evidence of plant reproduction and regeneration is present	The cover and species richness of the groundcover, including grasses and forbs, is stable or increasing, and is within the benchmark ranges	The ongoing persistence of groundcover species, which are relatively short lived and for which recruitment is not straightforward to measure, is regarded as evidence of reproduction and regeneration of these species	An initial decline in species richness and cover may occur, however a stabilisation in observed cover and richness should be observed by 5 to 10 years post-establishment.
		Second generation individuals of shrubs and trees are present	Presence of second-generation canopy species is evident within the rehabilitation domain (i.e. not limited to the plot, but present within rehabilitation of the same target community and age).	No performance guidance. The presence of second-generation trees and shrubs may not be evident for many years post-establishment.

Rehabilitation Objective	Performance Indicator	Completion Criteria	Example Justification/validation methods	Performance Guidance
	Cover of exotic species is low	Cover of 'high threat exotic' (HTE) and 'priority weeds' is no more than 2%.	Data collected in accordance with BAM. Sum foliage cover of species identified as 'high threat exotic' under the BAM and 'priority weeds' as identified by the Local Land Services (LLS) in the relevant strategic weed management plan for the region.	Cover of HTE and priority weed species are declining towards target value. Given the very high weed loads it is expected that it will take some time for weed growth to be brought under control and will require ongoing maintenance.
	Indicators of nutrient cycling are suitable for sustaining the target plant community type	Litter cover is within the benchmark range. There is no biometric benchmark, and thus the BAM benchmark of 40 for PCT835 is adopted	Data collected in accordance with BAM via five 1 m <sup>2</sup> subplots within the 20 m <sup>2</sup> floristic plot	Litter cover is increasing towards target value.
<p><b>Notes:</b></p> <p><i>Achieving biometric vegetation type (BVT) HN526 and/or plant community type (PCT) in the NSW Bionet Vegetation Information System (PCT835), can be used as a suitable surrogate for the EEC. BVT benchmarks are more specific (to vegetation type level, usually with lower and upper thresholds), whereas PCT benchmarks are to a broader vegetation class level (which is a grouping of similar vegetation types). For this reason, BVT benchmarks have generally been utilised in this table as being the best available.</i></p> <p><i>The Completion Criteria column refers to the desired end goal, with the Performance Guidance column providing broad guidance on how the completion criteria should be interpreted in terms of producing future performance criteria within the Biodiversity and Rehabilitation Management Plan required under condition B73 of Schedule 2 of this consent. It is noted that the completion criteria and performance indicators in Table 6 will need to be resolved with more specific performance criteria relevant to different areas of the site. For example, the Amended restoration area will contain a tree overstorey and thus the performance standard should be higher compared to the Amended extraction area where some time will be required for the tree overstorey cover to become established. Refined performance criteria are to be included in the Biodiversity and Rehabilitation Management Plan.</i></p> <p><i>It is also noted that stochastic events such as flood or fire might affect the achievement of performance standards and criteria, and whilst the intent will still be to achieve restoration and rehabilitation of the River-flat Eucalypt Forest EEC in the long-term, such events will need to be taken into account on a case by case basis for specific performance standards.</i></p>				

## Appendix 8 INCIDENT NOTIFICATION AND REPORTING REQUIREMENTS

### WRITTEN INCIDENT NOTIFICATION REQUIREMENTS

1. A written incident notification addressing the requirements set out below must be emailed to the Department at the following address: [compliance@planning.nsw.gov.au](mailto:compliance@planning.nsw.gov.au) within seven days after the Applicant becomes aware of an incident. Notification is required to be given under this condition even if the Applicant fails to give the notification required under condition D7 of Schedule 2 or, having given such notification, subsequently forms the view that an incident has not occurred.
2. Written notification of an incident must:
  - a. identify the development and application number;
  - b. provide details of the incident (date, time, location, a brief description of what occurred and why it is classified as an incident);
  - c. identify how the incident was detected;
  - d. identify when the applicant became aware of the incident;
  - e. identify any actual or potential non-compliance with conditions of consent;
  - f. describe what immediate steps were taken in relation to the incident;
  - g. identify further action(s) that will be taken in relation to the incident; and
  - h. identify a project contact for further communication regarding the incident.
3. Within 30 days of the date on which the incident occurred or as otherwise agreed to by the Planning Secretary, the Applicant must provide the Planning Secretary and any relevant public authorities (as determined by the Planning Secretary) with a detailed report on the incident addressing all requirements below, and such further reports as may be requested.
4. The Incident Report must include:
  - a. a summary of the incident;
  - b. outcomes of an incident investigation, including identification of the cause of the incident;
  - c. details of the corrective and preventative actions that have been, or will be, implemented to address the incident and prevent recurrence; and

details of any communication with other stakeholders regarding the incident.

11 June 2021

Joel Herbert  
Energy, Industry and Compliance  
Locked Bag 5022  
Parramatta NSW 2124

Uploaded to the Major Projects Portal

Dear Joel,

**Re: Menangle Quarry, Soil and Water Management Plan (DA85 2865-PA-11)**

Thank you for giving the Department of Planning, Industry and Environment – Water (DPIE-Water) the opportunity to review Menangle Quarry, Soil and Water Management Plan (DA85 2865-PA-11).

Department of Planning, Industry and Environment - Groundwater Management & Science Team (DPIE-Water) recommends the following:

Groundwater

1. The proponent must present a monitoring and operating strategy that includes on-going monitoring of permanent bores, as well as the proposed temporary method, that ensures extraction does not occur within one metre of the water table.
2. The proponent must monitor, record and report all water take to demonstrate that take is less than 3 ML/year, thus qualifying for the licence exemptions afforded by the Water Management (General) Regulation 2018.

Surface water

1. The Soil and Water Management Plan should include measures to address remediation or impacts that may be caused to the Nepean River or its banks and floodplain strips.
2. The proponent must provide clarification over the contention minimal site runoff will enter the Nepean River. This clarification must include an explanation of the hydrology of the site and run-on locations and inputs from upslope catchment to the west of the site.
3. Management of woody debris for such an exposed site requires additional hydraulic analysis to determine if large woody debris should be imported to the site to aid in retention of soil material and resistance to scour during a moderate to high flood event on site.
4. The Department requests a copy of the Flood Management Plan is provided for consultation. This is needed to improve the Soil and Water Management Plan and for the proponent to be prepared for future flood events that scour bank faces and/or overtop the bank and drown out operational and rehabilitation areas.

Should you have any further queries in relation to this submission please do not hesitate to contact the Natural Resources Access Regulator's Service Support Team at [nrar.servicedesk@dpie.nsw.gov.au](mailto:nrar.servicedesk@dpie.nsw.gov.au).

Yours Sincerely



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

12 October 2020

Mr Chris Kelly  
NSW Environment Protection Authority  
[planning.matters@epa.nsw.gov.au](mailto:planning.matters@epa.nsw.gov.au)

---

**Re: Menangle Sand and Soil Quarry – Soil and Water Management Plan – Consultation with EPA**

---

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 the soil and Water Management Plan (SWMP) is prepared in consultation with the Environment Protection Authority (EPA) and DPIE Water.

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 a *Flooding, Geomorphology and Onsite Water Management* report as part of the *Environmental Assessment* (EMM 2017). The assessment found that the proposed sediment extraction works and the mitigation measures would ensure that there would be no significant adverse impacts on flooding, river geomorphology and river water quality. The extraction works would have no significant adverse impacts on flood behaviour or flood levels because it would provide more flood conveyance area.

Following the preparation of this assessment, a number of additional reports were prepared in response to DOI/DPI-Water requests, including:

- *DA 85/2865 MOD1, Response to DOI-Water comments of 21 February 2018* (EMM 2018);
- *Menangle Quarry Modification to Development Consent 85/2865, Review of Fluvial Geomorphology* (Fluvial Systems 2018); and
- *Menangle Quarry Extension, Flood Impact Assessment* (Advisian 2018).

The modification application was initially rejected by DPIE. During the Land and Environment Court (Case number 2018/00342158) appeal, additional assessments were prepared during the appeal process, including:

- *Menangle Quarry, Amended Extraction Area and Setback*, letter dated 16 August 2019 (EMM);
- *Menangle Quarry, Groundwater Management*, letter dated 16 August 2019 (EMM);
- *Menangle Quarry, Riverside Batter*, letter dated 23 August 2019 (EMM);
- *Fluvial Geomorphology Assessment for Menangle Quarry Modification to Development Consent 85/2865* dated 5 September 2019 (Fluvial Systems);
- *Menangle Quarry, Flood Mitigation*, letter dated 9 September 2019 (EMM);
- *Menangle Quarry Extension – Flood Impact Sensitivity Assessment*, dated September 2019 (Advisian); and
- *Additional Flood Impact Sensitivity Assessment*, dated 17 December 2019 (Advisian).

These reports are available on the Major Projects website:

- [http://majorprojects.planning.nsw.gov.au/index.pl?action=view\\_job&job\\_id=8531](http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8531)

## 3 Management Plan

EMM Consulting Pty Limited (EMM) is now preparing a Soil and Water Management Plan (SWMP) in consultation with the EPA and DPIE Water in accordance with Part B, Condition B36 (b) of the consent.

The SWMP will address the matters raised in the Condition B34 of the consent and Menangle Sand and Soil's Summary of Commitments provided in Table 3.1 of Appendix A, including:

- a site water balance;
- erosion and sediment controls;



- surface water and groundwater baseline characterisation, monitoring and performance criteria;
- protocols for identifying and investigating any exceedances of performance criteria; and
- reporting requirements.

This letter seeks your input into the contents and preparation of the SWMP. We will also provide the draft SWMP 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 on the content or preparation the SWMP 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](mailto:jslattery@emmconsulting.com.au)

See Appendix A and B of letter to Department of Planning and Environment - Water, 12 October 2020



DOC20/987285

Mr Jeremy Slattery  
EMM Consulting Pty Limited  
PO Box 21  
ST LEONARDS NSW 1590

Email: [jslattery@emmconsulting.com.au](mailto:jslattery@emmconsulting.com.au)

Dear Mr Slattery

**Modification 1 - Update of Environmental Management Plans  
Menangle Sand and Soil Quarry - Menangle Rd, Menangle**

I am writing in response to the information submitted to the Environment Protection Authority (EPA) on 13 October 2020 regarding the recently approved (NSW Land and Environment Court) Modification 1 of the above Menangle Sand & Soil Pty Ltd (MSS) sand quarry operation. Your correspondence advises that the updated approval conditions require that the Soil and Water (SWMP), Air Quality (AQMP) and Noise Management Plans (NMP) are prepared in consultation with the EPA.

Following a review of the updated draft management plans, the EPA advises that the documents appear appropriate to manage the activities undertaken at the site. EMM Consulting Pty Limited should advise the proponent that they should review and update the management plans as necessary as the development progresses into the newly approved Stage 8.

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 preparation and implementation of any EMP for the above works is ultimately the responsibility of the proponent. MSS may wish to have the NMP, AQMP & SWMP audited to an industry standard or certified to the ISO 14001 Standard as part of an overall Environmental Management System.

If you have questions regarding the above, please phone Matt Fuller on (02) 4224 4100.

Yours sincerely

26/11/2020

**GREG NEWMAN**  
**Unit Head Regulation**

Phone 131 555  
Phone 02 4224 4100  
(from outside NSW)

Fax 02 4224 4110  
TTY 131 677  
ABN 43 692 285 758

PO Box 513  
WOLLONGONG  
NSW 2520

Level 3  
84 Crown Street  
WOLLONGONG  
NSW 2500  
AUSTRALIA

[info@epa.nsw.gov.au](mailto:info@epa.nsw.gov.au)  
[www.epa.nsw.gov.au](http://www.epa.nsw.gov.au)

Our ref: STH05/01238/21  
Contact: Andrew Lissenden 0418 962 703

18 December 2020

Ernest Dupere  
Benedict Industries Pty/Ltd  
BY EMAIL: [ernest@benedict.com.au](mailto:ernest@benedict.com.au)

## **MENANGLE SAND AND SOIL – REQUEST FOR IN PRINCIPLE AGREEMENT TO HOW MATERIAL IS TRANSPORTED WITHIN THE SITE.**

---

Dear Ernest,

Transport for NSW (TfNSW, formerly Roads and Maritime Services) refers to your email dated 4 November 2020, and the subsequent phone discussion had regarding the above.

TfNSW notes that:

- You are looking at amending the currently approved Menangle Quarry development consent (DA85/2865). As such, you are seeking an 'in-principle agreement' with TfNSW so as to enable you to progress a proposed design with some confidence that it is open to the idea;
- The change you are proposing seeks to allow material on the eastern side of the Hume Highway to be transported by heavy vehicles, as opposed to a conveyor belt, to the processing area on the western side of the Hume Highway (i.e. under the Menangle Bridges);
- The Menangle Bridges are a TfNSW asset;
- You have had discussions with TfNSW Area Maintenance Manager (Vincent Boer) who has not objected to the concept subject to additional information being provided; and
- The current development consent will need to be amended (i.e. lodgement of a Section 4.55 application) to allow the proposed change from a conveyor belt system to the use of trucks/heavy vehicles.

Having regard for the above, TfNSW advises that it provides 'in-principle agreement' to the concept of using heavy vehicles to transport material under the Hume Highway/Menangle Bridges being further investigated. This being subject to the requirements outlined in **Attachment 1**.

If you have any questions, please contact Andrew Lissenden on 0418 962 703.

Yours faithfully



Andrew Lissenden  
Development Assessment Officer  
Community and Place | South Region

Cc: [lauren.evans@planning.nsw.gov.au](mailto:lauren.evans@planning.nsw.gov.au)

1. Engineering designs that have been prepared by a suitably qualified person will need to be provided to TfNSW for its approval. These will need to have regard for issues including, but not limited to, the protection of piers and the bridge structure;
2. Further discussions be had with Vincent Boer (TfNSW Area Maintenance Manager) and Dony Castro (TfNSW Bridge Maintenance Planner) during the preparation of engineering designs;
3. The implementation and ongoing maintenance of any design approved by TfNSW will be at the quarry operator/owners own cost;
4. TfNSW will be licenced to use the enhanced access tracks; and
5. An application to amend the existing development consent will be lodged to enable the all relevant environmental and design factors to be considered.

---

Appendix B

# Plan approval

---



Mr Mark Hutcheson  
Operations Planning Support Manager  
Benedict Recycling Pty Ltd  
11 Narabang Way  
Belrose, NSW, 2085

24/09/2021

Dear Mr. Hutcheson

**Menangle Sand and Soil Quarry (DA85/2865)  
Soil and Water Management Plan**

I refer to the Soil and Water Management Plan submitted in accordance with Condition B36 of Schedule 2 of the consent for the Menangle Sand and Soil Quarry (DA85/2865).

The Department has carefully reviewed the document and is satisfied that it is consistent with the relevant conditions of consent.

Accordingly, the Planning Secretary has approved the Soil and Water Management Plan (Version 2, dated 26 July 2021). Please ensure that the approved plan is placed on the project website at the earliest convenience.

If you wish to discuss the matter further, please contact Wayne Jones on 6575 3406.

Yours sincerely

A handwritten signature in black ink that reads 'Jessie Evans'.

Jessie Evans  
Director  
Resource Assessments (Coal & Quarries)

As nominee of the Planning Secretary

Appendix C

# Menangle Quarry - Groundwater Model Report

---

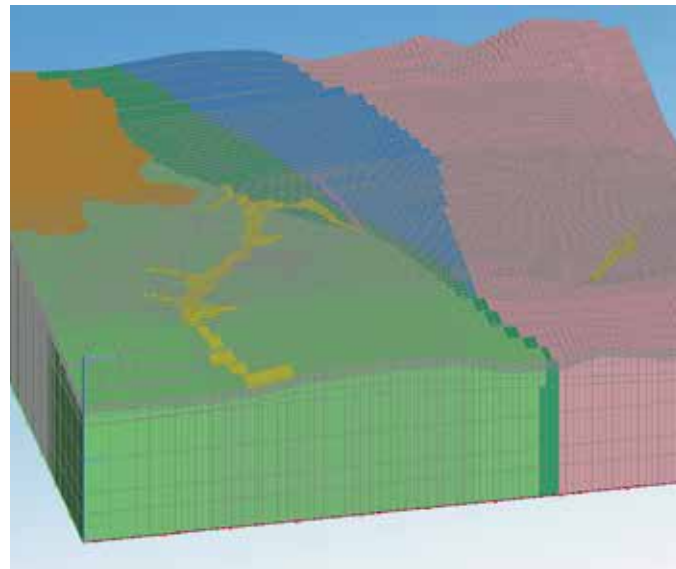
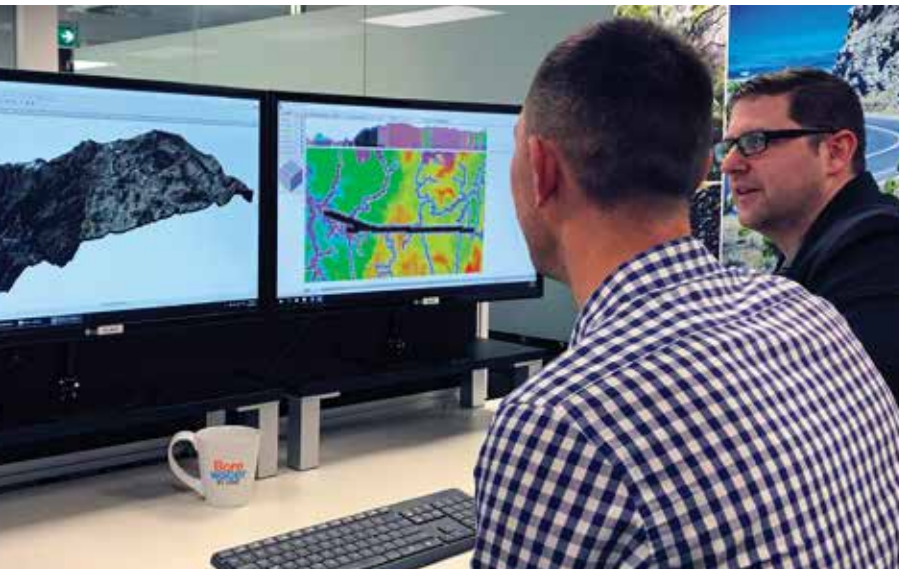




# Menangle Quarry

## Groundwater model report

Prepared for Menangle Sand and Soil Pty Ltd  
March 2021





# Servicing projects throughout Australia and internationally

## SYDNEY

Ground Floor, 20 Chandos Street  
St Leonards NSW 2065  
T 02 9493 9500

## NEWCASTLE

Level 3, 175 Scott Street  
Newcastle NSW 2300  
T 02 4907 4800

## BRISBANE

Level 1, 87 Wickham Terrace  
Spring Hill QLD 4000  
T 07 3648 1200

## ADELAIDE

Level 4, 74 Pirie Street  
Adelaide SA 5000  
T 08 8232 2253

## MELBOURNE

Ground Floor, 188 Normanby Road  
Southbank VIC 3006  
T 03 9993 1905

## PERTH

Suite 9.02, Level 9, 109 St Georges Terrace  
Perth WA 6000  
T 02 9339 3184

## CANBERRA

PO Box 9148  
Deakin ACT 2600

# Menangle Quarry

## Groundwater model report

### Report Number

---

J190166 RP32

### Client

---

Menangle Sand and Soil Pty Ltd

### Date

---

4 March 2021

### Version

---

v2 Final

### Prepared by

---



#### Jeff Whitter

Associate Hydrogeologist / Modeller

4 March 2021

### Approved by

---



#### Dr Doug Weatherill

Associate Groundwater Modeller

4 March 2021

This report has been prepared in accordance with the brief provided by the client and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of the client and no responsibility will be taken for its use by other parties. The client may, at its discretion, use the report to inform regulators and the public.

© Reproduction of this report for educational or other non-commercial purposes is authorised without prior written permission from EMM provided the source is fully acknowledged. Reproduction of this report for resale or other commercial purposes is prohibited without EMM's prior written permission.

# Table of Contents

1	Introduction	1
1.1	Background	1
1.2	Water affecting activities	1
1.3	Modelling objectives	2
1.4	Model confidence classification	2
2	Conceptual model	3
2.1	Geology and hydrostratigraphy	3
2.2	Aquifer properties	11
3	Numerical modelling	13
3.1	Model design	13
4	History matching and sensitivity analysis	24
4.1	Approach	24
4.2	Hydraulic properties	24
4.3	History-matching performance	25
4.4	Sensitivity analysis	28
5	Predictive scenarios	30
5.1	Predictive modelling	30
5.2	Predictive uncertainty analysis	33
6	Results	34
7	Summary	35
8	Limitations	36
	References	37

## Appendices

Appendix A	Hydrographs	
------------	-------------	--

## Tables

Table 2.1	Hydrostratigraphy summary	3
Table 2.2	Summary of measured hydraulic conductivity	11
Table 3.1	HSUs and model layers	19

Table 3.2	Model stress periods	20
Table 4.1	Calibrated hydraulic parameter values	25
Table 6.1	Model predicted inflow volumes	34
Table 6.2	Predictive uncertainty analysis – Area 8M-4 predicted inflow volumes	34

## Figures

Figure 2.1	Alluvium data locations	5
Figure 2.2	Ashfield Shale data locations	6
Figure 2.3	Hawkesbury Sandstone data locations	7
Figure 2.4	Conceptual cross section near BH01 and BH02	8
Figure 2.5	Conceptual cross section near BH03 and BH04	9
Figure 3.1	Groundwater model domain with Voronoi cells	15
Figure 3.2	Stage 8 area with Voronoi cells (northern area)	16
Figure 3.3	Stage 8 area with Voronoi cells (southern area)	17
Figure 3.4	Voronoi cells between Nepean River and Quarry area	18
Figure 3.5	Measured and modelled Nepean River stage	21
Figure 3.6	Model boundary conditions and regional groundwater levels	22
Figure 4.1	Modelled and measured hydraulic head over the history-matching period	26
Figure 4.2	Modelled and measured groundwater mounding over the history-matching period	27
Figure 4.3	Scatter plot of modelled versus measured hydraulic head	28
Figure 4.4	Relative composite sensitivity of the history-matched model	29
Figure 5.1	Nepean River high flow events since 1990 and the modelled synthetic scenario	31
Figure 5.2	Quarry pit locations simulated in predictive modelling	32

# 1 Introduction

Menangle Sand and Soil Pty Ltd (Menangle Sand and Soil) operates the Menangle Sand and Soil Quarry at 15 Menangle Road Menangle. In September 2020, the NSW Land and Environment Court (LEC) 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 hectares (ha) in area and extends about 2 kilometres (km) along the Nepean River.

Preliminary groundwater modelling has been conducted to quantify the groundwater licence volume required from the Sydney Basin Nepean Groundwater Source (Management Zone 2) to allow for temporary interception of groundwater by quarrying in the Stage 8 area. The modelling was informed by approximately three months of groundwater monitoring data, proposed quarrying operations and expected conditions at the site (water levels in the Nepean River and adjacent groundwater system are largely controlled by the Menangle Weir with only short duration rises above this long-term average level).

## 1.1 Background

The Menangle Quarry Extension – Modification 1 (MOD1) conditions of approval (CoA) require that:

- B24. The Applicant must develop a groundwater model using a variant of MODFLOW standard software, or equivalent software, to quantify the progressive takes from water sources during Quarrying Operations in the Stage 8 area.
- B25. The Applicant must:
  - (a) initially construct the groundwater model required under condition B24 of Schedule 2 using the first three months of groundwater monitoring data collected from 17 June 2020 to 16 September 2020;
  - (b) update the groundwater model following collection of the first 12 months of data collected from 17 June 2020 to 16 June 2021; and
  - (c) incorporate the outputs of the groundwater model into the Site Water Balance as required under condition B36(c)(i) of Schedule 2.
- B28. When making an application for any necessary Water Access Licence, the Applicant must specify the annual take of water from each affected water source, as estimated by the groundwater model required under condition B24 of Schedule 2.

This report describes the preliminary modelling results based on history matching to the first three months of groundwater monitoring data. As required under condition B25(b), once 12 months of monitoring data have been collected, the groundwater model will be updated utilising the extended groundwater monitoring record and the licence volume requirement updated in line with any changes to model predictions.

## 1.2 Water affecting activities

The quarry does not plan to excavate below the long-term average watertable elevation. However, during short-duration flooding in the Nepean River, the watertable in the adjacent alluvial water table is expected to rise. If the Nepean River water level increase is of sufficient magnitude and duration, the alluvial water table may rise above the base of the quarry and, hence, shallow alluvial groundwater will be intercepted. Quarrying ceases during such periods of inundation and intercepted groundwater will not be abstracted from the quarry area (eg by pumping) and water in the base will be allowed to infiltrate back into the base of the quarry. However, the NSW Aquifer Interference Policy (NSW AIP) requires intercepted water to be licensed.

### 1.3 Modelling objectives

The broad objective of the Menangle Sand and Soil Quarry groundwater modelling is to quantify the necessary groundwater volume to be licensed for the project. The modelling is being undertaken in two stages.

In Stage 1, a groundwater model has been built and undergone a ~3.5 month history-matching process using groundwater monitoring data from 3 June 2020 up to 23 September 2020. Initial predictions of groundwater interception will inform groundwater licensing.

The tasks in Stage 1 of the groundwater modelling are as follows:

- build a numerical groundwater flow model based on the conceptual model;
- calibrate/history-match the model using groundwater monitoring data from 3 June 2020 to 23 September 2020;
- simulate the proposed quarrying activities; and
- quantify groundwater potentially intercepted by the excavation voids (via indicative scenarios).

In Stage 2, the groundwater model will be reviewed and updated using a full year of groundwater monitoring data for history-matching. Predictive scenarios will be rerun and the required groundwater licence volume reassessed in line with the updated model.

### 1.4 Model confidence classification

The Australian Groundwater Modelling Guidelines (Barnett et al 2012) provide a framework from which to define a target “model confidence level”. Model class is closely linked to model history-matching, with reference to the historical stresses in comparison to the stresses (both magnitude and duration) in the predictions. The groundwater model is best described as a class 1 model at present. EMM expects that stage 2 of the modelling will be described as a class 1 model, with some class 2 attributes. Given the anticipated low groundwater risk of the project due to the expected relatively small groundwater interception, both in terms of duration and volume, a model of class 1 to class 2 categorisation is considered to be adequate.

# 2 Conceptual model

## 2.1 Geology and hydrostratigraphy

The following provides a summary of the site geology, taken from the joint expert report on groundwater (Merrick and Webb 2020). More detail is presented in monitoring bore installation and testing program report (EMM 2020a).

There are two geological units at the site:

- Thin alluvial Quaternary sand and alluvial deposits exist immediately adjacent to and underlying the Nepean River. Alluvial deposits contain discontinuous, unconfined local groundwater systems in direct connection with the Nepean River (Merrick and Webb 2020).
- The Hawkesbury Sandstone (HBSS) forms an extensive confined to semi-confined regional groundwater system within the Sydney Geological Basin with permeability from both the rock mass itself and fractures within the rock mass (ie dual permeability system) (Merrick and Webb 2020).

In the Stage 8 area, the HBSS is thick. At Bore GW105339, approximately 1.5 km south of the southern extent of Stage 8, the Bald Hill Claystone beneath the HBSS was intercepted at 238 m below ground level.

The alluvium deposit overlies HBSS, and the excavation will not intrude into the sandstone. The resource will be extracted so that the base of the quarry will be at least 1 m above the low flow water level in the Nepean River, as controlled by Menangle Weir downstream of the Stage 8 area. As the quarry will not excavate below the long-term average watertable elevation, and will not excavate into the HBSS, the project is considered to have very low potential to impact the regional HBSS aquifer.

The alluvial deposits and HBSS are two distinct hydrostratigraphic units (HSUs) at the quarry (Merrick and Webb 2020). These HSUs are managed as one groundwater source under the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011*. The groundwater source is the Sydney Basin Nepean Groundwater Source (Management Zone 2).

HSUs of relevance to the project area are presented with additional details in Table 2.1.

**Table 2.1 Hydrostratigraphy summary**

HSU name	HSU type	HSU typical thickness	Description
Alluvial sediments (Sand)	Disconnected, unconfined aquifer	~9 m	Shallow, disconnected and often unsaturated alluvial sediments.
Ashfield Shale	Aquitard	Up to ~150 m	The presence of this unit is limited to the west of the model domain and is inferred to act as a confining unit, consistent with observations in the greater Sydney basin. It is not mapped at the project site.
Hawkesbury Sandstone	Aquifer	Up to 238 <sup>#</sup> m	This unit forms a major regional aquifer in the Sydney basin and has been mapped and studied in the extensive detail. The Hawkesbury Sandstone is a sedimentary fractured rock aquifer with some primary porosity.

1. # value taken from Statement of Evidence by Dr. Noel Merrick (2020).



Surfaces for the top/bottom of the HSUs were developed using the regional hydrogeological understanding and drill hole data (sourced from Menangle Sand and Soil, WaterNSW and MinView drill hole databases). Figure 2.1 to Figure 2.3 show the locations of the data points used to generate HSU surfaces. The MinView database was used to download both exploration and groundwater drill hole databases. The orange points show the exploration drill hole database, while the red points are based on the groundwater drill hole database. The site-specific data (blue points) were included in the generation of the surfaces. In the figures, the quarry location is indicated as a pink area near the Nepean River. ELVIS topography data was used to define ground surface.

The joint expert report on groundwater (Merrick and Webb 2020) presented local-scale conceptual cross sections through the project area, aligned with the groundwater monitoring bores drilled for the project. These are reproduced as Figure 2.4 and Figure 2.5.

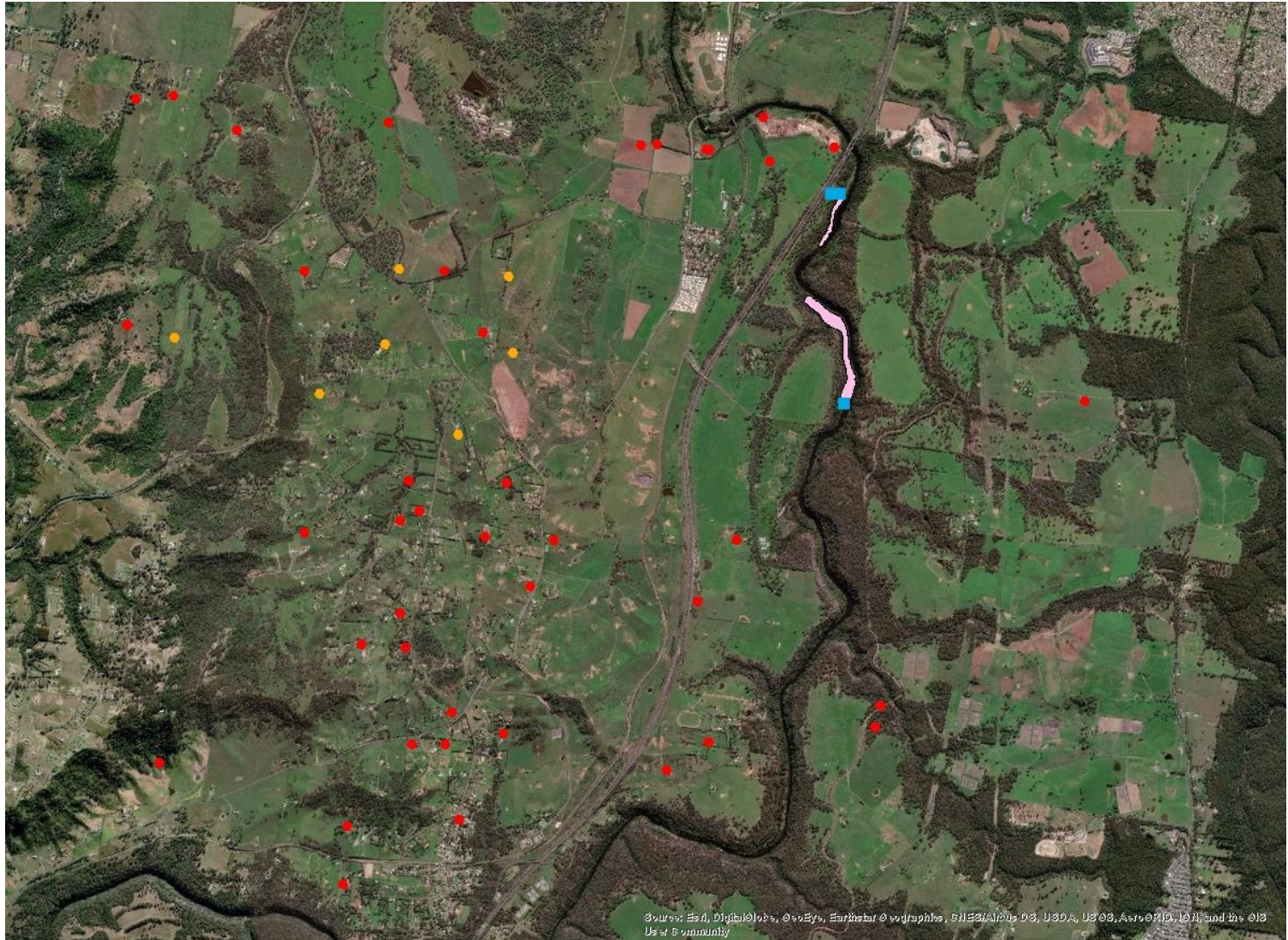


Figure 2.1 Alluvium data locations

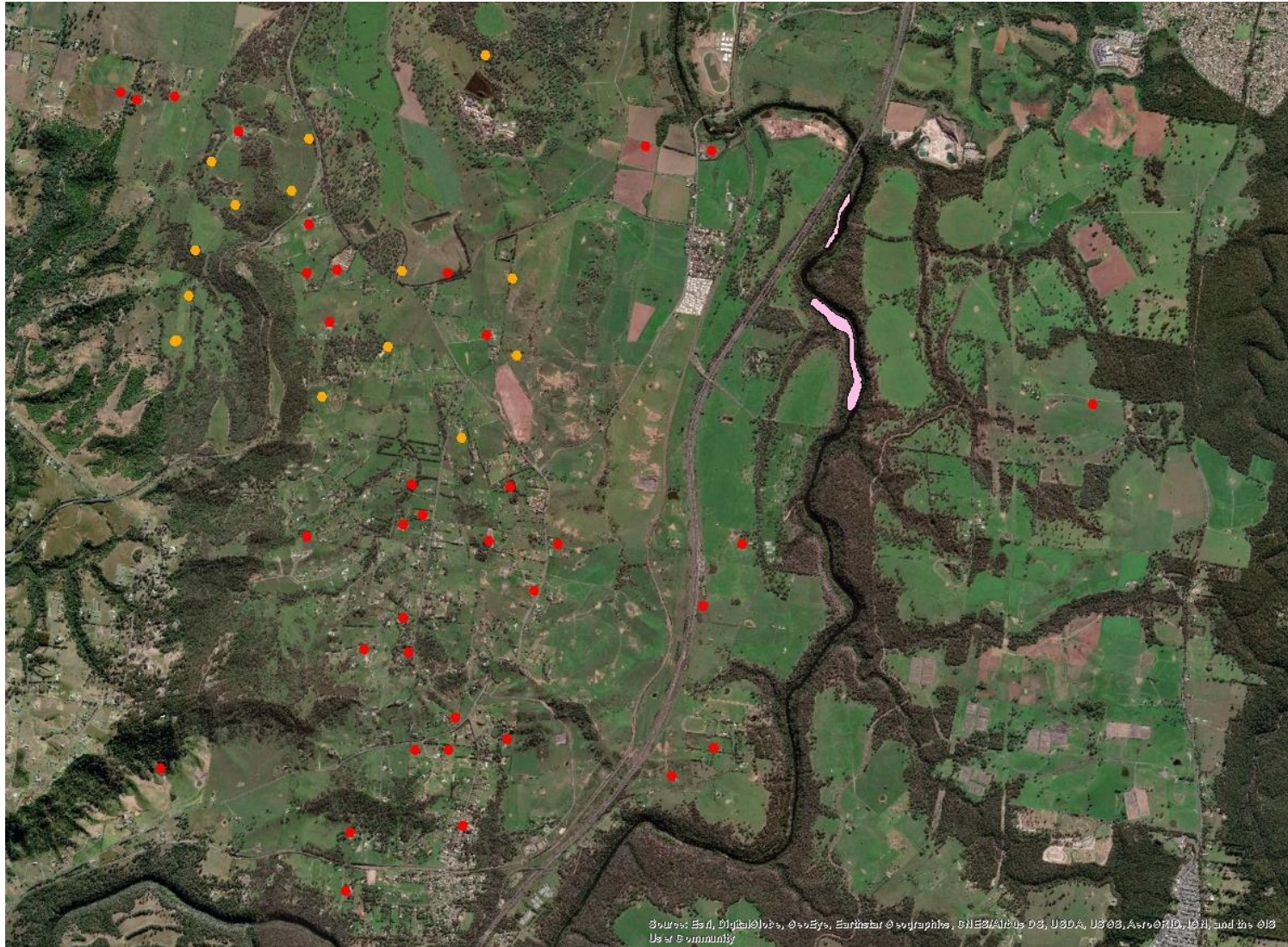


Figure 2.2 Ashfield Shale data locations

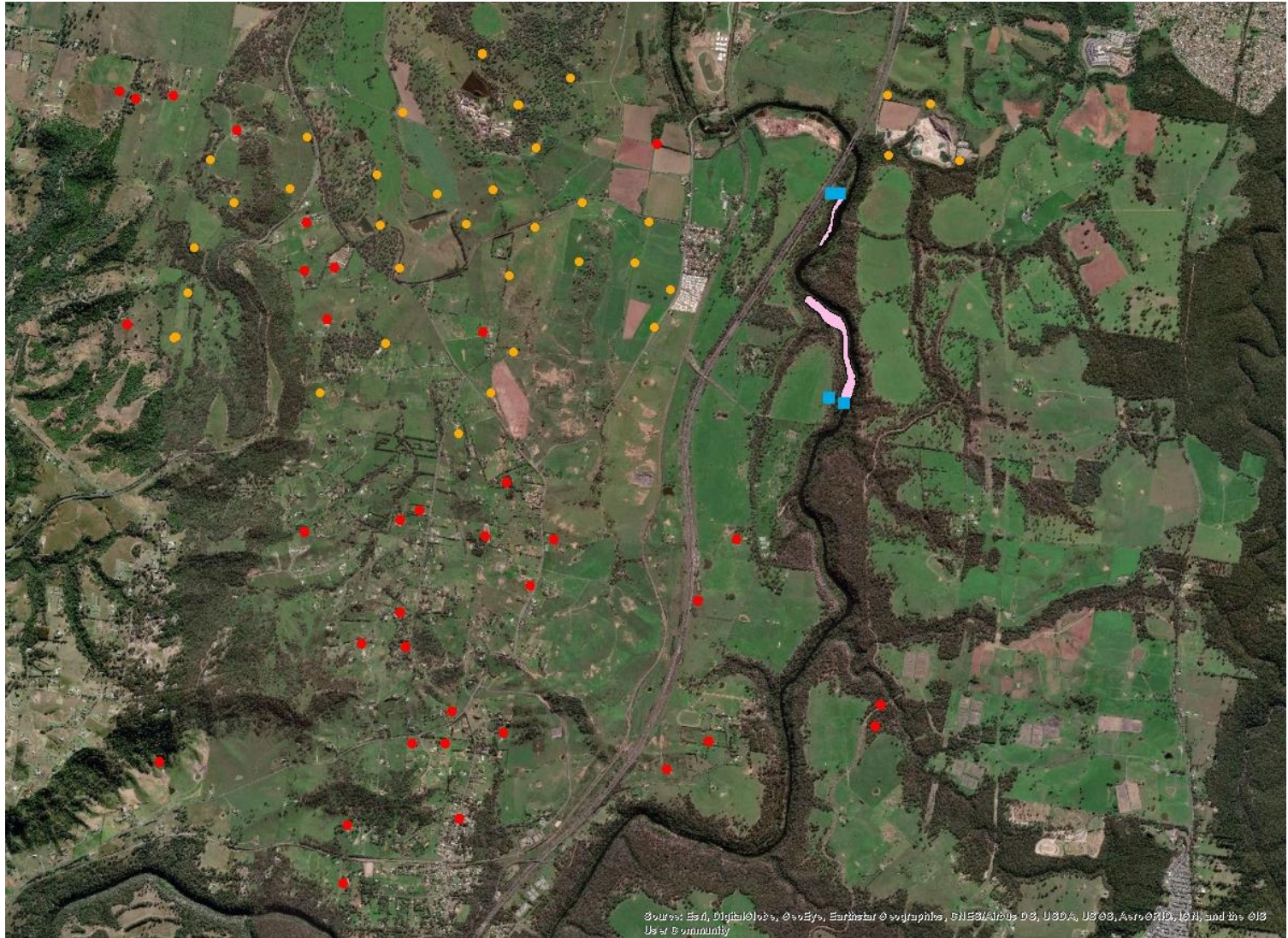
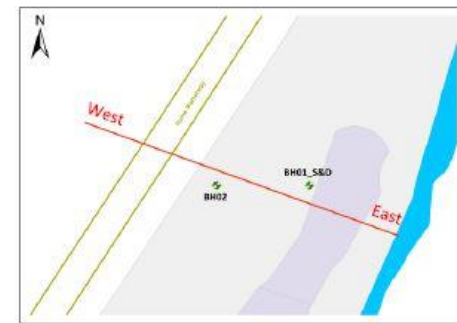
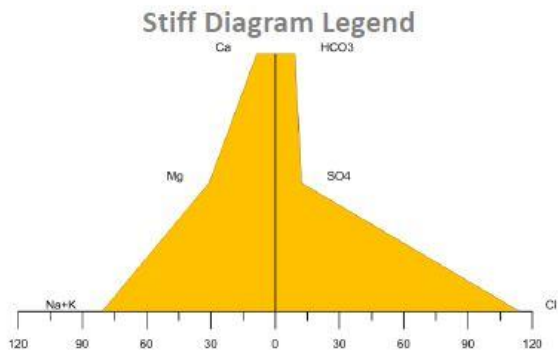
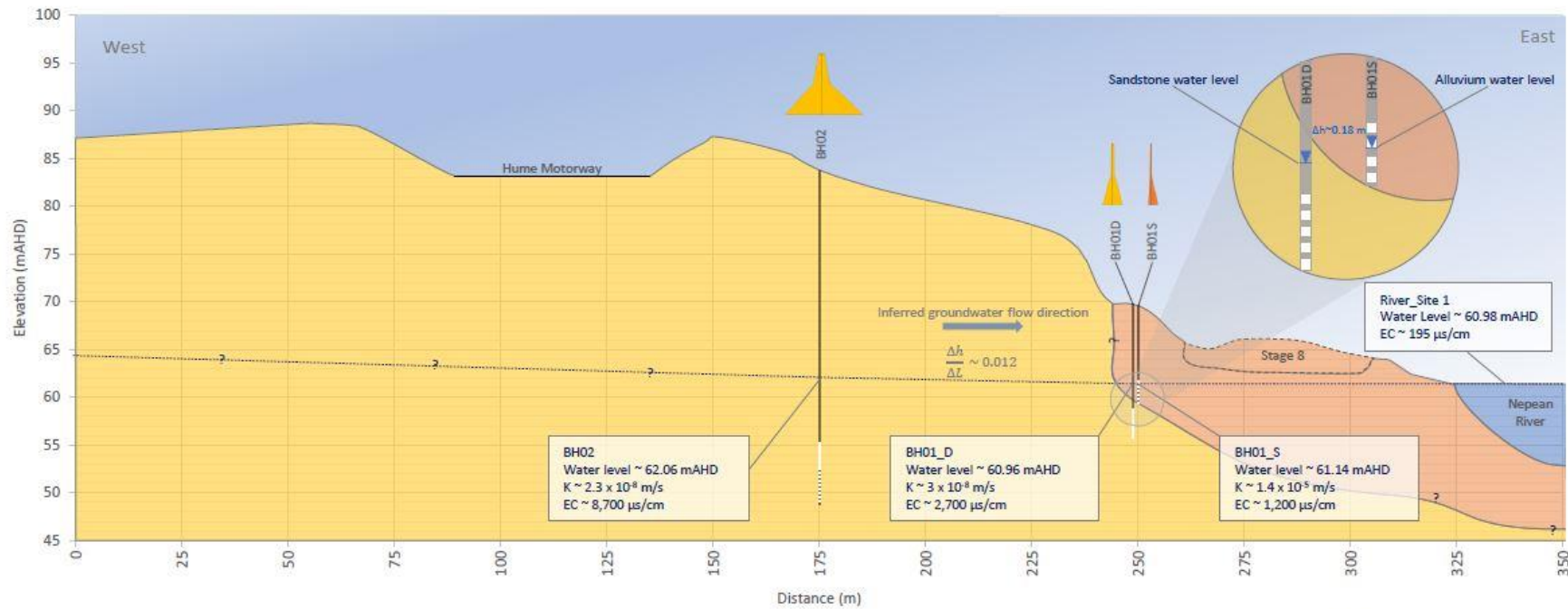
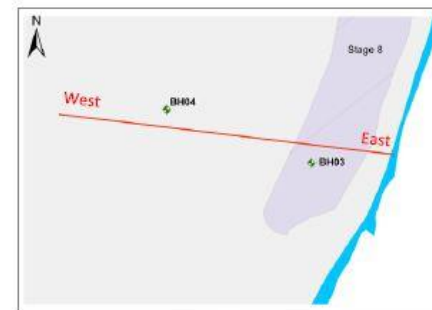
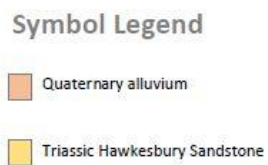
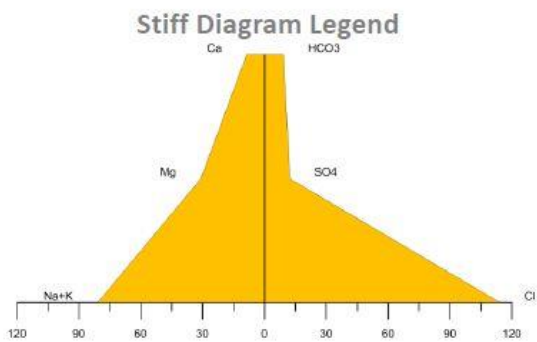
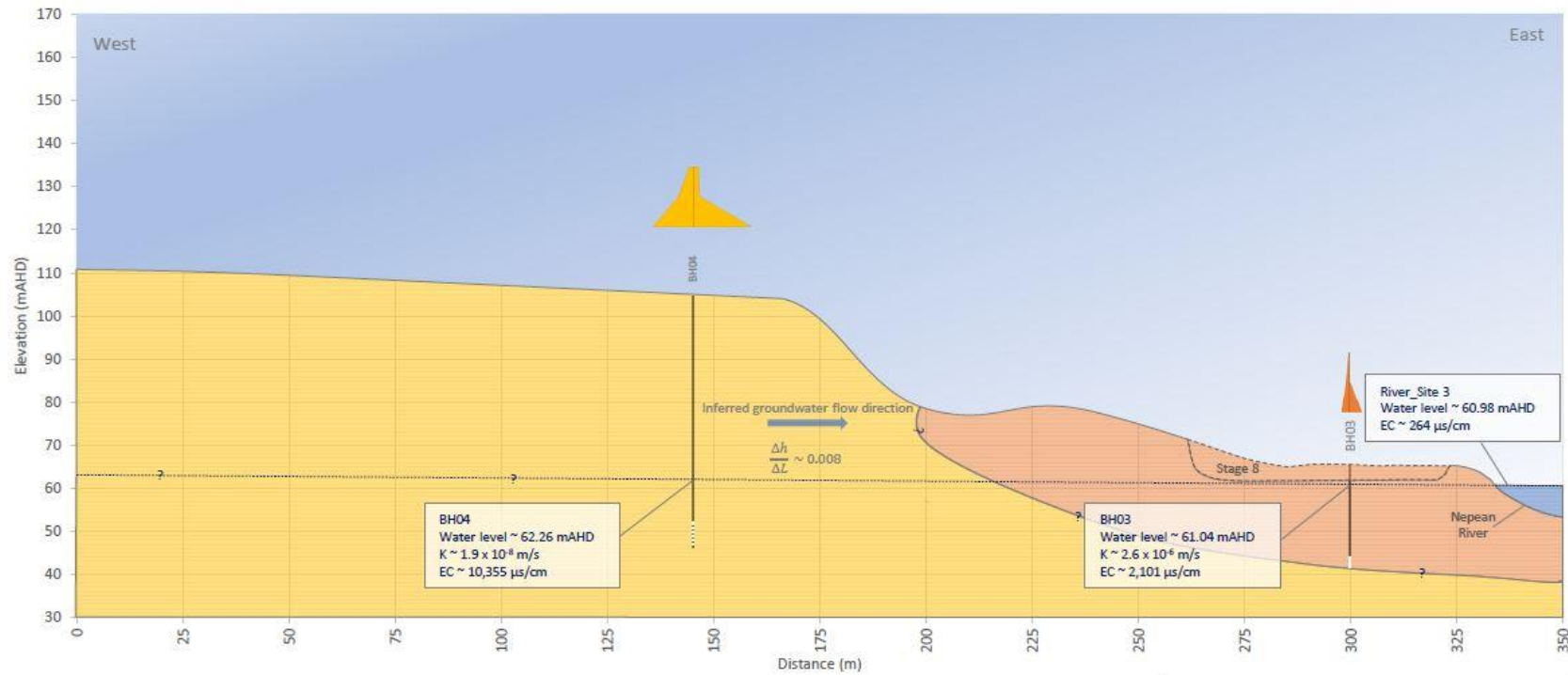


Figure 2.3 Hawkesbury Sandstone data locations



Menangle Quarry west-east conceptual cross section  
Menangle Sand and Soil Pty Ltd

Figure 2.4 Conceptual cross section near BH01 and BH02



Menangle Quarry west-east conceptual cross section  
Menangle Sand and Soil Pty Ltd

Figure 2.5 Conceptual cross section near BH03 and BH04

### 2.1.1 Groundwater levels and flow directions

Local-scale transient groundwater monitoring data are available for the groundwater monitoring bores installed for the project. Hydraulic heads are measured via pressure transducer every 6 hours at each of the 5 locations. Appendix A contains the data collected at the five monitoring locations until 23 September 2020. Of note from the joint experts report on groundwater (Merrick and Webb 2020) is that the alluvial groundwater level is observed by site operators to be controlled by the level in the Nepean River.

Two distinct groundwater behaviours are observed from the site hydrographs, bores BH01-S, BH01-D and BH03 can be grouped with similar behaviour, while bores BH02 and BH04 exhibit similar behaviour. The hydraulic head responses are associated with the bores being screened in either the alluvium or HBSS. The bore log for BH01-D suggests it is screened in the very top of the HBSS unit and monitoring data shows the characteristic changes associated with the alluvium watertable.

Monitoring data for the water table (ie alluvium bores) indicate that it is located at approximately 61 mAHD for the majority (>98%) of the time (based on river level data) (Merrick and Webb 2020). This level has been confirmed by the recent EMM bore installation and testing program (2020a) where the two alluvial bores having levels of 61.14 mAHD for BH01S, and 61.04 mAHD for BH03.

Available groundwater level data (Appendix A) show that the vertical hydraulic gradient in this area is upward from the regional HBSS aquifer towards the alluvium and the river. This supports the discussion in the joint experts report (Merrick and Webb 2020) that the head in the HBSS would generally be higher than that in the alluvium, from which groundwater discharges to the usually gaining Nepean River as baseflow.

The regional groundwater flow direction is from west to east on the western side of the Nepean River (refer Appendix A).

### 2.1.2 Nepean River

Hourly monitoring of Nepean River level is conducted by WaterNSW (Menangle weir station #212238). From the EMM joint experts report (Merrick and Webb 2020), it was agreed that the normal low flow level of the river in the Stage 8 area is approximately 61 mAHD. The river observation data are provided in Appendix A and show a strong correlation between river water level and alluvium groundwater levels at the local monitoring bores. It was agreed that 61 mAHD is the best estimate of the “average alluvial watertable level” (Merrick and Webb 2020).

Previous reporting (Merrick and Webb 2020) indicated the river level has exceeded 62 mAHD (the nominal base of quarry excavations) 1.0% of the time from 1990 to 2013, and 0.7% of the time from 1990 to 2020. The river level has also exceeded 64 mAHD, the height at which bank overtopping generally occurs, approximately 0.3% of the time, or 1.2 days per year, on average since ‘consent was granted’ (Merrick and Webb 2020).

The hydraulic gradient of the Nepean River is low, at approximately 1.9 cm/km, measured between Menangle Weir (60.84 mAHD) and Douglas Park Weir (61.10 mAHD) over a distance of approximately 14 km (Merrick and Webb 2020). Over the length of the Stage 8 corridor, the normal river levels are expected to range from 60.87 mAHD at the northern end to 60.92 mAHD at the southern end. Therefore, the adoption of 61 mAHD as the normal river level is appropriate.

The Nepean River is gaining the majority of the time in the project area, with gradient reversals during high flow events. In such events river water is expected to flow into the near-river alluvial aquifer, potentially being intercepted (but not extracted from) by quarry pits. When the river level declines this water is expected to flow back from the aquifer into the river, with the alluvium acting as a river bank storage. During overtopping events (ie when the river rises to 64 mAHD or higher) water will flow directly across the land surface and may flood pits from above, in addition to groundwater rising from the pit floor.

### 2.1.3 Rainfall

Daily rainfall in excess of 100 mm has occurred on only 0.06% of days since 1889 (31 days in 130 years), and the highest ever daily rainfall recorded in the location of the quarry was 235 mm (Merrick and Webb 2020). Therefore, rainfall is not considered a major contribution to the shallow groundwater system and is not considered an issue for site water management.

The joint experts report (Merrick and Webb 2020) agreed that the river flow is likely to be more affected by rainfall in the headwaters of the catchment, rather than rainfall at the project site due to the presence of significant weirs that would temper the variations in river levels. Hydrographs (Appendix A) show that site rainfall events have little to no influence on the groundwater levels and that the stage of the Nepean River has the greatest influence on the groundwater levels.

## 2.2 Aquifer properties

The permeability of the alluvial sediments associated with the Nepean River is known to be variable and dependent on the sediments, with sand and gravel deposits having high permeabilities, while clay lenses have a much lower permeability (Merrick and Webb 2020). The permeability of the HBSS rock mass itself (primary permeability) can be low relative to the overlying alluvium. However, the HBSS is a dual permeability system, and in areas of high density of interconnected fractures and faults the 'secondary permeability' can result in moderate to high permeabilities if intercepted (Merrick and Webb 2020).

Hydraulic testing (slug tests) of the recently installed site monitoring bores provided estimates of hydraulic conductivity. The results confirm that the hydraulic conductivity of the alluvium is approximately two orders of magnitude higher than the underlying HBSS. The hydraulic property ranges reported in the Drilling completion report (EMM 2020a) are reproduced in Table 2.2 for ease of reference.

**Table 2.2 Summary of measured hydraulic conductivity**

HSU	Area	Test type	Hydraulic conductivity (m/day)		
			Min	Max	Mean
Alluvium	Menangle Quarry	Rising head tests (2 tests)	0.2	1.2	0.7
HBSS	Menangle Quarry	Rising head tests (3 tests) and Development recovery (2 tests)	$1.0 \times 10^{-3}$	$3.5 \times 10^{-3}$	$2.1 \times 10^{-3}$

The Sydney Basin bioregional assessment (Heron et al 2018) reports 370 packer tests conducted in the HBSS around the Sydney metropolitan area. The scaled geometric mean hydraulic conductivity of the HBSS ranges from 0.5 m/day at the surface to 0.01 m/day at 50 m depth (Heron et al 2018). The conceptual understanding that the hydraulic conductivity of the HBSS unit decreases with depth is commonly simulated. Hume Coal (EMM 2018) presented values of the HBSS ranging between  $5 \times 10^{-3}$  to  $6 \times 10^{-1}$  m/d.

In the Sydney Basin bioregional assessment (Heron et al 2018), the Ashfield shale unit is reported to vary between 3 and 10 m in thickness, with hydraulic conductivities between 0.01 and 0.08 m/day, and behave as an aquitard.

Based on EMM's experience in the Sydney Basin geological environment, and from other regional modelling work, values of hydraulic conductivity and storage properties were used to guide the values applied in the model (EMM 2020b, EMM 2020c).



Due to the method of the hydraulic testing (slug tests) in the bore installation and testing program, site specific storage properties could not be estimated. Rau et al (2018) specifies plausible ranges for specific storage as between  $2.3 \times 10^{-7}$  and  $1.3 \times 10^{-5}$  m<sup>-1</sup>.

# 3 Numerical modelling

## 3.1 Model design

### 3.1.1 Software

A numerical groundwater flow model was developed using MODFLOW-USG (Panday et al 2013). This code contains additional capabilities over previous releases of MODFLOW. The formulation allows for the development of an unstructured, highly refined model mesh over areas of interest and larger, less computationally-demanding, model cells further away. In addition, MODFLOW-USG contains an optional Newton-Raphson formulation which improves model stability for processes involving the drying and rewetting of model cells.

The Groundwater Vistas 7 (ESI 2017) graphical user interface (GUI) was used to build and run the model, and to conduct some components of post-processing of the simulation results.

### 3.1.2 Equivalent porous medium

The model assumes an equivalent porous medium (EPM) approach for each HSU. This approach is commonly used in regional groundwater modelling of fractured rock hydrogeological environments. The EPM method assigns bulk hydraulic properties for a HSU and treats the rock (and pathways) as if it were a single porosity medium such as a granular aquifer (Anderson and Woessner 1991). This approach was adopted for the following reasons:

- in order to replicate regional hydraulic gradients, a simplified regional model was needed; and
- dual porosity models require significant detail on fracture/joint orientations, spacing and apertures. These details are not available for the geology in the model domain.

### 3.1.3 Model domain and spatial discretisation

The groundwater model domain was selected based on size of the quarry, publicly available groundwater level data, and the assumption that the Nepean River is a gaining river in the area of interest. The domain extends approximately 1.5 km to the west of the project. To the east, the model is bounded by the Nepean River. The model domain to the north and south uses the natural curves of the Nepean River and no flow boundaries perpendicular to the river, consistent with groundwater flow toward a gaining river. Groundwater monitoring data indicate that the Nepean River is lower than groundwater levels in the regional groundwater system on both sides of the river and, hence, groundwater converges at the river. Therefore, the river is typically gaining and groundwater beneath the river flows vertically upward, not across the river, making this an ideal model boundary. The model domain covers an area that is approximately 21.8 km<sup>2</sup>. The domain is adequately large enough to:

- encompass all of the Stage 8 quarry areas;
- include the inferred hydrogeological boundary conditions influencing groundwater flow; and
- encompass changes to the groundwater system in relation to quarrying and site operation.

AlgoMesh, with default 'high' quality settings, was used to create a Voronoi polygon mesh incorporating relevant site features and locations. This discretisation method is numerically efficient and can handle complex geometries. The resultant mesh has approximately 32,000 cells per layer. Regional cells have a maximum size of approximately 250 m across, with cell sizes refined down to approximately 2 m to 3 m in areas of refinement, specifically between the Stage 8 quarry and the Nepean River. The model mesh has progressive refinement from large regional cells to small cells around the area of interest. The model domain and mesh are presented in Figure 3.1 to Figure 3.4.

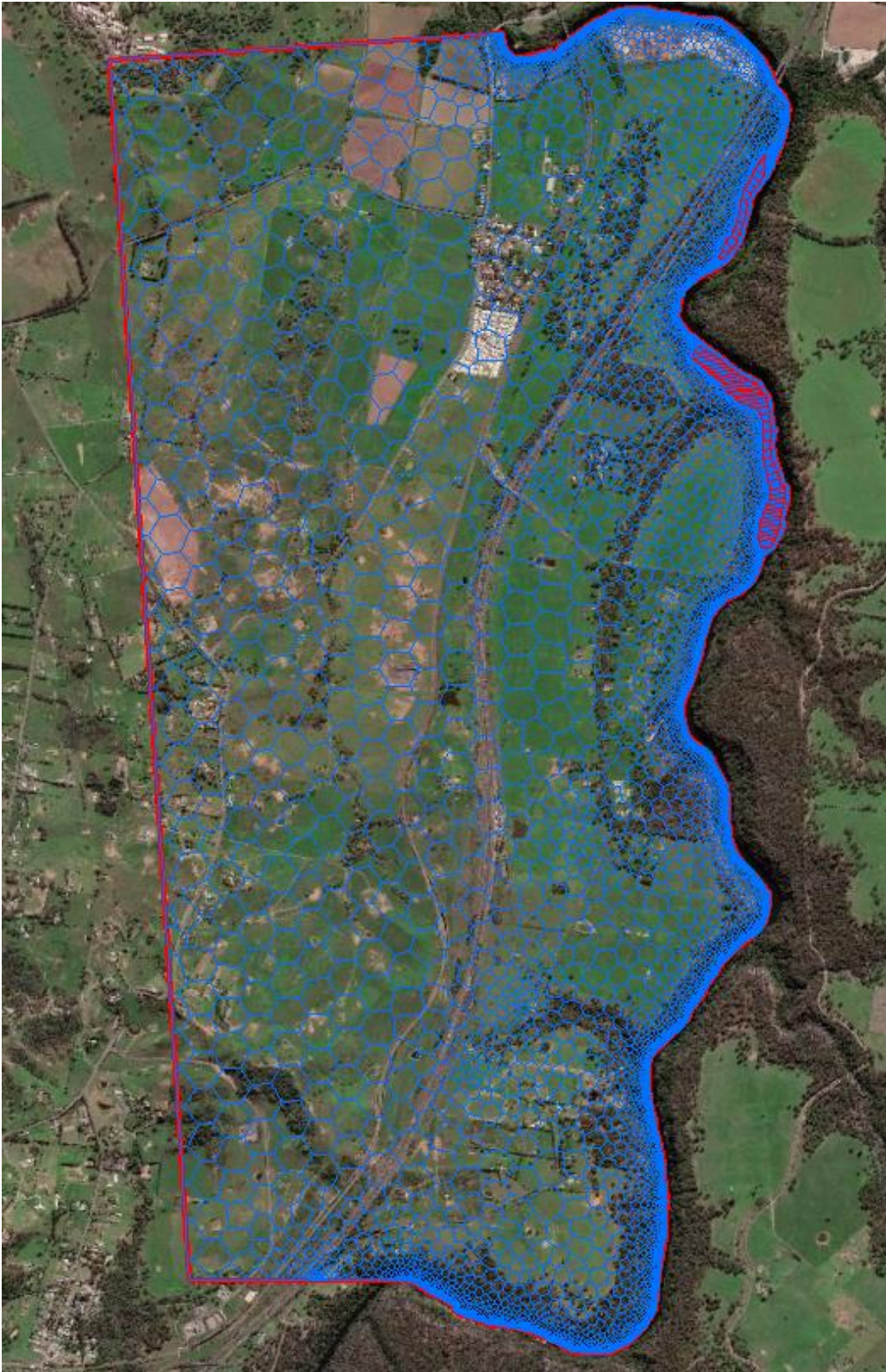


Figure 3.1 Groundwater model domain with Voronoi cells

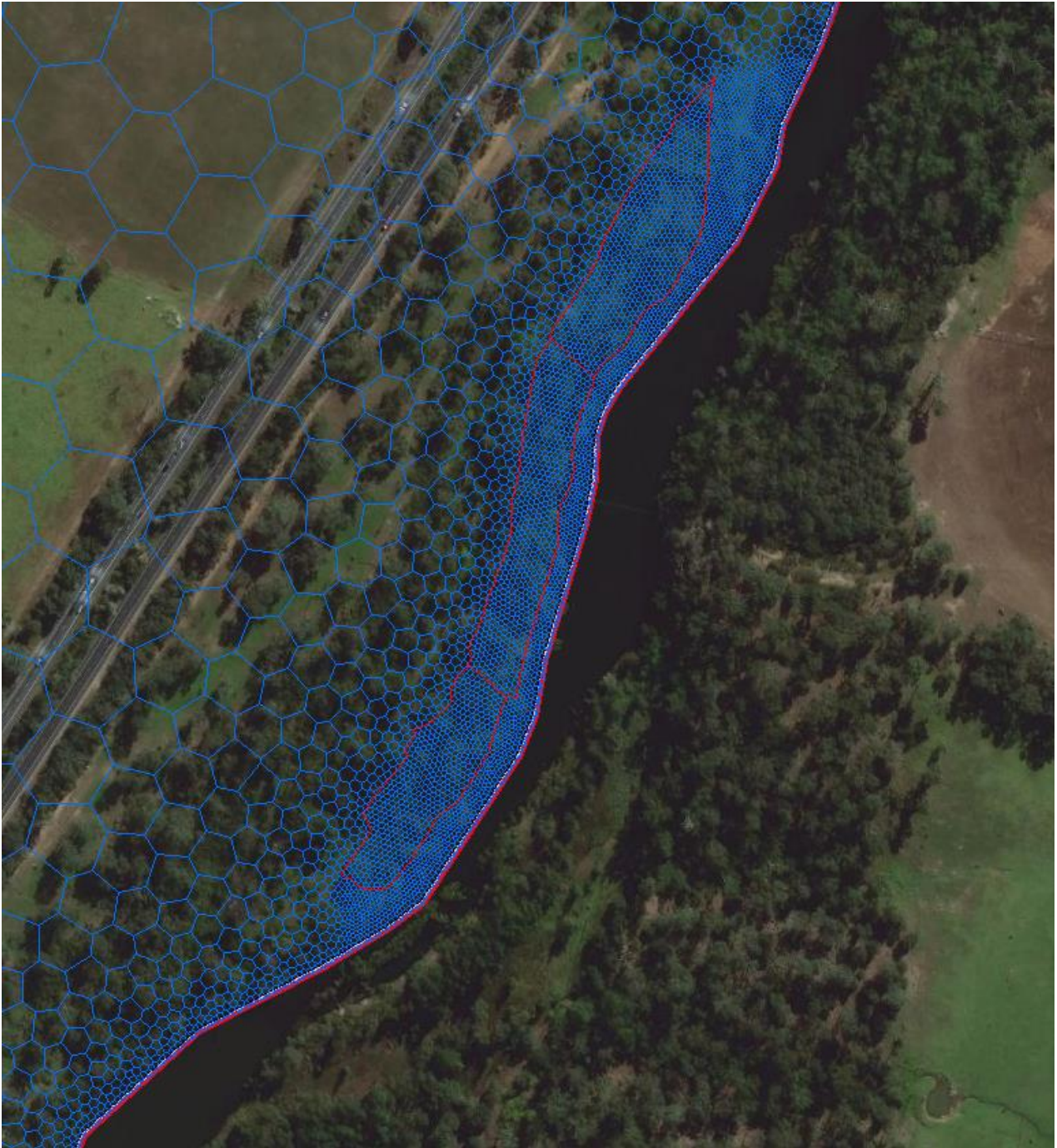


Figure 3.2 Stage 8 area with Voronoi cells (northern area)

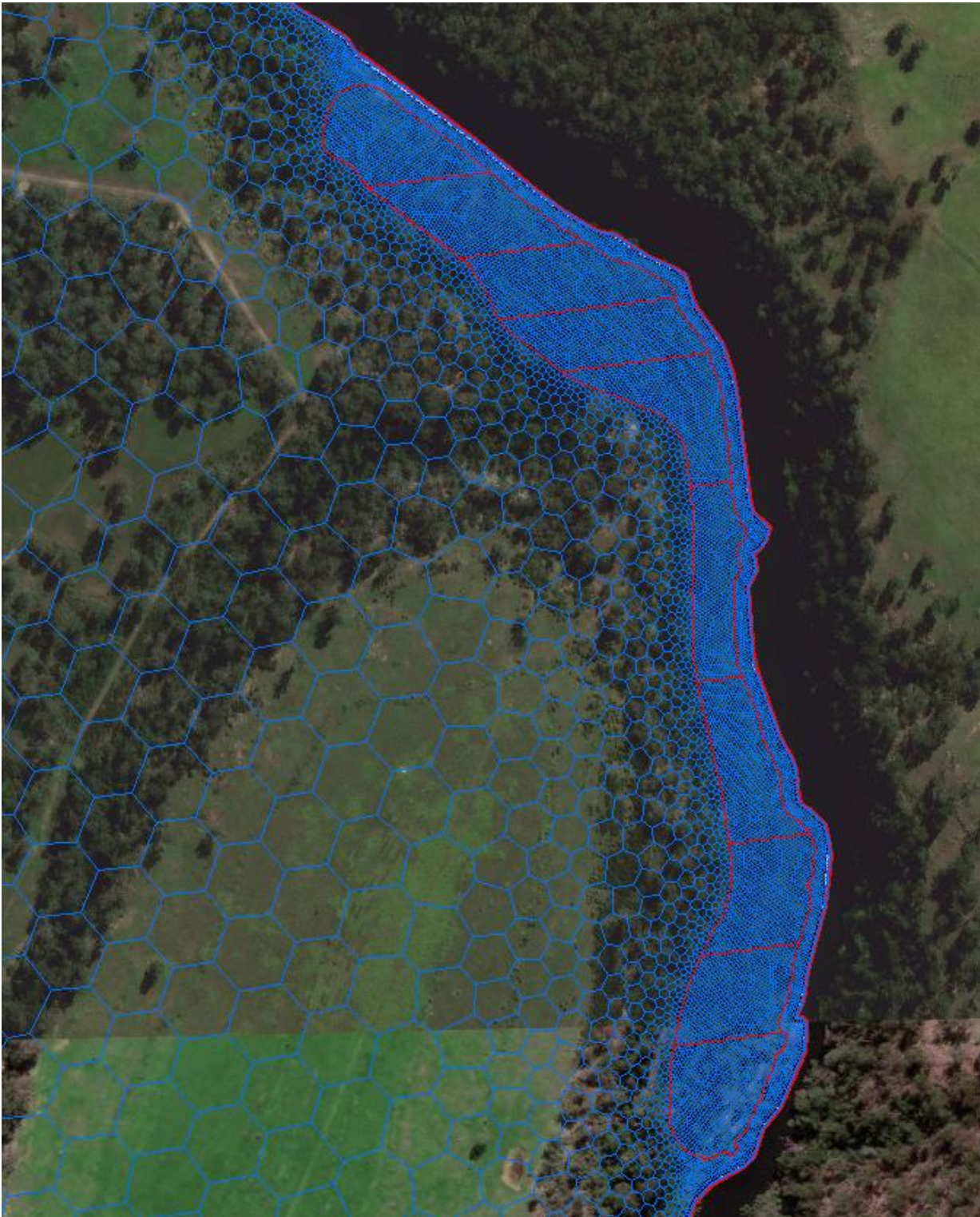
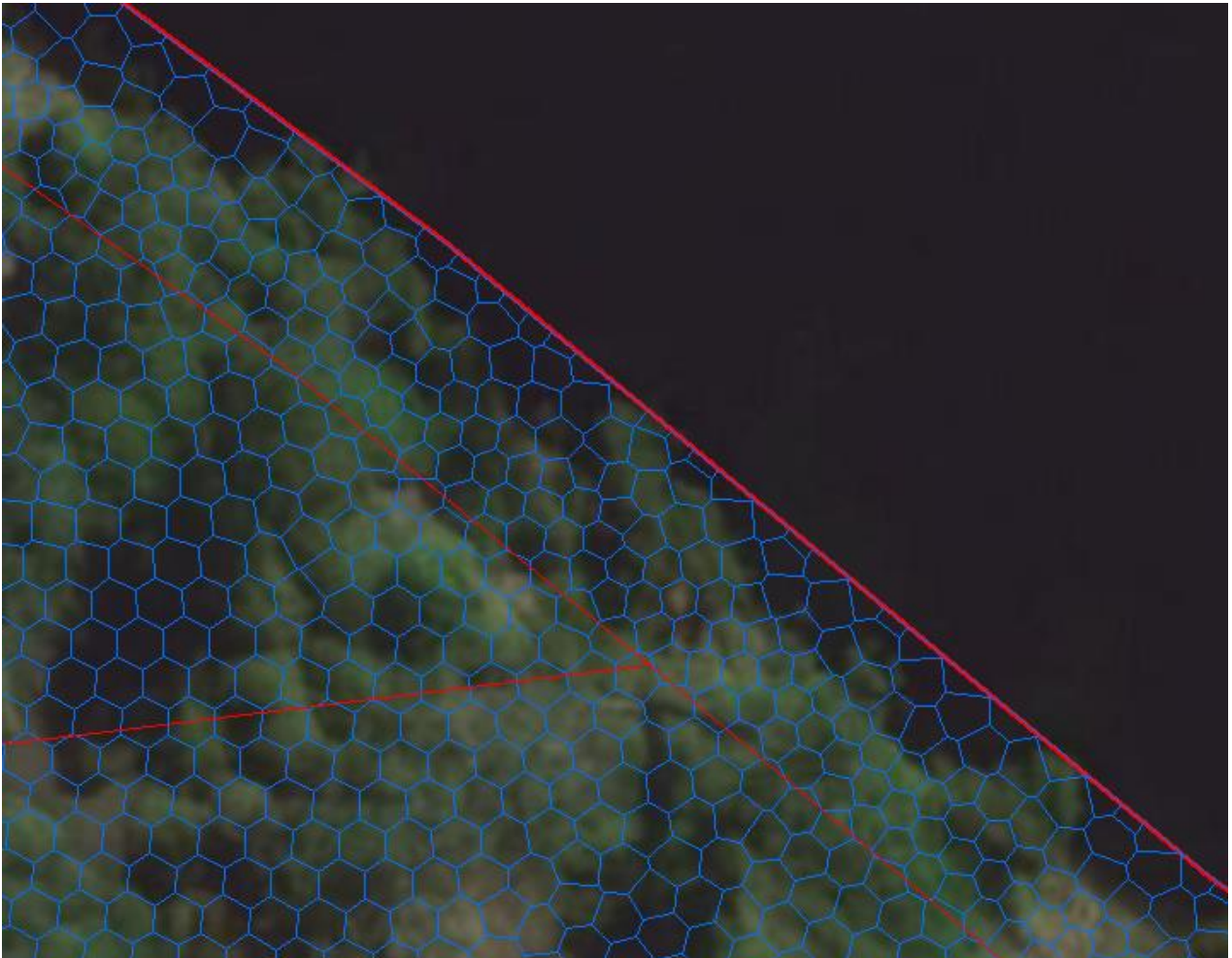


Figure 3.3 Stage 8 area with Voronoi cells (southern area)



**Figure 3.4** Voronoi cells between Nepean River and Quarry area

### 3.1.4 Model layers

Four model layers were employed to represent the HSUs and quarry operations (Table 3.1).

**Table 3.1 HSUs and model layers**

HSU Name	Groundwater model layer <sup>#</sup>	Comments	Quarry Infrastructure
Alluvium (above base of quarry)	Layer 1 – unconfined aquifer	As the area of interest is based on the removal of alluvium sediments, layer 1 of the groundwater model simulates quarry pits.	Present
Alluvium (below base of quarry)	Layer 2 – unconfined aquifer	Present over the entire model domain in various thicknesses- main conduit to water affecting activities.	Not included
Ashfield Shale	Layer 3 – aquitard	Present in the western area of the model domain.	Not included
Hawkesbury Sandstone	Layer 4 – aquifer	Regionally extensive.	Not included

<sup>#</sup> denotes model layer near Quarry area – groundwater model layers may be combined regionally based on HSUs and available information.

Model layer elevations were developed using drill hole data sourced from Menangle Sand and Soil and publicly available drill hole databases. The top of the model is set at topography using the ELVIS 1 second (~30 m) dataset from Geoscience Australia and the base of the model is set 150 m below the generated top of HBSS surface.

MODFLOW-USG allows model layers to pinch out and be deactivated. The alluvium is divided into two layers to represent the alluvium above the base of the quarry pits (62 mAHD) and the alluvium below the base of the pits. These layers pinch out a) where alluvium is not present and/or b) where the alluvium is not present below the proposed base of excavation. The Ashfield Shale layer pinches out towards the Nepean River, where it is mapped as not being present.

The base of the active extraction area is proposed as 62 mAHD and therefore 1 m above the long-term average watertable elevation in the alluvium (during the normal low flow level of the river). For most of the time (>98% of the time when normal river flow conditions occur), the excavations will be 1 m above the watertable and will not intercept groundwater.

### 3.1.5 Temporal discretisation

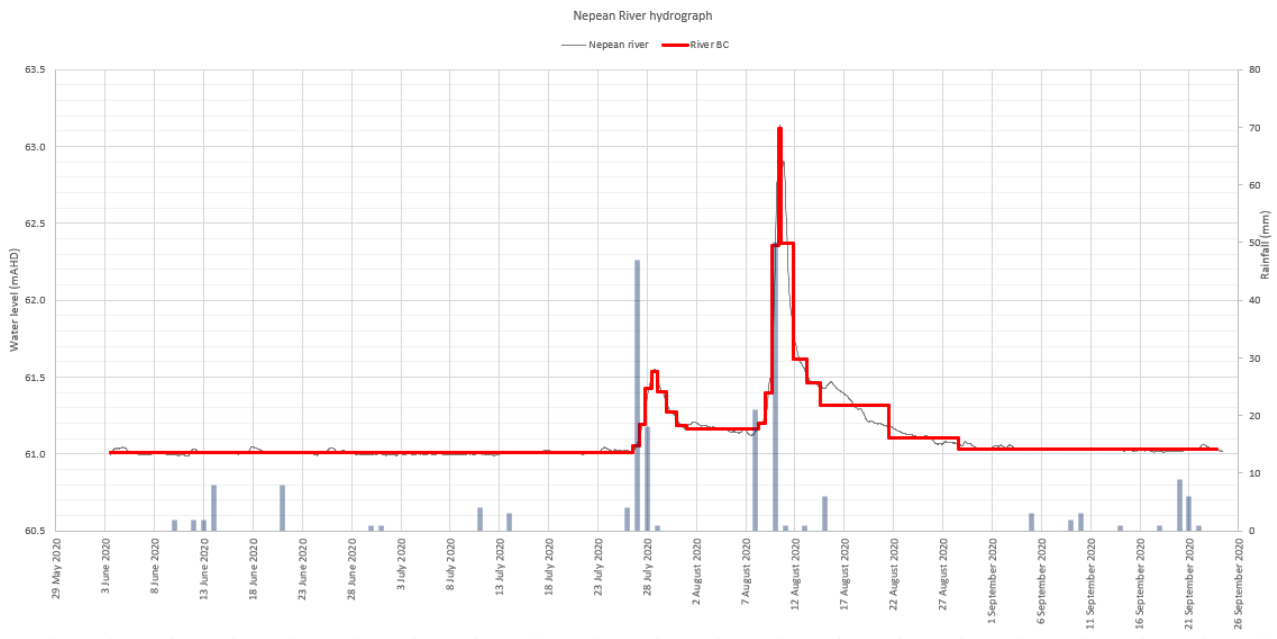
Stress periods used for history matching period are outlined in Table 3.2. The model employs an initial steady state stress period followed by a series of transient stress periods over which the Nepean River stage is varied in line with measured stage over the history matching period. River stage is the only time-varying stress in the history matching period and, hence, is the driver for design of stress periods. Figure 3.5 illustrates measured Nepean River level, the defined stress periods and modelled Nepean River boundary condition elevation.



**Table 3.2 Model stress periods**

Stress period	Duration	Description	Dates	River stage (mAHD)
1	Steady state (1 day)	Develops initial pre-project conditions in response to modelled hydraulic parameters and boundary conditions.	Prior to recording of any data	Constant at 61.009
2	53 days	History matching period, steady river levels	from 3 June 2020 to 26 July 2020 (12:00)	Use average river value of 61.009 over period
3-5	0.6667 days each	History matching period, increasing river levels	from 26 July 2020 (12:00) to 28 July 2020 (12:00)	Use average river value over stress period times (gradual increase 61.053, 61.194, 61.428)
6	12 hours total – 0.5 day	History matching period, steady river levels (peak)	from 28 July 2020 (12:00) to 28 July 2020 (24:00)	Use average river value over stress period times (steady value 61.538)
7-9	1 day each	History matching period, decreasing river levels	from 28 July 2020 (24:00) to 31 July 2020 (24:00)	Use average river value over stress period times (gradual decrease 61.405, 61.271, 61.185)
10	7.25 Days	History matching period, steady river levels	from 31 July 2020 (24:00) to 8 August 2020 (06:00)	Use average river value of 61.165 mAHD over period
11-13	0.708 day each	History matching period, increasing river levels	from 8 August 2020 (06:00) to 10 August 2020 (12:00)	Use average river value over stress period times (gradual increase 61.203, 61.4, 62.359)
14	0.1667 day	History matching period, steady river levels (peak)	from 10 August 2020 (12:00) to 10 August 2020 (14:00)	Use average river value over stress period times (steady value 63.118)
15-17	1.333 days each	History matching period, quickly decreasing river levels	from 10 August 2020 (14:00) to 14 August 2020 (14:00)	Use average river value over stress period times (gradual decrease 62.373, 61.614, 61.465)
18-19	7 days each	History matching period, gradually decreasing river levels	from 14 August 2020 (14:00) to 28 August 2020 (14:00)	Use average river value over stress period times (gradual decrease 61.318, 61.109)
20	26.25 days	History matching period, steady river levels	from 28 August 2020 (14:00) to 23 September 2020 (14:00)	Use average river value over stress period times (steady value 61.034)

The ATS package is used to adaptively adjust time step lengths within each stress period. An initial time step of  $1 \times 10^{-6}$  days was defined. The maximum timestep length was 2.5 days in stress period 20.



**Figure 3.5 Measured and modelled Nepean River stage**

### 3.1.6 Boundary conditions

#### a General head boundary condition

The General Head Boundary (GHB) package was employed to assigned boundary conditions to model cells along the western edge of the model domain in the HBSS layer to represent regional groundwater inflow to the model domain. Hydraulic head was set to 75 mAHD in line with measured groundwater elevations in the HBSS (see Figure 3.6). A sufficiently high conductance value was assigned such that it would not act as a limit to flow in and out of the model domain, effectively acting as a constant head boundary condition.



Figure 3.6 Model boundary conditions and regional groundwater levels

#### b River boundary condition

The River (RIV) package was used to simulate the Nepean River in model layers 1 and 2. The assigned river stage and timing are presented in Table 3.2. River conductance was assigned a value of  $80 \text{ m}^2/\text{d}$ , based on an approximate river width of 40 m, the average cell length parallel to the river of 2 m and riverbed thickness of 1 m and a vertical hydraulic conductivity of  $1 \text{ m}/\text{d}$ . Figure 3.5 shows the modelled river stage and the measured water levels of the Nepean River over the history-matching period.

#### c Evapotranspiration and recharge

As shown in site groundwater level hydrographs in Appendix A, periods of local rainfall do not significantly affect the groundwater levels at the site. Therefore, climate interaction via evapotranspiration and recharge from rainfall are not simulated.

# 4 History matching and sensitivity analysis

## 4.1 Approach

The numerical groundwater flow model was calibrated in two modes. The initial steady state stress period was used to calibrate the model to regional groundwater levels. A single indicative average unimpacted hydraulic head value for each observation location was used to quantify model performance. Following the initial steady state stress period, transient stress periods were used to calibrate the model to the key process of interest: the response of groundwater levels near the quarry to changes in Nepean River level. No measurements of groundwater fluxes to or from the Nepean River were available to inform calibration and, hence, history-matching was to hydraulic head data only.

## 4.2 Hydraulic properties

Hydraulic conductivity property ranges were guided by the ranges measured at the project site (refer Section 2.2) and from other projects in similar geological environments.

In the groundwater model, the hydraulic properties of the Ashfield Shale were not modified from a horizontal hydraulic conductivity of  $1 \times 10^{-4}$  m/d and  $1 \times 10^{-5}$  m/d for a vertical hydraulic conductivity. The adopted values are lower than reported in the bioregional assessment (Heron et al 2018), however the values are consistent with the conceptual understanding and with other reported (modelled) values in the region.

Site storage properties were not evaluated during the EMM drilling completion report, as these can only be calculated during aquifer pumping tests where data from observation bores are available. Representative values from literature were used. Specific storage values were constrained between the physical limits presented by Rau et al (2018) of  $2.3 \times 10^{-7}$  to  $1.3 \times 10^{-5}$ . A value of  $5 \times 10^{-6}$  was adopted. Specific yield values for assigned similarly, with sand typically around 20%; the Ashfield Shale is approximately 1%; and the HBSS is typically slightly lower at 0.5 to 0.8% (EMM 2018).

During the history-matching process, an additional model layer was added to aid the matching of the data observed at BH01-D. The HBSS was divided into an upper and lower system, where the upper layer was denoted as the upper 10 m of the HBSS unit.

During the automated history-matching process it was observed that some hydraulic parameters were trending towards values outside of their conceptual range. However, the parameters were constrained to plausible limits. The calibrated hydraulic parameter values are presented in Table 4.1.

**Table 4.1**      **Calibrated hydraulic parameter values**

Layer	Geological Unit	Hydraulic conductivity - horizontal	Hydraulic conductivity - vertical	Specific yield
1	Alluvium	5 m/d	0.1 m/d	0.05
2	Alluvium	5 m/d	0.1m/d	0.05
3	Ashfield Shale <sup>#</sup>	1x10 <sup>-4</sup> m/d	1x10 <sup>-5</sup> m/d	0.01
4	Upper Hawkesbury Sandstone	5 m/d	0.1 m/d	0.001
5	Lower Hawkesbury Sandstone	0.1 m/d	0.07 m/d	0.001

# - denotes that parameters were not adjusted during history matching process.

### 4.3 History-matching performance

Calibration performance was evaluated in several ways. Modelled regional groundwater contours and scaled root mean square (SRMS) error were used to evaluate the history-matching performance, in addition to the mounding of the watertable observed at the site bores (in response to high river flow events).

Modelled and measured hydrographs at the selected monitoring bores were used to quantify the ability of the model to replicate responses to changes in Nepean River level. Given that change in groundwater level is the key aspect of transient calibration, SRMS error was quantified for hydraulic head relative to steady state modelled head at each of the bores. The transient response to the changes in river levels was evaluated at the five project monitoring bores.

The history-matching performance of the groundwater model was evaluated for the transient response to the measured Nepean River level at the Menangle weir over approximately 3 months of monitoring. Figure 4.1 shows modelled and measured hydraulic head at the site-specific monitoring bores (BH01 to BH04). Figure 4.2 shows modelled and measured mounding of groundwater levels relative to the pseudo steady state period over the first ~1.5 months of measurements.

The calculated hydraulic head SRMS for the history-matching model is 22.7%. Figure 4.3 shows a scatter plot of modelled versus measured hydraulic head. Modelled heads are typically below the measured heads. It is expected that an improved match to measured groundwater behaviour will be achieved when the model is updated when 12 months of monitoring data are available.