South East Open Cut Project

and

Modification to Development Consent

(DA 309-11-2001-i)

ADDITIONAL INFORMATION

AND

PROJECT REVISIONS

January 2011

Version:	Details:	Approved:	Date:
Version 1	Submission to Department of Planning	M. Moore	31 January 2010

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1. INTRODUCTION

Ashton Coal Operations Pty Limited (Ashton) owns and operates the Ashton Coal Project (ACP) located at Camberwell, approximately 14 kilometres (km) northwest of Singleton, in the Hunter Valley, NSW (Figure 1).

The ACP comprises an open cut and underground mine, coal handling and processing plant (CHPP), rail loading facility and other support facilities. Development consent (DA 309-11-2001-i) for the ACP was granted by the Minister for Planning in October 2002.

In March 2009, Ashton submitted a major project application (MP 08_0182), under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act), to develop a new open cut coal mine, the South East Open Cut (SEOC).

The SEOC Project comprises an open cut coal mine, out of pit and in pit waste rock emplacement, a run-of-mine (ROM) coal handling facility and various other associated surface support facilities. The extracted ROM coal will be transferred via conveyor to the existing ACP CHPP for processing and transport to market. The SEOC will be developed on land adjacent to the existing Ashton coal mine, south of the New England Highway and village of Camberwell.

The SEOC is required as a replacement mine to the current ACP open cut, which is in the final stages of mining. The project is required to provide business and coal supply security for Ashton and continuity and employment security for 160 Ashton mine employees.

If approved, the SEOC will enable Ashton to extract up to 16.5 million tonnes of ROM coal from coal exploration licence areas EL 4918 and EL 5860 on behalf of and for the benefit of the state of NSW.

An Environmental Assessment Report (EA) (Wells, 2009) for the project was publicly exhibited for a period of 53 days from 27 November 2009. Issues raised in public and government authority submissions on the project were addressed in a Response to Submissions Report (Wells, 2010) and made publicly available on the Department of Planning's (DoP) website (www.planning.nsw.gov.au).

Since these reports were prepared the NSW Government released the Camberwell Cumulative Impact Review (DoP, 2010), which examined the cumulative dust and noise effects of current and proposed mine development in and around the Camberwell area on the village of Camberwell. There has also been growing general public and government concern on the effects of dust emissions from an expanding coal mining industry on the health and amenity of Hunter Valley communities.

In addition, the DoP and NSW Office of Water (NOW) both indicated they have residual concerns regarding the extent of potential interactions between the project and the adjacent alluvial aquifer and nearby Glennies Creek.

In light of these concerns, Ashton has reviewed the design of the SEOC Project to ensure the potential for adverse health or amenity effects on Camberwell village residents and adverse effects on nearby water sources from the operation of the project are reduced to the lowest extent practicable.

As a result of this review, Ashton has revised the design and operation of the SEOC to reduce the impacts of the project to as low as practicably possible. This includes:

- Setting back the northern extend of the open cut pit to provide greater separation between dust and noise generating sources and Camberwell village residents.
- Reducing mining rates (and dust and noise emissions) during the first two years, when mining activities are at their closest to Camberwell village residences.
- Locating waste rock and coal haul roads to reduce truck noise on Camberwell village residences.
- Avoiding night time mining operations during the first two years of operation.
- Implementing leading practice dust and noise mitigation and management, including use of real-time dust and noise monitoring and predictive weather forecasting.
- Installing a low permeability barrier along the western boundary of the open cut pit to mitigate the risk of alluvial groundwater inflows.

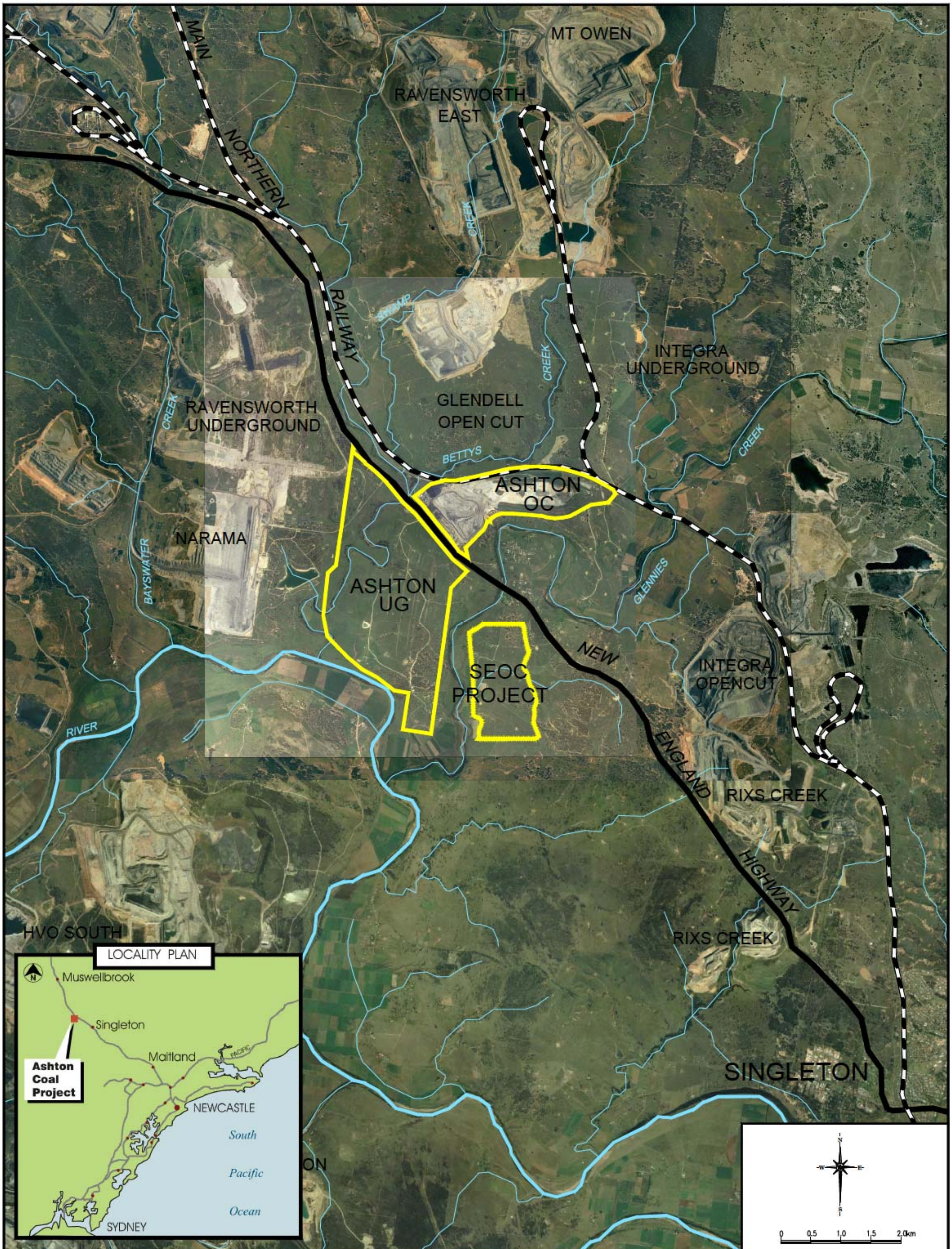
In addition, Ashton has continued to strategically acquire properties close to the project to increase the buffer between the open cut operation and the nearest potentially affected private Camberwell village residence. Ashton will also implement a strategy to monitor and manage dust and noise impacts on its tenanted village properties to ensure the health and amenity of tenanted residents are not adversely affected.

The implementation of these measures will ensure:

- Project related dust and noise impacts on Camberwell village are reduced to the lowest extent practicable.
- The project is developed and operated to avoid short-term dust exceedances and potential adverse health and amenity effects on Camberwell village residents.
- Impacts on Glennies Creek and its connected alluvial aquifer are minimised and these water sources are protected to the greatest extent possible.
- The coal resource within EL 4918 and EL 5860 is extracted to the maximum extent and in the most efficient manner possible, while protecting the health and amenity of Camberwell village residents.

The purpose of this document is to provide:

- A description of project changes and the revised mine design.
- An assessment of the dust and noise impacts of the revised mine design.
- A description of revised dust and noise mitigation and management measures.
- A description of revised alluvial groundwater mitigation and management measures.
- An updated statement of commitments for the project.



AshtonCoal

South East Open Cut Project

Location of the Ashton Coal Project and South East Open Cut

Figure 1

Revised EA Plan 1

Prepared by Pegasus Technical

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Only those elements of the project that have changed since the EA was exhibited are addressed in this document.

A summary of the key elements of the revised project is provided in Table 1.1.

Table 1.1 Revised SEOC Project summary

Aspect	Description
Project summary	• **development of a new open cut coal mine to replace the existing ACP open cut mine, which is nearing completion;** • **extraction of up to 3.6 million tonnes of ROM coal a year;** • **transfer of ROM coal via conveyor to the existing ACP CHPP for washing, stockpiling and transport by rail to the port of Newcastle;** • **disposal of coarse and fine rejects within mine voids;** • **rehabilitation of all mining and infrastructure areas.**
Project area	315ha, comprising an open cut pit (188 ha), waste rock emplacement (63ha); ROM coal facilities; workshop, office and associated mine support facilities; access roads; and water management and environmental control structures (64ha).
Coal reserves	16.5 Mt.
Open cut mining	Overburden and coal will be blasted and excavated using excavators and trucks.
Coal handling, and processing	ROM coal will be transferred from open cut extraction areas to the ROM coal facility by haul trucks and either directly dumped into the ROM coal hopper, or stockpiled and later rehandled. ROM coal will be transferred from the ROM coal facility to the ACP CHPP via a 2.5 km overland conveyor.
Water demand and supply	Integrated with the existing ACP. Water demand for the entire site at peak production will be about 5.8 ML/day (2,117 ML/year). Water will be supplied from mine inflows, surface water capture, recycled process water, water sharing with adjoining mines and licensed extraction.
Waste rock management	Initial out of pit emplacement to create environmental bund, until sufficient void space is available to safely backfill the pit.
Mine access	Access to open cut mine via new private road off New England Highway. Construction access via Glennies Street and other existing driveway accesses off New England Highway
Support facilities and utilities	Support facilities, including offices, bathhouses, workshops and fuel storages will be established adjacent to and east of the open cut pit and at the ROM coal facility area.
Hours of operation	Construction and mining operations in years 1 and 2: 7:00am to 10:00pm Monday to Saturday. 8:00am to 10:00pm Sunday and Public Holidays. Mining operations in years 3 to 7: 24-hours a day, 7 days a week. ROM coal handling and conveyor transfer to the ACP CHPP (for the life of the project): 24-hours a day, 7 days a week. Maintenance (for the life of the project): 24-hours a day, 7 days a week.
Capital investment value	$83 million.
Project life	21 years (including 7 years of open cut mining and 7 years of tailings emplacement).
Employment	Continued employment of 160 full time open cut mine employees.
Rehabilitation	All disturbed areas will be progressively rehabilitated to provide a mix of naturally wooded and open grazing areas.

2. BACKGROUND

2.1 The Proponent

Ashton Coal Operations Pty Limited (Ashton) is the proponent for the project. Ashton is a joint venture company comprising the following ownership:

- White Mining (NSW) Pty Limited (60%)
- Austral-Asia Coal Holdings Pty Ltd (30%)
- ICRA Ashton (10%)

Since the EA was exhibited, White Mining (NSW) Limited (and its parent company Felix Resources Limited) was acquired by Yancoal Australia Ltd (Yancoal). Yancoal is a wholly owned subsidiary of Yanzhou Coal Mining Company Limited.

Yancoal is the managing operator of the Ashton Coal Project.

2.2 Project Location and Setting

The SEOC Project is located south of the New England Highway and east of Glennies Creek at Camberwell, in the Hunter Valley of NSW. Camberwell is a small community surrounded by active open cut mine developments.

The project is situated about 1.5 km south of the existing ACP open cut mine and 0.5 km east of the existing ACP underground mine (Figure 1).

The dominant surrounding land uses include mining, agriculture, human settlement and infrastructure.

Mine Development

Large scale intensive open cut and underground coal mining is a significant land use in the Hunter Valley. Not including the ACP, there are eight open cut and two underground mines within a 4 km radius of the project (Figure 1), including:

- Xstrata's Mt Owen mine complex to the north, comprising the Mt Owen, Ravensworth East and Glendell open cut mines.
- Vale's Integra mine complex to the east and northeast, comprising the Integra open cut and underground mines.
- Bloomfield Collieries' Rix's Creek open cut mine to the southeast.
- Xstrata's Ravensworth mine complex to the west, comprising the Narama, Ravensworth West and Cumnock open cut mines. (Xstrata's Ravensworth Operations Project seeks to combine these into a single open cut operation).
- Xstrata's Ravensworth underground mine to the northwest.

Together with the ACP these mine developments provide employment for in excess of 2,500 people.

In addition to these mines, Coal & Allied's Hunter Valley North mine complex is situated about 5 km to the southwest of the SEOC Project.

Agricultural Land Use

Agriculture is an equally significant land use in the Hunter Valley. Stock grazing and dairy production are carried out in areas surrounding the mines, with pasture and cropping restricted to alluvial areas along the Hunter River and Glennies Creek.

Human Settlement

Camberwell village is located about 12 km northwest of Singleton on the New England Highway. The majority of the village is situated north of the highway and about 0.5 km south and east of the existing ACP open cut operations.

The village is generally defined to include land zoned 1(d) Small Rural Holdings within the *Singleton Local Environment Plan 1996* (LEP). Clause 19 of the LEP describes the controls that apply to the erection of dwellings in Camberwell. This includes restrictions on development of new dwellings. In 2008 the Director-General of DoP endorsed a land use strategy for Camberwell that reinforces the objectives of LEP clause 19 and aims to limit land use conflict within the village while coal mining is occurring on nearby lands.

Camberwell village currently comprises 44 residential dwellings (Figure 2). Of these, only 7 are privately-owned, one of which is currently uninhabitable. The remaining 37 residences are owned by Ashton. These are tenanted to mine workers, prior owners and other unrelated residents. There is also a small church (St Clement's) situated west of, but outside, the 1(d) land zone precinct. In 2008, the church was damaged by fire and is currently unused.

There are 12 privately-owned rural land holdings with residential dwellings in areas surrounding Camberwell and the SEOC Project. Of these, 7 are located north of the highway and east of the village. The remaining 5 are located south of the highway (Figure 3).

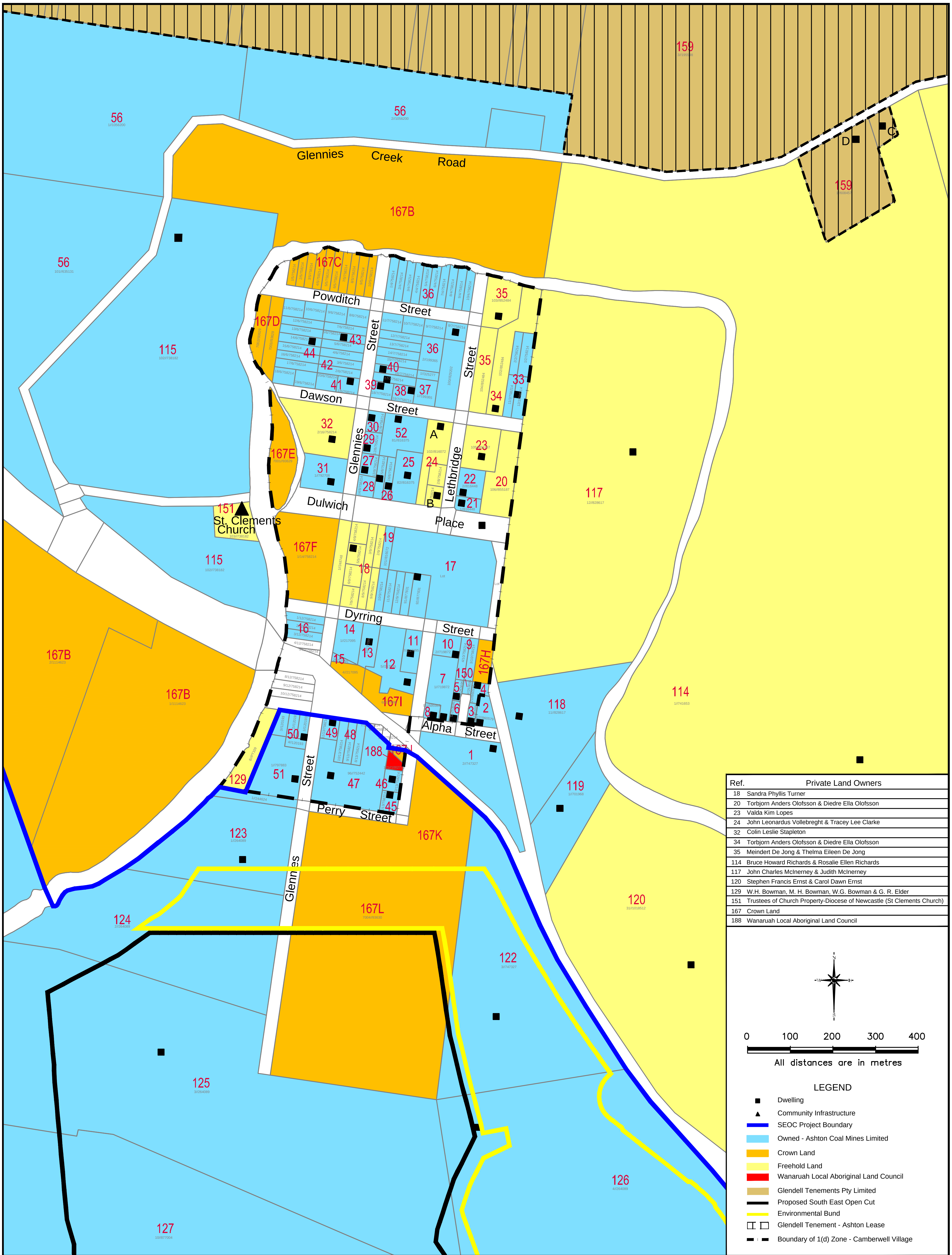
The status of property ownership surrounding the project, including vacant land holdings, is described further in Section 2.7.

The government has indicated it views the Camberwell village as a rural population centre and mine related dust and noise levels that have the potential to adversely affect public health should be avoided as far as possible.

Major Infrastructure

The locality is serviced by the New England Highway, which connects Singleton and Muswellbrook and provides the main access route for mine workers, rural residents, tourists and other road users. The New England Highway is a major freight route, connecting NSW and Queensland.

The Main Northern Railway provides the rail transport link for delivery of coal (and other commodities) to export markets (via the port of Newcastle).



Ref.	Private Land Owners
18	Sandra Phyllis Turner
20	Torbjorn Anders Olofsson & Diedre Ella Olofsson
23	Valda Kim Lopes
24	John Leonardus Vollebreght & Tracey Lee Clarke
32	Colin Leslie Stapleton
34	Torbjorn Anders Olofsson & Diedre Ella Olofsson
35	Meindert De Jong & Thelma Eileen De Jong
114	Bruce Howard Richards & Rosalie Ellen Richards
117	John Charles McInerney & Judith McInerney
120	Stephen Francis Ernst & Carol Dawn Ernst
129	W.H. Bowman, M. H. Bowman, W.G. Bowman & G. R. Elder
151	Trustees of Church Property-Diocese of Newcastle (St Clements Church)
167	Crown Land
188	Wanaruah Local Aboriginal Land Council

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South East Open Cut Project

Land Ownership of Camberwell as of 17th January 2011

Figure 2

Revised EA Plan 3

Prepared by Pegasus Technical

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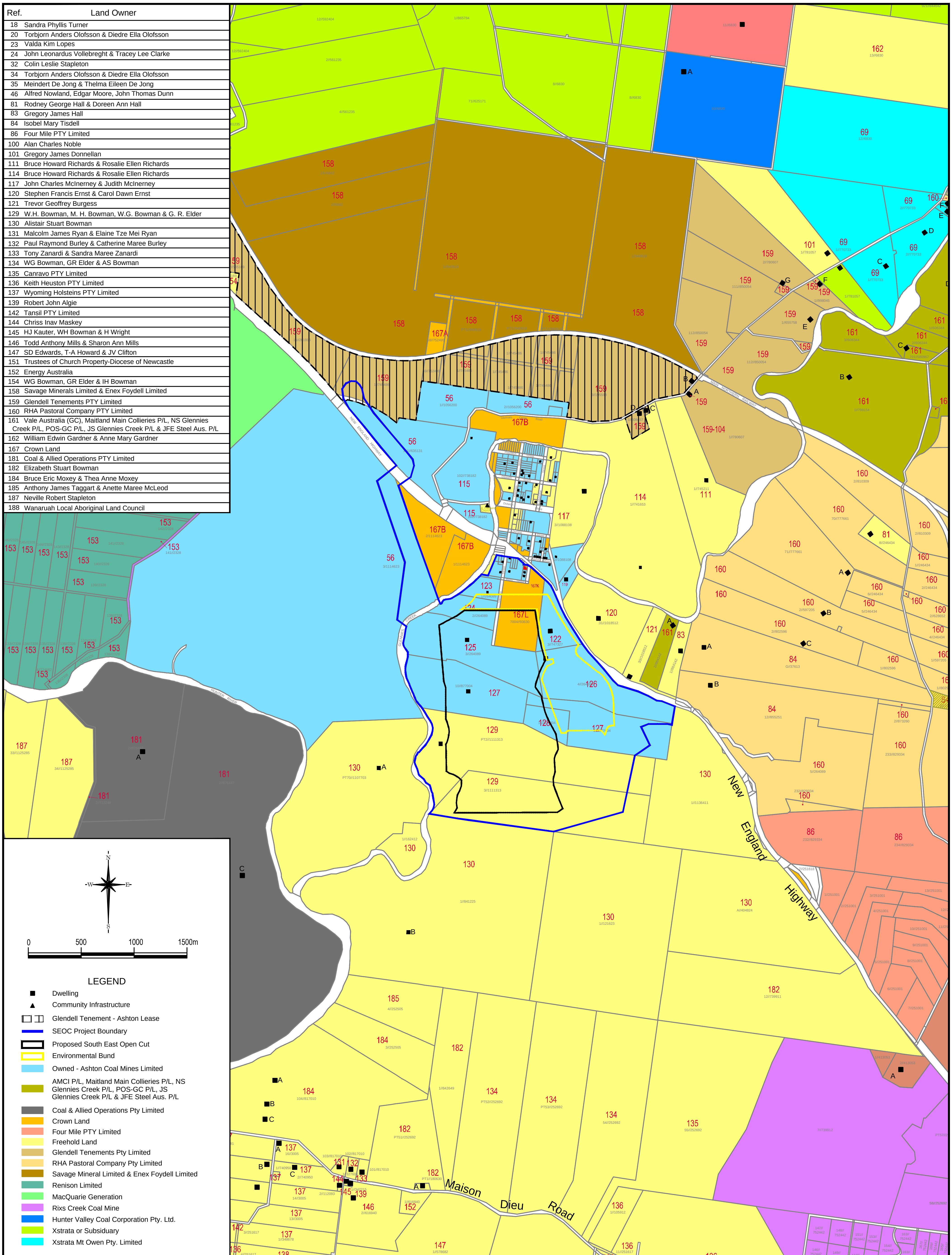

Ref.	Land Owner
18	Sandra Phyllis Turner
20	Torbjorn Anders Olofsson & Diedre Ella Olofsson
23	Valda Kim Lopes
24	John Leonardus Vollebregt & Tracey Lee Clarke
32	Colin Leslie Stapleton
34	Torbjorn Anders Olofsson & Diedre Ella Olofsson
35	Meindert De Jong & Thelma Eileen De Jong
46	Alfred Nowland, Edgar Moore, John Thomas Dunn
81	Rodney George Hall & Doreen Ann Hall
83	Gregory James Hall
84	Isobel Mary Tisdell
86	Four Mile PTY Limited
100	Alan Charles Noble
101	Gregory James Donnellan
111	Bruce Howard Richards & Rosalie Ellen Richards
114	Bruce Howard Richards & Rosalie Ellen Richards
117	John Charles McInerney & Judith McInerney
120	Stephen Francis Ernst & Carol Dawn Ernst
121	Trevor Geoffrey Burgess
129	W.H. Bowman, M. H. Bowman, W.G. Bowman & G. R. Elder
130	Alistair Stuart Bowman
131	Malcolm James Ryan & Elaine Tze Mei Ryan
132	Paul Raymond Burley & Catherine Maree Burley
133	Tony Zanardi & Sandra Maree Zanardi
134	WG Bowman, GR Elder & AS Bowman
135	Canravo PTY Limited
136	Keith Heuston PTY Limited
137	Wyoming Holsteins PTY Limited
139	Robert John Algie
142	Tansil PTY Limited
144	Chriss Inav Maskey
145	HJ Kauter, WH Bowman & H Wright
146	Todd Anthony Mills & Sharon Ann Mills
147	SD Edwards, T-A Howard & JV Clifton
151	Trustees of Church Property-Diocese of Newcastle
152	Energy Australia
154	WG Bowman, GR Elder & IH Bowman
158	Savage Minerals Limited & Enex Foydell Limited
159	Glendell Tenements PTY Limited
160	RHA Pastoral Company PTY Limited
161	Vale Australia (GC), Maitland Main Collieries P/L, NS Glennies Creek P/L, POS-GC P/L, JS Glennies Creek P/L & JFE Steel Aus. P/L
162	William Edwin Gardner & Anne Mary Gardner
167	Crown Land
181	Coal & Allied Operations PTY Limited
182	Elizabeth Stuart Bowman
184	Bruce Eric Moxey & Thea Anne Moxey
185	Anthony James Taggart & Anette Maree McLeod
187	Neville Robert Stapleton
188	Wanaruah Local Aboriginal Land Council

LEGEND

- Dwelling
- Community Infrastructure
- Glendell Tenement - Ashton Lease
- SEOC Project Boundary
- Proposed South East Open Cut
- Environmental Bund
- Owned - Ashton Coal Mines Limited
- AMCI P/L, Maitland Main Collieries P/L, NS Glennies Creek P/L, POS-GC P/L, JS Glennies Creek P/L & JFE Steel Aus. P/L
- Coal & Allied Operations Pty Limited
- Crown Land
- Four Mile PTY Limited
- Freehold Land
- Glendell Tenements PTY Limited
- RHA Pastoral Company Pty Limited
- Savage Mineral Limited & Enex Foydell Limited
- Renison Limited
- MacQuarie Generation
- Rixs Creek Coal Mine
- Hunter Valley Coal Corporation Pty. Ltd.
- Xstrata or Subsidiary
- Xstrata Mt Owen Pty. Limited

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Prepared by Pegasus Technical

South East Open Cut Project

Land Ownership of Camberwell and surrounding area as of 17th January 2011

Figure 3

Revised EA Plan 2

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2.3 Existing ACP Mine Development

The ACP operates under DA 309-11-2001-i (as modified) and various other environmental and mining approvals, including environment protection licence (EPL) 11879, mining lease (ML) 1529, 1533 and 1623 and various water licenses and other subordinate approvals.

The ACP includes:

- An open cut mine employing conventional blast, shovel and truck extraction techniques.
- Out of pit and in pit waste rock emplacement, including environmental bunds.
- A four seam descending underground longwall mine.
- CHPP, ROM and product coal stockpiles and train loading facility.
- Rejects and tailings disposal.
- Open cut and underground support facilities, including offices, workshops, site access roads, parking and water management facilities.
- Rehabilitation of the site.

The ACP is approved to:

- Operate open cut mining from 7am to 10pm Monday to Saturday and 8am to 10pm Sunday and Public Holidays, with blasting restricted from 9am to 5pm Monday to Saturday.
- Operate underground mining, coal handling and processing and train loading 24-hours a day, 7 days a week.
- Produce up to 5.45 Mtpa of ROM coal.
- Operate up to 2024, a period of 21 years from the date of grant of a mining lease.

2.4 Proposed Project

The SEOC Project comprises:

- An open cut mine employing conventional blast, shovel and truck extraction techniques.
- Out of pit and in pit waste rock emplacement, including an environmental bund.
- ROM coal stockpile, dump hopper, conveyor and transfer stations.
- In pit tailings disposal (post Year 7).
- Support facilities, including offices, workshop, site access, parking and water management.
- Rehabilitation of the site.

A full description of the project is provided in the EA (Wells, 2009).

The project will produce up to 3.6 Mtpa of ROM coal over an approximate seven year period. The ROM coal will be transferred by truck to a ROM coal facility adjacent to and west of the pit then by a 2.5 km long overland conveyor to the existing ACP CHPP for processing, stockpiling and transport by train to the port of Newcastle for export to overseas markets.

The project will produce export quality semi-soft coking coal and low moisture content high-energy thermal coal from a total defined in pit ROM coal resource of about 16.5 Mt. (The EA indicated the mineable resource was about 20.6 Mt. The reduction in ROM coal resource is the result of various mine design changes, including changes made to reduce project related impacts, since the EA was exhibited).

Existing mining equipment and employees will be transferred from the current ACP open cut mine to the SEOC.

Ashton is seeking approval to construct and operate the SEOC Project for a period of up to 21 years.

Ashton is also seeking to modify its existing development consent (DA 309-11-2001-i) to:

- Enable integration of the SEOC Project with the existing ACP operations.
- Increase the extraction rate of the ACP underground mine from 2.95 to 5 Mtpa of ROM coal.
- Increase the throughput of the ACP CHPP from 5.45 to 8.6 Mtpa of ROM coal, with a commensurate increase in total product coal output and rail loading of 2.3 Mtpa.

2.5 Project Need

The SEOC Project is required to:

- Access and extract identified state owned coal resources within EL 4918 and EL 5860.
- Provide business and coal supply continuity for Ashton.
- Provide security and continuity of employment for 160 mine workers.

2.6 Assessment History

Table 2.1 provides a brief summary of the assessment history for the project.

Table 2.1 Summary of project assessment history

Date	Event	Comment
11 March 2009	Major project application and preliminary environmental assessment lodged.	Meets Part 3A project criteria under Schedule 1 of State Environmental Planning Policy (Major Projects) 2005.
31 March 2009	On-site inter-agency planning focus meeting held.	Presentation of project to government authorities and initial discussion of key project impacts.
20 May 2009	Director-General's environmental assessment requirements issued.	Key environmental assessment issues formalised.

Table 2.1 Summary of project assessment history (cont'd)

Date	Event	Comment
27 November 2009 to 18 January 2010	Public exhibition of the EA.	EA exhibited for 53 days, minimum requirement is 30 days.
February 2010	Additional information provided to DoP.	Response to a specific request by DoP for additional information on project alternatives; groundwater model sensitivity analysis; biodiversity; and Aboriginal heritage.
June 2010	Response to Submissions Report submitted to DoP	Report addressing issues raised in submissions on the EA. Includes description of minor revisions to the project.
January 2011	Review of residual issues and project changes (this document).	Response to increased public and government concerns of cumulative mine dust and noise impacts on Camberwell and SEOC Project water impacts.

Table 2.2 provides a brief summary of key government responses to public concerns on cumulative mining and health related impacts on Hunter Valley communities, during the assessment period for the project.

Table 2.2 Government response to cumulative mining impacts in Hunter Valley

Date	Event	Comment
18 December 2008	Camberwell Cumulative Impact Study announced.	Study commissioned by DoP to review cumulative dust and noise levels from mining on Camberwell and potential for contamination of drinking water supplies. The study was extended in 2010 to include the potential cumulative impacts of the Integra, Ashton (SEOC) and Ravensworth project proposals.
May 2010	Independent Expert Health Panel established.	Air pollution expert advisory panel to review and provide advice on Upper Hunter health issues, including effects of air quality on public health.
May 2010	Compilation of air quality monitoring data from Upper Hunter Valley industry monitoring sites for the period 2005-09.	DECCW prepared compendium of air quality monitoring data to assist NSW Health in its review of community concerns of air quality related health impacts from coal mining and power generation in the Upper Hunter Valley. ***Ashton's real-time 24-hour PM_{10} data in Camberwell for the same period is significantly less than that presented in the DECCW's compilation, with much fewer short-term dust exceedances than reported.***
21 May 2010	Report on the health concerns of the Hunter New England Area released.	NSW Health report on respiratory and cardiovascular diseases and cancer among residents in the Hunter New England Area. The report shows there are higher than average rates of respiratory and cardiovascular problems in the region as a whole - but reaches no conclusion about the role of air pollution.

Table 2.2 Government response to cumulative mining impacts in Hunter Valley (cont'd)

Date	Event	Comment
21 May 2010	Report on the health concerns of the Hunter New England Area released (cont'd).	The report finds that further investigation is required to determine the role of pollutant exposure and suggests other risk factors including smoking need to be considered.
13 July 2010	Camberwell Cumulative Impact Study released.	DoP commissioned independent review of cumulative impacts of mining (dust, noise and drinking water impacts) on Camberwell village.
31 August / 1 September 2010	Tri-agency audit of dust management practices at the ACP.	One of a series of combined DECCW, DoP and DII audits on dust management practices at Hunter Valley coal mines.
4 October 2010	Three DoP regional mine compliance officers commenced work in Singleton.	New DoP compliance officers, to be based full-time in Singleton to monitor mines' compliance with their conditions of consent, particularly dust and noise.
5 November 2010	Report on Upper Hunter Health released.	NSW Health report on GP presentations in the Upper Hunter compared to other non-metropolitan areas in NSW, undertaken as part of the work being done on potential health effects from mining and other activities in the Upper Hunter Valley. Conditions presenting to GPs, rates of illness in people presenting to GPs and medications prescribed by GPs in the Upper Hunter region are similar to those in the rest of non-metropolitan NSW. While there appeared to be slightly higher rates of management for asthma and other respiratory problems, the report could not rule out the possibility that these may have been chance findings. The report findings are consistent with early (May 2010) studies. Any further work to be done on advice from Air pollution expert advisory panel.
9 December 2010	Upper Hunter Air Quality Network (UHAQN) commences.	Real-time air quality monitoring commenced in Singleton and Muswellbrook as part of a series of 14 monitors to be installed across the Upper Hunter Valley. PM_{10} and $PM_{2.5}$ data made available in real-time on the DECCW website (www.environment.nsw.gov.au/AQMS/). In 2011, a monitor will be installed in Camberwell, with PM_{10} and $PM_{2.5}$ data to made available in real-time.
23 December 2010	Draft NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining released for comment.	DECCW commissioned independent review of major dust emission sources for Hunter Valley coal mines and benchmarking of current dust management practices against international best practice. Outcomes will guide improved dust management at mine sites.

2.7 Property Overview and Ownership

Ashton has continued to increase its ownership of properties within and surrounding Camberwell village over the last few years. This is part of a general strategy to reduce the number of privately-owned properties potentially affected by the existing mine and development of the SEOC. Ashton's property acquisition strategy has also focused on increasing the buffer between the SEOC Project and privately-owned village residences to reduce potential land use conflicts.

In March 2009, at the time the application for the SEOC Project was lodged, Camberwell village (defined by the 1(d) Small Rural Holdings land use planning zone within the LEP) contained 17 privately-owned residential dwellings, 1 privately-owned uninhabitable dwelling, 3 privately-owned vacant land parcels, a community church (St Clements, unused due to fire damage sustained in 2008) and community hall (albeit derelict). Apart from 7 crown land parcels all other properties were owned by Ashton.

In November 2009, at the time the EA was exhibited, Camberwell village contained 14 privately-owned residential dwellings, 1 privately-owned uninhabitable dwelling, 3 privately-owned vacant land parcels, a community church (St Clement's, unused due to fire damage) and community hall (derelict). The closest private residence to the SEOC at this time was 100 m from the pit and 30 m from the toe of the out of pit dump (EA Plan 3).

In January 2011, at the time of preparing this report, Camberwell village contained 6 privately-owned residential dwellings, 1 privately-owned uninhabitable dwelling, 3 privately-owned vacant land parcels and a community church (St Clement's, unused due to fire damage). Currently, the closest private residence to the SEOC is 900 m from the pit shell and 750 m from the toe of the out of pit dump (Figure 2). The increased separation between the SEOC and private residences is the result of strategic property acquisitions and changes to the pit design resulting in a further 200 m set back of the pit.

Since the EA was exhibited, the Minister for Lands dissolved the Camberwell Common Trust and returned the common land to the crown as a reserve for rural purposes. Ashton has since been granted a licence for grazing and site investigation on these lands. If the SEOC Project is approved, Ashton will then seek to either acquire the land or enter into an agreement with the Minister to allow mining on the land. Ashton is also currently negotiating a compensation agreement with native title claimants with respect to a mining lease application (MLA 351) lodged over the prior common.

As a result of Ashton's property acquisitions, there are now no privately-owned Camberwell village residences located south of the highway. Further, all but one privately-owned village residences are located in the northern most part of the village (north of Dulwich Place). These residences are situated at least 0.5 km north of the highway and 1 km from the northern most extent of the revised out of pit dump and open cut pit limits. The other private residence is located in the central part of the village (between Dyrring Street and Dulwich Place). This residence is about 300 m north of the highway and 900 m from the revised open cut pit limits (Figure 2).

All of the privately-owned village residences are separated from the highway by a hill crest that provides a level of natural acoustic shielding to highway traffic noise. It is expected this topographic feature will also provide some shielding of noise from the SEOC Project.

The current status of land ownership within the village and in areas surrounding the SEOC Project is summarised in Tables 2.3 and 2.4, respectively (Figures 2 and 3).

Table 2.3 Property ownership within the village of Camberwell

Location	Property owner	Property ID	Land holding with residential dwelling	Vacant land holding	Comments
North of Dawson Street	Olofsson	34	1	-	
	De Jong	35	1	-	
	Ashton	33, 36, 37, 38, 39, 40, 41, 42, 43, 44	9	1	
	Crown	167C, 167D	-	2	
Between Dawson Street and Dulwich Place	Olofsson	20	-	1	
	Lopes	23	1	-	
	Clarke & Vollebreght	24A, 24B	2	-	Dwelling 24B is uninhabitable
	Stapleton	32	1	-	
	Ashton	21, 22, 25, 26, 27, 28, 29, 30, 31, 52	10	-	
	Crown	167E	-	1	
Between Dulwich Place and Dyrring Street	Turner	18	1	-	
	Anglican Diocese of Newcastle	151	-	-	St Clement's Anglican Church, outside the 1(d) planning zone
	Ashton	17, 19	1	1	
	Crown	167F	-	1	
Between Dyrring Street and the New England Highway	Ashton	1, 2, 3, 4, 5, 6, 7, 8, 9,10, 11, 12, 13, 14, 15, 16, 150	12	5	Properties 1 and 2 are outside the 1(d) planning zone
	Crown	167H, 167I	-	2	
South of New England Highway and north of Perry Street	W. Bowman	129	-	1	Small vacant non-residential land parcel
	Wonnarua Local Aboriginal Land Council	188	-	1	
	Ashton	45, 46, 47, 48, 49, 50, 51	5	1	Property 46 is the former Camberwell community hall
	Crown	167J	-	1	
Total per ownership group		10 private 46 Ashton 1 church 7 Crown	7 private (1 un-inhabitable) 37 Ashton	3 private 8 Ashton 7 Crown	
Total		**64**	**44**	**18**	

Table 2.4 Property ownership within rural areas surrounding the SEOC Project

Comment	Owner	Property ID	Land holding with residential dwelling	Vacant land holding	Comments
North of New England Highway	R. Hall	81	1	-	Within limits of Integra's open cut pit
	G. Hall	83	1	-	
	Richards	111	1	-	
	Richards	114	1	-	
	McInerney	117	1	-	
	Ernst	120	1	-	
	Burgess	121	1	-	
	Ashton	1, 118, 119	3	-	
South of New England Highway	W. Bowman	129	1	-	Within limits of open cut pit
	A. Bowman	130 (A & B)	1	-	Land holding includes 2 residential dwellings
	W. Bowman, G. Elder, A. Bowman	134	1	-	
	Canravo Pty Limited	135	-	1	
	E. Bowman	182	-	1	
	Moxey	184 (A, B & C)	1	-	Land holding includes 1 residential dwelling and 2 dwelling entitlements
	N. Stapleton	187	1	-	
	Ashton	122, 123, 124, 125, 126, 127, 128	5	2	
	Crown	167B, 167L	-	2	Former Camberwell common
Total per ownership group		14 private 10 Ashton 2 Crown	12 private 8 Ashton	2 private 2 Ashton 2 Crown	
Total		**26**	**20**	**6**	

Ashton currently leases its village properties to its mine employees, previous owners and other unrelated tenants. Ashton's objective is to support the long-term maintenance of Camberwell as a viable rural settlement, post-mining, and has an active maintenance and management program to ensure it maintains a viable housing stock to achieve this aim. The few dwellings situated between the highway and the project will be vacated and either demolished or relocated to the northern part of the village.

3. PROJECT CHANGES

Ashton has reviewed the design, layout and operation of the SEOC Project with the intent of minimising project impacts on Camberwell village residents, surrounding rural properties and Glennies Creek and its alluvial aquifer, to the lowest extent practicable. As a result, Ashton has made changes to the project proposed and described in the EA. These are described below.

It is important to note these changes do not substantially change the description of the project as presented in the EA, but rather reduce the footprint of the project and the extent, level and intensity of off-site impacts.

3.1 Key Project Changes

The key changes to the project include:

- Increasing the distance between open cut pit operations and Camberwell village residences by setting back the northern extent of the open cut pit further to the south.

  The open cut pit will be set back a distance of 200 m from that described in the EA. The toe of the environmental bund (i.e., out of pit emplacement) will be set back a distance of 120 m, this is to accommodate a slightly revised design for the bund.

  The closest part of the open cut pit will now be 900 m from the nearest privately-owned Camberwell village residence and at least 1 km from all other privately-owned Camberwell village residences.

  This additional setback will sterilise about 500,000 tonnes of ROM coal, but is considered necessary to reduce potential health and amenity impacts on Camberwell village residences.

- Reducing mining rates during the first two years, when mining activities are at their closest to Camberwell village.

  This will result in a 35% decrease in total project dust emissions in Years 1 and 2. Further reductions in dust emissions are achieved in Years 3 to 7, but at a smaller (6 to 8%) rate.

- Relocating haul roads and access ramps to areas further removed from Camberwell village.

  Previously the waste rock haul road access ramps ran along the northern and western dump face. These have been relocated to run up through the southern edges of the pit further away from village residences, and will enable the north-western dump faces to be progressed westerly more rapidly.

  This will reduce the noise of ascending and descending haul trucks on village residences.

- Reducing hours of mining in the first two years of the project from 24-hours a day, 7 days a week to:

    - 7:00am to 10:00pm Monday to Saturday (inclusive).
    - 8:00am to 10:00pm Sunday and Public Holidays.

However, ROM coal handling and conveyor transfer, and maintenance activities will be carried out on a 24-hour basis.

This will ensure night time noise amenity levels at Camberwell village residences are minimised as far as practicable.

- Using noise attenuated haul trucks.

  This will provide additional reductions in overall mine noise emission levels.

- Implementing leading practice dust and noise mitigation and management, including use of real-time dust and noise monitoring and predictive weather forecasting.

  This will enable Ashton to proactively manage SEOC operations under adverse weather conditions to ensure the health and amenity of Camberwell village residents is not adversely affected.

- Installing a low permeability barrier along the western boundary of the open cut pit prior to mining through unconsolidated sediments.

  This will mitigate the potential direct inflow of alluvial groundwater into the pit and minimise baseflow reduction in Glennies Creek associated with reduced alluvial groundwater levels caused by the project.

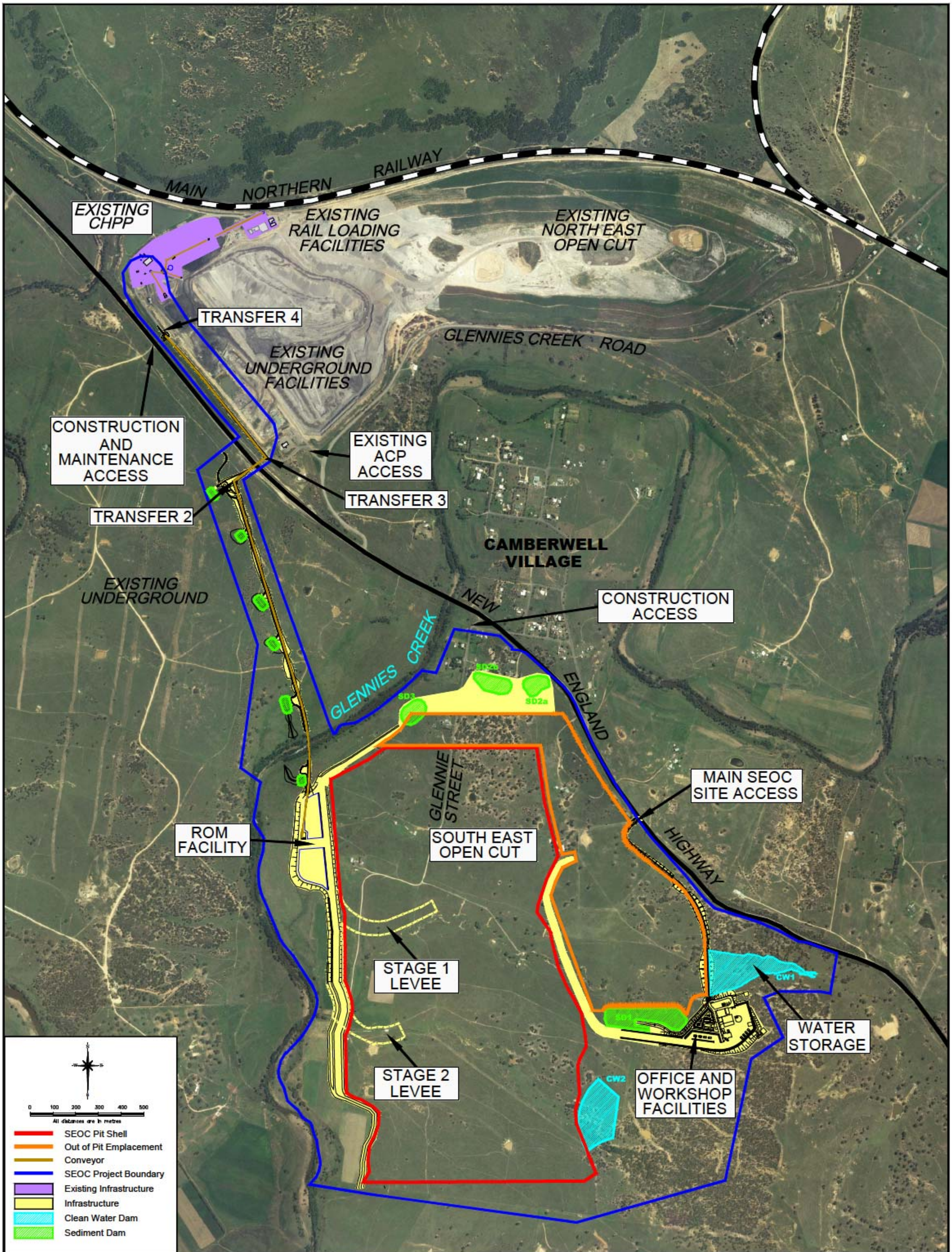
These changes will:

- Reduce project related and cumulative dust and noise impacts on Camberwell village residents to the lowest extent practicably possible.
- Minimise the potential for short-term dust exceedances and potential associated adverse health effects on Camberwell village residents.
- Protect the existing amenity of private Camberwell village residents.
- Minimise the impact of the project on Glennies Creek and its connected alluvial aquifer to the greatest extent practicable.
- Ensure that the state owned coal resource within EL 4918 and 5860 is extracted to the maximum extent and in the most efficient manner possible, while protecting the health and amenity of Camberwell village residents and the quality and quantity of water in adjacent water sources.

The general layout of the revised project is shown in Figure 4.

Table 3.1 summarises key project changes since the EA was exhibited.

The proposed progression of mining for Years 1, 3, 5 and 7 is shown in Figures 5 to 8. Tailings emplacement in the final void is conceptually shown for Year 9 in Figure 9.



AshtonCoal

South East Open Cut Project

Proposed SEOC General Arrangement

Figure 4

Revised EA Plan 4

Prepared by Pegasus Technical

CAD FILE: 07127A.dwg

Table 3.1 Summary of Key Project Changes

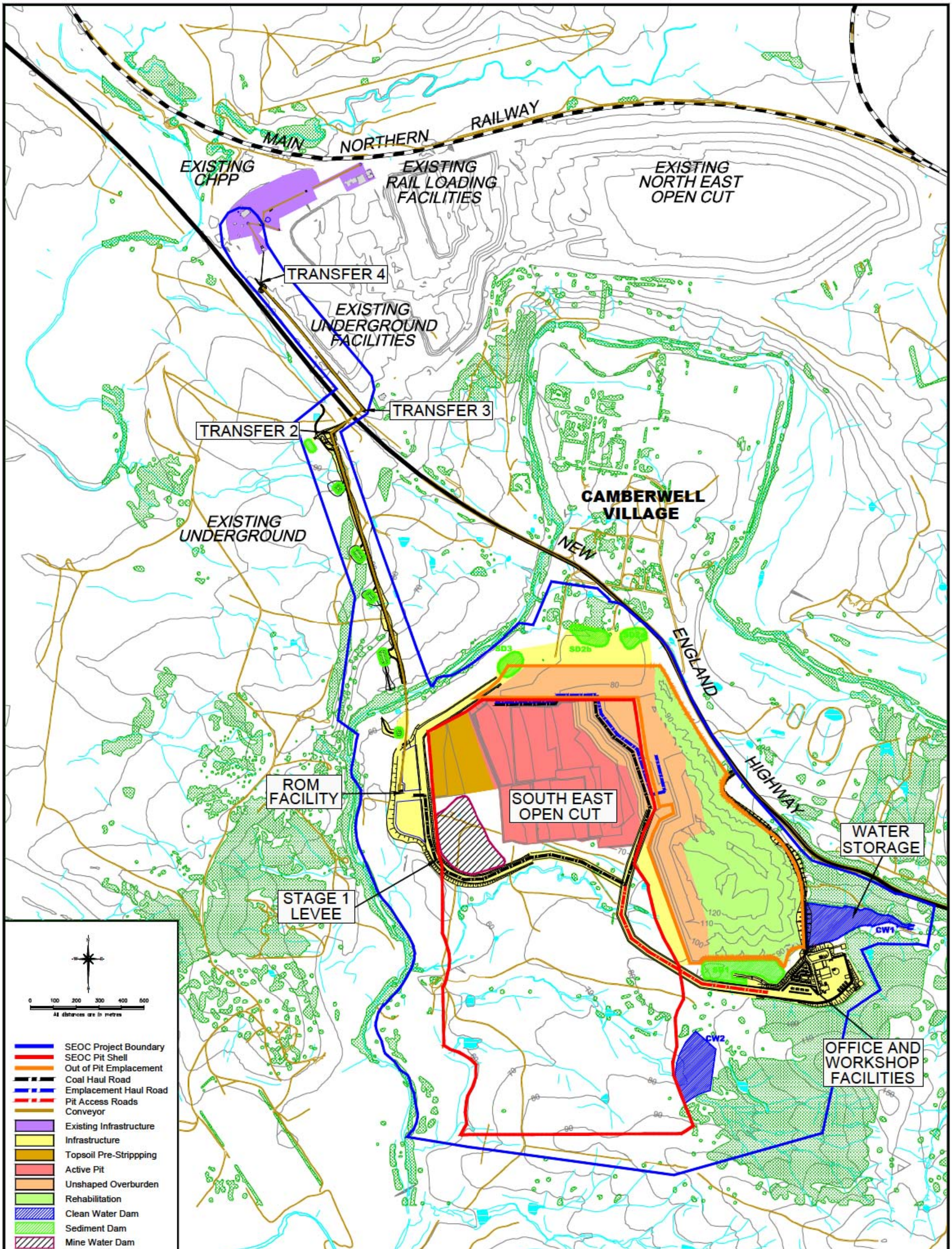
Key project element	2009 EA SEOC Project description	Revised SEOC Project (this document)	Pros and cons of project changes	Comments
Open cut pit limits	Northern extent within 100 m of the nearest privately-owned Camberwell village residence.	Northern extent within 900 m of the nearest privately-owned Camberwell village residence.	Pros: • Increased separation of mining from Camberwell village. • Reduced noise and dust amenity impacts on Camberwell village. • Reduced visual impact from highway and Camberwell village. Cons: • 500,000 tonnes of coal sterilised.	Changed to that described in Response to Submissions Report, June 2010.
Out of pit dump disturbance limits	Northern extent within 30 m of the privately-owned Camberwell village residences.	Northern extent within 750 m of the privately-owned Camberwell village residences.	Pros: • Increased separation of mining activities from Camberwell residences. • Reduced dust and noise amenity impacts on Camberwell. • Reduced visual impact from highway and Camberwell village. Cons: • 500,000 tonnes of coal sterilised.	Changed to that described in Response to Submissions Report, June 2010.
Haul roads and access ramps	The northern bund will be accessed via a ramp at its north-western end. Ramps will run along the northern and western dump face, exposed to Camberwell village.	The northern bund will be accessed via a ramp at its south-eastern end. Ramps will run up through the southern pit edge, with reduced exposure to Camberwell village.	Pros: • Haul roads further removed from Camberwell, resulting in improved dust and noise amenity on village residences. Cons: • Longer haul routes. • Reduced dump space due to pit floor space constraints.	Changed to that described in Response to Submissions Report, June 2010.

Table 3.1 Summary of Key Project Changes (cont'd)

Key project element	2009 EA SEOC Project description	Revised SEOC Project (this document)	Pros and cons of project changes	Comments
Operating hours	24-hours, 7 days a week operations.	Construction and mining operations Years 1 and 2: • 7:00am to 10:00pm Monday to Saturday. • 8:00am to 10:00pm Sunday and Public Holidays. Mining operations Years 3 to 7: • 24-hours a day, 7 days a week. ROM coal handling and conveyor transfer to the ACP CHPP: • 24-hours a day, 7 days a week. Maintenance: • 24-hours a day, 7 days a week.	Pros: • No night time mining activity during Years 1 and 2, resulting in improved dust and noise amenity on Camberwell. Cons: • Reduced production rate.	Changed to that described in Response to Submissions Report, June 2010.
Production rate	20.5 Mt ROM coal resource mined at up to 3.6 Mtpa, 24-hours a day, 7 days a week, over 7 years.	16.5 Mt ROM coal resource mined at up to 3.6 Mtpa, 15 hours a day for first 2 years of operation, then 24-hours a day, 7 days a week, for the remaining 5 years of operation.	Pros: • Reduced total dust emissions. • Reduced dust and noise impacts on Camberwell village residences. Cons: • Reduced productivity. • Reduced coal reserve.	Reduced coal resource due to various mine design changes, including changes made to reduce project related impacts, since the EA was exhibited.
Equipment fleet	Noise attenuation of partial mine fleet.	Noise attenuation of overburden and coal haul trucks.	Pros: • Reduced mine fleet noise emission levels. Cons: • Increased project cost.	Changed to that described in Response to Submissions Report, June 2010.

Table 3.1 Summary of Key Project Changes (cont'd)

Key project element	2009 EA SEOC Project description	Revised SEOC Project (this document)	Pros and cons of project changes	Comments
Groundwater management	Monitoring to inform mitigation response, including potential future installation of low permeability barrier in areas of unconsolidated sediment along western pit boundary.	Upfront installation of low permeability barrier along length of western pit boundary, prior to mining through unconsolidated sediments.	Pros: • Mine inflows from alluvial aquifer minimised. • Glennies Creek baseflow reductions minimised. • Improved stability of final western highwall. Cons: • Increased project cost.	Described in detail in Appendix 3.
Property acquisition	Voluntary acquisition of 37 Camberwell village residential properties and 9 rural properties to reduce the number of private properties potentially affected by the ACP and SEOC.	Additional acquisition of 8 residential Camberwell village properties and 1 rural property.	Pros: • Increased impact buffer between the project and privately-owned residences. • Reduced number of potentially affected private properties. Cons: • Increased project cost.	Described in detail in Section 2.7.



South East Open Cut Project

Proposed mining progression plan for Year 1

Figure 5

Revised EA Plan 9

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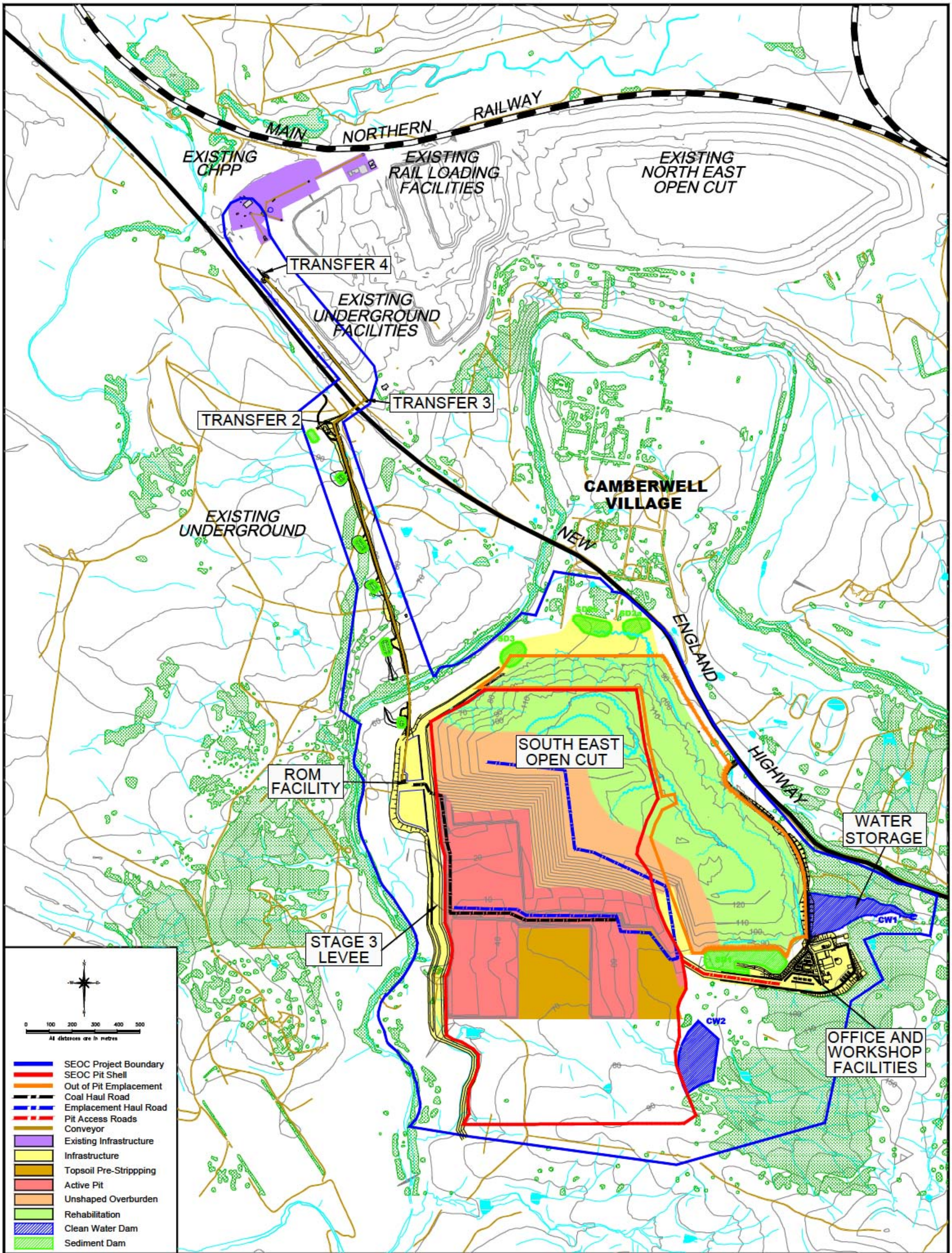

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South East Open Cut Project

Proposed mining progression plan for Year 3

Figure 6

Revised EA Plan 10

Prepared by Pegasus Technical

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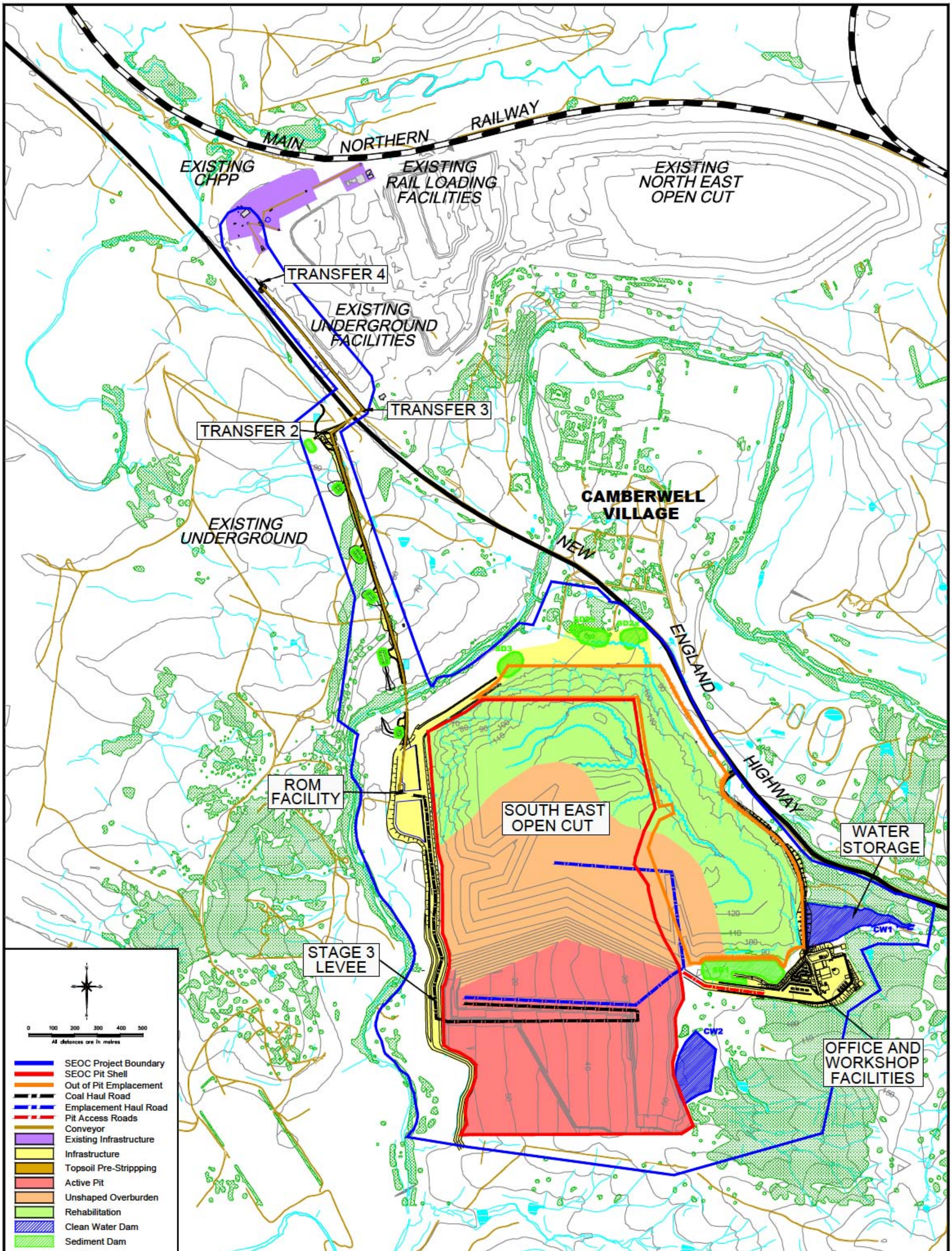

AshtonCoal

South East Open Cut Project

Proposed mining progression plan for Year 5

Figure 7

Revised EA Plan 11

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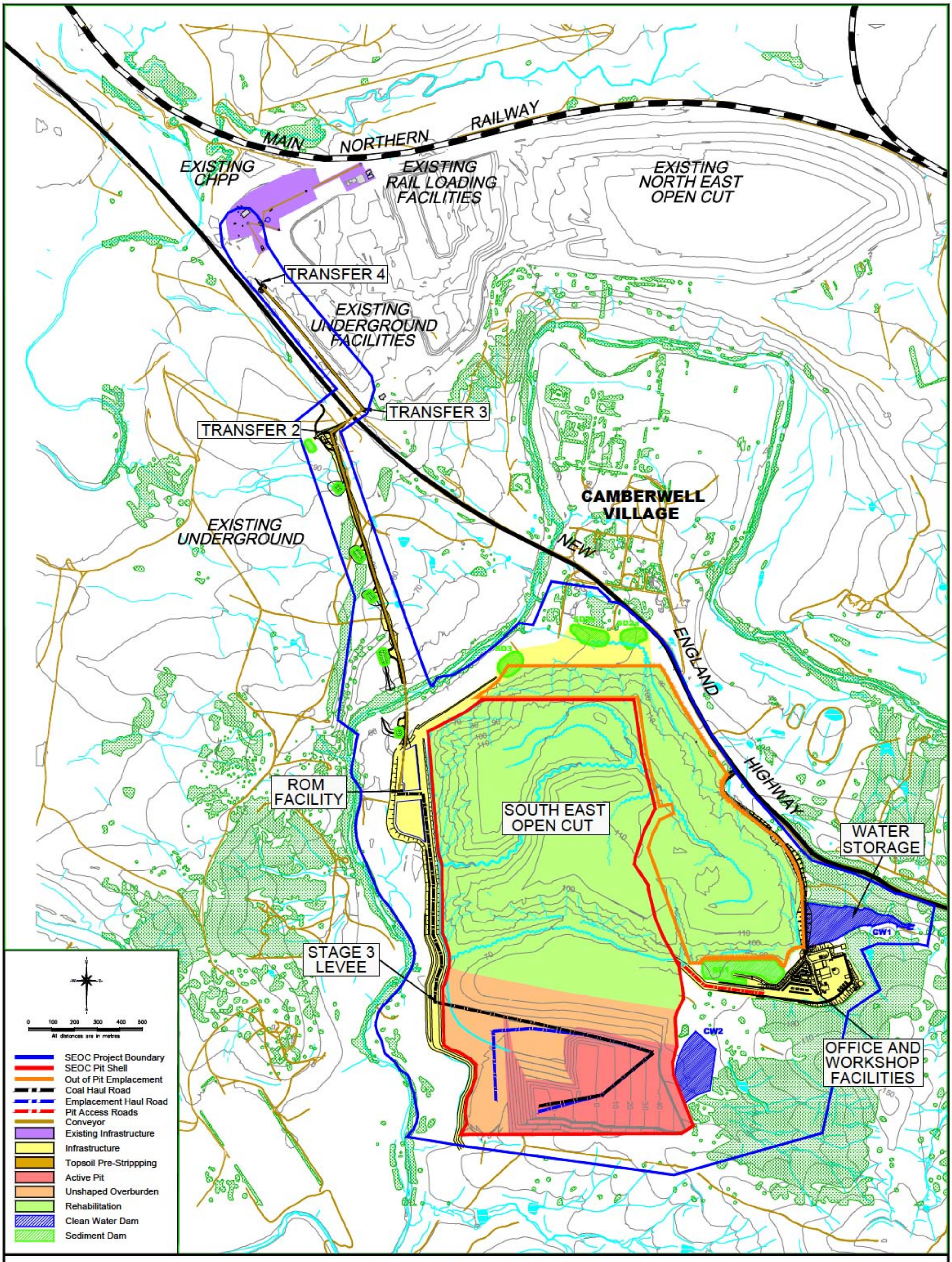

AshtonCoal

South East Open Cut Project

Proposed mining progression plan for Year 7

Figure 8

Revised EA Plan 12

Prepared by Pegasus Technical

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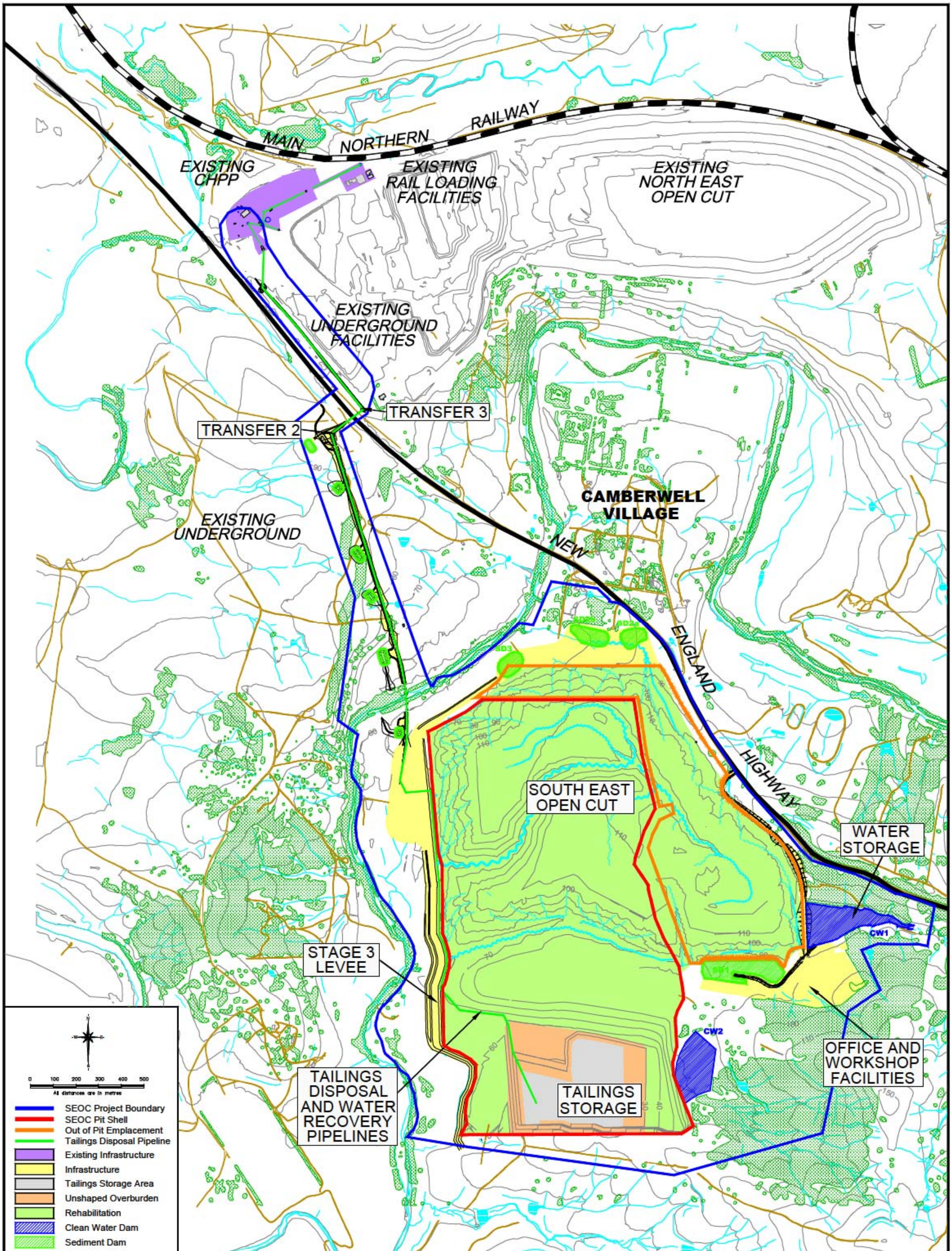


AshtonCoal

South East Open Cut Project

Proposed mining progression plan for Year 9 - tailings deposition

Figure 9

Revised EA Plan 13

Prepared by Pegasus Technical

CAD FILE: 07132A.dwg

3.2 Other Project Changes

Ashton has made other changes to the project since the EA was exhibited. These changes were described in the Response to Submissions Report (Wells, 2010) and include:

- Redesigning the conveyor layout to accommodate a curved conveyor.

  This removes the need for the originally proposed transfer station (No. 1) immediately west of Glennies Creek. The removal of the transfer station and use of a curved conveyor will reduce the overall noise emission levels from the conveyor.

- Incorporating natural landform features into the design of the environmental bund to conform to the design principles of Australian coal industry's research program (ACARP) - Research Project C18024.

  This includes introducing natural landscape features such as undulating ridges, faces, gullies and spurs into the design of the bund. The design of these features will be based on similar topographic features in the surrounding natural landscape. This will provide a more natural looking and more stable final landform.

- Temporary use of up to four rock crushing stations in two borrow pits within the initial pit excavation area. Up to two crushing stations will be required for each borrow pit. The crushing stations will be located below ground level and will each have a nominal processing capacity of up to 2,000 t/day.

  This will enable selection, extraction and processing of construction materials required for the office and workshop facilities area, flood levee and ROM coal facility, rather than requiring material import.

- Upgrading the New England Highway–site access intersection.

  A rural seagull intersection with separate right turn lanes (into and out of the SEOC site) will be constructed in place of the previously (EA) proposed channelised right turn and auxiliary left turn intersection, which will improve traffic safety.

- Minor adjustment in the design of clean water dam 2 and sediment dam 1.

  This is required to avoid conflict with other aspects of the project and will marginally reduce the amount of vegetation clearing.

- Minor changes to the number and size of previously described equipment, including:
  - An additional dozer working within the open cut.
  - An additional dozer working at the ROM coal facility.
  - Two wheeled (i.e., not tracked) loaders.
  - Up to four 2,000 t/day crushing stations for processing construction materials in Year 1.
- Staging of 66kV and 132kV powerline realignments.

The 66kV and 132kV powerlines will be realigned within a 50 m north-south oriented easement along the eastern boundary of the ACP underground mine. The realigned powerline route will extend south to the existing east-west 132kV powerline easement. At this juncture, the realigned 66kV and 132kV powerlines will follow the existing 132kV powerline to the east to rejoin their existing alignment. However, because Ashton is still negotiating with Energy Australia and relevant landowners over the final powerline route, the easterly extension of the realigned route will only be temporary.

Within 2 to 3 years of commencement of mining, it will be necessary to further realign the 66kV and two 132kV powerlines within the southern part of the SEOC Project area. Depending upon the outcome of negotiations over easements, the three powerlines will either be realigned along the southern extension of the EA Option 1 proposed powerline route (west of Glennies Creek) or alternatively along the southern portion of EA Option 2 proposed powerline route (east of Glennies Creek) (refer EA Section 4.6.1 and Response to Submissions Report Figure 11).

- Minor amendments to the Project Boundary to accommodate the above project changes.

4. REVISED IMPACTS, MITIGATION AND MANAGEMENT

As previously indicated, Ashton has reviewed the project to identify appropriate (reasonable and feasible) changes that could be implemented to avoid or reduce as far as practicable the dust, noise and groundwater impacts of the project. The review focused on those aspects of the project that could be changed to reduce dust and noise emission levels and the potential for adverse health and amenity affects on Camberwell village residents. It also investigated control measures that could be implemented to reduce impacts on Glennies Creek and its connected alluvial groundwater source.

Ashton has assessed the affect of implementing the proposed project changes on dust and noise emission levels and on alluvial groundwater mine inflows. This assessment indicates there will be a significant reduction in dust and noise emission levels in Camberwell village and reduced impacts on Glennies Creek and its connected alluvial aquifer. The results of this assessment are presented below.

Ashton has also reviewed the operational measures it will implement to mitigate and manage the residual dust, noise and groundwater impacts following implementation of the proposed project changes. This is in addition to the impact mitigation and management measures described in the EA. These additional operational mitigation and management measures are discussed below. An updated list of Ashton's impact mitigation and management commitments is provided in Section 6.

4.1 Dust

4.1.1 Revised Dust Impacts

PAEHolmes has assessed the dust impacts of the revised project with reference to its previous air quality impact assessments for the project (EA and Response to Submissions Report – Wells, 2009 and 2010) and the Independent Review of Cumulative Impacts on Camberwell (DoP, 2010). PAEHolmes' assessment report on the revised project is attached as Appendix 1.

This revised dust assessment considers the dust emission levels for the revised project for Years 1, 3 and 5. These years are considered representative of intervening years. Year 7 has not been remodelled as mining location, rates and volumes of materials moved in this year are generally the same as that assessed in the EA.

Only those residences that showed an exceedance in short-term dust levels (i.e., 24-hour PM_{10} levels) in previous modelling and only those residences that were included in the Camberwell cumulative study (PAEHolmes, 2010) for cumulative annual PM_{10} levels were considered in the revised assessment. It is assumed the modelled residences are representative of other nearby residential dwellings, where these have not been specifically modelled.

Table 4.1 presents a comparison of total suspended particulate (TSP) emissions for the project as described in the EA and the revised project as described in this document. The revised project results in a significant reduction (35%) in TSP emission rates in Year 1 (and 2) when mining activities are closest to Camberwell village residences. In other years (3, 4, 5, 6) project changes result in smaller reductions (<10%) in TSP emission rates. This is a direct result of reducing the footprint of the open cut pit (by setting back the northern extent of the pit by 200 m), gradually increasing material handling and dust generating activities over the first four months, and only operating during day and evening periods for the first two years of the project.

Table 4.1 Revised project TSP emission rates

Representative mine model scenario	TSP emission rate (kg/year)		Emission reduction
	EA (2009) mine plan	Revised (2011) mine plan	
Year 1	1,646,925	1,076,389	34.6%
Year 3	2,166,712	2,023,624	6.6%
Year 5	2,350,776	2,165,018	7.9%

Short-term dust impacts (24-hour average PM10)

The results for the revised project show a clear decrease in project related short-term dust levels at most modelled residential locations (for modelled Years 1, 3 and 5) compared to previously modelled project related dust emissions. There is also a decrease in the number of days of predicted short-term dust exceedances for those properties where an exceedance is still predicted. The results are presented in Table 4.2 and described briefly below. Note these are conservative predictions due to the inherently conservative nature of the air dispersion model used.

In Year 1, the short-term dust levels at all privately-owned Camberwell village residences are well below the criterion of 50 $\mu g/m^3$. The revised project will result in a decrease in short-term dust concentration levels at all these residences, except property 34 (Olofsson) which remains unchanged.

In Year 3, when night-time mining operations commence, short-term dust levels at all privately-owned Camberwell village residences remain below the 50 $\mu g/m^3$ criterion.

In Year 5, project changes result in a decrease in previously predicted short-term dust levels at all privately-owned Camberwell village residences, except for property 32 (Stapleton) which shows a minor increase of 1 $\mu g/m^3$ to 49 $\mu g/m^3$. While dust levels were shown to generally decrease, compared to EA modelling, the revised project short-term dust levels are predicted to occasionally (less than 3 times a year) exceed the 50 $\mu g/m^3$ criterion at all but two privately-owned Camberwell village residences (Table 4.2). Ashton has investigated the use of additional operational controls to further reduce the potential for short-term dust exceedances at these Camberwell village residences. This is discussed in Section 4.1.2.

In Year 7, there will be no short-term dust exceedance at any privately-owned Camberwell village residence.

Privately-owned rural residences outside the village and surrounding the project (83 – Hall, 114 – Richards, 120 – Ernst, 121 – Burgess, 129 – W. Bowman, 130A and 130B – A. Bowman, 187 – N. Stapleton) will experience short-term dust exceedances at some stage over the life of the project, albeit at reduced levels and on fewer days than previously assessed. With the exception of rural residences 114, 130B and 157, short-term dust exceedances at these privately-owned rural residences are predicted to occur greater than 5 times a year.

Ashton-owned Camberwell village residences in closer proximity to the project (i.e., south of Dyrring Street) will also experience short-term dust exceedances in Years 1 through 5. However, these exceedances are predicted to occur less than four times a year, which is below the accepted five day maximum limit.

Table 4.2 Summary of revised project short-term dust impacts (24-hour PM10)

Location	Residence (private and mine-owned)	Project specific health criteria (*assessment criterion = 50 µg/m³*)		
		Highest prediction (µ/m³)	Days above criteria	Year(s)
Village – north	35 – De Jong	47 (-3)	-	-
	34 – Olofsson	**52 (+2)**	1	5
	23 – Lopes	**53 (+3)**	1	5
	24A – Vollebreght & Clarke	**51 (+1)**	1	5
	24B – Vollebreght & Clarke	**52 (+2)**	3	5
	30 – Ashton-owned	50 (-)	-	-
	32 – C Stapleton	49 (-1)	-	-
Village - centre	17 – Ashton-owned	**58 (+8)**	3	5
	18 – Turner	**57 (+7)**	1	5
	151 – Church[1]	50 (-)	-	-
Village – south	2 – Ashton-owned	**77 (+27)**	2, 2, 3	1, 3, 5
	8 – Ashton-owned	**68 (+18)**	1, 4, 3	1, 3, 5
	10 – Ashton-owned	**60 (+10)**	3	5
	11 – Ashton-owned	**62 (+12)**	3	5
Rural properties with residence north of highway	111 – Richards	Not assessed		
	114 – Richards	**76 (+26)**	1, 4, 3	3, 5
	117 – McInerney	47 (-3)	-	-
	118 – Ashton-owned	**73 (+23)**	4, 1	1, 3, 5
	120 – Ernst	**117 (+67)**	**7, 13, 7**	1, 3, 5
	121 – Burgess	**209 (+159)**	**13, 41, 20**	1, 3, 5
	83 – Hall	**105 (+55)**	**1, 14, 7**	1, 3, 5
Rural properties with residence south of highway	129 – W Bowman	Within limits of open cut pit		
	130A – A Bowman	**170 (+120)**	**2, 25**	3, 5
	130B – A Bowman	Not assessed		
	184A – Moxey	Not assessed		
	187 – N Stapleton	**51 (+1)**	1	5

[1] Camberwell Church

Cumulative dust impacts (annual average PM10)

Modelling at representative village and rural residence locations indicates that dust emissions from the revised project combined with dust emissions from all other sources will not exceed the annual average PM_{10} criterion of 30 µg/m³, at any privately-owned or Ashton-owned Camberwell village residence or at rural residences 111 (Richards), 114 and 117 (McInerney). However, cumulative dust emissions at rural residences 120 and 130A are predicted to exceed the relevant annual average PM_{10} criteria, but only marginally. (Property 129 is not considered as it is within the limits of the open cut pit).

Cumulative annual average PM_{10} levels at representative locations are summarised in Table 4.3. This shows that predicted cumulative annual average dust levels incorporating the revised project are generally lower than that presented in the Camberwell cumulative study (PAEHolmes, 2010), which considered the unrevised SEOC Project. (Note, the Camberwell cumulative study considered dust emission levels for the SEOC Project incorporating changes described in the Response to Submissions Report. The changes described for the revised project, this document, supersede these previous project changes.)

Table 4.3 Cumulative annual average PM_{10} levels at representative locations[1]

Location	ID	Cumulative Annual Average PM_{10} (Assessment Criterion = 30 µg/m[3])					
		Year 1		Year 3		Year 5	
		Cumulative study[1]	Revised project	Cumulative study	Revised project	Cumulative study	Revised project
Representative village residences	R32	23	22	26	26	23	23
	R34	24	23	28	28	24	24
	R18	24	22	27	27	24	24
Representative rural residence north of highway	R114	26	25	27	26	27	26
	R117	26	26	29	29	27	27
	R120	**31**	26	**33**	**33**	27	26
Representative rural residence south of highway	R129	15	16	Within limits of open cut pit			
	R130A	12	12	30	29	**32**	**31**

[1] Representative assessment locations as described in PAEHolmes, 2010 (in DoP, 2010).

Comparison of EA and revised project dust impacts

A comparison of short-term and annual average PM_{10} levels at privately-owned residences for the EA described and revised project is shown in Tables 4.4a and 4.4b. This shows there is a general reduction in project related dust impacts on Camberwell village residences due to the implementation of the proposed project changes. Residences which exceed dust impact acquisition criteria are highlighted in red. (Note, Table 5.1 in Appendix 1 compares dust emission levels due to project changes described in the Response to Submissions Report for Year 1 with the revised project, this document. As these former changes are no longer relevant, Table 4.4 compares dust emission levels for the EA described project with the revised project, this document.)

Table 4.4a Summary of EA project dust impacts

Private residences		Project specific health criteria				Cumulative health criteria	
		PM_{10} 24-hour (µ/m³)	Highest prediction (µ/m³)	Days above criteria	Year(s)	PM_{10} annual (µ/m³)	Highest prediction (µ/m³)
Camberwell village	35 – De Jong	50	**55 (+5)**	2	5	30	**40**
	34 – Olofsson	50	**61 (+11)**	3	5	30	**38**
	23 – Lopes	50	**63 (+13)**	3	5	30	**36**
	24A – Vollebreght & Clarke	50	**59 (+9)**	3	5	30	**37**
	24B – Vollebreght & Clarke	50	**65 (+15)**	3	5	30	**33**
	32 – Stapleton	50	**51 (+1)**	1	5	30	**34**
	18 – Turner	50	**57 (+7)**	**1, 1, 5**	1, 3, 5	30	27
	151 – Church[1]	50	**56 (+6)**	2, 2, 2	1, 3, 5	30	28
Rural areas	111 – Richards	50	44 (-6)	-	3	30	**31**
	114 – Richards	50	**84 (+34)**	4, 3, 3	1, 3, 5	30	28
	117 – McInerney	50	**56 (+6)**	2, 2	3, 5	30	29
	120 – Ernst	50	**155 (+105)**	**29, 15**	1, 3	30	**33**
	121 – Burgess	50	**202 (+152)**	**49, 43, 26**	1, 3, 5	30	**37**
	83 – Hall	50	**123 (+73)**	**3, 14, 9**	1, 3, 5	30	24
	129 – W Bowman[2]	50	**120 (+70)**	**20**	3	30	**34**
	130A – A Bowman	50	**171 (+121)**	**3, 27, 34**	3, 5, 7	30	**36**
	130B – A Bowman	50	21 (-29)	-	5	30	23
	184A – Moxey	50	8 (-48)	-	5	30	23
	187 – N Stapleton	50	**52 (+2)**	1	5	30	**31**

[1] Camberwell Church
[2] Within limits of open cut pit

Exceedance of acquisition criteria

Table 4.4b Summary of revised project dust impacts

Private Residences		Project specific health criteria				Cumulative health criteria	
		PM_{10} 24-hour (µ/m³)	Highest prediction (µ/m³)	Days above criteria	Year(s)	PM_{10} annual (µ/m³)	Highest prediction (µ/m³)
Camberwell village	35 – De Jong	50	47 (-3)	-	-	30	NA[3]
	34 – Olofsson	50	**52 (+2)**	1	5	30	28
	23 – Lopes	50	**53 (+3)**	1	5	30	NA
	24A – Vollebreght & Clarke	50	**51 (+1)**	1	5	30	NA
	24B – Vollebreght & Clarke	50	**52 (+2)**	3	5	30	NA
	32 – Stapleton	50	49 (-1)	-	-	30	26
	18 – Turner	50	**57 (+7)**	1	5	30	27
	151 – Church[1]	50	50 (-)	-	-	30	NA
Rural areas	111 – Richards	Not assessed					
	114 – Richards	50	**76 (+26)**	4, 1	3, 5	30	26
	117 – McInerney	50	47	-	-	30	29
	120 – Ernst	50	**117 (+67)**	**7, 13, 7**	1, 3, 5	30	**33**
	121 – Burgess	50	**209 (+159)**	**13, 41, 20**	1, 3, 5	30	NA
	83 – Hall	50	**105 (+55)**	**1, 14, 7**	1, 3, 5	30	NA
	129 – W Bowman[2]	50	**85 (+35)**	**14**	3	30	**32**
	130A – A Bowman	50	**170 (+120)**	**2, 25**	3, 5	30	**31**
	130B – A Bowman	Not assessed					
	184A – Moxey	Not assessed					
	187 – N Stapleton	50	51	1	5	30	NA

[1] Camberwell Church
[2] Within limits of open cut pit
[3] NA = not assessed, neighbouring properties considered representative

4.1.2 Dust Mitigation, Management and Monitoring

4.1.2.1 Mitigation and management

Ashton has committed to implement best practice dust management for the SEOC Project, including use of:

- Real-time monitoring and management of mining operations.
- Chemical suppressants on selected areas.
- Water carts on haul roads.
- Water sprays at ROM coal facilities.
- Enclosed conveyor and conveyor transfer stations (as a minimum, conveyors will be enclosed on the top and side facing the village).
- Real-time and predictive weather forecasting.
- Regular review of best available technology, and implementation where this is reasonable and feasible.
- Temporary rehabilitation of areas required to be left exposed for long periods.
- Progressive rehabilitation of mined areas (see Figures 5 to 9).

These measures are currently used to effectively mitigate and manage dust impacts at the existing ACP, and the experience gained in their application will be carried across to the SEOC Project. (Other standard industry measures currently used at the ACP will be applied to the SEOC).

The dust dispersion modelling assumed the application of these dust control measures for the revised project.

Need for real-time control

The revised modelling indicates there are still some village residences that are predicted to experience occasional short-term dust impacts above the 50 µg/m³ criterion, even with the changes proposed for the revised project. Although these predicted exceedances are only marginal and expected to occur on less than three times a year, Ashton has identified and modelled additional operational and management controls which it can implement to eliminate the potential for short-term dust exceedances on Camberwell village residences.

An analysis of local meteorological data for the air shed is included in Appendix 1. This has identified the wind directions (150° to 235°) that have potential to transport project related dust toward Camberwell village. The analysis indicates winds from these directions occur for less than 6% of the time.

Ashton has considered and assessed two operational scenarios which restrict dust generating activities during periods when the wind direction is within the 150° to 235° arc:

> <u>Scenario 1:</u>
>
> Assumes all open cut mine activities (including stripping, loading and unloading, hauling, drilling and blasting) will be stopped when the wind direction is within the 150° to 235° arc.

Activities related to ROM transport and processing (including crushing and conveying of ROM coal to the CHPP) and other existing ACP operations (including coal processing and handling, train loading, hauling and dumping rejects, unloading underground coal and the underground vent shaft) will remain active.

Scenario 2:

Rather than stopping open cut operations (as assessed in scenario 1) under adverse wind directions, scenario 2 assumes open cut operations are reduced by 50%. All other aspects of this scenario are the same as for scenario 1.

Table 4.5 compares the reduction in annual TSP emissions for both scenarios. (Note Year 1 is separated in two components, with emissions presented prior to and after commencement of coal mining and 24-hour ROM coal handling).

Table 4.5 Comparison of emission reductions under controlled operating conditions

Year	Annual TSP emission	TSP emission from continuous operations[1]	Emission reduction for Scenario 1	Emission reduction for Scenario 2
Year 1 (Apr-Jul)	292,118	53,157	82%	41%
Year 1 (Rest of year)	784,271	226,895	71%	36%
Year 3	2,023,624	472,949	77%	38%
Year 5	2,165,018	510,224	76%	38%

[1]TSP emission from activities that cannot be stopped or reduced at any particular hour of the day.

Modelling of both scenarios shows that implementation of operational controls has the potential to avoid exceedance of short-term dust criterion at all Camberwell village residences in all years of the project (including mine-owned properties in the southern part of the village).

Due to predicted adverse wind directions occurring for only 6% of the time, the application of operational controls is considered to be practical and not overly onerous. Hence Ashton will implement operational controls under adverse wind directions for the project, the application of which will be guided by real-time monitoring and predictive forecasting of meteorological conditions.

Short-term dust impacts at representative Camberwell village residences for the revised project without and with 50% operational controls (scenario 2) is summarised in Table 4.6.

Table 4.7 presents a comparison of predicted short-term dust levels at representative Camberwell village residences for the EA described project, the revised project as described in this document and the revised project with 50% operational controls applied under adverse wind conditions.

Ashton currently uses similar operational control measures at its existing open cut mine to reduce short-term dust levels at Camberwell village residences under adverse (NW) weather conditions. These controls are used in conjunction with real-time dust and weather monitoring, which enables both proactive and reactive decisions to be made to modify or reduce mining operations on a temporal (hourly and daily) basis. Ashton has found the implementation of these measures to be very effective in controlling its short-term dust impacts on Camberwell village residences.

Ashton has committed to the use this approach of real-time dust level monitoring and predictive forecasting of adverse wind directions in its management of day to day dust generating project activities, including blasting.

Ashton considers the implementation of these measures is leading practice in mine site dust management.

Table 4.6 Comparison of short-term dust impacts using 50% operational controls

Location	Representative residence (private and mine-owned)	Project specific health criterion (50 µg/m3)	
		Without controls – highest prediction (µ/m3)	With controls – highest prediction (µ/m3)
Village – north	34 – Olofsson	**52 (+2)**	34 (-16)
	23 – Lopes	**53 (+3)**	35 (-15)
	24A – Vollebreght & Clarke	**51 (+1)**	34 (-16)
	24B – Vollebreght & Clarke	**52 (+2)**	34 (-16)
	30 – Ashton-owned	50 (-)	31 (-19)
Village - centre	18 – Turner	**57 (+7)**	32 (-18)
Village – south	2 – Ashton-owned	**77 (+27)**	46 (-4)
	8 – Ashton-owned	**68 (+18)**	43 (-7)
	11 – Ashton-owned	**62 (+12)**	39 (-11)

Table 4.7 Comparison of dust impacts on privately-owned Camberwell village residences for the EA described project, revised project and revised project with 50% operational controls applied under adverse wind conditions

Private residences	EA Project			Revised Project			Revised Project (with 50% operational controls applied)		
	Project specific health criteria PM_{10} 24-Hour (assessment criterion = 50 $\mu g/m^3$)			Project specific health criteria PM_{10} 24-hour (assessment criterion = 50 $\mu g/m^3$)			Project specific health criteria PM_{10} 24-Hour (assessment criterion = 50 $\mu g/m^3$)		
	Highest prediction (μ/m^3)	Days above criteria	Year(s)	Highest prediction (μ/m^3)	Days above criteria	Year(s)	Highest prediction (μ/m^3)	Days above criteria	Year(s)
35 – De Jong	**55 (+5)**	2	5	47 (-3)	-	-	NA[3]	-	-
34 – Olofsson	**61 (+11)**	3	5	**52 (+2)**	1	5	34 (-16)	Nil	None
23 – Lopes	**63 (+13)**	3	5	**53 (+3)**	1	5	35 (-15)	Nil	None
24A – Vollebreght & Clarke	**59 (+9)**	3	5	**51 (+1)**	1	5	34 (-16)	Nil	None
24B – Vollebreght & Clarke	**65 (+15)**	3	5	**52 (+2)**	3	5	34 (-16)	Nil	None
32 – Stapleton	**51 (+1)**	1	5	49 (-1)	-	-	NA	-	-
18 – Turner	**57 (+7)**	1, 1, **5**	1, 3, 5	**57 (+7)**	1	5	32 (-18)	Nil	None
151 – Church[1]	**56 (+6)**	2, 2, 2	1, 3, 5	50 (-)	-	-	NA	-	-

[1] Camberwell Church
[2] Within limits of open cut pit
[3] NA = not assessed, neighbouring properties considered representative

Exceedance of acquisition criteria (red shading)

(Note, adverse wind conditions are predicted to occur only 6% of time. Therefore application of real-time monitoring, meteorological forecasting and operational controls are both practical and not overly onerous).

Management of Tenanted Properties

In addition to the described controls, Ashton will implement measures to minimise exposure of Ashton tenanted residences to adverse short-term dust impacts from the project. Consequently, Ashton will:

- Provide its tenants with information relating to the potential health effects of mine dust (such as the recently updated *"Mine dust and you"* fact sheet – NSW Health, 2010: http://www.health.nsw.gov.au/factsheets/environmental/mine_dust.html).
- Provide a mechanism for tenants to break their lease agreement without penalty, at their request, based on the impacts of the project. (Note this is currently in place).
- Make air quality monitoring data available to tenants, upon request. (Note all monitoring data will be publicly available on Ashton's website. Further, the DECCW's Camberwell UPHAQN monitor will provide publicly available real-time PM_{10} data).
- Develop and implement a program to monitor and assess trends in short-term dust levels at nearby tenanted properties. This will inform the development of trigger response levels and appropriate actions to ensure short-term dust levels do not exceed the relevant DoP acquisition criterion for 24-hour PM_{10}.
- Vacate tenanted residences, either temporarily or for longer periods where monitoring trends indicate short-term dust levels may exceed the relevant DoP acquisition criterion for 24-hour PM_{10} levels.
- Vacate and either demolish or relocate the few dwellings (all Ashton-owned) situated between the highway and the project to the northern part of Camberwell village.

Additional Measures

As part of its commitment to maintain the amenity of the village, Ashton offers an annual water tank cleaning service to all residences and the installation of a water filter system with replacement filters.

Ashton has also voluntarily offered to acquire any privately-owned residence within the village.

Ashton implements a range of other standard practice dust management measures at its operation and these will be extended to the SEOC Project.

4.1.2.2 Monitoring

Ashton has an existing extensive dust monitoring network in and around the Camberwell area. This includes a fully integrated real-time network of seven tapered element oscillating microbalances (TEOM) which continuously measure PM_{10} levels at strategic locations around the existing ACP. This real-time data is used to reactively manage existing mining operations to reduce the potential for adverse impacts at offsite residential locations. One of these monitors is located on property 49, just south of the highway and north of the SEOC disturbance area limits (Figure 2).

Ashton will review the locations of the TEOMs to optimise their use in monitoring dust emissions from the SEOC Project. This will potentially include relocating at least one TEOM to a site between the northern extent of the SEOC and the nearest occupied Camberwell village residence, such as at property 8 (Ashton-owned and currently tenanted).

A key driver for optimising the monitoring network will be to ensure Ashton's ability to reactively manage dust emissions by implementing operational controls (such as discussed above) is maximised.

The final locations of all dust monitors for the SEOC Project will be determined in consultation with a specialist air quality consultant and the DECCW and described in the Air Quality Management Plan for the project.

4.2 Noise

Spectrum Acoustics has assessed the noise impacts of the revised project. This assessment considers the noise emission levels for the revised project for Years 1, 3, 5 and 7. These are considered representative of the other years of the project. The noise assessment report for the revised project is attached as Appendix 2.

As previously indicated, during Year 1 and 2, there will be no mining during the night time period (from 10pm to 7am). However, from month five onward the ROM coal facility (ROM coal handling and conveyor transfer) will be operated on a 24-hour basis. For this reason Year 1 has been modelled under two separate scenarios. The first is a four month period where there are no night time ROM coal facility activities. The second is an eight month period (the remainder of the year) incorporating 24-hour ROM coal handling and conveyor transfer.

The revised noise assessment assumes the implementation of the following noise mitigation measures:

- Enclosed conveyor and conveyor transfer stations (see Section 4.1.2.1).
- Conveyor transfer station No. 1 will be omitted.
- New haul trucks have full attenuator packages providing 7 dB noise reduction (based on manufacturers advice).
- Existing haul trucks will have attenuator packages (mufflers, radiator silencers) providing 2 dB noise reduction (confirmed by site measurements).
- A new Liebherr 996 excavator (where required) will have full attenuator package.
- Dozers in exposed locations will be limited to first gear in reverse providing 6 dB noise reduction (confirmed by measurements).
- The open cut pit will be set back 200 m south of the original location in the EA noise model, thereby placing mining noise sources a further 200 m south of Camberwell village
- The bund toe will be set back 120 m south of the original location in the EA noise model, thereby placing dump noise sources a further 120 m south of Camberwell village.

- The northern bund will be accessed via a haul road at its south-eastern end, and rapidly developed westward, rather than at its north-western end as was the case in the EA noise model.

A list of amended sound power levels for modelled mine sources is provided in Appendix 2.

The original assessment (EA Appendix 4) considered residences in the north of Camberwell village (essentially north of R18 – Turner) as *"rural"* and residences closer to the highway as *"suburban"*. This was because of the influence of the highway on the background amenity noise levels of residences in the southern part of the village. For the revised project, all Camberwell village residences are considered as *"suburban"* for the purposes of establishing amenity noise criteria. Residences on rural properties outside the village and not affected by highway noise (e.g., R111 and R184A) are considered *"rural"*. This is in keeping with the DoP's recent assessment of the noise impacts of the nearby Integra mine on Camberwell village.

The distinction between "suburban" and "rural" does not affect the current assessment as the evening and night time acceptable amenity noise levels in the NSW Industrial Noise Policy (INP) are the same for both classifications.

The operational noise criteria adopted for the revised project are summarised in Table 4.8.

Table 4.8 Summary of operational noise assessment criteria for the revised project

Location	Residence (private and mine-owned)	Intrusiveness criteria dB(A),$L_{eq(15minute)}$			Amenity criteria dB(A),$L_{eq(period)}$		
		Day	Evening	Night	Day	Evening	Night
Village - north	35 – De Jong	43	43	37	50	45	40
	34 – Olofsson	43	43	37	50	45	40
	23 – Lopes	43	43	37	50	45	40
	24 – Clarke	43	43	37	50	45	40
	52 – Ashton	43	43	37	50	45	40
	30 – Ashton	43	43	37	50	45	40
	32 – Stapleton	45	44	37	50	45	40
	26 – Ashton	43	43	37	50	45	40
Village - centre	18 – Turner	45	44	41	50	45	40
	151 – Church[1]	N/A	N/A	N/A	50 (external) when in use		
Village - south	2 – Ashton	45	44	41	50	45	40
	8 – Ashton	45	44	41	50	45	40
	11 – Ashton	45	44	41	50	45	40

Table 4.8 Summary of operational noise assessment criteria for the revised project (cont'd)

Location	Residence (private and mine-owned)	Intrusiveness criteria dB(A),$L_{eq(15minute)}$			Amenity criteria dB(A),$L_{eq(period)}$		
		Day	Evening	Night	Day	Evening	Night
Rural properties with residence north of highway	114 – Richards	43	43	41	50	45	40
	111 – Richards	43	43	41	50	45	37
	117 – McInerney	43	43	37	50	45	40
	119 – Ashton	46	46	44	50	45	40
	120 – Ernst	46	46	44	50	45	40
	121 – Burgess	46	46	44	50	45	40
	83 – Hall	45	44	41	50	45	40
Rural properties with residence south of highway	129 – Bowman	Not assessed – within limits of open cut pit					
	130A – Bowman	37	37	37	50	45	37
	130B – Bowman	37	37	37	50	45	37
	184A – Moxey	37	37	37	50	45	37

[1] Camberwell Church

For comparison, Table 4.9 shows the recommended acceptable amenity noise levels in the Independent Review of Cumulative Impacts on Camberwell (DoP, 2010). Ashton's operational amenity noise criteria for Camberwell is equal to or less than these recommended noise levels. It is important to note that the Independent Review of Cumulative Impacts on Camberwell (DoP, 2010) identified the current and ongoing impact of highway traffic noise on Camberwell residences (village and rural) either directly fronting or within 200 m of the highway. Further, that Camberwell should be treated as two distinct noise catchments, one close to the highway with increased amenity noise levels, the other in quieter areas away from the highway, more representative of rural amenity noise levels.

Table 4.9 Recommended Camberwell village amenity noise levels (DoP, 2010)

Period	Acceptable amenity noise levels		Maximum amenity noise levels	
	Areas influenced by highway traffic noise	Areas not influenced by highway traffic noise	Areas influenced by highway traffic noise	Areas not influenced by highway traffic noise
Day (dBA $L_{eq(period)}$)	50	50	55	55
Evening (dBA $L_{eq(period)}$)	45	45	50	50
Night (dBA $L_{eq(period)}$)	45	40	50	45

4.2.1 Revised Noise Impacts

The implementation of project changes results in a decrease in project related noise levels at most modelled residential locations compared to previously modelled project related noise levels. The results are summarised in Tables 4.10a and 4.10b and described briefly below.

Table 4.10a Noise Impacts (Re-modelled Years 1-2, day/evening – mining only)

Predicted exceedance	Perceived impact	Private residences
1 – 2 dB(A)	Marginal	18, 23*, 24*, 32, 34*, 114, 130B
3 – 5 dB(A)	Moderate	-
> 5 dB(A)	Significant	130A

* Due to night time ROM coal handling and conveying – inversion only – refer Appendix 2.

Table 4.10b Noise Impacts (Re-modelled Years 3-7, 24-hour mining)

Predicted exceedance	Perceived impact	Private residences
1 – 2 dB(A)	Marginal	18, 34, 35
3 – 5 dB(A)	Moderate	23, 24A, 24B, 32
> 5 dB(A)	Significant	130A, 130B

Camberwell Village

In Years 1 and 2, village residences 18 and 32 will experience a marginal (<2 dB) exceedance in project related noise criteria when winds blow across the project area toward the village. In addition, residences 23, 24 and 34 will experience a marginal (<2 dB) exceedance in project related noise criteria due to night time ROM coal handling and transfer activities, under inversion conditions. No other Camberwell village residence is predicted to experience noise levels that exceed the relevant noise criteria in these years.

In Years 3 to 7, village residences 18, 35 and 34 will experience a marginal (<2 dB) exceedance and residences 23, 24(A & B – 24B is uninhabitable) and 32 a moderate (3-5 dB) exceedance in project related noise criteria, due to commencement of night time mining activities in Year 3.

Rural areas

In Years 1 and 2, rural residences 114 and 130B will experience a marginal (<2 dB) exceedance in project related noise criteria and residence 130A a significant (>5 dB) exceedance when winds blow across the project area toward their location.

In Years 3 to 7, rural residences 130A and 130B will experience a significant (>5 dB) exceedance under a range of meteorological conditions.

No other rural residence (apart from 129 which is within the limits of the open cut pit) is predicted to experience an exceedance in project related noise criteria, including on 25% or more of individual rural properties in areas away from the rural residence, or on vacant land holdings.

Comparison of EA and revised project noise impacts

A comparison of project noise levels at privately-owned residences for the EA described and revised project is shown in Tables 4.11a, 4.11b, 4.11c and 4.11d. This shows there is an overall reduction in project related noise impacts on privately-owned village residences and most privately-owned rural residences due to the proposed project changes. Residences which exceed relevant noise impact criteria are highlighted – marginal exceedances are shown in blue, moderate exceedances in orange and significant exceedances in red.

Table 4.11a Summary of EA project noise impacts - Year 1

Private residences		Project specific criteria		Cumulative criteria	
		Intrusive criteria (Leq, 15min)	Highest prediction (Leq, 15min)	Amenity criteria (Leq, period)	Highest prediction (Leq, period)
Camberwell village	35 – De Jong	37	**48 (+11)**	40	**45 (+5)**
	34 – Olofsson	37	**49 (+12)**	40	**46 (+6)**
	23 – Lopes	37	**50 (+13)**	40	**47 (+7)**
	24A – Vollebreght & Clarke	37	**50 (+13)**	40	**47 (+7)**
	24B – Vollebreght & Clarke	37	**50 (+13)**	40	**47 (+7)**
	32 – Stapleton	37	**52 (+15)**	40	**49 (+9)**
	18 – Turner	41	**52 (+11)**	40	**49 (+9)**
	151 – Church[1]	50	**54 (+4)**	50	**51 (+1)**
Rural areas	111 – Richards	41	**43 (+2)**	40	40 (-)
	114 – Richards	41	**50 (+9)**	40	**47 (+7)**
	117 – McInerney	37	**48 (+11)**	40	45 (+5)
	120 – Ernst	44	**53 (+9)**	40	**50 (+10)**
	121 – Burgess	44	**53 (+9)**	40	**50 (+10)**
	83 – Hall	41	**50 (+9)**	40	**47 (+7)**
	129 – W Bowman	37	**52 (+15)**	40	**49 (+9)**
	130A – A Bowman	37	**50 (+13)**	40	**47 (+7)**
	130B – A Bowman	37	**45 (+8)**	40	**42 (+2)**
	184A – Moxey	37	35	40	32 (-7)

[1] Camberwell Church

Significant exceedance > 5dB

Moderate exceedance 3-5 dB

Marginal exceedance 1-2 dB

Table 4.11b Summary of revised project noise impacts - Year 1

Private residences		Project specific criteria		Cumulative criteria	
		Intrusive criteria[2] (Leq, 15min)	Highest prediction (Leq, 15min)	Amenity criteria[3] (Leq, period)	Highest prediction (Leq, period)
Camberwell village	35 – De Jong	43	41 (-2)	45	38 (-7)
	34 – Olofsson	43	42 (-1)	45	39 (-6)
	23 – Lopes	43	43 (-)	45	40 (-5)
	24A – Vollebreght & Clarke	43	43 (-)	45	40 (-5)
	24B – Vollebreght & Clarke	43	43 (-)	45	40 (-5)
	32 – Stapleton	44	**45 (+1)**	45	42 (-3)
	18 – Turner	44	**46 (+2)**	45	43 (-2)
	151 – Church[1]	50	48 (-2)	50	45 (-5)
Rural areas	111 – Richards	44	35 (-9)	45	32 (-13)
	114 – Richards	44	**45 (+1)**	45	42 (-3)
	117 – McInerney	43	42 (-1)	45	39 (-6)
	120 – Ernst	46	45 (-1)	45	42 (-3)
	121 – Burgess	46	42 (-4)	45	41 (-4)
	83 – Hall	44	37 (-7)	45	34 (-11)
	129 – W Bowman	Not assessed[4]			
	130A – A Bowman	37	**45 (+8)**	45	42 (-3)
	130B – A Bowman	37	**38 (+1)**	45	35 (-5)
	184A – Moxey	Not assessed[5]			

[1] Camberwell Church
[2] Assumes day and evening intrusive criteria applies for Years 1 and 2
[3] Assumes day and evening amenity criteria applies for Years 1 and 2
[4] Within open cut pit limits
[5] Outside limits of potential affectation

Table 4.11c Summary of EA project noise impacts - Years 3 to 7

Private residences		Project specific criteria: Intrusive criteria (Leq, 15min)	Project specific criteria: Highest prediction (Leq, 15min)	Cumulative criteria: Amenity criteria (Leq, period)	Cumulative criteria: Highest prediction (Leq, period)	Year(s)
Camberwell village	35 – De Jong	37	**47 (+10)**	40	**44 (+4)**	3, 5, 7
	34 – Olofsson	37	**47 (+10)**	40	**44 (+4)**	3, 5, 7
	23 – Lopes	37	**47 (+10)**	40	**44 (+4)**	3, 5, 7
	24A – Vollebreght & Clarke	37	**48 (+9)**	40	**45 (+5)**	3, 5, 7
	24B – Vollebreght & Clarke	37	**48 (+9)**	40	**45 (+5)**	3, 5, 7
	32 – Stapleton	37	**51 (+14)**	40	**48 (+8)**	3, 5, 7
	18 – Turner	41	**51 (+10)**	40	**48 (+8)**	3, 5, 7
	151 – Church[1]	50	**53 (+3)**	50	50 (-)	3, 5, 7
Rural areas	111 – Richards	41	40 (-1)	40	37 (-3)	-
	114 – Richards	41	**46 (+5)**	40	**43 (+3)**	3, 5, 7
	117 – McInerney	37	**46 (+9)**	40	**43 (+3)**	3, 5, 7
	120 – Ernst	44	43 (-1)	40	40 (-)	-
	121 – Burgess	44	**45 (+1)**	40	**42 (+2)**	3, 5, 7
	83 – Hall	41	**45 (+4)**	40	**42 (+2)**	3, 5, 7
	129 – W Bowman	37	**>55 (>18)**	37	**>52 (>15)**	3, 5, 7
	130A – A Bowman	37	**55 (+18)**	37	**52 (+15)**	3, 5, 7
	130B – A Bowman	37	**49 (+12)**	37	**46 (+9)**	3, 5, 7
	184A – Moxey	37	**38 (+1)**	37	35 (-2)	3, 5, 7

[1] Camberwell Church

Significant exceedance	Moderate exceedance	Marginal exceedance
> 5dB (red)	3-5 dB (orange)	1-2 dB (blue)

Table 4.11d Summary of revised project noise impacts - Years 3 to 7

Private residences		Project specific criteria: Intrusive criteria[2] (Leq, 15min)	Project specific criteria: Highest prediction (Leq, 15min)	Cumulative criteria: Amenity criteria[2] (Leq, period)	Cumulative criteria: Highest prediction (Leq, period)	Year(s)
Camberwell village	35 – De Jong	37	**39 (+2)**	40	36 (-4)	3, 5, 7
	34 – Olofsson	37	**39 (+2)**	40	36 (-4)	5, 7
	23 – Lopes	37	**40 (+3)**	40	37 (-3)	5, 7
	24A – Vollebreght & Clarke	37	**40 (+3)**	40	37 (-3)	3, 5, 7
	24B – Vollebreght & Clarke	37	**40 (+3)**	40	37 (-3)	3, 5, 7
	32 – Stapleton	37	**42 (+5)**	40	39 (-1)	3, 5, 7
	18 – Turner	41	**42 (+1)**	40	39 (-1)	5
	151 – Church[1]	NA	46	50	43 (-3)	-
Rural areas	111 – Richards	41	34 (-7)	40	31 (-9)	-
	114 – Richards	41	38 (-3)	40	35 (-5)	-
	117 – McInerney	37	36 (-1)	40	33 (-7)	-
	120 – Ernst	44	37 (-7)	40	34 (-6)	-
	121 – Burgess	44	40 (-4)	40	37 (-3)	-
	83 – Hall	41	39 (-2)	40	36 (-4)	-
	129 – W Bowman	Not assessed[4]				
	130A – A Bowman	37	**>50 (>10)**	37	**>47 (>10)**	3, 5, 7
	130B – A Bowman	37	**47 (+10)**	37	**44 (+7)**	3, 5, 7
	184A – Moxey	37	34 (-3)	37	31 (-6)	-

[1] Camberwell Church
[2] Assumes night time intrusive criteria applies from Year 3 onward
[3] Assumes night time amenity criteria applies from Year 3 onward
[4] Within open cut pit limits

4.2.2 Noise Mitigation, Management and Monitoring

4.2.2.1 Mitigation and management

Ashton has committed to implement best practice noise mitigation and management for the SEOC Project, including use of:

- An environmental bund to shield mining activities.
- Not mining during the night-time period (10pm to 7am) for the first two years of operation.
- Enclosed conveyors and conveyor transfer stations (see Section 4.1.2.1).
- Real-time monitoring and management of mining operations.
- Attenuation of overburden and coal haul trucks.
- Broadband reversing alarms.
- Regular review of best available technology, and implementation where this is reasonable and feasible.
- Locating waste rock and coal haul roads and access ramps to reduce truck noise on Camberwell village residences.

In addition, the real-time and predictive weather forecasting that Ashton will implement and the use of additional dust mitigating operational controls (Section 4.1.2) will have the added effect of reducing noise levels in Camberwell village for winds within the 150° to 235° arc. Note the effect of this has not been included in the noise impact assessment for the revised project. However, its implementation is expected to further reduce the predicted noise impacts of the project on Camberwell village residences under adverse wind directions.

Ashton will provide noise mitigation to residences where project related noise levels are shown to moderately exceed (3 to 5 dB) the project noise criteria, or acquire the property where project related noise levels significantly exceed (>5 dB) this criteria, upon request of the owner.

These and all other noise mitigation and management measures will be documented in a comprehensive Noise Management Plan which will be implemented for the project.

4.2.2.2 Monitoring

Acoustical monitoring for the SEOC will comprise a combination of continuous (near real-time) monitoring and logging of noise and attended monitoring by an acoustical consultant, having regard to the influence of highway traffic noise on surrounding residential dwellings.

Real-time monitoring will enable near continuous review of the noise levels at the monitoring sites and, if necessary, provide response triggers for site activities to be reviewed and modified. (Note as the data requires transmission and interpretation, the triggers and appropriate responses will occur 5 to 15 minutes after the noise is first made).

The results collated from the real-time monitoring will be used as an operational tool to understand noise levels emanating from the project. The continuous units will provide an early warning tool to inform relevant on-site personnel that noise levels are approaching relevant noise criteria levels.

In addition, a program of attended monitoring will be implemented to monitor project related noise emission levels at privately-owned Camberwell village residences.

Finally, prior to commencing night time mining operations in Year 3, Ashton will first monitor background night time noise levels, then demonstrate via modelling its ability to comply with the relevant night time Camberwell village project noise criteria.

The final locations of all noise monitor sites (real-time and attended) will be determined in consultation with a specialist noise consultant and the DECCW and described in the Noise Management Plan for the project.

4.3 Alluvial Groundwater Interaction

As previously indicated, the SEOC will be developed on land east of Glennies Creek. Glennies Creek is a regulated river conveying controlled releases from Lake St Clair, and flows into the Hunter River about 3 km downstream of the SEOC Project area. The western extent of the SEOC pit will be set back a distance of at least 150 m from Glennies Creek.

The impact of the SEOC on surrounding water sources was assessed in the EA and Response to Submissions Report (Wells, 2009 and 2010). Notwithstanding, the DoP and NOW have requested clarification on the extent of potential interactions between the project and the nearby Glennies Creek and its associated alluvial aquifer, including:

- The level of predicted alluvial groundwater mine inflows and Glennies Creek baseflow reduction.
- Mitigation and management of alluvial groundwater mine inflows and Glennies Creek baseflow reduction in the event of under predicted water impacts.
- Licensing of groundwater mine inflows and Glennies Creek baseflow reduction.
- Mitigation and management of potential interactions between saline colluvial and hard rock aquifer groundwater and fresher quality alluvial aquifer groundwater and Glennies Creek river water.
- The stability of the open cut western highwall and the potential for increased alluvial groundwater inflows and Glennies Creek baseflow reduction due to highwall instabilities, whether natural or mining induced (such as cross cutting faulting or blasting induced impacts).

Ashton has prepared a separate Conceptual Alluvial Groundwater Management Strategy to address these issues, which is included as Appendix 3. The key aspects of the strategy include:

- Constructing a low permeability barrier in the unconsolidated material above and adjacent to the western pit boundary as a pre-emptive measure to minimise alluvial groundwater inflows, Glennies Creek baseflow reduction and the potential for increased saline water interaction between aquifers.

- Implementing measures to maintain a safe and stable highwall, including use of best practice blast management.
- Developing the mine in a manner that provides opportunity to review the potential for increased impacts on the alluvial aquifer and Glennies Creek water sources, and to make adaptive impact mitigation and mine management responses to minimise these impacts accordingly.
- Implementing slope stability control measures and operational procedures to ensure the structural integrity of the western highwall is maintained.
- Securing sufficient water entitlements to account for the predicted volume of mine inflows (from alluvial and non-alluvial sources) and reduction in Glennies Creek baseflow, and acquiring additional water entitlements should actual impacts be greater than predicted.
- Implementing surface water and groundwater management and response plans, including monitoring the performance of the low permeability barrier and validating the groundwater model against monitoring data.

The low permeability barrier will be constructed along the length of the western edge of the SEOC pit (Figure 10) to the full depth of the unconsolidated sediments (Figure 11). It will be constructed beneath the levee and ROM facility area in stages, prior to mining through unconsolidated material. Generally the low permeability barrier will be:

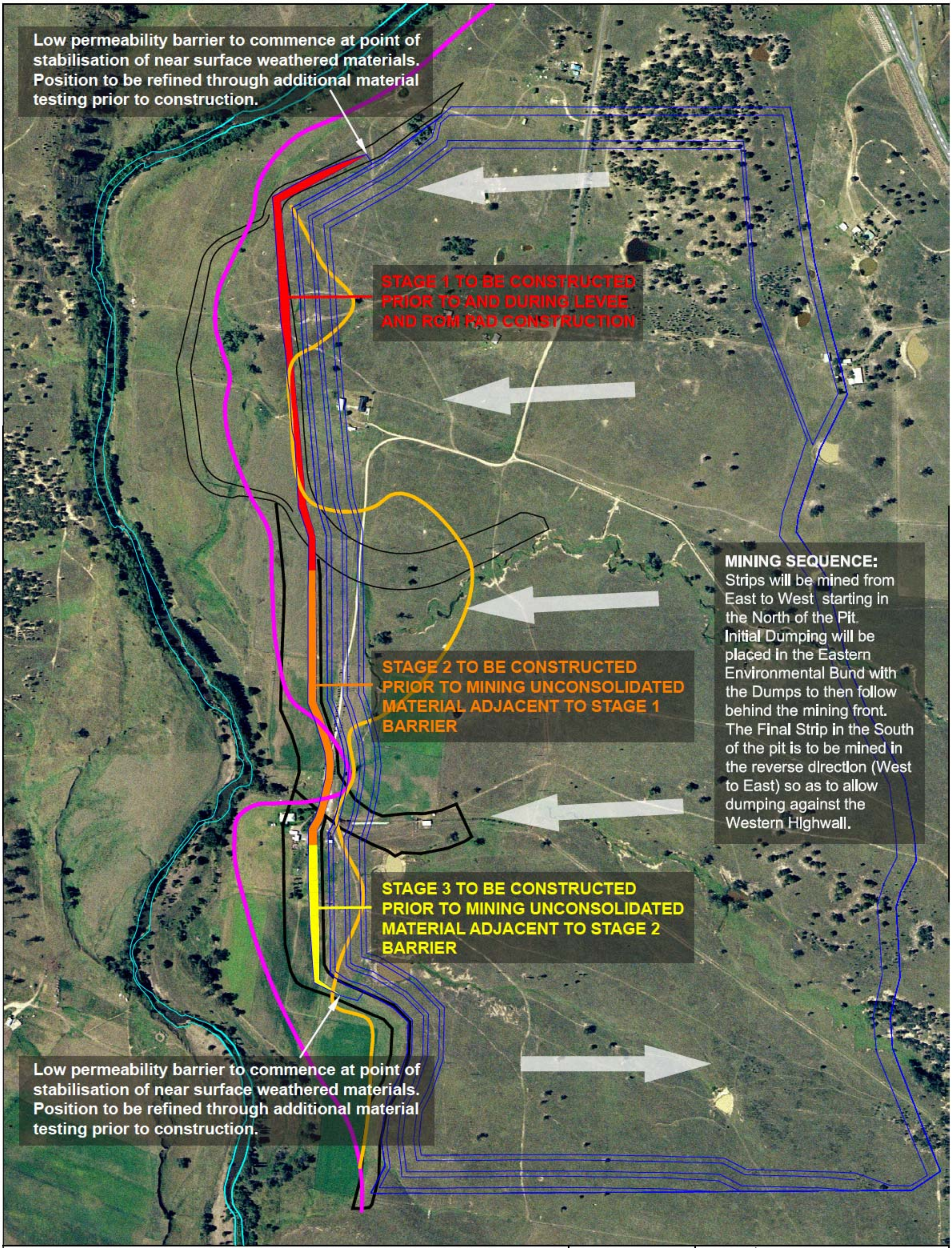
- Designed and constructed to appropriate quality standards in consultation with geotechnical and hydrogeological specialists.
- Constructed using suitable locally available materials.
- Constructed to achieve a permeability standard of at least $1x10^{-8}$ m/s.
- Constructed to provide long term stability.
- Constructed in stages in advance of mining.

The numerical groundwater model has been updated to assess the effect of installing a low permeability barrier on alluvial groundwater inflows and Glennies Creek base flow reduction. The results show that the installation of a low permeability barrier to a permeability standard of $1x10^{-8}$ m/s would reduce maximum alluvial groundwater inflows from 8.8 to 1.6 ML/year and Glennies Creek baseflow reduction from 17.7 to 9.4 ML/year, compared to the EA modelling.

In addition, the low permeability barrier will minimise the potential interaction of high and low saline groundwater during and post mining.

Finally, Ashton has committed to hold appropriate water entitlements to account for non-alluvial and residual alluvial groundwater mine inflows and Glennies Creek baseflow reduction. The volume and type of these water entitlements (i.e., general or high security river, or alluvial aquifer entitlements) will be reviewed by Ashton on an annual basis and adjusted through temporary or permanent trading on the water market.

The implementation of all these measures will ensure the potential impact of the revised project on Glennies Creek and its connected alluvial aquifer are minimised and these water sources are protected to the greatest extent possible.



LEGEND

- STAGE 1
- STAGE 2
- STAGE 3
- EXTENT OF SATURATED ALLUVIUM
- EXTENT OF SATURATED COLLUVIUM
- GLENNIES CREEK
- LEVEE
- PIT SHELL

DRAWN BY:	L.Hamson
DATE DRAWN:	05.11.2010
SCALE:	1 : 6000
REVISION No.:	1
REVISION DATE:	27.01.2011

AshtonCoal

SEOC PIT SHELL & LOW PERMEABILITY BARRIER

A3

PLAN No. SEOC 10026

Figure 10: Location and staging of low permeability barrier and mining sequence

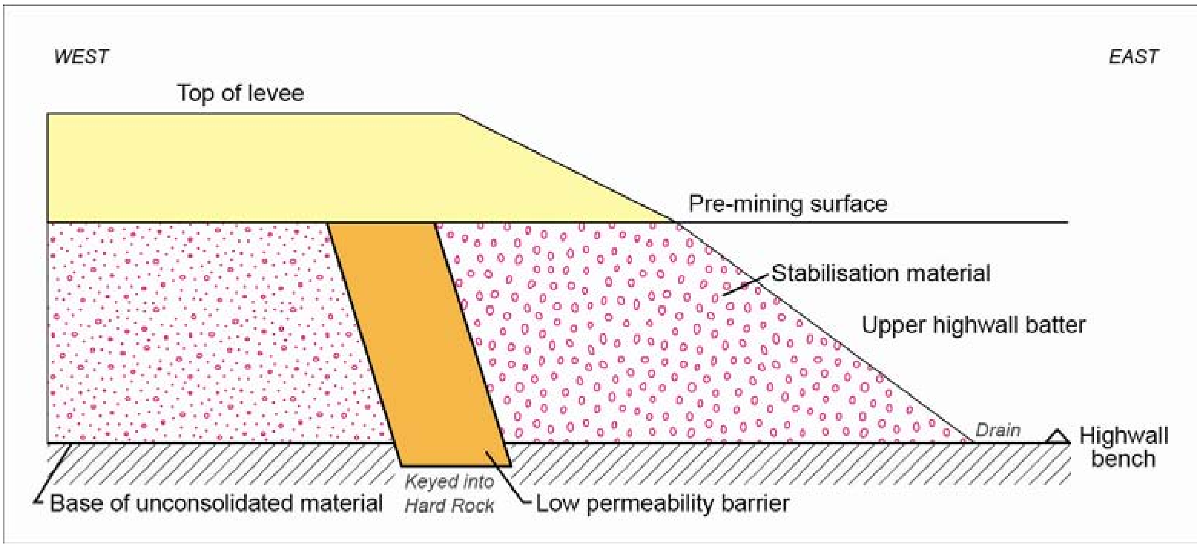


Figure 11: Conceptual cross-section of Western Highwall low permeability barrier and unconsolidated material stabilisation.

5. SUMMARY

Ashton has made changes to the design and operation of the SEOC Project including:

- Setting back the operation further from Camberwell village.
- Reducing mining rates and operating hours in the first years of operation.
- Locating haul roads in less exposed positions.
- Implementing leading practice dust and noise mitigation and management.
- Constructing a low permeability groundwater barrier.

The implementation of these changes will significantly reduce the potential impact of the project on Camberwell village and the surrounding environment. Hence the revised project will result in:

- No exceedance of project related short-term PM_{10} levels on privately-owned Camberwell village residences.
- Reduced potential for exceedance of project related annual average PM_{10} levels on privately-owned Camberwell village residences.
- No significant exceedance of project related noise levels on privately-owned Camberwell village residences.
- Flexibility to manage Ashton-owned tenanted residences to reduce the potential for project related health and amenity dust and noise impacts above relevant criteria.
- Minimal alluvial groundwater impacts and reduction in Glennies Creek baseflow.
- Accounting of residual alluvial groundwater pit inflows and reduction in Glennies Creek baseflow via appropriate water entitlements.

Ashton believes its commitment to implement these changes satisfactorily addresses the residual concerns raised by the DoP on the potential impacts of the project.

In addition, Ashton will continue to offer voluntary acquisition of privately-owned Camberwell village and rural residences where project related dust and noise impacts exceed relevant criteria.

Finally, Ashton has updated its Statement of Commitments to include the additional impact mitigation and management measures described above to ameliorate any residual impacts of the project. The updated Statement of Commitments is presented in Table 6.1, below.

6. REVISED STATEMENT OF COMMITMENTS

In addition to the revised project changes, Ashton has updated its statement of commitments for the project. These are summarised in Table 6.1 and replace the commitments made previously in the EA and Response to Submissions Report.

Table 6.1 Revised Statement of Commitments

Item	Description	Timing
General Commitments		
A1	Ashton will construct and operate the SEOC Project in an environmentally responsible manner and use its best endeavours to implement best practice environmental management procedures, wherever reasonable and feasible.	For the life of the project.
A2	Ashton will prepare and implement a comprehensive Environmental Management Strategy for the SEOC, including environmental management and monitoring plans.	For the life of the project.
A3	Ashton commits to construct, operate and manage the ACP and SEOC as one coal mine complex generally in accordance with the Environmental Assessment and in accordance with the ACP Development Consent (as amended), the SEOC Project Approval and all other applicable approvals.	For the life of the project.
A4	Ashton commits, to the extent practicable and as may be required by the Director-General, to apply for and obtain further approvals (single or integrated), licences and/or authorities as are required for the operation of the ACP and SEOC.	For the life of the project.
Operating Hours		
B1	Construction and mining operations (Yr1&2): • 7:00am to 10:00pm Monday to Saturday. • 8:00am to 10:00pm Sunday and Public Holidays. Mining operations (Yr3 to end of project): • 24-hours a day, 7 days a week (see commitment G4). ROM coal handling and conveyor transfer to the ACP CHPP (life of project): • 24-hours a day, 7 days a week. Maintenance (life of project): • 24-hours a day, 7 days a week.	1. Years 1 and 2. 2. Years 3 to end of mine life. 3. For the life of the project. 4. For the life of the project.
Land Acquisition		
C1	In addition to property acquisition requirements within the Project Approval where requested by any affected property owner within Camberwell Village, Ashton will enter into purchase negotiations in accordance with the property acquisition conditions of the Project Approval.	Where requested by the landowner.

Table 6.1 Revised Statement of Commitments (cont'd)

Item	Description	Timing
Management of Ashton owned properties within Camberwell Village		
D1	As a priority, properties owned by Ashton will be tenanted under residential tenancy agreements. Where properties are unable to be tenanted they will be maintained in a neat and tidy condition or if considered appropriate properties may be relocated or demolished.	
D2	Ashton will implement measures to minimise exposure of Ashton tenanted residences to adverse short-term dust impacts from the project and will ensure tenants are made aware of the potential dust impacts of the project. Consequently, Ashton will: • Provide its tenants with information relating to the potential impacts of mine dust (such as the recently updated "Mine dust and you" fact sheet – NSW Health, 2010: www.health.nsw.gov.au/factsheets/environmental/mine_dust.html). • Make air quality monitoring data available to tenants. • Temporarily vacate tenanted residences, where monitoring trends indicate short-term dust levels may exceed the relevant DoP acquisition criterion for 24-hour PM_{10} levels.	For the life of the project. 1. Within 12 months of mining, or at time of entering into tenancy agreement. 2. Where requested by the tenant. 3. As required
Air Quality		
E1	Implement an air quality monitoring network to ensure compliance with Project Approval. The network configuration will: • Where possible utilise Ashton's existing integrated real-time network of tapered element oscillating microbalances (TEOM's) and Metrological Stations. Where an existing monitor is not positioned in a suitable location for the SEOC it may be relocated to a more strategic position. • Be developed to ensure Ashton's ability to reactively manage dust emissions by implementing operational controls. • Have the ability to demonstrate compliance with Approval Conditions.	In accordance with management plan.
E2	Implement operational controls to reduce dust generating activities when the wind direction is within the 150° to 235° arc and conditions (e.g., no precipitation within the last 24 hours) and real-time monitoring show increased potential for short-term dust level exceedances in Camberwell village.	For the life of the project.
E3	Enclose conveyors on at least one side in a profiled coloured steel cladding.	During construction.
E4	Disturb only the minimum area necessary for mining.	At all times.

Table 6.1 Revised Statement of Commitments (cont'd)

Item	Description	Timing
Air Quality (cont'd)		
E5	Implement overburden and stockpile management to minimise dust generation: • Construct the environmental bund (and out of pit emplacement) with undulating ridges, faces, gullies and spurs to minimise wind entrained dust • Reshape, topsoil and rehabilitate completed overburden emplacement areas as soon as practicable. • Utilise temporary rehabilitation or crusting agents on exposed areas within 3 months of them not being actively used and if they are not scheduled for final rehabilitation in the following rehabilitation season. • Maintain coal handling areas / stockpiles in a moist condition using water carts • Long term topsoil stockpiles will be re-vegetated.	At all times.
E6	Implement road management measures to minimise dust generation: • All roads and trafficked areas will be watered as required using water trucks to minimise the generation of dust. • All haul roads will have edges clearly defined with marker posts or equivalent to control their locations, especially when crossing large overburden emplacement areas. • Obsolete roads will be ripped and re-vegetated.	At all times.
E7	When drilling: • Dust aprons will be lowered. • Drills will be equipped with dust extraction cyclones, or water injection systems. • Water injection or dust suppression sprays will be used when high levels of dust are being generated.	At all times.
E8	When blasting: • Meteorological conditions will be assessed prior to blasting. • Blasting will not be undertaken when the wind direction is consistently within the 150° to 235° arc and is within 800 m of the closest Camberwell village residence (see commitment H2). • Adequate stemming will be used at all times.	At all times.
E9	Ashton will investigate and where appropriate utilise other such technologies and initiatives as required to ensure that the air quality outcomes described in the EA are achieved.	As required/ where emissions are problematic.
Greenhouse Gas Emissions		
F1	Ashton will undertake regular reviews and monitoring of greenhouse gas emissions and energy efficiency initiatives to ensure that greenhouse gas emissions per tonne of product coal are kept to the minimum practicable level.	During operations.
F2	Specifying the use of energy efficient equipment for all new and upgraded mobile and fixed plant.	

Table 6.1 Revised Statement of Commitments (cont'd)

Item	Description	Timing
Noise		
G1	Undertake quarterly attended monitoring at the nearest privately-owned dwellings to determine compliance with project noise impact criteria.	In accordance with NMP.
G2	Review the location of Ashton's existing real-time operational noise logger, to ensure its ability to be effectively used for the SEOC.	Prior to mining
G3	Annually review the SEOC noise model taking into consideration the monitoring results of the previous 12 months.	Annually
G4	Prior to commencing 24 x 7 mining operations in Year 3, undertake noise monitoring and modelling to demonstrate an ability to comply with night time project impact noise criteria.	Prior to commencing night time mining operations
G5	Maintain equipment and machinery in good working order.	As required / specified by manufacturer.
G6	Maintain haulage roads in good condition free of pot-holes or unnecessarily rough areas to reduce haulage related noise.	At all times.
G7	Provide awareness and understanding of noise issues through site inductions for all staff and contractors to the SEOC.	When people are entering site for first time.
G8	Use and operation of equipment to: • Implement mine planning procedures that will minimise the potential for adverse noise impacts. Where possible equipment will be located at lower elevations in the pit during times when noise levels at receivers are likely to be exacerbated by weather conditions. • Dozers in exposed locations will be limited to first gear in reverse. • Reduce throttle settings and turn off equipment when not being used. • Use of broadband reverse alarms on all machinery that regularly reverses (e.g. bull dozers and front-end loaders). • Avoid metal to metal contact on equipment. • Where possible use quieter equipment (e.g. rubber wheeled tractors instead of steel tracked tractors), in situations where either piece of equipment will suit the purpose.	As required.
G9	During purchase of new equipment: • Specify noise attenuation in mobile plant supply contracts (e.g., grid box silencers and modified mufflers to dump trucks and modified mufflers to excavators). • Install broadband reverse alarms to machinery that regularly reverses (e.g. bull dozers and front-end loaders).	During purchase.
G10	Measurement of sound-power levels of major mobile plant and equipment.	Within 1 week of machinery being used on site.

Table 6.1 Revised Statement of Commitments (cont'd)

Item	Description	Timing
Noise (cont'd)		
G11	Ensure design and construction of infrastructure employs appropriate noise suppression methods. As a minimum all conveyors and transfer stations will be enclosed on sides exposed to Camberwell village.	During Design and Construction.
Blasting		
H1	Blasting to be undertaken between the hours of 9am – 5pm Monday to Saturday. There will be no blasting on Sundays or public holidays.	For the life of the project.
H2	Meteorological conditions will be assessed prior to blasting. • Meteorological conditions will be assessed prior to blasting. • Blasting will not be undertaken when the wind direction is consistently within the 150° to 235° arc and is within 800 m of the closest occupied Camberwell village residence. To satisfy this commitment, a series of 10 minute averaged wind direction readings will be made at least 30 minutes prior to blasting. Adequate stemming will be used at all times.	For the life of the project.
H3	Implement a 500 m or risk based blast exclusion zone.	Prior to blasting
H4	Provide notifications to private residences who requested to be on the blast notification list.	Prior to blasting
Groundwater		
I1	Prepare and implement a Groundwater Management Plan (GWMP) for the SEOC.	Within 12 months of commencement.
I2	The GWMP will incorporate: • A Groundwater Response Plan comprising "trigger levels" for selected sites to assess monitoring results based on groundwater levels, inflows and water quality. • Monthly monitoring of groundwater mine inflows from all open cut sumps. • Monthly monitoring of extracted groundwater quality including EC and pH of water pumped from the mine and/or from dewatering, or open-cut sumps. • Quarterly sampling of water transferred from the mine, or open-cut sumps for hydrochemical analysis. • Monthly monitoring of water levels in the network of monitoring bores.	As specified.
I3	Implement audits and data reviews: • Annual review of monitoring data by an approved experienced hydrogeologist to assess the impacts of the project on the groundwater resources, and compare impacts with the groundwater model predictions. • Two years after the commencement of coal production undertake a modelling post-audit, in accordance with industry best-practice (MDBC, 2001), and if necessary the model be recalibrated and confirmatory forward predictions made at that time. • Undertake further post-audits during the fourth or fifth year of mining, as this represents the most vulnerable time in relation to potential inflows from Glennies Creek.	1. Annual review 2. 2 years after coal production 3. 4 or 5 year aduit.

Table 6.1 Revised Statement of Commitments (cont'd)

Item	Description	Timing
Groundwater (cont'd)		
I4	Construct a low permeability barrier along the western boundary of the SEOC pit to minimise the inflow of alluvial groundwater. The barrier will be: • Constructed prior to mining through unconsolidated material. • Constructed of locally available clay materials to a permeability of 10-8m/s or better. Geotextiles may be incorporated into the design to assist achieve the desired permeability standard, where required. • Constructed generally in accordance with (AS) 3798-2007 to an appropriate quality standard.	Prior to mining in unconsolidated material.
I5	Hold adequate and appropriate water entitlements to account for the annual predicted inflow of groundwater into the mine and Glennies Creek baseflow reduction. Review these water entitlements annually and make adjustments through trading on the water market where required.	Prior to the baseflow loss being realised.
I6	Implement measures of the Groundwater Response Plan in the event of unforseen adverse impacts to groundwater levels, inflows or quality.	As required.
Surface Water		
J1	Prepare and implement a Site Water Management Plan (SWMP) for the SEOC.	Within 12 months of commencement.
J2	Implement a monitoring program comprising: • Monthly sampling of the on-site dams (sediment dams and select clean water dams). • Continued monitoring of Ashton's existing Glennies Creek monitoring sites. • Add additional monitoring site on Glennies Creek immediately downstream of the SEOC Project area. • Comprehensive sampling of both onsite dams and monitoring sites on a quarterly and annual basis.	For the life of the project.
J3	Monitor all key water movements around the mine site. Monitoring will be recorded on a minimum monthly basis or following significant rainfall events.	Monthly and following significant rainfall.
J4	Monitor dam storage levels. Dam levels will be assessed on a monthly basis and following significant rainfall events.	Monthly and following significant rainfall.
J5	Maintain and operate the Ashton weather stations.	At all times.
J6	Inspection of all dams, drains and culverts on a monthly basis and following significant rain.	Monthly and following significant rainfall.
J7	Inspection of rehabilitation areas on a monthly basis and following significant rain.	Monthly and following significant rainfall.

Table 6.1 Revised Statement of Commitments (cont'd)

Item	Description	Timing
Surface Water (cont'd)		
J8	Undertake routine maintenance of: • Accumulated sediment from dams and drains as required. • Underperforming rehabilitation areas as required. • Erosion control measures as required. • Wastewater management system. • Sediment chamber and oil and grease trap treating runoff from the hardstand area.	As required.
J9	Use the water balance to monitor the performance of on-site water management and to upgrade or change water storages and other water management provisions that may be required at the site.	Annually
J10	Reconstruct drainages and Tributary 4 through the post mining landscape.	During construction of Tributary 4.
J11	In the event of operational water shortages, Ashton will implement the following measures: • Obtain additional water extraction licenses. • Reduce the throughput through the CPP, which accounts for approximately 70% of the water usage. • Or reduce production levels., as a last resort	As required.
J12	In the event of unforseen adverse impacts Ashton will: • Increase monitoring frequency and sampling points to identify and confirm the source of any suspected degradation to water quality. • Review the SWMP in order to identify opportunities to improve or rectify any identified problem. The data collected as part of the monitoring programme will enable fully informed decisions to be made. • Provision of flocculation equipment on sedimentation ponds to improve the rate of sedimentation. • Augment the sediment dams to create greater retention volume and residence time to increase the capacity for suspended sediment to settle out. • Increase pumping capacity at each of the sedimentation ponds to minimise the potential for sediment laden discharges from the ponds. • If any component of the surface water management framework is identified as creating an unacceptable environmental impact, remedial actions will be established in close liaison with the relevant authority.	As required.
Flooding		
K1	Develop a Flood Evacuation Plan (FEP) for the SEOC.	Prior to mining in an area below the 1 in 100 ARI.
K2	Temporarily cease mining operations if flood levels in either the Hunter River or Glennies Creek are expected to meet or exceed a safe water level. The safe water level will be determined as part of the detailed design of the levee system and specified in the Flood Evacuation Plan.	As required.

Table 6.1 Revised Statement of Commitments (cont'd)

Item	Description	Timing
Flooding (cont'd)		
K3	In the event of an extreme flood, all personnel will evacuate to the office and workshop facilities area, located above the estimated Glennies Creek Dam break flood extent.	As required.
K4	The levee system is to be inspected and certified as adequate by a qualified engineer after a 1 in 20 ARI flood event.	As required following flood.
K5	The flood protection levee will be designed to resist scour due to flood flows based on the peak overbank flow velocities for the 500 year recurrence flood. The levee should consist of at least a grass covered embankment with localised rock armour sections where required.	During construction.
Soils		
L1	General topsoil management practices will include: • Where possible do not strip topsoil in overly wet or dry conditions. • Strip topsoils to depths generally specified within EA Table 5.37. • Limit rehandling of topsoil resources by using recovered topsoil immediately, where practicable. • Limit rehandling of topsoil resources by using recovered topsoil immediately, where practicable. • If the soil is to be stockpiled for an extended period of time, the stockpile height will generally not exceed 3 m and the stockpile will be revegetated.	During construction and operations.
L2	Maintain a topsoil inventory.	During construction and operations.
L3	Apply appropriate soil ameliorants such as superfine lime, gypsum fertiliser and/ or use of imported organic materials such as recycled wastes or biosolids.	As required
Acid Rock Drainage		
M1	Monitor key seepage, pit water and drainage from overburden materials and washery waste materials for indicators of ARD and salinity. Monitoring to include analysis of pH, EC, Sulphate (SO4) and acidity/alkalinity, with follow up multi element testing if any low pH conditions (<5.0) are detected.	As required.
Flora and Fauna		
N1	Fence the riparian corridor to exclude cattle and define the extent of clearance.	Before commencement.
N2	Locate and fence the River Red Gum to the drip line to ensure no direct or indirect impacts during construction and ongoing maintenance.	Before commencement.
N3	Rehabilitate disturbed areas to minimise erosion and weed invasion.	As required.
N4	Revegetate disturbed areas using species from an acceptable level of local provenance except where this is not practicable.	As required.
N5	Undertake weed and pest management over those lands controlled by Ashton.	As required.
N6	Conduct annual surveys within rehabilitated and revegetated areas.	As required.

Table 6.1 Revised Statement of Commitments (cont'd)

Item	Description	Timing
Flora and Fauna (cont'd)		
N7	Vegetation Clearance: • Undertake targeted surveys for nest sites within the woodland prior to vegetation clearance, with any nests belonging to threatened species identified to be protected or relocated if possible. • Undertake pre-clearance inspections to locate and mark potential habitat trees and verify number and type of hollows to be removed. • Avoid vegetation clearing where possible in spring when the threatened birds and arboreal mammals assessed are likely to have young in the nests. • To allow for or encourage dispersal of fauna, vegetation should be selectively cleared around habitat trees or nest trees. Habitat trees should be felled a minimum of 24-hours later. • Employ a suitably qualified animal handler or ecologist when clearing identified habitat trees, in order to safely capture and relocate disturbed resident fauna. • Where possible relocate any fallen timber and dead wood to the riparian corridor, rehabilitation area or offset area.	Before clearing.
N8	Enhance and manage a corridor of vegetation approximately 100 metres wide (i.e. ~20m both sides of creek) along the length of Glennies Creek adjacent to the SEOC Project area, equating to an area of approximately 35 ha.	Within 3 years of Project Approval, subject to landownership authority.
Aquatic Ecology		
O1	Integrate tributary rehabilitation with Glennies Creek riparian corridor.	During tributary rehabilitation.
O2	Undertake bank erosion stabilisation (where caused by land use, predominantly in the tributaries).	During operations.
Flora and Fauna Offsets		
P1	Prepare and implement an offset strategy for the SEOC, including: • Offsetting the clearing of EEC with like vegetation at a ratio of 2.5:1. • Securing the offset areas in perpetuity. • Offsetting the loss of hollows with the replacement of 3 nest boxes/hollows for each hollow removed. • Enhancing and managing approximately 35ha of the Glennies Creek riparian corridor. • Revegetating the open cut operations with suitable species to comprise a mix of grasslands and woodlands.	Within 3 years of Project Approval.

Table 6.1 Revised Statement of Commitments (cont'd)

Item	Description	Timing
Flora and Fauna Offsets (cont'd)		
P2	The management of offset areas will include : • Fencing to exclude cattle as required to remove grazing pressure. • Control of feral animals where practical. • Weed management program to reduce competition and encourage growth of native species in the understorey. • Fallen timber and branches within the disturbance area will be relocated to the offset areas to provide additional nesting and foraging habitat, or beneficially used within the Ashton Project area. • As a priority species to be used in any revegetation will include locally occurring species such as Narrow-leaved Ironbark (*Eucalyptus crebra*), Grey Box (*E. moluccana*), Forest Red Gum (*E. tereticornis*), Grey Gum (*E. punctata*), Gorse Bitter Pea (*Daviesia ulicifolia*), Western Golden Wattle (*Acacia decora*), Fan Wattle (*A. amblygona*) and Silver-stemmed Wattle (*Acacia parvipinnula*). • Fallen hollow logs and branches will be retained and relocated for habitat. • Searches for Speckled Warbler nests to determine habitat range of this population and to establish an appropriate monitoring strategy to ensure its long term viability in the area. • Baseline assessment of the community and habitat values of the offset area. • Identification of environmental weeds to be targeted in the weed management plan. • An ongoing monitoring program.	Within 3 years of Project Approval.
Visual Impacts		
Q1	Soften the engineered faces of the out of pit emplacement with undulating ridges, faces, gullies and saddles.	During construction.
Q2	Remove redundant infrastructure elements and conveyors on completion.	On completion
Q3	Retain existing vegetation around the new infrastructure areas and on the road fringes to the highway wherever possible.	During construction.
Q4	Select colours for the conveyor and transfer station to reduce bulk and scale.	During construction.
Q5	Lighting: • Minimise stray light from infrastructure areas. • Provide shields on all floodlights in the open cut area, and where practicable direct the light away from public areas or privately owned residences. • Install shielded lights on the conveyor system and reduce brightness. • Task and general lighting should be screened from viewers were possible but lighting levels must always be selected to meet safe working practices.	During construction and at all times.

Table 6.1 Revised Statement of Commitments (cont'd)

Item	Description	Timing
Visual Impacts (cont'd)		
Q6	Operational Control: • Where possible, after initial stripping and bund formation, program works on the north faces of the out of pit emplacement during daylight hours and work behind the emplacement during the evenings and night. • Where safe to do so, trucks on access roads should make use of portable visual edge markers to increase drivers' visibility of road edges when driving with dipped headlamps.	During bund construction and initial operations.
Aboriginal Heritage		
R1	Prepare and implement an Aboriginal Cultural Heritage Management Plan (ACHMP) for the SEOC in consultation with a qualified archaeologist and the local Aboriginal community.	Prior to disturbance of sites.
R2	Salvage all artefacts from impacted areas in collaboration with a qualified archaeologist and the local Aboriginal community.	Prior to disturbance of sites.
R3	Undertake site specific recommendations as per EA Table 5.49.	Prior to disturbance of sites.
R4	Avoid impacts to Aboriginal sites outside mine disturbance areas.	At all times.
R5	If Aboriginal objects are uncovered during the project the site is to be managed in accordance with the ACHMP and the site registered in the Aboriginal Heritage Information Management System (AHIMS).	At all times.
R6	The ACHMP will include a cultural awareness document clearly highlighting and explaining the materials likely to be exposed by earth moving activities and will be supplied to workers and kept on site at all times.	At all times.
R7	If human remains are located during project activity all works must cease in the immediate area to prevent any further impacts to the find(s). The local police, are to be called, if the police consider the site not an investigation site for criminal activities, the Aboriginal community and the Department of Environment and Climate Change (DECCW) are to be notified. Works shall not resume in the designated area until approval from the police and DECCW is obtained.	At all times.
R8	The ACHMP is to include management measures for the scar tree SA5/9 that include: • The accurate recording of the tree's drip line and elevation. • The tree will be fenced within a 10m radial exclusion zone. • Six monthly photographic and notated recording of tree health (i.e. new leaves or buds, leaf size, twig growth, crown dieback and bark abnormalities against dam water levels. • Where monitoring shows adverse tree stress, dam water levels will be reviewed and lowered where feasible. • In the event that the tree has an adverse reaction, the registered Aboriginal Stakeholders will be consulted regarding the preferred mitigation strategy for the tree (e.g. insitu conservation of stag or lopping for removal to keeping place).	Prior to and during use of clean water dam CW1.

Table 6.1 Revised Statement of Commitments (cont'd)

Item	Description	Timing
European Heritage		
S1	Undertake management measures as specified in Table 5.50.	Prior to site disturbance.
Traffic and Transport		
T1	Prepare and implement a Road Closure Plan (RCP) to manage the temporary closure of the New England Highway and other public roads that may be required during construction, delivery of large loads and for blasting.	Prior to commencement.
T2	Warning signage will be placed on the New England Highway for the duration of the construction works at each construction intersection.	During construction.
Bushfire		
U1	Maintain perimeter roads, management tracks and management zones.	At all times.
U2	Incorporate fire suppression assets such as water carts, dozers and static water storages into the mine and facility design.	During construction.
U3	Design and maintain appropriate access for emergency vehicles.	At all times.
Waste		
V1	Maintain effluent disposal areas in accordance with DECCW guidelines.	At all times.
V2	Undertake waste management measures as specified in EA Table 5.58.	At all times.
Rehabilitation and Connectivity		
W1	Establish stabilising vegetation on the northern face of the environmental bund and out of pit emplacement within twelve months of emplacement.	Within 12 months of emplacement.
W2	Undertake progressive rehabilitation of the mine site.	At all times.
W3	Enhance vegetation connectivity in an east to west direction.	Progressively.
W4	Enhance vegetation connectivity in an east to west direction and north to south along Glennies Creek.	See J14 & K1
W5	Rehabilitation of the SEOC to consist of a mixture of open woodland and pastures.	Progressively.
Mine Closure		
X1	Develop a mine closure plan for the SEOC, taking into consideration the principles and objectives for mine closure specified within the ANZEC MCA document Strategic Framework for Mine Closure, 2000 (or prevailing document).	At least 2 years prior to completion of mining in SEOC (e.g. before 2015 at scheduled rates).
X2	Relinquish the SEOC site in a condition that does not endanger public health and safety and allows the use of land for low intensity grazing and enhancement of local biodiversity.	At closure.

Table 6.1 Revised Statement of Commitments (cont'd)

Item	Description	Timing
Mine Closure (cont'd)		
X3	Aim for the closure of the SEOC site in a condition that does not require ongoing maintenance above that would be otherwise expected as part of responsible land management.	At closure.
Sustaining Camberwell Village		
Y1	Prepare a Camberwell Village Enhancement Plan in consultation with the residents of the village, Singleton Council and the DoP. Implement a program of works in accordance with the approved plan via a Voluntary Planning Agreement with the Minister for Planning and Singleton Council, or, fund a program of works of other identified social – community infrastructure for the Singleton local government area via a Voluntary Planning Agreement with the Minister for Planning and the Singleton Council.	Within 2 years of Project Approval.

7. REFERENCES

DoP, 2010. *Independent Review of Cumulative Impacts on Camberwell*, Department of Planning, July 2010.

PAEHolmes, 2010. *Additional Cumulative Air Quality Assessment for Proposed Ashton Coal Operations Ltd, Integra Coal Operations Pty Ltd and Ravensworth Operations Pty Ltd., in Independent Review of Cumulative Impacts on Camberwell*, Department of Planning, July 2010.

Wells, 2009. *South East Open Cut Project & Modification to the Existing ACP Development Consent, Environmental Assessment Report*, Wells Environmental Services, November 2009.

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Appendix 1

Revised Air Quality Assessment

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27 January 2010

Lisa Richards
Environment and Community
Relations Manager
Ashton Coal Operations Ltd.

Dear Lisa,

Re: Ashton South East Open Cut Project (SEOC) – Revised Mine Plan

PAEHolmes have completed air dispersion modelling for the revised mine plan and operational schedule for the SEOC project. This letter report summarises our findings and assessment of impacts.

1 INTRODUCTION

To reduce potential dust emissions at Camberwell Village as far as is practical and feasible, Ashton Coal Operations Limited (ACOL) has revised the mine plan for the proposed Ashton SEOC project previously presented in the Environmental Assessment (EA) document (**PAEHolmes, 2009**). The key modifications to the mine plan include a set-back away from the village, to the south, of 200m for the pit shell and 120m for the dump toe, altering the operation schedule and reducing the production schedule, from 24 hour operations, to daytime (15 hours per day) activity for the first two years. This current revised plan is referred to as the Jan 2011 mine plan hereafter in this report.

This report provides the results and analysis of an air quality modelling assessment conducted to take account of the above modifications to the mine plan and production schedule, and also makes a comparison with the 2009 EA results to illustrate the reduction in dust impacts that would be achieved.

A wind analysis was conducted to determine wind directions with potential to transport dust to sensitive receptors in Camberwell Village; the aim being to identify the scope for a feasible dust control regime to further reduce any potential the impact in the Village.

2 OUTLINE OF THE REVISONS PROPOSED

2.1 Mine Plan

To accommodate the proposed amelioration measures, the SEOC mine footprint was revised relative to the mine plan used in the 2009 EA. The most significant aspect of the altered Jan 2011 mine plan includes a set-back south, away from the village, of 200m for the pit shell and 120m for the dump toe. The greater distance between the mine and Camberwell Village has a significant benefit in reducing potential impacts. The benefit arises from the prevailing NW-SE wind regime in this area, which means the gradient concentration of mine generated dust falls sharply to the north (and south of the mine. **Figure 2.1** shows the location of SEOC and surrounding sensitive receptors.

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BRISBANE

GOLD COAST

TOOWOOMBA

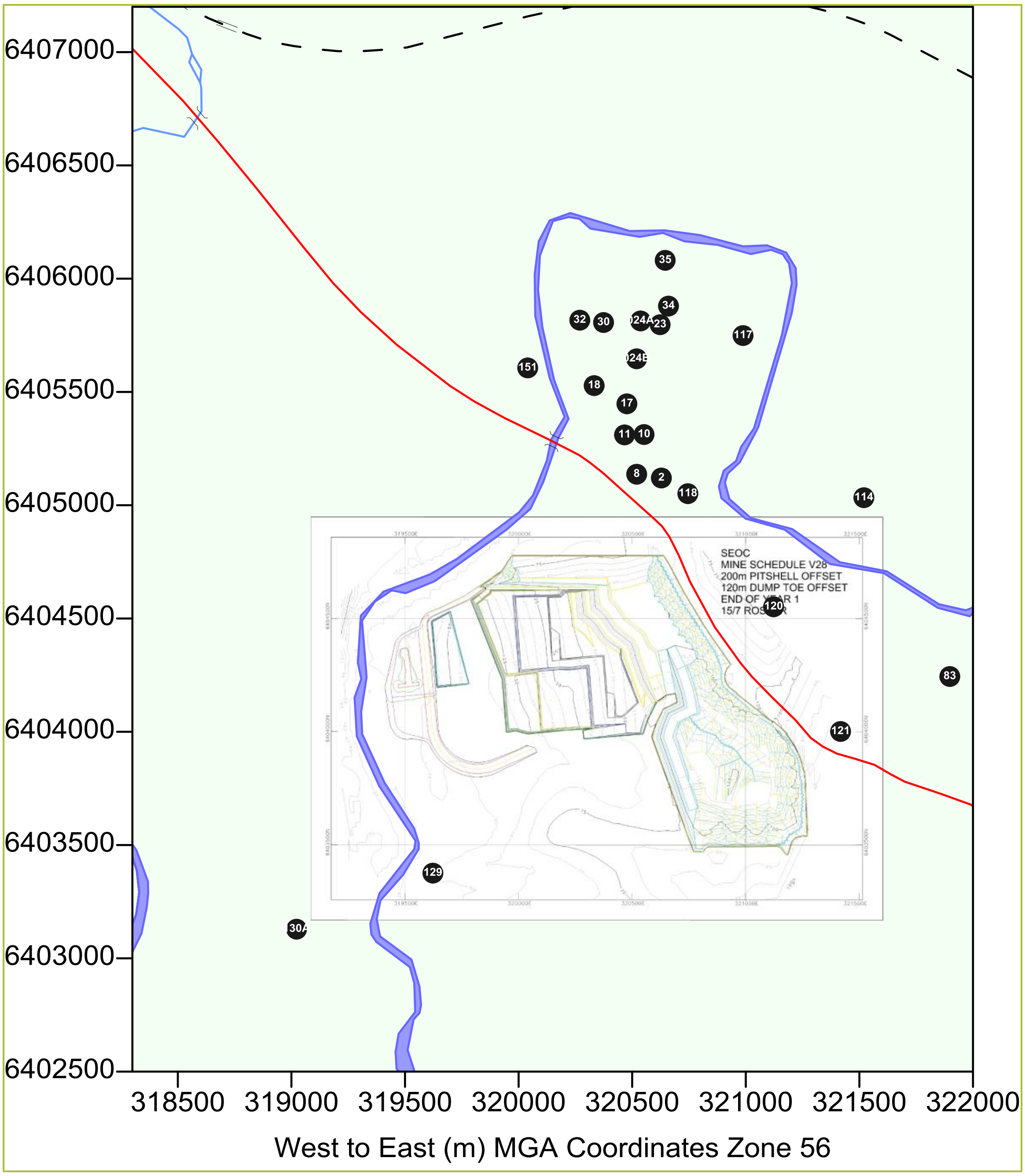


Figure 2.1: Location of SEOC and surrounding selected receptors

2.2 Operational Schedule

Operational hours for the major dust generating mine activity have been reduced from a 24-hour per day, 7 day a week operation to a daytime, 15-hour per day, 7-day a week operation for the first two years. .Operations with low dust impact potential that are related to ROM processing (crusher, conveyor and CHPP) will however continue 24 hours per day, 7 days a week for all years.

The reduced operating hours in the first two years will decrease the potential for impacts on receptors to the north (Camberwell Village) during the period when mining operations are closest. The benefit arises in having less activity (and hence less dust generated) in any day, but also in having the majority of dust generating activity occurring during the daytime when dispersion conditions are more favourable to producing low impacts, thus providing a double benefit.

Year 1 operations will also include a ramp-up period of 4 months, during which only overburden activities will take place. Following this period, Ashton plan to commence coal mining operations.

2.3 Production Schedule

The production schedule has also been revised to reduce the quantity of material mined over the life of the mine. The revision includes reductions to the ROM coal amount and the total overburden moved.

The reduction in the amount of activity has a direct benefit in reducing the total quantity of dust generated by mining activity in any day, or on an annual basis. The production schedule is most greatly reduced in the early years of the mine schedule to reduce as far as is feasible the amount of activity nearest to Camberwell Village.

3 ESTIMATED MINE DUST EMISSIONS

Table 3.1 presents the original 2009 EA and the revised Jan 2011 dust emission estimates based on the above changes for each modelled year. Detailed emissions inventories were developed for each year using the methodology described in Section 7 of the EA (see also Appendix F of the EA) (**PAEHolmes, 2009**).

Table 3.1: Comparison of estimated emissions from the SEOC project

Scenario Modelled	TSP emission rate (kg/year)		Reduction
	EA 2009	Jan 2011 mine plan	
Year 1	1,646,925	1,076,389	35%
Year 3	2,166,712	2,023,624	7%
Year 5	2,350,776	2,165,018	8%

4 METEROLOGY

A detailed analysis of the local atmospheric conditions and meteorological data used in the dispersion modelling is discussed in **Section 5** of the Air Quality Impact Assessment (**PAEHolmes, 2009**).

5 ASSESSMENT OF POTENTIAL IMPACTS

The applicable dust concentration and dust deposition criteria are discussed in Section 4 of the EA document (**PAEHolmes, 2009**).

The assessment described in this report focuses on potential PM_{10} impacts on sensitive receptors. It is important to note that only the receptors that have shown potential exceedences in previous modelling have been examined in detail in this assessment.

5.1 24-hour average PM10

Table 5.1 provides a comparison of the Jan 2011 24-hour PM_{10} model results with previous modelling. Years 3 and 5 are compared directly with results from the 2009 EA. However, to allow a reasonable "apples to apples" comparison, the Jan 2011 Year 1 results, are compared with revised 2010 Year 1 modelling results to account for the revised start date and mine plan (**PAEHolmes, 2010a**).

Table 5.1 shows decreased potential for impacts; the majority of sensitive receptors in Year 1, 3 and 5 show that lower dust levels would result from the proposed Jan 2011 mine plan. This is especially the case for year 1 where, for example, impacts are more than halved at receptor 18, located centrally in Camberwell Village

However it is noted that some of the receptors would still experience impacts above the DECCW 24-hour average PM_{10} criterion of 50 µg/m³. To examine the impacts at these receptors, some further assessment (described in **Section 5** and **6**) was made to determine the control measures required to minimise the impact to meet the DECCW criteria.

It is also noted that some receptors are predicted to experience slightly greater impacts. In this case it needs to be kept in mind that some if this change arises from rounding predicted values up and also the new alignment of sources in the model. This is a normal limitation of the model where many sources moving all over the mine during a year can only be represented by a limited number of fixed dust sources. Such small differences are normal and within the precision of air dispersion models, It is thus important to observe the overall trend as an indicator of the effect of the changes made.

In Year 1, predicted impacts have decreased at all receptors as a direct result of the proposed changed in the Jan 2011 modelling, (except for outlying receptors R117, R129 and R130A, and receptor 34 remains unchanged). Although predicted impacts at R117, R129 and R130A have increased in the revised modelling, results remain below the assessment criterion of 50 µg/m³.

In Year 3, predicted impacts have decreased at all receptors except for receptors R30 and R121. The maximum predicted impact at R30 has increased from 44 µg/m³ to 45 µg/m³ (note property R30 is owned by Ashton). Although the maximum predicted impact at R121 has increased by 7 µg/m³ due to the current (Jan 2011) modelling, the number of days predicted to exceed the criteria has decreased by 1 day.

In Year 5, predictions have decreased at all receptors except for R32 which has increased by 1 µg/m³ but remains below the assessment criterion. The maximum prediction at R18 remains unchanged however the number of days above the criteria has decreased from 5 to 1.

5.2 Annual Average PM_{10}

Table 4.2 shows a summary of predicted long term (annual average) dust levels at selected receptors. It is noted that cumulative annual averages were calculated based on the 2010 PAEHolmes study of cumulative dust impacts at Camberwell. However it is noted that not every receptor examined in this report (as presented in **Table 4.1**) was included in the Camberwell study and so annual average PM_{10} concentrations can only be reasonably presented for the receptors included in Camberwell study, as presented in **Table 4.2**.

The results presented in **Table 4.2** show that receptors located in Camberwell Village would see decreased or unchanged annual average PM_{10} levels, and are unlikely to experience annual average PM_{10} levels above DECCW criteria. Receptors R120, R129 and R130A outside the Village to the south and east of the proposed mine may still experience impacts that are a little above criteria. Annual average PM_{10} concentrations predicted for the Jan 2011 mine plan are generally lower compared with the Camberwell Study.

Table 5.1: Revised 24-hour PM_{10} modelling results and comparison with previous modelling (increment only)

Receptor ID	Year 1				Year 3				Year 5			
	Maximum 24h PM_{10} (*Assessment Criterion = 50 µg/m³*)											
	2010 Revised Year 1 Modelling	No. of Days Above Criterion	Current (Jan 2011) Modelling	No. of Days Above Criterion	2009 EA	No. of Days Above Criterion	Current (Jan 2011) Modelling	No. of Days Above Criterion	2009 EA	No. of Days Above Criterion	Current (Jan 2011) Modelling	No. of Days Above Criterion
R2 (MO)	**54**	NA	**77**	2	**73**	9	**65**	2	**92**	8	**69**	3
R8 (MO)	**60**	NA	**53**	1	**68**	9	**60**	4	**91**	8	**68**	3
R10 (MO)	**51**	NA	48	0	**61**	NA	46	0	**81**	NA	**60**	3
R11 (MO)	**58**	NA	36	0	**61**	3	49	0	**78**	7	**62**	3
R17 (MO)	**53**	NA	32	0	**55**	NA	47	0	**71**	NA	**58**	3
R18	**52**	1	19	0	**54**	1	48	0	**57**	5	**57**	1
R23	40	NA	38	0	49	0	43	0	**63**	3	**53**	1
R24a	43	NA	29	0	47	0	44	0	**59**	3	**51**	1
R24b	46	NA	32	0	50	0	45	0	**65**	3	**52**	3
R30 (MO)	42	NA	17	0	44	0	45	0	**51**	1	50	0
R32	42	NA	16	0	45	0	44	0	48	0	49	0
R34	38	NA	38	0	48	0	41	0	**61**	3	**52**	1
R35	35	NA	30	0	43	0	39	0	**55**	2	47	0
R83	**89**	3	**51**	1	**123**	14	**94**	14	**109**	9	**105**	7
R114	**56**	2	40	0	**84**	3	**76**	4	**84**	3	**72**	1
R117	26	NA	41	0	**55**	2	43	0	**56**	2	47	0
R118 (MO)	**63**	NA	**62**	1	**83**	NA	**73**	4	**81**	NA	**69**	3
R120	**112**	14	**92**	7	**142**	15	**117**	13	**140**	9	**116**	7
R121	**175**	55	**97**	13	**202**	43	**209**	41	**162**	26	**156**	20
R129	25	NA	34	0	**120**	20	**85**	14	Within pit limits			
R130A	18	NA	25	0	**82**	3	**57**	2	**171**	27	**170**	25
R151	35	NA	21	0	**51**	2	50	0	**53**	2	47	0
R187	15	NA	13	0	44	0	35	0	**52**	1	**51**	1

Notes: Values shown in **bold** are predicted to exceed the assessment criteria. NA = Not Assessed, MO = Mine-Owned.

Table 5.2: Revised cumulative annual PM_{10} modelling results and comparison with previous cumulative assessment

Receptor ID	Year 1		Year 3		Year 5	
	PM_{10} Annual Cumulative (*Assessment Criterion = 30 µg/m*^{3})					
	2010 Cumulative Study	Current (Jan 2011) Modelling	2010 Cumulative Study	Current (Jan 2011) Modelling	2010 Cumulative Study	Current Modelling
R18	24	22	27	27	24	24
R32	23	22	26	26	23	23
R34	24	23	28	28	24	24
R114	26	25	27	26	27	26
R117	26	26	29	29	27	27
R120	**31**	26	**33**	**33**	27	26
R129	15	16	**34**	**32**	Within pit limits	
R130A	12	12	30	29	**32**	**31**

Notes: Values shown in **bold** are predicted to exceed the assessment criteria.

6 WIND DIRECTION ANALYSIS

The local meteorological data was analysed to establish the potential conditions that may lead to dust impacts at the Village. **Figure 6.1** presents the percentage of time that wind blows from all wind directions in the area, in ten degree increments. The shaded region shows the winds between 150º and 235º that blow from the proposed mine towards the Village.

It can be observed from **Figure 6.1** that unfavourable winds would occur for a relatively small fraction of the time, i.e. less than <6% annually. Due to the low fraction of time that winds may blow dust directly into the Village, it would appear possible for the mine to implement additional control measures can to reduce dust generating activities and hence minimise or control short term mine dust impact in Camberwell Village. Measures which may be implemented would include a range of controls from reduction in open cut mine activities to full shut down of the open cut mine operation. The effect of implementing such measures is outlined below.

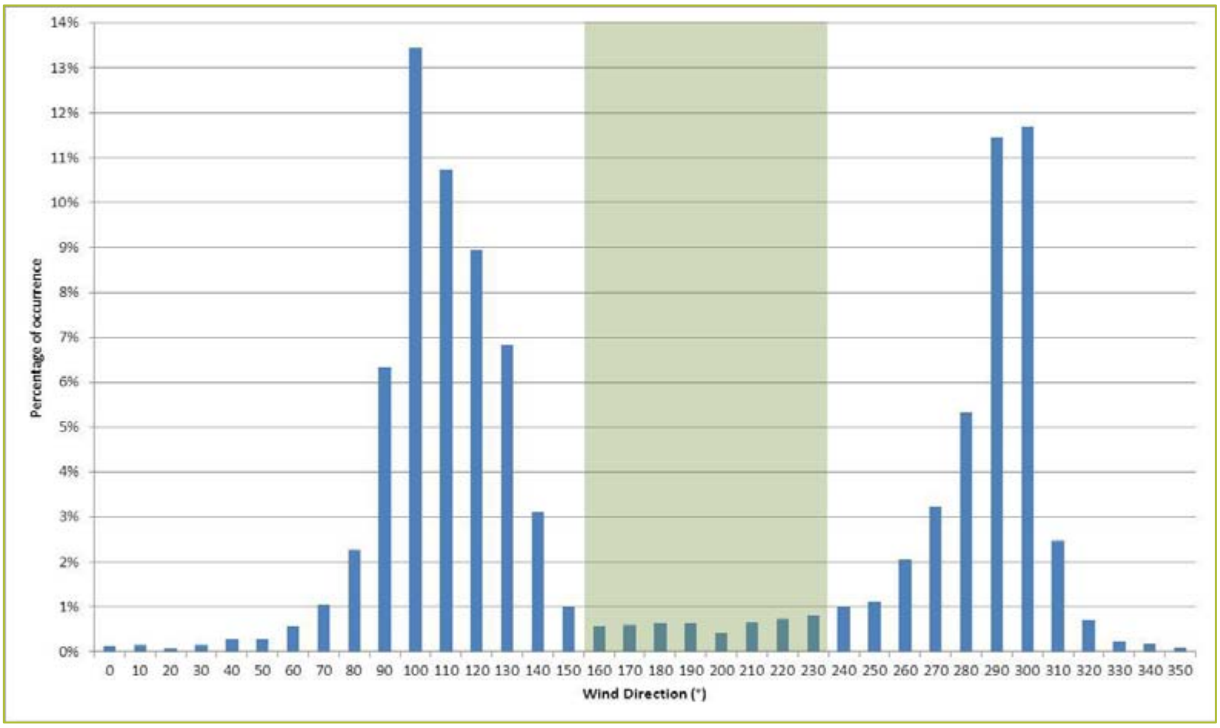


Figure 6.1: Wind direction analysis for meteorological data used in dispersion modelling

7 CONTROLLED SCENARIO

The meteorological analysis presented in **Section 6** and some further brief examination of data shows that on the worst day of impact, the highest dust levels correspond to periods of wind blowing towards the Village. In reality many other factors that change on a short term basis such as recent rainfall events or the surface moisture and dustiness of materials would influence the mines actions in controlling impacts. However, overall, the analysis shows that unfavourable wind regimes are relatively limited for the proposed mine, and this provides good scope for implementing real-time or predictive controls to minimise or control potential impacts.

In light of this, some further investigation was carried out to identify the likely benefit of potential control measures to minimise or control the dust impact in the Village. It is important when interpreting these results to consider that the distance dust will travel in a particular direction depends on numerous factors, including: wind speed, terrain, and atmospheric stability. Although the dispersion modelling takes most of these key factors into account, models are limited when examining short periods of time as in reality wind generally does not flow in a single direction for the set modelling time increments.

The potential operational control measures to minimise or control impacts in Camberwell Village to the North of the proposed mine that are presented below focus on periods of wind blowing mine dust directly into the Village, i.e. NNW to NNE winds from 150º to 235º.

It is noted that there are other scattered residential properties to the east and southwest of the proposed mine that have not been included in identifying the control measures.

Scenario 1:
Assumes all the open cut mine operations, including stripping, loading, unloading, hauling, grading, blasting and drilling operations, will be stopped when wind are between 150°and 235°. Other operations related to ROM transport and processing (including crushing ROM coal, conveying ROM coal to CHPP, CHPP activities, loading product coal to train, hauling and dumping rejects from CHPP, unloading coal from underground mine operation and underground mine vent shaft operation) would remain active.

Scenario 2:
Assumes all the open cut mine operations, including stripping, loading, unloading, hauling, grading, blasting and drilling operations, will be reduced by 50% when winds are between 150° and 235°. Other operations related to ROM transport and processing (including crushing ROM coal, conveying ROM coal to CHPP, CHPP activities, loading product coal to train, hauling and dumping rejects from CHPP, unloading coal from underground mine operation and underground mine vent shaft operation) would remain active.

The modelling was re-run for both the above scenarios. To operate the model, emission reduction factors for these scenarios were calculated based on the activities that can be stopped or reduced on short notice to minimise the dust emissions. The emission reduction factors were applied only during the hours when winds were between 150° and 235°. No emission reduction factor has been applied to the rest of the operating hours.

Table 7.1: Estimated reduction factor for controlled scenario

Year	Annual TSP emission	TSP emission from continuous operations[1]	Emission reduction factor for Scenario 1[2]	Emission reduction factor for Scenario 2[3]
Year 1 (Apr-Jul)	292,118	53,157	82%	41%
Year 1 (Rest of yr 1)	784,271	226,895	71%	36%
Year 3	2,023,624	472,949	77%	38%
Year 5	2,165,018	510,224	76%	38%

[1]TSP emission from continuous activities and activities that cannot be stopped or reduced at any particular hour of the day. These activities include crushing ROM coal, conveying ROM coal to CHPP, CHPP activities, loading product coal to train, hauling and dumping rejects from CHPP, wind erosion, unloading coal from underground mine operation and underground mine vent shaft operation.

[2]Assumes all the open cut mine operations that includes stripping, loading, unloading, hauling, grading, blasting and drilling operations will be stopped.

[3]Assumed all the open cut mine operations that includes stripping, loading, unloading, hauling, grading, blasting and drilling operations will be reduced by 50%.

Receptors predicted to experience 24-hour average PM_{10} levels above criteria, as presented in **Table 5.1,** were modelled to show the effect of implementing the two potential controlled scenarios. **Table 7.2** shows the predicted concentration at each of these receptors for each day where dust levels are predicted to exceed criteria for the Jan 2011 operation and also the two controlled scenarios.

The results presented in **Table 7.2** show that implementing the two controlled scenarios for the proposed Jan 2011 activities, as represented here by reducing the activity rate or shutting down the open cut mine operations when winds are towards the Village is likely to significantly reduce the short term PM_{10} concentrations in Camberwell Village from the proposed SEOC mine.

The results show that the implementation of such additional control measures provides scope for the SEOC to operate without short term dust levels exceeding criteria at any private receptors in Camberwell Village. It does need to be noted that whilst a model can instantly switch off dust, and assumes that for each modelled time increment the conditions are constant, the reality is that mine dust, once released, cannot be stopped instantaneously, and winds will vary constantly. And whilst the modelling in this case may well show potential for no impacts to occur, the overall interpretation of the modelling results is that a significant reduction in short-term impacts, to near full compliance with DECCW impact assessment criteria is possible, and also that compliance with DoP short term acquisition criteria is expected with good operational controls.

The results thus show that potential short term (24-hour average) dust impacts at Camberwell Village can be significantly reduced by implementing control measures altering open cut mining activity under unfavourable wind conditions. Similar control measures are used by other mines routinely in the Hunter Valley. For example Ashton North East open cut mine has been able to operate, (in later years) with significantly lower dust levels than originally predicted in the EA by implementing such control measures..

It is noted that Ashton is committed to the use of real time monitoring of meteorological conditions and dust to determine if operations should be modified to limit potential impacts in Camberwell Village.

Table 7.2: Comparison of 24-hour average predicted PM_{10} concentration for current (Jan 2011) base and controlled scenarios for Camberwell Village Receivers

	Current (2011) Base		Scenario 1			Scenario 2		
	No. of Days Above Criterion	Maximum 24h PM_{10} (*Assessment Criterion = 50 µg/m³*)	No. of Days Above Criterion	Maximum 24h PM_{10} (*Assessment Criterion = 50 µg/m³*)	% reduction	No. of Days Above Criterion	Maximum 24h PM_{10} (*Assessment Criterion = 50 µg/m³*)	% reduction
Year1								
R2	2	77	0	22	71%	0	46	40%
		51		15[1]	-		30[1]	-
R8	1	53	0	10	80%	0	32	40%
R118	1	62	0	23	63%	0	42	32%
Year3								
R2	2	65	0	17	74%	0	41	37%
		57		15[1]	-		36[1]	-
R8	4	60	0	15	75%	0	38	37%
		53		13[1]	-		33[1]	-
		52		13[1]	-		33[1]	-
		51		13[1]	-		32[1]	-
R118	4	73	0	20	73%	0	47	36%
		63		17[1]	-		40[1]	-
		56		15[1]	-		36[1]	-
		52		14[1]	-		33[1]	-
Year 5								
R2	3	69	0	16	76%	0	43	37%
		62		15[1]	-		39[1]	-
		62		15[1]	-		39[1]	-
R8	3	68	0	18	74%	0	43	37%
		65		17[1]	-		41[1]	-
		65		17[1]	-		41[1]	-
R11	3	62	0	15	77%	0	39	38%
		59		14[1]	-		37[1]	-
		57		13[1]	-		36[1]	-
R18	1	57	0	12	79%	0	32	37%
R23	1	53	0	16	69%	0	35	34%
R24A	1	51	0	16	68%	0	34	33%
R24B	2	52	0	15	71%	0	34	35%
		52		15[1]	-		34[1]	-
R30	1	50	0	12	77%	0	31	39%
R34	1	52	0	16	68%	0	34	34%
R118	3	69	0	17	76%	0	43	38%
		56		13[1]	-		35[1]	-
		52		12[1]	-		32[1]	-

[1]calculated based on percentage reduction on the day with predicted highest 24-hour PM_{10}

8 CONCLUSION

This report outlines the results and analysis of PM_{10} dispersion modelling for private receptors and representative mine owned properties in the vicinity of the proposed Ashton SEOC coal mine. The modelling has taken into account significant modifications to the mine plan including a set-back to the south of 200m for the pit shell and 120m for the dump toe, altering the operation schedule and reducing the production schedule from 24 hour operations, to daytime (15 hours per day) activity for the first two years.

The purpose of the modifications is to ameliorate impact in Camberwell Village, and the Jan 2011 results have been compared to previous air quality assessments completed for the project (**PAEHolmes, 2009 and 2010a and 2010b**) to show the effect of these proposed changes in reducing impacts.

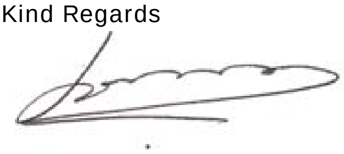
The results show a relative reduction in potential dust impact for the proposed Jan 2011 mine at the majority of sensitive receptors in the years modelled (1, 3 and 5). Both the annual average and 24-hour average dust levels and the number of days above short term impact assessment criteria are reduced at most receptors due to the proposed changes. While there are some increases in predicted impacts at some, generally outlying receptors, these are few and predominantly minor.

Analysis of potential control measures was also conducted and shows that maximum 24-hour average PM_{10} concentrations can be significantly reduced by implementing some progressive modification of activities or shut down of the main dust generating activities when winds blow from the mine to the Village. The results indicate that the proposed mine would be situated relative to the Village such that unfavourable winds occur infrequently, around 6% of the time annually. This situation provides scope for the proposed mine to implement real time or predictive mitigation measures to good effect and thus to minimise or eliminate potential dust impacts.

Ashton has committed to implement measures that will provide effective real-time management of dust impacts.

Please feel free to contact us if you have any queries or seek to discuss any issues related to this report.

Kind Regards



Fardausur Rahaman
Air Quality Engineer
PAEHolmes

9 REFERENCES

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PAEHolmes (2010b)

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Appendix 2

Revised Noise Impact Assessment

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24 January 2011

Ref: 07373/3834

Lisa Richards
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P.O. Box 699
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ASHTON SEOC – RE-MODELLED NOISE SCENARIOS

Dear Lisa,

This report presents the results of supplementary (Jan 2011) noise modelling for the Ashton South East Open Cut (SEOC) project to determine the effectiveness of several noise control measures.

NOISE CONTROL MEASURES

Ashton Coal Operations Limited (ACOL) has revised the mine plan for the Ashton SEOC project presented in the Environmental Assessment (EA 2009) document. The key modifications to the mine plan include a set-back in the southern direction of 200m for the pit shell and 120m for the dump toe, altering the operation schedule to day and evening for the first two years of operations (thereby avoiding night time inversion conditions and the lower night time noise criteria) and reducing the production schedule. This current revised plan shall be referred to as the Jan 2011 mine plan.

In addition to these changes the following noise control measures have been committed to.

- Conveyor will be enclosed;
- Transfer station (1) will be omitted;
- Transfer stations (2) and (3) will be fully enclosed;
- New haul trucks have full attenuator packages providing 7 dB noise reduction (manufacturers advice);
- Existing trucks will have attenuator packages (mufflers, radiator silencers) providing 2 dB noise reduction (confirmed by site measurements);
- A new Liebherr 996 excavator will have full attenuator package;
- Dozers in exposed locations will be limited to first gear in reverse providing 6 dB noise reduction (confirmed by measurements);
- The bund toe is to be offset 120m south of the original location in the EA noise model, thereby placing dump sources a further 120m south of Camberwell village; and
- The northern bund would be accessed via a haul road at its south-eastern end, rather than at its north-western end as was the case in the original modelling.

MODELLED NOISE SOURCES

Noise source sound power levels for the revised modelling are summarised in **Table 1**, which has been reproduced from the original noise assessment. Any original values that have been deleted are struck through and any revised or new values are shown in blue type.

Table 1
Noise source sound power levels

Operational noise source	Sound power level, dB(A)		Source Height, m
	$L_{eq(15 min)}$	L_{max}	
Loading empty coal wagons	101	116	3
3 x loco's idling on loop	105	111	3
Loader ROM hopper	114	120	3
Rotary breaker (enclosed)	108	112	5
Tracked dozer (fwd/reverse cycle)	115	128	2
Tracked dozer (1st gear in reverse)[1]	109	114	2
Overburden drill	114	116	1
Existing O/B excavator	117	125	5
Existing Coal excavator	116	122	5
Overburden dump (full cycle)[2]	~~115~~ 113	~~121~~ 119	3
Overburden haul (on slope, per 350m)[2]	~~115~~ 113	~~123~~ 121	3
Overburden haul (on flat, per 350m)[2]	~~113~~ 111	~~118~~ 116	3
Coal haul (per 350m)[2]	~~111~~ 109	~~120~~ 118	3
O/B dump (new trucks, full cycle)[3]	108	119	3
O/B haul (new trucks on slope, per 350m)[3]	108	116	3
O/B haul (new trucks on flat, per 350m)[3]	106	111	3
Transfer station (steel clad)	~~112~~ 102	~~116~~ 106	15
Coal washery	112	116	15
Conveyors (per 100m) (fully enclosed)	~~96~~ 84	N/A	2-10
Stacker/reclaimers (each)	105	N/A	10

1. Dozers to reverse in first gear only while in elevated locations exposed to Camberwell village.
2. Existing trucks with 2 dB attenuation (included in models for the first two years of operation).
3. New trucks with 8 dB attenuation (included in models from the third year of operation onwards).

OPERATIONAL NOISE CRITERIA

Operational noise criteria adopted for the project in this assessment are summarised in **Table 2**. The original assessment considered receivers in north Camberwell (essentially north of R18 Turner) as "rural" and receivers closer to the New England Highway as "suburban". In keeping with the Department of Planning's recent assessment of the adjoining Integra project, all receivers in Camberwell are considered as "suburban" for the purposes of establishing amenity criteria and receivers outside the village and away from the highway (ie, R111 and R184A) are considered "rural"[1].

In Table 2 and all following Tables, receivers shaded blue are ACOL owned and receivers shaded green are owned by another mining company.

[1] The distinction between "suburban" and "rural" does not affect the current assessment as the evening and night time acceptable amenity noise levels in the NSW Industrial Noise Policy (INP) are the same for both classifications.

Table 2
Operational noise criteria

	Intrusiveness criteria dB(A),$L_{eq(15minute)}$			Amenity criteria dB(A),$L_{eq(period)}$		
Receiver	Day	Evening	Night	Day	Evening	Night
R35 De Jong	43	43	37	50	45	40
R117 McInerney	43	43	37	50	45	40
R34 Olofsson	43	43	37	50	45	40
R23 Lopes	43	43	37	50	45	40
R24 Clarke	43	43	37	50	45	40
R52	43	43	37	50	45	40
R30	43	43	37	50	45	40
R32 Stapleton	45	44	37	50	45	40
R26	43	43	37	50	45	40
R151 Church*	N/A	N/A	N/A	50 (external) when in use		
R18 Turner	45	44	41	50	45	40
R11	45	44	41	50	45	40
R8	45	44	41	50	45	40
R2	45	44	41	50	45	40
R50	This residence will never be occupied – not considered further					
R51	This residence will never be occupied – not considered further					
R119	46	46	44	50	45	40
R120 Ernst	46	46	44	50	45	40
R121 Burgess	46	46	44	50	45	40
R83 Hall	45	44	41	50	45	40
R84 Tisdell	45	44	41	50	45	40
R114 Richards	43	43	41	50	45	40
R111 Richards	43	43	41	50	45	37
R129 Bowman	Within pit limits					
R130A Bowman	37	37	37	50	45	37
R130B Bowman	37	37	37	50	45	37
R184A Moxey	37	37	37	50	45	37

* St. Clement's Anglican Church

This report aims to define noise management and affectation (or acquisition) zones, particularly within Camberwell village. The noise management zone is often divided into two zones: "minor" exceedance of the criterion by 1-2 dB and "moderate" exceedances by 3-5 dB. Provided the project has already incorporated reasonable and feasible noise control into the noise modelling, minor exceedances often do not require further noise reduction, although compliance monitoring should be conducted at these receivers. Moderate exceedances usually result in a requirement that the landowner is entitled to some form of additional noise mitigation (upgraded glazing, acoustic fencing, etc) upon formal request to the proponent. Exceedances greater than 5 dB are considered "major" and often result in the property being purchased by the proponent upon receipt of a formal request from the landowner.

The amenity criteria are generally higher than the intrusive criteria within the village, yet the predicted intrusive noise levels from the SEOC are 3 dB higher than the amenity noise levels (as seen in the following tables of results). The greatest differential between predicted levels and criteria occurs for the intrusive noise levels and therefore the noise management and acquisition zones will be defined by the intrusive noise levels.

PREDICTED NOISE LEVELS

Years 1 and 2

For the initial (nominally Autumn 2011) scenario the relevant meteorological conditions are neutral, and winds from the NE, ESE and S (from Table 2 of the original acoustic assessment). Being the beginning of autumn, no temperature inversion has been modelled. Predicted intrusive noise levels are summarised in **Table 3**, assuming day/evening operation. Amenity (ie, full time period) noise levels are estimated as being 3 dB below the predicted intrusive noise levels. Estimated amenity noise levels and amenity criteria are summarised in **Table 4**. In all Tables of results, **bold type** indicates an exceedance of the noise criterion and grey shading indicates more than 5 dB exceedance (ie, acquisition zone).

For the second scenario (Winter 2011) the relevant meteorological conditions are neutral, and winds from the N and WSW. As South winds do not occur for more than 30% of the time during winter, in accordance with the INP they are not required to be modelled. However as this wind direction is worst case with respect to receivers in Camberwell village we have included south winds within the Winter scenario, this also allows for assessment this scenarios impacts should they occur outside of the Winter months.
Predicted intrusive noise levels are summarised in **Table 5**, assuming day/evening mining operations. Estimated amenity noise levels and amenity criteria are summarised in **Table 6**. Since mining in the SEOC would not occur at night time, modelling under inversion conditions has included ROM, conveyor and CHPP sources but no mining activities. Results under inversion conditions in Tables 5 and 6 for the ROM, conveyor and CHPP operations are followed by the night time criteria in brackets.

The Autumn 2011 scenario is considered as initial earthworks and therefore the ROM area and conveyor transfer system are not included in the model. The bund toe is offset 120m south of the original location in the EA noise model, thereby placing dump sources a further 120m south of Camberwell village. Coaling would commence at the end of the fourth month, but would be stockpiled in the ROM area for some time before being conveyed to the existing CHPP area. As a measure of conservatism, however, ROM area and conveyor system sources were added to the Winter 2011 model to represent worst case conditions throughout the first two years of day/evening mining operations.

Receiver	Predicted intrusive noise level dB(A),$L_{eq(15min)}$				Criteria
	Neutral	Winds			
		NE	ESE	S	
R35	29	25	33	40	43
R117	31	29	33	40	43
R34	29	26	33	40	43
R23	28	26	34	41	43
R24	29	26	34	41	43
R52	29	27	34	41	43
R30	30	28	34	42	43
R32	32	28	34	43	44
R26	33	30	36	43	43
R151	38	35	44	46	N/A
R18	37	34	38	46	44
R11	36	35	41	46	44
R8	37	34	42	46	44
R2	36	34	42	46	44

TABLE 3
Predicted intrusive noise levels for Autumn 2011 scenario (day/evening only, bund toe is offset 120m south of original location, trucks attenuated 2 dB and no ROM/conveyors).

Receiver	Predicted intrusive noise level dB(A),$L_{eq(15min)}$				Criteria
	Neutral	Winds			
		NE	ESE	S	
R119	40	37	42	46	46
R120	40	37	39	44	46
R121	43	39	43	44	46
R83	34	29	29	34	44
R84	29	24	24	29	44
R114	35	32	34	39	44
R111	24	<20	27	31	44
R129	Within pit limits				
R130A	35	45	40	35	37
R130B	27	38	31	25	37
R184A	Not affected for Years 1 & 2 – not impacted				

Receiver	Estimated amenity noise level dB(A),$L_{eq(period)}$				Criteria
	Neutral	Winds			
		NE	ESE	S	
R35	26	22	30	37	45
R117	28	26	30	37	45
R34	26	23	30	37	45
R23	25	23	31	38	45
R24	26	23	31	38	45
R52	26	24	31	38	45
R30	27	25	31	39	45
R32	29	25	31	40	45
R26	30	27	33	40	45
R151	35	32	41	43	50
R18	34	31	35	43	45
R11	33	32	38	43	45
R8	34	31	39	43	45
R2	33	31	39	43	45
R119	37	34	39	43	45
R120	37	34	36	41	45
R121	40	36	40	41	45
R83	31	26	26	31	45
R84	26	21	21	26	45
R114	32	29	31	36	45
R111	21	<20	24	28	45
R129	Within pit limits for scenarios after Year 2				
R130A	32	42	37	32	45
R130B	24	35	28	22	45
R184A	Not affected for Years 1 & 2 – not impacted				45

TABLE 4

Estimated amenity noise levels for Autumn 2011 scenario (day/evening only, bund toe is offset 120m south of original location, trucks attenuated 2 dB and no ROM/conveyors).

These results show that all receivers in Camberwell village are removed from the noise acquisition zone for the Autumn 2011 scenario, assuming day/evening operations only.

Receiver	Predicted intrusive noise level dB(A),$L_{eq(15min)}$					Criteria
	Neutral	Inversion / Winds				
		Inversion*	N	S	WSW	
R35	29	34 (37)	25	41	40	43
R117	31	35 (37)	30	42	41	43
R34	30	38 (37)	28	42	41	43
R23	30	39 (37)	29	43	41	43
R24	30	39 (37)	29	43	42	43
R52	30	38 (37)	29	44	42	43
R30	30	38 (37)	29	44	42	43
R32	31	37 (37)	29	45	44	44
R26	33	39 (37)	31	45	44	43
R151	38	41 (50)	36	48	48	N/A
R18	35	41 (41)	37	46	45	44
R11	39	40 (41)	39	49	48	44
R8	39	40 (41)	40	50	48	44
R2	40	40 (41)	40	50	48	44
R119	40	39 (44)	39	48	47	46
R120	39	40 (44)	40	43	45	46
R121	40	42 (44)	42	39	41	46
R83	32	35 (41)	35	36	37	44
R84	27	30 (41)	30	30	32	44
R114	39	35 (41)	37	42	45	44
R111	21	24 (41)	20	33	35	44
R129	Within pit limits					
R130A	35	40	40	35	35	37
R130B	26	33	36	22	22	37
R184A	Not affected for Years 1 & 2 – not impacted					37

* CHPP and ROM/conveyor sources only as mining in the SEOC would not occur at night time.
Night time intrusive criteria are shown next to predicted level in brackets.

TABLE 5

Predicted intrusive noise levels for Winter 2011 scenario (day/evening only, bund toe is offset 120m south of original location, trucks attenuated 2 dB and ROM/conveyors operating). Inversion results are for CHPP/ROM/conveyors only). Night time intrusive criteria are displayed in brackets next to inversion results.

Receiver	Estimated amenity noise level dB(A),$L_{eq(period)}$					Criteria
	Neutral	Inversion / Winds				
		Inversion*	N	S	WSW	
R35	29	31 (40)	22	38	37	45
R117	31	32 (40)	27	39	38	45
R34	30	35 (40)	25	39	38	45
R23	30	36 (40)	26	40	38	45
R24	30	36 (40)	26	40	39	45
R52	30	35 (40)	26	41	39	45
R30	30	35 (40)	26	41	39	45
R32	31	34 (40)	26	42	41	45
R26	33	36 (40)	28	42	41	45
R151	38	38 (50)	33	45	45	50
R18	35	38 (45)	34	43	42	45
R11	39	37 (45)	36	46	45	45
R8	39	37 (45)	37	47	45	45
R2	40	37 (45)	37	47	45	45
R119	37	36 (45)	36	46	44	45
R120	36	37 (45)	37	40	42	45
R121	37	39 (45)	39	36	38	45

TABLE 6

Estimated amenity noise levels for Winter 2011 scenario (day/evening only, bund toe is offset 120m south of original location, trucks attenuated 2 dB, ROM/conveyors operating) Night time amenity criteria are displayed in brackets next to inversion results.

Receiver	Estimated amenity noise level dB(A),$L_{eq(period)}$					Criteria
	Neutral	Inversion / Winds				
		Inversion*	N	S	WSW	
R83	29	32 (40)	32	33	34	45
R84	27	27 (40)	27	27	29	45
R114	36	32	34	39	42	45
R111	21	21 (37)	<20	30	32	45
R129	Within pit limits					
R130A	32	37	37	32	32	45
R130B	23	30	33	<20	<20	45
R184A	Not affected for Years 1 & 2 – not impacted					45

* CHPP and ROM/conveyor sources only, as mining in the SEOC would not occur at night time.
Night time amenity criteria are shown next to predicted level in brackets.

As with the previous Autumn 2011 scenario, the above results show that applying the noise reduction measures detailed on Page 1 and restricting mining operations to day/evening only, there are no privately owned Camberwell receivers within the acquisition zone. Some privately owned Camberwell receivers remain in a noise management zone under inversion conditions due to night time operation of the coal handling and transfer sources. Predicted exceedances are "minor" as they do not exceed 2dB and no additional noise control measures are recommended for these receivers. Any future noise monitoring program should include night time monitoring at one nor more of these receivers even though mining would not occur at night for the first two years.

Year 3

Re-modelling for Year 3 included all the noise reduction measures discussed on Page 1, with the exception that 24-hour mining operations would commence at this time. Predicted intrusive noise levels are summarised in **Table 7**. Estimated amenity noise levels and amenity criteria are summarised in **Table 8**. Since this scenario is representative of typical operations throughout the year, all relevant meteorological conditions have been assessed.

Receiver	Predicted intrusive noise level dB(A),$L_{eq(15min)}$							Criteria
	Neut	Inv	Winds					
			N	NE	ESE	S	WSW	
R35	26	36	26	22	28	35	39	37
R117	23	35	29	20	24	29	35	37
R34	25	36	29	22	25	32	37	37
R23	25	36	30	23	26	32	37	37
R24	26	37	30	25	28	33	38	37
R52	29	38	30	25	30	35	38	37
R30	30	38	30	25	31	37	38	37
R32	31	39	31	28	34	40	39	37
R26	32	40	35	30	34	39	40	37
R151	37	43	40	35	40	46	44	N/A
R18	32	41	39	30	33	39	41	41
R11	31	40	38	30	31	35	40	41
R8	31	40	38	30	30	34	39	41
R2	30	39	37	28	29	32	38	41
R119	27	35	35	27	28	30	37	44
R120	27	33	33	25	26	29	35	44

TABLE 7
Re-modelled Year 3 intrusive noise levels.

Receiver	Predicted intrusive noise level dB(A),$L_{eq(15min)}$							Criteria
	Neut	Inv	Winds					
			N	NE	ESE	S	WSW	
R121	31	37	37	28	28	32	40	44
R83	28	35	35	25	25	34	39	41
R84	23	30	30	20	20	25	34	41
R114	34	34	33	31	33	35	37	41
R111	20	30	30	<20	<20	30	29	41
R129	Within pit limits							
R130A	>50	>50	>50	>50	>50	>50	50	37
R130B	35	40	40	42	35	30	31	37
R184A	20	31	31	33	20	<20	<20	37

Receiver	Estimated amenity noise level dB(A),$L_{eq(period)}$							Criteria
	Neut	Inv	Winds					
			N	NE	ESE	S	WSW	
R35	23	33	23	<20	25	32	36	40
R117	20	32	26	<20	21	26	32	40
R34	22	33	26	<20	22	29	34	40
R23	22	33	27	20	23	29	34	40
R24	23	34	27	22	25	30	35	40
R52	26	35	27	22	27	32	35	40
R30	27	35	27	22	28	34	35	40
R32	28	36	28	25	31	37	36	40
R26	29	37	32	27	31	36	37	40
R151	33	40	37	32	37	43	41	50
R18	29	38	36	27	30	36	38	40
R11	28	37	35	27	28	32	37	40
R8	28	37	35	27	27	31	36	40
R2	27	36	34	25	26	29	35	40
R119	24	32	32	24	25	30	34	40
R120	24	30	30	22	23	26	32	40
R121	28	34	34	25	25	29	37	40
R83	25	32	32	22	22	31	36	40
R84	20	27	27	<20	<20	22	31	40
R114	31	31	30	28	30	32	36	40
R111	<20	27	27	<20	<20	27	26	37
R129	Within pit limits							
R130A	>47	>47	>47	>47	>47	>47	47	37
R130B	32	37	37	39	32	27	28	37
R184A	<20	28	28	30	<20	<20	<20	37

TABLE 8

Estimated Year 3 amenity noise levels.

The above results show that there are no privately owned Camberwell receivers within the acquisition zone for the year 3 operational scenario. However privately owned receivers R24 and R32 would be within a noise management zone. As with the previous scenario, the exceedance is not greater than 2 dB so no additional noise reduction measures are recommended, although noise compliance monitoring should include at least one of these receivers. As a point of note predicted levels at R32 and R26 are higher than at receivers R11, R8 and R2 under some wind conditions even though the latter receivers are closer to the mining operation. This is because R11, R8 and R2 are closer to the environmental bund than R32 and R26, thereby getting a greater benefit from the bund's acoustic shadow zone.

Receiver 130B to the south-west of the site falls within the 3-5dB management zone. This receiver, however, is within a noise acquisition zone for future scenarios which is likely to impact upon the habitability of this residence.

Year 5

Re-modelling for Year 5 included all the noise reduction measures discussed on Page 1, with the exception that 24-hour mining operations are continuing. Predicted intrusive noise levels are summarised in **Table 9**. Estimated amenity noise levels and amenity criteria are summarised in **Table 10**. This scenario is representative of typical operations throughout the year so all relevant meteorological conditions have been assessed.

Receiver	Predicted intrusive noise level dB(A),$L_{eq(15min)}$							Criteria
			Winds					
	Neut	Inv	N	NE	ESE	S	WSW	
R35	25	38	27	24	24	33	38	37
R117	24	36	28	20	20	34	36	37
R34	25	39	29	22	24	34	37	37
R23	25	40	30	22	25	34	37	37
R24	26	40	30	23	25	35	38	37
R52	28	40	30	25	26	35	38	37
R30	30	40	30	26	27	36	39	37
R32	31	40	31	28	30	40	40	37
R26	32	42	35	30	30	40	40	37
R151	36	44	41	35	35	44	44	N/A
R18	32	42	39	30	30	39	41	41
R11	31	41	38	30	28	35	39	41
R8	31	41	37	30	27	35	39	41
R2	28	40	36	28	26	34	38	41
R119	26	39	35	22	25	33	37	44
R120	25	37	32	25	24	29	34	44
R121	30	40	32	27	27	35	40	44
R83	28	39	30	25	25	33	39	41
R84	23	34	26	20	20	28	35	41
R114	32	36	31	30	31	35	38	41
R111	20	34	20	<20	<20	31	33	41
R129	Within pit limits							
R130A	>50	>50	>50	>50	>50	>50	>50	37
R130B	34	45	45	47	40	34	34	37
R184A	23	34	34	35	28	20	<20	37

TABLE 9
Re-modelled Year 5 intrusive noise levels.

Receiver	Estimated amenity noise level dB(A),$L_{eq(period)}$							Criteria
			Winds					
	Neut	Inv	N	NE	ESE	S	WSW	
R35	22	35	24	21	21	30	35	40
R117	21	33	25	<20	<20	31	33	40
R34	22	36	26	<20	21	31	34	40

TABLE 10
Estimated Year 5 amenity noise levels.

Receiver	Estimated amenity noise level dB(A),$L_{eq(period)}$							Criteria
	Neut	Inv	Winds					
			N	NE	ESE	S	WSW	
R23	22	37	27	<20	22	31	34	40
R24	23	37	27	20	22	32	35	40
R52	25	37	27	22	23	32	35	40
R30	27	37	27	23	24	33	36	40
R32	28	37	28	25	27	37	37	40
R26	29	39	32	27	27	37	37	40
R151	33	41	38	32	32	41	41	50
R18	29	39	36	27	27	36	38	40
R11	28	38	35	27	25	32	36	40
R8	28	38	34	27	24	32	36	40
R2	25	37	33	25	23	31	35	40
R119	23	36	32	<20	22	30	34	40
R120	22	34	29	22	21	26	31	40
R121	27	37	29	24	24	32	37	40
R83	25	36	27	22	22	30	36	40
R84	20	31	23	<20	<20	25	32	40
R114	29	33	28	27	28	32	35	40
R111	<20	31	<20	<20	<20	28	30	37
R129	Within pit limits							
R130A	>47	>47	>47	>47	>47	>47	>47	37
R130B	31	42	42	45	37	31	31	37
R184A	20	31	31	32	25	<20	<20	37

The above results show that there are no privately owned Camberwell Village receivers within the acquisition zone for the Year 5 operational scenario. However privately owned receivers R34, R23, R24 and R32 would be in a noise management zone. The 2 dB exceedance at R34 suggests that no further noise control measures are necessary, subject to confirmation of noise levels through compliance monitoring. Exceedances are greater than 2 dB (but less than 5 dB) at R23, R24 and R32 and additional noise mitigation upon request (such as upgraded glazing, air conditioning etc) should be made available to these receivers.

Year 7

Re-modelling for Year 7 included all the noise reduction measures discussed on Page 1, with the exception that 24-hour mining operations are continuing. Predicted intrusive noise levels are summarised in **Table 11**. Estimated amenity noise levels and amenity criteria are summarised in **Table 12**. This scenario is representative of typical operations throughout the year so all relevant meteorological conditions have been assessed.

TABLE 11

Re-modelled Year 7 intrusive noise levels.

Receiver	Predicted intrusive noise level dB(A),$L_{eq(15min)}$							Criteria
	Neut	Inv	Winds					
			N	NE	ESE	S	WSW	
R35	25	37	28	23	25	35	39	37
R117	24	35	29	20	23	34	36	37
R34	25	38	28	23	24	35	38	37
R23	25	40	30	24	24	35	38	37
R24	26	40	30	24	23	36	40	37
R52	29	40	30	25	27	38	40	37

Receiver	Predicted intrusive noise level dB(A),$L_{eq(15min)}$							Criteria
			Winds					
	Neut	Inv	N	NE	ESE	S	WSW	
R30	30	41	30	25	28	39	40	37
R32	31	42	31	28	31	42	41	37
R26	32	42	35	30	31	42	42	37
R151	37	45	40	35	37	44	44	N/A
R18	31	41	38	30	31	41	41	41
R11	30	40	38	30	28	35	40	41
R8	30	39	37	29	27	34	39	41
R2	29	39	36	28	26	32	38	41
R119	28	38	35	26	25	30	37	44
R120	24	36	33	24	24	28	34	44
R121	28	37	30	27	28	34	38	44
R83	28	38	30	25	25	33	38	41
R84	23	34	26	20	20	28	33	41
R114	31	35	30	29	30	34	37	41
R111	20	34	20	<20	<20	30	33	41
R129	Within pit limits							
R130A	>50	>50	>50	>50	>50	>50	>50	37
R130B	35	44	43	44	36	31	34	37
R184A	<20	33	32	32	25	<20	<20	37

Receiver	Estimated amenity noise level dB(A),$L_{eq(period)}$							Criteria
			Winds					
	Neut	Inv	N	NE	ESE	S	WSW	
R35	22	34	25	20	22	32	36	40
R117	21	32	26	<20	20	31	33	40
R34	22	35	25	20	21	32	35	40
R23	22	37	27	21	21	32	35	40
R24	23	37	27	21	20	33	37	40
R52	26	37	27	22	24	35	37	40
R30	27	38	27	22	25	36	37	40
R32	28	39	28	25	28	39	38	40
R26	29	39	32	27	28	39	39	40
R151	34	42	37	32	34	41	41	50
R18	28	38	35	27	28	38	38	40
R11	27	37	35	27	25	32	37	40
R8	27	36	34	26	24	31	36	40
R2	26	36	33	25	23	29	35	40
R119	25	35	32	23	22	27	34	40
R120	21	33	30	21	21	25	31	40
R121	25	34	27	24	25	31	35	40
R83	25	35	27	22	22	30	35	40
R84	20	31	23	<20	<20	25	30	40
R114	28	32	27	26	27	31	34	40
R111	<20	31	<20	<20	<20	27	30	37
R129	Within pit limits							
R130A	>47	>47	>47	>47	>47	>47	>47	37
R130B	32	41	40	41	33	28	31	37
R184A	<20	30	29	29	22	<20	<20	37

TABLE 12

Estimated Year 7 amenity noise levels.

The above results show that there are no privately owned Camberwell Village receivers within the acquisition zone for the Year 7 operational scenario. However privately owned receivers R23, R24 and R32 remain within a noise management zone.

Privately Owned Vacant Land

The preceding assessment focussed on potential noise impacts at residential receivers. There is a requirement, however, to also consider potential impact on privately owned vacant land. Noise management and acquisition zones are defined for vacant land as criterion exceedances over 25% of that land, rather than at a single point (ie, a dwelling). Figure 1 shows several blocks of vacant land owned by R18 and also a significant portion of R117 lies to the south of the actual residence.

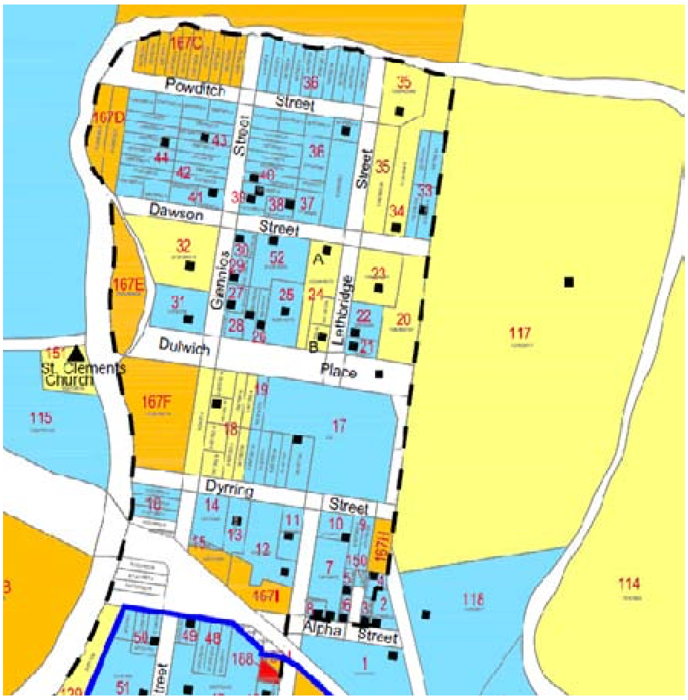

FIGURE 1
Receivers in Camberwell village.

Noise contours for the project were reviewed and it was found that only the two blocks to the south, and the elongated block to the west, of R18 would be in a noise management zone. Any future residences constructed on these blocks would require some form of noise mitigation. Further analysis of rural properties outside Camberwell village has found none where the criterion would be exceeded over more than 25% of the land area.

I trust this information satisfies your requirements at this time. Please call our office on 4954 2276 if you require further information.

Yours faithfully,
SPECTRUM ACOUSTICS PTY LIMITED

Neil Pennington
Principal/Director

Appendix 3

Conceptual Alluvial Groundwater Management Strategy

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South East Open Cut Project
&
Modification to the Existing ACP Development Consent

Conceptual Alluvial Groundwater Management Strategy

Ashton Coal Operations Pty Limited
PO Box 699
Singleton NSW 2330

January 2010

Version:	Details:	Approved:	Date:
Version 1	Submission to Department of Planning	M. Moore	26 Nov 2010
Version 2	Submission to Department of Planning	M. Moore	28 Jan 2011

Contents

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Tables

1 INTRODUCTION

Ashton Coal operations Limited (ACOL) is seeking approval for the South East Open Cut (SEOC) Project and modification of the existing Ashton Coal Project (ACP) development consent, under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The SEOC Project is a new open cut mine which is proposed to be developed adjacent to and south of the existing Ashton open cut coal mine at Camberwell, approximately 14 km northeast of Singleton, in the Hunter Valley, NSW. The SEOC is a replacement mine for the existing open cut mine, which is due to cease coal production in January 2011. The SEOC has a projected operational mine life of seven years.

An Environmental Assessment (EA) for the SEOC Project and modification of the ACP development consent was publicly exhibited by the Department of Planning (DoP) from 27 November 2009 to 18 January 2010. The EA (Wells Environmental Services, 2009) included an assessment of the impacts of the SEOC on adjacent and surrounding water sources, including Glennies Creek and its associated alluvial flood plain aquifer (EA Section 5.10 and EA Appendix 5).

The SEOC will be developed south of the New England Highway and east of Glennies Creek and its associated alluvial flood plain. A set back distance of at least 150 m will be maintained between the western extent of the SEOC pit and Glennies Creek.

Glennies Creek is a regulated river conveying controlled releases from Lake St Clair and is administered under the *Water Sharing Plan for the Hunter Regulated River Water Source 2003* (Hunter Regulated River WSP). The groundwater within the Glennies Creek alluvial flood plain aquifer is administered under the *Water Sharing Plan for the Unregulated Hunter and Alluvial Water Sources 2009* (Hunter Unregulated River and Alluvial Aquifer WSP).

This conceptual alluvial groundwater management strategy has been prepared in response to discussions with the DoP and NSW Office of Water (NOW) concerning the interaction of the SEOC with the adjacent alluvial and regulated river water sources and extent of potential impacts. This includes:

- The level of predicted alluvial groundwater mine inflows and Glennies Creek baseflow reduction.
- Mitigation and management of alluvial groundwater mine inflows and Glennies Creek baseflow reduction in the event of under predicted water impacts.
- Licensing of groundwater mine inflows and Glennies Creek baseflow reduction.
- Mitigation and management of potential interactions between saline colluvial and hard rock aquifer groundwater and fresher quality alluvial aquifer groundwater and Glennies Creek river water.
- The stability of the open cut western highwall and the potential for increased alluvial groundwater inflows and Glennies Creek baseflow reduction due to highwall instabilities, whether natural or mining induced (such as cross cutting faulting or blasting induced impacts).

To address these issues, ACOL proposes to:

- Construct a low permeability barrier in the unconsolidated material above and adjacent to the western pit boundary as a pre-emptive measure to minimise alluvial groundwater inflows and Glennies Creek baseflow reduction and the potential for increased saline water interaction between aquifers.
- Hold adequate and suitable water entitlements to account for the predicted volume of mine inflows (from alluvial and non-alluvial sources) and reduction in Glennies Creek baseflow.

- Acquire additional water entitlements should actual impacts be greater than predicted.
- Develop the mine in a manner that provides opportunity to review the potential for increased impacts on the alluvial aquifer and Glennies Creek water sources, and to make adaptive impact mitigation and mine management responses to minimise these impacts accordingly.
- Implement slope stability control measures and operational procedures to ensure the structural integrity of the western highwall is maintained.

The implementation of these measures will minimise the risk of impact to the alluvial groundwater source, Glennies Creek, its associated dependent environmental features and downstream water users from the development and operation of the mine.

This conceptual strategy has been compiled with the assistance of Wells Environmental Services, RPS Aquaterra (groundwater specialists), John Quinn Projects Pty Ltd (civil engineering specialist) and GHD (geotechnical specialists).

2 GROUNDWATER ASSESSMENT

2.1 Prior Studies

The EA included a detailed groundwater impact assessment for the SEOC project carried out by Aquaterra (EA Appendix 5). This was based on a calibrated quantitative numerical groundwater model and extensive site investigations, including bore drilling, lithological logging, hydraulic testing, groundwater level monitoring and groundwater quality testing. These investigations were instrumental in delineating the extent and saturated thickness of Glennies Creek alluvial flood plain deposits and upslope colluvial deposits and determining the hydrogeological properties of each of these unconsolidated materials used as inputs to the numerical groundwater model.

Following exhibition of the EA and at the request of NOW, ACOL commissioned additional groundwater studies to include alternate interpretations of the geomorphology and hydrogeology of the Glennies Creek alluvial flood plain deposits. These additional studies involved uncertainty analysis of the groundwater model predictions, assessing the effects on alluvial groundwater inflows and Glennies Creek baseflow reduction, of greater than expected levels of hydraulic connectivity between the open cut pit and Glennies Creek and its connected alluvium (Wells Environmental Services, 2010a and 2010b).

The results of the numerical groundwater model studies are summarised in Table 1. This shows that under a range of higher than expected connectivity scenarios, the development of the SEOC will result in predicted maximum alluvial groundwater mine inflows of between 8.9 and 17.7 ML/annum (ML/a) and an associated reduction in Glennies Creek baseflow of between 17.2 and 24.8 ML/a. However, alluvial groundwater inflows are not predicted to start occurring until Year 3 of operations, with maximum and consistent inflows predicted from Year 5. Much more groundwater inflow, up to about 216 ML/a, is expected from the underlying Permian coal measures.

Table 1: Groundwater impact assessment outcomes for reported modelled scenarios

Model Scenario	Maximum Alluvial Groundwater Inflow (ML/a)	Maximum Glennies Creek Baseflow Reduction (ML/a)	Notes/Comments
EA Base Case Model Scenario	8.9 (24 kL/d)	17.2 (47 kL/d)	Uncertainty analysis was carried out by increasing and decreasing horizontal permeability by a factor of 2 for the alluvial aquifer. This resulted in a +/- 3 ML/a change in Glennies Creek baseflow reduction.
Additional Model Scenario 1: Realistic Worst Case.	13.8	20.4	Assumes east-west oriented gravel braiding that connects Glennies Creek to the pit shell through higher permeability zones.
Additional Model Scenario 2: Maximum Potential 'Braiding' Connectivity.	17.7	24.8	Same as Scenario 1, but considers very wide high permeability connective zones up to 150 m wide.
Additional Model Scenario 3: Generalised Background Connectivity.	12.1	19.3	Similar to EA base case model but includes the intersection of the pit with higher permeability zones. This shows that impacts are also not particularly sensitive to assumptions over the general permeability of the intercalated gavel/silt layers that occur near the pit shell.

Model Scenario	Maximum Alluvial Groundwater Inflow (ML/a)	Maximum Glennies Creek Baseflow Reduction (ML/a)	Notes/Comments
Additional Model Scenario 4: Worst Case North-South Oriented High Permeability Alluvial Channels.	14.0	21.7	Represents unsubstantiated "worst case" mine-alluvium-creek hydraulic connectivity based on NOW's interpretation of the geomorphic and hydrogeologic environment. This interpretation is not supported in the information obtained from detailed field investigations (i.e., from drilling, lithological logging, water level monitoring, water quality testing and hydrogeological testing).

Other more extreme geomorphic and hydrogeologic alluvial connectivity conditions were examined. However, these were not carried forward as the postulated conditions were not supported in the results of the extensive site investigations, or in the observed impacts of mine inflows to the existing Ashton open cut and underground mines.

2.2 Extent of Mine-Water Interactions

Following their review of the EA and Response to Submissions Report, DoP and NOW have requested clarification on the interaction of the SEOC with the adjacent alluvial and regulated river water sources and extent of potential impacts, including:

- The potential for under predicted alluvial groundwater mine inflows and Glennies Creek baseflow reduction.
- The potential for increased saline groundwater interaction with fresher quality alluvial aquifer groundwater and Glennies Creek river water.
- The stability of the western highwall and the potential for increased alluvial groundwater inflows and Glennies Creek baseflow reduction, including consideration of blasting and the presence of geological structures on highwall conditions.
- The depth of the water market and ACOL's ability to obtain additional entitlements in the event that alluvial groundwater inflows and Glennies Creek baseflow reduction are significantly under predicted.

2.2.1 Level of Predicted Groundwater Impacts

Further numerical groundwater modelling has been carried out to determine the extent of potential (though unlikely) alluvial groundwater inflows and Glennies Creek baseflow reduction, in the event that the EA and subsequent assessments (Section 2.1) under predict these volumes. This included:

- Increasing the hydraulic conductivity (Kh) of more permeable connective alluvial aquifer zones between Glennies Creek and the pit edge by a factor of 10 and a factor of 100, relative to the EA base case groundwater model parameters.
- Addition of a narrow (50 m wide) permeable vertical zone within Permian strata extending east from Glennies Creek to 450 m inside the open cut pit, to replicate a connecting geological fault zone.
- Addition of a zone (50 m wide) of increased permeability (Kh) adjacent to the pit highwall, to simulate blasting induced fracturing.

The results of these further numerical groundwater model studies are summarised in Table 2. This shows that even by significantly increasing the hydraulic conductivity of connective alluvial aquifer zones, or including increased hard rock permeability zones to the west of the pit, the predicted alluvial groundwater inflows and Glennies Creek baseflow reduction are within the range previously assessed (Table 1).

Table 2: Additional groundwater model scenario outcomes

Model Scenario	Maximum Alluvial Groundwater Inflow (ML/a)	Maximum Glennies Creek Baseflow Reduction (ML/a)	Notes/Comments
Additional Model Scenario 5: Maximum Potential 'Braiding' Connectivity (Kh x 10)	11.9	20.4	Same as Scenario 2 in Table 1, which assumes east-west oriented gravel braiding that connects Glennies Creek to the pit shell through 150 m wide higher permeability zones, but with a 10 fold increase in the Kh of the connecting braiding stringers.
Additional Model Scenario 6: Maximum Potential 'Braiding' Connectivity (Kh x 100)	14.4	23.1	Same as Scenario 5 (above), but with a 100 fold increase in the Kh of the connecting braiding stringers.
Additional Model Scenario 7: Simulation of an east-west geological fault between Glennies Creek and the pit.	9.0	17.1	Same as EA base case model, but with permeability of hard rock (model layers 2 to 10) increased to 0.5 m/d (Kh) and 0.1 m/d (Kv) in a row of model cells extending from Glennies Creek to 450 m inside the pit.
Additional Model Scenario 8: Simulation of blast damage to pit highwall.	11.8	19.7	Same as EA base case model, but with permeability of hard rock (model layers 2 to 10) increased to 0.1 m/d (Kh) and 0.001 m/d (Kv) in a column of model cells adjacent to the pit highwall. These permeability values are nominally 100 times the EA base case values. The width of blast damage is 50 m (i.e., one model cell width), although blast damage is expected to penetrate much less than 20 m from the face, based on studies at other mines.

2.2.2 Saline Groundwater Interactions

Drilling of monitoring bores along or close to the proposed western pit boundary revealed the existence in places of low permeability unconsolidated material. Monitoring and testing of these bores, at all but one location, revealed that this unconsolidated material either contains saline quality groundwater or is unsaturated. Further, there is a sharp drop in groundwater salinity across a very short lateral distance (evident as a steep electrical conductivity – EC – gradient), which occurs at the interface between upslope colluvial (colluvium) and flood plain deposited alluvial (alluvium) material.

The high EC groundwater within the colluvium currently has a very small to negligible impact on the salinity of groundwater within the alluvium. Further, the volume of saline groundwater making its way to the alluvium from the colluvium and underlying Permian age hard rocks (coal measures) must be much smaller than the recharge from infiltration of rainfall across the floodplain, otherwise the alluvial groundwater would be higher in salinity concentration. This indicates the colluvium and alluvium are not hydraulically well-connected. Further, that the alluvium provides buffering between saline hard rock and colluvium groundwater and low salinity alluvial groundwater discharging to the creek as baseflow.

The western limit of the SEOC pit will be developed to the east of the interface between the low permeable high salinity colluvium and the more permeable low salinity alluvium. Although parts of the pit will intersect saturated unconsolidated material, the alluvium will not be removed by mining. Further, the colluvium, having low permeability, will not contribute large volumes of inflow to the pit. Hence the buffering potential of the alluvium will not be impacted.

During mining, areas of the pit that have not yet been backfilled with waste rock will capture any saline water inflowing from the coal measures. Hence the pit will also act as a buffer between the hard rock saline groundwater and the alluvium and the creek.

As the pit becomes backfilled with waste rock, groundwater will gradually recover into the waste rock. Modelling of groundwater recovery predicts that groundwater levels within the backfilled material will remain below the alluvium groundwater levels until well after the completion of mining. When groundwater levels return to equilibrium in the long-term, the low permeability of the rocks along the western pit boundary, between the pit and the edge of connected alluvium, will resume the role as a buffer between the saline groundwater and the low EC water in the alluvium and the creek. This buffer function will continue into the future, post-mining.

The implementation of a low permeability barrier along the western pit boundary will further minimise the interaction of high and low saline groundwater during and post mining.

2.2.3 Highwall Stability

ACOL has obligations under coal mine safety legislation, administered by Industry & Investment – Minerals and Petroleum (I&I – Minerals), to assess and manage highwall slope stability and to develop and implement a slope stability safety management plan. In accordance with these obligations, ACOL engaged the services of an expert geotechnical consultant with extensive experience in highwall slope stability in Australian coal mines to assess the geotechnical characteristics of the SEOC highwall.

Among other things, the geotechnical assessment (GHD, 2010) considered the effect of geological faulting, groundwater seepage and blasting on the stability of the highwall and the potential for toppling, plane sliding and wedge failure from highwall batter faces.

The assessment found that seepage rates from faults cross cutting the highwall will be small, with an estimated combined long-term seepage rate of up to about 11 ML/a, derived from the hard rock aquifers. (This is a similar magnitude to the fault seepage rate predicted by Aquaterra and presented in Table 2). Further, that seepage levels from faults and the highwall rock mass will be low and will have minimal impact on highwall stability. Finally, as a result of these conditions, there is minimal risk for toppling, plane slide or wedge failure occurring in the highwall. Nevertheless, a number of recommendations have been made to ensure final highwall stability is maintained during and post mining. This includes:

- Highwall batter slopes and bench widths.
- Stabilisation of unconsolidated material along the pit margin.
- Seepage control from unconsolidated material along the pit margin.
- Seepage and hydraulic pressure control from the hard rock highwall face and pit floor.
- Blast management.

The implementation of these measures will be incorporated into the mine design and the slope stability safety management plan. This is discussed further in Section 3.

2.2.4 Water Licensing

Glennies Creek and its connected alluvial groundwater source are administered under the Hunter Regulated River WSP and the Hunter Unregulated River and Alluvial Aquifer WSP, respectively[1]. These plans describe the total unit entitlements available within the water management zones within which the SEOC will be developed and the dealing rules associated with trading of entitlements. According to these water sharing plans there is a total entitlement of:

- 6,050 units[2] of regulated river (general security) and 1,765 units of regulated river (high security) in zone 3 (i.e., the Glennies Creek management zone) of the Hunter Regulated River Water Source.
- 24,132 units in the Hunter Regulated River Alluvial Water Source.

This indicates there is considerable depth to the water market for both these water sources.

ACOL currently holds 91 units of high security regulated river water and 354 units of general security regulated river water within zone 3 (i.e., Glennies Creek) of the Hunter Regulated River Water Source.

ACOL notes there are restrictions on the trading of water licences into the water management zone which Glennies Creek alluvium is part of. However, it is considered that these restrictions do not impose a prohibition or significant barrier to obtaining an aquifer access licence within the relevant water management zone.

In separate correspondence with the Commissioner for Water, the Commissioner has indicated that projected volumetric water-based impacts associated with mine development need to be appropriately licensed and accounted for during operation and post-mine closure, and on an annual and daily basis. To satisfy these requirements, ACOL committed to the Commissioner to:

> *Meet forecast shortfalls in annual entitlements for all water sources impacted by existing and proposed mine developments, when these impacts and shortfalls occur.*

ACOL reiterates its commitment to hold adequate entitlements to account for alluvial groundwater mine inflows and Glennies Creek baseflow reduction on an annual and daily basis.

---

[1] The Hunter Regulated River WSP includes connected alluvial groundwater within 40 m of the bank of the regulated river bank.

[2] 1 unit is equivalent to 1 ML under normal climatic conditions and 100% available water determination.

3 MANAGEMENT STRATEGY

To mitigate and manage the potential impact of developing the SEOC on the adjacent alluvial and regulated river water sources ACOL will:

- Construct a low permeability barrier along the length of the western boundary of the pit.
- Stabilise unconsolidated materials along the western highwall.
- Implement measures to maintain a safe and stable highwall, including best practice blast management.
- Develop the mine progressively, commencing in areas furthest away from unconsolidated materials and the alluvial aquifer.
- Review all monitoring data on an annual basis, to compare observed impacts to predicted impacts, including the effectiveness of the low permeability barrier.
- Validate the numerical groundwater model against realised groundwater inflows and groundwater monitoring data at the end of mining Year 2, and again in Year 4 or Year 5.
- Secure and hold appropriate and sufficient water entitlements against predicted groundwater inflows and creek baseflow reduction, to be revised annually.
- Prepare and implement surface water and groundwater management and response plans, including monitoring of the performance of the low permeability barrier.
- Prepare and implement a slope stability safety management plan.

The implementation of these measures will minimise the risk of impact to the alluvial groundwater source, Glennies Creek, its associated dependent environmental features and downstream water users from the development and operation of the mine

3.1 Low Permeability Barrier

As previously indicated (Section 2) the maximum predicted alluvial groundwater inflows to the SEOC and associated Glennies Creek baseflow reduction are 17.7 ML/a and 24.8 ML/a, respectively. These relatively low inflows are despite studies that examined the effect of: significantly enhanced alluvial permeability zones adjacent to the pit; a permeable cross cutting and connective fault zone (extending from beneath Glennies Creek to a position 450 m inside the pit); and a more permeable blast affected rock mass zone along the length of the highwall.

ACOL provided a commitment within the EA to implement a low permeability barrier as a contingency in the event that groundwater inflows from intersected unconsolidated material along the pit edge are greater than predicted. ACOL will now construct this low permeability barrier prior to mining, as a pre-emptive measure to minimise alluvial groundwater inflows and Glennies Creek baseflow reduction and to further minimise the potential for saline water interactions between aquifers. Its implementation will also assist stabilisation of the unconsolidated material that will form the uppermost batter of the final western highwall.

3.1.1 Conceptual Design and Construction

The low permeability barrier will be constructed along the length of the western edge of the SEOC pit (Figure 1) to the full depth of the unconsolidated sediments (Figure 2). It will be constructed beneath the levee and run-of-mine (ROM) pad area in stages, at least 6 to 12 months prior to mining through unconsolidated material.

The low permeability barrier will generally be:

- Designed and constructed to appropriate quality standards in consultation with geotechnical and hydrogeological specialists.
- Constructed using suitable locally available materials.
- Constructed to achieve a permeability standard of at least 1×10^{-8} ms^{-1}.
- Constructed to provide long term stability.
- Constructed in stages in advance of mining.

Drilling and site investigations have determined that suitable low permeability (10^{-8} ms^{-1}) clay materials are available from a borrow area located within the northern part of the SEOC pit area. This material has been subject to thorough geotechnical investigation. The borrow area will be operated and managed under quality control, with the barrier material being won, refined, tested and stockpiled in accordance with design specifications.

During the construction phase and prior to levee and ROM pad area establishment, unconsolidated materials along the western pit boundary will be excavated down to the underlying sandstone bedrock. In places this will require excavating unconsolidated and partly saturated materials to a depth of about 12 m. The width of excavation will vary (generally up to about 50 m) according to depth and degree of saturation of the excavated materials to ensure safe and stable conditions are maintained during construction.

All activities associated with constructing the low permeability barrier will be contained within the disturbance footprint of the levee, ROM pad and pit area. Hence there will be no additional disturbance to that already described and assessed within the EA.

Although the unconsolidated material along the western pit boundary is typically low in permeability, it is expected that saturated higher permeability areas may be locally encountered, particularly near the base of thicker unconsolidated material areas. Temporary dewatering of these locally saturated areas may be required to maintain an open and safe excavation during the construction of the low permeability barrier. Any water encountered is expected to be saline and will be used for dust suppression and managed in a manner that avoids contamination of other locally adjacent water sources or non-mining land areas.

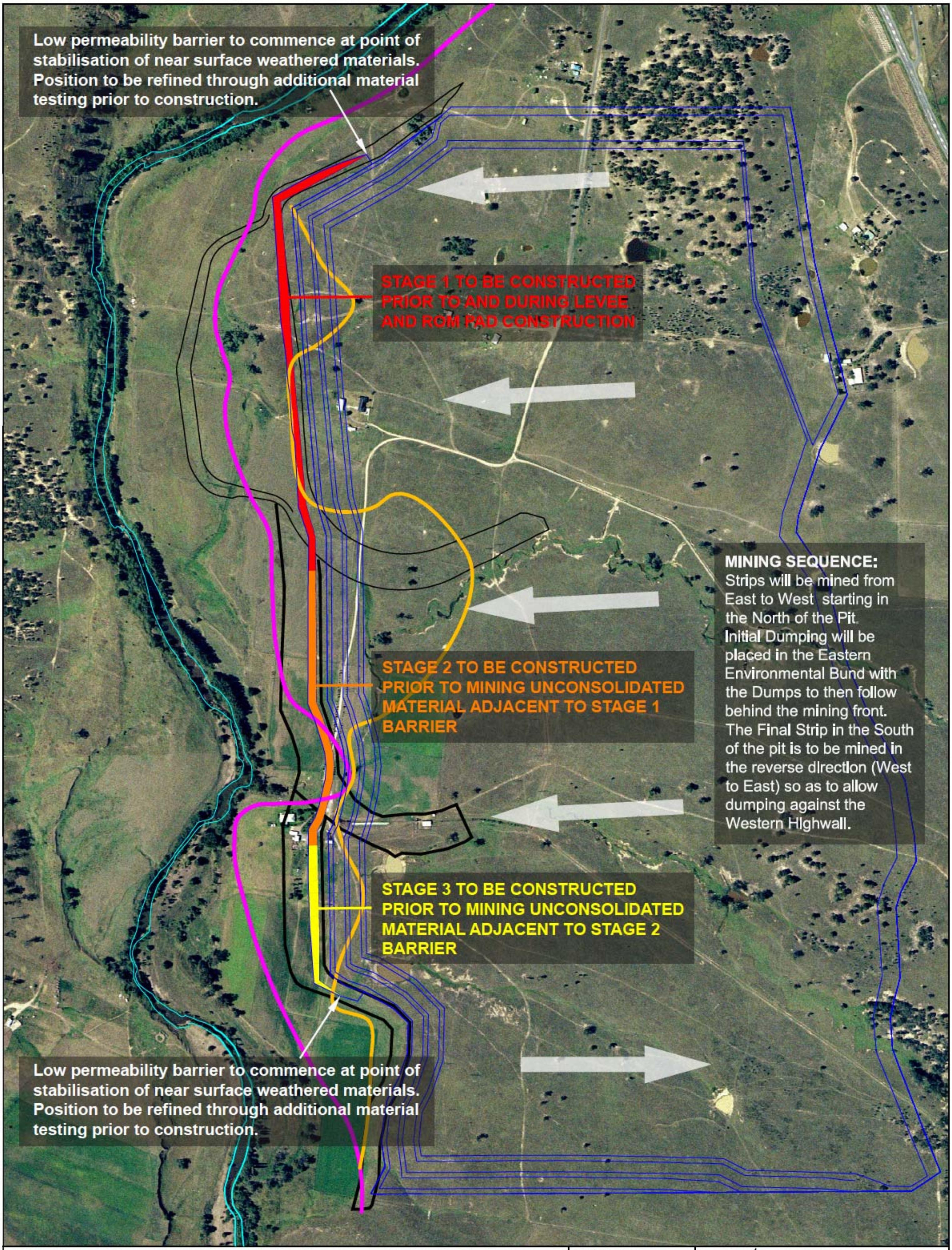
A key trench will be cut into the bedrock at the base of excavation. This will be backfilled with select low permeability material and compacted to form the base of the low permeability barrier.

The low permeability barrier will be built up in lifts to enable shaping and compacting to the required permeability standard. For each lift the adjacent open-batter areas will be backfilled with suitable materials and compacted, providing enhanced geotechnical stability to the uppermost highwall batter.

The final lift and backfilled open-batter areas will be compacted to the design base level for the levee and ROM pad area. This will enable transition to construction of the levee and ROM pad, which will overlay the low permeability barrier.

The concept design for the low permeability barrier also allows for the inclusion of a geotextile fabric to further reduce the permeability and enhance the stability of the barrier, if deemed necessary during construction.

The low permeability barrier will be constructed and tested generally in accordance with Australian Standard (AS) 3798-2007, *Guidelines on earthworks for commercial and residential developments*, to ensure it achieves the required permeability standard and an appropriate level of long-term performance.



LEGEND

- STAGE 1
- STAGE 2
- STAGE 3
- EXTENT OF SATURATED ALLUVIUM
- EXTENT OF SATURATED COLLUVIUM
- GLENNIES CREEK
- LEVEE
- PIT SHELL

DRAWN BY:	L.Hamson
DATE DRAWN:	05.11.2010
SCALE:	1 : 6000
REVISION No.:	1
REVISION DATE:	27.01.2011

AshtonCoal

SEOC PIT SHELL & LOW PERMEABILITY BARRIER

A3

PLAN No. SEOC 10026

Figure 1: Location and staging of low permeability barrier and mining sequence

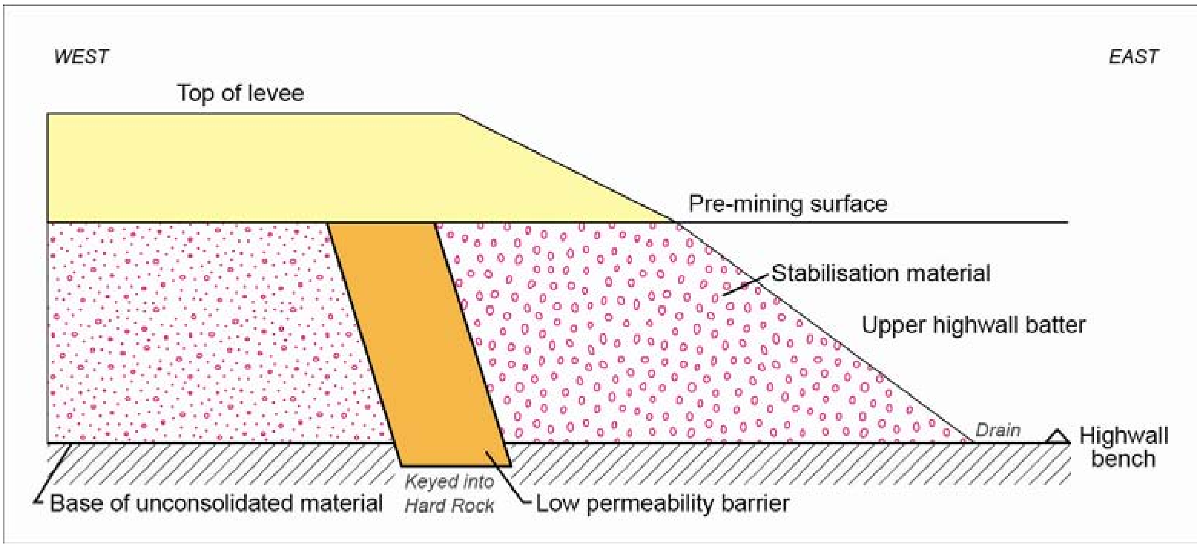


Figure 2: **Conceptual cross-section of Western Highwall low permeability barrier and unconsolidated material stabilisation.**

3.1.2 Effect of Low Permeability Barrier

The numerical groundwater model has been updated to assess the effect of installing a low permeability barrier on alluvial groundwater inflows and Glennies Creek base flow reduction. The results are summarised in Table 3. This shows that the installation of a low permeability barrier to a permeability standard of 0.001 m/d (10^{-8} m/s) would reduce maximum alluvial groundwater inflows from 8.8 to 1.6 ML/a and Glennies Creek baseflow reduction from 17.7 to 9.4 ML/a, relative to the EA base case model.

Table 3: **Additional groundwater model scenario outcomes including a low permeability barrier**

Model Scenario	Maximum Alluvial Groundwater Inflow (ML/a)	Maximum Glennies Creek Baseflow Reduction (ML/a)	Notes/Comments
Additional Model Scenario 9: EA Base Case model with low permeability barrier installed.	1.6	9.4	Same as EA base case model but with low permeability barrier installed through full thickness of unconsolidated material above the western high wall – Kh = 0.001 m/d.
Additional Model Scenario 10: Max Potential 'Braiding' Connectivity (Kh x 10) with low permeability barrier installed.	1.6	9.5	Same as Scenario 5 in Table 2, but with low permeability barrier installed through full thickness of unconsolidated material above the western high wall – Kh = 0.001 m/d.
Additional Model Scenario 11: Max Potential 'Braiding' Connectivity (Kh x 100) with low permeability barrier installed.	1.7	9.5	Same Scenario 6 in Table 2, but with low permeability barrier installed through full thickness of unconsolidated material above the western high wall – Kh = 0.001 m/d.

Even in the unlikely event that much higher permeability braids (10 times or 100 times EA base case permeability) connect with the pit, the low permeability barrier is predicted to restrict maximum alluvial groundwater inflow and baseflow reduction to the same low values.

A comparison of alluvial groundwater inflows without and with the low permeability barrier installed is provided in Table 4.

Table 4: Groundwater inflows (ML/a) from Glennies Creek alluvium – without and with a low permeability barrier.

Mine Year	Base Case (no LPB)	Scenario 9 (Base Case with LPB Kh = 0.001 m/d)	Scenario 5 (Braids Kh = 10 x Base Case)	Scenario 10 (as Scenario 5, with LPB Kh = 0.001 m/d	Scenario 6 (Braids Kh = 100 x Base Case)	Scenario 11 (as Scenario 6, plus LPB Kh = 0.001 m/d
1	0	0	0	0	0	0
2	0.11	0.06	0.21	0.06	0.22	0.06
3	1.1	0.44	1.7	0.44	1.8	0.44
4	3.1	1.12	4.9	1.14	5.3	1.18
5	8.8	1.45	11.6	1.48	14.2	1.55
6	8.8	1.54	11.8	1.57	14.4	1.64
7	8.8	1.58	11.9	1.61	14.4	1.68

3.1.3 Monitoring and Performance

During construction, the low permeability barrier will be monitored and tested to ensure that an appropriate level of quality control is maintained and that the desired permeability standard is achieved.

Following construction, there will be a period of at least 6 months where the performance of the low permeability barrier will be monitored prior to mining through saturated unconsolidated materials. This information will be used to inform final design and material selection for additional stabilising works for the uppermost highwall batter, which will be developed in unconsolidated material adjacent to the barrier.

3.2 Highwall Stability

Parts of the top batter of the western highwall will be developed in unconsolidated material. Failure of this batter could potentially increase alluvial groundwater pit inflows and associated baseflow reduction in Glennies Creek.

Geotechnical stabilisation of the top highwall batter has been included in the concept design for the low permeability barrier (Figure 2). This includes consideration of the location of the low permeability barrier, relative to the top of the highwall, choice of backfill material on the pit side of the barrier and the design of the outer face slope of this backfilled material.

The geotechnical assessment (GHD, 2010) provides further recommendations concerning the slope of the top highwall batter and bench width to ensure stability of the batter is maintained prior to backfilling and buttressing following mining. This will be further evaluated once mining commences and the performance of the low permeability barrier and stabilising geotechnical backfill material is confirmed.

The geotechnical assessment (GHD, 2010) also recommends measures to ensure stability of the exposed hard rock highwall is maintained and to control seepage and hydraulic pressure from the highwall hard rock face and pit floor. This includes recommended overall highwall slope angle, highwall batter slope angles, bench widths and highwall and pit floor drain-hole requirements.

The proposed design for sub-horizontal drains in the highwall includes establishment of 100 mm diameter holes drilled 50 m into the face at an up dip angle of about 3°, with holes spaced every

50 m and fitted with slotted PVC piping. It is also proposed that the drained water would report to a catch drain on the inner edge of the bench to prevent water draining directly over the bench. A series of pressure relief boreholes drilled to about 10 m depth along the toe of the highwall are also proposed to depressurise any high seepage pressures in the pit floor.

While ACOL will incorporate the recommended highwall slope angles and bench widths into the SEOC pit design, the need for and design of highwall hard rock and pit floor drainage will be further evaluated during the course of mining.

3.3 Mine Staging

The SEOC pit will be developed from north to south with the staging of overburden removal, coal extraction and waste rock emplacement occurring in strips that progress down dip from east to west, except for the southernmost strip which will be developed from west to east. The reverse direction (i.e., up dip from west to east) for the southern strip is required to enable backfilled waste rock to be placed against the western highwall, rather than leaving the highwall exposed in the final void. An indicative construction and mine operational schedule is shown in Figure 3.

This progressive mine staging means that the western highwall will generally only remain exposed for short periods, up to about 24 months. While the risk of highwall instability has been assessed as low (see Section 2.2.3), the limited period of highwall exposure will further reduce the potential for unstable highwall conditions to develop, prior to buttressing of the highwall with backfilled waste rock material.

Progressively mining down dip towards more sensitive water source areas will also enable the early identification of geological features that may give rise to unanticipated instability conditions or zones of increased groundwater seepage in the highwall hard rock mass. Hence, this mining approach will enable final highwall and groundwater conditions to be reviewed prior to progression of the mining strip to the final western highwall location.

Once mining commences, it will take 12 to 18 months for pit excavations to reach unconsolidated materials in the western area of the pit. During this time the initial stage of the low permeability barrier will be constructed (Section 3.1.1), along with the first stage of the flood levee and the ROM pad area. This will ensure the low permeability barrier is operational at least 6 to 12 months prior to mining through unconsolidated material.

The staged sequence of barrier construction, monitoring then progressively mining into unconsolidated colluvial and alluvial materials will provide for the refinement of the numerical groundwater model, to improve the forecasting of future mine inflows allowing the staged acquisition of additional licences, where required (see Figure 3).

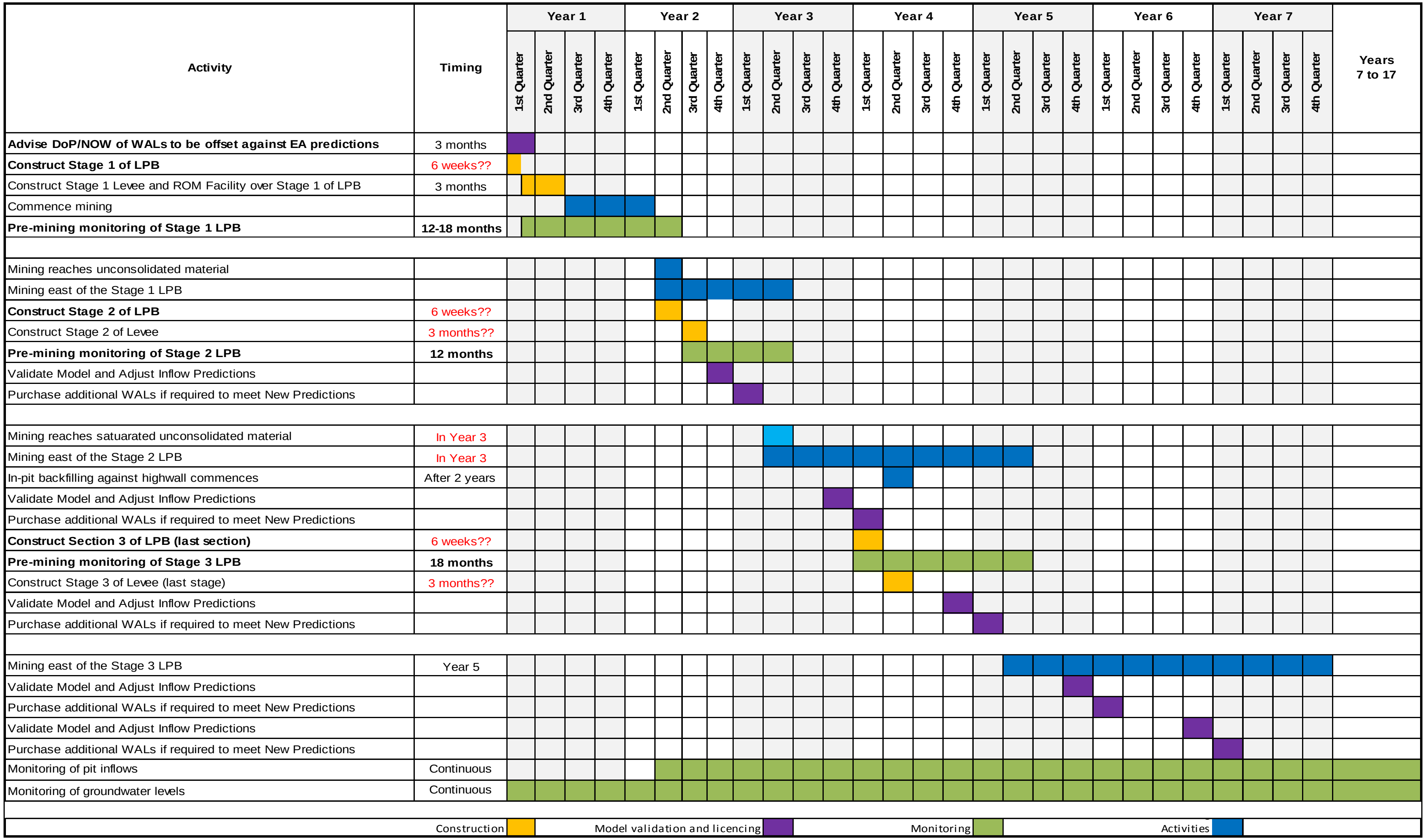


Figure 3: **Indicative Construction Schedule and Staging of the Low Permeability Barrier and Open Cut Mining.**

3.4 Blast Management

ACOL uses best practice blast management in its existing open cut operation, which is based on detailed site knowledge built up over a number of years. It involves the use of sophisticated modelling and electronic detonators to minimise and control ground vibration through the highwall.

During blasting, stability of the final highwall and the extent of rock mass fracturing beyond the highwall face is maintained through use of pre-split blasting. This practice involves use of smaller designed blasts to create a single crack along a designed pre-split line. The subsequent larger production blast then moves the pre-split rock mass away from the highwall, rather than breaking and cracking the final highwall rock mass. This technique minimises blasting impacts on the highwall and assists in maintaining the integrity and stability of the final highwall.

These current best practice blast management procedures will be used during construction and operation of the SEOC, which will ensure the potential for blasting induced impacts on the highwall are minimised.

3.5 Groundwater Model and Impact Prediction Validation

The numerical groundwater model will be validated prior to mining through saturated unconsolidated material in Year 2 of operations, when sufficient groundwater monitoring data on the performance of the low permeability barrier will be available, and then again in Year 4 or Year 5. All monitoring data will be reviewed on an annual basis by an approved experienced hydrogeologist, to compare actual impacts with those predicted by the groundwater modelling.

This will enable annual review and adjustment of ACOL's water entitlements, where required.

3.6 Water Licensing

As previously discussed (Section 2.2.4), ACOL has committed to hold adequate and appropriate water entitlements to account for alluvial and non-alluvial groundwater mine inflows and Glennies Creek baseflow reduction. The volume and type of these water entitlements (i.e., general or high security river, or alluvial aquifer entitlements) will be reviewed by ACOL on an annual basis and adjusted through temporary or permanent trading on the water market.

3.7 Water Management and Response Plans

ACOL will develop and implement surface and ground water management and response plans for the SEOC in consultation with NOW. These plans will determine appropriate surface and ground water impact triggers and mitigation and management response actions as well as contingency measures to be implemented in the event of unpredicted water impacts occurring. The management plans will also set out the detailed water monitoring regime for the mine, including monitoring the performance of the low permeability barrier.

3.8 Slope Stability Safety Management Plan

ACOL will develop and implement a slope stability safety management plan for the SEOC in consultation with I&I – Minerals. This plan will describe the mitigation and management measures ACOL will adopt to ensure the stability and integrity of the highwall is maintained and highwall–alluvial groundwater interactions are minimised.

3.9 Post Mine Closure

Groundwater will gradually recover into the backfilled waste rock. Modelling predicts the level of the recovered groundwater will remain below the alluvial groundwater level to the west of the pit until well after the completion of mining. When groundwater levels return to equilibrium in the long-term, the low permeability of unconsolidated material and underlying hard rock along and outside the western pit boundary will resume the role of buffering saline groundwater from the low EC water in the alluvium and the creek.

At mine closure the ROM facility will be removed and the levee merged into the final landform. The levee height will be lowered in places to provide for the free draining of reconstructed drainage lines within the rehabilitated landform.

The low permeability barrier will be left in-situ to provide additional long-term protection against potential adverse water quality impacts from the interaction of these groundwater sources and to Glennies Creek.

The requirement for post-closure water monitoring and management will be described in a detailed mine closure plan for the mine.

4 GROUNDWATER COMMITMENTS

The EA and Response to Submissions report includes commitments ACOL has made to mitigate and manage impacts on water sources from developing the SEOC Project. ACOL has now made additional commitments in relation to constructing the low permeability barrier and holding appropriate water entitlements. These commitments are summarised in Table 5. The shaded rows reflect the new additional commitments.

Table 5: Revised groundwater mitigation and management commitments.

Item	Description	Timing
G1	Prepare and implement a Groundwater Management Plan (GWMP) for the SEOC.	Within 12 months of commencement.
G2	The GWMP will incorporate: • A Groundwater Response Plan comprising "trigger levels" for selected sites to assess monitoring results based on groundwater levels, inflows and water quality. • Monthly monitoring of groundwater mine inflows from all open cut sumps. • Monthly monitoring of extracted groundwater quality including EC and pH of water pumped from the mine and/or from dewatering, or open-cut sumps. • Quarterly sampling of water transferred from the mine, or open-cut sumps for hydrochemical analysis. • Monthly monitoring of water levels in the network of monitoring bores.	As specified.
G3	Implement audits and data reviews: • Annual review of monitoring data by an approved experienced hydrogeologist to assess the impacts of the project on the groundwater resources, and compare impacts with the groundwater model predictions. • Two years after the commencement of coal production undertake a modelling post-audit, in accordance with industry best-practice (MDBC, 2001), and if necessary the model be recalibrated and confirmatory forward predictions made at that time. • Undertake further post-audits during the fourth or fifth year of mining, as this represents the most vulnerable time in relation to potential inflows from Glennies Creek.	As stated, annually, 2 years, 4 or 5 years.
G4	Implement measures of the Groundwater Response Plan in the event of unforseen adverse impacts to groundwater levels, inflows or quality.	As required.
G5 (new)	Construct a low permeability barrier along the western boundary of the SEOC pit to minimise the inflow of alluvial groundwater. The barrier will be: • Constructed prior to mining through unconsolidated material. • Constructed of locally available clay materials to a permeability of 10^{-8}m/s or better. Geotextiles may be incorporated into the design to assist achieve the desired permeability standard, where required. • Constructed generally in accordance with (AS) 3798-2007 to an appropriate quality standard.	Prior to mining.
G6 (new)	Hold adequate and appropriate water entitlements to account for the annual predicted inflow of groundwater into the mine and Glennies Creek baseflow reduction. Review these water entitlements annually and make adjustments through trading on the water market where required.	Prior to the baseflow loss being realised.

5 REFERENCES

GHD 2010, *Ashton Coal Operations Pty Limited Geotechnical Pit Design Criteria, South East Open Cut*, November 2010.

Wells Environmental Services 2009, *Ashton Coal, South East Open Cut Project & Modification to the Existing ACP Consent, Environmental Assessment*, November 2009.

Wells Environmental Services 2010a, *Response to NSW Department of Planning Letter of 23 November 2009, South East Open Cut Project & Modification to the Existing ACP Consent*

Wells Environmental Services 2010b, *Response to Submissions, South East Open Cut Project & Modification to the Existing ACP Consent*, June 2010.