AngloAmerican

DRAYTON SOUTH COAL PROJECT

Response to Submissions

May 2013

Volume 1

Main Report

HansenBailey

ENVIRONMENTAL CONSULTANTS

DRAYTON SOUTH COAL PROJECT

RESPONSE TO SUBMISSIONS

Prepared by:

HANSEN BAILEY
6/127-129 John Street
Singleton NSW 2330

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For:

ANGLO AMERICAN METALLURGICAL COAL PTY LTD
201 Charlotte Street
Brisbane QLD 4000

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF APPENDICES

DRAYTON SOUTH COAL PROJECT
RESPONSE TO SUBMISSIONS

for
Anglo American Metallurgical Coal Pty Ltd

1 INTRODUCTION

This section provides context of the existing operations at Drayton Mine and its interactions with the Drayton South Coal Project (the Project). It also outlines the status of the Project in the approvals process and explains the purpose of this Response to Submissions document (RTS).

1.1 BACKGROUND

Drayton Mine commenced production in 1983 and is managed by Anglo American Metallurgical Coal Pty Ltd (Anglo American), the controlling partner of the Drayton Joint Venture. Drayton Mine currently operates under Project Approval 06_0202, approved 1 February 2008, to provide predominantly steaming coal to export and domestic markets at a maximum of 8 Million tonnes per annum (Mtpa) of Run of Mine (ROM) coal. The Antiene Rail Spur (approved under Development Consent 106-04-00) is utilised to transport export steaming coal to the Port of Newcastle via the Main Northern Railway. Project Approval 06_0202 expires in 2017; however, the economically mineable coal resource will be exhausted by 2015 at which time operations will cease.

The Project will allow for the continuation of the existing Drayton Mine by the development of open cut and highwall mining operations within the Drayton South area, which is located within Exploration Licence (EL) 5460. The continued operations will utilise the existing workforce, infrastructure and equipment. A transport corridor will be constructed to link Drayton Mine and the Drayton South area (collectively referred to as the Drayton Complex). The conceptual layout of the Project is illustrated in **Figure 1**.

The Drayton Complex is located approximately 10 kilometres (km) north-west of the village of Jerrys Plains and approximately 13 km south of the township of Muswellbrook in the Upper Hunter Valley of New South Wales (NSW). The Drayton Complex is predominately situated within the Muswellbrook Local Government Area (LGA).

Anglo American is seeking approval for the Project under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). A major project application (11_0062) and supporting Preliminary Environmental Assessment was submitted to the NSW Department of Planning and Infrastructure (DP&I) in March 2011. Subsequently, the Director-General's Environmental Assessment Requirements (EARs) were issued by DP&I on 3 August 2011 followed by supplementary requirements on 30 April 2012.

The *Drayton South Coal Project Environmental Assessment* (EA) was prepared by Hansen Bailey Environmental Consultants (Hansen Bailey) (2012) on behalf of Anglo American to support the major project application. The EA was placed on public exhibition between 7 November and 21 December 2012 (period of six weeks).

Since the public exhibition of the EA, Anglo American has completed further detailed design work for the infrastructure required to implement the Project. The outcomes of this work have resulted in minor amendments to the conceptual Project layout for which approval is being sought. In respect of the amendments proposed, DP&I formally requested on 18 February 2013 that a Preferred Project Report be prepared and lodged in conjunction with the response to submissions process.

1.2 DOCUMENT PURPOSE

DP&I requested a formal response to submissions on 22 January 2013, following public exhibition of the EA.

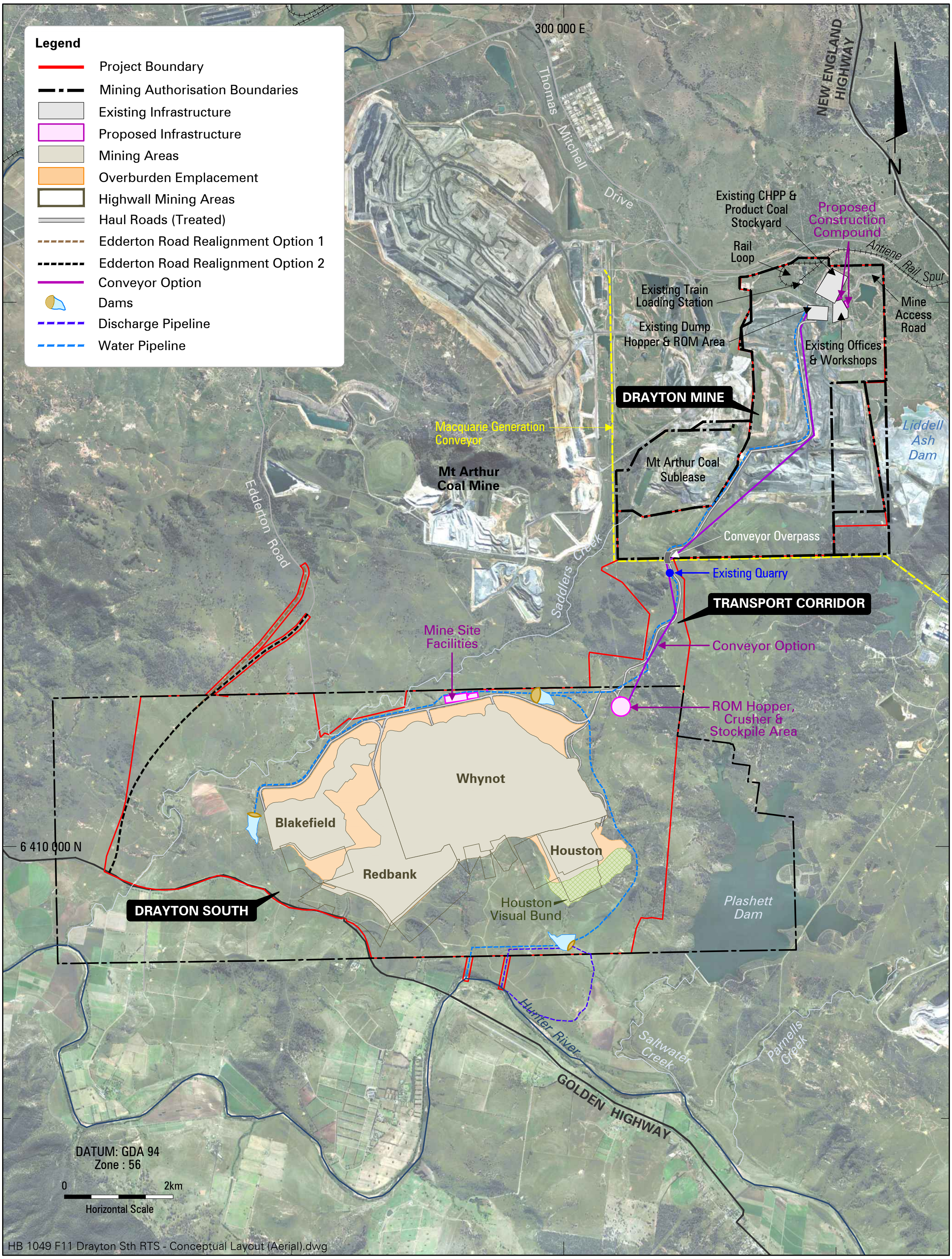
This RTS has been prepared by Hansen Bailey on behalf of Anglo American to support major project application 11_0062 under section 75H(6) of the EP&A Act. The document responds to the submissions received from stakeholders pertaining to the EA.

1.3 DOCUMENT STRUCTURE

This RTS consists of two volumes. Volume 1 encompasses the main report and is structured as follows:

- **Section 2** outlines of the submissions received from stakeholders;
- **Section 3** sets the regulatory and planning context for the Project and provides comprehensive responses to issues raised in stakeholders submissions with regard to the requirements for the Project to address key environmental planning principles;
- **Section 4** provides comprehensive responses to the environmental and socio-economic issues raised in stakeholder submissions;
- **Section 5** justifies the existing statement of commitments for the Project;
- **Section 6** lists abbreviations used within the RTS; and
- **Section 7** outlines all materials referenced within the RTS.

Volume 2 of this RTS provides the documents that support and form appendices to Volume 1 (the main report).



DRAYTON SOUTH COAL PROJECT
RESPONSE TO SUBMISSIONS

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Conceptual Project Layout

FIGURE 1

1.4 DOCUMENT READING GUIDE

Volume 1 of this RTS (the main report) is to be read in conjunction with the EA and **Appendix A** and **Appendix B**, which are presented in Volume 2.

Appendix A provides a summary of the stakeholders who made submissions in relation to the Project and assigns each a stakeholder identification reference (e.g. RA1, SIG1 or P1). The issues raised in each submission have been signified by a symbol under the relevant environmental, planning or socio-economic aspect. A consolidated and complete listing of the submissions received is presented in **Appendix B** and categorised according to the environmental, planning and socio-economic issues provided in **Appendix A**.

Responses to stakeholder submission issues (see **Section 3** and **4**) have been prepared and structured in accordance with **Appendix A**. Where a stakeholder has raised a specific issue, their corresponding stakeholder identification reference is noted prior to the response associated with the relevant environmental, planning or socio-economic aspect.

Technical specialists involved in the preparation of the EA have provided expert advice for this RTS. Where applicable and as referenced, this RTS should be read in conjunction with **Appendix C** to **J**, which provides complete copies of supporting detailed technical assessments.

2 STAKEHOLDERS AND SUBMISSIONS RECEIVED

This section provides a summary of the stakeholders whom made submissions pertaining to the Project and the content in the EA.

Following public exhibition of the EA, DP&I provided to Anglo American a total of 74 submissions from various stakeholders, including regulatory agencies, special interest groups and individual members of the public, in relation to the Project.

Submissions were received from 17 regulatory agencies, including:

- Australian Rail Track Corporation (ARTC);
- Department of Sustainability, Environment, Water, Population and Communities (SEWPaC);
- Department of Sustainability, Environment, Water, Population and Communities – Independent Expert Scientific Committee (IESC);
- Muswellbrook Shire Council (MSC);
- NSW Crown Lands (Crown Lands);
- NSW Department of Primary Industries – Office of Agricultural Sustainability and Food Security (DPI);
- NSW Division of Resources and Energy (DRE);
- NSW Environmental Protection Authority (EPA);
- NSW Fisheries;
- NSW Health;
- NSW Heritage Council;
- NSW Office of Environment and Heritage (OEH);
- NSW Office of Water (NOW);
- NSW Roads and Maritime Services (RMS);
- NSW Rural Fire Service (RFS);
- NSW Transport;
- Upper Hunter Shire Council (UHSC).

Submissions were also received from 41 members of the public and 16 special interest groups, including:

- Beyond Zero Emissions (BZE);
- Construction, Forestry, Mining and Energy Union (CFMEU);
- Coolmore Australia;
- Darley Australia;
- Hunter Communities Network (HCN);
- Hunter Community Environmental Centre (HCEC);

- Hunter Environmental Lobby (HEL);
- Hunter Thoroughbred Breeders Association (HTBA);
- Hunter Valley Wine Industry Association (HVWIA);
- Lock the Gate Alliance (LTGA);
- Muswellbrook Chamber of Commerce (MCC);
- Nature Conservation Council (NCC);
- Scone Equine Hospital (SEH);
- United Pastoral Pty Ltd (United Pastoral);
- Upper Hunter Wine Makers Association (UHWMA); and
- Wilderness Society (WS).

Of the 57 non-government submissions, three were supportive of the Project, including MCC, CFMEU and Spur Hill Management.

Further information regarding the response to submissions and the broader approvals process for the Project can be found on the DP&I website (*http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=4814*).

3 REGULATORY AND PLANNING CONTEXT

This section responds to the submissions raised by stakeholders as to the compliance with a number of environmental planning principles and issues as presented in ***Appendix B****, including:*

- *Satisfaction of environmental planning assessment requirements;*
- *The suitability of the site for the Project;*
- *Potential for "land use conflict"; and*
- *The "merits" of the Project.*

To assist, this section considers the context of the development having regard to the thoroughbred horse breeding, viticultural, agricultural, mining and industrial industries in the Hunter region and the LGAs of Singleton, Muswellbrook and the Upper Hunter.

3.1 ENVIRONMENTAL PLANNING ASSESSMENT CONTEXT

This section responds to the submissions raised by stakeholders regarding environmental planning assessment principles.

Submission: RA2, SIG13, SIG15, SIG16 and P23

The requirements for the environmental planning assessment of the Project are reported in Section 5 of the EA.

The Project is a *"transitional Part 3A Project"* to be determined under the former Part 3A of the EP&A Act. Section 75J of the EP&A Act provides the determination power of the Minister. Section 75 J (2) of the EP&A Act results in there being two mandatory relevant matters to be considered by the Minister in determining the Project application. First the Minister must consider the Director-General's report on the Project. Secondly, if the Planning Assessment Commission (PAC) has reviewed the Project, the Minister must consider any findings or recommendations of the PAC.

In addition the Minister must consider those matters which, by implication from the subject matter, scope and purpose of the EP&A Act, are required to be considered. These include the *"objects"* of the EP&A Act and the *"public interest"*, which includes the application of the principles of *"ecologically sustainable development''*.

3.1.1 Director-General's Environmental Assessment Requirements

The Director-General's EARs for the Project were issued on 3 August 2011 and included the requirement that the EA must include:

> *"a conclusion justifying the project, taking into account:*
>
> - *the suitability of the site;*
> - *the economic, social and environmental impacts of the project as whole; and*
> - *whether the project is consistent with the objects of the EP&A Act*."

Supplementary Director-General's EARs issued on 30 April 2012 required that the EA include:

> "*An Agricultural Impact Statement that includes a specific focused assessment of the impacts of the proposal on strategic agricultural land, having regard to the draft gateway criteria in the* (then) *draft Upper Hunter Strategic Regional Land Use Plan*".

In September 2012, the *Draft Strategic Regional Land Use Plan – Upper Hunter* (DP&I, 2012a) was replaced by the *Strategic Regional Land Use Plan – Upper Hunter* (SRLUP) (DP&I, 2012b) providing for a Gateway process for any development involving Strategic Agricultural Land (SAL), which could comprise Biophysical Strategic Agricultural Land (BSAL) or Critical Industry Cluster (CIC) land (equine CIC or viticulture CIC).

Commencement of the Gateway process, a key component of the provisions of the SRLUP, awaits amendment of the *Environmental Planning and Assessment Regulation 2000* and *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP), which are currently on public exhibition.

3.1.2 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 – Clause 12

The Coolmore Australia submission references clause 12 of the Mining SEPP as relevant to be considered in the determination of the application for approval of the Project.

The Project is a transitional Part 3A project to be determined under the provisions of the former Part 3A of the EP&A Act. Clause 12 would involve a consideration of the following:

> *(i) the existing uses and approved uses of land in the vicinity of the development, and*
>
> *(ii) whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development, and*
>
> *(iii) any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses, and*
>
> *(b) evaluate and compare the respective public benefits of the development and the land uses referred to in paragraph (a) (i) and (ii), and*
>
> *(c) evaluate any <u>measures proposed by the applicant to avoid or minimise any incompatibility</u>, as referred to in paragraph (a) (iii)*."

The present land use to the north-west, north, north-east and east of the Project is primarily coal mining and power generation. The land to the south-east, south and south-south west of the Project is owned by Coolmore Stud and Woodlands Stud (thoroughbred horse breeding enterprises) and Arrowfield Estate (viticulture enterprise).

Each of the coal, power generation, thoroughbred horse breeding and viticultural industries are of importance to and part of the social fabric of the immediate locality as well as that of the wider regional and state-wide communities, with coal and power generation dominating in the locality.

Coolmore Australia and Darley Australia are leading participants in the thoroughbred horse breeding industry and whilst important to it, constitutes a small proportion of it.

Arrowfield Estate is a small participant in the viticulture industry; however, for the past few seasons has not been in production. It is likely that when the vineyard was operational, it produced some 115 tonnes (t) of a national grape crop, which is in excess of 1.2 Mt of which the whole of the Hunter region is estimated to produce about 2.5%.

The Project has been designed and is to apply management and operational processes to avoid or minimise environmental impacts as a result of mining on Coolmore Stud, Woodlands Stud and Arrowfield Estate, which are assessed to be negligible as is reported elsewhere in this RTS.

As demonstrated in the EA and in this RTS, the assessed impacts of the Project are not such as will have a material effect on the existing uses of the land in the vicinity of the Project and will not inhibit the conduct of the existing thoroughbred horse breeding, viticultural and agricultural uses of the adjacent land.

The public benefits that will flow from the Project are summarised in the main volume of the EA and in detail in the economic impact assessment (see Appendix U of the EA).

3.1.3 Strategic Regional Land Use Plan – Upper Hunter

The implementation of Gateway process and formation of the Gateway Committee provided for in the SRLUP awaits the amendments to the *Environmental Planning and Assessment Regulation 2000* and the Mining SEPP (Gateway Amendments). However, the Director-General's EARs require the assessment of the Project against the *"gateway criteria"* in the SRLUP for applicable SAL.

The Project does not affect any land mapped in the SRLUP as BSAL. There is a water pipeline through Anglo American owned land mapped as BSAL in the SRLUP from the southern section of the Project area to the Hunter River. The pipeline will be buried and the surface restored so as not to affect BSAL. Additionally, the Gateway Amendments when operative and as presently proposed exclude from the Gateway process any aspects of the Project, which are not in the *"mining area"* of the Project, thus excluding the pipeline from the Gateway process.

The Project does include land mapped in the SRLUP as equine or viticulture CIC. The supplementary Director-General's EARs require consideration of the gateway criteria for equine and viticulture CIC. This involves consideration as to "*Whether the* (Project) *would lead to significant impacts on the* (equine and the viticulture) *critical industry cluster(s) through…"* the following:

> *"(a) Surface area disturbance;*
>
> *(b) Subsidence;*
>
> *(c) Reduced access to agricultural resources;*

(d) Reduced access to support services and infrastructure;

(e) Reduced access to transport routes; or

(f) Loss of scenic and landscape values."

The agricultural impact statement prepared for the Project (see Appendix R of the EA), assesses the impacts of the Project having regard to the gateway criteria in the SRLUP. The agricultural impact statement concluded that the Project will not result in any significant adverse impacts on either the equine CIC or the viticulture CIC having regard to the gateway criteria.

The conduct of the Project will not affect any land currently used for or related to the conduct of thoroughbred horse breeding or viticulture will not cause any disturbance or subsidence to this land and will not result in reduced access to agricultural services. As a result, the use of the land for the Project will not affect the demand for services to either thoroughbred horse breeding or viticulture.

As none of the land within the Project Boundary is used for or related to the conduct of thoroughbred horse breeding or viticulture, the conduct of the Project will not have any effect on the existing or future access to or availability of support services and infrastructure for the conduct of thoroughbred horse breeding or viticulture.

The Project will not cause any reduced access to transport routes. Some relocation and upgrading of the Edderton Road will occur as part of the Project during the works for which appropriate access will be maintained along that road. Accordingly, access to transport routes related to thoroughbred horse breeding or viticulture uses and otherwise will not be reduced. Upgrades proposed for Edderton Road will improve access for Woodlands Stud and Coolmore Stud to the equine service centre at Scone.

The visual impact on Woodlands Stud is very limited. The vast majority of the property is screened by existing topography. The only exception is from a location on Trig Hill, which also currently has views of the existing Mt Arthur Coal Mine. Similarly, the Project will not be visible from the majority of Arrowfield Estate with the exception of an area on the highest point of the north-western ridgeline at the back of the property (associated with the Trig Hill spur). With regard to Coolmore Stud, the visual impact assessment has determined that views to the Project are also largely screened. The exception is the views that will be available during the construction of the Houston visual bund for a period of approximately 16 months. To limit potential high impact periods, the construction of the visual bund has been designed in a series of lifts with progressive rehabilitation being undertaken as part of this process.

As such, the Project does not significantly compromise the scenic and landscape settings of the equine and viticulture CICs with activities for the greater part screened by existing topography and the proposed Houston visual bund.

Relative to the application of the gateway criteria of the SRLUP, the agricultural impact statement (see Appendix R of the EA) notes that the Drayton South disturbance footprint is comprised of lower category land capability, with the predominant land classes being Class

VI (48.4%) and Class VII (39.4%) with only small portions of Class V (10.7%) and Class IV (1.5%) land. This presents an indication of the low agricultural values associated with the site.

3.2 PREDOMINANT LAND USES IN THE HUNTER VALLEY

This section responds to the submissions raised by stakeholders regarding the dominant land uses in the Hunter Valley and locality of the Project in order to provide perspective and context of the development.

Submission: RA2, RA6, SIG9, SIG13, SIG14, SIG15 and SIG16

3.2.1 Mining

Commencing in Newcastle soon after settlement, coal mining has moved up the valley. While mining commenced in the Singleton and Muswellbrook areas in the 1900s, those towns have, since the 1960s with the construction of Liddell and then Bayswater Power Stations, become the centre of the Hunter region and dominant in the NSW coal industry.

The Hunter region is the dominant contributor to the NSW coal industry as is indicated by the figures from the Australian Bureau of Statistics. This highlights that of the 39,004 persons employed by the mining industry in NSW in 2011 that 17,232 of these were employed in the Hunter Valley (NSW Minerals Council, 2011).

Coal has been produced within the locality of the Project for in excess of 30 years, including from the Drayton Mine. Furthermore, the Drayton South area has previously been approved for coal mining in the late 1980s and early 1990s. Coal is and has been for decades the dominant contributor to the economy and social fabric of the Hunter region and the Muswellbrook and Singleton LGAs, which has increased materially over the last 15 to 20 years.

The State and the community have a very large amount of capital invested in the extensive infrastructure established to support the Hunter region coal industry. Coal mining and power generation public infrastructure includes Liddell and Bayswater Power Stations, the Main Northern Railway and rail network and the Port of Newcastle, the cost of which can only be justified and supported by continued coal supply.

3.2.2 Agriculture

The Hunter region has always, and continues to have, an important diverse agricultural industry. Agriculture, (separately to the thoroughbred horse breeding and wine grape production) has for many decades been important to the economic and social fabric of the Hunter region and the two LGAs. Whilst the importance of the agricultural industry is acknowledged, power generation and heavy industry have, since the 1960s, materially displaced agriculture becoming the dominant economic contributor and aspect of the social fabric.

3.2.3 Thoroughbred Horse Breeding

The thoroughbred horse industry is important to the Hunter Valley and is considered the leading thoroughbred horse breeding region of Australia. In 2011, the horse breeding, racing and related industries located in the Upper Hunter employed 699 persons (ABS, 2011).

Thoroughbred horse breeding has always been an aspect of land use development and contributed to the social fabric of the Hunter region. Horses were bred generally throughout the Hunter region, including Scone and the Jerrys Plains area, since early settlement. This grew through the latter half of the 20th century expanding further in the Scone and Jerrys Plains areas displacing material areas of dairy farming and intensive cropping.

Scone, located some 35 km north of the Project, is promoted as the *“Horse Capital of Australia”*. Scone is the centre of the thoroughbred horse breeding industry in the Hunter Valley comprising in the order of 100 commercial breeding establishments.

The Hunter region thoroughbred horse breeding industry focusses on Scone in all ways in that the majority of the commercial studs are in close proximity to Scone and north of Muswellbrook. Flowing from this the services required to support the thoroughbred horse breeding industry, including specialist veterinarians, farriers, equine dentists and chiropractors, feed suppliers, horse trainers and the first class racing and training facilities are all located at Scone.

Scone has the concentration of facilities and services for the thoroughbred horse breeding industry envisaged by the *“critical industry cluster”* of the SRLUP and is the nearest location of those services for Coolmore Stud and Woodlands Stud.

Sales figures for the 2013 Sydney William Inglis & Sons Easter yearling sales and the 2012 Gold Coast Magic Millions yearling sales provided in **Section 3.3.2** indicate the relativity of sales from Coolmore Stud and Woodlands Stud and sales from other breeding enterprises.

3.2.4 Viticulture

The Hunter region contributes about 2.5% of the national grape crop. The centre of the Hunter region wine industry is Pokolbin (located near Cessnock) and Broke/Fordwich (located between Cessnock and Singleton) in the Lower Hunter, which are the major producing areas in the Hunter Valley. As in relation to Scone for thoroughbred horse breeding, the essential services (including machinery and chemical suppliers, specialist wine industry contractors, wineries, packaging plants and viticulturists) supporting the operation of the Hunter region wine industry are located around Cessnock and Pokolbin.

Relative to the Upper Hunter, Denman is consider the main wine growing region and is located some 10 km west of the Project. Arrowfield Estate, which is adjacent to the Project, is the only vineyard within 10 km of the Project. It is thought to be able to produce some 115 t of grapes, however, for the past few seasons it has not been in production.

The retreat of the Hunter region wine industry mirrors that of the Australian wine industry with some 2,000 hectares of vines thought to have been removed from the Hunter region over the last three to five years; a situation that applies to all Australian wine areas. Press articles report that the economic position of the Australian viticulture and wine industry is parlous with a pessimistic outlook. As with many primary and secondary foods wine imports have increased and are increasing.

3.3 THE LOCALITY

This section responds to the submissions raised by stakeholders regarding the current land uses in the locality and their historic context to assist in the consideration of the suitability of the site for the Project.

Submission: RA6, RA12, SIG9, SIG13, SIG15, SIG16, P33 and P39

3.3.1 Coal Mining

Coal mining commenced in Muswellbrook during 1906 at the Muswellbrook Colliery. Following the construction of the Liddell Power Station in the 1960s and Bayswater Power Station in the 1980s and the closure of old mines in the lower Hunter Valley, mining expanded into the Upper Hunter and the Singleton and Muswellbrook LGAs.

Coal mining and electricity generation became the dominant economic land use and contributor to the economy of the local and regional economies. By the 1980s all of the land north and east of the eastern limit of the Hunter floodplain and the Golden Highway north to the Drayton and Mt Arthur coal mine was owned or held under mining authorities by the NSW Government or Government entities for power generation or for proposed mining.

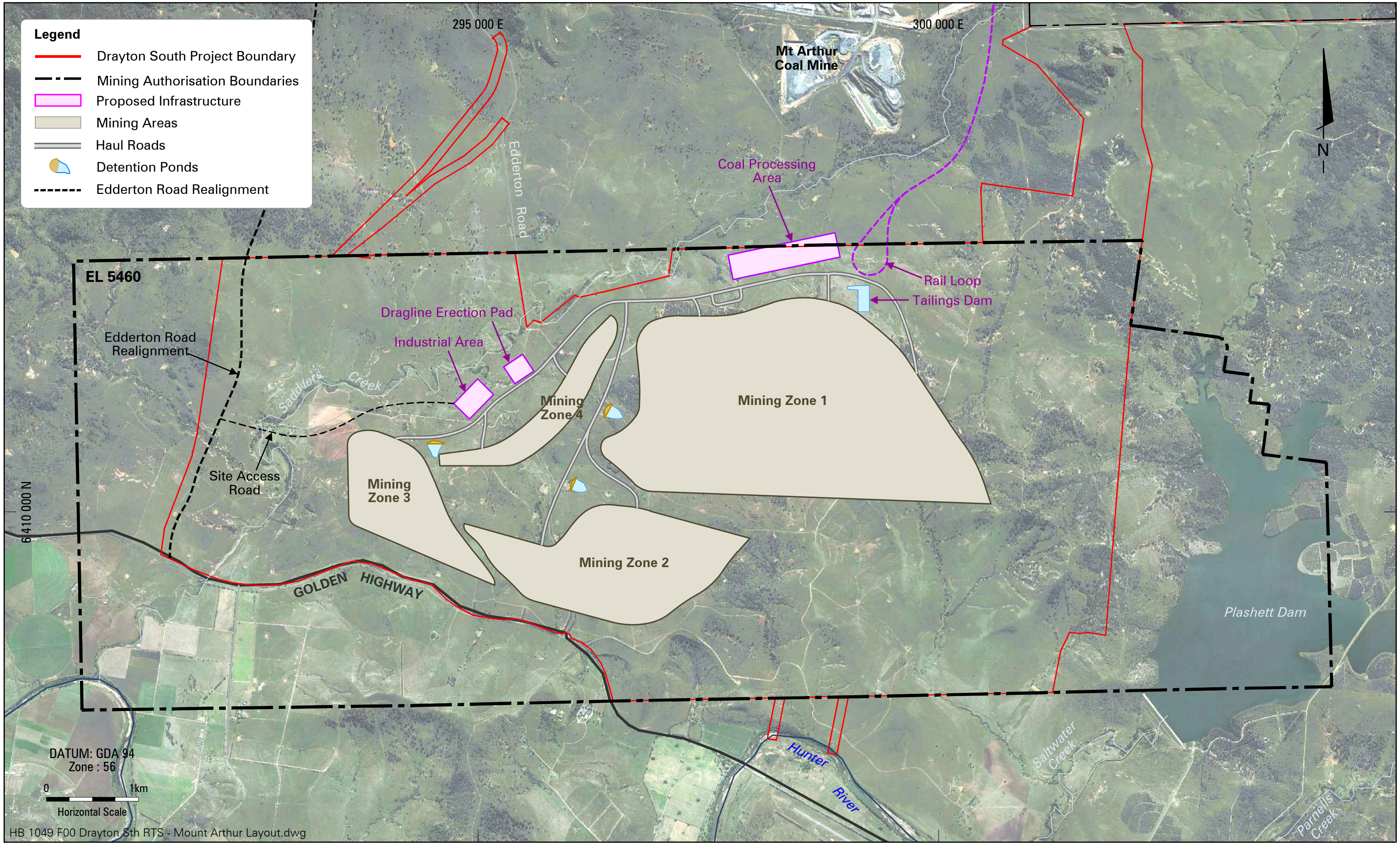
Exploration of the Drayton South area was initially undertaken during the late 1940s and early 1950s by the then Bureau of Mineral Resources. Further exploratory drilling work was undertaken by the Joint Coal Board, the Electricity Commission of NSW and the Department of Mines during the 1960s and 70s.

The Drayton South area land was purchased in the 1980s, along with land for the present Mt Arthur Coal mine, by the then Electricity Commission of NSW, which as Mount Arthur South Coal Limited (MASCL) was granted Development Consent on 22 September 1986 and a Mining Lease in 1989 for mining.

The Mount Arthur South Coal Project, as previously approved, included:

- The development of an open cut coal mining operation consisting of four key mining zones extracting up to 120 million tonnes (Mt) over a 20 year mine life;
- Mining further to the west and into the existing ridgeline;
- Operation of an equipment fleet, including four draglines, a hydraulic shovel and a supporting fleet of trucks and front end loaders;
- Establishment of a Coal Handling and Preparation Plant (CHPP) and stockpile facilities adjacent to the site;
- Establishment of a new rail spur, rail loop and associated load out infrastructure at the site;
- Establishment of an industrial area, including workshops, offices and laydown areas;
- Establishment of a construction camp; and
- The realignment of Edderton Road and permanent site access from it.

The conceptual layout of the Mt Arthur South Coal Project, as previously approved, is illustrated in **Figure 2**.



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DRAYTON SOUTH COAL PROJECT
RESPONSE TO SUBMISSIONS

Mt Arthur South Coal Project Layout

FIGURE 2

The MASCL consent lapsed in 1991 and the Mining Lease in 1994. EL 5460 for the Drayton South area was granted to Anglo American in 1998 to secure the continuation of the then operating Drayton Mine following the exhaustion of its coal resource.

3.3.2 Thoroughbred Horse Breeding

Coolmore Stud is situated to the south of the Golden Highway opposite the southern limit of the Drayton South area separated by a ridgeline. The property previously contained about 1,000 acres of vines under a former owner but these were removed to enable the conduct of a horse stud. In 1986, the Arrowfield, Strowan and Oak Range properties were purchased by Australian Racing and Breeding Stables Ltd, which later changed its name to the Arrowfield Group. This enterprise was operational at the time MASCL was granted Development Consent and a Mining Lease for the Mt Arthur South Coal Project. Coolmore Australia purchased these properties from the Arrowfield Group in 1991 and has since acquired a number of other adjoining properties, many of which operated as existing dairies, to extend their horse breeding enterprise. Coolmore Australia established Coolmore Stud in 1991 at which time, MASCL still held a valid Development Consent and Mining Lease over the Mt Arthur South area.

Woodlands Stud situated to the south of the Golden Highway was purchased by Darley Australia in 2008 following the issue of EL 5460 to Anglo American in 1998.

In 1991, when the Coolmore Australia purchase occurred, the area to the north was subject to mining authorities and active mining was occurring at Drayton Mine and Mt Arthur Coal Mine. The Mt Arthur South Coal Project Development Consent and Mining Lease also still applied. The Liddell and Bayswater Power Stations operated to the east, the Hunter Valley Operations Coal Mine, United Coal Mine and Wambo Coal Mine operated to the west and the Lemington Coal Mine operated to the south. In addition, by 2008 when Darley purchased Woodlands Stud, Mt Arthur Coal Mine was operating at some 12 Mtpa and the Drayton South area was subject to intensive prospecting.

The Coolmore Stud and Woodlands Stud have developed and operated (as described by them in their submissions) in close proximity to and surrounded by intense active coal mining and power generation.

The proportionality of the contribution of these two prestigious horse studs to the thoroughbred horse breeding industry of Australia is indicated by the proportion of their offering at the industry pinnacle blood horse sales. Coolmore Australia offered 37 broodmares and 17 yearlings of a total 577 and 569, respectfully, at the 2013 William Inglis & Sons Sydney Easter yearling sale and 46 of a total of 972 at the 2012 Gold Coast Magic Millions sales. Darley Australia offered 17 broodmares at the 2013 William Inglis & Sons Sydney Easter yearling sale.

3.3.3 Viticulture

Arrowfield Estate is the one small vineyard adjacent to the Project. The next closest vineyard is some 10 km to the west where there is a group of vineyards based around the town of Denman. Next is a group of vineyards based in Broke/Fordwich some 45 km to the south and then some 55 km to the south west is the centre of the Hunter region wine industry at Pokolbin near Cessnock.

The existing Arrowfield Estate is the remainder of a 1,000 acre vineyard planted by WR Carpenter Holdings Limited in the 1970s, which was subsequently removed to facilitate the establish of what is now Coolmore Stud.

Arrowfield Estate was transferred to United Pastoral on 13 February 2012 at which time the surrounding industrial, power generation and mining context of the locality was generally, as described, in relation to the time of the purchase of Woodlands Stud. In addition, the planning approval application for the Project was well advanced and public knowledge was available.

3.4 SUITABILITY OF THE SITE FOR MINING

This section responds to the submissions raised by stakeholders regarding the suitability of the site for the Project (in the context of the Project Boundary). It also describes the adjoining and nearby land uses and the effect of the Project on them.

Submission: RA6, RA12, SIG9, SIG13, SIG15, SIG16, P33 and P39

3.4.1 Context

All of the land required for the Project is owned or occupied by Anglo American under arrangements with Macquarie Generation or Hunter Valley Energy Coal Pty Limited (HVEC), which own and occupy the land adjoining the Project Boundary to the north-west, north, north-east and east for their respective power generation or coal mining businesses. The remaining adjoining lands include the Coolmore Stud, Woodlands Stud and Arrowfield Estate to the south and south-west.

The EA concludes that the Project will not inhibit the continued use of those properties for their present uses. Coolmore Australia, Darley Australia and United Pastoral submit otherwise with Coolmore Australia challenging the validity of the EA. This RTS responds to those issues in the respective sections.

Project *"site suitability"* is considered, first, in the context of the appropriateness of the actual Project area for coal mining; second, in the context of the likely impacts of the Project on other nearby or adjacent land and the ability of the operator to continue their business and; third, in the context of the environmental planning acceptability of the proposed Project, which itself relates to the second issue.

Mining is not proposed on any land owned or used by either Coolmore Stud or Woodlands Stud for their thoroughbred breeding enterprises nor Arrowfield Estate for its viticulture enterprise. Site suitability will therefore relate materially to any impacts the conduct of the Project would have on the nearby land and their respective uses.

The presence and recoverability of the coal in the Drayton South area has been known for decades and has previously been approved for mining (Mt Arthur South Coal Project). The EA establishes that the valuable State-owned coal resource is able to be recovered by appropriate and acceptable mining operations. This can be conducted with feasible management and operational controls with, as is noted below, acceptable environmental planning controls, safeguards and outcomes, generally and particularly, with regard to adjoining and nearby lands and their current and approved land uses.

The Project on the *"site"* will release the *"in situ"* coal asset for the benefit of the people of the State of NSW and Australia as a whole but in particular the locality and the region of the Hunter Valley, where the economic and social benefits will largely be incurred.

The Project is the continuation of the existing Drayton Mine, which having commenced in 1983 and having exhausted the resource approved for recovery will continue mining in the Drayton South area. This will involve utilising the existing infrastructure and maximising the economic benefits of the capital already invested. The Project will not create a new source of mining impacts (the impacts being generally a continuation of the existing mining impacts from operations at Drayton Mine) and will provide a continuation of economic benefits to the State, Australian and local economies.

Mining as proposed by the Project at the site represents the maximisation of the existing private and public infrastructure, the minimisation of capital investment and optimisation of the economic benefits for the public whilst not materially changing the existing offsite mining impacts.

3.4.2 Competition for Land Use

The suitability of the site for mining, as proposed, is also to be considered in the context of the potential for impacts on the ability of other land uses such as Coolmore Stud, Woodlands Stud and Arrowfield Estate to continue the conduct of their respective thoroughbred horse breeding and viticulture enterprises. As the Project does not propose the use of any of the land of any of these enterprises this aspect is to be considered in the context of the offsite impacts that would result from the conduct of the Project.

The suitability of the Project site is therefore to be considered having regard to the offsite environmental impacts to enable a conclusion as to whether they are such that the other land users in the area are unable to continue their enterprises. If so, this would require a decision as to whether the Project should prevail over those other land uses.

The EA has assessed the offsite impacts of the Project in accordance with the requirements of the EP&A Act and in particular the objects and the Director-General's EARs in accordance with the principles of ecologically sustainable development.

The EA concludes that the offsite environmental impacts are not of materiality and that there is no need to choose between the mining land use and the thoroughbred horse breeding and/or viticultural land use. The EA concludes that all the existing land uses are able to coexist.

3.4.3 Offsite Environmental Impacts

Air Quality and Noise and Blasting

Modelling in the air quality and acoustics impact assessments for the Project (see Appendix F and G of the EA) conclude that the offsite impacts are within the appropriate goals and will not affect the conduct of thoroughbred horse breeding or viticulture enterprises at Coolmore Stud, Woodlands Stud or Arrowfield Estate (see **Section 4.2**, **4.4** and **4.5**).

Water

Modelling in the groundwater and surface water impact assessments (see Appendix M and N of the EA) concludes that the Project will not affect the existing and future availability or quality of water presently available to and used by Coolmore Stud, Woodlands Stud or Arrowfield Estate (see **Section 4.11**, **4.12** and **4.13**).

Traffic and Transport

The traffic and transport impact assessment (see Appendix T of the EA) concludes that there is appropriate and suitable access for the conduct of the Project and the continued needs of the community within the existing road hierarchy subject to the relocation and upgrade of part of Edderton Road (see **Section 4.21**).

Visual

The visual impact assessment (see Appendix I of the EA) concludes that with the proposed visual screening and amelioration, the Project results in some visibility from the surrounding power generation and mining used lands to the north-west, north, north-east and east. With regard to views from the sensitive southern sector (including Coolmore Stud, Arrowfield Estate and in the south-west Woodlands Stud) the visual impact assessment determined that views are largely screened due to the design of the Project to remain behind existing topography and the establishment of the Houston visual bund and tree screening (see **Section 4.7**).

Agricultural Productivity

The agricultural impact statement (see Appendix R of the EA) concluded that the Project is not anticipated to have any material impacts on the availability of land or water supply for agricultural purposes or result in excessive air, noise or blasting impacts for neighbouring properties. The Project will not materially impact traffic regimes along support infrastructure routes, affect labour supply or support services associated with agricultural enterprises in the locality (see **Section 4.16**).

3.4.4 Bickham Coal Project

The Coolmore Australia submission includes a number of quotes from the PAC report into the Bickham Coal Project as to the appropriateness of coal mining in the Hunter region and incompatibility between thoroughbred horse breeding and coal mining to support in some way the opposition that Coolmore Australia expresses to any approval of the Project.

The Bickham Coal Project PAC report was issued in May 2010 following a request by the Minister for Planning:

> ”*to advise on the water related risks of the (Bickham) project, whether these risks can be suitably managed to an acceptable level of performance (having regard to the recommendations on the Strategic Assessment of Coal Mining in the Upper*

Hunter Valley, Department of planning 2005) and the adequacy of the Water Resource Assessment of the draft Water management plan…

The Minister also directed the commission to advise on any other significant issues raised in submissions, whether the project should proceed to a merit assessment under Part 3A of the Environmental Planning & Assessment Act (EP&A Act), and if so, to provide the Director-General of Planning with any requirements for preparation of an Environmental Impact Statement…

The Bickham Coal Project refers to the proposal by Bickham Coal Company Pty Limited (the proponent) to develop a new open cut mine approximately 13 km south east of Murrurundi in the Upper Hunter Valley."

[Page i – Overview to the Bickham PAC Report]

The document entitled *Strategic Assessment of Coal Mining in the Upper Hunter Valley* (DOP, 2005) was a report which outlined issues related to the potential for mining in the Upper Hunter LGA, with a particular focus on Scone.

The Bickham Coal Project was located 25 km north of Scone in the catchment of the Pages River, which interacts with the catchment of the Kingdon Ponds. Scone is some 35 km north of the Project. The Bickham Coal Project was 60 km north of the Project.

The *Strategic Assessment of Coal Mining in the Upper Hunter Valley* (DOP, 2005) and the Bickham Coal Project PAC report relates only to the Bickham Coal Project in the context of the catchment of the Pages River and the Kingdon Ponds. The references in the Bickham Coal Project PAC report are also limited and where it refers to the Upper Hunter it is referring to the Upper Hunter LGA.

Whilst the Bickham Coal Project PAC report considers the importance of the thoroughbred horse breeding industry and opines as to the compatibility or desirability of close interaction between open cut mining and horse breeding, it does so only in respect of the context of the *Strategic Assessment of Coal Mining in the Upper Hunter Valley* (DOP, 2005) and the Upper Hunter LGA, to which it refers when it uses the term *"Upper Hunter"*.

The Bickham Coal Project PAC report makes this clear itself when at page 44 it says "*The commission offers no comment as to the merits of mining development in the Lower Hunter Valley. Economic development needs to occur and coal mining is a very significant contributor to economic development".* The report relates only to the Upper Hunter LGA, which is made patently clear when the Bickham Coal Project PAC report goes on to say "*However, the arguments put by the Bickham opponents are that open cut coal mining is incompatible with the existing high economic value land use patterns and lifestyle values in the Upper Hunter Valley Shire and should be prohibited.*"

Asserting that the Bickham Coal Project PAC report supports the propositions put by Coolmore Australia in its submission with regard to the inappropriateness of the Project and using the quotes from that report to support its position is fallacious and misrepresents the conclusions made in the Bickham Coal Project PAC report.

3.5 ENVIRONMENTAL PLANNING ASSESSMENT

This section responds to the submissions raised by stakeholders regarding the principal environmental planning aspects of the Project relevant to competition for land use with regard to mining, thoroughbred horse breeding, viticultural and other agricultural land uses.

Submission: RA6, RA12, SIG9, SIG13, SIG15, SIG16, P33 and P39

3.5.1 Continuation of Drayton Mine

The Project will facilitate the continuing recovery of a valuable State-owned coal resource in an area that has long been identified for mining by the NSW government, approved for that purpose in 1986 and acquired by Anglo American in 1998 for the specific purpose of facilitating the continuation of the Drayton Mine. During that time, the existing owners and operators of the Coolmore Stud, Woodlands Stud and Arrowfield Estate acquired their properties and developed the business on them that they presently have.

The Project maximises resource recovery and returns from capital invested in Drayton Mine. In doing so it optimises the private and public returns from the existing infrastructure and continues the contribution of mining by Drayton Mine to the support of the existing Hunter Valley infrastructure as well as the social fabric and economy of the Muswellbrook and Singleton LGAs. Beyond this, the Project will result in the continued support of the economies of the Hunter region, NSW and Australia.

3.5.2 Site Suitability

The site contains a valuable operationally, environmentally and socially acceptable recoverable State-owned coal resource.

The land uses in the locality are dominated by open cut coal mining, power generation and industrial activities as well as thoroughbred horse breeding, viticulture, agriculture, rural residential and urban residential areas. The Project is situated remotely from heavily populated areas being located over 10 km from the village of Jerrys Plains and 13 km from the township of Muswellbrook.

The existing thoroughbred horse breeding, viticulture and agriculture enterprises have coexisted with the industrial land uses for at least the last 20 years during which time the existing thoroughbred horse breeding and viticulture businesses under their current ownership have been established, expanded and operated.

The mining impacts on those businesses assessed as part of the EA and required under the EP&A Act and relevant environmental planning instruments, plans and policies concludes that the Project will not be such as to prevent the continuation of those businesses with consistent availability of services. Further, the EA concludes that the Project is capable of operating without impacting on the equine or the viticulture CIC as required by the gateway criteria applicable under the SRLUP.

3.5.3 Perception-Based Issues

Coolmore Stud and Woodlands Stud have been in the general proximity of mining for at least two decades. Viticulture and wine making in the Hunter region has been undertaken for a century and mostly associated with the Pokolbin area near Cessnock, which was the centre of coal mining in the Hunter region from 1900 until coal mining moved to the Upper Hunter in the 1960s. These observations open the availability of a conclusion that the measure of success of a horse stud may be determined more by the acknowledged quality of the blood lines and success on the race track of the progeny and that the success of viticulture and wine making may be materially sourced to the quality of the grapes produced and the skill of the winemaker.

It might also be worth noting that the Muswellbrook Race Club and Edinglassie Stud, which are located in close proximity to the Bengalla and Mt Arthur coal Mines have themselves continued to operate for decades without concern.

Edinglassie Stud is located approximately 500 metres (m) from the boundary of Mt Arthur Coal Mine's operations and is separated from the mine by Denman Road. It is also in close proximity to the neighbouring Bengalla Mine. Despite the stud's proximity to the neighbouring mines, the lessee (Mick Tally) continues to produce high quality thoroughbred race horses that have included multiple Group 1 race winners such as Bentley Biscuit which was trained by Gai Waterhouse and raced in the prestigious Kings Stand Stakes at Royal Ascot in 2007. Other Group 1 race winners that have come from Edinglassie Stud include Wonderful World, Gods Own, Nadeem, Tell a Tale, Sharscay, Miss Margaret, Suntain, Emerald Dream, Lasserfaire, and most recently Nechita who won the Group 1 Coolmore Stud Stakes in 2012.

Mick Tally quoted:

> *"Edinglassie stud has a good reputation in the local industry for breeding good race horses and selling quality foals.*
>
> *Both industries have been around a long time and the fact that we are continuing to provide the local industry with quality horses shows that mining and thoroughbred farmers have worked side by side."*

In consideration of the case study and the predicted impacts, the Project is not anticipated to discourage clientele or the public from investing in or appreciating the quality of the horses produced from the thoroughbred horse breeding enterprises of Coolmore Stud and Woodlands Stud. This case study demonstrates that these two industries can coexist.

3.5.4 Assessed Impacts

It is established that the Project will not result in material impacts on Coolmore Stud, Woodlands Stud or Arrowfield Estate and not result in any relevant adverse impacts on equine health or vine vigour nor on the groundwater and surface water resources utilised by these enterprises.

The visual impact assessment (see Appendix I of the EA) has determined that views to the Project are largely screened from the surrounding areas due to extensive redesign of the mine plan, existing natural topography, remanent vegetation and the establishment of tree screening. The exception is the views that will be available to the Houston visual bund while it is being constructed (during a period of 16 months). Once established, the Houston visual bund has been designed to integrate with the existing ridgeline and will assist in shielding views to the Project over the remaining operational years.

3.5.5 Measures to Avoid or Alleviate Land Use Incompatibilities

The Project design is the result of a comprehensive pre-feasibility study of various mine plans and operating scenarios to avoid or minimise impacts, including to adjoining land uses and particularly on Coolmore Stud, Woodlands Stud and Arrowfield Estate. Measures incorporated into the mine plan to avoid and/or minimise mining impacts include:

- Significantly reducing the footprint of the Blakefield and Redbank mining areas so that they are situated entirely to the north of the southern ridgeline, which shields the majority of the Project from Coolmore Stud and other southern receivers;
- Utilisation of highwall mining to maximise coal recovery while maintaining the existing ridgeline as a buffer between the operational areas of the Project and the receivers to the south;
- Design and location of the Houston visual bund. An additional alternative has also been considered as part of this RTS document as outlined in **Section 4.7**;
- Extensive tree screening to limit views to the operational areas of the Project and improve the amenity of the surrounding area;
- Limiting the intensity of excavator operations in the Redbank mining area in Year 10 to 15 to ensure that relevant air quality criteria can be achieved at Coolmore Stud;
- Replacing the existing truck fleet with larger trucks in Year 10 to reduce dust generation;
- Design of all permanent haul roads to be treated with a dust suppressant to minimise dust emissions associated with vehicle movements;
- Implementations of additional controls for reducing adverse noise levels from mobile plant and conveyors at the CHPP; and
- Design of the mine plan to ensure sufficient buffer zones are maintained for both the Hunter River alluvium and the Saddlers Creek stream bank.

Additional commitments as part of this RTS document to further reduce the Project's air quality impacts, in particular for Arrowfield Estate, as detailed in **Section 4.2**, including:

- An increased commitment to achieve an 80% dust control rate on in-pit roads with an 85% control rate for in-pit roads in the Redbank mining area; and
- Aerial seeding of all exposed surfaces in the Houston mining area following the completion of the Houston visual bund (for the period it remains dormant).

A range of environmental monitoring and management commitments were made as part of the proposal for the Project to avoid and/or minimise land use incompatibilities, including:

- Implementation of real time monitoring systems within the vicinity of the Project to ensure that dust and noise targets are not exceeded;

- Establishment of a real time meteorological monitoring station with predictive software capabilities, enabling meteorological forecasts to be made for upcoming days and highlighting activities with the potential to generate excessive dust. This provides the accountable personnel with the information required to implement appropriate mitigation and management controls to keep emissions to an acceptable level, such as relocating equipment from exposed locations and shutting down certain activities during certain weather conditions;
- Fitting mobile plant with leading practice exhaust silencers and sound attenuation devices;
- Implementation of a blast monitoring program representative of the closest sensitive receivers to ensure compliance with the relevant blast criteria;
- Regular consultation with Coolmore Stud, Woodlands Stud and Arrowfield Estate about site operations;
- Development of the Houston visual bund to alleviate potential long term views of the Project. The Houston visual bund has been designed to be constructed as quickly as possible in a staged lift configuration so that each main stage lift is able to be progressively covered with available topsoil and rehabilitated with a crop of pasture grass to minimise exposed areas. Tree plantings, composed of native species, will be established on the visual bund to restore visual amenity and compatibility with surrounding woodland landscapes;
- Establishment of tree screens along the Golden Highway and ridgeline adjoining the Houston visual bund and the Edderton Road realignment to minimise views of the Project from various vantage points;
- Use of low lux lamps and the implementation of work procedures related to the use of mobile lighting plants to avoid adverse off site lighting impacts;
- A comprehensive surface water and groundwater monitoring program; and
- Sustainable farming practices, such as rotational grazing, are considered an ongoing land use goal in available areas outside of the Drayton South disturbance footprint on land owned by Anglo American. This includes land to the west near Saddlers Creek, to the east towards Plashett Dam and to the south beyond the existing ridgeline.

3.6 INFRASTRUCTURE CONTRIBUTIONS – VOLUNTARY PLANNING AGREEMENT

This section responds to the submissions raised by MSC regarding the Project's contributions to community infrastructure under section 94 and the proposed offer for a Voluntary Planning Agreement (VPA) with council.

Submission: RA6

MSC has made a submission on the EA referencing a desire to require the payment by Anglo American of a number of different contributions to the council as a condition of its support for the Project.

Section 94 of the EP&A Act gives the Minister the power to impose a condition in a planning approval requiring Anglo American to pay money to MSC in order to reimburse them for any amount that the council would otherwise be required to pay to provide public amenities or services the need for, which is due to the Project. Any such amount must be a reasonable contribution towards recoupment of the cost concerned.

Division 6 of Part 4 of the EP&A Act provides for a VPA, which may be entered into between Anglo American and MSC, which is not constrained as to the amount that may be paid as provided for in section 94. A condition may be included in a planning approval to require the developer to enter into a VPA but only if there has been an offer by Anglo American to do so. Unless there is such an offer the amount that a planning approval can require Anglo American to pay is limited as provided in section 94.

Anglo American has been in discussion with MSC seeking to reach agreement to enter into a VPA to pay the following amounts believed to exceed that which could be imposed in a planning approval under section 94:

- A payment of $1.0 million (M) as a direct contribution towards the cost of the Thomas Mitchell Drive upgrade;
- An annual contribution of $100,000 to MSC to assist in funding road maintenance in the LGA;
- An annual contribution of $15,000 to assist in funding environmental monitoring of mining and environmental works by council; and
- Annually following the commencement of coal production from the Project on each 30 January during which coal is produced, an amount of $0.065 for each tonne of saleable coal produced from the Project being for the promotion of the economic and social health (including human health, environmental enhancements and education) of the LGA.

In addition, Anglo American would use its reasonable endeavours to engage four apprentices in each year of operations under the Project Approval from residents the within Muswellbrook and Singleton LGAs, Aberdeen or Jerrys Plains.

It is noted that the Minister has, when requesting the "*review*" of the Project, required the PAC to report on the potential for section 94 contributions.

3.7 ENVIRONMENTAL ASSESSMENT ADEQUACY

This section responds to submissions raised by stakeholders regarding the adequacy of the EA as prepared for the Project and placed on public exhibition.

Submission: RA2, RA9, SIG3, SIG5, SIG8, SIG13, SIG15, SIG16, P4, P14, P22 and P23

In its submission following the public exhibition of the EA, Coolmore Australia has made a number of assertions as to the inadequacy of the EA and the assessed air quality, noise and vibration, equine health, visual, surface water, groundwater, agriculture and economic impacts.

With regard to the specific issues that Coolmore Australia raised in relation to the EA, these have been reviewed and considered as part of this RTS. In each of these subject areas, the technical specialists have reviewed the concerns raised and provided detailed responses to address each. These responses are provided in the following sections of this document:

- Air quality (**Section 4.2**);
- Noise and vibration (**Section 4.4** and **4.5**);
- Equine health (**Section 4.6**);
- Visual (**Section 4.7**);
- Surface water (**Section 4.11**);
- Groundwater (**Section 4.12**):
- Agriculture (**Section 4.16**); and
- Economics (**Section 4.24**).

Section 75H of the EP&A Act requires an EA to be prepared addressing the Director-General's EARs, which he is required to provide under section 75F(2). The Director-General consulted with the relevant NSW government agencies and SEWPaC and issued his EARs for the Project on 3 August 2011. On 30 April 2012, a supplementary requirement was issued by the Director-General under section 75F(3) of the EP&A Act requiring the preparation of an agricultural impact statement that includes a specific focused assessment of the impacts of the Project on SAL, having regard to the gateway criteria in the SRLUP.

The EARs as issued for and addressed for the Project are included in Table 19 of the EA.

Each of the experts technical assessments have been completed in accordance with the EARs for the Project and other relevant legislative requirements, regulations, polices and standards (as applicable to each technical area). Each of the technical assessments provides a complete and a proper basis for the environmental planning assessment and determination of the Project application, as they are to enable the determination of the application in accordance with the EP&A Act, applying the principles of ecologically sustainable development and facilitating the addressing of the objects of the EP&A Act.

Prior to allowing a development proposal to proceed to public exhibition, DP&I first reviews the proponent's EA to ensure it adequately addresses all the necessary requirements (as outlined in the Director-General's EARs for the Project). The EA adequately meets the requirements as set out in the EARs for the Project. This was confirmed through DP&I's acceptance of the EA (which includes all of the technical assessments provided as appendices) following the adequacy review stage, which enabled the EA to be placed on public exhibition.

4 ENVIRONMENTAL AND SOCIO-ECONOMIC ISSUES

This section responds to the submissions raised by stakeholders as to a number of environmental and socio-economic issues as presented in ***Appendix B****.*

4.1 MINE PLAN JUSTIFICATION

This section responds to the submissions raised by stakeholders regarding the mine plan proposed for the Project. Submissions questioned the requirement for the four mining areas and if all reasonable and feasible mitigation measures had been adopted in the mine plan design.

Submission: RA2, RA3, RA4, RA6, SIG15 and SIG16

4.1.1 Drayton South Mining Areas

During the initial years of mining within the Drayton South area, the dragline operates between the Whynot and Blakefield mining areas to provide high quality, low ash coal. Both mining areas are required to sequence the dragline effectively and allow sufficient time for de-coaling, drilling and blasting of the next strip. Restricting mining to a single mining area would introduce a high risk of significant downtime for the dragline while waiting for the next strip to be prepared thereby affecting the rate at which coal is uncovered. For this reason, both the Whynot and Blakefield mining areas are required and have been incorporated in the final mine plan design as presented in the EA.

The Redbank mining area is also required during the initial years of mining in the Drayton South area and will be facilitated by a truck and excavator operation. This mining area provides the bulk of the coal tonnage in the early years of the Project, which predominantly comprises of lower quality, higher ash coal when compared to that recovered from the Whynot and Blakefield mining areas. As such, it is essential that the bulk coal tonnes from the Redbank mining area are recovered simultaneously with the high quality, low ash coal from the Whynot and Blakefield mining areas to allow for the necessary blending during coal processing.

The Houston mining area is established in Year 3 with the excavation of an initial box cut required to construct the Houston visual bund. The scheduling of this unusual situation is necessary to ensure that the Whynot mining area is shielded from receivers to the south of the Project by Year 5. The Houston mining area will then remain dormant, from an open cut mining perspective, until the completion of operations in the Blakefield and Redbank mining areas at approximately Year 13. At this point, operations in the Houston mining area will recommence with the dragline cycling between the Whynot and Houston mining areas.

During the period that the Houston mining area remains dormant to open cut mining, Anglo American has committed to aerial seed all exposed areas in order to further minimise dust emissions from the Project. Further details with regard to this are provided in **Section 4.2**.

With the exception of the period between Year 3 and 5 while the Houston visual bund is established, the Project consists of three open cut mining areas until approximately Year 13. Once mining is complete in the Blakefield and Redbank mining areas, operations will be limited to two mining areas (Houston and Whynot mining areas).

4.1.2 Importance of the Houston Mining Area

This section outlines the major impacts that would occur to the Project if the Houston mining area was not to proceed as planned. It has been prepared as a high level review and the impacts as identified have been grouped under revenue impacts, schedule impacts, value impacts and environmental impacts.

Overview

The Houston mining area, which is situated to the south-east of the Whynot mining area, covers an area of approximately 800 m x 800 m (see **Figure 1**). The initial L-shaped boxcut, which is required to be established in Year 3, serves a dual purpose. It provides material for the construction of the Houston visual bund to the south of the workings, which screens operations in the Whynot and Houston mining areas from receivers in the south and provides access to highwall mining of some 700,000 t of the Redbank lower seams from Year 6 of the mine life. The overall ROM stripping ratio of the Houston mining area is lower than the average of the total mine at approximately 6:1. Current mine planning has the boxcut being completed early in the mine life to facilitate construction of the visual bund, followed by a highwall mining operation in Year 6 and a dragline operation starting from Year 13. The bulk of overburden removal and coal mining occurs in the Houston mining area after Year 13.

Revenue Impacts

The Houston mining area contains over 12 Mt of coal of varying quality, which would produce approximately 9 Mt of standard Hunter Valley thermal coal product. This equates to almost 10% of the total reserve for the Project. The impact of the removal of this tonnage from the existing mine plan would see loss of revenue in excess of $900 M (at $100/t). As approximately 4 Mt ROM of this occurs in the initial seven years of the mine life, the impact on Project value would be significant and revenue losses could not be offset by cost savings due to capacity requirements in other working areas.

Schedule Impacts

Once the dragline has completed work in the Blakefield mining area in Year 13, it will still be required to continue mining in the Whynot mining area until the end of the mine life. The process of overburden removal by dragline (which involves pre-strip, drill, blast, doze, dragline overburden removal and coal mining activities) is such that scheduling these operations in one area is extremely complex. As such, it is necessary for the dragline to have an alternative work area to go to. This enables coal mining, drilling and blasting activities to be carried out in advance so that the dragline will not have to stop and wait for other processes, which is initially facilitated by the Blakefield mining area. The dragline cycles between the two working areas until the completion of the Blakefield mining area. The Houston mining area provides this alternative after Year 13 and prevents unnecessary scheduling delays in the dragline process. It has been estimated that the dragline would have to stop for approximately six weeks every year if the Houston mining area was not available as an alternate work area. The minimum impact foreseeable is that work currently scheduled for dozers would be required to be completed by the dragline, impacting rehandle significantly, decreasing the rate of coal uncovered and increasing unit costs.

Project Value

Cost savings as a result of lower tonnage would equal approximately $400 M against a revenue decrease of around $900 M. It is estimated that the decline in dragline efficiency from Year 13 would increase overall unit costs by $2.50/t or a total of more than $100 M. The total impact of the removal of the Houston mining area on value is a decrease in cash flow of more than $600 M. No net present value calculation has been completed as part of this high level review, however, as a significant reduction in tonnage occurs early in the mine life it would certainly be material.

Environmental Impact

One of the major design criteria for the Houston mining area was a requirement to build a visual bund capable of screening the entire operations from receivers to the south, including Coolmore Stud and Jerrys Plains. To this end, a boxcut of approximately 16.6 million loose cubic metres (Mlcm) was designed to provide sufficient material to construct the bund. As operations within the Whynot mining area will be visible from Year 5, it is a requirement to have the bund completed before this time. Coolmore Australia has since, in their submission on the EA, suggested a fourth alternative bund design which would require a smaller box cut and shorter build time (the Coolmore (Option 4) visual bund). The Coolmore (Option 4) visual bund has been assessed as part of this RTS and is provided in **Section 4.7.2**. This option presents a range of advantages when compared to the EA (Option 3) visual bund; however, it does not fully screen the mine from views as per the original design brief. It is noted, however, that the Coolmore (Option 4) visual bund is an alternative which is acceptable to Anglo American should it be required.

If the Houston mining area is removed from the mine plan, the Houston visual bund would not be constructed and operations within the Whynot mining area will be visible from Year 5 until the end of the mine life.

Conclusion

The Houston mining area is an integral part of the mine plan for the Project. It contributes positively to the value of the Project and permits efficient scheduling of the dragline process. Removal of this operational area from the mine plan would seriously impact revenue and project value as well as increase production costs.

4.1.3 Mine Plan Design Considerations and Concessions

The mine plan as proposed and assessed in the EA was developed with reference to a range of constraints that were identified throughout the extensive Project planning phase. Anglo American's primary objective was to develop a mine plan that minimised potential environmental and social impacts whilst maximising resource recovery and operational efficiency. This involves the continuation of the existing Drayton Mine via the development of an open cut and highwall mining operation, producing up to 7 Mtpa of ROM coal for 27 years.

The Project maximises the opportunity to secure the social and economic benefits that would result from the continued utilisation of the existing Drayton Mine infrastructure and employment for the existing workforce.

As part of the Project planning phase and studies undertaken for the EA, a number of additional environmental constraints were identified. In order to adequately address these Anglo American made necessary refinements and changes to the mine plans for the Project.

The mine plan has been comprehensively assessed and progressively modified so that the Project satisfies legal, political, environmental and social expectations and achieves a "*social licence to operate*". The following modifications have been incorporated into the mine plan design as described and assessed in the EA:

- Significant reduction in the footprint of the Blakefield and Redbank mining areas to remain entirely to the north of the ridgeline and shielded from receivers to the south of the Project;
- Utilisation of highwall mining to maximise coal recovery while maintaining the existing ridgeline as a buffer between the operational areas of the Project and the receivers to the south;
- Revision and modifications of the design and location of the Houston visual bund in consultation with stakeholders located to the south of the Project;
- Incorporation of extensive tree screening into the mine plan to limit views to the operational areas of the Project and improve the amenity of the surrounding area;
- Reduction in the intensity of excavator operations in the Redbank mining area during Year 10 to 15 to minimise air quality impacts;
- Replacement of the existing truck fleet with larger models in Year 10 to reduce dust generation;
- Treatment of all permanent haul roads with a dust suppressant to minimise dust emissions associated with vehicle movements;
- Implementation of additional controls for reducing adverse noise levels from mobile plant and conveyors at the CHPP;
- Design of the mine plan to ensure sufficient buffer zones are maintained for both the Hunter River alluvium and the Saddlers Creek stream bank; and
- Avoidance of the stone quarry Aboriginal archaeological site when realigning Edderton Road.

Subsequently as a result of the additional concessions and considerations that have been made 53 Mt of coal has been removed from the mine plan resulting in a total loss of direct revenue in the order of $5.3 billion.

These constraints and the necessary changes made are described in greater detail in Section 4.16 of the EA.

Further to the refinements and changes that were made to the mine plans for the Project as presented in the EA, Anglo American has made a number of additional commitments that have been considered and assessed as part of this RTS, including:

- Achievement of an 80% dust control efficiency rate on in-pit roads with an 85% control rate for in-pit roads in the Redbank mining area;
- Aerial seeding of all exposed surfaces in the Houston mining area following the completion of the Houston visual bund (for the period it remains dormant);
- Construction of the Coolmore (Option 4) visual bund, if required; and
- The use of Geofluv software and design principles in the development of the final landform (refer **Section 4.19**).

4.2 AIR QUALITY

4.2.1 Assessment Approach

This section responds to the submissions raised by stakeholders regarding the applicable criteria for air quality assessments in NSW and the approach taken by the air quality impact assessment, particularly with regard to predicting cumulative impacts.

Submission: RA2, RA11, SIG4, SIG5, SIG13 and SIG16

The predicted ground level dust concentrations and deposition levels of the Project were assessed in accordance with *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (DEC, 2005a) impact assessment criteria (see **Table 1**), which is also relied upon to guide land acquisition. Assessment criteria provide benchmarks, which are intended to protect the community against the adverse effects of particulate matter. These criteria reflect current Australian and NSW standards for the protection of health and protection against nuisance effects. It is noted that the National Environment Protection Measure (NEPM) does not set a goal/criteria for annual average Particulate Matter less than 10 microns in diameter (PM_{10}).

Table 1
Air Quality Impact Assessment Criteria

Pollutant	Criterion	Averaging Period	Application
TSP	90 µg/m^3	Annual	Cumulative
PM_{10}	50 µg/m^3	24-h	Cumulative
	30 µg/m^3	Annual	Cumulative
Deposited Dust	2 g/m^2/month	Annual	Incremental
	4 g/m^2/month	Annual	Cumulative

DPI asserted that the impacts of dust on Arrowfield Estate and its associated residences may have been under considered due to the assumption that it was inoperative.

The air quality impacts at Arrowfield Estate and its residences have not been under considered given its current non-operational status. Arrowfield Estate was represented in the air quality impact assessment (see Appendix F of the EA) as receiver 226 with each of the residences denoted as A, B, C and D. Predicted ground level concentrations of particulate matter and deposited dust at all private and mine-owned residences in the vicinity of the Project was modelled regardless of the status of other activities in the area.

4.2.2 Monte Carlo Method

This section responds to the submission raised by stakeholders requesting further information as to how the Monte Carlo method is applied in order to estimate cumulative 24-hour (h) average PM_{10} for the Project.

Submission: SIG5, SIG12, SIG13 and SIG16

The Monte Carlo method is commonly used to model situations or scenarios associated with significant uncertainty, for example, the calculation of risk in business. Its application in space exploration and oil exploration has shown that their predictions of failures, cost overruns and schedule overruns are routinely better than human intuition or alternative *"soft"* methods (Hubbard, 2009). The United States Environmental Protection Agency started using Monte Carlo simulations in the 1990s as part of its risk assessments to analyse the overall health risks of smog in cities. As the smog levels vary among neighbourhoods and people spend varying amounts of time outdoors, the exposure to smog is highly variable. Given a range of values for each variable, a Monte Carlo simulation will randomly select a number within each range, and see how they combine — and repeat the process tens of thousands or even millions of times. No two iterations of the simulation are identical but collectively they build up a realistic picture of the population's smog exposure.

As with exposure to smog, there is uncertainty in predicting the cumulative 24-h PM_{10} concentrations using dispersion modelling due to the difficulties in resolving (on a day to day basis) the varying intensity, duration and precise locations of activities for mining developments, and the precise weather conditions at the time of the activity or combination of activities. The uncertainty in predicting cumulative 24-h impacts are compounded by the day to day variability in ambient dust levels and the spatial and temporal variation in any other anthropogenic activity (e.g. agricultural activity, bushfires etc.), including mining in the future. Experience shows that the worst case 24-h PM_{10} concentrations are often strongly influenced by other sources, such as bushfires and dust storms, which are essentially unpredictable. The variability in 24-h average PM_{10} concentrations can be clearly seen in the data collected at High Volume Air Samplers (HVAS) located in the vicinity of the Drayton South area (see **Figure 3** to **Figure 5**).

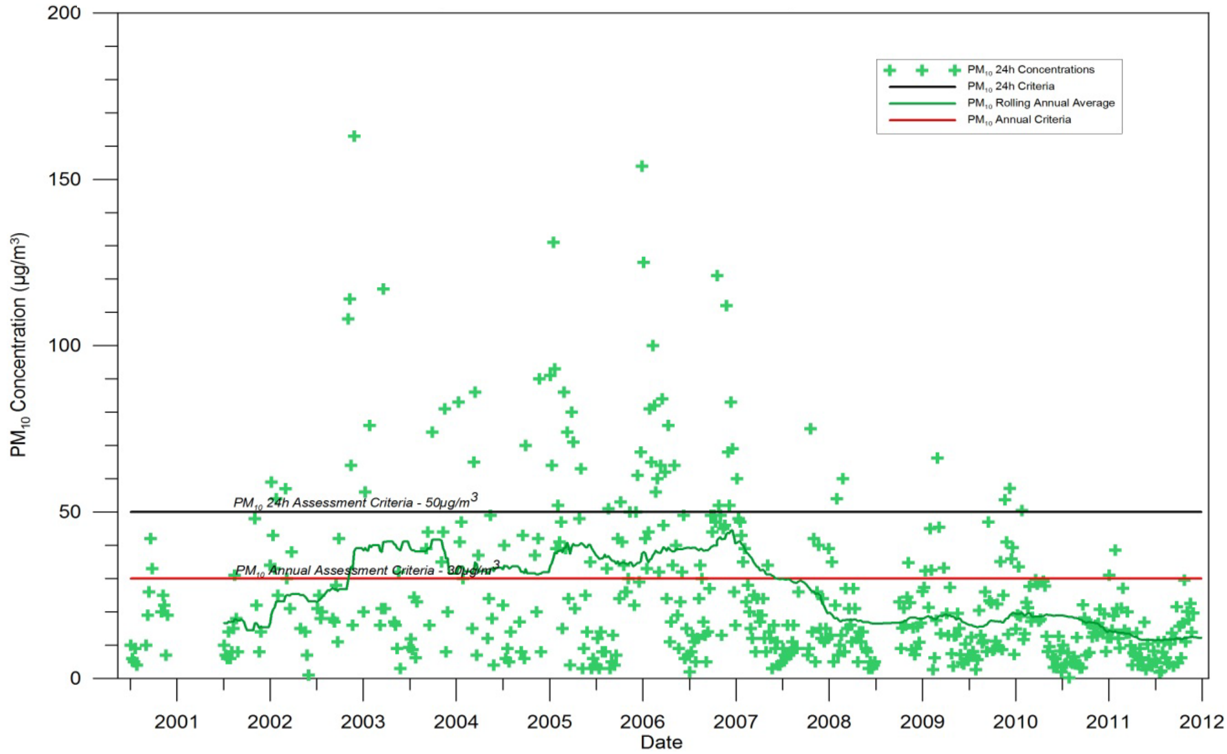


Figure 3

PM_{10} (24-hour Average) Concentrations at Llanillo (HV2a) – 2000 to 2011

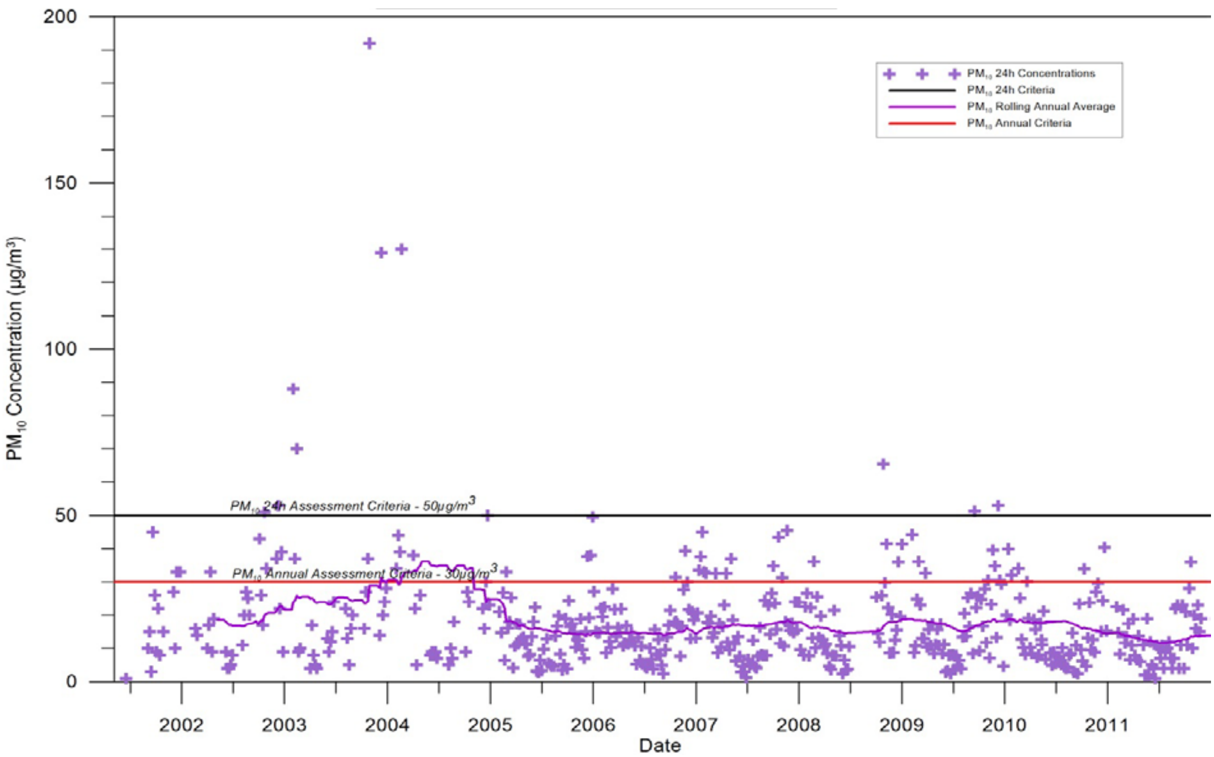


Figure 4

PM_{10} (24-hour Average) Concentrations at Jerrys Plain School (HV5) – 2001 to 2011

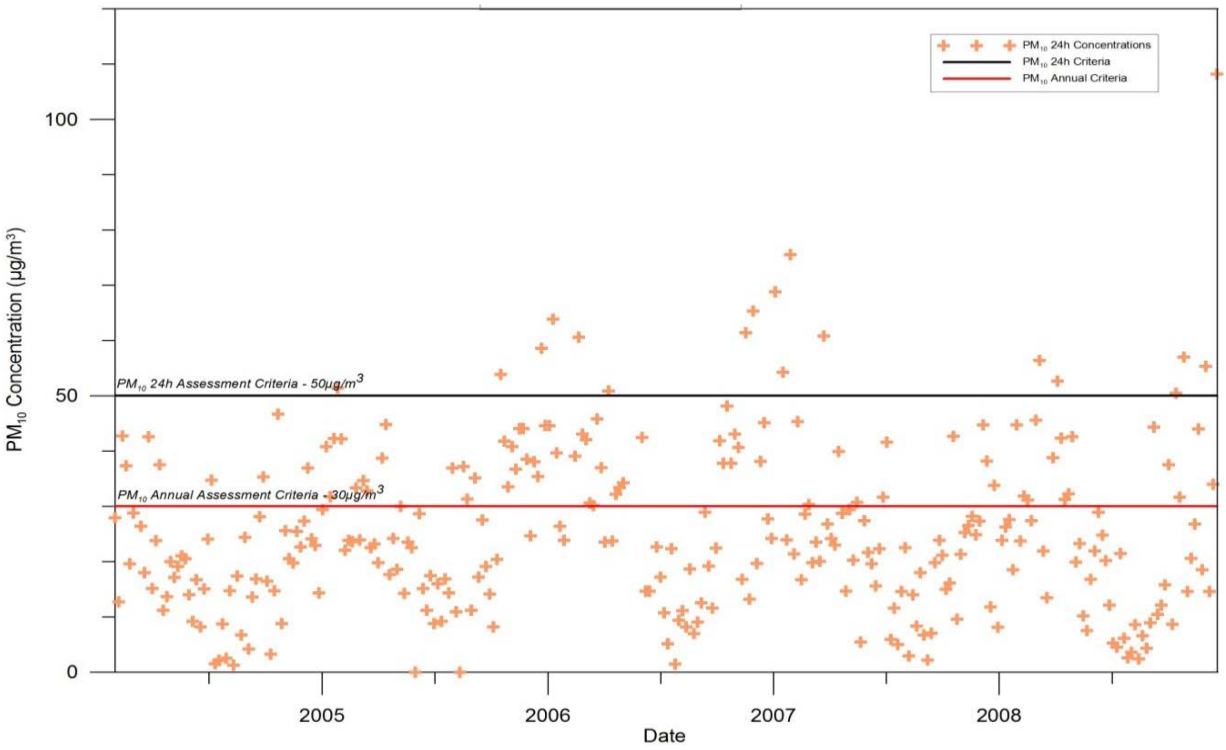


Figure 5

PM_{10} (24-hour Average) Concentrations at Lot 9, Drayton Mine – 2005 to 2011

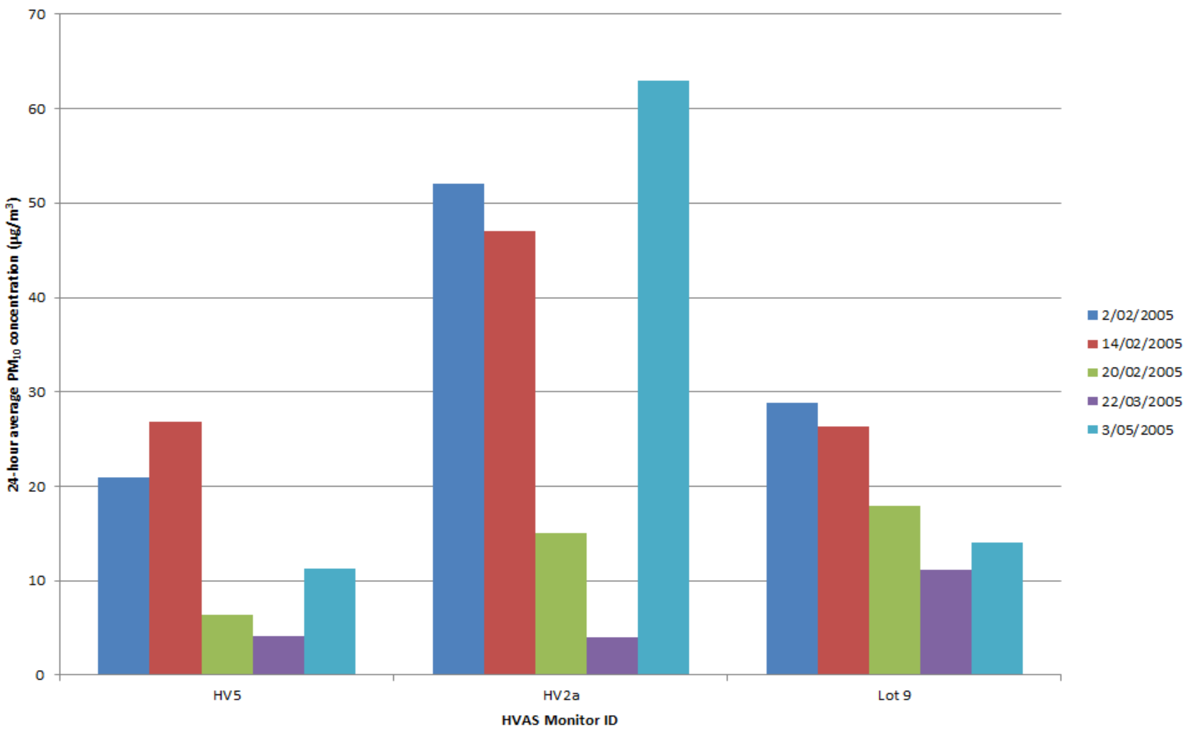


Figure 6

PM_{10} (24-hour Average) Concentrations HV5, HV2a and Lot 9

The Monte Carlo method assigns a probability to each of the possible outcomes of a random situation. In the case of the Project, this is the modelled predictions occurring with an existing variable background 24-h average concentration. This provides confidence around the probability of predicted cumulative 24-h average PM_{10} concentrations.

Whilst there are clear seasonal trends in the data, with higher concentrations typically measured in the summer months, on a day to day basis there are significant differences in measured concentrations between the monitoring locations. This is demonstrated in **Figure 6**, which shows five days of data for 2005 for the three monitoring stations (HV5, HV2a and Lot 9). It can be seen from this data that there is no pattern to the measured concentrations and it is exactly this wide variability in the data that the use of the Monte Carlo method seeks to overcome.

As detailed in the air quality impact assessment (see Appendix F of the EA), the EPA describes two methods for assessing cumulative air quality effects (see Section 11.2 of NSW EPA, 2005a):

- A Level 1 assessment (suitable for a screening assessment) requires the highest predicted concentration from the proposal be added to the highest observed concentration in a data set which provides measurements of PM_{10} concentrations representative of conditions at the site being assessed. If this results in exceedances of the PM_{10} impact assessment criteria, a Level 2 assessment is required; or
- A Level 2 assessment provides a more rigorous approach when background levels are elevated and requires (1) that the highest ten observed 24-h average PM_{10} concentrations (below criteria) are added to the predicted concentrations for the same days; and (2) the ten highest predicted 24-h average PM_{10} concentrations are added to the observed concentrations for the same days.

There are no available continuous 24-h average PM_{10} data for the area that match the year of meteorological data used in the dispersion modelling (i.e. 2005). Whilst HVAS data are available every sixth day, the data are insufficient to provide a representative background for each day of the model simulation as required for a cumulative assessment. Even if there were continuous monitoring data available, this would only allow an assessment of the cumulative 24-h PM_{10} concentrations based on the measured background concentrations in 2005. As presented in **Table 2**, the Monte Carlo method applied uses data from as early as 2000 through to late 2011, thus capturing all the variability in background concentrations from data available, not just those that occurred in 2005.

Table 2
Monitoring Data Availability for Cumulative 24-hour Assessment

Monitoring Location	Monitoring Period	No. of Daily 24-h Average Concentrations	Data Source	Receiver ID
Mt Arthur Coal Edderton (DF04)	2002 – 2010	530	PAEHolmes (2009) BHP Billiton (2009) BHP Billiton (2010)	410 and 411
Anglo American Lot 9	2005 – 2009	288	Anglo American	
Mt Arthur Coal Windmill (DF03)	2002 – 2010	528	PAEHolmes (2009) BHP Billiton (2009) BHP Billiton (2010)	57, 58A, 145A, 226B, 226D, 227A, 227F, 240A and 250A
Anglo American HV2a	2000 – Nov. 2011	502	Anglo American	
Anglo American HV5	May 2001 – Nov. 2011	477	Anglo American	209 and 217

For each of the selected receivers, the Monte Carlo method randomly selects one predicted 24-h average concentration due to the Project (from a total of 365 predictions for a year) and another 24-h average concentration from the monitoring data. These values are summed to give a cumulative 24-h average concentration. This process is repeated 250,000 times at each receiver and the results of the individual calculations are then aggregated to give the final result, which corresponds to the calculation of the probability that a certain number of days may exceed the cumulative 24-h average criterion of 50 microgram (μg)/m^3.

4.2.3 Predicted Air Quality Impacts

This section responds to the submissions raised by stakeholders regarding the predicted air quality impacts of the Project. It also presents the results of additional modelling that has been undertaken for the Project in order to appropriately consider and address the concerns raised with regards to the air quality impacts as predicted in the EA.

Submission: RA2, RA4, RA6, RA11, SIG1, SIG2, SIG3, SIG4, SIG5, SIG8, SIG9, SIG10, SIG11, SIG12, SIG13, SIG14, SIG15, SIG16, P3, P6, P7, P8, P10, P11, P12, P13, P14, P15, P16, P17, P18, P20, P21, P23, P24, P25, P28, P29, P30, P31, P33, P37, P40 and P41

A range of submissions were received from a number of stakeholders requesting that further control measures be implemented in order to minimise the Project's predicted air quality impacts on private receivers and reduce as far as practicable the contribution of dust to the Hunter Valley air shed.

In order to appropriately consider and address the concerns raised, Anglo American investigated the feasibility of making further commitments to impose additional controls into the Project design in order to reduce the potential air quality impacts. In addition to this, the accuracy of the air quality modelling for the Project has been improved by incorporating site specific monitoring data from the existing Drayton Mine for silt and moisture content percentages associated with the major dust sources, including overburden, coal and haul roads. The requirement for incorporating site specific monitoring data in air quality modelling has been requested by recent PACs for other major coal mining projects and hence has been undertaken in part to pre-empt this contemporary requirement for air quality impact assessments.

Revised Project Air Quality Modelling Assumptions

The air quality impact assessment (see Appendix F of the EA) showed that Year 10 and Year 15 of the Project life are predicted to result in the highest ground level concentrations at receivers. All other years as modelled for the EA showed no impacts above the relevant air quality impact assessment criteria at private receivers. As such, the emission estimates have been revised and remodelled for Year 10 and 15 only having regard of the additional controls and updated silt and moisture data for the Project's major dust sources.

The following modifications have been applied to the emission calculations and subsequent air quality modelling:

- An additional 80% control for all in-pit haul roads consistent with the latest requirements of the Drayton Mine Environmental Protection Licence (EPL) conditions (compared with the previously modelled 75%). All out-of-pit roads remain at 85% for Dust-A-Side;
- An additional 85% control for all in-pit haul roads within the Redbank mining area (as this is closest to receivers in the south and has been identified as a large contributor of dust emissions);
- Aerial seeding of all exposed surfaces within the Houston mining area from Year 5 to Year 11 while the mining area is dormant. This represents a 70% control on exposed areas within the Houston mining area; and
- Revised silt and moisture content percentages based on actual measured values from samples collected at the existing Drayton Mine (see **Table 3**). A copy of the analysis of samples collected at Drayton Mine is provided in **Appendix C**.

Table 3
Silt and Moisture Content – Previously Modelled Compared with Measured at Drayton Mine

Source	Silt (%)		Moisture (%)	
	Modelled	Measured	Modelled	Measured
Active Overburden	10	1.8	2.5	10.9
Inactive Overburden	N.A.	0.5	N.A.	6.4
Reject Coal	5	0.2	9	3.9
Product Coal	N.A.	0.8	11	5.4
ROM Coal	5	1.1	9	6.6
Haul Roads Main	3	0.4	N.A.	2.8
Haul Roads In-pit	3	4.1	N.A.	2

N.A. Not applicable

The revised emissions estimates for Year 10 and 15 incorporating the additional controls and revised and silt and moisture values are presented in Table 2-2 in **Appendix C**. With the incorporation of the changes as presented above the total emissions are able to be further reduced by approximately 28% for both years.

Revised Project Air Quality Modelling Predictions

Figure 7 and **Figure 8** illustrate the air quality contours for predicted annual average Total Suspended Particulates (TSP), annual average PM_{10}, 24-h average PM_{10} and annual average dust deposition concentrations in relation to neighbouring private receivers within the vicinity of the Drayton South area for Year 10 and 15, which represent the worst case years. See Figure 42 and 43 of the EA for a comparison with the original modelled results.

The results show a significant reduction in the maximum predicted 24-h average PM_{10} ground level concentrations at a number of private residences compared with the original EA air quality modelling. Residences 226 (B and C) are predicted to experience exceedances of the 24-h average PM_{10} assessment criterion of up to three days during Year 10 of the Project's operations. This represents a significant reduction when compared with the 23 days that was predicted to be in exceedance as part of the EA modelling. No exceedances of the assessment criterion are predicted in Year 15. It is proposed that the impacts at these locations would be managed via a real-time and/or predictive monitoring system where operations could be modified (or temporarily shut down in extreme cases) under certain meteorological conditions to minimise the impacts. No other residences are predicted to experience 24-h average PM_{10} concentrations above the assessment criterion due to emissions from the Project alone.

The results from the revised dispersion modelling indicate that the annual average PM_{10}, TSP and dust deposition ground level concentrations are not predicted to exceed the relevant criteria from the project alone at any private residences. The revised cumulative assessment also resulted in no exceedances at private residences and only one exceedance for a mine owned residence (PM_{10} and TSP). There is an overall reduction in the predicted annual average concentrations at all other modelled residences due to the revised emission estimates.

Furthermore, the overall predicted contribution of dust to the Hunter Valley air shed has been clarified to be less than initially thought due to the application of actual site monitoring data for silt and moisture content from the existing Drayton Mine, thereby improving the accuracy of the Project air quality model, and Anglo American's commitment to impose additional controls into the Project design.

Table 4 and **Table 5** present the revised predicted air quality exceedances for the Project and provide a comparison with the results that were included in the EA.

Table 4
Summary of Predicted Air Quality Exceedances (24-hour Average)

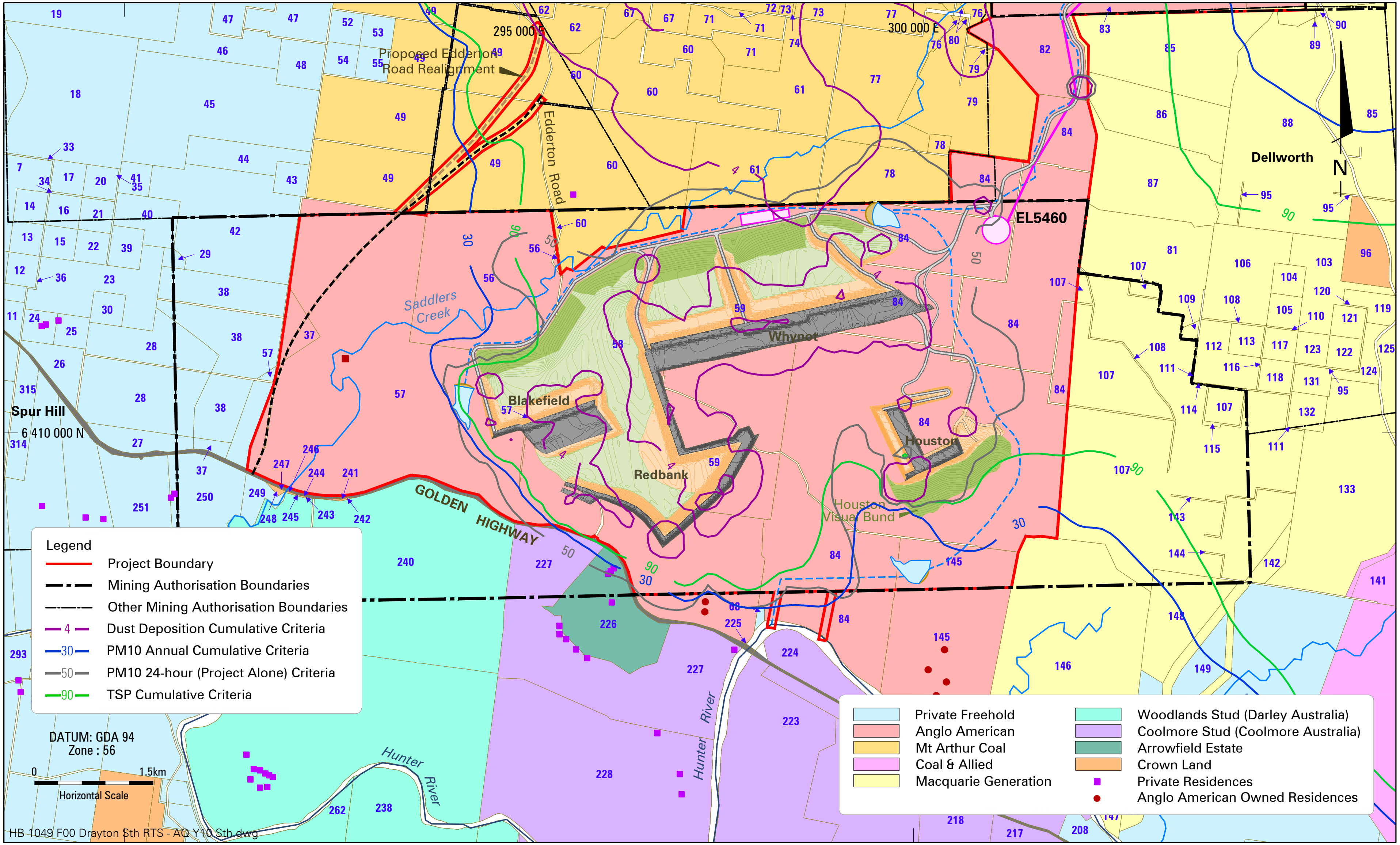
Averaging Period	PM_{10} 24-h Average (Project Alone)	
Criteria	50 µg/m³	
Residence	EA Model Results	Revised Model Results
226	Year 5 – 1 day (58 µg/m³) Year 10 – 23 days (106 µg/m³) Year 15 – 19 days (102 µg/m³)	Year 10 – 3 days (57 µg/m³)
227F	Year 10 – 1 day (52 µg/m³) Year 15 – 1 day (55 µg/m³)	N.A.
228M	Year 10 – 1 day (54 µg/m³)	N.A.

N.A. Not applicable

Table 5
Summary of Predicted Air Quality Exceedances (Annual Average)

Averaging Period	PM_{10} Annual (Cumulative)		TSP Annual (Cumulative)	
Criteria	30 µg/m³		90 µg/m³	
Receiver	EA Model	Revised Model	EA Model	Revised Model
226	Year 10 – 36 µg/m³ Year 15 – 32 µg/m³	N.A.	Year 10 – 99 µg/m³	N.A.

N.A. Not applicable



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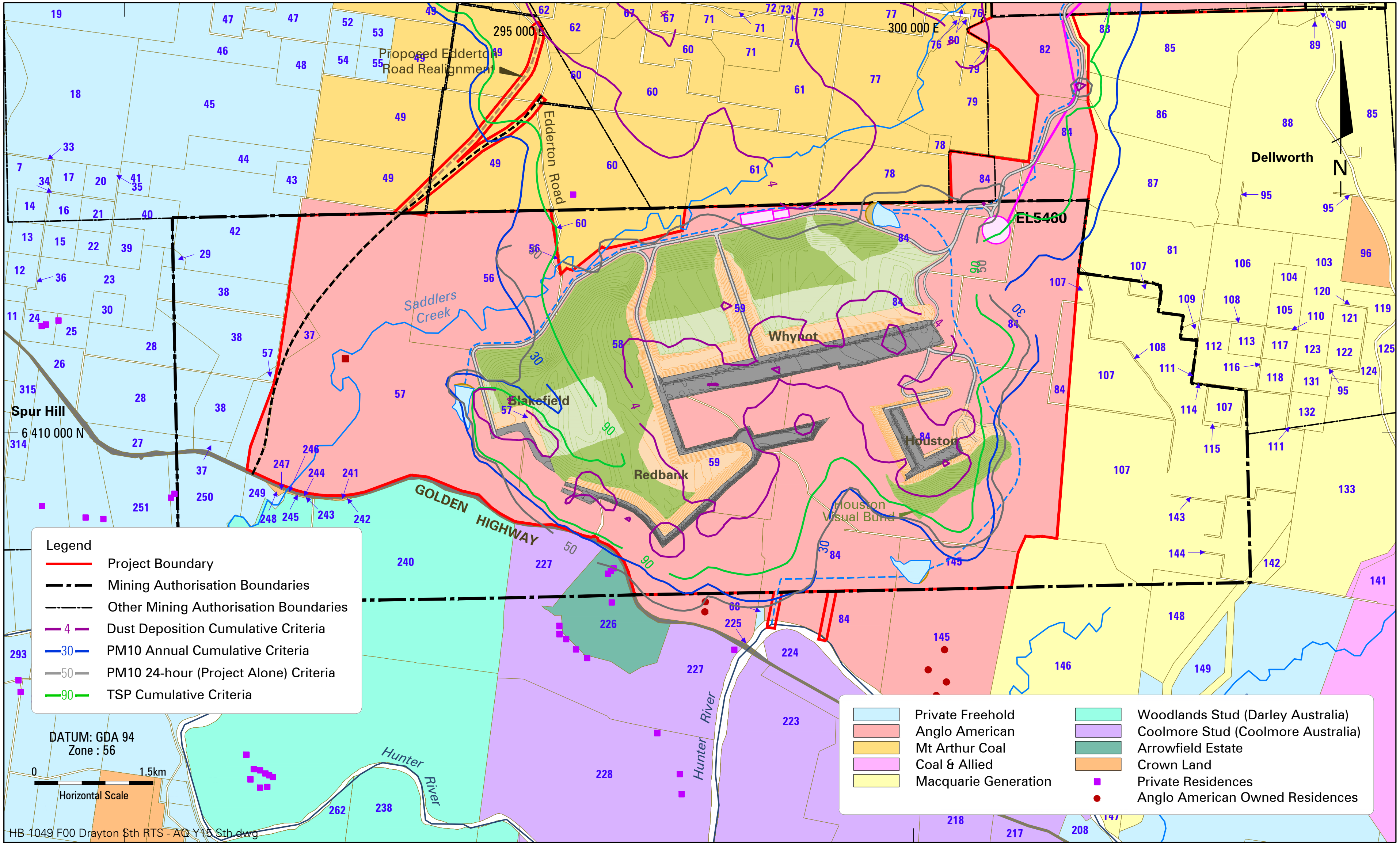
RESPONSE TO SUBMISSIONS

Revised Air Quality Contours - Year 10

FIGURE 7



DRAYTON SOUTH COAL PROJECT
RESPONSE TO SUBMISSIONS

Revised Air Quality Contours - Year 15

FIGURE 8

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4.2.4 Air Quality Baseline Data

This section responds to the submissions raised by stakeholders regarding the suitability of the air quality baseline data that has been used for and referenced in the air quality impact assessment as part of the EA.

Submission: RA6, SIG1, SIG3, SIG4, SIG5, SIG13, SIG15, P3, P6, P10, P12, P23, P25, P34 and P37

As discussed in the air quality impact assessment (see Appendix F of the EA), air quality monitoring data collected by the Anglo American in the vicinity of the Drayton South area were collected using a network of HVAS to measure TSP and PM_{10} concentrations and dust deposition gauges to measure deposited dust levels.

HVAS obtain samples for a 24-h period every sixth day in accordance with the *Approved Methods for the Sampling and Analysis of Air Pollutant* (DEC, 2006c). The monitor collects all sources of TSP or PM_{10} in the local air shed. Whilst it is agreed some of the day to day variability in the 24-h average concentrations may not be captured with this method (as shown in **Table 6**), the annual average compares well with other data collected in the area, including data collected continuously using Tapered Element Oscillating Microbalances (TEOM) located at Muswellbrook Coal Mine.

Table 7 presents a summary of the dust deposition data collected between 1998 and 2011. This data shows significant variability between different sites for the same year and also for the same sites when compared year-on-year. There is no clear evidence to support the submissions asserting that dust deposition rates are increasing over time.

Table 6
Annual Average PM_{10} Concentrations – 2002 to 2011

Monitor ID	Mine	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Lot 9	Drayton	-	-	-	17	25	25	19	19	-	-
HV2a	Drayton South	**39**	**31**	**32**	**37**	**42**	20	16	20	14	23
HV5	Drayton South	22	**31**	25	14	15	18	17	18	15	13
PM10-1	Mangoola	-	-	16	17	20	-	-	-	-	-
PM10-2	Mangoola	-	-	19	14	21	-	-	-	-	-
DF01	Mt Arthur Coal	9	17	17	16	17	18	18	24	16	21
DF02	Mt Arthur Coal	20	19	19	16	16	16	14	20	15	15
DF03	Mt Arthur Coal	20	17	15	14	17	17	15	18	14	14
DF04	Mt Arthur Coal	25	24	23	19	18	22	20	27	19	21
DF05	Mt Arthur Coal	24	21	19	16	18	17	16	23	16	17
DF06	Mt Arthur Coal	-	-	28	21	27	27	21	30	21	21
DF07	Mt Arthur Coal	-	25	28	22	22	23	21	28	20	21
DF08	Mt Arthur Coal	21	19	18	18	18	20	21	26	19	21
HV2	Bengalla	24	23	20	23	24	-	-	-	-	-
HV4	Bengalla	23	21	18	20	22	-	-	-	-	-
Site 1*	Muswellbrook Coal Mine	-	-	-	13	17	17	15	17	-	-
Site 2*	Muswellbrook Coal Mine	-	-	-	16	21	21	16	20	-	-
Site 3*	Muswellbrook Coal Mine	-	-	-	16	20	18	16	22	-	-
Wandewoi	Hunter Valley Operations	-	-	-	17	-	-	-	-	-	-
Jerrys Plains School	Hunter Valley Operations	22	**31**	25	14	15	18	17	18	15	13

** Data collected using a TEOM.*

Table 7
Annual Average Dust Deposition (Insoluble Solids) – 1998 to 2011

Year	D1	D2	D4	D5	D6	D7	D8	D9	D10	D11	D12
1998	1.1	0.7	-	0.8	1.8	2.6	1.2	2.7	-	-	-
1999	1.4	1.1	2.4	1.2	1.2	0.8	2.1	2.6	-	-	-
2000	1.1	4.1	-	1.0	1.3	2.7	1.6	3.4	-	0.8	-
2001	1.2	1.8	-	1.2	1.0	-	1.0	2.6	0.9	0.9	0.7
2002	-	-	-	-	-	-	1.5	4.1	1.3	1.0	1.8
2003	-	-	-	-	-	-	0.8	2.3	0.9	0.9	0.8
2004	-	-	-	-	-	-	1.4	2.9	1.1	1.5	1.3
2005	-	-	-	-	-	-	0.8	2.5	0.9	0.9	0.9
2006	-	-	-	-	-	-	1.1	2.9	0.9	1.0	1.5
2007	-	-	-	-	-	-	1.1	2.4	0.9	1.4	1.1
2008	-	-	-	-	-	-	0.9	2.9	1.0	1.1	0.7
2009	-	-	-	-	-	-	1.1	3.8	1.5	1.6	2.1
2010	-	-	-	-	-	-	0.9	3.2	0.9	1.6	1.6
2011	-	-	-	-	-	-	1.0	-	1.6	2.3	2.2

Concerns were also raised regarding the current air quality in Muswellbrook and Singleton. In January 2013, the EPA released a review of the ambient air quality monitoring data from the Upper Hunter Air Quality Monitoring Network for 2012 (NSW EPA, 2013). The report concluded that:

- Singleton Central was the only population centre station that did not meet the annual goal of the NEPM for PM_{10} with exceedances of the criterion over 6 days; and
- Muswellbrook Central was the only population centre station to record Particulate Matter less than 2.5 microns in diameter ($PM_{2.5}$) levels above the national advisory reporting daily and annual levels.

It is important to note that the NEPM and NSW 24-h average goals for PM_{10} and $PM_{2.5}$ are based on a fixed period average of all data collected between midnight and midnight in a single 24-h period, as outlined in the NEPM guidance on data collection and handling (NEPM, 2001).

The alerts being provided by the EPA are based on a rolling 24-h average. This means that a single 1-h average spike in the monitoring data that could be caused, for example, by a vehicle idling close to the monitor, can result in an alert being sent that the criteria have been exceeded. Yet when the fixed period 24-h averages are calculated for the same day there is no exceedance of the criteria. This is demonstrated in **Figure 9** to **Figure 11**, which shows three days of data from the Muswellbrook Central EPA monitoring station, including the 1-h PM_{10} average, rolling 24-h PM_{10} average and fixed 24-h PM_{10} average.

Based on the rolling 24-h average, an alert would have been sent at 1:00 am on 21 October 2012 given that a concentration of 51.3 $\mu g/m^3$ was calculated (see **Figure 9**). It is EPA policy that an alert is only sent out for the first instance of an exceedance for that day. When compared against the air quality assessment criteria (based on the fixed 24-h average), a concentration of 24.7 $\mu g/m^3$ was calculated, which is well below the criterion of 50 $\mu g/m^3$.

Similarly, an alert would have been sent out at 6:00 pm on 7 November 2012 (see **Figure 10**), based given that a concentration of 50.7 $\mu g/m^3$ was calculated. When compared against the air quality assessment criteria (based on the fixed 24-h average), a concentration of 46.2 $\mu g/m^3$ was calculated, which is well below the criterion of 50 $\mu g/m^3$.

Of the data collected at Muswellbrook Central in 2012, there was only one recorded exceedance of the assessment criterion at 51 $\mu g/m^3$ on 20 October, when compared against the fixed 24-h average (see **Figure 11**).

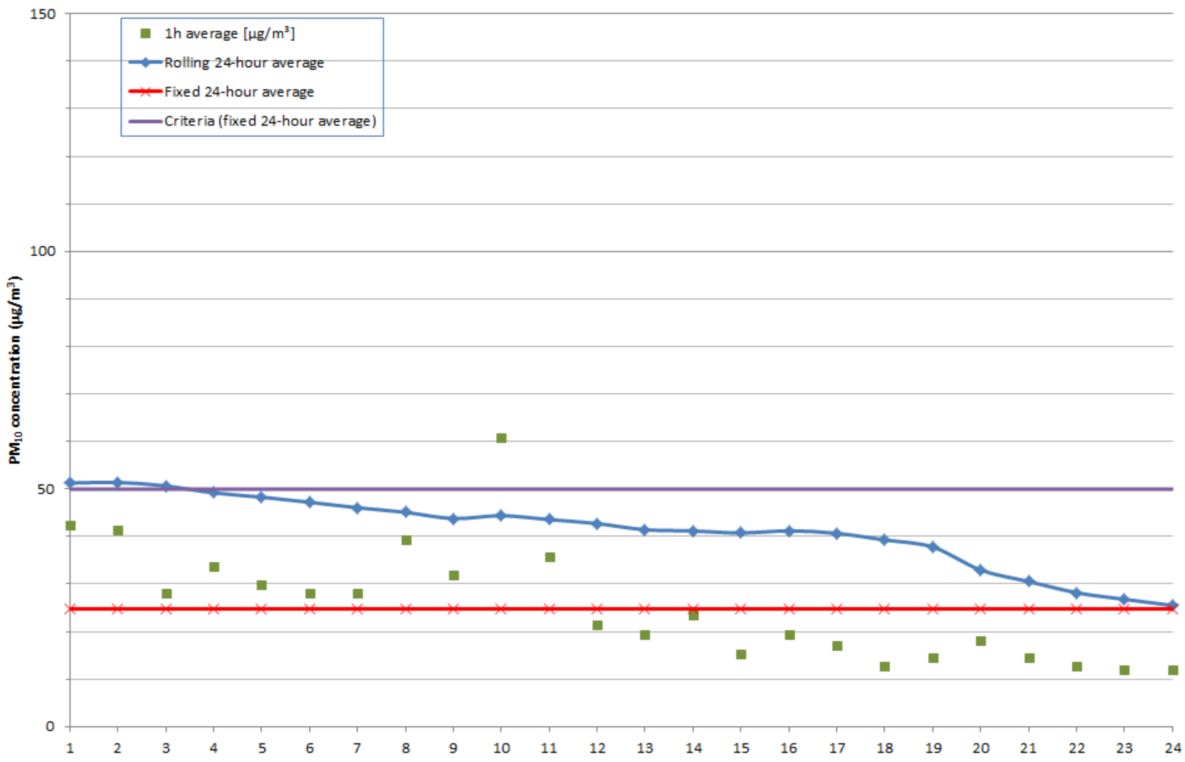


Figure 9

Muswellbrook Central EPA Monitor – PM_{10} Concentrations (21 October 2012)

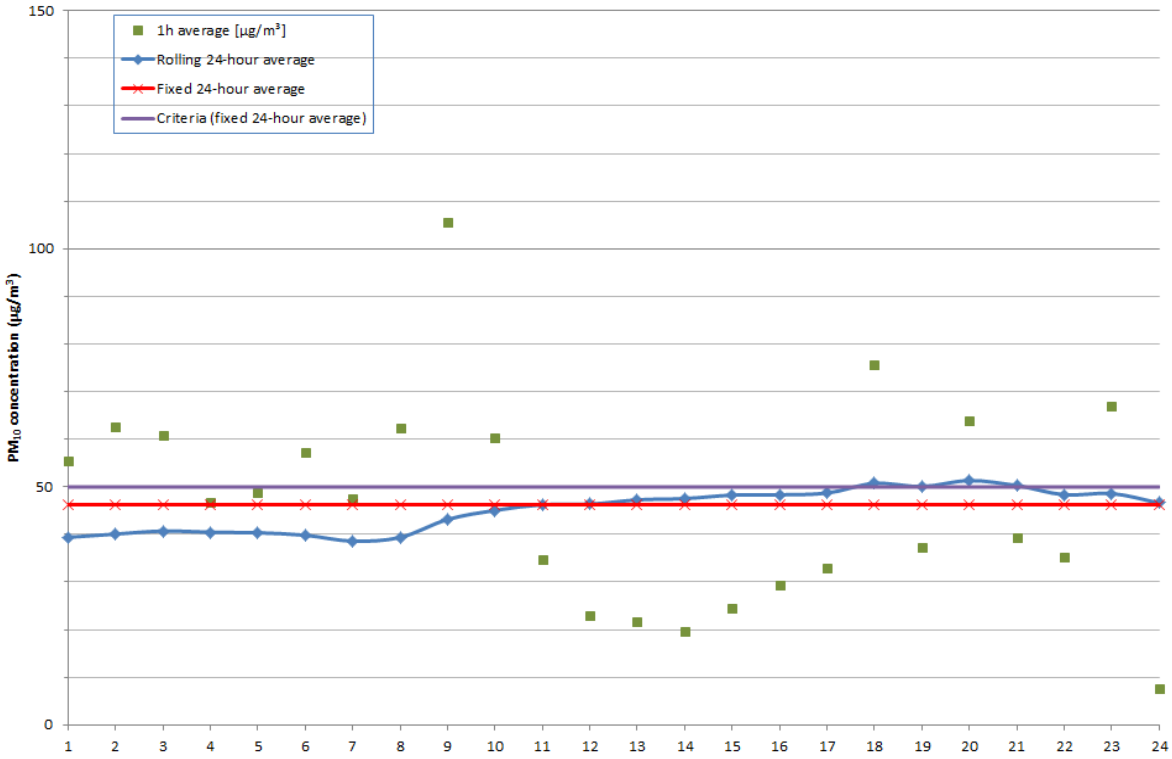


Figure 10

Muswellbrook Central EPA Monitor – PM_{10} Concentrations (7 November 2012)

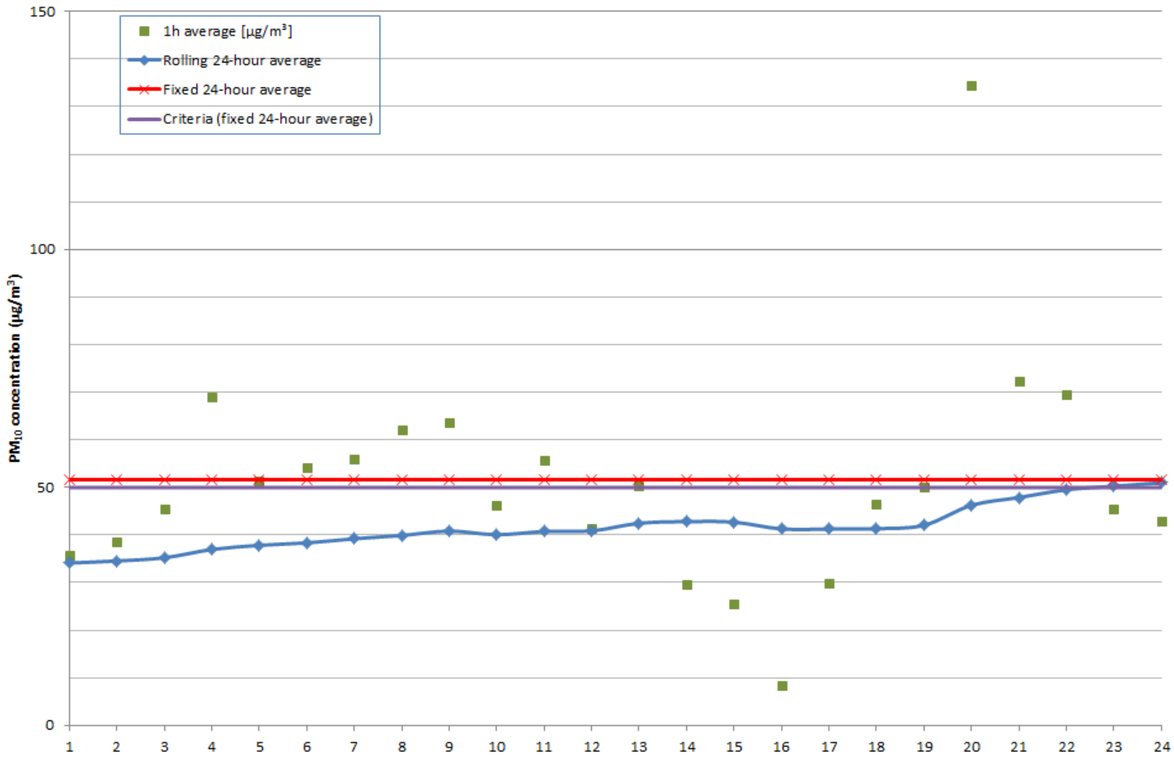


Figure 11

Muswellbrook Central EPA Monitor – PM_{10} concentrations (20 October 2012)

4.2.5 Meteorological Data

This section responds to the submissions raised by HTBA regarding the suitability of the meteorological data that has been used for and referenced in the air quality impact assessment (see Appendix F of the EA).

Submission: SIG13

As discussed in the air quality impact assessment, 2005 was selected as a representative meteorological year, given that there was a marked increase in the percentage of measured calm periods (wind speeds less than 0.5 m/s) at Drayton South meteorological station between 2006 and 2010 (see **Table 8**). This data was compared to the nearby Macleans Hill station located at the adjacent Mt Arthur Coal Mine to demonstrate the similarity between data at different stations in the area.

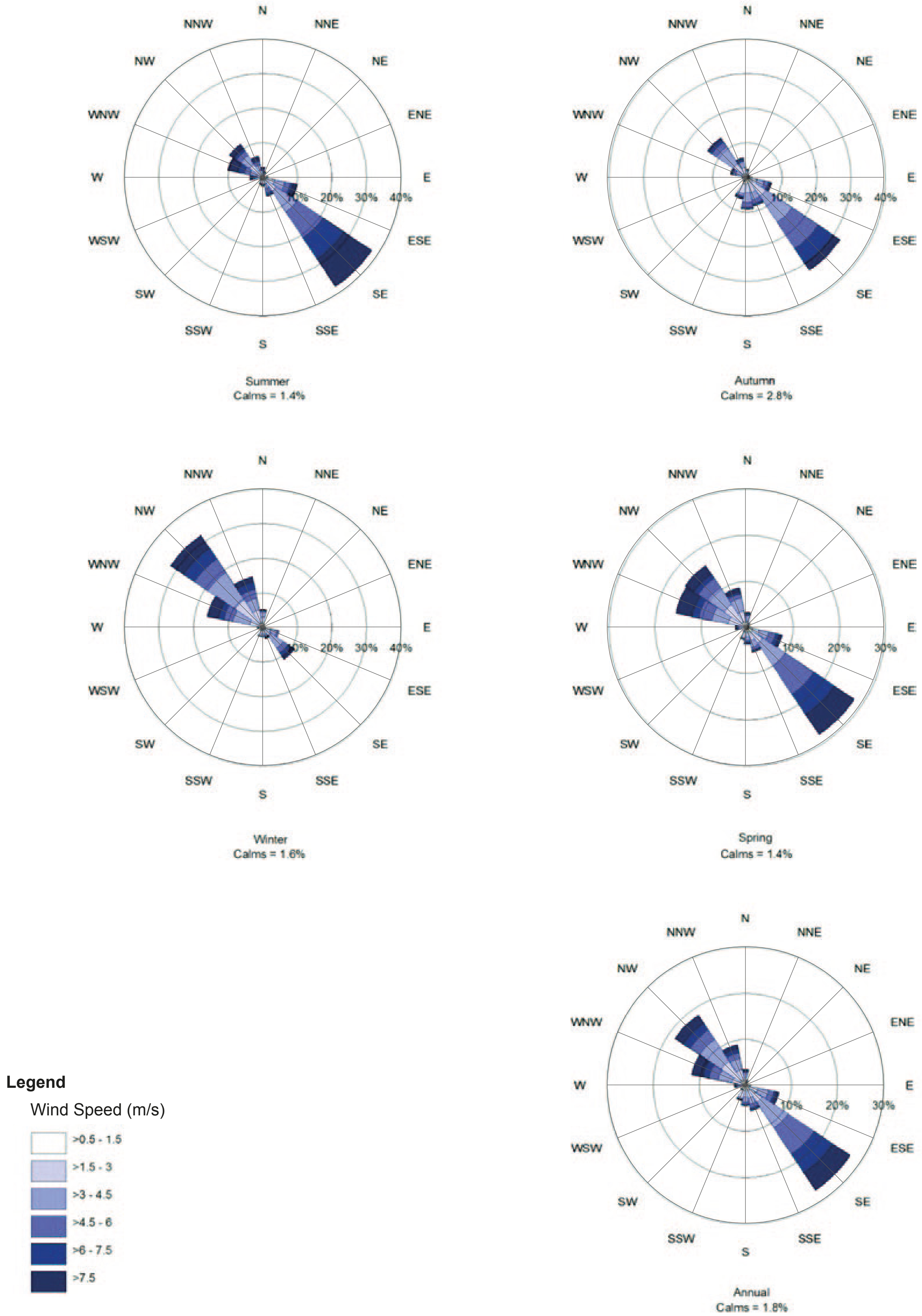
Table 8
Percentage of Calm Periods in Drayton South Meteorological Data

Period	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	%									
All	1.9	2.3	2.2	2.8	5.4	9.9	6.1	11.6	25.3	1.2
Summer	0.9	1.5	1.8	2.3	3.7	6.5	6.2	11.6	15.5	0.6
Autumn	3.8	2.8	3.1	4.5	4.4	13.1	7.6	N.A	30.6	0.6
Winter	1.4	2.6	1.9	2.0	7.7	9.1	5.1	N.A	32.4	1.6
Spring	1.6	2.3	1.7	2.6	5.3	10.9	2.1	N.A	18.2	1.9

N.A. Not applicable

A new meteorological station was installed in November 2010 in the Drayton South area. **Figure 12** illustrates that the data recorded in 2012 compared well with that selected from 2005. However, it is noted there still were more valid hours of data collected in 2005 (8,478 h) compared with 2012 (7,618 h).

Data from a number of meteorological stations across the region was utilised to develop a 3-dimensional meteorological file for the air quality model (TAPM/CALMET). A summary of the data adopted in the air quality impact assessment is presented in **Table 9**.



HB 1049 S02 F04 Drayton Sth EA - Windroses within Drayton South.indd

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Windroses within the Drayton South Area

FIGURE 12

Table 9
Summary of Meteorological Data

Monitor	Wind Speed	Wind Direction	Temperature	Relative Humidity	Sea Level Pressure	Cloud Height	Cloud Amount
Inner and Outer Grid							
Drayton South	x	X	X				
Macleans Hill	x	X	X				
Drayton Mine	x	X	X	x			
TAPM	x	X	X	x	x	x	x
Outer Grid Only							
Williamtown AWS	x	X	X	x	x	x	x
Paterson AWS	x	X	X	x			
Scone AWS	x	X	X	x	x		
Cessnock Airport AWS	x	X	X	x	x		

4.2.6 Best Practice Controls

This section responds to the submissions raised by stakeholders regarding the suitability of best practice dust controls that have been included in the Project and whether further measures can be implemented to avoid and/or minimise the potential air quality impacts of the Project.

Submission: RA2, RA4, RA6, SIG1, SIG4, SIG12, P6, P10, P11, P13, P23, P26 and P30

In preparing the air quality impact assessment (see Appendix F of the EA), a review was completed of all potential control options outlined 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). All controls that were deemed reasonable, feasible and practicable were adopted and used to estimate dust emissions for the Project (see **Table 10**).

Table 10
Summary of Dust Controls

Mining Activity	Best Practice Control
Pre-strip	Application of water
Hauling on unsealed roads	Grader speed reduction from 16 km/h to 8 km/h
	Watering (standard procedure)
	Dust suppressants (Dust-A-Side or Dust Block)
	Use of larger vehicles (from Year 10)
Wind erosion on exposed areas and overburden emplacement areas	Minimise pre-strip
	Watering
	Vegetative ground cover
Wind erosion and maintenance (coal stockpiles)	Water sprays
	Vegetative windbreaks
Blasting and drilling	Water injection while drilling
Dragline	Minimise drop height
Loading and dumping overburden	Water application
Loading and dumping ROM coal	Three-sided enclosure of ROM bin
	Water sprays at ROM hopper
Conveyors and transfers	Application of water at transfers
Stacking and reclaiming product coal	Variable height stack
	Bucket-wheel, portal or bridge reclaimer with water application

Best practice controls for the Project will be reviewed and augmented in the air quality management plan to be prepared for the Drayton Complex and the associated EPL.

As described in **Section 4.2.2**, Anglo American has committed to implement additional controls into the Project design in order to attempt and reduce further the potential air quality impacts. The inclusion of these additional controls has assisted in reducing the Project's impacts on surrounding receivers and the Hunter Valley air shed.

It should also be noted that it is not possible for all best practice control measures identified 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) to be implemented for each activity as they are intended to be options for consideration and not additive controls. For example, there a number of conveyor options including, (1) wind shielding with a roof or side wall, or (2) wind shielding with a roof and side wall, which cannot both be applied as one is an extension of the other.

4.2.7 Air Quality Management Measures

This section responds to the submissions raised by stakeholders regarding the suitability of proposed air quality management measures that have been included for the Project.

Submission: RA2, RA4, RA6, SIG12, SIG14, P13, P26 and P30

Anglo American has recently installed and is validating a proactive dust and blast fume management system at the existing Drayton Mine in preparation for operations within the Drayton South area, which includes:

- Real time air quality and meteorological monitoring;
- Meteorological forecasting;
- Processes to guide the day to day planning of mining operations;
- Proactive dust mitigation measures;
- Proactive planning to manage potential blast fume impacts;
- Approaches to ensure that air quality criteria are achieved; and
- Procedures for identifying the source(s) contributing to air quality impacts using the air quality and meteorological monitoring network and appropriate investigative tools, such as back track modelling of plume dispersion, as part of an integrated system.

Upon receipt of Project Approval for the Project, Anglo American has committed to preparing a detailed air quality management plan for the Drayton Complex, which would include transition and extension of the proactive dust and blast fume management system to the Drayton South operations.

Anglo American are also working with HVEC regarding the revision of the existing joint acquisition management plan, which includes measures to reduce cumulative impacts (including air and noise) on residences in the Antiene area.

4.2.8 Night Dust Emissions

This section responds to the submission raised by MSC with regard to the potential issues associated with predicting night dust emissions.

Submission: RA6

MSC submitted that 12:00 pm to 12:00 am dust readings have typically been higher than daytime readings. **Figure 13** presents the average of hourly PM_{10} concentrations by hour of day for 2012, as measured at the Muswellbrook Central EPA monitor. This indicates that there is very little difference between the average PM_{10} concentration measured between midnight and midday (approximately 20 $\mu g/m^3$) and that measured between midday and midnight (approximately 24 $\mu g/m^3$). However, there are clear peaks in the measured concentrations, which occur during both the morning and evening peak commuter travel times. It also noted that the average PM_{10} concentrations decrease after 7:00 pm and don’t start to increase again until 5:00 am.

The measured PM_{10} concentrations depend not only the type and quantity of dust generating activities that are occurring but also the prevailing meteorology, predominately the stability of the atmosphere, which determines how well particle emissions disperse (or do not). Typically the atmosphere is more unstable during the daytime, resulting in better dispersion of particle emissions, and hence lower measured concentrations.

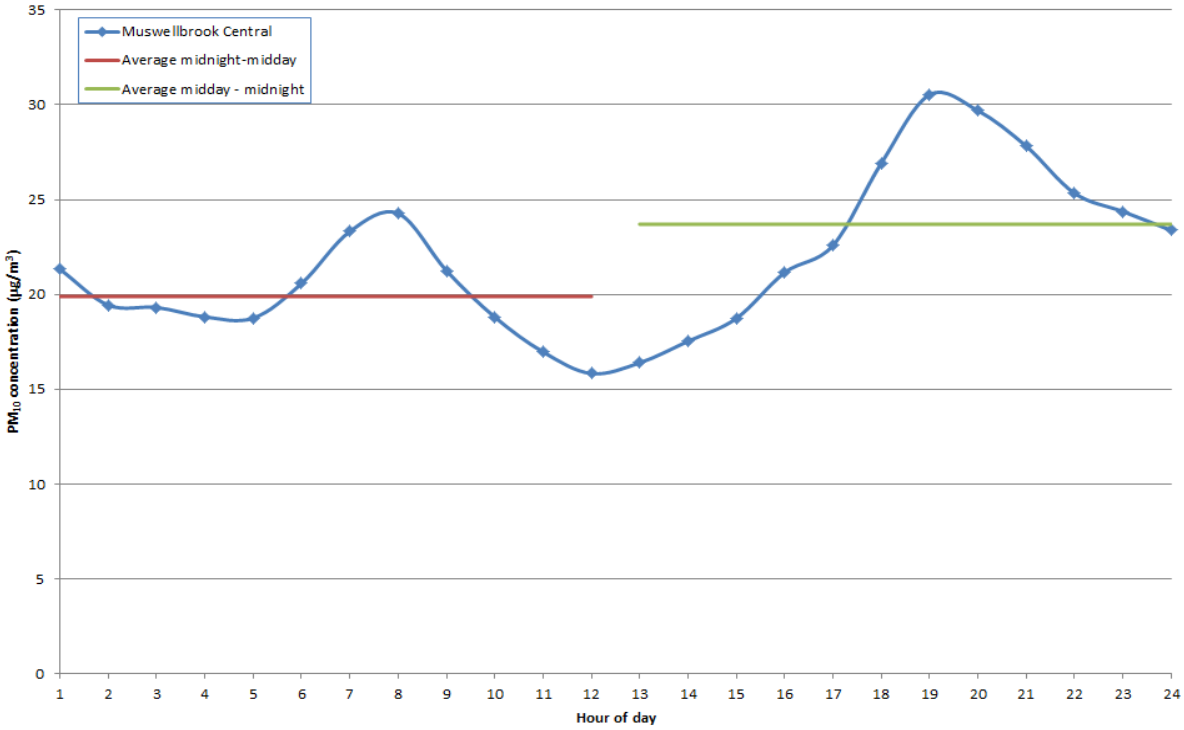


Figure 13

Muswellbrook Central EPA Monitor – Average PM_{10} Concentrations by Hour of Day (2012)

4.2.9 Health

This section responds to the submissions raised by stakeholders regarding the potential health impacts associated with increases in dust emissions.

Submission: RA6, RA11, SIG1, SIG2, SIG3, SIG4, SIG5, SIG9, SIG10, SIG13, SIG16, P3, P6, P7, P8, P10, P12, P13, P15, P16, P17, P20, P21, P22, P23, P24, P25, P26, P29, P31, P32, P33, P34, P38, P40 and P41

Residents of the Hunter Valley live in an area with a high number of open cut coal mines and power stations. A number of stakeholders assert that people living in this area are at a greater risk of disease and death associated with the exposure to air pollutants. In response, NSW Health completed an analysis of respiratory and cardiovascular diseases and cancer health data for the Hunter New England Health Area Service (NSW Health, 2010).

The statistically-based study covered a wide range of diseases but focused on diseases and causes of death that are known to be associated with exposure to air pollutants. The study covered areas where the population would clearly be exposed to emissions from mining (e.g. Singleton and Muswellbrook and surrounding areas) and areas too distant from mining to experience significant exposure from mining emissions (e.g. Tamworth, Armidale, etc.). The study was based on a geographical analysis and did not make direct use of air quality data. At the time the review was complete, no suitable ambient air quality data existed in the Hunter Valley.

The study provided insights into the incidence of various categories of disease and the use of health services. The factors affecting the measures of health that are examined in the study are complex and it is difficult to provide a brief summary of these findings, however, some observations are pertinent.

For example, asthma is of concern to the community and the rates of asthma separation for hospitals in the area for the period 2004 to 2009 shows that Muswellbrook, which would be expected to be affected by mining emissions, is higher than the NSW average. However, this rate is lower than Liverpool Plains, which would not be expected to be significantly affected by mining emissions.

Singleton, which would be expected to be affected by mining emissions, experiences separation rates lower than Muswellbrook and lower than the NSW average. These types of findings undermine a hypothesis that mining emissions and the air pollution levels that exist in the study areas are leading to increased rates of asthma. It would of course still be appropriate to investigate whether mining emissions contribute to increased rates of asthma, however, the data suggests that other factors appear to be more important, which illustrates the complexity of the issue.

From the information presented in *Respiratory and cardiovascular diseases and cancer among residents in the Hunter New England Area Health Service* (NSW Health, 2010), it is reasonable to conclude that significant differences in the statistical measures of health are observed in the different areas studied. However, it is also reasonable to conclude that the data do not point to areas where mining takes place as having significantly different health outcomes compared with those where mining does not occur. The data appear to suggest that other factors that influence health (e.g. lifestyle and population make up) and other factors, including non-lifestyle factors (e.g. the way different communities use available health services), are more important than the presence or absence of open cut mines in determining health statistics.

NSW Health does not conclude that adverse health effects in this area are directly attributable to air pollutants generated from coal mining or coal-fired power generation. Instead, NSW Health is of the opinion that further investigation is required to determine if there is a link between the air quality in the Hunter region and increased risk of illness and death associated with this exposure.

Since the NSW Health review was completed, the EPA has established the Upper Hunter Air Quality Monitoring Network, the data from which is demonstrating that in general, air quality impact assessment criteria are met in populated areas (see **Section 4.2.2**).

The finer $PM_{2.5}$ particles are considered to be of the greatest concern owing to their impact on human health. Given that there are multiple sources of $PM_{2.5}$, including mining, wood smoke from solid fuel heaters and other forms of combustion (e.g. road and rail transport, coal-fired power generation and coal-seam spontaneous combustion), NSW Health and the EPA commissioned a research study to better understand the composition and source of fine particles in the Upper Hunter. The fine particle characterisation study is due for completion in June 2013 and will assist in determining:

- The major sources contributing to $PM_{2.5}$ particle levels in the Upper Hunter, including the townships of Singleton and Muswellbrook, and their relative importance; and
- Whether there are any weekly and seasonal changes in $PM_{2.5}$ particles in the Upper Hunter.

It is understood that the EPA will use this data to assist in the development of government programs aimed at reducing fine-particle pollution and also feed into potential future studies in the region.

4.2.10 Rainwater Tanks

This section responds to the submissions regarding the potential health impacts associated with increases in dust emissions and impacts on rainwater tanks.

Submission: RA6, RA11, SIG1, SIG2, SIG3, SIG4, SIG5, SIG9, SIG10, SIG13, SIG16, P3, P6, P7, P8, P10, P12, P13, P15, P16, P17, P20, P21, P22, P23, P25, P24, P26, P29, P31, P33, P34, P40 and P41

A number of stakeholders raised concern that fine dust from mining operations containing heavy metals (including lead) was exceeding national guidelines, accumulating in tank water, and giving rise to increased respiratory and other illness. In response, a risk assessment was completed by the University of Queensland on behalf of three Hunter Valley mine operators, namely, Ashton Coal Pty Ltd, Integra Coal Operations and BHP Billiton Energy Coal Pty Ltd (Noller, 2009) to address this exact issue. The study also measured lead levels at residences in proximity to coal mine operations in Camberwell and Muswellbrook with reference sites distant from mining activity.

It is important to note that the air quality impact assessment undertaken for the Project (see Appendix F of the EA) did not predict any exceedances of the relevant dust deposition criteria at any private residences, either due to the Project alone or when considering cumulative impacts.

Noller (2009) collected and analysed water samples directly from rainwater tanks and sludge samples from the bottom sediment layer of the tanks. In addition, to determine if there is a potential for the dust to generate high lead levels in tank water, samples of house dust from floor wipes, window sill and trough wipes were also collected and analysed for lead content.

Ambient air samples of TSP were analysed for lead content, together with sampling and analysis of fines from overburden, coal and topsoil.

Tank Water and Sludge Analysis

Noller (2009) found that the tank water showed no exceedance of the *Australian Drinking Water Guideline* (NHMRC, 2011) for lead in any of the water samples. There was no significant difference in drinking water lead levels between houses with tanks close to coal mining operations and that obtained from background sites, including Newcastle town water.

Whilst the sludge in tanks contained lead, it is not being transferred to water. The high pH of the tank water (> 7.0) ensures that lead is not present in solution from any sludge. Some tanks contained more sludge than others, however it was noted that these tanks may not have been cleaned for some time and at some sites no cleaning had ever been undertaken. The *Private Water Supply Guidelines* (NSW Health, 2008) recommends that sludge is cleaned from tanks every two years. Noller (2009) also noted that the mean concentration of lead in sludge is similar to the mean of selected tanks sludges (184 milligrams (mg)/kilogram (kg)) found in Brisbane and associated with urban sources.

Overburden, Coal and Topsoil Analysis

It is unlikely that the dust from mines is the cause of high lead levels found in some sludge samples. Average levels of lead measured by Noller (2009) in overburden (13 mg/kg), coal (15 mg/kg) and topsoil samples (16 mg/kg) were within the range for lead in Australian coal (2 to 14 mg/kg) and have significantly lower percentage than found in the sludge. It is more likely that sites with higher concentration of lead in the sludge could be due to historical lead paint, roof materials, lead based solder etc.

Total Suspended Particulate Results

Noller (2009) found that the TSP results of ambient air showed no detectable lead, and as such it would be unlikely to exceed the NEPM ambient air quality criteria.

Management Measures

Regardless of the research showing that mining operations are unlikely to contribute metal contamination to tanked rainwater, health and aesthetic hazards for rainwater collected in tanks can be minimised by sensible preventative management procedures, as detailed in the *Guidance on Use of Rainwater Tanks* (enHealth, 2010). An example of some of the sources potential health and aesthetic hazards, and preventative measures identified by the Environmental Health Committee of the Australian Health Protection Committee are presented in **Table 11**.

Table 11
Sources of Potential Health and Aesthetic Hazards and Preventative Measures

Health Hazard	Cause	Preventative Measure	Monitoring	Corrective Action
Lead contamination	Lead based paints and primers on roofs.	Do not collect rainwater from painted with products containing high lead concentrations (e.g. pre-1970s paint). When painting roof, check suitability with paint retailer.		
	Uncoated lead flashing on roofs.	Paint existing material or use pre-coated products.	Inspect roof and gutters every six months.	Use coated lead flashing or alternative materials on new roofs. Paint existing uncoated flashing.
	Increased corrosion of metals due to low pH from long periods of contact between rainwater and leaves.	Keep gutters clean. Install leaf protection devices on gutters.	Inspect roof and gutters every six months.	Clean gutters. If large amounts of leaves are detected on regular inspections, clean more often.
Faecal contamination from birds and small animals	Overhanging branches on roof.	Prune tree branches. Install first flush device.	Check tree growth every six months. Check device after rainfall.	Prune branches. Empty contents of device after rainfall.
Coloured water	Accumulated damp leaves in gutter.	Keep gutters clean. Install leaf protection devices on gutters.	Inspect roof and gutters every six months.	Clean gutters. If large amounts of leaves are detected on regular inspections, clean more often.

Adapted from Table 2 and Table 3 enHealth (2010)

NSW Health (2008) also provides the following recommendations on measures to avoid or minimise rainwater quality problems:

- Regularly clean the roof and gutters collecting rainwater to remove leaves, bird droppings and other organic matter. These can be a source of bacteria and intestinal parasites. They can also cause taste and odour problems or be a source of nutrients to promote the growth of microorganisms;
- After a dry spell, divert water from the first rainfall using a first flush or bypass device. This reduces the amount of contaminants entering the tank;
- Remove overhanging tree branches that may drop leaves into gutters;
- Paint or remove any lead flashings used in the roof construction;
- Install screens on tank inlets and overflows to prevent the entry of leaves and small animals. Check the screens regularly to prevent tanks becoming breeding sites for mosquitoes;
- Tanks should be examined for build-up of sediments every two to three years or if sediments are seen in the water flow. Any build up needs to be removed (desludged) as sediments can be a source of contamination, off-tastes and odours. Sediment can be removed by siphoning the tank without emptying it, or by completely emptying the tank for a thorough clean; and
- If the water supply has not been used for 24 h or more, and water has been stagnant in pipes, copper or lead can build up in the water, it is recommended that the pipes be flushed for a few minutes until fresh water flows through from the tank. The flushed water can be used safely on the garden.

As noted by NSW Health, it is good practice for any rain water system in any location to install a simple first flush system to prevent particulate matter (or any other undesirable materials) that have collected on the roof being washed into the rain water tank.

Given that the air quality impact assessment completed for the Project (see Appendix F of the EA) did not predict any exceedances of the relevant dust deposition criteria at any private residences, either due to the Project alone or when considering cumulative impacts, no further mitigation measures are considered necessary.

4.2.11 Existing Drayton Mine Air Quality Impacts

This section responds to the submissions raised by the public in relation to Drayton Mine's existing operational air quality, compliance with relevant criteria and the impacts at receivers.

Submission: P17 and P36

Two Antiene area residents noted consistent and unacceptable dust levels as a result of existing operations at Drayton Mine. These concerns were investigated and compared against Drayton Mine's environmental performance records for air quality management as outlined in a recent Annual Review (Anglo American, 2012).

In 2012, TSP and PM_{10} levels were compliant with relevant annual average air quality impact assessment criteria at all private receivers. Generally, dust deposition achieved the annual average air quality impact assessment criterion; however, this was exceeded at monitoring station 2197 with a reading of approximately 5 gram (g)/square metre (m^2).

To manage dust from existing operations, Drayton Mine conducts activities in accordance with an approved air quality management plan, monitoring network and conditions of its revised EPL, which accounts for the site specific Pollution Reduction Program. Real-time monitoring of operations is now undertaken on site to assess dust levels against relevant licence and approval conditions. This system provides accountable personnel with information required to implement appropriate mitigation and management controls to keep dust to an acceptable level through a Trigger Action Response Plan linked to the air quality management plan.

4.3 GREENHOUSE GAS AND CLIMATE CHANGE

This section responds to the submissions raised by stakeholders regarding the Project's contribution to increases in greenhouse gas emissions.

Submission: SIG2, SIG8, SIG11, SIG12, SIG13, P14, P18, P22, P28, P31 and P37

The air quality and greenhouse gas impact assessment (see Appendix F of the EA) was undertaken in accordance with the *Greenhouse Gas Protocol* (WRI/WBCSD, 2004), the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (DCCEE, 2008) and the *National Greenhouse Accounts Factors 2011* (DCCEE, 2011).

The *National Greenhouse Accounts Factors 2011* (DCCEE, 2011) defines three scopes (or emission categories) consistent with those defined by the *Greenhouse Gas Protocol* (WRI/WBCSD, 2004). The scopes relative to the Project include:

- Scope 1 – Accounts for direct emissions from sources within the Project Boundary, such as diesel usage, blasting and methane released during mining;
- Scope 2 – Accounts for indirect emissions from the consumption of electrical energy used in coal processing; and
- Scope 3 – Accounts for all other indirect emissions that are a consequence of the organisation's activities but are not from sources owned or controlled by Anglo American, including:
    - Consumption of purchased electrical energy (indirect emissions from the extraction, production and transport of fuel burned at generation and the indirect emissions attributable to the electricity lost in delivery in the transmission and distribution network); and
    - Consumption of fossil fuels (indirect emissions from the extraction, production and transport), which includes diesel usage on site, fuel usage in rail and sea transport of product coal and burning of product coal.

Table 12 indicates that approximately 96% of the annual average carbon dioxide equivalent (CO_2-e) emissions generated by the Project are defined as Scope 3, which account for emissions almost exclusively due to the usage (i.e. combustion) of product coal.

Table 12
Estimated Annual Average Greenhouse Gas Emissions

Activity	Scope 1	Scope 2	Scope 3	Annual Emissions
	(t CO_2-e)			
Diesel Consumption	87,665	-	6,685	94,350
Electricity Consumption	-	80,847	16,351	97,198
Fugitive Methane	219,275	-	-	219,275
Explosive Use	3,387	-	-	3,387
Transportation of coal (Rail)	-	-	11,899	11,899
End Use of Coal	-	-	8,883,833	8,883,833
Total (Per Annum)	**310,326**	**80,847**	**8,918,769**	**9,309,941**

The product coal from the Project will be exported overseas. As such, emissions from the burning of this coal will not be included in the calculation of CO_2-e emissions from NSW. It is accepted that no matter where the coal is burnt the CO_2-e emissions will add to the global CO_2 load. However, only the Scope 1 and Scope 2 CO_2-e emissions from the Project are included in NSW CO_2-e emission inventory. The Scope 3 CO_2-e emissions that occur within NSW (e.g. rail transport) will be accounted for in the State's totals as emissions released by the railway operator.

The total emissions for NSW in 2010 (the latest year of validated data) were 157 Mt CO_2–e (NSW EPA, 2012). The average annual emissions estimated for the lifetime of the Project (Scopes 1 and 2) are 0.39 Mt CO_2–e/annum, which equates to approximately 0.25% of the total emissions for NSW in 2010. Therefore, the Scope 1 and 2 emissions of the Project will only minimally increase the total emissions for NSW.

Globally, in excess of 44.1 gigatonnes/annum of CO_2-e are currently estimated to be emitted to the atmosphere (WRI, 2011). On this basis, average annual emissions over the lifetime of the Project from the mining, transportation and burning of coal are estimated to be 0.02% of the current global annual anthropogenic CO_2–e emissions. Therefore, the increase in global greenhouse gas emissions will be negligible due to the Scope 3 emissions generated by the Project.

4.3.1 Climate Change

This section responds to the submission raised by HTBA regarding the Project's potential contribution to regional climate change and how this may impact on localised meteorological conditions and potentially influence the predicted dust emissions for the Project.

Submission: SIG13

It is important to note that measurable changes to the climate have occurred over a long period of time when compared to the anticipated 27 year life of the Project. There are a number of uncertainties associated with climate change modelling. Furthermore, the predicted short term changes are no greater than are evidenced on a year-to-year basis.

In 2007, CSIRO released a report detailing the most recent assessment of observed climate change in Australia, the likely causes and projections of future changes for the period between 2030 and 2070. The predicted projections are based on low, mid-range and high greenhouse gas emission scenarios. These scenarios were developed by the Intergovernmental Panel on Climate Change and are based on various assumptions regarding demographic, economic and technological factors likely to influence future emissions. The 50^{th} percentile (the mid-point of the spread of model results) provides a best estimate result while the 10^{th} and 90^{th} percentiles (lowest 10% and highest 10% of the spread of model results) provide a range of uncertainty.

Projections are given for 2030, 2050 and 2070 as an estimate of the average climate under future greenhouse gas emission scenarios taking into account the consistency among climate models. Individual years show some variation from this average. For the air quality and greenhouse gas impact assessment (see Appendix F of the EA), only the projections to 2030 have been considered.

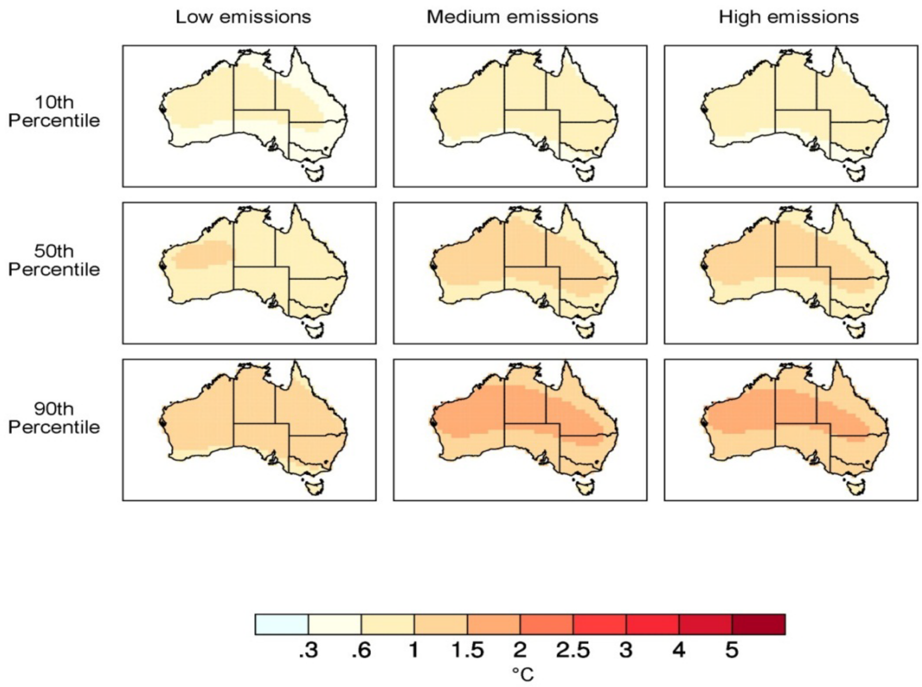
Having regard to the work undertaken by CSIRO (2007), the following sections discuss the predicted changes in the Australian climate and how various factors may affect the air quality modelling results as presented in Appendix F of the EA.

Temperature

CSIRO (2007) concluded that the change in mean annual temperatures over the Hunter Valley in NSW is expected to increase by 0.6 to 1.0°C by 2030 (see **Figure 14**). An increase in the frequency of hot days and warm nights is predicted to accompany this shift in mean temperatures. In this regard, the impact on predicted ground level dust concentrations generated by the Project due to changes in air temperature is likely to be minimal.

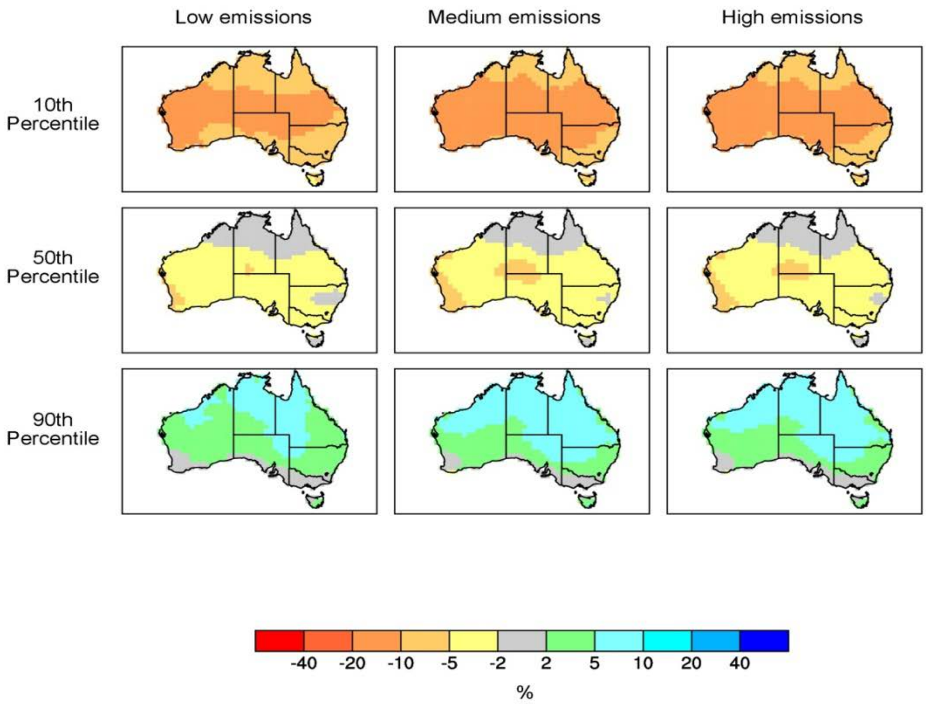
Rainfall

CSIRO (2007) concluded that the annual rainfall in NSW is likely to vary between ± 2 % by 2030 (see **Figure 15**). This is predicted to be accompanied by an increase in the number of dry days. In this regard, a drier environment may marginally increase the predicted ground level dust concentrations generated by the Project due to a higher incidence of wind erosion.



CSIRO (2007)

Figure 14
Predicted Temperate Change by 2030



CSIRO (2007)

Figure 15
Predicted Rainfall Change by 2030

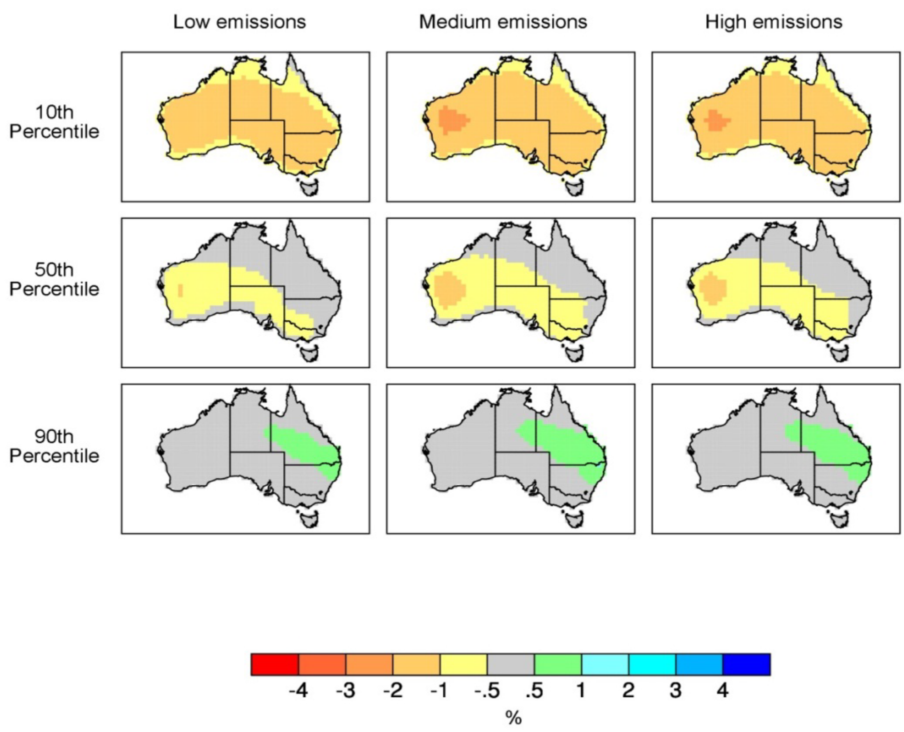
Humidity

CSIRO (2007) concluded that the relative humidity across Australia is predicted to decrease slightly in the order of a 1% decline by 2030 (see **Figure 16**). Simulations accompanying the climate modelling suggest a 2% increase in evapotranspiration in northern and eastern Australia by 2030 (see **Figure 17**).

Drought conditions are expected to occur more frequently over most of Australia. This is likely to result in reduced soil moisture content, which may contribute to a marginal increase in the predicted ground level dust concentrations generated by the Project due to a higher incidence of wind erosion.

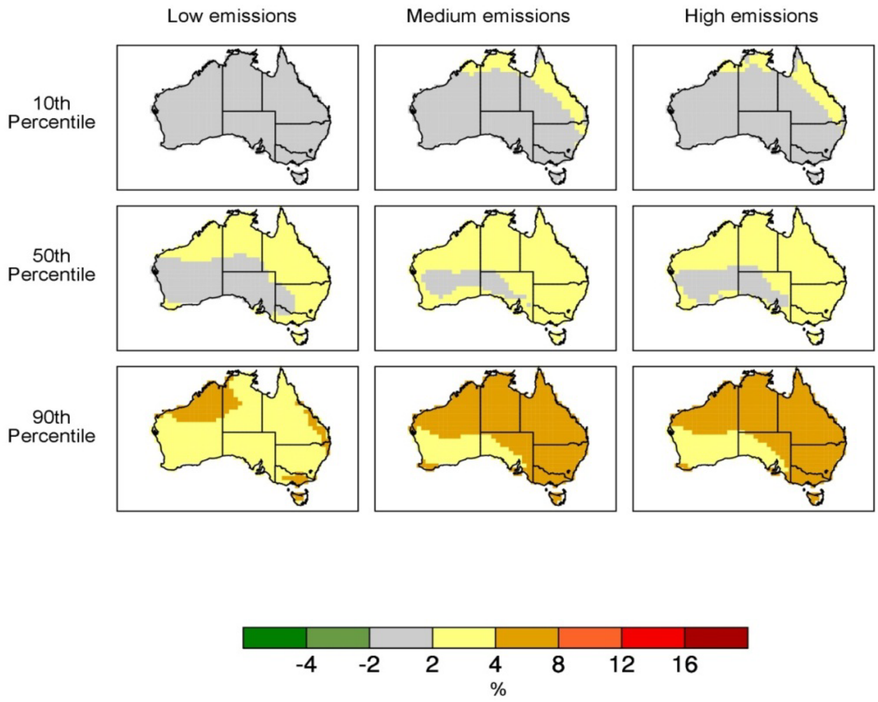
Wind Speed

Projected changes in wind speed are more uncertain than other projections and appear to be confined largely to coastal areas. CSIRO (2007) concluded that mean 10m wind speeds in NSW is expected to vary between ± 2 % by 2030 (see **Figure 18**). In this regard, wind speed changes may marginally increase the predicted ground level dust concentrations generated by the Project due to a higher incidence of wind erosion and better dispersion over a wider area.



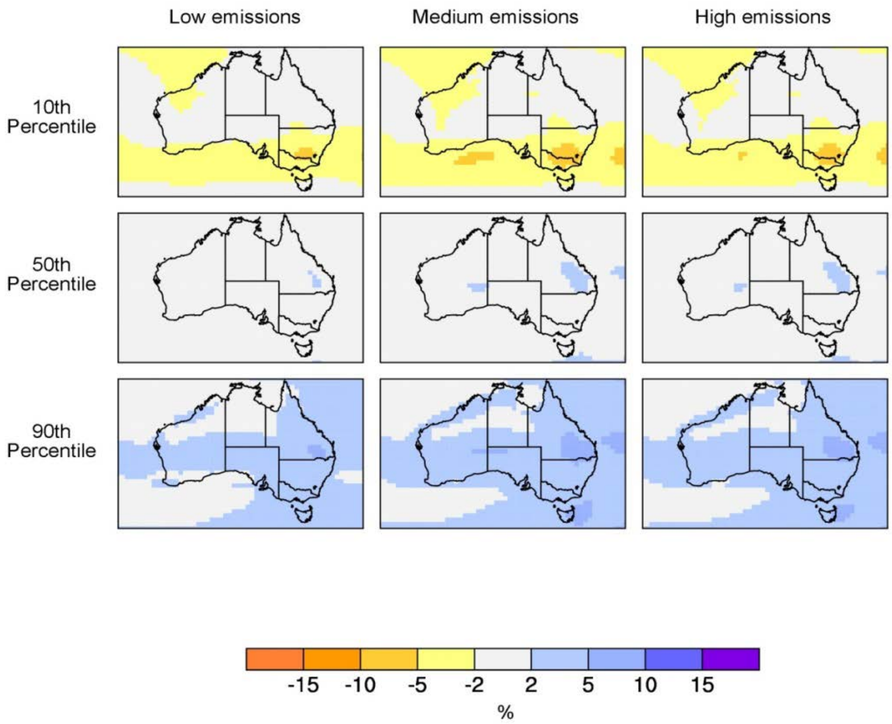
CSIRO (2007)

Figure 16
Predicted Relative Humidity Change by 2030



CSIRO (2007)

Figure 17
Predicted Evapotranspiration Change by 2030



CSIRO (2007)

Figure 18
Predicted Wind Speed Change by 2030

4.3.2 Coal Dependency

This section responds to the submission raised by stakeholders calling for coal production to be curtailed and replaced with non-carbon energy sources.

Submission: SIG2, SIG5, SIG8 and SIG11

BZE (2010) has published the *Zero Carbon Australia Stationary Energy Plan*, which presents a strategy for replacing carbon based energy sources with renewable alternatives within the next decade. The need to transition to non-carbon energy sources is also recommended in *Laggard to Leader: How Australia Can Lead the World to Zero Carbon Prosperity* (BZE, 2012).

Studies by the International Energy Agency, an autonomous agency, indicate that the phasing out of coal generated electricity is not possible within the timeframes suggested by BZE. The IEA acknowledges that there will be increasing reliance on renewable energy sources to meet the world's energy demands in the future. However, the reliance on coal and other fossil fuels is expected to continue for decades. The International Energy Agency's annual publication titled *Electricity Information* (2012) states:

> *"Shares of renewable energy (RE) supply have risen over the past years and projections show the trend is likely to continue as countries transition to a low-carbon economy. Renewable energy is one of the key solutions to the world's energy challenges. However, transitions take time, especially when they are on the scale needed to re-invent the energy system. Even though in the coming decades the share of renewables will rise, fossil and other alternative fuels will still play a major role."*

For the duration of the Project, the world will continue to be dependent on fossil fuels for supplying a major portion of the world's electricity. The Project is therefore essential for satisfying global energy demands whilst non-carbon energy sources are progressively developed.

4.4 NOISE

4.4.1 Assessment Approach

Noise Model Method

This section responds to the submission raised by United Pastoral regarding the adequacy of time average approach adopted for the noise model.

Submission: SIG14

RCA Acoustics on behalf of United Pastoral notes that the noise model adopts a time average approach whereby a mobile noise source spends a proportionate amount of time in several locations. RCA Acoustics asserts that time averaging effectively discounts the noise levels of equipment and does not provide an accurate representation of noise at an affected receiver.

Each noise model scenario has been carefully constructed to calculate the $L_{Aeq(15min)}$ noise level (energy average noise from a source, and is the equivalent continuous sound pressure level over 15 minutes) during a reasonable worst case situation with all proposed equipment operating (subject to equipment maintenance periods and other practical equipment availability issues) under prevailing weather conditions, as required by the *Industrial Noise Policy* (EPA, 2000).

An item of mobile equipment, such as a haul truck, does not operate continuously in a specific location but moves along a route from a loading point to a disposal point. In this regard, it is appropriate to model the equipment in a number of locations for a proportion of time along a route. For less mobile equipment, such as a drill, the noise model considers sources on upper benches and lower benches for a portion of time. Given that a mine cannot practically operate with all equipment working simultaneously on the upper benches, it is appropriate to model the equipment between different bench levels.

RCA has concentrated on the discounting effect of time averaging while ignoring the consequent increase in the number of modelled sources. For example, the time averaging process replaces a single haul truck source (sound power level of 113 decibels (A-weighted scale) (dBA)) with two separate 50% sources (with a combined sound power level of 113 dBA). In some cases, four or eight partial haul truck sources have been used. With no change to total modelled sound power levels as a result of the distribution of mobile noise sources, there is no inappropriate discounting and the noise model correctly predicts $L_{Aeq(15min)}$ noise levels at receivers. This aspect of the assessment has also been carefully reviewed by the EPA and no adverse or other comments have been received from them.

Noise Model Assumptions

This section responds to the submission raised by United Pastoral regarding the assumption adopted in the noise model for the shielding of operational noise.

Submission: SIG14

RCA Acoustics on behalf of United Pastoral asserts that the acoustic impact assessment (see Appendix G of the EA) assumes all equipment operates behind a 6m high wall and as such incorrectly predicts the impacts at receivers.

Anglo American has adopted a number of noise mitigation and management measures to minimise or avoid noise impacts at the closest receivers, including Arrowfield Estate. One such measure is the operation of some equipment in shielded locations of the mining areas during the more sensitive night period, which is reflected in the noise model. All other equipment has been modelled in exposed locations of the mining areas during the less sensitive day period. In this regard, the statement that the noise model assesses all equipment behind a 6 m high wall as made by RCA Acoustics in incorrect.

Additional mitigation and management measures to be adopted for the Project are outlined in **Section 4.4.8**.

RCA Acoustics present independently calculated noise levels for equipment operating on exposed surfaces within mining areas closest to Arrowfield Estate. However, does not disclose detailed assumptions as to how such noise levels were calculated. Furthermore, any such calculations would not be relevant to the Project without considering the topography, source sound power levels, weather conditions and other relevant factors that apply to each modelled scenario described in the acoustics impact assessment. As such, these calculations should be discounted.

Adopted Criteria

This section responds to the submission raised by United Pastoral regarding the suitability of the noise criteria adopted in the acoustics impact assessment (see Appendix G of the EA).

Submission: SIG14

RCA Acoustics on behalf of United Pastoral acknowledges that the acoustics impact assessment adopts the criteria outlined in the *Industrial Noise Policy* (EPA, 2000), however, suggests that the assessment does not properly set a baseline against which the total noise impacts can be considered.

The acoustic impact assessment adopts the current best practice methods as stipulated in the *Industrial Noise Policy* (EPA, 2000), which requires A-weighting be applied to background, criteria and Project noise levels. As the A-weighting frequency scale as described in *Australian Standard* (AS) *1259 Acoustics – Sound Level Meters* takes into account the human ear's sensitivity to noise of different frequencies, the noise criteria and predicted noise levels described in the acoustics impact assessment are considered relevant and appropriate.

Furthermore, the *Industrial Noise Policy* (EPA, 2000) is designed to impose a limit on the total noise produced by industrial developments and to protect the health of the community from noise levels that are invasive or unpleasant.

Noise Source Plots

This section responds to the submission raised by United Pastoral regarding the adequacy of the noise source plots presented in the acoustics impact assessment (see Appendix G of the EA) having regard to the proposed mobile equipment fleet.

Submission: SIG14

RCA Acoustics on behalf of United Pastoral asserts that the noise source plots provided in the acoustics impact assessment are difficult to interpret given its scale and does not reflect the number of equipment stated in the main volume of the EA (e.g. Year 5).

The noise source plots have been presented at the largest possible scale consistent with the preferred A4 format of the report. Care has been taken to include high resolution source location figures to allow the electronic versions of the report to be zoomed in for detailed inspection and verification.

As raised by RCA Acoustics, the main volume of the EA indicates 14 dozers and 17 haul trucks operating in Year 5. Considering typical availability factors of 75% for dozers and 85% for haul trucks (factoring in down time and scheduled maintenance), as advised by Anglo American, this equates to approximately 10.5 dozers and 14.5 haul trucks operating at any one time in Year 5 (see Figures C1 and C9 of the acoustics impact assessment). This accounts for the variations as stated by RCA Acoustics.

4.4.2 Background Noise Levels

This section responds to the submissions raised by stakeholders regarding the background levels adopted for the assessment of noise at receivers within the vicinity of the Project.

Submission: SIG12 and SIG13

Background noise levels were determined for the Project's acoustics impact assessment (Appendix G of the EA) from a desktop review of EAs for neighbouring developments and through both unattended and attended noise surveys. This method is consistent with the guidelines for measuring and determining background noise levels outlined in the *NSW Industrial Noise Policy* (EPA, 2000). The rating background levels adopted for the Project's receivers (Drayton Mine and Drayton South area) are listed in **Table 13**.

Table 13
Rating Background Levels for Receivers

Receiver Group		Rating Background Level, $L_{A90(15min)}$		
		Day	Evening	Night
Drayton Mine Receivers				
A	Antiene (west and near the New England Highway)	32	32	32
B	Antiene (east and central)	30	30	30
Drayton South Area Receivers				
C	Jerrys Plains (M1), Coolmore Stud (M2)	35	33	33
D	Woodlands Stud (M3), private properties (west and north-west of Drayton South) (M4)	30	30	30

Given the Project's proximity to a number of existing coal mining and power generation operations, industrial background noise levels as measured in previous EAs (Hansen Bailey, 2007 and 2009) were considered in the rating background levels for Drayton Mine receivers.

Receivers along the western extent of the Antiene area and near the New England Highway are subject to increased noise levels when compared to other Drayton Mine receivers (Antiene – east and central). This is due to the proximity and exposure to noise generated from main roads and neighbouring mining operations, including Mt Arthur Coal Mine. As such, a higher rating background level has been adopted at these receivers.

For Drayton South area receivers, the dominant influence on background noise levels is traffic along the Golden Highway.

To measure the background noise levels for these receivers, a long term (unattended) and short term (attended) noise survey was conducted in 2011 at four locations, including:

- Location M1: Eastern corner of Pagan Street and Pearse Street in Jerrys Plains, to the south-east of the Drayton South area;
- Location M2: Adjacent to Strowan Homestead on Coolmore Stud, to the south of the Drayton South area;
- Location M3: Adjacent to a residence on Woodlands Stud, to the south-west of the Drayton South area; and
- Location M4: Approximately 300 m to the west of Edderton Road, to the north-west of the Drayton South area.

The rating background levels for Drayton South area receivers vary given existing topography and exposure to road infrastructure and traffic noise. Receivers within the vicinity of Jerrys Plains (M1) and Coolmore Stud (M2) are subject to increased traffic noise levels when compared to other Drayton South receivers (M3 and M4). This is due to the proximity and exposure to the Golden Highway and the relatively flat topography of this route. As such, a higher rating background level has been adopted at these receivers.

4.4.3 Predicted Noise Impacts

Project Construction Noise

This section responds to the submissions raised by stakeholders in relation to Project construction noise and the predicted impacts at receivers.

Submission: RA4, SIG5 and SIG12

An assessment of predicted construction noise was undertaken as a component of the acoustics impact assessment (Appendix G of the EA). A worst case scenario was adopted for this component of the assessment, which considered the normal operation of Drayton Mine occurring simultaneously with Drayton South construction activities. Mining operations within the Drayton South area will not commence until after the completion of the construction program. As a result, predicted noise impacts from operational activities were not considered when assessing the noise levels for Drayton South area receivers during the construction phase.

The predicted construction noise levels will not exceed the day time intrusive criteria adopted for Drayton Mine receivers. However, it will exceed the night time criteria in the absence of noise mitigation measures and impact on a number of Drayton Mine receivers (see Figure B26 of the acoustics impact assessment, Appendix G of the EA). These exceedances are primarily associated with upgrades to the CHPP to facilitate processing of coal from the Drayton South area.

Similarly, the predicted construction noise levels will not exceed the day time intrusive criteria adopted for Drayton South area receivers with exception to residences at receivers 60, 240 and 250 (see Figure B27 of the acoustics impact assessment, Appendix G of the EA). Intermittent exceedances of the day time intrusive criteria at receivers 240 and 250 are predominantly associated with the construction of the Edderton Road realignment. Construction noise levels of 35 to 38 dBA will be experienced by these receivers during an approximate three month period. Receiver 60, which is owned by HVEC, will experience noise levels of up to 45 dBA from sources required for the construction of the Drayton South mine site facilities and the Edderton Road realignment. The majority of construction activities at Drayton South will occur only during the day.

No exceedances of the evening and night criteria are predicted at any of the Drayton South area receivers.

Anglo American has committed to implementing a range of controls to manage and minimise noise generated by the Project at all receivers. These controls, including those for predicted construction noise impacts, are described further in **Section 4.4.8**.

Project Operational Noise

This section responds to the submissions raised by stakeholders in relation to Project operational noise and the predicted impacts at receivers.

Submission: RA2, RA4, RA6, RA11, SIG1, SIG2, SIG3, SIG5, SIG8, SIG9, SIG10, SIG12, SIG13, SIG14, SIG15, SIG16, P3, P6, P7, P8, P10, P11, P12, P13, P14, P15, P16, P17, P18, P20, P21, P22, P23, P24, P25, P28, P29, P31, P32, P36, P37 and P41

An assessment of predicted operational noise was undertaken as a component of the acoustics impact assessment (Appendix G of the EA). A worst case noise impact scenario was adopted for the assessment, which considered:

- Representative operating locations with some equipment working in relatively exposed sections of the mining area consistent with proposed noise control measures;
- Representative noise levels for the equipment fleet with all operating at full speed and capacity; and
- Prevailing (i.e. noise enhancing) wind and temperature inversion conditions depending on the time period (day, evening or night).

All activities associated with the operation of the Project have been included in the acoustics impact assessment, including the construction of the Houston visual bund, mining operations across representative years and coal processing activities.

In accordance with the *Industrial Noise Policy* (EPA, 2000), the acoustics impact assessment adopted an intrusive criteria for noise generated by the Project alone during the operations phase. The intrusive criteria are set at 5 dBA above the background noise levels for the day, evening and night periods (see **Table 14** and **Table 15**). These criteria are used to determine the audibility of an industrial noise source above other sources.

Table 14 and **Table 15** outlines the predicted noise levels during the operations phase of the Project at Drayton Mine and Drayton South area receivers, respectively. The predicted noise levels for operational activities include all reasonable and feasible noise mitigation and management measures for the Project as outlined in **Section 4.4.8**.

Table 14
Predicted Operational Noise Levels – Drayton Mine Receivers

Residence				Area ≤ 25% of Property				Criteria (dBA)
Receiver	Day (dBA)	Evening (dBA)	Night (dBA)	Receiver	Day (dBA)	Evening (dBA)	Night (dBA)	Day, Evening, Night
382	-	-	-	382	28.3	39.9	37.1	37, 37, 37
386	22.2	32.9	31.4	386	25.3	35.4	34.9	35, 35, 35
387[1]	25.0	35.8	34.4	387[1]	25.2	36.0	35.0	37, 37, 37
399[1]	26.3	37.6	36.6	399[1]	26.4	37.8	36.9	37, 37, 37
390	28.2	39.9	38.3	390	29.0	40.6	38.8	37, 37, 37
398	27.7	39.4	38.2	398	28.1	39.8	38.8	37, 37, 37
400	25.7	36.3	36.3	400	26.0	36.9	36.7	35, 35, 35
401	26.2	36.7	37.2	401	26.4	36.9	37.4	35, 35, 35
402	27.7	38.8	38.5	402	27.7	38.9	38.5	35, 35, 35
403	28.0	38.8	38.6	403	28.3	38.8	38.7	35, 35, 35
411	30.8	34.2	40.1	411	31.0	34.9	40.0	37, 37, 37
418	30.1	33.5	39.3	418	30.1	33.8	39.4	37, 37, 37
419	29.2	32.1	37.9	419	30.5	33.6	39.4	37, 37, 37
420E[2]	28.9	31.8	37.4	420	29.7	33.5	39.4	37, 37, 37
420W[2]	29.2	32.6	38.3					
421	28.3	33.2	38.6	421	28.5	33.9	39.2	37, 37, 37
423	27.9	34.2	38.8	423	27.7	34.2	38.5	37, 37, 37
424	26.2	34.3	37.4	424	26.4	34.7	37.6	37, 37, 37
425	26.6	33.9	37.5	425	26.7	34.0	37.5	37, 37, 37

1 Residences 387 and 399 are under common ownership.

2 Residences 420E and 420W are under common ownership.

Note: Light Teal – a moderate noise impact of between 2 to 5 dBA above the intrusive criteria; and
Dark Teal – a mild noise impact of 2 dBA or less above the intrusive criteria.

Table 15
Predicted Operational Noise Levels – Drayton South Area Receivers

Residence			Area ≤ 25% of Property			Criteria (dBA)
Receiver	Day (dBA)	Evening and Night (dBA)	Receiver	Day (dBA)	Evening and Night (dBA)	Day and Evening/ Night
217N[1]	19.5	32.8	Coolmore Australia	19.8	31.6	40, 38
217S[1]	19.5	32.8				40, 38
219C[1]	21.8	34.6				40, 38
219E[1]	21.6	34.2				40, 38
219W[1]	21.9	35.0				40, 38
227C[1]	22.7	28.2				40, 38
227E[1]	20.2	34.3				40, 38
227W[1]	23.4	29.6				40, 38
228[1]	19.3	29.4				40, 38
-	-	-	Darley Australia	15.8	25.3	35, 35
250	18.1	30.0	249 - 251,254	17.5	30.0	35, 35
226N[2]	27.6	32.3	Arrowfield Estate	26.8	30.9	40, 38
226S[2]	25.8	30.7				40, 38
209	17.3	31.1	209	17.4	31.3	35, 35
211	15.8	30.0	174 - 177,208, 210,211	16.0	30.1	35, 35

1 *Residences are under common ownership (Coolmore Australia)*

2 *Residences are under common ownership (Arrowfield Estate)*

A receiver is deemed to be significantly impacted if the predicted operational noise level exceeds the intrusive criteria by greater than 5 dBA. Significant noise impacts are not predicted at any receivers.

If the predicted operational noise level exceeds the intrusive criteria by 2 to 5 dBA, the receiver is deemed to experience moderate noise impacts. There are seven Drayton Mine receivers associated within the Antiene area (390, 398, 401, 402, 403, 411 and 418) that will experience moderate noise impacts at residences. All seven of these receivers will also experience moderate noise impacts over an area greater than 25% of the property. There are a further four Drayton Mine receivers (382, 419, 420 and 421) that will be subject to moderate noise impacts over an area greater than 25% of the property, however, no impacts are anticipated at residences on these properties (see Figure 44 and 45 of the EA).

A receiver is deemed to experience a mild noise impact if the intrusive criteria are exceeded by less than 2 dBA. There are nine Drayton Mine receivers associated with the Antiene area (399, 400, 419, 420E, 420W, 421, 423, 424 and 425) that will experience mild noise impacts at residences and one receiver (386) that will experience mild noise impacts over an area greater than 25% of the property. Five of these receivers (399, 400, 423, 424 and 425) will also be subject to moderate noise impacts over an area greater than 25% of the property (see Figure 44 and 45 of the EA).

Predicted noise levels will generally be lower than that reported in the *Drayton Mine Extension Environmental Assessment* (Hansen Bailey, 2007) for Drayton Mine receivers. This is a result of additional noise control measures proposed since the documentation for the Drayton Mine Extension was prepared, which have subsequently been included in the noise modelling for the Project.

There are no exceedances of the intrusive criteria for any Drayton South area receivers, including Arrowfield Estate and Coolmore Stud (see Figure 46 of the EA). In this regard, community health will not be impacted by the Project from noise levels that are invasive or unpleasant.

The impacts of noise at Arrowfield Estate and its residences have not been under considered given its current non-operational status. Arrowfield Estate was represented in the acoustics impact assessment as receiver 226. Operational noise generated by the Project at Arrowfield Estate has been assessed and remains below the adopted intrusive criterion of 38 $L_{Aeq(15\ min)}$ in all years and time periods (day, evening and night) with:

- Up to 32.3 $L_{Aeq(15min)}$ predicted at residences in Year 10 under night prevailing conditions; and
- Up to 30.9 $L_{Aeq(15min)}$ predicted over 25% of the property in Year 10 under night prevailing conditions.

Operational noise generated by the Project at Coolmore Stud has been assessed and remains below the adopted intrusive criterion of 38 $L_{Aeq(15\ min)}$ in all years and time periods (day, evening and night) with:

- Up to 35.0 $L_{Aeq(15min)}$ predicted at residences (Receiver 217, 219, 227 and 228) in Year 10 under night prevailing conditions; and
- Up to 31.6 $L_{Aeq(15min)}$ predicted over 25% of the property in Year 10 under night prevailing conditions.

Under the operational conditions assessed, the Project is predicted to result in noise levels up to 2 dBA above the night rating background level of 33 dBA at Coolmore Stud (see **Section 4.4.2**). This increase in noise is often inaudible to the human ear, particularly during the day period when other background noise sources are present.

The potential impacts of predicted operational noise generated by the Project on equine health are discussed in **Section 4.6**.

Anglo American has committed to implementing a range of controls to manage and minimise noise generated by the Project at all receivers. These controls are described further in **Section 4.4.8**.

Cumulative Operational Noise

This section responds to the submissions raised by stakeholders in relation to the Project's assessment and contribution to cumulative noise impacts at receivers.

Submission: RA2, SIG2, SIG3, SIG5, SIG9, SIG10, SIG13, SIG15, SIG16, P3, P6, P7, P8, P10, P11, P12, P13, P15, P16, P17, P20, P21, P22, P23, P24, P25, P28, P29, P30, P31, P32, P37 and P41

An assessment of cumulative noise was undertaken as a component of the acoustics impact assessment (Appendix G of the EA). Various industrial operations were identified within the vicinity of the Project, including Hunter Valley Operations Coal Mine, Mt Arthur Coal Mine and Macquarie Generation's Bayswater and Liddell Power Stations and Hunter River pump station.

In accordance with the *Industrial Noise Policy* (EPA, 2000), the acoustics impact assessment adopted an intrusive criteria for noise generated by the Project and other sources during the operations phase. The purpose of the intrusive criteria is to impose a limit on the total cumulative noise produced by industrial developments in an area. The criteria are also designed to protect the community from noise levels that are invasive or unpleasant.

The intrusive criteria are determined by the nature of the area in which the receiver is located and the level of existing industrial noise. All of the Project's receivers have been conservatively assigned to the '*rural residence*' intrusive category. The intrusive criteria are generally 50 dBA for the day period, 45 dBA for the evening period, and 40 dBA for the night period. However, a modifying factor is applied if the existing industrial noise level is within 6 dBA of the criteria (as defined in Table 2.2 of the *Industrial Noise Policy* (EPA, 2000)). As a result, a modifying factor was applied to the criteria for Drayton Mine (Group A) receivers.

Operational noise levels for each of the relevant cumulative contributors in proximity to the Project were measured as $L_{Aeq(15min)}$ values (energy average noise from a source over a 15 minute period) during short term (attended) noise surveys. A correction factor of – 3 dBA was applied to convert these to $L_{Aeq(9hr)}$ values (energy average noise from a source over a 9 h period) for the purposes of assessing cumulative noise against the night intrusive criteria as specified by the *NSW Industrial Noise Policy* (EPA, 2000). The adopted $L_{Aeq(9hr)}$ noise levels for neighbouring developments considered in the assessment of cumulative noise impacts for the Project are listed in **Table 16**.

Bengalla Coal Mine, Mangoola Coal Mine and the Mt Pleasant Project are located over 10 km from the Project's receivers and are therefore unlikely to contribute materially to cumulative operational noise levels. As such, these operations have not been considered in the impact assessment.

Table 16
Predicted Cumulative Operational Noise Levels

Industrial Noise Source	Existing Noise Levels, $L_{Aeq\ (night)}$					
	Group A	Group B	Group C		Group D	
	Antiene	Antiene	M1	M2	M3	M4
The Project	< 37	< 36	< 30	< 35	< 30	< 35
Hunter Valley Operations Coal Mine	-	-	23	22	-	-
Hunter River Pump Station	-	-	21	21	-	-
Bayswater and Liddell Power Stations	22	22	-	-	-	-
Mt Arthur Coal Mine	35	33	< 25	< 25	< 25	30
Cumulative Industrial Noise Level (Night)	39	38	32	36	31	36
Intrusive Criteria (Night)	38	40	40	40	40	40

The cumulative operational noise levels were found to exceed the conservative night intrusive criteria adopted for Drayton Mine (Group A) receivers in the Antiene area. As a result, receivers 390 and 398 will experience an exceedance of 1 dBA above the night intrusive criteria. The cumulative operational noise level of 39 dBA only occurs during simultaneous noise enhancement from both the Project and Mt Arthur Coal Mine. In the absence of simultaneous noise enhancement for both sources, the cumulative noise level would be 37 dBA, which is within the night intrusive criteria.

All other Drayton Mine (Group B) and Drayton South (Group C and D) receivers will not experience cumulative noise above the night intrusive criteria. In this regard, human health is not considered to be at risk from the effects of cumulative noise generated by the Project and other sources.

Anglo American has committed to implementing a range of controls to manage and minimise noise generated by the Project and cumulatively at all receivers. These controls are described further in **Section 4.4.8**.

4.4.4 Low Frequency Noise

This section responds to the submissions raised by stakeholders in relation to the correction factor adopted for the Project's assessment of low frequency noise and potential impacts at receivers.

Submission: RA4, SIG5 and SIG13

An assessment of low frequency noise generated by the Project was undertaken as a component of the acoustics impact assessment (see Appendix G of the EA) and in accordance with the *NSW Industrial Noise Policy* (EPA, 2000). The policy indicates that when a noise source demonstrates dominant low frequency characteristics, there is evidence to suggest that it can cause greater annoyance than other noise sources at the same level. To account for dominant low frequency noise sources at receivers, the *NSW*

Industrial Noise Policy (EPA, 2000) specifies that a 5 dBA correction factor be applied to the measured or predicted noise levels prior to comparison with relevant criteria.

A 5 dBA correction factor applied to a particular source is reflected in the calculated noise level. If a noise source is the dominant contributor at a receiver, the correction factor will significantly affect the total noise level from all sources.

Conversely, some sources produce a dominant low frequency noise but total noise from these sources may not be significant at a receiver. Under these circumstances, total noise at a receiver may not necessarily show low frequency characteristics and as such a 5 dBA correction factor is not required. For example, components of the Drayton Mine CHPP such as the ROM bin, tertiary sizers/screen and coal treatment unit are acknowledged to be low frequency noise sources, however, measured existing and predicted noise from these sources is insignificant (and currently inaudible) at receivers located generally south of the Project. In this regard, it would not be appropriate to apply a 5 dBA correction factor to total noise levels at these receivers due to inaudible low frequency noise generated by these sources.

The adopted noise modelling method for the Project integrates the 5 dBA correction factor in the sound power level for low frequency noise sources. This allows the correction factor to be applied automatically, where appropriate. It is also the only practical method of applying the correction factor to the predicted noise contours, as the Environmental Noise Model contour calculation does not report received noise levels in frequency bands and does not show the relative contribution of each modelled source.

Low frequency noise levels from the Project are implicitly controlled by the intrusive noise criteria as intended by the *NSW Industrial Noise Policy* (EPA, 2000). As outlined in **Section 4.4.3**, the Project is predicted to contribute up to 5 dBA above the intrusive criteria at select Drayton Mine receivers causing mild to moderate impacts. Low frequency noise generated from the CHPP, select activities within the active mining areas at Drayton Mine and train wagon bunching on the rail loop or Antiene Rail Spur is considered to contribute to the predicted noise impacts at Drayton Mine receivers. No exceedances of the intrusive criteria are anticipated for any Drayton South area receivers.

Anglo American has committed to managing and mitigating noise impacts resulting from the Project at all receivers. These measures are described further in **Section 4.4.8**.

4.4.5 Rail Traffic Noise

This section responds to the submissions raised by stakeholders regarding the assessment of Project-related rail traffic noise and potential impacts of this activity on receivers.

Submission: RA4, SIG13, SIG15, P13, P17 and P30

An assessment of rail traffic noise generated by the Project was undertaken as a component of the acoustics impact assessment (Appendix G of the EA). It considered the worst case rail operational scenario based on maximum production rates for the Project and approved neighbouring mining operations. Under this scenario, rail traffic noise generated by the

Project was determined to contribute up to 0.4 dB (A-weighted scale) (dBA) to existing noise levels.

Appendix 2 of the *Draft Rail Infrastructure Noise Guideline* (OEH, 2012a) recommends that a detailed assessment be completed where a development has the potential to produce a significant increase in rail traffic noise. The definition of a significant project-related noise increase as stipulated in the guideline is a change of 0.5 dBA or more at a receiver. In this regard, the increase in rail traffic noise generated by the Project (<0.4 dBA) along the Main Northern Railway and at nearby receivers is deemed insignificant and therefore does not warrant further assessment.

Given the negligible increase in rail traffic noise predicted to be generated by the Project, a specific assessment of maximum noise was not regarded necessary. However, it is reasonable to assume that maximum noise levels experienced at receivers along the Main Northern Railway from coal trains associated with the Project will be consistent with existing conditions. This is because the number of daily train movements required for the Project will be consistent with the currently approved number of rail movements.

4.4.6 Sleep Disturbance

This section responds to the submission raised by stakeholders in relation to the Project's assessment of noise and its potential to cause sleep disturbance and associated health impacts.

Submission: RA4, RA6, SIG1, SIG2, SIG3, SIG5, SIG9, SIG10, SIG13, SIG16, P3, P6, P7, P8, P12, P13, P15, P16, P17, P20, P21, P22, P23, P24, P29, P31 and P41

As a component of the acoustics impact assessment (Appendix G of the EA), noise generated by the Project was assessed in accordance with the sleep disturbance criteria outlined in the *NSW Road Noise Policy* (DECCW, 2011). The criteria are presented in terms of L_{A1} noise levels (the level exceeded for 1% of the specified time period of 1 minute) during the night period between 10:00 pm to 7:00 am.

Sleep disturbance can occur when a short, sharp noise is noticeably louder than the background noise level. Received noise levels from distinct sources, which demonstrate the characteristics to cause sleep disturbance, are calculated from $L_{A\ max}$ (the maximum level during the specified time period) or L_{A1} sound power levels. However, the difference between $L_{A\ max}$ and L_{A1} noise levels is often difficult to quantify for many sources. As such, the acoustics impact assessment has adopted $L_{A\ max}$ noise levels to depict a worst case scenario. The use of $L_{A\ max}$ noise levels in lieu of the L_{A1} noise levels is considered comparable to the relevant criteria in the *NSW Road Noise Policy* (DECCW, 2011) and conservative in the approach to the assessment of sleep disturbance.

The total noise level at a receiver with consideration of the Project is effectively the L_{Aeq} noise (energy average noise from a source), which is typically an indistinct noise made up of a large number of otherwise distinctly audible sources, in summation with noise ($L_{A\ max}$) from distinct sources capable of causing sleep disturbance. These noise levels under varying operational conditions are illustrated in Figure B23, B24 and B32 of the acoustics impact assessment and provide a more representative consideration of noise levels to be experienced at receivers within the Drayton Mine and Drayton South areas than the calculated $L_{A\ max}$ levels alone.

Under worst case operations, the total noise levels (L_{Aeq} + $L_{A\ max}$) generated by the Project during night conditions are predicted to be significantly less than the sleep disturbance criteria as stipulated in the *NSW Road Noise Policy* (DECCW, 2011) to cause awakening or health impacts.

4.4.7 Existing Drayton Mine Noise Impacts

This section responds to the submissions raised by the public in relation to Drayton Mine's existing operational noise, compliance with relevant criteria and the impacts at receivers.

Submission: P11 and P17

Two Antiene area residents noted consistent and unacceptable noise levels as a result of existing operations at Drayton Mine and train movements along the rail loop and Antiene Rail Spur. These concerns were investigated and compared against Drayton Mine's environmental performance records for noise management as outlined in recent Annual Reviews (Anglo American, 2011 and 2012).

During 2011, 14 enquiries were received in relation to noise, including 10 specific to noise from trains and railing activities. The remaining four enquiries were confirmed as not pertaining to Drayton Mine train activity given the dates and times subject to investigation. As the rail infrastructure is shared, all enquiries received relating to train noise were communicated to Mt Arthur Coal Mine.

In response to enquiries received and as requested by DP&I, an independent noise assessment was undertaken at an Antiene area residence. The results showed general compliance with the noise criteria.

DP&I further imposed a condition that the rail loop and Antiene Rail Spur be accessed only by trains approved to operate on the NSW rail network in accordance with noise criteria published in RailCorp's Environmental Protection Licence (EPL) 12208. Drayton Mine's rail carrier confirmed that all trains currently operating on the rail loop and Antiene Rail Spur are certified compliant with the relevant noise criteria.

During 2012, two exceedances (minor and moderate) of the evening criteria occurred at two Antiene area locations when wind speeds were above the upper limit for the noise criteria to be applicable.

Anglo American is committed to managing and mitigating noise impacts resulting from existing Drayton Mine operations at all receivers through a range of measures described in **Section 4.4.8**.

4.4.8 Management and Mitigation

Project Construction Noise

This section responds to the submission raised by stakeholders in relation to the measures proposed to mitigate and manage construction noise generated by the Project.

Submission: RA2 and RA4

As outlined in **Section 4.4.3**, construction activities for the Project are primarily associated with the upgrade of the CHPP and are predicted to cause exceedances of the night time intrusive criteria at a number of Drayton Mine receivers in the absence of mitigation measures. Anglo American has committed to preparing a construction environmental management plan, which will outline relevant criteria and controls to be implemented during the CHPP upgrade, including:

- Establishment of noise criteria for each time period (day, evening and night);
- Implementation of time restrictions for more noisy activities, such as heavy earthmoving, rock or concrete removal and concrete pouring;
- Acknowledgement that only quieter activities, such as installation of mechanical and electrical equipment and excavation using small machines, will be scheduled for the evening and night periods; and
- Implementation of a construction noise monitoring program, addressing evening and night activities, to identify any noise sources that may exceed relevant noise criteria at receivers.

Three Drayton South area receivers are predicted to experience noise impacts during the day time period as a result of the Edderton Road realignment. To manage noise from this activity, the construction environmental management plan will outline relevant criteria and controls to be implemented for the realignment works, including:

- Establishment of noise criteria for the period between 7:00 am and 5:00 pm Monday to Saturday;
- Scheduling of respite periods during extended durations of noisy activity;
- Minimisation of cut and fill activities and the movement of associated materials along the road realignment; and
- Utilisation of appropriate machines for each task and establishment of efficient work practices to minimise total construction noise sources.

To capture any variation to the modelled noise predictions (as presented in Appendix G of the EA), Anglo American has committed to implementing a construction noise monitoring network and program to identify any noise sources that may exceed relevant noise criteria at receivers. This will allow accountable personnel to implement appropriate mitigation and management controls to keep construction noise to an acceptable level.

Project Operational Noise

This section responds to the submissions raised by stakeholders in relation to the measures proposed to mitigate and manage operational noise generated by the Project.

Submission: RA2, RA4, RA11, and SIG12

To manage the noise impacts of the Project on receivers, Anglo American has committed to a number of controls, including:

- Fitting low noise idlers to select conveyors at the CHPP;
- Fitting mobile plant with leading practice exhaust silencers and sound attenuation devices;
- Limiting the operation of particular equipment on exposed surfaces to daylight hours during select years to avoid adverse noise impacts;
- Constructing the Houston visual bund, which will provide acoustic shielding; and
- Employing a double benching method during the initial construction of the box cut for the Houston mining area so that excavators can work below natural ground level.

As outlined in **Section 4.4.3**, mild to moderate noise impacts are predicted at select Drayton Mine receivers during the early stages of the Project when operations are occurring simultaneously at Drayton Mine and within the Drayton South area. Where total received noise levels from the Project are validated by monitoring to result in an increase above the intrusive criteria during evening or night periods, Anglo American has committed to implementing additional mitigation measures, such as installing double glazing, insulation, and/or air conditioning, at affected residences upon written request from the land owner.

To capture any variation to the modelled noise predictions (as presented in Appendix G of the EA), Anglo American has committed to implementing a real-time monitoring network to provide ongoing feedback regarding the performance of the Project under varying operational and weather conditions. This system provides accountable personnel with information required to implement appropriate mitigation and management controls to keep operational noise to an acceptable level, including:

- Relocation of equipment from exposed areas to remote or shielded sites under adverse weather conditions or during certain time periods;
- Removal of equipment from operation if deemed to be generating atypical noise and contributing to a significant increase above adopted sound power levels and to total noise; and
- Relocation of equipment to more remote sites within the mining area if total noise from numerous sources approaches relevant criteria.

Details specific to each control described above will be documented in the noise management plan for the Drayton Complex.

Cumulative Operational Noise

This section responds to the submissions raised by stakeholders in relation to the measures proposed to mitigate and manage cumulative operational noise generated by the Project and other sources.

Submission: RA2, SIG10, SIG13, SIG15, P6, P8, P10, P11, P13, P15, P21, P24, P25, P28, P30, P31, P32 and P37

Anglo American are working with HVEC regarding the revision of the existing joint acquisition management plan, which includes measures to reduce cumulative impacts (including air and noise) on residences in the Antiene area.

Existing Drayton Mine Operational Noise

This section responds to the submission raised by stakeholders in relation to the management of operational noise from the existing Drayton Mine.

Submission: P11 and P17

To manage noise from existing operations, Drayton Mine conducts activities in accordance with an approved noise management plan and monitoring network. Real-time monitoring of operations is undertaken on site to assess noise levels against relevant licence and approval conditions. This system provides accountable personnel with information required to implement appropriate mitigation and management controls to keep noise to an acceptable level.

Anglo American has implemented a range of best practice mitigation measures to minimise noise generated by the existing operations of Drayton Mine, including:

- Utilisation of one loading unit in the North Pit during evening and night periods;
- Emplacement of overburden from the North and East Pit in shielded locations during evening and night;
- Utilisation of pit walls or construction of a berm in the direction of residences to shield pre-strip haul roads during evening and night periods;
- Loading units within the North Pit pre-strip are located in a shielded area below the natural surface during the evening and night;
- Realignment of the coal haul road from the South Pit to the lowest possible elevation, with minimal long straight sections of road directly in line with residences;
- Construction of a 5 m wall or equivalent berm along the northern, eastern and western sides of the ROM stockpile located south of the existing workshop to minimise noise from loaders and trucks;
- Construction of a 4 m berm and/or wall along the eastern side of the coal haul road from the ROM stockpile to the existing ROM hopper wall;
- Implementation of a sound power level limit of 103 dBA for each of the three new reclaimers and one ROM coal stacker;

- Installation of steel sheeting on the northern face of the secondary crusher building after the removal of the rotary breaker and inclusion of the new screen and crusher; and
- Installation of upgraded exhaust mufflers on select trucks (with the exception of the South Pit overburden fleet).

The effectiveness of these measures to shield or minimise noise generated from Drayton Mine at sensitive receivers will continue to be reviewed on a regular basis as the mine progresses.

Anglo American is also committed to investigating all enquiries from stakeholders to ensure compliance with relevant approvals and to maintain its environmental performance standards.

4.5 BLASTING

4.5.1 Assessment Approach

This section responds to the submission raised by stakeholders regarding blast input parameters and amenity criteria adopted for the acoustics impact assessment (see Appendix G of the EA).

Submission: SIG14, P13, P30 and P40

RCA Acoustics on behalf of United Pastoral noted that default values were adopted for the acoustics impact assessment rather than site specific propagation characteristics. It is acknowledged that the default ground coefficients in the *AS 2187 Explosive – Storage and Use* are average or typical values that do not necessarily apply to all situations, however, at the time of preparing the impact assessment there was no site specific data available to refine the parameters. Anglo American has, however, extensive experience in tailoring mine blast events given the sensitive receivers in the Antiene area near Drayton Mine. This experience indicates that the default values adopted are appropriate.

RCA Acoustics also asserts that the adopted maximum instantaneous charge of 500 kg is at the lower end of charge weights and should not be relied upon in conjunction to the generalised coefficients to predict vibrations at receivers. Although 500 kg is at the lower end of the range used for typical open cut coal mine blasts in the Hunter Valley, Anglo American has committed to using smaller charge weights and other control measures, as required, to meet the criteria at sensitive receivers, including Arrowfield Estate.

The acoustics impact assessment adopts the blast criteria recommended in the *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (ANZECC, 1990), which is specified in the Director-General's EARs for the Project and has been successfully used for the control of blast impacts at residences since the early 1990s. The EA therefore refers to the most appropriate and relevant blasting criteria to maintain human health and structural integrity. Any assertion by RCA Acoustics regarding the adoption of inappropriate criteria for the impact assessment is false.

4.5.2 Predicted Blasting Impacts

This section responds to the submissions raised by stakeholders in relation to blasting required to support the Project and the predicted impacts at receivers.

Submission: RA2, RA5, SIG1, SIG3, SIG12, SIG13, SIG14, SIG15, SIG16, P11, P13, P23 and P30

An assessment of blasting was undertaken for the Project as a component of the acoustics impact assessment (Appendix G of the EA). The assessment considered an average of up to five blast events per week for the Project to prepare overburden for removal and for coal recovery. This is consistent with the *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (ANZECC, 1990), which recommends a limit of one blast per day to minimise impacts at receivers.

Blasting is scheduled to occur during the hours of 9:00 am to 5:00 pm Monday to Saturday inclusive, excluding Sundays and public holidays, except in unusual circumstances where prior approval for divergence would need to be granted from the EPA. The restricted day-time hours is a key management measure, consistent with *Assessing Vibration – A Technical Guide* (DEC, 2006a), to reduce vibration and overpressure levels at occupied privately owned residences to the least sensitive time periods.

In accordance with the *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (ANZECC, 1990), the acoustics impact assessment adopted a blast amenity criteria of 5 millimetres (mm)/second (s) for vibration and 115 linear decibels (dBL) for overpressure at occupied privately owned residences and structures. The criteria are designed to provide an acceptable amenity for humans and their health.

Blast events associated with the Project are predicted to be short in duration (seconds) and in some instances unperceivable above background levels, pending relevant blast design parameters. The vibration and overpressure levels produced by the Project are not predicted to exceed amenity criteria at any privately owned residences and heritage buildings, including Coolmore Stud and Arrowfield Estate.

Vibration levels between 1.2 and 3.7 mm/s and overpressure levels between 103 and 109 dBL are predicted at the closest residences on Coolmore Stud across all years. The potential impacts of predicted noise and vibration from blasting generated by the Project on equine health are discussed in **Section 4.6**. A vibration level of 4.7 mm/s and an overpressure level of 114 dBL are predicted at the closest residences on Arrowfield Estate when operations occur in the most southerly extent of the Redbank mining area and maximum instantaneous charge weight is restricted to 500 kg.

Anglo American recognises the variability of ground conditions in the region and consequent potential for variability of blast effects at receivers. The acoustics impact assessment acknowledges that blasting has the potential to exceed relevant criteria at Arrowfield Estate based on typical ground conditions and in the absence of mitigation measures. However, given Anglo American propose to restrict the maximum instantaneous charge weight and implement mitigation measures outlined in **Section 4.5.5**, the vibration and overpressure impacts are predicted to remain within the amenity criteria. For all other stages of the Project, a maximum instantaneous charge of 2,000 kg may be applied without exceeding the relevant blasting amenity criteria at occupied privately owned residences or heritage buildings.

All blasts associated with the Project will be adequately designed to meet relevant vibration and overpressure criteria at occupied privately owned residences. This is particularly the case given that blasting will commence remotely in the north and only gradually move towards sensitive receptors in the south over many years. In this regard blast designs can be adjusted based on site experience and there can be further certainty that there should be no exceedances.

4.5.3 Cumulative Blasting Impacts

This section responds to the submission raised by a member of the public in relation to cumulative blasting impacts at receivers.

Submission: P11

There are likely to be blasting activities associated with the neighbouring mining operations at Mt Arthur Coal Mine and Hunter Valley Operations during the life of the Project. Anglo American will continue to consult with the neighbouring mines to ensure that blast events from the adjoining operations would not occur simultaneously, with a blast coordination procedure to be included in the blast management plan for the Drayton Complex. Drayton Mine currently implements a blast coordination procedure with Mt Arthur Coal to ensure that the unlikely event of simultaneous blasting does not occur. As such, overpressure and ground vibration levels from the cumulative effects of all mines would not result in exceedances of the relevant criteria.

4.5.4 Existing Drayton Mine Blasting Impacts

This section responds to the submission raised by a member of the public in relation to Drayton Mine's existing blasting operations, compliance with relevant criteria and the impacts at receivers.

Submission: P11

An Antiene area resident noted consistent and unacceptable vibration and overpressure levels as a result of blasting at Drayton Mine. This submission was investigated and compared against Drayton Mine's environmental performance records for blasting as outlined in recent Annual Reviews (Anglo American, 2011 and 2012).

During 2011, a total of 178 blast events occurred on site at Drayton Mine. All events were compliant with the relevant blasting criteria with the exception of one reportable exceedance. This represents compliance with the blasting criteria on 99.5% of blasts. The incident resulted in an overpressure level of 122.4 dBL at the de Boer monitor, which is 2.4 dBL above the relevant criteria. No complaints or enquiries were recorded from private owned receivers as a result of the blast. Investigations revealed that a combination of waveform reinforcement, stemming ejection caused by undetected bridging between holes and calm weather conditions at the time of the blast led to the exceedance. This was reported to the EPA in accordance with requirements and to the satisfaction of DP&I (Anglo American, 2011).

During 2012, a total of 159 blast events occurred on site at Drayton Mine. All events were compliant with the relevant blasting criteria with the exception of one reportable exceedance. This represents compliance with the blasting criteria on 99.4% of blasts. The incident resulted in an overpressure level of 121.2 dBL at the de Boer monitor, which is 1.2 dBL above the relevant criteria. Two complaints were received as a result of the blast. Investigations revealed that one of the first holes in the initiation sequence vented close to the surface. This was reported to the EPA in accordance with the requirements and to the satisfaction of DP&I (Anglo American, 2012).

Blasting at the Drayton Complex will continue to be managed in accordance with the relevant criteria. Further, it is noted that once operations commence within the Drayton South area, mining will wind down at Drayton Mine and hence the requirements to blast in this area (in proximity to the Antiene area) will be reduced as mining in this area is completed.

4.5.5 Management and Mitigation

This section responds to the submissions raised by stakeholders in relation to measures proposed to mitigate and manage vibration and overpressure generated by blasting required to support the Project.

Submission: RA2, RA5, RA11, SIG12, SIG14, SIG15 and P11

Anglo American has committed to preparing a blasting management plan for the Drayton Complex to include appropriate management and mitigation measures to ensure that the relevant criteria are met for all privately owned residences and structures. The plan will specify that:

- Blasting should not occur closer than 500 m to any occupied or sensitive building or structure unless adequate controls are implemented to minimise the risk of fly rock;
- Coordination of blasting schedules will be undertaken with adjoining mines to avoid any potential for simultaneous blast events;
- Stakeholders will be notified in advance of blast events upon request, on the Anglo American website and through appropriate signage;
- Blast events will be designed to meet the relevant overpressure and ground vibration criteria; and
- Prior to commencement of mining operations a dilapidation assessment will be undertaken for all identified heritage items listed in **Section 4.10**.

The blasting management plan will also include measures to detect, avoid or consider factors such as ground faults, while maintaining an adequate “margin of safety” for increase blast impacts due to unexpected ground conditions.

To capture any variation to the modelled blasting predictions (as presented in Appendix G of the EA), Anglo American has committed to implementing a blast monitoring network, which is representative of the closest sensitive receivers. In principle, blast effects would gradually increase during the first few operating years as the active mining areas approach receivers in the south, including Coolmore Stud and Arrowfield Estate. By carefully monitoring the increase in blast effects as the mining area advances, Anglo American will be able to:

- Determine site specific blasting parameters rather than the default or typical parameters of *AS 2187 Explosive – Storage and Use*;
- More accurately predict blast effects for future blast events, based on the site specific parameters and other relevant factors, such as topography;
- Determine the setback distance from receivers at which a reduction of maximum instantaneous charge or other blast control measures are required to meet the criteria; and
- Design all blasts to meet the criteria considering the setback distance from each blast event.

In the event vibration and overpressure levels substantially differ to that predicted, mandatory reporting will be undertaken and data collected from monitors will be used to ensure future blasts designs are altered to ensure compliance with relevant criteria.

Given the nature of agricultural operations in the vicinity of the Project, including those of Coolmore Stud, Anglo American has committed to ongoing consultation with neighbouring stakeholders to allow blasting schedules to be tailored to attempt and avoid conflict with key events or client visits.

4.6 EQUINE HEALTH

4.6.1 Air Quality

Predicted Impacts

This section responds to the submissions raised by stakeholders regarding the broader impact of dust generated by the Project and its potential to impact equine health.

Submission: RA2, SIG9, SIG13, SIG15, SIG16, P10, P17, P20, P23, P24 and P41

In consideration of the revised air quality modelling (see **Section 4.2**), the Project is predicted to generate annual average cumulative PM_{10} concentrations of up to 24 µg/cubic metres (m^3) over Coolmore Stud and up to 17 µg/m^3 over Woodlands Stud. This is within the human amenity cumulative criterion for PM_{10} (30 µg/m^3).

Cargill (1999) recommends a maximum inspirable (inhalable) dust concentration of 3,000 µg/m^3 and a maximum respirable dust concentration of 230 µg/m^3 in stables and 170 µg/m^3 for paddocks. The PM_{10} levels generated by the Project are well below the limits recommended by Cargill (1999). In this regard, dust concentrations produced by the Project, when considered in isolation of other factors, will not pose a risk to equine health, including adults and foals.

Dust Composition and Size

This section responds to the submissions raised by stakeholders regarding the impact of different types of dust (coal and crustal) generated by the Project on equine health, including foals.

Submission: RA2, SIG9, SIG13, SIG15, SIG16, P10, P17, P20, P23, P24 and P41

Various activities associated with open cut mining generate dust. In the case of the Project, the removal and transportation of topsoil and more frequently overburden is the major contributor to dust emissions. Overburden is generally inorganic and often has no specific coal content. The dust generated from the extraction of coal is generally isolated to the active mining area. This is due to the depth of the mining area and the typical size of coal particles, which do not generally favour dispersion. In this regard, the majority of the dust predicted to be generated and dispersed offsite by the Project (as described in subsection *"Predicted Impacts"*) will predominantly be associated with topsoil and overburden activities.

In any event the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC, 2005a) amenity criteria are based on the size and quantity of dust rather than its composition or origin.

Dust can be categorised as inspirable or respirable matter. Inspirable (inhalable) dust is defined as a material that may be deposited anywhere along the respiratory tract, where the aerodynamic diameter of the dust may range from 0 to 100 micrometre (µm) (ACGIH, 2005). Respirable dust is defined as the proportion of airborne dust levels that when inhaled may penetrate to the unciliated airways of the lung. The median diameter of the respirable dust particles is 4.25 µm (Reed et al., 2006).

The United States Environmental Protection Agency (US EPA, 1978) identified that the mass median diameter of dust samples sourced from coal mines range in the order of approximately 10 to 35 µm. This indicates that a high percentage of dust exceeds the respirable size range for humans and is subject to deposition. For horses, Votion et al. (1997) and Malikides and Hodgson (2003) reported that only particles with a diameter less than 5 µm have the potential to reach and affect the lower respiratory tract.

In consideration of published studies, much of the dust generated from the Project will be greater than the respirable size range of horses. As such, the Project is not likely to pose a risk to the health of horses, including foals, on Coolmore Stud and Woodlands Stud by means of induced inflammatory airway disease. Other factors that contribute to this disease are discussed further in subsection *"Endotoxins and Inflammatory Airway Disease"*.

Endotoxins and Inflammatory Airway Disease

This section responds to the submissions raised by stakeholders regarding the potential for Project related dust to impact on equine health. It provides relevant information with regard to the role that endotoxins play in contributing to respiratory issues in horses. It also provides relevant information with regard to the level of endotoxins associated with dust generated by the Project and the potential for this to increase the incidence of inflammatory airway disease and other respiratory diseases in thoroughbred horses (including foals).

Submission: RA2, P10, P17, P20, P23, P24, SIG3, SIG9, SIG13, SIG15, SIG16 and P41

Endotoxins are bacterial structural components that are released when such a cell is lysed. These components are toxic if administered to humans and/or animals, causing a pyrogenic response (rise in body temperature). The major cause of adverse effects from dust exposure for horses in any environment is not the particulate matter as such but the endotoxins, bacteria and fungi that is attached to the particulate matter (McGorum et al., 1998; Malakides and Hodgson, 2003). While dust alone is relatively inert and rapidly expelled by the horse, endotoxins trigger an immediate inflammatory reaction that can result in varying severities of lower respiratory tract disease.

The most common disease of the lower respiratory tract of horses in Australia is inflammatory airway disease. It is primarily associated with stabled horses and is considered to be more a response to the presence of irritant material in the lower airways, rather than a more severe allergic response. Malakides and Hodgson (2003) found that approximately 40% of horses developed inflammatory airway disease within the first two weeks of entering racetrack stable for training with more than a third having some form of inflammation prior to a racing event.

The incidence in pastured horses is much lower given that dust has minimal impact on horses in such an environment. It is well established that horses with many types of respiratory tract diseases associated with dust recover rapidly once the horse is returned to a paddock environment, irrespective of how much dust may be in the paddock environment.

McGorum et al. (1998) found that endotoxins are unlikely to cause diseases of the lower respiratory tract unless the airborne endotoxin concentration exceeds 20 nanograms (ng)/m^3 (0.02 µg/m^3). A typical pasture environment was found to possess endotoxin levels of 0.00129 µg/m^3 (McGorum et al., 1998), which is well below the amount likely to cause diseases of the lower respiratory tract.

The nature of the dust generated from the Project will be far less inflammatory than that encountered in stables given that it will almost exclusively be from the removal of overburden, which is typically inorganic. However, in order to understand the likelihood of endotoxins in the material to be excavated, topsoil and dust samples from within the Drayton South area were analysed. The levels in the soil were found to be very low with the average endotoxin content in the topsoil at 0.0000278 ng/µg.

The endotoxin contents were multiplied by the worst case scenario PM_{10} level to obtain the airborne endotoxin concentration. Assuming a cumulative annual average PM_{10} concentration of 24 µg/m^3 (at receiver 227F, Coolmore Stud in Year 10), this would equate to an endotoxin concentration of 0.00067 ng/m^3. These levels are substantially lower than the 20 ng/m^3 threshold recommended by McGorum et al (1998). The results of the endotoxin testing indicate that the dust generated by the Project will not increase the incidence of inflammatory airway disease of horses on Coolmore Stud and Woodlands Stud. This would apply to horses of all ages as well as those both permanently on the properties and those visiting temporarily.

Foals

Rattles is a common lower respiratory tract disease in foals and is particularly prevalent in the Hunter Valley of NSW. There is an increased incidence of the disease associated with dust particles carrying the *Rhodococcus equi* bacteria (a type of endotoxin). The most common source of *Rhodococcus equi* bacteria is considered to be the manure from *"carrier"* mares, which is then compacted into soil and in dry dust conditions, can be inhaled by foals. Muscatello et al. (2006) found the most dangerous areas on studs for foals to contract the *Rhodococcus equi* bacteria are likely to be laneways and holding pens. As the immune system of foals is poorly developed they are susceptible to the disease.

Hoffman et al. (1993) examined the incidence of distal respiratory tract disease in thoroughbred foals. The study found that 82% of foals were affected at one time by lower respiratory tract disease over a seven moth period when in a stable environment with bacterial infection the most common inciting factor.

As described in the above sections, the majority of the dust generated from the Project is composed of relatively inorganic matter with very low levels of endotoxin. Given the typical sources of the *Rhodococcus equi* bacteria is associated with stable environments, it is unlikely that dust generated from the Project will carry the endotoxin. In this regard, any dust that originates from the Project and is inhaled by foals on Coolmore Stud and Woodlands Stud is not likely to result in Rattles or any other form or lower respiratory tract disease.

Respiratory Defence Mechanisms

This section responds to submissions raised by stakeholders regarding the potential for Project related dust to impact on equine health. It provides relevant information with regard to the defence mechanisms of the equine respiratory system and its role in the prevention of contamination.

Submission: SIG13, SIG15, SIG16, P10, P17, P20, P23, P24 and P41

Malikides and Hodgson (2003) analysed the effect of dust on horses and resultant incidents of inflammatory airway disease. During normal breathing, more than 95% of inhaled particles greater than 5 µm (e.g. small hay and straw fibres, fine wood shaving fibres, sand, pollens, plant spores and larger bacteria) are filtered in the nasal passages, pharynx and tracheal bifurcation as a result of collision and impaction between high velocity particles within the airflow and changing airway anatomy. In the nasal passages, soluble noxious gases are concomitantly removed and neutralised via buffering by fluid and protein found in nasal mucus.

Once a particle impacts upon the moist nasal respiratory epithelium, it is trapped by mucus and removed by ciliary transport. Few particles larger than 5 µm enter the trachea and more distal airways. When air reaches the level of the respiratory bronchioles and alveoli, most particles less than 0.5 µm do not contact the respiratory epithelium and are expelled in exhaled air. However, given that air velocity is very low in the gas exchanging structures, particles with a diameter less than 0.1 µm (e.g. gas molecules, endotoxin molecules, viruses, proteins, combustion nuclei, ultra-fine particles) are subject to random thermal kinetic buffering (Brownian motion/diffusion) and have time to diffuse to the walls of surrounding air surfaces.

Malikides and Hodgson (2003) reported that under normal outdoor circumstances low concentrations of endotoxin are inhaled, however, the respiratory tract has efficient defence mechanisms to counteract this airborne material. It is only when high concentrations of dusts containing endotoxin is inhaled and deposited within the airways that inflammation develops.

As described in subsections *"Dust Composition and Size"* and "*Endotoxins and Inflammatory Airway Disease"*, the majority of the dust generated from the Project will be greater than the respirable size range of horses and composed of a relatively inorganic matter with very low levels of endotoxin. In this regard, any dust that could originate from the Project and could be inhaled by horses on Coolmore Stud and Woodlands Stud is likely to be expelled or neutralised by the respiratory system and not cause any negative impacts to their health.

4.6.2 Noise

This section responds to the submissions raised by stakeholders in relation to the impact of noise generated by the Project on equine health and the ability for horses to habituate to such effects.

Submission: RA2, SIG3, SIG9, SIG13, SIG15, SIG16, P17, P20, P23, P24, P30 and P41

Predicted Impacts

Heffner and Heffner (1983) documented that horses exposed to noise levels with an intensity of 60 dBA were capable of detecting frequencies ranging from 55 hertz (Hz) to 33.5 kilohertz (kHz), with a region of best sensitivity from 1 to 16 kHz. Hearing in horses is similar to humans although less sensitive, with hearing approximately 15 dBA less sensitive than humans.

Under worst case meteorological and operating conditions, noise levels across the majority of Coolmore Stud and Woodlands Stud are predicted to be less than 30 to 33 dBA, which is comparable to the rating background noise level. A very small portion of these properties (nearest the boundary with the Golden Highway) will be subject to noise levels up to 40 dBA. At an intensity of 40 dBA, audiograms (Heffner and Heffner, 1983) correlate with a frequency of approximately 0.125 and 32 kHz, which is within the range of hearing for horses.

Huybregts (2008) investigated the potential impact of noise from the Big Day Out concert on horses stabled at Flemington Racecourse. The study found that horses exposed to noise levels in the range of 54 to 70 dBA did not exhibit signs of distress particularly in the absence of a visual stimuli or threat. These noise levels are equivalent to a frequency of approximately 0.064 and 32 kHz (Heffner and Heffner, 1983), which is within the range of hearing for horses, and are significantly higher than the levels predicted to be generated by the Project.

As outlined in the submission received by Coolmore Australia under current operations, Coolmore Stud maintains an airstrip to cater for respective clientele. Using *AS 2021-2000 Acoustics – Aircraft Noise Intrusion – Building Siting and Construction* as a guide, a light general aviation aircraft has the potential to generate at worst a noise level of 83 dBA with a landing noise level of 72 dBA (based on a centreline distance of 1,500 to 3,000 m and a sideline distance of 200 m). As part of the existing operations at Coolmore Stud and Woodlands Stud it is noted they frequently operate tractors and slasher fittings to maintain the amenity of paddocks. When slashing grass at a mild speed on a slight uphill gradient, this machinery has the potential to generate noise levels of 52 dBA at 50 m or 46 dBA at 100 m (based on a measured noise level of a 44 horsepower diesel tractor/slasher configuration). These noise levels are significantly higher than the levels predicted to be generated by the Project over Coolmore Stud and Woodlands Stud. When subject to these noise levels on a regular basis, the horses on both studs, including foals, show little reaction or anecdotal evidence of adverse health effects.

Given the limited reaction of horses subject to increased noise levels outlined in Huybregts (2008) and under current operational activities, it is unlikely that operational noise generated by the Project will impact on the health of horses at Coolmore Stud and Woodlands Stud.

The Project is also predicted to generate noise from blasting (overpressure), which is typically short and sudden in nature and would be noticeably louder than the rating background level at neighbouring receivers. Noise levels from blasting (when closest to the receiver) are predicted in the range of 93 to 109 dBL for indicative locations on Coolmore Stud and Woodlands Stud.

BHP BMA (2009) investigated the behaviour of farm animals, including 100 horses, when subject to sonic boom conditions. The study found that the horses showed only mild reactions made evident by temporary cessation of eating or rising of heads when exposure to sonic booms ranging between 125 and 136 dBA. Given the limited reaction of horses subject to sonic boom conditions outlined in BHP BMA (2009), it is unlikely that blasting noise generated by the Project will impact on the health of horses at Coolmore Stud and Woodlands Stud.

Habituation

Horses are known to demonstrate habituation, which is the ability to become accustomed to certain stimuli. If a noise becomes familiar to the horse and it is not associated with danger it will not be startled by the noise. The concept of habitation is supported by studies undertaken by the United States Air Force (1994) and Le Blanc et al. (1991), which investigated the effects of jet aircraft noise on the survivability and reproductive success of horses situated within flight paths. It was reported that horses were initially startled by the noise generated from the jet air crafts. However, with an increase in the frequency of exposures horses showed evidence of habituation with the intensity and the durations of the startle response decreasing. The studies also showed that this response did not affect the survivorship or conception rate when compared to control groups.

In consideration of previous studies, it is anticipated that horses at Coolmore Stud and Woodlands Stud will demonstrate habituation over time to noise generated by the Project (particularly given that operational noise impacts are only predicted to be marginally above background levels). Although it is acknowledged that there may be some variation in the individual response to noise generated by the Project, a collective approach (i.e.

consideration as a herd) has been adopted for horses in a similar manner to assessing the impact of noise on humans.

It is understood that the thoroughbred operations of Coolmore Stud and Woodlands Stud are fluid in nature and as such there is a high turnover of visiting mares and foals. However, these horses will have been exposed in transit to noise levels much higher than are predicted to arise from the Project and should not be affected by any slight increase in background noise. Furthermore, any foals born on the studs will be in the best position to habituate to noise from the Project as they mature given that such noise levels will be considered a part of their normal environment.

4.6.3 Vibration

This section responds to the submissions raised by stakeholders in relation to the potential for blast vibrations generated by the Project to impact on equine health and the ability for horses to habituate to such effects.

Submission: RA2, SIG3, SIG9, SIG13, SIG15, SIG16, P17, P20, P23 and P41

Mining within the Drayton South area will occur in a north to south direction. As a result, the distance from blasting to the horse studs will be greatest at the beginning of the Project and vibration and overpressure levels will be significantly lower. As mining progresses southwards it is likely that horses will have developed an increased tolerance to vibration and overpressure associated with blasting due to habituation. This concept is discussed further in **Section 4.6.2**.

The worst case vibration levels predicted to be produced by blasting at Coolmore Stud (1.2 to 3.7 mm/s at closest receiver) and Woodlands Stud (0.4 to 1.3 mm/s at closest receiver) would be lower than the levels experienced by horses during road and air transportation. Although there is little scientific research into the impacts of transportation on animal health, anecdotal evidence shows that horses do not suffer any ill effects from the vibrations experienced during transportation. There is also anecdotal evidence indicating that horses at the Muswellbrook Racecourse and nearby Edinglassie Stud are not startled by blasting at the neighbouring Bengalla or Mt Arthur Coal Mines. Therefore, the ground vibration caused by blasting is not expected to have any negative impacts on the health of horses on Coolmore Stud and Woodlands Stud.

4.6.4 Lighting

This section responds to submissions raised by stakeholders in relation to the potential impact of lighting on the breeding cycle of horses.

Submission: SIG9, SIG13, SIG15, SIG16, P17, P20 and P41

The use of artificial light is commonly adopted to alter the normal equine breeding season. During winter, mares do not cycle and require approximately 16 h/day of increased artificial light over the course of 60 days, which mimics longer day light hours, before they begin cycling again. Kooistra and Ginther (1975) investigated the effect of fixed daily photoperiods on the onset of the equine breeding season. The study found that exposure to light of 16 or 24 h induced early onset of the breeding season.