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Dixon Sand (Penrith) Pty Ltd

HAERSES ROAD QUARRY EXTRACTION AREA MODIFICATION

Response to Submissions

FINAL

June 2017

Dixon Sand (Penrith) Pty Ltd

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Response to Submissions

FINAL

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on behalf of
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Table of Contents

1.0 Introduction 1

1.1 Haerses Road Quarry 1

1.2 The Modification 1

1.3 Change to Modification Extraction Sequence 2

1.4 Submissions Received 5

1.5 Report Structure 5

2.0 Agency Submissions 6

2.1 Department of Planning and Environment 6

2.1.1 Biodiversity 6

2.1.2 Traffic 6

2.1.3 Visual Impacts 7

2.1.4 Noise 15

2.1.5 Agency and Public Submissions 15

2.2 Office of Environment and Heritage 15

2.2.1 Biodiversity 15

2.2.2 Aboriginal Cultural Heritage 17

2.3 The Hills Shire Council 17

2.4 Department of Primary Industries – Water 18

2.5 Environment Protection Authority 19

2.5.1 Air Quality 19

2.5.2 Noise 21

2.6 Roads and Maritime Services 22

2.7 Office of Environment and Heritage – Heritage Council 22

2.8 Department of Industry – Resources and Energy 23

3.0 References 24

Figures

Figure 1.1 Locality Map 3

Figure 1.2 Proposed Modification 4

Figure 2.1 Visual and Transect Locations 9

Figure 2.2 Visual Road Locations 10

Figure 2.3 Visual Location 3 11

Figure 2.4 Visual Location 4 12

Figure 2.5 Visual Location 6 13

Figure 2.6 Visual Transects 14

Appendices

Appendix 1	Matters of National Environmental Significance
Appendix 2	Traffic Impact Assessment
Appendix 3	Groundwater
Appendix 4	Air Quality Assessment
Appendix 5	Historic Heritage

1.0 Introduction

This document provides a response to the issues raised in submissions made during the public exhibition of the Environmental Assessment (EA) for the proposed Haerses Road Quarry Extraction Area Modification (the Modification). It has been prepared on behalf of Dixon Sand (Penrith) Pty Limited (Dixon Sand) in response to a request from the Secretary of the Department of Planning and Environment (DP&E) in accordance with Clause 85A of the Environmental Planning and Assessment Regulation 2000.

Dixon Sand is seeking approval for the proposed changes to Haerses Road Quarry through a modification to the development consent (DA 165-7-2005) in accordance with Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The modification, if granted, will be the first modification of the Haerses Road Quarry development consent.

The EA was exhibited from 12 October 2016 to 10 November 2016. This report outlines Dixon Sand's response to matters raised in the submissions.

1.1 Haerses Road Quarry

Dixon Sand has been operating the Haerses Road Quarry, located on Haerses Road at Maroota NSW (refer to **Figure 1.1**), since consent was granted in 2006. The resource contains a Tertiary deposit of fluvial and eluvial sediments that are suited for use as concrete and specialty sands.

The development consent currently allows for extraction of 7 million tonnes from the site over 25 years at a rate of 250,000 tonnes per annum (tpa). The consent also allows for hauling of 190,000 tpa of screened sand to the processing facility at Dixon Sand's Old Northern Road Quarry located approximately two kilometres to the north, and hauling of 60,000 tpa of screened sand direct to local and regional markets.

1.2 The Modification

The proposed Modification involves increasing the extraction area to quarry a friable sandstone resource in addition to the tertiary sand deposit as well as including provision of additional plant and equipment at the site to provide for the processing of the friable sandstone and tertiary material. The key components of the proposed Modification include:

- new 30 year quarry life from 2016 to 2046 based on the extent of the available resource
- increasing the extraction area by approximately 19 hectares to allow extension into the friable sandstone resource within Lots 177 DP 752039 and 216 DP 752039 (refer to **Figure 1.2**). The friable sandstone would be extracted using similar methods and equipment as currently used at the site, being a dozer, excavator, trucks and a loader
- addition of mobile crushers (one jaw crusher and one rotary crusher) to break sandstone clumps prior to screening using the existing dry screening plant
- addition of a mobile wet plant to wash the crushed friable sandstone and tertiary material to remove clay fines from the sand product. This will allow processing at the Hearses Road site as opposed to necessarily having to transport it to the Dixon Sand's Old Northern Road Quarry for processing

- importation of up to 100,000 tpa of clean recycled Virgin Excavated Natural Material (VENM) and Excavated Natural Material (ENM). The VENM and ENM would be reprocessed by blending with product from either the Haerses Road Quarry or Old Northern Road Quarry prior to sale. VENM or ENM would also be used to achieve the final landform where there is a shortfall in overburden or fines from the washing process

- utilise the existing approved traffic movements between Old Northern Road and Hearses Road quarries to allow for blending of speciality sands, including VENM and ENM. No new traffic movements would be generated by the proposed modification and there would be negligible change to traffic generation between quarries as a result of the modification

- use of mobile washing and processing plant on site, utilising water from existing water licence provisions

- installation of additional detention basins and associated water management infrastructure

- establishment of site office, workshop and weighbridge

- progressive rehabilitation of the proposed additional extraction area.

1.3 Change to Modification Extraction Sequence

Following discussions with government agencies in relation to groundwater monitoring to confirm impact assessment predictions, Dixon Sands has agreed to change the extraction sequence from that identified in the EA. With reference to **Figure 1.2**, the original extraction sequence was to commence in Cell 1A and then subject to groundwater monitoring in the 'B' series of cells confirming the predictions of the Groundwater Impact Assessment, move into Cell 1B and then progress north moving from 2A to 2B and so on.

To allow for additional time to monitor for any changes to groundwater conditions, the currently proposed extraction sequence (refer **Figure 1.2**) is as follows:

Extraction Sequence
1a
2a
1b (subject to groundwater monitoring)
2b (subject to groundwater monitoring)
3a
3b (subject to groundwater monitoring)
4a
4b (subject to groundwater monitoring)
5a
5b (subject to groundwater monitoring).

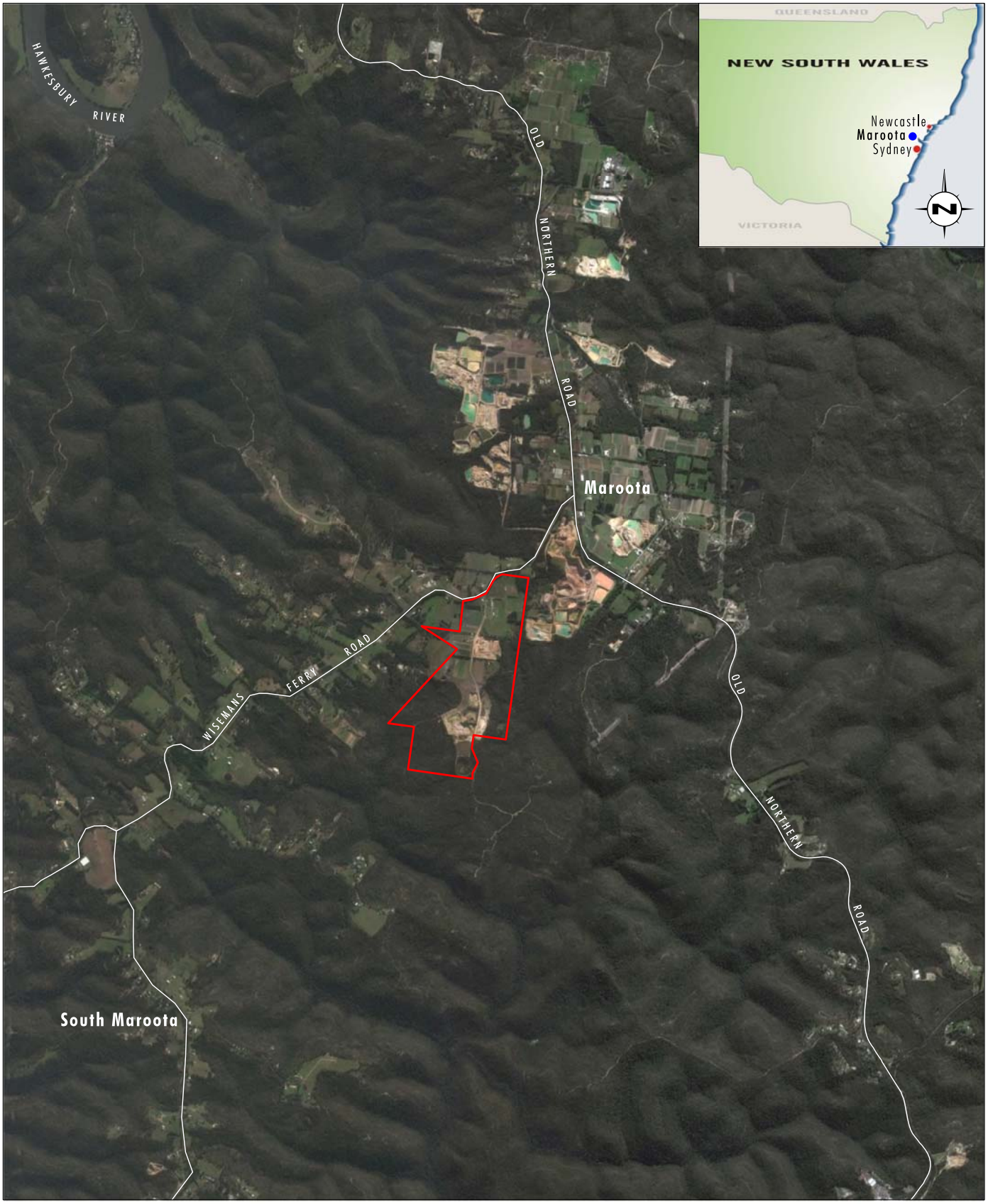


Image Source: Google Earth (2014)

0 0.5 1.0 2.0km
1:50 000

Legend

Haerses Road Quarry Project Site

FIGURE 1.1

Locality Map

File Name (A4): R06/3479_076.dgn
20160627 14.24

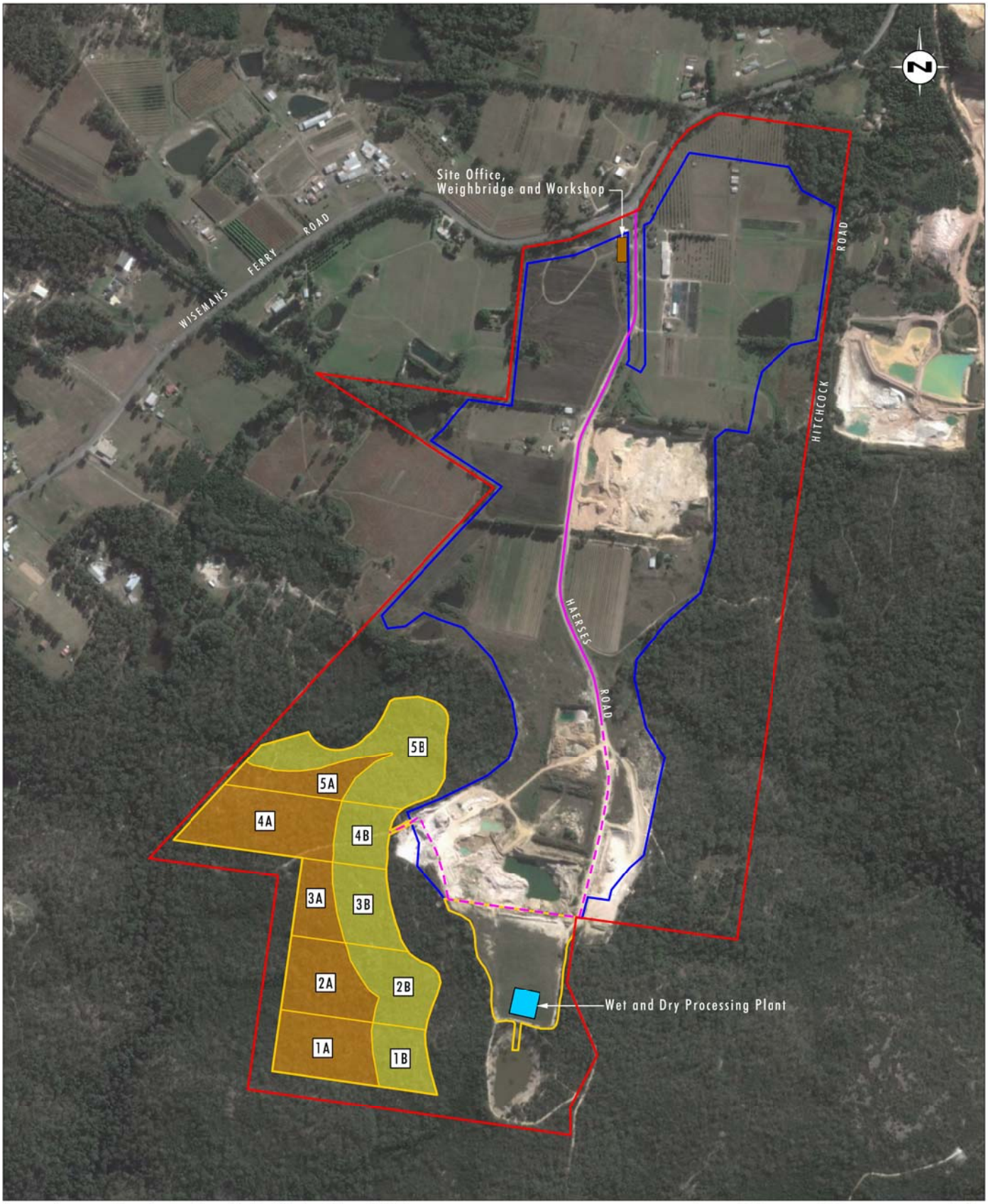


Image Source: Google Earth - DigitalGlobe (May 2016)
Data Source: Mc Kinlay Morgan & Associates Pty Ltd (2014)

0 100 250 500m
1:10 000

Legend

- Haerses Road Quarry Site
- Approved Extraction Area
- Modification Disturbance Area
- Proposed Extraction Area A
- Proposed Extraction Area B
- [1] Extraction Cell Number
- Site Office, Weighbridge and Workshop
- Wet Processing Plant
- Indicative Unsealed Haul Road
- Sealed Haul Road

FIGURE 1.2

Proposed Modification

File Name (A4): R06/3479_091.dgn
20170531 11.11

It is noted that this sequence may change over the life of the quarry in response to the results of ongoing groundwater monitoring. Any changes to the sequence will be identified through the Annual Review for the quarry.

1.4 Submissions Received

There were no submissions received from community members on the Modification.

A total of eight submissions were received during the EA exhibition period. All of the submissions were from NSW government agencies being:

- DP&E
- Office of Environment and Heritage (OEH)
- The Hills Shire Council
- Department of Primary Industries (DPI)
- Environment Protection Agency (EPA)
- Roads and Maritime Services (RMS)
- Office of Environment and Heritage – Heritage Council
- Department of Industry – Resources and Energy (DRE).

Matters raised in these submissions are addressed in detail in **Section 2.0** of this report.

1.5 Report Structure

This response to submissions report has been prepared by Umwelt (Australia) Pty Limited (Umwelt) on behalf of Dixon Sand to address the key issues raised through the submissions received on the EA through the public exhibition period. For each issue, the theme of the issue raised is noted in a text box, with a response provided following each text box.

2.0 Agency Submissions

2.1 Department of Planning and Environment

2.1.1 Biodiversity

a. The BAR must include a separate chapter which addresses each of the specific requirements outlined by the Commonwealth Department of Environment in Attachment 1 of DPE's letter dated 12 February 2016.

The requirements outlined by the Commonwealth Department of Environment in Attachment 1 of DPE's letter dated 12 February 2016 have been addressed in **Appendix 1** of this report.

b. The BAR must include a more detailed Biodiversity Offset Strategy, which conforms to the minimum standards specified in the Framework for Biodiversity Assessment, NSW Biodiversity Offsets Policy for Major Projects, and addresses the issues raised by OEH in its submission.

Dixon Sand is currently in discussion with DPE and OEH regarding the Biodiversity Offset Strategy in relation to the progressive retirement of the credits required for the Modification. As agreed with DPE, an addendum to this response to submissions report will be provided following finalisation of the offset strategy.

2.1.2 Traffic

The Department considers that the EA does not adequately address the relationship between the Haerses Road and Old Northern Road sites, and the potential traffic impacts of the proposed modification. The development consent for the Old Northern Road Quarry states that the combined daily truck movements at that site shall not exceed 180. This includes up to 28 inbound trucks from the Haerses Road Quarry. The proposed modification would allow 100 percent of outbound trucks from the Haerses Road site to travel direct to market. Without incoming product from the Haerses Road site, the Old Northern Quarry could then increase truck movements to and from the site, without any modification to the development consent, and without any assessment of the associated traffic impacts within the locality.

It is noted that the Modification application relates to Hearses Road and does not propose any change to the inbound and outbound traffic movements associated with the Old Northern Road Quarry. It is also noted that the scenario indicated by DPE in the above comment would result in the highest number of traffic movements associated with Dixon Sands local quarry operations. The Traffic Impact Assessment has been revised to include the potential impact of additional truck movements within the locality to assess the scenario of 100% of outbound daily truck movements from the Haerses Road site travelling direct to market and a full 180 daily truck movements to/from the Old Northern Road site. The revised report is provided as **Appendix 2**; refer specifically to Sections 4.1, 4.3 and 4.4.1 of the revised traffic assessment.

The revised assessment identified that an additional 28 truck movements per day (inbound and outbound) associated with the Old Northern Road Quarry will have minimal impact on the daily traffic movements in the immediate locality of the subject site. The additional 28 truck movements in either direction on Old Northern Road represent a less than 4% increase in the total daily traffic flows and is well within the acceptable limit for local roads in this location.

The Department considers that this issue may be addressed by modifying the Old Northern Road Quarry DA 250-09-01. However, any such application would best be assessed in conjunction with the present modification application.

As noted above, no changes are proposed to the trucks movement into and out of the Old Northern Road site as a result of the Modification; however, it is acknowledged that the Modification, may, depending on customer requirements, result in modified traffic flows across the two quarries, however these are within the existing truck movements under respective existing consents. This scenario has been assessed as identified above and has concluded that total traffic volumes are well within the capacity of the existing road network. As Dixon Sand do not propose any change to the existing total of 180 combined daily truck movements and trucks from the Haerses Road site may still travel to the Old Northern Road if the Modification is approved, Dixon Sand do not propose to modify DA 250-09-01.

2.1.3 Visual Impacts

Section 6.9.2 of the EA states that the visual impacts of the extended extraction area would be mitigated, to some extent, by a combination of earth bunds and/or acoustic fencing. However, no consideration is given to the visual impact of these structures themselves, which the Department notes would be up to seven metres in height. Given the scale of the proposed works and the topography of the site relative to nearby receivers, DPE requests a more detailed visual assessment, including photomontages.

Further visual assessment including three dimensional terrain modelling has been undertaken for the Modification. The purpose of the further assessment was to determine if there were any surrounding residences or public viewing locations from which the additional extraction area, earth bunds and/or acoustic fencing and processing plant would be visible from the surrounding landscape and residences.

Methodology

Using LiDAR data a three dimensional digital model eight kilometres by eight kilometres was created, centred on the proposed extraction area. To most accurately determine the points from which the Modification would potentially be visible, the digital model incorporated a combined terrain (ground surface) and vegetation canopy layer. Using a combined terrain and canopy layer allows the screening afforded by vegetation to be taken into account when determining the line of sight visibility between two points.

The detailed terrain model of the area surrounding the Modification was examined to determine potential viewing locations at which to run a detailed radial analysis. The radial analysis identifies the parts of the terrain that are visible (and the Modification if visible) from the selected viewing location. Three publicly accessible locations on Wisemans Ferry Road were selected where motorists potentially have a view to the proposed extraction area (refer **Figure 2.1**).

Three dwelling locations were also selected to the west and south of the proposed extraction area based on their proximity (closest residences with potential views) and position (elevated position) within the landscape (refer **Figure 2.1**).

Transects from the three dwelling locations towards the highest point within the Modification area, and the wet and dry processing plant location, were created to determine whether there are line of sight views from these locations. The locations of the transects are shown on **Figure 2.1**.

Visual Assessment

Residences

The radial analysis did not identify any surrounding residences that are predicted to have views of the additional works associated with the Modification including the additional extraction area, proposed earth bunds, acoustic fencing, or the wet and dry processing plant.

The closest residences to the additional extraction area are located on Wisemans Ferry Road to the west. As shown in **Figures 2.3** and **2.4** the radial analysis identifies that views from these residences are restricted to the areas immediately surrounding the residence due to the screening afforded by vegetation and there will be no views from these residences.

Figure 2.5 illustrates the extent of views from a dwelling located to the south of the additional extraction area on Days Road. Views are largely restricted to the cleared areas surrounding the dwelling before there is substantial screening provided from the surrounding bushland. There are now views of the Modification from this location.

Figure 2.6 shows the visual transects from a direct 'line of sight' from a point 1.7 m above ground level (representing eye height) immediately outside of the dwelling houses at assessment locations 3, 4 and 6 looking towards the highest point within the Modification area which would be the stacker tower within the processing area at 12 m above ground level. The cross sections confirm the findings of the radial analysis which is that no views of the Modification will occur from these residences due to the screening afforded by the topography and/or vegetation between the potential viewer and the processing area. As there will not be views into the Modification area and its component elements from the nearest potentially affected view points photomontages have not been produced.

Public Roads

The results of the radial analysis for the publicly accessible view points along Wisemans Ferry Road are shown in **Figure 2.2**. From Location 1 at the intersection of Haerses Road and Wisemans Ferry Road, which is the site entry point, there are some restricted views into the site of the existing active and approved parts of the quarry in the north of the site. Existing trees screen views further south towards the additional extraction area and processing area proposed as part of the Modification. That is, the proposed additional extraction area, bunds and acoustic fences and the processing area are not visible.

Location 2 on Wisemans Ferry Road is located approximately 500 metres to the west of the site and north-west of the additional extraction area and processing area. From this location views to the site are screened by the existing substantial areas of vegetation on the properties on the southern side of Wisemans Ferry Road which extend up to the boundary of the site and there are no views of the site (refer to **Figure 2.2**).

Location 5 on Wisemans Ferry Road is approximately 1.1 km west of the additional extraction area and was selected for further assessment as based on topography alone motorists travelling east along Wisemans Ferry Road could potentially have views straight ahead to the additional extraction area.

The radial analysis identified that views from this location are screened by roadside vegetation and there are no views of the site (refer to **Figure 2.2**).

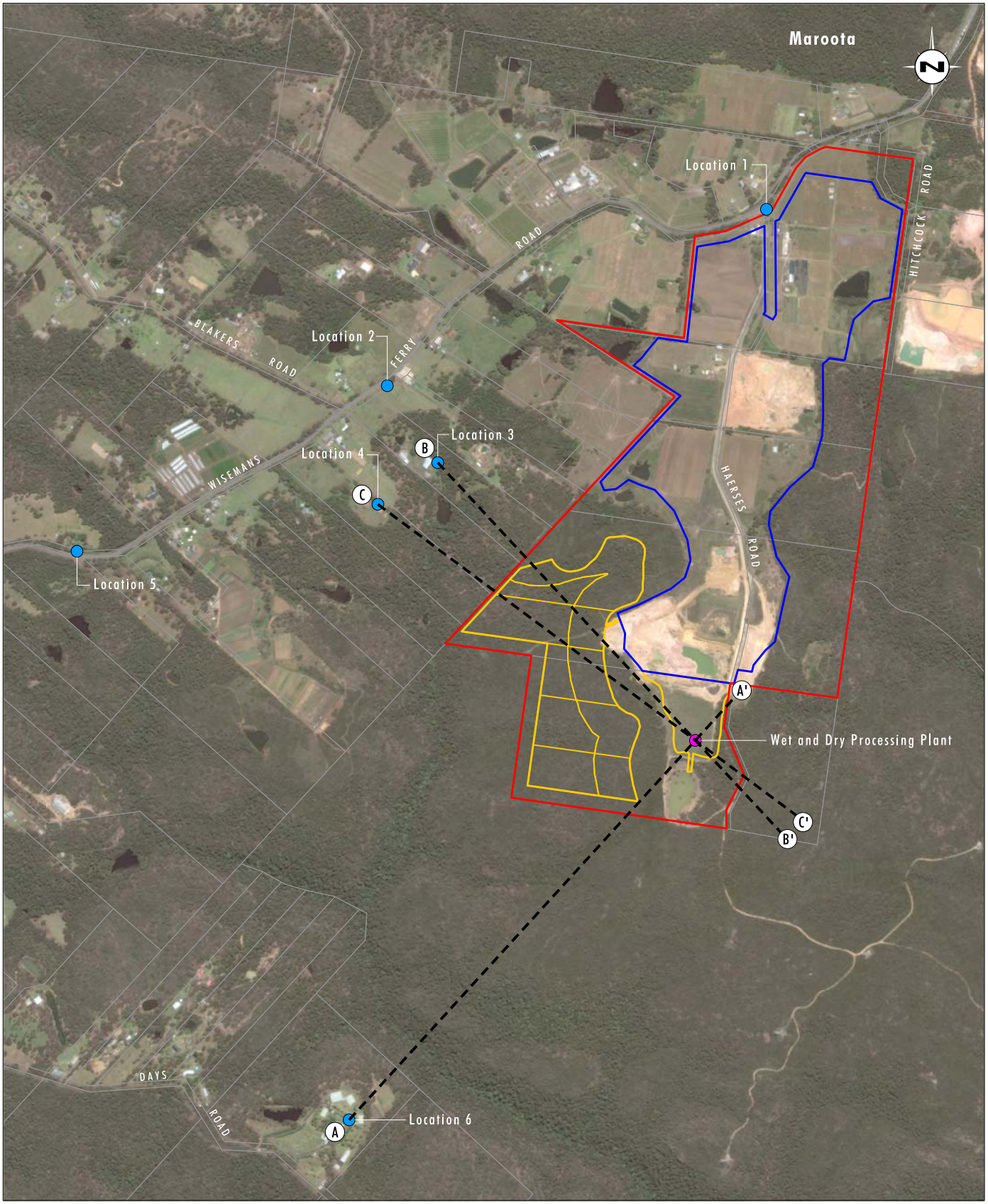


Image Source: Google Earth - DigitalGlobe (Dec 2016)
Data Source: Mc Kinlay Morgan & Associates Pty Ltd (2014)

0 250 500 750m
1:15 000

Legend

- Haerses Road Quarry Project Site
- Approved Extraction Area
- Modification Disturbance Area
- Visual Location
- Transect Location

FIGURE 2.1

Visual and Transect Locations

File Name (A4): R06/3479_077.dgn
20170526 11.35

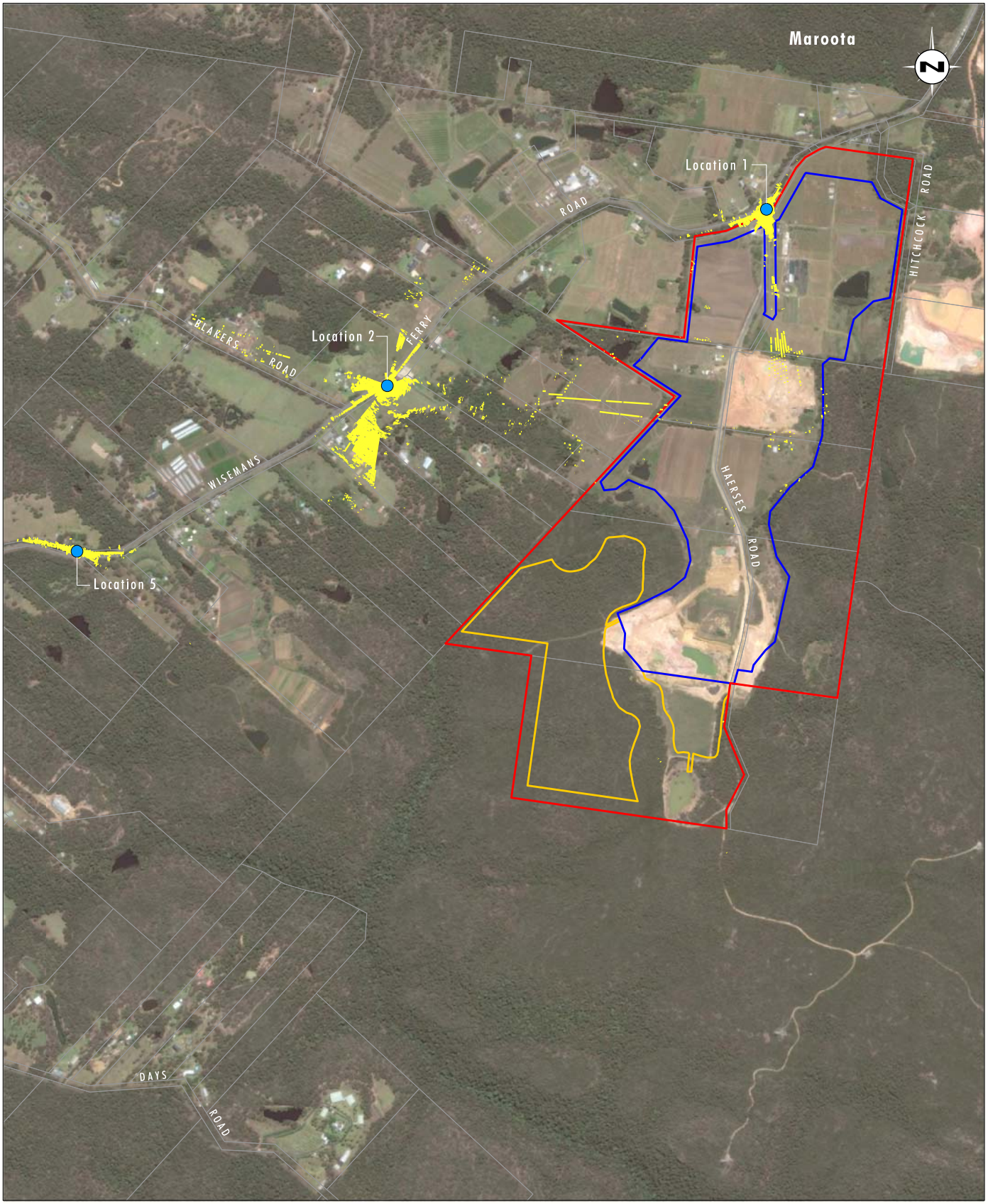


Image Source: Google Earth - DigitalGlobe (Dec 2016)
Data Source: Mc Kinlay Morgan & Associates Pty Ltd (2014)

0 250 500 750m
1:15 000

Legend

- Haerses Road Quarry Project Site
- Approved Extraction Area
- Modification Disturbance Area
- Visual Location
- Radial Analysis

FIGURE 2.2

Visual Road Locations

File Name (A4): R06/3479_078.dgn
20170531 11.12

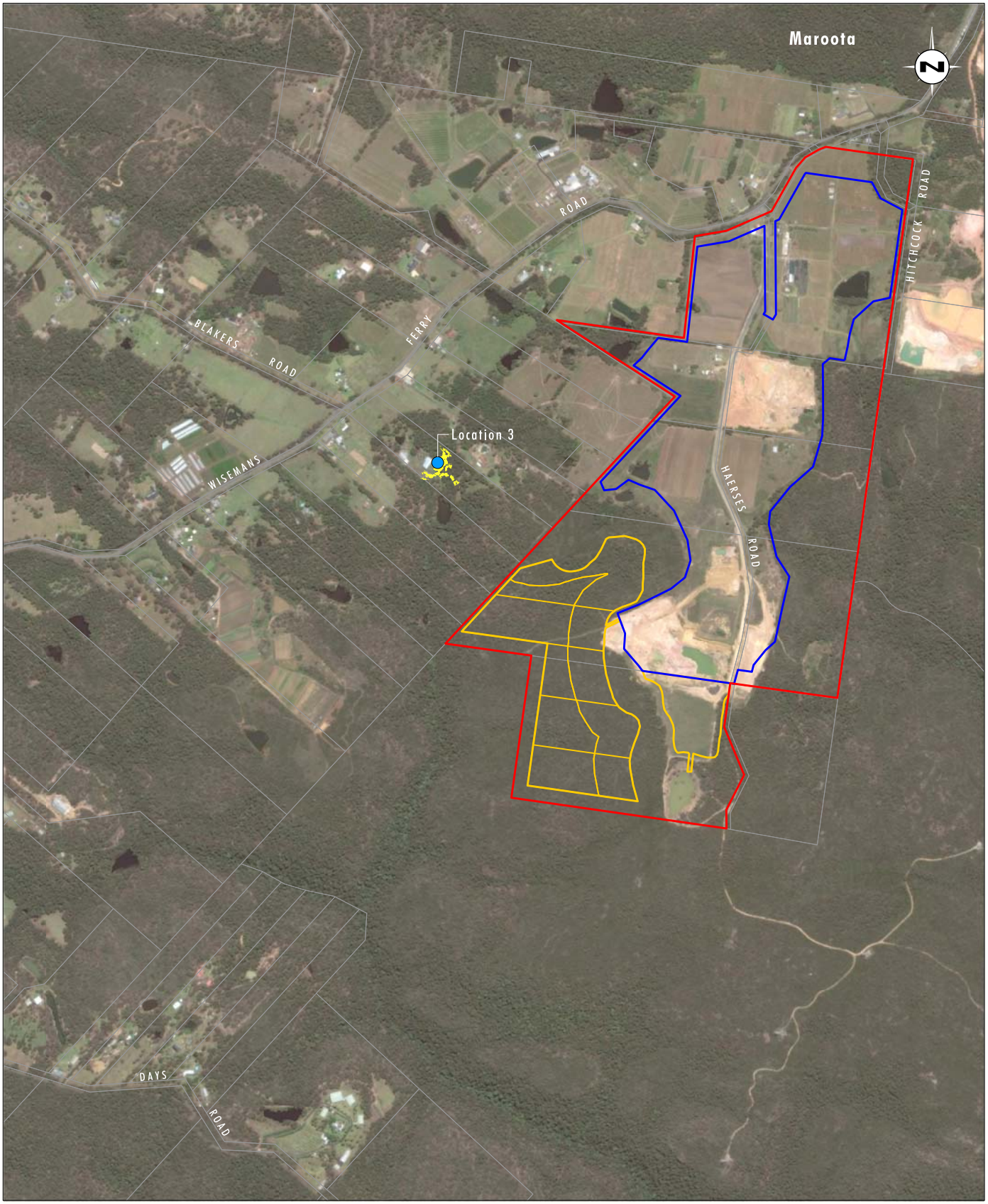


Image Source: Google Earth - DigitalGlobe (Dec 2016)
Data Source: Mc Kinlay Morgan & Associates Pty Ltd (2014)

0 250 500 750m
1:15 000

Legend

- Haerses Road Quarry Project Site
- Approved Extraction Area
- Modification Disturbance Area
- Visual Location
- Radial Analysis

FIGURE 2.3

Visual Location 3

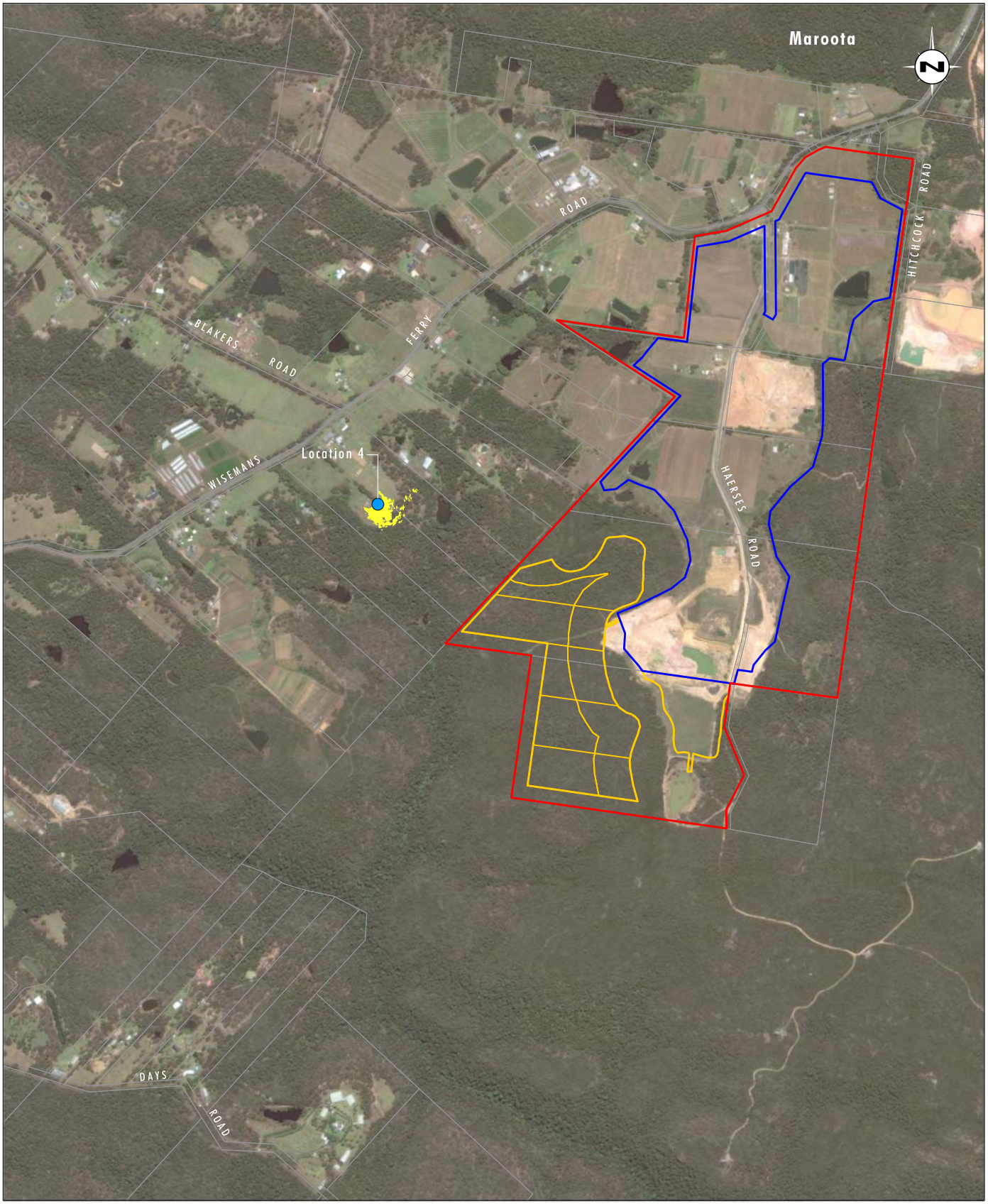


Image Source: Google Earth - DigitalGlobe (Dec 2016)
Data Source: Mc Kinlay Morgan & Associates Pty Ltd (2014)

0 250 500 750m
1:15 000

Legend

- Haerses Road Quarry Project Site
- Approved Extraction Area
- Modification Disturbance Area
- Visual Location
- Radial Analysis

FIGURE 2.4

Visual Location 4

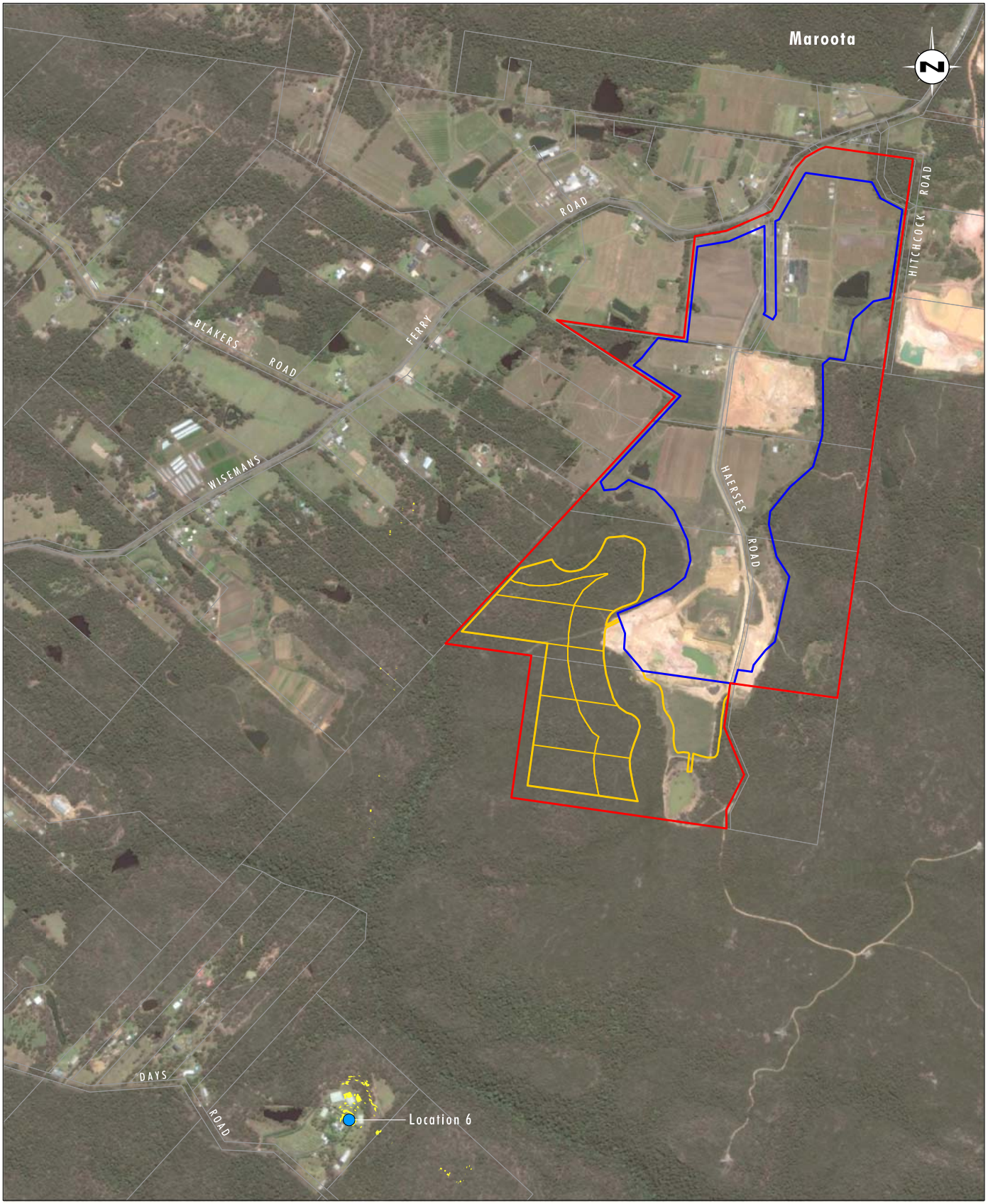


Image Source: Google Earth - DigitalGlobe (Dec 2016)
Data Source: Mc Kinlay Morgan & Associates Pty Ltd (2014)

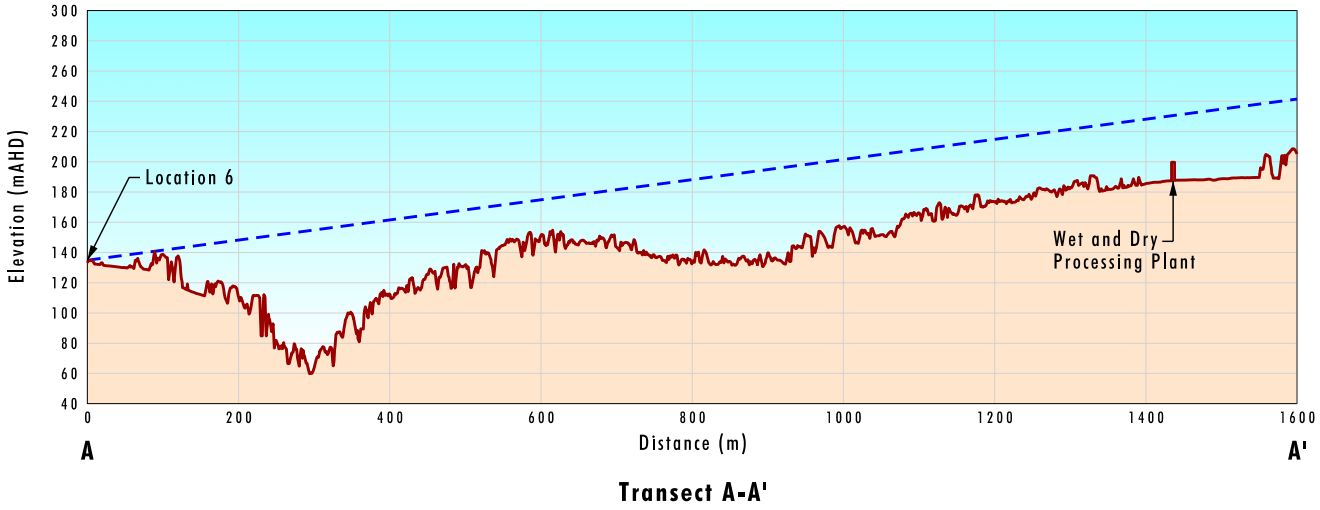
0 250 500 750m
1:15 000

Legend

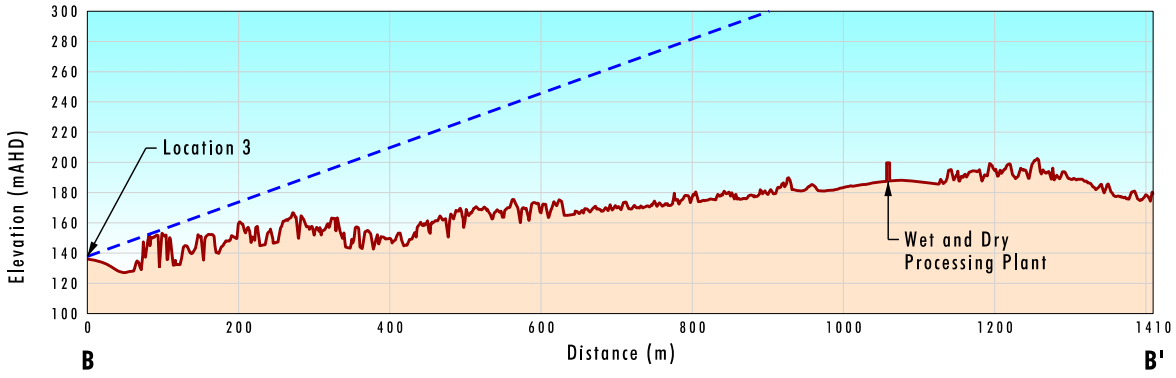
- Haerses Road Quarry Project Site
- Approved Extraction Area
- Modification Disturbance Area
- Visual Location
- Radial Analysis

FIGURE 2.5

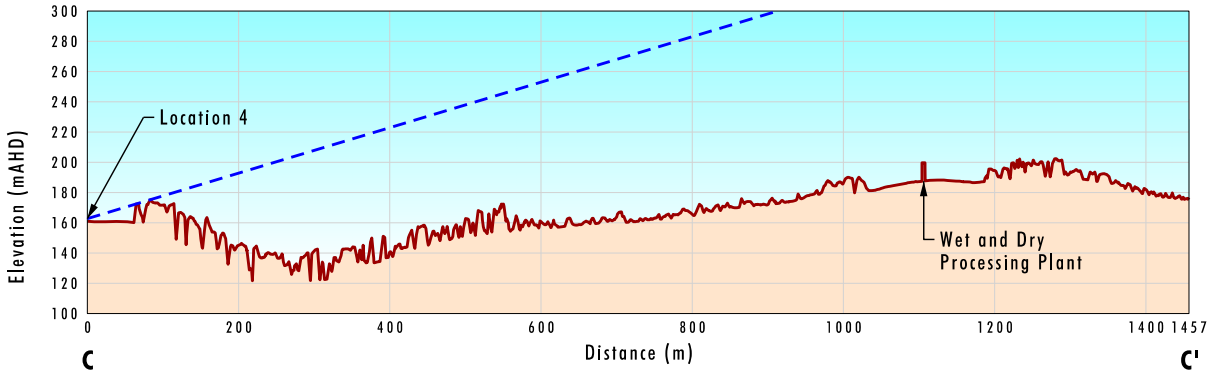
Visual Location 6



Transect A-A'



Transect B-B'



Transect C-C'

Legend

Natural Surface with Canopy

View Line

0 100 250 500m

Horizontal Scale 1:10 000

0 50 125 250m

Vertical Scale 1:5 000

Note: Vertical Exaggeration 2:1

FIGURE 2.6

Visual Transects

For each of the publicly accessible locations potential views towards the additional extraction area and processing area are screened by vegetation in proximity to the viewing location. As such, there would be no views of the proposed additional extraction area, earth bunds or acoustic fencing, or processing area.

Conclusion

The visual assessment has found that there will not be any views of the Modification from any surrounding residences due to screening from topography and vegetation. An analysis of potential views from surrounding roads has also indicated that while there will be views into the existing approved quarrying area from the intersection of Haerses Road and Wisemans Ferry Road (the site entrance) no views are predicted of the proposed additional extraction area, bunds and acoustic fences and the processing area.

No adverse visual impacts are predicted to result from the Modification with the proposed additional extraction area and processing area well screened by topography and thick native vegetation.

2.1.4 Noise

Table 6.14 of the Noise Impact Assessment (NIA) indicates that the predicted $L_{Aeq\ (15\ minute)}$ daytime noise level for Receiver 1 during early extraction of Cell 4 is 41 dB(A). This result appears incongruous when compared with the other predictions for Receiver 1. DPE requests further information or clarification on this matter, in addition to the other issues raised by the EPA in its submission.

The 41 dB(A) indicated for Receiver 1 during early extraction of Cell 4 was a typographical error. The correct value is 31 dB(A).

The issues raised by the EPA in relation to noise are addressed in **Section 2.5**.

2.1.5 Agency and Public Submissions

DPE requests a response to all agency and public submissions received, including advice presented and recommendations made therein.

This report addresses the agency submissions received including advice presented and recommendations made. No public submissions were received for the Modification.

2.2 Office of Environment and Heritage

2.2.1 Biodiversity

The minimum information requirements for the Biodiversity Offset Strategy (BOS) have not been met within the *Framework for Biodiversity Assessment, NSW Biodiversity Offsets Policy for Major Projects* (FBA).

As discussed in **Section 2.1.1**, Dixon Sand is currently in discussion with DPE and OEH regarding the Biodiversity Offset Strategy in relation to the progressive retirement of the credits required for the Modification. As agreed with DPE, an addendum to this response to submissions report will be provided following finalisation of the offset strategy.

With regard to the FBA calculator and the Biodiversity Assessment Report (BAR):

1. **The 1000 ha assessment circle does not appear to be centred on the area of native vegetation that is most impacted by the proposal**

2. **It is unclear why in the FBA credit calculator, the 'land within 500 m of sandstone escarpments with hollow-bearing trees (etc)' has not been ticked. If it was ticked it would trigger survey requirement for the broad-headed snake, which was surveyed for anyway**

3. **It is unclear why, as stated in Table 2.2, some plots were undertaken outside the proposed development area**

4. **There is no information on the direction of the plots/transects**

5. **It is unclear why in the site values tab in the credit calculator, HN560 is listed as 'not an EEC' when in the BAR it is acknowledged that it is an EEC,**

6. **In the offset site calculator, the location of the site needs to be changed from Teralba to Maroota.**

A response to the six items identified above is provided below. Based on these minor changes to the FBA calculator, the credits generated for the Modification did not change.

1. Umwelt has re-centered the 1000 ha assessment circle over the area of native vegetation that is most impacted by the proposal. This change did not affect the percentage of native vegetation category for the outer circle. These remained at 71-75 before the development and 71-75 after the development.

   There was no change to the Assessment Circle Score, this remained at 13.20.

2. Umwelt has ticked 'land within 500 m of sandstone escarpments with hollow-bearing trees (etc)' within the habitat features section of the calculator and also updated the survey results section of the calculator to indicate that surveys were completed for broad-headed snake. Surveys undertaken did not record this species.

3. The original surveys undertaken for the Modification were completed within an original survey area that is referred to as the Modification Area in the FBA report. Through avoidance and minimisation efforts, the Development Site boundary was amended and ultimately reduced so as to avoid and or minimise impacts on particular environmental values within the site. It is through this avoidance of impact that some plots ended up being outside the final proposed development area.

4. All plots/transects undertaken as part of this Modification were completed with the north-east corner of the plot being recorded by handheld GPS. This is the point being shown in Figure 2.1 of the FBA report. Transects were consistently run 50 metres south from the north-east corner of the plot.

5. The credit calculator did not provide an option to allocate HN560 to an EEC. Umwelt has since attempted to allocate HN560 to an EEC (after attempting to do so prior to submission) but again no option was provided for in the calculator. This appears to be an error in the FBA credit calculator but has no bearing on the outcome of credits generated.

6. Umwelt have amended this section of the credit calculator as per OEH's comment.

The proposed BOS for the modification consists of the Haerses Road Offset Site and Porters Road Offset Site and the purchase of credits from the register. It is also proposed development be staged and credits '*retired progressively based on the staging of native vegetation disturbance in line with the progressive development of the quarry*' with credits for the first stage to be retired 12 months after approval. In accordance with the BOP, however, any required offsets should generally be secured before development commences. If the proponent wishes to secure offsets after development commences, the BOP requires they enter into a voluntary planning agreement (VPA) prior to the granting of project approval to ensure the BOS is fulfilled.

Following consultation with DP&E and OEH, Dixon Sand are currently progressing the BOS as detailed in **Section 2.1.1**.

2.2.2 Aboriginal Cultural Heritage

The predictive model identifies a potential for grinding grooves and engravings (grinding features) to be located on suitable sandstone surfaces. The archaeological survey indicates there was very low ground surface visibility and exposure, which greatly reduced the effective survey coverage. Consequently, there is potential for grinding features to be obscured by existing dense vegetation or leaf litter. OEH therefore recommends DPE condition a requirement to cease work and protect grinding features should any be uncovered during operations.

Noted. This recommendation is in line with the management measures identified in Section 6.10.7 of the Environmental Assessment.

2.3 The Hills Shire Council

The Hills Shire Council has concerns with the proposal to import VENM and ENM into the site for blending and rehabilitation works. The current approval does not allow the importation of these materials. The importation of materials to the site would be defined as a 'waste or resource management facility' which significantly changes the current approval which is in place.

Dixon Sand is seeking to modify the current approval to allow for the importation of up to 100,000 tonnes per annum (tpa) of VENM or ENM. It is proposed to process the VENM or ENM through blending with other material excavated from the Haerses Road Quarry prior to sale.

Dixon Sand has an existing Environment Protection Licence (EPL) for the scheduled activity of 'extractive activities'. Under the provisions of the *Protection of the Environment Operations Act 1997* (POEO Act) VENM and ENM are classified as general waste and as such the processing of these materials for sale is 'resource recovery' which is identified as a scheduled activity under clause 34 of Schedule 1 of the POEO Act. If the Modification is approved, Dixon Sand will apply to modify the current EPL to include the activity of 'resource recovery'.

The potential processing of VENM and ENM at the Haerses Road Quarry is considered a positive environmental outcome leading to the reuse of a resource which might otherwise be disposed of. The potential processing of VENM and ENM at the site is not considered a significant change in terms of activities or impacts as there would be very few changes required to the current operations at the site to facilitate this reprocessing.

At the moment trucks entering the site are unladen. There would be no change to overall traffic numbers in and out of the site with the only change being that currently all trucks enter the site unladen but if approved a proportion of trucks entering the site would do so laden with VENM/ENM for processing. If the full 100,000 tpa of VENM/ENM were processed in a year, this would mean a maximum of 40% of the trucks would entering the site carrying a load.

As the annual output from the Haerses Road Quarry is not proposed to increase from the current 250,000 tpa, the processing of up to 100,000 tpa of VENM/ENM on site would prolong the existing resource for continued supply to the market place reducing the need for other new quarries or existing developments to increase production in the future.

The proposed modification does not provide justification for the proposed importation of materials or address potential impacts such as amount of materials to be imported, sourcing of materials, storage and similar.

Section 3.8.2 of the EA provides a justification for the Modification. In relation to the importation of VENM and ENM specifically, there are currently several large infrastructure construction projects within the Sydney region involving tunnelling that have the potential to generate a large volume of VENM/ENM. There is the opportunity for the beneficial reuse of this material to supply the construction sand market in Sydney through processing at the Haerses Road Quarry site. This material may otherwise be disposed at a landfill site.

The amount of VENM and/or ENM material to be imported is up to 100,000 tpa as specified in Sections 1.1, 3.2, 3.6 of the EA. The potential source of VENM or ENM material is not currently determined but is likely to from within the Sydney metropolitan area where there are several large infrastructure projects currently, or soon to be, in the construction phase. Regardless of the source of potential material there is no change proposed to the existing inbound traffic movements to the Haerses Road Quarry which will remain at 28 right hand turn movements from Wisemans Ferry Road per day with a maximum of 10 movements between the hours of 6am and 7am.

The VENM or ENM material imported to the site would be either blended on site within the existing processing area before transportation to market or used as part of rehabilitation to shape the final landform as part of the progressive rehabilitation of the extraction cells. Material would be temporarily placed either within the processing area for processing and sale or within an extraction cell for placement as part of the final landform.

2.4 Department of Primary Industries – Water

DPI provided an initial submission including a request to meet to discuss the response to groundwater issues raised prior to finalisation of this Response to Submissions Report. This meeting was held and the questions that DPI had were discussed and resolved. Following the meeting a revised submission was provided by DPI in relation to groundwater issues. The revised DPI submission and the response to these issues raised are provided in **Appendix 3** which includes the minutes from the meeting.

2.5 Environment Protection Authority

A Resource Recovery Exemption for ENM may apply if the material is, or is intended to be, applied to land as engineering fill or for use in earthworks. For VENM, the applicant must demonstrate that the supplier of the material has certified it as VENM prior to receiving it from off site. All imported materials will require assessment against relevant provisions of the *Protection and Environment Operations Act 1997* and the *Protection of the Environment Operations (Waste) Regulation 2014*.

These requirements are noted.

The applicant will need to apply to the EPA for a licence variation to have Schedule 1 scheduled activities such as *Resource recovery (Recovery of general waste)* and *Waste storage* authorised and added to the existing Environment Protection Licence (EPL). A licence variation is also needed to accommodate amendments to licence conditions relevant to noise matters and to update the licence to a contemporary format.

If the Modification is approved Dixon Sand will apply to the EPA to vary its existing EPL (no. 12513) to address the matters noted by the EPA. The EPL variation would include the following:

- Addition of the scheduled activity *Resource recovery (Recovery of general waste)*
- Addition of the scheduled activity *Waste storage*
- Revision of noise limits to be consistent with the modified consent conditions should the Modification be approved.

2.5.1 Air Quality

It is unclear if the crushing and screening plant will comply with the Clean Air Regulation

Emissions from the crushing and screening activities were included in the Air Quality Assessment (AQA) as detailed in the emission inventories provided in Table 6.2 and Table 6.3 of the AQA. The assumed emission rates from crushing (0.0195 kg/t) and screening (0.0125 kg/t) were sourced from US EPA AP-42 Section 11.19.2 *Crushed Stone Processing and Pulverized Mineral Processing* Table 11.19.2-1. The emission factors by default include exhaust emissions which would have been much higher when the emission factors were developed in the 1980/1990's.

The specifications for both the proposed screen (http://www.powerscreen.com/wp-content/uploads/2016/04/Powerscreen-Chieftain-1400-Brochure.pdf) and the crusher (http://www.terex.com/mobile-processing-equipment/en/products/crushers/jaw-crushers/index.htm) state the engines will comply with the NSW EPA requirement that all new diesel equipment must conform to Tier 3 or Tier 4 in the US and Stage IIIA or Stage IIIB within the European Union.

Therefore, the particulate emissions (dust) from the crushing process have been assessed in accordance with the EPAs guidelines and the exhaust emissions from the engines will comply with EPA requirements, including the Clean Air Regulation.

Incorrect reporting of cumulative 24 hour average $PM_{2.5}$ and PM_{10} concentrations

As noted by NSW EPA, Table 7.1 to Table 7.4 of the AQA prepared by Pacific Environment Limited (PEL) erroneously calculated the maximum cumulative 24-hour average PM_{10} and $PM_{2.5}$ concentrations using the annual average.

The corrected tables provided by PEL are included in Table 1 to Table 4 in **Appendix 4**. Scenario 1 assessed the scenario where dry processing occurs outside the extraction cells; Scenario 2 assessed the scenario where dry processing occurs inside the extraction cells.

Section 7.2 of the AQA provided a detailed cumulative assessment for four most impacted receptors due to the Modification. This was completed in accordance with the Approved Methods, with Figure 7.7 and Figure 7.8 presenting the daily contribution of the Modification plus the corresponding concentration on the same day from the monitoring station at Maroota School.

Whilst PEL reviewed the updated results for the Modification they identified that the text in Section 7.2 of the AQA contained a typographic error (with respect to 24-hour average PM_{10} concentrations): "R1 is the most impacted, with the Modification predicted to result in an additional four exceedances". As shown in Table 1 to Table 4 the most impacted receptor is R11, not R1. In order to verify the results presented in Figure 7.7 and Figure 7.8 of the AQA, PEL repeated the cumulative assessment for all receptors finding that in addition, the statement in the AQA that the Modification was "predicted to result in an additional four exceedances" was also incorrect. Figure 7.7 and Figure 7.8 in the AQA had erroneously shown the predicted 24-hour average PM_{10} concentrations for R20 as the existing air quality, instead of the data from Maroota School. The correct plots for each receptor are shown in Figure 1 to Figure 6 for PM_{10} and Figure 7 to Figure 12 for $PM_{2.5}$ of **Appendix 4**. These demonstrate when the correct background data are combined with the increment due to the Modification, there is only one additional exceedance of the 24-hour average PM_{10} criterion of 50 $\mu g/m^3$ predicted at one receptor - R6 and no predicted exceedances of the 24-hour $PM_{2.5}$ criterion of 25 $\mu g/m^3$.

Proposed dust management practices are not benchmarked against best practice

Section 6.4 of the AQA detailed the proposed management and mitigation measures that would be implemented for dust control for the Proposal. In the absence of specific guidance in NSW that details best practice measures for quarrying operations, PEL has undertaken a comparison based on recommendations contained in the *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining* (Donnelly et al., 2011) (the Best Practice Report), as presented in Table 5 of **Appendix 4**. It is noted that some dust control measures (for example, restricting speed limits) are not directly quantified in the emission calculations and hence PEL considers that the predicted contribution from the Modification presented in the AQA are conservative. It is also noted that the Best Practice Report does not provide control measures for crushing and screening. In this case, uncontrolled emission factors were applied which again provides a conservative assessment.

Should the Modification be approved, the Air Quality Management Plan for the site would be updated, in consultation with the relevant stakeholders and would include relevant management measures.

The Assessment predicts additional exceedances of the EPA's impact assessment criteria. The reactive dust control measures already in place at the site are not considered to be sufficient to prevent additional exceedances. However, additional dust controls were not considered in the Assessment.

As discussed above, PEL has advised that a review of their cumulative assessment for the Modification identified that the wrong data had been applied for the existing air quality. When the correct background data are combined with the increment due to the Modification, there is only one additional exceedance predicted of the 24-hour average PM_{10} criterion of 50 µg/m^3 predicted at one receptor - R6, and no predicted exceedances of the 24-hour $PM_{2.5}$ criterion of 25 µg/m^3. PEL further notes that a number of emission controls that will be in place at the Modification (per Table 5 **Appendix 4**) that were not explicitly applied to the emission estimation used in the dispersion modelling and as such it is considered there is very limited potential for the Modification to result in any additional exceedances of the air quality criteria.

When considering the management measures, Figure 13 of **Appendix 4** shows a scatter-plot of the predicted 24-hour average PM_{10} concentrations at R6, matched with the corresponding 24-hour average PM_{10} concentration measured at Maroota School on the same day. The figure shows that when the predicted increment at R6 exceed 8 µg/m^3, the measured concentrations at Maroota School are 16 µg/m^3 or below. It is therefore considered the current management measure of 42 µg/m^3 remains adequate.

2.5.2 Noise

Licence conditions relating to noise in the EPL should be updated to reflect current licensing practice, as outlined in the EPA letter dated 16 November 2016. The EPA recommends that the EPL also be updated with receiver's Lot and DP numbers for clarity.

As identified in **Section 2.5**, if the Modification is approved Dixon Sand will apply to the EPA to vary the existing EPL (no. 12513) to address the issues specified in the EPA's submission letter dated 16 November 2017.

Table 6.14 of the EA shows a level of 41 dBA at receiver R1 during Cell 4 Early Extraction. This is possibly a typographical error and is 4 dB above the 37 dBA criterion at this receiver. This value should be checked and amended if necessary, or otherwise explained in the accompanying text.

The 41 dB(A) indicated for Receiver 1 during early extraction of Cell 4 is a typographical error. The correct value is 31 dB(A).

Table 6.14 of the EA shows a level of 40 dBA at receiver R6 during Cell 4 bund construction. This is 5 dB above the 35 dBA operational noise criterion at this receiver. In view of the fact that this activity is being carried out to create a noise mitigation bund for future operations, the EPA considers this exceedance to be acceptable, provided that the noise mitigation and management measures outlined in Section 6.5.4.4 and 6.5.7 are implemented. The EPA recommends that noise limits not apply to bund construction activities, provided they are carried out only during the standard construction hours in the *NSW Interim Construction Noise Guidelines*, and construction be completed as soon as practicable, and within no more than 6 months of construction commencement.

The approach suggested by the EPA is appropriate and Dixon Sand will ensure that the noise mitigation and management measures outlined in Section 6.5.4.4 and 6.5.7 of the EA are implemented during bund construction, that this activity is only undertaken during standard construction hours and that it will be completed as soon as practicable and within no more than six months of construction commencement.

2.6 Roads and Maritime Services

Roads and Maritime has reviewed the submitted documentation and raises no objection to the proposed modifications subject to the following conditions being included in the conditions of consent.

Noted.

Roads and Maritime has concerns with regard to the restricted sight distance at the T-intersection of Haerses Road/Wisemans Ferry Road and lack of appropriate linemarking to guide the conflicting traffic movements at the intersection. In this regard, Roads and Maritime requests that the intersection of Haerses Road/Wisemans Ferry Road to be improved to a channelised right-turn treatment (CHR) on Wisemans Ferry Road with linemarking and chevron as shown in *Austroads Guide to Road Design*.

Detailed design plans of the CHR treatment and proposed works are to be submitted to Roads and Maritime for approval prior to the issue of a Construction Certificate and commencement of any road works.

The RMS's request for upgrades to the Haerses Road / Wisemans Ferry Road intersection is noted. The upgrades will be completed prior to the commencement of product delivery from the additional extraction area.

All works/regulatory signposting associated with the proposed development are to be at no cost to Roads and Maritime.

Noted.

2.7 Office of Environment and Heritage – Heritage Council

As far as can be determined, no historic archaeological assessment has occurred for the subject area, so the comment that 'No impacts on historic heritage are predicted as a result of the Modification' cannot be not supported without further assessment.

The conclusion that no impacts to historic heritage are predicted as a result of the Modification was based on the results of a search of statutory and non-statutory heritage databases, knowledge of the history of the use and occupation of the area and a visual inspection undertaken by Amanda Reynolds, Umwelt Senior Archaeologist. Amanda Reynolds is an archaeologist experienced in both historical heritage and archaeology and Aboriginal cultural heritage and archaeology. The inspection was undertaken on foot to determine the potential presence/absence of archaeological resources and identify any potential historical heritage items not identified during database searches and historical documentation. Note that the inspection was not targeted only at Aboriginal heritage values.

The following additional consent condition is recommended: An historical archaeological assessment should be prepared by a suitably qualified historical archaeologist in accordance with the Heritage Division, Office of Environment and Heritage Guidelines, including 'Assessing Significance for Historical Archaeological Sites and 'Relics' 2009. This assessment should identify what deposits or relics, if any, are likely to be present, assess their significance and consider the impacts from the proposal on this potential resource. Where harm is likely to occur, it is recommended that the significance of the deposits or relics be considered in determining an appropriate mitigation strategy. In the event that harm cannot be avoided in whole or part, an appropriate Research Design and Excavation Methodology should also be prepared prior to any excavation occurring to guide any proposed excavations.

Further detail in support of the conclusion that no impacts to historic heritage are predicted as a result of the Modification is provided in **Appendix 5**.

2.8 Department of Industry – Resources and Energy

Geological Survey of New South Wales (GSNSW) has no resource issues to raise in regard to the modification. GSNSW supports maximising the resource recovery at the Haerses Road site.

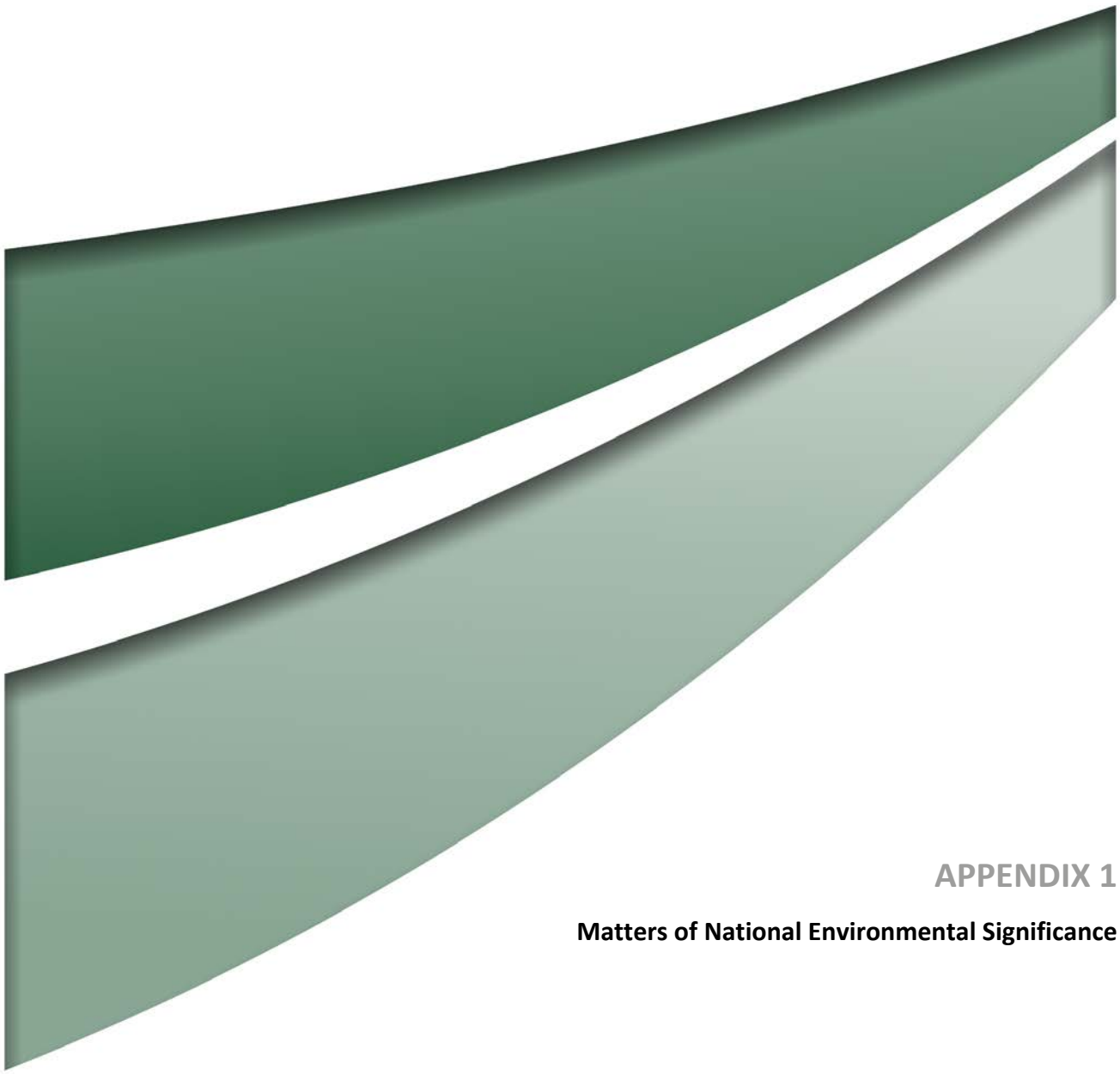
Noted.

The Division of Resources & Energy collects data on the quantity and value of construction materials produced annually throughout the State. Forms are sent to all operating quarries at the end of each financial year for this purpose. In order to assist in the collection of construction material production data, the proponent should be required to provide annual production data for the subject site to DRE as a condition of any new or amended development consent.

Noted. Dixon Sand will continue to provide annual production data from the Haerses Road Quarry to DRE.

3.0 References

Donnelly, S.-J., Balch, A., Wiebe, A., Shaw, N., Welchman, S., Schloss, A., Castillo, E., Henville, K., Vernon, A., Planner, J. (2011). *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and / or Minimise Emissions of Particulate Matter from Coal Mining*. Prepared by Katestone Environmental Pty Ltd for Office of Environment and Heritage June 2011.



APPENDIX 1

Matters of National Environmental Significance

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Dixon Sand (Penrith) Pty Ltd

HAERSES ROAD QUARRY EXTRACTION AREA MODIFICATION

Assessment of Commonwealth Matters

DRAFT

June 2017

Dixon Sand (Penrith) Pty Ltd

HAERSES ROAD QUARRY EXTRACTION AREA MODIFICATION

Assessment of Commonwealth Matters

DRAFT

Prepared by
Umwelt (Australia) Pty Limited
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Table of Contents

1.0 Background Error! Bookmark not defined.

2.0 DoEE Assessment Requirements **2**

2.1 Assessment of Significance under the EPBC Act 8

2.1.1 Endangered Species 8

2.1.2 Vulnerable Species 12

2.2 Further Assessment of MNES Potentially Significantly Impacted 14

2.2.1 Coastal Upland Swamps in the Sydney Basin Bioregion EEC 15

2.2.2 Darwinia biflora 16

3.0 References **19**

1.0 Introduction

This report responds to the Commonwealth Department of the Environment and Energy (DoEE) assessment requirements contained within Attachment 1 of the NSW Department of Planning and Environment Environmental Assessment Requirements letter (dated 12 February 2016) for the Haerses Road Quarry Extraction Area Modification Project (hereafter referred to as the 'Modification'). Relevant sections of the Biodiversity Assessment Report (Umwelt 2016a) and the Environmental Assessment (Umwelt 2016b) are referenced in this report to address various matters. Where required additional information and assessments of significance are provided on relevant Matters of National Environmental Significance (MNES) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

2.0 DoEE Assessment Requirements

Table 1.1 below details each of DoEE assessment requirements for the Modification according to Attachment 1 of the NSW Department of Planning and Environment Environmental Assessment Requirements letter (2016) and indicates where they are addressed in either the EA or this report.

Table 1.1 DoEE Assessment Requirements and Responses

DoEE Assessment Requirements	Response
General Requirements	
4. the precise location and description of all works to be undertaken (including associated offsite works and infrastructure), structures to be built or elements of the action that may have impacts on matters of national environmental significance (MNES)	See Sections 3.2 to 3.5 and Figures 1.3 and 6.16 to 6.19 of the Environmental Assessment (Umwelt 2016b)
5. how the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impacts on MNES	See Sections 3.2 to 3.5 and Figures 1.3 and 6.16 to 6.19 of the Environmental Assessment (Umwelt 2016b)

DoEE Assessment Requirements	Response
6. an assessment of the relevant impacts of the action on threatened species and communities; Including (i) a description and detailed assessment of the nature and extent of the likely direct, indirect and consequential impacts, including short term and long term relevant impacts; (ii) a statement whether any relevant impacts are likely to be known, unpredictable or irreversible; analysis of the significance of the relevant impacts; (iii) any technical data and other information used or needed to make a detailed assessment of the relevant impacts; and (iv) a comparative description of the impacts of alternatives, if any, on the threatened species and communities.	6 (i) The nature and extent of likely direct impacts on MNES with the potential to be significantly impacted by the Modification is detailed in **Section 2.1** below. Further assessment of those MNES likely to be significantly impacted are addressed in **Section 2.2** below. The Modification involves the removal (long term impact) and direct disturbance to approximately 19 hectares of native vegetation which provides potential habitat for some species that are MNES. As discussed in further detail in Section 4.5 of the Biodiversity Assessment Report (Umwelt 2016a) the Modification is not expected to result in any substantial indirect impacts on biodiversity values or MNES in surrounding lands during the construction or operational phases. Indirect impacts considered included noise, dust, weed and feral animal impacts. Of note is the provision of a 50 metre buffer around the MNES *Coastal Upland Swamps in the Sydney Basin Bioregion* endangered ecological community (EEC) in the adjacent onsite offset. This buffer area has been provided to avoid impacts to groundwater which is essential to the long-term survival of this EEC. 6 (ii) The impacts of the Modification are considered to be known as they relate to clearing of native vegetation and quarrying which are well understood impacts. An analysis of significance provided in **Section 2.1** below. 6 (iii) All relevant data is provided in the Biodiversity Assessment Report (Umwelt 2016a). 6 (iv) No alternatives to the Modification are proposed.

DoEE Assessment Requirements	Response
7. information on proposed avoidance and mitigation measures to manage the relevant impacts of the action including: (i) a description of the proposed avoidance and mitigation measures to deal with the relevant impacts of the action; (ii) assessment of the expected or predicted effectiveness of the mitigation measures; (iii) the cost of the mitigation measures; (iv) a description of the outcomes that the avoidance and mitigation measures will achieve; (v) a description of the offsets proposed to address the residual adverse significant impacts and how these offsets will be established.	7(i) Refer to Section 4.0 Avoidance and Minimisation Measures of the Biodiversity Assessment Report (Umwelt 2016a). This includes avoidance and minimisation measures for the site selection/planning phase, construction phase and operational phase. 7(ii) The potential impacts associated with the Modification are well understood and can generally be predicted with a high level of certainty. The mitigation measures proposed are tried and tested methods that have been implemented successfully on numerous other projects. It is predicted that the proposed mitigation measures will be successful in managing the potential impacts associated with the Modification. 7(iii) In regard to the cost of the mitigation measures, these costs have been included within the operating costs of the Project. This includes the costs of mitigation measures, biodiversity monitoring and rehabilitation costs. There will also be additional costs associated with establishing and managing biodiversity offsets for the Project. 7 (iv) Refer to Section 4.0 Avoidance and Minimisation Measures of the Biodiversity Assessment Report (Umwelt 2016a). In summary the avoidance measures put in place include modifying the Development Site several times to reduce impacts on the MNES *Coastal Upland Swamps in the Sydney Basin Bioregion* EEC under the EPBC Act. In particular, the revision to the boundary of the Development Site was made to provide a minimum 50 metre buffer around this EEC that occurs in the proposed onsite offset area that occurs north of the Development Site. The other MNES *Darwinia biflora* likely to be significantly impacted by the Modification could not be avoided by the Modification and is intended to be offset using the *Framework for Biodiversity Assessment – NSW Biodiversity Offsets Policy for Major Projects*. The mitigation measures intend to manage arboreal species and habitat, weeds, sediment and erosion, noise, dust and feral animals through the various phases of the Modification 7 (v) Refer to Section 8 Offsetting Comparison in the Biodiversity Assessment Report (Umwelt 2016a) and Haerses Road Quarry Extraction Area Modification Project (Umwelt 2017). As discussed in further detail in these documents, the Biodiversity Offset Strategy for the Modification is currently being finalised and will include onsite

DoEE Assessment Requirements	Response
	Framework for Biodiversity Assessment – NSW Biodiversity Offsets Policy for Major Projects along with the potential purchase of credits on the BioBanking market. As discussed in the main text of this Response to Submissions report, Dixon Sands is currently refining the offset strategy for the Modification in consultation with DPE and OEH and the final offset strategy will be submitted as an addendum to the Response to Submissions Report.
Key Issues – Biodiversity	
8. The EIS must address the following issues in relation to Biodiversity including separate: - identification of each EPBC Act listed threatened species and community likely to be significantly impacted by the development. Provide evidence why other EPBC Act listed threatened species and communities likely to be located in the project area or in the vicinity will not be significantly impacted in accordance with the Matters of National Environmental Significance - Significant lmpact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999 (Significant lmpact Guidelines).	Refer to **Section 2.1** below.

DoEE Assessment Requirements	Response
9. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide a separate: (i) description of the habitat and habits (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans, threat abatement plans and wildlife conservation plans; and (ii) details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements. (iii) description of the impacts of the action having regard to the full national extent of the species or community's range.	Refer to **Section 2.2** below.

DoEE Assessment Requirements	Response
10. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide a separate: (i) identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account. (ii) details of how the current published NSW Framework for Biodiversity Assessment (FBA) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts; (iii) details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the development in accordance with the FBA and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites. [Note: For the purposes of approval under the EPBC Act, it is a requirement that offsets directly contribute to the ongoing viability of the specific protected matter impacted by a proposed action i.e. 'like for like'. In applying the FBA, residual impacts on EPBC Act listed threatened ecological communities must be offset with Plant Community Type(s) (PCT) that are ascribed to the specific EPBC listed ecological community. PCTs from a different vegetation class will not generally be acceptable as offsets for EPBC listed communities.]	Refer to **Section 2.2** below.
11. Any significant residual impacts not addressed by the FBA may need to be addressed in accordance with the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offset Policy. http://www.environment.gov.au/epbc/publications/epbc-actenvironmental-offsets-policy. [Note if the EPBC Act Environmental Offset Policy is used to calculate proposed offsets for a threatened species or community you may wish to seek further advice from the Department of Planning and Environment.	Refer to **Section 2.2** below.

2.1 Assessment of Significance under the EPBC Act

Revised assessments of significance were undertaken for MNES potentially significantly impacted by the Modification, as identified in Attachment A of Attachment 1 Commonwealth Department of Environment Assessment Requirements as part the letter detailing Environmental Assessment Requirements (NSW Department of Planning and Environment 2016). These revised impact assessments (according to the significant impact guidelines 1.1 – Department of the Environment 2013) have been updated from the Referral (Umwelt 2015) taking into account changes to the design of the Modification since that time and the requirements of Attachment 1 Commonwealth Department of Environment Assessment Requirements. The following assessments of significance include the terminology of 'Development Site' and 'Modification Area' as per the Biodiversity Assessment Report (Umwelt 2016a). The DoEE consider *Darwinia biflora* (vulnerable) and *Coastal Upland Swamps in the Sydney Basin Bioregion* EEC as likely to be significantly impacted and additional assessment requirements are addressed in **Section 2.2**.

In addition to this, a revised EPBC Act Protected Matters Reports (Department of the Environment and Energy 2017a) was undertaken to ensure any potentially significantly impacted MNES are addressed since the preparation of the Referral (Umwelt 2015). Four additional terrestrial (non-marine) MNES were listed as part of this search including, greater glider (*Petauroides volans*), downy wattle (*Acacia pubescens*), Illawarra greenhood (*Pterostylis gibbosa*) and austral toadflax (*Thesium australe*). These species were not recorded at the site and are considered unlikely to be impacted by the Modification based on either unsuitable habitat and/or being not recorded as part of flora and fauna surveys. As these species have been assessed as unlikely to be impacted, no further assessments of these MNES have been made.

2.1.1 Endangered Species

The following EPBC Act listed endangered/critically endangered species are considered in this assessment:

- Dural land snail (*Pommerhelix duralensis*) – Endangered
- Eastern bristlebird (*Dasyornis brachypterus*) – Endangered
- Swift parrot (*Lathamus discolor*) – Critically Endangered
- Regent honeyeater (*Anthochaera phrygia*) – Critically Endangered
- Spotted-tailed quoll (SE mainland population) (*Dasyurus maculatus maculatus*) – Endangered
- Southern brown bandicoot (Eastern) (*Isoodon obesulus obesulus*) – Endangered

Of the above species, only the Dural land snail has been recorded in the Modification Area.

An assessment in accordance with the significant impact criteria (Department of the Environment 2013) is provided below for these species.

In this case, a 'population of a species' is defined as an occurrence of the species in a particular area. Occurrences include but are not limited to:

- A geographically distinct regional population, or collection of local populations, or
- A population, or collection of local populations, that occurs within a particular bioregion.

Due to its restricted local distribution, the Dural land snail is considered likely to form part of a population, or a collection of local populations, that occurs within a particular bioregion. A single individual of this species was recorded during targeted surveys undertaken in December 2015. This species was recorded outside the Development Site (the area to be impacted by the Modification) in the Modification Area (which is now being set up as an offset site); however suitable habitat within the Development Site has been identified. In addition to this, recent surveys in May 2017 identified this species as present at the proximate onsite offset area. According to the Conservation Advice (Threatened Species Scientific Committee 2015) '*The species is known to occur as far north as St Albans. Moving southwest from St Albans, the species occurs in East Kurrajong and then south along the footslopes of the Blue Mountains as far south as Mulgoa. Southeast from St Albans, the species is found across The Hills Shire Local Government Area and south to Parramatta*.' Thus this species is considered a population, or collection of local populations, that occurs within a particular bioregion, being the Sydney Basin Bioregion.

The eastern bristlebird was not recorded in the Modification Area. If the eastern bristlebird is present it could be part of a population, or a collection of local populations, that occurs within a particular bioregion.

The swift parrot was not recorded in the Modification Area. If present, the swift parrot in NSW is considered to form part of the national migratory population (Saunders and Tzaros 2011) that forages in eastern Australia during the winter months and returns to Tasmania to breed during spring.

The regent honeyeater was not recorded in the Modification Area. For the regent honeyeater, although there appears to be minor behavioural differences between regent honeyeaters in the three main areas inhabited by the species (the Bundarra-Barraba area in NSW, the Capertee Valley in NSW, and north-eastern Victoria), the direction and extent of movements, including evidence of movement between breeding sites, and a lack of discernible genetic differences between the sites suggest that the species occurs as a single, contiguous population (Garnett & Crowley 2000).

The spotted-tailed quoll was not recorded in the Modification Area. If the spotted-tailed quoll is present in the Development Site, it is likely be part of a large population that extends west to the Blue Mountains National Park, Wollemi National Park and further.

The southern brown bandicoot was not recorded in the Modification Area. If present, the southern brown bandicoot could be part of a collection of local populations.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of a population, or;

Due to the small area of potential habitat (up to 19 hectares of native vegetation) to be removed and the large areas of similar habitat in the local area, the proposed action is unlikely to lead to a long-term decrease in the size of a potential population of the Dural land snail, eastern bristlebird, swift parrot, regent honeyeater, spotted-tailed quoll or southern brown bandicoot.

Of the above mentioned species, the Dural land snail was the only species to be recorded as part of targeted surveys within the Modification Area, from a location adjacent to the Development Site. A single individual was recorded from this location. From this record an assessment of similar habitat within the development site determined that approximately 18.81 hectares of potential habitat would be removed (Umwelt 2017), which has been revised slightly since the Biodiversity Assessment Report (Umwelt 2016a) to account for the above mentioned new record of the species in a different vegetation community. It should be noted that in consultation with OEH, Dixon Sand intend to undertake further targeted surveys for this species to refine the mapped habitat within the Modification Area based on micro-habitat features such as the presences of rocks and logs. Any further refinements to the mapped habitat area for this

species will be provided as part of the updated biodiversity offset strategy which will be included as an addendum to this report. According to the Conservation Advice (Threatened Species Conservation Advice 2015) an estimated 191,400 individuals occur in the wild at a maximum recorded density of three individuals per hectare. Based on these numbers, the removal of potential habitat from the Development Site would result in a maximum of 56 individuals or 0.029 per cent of the known population being removed. This small loss is not considered to lead to a long-term decrease in the population size of this species.

A review of relevant recovery plans of the remaining EPBC Act listed endangered/critically endangered species considered in this assessment found that potential habitat for these species in the Development Site comprises:

- eastern bristlebird
    - Potential habitat for this species is broad, comprising grassland, sedgeland, heathland, swampland, scrubland, grassy sclerophyll forest and woodland, and rainforest. Considering this, the 19 hectares of native vegetation to be removed from the Development Site is considered to represent potential habitat for this species. However, this species was not recorded as part of targeted surveys and the Modification Area does not occur near the three known populations of this species (comprising the North, Central and Southern populations) (OEH 2012).
- swift parrot
    - The Development Site does not contain any key tree species according to the National Recovery Plan for the Swift Parrot (Saunders and Tzaros 2011) and thus the native vegetation to be removed is not considered to be primary foraging habitat for this species.
- regent honeyeater
    - The Development Site does not contain any key tree species according to the National Recovery Plan for the Regent Honeyeater (DoE 2016) and thus the native vegetation to be removed is not considered to be primary foraging habitat for this species.
- spotted-tailed quoll
    - According to the National Recovery Plan for the Spotted-tailed quoll (DELWP 2016) the spotted-tailed quoll has been recorded from a wide range of habitats, including rainforest, wet and dry sclerophyll forest, coastal heathland, scrub and dunes, woodland, heathy woodland, swamp forest, mangroves, on beaches and sometimes in grassland or pastoral areas adjacent to forested areas. Considering this, the 19 hectares of native vegetation to be removed from the Development Site is considered to represent potential habitat for this species. However, this species was not recorded as part of targeted surveys.
- southern brown bandicoot
    - There is currently no adopted recovery plan for the southern brown bandicoot. According to the SPRAT profile (DoE 2017), this species occurs in a variety of habitats, including heathland, shrubland, sedgeland, heathy open forest and woodland usually associated with infertile sandy soils. Considering this, the 19 hectares of native vegetation to be removed from the Development Site is considered to represent potential habitat for this species. However, this species was not recorded as part of targeted surveys.
- reduce the area of occupancy of the species, or;

The Proposed Action would result in a reduction in the area of potential occupancy for the Dural land snail, eastern bristlebird, swift parrot (not primary foraging habitat), regent honeyeater (not primary foraging habitat), spotted-tailed quoll or southern brown bandicoot through the removal of up to 19 hectares of habitat from the Development Site. However the removal of up to 19 hectares of habitat is considered unlikely to significantly impact on a potential population of any of the species due to the local availability of similar potential habitat for each species.

In particular, the Dural land snail has an estimated upper area of occupancy of 638 km^2 according to the conservation advice (Threatened Species Conservation Advice 2015). As a result the removal of potential habitat within the Development Site represents an approximate 0.029 per cent reduction to area of occupancy and is thus considered to cause a negligible loss of area of occupancy for this species.

- **fragment an existing population into two or more populations, or;**

Due to the relatively small area of potential habitat (up to 19 hectares) for the Dural land snail, eastern bristlebird, swift parrot (not primary foraging habitat), regent honeyeater (not primary foraging habitat), spotted-tailed quoll or southern brown bandicoot to be removed from the Development Site and the availability of large areas of similar habitat adjoining the Development Site, the Proposed Action is unlikely to fragment an existing population into two or more populations. Apart from the Dural land snail, all other species being assessed are mobile or highly mobile and would readily disperse into expansive areas of suitable habitat surrounding the Development Site. Although the Dural land snail dispersal is extremely slow, the record of this species is outside the impact footprint and the location of the record of this species is well connected to surrounding suitable habitat.

- **adversely affect habitat critical to the survival of a species, or;**

Due to the relatively small area of potential habitat (up to 19 hectares) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to adversely affect habitat critical to the survival of the Dural land snail, eastern bristlebird, swift parrot, regent honeyeater, spotted-tailed quoll or southern brown bandicoot.

- **disrupt the breeding cycle of a population, or;**

Due to the relatively small area of potential habitat (up to 19 hectares) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to disrupt the breeding cycle of a population of the Dural land snail, eastern bristlebird, swift parrot, regent honeyeater, spotted-tailed quoll or southern brown bandicoot.

- **modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

Due to the relatively small area of potential habitat (up to 19 hectares) to be removed from the Development Site and the availability of large areas of similar potential habitat adjoining the Development Site, the Proposed Action is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Dural land snail, eastern bristlebird, swift parrot, regent honeyeater, spotted-tailed quoll or southern brown bandicoot are likely to decline.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species habitat, or;**

The Proposed Action is not likely to result in invasive species that are harmful to the Dural land snail, eastern bristlebird, swift parrot, regent honeyeater, spotted-tailed quoll or southern brown bandicoot becoming established in their habitat.

Ongoing weed management is proposed and was discussed in detail in Section 4.2.2 and Section 4.3.1 of the Biodiversity Assessment Report (Umwelt 2016a).

- **introduce disease which may cause the species to decline, or;**

The Proposed Action is unlikely to introduce a disease which may cause a decline in the Dural land snail, eastern bristlebird, swift parrot, regent honeyeater, spotted-tailed quoll or southern brown bandicoot.

- **interfere with the recovery of the species.**

The Proposed Action is unlikely to interfere substantially with the recovery of the Dural land snail, eastern bristlebird, swift parrot, regent honeyeater, spotted-tailed quoll or southern brown bandicoot, as a relatively small amount of potential habitat, not primary foraging habitat for the swift parrot or regent honeyeater, is being removed from the local area.

Conclusion

The Proposed Action is unlikely to result in a significant impact on the Dural land snail, eastern bristlebird, swift parrot, regent honeyeater, spotted-tailed quoll or southern brown bandicoot.

2.1.2 Vulnerable Species

The following EPBC Act listed vulnerable species are considered in this assessment:

- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- Giant Burrowing Frog (*HeIeiporus australiacus*)
- Littlejohn's Tree Frog (*Litoria littlejohni*)
- Broad-headed Snake (*Hoplocephalus bungaroides*)
- Koala (*Phascolarctos cinereus*)
- Long-nosed Potoroo (*Potorous tridactylus tridactylus*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- New Holland Mouse (*Pseudomus novaehollandiae*)

An assessment in accordance with the significant impact criteria (Department of the Environment 2013) is provided below for these species.

In this case, an important population is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- **key source populations either for breeding or dispersal; or**
- **populations that are necessary for maintaining genetic diversity, and/or**
- **populations that are near the limit of the species range.**

The Development Site provides potentially suitable habitat for the large-eared pied bat, giant burrowing frog, Littlejohns tree frog, broad-headed snake, koala, long-nosed potoroo, grey-headed flying-fox and New Holland mouse. However, apart from the large-eared pied bat, none of these species have been recorded in the Development Site or Modification Area as part of targeted and opportunistic surveys.

The large-eared pied-bat was recorded north of the Development Site within the Modification Area (Umwelt 2016a). It was recorded through use of bat echolocation recordings using an Anabat II Bat Detector. These recordings were then professionally identified by Anna McConville of Echo Ecology Pty Limited. The Development Site does not contain any roosting habitat for the species but is considered to comprise marginal foraging habitat for this species as part of a wider foraging range in the locality.

The identification of habitat or potential habitat for the large-eared pied bat, giant burrowing frog, Littlejohn's tree frog, broad-headed snake, koala, long-nosed potoroo, grey-headed flying-fox or New Holland mouse within the Development Site does not constitute the presence of an 'important population' as defined by the criteria listed above. The Development Site is unlikely to contain a key source population for breeding or dispersal, or populations that are necessary for maintaining genetic diversity, or populations that are near the limit of the species range

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species, or;**

Given that there is not considered to be an important population of the large-eared pied bat, giant burrowing frog, Littlejohns tree frog, broad-headed snake, koala, long-nosed potoroo, grey-headed flying-fox or New Holland mouse present within the Development Site, the Modification will not lead to a long-term decrease in the size of an important population of these species.

- **reduce the area of occupancy of an important population, or;**

The Development Site is unlikely to comprise an important population of large-eared pied bat, giant burrowing frog, Littlejohns tree frog, broad-headed snake, koala, long-nosed potoroo, grey-headed flying-fox or New Holland mouse and therefore the Modification is unlikely to reduce the area of occupancy of an important population.

- **fragment an existing important population into two or more populations, or;**

The Development Site is unlikely to comprise an important population of the large-eared pied bat, giant burrowing frog, Littlejohns tree frog, broad-headed snake, koala, long-nosed potoroo, grey-headed flying-fox or New Holland mouse and therefore the Modification is unlikely to fragment an existing important population into two or more populations.

- **adversely affect habitat critical to the survival of a species, or;**

The habitat in the Development Site is not known to provide core habitat for large-eared pied bat, giant burrowing frog, Littlejohns tree frog, broad-headed snake, koala, long-nosed potoroo, grey-headed flying-fox or New Holland mouse. The Development Site is not considered to be critical habitat for these species and consequently the Modification is not expected to adversely affect habitat critical to the survival of these species.

- **disrupt the breeding cycle of an important population, or;**

The Development Site is unlikely to comprise an important population of the large-eared pied bat, giant burrowing frog, Littlejohns tree frog, broad-headed snake, koala, long-nosed potoroo, grey-headed flying-fox or New Holland mouse and therefore the Modification is unlikely to disrupt the breeding cycle of an important population of these species. The record of the large-eared pied bat near the Development Site is considered to be a foraging record and breeding habitat (including caves) is not known to occur in the local area.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The Development Site is unlikely to comprise an important population of the large-eared pied bat, giant burrowing frog, Littlejohns tree frog, broad-headed snake, koala, long-nosed potoroo, grey-headed flying-fox or New Holland mouse and therefore the Modification is unlikely to modify, destroy, remove, isolate, or decrease the availability or quality of habitat for these species to the extent that they would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat, or;**

The Modification is unlikely to result in an invasive species that is harmful to the large-eared pied bat, giant burrowing frog, Littlejohns tree frog, broad-headed snake, koala, long-nosed potoroo, grey-headed flying-fox or New Holland mouse becoming established in their habitat.

- **Introduce disease that may cause the species to decline.**

The Modification is unlikely to introduce disease that may cause the large-eared pied bat, giant burrowing frog, Littlejohns tree frog, broad-headed snake, koala, long-nosed potoroo, grey-headed flying-fox or New Holland mouse to decline.

- **interferes substantially with the recovery of the species.**

The Modification is unlikely to interfere substantially with the recovery of the large-eared pied bat, giant burrowing frog, Littlejohns tree frog, broad-headed snake, koala, long-nosed potoroo, grey-headed flying-fox or New Holland mouse.

Conclusion

The Modification is unlikely to result in a significant impact on the large-eared pied bat, giant burrowing frog, Littlejohns tree frog, broad-headed snake, koala, long-nosed potoroo, grey-headed flying-fox or New Holland mouse.

2.2 Further Assessment of MNES Potentially Significantly Impacted

As identified in Attachment A of Attachment 1 Commonwealth Department of Environment Assessment Requirements as part the letter detailing Environmental Assessment Requirements (NSW Department of Planning and Environment 2016) the following requirements are addressed for the MNES *Coastal Upland Swamps in the Sydney Basin Bioregion* EEC and *Darwinia biflora* which are likely to be significantly impacted according to DoEE.

2.2.1 Coastal Upland Swamps in the Sydney Basin Bioregion EEC

9. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide a separate:

(i) description of the habitat and habits (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans, threat abatement plans and wildlife conservation plans; and

Coastal Upland Swamps in the Sydney Basin Bioregion EEC was recorded as one small patch within the Development Site and a larger patch in the Modification Area which will be setup as an onsite offset. Refer to Section 3.2 of the Biodiversity Assessment Report (Umwelt 2016a) for further details. This EEC occurs where groundwater seeps to the surface or where surface waters collect near-surface. The very small area (0.08 hectares) of this EEC to be removed is considered to be a negligible impact and is not considered to represent habitat critical to the survival of this community.

(ii) details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements.

Detailed floristic surveys (including systematic plot surveys) were undertaken to identify the occurrences of *Coastal Upland Swamps in the Sydney Basin Bioregion* EEC in 2014. Analysis of consistency with the conservation advice for this EEC was undertaken (Threatened Species Scientific Committee 2014).

(iii) description of the impacts of the action having regard to the full national extent of the species or community's range.

Overall the current extent of this community in Australia is estimated to be approximately 5360 hectares (Threatened Species Scientific Committee 2014). The removal of this community within the Development Site will result in approximately a 0.0015 per cent reduction within Australia. The Modification involves the complete removal of this community (approximately 0.08 hectares) from within the Development Site.

10. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide a separate:

(i) identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account.

As detailed above, a total of 0.08 hectares of *Coastal Upland Swamps in the Sydney Basin Bioregion* EEC will be removed from the Development Site.

(ii) details of how the current published NSW Framework for Biodiversity Assessment (FBA) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts;

Dixon Sands has completed a Biodiversity Assessment Report (Umwelt 2016a) using the *Framework for Biodiversity Assessment – NSW Biodiversity Offsets Policy for Major Projects* (FBA) for the Development Site along with the inclusion of offset credit calculations for two proposed offset sites as part of a Biodiversity Offset Strategy (Umwelt 2017), comprising the Haerses Road Offset Site and the Porters Road Offset Site. The Biodiversity Assessment Report is currently being finalised in consultation with DPE and OEH with an addendum to be prepared to this report with the final strategy. In summary, the Biodiversity Offset Strategy will likely involve a range of offsetting mechanisms available under FBA, including BioBanking

offset lands, purchasing deficit credits from the credit market and/or possible future contributions to an offset fund. With regard to offsetting *Coastal Upland Swamps in the Sydney Basin Bioregion* EEC, the FBA process has been applied to generate surplus ecosystem credits for the same Plant Community Type (PCT) which also meets the *Coastal Upland Swamps in the Sydney Basin Bioregion* EEC under the EPBC Act. That is, the proposed offsets fully address the offset requirement for this EEC. A further detailed response is provided below regarding credit profiles and the condition of this EEC.

(iii) details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the development in accordance with the FBA and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites.

To offset the impacts on *Coastal Upland Swamps in the Sydney Basin Bioregion* EEC the onsite Haerses Road Offset Site is proposed. According to the FBA assessment the credit profile requires 3 ecosystem credits to offset the impacts of the Modification. The credit profile also lists three plant community types (PCTs) which can be used to offset the impacts in the Yengo – Hawksbury/Nepean IBRA subregion (or any IBRA subregion which adjoins). These requirements are met through the generation of 11 ecosystem credits (a surplus of 8 ecosystem credits) from the equivalent PCT which is also forms part of the Co*astal Upland Swamps in the Sydney Basin Bioregion* EEC meeting like for like rules.

It is also noted that in addition to satisfying FBA offsetting requirements, a preliminary EPBC offset calculator assessment found that the proposed offset provides a 239.04 % offset requirement for the impacts. Note that 0.2 hectares is the minimum area for the calculator and this was used instead of the 0.08 hectares of this EEC to be impacted.

11. Any significant residual impacts not addressed by the FBA may need to be addressed in accordance with the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offset Policy.

As discussed above, the proposed Haerses Road Offset Site according to the FBA and the EPBC Act offset calculator fully satisfies the offsetting requirements for the EEC and provides a surplus of credits/land based offsets.

2.2.2 Darwinia biflora

9. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide a separate:

(i) description of the habitat and habits (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans, threat abatement plans and wildlife conservation plans; and

This species was recorded throughout the Development Site and Modification Area, refer to Section 3.3.2.3 of the Biodiversity Assessment Report (Umwelt 2016a) for further details. The density of *Darwinia biflora* was found to be high and it was impractical to record every individual. This species is a known fire ephemeral and populations fluctuate substantially post-fire with high population numbers after fire and a decrease with time since fire (NSW Department of Environment and Conservation 2004). Instead of a count of the number of individuals, the area of habitat for this species has been mapped within the Development Site according to the NSW Guide to Surveying Threatened Plants (OEH 2016). The total area of mapped likely habitat for *Darwinia biflora* is 17.82 hectares within the Development Site, comprising all occurrences of Red Bloodwood - scribbly Gum Heathy Woodland on Sandstone Plateaux of the Sydney Basin Bioregion

and Scribbly Gum - Hairpin Banksia - Dwarf Apple Heathy Woodland on Hinterland Sandstone Plateaux of the Central Coast, Sydney Basin Bioregion. As per the assessment of significance undertaken as part of the Referral (Umwelt 2015), the population of *Darwinia biflora* is considered to be an important population. The habitat with the Development Site is however not considered to be critical to the survival of *Darwinia biflora* given that this species is known to be occur in seven conservation areas, with greater than 5,000 individuals present at each of these sites (Department of the Environment and Energy 2017b)

(ii) details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements.

Targeted surveys were undertaken for *Darwinia biflora* during two separate surveys events in November 2014 and December 2015. For further details refer to Section 2.7 of the Biodiversity Assessment Report (2016). These surveys are consistent with the survey guidelines specified on the Species Profile and Threats Database (Department of the Environment and Energy 2017b).

(iii) description of the impacts of the action having regard to the full national extent of the species or community's range.

As detailed above a total of 17.82 hectares of likely *Darwinia biflora* will be removed.

10. For each of the relevant EPBC Act listed threatened species and communities likely to be significantly impacted by the development the EIS must provide a separate:

(i) identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account.

As detailed above a total of 17.82 hectares of likely *Darwinia biflora* will be removed.

(ii) details of how the current published NSW Framework for Biodiversity Assessment (FBA) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts;

As previously discussed, Dixon Sands have completed a Biodiversity Assessment Report (Umwelt 2016a) using the *Framework for Biodiversity Assessment – NSW Biodiversity Offsets Policy for Major Projects* (FBA) for the Development Site along with the inclusion of offset credit calculations for two proposed offset sites as part of a Biodiversity Offset Strategy (Umwelt 2017), comprising the Haerses Road Offset Site and the Porters Road Offset Site. As discussed above, the Biodiversity Assessment Report is currently being finalised in consultation with DPE and OEH. In summary, the Biodiversity Offset Strategy will likely involve a range of offsetting mechanisms available under FBA, including BioBanking offset lands, purchasing deficit credits from the credit market and/or possible future contributions to an offset fund. With regard to *Darwinia biflora* Dixon Sands have two offset sites which contain habitat for this species and will contribute to offsetting the residual adverse impacts. A further detailed response is provided below regarding credit profiles and the condition of habitat for this species.

(iii) details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the development in accordance with the FBA and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites.

To offset the impacts on *Darwinia biflora* the onsite Haerses Road Offset Site and the offsite Porters Road Offset Site are proposed. According to the FBA assessment the credit profile requires 360 species credits (based on 17.82 hectares of habitat as opposed to individuals) to offset the impacts of the Modification. The Haerses Road Offset Site provides 163 species credits (comprising approximately 23 hectares of

habitat) and the Porters Road Offset Site provides 270 credits (comprising approximately 38 hectares of habitat). A surplus 73 credits are generated using land based offsets.

A preliminary EPBC calculator assessment found that the proposed offsets provide a 214.63 % offset requirement for the impacts.

11. Any significant residual impacts not addressed by the FBA may need to be addressed in accordance with the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offset Policy.

As discussed above the proposed offset strategy fully satisfies the offsetting requirements for the species and exceeds the residual impact requirements for *Darwinia biflora* under the FBA.

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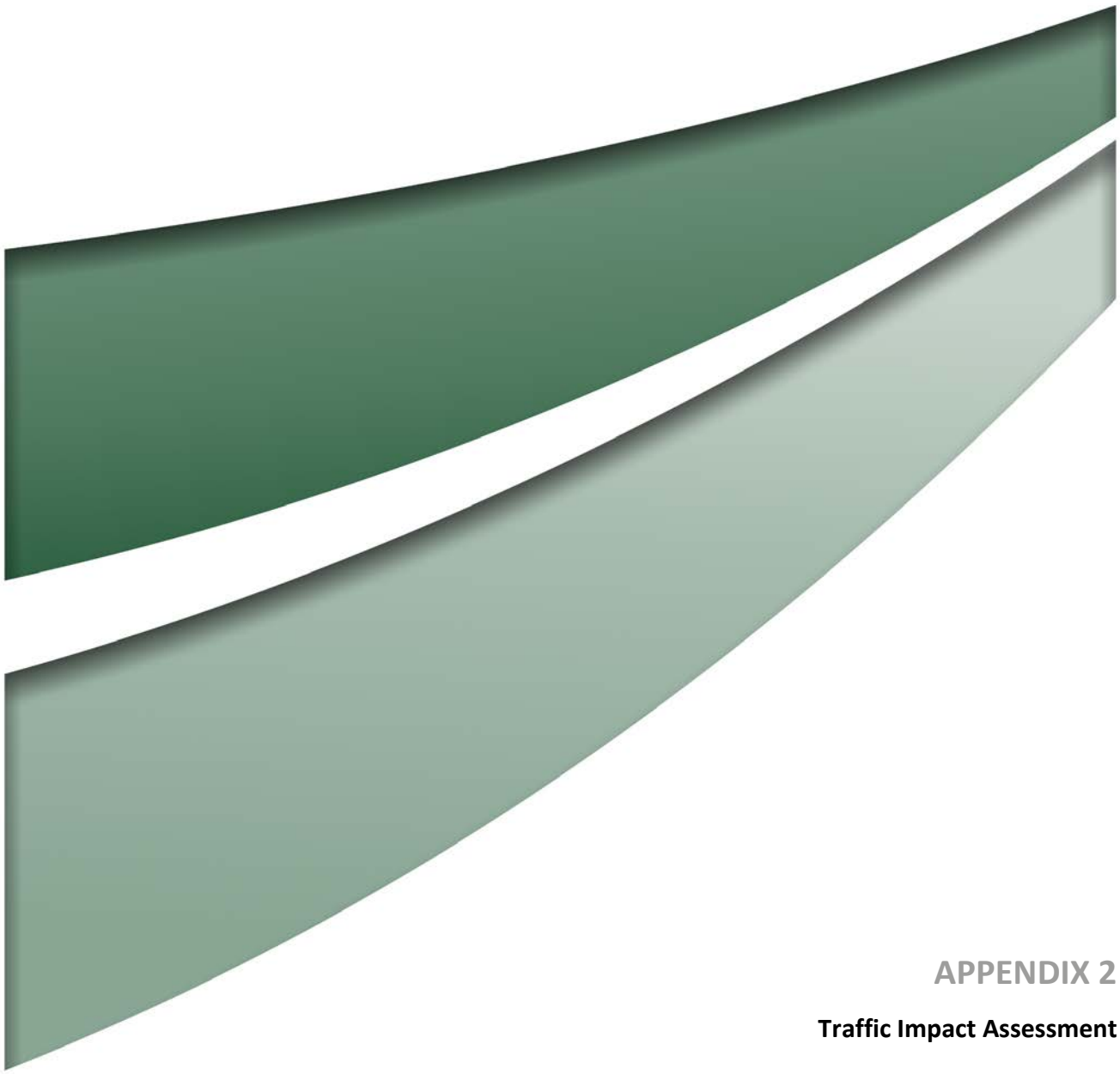

APPENDIX 2

Traffic Impact Assessment

SECAsolution
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20 December 2016

P0300 Dixon Quarry

Umwelt (Australia) Pty Limited
75 York Street
Teralba, NSW 2284

Attn: Lachlan Sweeney

Dear Lachlan,

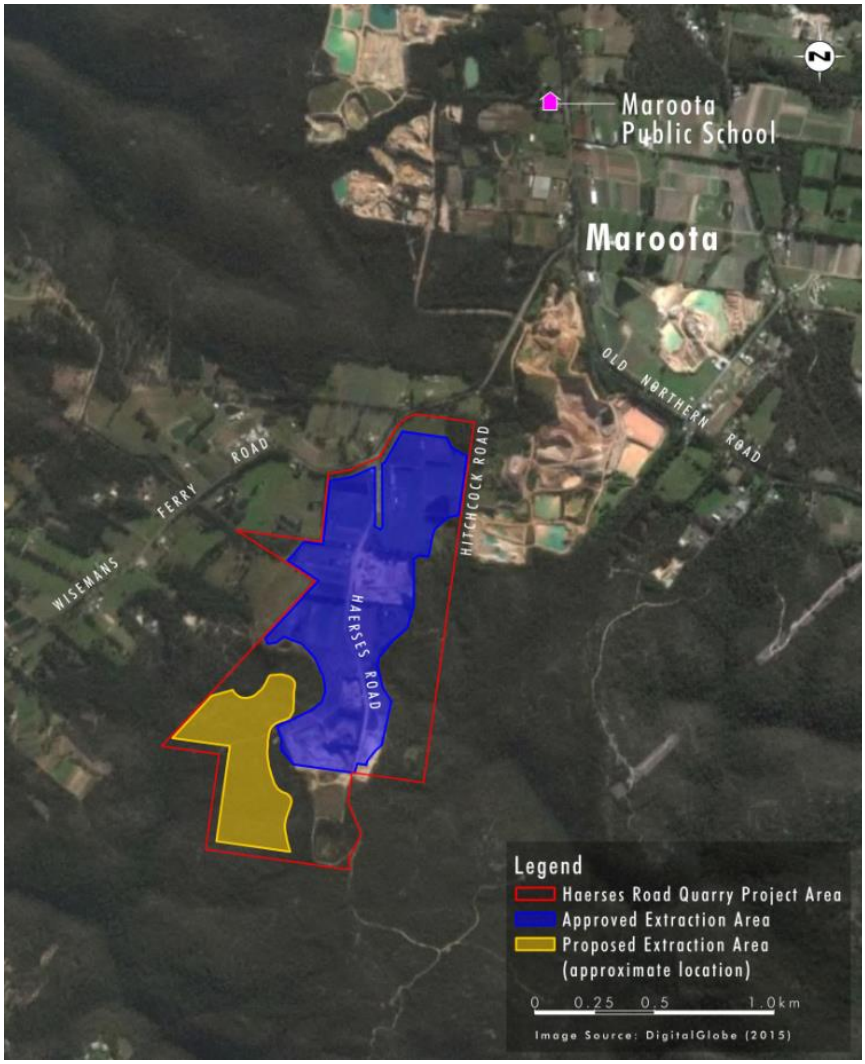
Proposed additional extraction area, Dixon Sand Quarry, Haerses Road, Maroota, NSW
Traffic Impact Assessment

Further to our recent discussions, we have completed our site investigation of the proposed additional extraction area of the Dixon Sand quarry at Haerses Road, Maroota. We have reviewed the access location and have reviewed the project description. The subject site is located within the general locality of Maroota with the key access route being south along the Old Northern Road towards Sydney.

This traffic impact assessment has been prepared in accordance with the Austroads Guidelines and Section 2.3 of the RMS Guide to Traffic Generating Developments. Section 2.3 of the RMS Guide to Traffic Generating Developments provides a structure for reporting, covering the key issues to be addressed in determining the impact of traffic associated with a development. The Guide indicates that using this format and checklist will ensure that the most significant matters associated with a Development Application are considered by the road authority, be they the RMS or Council.

The report has also taken into consideration The Hills Hornsby Development Control Plan 2013 which makes reference to the Sydney Regional Environmental Plan No 9--Extractive Industry (No 2--1995) - Reg 1.

The location of the site is shown below.



The items identified in Section 2.3 of the RMS Guide to Traffic Generating Developments are addressed below.

Item	Response
Existing Situation	
2.1.1 Site Location and Access	The quarry is located on Haerses Road, off Wisemans Ferry Road, to the west of the intersection with Old Northern Road. The current vehicle access is via Haerses Road which will continue to be used for the proposed expansion on the project site
2.2.1 Road Hierarchy	The main road through the locality is **Old Northern Road**, which runs in a north south direction to the west of the subject site. It provides an important road link through the locality, providing a connection for a number of rural suburbs between Wisemans Ferry to the north and Baulkham Hills and the greater area of Sydney to the south. In the locality of the subject site it generally provides a single lane of travel in each direction with additional turn lanes at key locations to maintain capacity. It operates under the posted speed limit of 80 km/h in the vicinity of the site and the intersection with Wisemans Ferry Road. There are no footpaths

Item	Response
	along the road in the location of the site with minimal sealed shoulders, reflective of the rural setting in this locality. **Wisemans Ferry Road** connects with **Old Northern Road** to the east of the site. Wisemans Ferry Road provides a sealed width in the order of 6m operating effectively under a speed limit of 80 km/h with a varying width sealed shoulder with a minimal verge bounded by small trees and shrubs. The road provides a route through to Richmond and the north-west sector of Sydney.
2.2.2 Roadworks	No road works are occurring within the general locality of the subject site. Given the reasonably low traffic flows in this area it can be seen that other than road maintenance there is no requirement for any major road upgrades in this location.
2.2.3 Traffic Management Works	None currently noted.
2.2.4 Pedestrian and Cycling Facilities	No pedestrian or cyclists facilities provided. Cyclists are able to use the road as required and there is generally very limited demand for pedestrian movements in this rural location due to the lack of local shops, schools etc.
2.2.5 Public Transport	There are no bus stops in the locality. It is noted that there are a number of school bus runs in this location and that buses pick up and drop off at informal locations along Old Northern Road adjacent to side roads and / or residents as required.
2.3 Traffic Flows	
2.3.1 Daily Traffic Flows	Daily traffic flows in the vicinity of the site are reasonably low, reflective of the rural location. As part of the project work, Seca Solution completed a traffic survey on Old Northern Road to the north of Maroota during the AM and PM peak periods during a typical working day (23rd November 2015). These counts shows that during the AM peak the 2-way flow was 146 vehicles per hour and 144vph in the PM peak. Based on the peak hour flow typically representing 10% of the daily flows, the daily traffic flows on this section of Old Northern Road could be in the order of 1,500 vehicles per day. Traffic surveys were also completed by Seca Solution on 4th December 2014 at the intersection of Old Northern Road and Wisemans Ferry Road, between 2.30PM and 5.00PM to determine the current traffic flows during the peak period associated with the Maroota Public School to the north of this location. These flows show that the two-way traffic flow on Old Northern Road to the north of Wisemans Ferry Road was 216 vehicles, indicating that daily traffic movements could be in the order of 2,100 vehicles per day, slightly higher than the surveys further north on Old Northern Road near Laughtondale Gully Road. Traffic flows on Wisemans Ferry Road, in the location of the site, were in the order of 176 vehicles during the afternoon peak period. This would indicate daily flows in the order of 1,800 per day.

Item	Response
2.3.2 Daily Traffic Flow Distribution	The peak hour traffic flows along Old Northern Road show a slight bias in traffic movements southbound in the AM peak, reflective of education and work opportunities to the south of the locality. In the PM peak the flows are reasonably evenly balanced. Daily traffic flows are expected to be equally balanced between northbound and southbound.
2.3.3 Vehicle Speeds	No speed surveys were completed as part of the study work. However, it is considered that the majority of drivers drive at the posted speed limit, due to the road alignment in the general locality of the site along Wisemans Ferry Road.
2.3.4 Existing Site Flows	The site is currently used for sand extraction with the current consent allowing for a maximum of 28 truck movements per day onto Hearses Road, with a limit of 10 trucks between 6-7 AM.
2.3.5 Heavy Vehicle Flows	There are a number of heavy vehicle movements in the locality, associated with the various quarries in the area as well as rural use demands. The vast majority of the heavy vehicle demands associated with the quarries are to the south of the locality, to the Greater Sydney area with very few heavy vehicles continuing north to Wisemans Ferry and beyond. A number of trucks were observed during the survey periods, associated with quarry activities and typical are truck and dog combinations.
2.3.6 Current Road Network Operation	The road network in the vicinity of the subject site currently operates very well with limited delays and congestion.
2.4 Traffic Safety and Accident History	The local road network in the general vicinity of the subject site is well laid out and caters safely for the overall traffic flows in the general vicinity of the subject site. Crash Data provided by the RMS for the past five years show that there have been no accidents recorded at the intersection of Haerses Road and Wisemans Ferry Road, Maroota. For the same period there has been only two crashes recorded at the intersection of Wisemans Ferry Road and Old Northern Road. One in 2010 and one in 2011. Neither involved a heavy vehicle. Overall it is considered that road safety in the locality of the subject site is good and that the limited number of heavy vehicles in the locality do not create any significant safety concerns.
2.5 Parking Supply and Demand	
2.5.1 On-street Parking Provision	There are no designated parking areas within the general locality of the site with parking demands catered for within the individual lots. Parking is permitted along the side of the roads if required on the verges, although observations on site show that there is little demand for road side parking in this area.
2.5.3 Parking Demand and Utilisation	There has been no demand for parking noted within the vicinity of the site.
2.5.4 Set down or pick up areas	There are no designated set down areas in the immediate locality of the subject site.
2.6 Public Transport	
2.6.1 Rail Station Locations	The location is not served by trains.

Item	Response
2.6.2 Bus Stops and Associated Facilities	There are no regular bus services to this location. There are a number of school bus runs that operate along Old Northern Road providing a service primarily for school students.
2.6.3 Pedestrians	There are no pedestrian footpaths within the vicinity reflecting the limited demand and rural setting.
2.7 Other Proposed Developments	No other significant developments noted in the immediate locality of the subject site. A new quarry has been approved on Laughtondale Gully Road to the north of the subject site.
Proposed Development	
3.1 The Development	Dixon Sand (Penrith) Pty Ltd (Dixon Sand) is seeking a modification to the existing development consent to expand the extraction area of the Hearses Road Quarry. The proposed modification seeks not to alter the overall number of truck movements in and out of the project site, however may see an increase in overall truck movements due to changes in the flows between this subject site and the associated facility on the Old Northern Road. The proposed modification involves the following: - Maximum of 250,000 tonnes per annum exiting the site - Maximum of 250,000 tonnes per annum direct to market (increase from current consent of 60,000 tonnes per annum) - Maximum of 190,000 tonnes per annum exit site to Old Northern Road site (NO change to current movements through township of Maroota) - Up to 100,000 tonnes per annum of VENM / ENM to / from site for processing. The 100,000 tonnes of VENM / ENM will be transported to the site in trucks that are currently entering the site empty to pick up a load for removal of product to either the associated Old Northern Road Quarry or to market. The consent seeks to increase the overall number of truck movements associated with the quarry, in and out of the site (by 28 per day), from the current restriction of a maximum of 7 trucks movements to the south-west per day and increase this to a maximum of 28 per day.
3.1.1 Nature of Development	Sand extraction quarry
3.1.2 Access and Circulation Requirements	Access will be provided via the existing access along Hearses Road which then connects with Wisemans Ferry Road. The layout of the site and the operations allows for all vehicles to enter and exit the site in a forward direction. There is no change to the current access arrangements for the project.
3.2 Access	The access to the site will be via the existing access on Hearses Road. Hearses Road connects with Wisemans Ferry Road via a simple Give Way control, with Hearses Road being located on the outside of the slight curve in this location which allows for good visibility for vehicles entering and exiting Hearses Road.

Item	Response
	This access currently caters for all turning movements associated with the current operations on the site, which allow for trucks and light vehicles to enter and exit Hearses Road from the east and west on Wisemans Ferry Road.
3.2.1 Driveway Location	The driveway access to the site is located at the end of Hearses Road and effectively operates as the terminus of Hearses Road.
3.2.2 Sight Distances	The intersection of Hearses Road and Wisemans Ferry Road is a simple T intersection, with Wisemans Ferry Road being the priority road. There is a short length of sheltered right turn lane that allows for the vehicles turning right off Wisemans Ferry Road into Hearses Road. The sight distances at this location are restricted, due to curvature of the roads and the road side vegetation. For the posted speed limit of 80 km/h, the required safe intersection sight distance is 160 metres, whilst the stopping sight distance requirement is 100 metres. The sight distance available in both directions is approximately 140 metres, which equates to a design speed of 70 km/h. The alignment of the road in the locality of the intersection with Hearses Road does not encourage speeding with vehicles typically travelling at lower than the posted speed limit. The sight distance available exceeds the requirements under Approach Sight Distance requirement of 100 metres under Austroads requirements. Approach Sight Distance allows an approaching driver to appreciate the intersection geometry and pavement markings in order to negotiate the intersection or stop (if necessary). Whilst the safe intersection sight distance is short be 20m this existing access appears to operate in a safe manner with vehicles able to observe the intersection and adjust speeds accordingly. Based upon observations on site and a review of the current operations on site, it is considered that the intersection of Hearses Road and Wisemans Ferry Road can continue to operate to an acceptable standard for the proposed modification of the quarry. It is noted that the proposed modification will not increase the current number of truck movements using this intersection associated with the quarry.
3.2.3 Service Vehicle Access	The site will require limited servicing and the service vehicles will typically be required for maintenance of construction vehicles on site, tyre changes, etc. These vehicles will typically be a small rigid truck or smaller. The number of service vehicles is not expected to alter with the proposed modification.
3.2.4 Queuing at entrance to site	No vehicle queues expected at site entry / exit point due to the low overall flows from the site as well as low flows on Wisemans Ferry Road. Observations on site during a typical morning and afternoon peak period showed that the current intersection of Hearses Road and Wisemans Ferry Road operates very well, with no delays or congestion noted. The vast majority of turn movements in and

Item	Response
	out of Hearses Road occurred with no delays other than the geometric delay created by the intersection, with the through movement on Wisemans Ferry Road being low and accordingly leaving large gaps in the traffic movements. This pattern also occurs at the intersection of Wisemans Ferry Road and Old Northern Road, with no delays for the vast majority of drivers other than those associated with negotiating the intersection.
3.2.5 Comparison with existing site access	Existing site access is via Hearses Road and there will be no change to this access required or proposed.
3.2.6 Access to Public Transport	There is very limited access to public transport in this area and it is considered that employees associated with the project will not rely on public transport to access the site.
3.3 Circulation	
3.3.1 Pattern of circulation	All vehicles can enter and exit the site in a forward direction and circulate around the site as required.
3.3.2 Road width	The existing internal roads allow for two-way traffic movements as required and given the very low traffic movements associated the development the existing internal road does not create any issues.
3.3.3 Internal Bus Movements	No internal bus movement will be required for this modification.
3.3.4 Service Area Layout	No specific service area layout required. A maintenance shed is provided on site to allow for vehicle maintenance as required.
3.4 Parking	
3.4.1 Proposed Supply	A gravel car parking providing 12 spaces (8 staff and 4 visitor) will be located adjacent to Haerses Road at the weighbridge. There will be no trucks parked on the site overnight.
3.4.2 Authority Parking	No specific parking rate provided for the development land use under The Hills Development Control Plan. Similarly, the RMS Guide to Traffic Generating Developments makes no recommendations for parking for extractive industries. Thus the parking is to be provided based upon the actual demand of the end user.
3.4.3 Parking Layout	No formal parking bays to be provided. Parking will occur adjacent to the weighbridge and/or maintenance shed.
3.4.4 Parking Demand	Normal parking demands can be accommodated within the site.
3.4.5 Service Vehicle Parking	Service vehicles can be accommodated within the site as required.
3.4.6 Pedestrian and Bicycle Facilities	It is considered that there will be no demand for pedestrian or cycle access given the remote location of the site and as such, no formal facilities will be provided.
Traffic Assessment	
4.1 Traffic Generation	There are no standard traffic generation rates provided by the RTA Guide to Traffic Generating Development for this type of development and as such the generation should be based upon the future operational characteristics of the site. The modification will allow for the continual extraction of up to 250,000 tonnes of material per annum from the site. This means

Item	Response
	that the current limit of truck movements in and out of the site will remain at the current levels i.e. 28 per day. Currently a maximum of 190,000 tonnes is extracted from the site and proceeds north on Old Northern Road to the other facilities operated by Dixon Sands. This will not change under the proposed modification. Currently, a maximum of 60,000 tonnes per annum (out of the total of 250,000 tonnes per annum) is extracted from the site and dispatched directly to the market. The modification seeks to increase this to a maximum of 250,000 tonnes per annum direct to market. If the full quantity of 250,000 tonnes per annum is extracted and delivered direct to market, then there will be no material moved to the site on Old Northern Road to the north of Maroota. The proposal will also allow for the import of VENM and ENM material, up to 100,000 tonnes per annum. This will utilise empty trucks travelling to the site, which will then carry the outbound material from the site. Currently these inbound trucks do not carry a load. The modification allowing for all trucks to go direct to market rather than the current arrangement providing for up to 28 laden trucks per day to travel between the site and the Old Northern Road quarry. This may see a potential increase in truck movements from the Old Northern Road Quarry as the consent for the Old Northern Road site includes up to 28 inbound laden trucks per day which will not occur, therefore creating an opportunity for additional truck movements in association with the Old Northern Road quarry. This could see an extra 28 trucks per day (inbound and outbound) either via Old Northern Road or Wiseman Ferry Road or a combination of the two routes, dependent upon the market demands. This means an additional 28 trucks movements per day would be generated as a result of this modification. The hours of operation for the quarry will be Monday to Saturday 7am to 6pm. The modification will result in an additional 28 truck movements per day in and out and a limit of 10 trucks per hour between 6-7 AM.
4.1.1 Other Developments	No other significant developments are noted within the locality of the site. A quarry has been approved on Laughtondale Gully Road to the north of the subject site. This will generate traffic movements along Old Northern Road, once it becomes fully operational.
4.1.3 Daily and Seasonal Factors	Operational traffic associated with the quarry is in response to market demands. There will be a significant daily variation in traffic movements as a consequence of this. At times there may be no demand and as such there will be no activity in and out of the quarry.
4.1.4 Pedestrian Movements	No pedestrian movements are expected to and from the site. All internal pedestrian movements will be covered by WH&S guidelines.

Item	Response
4.2 Traffic Distribution and Assignments	The traffic movements will allow for access in both directions along Wisemans Ferry Road dependent upon the market demands. Current traffic movements are limited to a maximum of 7 trucks to the west of Hearses Road with the balance, up to 28 trucks per day, to the east on Hearses Road. The modification seeks to increase the maximum number of trucks by 28 per day being an allowance for up to 28 trucks to use Wisemans Ferry Road to the east or west of Hearses Road or Old Northern Road.
4.2.1 Origin / destinations assignment	100% of trucks will enter and exit via Hearses Road only. Up to 28 trucks per day will travel along Wisemans Ferry Road with no restriction on how many of these travel to the west or to the east. Those travelling east will then access the broader network along Old Northern Road south dependent upon if outbound material to market.
4.3 Impact on Road Safety	It is considered that the project will have a minimal impact upon road safety in the general locality of the subject site. The modification does not allow for an increase in the number of truck movements directly associated with the quarry however may see an additional 28 inbound and 28 outbound movements due to the change in movements to the Old Northern Road Quarry. The road network in the locality of the subject site operates well with minimal delays. The rural nature of the locality does not encourage high traffic speeds and the road alignment of Wisemans Ferry Road and Old Northern Road both allow for safe traffic movements. There are already a number of quarry related truck movements in the area which generate heavy vehicle movements and these overall movements will not increase due to the modification. The modification will increase the number of truck movements passing through the township of Maroota and past Maroota Pubic School in this location by 28 trucks per day in both directions but will have an acceptable impact on safety at this location. Overall the typical 11 hour working day the number of trucks will be 3 per hour per direction and during peak periods will remain at less than 10 trucks per hour as per the current operations.
4.4 Impact of Generated Traffic	
4.4.1 Impact on Daily Traffic Flows	It is considered that the traffic movements generated by the modification will have a minimal impact on the daily traffic movements in the immediate locality of the subject site. The development has the potential to generate 28 additional traffic movements in any direction. The development will generate 28 truck movements per day (inbound and outbound). Current daily flows on Old Northern Road, based upon the peak hour surveys completed by Seca Solution, are in the order of 1,500 vehicles per day well within acceptable limits for the local roads in this location. The additional 28 truck movements per direction will increase the daily traffic flows by less than 4% with the total flows remaining well within acceptable limits on the local road network.

Item	Response
	For the alternative access route, with the market demand requiring all 28 trucks to head to market via Wiseman Ferry Road to the south-west of the site, the current daily traffic flows are in the order of 2,100 in the vicinity of the site. It is considered that the additional 28 truck movements per day in both directions would have a negligible impact upon the operation of this road in this location. It is noted that the current consent permits up to 7 trucks per day via this route and so the proposal is to increase this by 28 trucks per day per direction.
4.4.2 Peak Hour Impacts on Intersections	The key intersections identified as being potentially affected by the modification is the T intersection of Hearses Road with Wisemans Ferry Road and Wisemans Ferry Road with Old Northern Road. Observations on site show that both of these intersections operate very well with no delays for the majority of traffic movements. Traffic turning into or out of the side road typically did not need to stop and the only delay was that associated with manoeuvring through the intersection. A Sidra intersection analysis has been completed at the intersection of Old Northern Road and Wisemans Ferry Road and the analysis confirms that the intersection operates very well with negligible delays and congestion. Levels of service for all movements are A and the delays are less than 7 seconds for all movements. It is considered that the intersection of Hearses Road and Wisemans Ferry Road would operate to a similar level of service and delays. With no increase to the truck numbers at this location the intersection will continue to operate at this level of service. Traffic flows are lower than at the intersection of Old Northern Road and Wisemans Ferry Road and observations on site show that this intersection currently operates with negligible delays for all traffic movements.
4.4.3 Impact of Construction Traffic	All construction work will be contained within the site so minimal impact upon external road network. The majority of the equipment is located on the site and will be able to continue to be used and as such there will be little if any additional construction traffic movements.
4.4.4 Other Developments	No other significant developments occurring in the immediate locality of the subject site.
4.5 Public Transport	
4.5.1 Options for improving services	No requirements to improve services.
4.5.2 Pedestrian Access to Bus Stops	None required
4.6 Recommended Works	
4.6.1 Improvements to Access and Circulation	No improvements for access to the internal road network is proposed. The internal roads allow for safe and efficient movement of vehicles and will not allow for general public access.

Item	Response
4.6.2 Improvements to External Road Network	None required as the development will not increase the traffic demands associated with the site.
4.6.3 Improvements to Pedestrian Facilities	No upgrades required.
4.6.4 Effect of Recommended Works on Adjacent Developments	No impact as no external works recommended.
4.6.5 Effect of Recommended Works on Public Transport Services	Nil
4.6.6 Provision of LATM Measures	None required
4.6.7 Funding	No external road upgrades required.

Photo 1 – View north along Old Northern Road showing typical alignment and approach to Wisemans Ferry Road

Photo 2 – View to left for drivers exiting Wisemans Ferry Road onto Old Northern Road

Photo 3 – View to right for drivers exiting Wisemans Ferry Road onto Old Northern Road

Conclusion

From the site work completed and the review of the proposed modification, it is considered that the proposed quarry expansion will have a minimal impact upon the overall road network within the general vicinity of the site.

The site access can continue to operate in a safe manner and allows for vehicles to enter and exit the site in a safe manner, via the intersection of Hearses Road and Wisemans Ferry Road. This intersection currently allows for safe turning movements and provides adequate sight lines to maintain road safety.

The modification seeks to increase the daily truck movements associated with the quarry by 28 per day via Hearses Road with up to 28 trucks per day travelling east or west along Wisemans Ferry Road or Old Northern Road, dependent upon the market demands. The current consent permits up to 28 truck movements per day on Old Northern Road heading south. If the market demand is for 28 truckloads per day to head south-west then this will potentially increase the truck movements on Wisemans Ferry Road to the south-west of the site 28 per day each way. This will have a minimal and acceptable impact upon the operation of Wisemans Ferry Road. There will potentially be an increase of 28 trucks per day associated with the Old Northern Road quarry when there are no inbound trucks from the subject site. These additional 28 truck movements in any direction will increase the daily traffic flows by less than 4% with the total flows remaining well within acceptable limits on the local road network. The import of VENM or ENM product, utilising empty trucks inbound to the quarry, will not impact on the number of movements but rather utilise existing trucks on the road network.

It is therefore concluded that the development should be approved on traffic and access grounds.

Sean Morgan

Director

Attachment A - Site Plan Location and Plan

SECAsolution

Attachment B - Accident Data

Summary Crash Report

Transport for NSW — Centre for Road Safety

# Crash Type		
Car Crash	1	50.0%
Light Truck Crash	0	0.0%
Rigid Truck Crash	0	0.0%
Articulated Truck Crash	0	0.0%
'Heavy Truck Crash	*(0)*	*(0.0%)*
Bus Crash	0	0.0%
"Heavy Vehicle Crash	*(0)*	*(0.0%)*
Emergency Vehicle Crash	0	0.0%
Motorcycle Crash	1	50.0%
Pedal Cycle Crash	0	0.0%
Pedestrian Crash	0	0.0%

' Rigid or Artic. Truck " Heavy Truck or Heavy Bus
These categories are NOT mutually exclusive

Location Type		
*Intersection	1	50.0%
Non intersection	1	50.0%

* Up to 10 metres from an intersection

Collision Type		
Single Vehicle	1	50.0%
Multi Vehicle	1	50.0%

Road Classification		
Freeway/Motorway	0	0.0%
State Highway	0	0.0%
Other Classified Road	2	100.0%
Unclassified Road	0	0.0%

Contributing Factors		
Speeding	0	0.0%
Fatigue	0	0.0%

Weather		
Fine	1	50.0%
Rain	1	50.0%
Overcast	0	0.0%
Fog or mist	0	0.0%
Other	0	0.0%

Road Surface Condition		
Wet	1	50.0%
Dry	1	50.0%
Snow or ice	0	0.0%

Natural Lighting		
Dawn	0	0.0%
Daylight	2	**********
Dusk	0	0.0%
Darkness	0	0.0%

Crash Movement		
Intersection, adjacent approaches	0	0.0%
Head-on (not overtaking)	0	0.0%
Opposing vehicles; turning	0	0.0%
U-turn	0	0.0%
Rear-end	1	50.0%
Lane change	0	0.0%
Parallel lanes; turning	0	0.0%
Vehicle leaving driveway	0	0.0%
Overtaking; same direction	0	0.0%
Hit parked vehicle	0	0.0%
Hit railway train	0	0.0%
Hit pedestrian	0	0.0%
Permanent obstruction on road	0	0.0%
Hit animal	0	0.0%
Off road, on straight	0	0.0%
Off road on straight, hit object	0	0.0%
Out of control on straight	1	50.0%
Off road, on curve	0	0.0%
Off road on curve, hit object	0	0.0%
Out of control on curve	0	0.0%
Other crash type	0	0.0%

Speed Limit					
40 km/h or less	0	0.0%	80 km/h zone	1	50.0%
50 km/h zone	0	0.0%	90 km/h zone	0	0.0%
60 km/h zone	0	0.0%	100 km/h zone	0	0.0%
70 km/h zone	1	50.0%	110 km/h zone	0	0.0%

~ 07:30-09:30 or 14:30-17:00 on school days	~ 40km/h or less		~ School Travel Time Involvement	
	0	0.0%	0	0.0%

Day of the Week												
Monday	0	0.0%	Wednesday	0	0.0%	Friday	0	0.0%	Sunday	0	0.0%	WEEKEND	2 **********
Tuesday	0	0.0%	Thursday	0	0.0%	Saturday	2 **********		WEEKDAY	0	0.0%		

#Holiday Periods																
New Year	0	0.0%	Easter	0	0.0%	Queen's BD	0	0.0%	Christmas	0	0.0%	Easter SH	1	50.0%	Sept./Oct. SH	0	0.0%
Aust. Day	0	0.0%	Anzac Day	0	0.0%	Labour Day	0	0.0%	January SH	0	0.0%	June/July SH	0	0.0%	December SH	0	0.0%

CRASHES	2	
Fatal	0	0.0%
Serious inj.	0	0.0%
Moderate inj.	1	50.0%
Minor/Other inj.	1	50.0%
Uncategorised inj.	0	0.0%
Non-casualty	0	0.0%

Self Reported Crash	0	0%

Time Group		% of Day	
00:01 - 02:59	0	0.0%	12.5%
03:00 - 04:59	0	0.0%	8.3%
05:00 - 05:59	0	0.0%	4.2%
06:00 - 06:59	0	0.0%	4.2%
07:00 - 07:59	0	0.0%	4.2%
08:00 - 08:59	0	0.0%	4.2%
09:00 - 09:59	0	0.0%	4.2%
10:00 - 10:59	0	0.0%	4.2%
11:00 - 11:59	0	0.0%	4.2%
12:00 - 12:59	1	50.0%	4.2%
13:00 - 13:59	0	0.0%	4.2%
14:00 - 14:59	1	50.0%	4.2%
15:00 - 15:59	0	0.0%	4.2%
16:00 - 16:59	0	0.0%	4.2%
17:00 - 17:59	0	0.0%	4.2%
18:00 - 18:59	0	0.0%	4.2%
19:00 - 19:59	0	0.0%	4.2%
20:00 - 21:59	0	0.0%	8.3%
22:00 - 24:00	0	0.0%	8.3%

Street Lighting Off/Nil		% of Dark
0	of 0	in Dark 0.0%

CASUALTIES	2	
Killed	0	0.0%
Seriously inj.	0	0.0%
Moderately inj.	1	50.0%
Minor/Other inj.	1	50.0%
Uncategorised inj.	0	0.0%
^ Unrestrained	0	0.0%

^ Belt fitted but not worn, No restraint fitted to position OR No helmet worn

Crashes		Casualties
1	2011	1
1	2010	1

McLean Periods		% Week	
A	0	0.0%	17.9%
B	0	0.0%	7.1%
C	0	0.0%	17.9%
D	2	100.0%	3.5%
E	0	0.0%	3.6%
F	0	0.0%	10.7%
G	0	0.0%	7.1%
H	0	0.0%	7.1%
I	0	0.0%	12.5%
J	0	0.0%	10.7%

Crashid dataset 6820 - Reported crashes within 20m of intersection - Wisemans Ferry Rd & Old Northern Rd - 1 July 2010 to 30 June 2015

Note: Crash self reporting, including self reported injuries began Oct 2014. Trends from 2014 are expected to vary from previous yrs. More unknowns are expected in self reported data. Reporting yrs 1996-2004 and 2014 onwards contain uncategorised inj crashes.

Percentages are percentages of all crashes. Unknown values for each category are not shown on this report.

Rep ID: REG01 **Office:** Sydney **User ID:** nafiza

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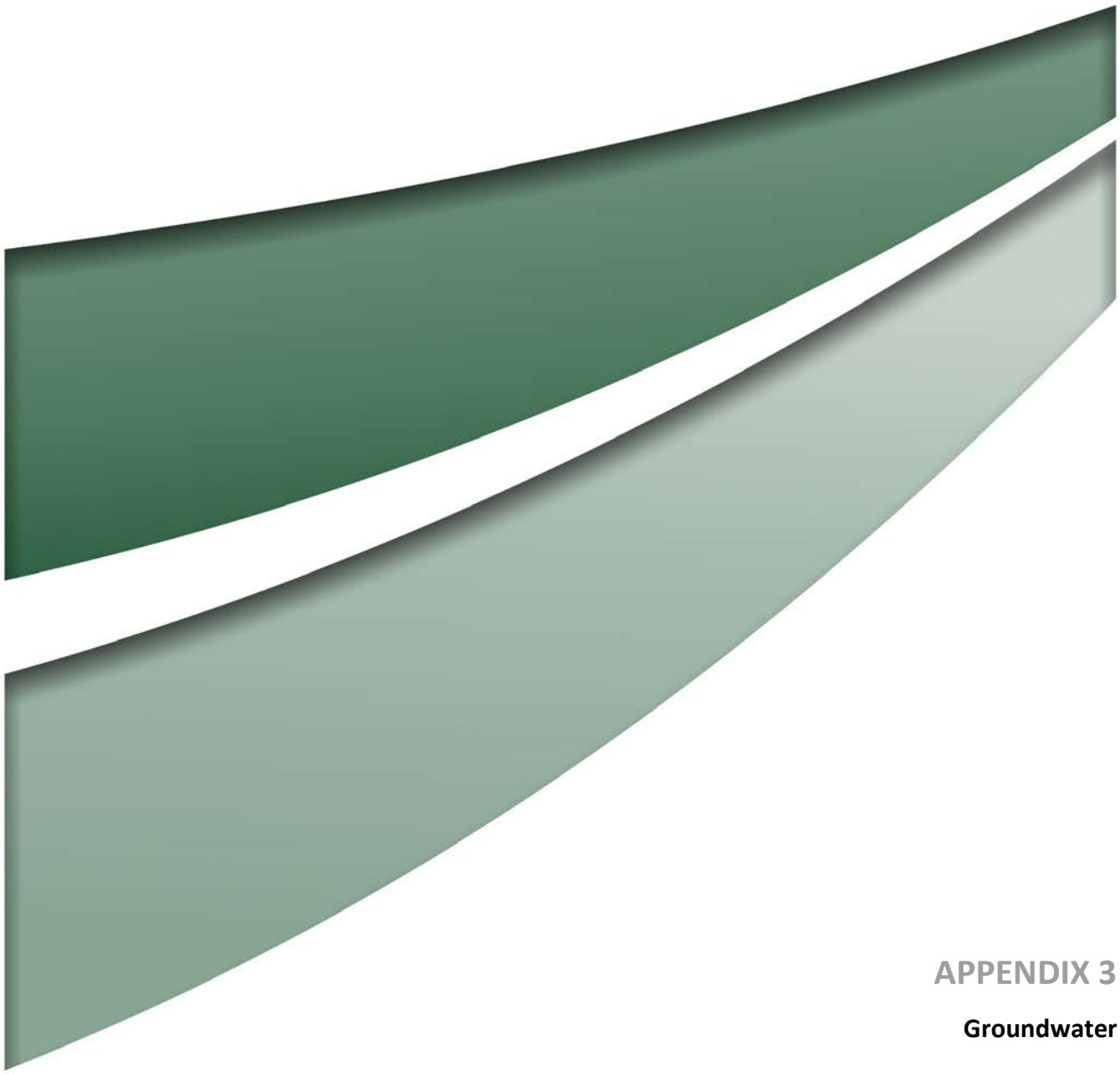

APPENDIX 3

Groundwater

NSW GOVERNMENT | Department of Primary Industries

OUT16/43396

Ms Lauren Evans
Resource Assessments
NSW Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

Lauren.evans@planning.nsw.gov.au

Dear Ms Evans

Haerses Road Sand Quarry Modification 1 (DA 165-7-2005 MOD 1)
Comment on the Environmental Assessment

I refer to your email of 11 October 2016 to the Department of Primary Industries (DPI) in respect to the above matter. Comment has been sought from relevant divisions of DPI. Views were also sought from NSW Department of Industry - Lands that are now a division of the broader Department and no longer within NSW DPI. Any further referrals to DPI can be sent by email to landuse.enquiries@dpi.nsw.gov.au.

DPI has reviewed the Environmental Assessment and provides the following comments, recommendations and advice:

- There is significant uncertainty associated with aspects of the hydrogeology in the Proponents modification application. The uncertainty relates to:
    - hydraulic conductivity of the friable Hawkesbury Sandstone;
    - hydraulic connectivity between the Maroota Sands and the Hawkesbury Sandstone;
    - regional groundwater levels in the Hawkesbury Sandstone and Maroota Sands aquifers;
    - monitoring bore screen construction not consistent with identified water strikes and yields tested; and
    - insufficient number of proposed, clustered monitoring bores.
- While the EIS indicates that groundwater will not be encountered during excavation for the project, DPI does not consider that this has been adequately established. Due to the topography of the surrounding area, and the uncertainty surrounding the hydrogeology, there is a risk that if groundwater is encountered this could lead to leakage of groundwater from the Maroota Tertiary Aquifer with potential flow on effects to the environment and other land users.

- Conditions of consent should prohibit interception of groundwater, and require immediate cessation of operations if groundwater is encountered. Alternatively, the proponent should undertake additional investigations as outlined below.

- Prior to approval and in order to satisfy the AIP requirements for future development assessment the proponent should reduce hydrogeological uncertainty as outlined above by:
    - Expanding their proposed clustered monitoring bore network to better understand any hydraulic connections in addition to the two already proposed. Borehole logs for bores BH4 and BH 5 indicated that multiple, relatively high yielding water strikes were noted during drilling. Screens of the clustered monitoring bores should target the water yielding stratigraphy as indicated by water strikes encountered during drilling.
    - Drilling a minimum of two core holes into the Hawkesbury Sandstone Aquifer to obtain detailed information about stratigraphy and structural features that may be transmitting groundwater.
    - Locating additional clustered monitoring bores between the proposed development and:
        - Maroota Sands
        - Coastal Upland Swamps
        - Users to the north, west and south
    - Installing loggers at all clustered monitoring bores including monitoring bores within the Maroota Sands to ensure water level records between the different water sources can be compared.
    - Performing an aquifer pumping test of the Hawkesbury Sandstone Aquifer with nearby monitoring of all other aquifers.
    - Providing further detail on staged development with progressive quarrying of cells as proposed to include staging of depth of excavation. The intent being to monitor for the presence of groundwater at increasing depths of excavation. The Trigger Action Response Plan should provide for a cease mining condition, should groundwater be encountered and in consultation with DPI Water hydrogeologists.
- The proponent should provide further detail on staged development with progressive quarrying of cells as proposed to include staging of depth of excavation. The intent being to monitor for the presence of groundwater at increasing depths of excavation. The Trigger Action Response Plan should provide for a cease mining condition, should groundwater be encountered, with a requirement for consultation with DPI Water hydrogeologists before continuing work.
- The proponent should install water level monitoring loggers at all dams, both in the Maroota Tertiary Sands Groundwater Source and the Hawkesbury Sandstone Aquifer of the Sydney Central Basin Groundwater Source, in order to establish the extent (or absence) of connectivity with groundwater.
- The proponent should keep metered records of all water use on existing and proposed site and measure all inflows observed.

- The proponent should ensure all new monitoring bores are logged and that they are designed and constructed in accordance with the *Minimum Construction Requirements for Water Bores in Australia (2012)* as well as inspected by a licensed surveyor.
- The proponent should provide information on the bores that may be utilised in periods of water deficit to be identified in a table outlining licence numbers, locations (Lot and DP) and authorised works purpose.
- The proponent will be required to acquire appropriate Water Access Licences from the appropriate groundwater water sources.
- The proponent should consult with DPI Water Hydrogeologists, who will be available for a meeting to discuss the existing issues and recommendations.

Yours sincerely

Mitchell Isaacs
Director, Planning Policy & Assessment Advice
15 December 2016

DPI appreciates your help to improve our advice to you. Please complete this three minute survey about the advice we have provided to you, here:
https://goo.gl/o8TXWz

NSW GOVERNMENT | Department of Primary Industries

OUT17/17487

Mr Lachlan Sweeney
Senior Environmental Scientist
Umwelt (Australia) Pty Limited

lsweeney@umwelt.com.au

Dear Mr Sweeney

Haerses Road Sand Quarry (DA 165-7-2005 MOD 1)
Comment on the Response to Submissions (RTS)

I refer to your email of 16 February 2017 to the Department of Primary Industries (DPI) in respect to the above matter. Comment has been sought from relevant divisions of DPI. Views were also sought from NSW Department of Industry - Lands that are now a division of the broader Department and no longer within NSW DPI.
Any further referrals to DPI can be sent by email to landuse.enquiries@dpi.nsw.gov.au.

DPI has reviewed the information provided by Umwelt (Australia) Pty Limited in response to comments made on the Environmental Assessment for this project and provides the following recommendations, with further detail in **Attachment A**:

- The monitoring bore network should be expanded to include the following:
    - Clustered monitoring bores within the proposed 100 m buffer, with 3 bores at each monitoring location. These bores should be screened at various depths to capture the shallow water strikes and the deeper water levels. To increase understanding of the deeper regional water table the third bore should be constructed to a depth of competent unweathered Hawkesbury Sandstone allowing differentiation between the various water tables.
    - Clustered monitoring bores should be located between the buffer and upland swamps and also between the proposed mining area and other water extractors to the north, west and south.
    - Automatic data loggers to be installed in all monitoring bores.
- The proponent should carry out aquifer testing of the Hawkesbury Sandstone in the proposed buffer zone.
- Core holes should be drilled between the Maroota Sands and the upland swamps.
- Down hole geophysical surveys of dry holes should be assessed to increase understanding of moisture levels.
- The intent of the proposed 100 m buffer is to ensure that the extraction activity does not increase the hydraulic connection and cause depressurisation of the Maroota Sands Groundwater Source and cause incidental water take. As such the monitoring network should be designed to assess the effectiveness of the buffer and include triggers for when further investigation is required.
- The proponent should continue to consult with DPI Water (water.referrals@dpi.nsw.gov.au) in relation to location and depth when the drilling program is proposed to commence. In addition all construction and lithology information should be provided to DPI Water.

- The Water Management Plan (WMP) for the site should be developed in consultation with DPI Water and include Trigger Action Response Plans with detailed timeframes for action and notification to relevant government agencies. This is consistent with discussions between DPI Water and the proponent on 5 April 2017.
- The monitoring program should include visual inspections of the pit walls to ascertain whether any seepage is occurring and timely notification to DPI Water should this occur.
- DPI is satisfied with commitments made in the letter dated 13 February 2017 whereby the proponent has agreed to previous recommendations.
- The proponent should ensure that sufficient Water Access Licenses are held to account for take from each water source extracted in both a passive and active manner.

Yours sincerely

Alison Collaros
A/Director, Planning Policy & Assessment Advice
3 May 2017

Cc. Lauren Evans, Department of Planning and Environment,
Lauren.evans@planning.nsw.gov.au

DPI appreciates your help to improve our advice to you. Please complete this three minute survey about the advice we have provided to you, here:
https://goo.gl/o8TXW

Attachment A

Haerses Road Sand Quarry (DA 165-7-2005 MOD 1)
Request for Input into Secretary's Environment Assessment Requirements
Detailed comments - Groundwater

Item	Proponents Response	DPI Water Response (29/03/2017)
There is significant uncertainty associated with aspects of the hydrogeology in the Proponents modification application. The uncertainty relates to:	The MTSGS and the Sydney Central Basin Groundwater Source (SBCGS) revealed different hydraulic (vertical) heads of 30 m which implies limited hydraulic connection between the two aquifer systems. Any further uncertainty associated with the level of hydraulic connection between the MTSGS and Hawkesbury Sandstone has been removed by the creation of a 100 m buffer zone from the western boundary of MTSGS to the eastern pit wall. This buffer will allow for progressive groundwater testing during staged extraction within cells (Figure 1.3). Extraction will commence in Cells 'A' (west of buffer) and progress south to north. Extraction will only commence within the buffer zone (Cells 'B') following further groundwater testing indicating that no impacts to the MTSGS will occur. Prior to operation, an additional 4 paired groundwater monitoring sites will be added to the existing groundwater monitoring network and these will monitor the connectivity between the MTSGS and any perched groundwater identified above the deeper regional water table of the SBCGS. As mentioned above excavations of cells will be conducted via a staged approach. This will enable Dixon Sands to monitor the groundwater responses in the perched zone and MTSGS at increasing depths of excavation and as excavation progresses towards the buffer zone. A cease of mining condition can apply in the unlikely event that seepages from the buffer zone are deemed to be sourced from the MTSGS. Modification to the excavation plan, such as extraction depth can be applied to subsequent cells.	The implication regarding limited connectivity between the MTSGS and the SBCGS is based on limited drilling and no aquifer testing. Recommendation to drill additional bores within the central part of this buffer zone still applies.
• hydraulic conductivity of the friable Hawkesbury Sandstone;		The creation of the 100 m buffer provides no certainty until its performance has been tested. Aquifer testing with monitoring using loggers is recommended.
• hydraulic connectivity between the Maroota Sands and the Hawkesbury Sandstone;		DPI Water recommendation was for clusters of monitoring bores. Bores are to be screened at various depths within the MTSGS and SBCGS so as to capture the shallow water strikes encountered and also to capture deeper water levels. A bore drilled to significant depth within the extremely competent unweathered Hawkesbury Sandstone is also recommended to understand the deep regional water levels and allow differentiation between this location and shallower water tables. A minimum of 3 bores at each cluster are recommended in the buffer zone and between the upland swamps and users to the north, west and south of the proposed new mining area.
• regional groundwater levels in the	Groundwater elevations of the deep regional SBCGS were established from the	The site lacks clusters of monitoring bores to

Hawkesbury Sandstone and Maroota Sands aquifers;	existing BH4 and BH5. Groundwater levels obtained from private bore GW109927m (located 300 m to the west of BH5), drilled to 162 m deep revealed a groundwater elevation of 69 mAHD or (74 m bgl). This elevation is consistent with the regional E to W hydraulic gradient, shown on **Figure 1** below. The hydraulic heads measured in the i) MTSGS, ii) upper perched zone and iii) deeper regional water table of the SBCGS are shown on Figure 1. The vertical hydraulic heads of the MTSGS and SBCGS are up to 30 m apart. This implies the groundwater sources are not connected as the hydraulic heads are not uniform with depth.	allow sufficient assessment of the hydraulic head relationships between the deeper and shallower aquifers and between the MTSGS and SBCGS. The presence of water strikes at shallower depths, that were not screened, indicates the possibility of hydraulic connection between the Maroota Sands and the friable and weathered Hawkesbury Sandstone that remains to be investigated.
• monitoring bore screen construction not consistent with identified water strikes and yields tested; and insufficient number of proposed, clustered monitoring bores.	The deep monitoring bores (BH4 and BH5) were drilled and screened across the deep regional groundwater level of the SBCGS. This was undertaken to identify the wet weather groundwater elevation of the deep SBCGS and therefore the maximum pit extraction depth (which will be maintained 2 m above the wet weather elevation). The water strike encountered above the screened interval in BH4 represented localised perched water in the Hawkesbury Sandstone. The perched water was on top of a clay band at 25 m below ground level. The flow rate was 40 L per minute (or 0.66 L/s). The presence of perched water in the SBCGS is not prevalent (spatially extensive) as no perched water was encountered at BH5. The perched system is laterally discontinuous and this observation is consistent with drilling logs of boreholes drilled at the Dixon Sand Old Northern Rd Quarry on Lots 196(DP752025) (BH1) and Lot 1 and 2 (DP 547255) (BH6 and 7). Dixon sands proposes to install 4 paired monitoring sites (8 bores), positioned on the eastern boundary the buffer zone as shown on **Figure 2** below. These will target the shallow perched water of the SBCGS and MTSGS. The monitoring bores will be equipped with groundwater level transducers. This monitoring network will provide certainty regarding groundwater levels in in the vicinity of the quarry, with the extraction plan to be modified if required to avoid impacts.	Please see above recommendations. DPI Water requests further information as to why the cluster of monitoring bores are proposed to be located solely on the eastern boundary of the buffer zone and not the central part? It is suggested that the central part of the buffer zone would provide a more representative response in water levels as to the hydraulic behaviour of the rock than the margins which may be eroded and be overly responsive to Maroota Sand water levels.
While the EIS indicates that groundwater will not be encountered during excavation for the project, DPI does not consider that this has been adequately established. Due to the topography of the surrounding area, and the uncertainty surrounding the hydrogeology, there is a risk that if groundwater is encountered this could lead to leakage of groundwater from the Maroota Tertiary Aquifer with potential flow on effects to the environment and other land users.	Groundwater losses from the perched water in the Hawkesbury Sandstone would be small, based on the drilling results of BH5 showing very minor water and BH4 not showing any perched water. This is consistent with existing operations. Experience at extraction pits at the Old Northern Road Quarry to the north of the Haerses Road site which occurs in a similar groundwater environment, where the excavation has extended beyond the perched groundwater level without any resulting drawdown in monitoring bores completed in the upper perched zone. Therefore, leakage from the perched zone is insufficient to induce leakage from the MTSGS.	Please see above response.

	Any further uncertainty associated with the level of hydraulic connection between the MTSGS and Hawkesbury Sandstone has been removed by the creation of a 100 m buffer zone from the western boundary of MTSGS to the eastern pit wall. This buffer will allow for progressive groundwater testing during staged extraction of cells 'A' and 'B' (Figure 1.3). Extraction will only commence within Cells 'B' following further groundwater testing indicating that no impacts to the MTSGS will occur. These observations are consistent with similar observations at the Old Northern Rd Quarry for (Lots- 29 (DP752025), -1, -2 (DP 547255) and -196 (DP752025).	
Conditions of consent should prohibit interception of groundwater, and require immediate cessation of operations if groundwater is encountered.	Perched water intercepted within the upper zone of the SBCGS is expected to be of minor quantity and with negligible connectivity to the MTSGS. This is consistent with the borehole strikes encountered during drilling. This is also consistent with existing consents at the Old Northern Road Quarry and similar groundwater environment. No seepages from the perched zones have been observed during the extraction on these allotments, as these perched zones do not store and transmit large quantities of groundwater. The condition of consent should prohibit the interception of deeper regional groundwater level in the SBCGS and the shallow MTSGS, and these elevations have been determined by long term baseline groundwater level monitoring of these two aquifer systems. Any seepage from the MTSGS will be prohibited by the creation of 100 m buffer zone, positioned between the pit wall and the western margin of MTSGS. As outlined above, an additional 4 paired monitoring bores will be positioned at eastern boundary of the buffer zone and can be used to detect whether seepages from MTSGS are reporting to the pit face. Extraction will only commence within the buffer zone following further groundwater testing indicating that no impacts to the MTSGS will occur.	An insufficient understanding of the conceptual hydrogeology has been obtained from the limited monitoring and further drilling is required to understand groundwater conditions on site. The creation of the 100 m buffer provides no certainty until its performance has been tested. Aquifer testing with monitoring using loggers is recommended.
Prior to approval and in order to satisfy the AIP requirements for future development assessment the proponent should reduce hydrogeological uncertainty as outlined above by:		
• Expanding their proposed clustered monitoring bore network to better understand any hydraulic connections in addition to the two already proposed. Borehole logs for bores BH4 and BH 5	Water strikes encountered in BH5 during drilling represented perched water in the SBCGS and not the deep regional water table of the SBCGS. The perched zone reported a very low yield of 40 L per minute. Groundwater losses from the perched water in the Hawkesbury Sandstone would be small, based on existing drilling on site, and the experience at extraction pits at the nearby Old Northern Road Quarry,	An insufficient understanding of the conceptual hydrogeology has been obtained from the limited monitoring and further drilling is required to understand groundwater conditions on site.

indicated that multiple, relatively high yielding water strikes were noted during drilling. Screens of the clustered monitoring bores should target the water yielding stratigraphy as indicated by water strikes encountered during drilling.	where the excavation have extended beyond the perched groundwater level without any noticeable inflows being observed, and without any resulting drawdown in monitoring bores completed in the upper perched zone. Dixon Sands has proposed to install 4 paired monitoring sites (8 bores) positioned on the eastern boundary of the buffer zone, targeting upper perched zones and the MTSGS.	
• Drilling a minimum of two core holes into the Hawkesbury Sandstone Aquifer to obtain detailed information about stratigraphy and structural features that may be transmitting groundwater.	Cored holes can be drilled as part of the installation of new monitoring bores. The cores can be analysed to evaluate the occurrence and modes of groundwater flow in the upper perched zone of the SBCGS, including obvious structures, bedding planes or low permeability layers that correspond with observed water strikes.	Agreed. Drilling of core holes between Maroota Sands, upland swamps and the proposed quarry is recommended and water strikes and penetrations rates are to be carefully monitored.
• Locating additional clustered monitoring bores between the proposed development and: Maroota Sands Coastal Upland Swamps Users to the north, west and south	Proposed locations are presented on Figure 2. These are nominal as actual locations will be dictated by site access. Groundwater users exist to the west but these bores target the deep regional groundwater system of the SBCGS (See Figure 6 of the AGT groundwater assessment). These users will not be impacted as the proposed extraction will be at least 2 m above the wet weather groundwater level as determined by BH5 which is located between these existing users and the eastern boundary of the proposed extraction area. The focus of groundwater monitoring within the nominated buffer zone between the extraction area and MTSGS and Coastal Upland Swamp (Figure 2) addresses the requirement to monitor the Maroota Sands and Coastal Upland Swamps. The additional bores will also assist in confirming the wet weather groundwater levels for determination of base of extraction to be 2m above wet weather level.	DPI Water considers that the wet weather groundwater level has not been established for the site as yet and requests further detailed drilling of clustered bores to gain an understanding of hydrological conditions on site.
• Installing loggers at all clustered monitoring bores including monitoring bores within the Maroota Sands to ensure water level records between the different water sources can be compared.	Dixon Sands will install groundwater level loggers to monitor aquifer response from seasonal rainfall patterns and trends and to allow water level records between the different sources to be compared.	Agreed. Satisfactory response.
• Performing an aquifer pumping test of the Hawkesbury Sandstone Aquifer with nearby monitoring of all other aquifers.	A pumping test is not required on the deeper regional SBCGS as the pit floor of each cell will be maintained at least 2 m above the water table (and hence groundwater from the SBCGS will not be intercepted). As excavations will occur through the upper perched zone of the Hawkesbury Sandstone, the limited hydraulic connection to the MTSGS may be confirmed via undertaking a pumping test of the perched zone, whilst monitoring the water level response in the MTSGS. A pumping test may be undertaken at one of the new paired monitoring sites, preferably at the site which exhibits the highest yield. However, due to the limited extent and the very low yields of the perched zone encountered to date (0.1 L/s and	Unsatisfactory response. Aquifer testing of all aquifers or water bearing zones is required with monitoring of surrounding clustered bores. Including the deep regional SBCGS. DPI Water considers that the wet weather groundwater level has not been established

	0.6 L/s (BH-1 to -7), a constant rate pumping test may not be sustained and may not be able to create a drawdown detectable at distance from the pumping bore. Despite this, a pumping test will provide useful information about extent and hydraulic conductivity of the perched zone. This can be coupled with findings from cored holes to validate the conceptual hydrogeological model.	for the site as yet.
• Providing further detail on staged development with progressive quarrying of cells as proposed to include staging of depth of excavation. The intent being to monitor for the presence of groundwater at increasing depths of excavation. The Trigger Action Response Plan should provide for a cease mining condition, should groundwater be encountered and in consultation with DPI Water hydrogeologists.	A staged development has been proposed together with a groundwater monitoring plan and Trigger Action Response Plan TARP with further details of the staging provided earlier in this letter. The staged development enables Dixon Sands to monitor the groundwater responses in the perched zone and MTSGS at increasing depths of excavation and as excavation progresses towards the buffer zone. The groundwater responses observed in the additional paired groundwater monitoring sites will be used to determine whether pit seepages are reporting from the MTSGS. In the event groundwater seepages are encountered in a cell wall and MTSGS identified as being the source, a cease of quarrying condition will apply for that cell and modification to excavation plan, such as extraction depth can be applied to subsequent cells.	The Proponent has presented a conceptual model of an impermeable buffer zone between the proposed quarry and the Maroota Sands. If seepage presents on the eastern or northern boundary of the proposed quarry sides the source can only be the groundwater of the Maroota Sands aquifer moving through the buffer zone towards the downgradient proposed quarry. Cease mining condition is to apply in this case.
The proponent should provide further detail on staged development with progressive quarrying of cells as proposed to include staging of depth of excavation. The intent being to monitor for the presence of groundwater at increasing depths of excavation. The Trigger Action Response Plan should provide for a cease mining condition, should groundwater be encountered, with a requirement for consultation with DPI Water hydrogeologists before continuing work.	As above.	As above
The proponent should install water level monitoring loggers at all dams, both in the Maroota Tertiary Sands Groundwater Source and the Hawkesbury Sandstone Aquifer of the Sydney Central Basin Groundwater Source, in order to establish the extent (or absence) of connectivity with groundwater.	Agree	Satisfactory response.
The proponent should keep metered records of all water use on existing and proposed site and measure all inflows observed.	Agree	Satisfactory response.

The proponent should ensure all new monitoring bores are logged and that they are designed and constructed in accordance with the Minimum Construction Requirements for Water Bores in Australia (2012) as well as inspected by a licensed surveyor.	Agree	Satisfactory response all bores to be surveyed.
The proponent should provide information on the bores that may be utilised in periods of water deficit to be identified in a table outlining licence numbers, locations (Lot and DP) and authorised works purpose.	Agree	Satisfactory response.
The proponent will be required to acquire appropriate Water Access Licences from the appropriate groundwater water sources.	Dixon Sands will seek to convert their existing groundwater allocation use from agricultural to extractive industries.	Satisfactory response.
The proponent should consult with DPI Water Hydrogeologists, who will be available for a meeting to discuss the existing issues and recommendations.	Agree	Satisfactory response.

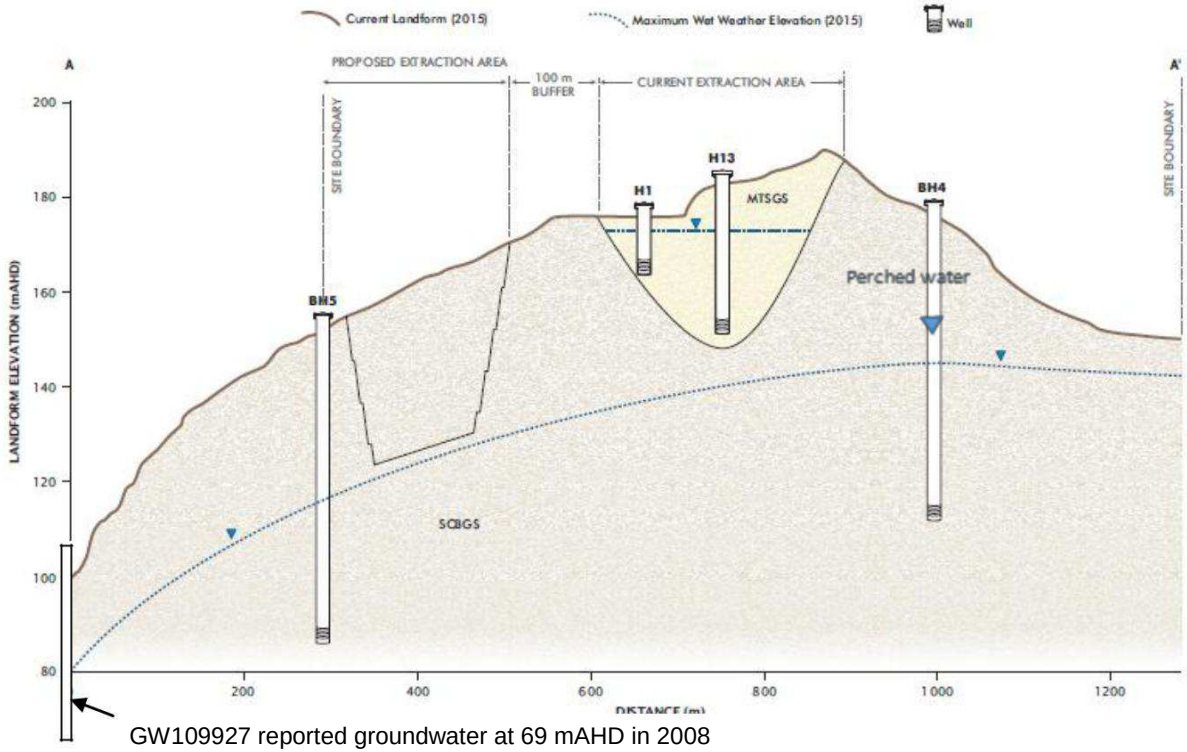

Figure 1: West to east cross section showing hydraulic heads of the MTSGS and SBCGS. Also shown is the minor water cut identified during the drilling of BH4 which is above the regional water table of the SBCGS.

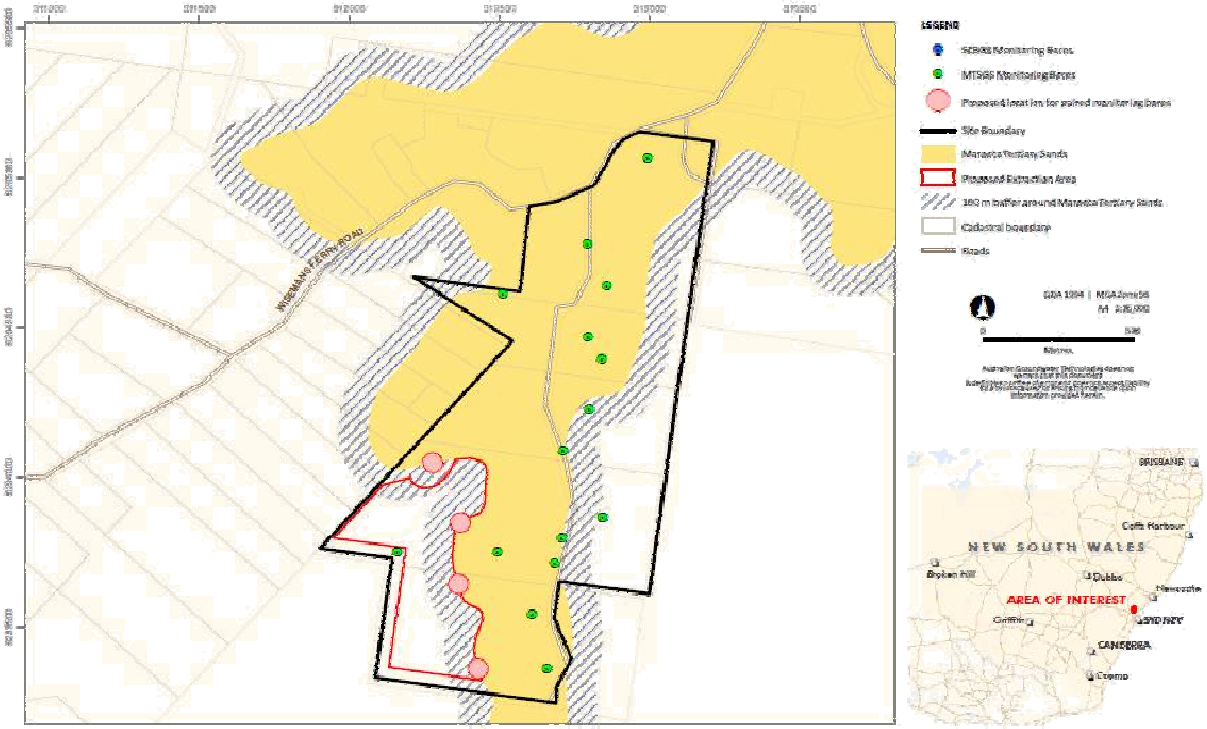

Figure 2: Plan of proposed monitoring sites

End Attachment A

Dundon Consulting Pty Limited
ACN 083 246 459
ABN 27 083 246 459

PO Box 6219, PYMBLE NSW 2073
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facsimile: none
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9 June 2017

Department of Primary Industries
Level 11, 323 Castlereagh Street
SYDNEY, NSW 2000

Attention: Ms Alison Collaros
A/Director, Planning Policy and Assessment Advice

Dear Ms Collaros,

Re: Haerses Road Sand Quarry (DA 165-7-2005 MOD 1) - Comment on the Response to Submissions (RTS)

This letter has been prepared to address the recommendations outlined in Department of Primary Industries (DPI's) submission response letter dated 3 May 2017 (ref OUT/17/17487), regarding the Environmental Assessment for DA 165-7-2005 MOD 1.

We are in general agreement with the recommendations outlined in your letter and provide the following comments, with further detail provided in **Attachment A**.

Prior to this letter being received, a teleconference was held with the DPI on 5 April 2017 and the minutes of this meeting are provided as **Attachment B** for reference.

A 100m buffer zone, comprising low permeability Hawkesbury Sandstone will be put in place along the western boundary of the Maroota Tertiary Sands Groundwater Source (MTSGS) (Figure 1). The existing groundwater monitoring network will be enhanced by the drilling of clusters of monitoring bores positioned within the proposed buffer zone (see **Figure 1** below).

The information collected from the new bore clusters is designed to monitor and assess if there is any hydraulic connection between the perched water in the Hawksbury Sandstone and the MTSGS. No extraction would be undertaken below perched zones within the buffer zone until groundwater monitoring results have shown that quarrying can be undertaken in this area without incurring water loss from the MTSGS. The decision to commence quarrying in this area below perched water zone will be undertaken in consultation with DPI Water.

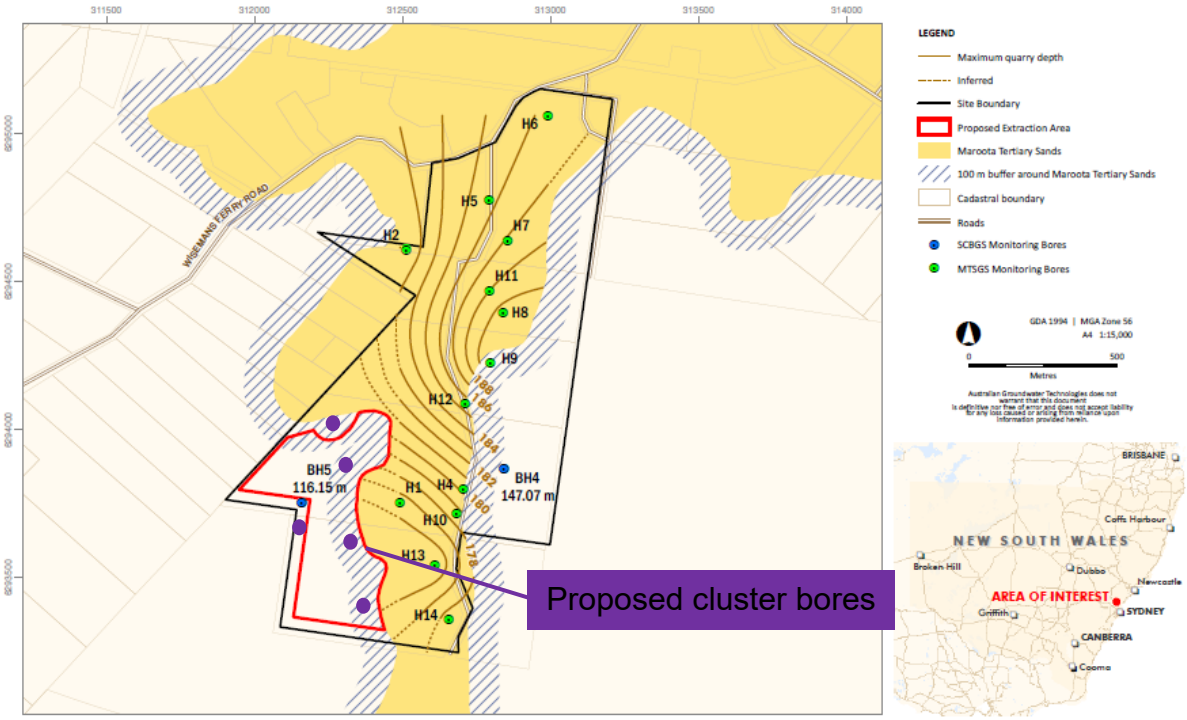

Figure 1: Proposed drilling locations

The following outlines our response to the recommendations made in your letter. Further clarification is provided in the attached table – **Attachment A**

1) Expansion of the existing groundwater monitoring network will be undertaken to include three (3) additional clustered monitoring bores at four (4) locations within the proposed buffer zone targeting:

   - Perched water in weathered sandstone
   - Perched water in the unweathered sandstone; and
   - Deep regional groundwater system in unweathered sandstone.

   A fifth additional monitoring bore will be drilled to the west of the extraction area and just south of existing bore BH5, as shown in **Figure 1** above, to satisfy monitoring requirements between other water extractors to the west and south/west of the site.

   Pressure transducers will be installed in all newly installed monitoring bores.

2) Depending on the yields encountered during drilling, we envisage that aquifer testing could involve either a short-term pumping test, airlift and recovery test or a slug (falling head) test. Where yield is sufficient, a pumping test will be undertaken whilst also monitoring groundwater responses in other cluster bores to assess hydraulic connection.

3) The method of drilling will include:

   o Cored holes south of the upland swamp (northern cluster site). The core will be examined to understand the modes of groundwater flow. The limitation of cored holes is that water bearing zones cannot be easily identified during drilling and therefore we recommend only two holes should be cored.

- Air core, reverse circulation or air hammer methods will be adopted for all other holes. These methods allow water bearing zones to be easily identified during the drilling process. Our recommended approach is to drill the deepest hole first so that any water strikes identified in the upper part of the Hawksbury Sandstone can be used to inform the depth of the subsequent shallow cluster bores.

4) Where ground conditions allow, undertake downhole geophysical logging of dry holes to understand moisture content.
5) The proposed monitoring network is designed to assess if there is any hydraulic connection between upper perched zones in the Hawkesbury Sandstone and the MTSGS. The intent of monitoring the buffer zone is to provide data to determine whether future extraction in the buffer zone can take place beyond the perched water table zones without incidental water take from the MTSGS.
6) We will continue to consult with DPI Water in relation to the planned drilling activities and approach and provide DPI Water with all information collected during drilling.
7) The Site Water Management Plan (SWMP) and Trigger Action and Response Plan (TARP) will be updated in consultation with DPI Water to include the additional cluster monitoring bores, with specific emphasis on monitoring the performance of the proposed buffer zone and setting of new triggers for when further investigation is required.
8) The monitoring program will include visual inspections of the pit walls, together with groundwater responses in cluster bores to ascertain whether any seepage is occurring and timely notification to DPI Water should this occur. As discussed in the teleconference on 5 April 2017, in the event seepage is detected in the pit wall, the cease to quarry condition should not be imposed, rather the monitoring data will be reviewed to determine the source of the water. If the source is determined to be from the MTSGS, remedial actions will be undertaken in accordance with the response outlined in the TARP.
9) In the unforeseen event groundwater inflows are detected, Dixon Sands will hold sufficient Water Access Licenses to account for take from each water source extracted in both a passive and active manner.

We trust this letter now resolves the outstanding matters raised by DPI in their response letter dated 3 May 2017 and subsequent discussions.

Yours faithfully,

Peter Dundon

Attachment A Haerses Road Sand Quarry (DA 165-7-2005 MOD 1) Request for Input into Secretary's Environment Assessment Requirements Detailed comments – Groundwater			
DPI response in letter dated 15 Dec 2016 (ref OUT16/43396)	**Proponent response to DPI (AGT revised report dated 13 Feb 2017)**	**DPI response in letter dated 3 May 2017 (ref OUT17/17487)**	**Proponent response to DPI in letter dated 9 June 2017**
There is significant uncertainty associated with aspects of the hydrogeology in the Proponents modification application. The uncertainty relates to:	The MTSGS and the Sydney Central Basin Groundwater Source (SBCGS) revealed different hydraulic (vertical) heads of 30 m which implies limited hydraulic connection between the two aquifer systems. Any further uncertainty associated with the level of hydraulic connection between the MTSGS and Hawkesbury Sandstone has been removed by the creation of a 100m buffer zone from the western boundary of MTSGS to the eastern pit wall. This buffer will allow for progressive groundwater testing during staged extraction within cells (Figure 1.3). Extraction will commence in Cells 'A' (west of buffer) and progress south to north. Extraction will only commence within the buffer zone (Cells 'B') following further groundwater testing indicating that no impacts to the MTSGS will occur. Prior to operation, an additional 4 paired groundwater monitoring sites will be added to the existing groundwater monitoring network and these will monitor the connectivity between the MTSGS and any perched groundwater identified above the deeper regional water	The implication regarding limited connectivity between the MTSGS and the SBCGS is based on limited drilling and no aquifer testing. Recommendation to drill additional bores within the central part of this buffer zone still applies.	Monitoring bore clusters will be drilled at five locations within the Buffer Zone as shown in Figure 1 of the cover letter. Monitoring Bore Cluster will be located between the proposed development and: - Maroota Sands (3 bore clusters) - Coastal Upland Swamp and users to the north (1 bore cluster) - Users to the west and south (1 bore cluster incorporating the existing regional BH5)
• hydraulic conductivity of the friable Hawkesbury Sandstone;		The creation of the 100 m buffer provides no certainty until its performance has been tested. Aquifer testing with monitoring using loggers is recommended.	The aquifer testing method will be dictated by bore yield. Where sufficient yield is encountered, a short term pumping test will be conducted from the upper weathered or perched sections of the Hawkesbury Sandstone, whilst monitoring other cluster monitoring bores. In the event insufficient yield is observed during drilling, falling head (slug) tests can be performed to determine aquifer permeability.

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• hydraulic connectivity between the Maroota Sands and the Hawkesbury Sandstone;	table of the SBCGS. As mentioned above excavations of cells will be conducted via a staged approach. This will enable Dixon Sands to monitor the groundwater responses in the perched zone and MTSGS at increasing depths of excavation and as excavation progresses towards the buffer zone. A cease of mining condition can apply in the unlikely event that seepages from the buffer zone are deemed to be sourced from the MTSGS. Modification to the excavation plan, such as extraction depth can be applied to subsequent cells..	DPI Water recommendation was for clusters of monitoring bores. Bores are to be screened at various depths within the MTSGS and SBCGS so as to capture the shallow water strikes encountered and also to capture deeper water levels. A bore drilled to significant depth within the extremely competent un-weathered Hawkesbury Sandstone is also recommended to understand the deep regional water levels and allow differentiation between this location and shallower water tables. A minimum of 3 bores at each cluster are recommended in the buffer zone and between the upland swamps and users to the north, west and south of the proposed new mining area.	Existing bores within the approved quarry area provide comprehensive monitoring of groundwater levels in the MTSGS. The two deeper regional monitoring bores BH4 and BH5 monitor groundwater levels in the regional water table of the SBCGS. The additional bore clusters proposed to be installed in the buffer zone provide additional monitoring of the SBCGS regional water table and any perched groundwater within the SBCGS, to facilitate monitoring of any hydraulic connection between the MTSGS and perched groundwater in the SBCGS. There is no MTSGS present within the buffer zone.

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• regional groundwater levels in the Hawkesbury Sandstone and Maroota Sands aquifers;	Groundwater elevations of the deep regional SBCGS were established from the existing BH4 and BH5. Groundwater levels obtained from private bore GW109927m (located 300 m to the west of BH5), drilled to 162 m deep revealed a groundwater elevation of 69 mAHD or (74 m bgl). This elevation is consistent with the regional E to W hydraulic gradient, shown on Figure 1 below. The hydraulic heads measured in the i) MTSGS, ii) upper perched zone and iii) deeper regional water table of the SBCGS are shown on Figure 1. The vertical hydraulic heads of the MTSGS and SBCGS are up to 30 m apart. This implies the groundwater sources are not connected as the hydraulic heads are not uniform with depth.	The site lacks clusters of monitoring bores to allow sufficient assessment of the hydraulic head relationships between the deeper and shallower aquifers and between the MTSGS and SBCGS. The presence of water strikes at shallower depths, that were not screened, indicates the possibility of hydraulic connection between the Maroota Sands and the friable and weathered Hawkesbury Sandstone that remains to be investigated.	The rate of downward leakage from the MTSGS to the perched zones in the SBCGS is controlled by the downward hydraulic gradient and the presence of zones of reduced permeability beneath the Maroota Sands and within the underlying Hawkesbury Sandstone. Excavation through the upper perched zones of the SBCGS to the west of the proposed buffer zone will not alter the current downward hydraulic gradient and therefore regardless of the development, the leakage rate from the MTSGS will not alter. The hydraulic head relationships between the deeper and shallower aquifers and between the MTSGS and SBCGS will be confirmed by the drilling bore clusters.

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• monitoring bore screen construction not consistent with identified water strikes and yields tested; and insufficient number of proposed, clustered monitoring bores.	The deep monitoring bores (BH4 and BH5) were drilled and screened across the deep regional groundwater level of the SBCGS. This was undertaken to identify the wet weather groundwater elevation of the deep SBCGS and therefore the maximum pit extraction depth (which will be maintained 2 m above the wet weather elevation). The water strike encountered above the screened interval in BH4 represented localised perched water in the Hawkesbury Sandstone. The perched water was on top of a clay band at 25 m below ground level. The flow rate was 40 L per minute (or 0.66 L/s). The presence of perched water in the SBCGS is not prevalent (spatially extensive) as no perched water was encountered at BH5. The perched system is laterally discontinuous and this observation is consistent with drilling logs of boreholes drilled at the Dixon Sand Old Northern Rd Quarry on Lots 196(DP752025) (BH1) and Lot 1 and 2 (DP 547255) (BH6 and 7). Dixon sands proposes to install 4 paired monitoring sites (8 bores), positioned on the eastern boundary the buffer zone as shown on Figure 2 below. These will target the shallow perched water of the SBCGS and MTSGS. The monitoring bores will be equipped with groundwater level transducers. This monitoring network will provide certainty regarding groundwater levels in in the vicinity of the quarry, with the extraction plan to be modified if required to avoid impacts.	Please see above recommendations. DPI Water requests further information as to why the cluster of monitoring bores are proposed to be located solely on the eastern boundary of the buffer zone and not the central part? It is suggested that the central part of the buffer zone would provide a more representative response in water levels as to the hydraulic behavior of the rock than the margins which may be eroded and be overly responsive to Maroota Sand water levels.	The bore locations were nominal and will be dictated by drill rig access. Where possible bores will be installed within the central part of the buffer zone.

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While the EIS indicates that groundwater will not be encountered during excavation for the project, DPI does not consider that this has been adequately established. Due to the topography of the surrounding area, and the uncertainty surrounding the hydrogeology, there is a risk that if groundwater is encountered this could lead to leakage of groundwater from the Maroota Tertiary Aquifer with potential flow on effects to the environment and other land users.	Groundwater losses from the perched water in the Hawkesbury Sandstone would be small, based on the drilling results of BH5 showing very minor water and BH4 not showing any perched water. This is consistent with existing operations. Experience at extraction pits at the Old Northern Road Quarry to the north of the Haerses Road site which occurs in a similar groundwater environment, where the excavation has extended beyond the perched groundwater level without any resulting drawdown in monitoring bores completed in the upper perched zone. Therefore, leakage from the perched zone is insufficient to induce leakage from the MTSGS. Any further uncertainty associated with the level of hydraulic connection between the MTSGS and Hawkesbury Sandstone has been removed by the creation of a 100 m buffer zone from the western boundary of MTSGS to the eastern pit wall. This buffer will allow for progressive groundwater testing during staged extraction of cells 'A' and 'B' (Figure 1.3). Extraction will only commence within Cells 'B' following further groundwater testing indicating that no impacts to the MTSGS will occur. These observations are consistent with similar observations at the Old Northern Rd Quarry for (Lots- 29 (DP752025), -1, -2 (DP 547255) and -196 (DP752025).	Please see above response	As Above

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Conditions of consent should prohibit interception of groundwater, and require immediate cessation of operations if groundwater is encountered.	Perched water intercepted within the upper zone of the SBCGS is expected to be of minor quantity and with negligible connectivity to the MTSGS. This is consistent with the borehole strikes encountered during drilling. This is also consistent with existing consents at the Old Northern Road Quarry and similar groundwater environment. No seepages from the perched zones have been observed during the extraction on these allotments, as these perched zones do not store and transmit large quantities of groundwater. The condition of consent should prohibit the interception of deeper regional groundwater level in the SBCGS and the shallow MTSGS, and these elevations have been determined by long term baseline groundwater level monitoring of these two aquifer systems. Any seepage from the MTSGS will be prohibited by the creation of 100 m buffer zone, positioned between the pit wall and the western margin of MTSGS. As outlined above, an additional 4 paired monitoring bores will be positioned at eastern boundary of the buffer zone and can be used to detect whether seepages from MTSGS are reporting to the pit face. Extraction will only commence within the buffer zone following further groundwater testing indicating that no impacts to the MTSGS will occur.	An insufficient understanding of the conceptual hydrogeology has been obtained from the limited monitoring and further drilling is required to understand groundwater conditions on site. The creation of the 100 m buffer provides no certainty until its performance has been tested. Aquifer testing with monitoring using loggers is recommended.	Drilling (including coring), aquifer testing and monitoring is designed to assess whether there is hydraulic connection between the perched water in the Hawkesbury Sandstone and the MTSGS. No extraction would be undertaken below perched zones within the buffer zone until groundwater monitoring results show that quarrying can be undertaken in this area without incurring water loss from the MTSGS. The decision to commence quarrying in this area below perched water zone will be undertaken in consultation with DPI Water.

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Prior to approval and in order to satisfy the AIP requirements for future development assessment the proponent should reduce hydrogeological uncertainty as outlined above by: • Expanding their proposed clustered monitoring bore network to better understand any hydraulic connections in addition to the two already proposed. Borehole logs for bores BH4 and BH 5 indicated that multiple, relatively high yielding water strikes were noted during drilling. Screens of the clustered monitoring bores should target the water yielding stratigraphy as indicated by water strikes encountered during drilling.	Water strikes encountered in BH5 during drilling represented perched water in the SBCGS and not the deep regional water table of the SBCGS. The perched zone reported a very low yield of 40 L per minute. Groundwater losses from the perched water in the Hawkesbury Sandstone would be small, based on existing drilling on site, and the experience at extraction pits at the nearby Old Northern Road Quarry, where the excavation have extended beyond the perched groundwater level without any noticeable inflows being observed, and without any resulting drawdown in monitoring bores completed in the upper perched zone. Dixon Sands has proposed to install 4 paired monitoring sites (8 bores) positioned on the eastern boundary of the buffer zone, targeting upper perched zones and the MTSGS.	An insufficient understanding of the conceptual hydrogeology has been obtained from the limited monitoring and further drilling is required to understand groundwater conditions on site.	Addressed above

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• Drilling a minimum of two core holes into the Hawkesbury Sandstone Aquifer to obtain detailed information about stratigraphy and structural features that may be transmitting groundwater.	Cored holes can be drilled as part of the installation of new monitoring bores. The cores can be analysed to evaluate the occurrence and modes of groundwater flow in the upper perched zone of the SBCGS, including obvious structures, bedding planes or low permeability layers that correspond with observed water strikes.	Agreed. Drilling of core holes between Maroota Sands, upland swamps and the proposed quarry is recommended and water strikes and penetrations rates are to be carefully monitored.	Agreed. A combination of core drilling and airlifting from non-cored holes will be undertaken to assess water strikes.
• Locating additional clustered monitoring bores between the proposed development and: o Maroota Sands o Coastal Upland Swamps o Users to the north, west and south	Proposed locations are presented on Figure 2. These are nominal as actual locations will be dictated by site access. Groundwater users exist to the west but these bores target the deep regional groundwater system of the SBCGS (See Figure 6 of the AGT groundwater assessment). These users will not be impacted as the proposed extraction will be at least 2 m above the wet weather groundwater level as determined by BH5 which is located between these existing users and the eastern boundary of the proposed extraction area. The focus of groundwater monitoring within the nominated buffer zone between the extraction area and MTSGS and Coastal Upland Swamp (Figure 2) addresses the requirement to monitor the Maroota Sands and Coastal Upland Swamps. The additional bores will also assist in confirming the wet weather groundwater levels for determination of base of extraction to be 2m above wet weather level.	DPI Water considers that the wet weather groundwater level has not been established for the site as yet and requests further detailed drilling of clustered bores to gain an understanding of hydrological conditions on site.	Drilling of additional deep holes into the SBCGS is proposed in the buffer zone, and with the existing bores BH4 and BH5 will be able to improve confirmation of the wet weather elevation of the regional SBCGS water table.

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• Installing loggers at all clustered monitoring bores including monitoring bores within the Maroota Sands to ensure water level records between the different water sources can be compared.	Dixon Sands will install groundwater level loggers to monitor aquifer response from seasonal rainfall patterns and trends and to allow water level records between the different sources to be compared.	Agreed. Satisfactory response.	
• Performing an aquifer pumping test of the Hawkesbury Sandstone Aquifer with nearby monitoring of all other aquifers.	A pumping test is not required on the deeper regional SBCGS as the pit floor of each cell will be maintained at least 2 m above the water table (and hence groundwater from the SBCGS will not be intercepted). As excavations will occur through the upper perched zone of the Hawkesbury Sandstone, the limited hydraulic connection to the MTSGS may be confirmed via undertaking a pumping test of the perched zone, whilst monitoring the water level response in the MTSGS. A pumping test may be undertaken at one of the new paired monitoring sites, preferably at the site which exhibits the highest yield. However, due to the limited extent and the very low yields of the perched zone encountered to date (0.1 L/s and 0.6 L/s (BH-1 to BH-7), a constant rate pumping test may not be sustained and may not be able to create a drawdown detectable at distance from the pumping bore. Despite this, a pumping test will provide useful information about extent and hydraulic conductivity of the perched zone. This can be coupled with findings from cored holes to validate the conceptual hydrogeological model.	Unsatisfactory response. Aquifer testing of all aquifers or water bearing zones is required with monitoring of surrounding clustered bores. Including the deep regional SBCGS. DPI Water considers that the wet weather groundwater level has not been established for the site as yet.	All water bearing zones will be assessed during drilling, and also where yields are sufficient post drilling by aquifer testing. The method of testing will be dictated by available yield.

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Providing further detail on staged development with progressive quarrying of cells as proposed to include staging of depth of excavation. The intent being to monitor for the presence of groundwater at increasing depths of excavation. The Trigger Action Response Plan should provide for a cease mining condition, should groundwater be encountered and in consultation with DPI Water hydrogeologists.	A staged development has been proposed together with a groundwater monitoring plan and Trigger Action Response Plan TARP with further details of the staging provided earlier in this letter. The staged development enables Dixon Sands to monitor the groundwater responses in the perched zone and MTSGS at increasing depths of excavation and as excavation progresses towards the buffer zone. The groundwater responses observed in the additional paired groundwater monitoring sites will be used to determine whether pit seepages are reporting from the MTSGS. In the event groundwater seepages are encountered in a cell wall and MTSGS identified as being the source, a cease of quarrying condition will apply for that cell and modification to excavation plan, such as extraction depth can be applied to subsequent cells.	The Proponent has presented a conceptual model of an impermeable buffer zone between the proposed quarry and the Maroota Sands. If seepage presents on the eastern or northern boundary of the proposed quarry sides the source can only be the groundwater of the Maroota Sands aquifer moving through the buffer zone towards the downgradient proposed quarry. Cease mining condition is to apply in this case.	The monitoring program will include visual inspections of the pit walls, together with groundwater responses in cluster bores to ascertain whether any seepage is occurring and timely notification to DPI Water should this occur. As discussed in the teleconference on 5th April 2017, in the event seepage is detected in the pit wall, the cease to quarry condition should not be imposed, rather the monitoring data will be reviewed to determine the source of the water. Should seepage occur from perched zones in the Hawkesbury Sandstone on the northern or eastern quarry walls, this does not of itself indicate that the MTSGS is the source of the seepage. The clusters of monitoring bores within the buffer zone, in conjunction with monitoring of the existing bores within the MTSGS, will facilitate assessment of the ultimate source of the seepage. If the source is determined to be from the MTSGS, remedial actions will be undertaken in accordance with the response outlined in the TARP.

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The proponent should provide further detail on staged development with progressive quarrying of cells as proposed to include staging of depth of excavation. The intent being to monitor for the presence of groundwater at increasing depths of excavation. The Trigger Action Response Plan should provide for a cease mining condition, should groundwater be encountered, with a requirement for consultation with DPI Water hydrogeologists before continuing work.	As above.	As above	
The proponent should install water level monitoring loggers at all dams, both in the Maroota Tertiary Sands Groundwater Source and the Hawkesbury Sandstone Aquifer of the Sydney Central Basin Groundwater Source, in order to establish the extent (or absence) of connectivity with groundwater.	Agree	Satisfactory response.	
The proponent should keep metered records of all water use on existing and proposed site and measure all inflows observed.	Agree	Satisfactory response.	

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The proponent should ensure all new monitoring bores are logged and that they are designed and constructed in accordance with the Minimum Construction Requirements for Water Bores in Australia (2012) as well as inspected by a licensed surveyor.	Agree	Satisfactory response all bores to be surveyed.	
The proponent should provide information on the bores that may be utilised in periods of water deficit to be identified in a table outlining licence numbers, locations (Lot and DP) and authorised works purpose.	Agree	Satisfactory response.	
The proponent will be required to acquire appropriate Water Access Licences from the appropriate groundwater water sources.	Dixon Sands will seek to convert their existing groundwater allocation use from agricultural to extractive industries.	Satisfactory response.	
The proponent should consult with DPI Water Hydrogeologists, who will be available for a meeting to discuss the existing issues and recommendations.	Agree	Satisfactory response.	

Haerses Road Sand Quarry Modification 1 (DA 165-7-2005 MOD 1) - Minutes of Phone Meeting with DPI-Water and Dixon Sand on 5 April 2017

In Attendance:

Andrew Druzynski (AD)	*DPI Water*
Hannah Grogan (HG)	*DPI Water*
John Merrell (JM)	*Umwelt*
Lachlan Sweeney	*Umwelt*
Peter Dundon (PD)	*Dundon Consulting*
Jason Van der Akker (JA)	*Australian Groundwater Technologies (AGT)*
David Dixon	*Dixon Sand*
Hunny Churcher	*Dixon Sand*
Mark Dixon	*Dixon Sand*

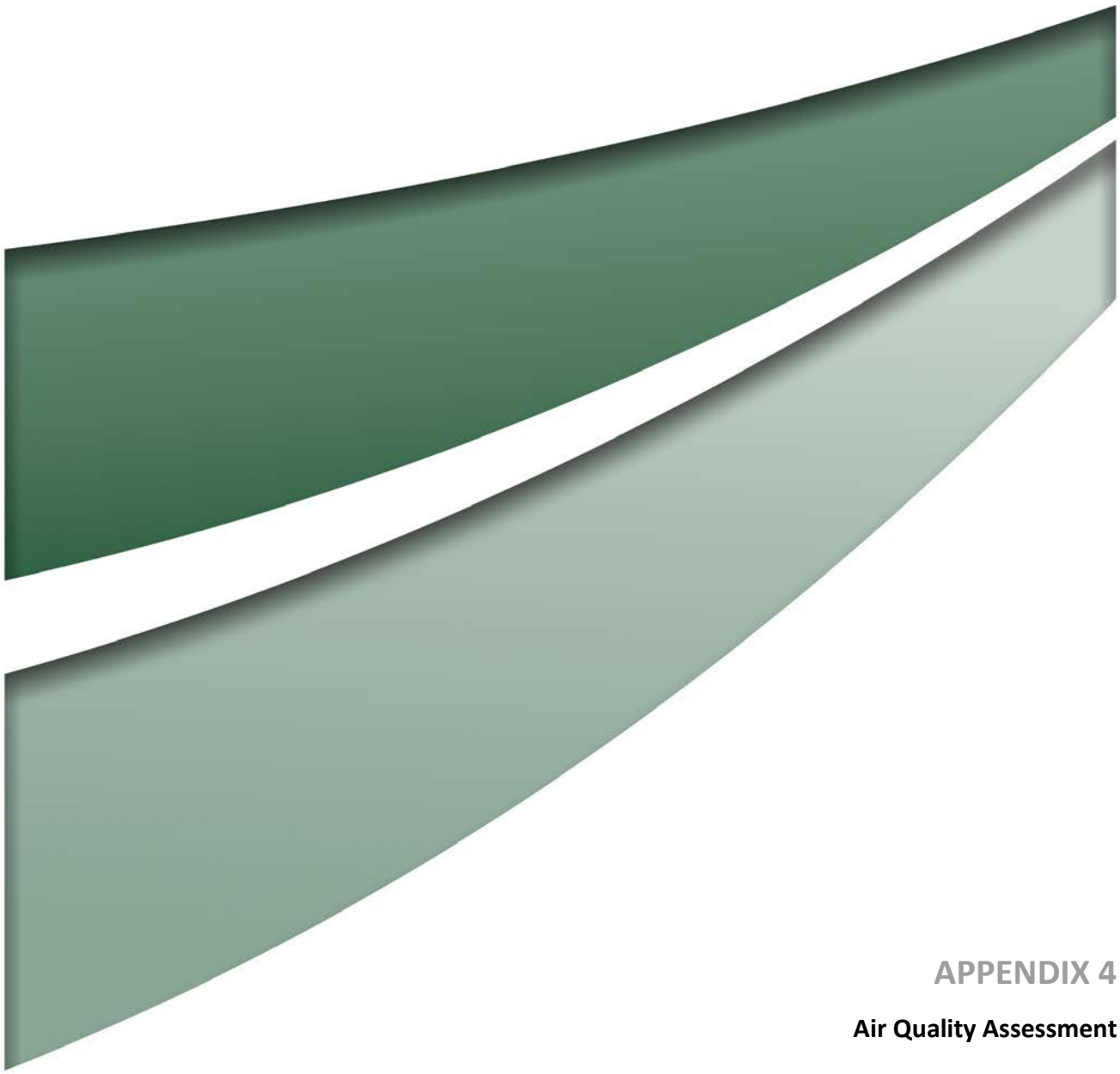
Minutes:

- AD said that recommendations had generally been followed in the AGT submission dated 13 Feb 2017 but had some general comments as below.
- AD commented on the proposed locations for monitoring bores assuming would be better closer to middle of buffer zone. JA commented that locations proposed in AGT submission were nominal and subject to amongst other things rig access during installation drilling issues etc. Nominal bore location was sited so that shallow and deep bores were clustered together while shallow bore remained in perched groundwater and deep in regional water tables respectively
- HG said that monitoring of water into pit face needed to determine if WAL is being complied with or if not should be required.
- JM commented that the DPE are likely to condition consent to include an updated groundwater monitoring program for the site drafted in consultation with DPI Water.
- AD agreed with number of cluster bores proposed i.e. x 4 clusters proposed in AGT submission.
- AD suggested that the cluster should constitute of 3 bores (not 2 as proposed by AGT) with the third located in the friable sandstone just below the regional water table to monitor any seepage or interconnection between the Maroota sands the friable weathered sandstone. AD also noted water strikes encountered in the existing BH4 /BH5 constructions and as such was concerned about any interconnection between the more weathered sandstone that may occur with the proposal.
- AD suggested 4 x
    - 1 bore in any perched water inflow zone in weathered sandstone
    - 1 in weathered sandstone (just below the regional water table)
    - 1 in deeper inflow zone below regional water table (i.e. in truly competent sandstone)
- AD suggested measuring inflows not acceptable as difficult to quantify due to for example impacts of evaporation in collection pit. Monitoring of flows in weathered sandstone using bore loggers to replace this.

- Also the third bore to be installed close to any water strikes should they be encountered during drilling
- Downhole geophysics to determine if bore is 'dry'
- JA suggested that pump tests were not productive due to low conductivity of sandstone. PD had experienced this at other Maroota quarry site and suggested a falling head test may be best bet.
- AD agreed that a falling head or low flow pump test best option for permeability test.
- AD requested that penetration rates and water strikes be noted when doing bores.
- JA asked if all bores needed to be cored. AD recommended that min of 2 cored holes would be required as suggested in original response.
- AD suggested deep bore between pit and upland swamp
- AD said that the regional WT level in deep sandstone was yet unknown and as such deep bores are required.
- AD suggested that a cease mining condition be proposed to DPE as a consent condition if significant seepage into pit found during extraction. JM suggested that perched water could be intercepted and should not be a precedent for cease mine condition. AD agreed that progressive monitoring of bores in buffer would be used to determine if seepage is derived from Maroota sands and as such a cease condition for this not required.

Actions:-

- Dixon Sand to provide DPI with Old Northern Rd Quarry cluster bore monitoring data within 100m buffer as a useful and similar context to Haerses site
- Dixon Sand to send DPI a map showing location of Upland Coastal Swamp area(s) in relation to proposed extraction area at Haerses Rd modification.
- DPI Water have completed a written response to AGT submission and will send through shortly.
- JA to update draft AGT response dated 13 Feb 2017 based on resolutions and discussions at meeting on 5 April 2017. Final response to be sent to DPE as a response to submissions.



APPENDIX 4

Air Quality Assessment

Lachlan Sweeny
Senior Environmental Consultant
Umwelt (Australia) Pty Limited

Email: lsweeney@umwelt.com.au

16 February 2017

Dear Lachlan

Re: Haerses Road Sand Quarry - Response to EPA

1 Introduction

In September 2016 Pacific Environment provided an air quality assessment (AQA) for the proposed Haerses Road Sand Quarry (the Proposal) (**Pacific Environment, 2016**). Following a review of the AQA, NSW Environment Protection Agency (NSW EPA) have subsequently a number of items be addressed.

The following sections provide a copy of the full comment from NSW EPA and a response to each.

2 Crushing and screening plant emissions

EPA comment:

1. **Unclear if the crushing and screening plant will comply with the Clean Air Regulation**

   As outlined in Schedule 4 of the Protection of the Environment Operations (Clean Air) Regulation 2010 (the Clean Air Regulation) any crushing, grinding, separating or materials handling activity must comply with a Group 6 solid particles (Total) emission concentration limit of 20 mg/Nm^3. The Assessment did not include an estimate of the concentration of solid particle emissions from the crushing and screening operations and whether or not emissions would comply with the Clean Air Regulation limit.

   Action: The Assessment must be revised to include the concentration of solid particle emissions from crushing and screening operations and a comparison to the Clean Air Regulation limit of 20 mg/Nm^3.

Response:

As detailed in emission inventories provided in Table 6.2 and Table 6.3 of the AQA, emissions from the crushing and screening activities were explicitly included. The assumed emission rates from crushing (0.0195 kg/t) and screening (0.0125 kg/t) were sourced from US EPA AP-42 Section 11.19.2 *Crushed Stone Processing and Pulverized Mineral Processing* Table 11.19.2-1. The emission factors by default include exhaust emissions which would have been much higher when the emission factors were developed in the 1980/1990's.

The specifications for both the proposed screen (http://www.powerscreen.com/wp-content/uploads/2016/04/Powerscreen-Chieftain-1400-Brochure.pdf) and the crusher (http://www.terex.com/mobile-processing-equipment/en/products/crushers/jaw-crushers/index.htm) state the engines will comply with the NSW EPA requirement that all new diesel equipment must conform to Tier 3 or Tier 4 in the US and Stage IIIA or Stage IIIB within the European Union.

3 24-hour average PM_{10} and $PM_{2.5}$ concentrations

EPA comment:

> **2. Incorrect reporting of cumulative 24 hour average $PM_{2.5}$ and PM_{10} concentrations**
>
> The cumulative PM_{10} and $PM_{2.5}$ 24 hour averages reported in Tables 7.1-7.4 are incorrect since they are calculated using annual average background concentrations. The Approved Methods outlines the approaches that are to be used to include background concentration in an assessment.
>
> **Action: Maximum cumulative 24 hour $PM_{2.5}$ and PM_{10} concentrations reported in Table 7.1 - 7.4 of the AQIA must be revised using 24 hour background concentrations in accordance with the Approved Methods.**

Response:

As noted by NSW EPA, Table 7.1 to Table 7.4 of the AQA erroneously calculated the maximum cumulative 24-hour average PM_{10} and $PM_{2.5}$ concentrations using the annual average.

The corrected tables are provided in **Table 1** to **Table 4** below. Scenario 1 assessed the scenario where dry processing occurs outside the extraction cells; Scenario 2 assessed the scenario where dry processing occurs inside the extraction cells.

Section 7.2 of the AQA provided a detailed cumulative assessment for four most impacted receptors due to the Proposal. This was completed in accordance with the Approved Methods, with Figure 7.7 and Figure 7.8 presenting the daily contribution of the Project plus the corresponding concentration on the same day from the monitoring station at Maroota School.

Whilst reviewing the results it was identified that the text in Section 7.2 of the AQA erroneously stated (with respect to 24-hour average PM_{10} concentrations): "*R1 is the most impacted, with the Modification predicted to result in an additional four exceedances*". As shown in **Table 1** to **Table 4** the most impacted receptor is R11, not R1. In order to verify the results presented in Figure 7.7 and Figure 7.8 of the AQA, the cumulative assessment was repeated for all receptors and showed that in addition, the statement of "*predicted to result in an additional four exceedances"* was also incorrect. Figure 7.7 and Figure 7.8 in the AQA had erroneously shown the predicted 24-hour average PM_{10} concentrations for R20 as the existing air quality, instead of the data from Maroota School. The correct plots for each receptor are shown in **Figure 1** to **Figure 6** for PM_{10} and **Figure 7** to **Figure 12** for $PM_{2.5}$. These demonstrate when the correct background data are combined with the increment due to the Project, there is only one additional exceedance of the 24-hour average

PM_{10} criterion of 50 μg/m^3 predicted at one receptor - R6 and no predicted exceedances of the 24-hour $PM_{2.5}$ criterion of 25 μg/m^3.

Table 1: Predicted incremental and cumulative ground level concentrations for Scenario 1 (Annual Operations) – replacing Table 7.1 in AQA

Pollutant	PM_{10}			$PM_{2.5}$			TSP		Dust Deposition	
Averaging Period	24 hour	Annual		24 hour	Annual		Annual		Annual	
Scenario	Increment	Increment	Cumulative	Increment	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative
Units	$\mu g/m^3$								$g/m^2/month$	
	Impact Assessment Criteria									
Receptor ID	*N/A*	*N/A*	*30*	*N/A*	*N/A*	*8*	*N/A*	*90*	*2*	*4*
R1	9.2	0.2	13.2	1.3	0.1	6.3	0.5	33.0	0.02	2.12
R2	6.8	0.4	13.4	1.1	0.1	6.3	1.3	33.8	0.04	2.14
R3	7.1	0.4	13.4	1.4	0.1	6.3	0.5	33.0	0.02	2.12
R4	4.2	0.3	13.3	1.2	0.1	6.3	0.4	32.9	0.01	2.11
R5	8.3	0.7	13.7	4.1	0.2	6.4	0.6	33.1	0.01	2.11
R6	25.7	1.4	14.4	5.7	0.4	6.6	1.4	33.9	0.04	2.14
R7	5.6	0.6	13.6	2.2	0.2	6.4	0.6	33.1	0.02	2.12
R8	18.7	1.3	14.3	3.5	0.4	6.6	1.5	34.0	0.05	2.15
R9	24.6	1.3	14.3	4.2	0.4	6.6	1.4	33.9	0.04	2.14
R10	25.8	1.0	14.0	4.5	0.3	6.5	1.0	33.5	0.03	2.13
R11	30.8	1.3	14.3	5.4	0.4	6.6	1.3	33.8	0.04	2.14
R12	10.5	0.2	13.2	1.6	0.1	6.3	0.6	33.1	0.02	2.12
R13	10.1	0.2	13.2	1.5	0.0	6.2	0.5	33.0	0.02	2.12
R14	5.1	0.2	13.2	1.1	0.1	6.3	0.4	32.9	0.01	2.11
R15	3.1	0.2	13.2	0.7	0.1	6.3	0.3	32.8	0.01	2.11
R16	2.8	0.2	13.2	0.8	0.1	6.3	0.3	32.8	0.01	2.11
R17	21.8	0.7	13.7	3.8	0.2	6.4	0.5	33.0	0.01	2.11
R18	6.9	0.4	13.4	2.1	0.1	6.3	0.3	32.8	0.01	2.11
R19	9.1	0.3	13.3	1.7	0.1	6.3	0.3	32.8	0.01	2.11
R20	22.1	0.3	13.3	5.4	0.1	6.3	0.3	32.8	0.01	2.11
D1	8.7	0.2	13.2	1.4	0.0	6.2	0.5	33.0	0.02	2.12
PF1	4.0	0.1	13.1	0.6	0.0	6.2	0.4	32.9	0.01	2.11
PF2	4.5	0.2	13.2	0.7	0.0	6.2	0.5	33.0	0.02	2.12
PF3	6.2	0.4	13.4	1.0	0.1	6.3	0.7	33.2	0.02	2.12

Table 2: Predicted incremental and cumulative ground level concentrations for Scenario 1 (Wort Case Day Operations) – replacing Table 7.2 in AQA

Pollutant	PM_{10}			$PM_{2.5}$			TSP		Dust Deposition	
Averaging Period	24 hour	Annual		24 hour	Annual		Annual		Annual	
Scenario	Increment	Increment	Cumulative	Increment	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative
Units	$\mu g/m^3$								$g/m^2/month$	
	Impact Assessment Criteria									
Receptor ID	*N/A*	*N/A*	*30*	*N/A*	*N/A*	*8*	*N/A*	*90*	*2*	*4*
R1	9.8	0.3	13.3	1.4	0.1	6.3	0.6	33.1	0.02	2.12
R2	7.0	0.5	13.5	1.2	0.1	6.3	1.5	34.0	0.04	2.14
R3	7.2	0.4	13.4	1.6	0.1	6.3	0.6	33.1	0.02	2.12
R4	4.8	0.3	13.3	1.3	0.1	6.3	0.5	33.0	0.01	2.11
R5	9.7	0.7	13.7	4.4	0.2	6.4	0.6	33.1	0.02	2.12
R6	26.4	1.5	14.5	6.2	0.4	6.6	1.5	34.0	0.04	2.14
R7	6.7	0.6	13.6	2.3	0.2	6.4	0.7	33.2	0.02	2.12
R8	18.8	1.4	14.4	3.5	0.4	6.6	1.6	34.1	0.05	2.15
R9	24.6	1.4	14.4	4.3	0.4	6.6	1.5	34.0	0.04	2.14
R10	25.8	1.1	14.1	4.5	0.3	6.5	1.1	33.6	0.03	2.13
R11	30.8	1.4	14.4	5.4	0.4	6.6	1.4	33.9	0.04	2.14
R12	10.6	0.3	13.3	1.6	0.1	6.3	0.7	33.2	0.02	2.12
R13	10.4	0.3	13.3	1.6	0.1	6.3	0.6	33.1	0.02	2.12
R14	5.7	0.3	13.3	1.3	0.1	6.3	0.4	32.9	0.01	2.11
R15	3.6	0.2	13.2	0.9	0.1	6.3	0.3	32.8	0.01	2.11
R16	3.4	0.2	13.2	1.0	0.1	6.3	0.3	32.8	0.01	2.11
R17	21.9	0.7	13.7	3.8	0.2	6.4	0.6	33.1	0.01	2.11
R18	7.7	0.4	13.4	2.3	0.1	6.3	0.3	32.8	0.01	2.11
R19	9.3	0.4	13.4	1.7	0.1	6.3	0.4	32.9	0.01	2.11
R20	22.1	0.3	13.3	5.4	0.1	6.3	0.3	32.8	0.01	2.11
D1	8.7	0.2	13.2	1.4	0.1	6.3	0.6	33.1	0.02	2.12
PF1	4.0	0.2	13.2	0.6	0.0	6.2	0.4	32.9	0.01	2.11
PF2	4.6	0.2	13.2	0.7	0.0	6.2	0.5	33.0	0.02	2.12
PF3	6.2	0.4	13.4	1.2	0.1	6.3	0.8	33.3	0.02	2.12

Table 3: Predicted incremental and cumulative ground level concentrations for Scenario 2 (Annual Operations) – replacing Table 7.3 in AQA

Pollutant	PM_{10}			$PM_{2.5}$			TSP		Dust Deposition	
Averaging Period	24 hour	Annual		24 hour	Annual		Annual		Annual	
Scenario	Increment	Increment	Cumulative	Increment	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative
Units	$\mu g/m^3$								$g/m^2/month$	
	Impact Assessment Criteria									
Receptor ID	*N/A*	*N/A*	*30*	*N/A*	*N/A*	*8*	*N/A*	*90*	*2*	*4*
R1	7.9	0.2	13.2	1.2	0.1	6.3	0.6	33.1	0.02	2.12
R2	6.5	0.4	13.4	1.0	0.1	6.3	1.3	33.8	0.04	2.14
R3	7.1	0.3	13.3	1.3	0.1	6.3	0.6	33.1	0.02	2.12
R4	3.9	0.3	13.3	1.2	0.1	6.3	0.4	32.9	0.01	2.11
R5	7.2	0.7	13.7	3.5	0.2	6.4	0.7	33.2	0.02	2.12
R6	27.4	2.0	15.0	6.1	0.5	6.7	1.8	34.3	0.05	2.15
R7	6.1	0.6	13.6	2.5	0.2	6.4	0.7	33.2	0.02	2.12
R8	18.9	1.6	14.6	4.0	0.4	6.6	2.0	34.5	0.06	2.16
R9	24.7	1.6	14.6	5.0	0.4	6.6	1.8	34.3	0.05	2.15
R10	25.8	1.2	14.2	4.5	0.3	6.5	1.2	33.7	0.04	2.14
R11	30.9	1.5	14.5	5.4	0.4	6.6	1.5	34.0	0.04	2.14
R12	10.5	0.3	13.3	1.6	0.1	6.3	0.6	33.1	0.02	2.12
R13	9.7	0.3	13.3	1.5	0.1	6.3	0.6	33.1	0.02	2.12
R14	5.1	0.2	13.2	1.0	0.1	6.3	0.4	32.9	0.01	2.11
R15	2.2	0.2	13.2	0.6	0.0	6.2	0.3	32.8	0.01	2.11
R16	2.7	0.2	13.2	0.7	0.0	6.2	0.3	32.8	0.01	2.11
R17	21.8	0.7	13.7	3.8	0.2	6.4	0.5	33.0	0.01	2.11
R18	6.0	0.4	13.4	1.8	0.1	6.3	0.3	32.8	0.01	2.11
R19	8.9	0.3	13.3	1.6	0.1	6.3	0.3	32.8	0.01	2.11
R20	22.1	0.3	13.3	5.4	0.1	6.3	0.3	32.8	0.01	2.11
D1	8.8	0.2	13.2	1.4	0.0	6.2	0.6	33.1	0.02	2.12
PF1	4.1	0.1	13.1	0.6	0.0	6.2	0.4	32.9	0.01	2.11
PF2	4.6	0.2	13.2	0.7	0.0	6.2	0.5	33.0	0.02	2.12
PF3	6.3	0.3	13.3	1.0	0.1	6.3	0.7	33.2	0.02	2.12

Table 4: Predicted incremental and cumulative ground level concentrations for Scenario 2 (Worst Case Day Operations) – replacing Table 7.4 in AQA

Pollutant	PM_{10}			$PM_{2.5}$			TSP		Dust Deposition	
Averaging Period	24 hour	Annual		24 hour	Annual		Annual		Annual	
Scenario	Increment	Increment	Cumulative	Increment	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative
Units	$\mu g/m^3$								$g/m^2/month$	
	Impact Assessment Criteria									
Receptor ID	*N/A*	*N/A*	*30*	*N/A*	*N/A*	*8*	*N/A*	*90*	*2*	*4*
R1	8.2	0.3	13.3	1.2	0.1	6.3	0.7	33.2	0.02	2.12
R2	6.7	0.5	13.5	1.1	0.1	6.3	1.6	34.1	0.05	2.15
R3	7.2	0.4	13.4	1.3	0.1	6.3	0.7	33.2	0.02	2.12
R4	4.4	0.3	13.3	1.2	0.1	6.3	0.5	33.0	0.01	2.11
R5	8.1	0.8	13.8	3.6	0.2	6.4	0.8	33.3	0.02	2.12
R6	28.5	2.2	15.2	6.6	0.5	6.7	1.9	34.4	0.05	2.15
R7	7.3	0.7	13.7	2.6	0.2	6.4	0.8	33.3	0.02	2.12
R8	18.9	1.8	14.8	4.1	0.4	6.6	2.2	34.7	0.06	2.16
R9	24.8	1.8	14.8	5.2	0.4	6.6	2.0	34.5	0.06	2.16
R10	25.9	1.3	14.3	4.7	0.3	6.5	1.4	33.9	0.04	2.14
R11	30.9	1.7	14.7	5.4	0.4	6.6	1.6	34.1	0.04	2.14
R12	10.6	0.3	13.3	1.6	0.1	6.3	0.7	33.2	0.02	2.12
R13	10.0	0.3	13.3	1.5	0.1	6.3	0.7	33.2	0.02	2.12
R14	5.2	0.2	13.2	1.0	0.1	6.3	0.4	32.9	0.01	2.11
R15	2.4	0.2	13.2	0.6	0.1	6.3	0.4	32.9	0.01	2.11
R16	3.1	0.2	13.2	0.8	0.1	6.3	0.3	32.8	0.01	2.11
R17	21.9	0.7	13.7	3.8	0.2	6.4	0.6	33.1	0.01	2.11
R18	6.2	0.4	13.4	1.9	0.1	6.3	0.4	32.9	0.01	2.11
R19	9.1	0.4	13.4	1.7	0.1	6.3	0.4	32.9	0.01	2.11
R20	22.1	0.4	13.4	5.4	0.1	6.3	0.3	32.8	0.01	2.11
D1	8.8	0.3	13.3	1.4	0.1	6.3	0.7	33.2	0.02	2.12
PF1	4.1	0.2	13.2	0.6	0.0	6.2	0.4	32.9	0.01	2.11
PF2	4.7	0.2	13.2	0.7	0.0	6.2	0.6	33.1	0.02	2.12
PF3	6.4	0.4	13.4	1.0	0.1	6.3	0.8	33.3	0.02	2.12

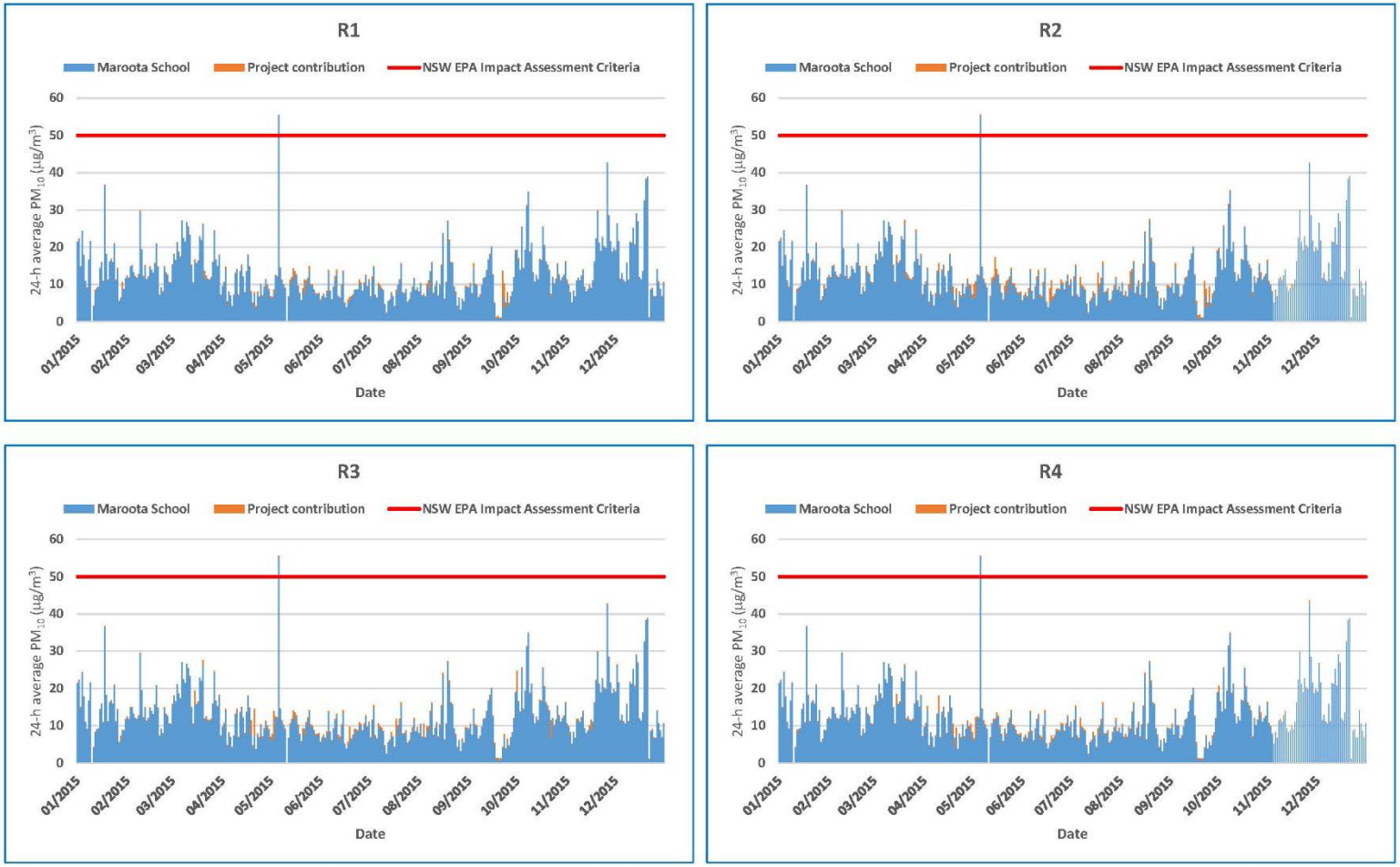


Figure 1: Cumulative 24-hour average PM_{10} concentrations ($\mu g/m^3$) – R1 to R4

Figure 2: Cumulative 24-hour average PM_{10} concentrations ($\mu g/m^3$) – R5 to R8

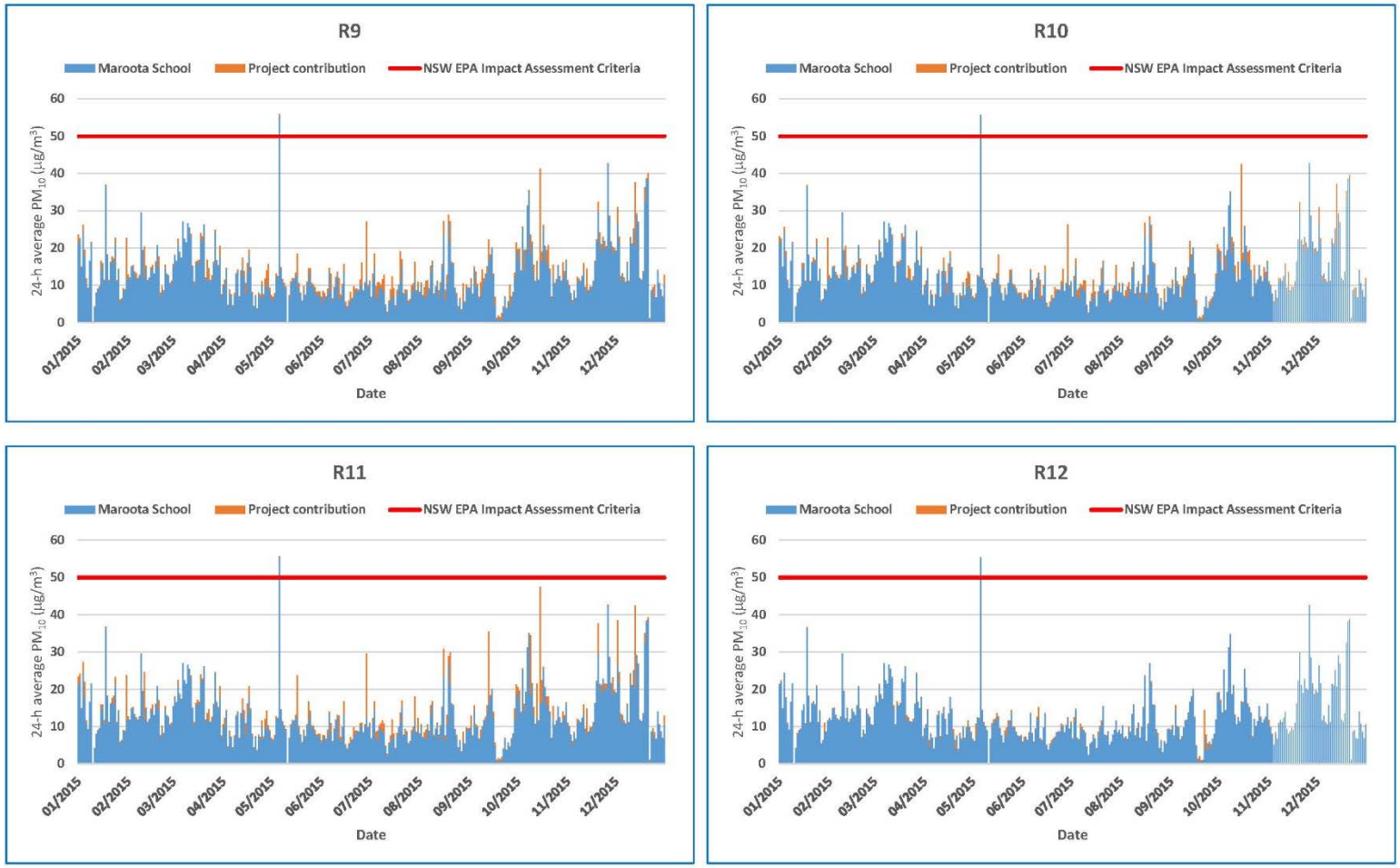


Figure 3: Cumulative 24-hour average PM_{10} concentrations ($\mu g/m^3$) – R9 to R12

Figure 4: Cumulative 24-hour average PM_{10} concentrations ($\mu g/m^3$) – R13 to R16

Figure 5: Cumulative 24-hour average PM_{10} concentrations ($\mu g/m^3$) – R17 to R20

Figure 6: Cumulative 24-hour average PM_{10} concentrations ($\mu g/m^3$) – D1 & PF1 to PF3

Figure 7: Cumulative 24-hour average $PM_{2.5}$ concentrations ($\mu g/m^3$) – R1 to R4

Figure 8: Cumulative 24-hour average $PM_{2.5}$ concentrations ($\mu g/m^3$) – R5 to R8

Figure 9: Cumulative 24-hour average $PM_{2.5}$ concentrations ($\mu g/m^3$) – R9 to R12

Figure 10: Cumulative 24-hour average $PM_{2.5}$ concentrations ($\mu g/m^3$) – R13 to R16

Figure 11: Cumulative 24-hour average $PM_{2.5}$ concentrations ($\mu g/m^3$) – R17 to R20

Figure 12: Cumulative 24-hour average $PM_{2.5}$ concentrations ($\mu g/m^3$) – D1 & PF1 to PF3

4 Proposed dust management measures

EPA comment:

> **3. Proposed dust management practices are not benchmarked against best practice**
>
> Section 128 of the Protection of the Environment Operations Act requires that the occupier of any premises must ensure that all necessary practicable means are used to prevent or minimise air pollution. The proposed control measures listed in Section 6.4 of the Assessment are not benchmarked against best available management practices. Specifically, management practices for crushing, screening and wind erosion are not specified. This is especially important considering there are predicted exceedances, and that emissions from crushing, screening and wind erosion account for approximately 43% of the total particulate emissions.
>
> **Action: The Assessment must be revised to benchmark the proposed dust management practices against best available management practices.**

Response:

Section 6.4 of the AQA detailed the proposed management and mitigation measures that would be implemented for dust control for the Proposal. In the absence of specific guidance in NSW that details best practice measures for quarrying operations, comparison has been made based on recommendations contained in the *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining* (**Donnelly *et al.*, 2011**) (the Best Practice Report), as presented in **Table 5**. It is noted that some dust control measures (for example, restricting speed limits) are not directly quantified in the emission calculations and hence it is considered the predicted contribution from the Proposal presented in the AQA are conservative. It is also noted that the Best Practice Report does not provide control measures for crushing and screening. In this case, uncontrolled emission factors were applied.

Should the Proposal be approved, the Air Quality Management Plan for the site would be updated, in consultation with the relevant stakeholders and would include relevant management measures.

Table 5: Summary of Best Practice Dust Management

OEH best practice		Mining Activity	Best Practice Control		Applied at site (Y/N/Not applicable)	Level of control applied in modelling	Comments For example: -Is there any site-specific information on effectiveness? -Are controls applied consistently (e.g. are some roads treated and not others)?
Section	Table						
9.2	66	Hauling on Unsealed Roads	Vehicle restrictions	Speed reduction from 75 km/h to 50 km/h	N		
				Speed reduction from 65 km/h to 30 km/h	Y	Not quantifiable	20km/h truck speed limit on unsealed haul road and all quarry areas
				Grader speed reduction from 16 km/h to 8 km/h	N		
			Surface improvements	Pave the surface	N		
				Low silt aggregate	Y	Not quantifiable	Emission equation contains parameter for silt content of road. Conservative value of 6.4% used.
				Oil and double chip surface	N		
			Surface treatments	Watering (standard procedure)	Y	75%	Use of watercart and sprinklers. Currently trialling best type of suppressant
				Watering Level 1 (2 L/m^2/h)	N		
				Watering Level 2 (>2 L/m^2/h)	N		
				Watering grader routes	Y	None	
				Watering twice a day for industrial unpaved road	Y	None	
				Dust suppressants (please specify)	N		
			Other	Use of larger vehicles	N		
				Conveyors	N		

OEH best practice		Mining Activity	Best Practice Control		Applied at site (Y/N/Not applicable)	Level of control applied in modelling	Comments For example: -Is there any site-specific information on effectiveness? -Are controls applied consistently (e.g. are some roads treated and not others)?
Section	Table						
9.3	71	Wind Erosion on Exposed Areas & Overburden Emplacements	Avoidance	Minimise pre-strip	Y	Not quantifiable	
			Surface stabilisation	Watering	Y	None	As no control was applied to the emissions, the modelling results are considered conservative
				Chemical suppressants	N		
				Paving and cleaning	N		
				Application of gravel to stabilise disturbed open areas	N		
				Rehabilitation goals	Y	Not quantifiable	
			Wind speed reduction	Fencing, bunding, shelterbelts or in-pit dump	Y	Not quantifiable	As no control was applied to the emissions, the modelling results are considered conservative.
				Vegetative ground cover	Y	None	As no control was applied to the emissions, the modelling results are considered conservative.
9.3	72	Wind Erosion and Maintenance - Coal Stockpiles	Avoidance	Bypassing stockpiles	N		
			Surface stabilisation	Water sprays	N		
				Chemical wetting agents	Y	None	As no control was applied to the emissions, the modelling results are considered conservative.
				Surface crusting agent	N		
				Carry over wetting from load in	N		
			Enclosure	Silo with bag house	N		
				Cover storage pile with a tarp during	N		

OEH best practice		Mining Activity	Best Practice Control		Applied at site (Y/N/Not applicable)	Level of control applied in modelling	Comments For example: -Is there any site-specific information on effectiveness? -Are controls applied consistently (e.g. are some roads treated and not others)?
Section	Table						
				high winds			
			Wind speed reduction	Vegetative windbreaks	Y	None	As no control was applied to the emissions, the modelling results are considered conservative.
				Reduced pile height	Y	None	As no control was applied to the emissions, the modelling results are considered conservative.
				Wind screens/fences	Y	None	As no control was applied to the emissions, the modelling results are considered conservative.
				Pile shaping/orientation	Y	None	As no control was applied to the emissions, the modelling results are considered conservative.
				Erect 3-sided enclosure around storage piles	N		
9.4	76	Bulldozers on OB	Minimise travel speeds and distance		N		
			Travel routes and material kept moist		N		
9.5	81	Blasting and drilling	Blasting	Delay shot to avoid unfavourable weather conditions	N		
				Minimise area blasted	N		
	82		Drilling	Fabric filters	N		
				Cyclone	N		
				Water injection while drilling	N		
9.6	85	Draglines	Minimise drop height		N		
			Minimising drop height		N		
			Modify activities in windy conditions		N		

OEH best practice		Mining Activity	Best Practice Control		Applied at site (Y/N/Not applicable)	Level of control applied in modelling	Comments
Section	Table						For example: -Is there any site-specific information on effectiveness? -Are controls applied consistently (e.g. are some roads treated and not others)?
			Water sprays		N		
			Minimise side casting		N		
9.7	90	Loading and dumping overburden	Excavator	Minimise drop height	N		
			Truck dumping	Minimise drop height	N		
				Water application	N		
				Modify activities in windy conditions	N		
9.8	95	Loading and dumping ROM coal	Avoidance	Bypass ROM stockpiles	N		
			Truck or loader dumping coal	Minimise drop height	N		
				Water sprays on ROM pad	N		
			Truck or loader dumping to ROM bin	Water sprays on ROM bin or ROM pad	N		
				Three sided and roofed enclosure of ROM bin	N		
				Three sided and roofed enclosure of ROM bin + water sprays	N		
				Enclosure with control device	N		
9.9	96	Conveyors and transfers	Conveyors	Application of water at transfers	N	None	Note washed products are already saturated.
				Wind shielding - roof OR side wall	N		

OEH best practice		Mining Activity	Best Practice Control		Applied at site (Y/N/Not applicable)	Level of control applied in modelling	Comments For example: -Is there any site-specific information on effectiveness? -Are controls applied consistently (e.g. are some roads treated and not others)?
Section	Table						
				Wind shielding - roof AND side wall	N		
				Belt cleaning and spillage minimisation	Y	Not quantifiable	
			Transfers	Enclosure	N		
9.1	97	Stacking and reclaiming product coal	Avoidance	Bypass coal stockpiles	N		
			Loading coal stockpiles	Variable height stack	N		
				Boom tip water sprays	Y	None	As no control was applied to the emissions, the modelling results are considered conservative
				Telescopic chute with water sprays	N		
			Unloading coal stockpiles	Bucket-wheel, portal or bridge reclaimer with water application	N		
9.11	-	Train and truck load out and transportation	Limit load size to ensue coal is below sidewalls		N		
			Maintain a consistent profile		N		
			Water sprays		N		
			Use bed liners to minimise seepage		N		
			Cover load with tarpaulin		N		
			Utilise truck wheel wash		N		

5 Proposed dust management measures

EPA comment:

4. **The Assessment predicts additional exceedances of the EPA's impact assessment criteria. The reactive dust control measures already in place at the site are not considered to be sufficient to prevent additional exceedances. However, additional dust controls were not considered in the Assessment.**

   The Assessment, assuming worst case conditions, predicted the proposed expansion would have caused 4 exceedances of 24 hour average PM_{10} concentrations in 2015. This is 3 additional exceedances than was measured in 2015. The Assessment also predicted that the proposed expansion would have caused 1 additional exceedance of 24 hour average $PM_{2.5}$ concentrations in 2015.

   The Assessment concluded that the modelling approach was very conservative, and the likelihood of exceedances occurring is very low, and can be managed by maintaining the stop work condition if background PM_{10} reaches 42 µg/m^3. However, ATASU does not consider that this management practice will be sufficient to prevent additional exceedances. For example, the stop work criterion would not have prevented PM_{10} exceedances at:

   - R10: December 2015;
   - R11: September and December 2015; and
   - R20: June 2015

   On these occasions, there were exceedances in PM_{10}, and yet the background was below the stop-work criterion of 42 µg/m^3.

   Furthermore, ATASU notes that the most impacted sensitive receptors are to the south (R20) and west (R11) of the site. However, the dust prevention controls specified in Condition M2.4 of the EPL (and relied upon by the Assessment as a dust mitigation measure) will not mitigate dust impacts to these residences.

   Action: In accordance with Section 11.2.3 of the Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, and since the Assessment predicts additional exceedances in ground level PM_{10} and $PM_{2.5}$ concentrations, the proponent must revise the Assessment to include the application of effective mitigation measures or emission controls.

Response:

As discussed in **Section 3**, a review of the cumulative assessment identified that the wrong data had been applied for the existing air quality. When the correct background data are combined with the increment due to the Project, there is only one additional exceedance predicted of the 24-hour average PM_{10} criterion of 50 µg/m^3 predicted at one receptor - R6, and no predicted exceedances of the 24-hour $PM_{2.5}$ criterion of 25 µg/m^3. It is further noted that a number of emission controls that will be in place at the Proposal (per **Table 5**) were not explicitly applied to the emission estimation used in the dispersion

modelling and as such it is considered there is very limited potential for the Proposal to result in any additional exceedances of the air quality criteria.

When considering the management measures, Figure 13 shows a scatter-plot of the predicted 24-hour average PM_{10} concentrations at R6, matched with the corresponding 24-hour average PM_{10} concentration measured at Maroota School on the same day. The figure shows that when the predicted increment at R6 exceed 8 $\mu g/m^3$, the measured concentrations at Maroota School are 16 $\mu g/m^3$ or below. It is therefore considered the current management measure of 42 $\mu g/m^3$ remains adequate.

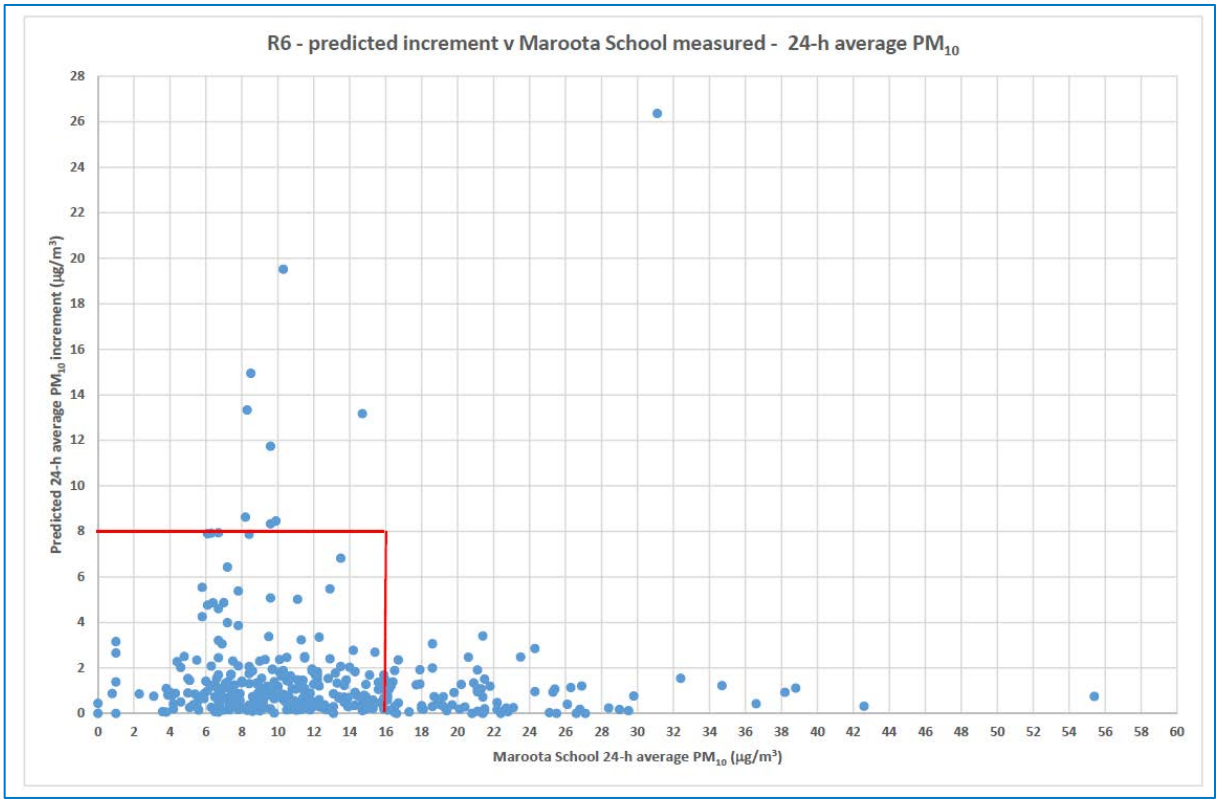


Figure 13: 24-hour PM10 concentration - R6 increment matched with Maroota School ($\mu g/m^3$)

Kind regards

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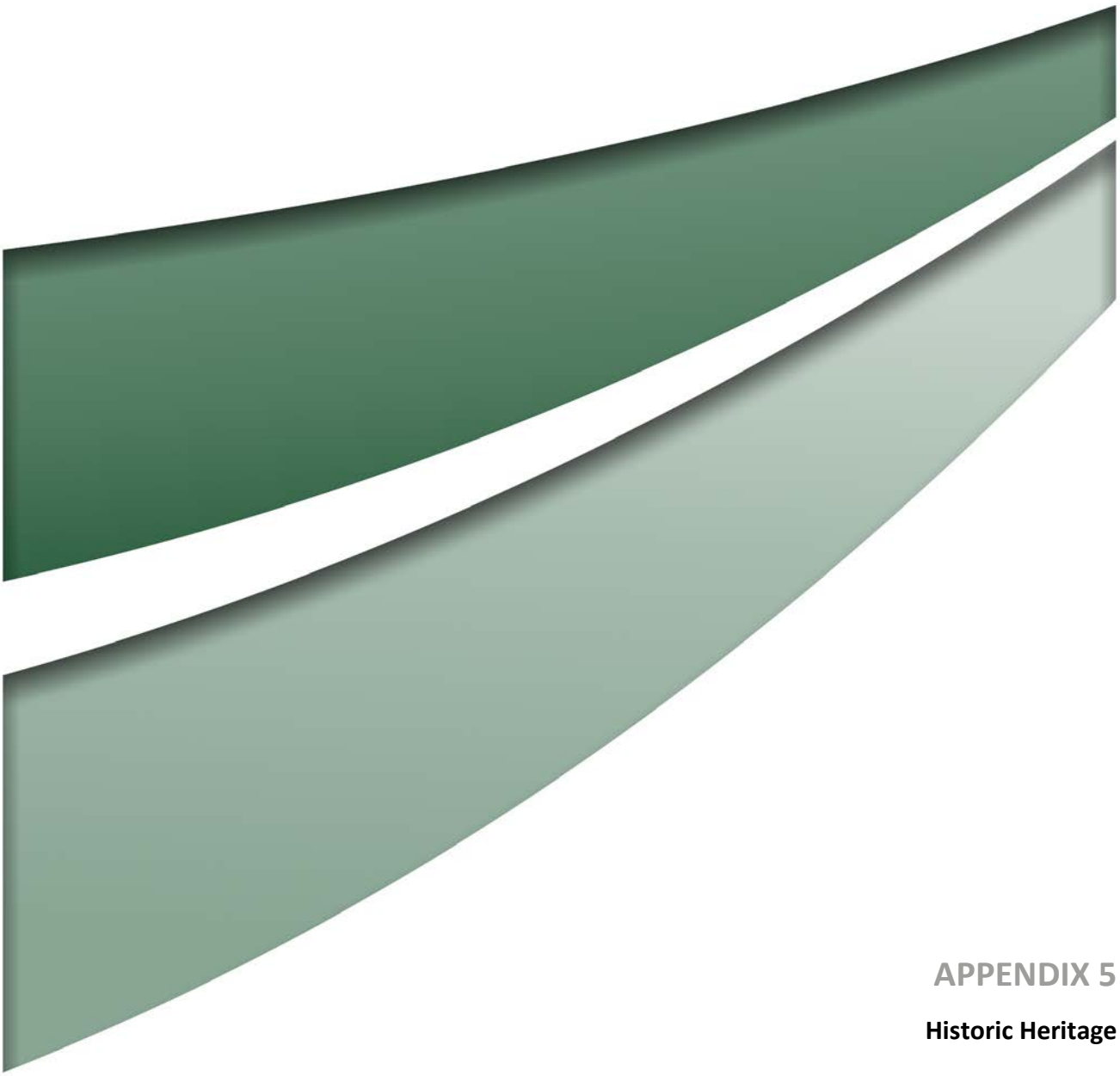
Pacific Environment (2016 Dixon Sand Haerses Road Quarry Modification – Air Quality Assessment, prepared for Dixon Sand Quarry c/ Umwelt. Job ID 21153. 13 September 2016.



APPENDIX 5

Historic Heritage

Historic Heritage – Response to Submissions for Haerses Road Quarry Modification

1.0 Statutory Context

This historical archaeological assessment has been undertaken in accordance with the following NSW Heritage Division guidelines:

- *Assessing Heritage Significance* (2001);
- *Statements of Heritage Impact* (2002); and
- *Assessing Significance for Historical Archaeological Sites and 'Relics'* (2009).

1.1 The Heritage Act 1977 (NSW)

The Heritage Act affords automatic statutory protection to items of heritage significance which form part of the heritage record of NSW (except where these provisions are suspended by other prevailing legislation). The Heritage Act defines a heritage item as a place, building, work, 'relic', moveable object or precinct.

The Heritage Act defines a 'relic' as any deposit, object or material evidence that:

- relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and
- is of State or local heritage significance.

The Heritage Council of NSW, appointed by the Minister, is responsible for heritage in NSW, as constituted under the *Heritage Act 1977*. The Council is a cross-section of heritage experts with the NSW Heritage Division being the operational arm of the Council.

The Heritage Division provides guidelines for conducting assessments of heritage significance. In 1996 The Heritage Council published the heritage manual for 'Assessing Significance for Historical Archaeological Sites and Relics' which outlined specific criteria for addressing the significance of an item. These criteria are addressed in Section 5 of this report.

1.2 Environmental Planning and Assessment Act 1979

The EP&A Act requires that consideration be given to environmental impacts – including heritage – as part of the land use planning process, and the provisions of the EP&A Act allow for the implementation of Local Environmental Plans (LEPs).

Part 5 Clause 5.10 of The Hills Shire LEP 2012 provides the statutory framework for heritage conservation including the conservation of:

- the environmental heritage of The Hills;
- the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views;
- archaeological sites; and
- Aboriginal objects and Aboriginal places of heritage significance.

1.3 Historical Context

The Haerses Road Quarry site, situated within the wider Maroota region, is located within the traditional lands of the Darug people. The Darug language group extended from the coast between Port Jackson and Botany Bay, over the Cumberland Plain to the Blue Mountains (Attenbrow 2010).

The Maroota region was first surveyed in 1825 by Heneage Finch as part of the original Great North Road alignment (Casey and Lowe, 1994). The road was originally constructed by convict road gangs however the road near Maroota had quickly fallen in to disrepair and by 1829 the portion of road near Maroota was identified as being little more than a bush track. For much of the later nineteenth century and up until the 1940s the portion of the Great North Road between Castle hill and Maroota was abandoned (Casey and Lowe, 1994).

First settled by Europeans in 1832 by army veterans, the Maroota settlement area was originally known as Forest Glen. However by 1834, due to the lack of soil fertility, the original settlement had failed and was abandoned with the army veterans petitioning the government for a transfer of the land grants. Settlement was re-established during the nineteenth century and was proclaimed Maroota Village in February 1892 (http://dictionaryofsydney.org/entry/maroota). The current Maroota Village settlement area is located approximately one kilometre north of the Haerses Road Quarry site closer to the original Great North road alignment.

Historical and modern disturbances within the local area include vegetation clearance, grazing, farming and quarrying. The Haerses Road Quarry site itself has been subject to vegetation clearance, grazing and modern quarrying activities.

The current Haerses Road Quarry site was originally set apart for Conditional Purchase or Crown lease in 1906. The Haerses Road Quarry site has been subject to primarily logging and farming disturbances from the mid-1920s until the late twentieth century. **Table 1** summarises the occupation history of Lot 177 DP 752039 while **Table 2** summarises the occupation history of Lot 216 DP 752039. The Tables highlight that the land comprising the Haerses Road Quarry site was not granted until the early twentieth century over 70 years after the original Maroota / Forest Glen land grants.

Plates 1.1 to **1.4** are a series of Parish maps that show the land grants and development across the Haerses Road Quarry site and local region. **Plates 1.5** and **1.6** show the earliest plans of the two lots within the Haerses Road Quarry site.

Table 1 Lot 177 DP 752039

Date of Acquisition & Term Held	Registered Proprietor(s) & Occupations where available	Reference to Title at Acquisition and sale
21.11.1906	Set apart for Conditional Purchase or Crown Lease	
15.12.1915	Part of Classification reserve	
05.07.1921 (1921 to 1924)	James Amos Snelgrove	Crown Tenure Crown Lease 1921/10 Now Crown Tenure Conditional Purchase 1923/5
11.08.1924 (1924 to 1959)	Henry Robert Dawson (Orchardist, now Accountant)	Crown Tenure Conditional Purchase 1923/5 (Book 1372 No. 359)

Date of Acquisition & Term Held	Registered Proprietor(s) & Occupations where available	Reference to Title at Acquisition and sale
19.10.1959 (1959 to 1964)	Keith Paull (Orchardist)	Crown Tenure Conditional Purchase 1923/5 (Book 2512 No. 986) Now Vol 7882 Fol 90
21.12.1964 (1964 to 1968)	John Waldo Cornford (Orchardist)	Vol 7882 Fol 90
13.11.1968 (1968 to 194)	Colin Frederick Marsh (Farmer)	Vol 7882 Fol 90
24.04.1974 (1974 to 1981)	Marina Victoria Ann Marsh (Widow) (Section 94 Application not investigated)	Vol 7882 Fol 90 Now Vol 12679 Fol 249
23.10.1981 (1981 to 1985)	Farley & Lewers Limited	Vol 12679 Fol 249
05.12.1985 (1985 to 1998)	CSR Limited	Vol 12679 Fol 249 Now 177/752039
25.09.1998 (1998 to date)	# K.H. Dixon (No. 2) Pty Limited	177/752039

Table 2 Lot 216 DP 752039

Date of Acquisition & Term Held	Registered Proprietor(s) & Occupations where available	Reference to Title at Acquisition and sale
21.11.1906	Set apart for Conditional Purchase or Crown Lease	
15.12.1915	Part of Classification reserve	
15.11.1935	Crown Reserve No. R 62235 for Timber	
1950	George Henry Baxter	Crown Tenure Special Lease 1950/19 Forfeited 17.10.1958
17.10.1958	Crown Land reserved from sale or lease	
1965	John Waldo Cornford (Orchardist)	Crown Tenure Special Lease 1965/16 ? formalised
12.08.1977	Crown Reserve No. R 90864 for Future Public Requirements	Revoked 11.02.2005
16.10.2004	State of New South Wales	216/752039
15.02.2005 (2005 to date)	# K.H. Dixon (No. 2) Pty Limited	216/752039

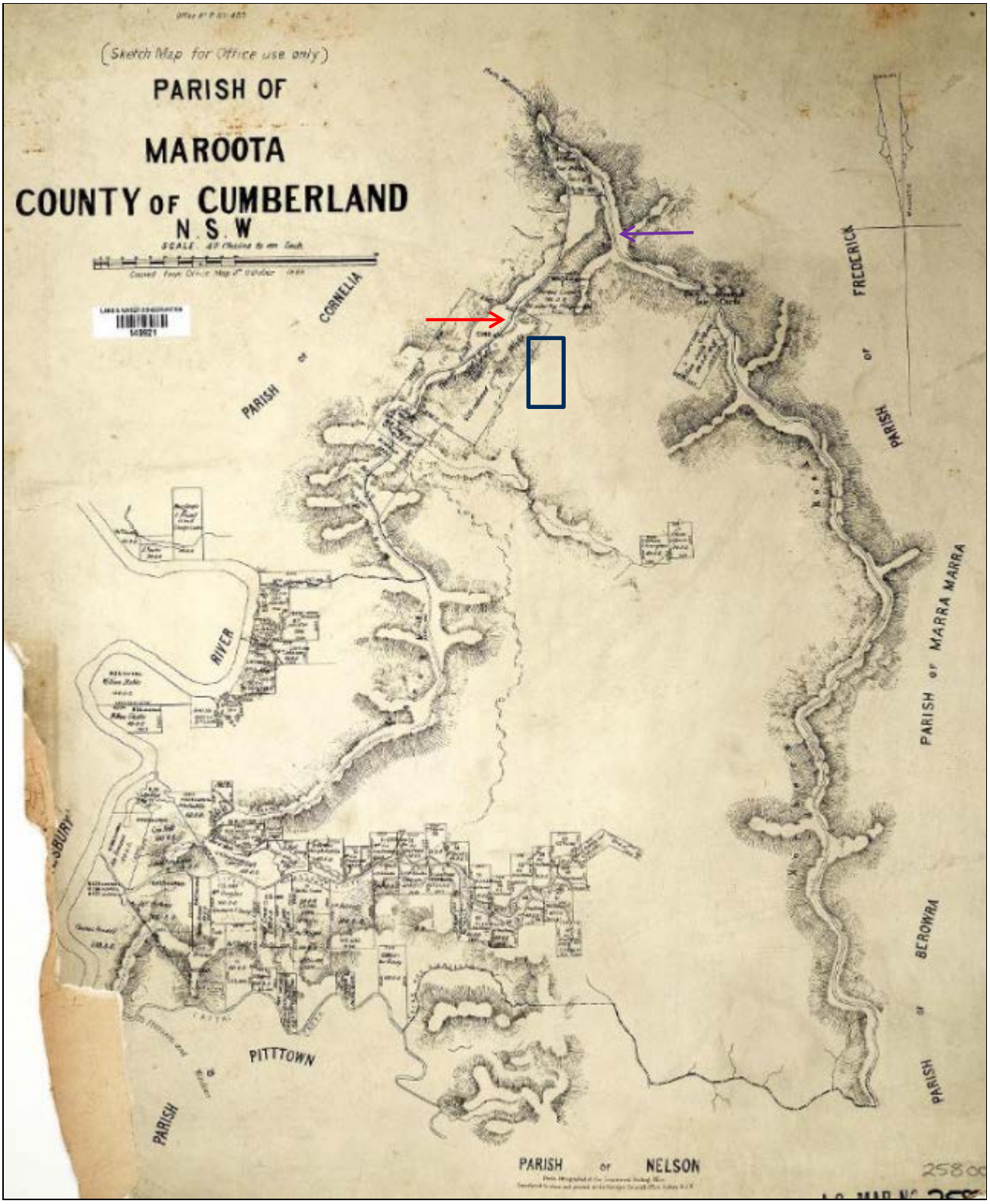


Plate 1.1 Parish of Maroota, County of Cumberland: copied of 11 October 1883 sketch map. Wisemans Ferry road is indicated with a red arrow, the Old North Road is indicated with a purple arrow and the approximate location of the current Haerses Road Quarry site is outlined.

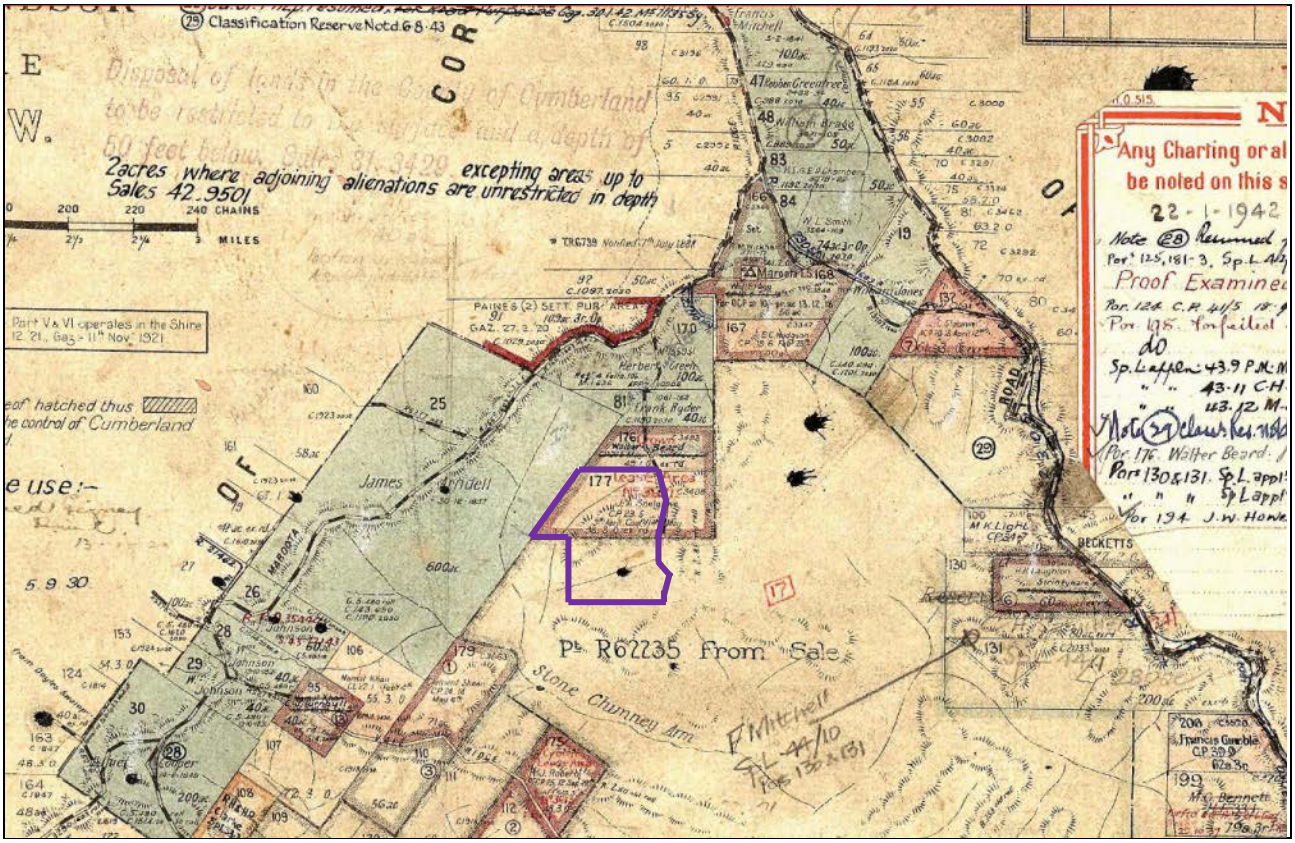


Plate 1.2 Detail of Parish Map of Maroota, County of Cumberland, Land District of Windsor: Eastern Division Fourth Edition 1927. Haerses Road Quarry site indicated in purple.

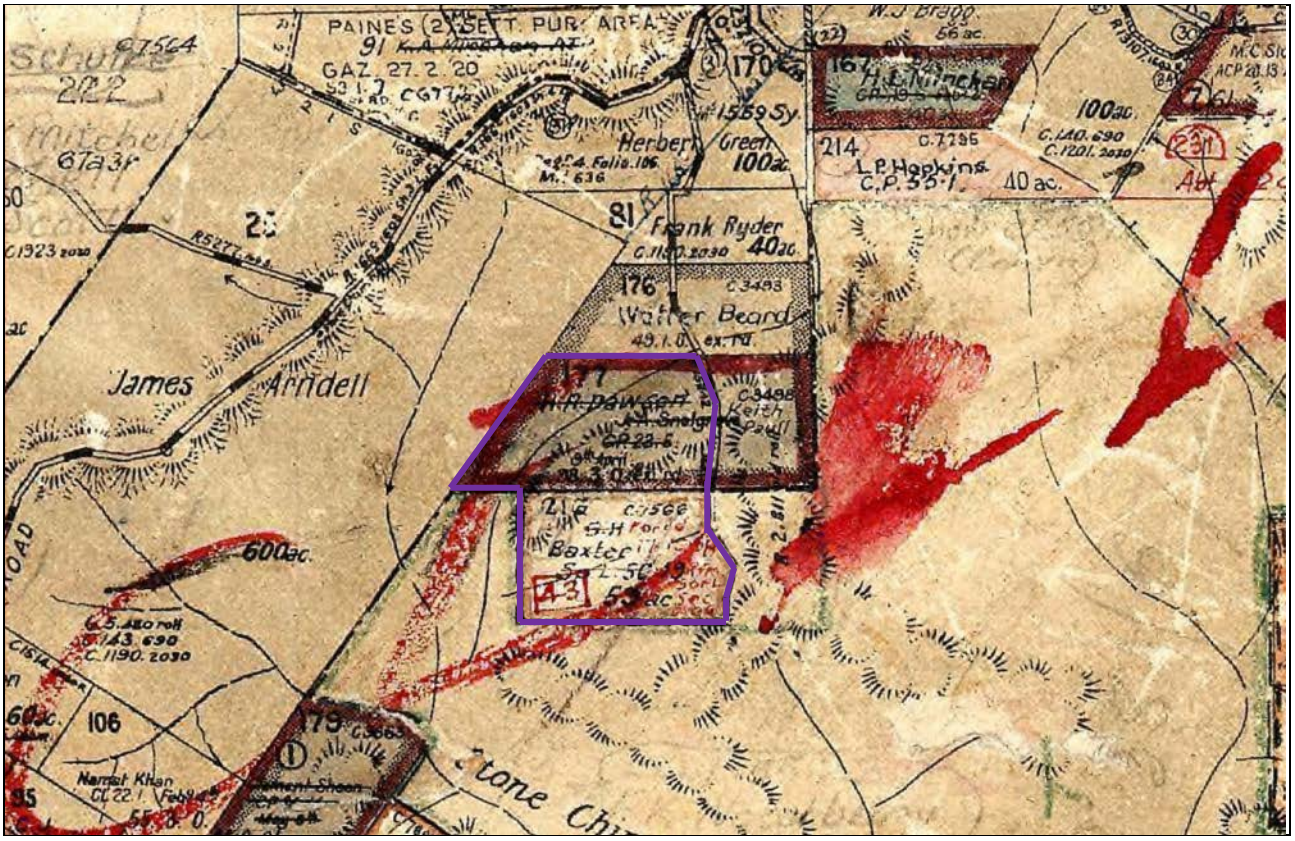


Plate 1.3 Detail of Parish Map of Maroota, County of Cumberland, Land District of Windsor: Eastern Division Sixth Edition 1942. Haerses Road Quarry site indicated in purple.

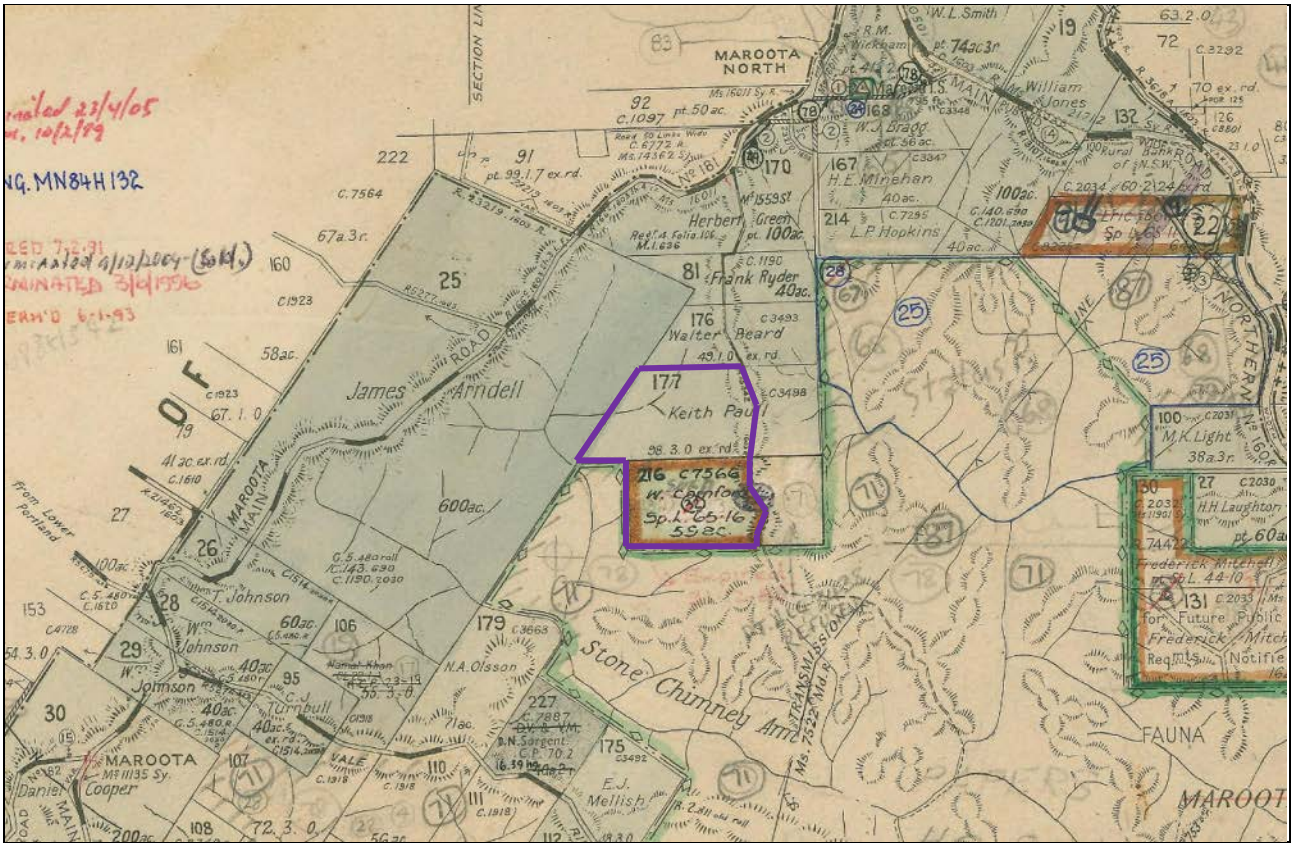


Plate 1.4 Detail of Parish Map of Maroota, County of Cumberland, Land District of Windsor: Eastern Division Eighth Edition 1970s. Haerses Road Quarry site indicated in purple.

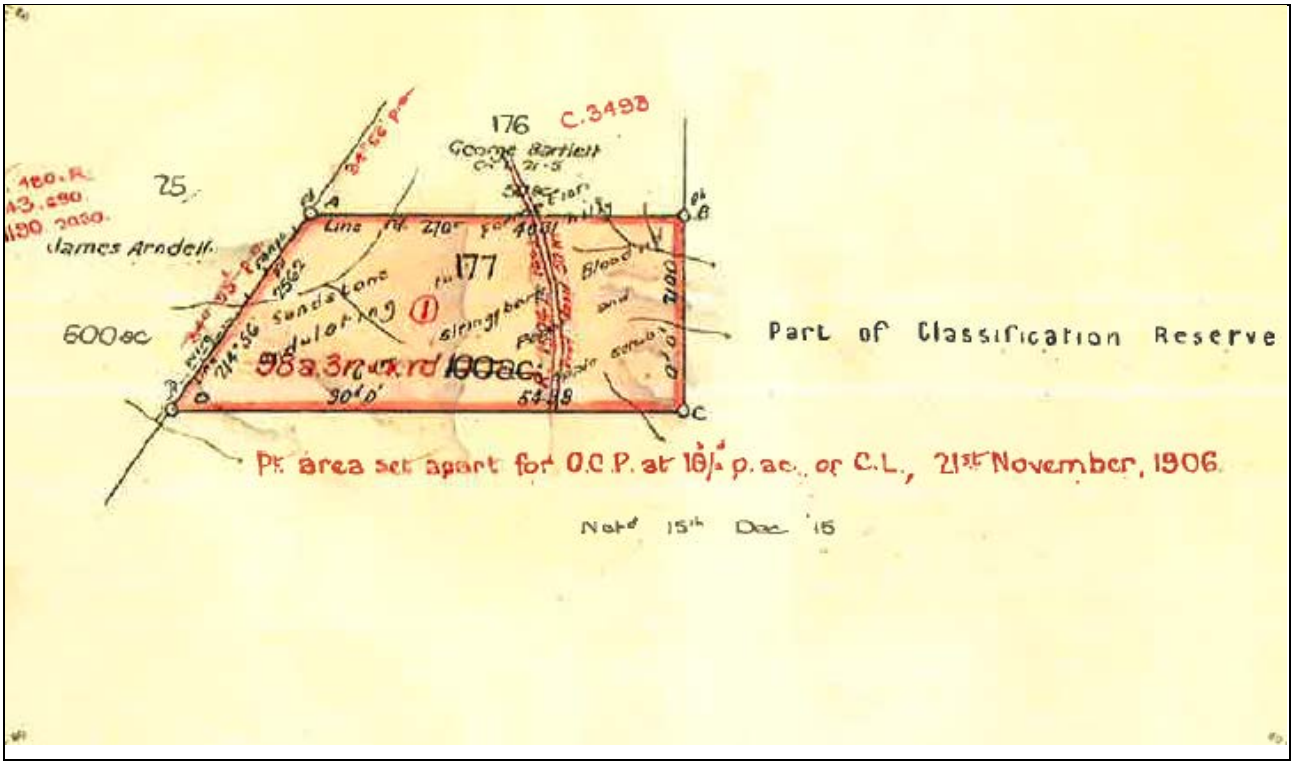


Plate 1.5 Plan of Portion 177 within the Haerses Road Quarry site showing the classification as reserve as Stringybark and bloodwood scrub in 1906.

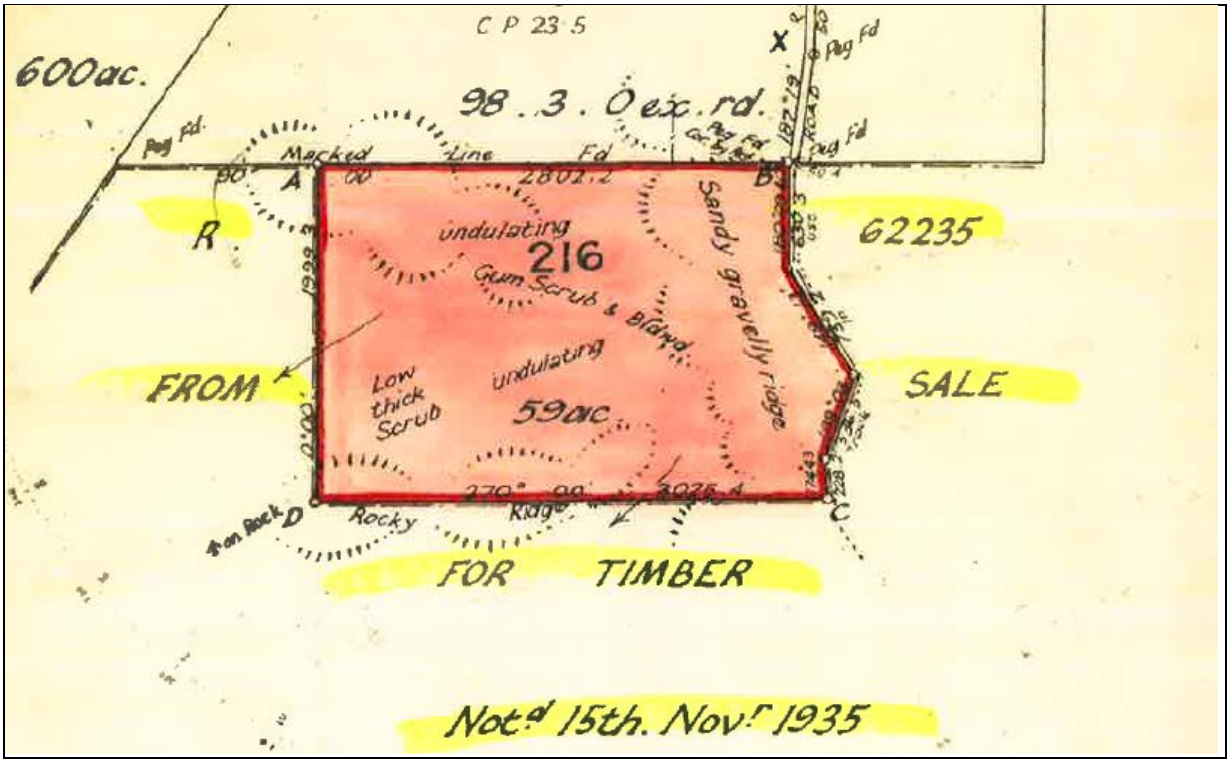


Plate 1.6 Plan of Portion 216 within the Haerses Road Quarry site showing the portion as scrub with no other improvements in 1935.

1.4 Recorded Historic Heritage Items

Historic heritage items, relics and places are recorded in statutory and non-statutory registers which are held at Federal, State and local levels depending upon the significance level ascribed. Sites which are representative of 'outstanding universal value' are identified as internationally significant and are inscribed in the World Heritage List.

The federal designations are maintained by the Commonwealth Department of Environment and include the Commonwealth Heritage List and the non-statutory National Heritage List. Historic heritage places of state significance are found on the NSW State Heritage Register (SHR) administered by the Heritage Division and available on the NSW Heritage Inventory online database. Places of local significance are included in heritage schedules in Local Environmental Plans.

World Heritage

There are no World Heritage items located within or within close proximity to the Haerses Road Quarry site.

National and Commonwealth Heritage

An updated search of the Australian Heritage Database was undertaken on 16 February 2017 which indicated that there are no National or Commonwealth heritage items within close proximity to the Haerses Road Quarry site.

State Heritage Register

An updated search of the State Heritage Register on 15 February 2017 found that, there are no State Heritage Register items within close proximity to the Haerses Road Quarry site.

Local Heritage

An updated search of Schedule 5 of The Hills Shire LEP 2012 on 15 February 2017 identified two locally listed archaeological sites within approximately one kilometre of the Haerses Road Quarry site (**Table 1.1**).

Table 3 Local Heritage Listings within one kilometre of the Haerses Road Quarry site

Item Name	Address	Item Number	Approximate Distance from Haerses Road Quarry site
Old Northern Road	Old Northern Road between Dural and Wisemans Ferry	A12	1 kilometre
Bypassed section of Old Northern Road	Crown Reserve R88205, 4230–4254 Old Northern Road	A17	1 kilometre

1.5 Visual Inspection

A visual inspection of the Haerses Road Quarry site was undertaken on 8 December 2015 by Amanda Reynolds, Senior Archaeologist of Umwelt. The visual inspection was undertaken on foot to determine the potential presence/absence of archaeological resources and identify any potential historical heritage items not identified during database searches and historical documentation.

No potential historic heritage items were identified during the visual inspection of the Haerses Road Quarry site. Further, no evidence of historic structures and or potential sub-surface features/relics were identified.

1.6 Significance Assessment

As outlined in the *Australian Burra Charter*, prior to making decisions on the future of a heritage item, it is necessary to understand the heritage significance and the values it embodies. The following section contains a summary of the heritage significance of the Haerses Road Quarry site. This section assesses the Haerses Road Quarry site using the NSW state significance heritage criteria as explained in *Assessing Heritage Significance* (Heritage Office (former), 2001.

The table below summarises the significance assessment of the Haerses Road Quarry site.

Table 4 Summary of Significance Assessment

Significance Criterion	Criterion Outline	Assessment
Historical Significance (A)	An item is important in the course, or pattern, of NSW's cultural history (or the cultural or natural history of the local area)	Does not meet this criterion
Associative Significance	An item has strong or special association with the life or works of a person, or a group of persons, of importance in NSW's cultural or natural history.	Does not meet this criterion
Aesthetic Significance (C)	An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement.	Does not meet this criterion

Significance Criterion	Criterion Outline	Assessment
Social Significance (D)	An item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons.	Does not meet this criterion
Research Potential (E)	An item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history.	Does not meet this criterion
Rarity (F)	An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area).	Does not meet this criterion
Representativeness (G)	An item is important in demonstrating the principal characteristics of a class of NSW's (or the local areas) cultural or natural places; or cultural or natural environments.	Does not meet this criterion

The desktop and visual inspection assessment components identified that there are no historic heritage items and/or areas where potential relics would be buried sub-surface within the Haerses Road Quarry site. Due to the lack of heritage items and potential sub-surface relics, the significance assessment has therefore identified that the Haerses Road Quarry site does not meet any of the SHR Significance Criteria.

1.7 Impact Assessment

The proposed modification to DA 165-7-2006-5, being sought for the Haerses Road Quarry involves increasing the extraction area (beyond that currently approved) as well as including a provision for mobile plant and equipment to be utilised on the site to avoid double handling and double processing of the product.

In considering the impact of the proposed works, it is important to clarify those physical components and attributes which embody or form part of the heritage significance of a site. In the case of the current Haerses Road Quarry site, this assessment has found that there are no identified historical heritage and/or potential archaeological components that would be impacted upon by the proposed works.

1.8 Conclusions

The historical context has identified that the earliest use of the Haerses Road Quarry site was as crown reserve up until the 1920s. Throughout much of the twentieth century the Haerses Road Quarry site was subject to primarily farming and orcharding practices with no known early structures identified within the Haerses Road Quarry site. The visual inspection of the Haerses Road Quarry site did not identify any historic heritage items and/or areas where potential sub-surface relics may be present. The significance assessment found that the Haerses Road Quarry site does not meet any of the SHR Significance Criteria. As such, this assessment has found that the proposed works are unlikely to impact upon any known or potential items or relics of heritage significance. Noting that, if during the course of proposed works previously unknown historical archaeological material or heritage items are discovered, all work in the area of the item(s) shall cease immediately and the Heritage Division, OEH and a qualified heritage consultant will be consulted, in accordance with Section 146 of the Heritage Act, to determine an appropriate course of action prior to the recommencement of work in the area of the item.

1.9 References

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http://dictionaryofsydney.org/entry/maroota

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