THE AUSTRAL BRICK COMPANY PTY LIMITED

ABN: 52 000 005 550

Air Quality Management Plan

for the

New Berrima Clay/Shale Quarry

PA08_0212

Prepared by:

R.W. CORKERY & CO. PTY. LIMITED

March 2016

Approved by

the Secretary's nominee, Howard Reed,

on 13 May 2016

Air Quality Management Plan

for the

New Berrima Clay/Shale Quarry

PA08_0212

Prepared for:

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COMMONLY USED ACRONYMS

AHD	Australian Height Datum
AS	Australian Standard
CCC	Community Consultative Committee
DPE	Department of Planning and Environment
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	Environment Protection Authority
EPL	Environment Protection Licence
NATA	National Association of Testing Authorities
NPI	National Pollution Inventory
PA	Project Approval

KEY FACTS AND FIGURES

Project Areas (approximate)	Quarry Site – 51 ha Extraction Area Stages 1-4 – 5.5 ha Extraction Area Stages 5-7 – 5.0 ha Surplus Overburden Stockpile Area – 1.5 ha Final Landform Area South – 1.4 ha Total Area of Disturbance - 14 ha
Annual Production	Maximum 150 000t per year
Approved Quarry Life	Until 30 June 2045
Capital Investment	Approximately $1 million
Employment	Approximately four full time equivalent positions
Extraction Equipment	Scraper, bulldozer, haul truck, front-end loader
Extraction Floor	640m AHD
Extraction Stages and Resources	Stages 1 to 4 (southern section of extraction area) Approximately 1.6 million tonnes Stages 5 to 7 (northern section of extraction area) Approximately 2.3 million tonnes
Hours of Operation	Monday to Friday - 7:00am to 5:00pm Saturday - 8:00am to 1:00pm Sundays and Public Holidays – No Operations
Length of Sealing of Quarry Access Road	Approximately 400m (from Berrima Road)
Traffic Volumes (approximate)	Typical day - 0 to 34 truckloads (0 to 68 truck movements) Typical transport campaign day – 17 to 34 truckloads (34 to 68 truck movements) Maximum per day - 68 truckloads (132 truck movements)
Visibility Barrier Dimensions (approximate)	Central Visibility Barrier - approximately 8m to 12m high, 30m to 45m wide, and 420m long (Area =1.5 ha) Northern Visibility Barrier - approximately 8m to 9m high, 35m to 50m wide, and 160m long (Area = 0.7 ha) Southern Visibility Barrier – up to 4m high, up to 20m wide, and up to 350m long (Area = 0.7 ha)

1. INTRODUCTION

This *Air Quality Management Plan* (the Plan) has been prepared by R W Corkery & Co Pty Limited on behalf of The Austral Brick Company Pty Ltd (Austral) for the New Berrima Quarry (the Quarry). The Quarry is located approximately 1.5km east of New Berrima in the Southern Highlands of NSW (**Figure 1**).

This Plan has been prepared in satisfaction of *PA Condition 3(11)* and *5(3)* of Project Approval (PA) 08_0212[1] and describes the following.

- The activities approved under PA 08_0212.
- The consultation undertaken during preparation of this Plan.
- The legal and other requirements associated with management of air quality emissions from the Quarry.
- The objectives and key performance outcomes for this Plan and the Quarry.
- Roles and responsibilities.
- Competence training and awareness.
- Surrounding residences.
- A description of the existing air quality environment and predicted air-quality related impacts.
- Air quality management measures that will be implemented during construction and operation of the Quarry.
- Air quality-related monitoring that will be undertaken.
- Evaluation of compliance with air quality criteria.
- Corrective and preventative actions that will be implemented should exceedance(s) of the relevant criteria be identified.
- Complaints handling and response procedures that will be implemented.
- Incident reporting procedures.
- Publication of monitoring information.
- Plan review.

The approved Quarry is fully described in the *Environmental Assessment* dated May 2015 to support a modification to PA 08_0212, and the *Environmental Assessment* dated December 2010 and associated documentation prepared to support the application for PA 08_0212. Key facts and figures about the approved quarry are provided on the previous page and an overview of the approved activities and staged operations are outlined in Section 2.

[1] All conditions in Project Approval 08_0212 are referred to as *PA Condition …*

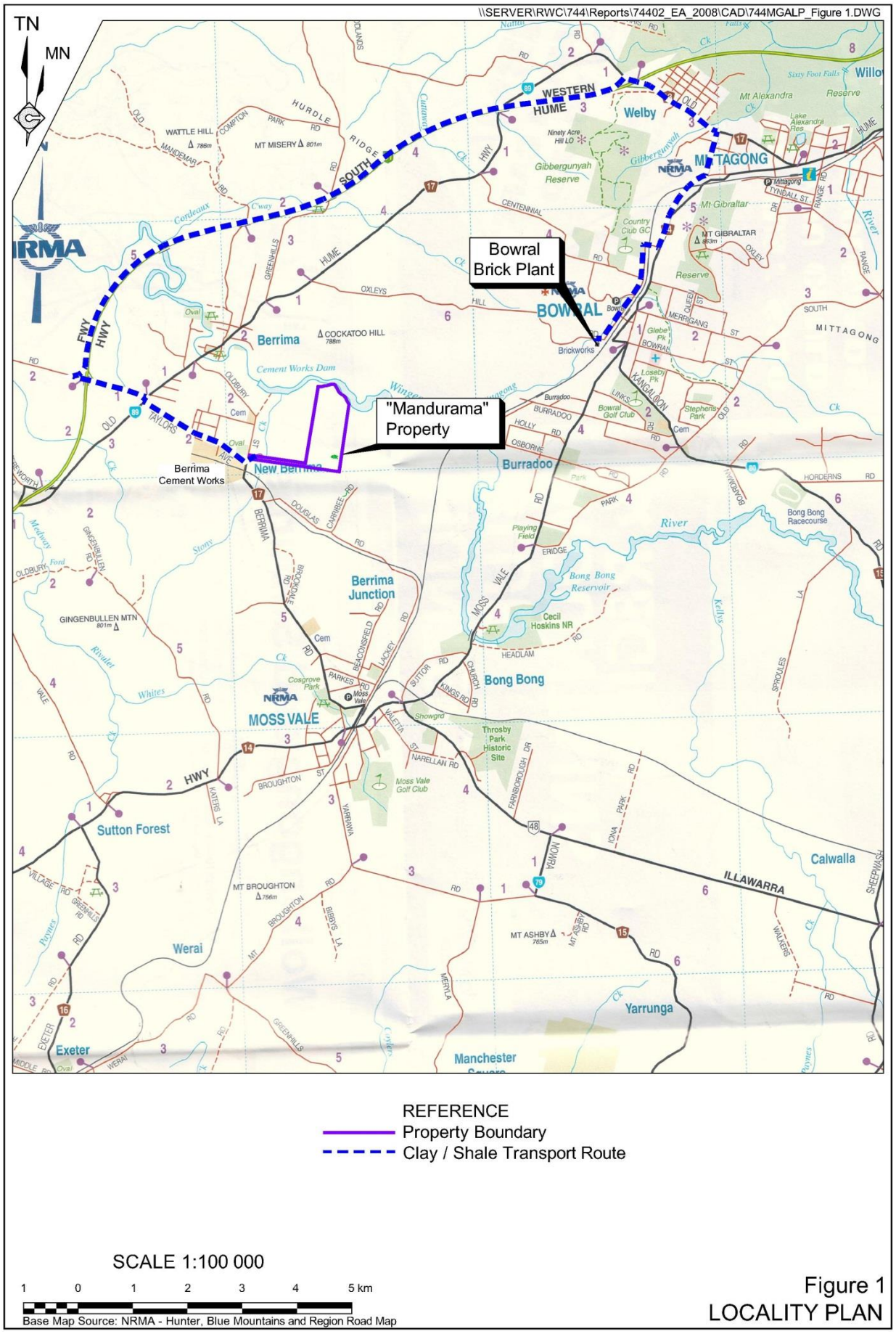

Figure 1
LOCALITY PLAN

In addition, a range of other management plans have also been prepared to guide operations within the Quarry. These include the following.

- Environmental Management Strategy.
- Transport Management Plan.
- Noise Management Plan.
- Water Management Plan.
- Landscape Management Plan.
- Aboriginal Cultural Heritage Management Plan.

2. APPROVED ACTIVITIES AND STAGED OPERATIONS

2.1 APPROVED ACTIVITIES

The approved activities at the Quarry (**Figure 2**) comprise the following.

- Construction of visibility barriers to provide visual screening for the quarry operations.
- Establishment of an extraction area to extract clay/shale using standard ripping, pushing and loading techniques.
- Use of an existing Quarry access road and upgrading of two intersections.
- Transportation of up to 150 000t per year of quarry products via Berrima Road using articulated and rigid trucks not exceeding 19m in length.

The relevant limitations upon the approved activities nominated in Conditions within PA 08_0212 are as follows.

- "The Proponent shall not carry out any development in the extraction area below a level of 640m AHD" *PA Condition 2(6).*
- "The Proponent shall not extract more than 150 000 tonnes of extractive materials from the site in any calendar year" *PA Condition 2(7).*
- "The Proponent shall not transport more than:
  a) 150,000 tonnes of product from the site in any calendar year;
  b) 68 laden trucks from the site in a day; and
  c) 8 laden trucks from the site in an hour.

The approved quarry life is until 30 June 2045 and the approved hours of operation are outlined in **Table 1**.

Table 1
Hours of Operation

Day	Extraction Operations	Clay/Shale Transportation
Monday – Friday	7:00am to 5:00pm	7:00am to 4:00pm
Saturday	8:00am to 1:00pm	8:00am to 1:00pm
Sundays and Public Holidays	None	None

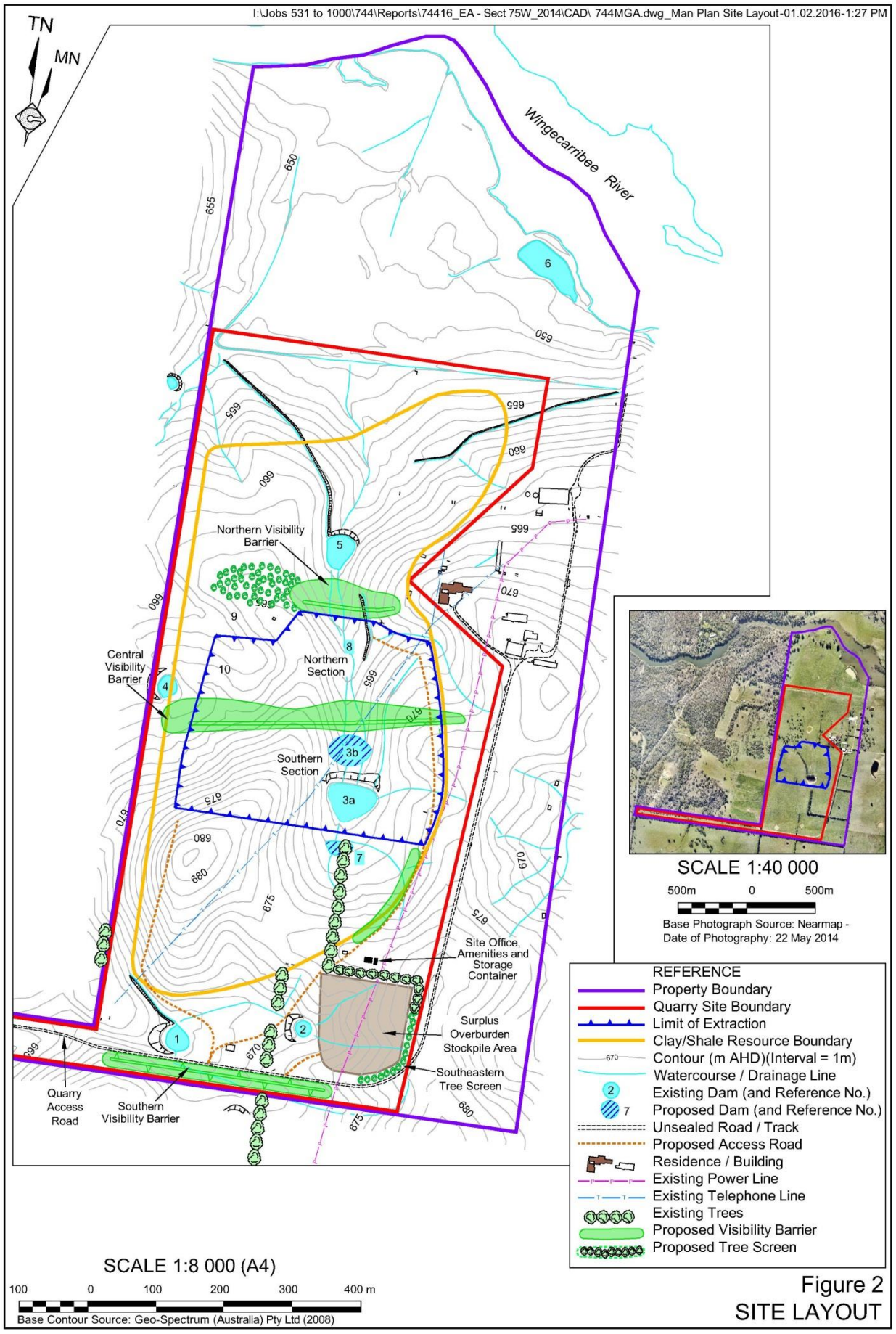

Figure 2
SITE LAYOUT

2.2 STAGED OPERATIONS

The sequence of extraction throughout the initial stages of the quarry will reflect the need to complete the construction of the central visibility barrier to the north of the southern section of the extraction area (**Figure 2**) using overburden, whilst gaining access to the underlying shale as efficiently as practicable. **Figure 3** displays the staging sequence throughout the life of the Quarry. The southern section would be extracted in four stages, namely Stages 1 to 4. Once extraction ceases in the southern section, extraction would commence in the northern section with extraction undertaken in three stages, namely Stages 5 to 7. The approximate sequence plan for extraction is as follows.

Year 1 – Stage 1 extraction to provide material for central visibility barrier construction. Commence extraction of shale in Stage 2.

Years 2 to 4 – Complete extraction of shale in Stage 2.

Years 5 to 14 – Complete Stages 3 and 4 of extraction and complete extraction in southern section of extraction area.

Years 15 to 30 – Commence extraction in Stage 5 to construct the northern visibility barrier. Complete extraction of Stages 6 and 7 progressively.

3. CONSULTATION

3.1 GOVERNMENT AGENCY CONSULTATION

The following government agency consultation was undertaken during the preparation of this Plan.

- An email was sent to the Environment Protection Authority (EPA) on 16 August 2012 to confirm any requirements for this Plan. The EPA replied on 24 August 2012 stating the Authority does not review draft management plans during preparation. Rather, final plans could accompany an application for an Environmental Protection Licence.
- A meeting with Mr Matthew Fuller from the EPA was held at the Quarry Site on 16 November 2015 to determine air quality monitoring locations. The nominated monitoring locations were confirmed by Mr Fuller via email on 20 November 2015.

3.2 LANDHOLDER CONSULTATION

Austral consulted with three surrounding landowners during the preparation of this document. Austral established that a number of the surrounding residents did not necessarily live full time at their residences and hence, access for monitoring purposes would be problematic. Austral will undertake a letterbox drop immediately before operations commence on site to notify surrounding residents about its planned activities and to provide relevant contact names and phone numbers for contact, if required.

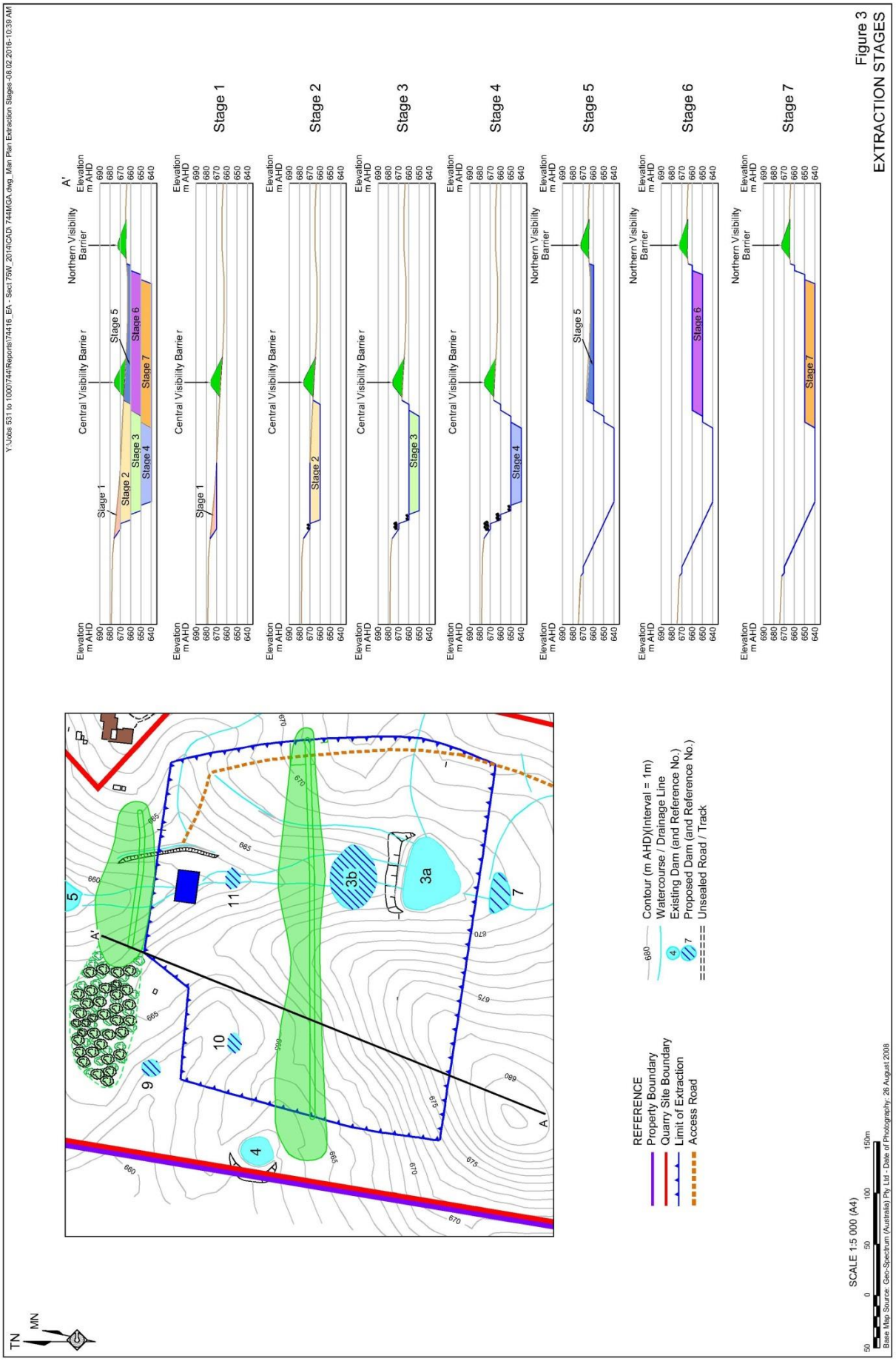
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Figure 3
EXTRACTION STAGES
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Northern Visibility Barrier
Central Visibility Barrie r
Elevation m AHD
A
A'
REFERENCE
Property Boundary
Quarry Site Boundary
Limit of Extraction
Access Road
Contour (m AHD)(Interval = 1m)
Watercourse / Drainage Line
Existing Dam (and Reference No.)
Proposed Dam (and Reference No.)
Unsealed Road / Track
SCALE 1:5 000 (A4)
Base Map Source: Geo-Spectrum (Australia) Pty Ltd - Date of Photography: 28 August 2008
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3.3 COMMUNITY CONSULTATION

Austral will maintain contact with the community through the required Community Consultative Committee (CCC). This committee will be established prior to the commencement of site activities. The CCC will meet at intervals considered appropriate by the committee.

Austral will consult with surrounding landowners, as required throughout the life of the Quarry. In the event any exceedance of air quality criteria is identified, Austral will notify potentially affected landowners in accordance with *PA Condition 4(1)*, and provide monitoring results to those landowners until compliance with the relevant air quality criteria are achieved.

4. LEGAL AND OTHER REQUIREMENTS

Austral was granted PA 08_0212 by the Director-General of Planning and Infrastructure on 7 July 2012 pursuant to Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Modification 1 of PA 08_0212 was issued on 15 December 2015 to incorporate modifications to the Quarry associated with an alternate extraction area boundary. PA 08_0212 includes the criteria that Austral needs to comply with and sets out the matters that need to be addressed within this plan. Relevant air quality-related conditions in PA 08_0212 are reproduced in **Table 2**.

Table 2
Project Approval Requirements Relating to Air Quality

Page 1 of 3

<table>
<tr><th>Schedule</th><th>Condition</th><th>Plan Section</th></tr>
<tr><td colspan="3">Air Quality</td></tr>
<tr><td>3(9)</td><td>The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated on site do not exceed the criteria in Table 3, Table 4 and Table 5 at any residence on privately-owned land, or on more than 25% of any privately-owned land.

Table 3 - Long-term criteria for particulate matter
<table><tr><th>Pollutant</th><th>Averaging period</th><th>[d]Criterion</th></tr><tr><td>Total suspended particulate (TSP) matter</td><td>Annual</td><td>[a]90 µg/m^3</td></tr><tr><td>Particulate matter < 10 µm (PM_{10})</td><td>Annual</td><td>[a]30 µg/m^3</td></tr></table>
Table 4 - Short term criterion for particulate matter
<table><tr><th>Pollutant</th><th>Averaging period</th><th>[d] Criterion</th></tr><tr><td>Particulate matter < 10 µm (PM_{10})</td><td>24 hour</td><td>[a] 50 µg/m^3</td></tr></table>
Table 5 - Long term criteria for deposited dust
<table><tr><th>Pollutant</th><th>Averaging period</th><th>Maximum increase in deposited dust level</th><th>Maximum total[1] deposited dust level</th></tr><tr><td>[c]Deposited dust</td><td>Annual</td><td>[b]2 g/m^2/month</td><td>[a]4 g/m^2/month</td></tr></table>
Notes for Tables 3-5:
• [a]Total impact (i.e. incremental increase in concentrations due to the project plus background concentrations due to other sources);
• [b] Incremental impact (i.e. incremental increase in concentrations due to the project on its own);
• [c] Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method; and
• [d] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents, illegal activities or any other activity agree to by the Director-General in consultation with EPA.</td><td>Section 10</td></tr>
</table>

Table 2 (Cont'd)
Project Approval Requirements Relating to Air Quality

Schedule	Condition	Plan Section
3(10)	The Proponent shall: (a) implement best management practice to minimise the dust emissions of the project;	Section 10
	(b) regularly assess air quality monitoring data and relocate, modify, and/or stop operations on site to ensure compliance with the relevant conditions of this approval,	Sections 10 & 11
	(c) minimise the air quality impacts of the project during adverse meteorological conditions and extraordinary events (see Noted under Table 5 above);	Section 10.1
	(d) minimise any visible off-site air pollution; and	Section 10
	(e) minimise the surface disturbance of the site generated by the project.	Section 10
3(11)	The Proponent shall prepare and implement an Air Quality Management Plan for the project to the satisfaction of the Secretary. This plan must:	
	(a) be prepared in consultation with the EPA, and submitted to the Secretary for approval prior to the construction of the visibility barriers;	Section 3.1
	(b) describes the measures that would be implemented to ensure: - best management practice is employed; - the air quality impacts of the project are minimised during adverse meteorological conditions and extraordinary events; and - compliance with the relevant conditions of this approval;	Section 10
	(c) describes the proposed air quality management system; and	Section 10
	(d) includes an air quality monitoring program that: - is capable of evaluating the performance of the project; - Includes a protocol for determining any exceedances of the relevant conditions of approval; - adequately supports the air quality management system; and - evaluates and reports of the adequacy of the air quality management system.	Section 11 Section 12
3(12)	During the life of the project, the Proponent shall ensure that there is a suitable meteorological station in the vicinity of the site that complies with the requirements in the "Approved Methods for Sampling of Air Pollutants in New South Wales" guideline.	Section 11.8
4(1)	As soon as practicable after obtaining monitoring results showing an: (a) exceedance of any relevant criteria in schedule 3, the Proponent shall notify affected landowners in writing of the exceedance, and provide regular monitoring results to each of affected landowner until the project is again complying with the relevant criteria.	Section 3.2
5(3)	The Proponent shall ensure that the Management Plans required under this approval are prepared in accordance with any relevant guidelines, and include: (a) detailed baseline data;	Section 11.2
	(b) a description of: - the relevant statutory requirements (including any relevant approval, licence or lease conditions); - any relevant limits or performance measures/criteria; and - the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;	Section 4 Section 11.3
	(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	Section 10

Table 2 (Cont'd)
Project Approval Requirements Relating to Air Quality

Schedule	Condition	Plan Section
5(3) (Cont'd)	(d) a program to monitor and report on the:	
	- impacts and environmental performance of the project; and	Section 11
	- effectiveness of any management measures (see (c) above);	Section 12
	(e) a contingency plan to manage any unpredicted impacts and their consequences;	Sections 12, 12 & 15
	(f) a program to investigate and implement ways to improve the environmental performance of the project over time;	Sections 12 & 13
	(g) a protocol for managing and reporting any:	
	- incidents;	Section 15
	- complaints;	Section 14
	- non-compliances with statutory requirements; and	Sections 12, 13 & 15
	- exceedances of the impact assessment criteria and/or performance criteria; and	
	(h) a protocol for periodic review of the plan. *Note: The Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.*	Section 17
5(4)	By the end of December 2016, and annually thereafter, the Proponent shall review the environmental performance of the project to the satisfaction of the Secretary. This review must:	
	(a) describe the development (including rehabilitation) that were carried out in the previous calendar year, and the works that are proposed to be carried out over the next year;	Section 16
	(b) include a comprehensive review of the monitoring results and complaints records of the project over the past year, which includes a comparison of these results against: - the relevant statutory requirements, limits or performance measures/criteria; - the monitoring results of previous years; and - the relevant predictions in the EA;	
	(c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;	
	(d) identify any trends in the monitoring data over the life of the project;	
	(e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and	
	(f) describe what measures will be implemented over the next year to improve the environmental performance of the project.	
5(7)	The Proponent shall notify, at the earliest opportunity, the Secretary and any other relevant agencies of any incident that has caused, or threatens to cause, material harm to the environment. For any other incident associated with the project, the Proponent shall notify the Secretary and any other relevant agencies as soon as practicable after the Proponent becomes aware of the incident. Within 7 days of the date of the incident, the Proponent shall provide the Secretary and any relevant agencies with a detailed report on the incident, and such further reports as may be requested.	Section 15
5(8)	The Proponent shall provide regular reporting on the environmental performance of the project on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this approval.	Section 16

Table 3
Project Approval Statement of Commitments

Commitment			Plan Section
Limit the generation of dust and other emissions from Site activities.	8.1	Construct vegetated visibility barriers to provide barriers to minimise the spread of dust from the Project Site.	Section 10
	8.2	Commence progressive rehabilitation of all disturbed areas as soon as possible after the completion of excavation in that area.	
	8.3	Use water truck to routinely spray unsealed roads, tracks and stockpile areas.	
	8.4	Cover and effectively seal tailgates of trucks leaving the Project Site.	
	8.5	Prohibit all vehicles and machinery from idling unnecessarily.	
	8.6	Maintain all vehicles and machinery in accordance with manufacturers' specifications.	
	8.7	Amend extraction practices as required during adverse wind conditions to minimise the generation and spread of dust from the Project Site.	
	8.8	Minimise drop heights between front-end loader buckets and truck trays through operator training and education on the management of dust.	
	8.9	Apply dust suppressants (e.g. Gluon or TerraControl) on unsealed roads used for product transport.	

5. OBJECTIVES AND OUTCOMES

Table 4 presents the objectives and key performance outcomes for this Plan and the Quarry.

Table 4
Objectives and Key Performance Outcomes

Objectives		Key Performance Outcomes	
Air Quality			
(a)	To ensure compliance with all relevant Project Approval and Environment Protection Licence criteria and reasonable community expectations.	(i)	Compliance is achieved with all relevant criteria nominated in the Project Approval 08_0212 and Environment Protection Licence and reasonable community expectations.
(b)	To implement appropriate air quality management and mitigation measures during all stages of the Project.	(ii)	All identified air quality management and mitigation measures are implemented to the extent required.
(c)	To implement an appropriate air quality monitoring program to establish compliance or otherwise with relevant criteria during all stages of the Project.	(iii)	All identified monitoring is undertaken in accordance with the relevant procedures and at the relevant intervals.
(d)	To implement an appropriate complaints handling and response protocol.	(iv)	Complaints (if any) are handled and responded to in an appropriate and timely manner.
(e)	To implement continual improvement for investigating, implementing and reporting on reasonable and feasible measures to reduce air quality impacts.	(v)	An appropriate continual improvement program has been implemented.
(f)	To implement an appropriate incident reporting program, if required.	(vi)	Incidents (if any) are reported in an appropriate and timely manner.

6. ROLES AND RESPONSIBILITIES

Table 5 presents the roles and responsibilities for the implementation of this Plan.

Table 5
Roles and Responsibilities

Roles	Responsibilities
NSW Manufacturing Manager	• Ensure all documentation is reviewed, as required. • Ensure adequate resources are available to enable implementation of the Plan.
Quarry Manager/ Supervisor	• Implementation of all air quality controls outlined in Section 9.
Environmental Officer	Manage the implementation of the following components of this Plan. • Air Quality monitoring as outlined in Section 11 • Evaluation of compliance as outlined in Section 12 and related follow-up actions. • Complaints handling and response as outlined in Section 14. • Incident reporting as outlined in Section 15. • Coordinate Environmental Monitoring and publishing data as outlined in Section 16. • Review of this Plan as outlined in Section 17. • Conduct environmental component of site induction for all employees and contractors.
All personnel	• Ensure training and awareness induction has been undertaken. • Compliance with this Plan.

7. COMPETENCE TRAINING AND AWARENESS

All Company personnel and contractors and their employees will undergo Company and site specific inductions, incorporating air quality management awareness training as part of the site induction program. The following areas will be covered in the induction.

- Awareness of prevailing wind directions and their potential to increase air emissions downwind.
- Awareness of approved air quality control measures.
- Awareness of operating hours.
- Awareness of community complaints protocols.
- Monitoring of air quality emissions at the three locations near the boundary of the Quarry Site.
- Awareness of the requirements for notifying incidents.

The Quarry Manager will be responsible for ensuring the appropriate air quality management training is included in the induction.

8. SURROUNDING RESIDENCES

Figure 4 displays the location of residences surrounding the Quarry.

9. EXISTING ENVIRONMENT

9.1 INTRODUCTION

The following sections provide a summary of the ambient air quality baseline and predicted air quality levels that were assessed for the Quarry. These predictions are sourced from the following air quality assessments.

- Heggies (2010) Air Quality Assessment, prepared to support the 2010 *Environmental Assessment* in application for PA 08_0212.
- SLR (2015) Air Quality Assessment, prepared as part of the application for modification to PA 08_0212.

9.2 WIND ENVIRONMENT

Annual and seasonal wind roses displaying wind speed and directions at Moss Vale are shown in **Figure 5**. Winds are predominantly from the west in autumn, winter and spring, with strong winds over 10 m/s originating mainly from the west. Somewhat lighter winds are predicted in summer, ranging from the north to the east and chiefly from the north-northeast.

9.3 AMBIENT AIR QUALITY

Relevant ambient air quality data for both dust deposition and airborne particulate matter for the Quarry was assembled by Heggies (2010).

Table 6 provides the ambient background air quality levels that have been adopted for the Quarry.

Table 6
Ambient Air Quality Levels

Parameter	Averaging Period	Assumed Background Concentration/Level
PM_{10}	24-hours	Daily varying[1]
	Annual	12.8µg/m^3
TSP[2]	Annual	19.2µg/m^3
Dust	Annual	2g/m^2/month
Note 1: Daily varying 24-hour average PM_{10} concentrations were used for modelling purposes. Note 2: Total Suspended Particulate		
Source: Heggies, 2010 Modified Table 4.3		

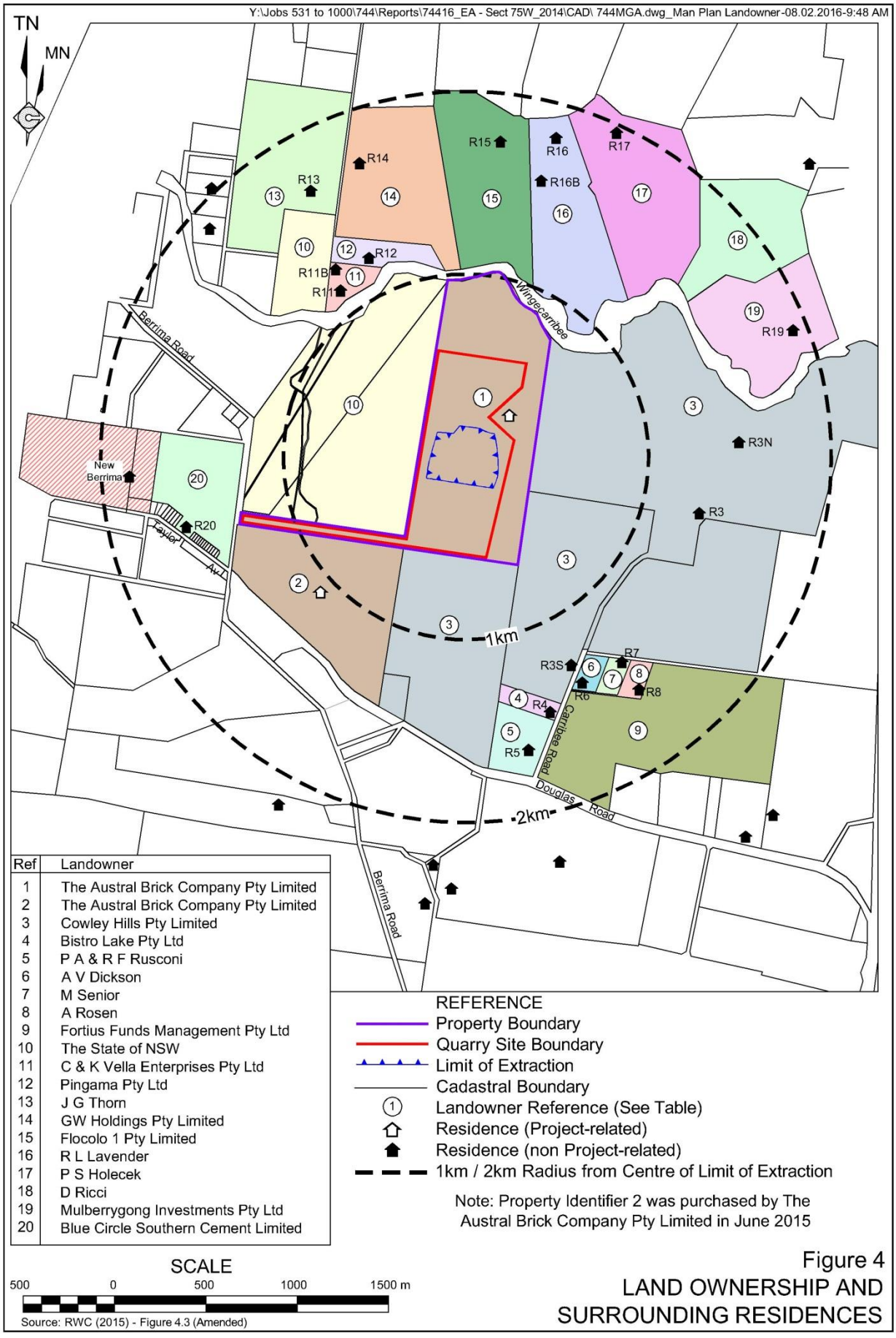
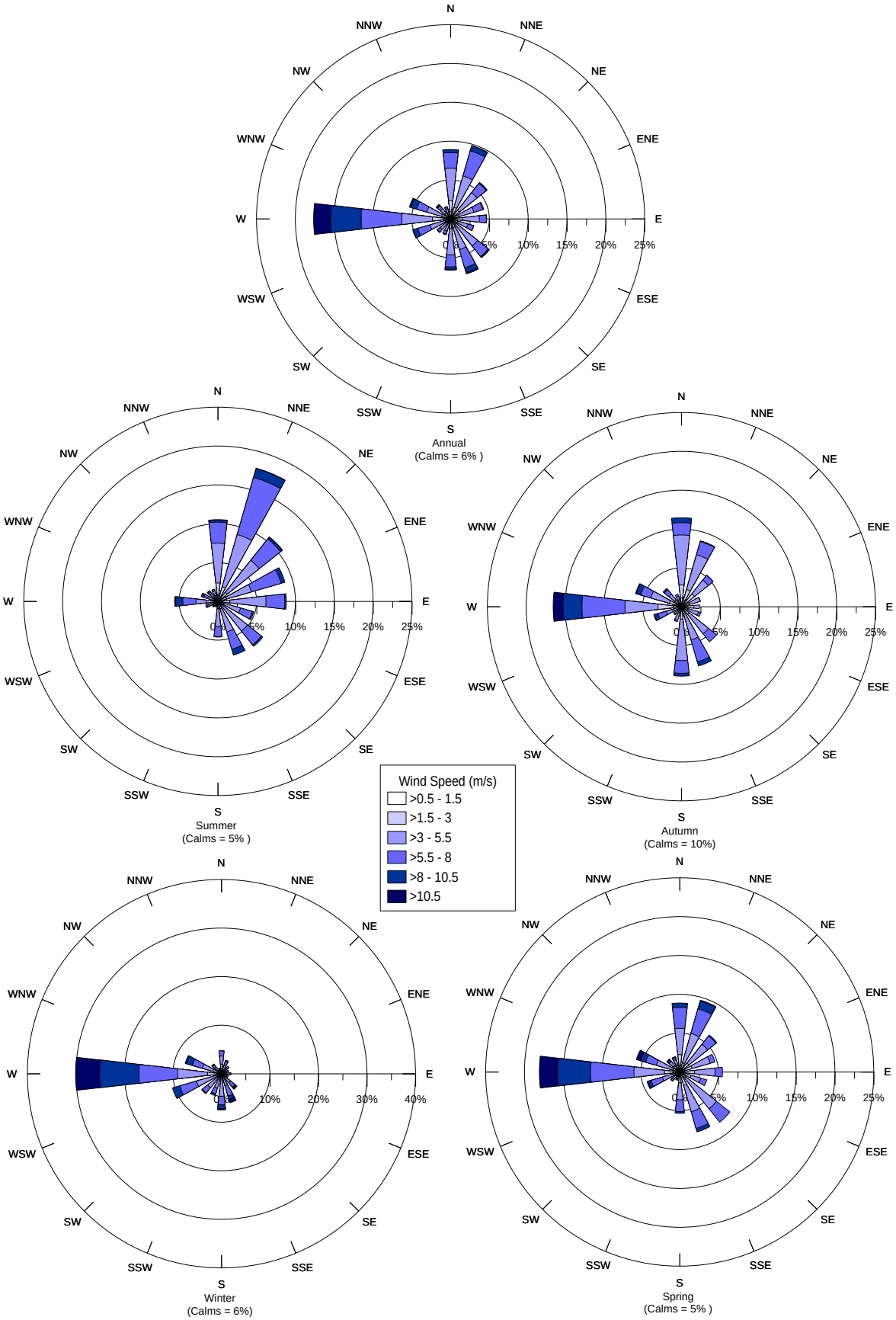


Figure 4
LAND OWNERSHIP AND SURROUNDING RESIDENCES



(Source: 2010 Environmental Assessment Air Quality Assessment [Heggies] – 2007 Seasonal Wind Roses)

Figure 5
ANNUAL AND SEASONAL WIND ROSES

9.4 POTENTIAL AIR QUALITY IMPACTS

Potential air quality impacts include dust and exhaust and greenhouse gas emissions. The sources of these emissions would be as follows.

- Excavation and extraction – topsoil stripping, overburden excavation, extraction of the clay/shale product.
- Visibility barrier construction – placement of overburden and topsoil.
- Transportation – dust emissions from the materials being transported.
- Road dust – dust emissions from the internal roads as vehicles travel along them.
- Stockpiles – dust emissions from bare stockpiles and bunds prior to revegetation.
- Exhaust and greenhouse gas emissions from trucks and machinery.

10. AIR QUALITY CONTROL MEASURES

10.1 DUST CONTROL PROCEDURES

Table 7 presents the air quality control measures that will be implemented to mitigate dust emissions from the quarrying activities.

Prior to the commencement of daily operations, the Quarry Supervisor will undertake an assessment of meteorological information to determine if any adverse wind conditions are predicted. If adverse conditions are predicted, the various activities planned for the day will be assessed to determine if further control procedures will be required to ensure that air quality compliance criteria are met. If compliance is unlikely to be achievable, activities will be temporarily suspended.

Table 7
Dust Control Measures

Page 1 of 2

Source	Control Procedures	Personnel Responsible
General	• Visually inspect operations for visible dust and adjust operations to reduce visible dust	Quarry Supervisor
Clearing Operations	• Disturb only the minimum area necessary for quarrying and related operations. • Maintain water sprays/water truck on stockpiles to minimise the generation of dust, as required.	Quarry Supervisor Quarry Supervisor All personnel
Soil Stripping	• Maintain water sprays/water truck on stockpiles to minimise the generation of dust, as required.	Quarry Supervisor All personnel
Topsoil Stockpiles	• Revegetate long term topsoil stockpiles	Quarry Supervisor
Loading of clay/shale	• Minimise the drop heights between front-end loader buckets and truck carrying quarry materials.	Quarry Supervisor and Equipment Operators

Table 7 (Cont'd)
Dust Control Measures

Source	Control Procedures	Personnel Responsible
Internal Roads	• All unsealed roads and trafficked areas will be watered, as required, to minimise the generation of dust.	Quarry Supervisor
	• Enforce a speed limit of 40km/hr on the Quarry access road and 10km/hr on all internal unsealed roads within the Quarry.	All personnel
	• All internal roads will have edges clearly defined with marker posts or equivalent to define their locations.	Quarry Manager
	• Development of minor roads or tracks will be limited and the locations of these clearly defined.	Quarry Manager
	• Obsolete roads will be ripped and re-vegetated.	Quarry Manager
	• Apply dust suppressants (e.g. Gluon or TerraControl) on unsealed roads used for product transport in the event that sufficient water is not available on Site for dust suppression.	Quarry Supervisor
Product Stockpiles	• Maintain product handling areas / stockpiles in a moist condition as required to minimise wind-blown and traffic-generated dust.	Quarry Manager
Transportation of Extracted Clay/Shale	• Maximise truck capacities to reduce the number of movements necessary to transport products.	Quarry Manager
	• Cover all loads prior to leaving the Quarry.	Quarry Supervisor
	• Prohibit all vehicles and machinery from idling unnecessarily.	All personnel
Visibility Barriers	• Ensure construction of visibility barriers as soon as possible to reduce dust emissions from extraction operations.	Quarry Manager
	• Revegetate visibility barriers as soon as possible and progressively, if feasible.	Quarry Supervisor
	• Seal 400m of the quarry access road approaching Berrima Road.	Quarry Manager
Rehabilitation	• Establish the interim or final landform as soon as areas become available for rehabilitation.	Quarry Manager
	• Revegetate interim or final landforms as soon as conditions are favourable.	Quarry Manager
	• Apply dust suppressants if conditions are not favourable for the establishment of vegetation.	Quarry Supervisor

11. AIR QUALITY MONITORING

11.1 INTRODUCTION

PA 08_0212 requires that an Air Quality Management Plan for the Quarry include the following.

- Details of air quality monitoring (*PA Condition 3(11)(d)*).
- Baseline air quality data (*PA Condition 5(3)(a)*).

Additionally, *PA Condition 3(12)* requires meteorological monitoring be undertaken. The following sub-sections are presented to satisfy these requirements.

11.2 BASELINE AIR QUALITY

The following baseline air quality data is sourced from the Air Quality Assessment (Heggies 2010), which was part of the *Environmental Assessment* submitted an application for PA 08_0212.

11.2.1 Surrounding Sources of Pollutants

The Quarry is situated in a semi-rural area dominated by agriculture and livestock operations. These operations are unlikely to generate significant levels of the key pollutants expected to be associated with the Quarry. However, following a review of the local area and the National Pollution Inventory (NPI) database, a number of industrial operations are currently established.

Of note are the Berrima Cement Works and the Bowral Brickwork Plant, located approximately 2.3km to the west-southwest and 5.1km to the east-northeast of the Quarry respectively. **Figure 1** illustrates the proximity of these operations to the Quarry.

11.2.2 OEH Air Quality Monitoring Stations

OEH maintains a network of air quality monitoring stations across NSW. No air quality monitoring is currently conducted in the area surrounding the Quarry.

The nearest OEH air quality monitoring station to the Quarry is located at Bargo on the outskirts of the Sydney Metropolitan Basin, approximately 30km to the northeast. This station currently monitors the following parameters:

- Oxides of Nitrogen (NO, NO_2 and NO_X);
- Ozone (O_3);
- Sulphur Dioxide (SO_2); and
- Meteorological Parameters (Wind Speed, Wind Direction, Temperature, etc.).

However, the nearest and most representative OEH air quality monitoring station to the Quarry that currently monitors fine particulates (PM_{10}) is located at Oakdale, approximately 50km to the north-northeast. While it is noted that the OEH station located at Albion Park is closer, approximately 40km east-southeast of the Quarry, the setting of the Quarry is more comparable with that of the Oakdale station (semi-rural region, inland setting and comparable elevation).

The OEH-recorded monitoring data from Oakdale (PM_{10}) will be used in this report to provide a suitable representation of the baseline air quality environment Quarry in the absence of site specific data.

11.2.3 Background Particulate Matter Environment

The verified data for 2007 showing 24-hour average PM_{10} concentrations at the Oakdale OEH monitoring station is presented in **Figure 6**.

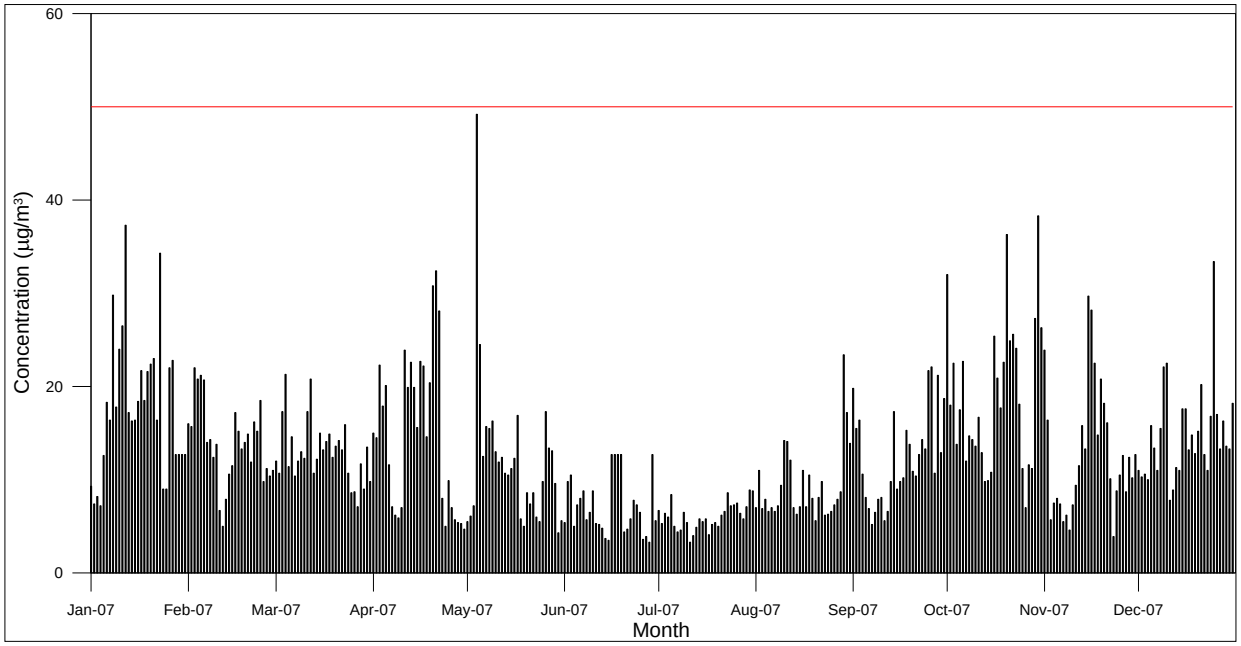


Figure 6
OEH PM_{10} (24-HOUR AVERAGE) MONITORING RESULTS FOR OAKDALE, 2007

The results indicate that the highest 24-hour average PM_{10} concentration at the Oakdale monitoring site was 49.2µg/m^3, recorded on 4 May 2007.

The annual average PM_{10} concentration for 2007, recorded at the OEH Oakdale monitoring site was 12.8µg/m^3.

It is noted that the PM_{10} sub-set is typically approximately 50% of TSP in the ambient air in regions where road traffic is not the dominant particulate source, such as rural areas (US EPA, 2001). Consequently, the annual average TSP criterion of 90µg/m^3 is consistent with an annual average PM_{10} criterion of approximately 45µg/m^3.

In the interest of conservatism, annual average TSP concentrations have been assumed to be 1.5 times the annual average PM_{10} concentrations. This equates to 19.2µg/m^3.

11.2.4 Background Dust Deposition Environment

Dust deposition monitoring data for the area surrounding the Quarry is currently not available. As it is not appropriate to assume negligible levels of dust deposition due to the surrounding industrial and agricultural operations, dust deposition associated with the Quarry will be assessed based on the incremental guideline of 2g/m^2/month.

11.3 MONITORING LOCATIONS

Dust gauges will be installed at three locations near the Quarry Site boundary (to the north, east and southeast) to measure compliance with the Quarry deposited dust criteria. **Figure 7** displays the three air quality monitoring locations.

It is noted that in order to minimise disturbance and inconvenience for surrounding land owners, air quality monitoring locations are within the Quarry Site boundary between the proposed extraction area and the respective representative residences. The EPA has agreed that demonstration of compliance at those locations will satisfy the requirements of *PA Conditions 3(4), 3(5)* and *3(8).*

The Environmental Officer will be responsible for the installation and management of all dust monitoring equipment.

11.4 MONITORING EQUIPMENT

Deposited dust monitoring is proposed as a surrogate for demonstration of compliance with the PM_{10} and TSP criteria in **Table 8**. If exceedances of deposited dust criteria are attributed to activities related to the Quarry, PM_{10} monitoring will be introduced to quantify PM_{10} contributions from the Quarry.

Dust monitoring equipment will be installed in accordance with the following standards and guidelines.

- *AS/NZS 3580.10.1:2003 Methods for Sampling and Analysis of Ambient Air, Determination of Particulates— Deposited Matter—Gravimetric method.*
- AS 2922:1987 *Ambient Air - Guide for the Siting of Sampling Units*.
- NSW EPA *Approved methods for the sampling and analysis of air pollutants in NSW* (DECC, 2006).

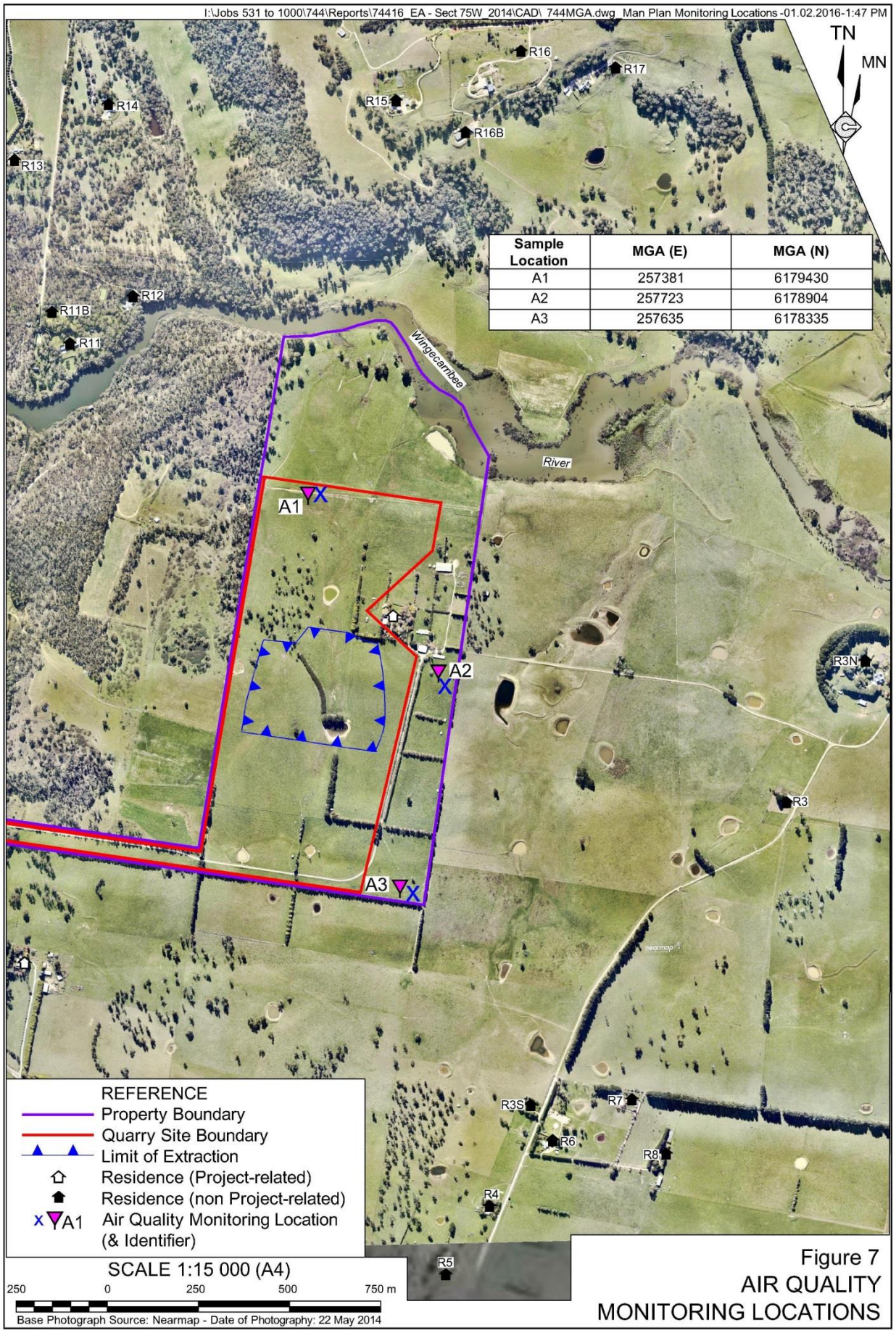
11.5 PARAMETERS AND ASSESSMENT CRITERIA

Table 8 presents the relevant air quality assessment criteria that will apply to the Quarry at surrounding residences in accordance with *PA Condition 3(18).*

Table 8
Background Air Quality Environment for Assessment Purposes

Air Quality Parameter	Averaging Period	Assumed Background Concentration / Level	Assessment Criteria
PM_{10}	24-hour	Daily Varying	50
	Annual	12.8 µg/m^3	30
TSP	Annual	19.2 µg/m^3	90
Deposited Dust	Annual	2 g/m^2/month	4 g/m^2/month

Whilst placement of deposited dust gauges on or near the boundary of the "Mandurama" property (in the direction of surrounding residences) is an accepted method to assess compliance for deposited dust, insufficient information is currently available to set a criterion at each gauge. In order to more accurately establish a criterion at each gauge, SLR Consulting Australia Pty Ltd has proposed the following method.



Sample Location	MGA (E)	MGA (N)
A1	257381	6179430
A2	257723	6178904
A3	257635	6178335

Figure 7
AIR QUALITY
MONITORING LOCATIONS

"In the event that the dust deposition gauge monitoring on or near the boundary of the Mandurama property exceeds the 4 g/m2/month criterion during three successive months (and a wind direction analysis indicates that the elevated levels could be attributable to the quarry), dispersion modelling will be undertaken for the relevant monthly sampling periods using meteorological data gathered on-site. The dust deposition rates predicted at the monitoring location and the nearest sensitive receptor will be used to derive a scaling factor that is then applied to the standard 4 g/m2/month criterion to provide an alternative criterion for the monitoring result specific for the conditions experienced during the sampling period."

The adoption of this method would provide an opportunity to establish a site specific criterion for dust deposition at the boundary. In the even the deposited dust level at the gauges remains below 4g/m^2/monthly, compliance will be achieved at the more distant residences.

11.6 MONITORING FREQUENCY

Dust deposition gauges will be sampled monthly in accordance with *AS/NZS 3580.10.1:2003*, i.e. samples will be collected/changed over within 2 days of the first day of each month. The Environmental Officer will be responsible for ensuring sampling is undertaken in accordance with the relevant standards, guidelines and procedures outlined in Section 11.7.

11.7 DEPOSITED DUST MONITORING PROCEDURE

11.7.1 Introduction

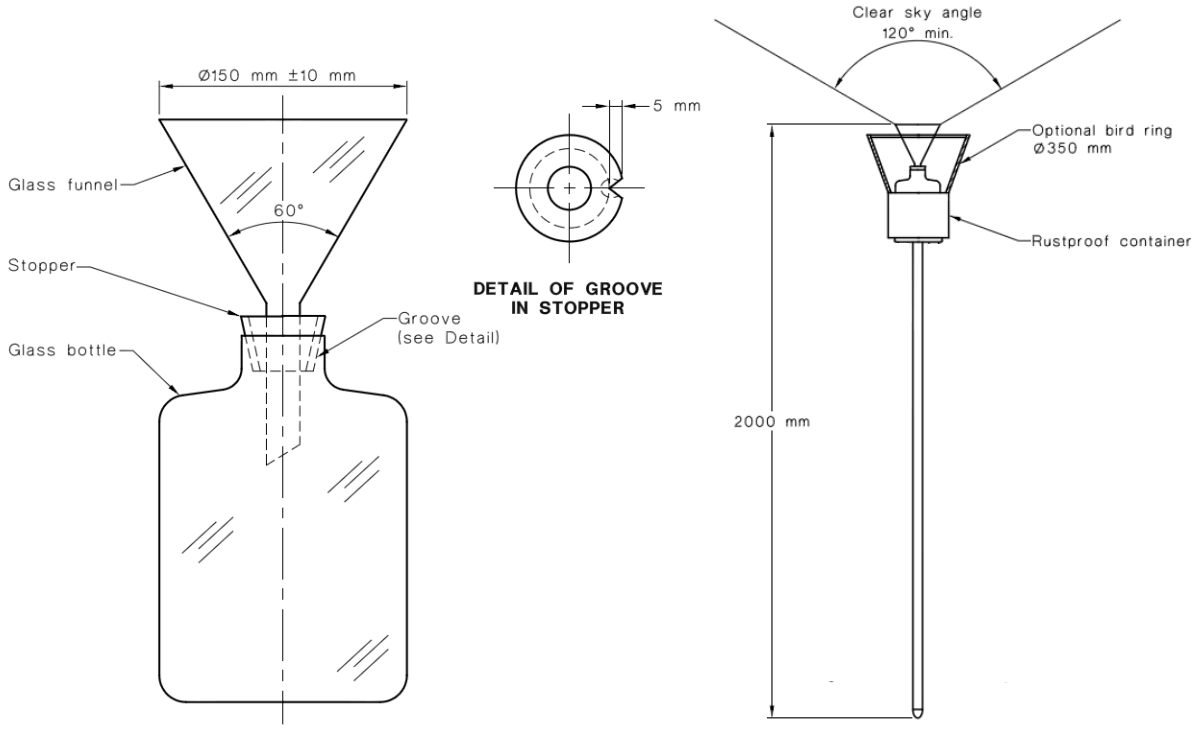
Deposited dust sampling will be undertaken in accordance with the standards and guidelines listed in Section 11.4. The following presents the sampling procedures that will be implemented for sampling of dust deposition.

11.7.2 Sampling Equipment

Each deposited dust gauge will comprise the following components.

- A 2.4m steel post.
- A plastic sample holder.
- A glass sample container/bottle (2 litres).
- A 150mm diameter glass funnel (and rubber stopper).

Deposited dust gauges will be installed in accordance with *AS 3580.10.1-2003* which requires the top of the glass funnel to be 2.0m + 0.1m above the surrounding ground level. It is also a requirement that the angle between the top of the gauge and surrounding vegetation is less than 30^o. **Figure 8** displays an assembled gauge.



Source: AS 3580.10.1-2003 Methods for sampling and analysis of ambient air.

Figure 8
TYPICAL DEPOSITED DUST GAUGE

11.7.3 Sample Collection

Deposited dust samples will be collected monthly and within 2 days of the first day of each month. The following equipment will be required during the monthly sample changeover.

- Deposited dust monitoring sheet and chain of custody form.
- Crate/container for sample container.
- 3 x glass sample containers (with copper sulphate $CuSO_4$ added at laboratory).
- Marker pen/ink pen.
- 50mL wash bottle.
- 1 x container of distilled water.
- Clean cotton cloth.
- Narrow bottle brush.
- Spares kit:
  - glass funnel;
  - rubber stopper;
  - 1 litre bottle of $CuSO_4$ solution (available from laboratory); and
  - marker pen/ink pen.

11.7.4 Office Procedures

The following procedures are to be undertaken by the Quarry Supervisor prior to commencing the sampling program.

1. Check all new sample containers have the required quantity of copper sulphate added.
2. Check all equipment for use in the sample collection/changeover (Section 12.5.3) is present and functional.

11.7.5 Field Procedures

The following procedure will be implemented during collection/changeover of sample bottles.

1. Carefully remove the sample bottle and funnel from the sample holder (be careful of spiders, etc.).
2. Wash down the inside surface of the funnel with approximately 50mL of distilled water into the sample bottle using the bottle brush to loosen any deposited dust.
3. Remove the stopper and funnel from the sample bottle, taking care not to break the neck of the funnel and immediately place a cap on the sample bottle.
4. Complete the labelling of the sampling period on the sample flagon bottle by placing the date of collection on the bottle (see example below).

   New Berrima Quarry
   DG1
   Sampling Period
   01/06/16 - 01/07/16
5. Place the stopper and cleaned funnel on the new bottle.
6. Ensure that the new bottle is properly numbered and the commencement date of the sampling period is recorded on the bottle (see example below).

   New Berrima Quarry
   DG1
   Sampling Period
   01/07/16 -
7. Replace the new bottle and funnel in the sample holder ensuring the top of the funnel is horizontal.
8. Ensure all relevant data and comments are written on the deposited dust monitoring sheet and chain of custody form before leaving each monitoring site.

It is always important to note whether there have been any changes in land use immediately adjacent to the gauge since the last collection period. Some changes may be slow, e.g. increasing height of nearby vegetation. It is also important to note if the sample has been contaminated by extraneous material including vegetation, bird droppings, insects, etc. This information needs to be recorded on the monitoring sheet and chain of custody form.

11.7.6 Sample Despatch

All samples despatched to the laboratory need to be accompanied by a deposited dust monitoring sheet and chain of custody form. It is important to establish a chain of custody for all documentation relating to the samples and the supply of the results, i.e.

- laboratory formally acknowledges receipt of samples and planned date for issue of draft results (if not received then follow up to check samples have not gone astray);
- draft results provided by laboratory (to be checked by Company personnel that they are appropriate and no laboratory errors have occurred); and
- receipt of final results (in a timely manner).

11.7.7 Data Recording and Reporting

Upon receipt of the laboratory results, the following will be undertaken.

- The results will be entered into a spreadsheet and compared with the guideline level of 4g/m^2/month and with previous results to identify any inconsistent results.
- Download monthly wind speed and direction data from the meteorological station for the period of sampling.
- In the event there are any excessive deposited dust levels, these need to be compared with the recorded wind speed and direction data (see Section 11.8) and any comments recorded during sample bottle changeover to potentially ascertain the source/s of the excessive levels. It is also worth reviewing the ash content on samples recording high total insoluble solid levels as low ash values indicate the dust to be of organic origin (e.g. pollen).

11.8 METEOROLOGICAL MONITORING

Austral will establish an on-site meteorological station prior to the commencement of extraction activities to record:

- temperature;
- rainfall;
- wind speed and direction;
- solar radiation; and
- barometric pressure.

For the purposes of the Quarry's air quality monitoring, focus will be placed upon the assembly of a wind rose for the exact period of monitoring each month.

12. EVALUATION OF COMPLIANCE

The air quality monitoring results will be reviewed and tabulated by the Environmental Officer within 7 days of the receipt of data. The tabulated data will include an assessment of the monitoring results against the criteria identified in *PA Conditions 3(9)*. A copy of the tabulated data will be included within each Annual Review.

In the event that the monitoring results approach the criteria identified in *PA Condition 3(9)*, the Quarry Manager or Environmental Officer will:

- review the meteorological data and Quarry-related activities for the same period;
- determine if the elevated dust levels/concentrations are Quarry-related; and
- if so, implement appropriate corrective and preventative actions, including further review of air quality monitoring data.

13. CORRECTIVE AND PREVENTATIVE ACTIONS

In the event that air quality monitoring identifies an exceedance of the air quality criteria identified in *PA Condition 3(9)*, the exceedance will be investigated to determine the likely cause. The investigation will seek to determine:

- the date(s) and period of the exceedance and the wind speed and direction data during the monitoring period.
- whether the exceedance of the criteria was directly related to one or more air quality sources associated with the Quarry or if any other factors contributed to the exceedance;
- the primary cause(s) of the incident;
- any contributing factor(s) which led to the incident;
- whether appropriate controls were implemented to prevent the incident; and
- the most appropriate corrective and preventative measures that need to be implemented to prevent a recurrence of the incident.

If it has been identified that the criteria have been exceeded, Austral will report and investigate the exceedance in accordance with the procedure identified in Section 13.

Corrective and/or preventative actions will be assigned to relevant Company personnel. Actions will be communicated internally through planning meetings and toolbox talks and outstanding actions will be monitored for their effectiveness upon completion.

14. COMPLAINTS HANDLING AND RESPONSE

The *Environmental Management Strategy* as required by *PA Condition 5(1)* includes a detailed complaints management procedure. This sub-section records the procedures that would be implemented following receipt of a complaint.

Complaints may be received via one of the following methods.

- Directly via the 24-hour, 7 day per week Community Information Line (1800 635 620) or via the Bowral Brick Plant phone line 4861 3031). This number will be displayed on a sign at the Quarry entrance and on Austral's web site.
- Directly via a dedicated email address *nswenvironmental@australbricks.com.au* which will be advertised in a similar manner to the Community Information Line.

Indirectly via a local or state government agency. Following receipt of any air quality-related complaint, Austral will implement the following procedure.

1. The complaint will be reviewed by the Quarry Manager or their delegate to determine the nature, date and time of the air quality emission.
2. Relevant monitoring data will be reviewed, including meteorological and deposited dust data.
3. Should the air quality monitoring report indicate that no exceedance of the criteria identified in *PA Condition 3(9)*, the Quarry Supervisor will continue to consult with the complainant in relation to managing air quality emissions within the Quarry.
4. Should the air quality monitoring report indicate that an exceedance of the criteria identified in *PA Condition 3(9)*, the Quarry Manager will notify the NSW Department of Planning and Environment (DPE) and Environment Protection Authority (EPA) and will implement the procedures identified in *PA Condition 4(2)*. In addition, the Quarry Supervisor will continue to consult with the complainant, as required, in relation to the complaint.

   In the event that two complaints are received from the same person(s) and Austral can demonstrate compliance with the criteria identified in *PA Conditions 3(9)* in each case. No further monitoring will be undertaken.

All complaints would be recorded using a proforma complaints record sheet.

15. INCIDENT REPORTING

In the event that an initial investigation concludes that an exceedance of an air quality criterion was directly attributed to activities associated with the Quarry, the exceedance will be reported to DPE and EPA within 72 hours of identifying the exceedance.

Within 7 days of identifying the exceedance, Austral will submit a written report with regular updates on the status of the additional mitigation actions to the DPE, EPA and, where relevant, the complainant, in accordance with the procedures identified in Section 14. In addition, a summary of all reports will be in included in the relevant *Annual Review.*

The Quarry Supervisor will be responsible for incident reporting.

16. PUBLICATION OF MONITORING INFORMATION

Austral will place a copy of all air quality monitoring results, as well as any incident and/or exceedance investigation reports on Austral's website.

In addition, Austral will include a summary of all air quality monitoring data within each *Annual Review*. That document, once approved by the relevant government agency, will be published on Austral's website.

The Environmental Officer will be responsible for publication of all relevant monitoring information.

17. PLAN REVIEW

In accordance with *PA Condition 5(5)*, this *Air Quality Management Plan* will be reviewed and, if required, revised within 3 months of:

- the submission of an annual review under *PA Condition 5(4);*
- the submission of an incident report under *PA Condition 5(7);*
- the submission of an audit report under *PA Condition 5(9)*; and
- any modification to the conditions of PA08_0212.

The Environmental Officer will be responsible for the review of this Plan.

18. REFERENCES

Heggies Pty Ltd, 2010. *Environmental Assessment: Air Quality Assessment* prepared on behalf of The Austral Brick Company.

SLR Consulting Australia Pty Ltd (SLR) (2015), *Air Quality Assessment* prepared on behalf of The Austral Brick Company.

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