



DRAYTON MINE PROJECT APPROVAL MODIFICATION 3

ENVIRONMENTAL ASSESSMENT

for

Anglo Coal (Drayton Management) Pty Limited

April 2012

Hansen Bailey

ENVIRONMENTAL CONSULTANTS

**DRAYTON MINE
PROJECT APPROVAL MODIFICATION 3**

ENVIRONMENTAL ASSESSMENT

Prepared by:

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PO Box 473

SINGLETON NSW 2330

April 2012

For:

ANGLO COAL (DRAYTON MANAGEMENT) PTY LIMITED

PMB 9

MUSWELLBROOK NSW 2333

ENVIRONMENTAL ASSESSMENT STATEMENT

Submission of Environmental Assessment (EA)

Under Section 75W of the *Environmental Planning and Assessment Act 1979*

EA Prepared by

Name:

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Qualifications:

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Address:

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In Respect Of:

Drayton Mine Project Approval Modification

Applicant Name:

Anglo Coal (Drayton Management) Pty Limited

Applicant Address:

Thomas Mitchell Drive
MUSWELLBROOK NSW 2333

Land to be Developed:

Appendix 1 of Project Approval 06_0202.

Proposed Development:

Minor extension to the mining operations as outlined in **Section 3** of the attached Environmental Assessment.

Environmental Assessment:

An Environmental Assessment for the Modification is attached.

Certification:

I certify that I have read and am aware of the terms of the *Expert Witness Code* of the Land & Environment Court of NSW. I further certify that I have prepared the contents of this EA, and to the best of my knowledge:

- It is in accordance with Sections 75E and 75F of the *Environmental Planning and Assessment Act 1979*;
- It contains all available information that is relevant to the environmental assessment of the activity to which the statement relates; and
- The information contained in the statement is neither false nor misleading.

Signature:



Name:

James Bailey
Director

Date:

April 2012

EXECUTIVE SUMMARY

BACKGROUND

Drayton Mine is operated by Anglo Coal (Drayton Management) Pty Ltd and is located in the Upper Hunter Valley, approximately 13 km south of Muswellbrook. Project Approval 06_0202 for Drayton Mine was granted by the Minister for Planning on 1 February 2008 under Section 75J of the *Environmental Planning & Assessment Act 1979* to authorise the continuation and extension of open cut coal mining operations at Drayton Mine. Project Approval 06_0202 authorises Drayton Mine to extract coal via open cut methods up to 8 Million tonnes per annum to 2017 and is supported by the *Drayton Mine Extension Environmental Assessment* (Hansen Bailey, 2007).

An application for the modification of Project Approval 06_0202 (MOD1) was granted by the Minister for Planning on 16 October 2009 to allow an 8 hectare extension of the Approved Mining Disturbance Footprint to the north and the establishment of a new conservation area to provide an appropriate offset for this additional disturbance. The supporting document was the *Drayton Mine Project Approval Modification Environmental Assessment* (Hansen Bailey, 2009).

A further application for the modification of Project Approval 06_0202 (MOD2) was granted by the Minister for Planning and Infrastructure on 17 February 2012 to allow the emplacement of raw tailings in the Drayton East Pit void and the construction and operation of an explosives storage facility. The supporting document was the *Drayton Mine East Pit Tailings Emplacement & Explosive Storage Facility Environmental Assessment* (Hansen Bailey, 2011).

MODIFICATION

Anglo Coal (Drayton Management) Pty Ltd seeks approval from the Minister for Planning for a further modification to Project Approval 06_0202 (MOD3) under Section 75W of the *Environmental Planning & Assessment Act 1979* to authorise a 36.5 hectare extension of the Approved Mining Disturbance Footprint to recover an additional 1.4 million tonne remnant coal resource, to provide additional working room to develop a more sustainable final highwall in the approved North Pit and to facilitate the development of a safer final void in the approved South Pit.

MOD 3 also seeks approval to change the approved equipment fleet to utilise 30 x 180 tonne trucks (instead of the previously proposed 25 haul trucks (consisting of 14 x 280 tonne trucks and 11 x 180 tonne trucks) due to both supplier availability and operational constraints.

STAKEHOLDER CONSULTATION

Stakeholder consultation was undertaken for MOD 3 and included personal briefings, presentations and correspondence with relevant stakeholders including the NSW Department of Planning and Infrastructure, with all issues raised in relation to the modification addressed in this Environmental Assessment.

Notification of the MOD 3 was provided to Drayton's near neighbours via the distribution of a brief letter outlining the proposal and providing relevant contact details should further information be required. Notification of MOD 3 was also provided to Drayton's Community Consultative Committee. The modification was discussed with the Mayor and General Manager of Muswellbrook Shire Council at a meeting on the 14 November 2011 and 17 April 2012. Anglo Coal (Drayton Management) Pty Ltd will continue the ongoing consultation process through maintaining contact with regulatory and community stakeholders via regular meetings and the release of public documents reporting on environmental performance.

IMPACT ASSESSMENT AND MITIGATION

Environmental impact assessment of the proposed changed operations were undertaken in relation to air quality, noise, ecology, groundwater, rehabilitation and final landform, surface water, spontaneous combustion, visual, heritage (both Aboriginal and Non-Aboriginal), traffic management, socio-economic and waste. These assessments were undertaken in accordance with relevant State Government technical and policy guidelines and where necessary, involved the review of the assessments undertaken for the Drayton Mine Extension Environmental Assessment and Drayton Mine Project Approval Modification Environmental Assessment.

The impact assessments undertaken for the environmental issues outlined above conclude that the environmental effects of Drayton Mine as sought to be authorised by MOD 3 will be consistent with its current operations and those assessed in the *Drayton Mine Extension Environmental Assessment* (Hansen Bailey, 2007) and the *Drayton Mine Project Approval Modification Environmental Assessment* (Hansen Bailey, 2009). The assessment concludes that the existing and proposed management and mitigation measures developed for Drayton Mine under Project Approval 06_0202 and the other current approvals will be effective in minimising and managing environmental impacts from the operation of the Drayton Mine as sought by MOD 3.

CONCLUSION

MOD 3 is sought to optimise resource recovery from the existing Drayton Mine by the effective and efficient extraction of a recently identified recoverable coal resource beneath the existing mine-water Industrial Dam adjacent to Drayton Mine's Approved Mining Disturbance Footprint that would otherwise be sterilised. The minor extensions of the North Pit and South Pit will allow for an increase in existing safety margin and a more environmentally sustainable highwall to be developed for the end of approved mining at Drayton Mine in 2017.

The modification will maximise the substantial socio-economic benefits to the State of NSW by the recovery of an additional 1.4 million tonnes of coal that would otherwise be sterilised, without material additional environmental or social costs.

This environmental impact assessment has been governed by the principles of Ecologically Sustainable Development and established that the approval of MOD 3 would be in accordance with the Objects of the *Environmental Planning & Assessment Act 1979*. It has confirmed that the impacts from the activities proposed by MOD 3 are minor in nature and will result in the environmental effects from the operation of Drayton Mine being no greater than presently approved, however maximise economic and social benefits to the community.

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Appendix C	Ecological Impact Assessment
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1 BACKGROUND

This section provides an introduction to the Environmental Assessment, provides details of the proponent and summarises the report structure.

1.1 INTRODUCTION

Drayton Mine (Drayton) is located approximately 13 km south of Muswellbrook and approximately 120 km north-west of Newcastle in NSW. Drayton is managed by Anglo Coal (Drayton Management) Pty Ltd, a division of Anglo American Metallurgical Coal Pty Ltd (Anglo American). Drayton is located west of the New England Highway, north-west of Liddell and Bayswater Power Stations and south-west of the rural-residential Estate of Antiene. Drayton is located immediately to the east of Mt Arthur Coal and is within the Muswellbrook Local Government Area (LGA) (see **Figure 1**).

Drayton commenced production in 1983 and currently operates under the authority of Project Approval 06_0202 (approved 1 February 2008) (PA 06_0202) to provide predominantly steaming coal to export and domestic markets at a maximum of 8 Million tonnes per annum (Mtpa) of Run-of-Mine (ROM) coal to 2017. The supporting document to PA 06_0202 is the *Drayton Mine Extension Environmental Assessment* (Drayton EA) dated August 2007 (Hansen Bailey, 2007). The Antiene Rail Spur (approved under Development Consent 106-04-00) (Antiene Rail Spur DA) is utilised to transport all coal to the Port of Newcastle via the Main Northern Railway Line for export.

A modification to PA 06_0202 (MOD 1) was granted by the Minister for Planning on 16 October 2009 to allow an 8 ha extension of the Approved Mining Disturbance Footprint to the north and the establishment of a new conservation area to provide an appropriate offset for this additional disturbance. The supporting document for that application is the *Drayton Mine Project Approval Modification Environmental Assessment* (Drayton Modification EA) dated July 2009 (Hansen Bailey, 2009).

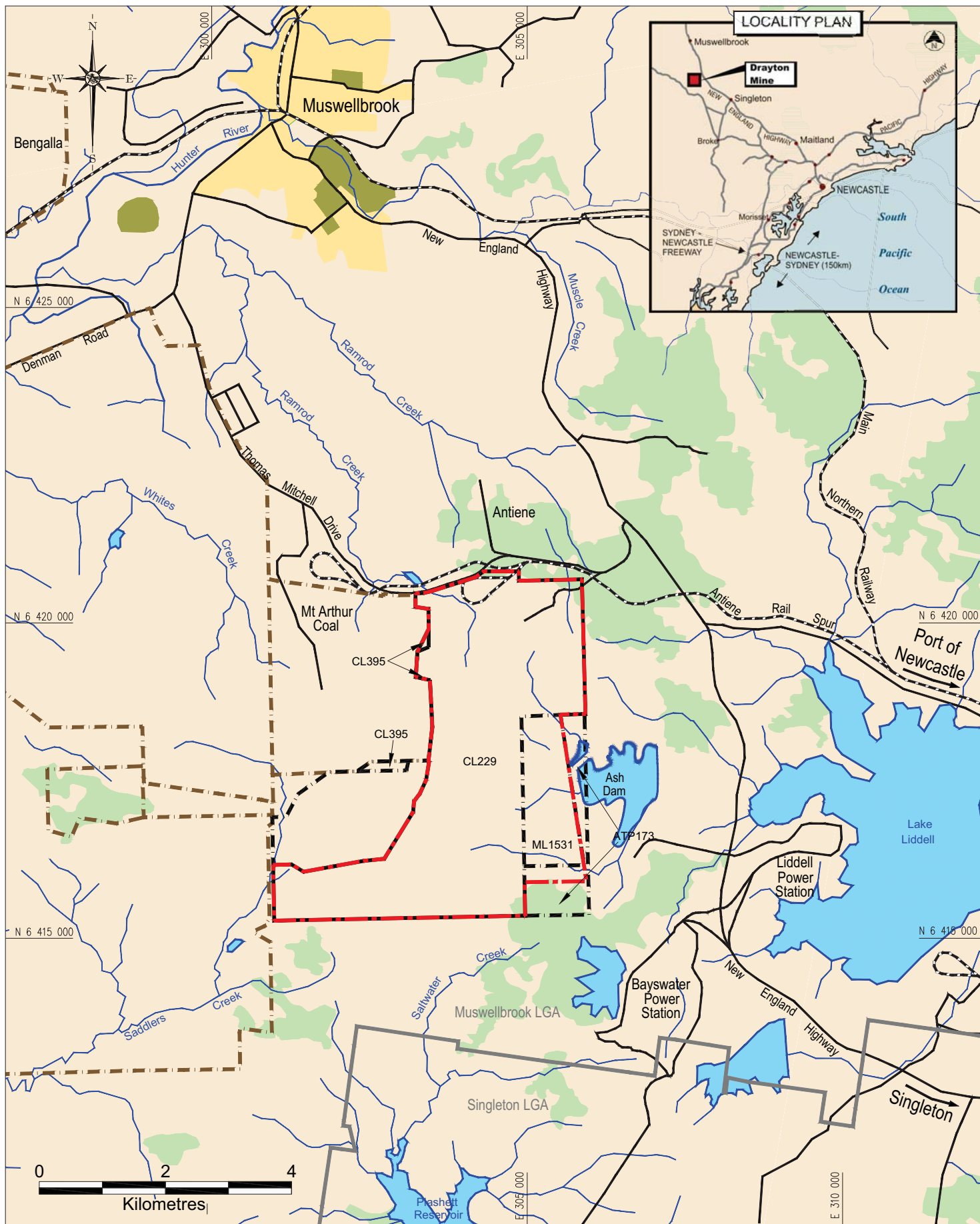
A further modification to PA 06_0202 (MOD 2) was granted by the Minister for Planning and Infrastructure on 17 February 2012 to allow the emplacement of raw tailings in the Drayton East Pit void and the construction and operation of an explosives storage facility. The supporting document for MOD 2 is the *Drayton Mine East Pit Tailings Emplacement & Explosive Storage Facility Environmental Assessment* (Hansen Bailey, 2011).

1.2 PROPONENT

Anglo American is the management company for the Drayton Joint Venture Partnership which consists of:

- Anglo American Metallurgical Coal Pty Limited (88.2%);
- Mitsui Coal Development (Australia) Pty Limited (3.8%);
- NCE Australia Pty Limited (3.0%);
- Hyundai Australia Pty Limited (2.5%); and
- Daesung Australia Limited (2.5%).

Anglo American is one of Australia's largest coal producers and has extensive coal mining interests and development prospects in both QLD and NSW.



Legend

- EA Boundary
- Drayton Mining Tenements
- Other Mining Tenements
- Roads
- Railways
- Creeks
- Local Government Boundary



Co-ordinate System: MGA Zone 56

DRAYTON MINE MODIFICATION

Regional Location

Cad File: 06964A.dwg

Date: 23.11.2010

Drawn: CP

Figure

1

1.3 DOCUMENT PURPOSE

Drayton seeks approval from the Minister for Planning for a third Modification to PA 06_0202 under Section 75W of the *Environmental Planning & Assessment Act 1979* (EP&A Act) to facilitate a 36.5 ha extension of the Approved Mining Disturbance Footprint (the Modification).

This Environmental Assessment (EA) has been prepared to support the Modification Application which will be lodged with the Department of Planning & Infrastructure (DP&I) for determination by the Minister for Planning and Infrastructure (or delegate). A description of the activities that the Modification seeks approval for is provided in **Section 3**.

The environmental effects from the operation of Drayton Mine as proposed by MOD 3 will be consistent with the environmental effects of Drayton Mine as approved by PA 06_0202 (as modified). The schedule of land to which this EA applies is also consistent with Appendix 1 of PA 06_0202.

1.4 DOCUMENT STRUCTURE

This EA includes the following sections:

- **Section 2** provides detail on the approved operations at Drayton;
- **Section 3** includes a description of the various components of the Modification;
- **Section 4** discusses the regulatory framework relevant to the Modification;
- **Section 5** summarises the stakeholder engagement undertaken and any issues raised during that process;
- **Section 6** provides the findings of the risk assessment adopted to rank all identified environmental issues;
- **Section 7** outlines impacts identified in relation to the Modification and provides management and mitigation measures to be implemented by Drayton in response;
- **Section 8** lists management commitments to be implemented as a result of the Modification;
- **Section 9** provides a justification for the Modification;
- **Section 10** provides a list of abbreviations utilised in this EA; and
- **Section 11** provides a list of documents referenced in this EA.

2 EXISTING OPERATIONS AND ENVIRONMENT

This section provides a summary of the existing operations of Drayton as approved under PA 06_0202.

2.1 APPROVED MINING ACTIVITIES

Mining activities at Drayton are undertaken in accordance with PA 06_0202, the Drayton EA and the Drayton Modification EA. Drayton has approval to mine up to 8 Mtpa of ROM coal until 2017.

Drayton holds three mining tenements relevant to the mining operation, being Mining Lease (ML) 1531 and Coal Leases (CL) 229 and CL 395 as shown on **Figure 1**.

Drayton is an open cut mining operation where mining advances based on dragline strips. Pre-stripped overburden is removed by loader and / or excavator and trucks in advance of the dragline operation. Loaders and / or excavators are utilised for subsequent coaling from the Brougham, Grasstrees, Thiess, Puxtrees and Balmoral target seams of the Greta coal measures up to a depth of 110 m below the surface. Mining is conducted up to 24 hours per day, 7 days per week.

Drayton produced 5.43 Mt of ROM coal and directly employed approximately 410 personnel in 2010.

2.2 INFRASTRUCTURE AND COAL HANDLING

Drayton is serviced by surface facilities as shown on **Figure 2** which includes an administration office, bathhouse, workshop, warehouse facilities, Coal Handling Plant (CHP), stacker, stockpile reclaimers, rail facilities and an overland conveyor to Bayswater Power Station.

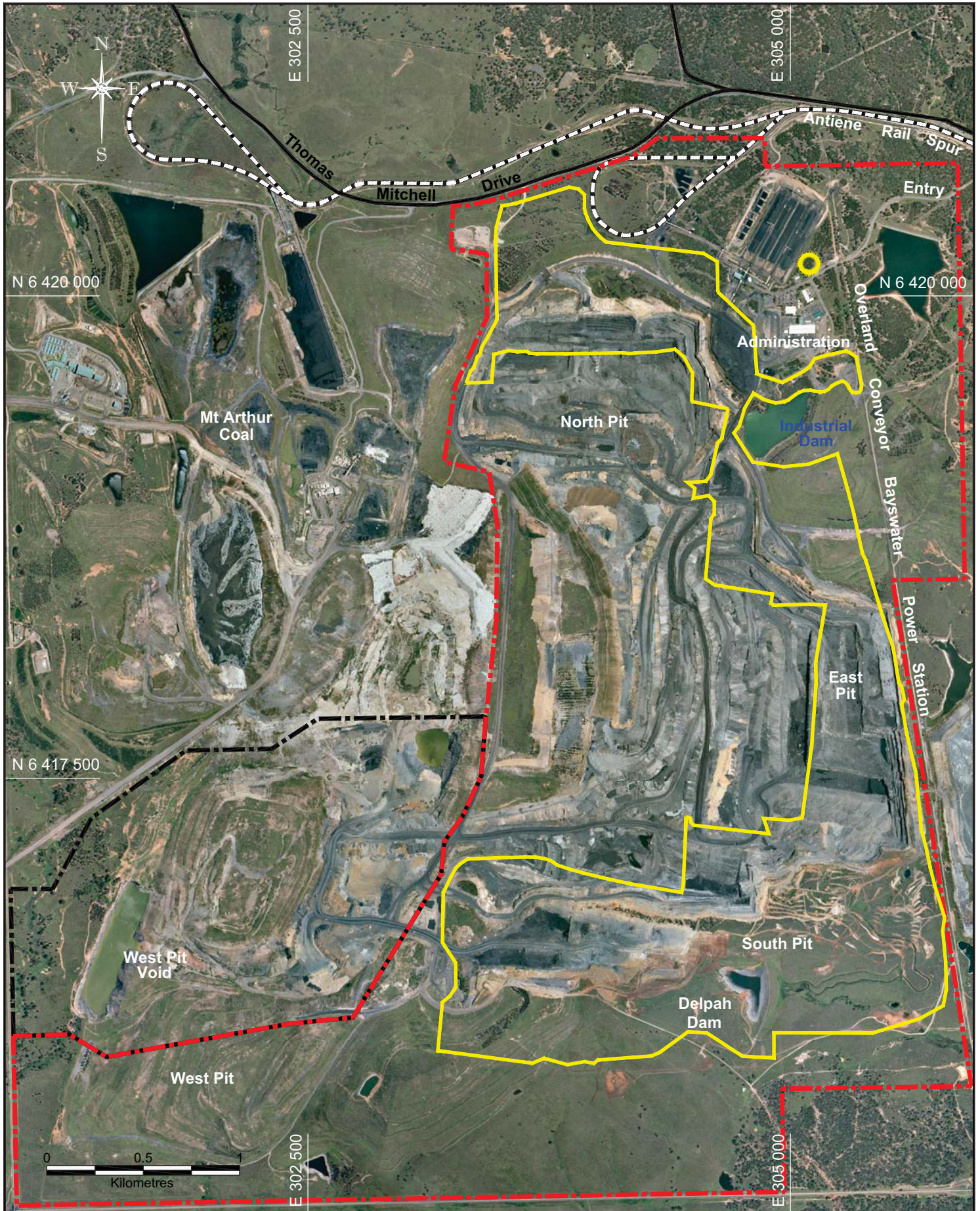
2.3 ENVIRONMENTAL MANAGEMENT SYSTEM

Drayton operates under a Safety, Health, Environment and Community Management System (SHECMS) accredited to *International Standards Organisation 14001* standards. The SHECMS is designed to enable Drayton to:

- Effectively manage its environmental issues;
- Ensure compliance with regulatory requirements;
- Continually improve its environmental performance; and
- Address the expectations of stakeholders.

Drayton's SHECMS is founded on the Anglo American Safety and Sustainable Development Policy, the Anglo American SHECMS, a series of regulatory required management plans and external and internal environmental standards and procedures.

Drayton also has a comprehensive Environmental Monitoring Program (EMP) in place as shown in **Figure 3**. This EMP ensures that regulatory expectations are met and allows for the identification and management of environmental risks. The EMP incorporates requirements of Drayton's Environmental Protection Licence (EPL) 1323 and SHECMS procedures.



Legend

- EA Boundary
- MAC Sub-lease
- Approved Mining Disturbance Footprint



Co-ordinate system: MGA Zone 56
Aerial: May 2009

DRAYTON MINE MODIFICATION

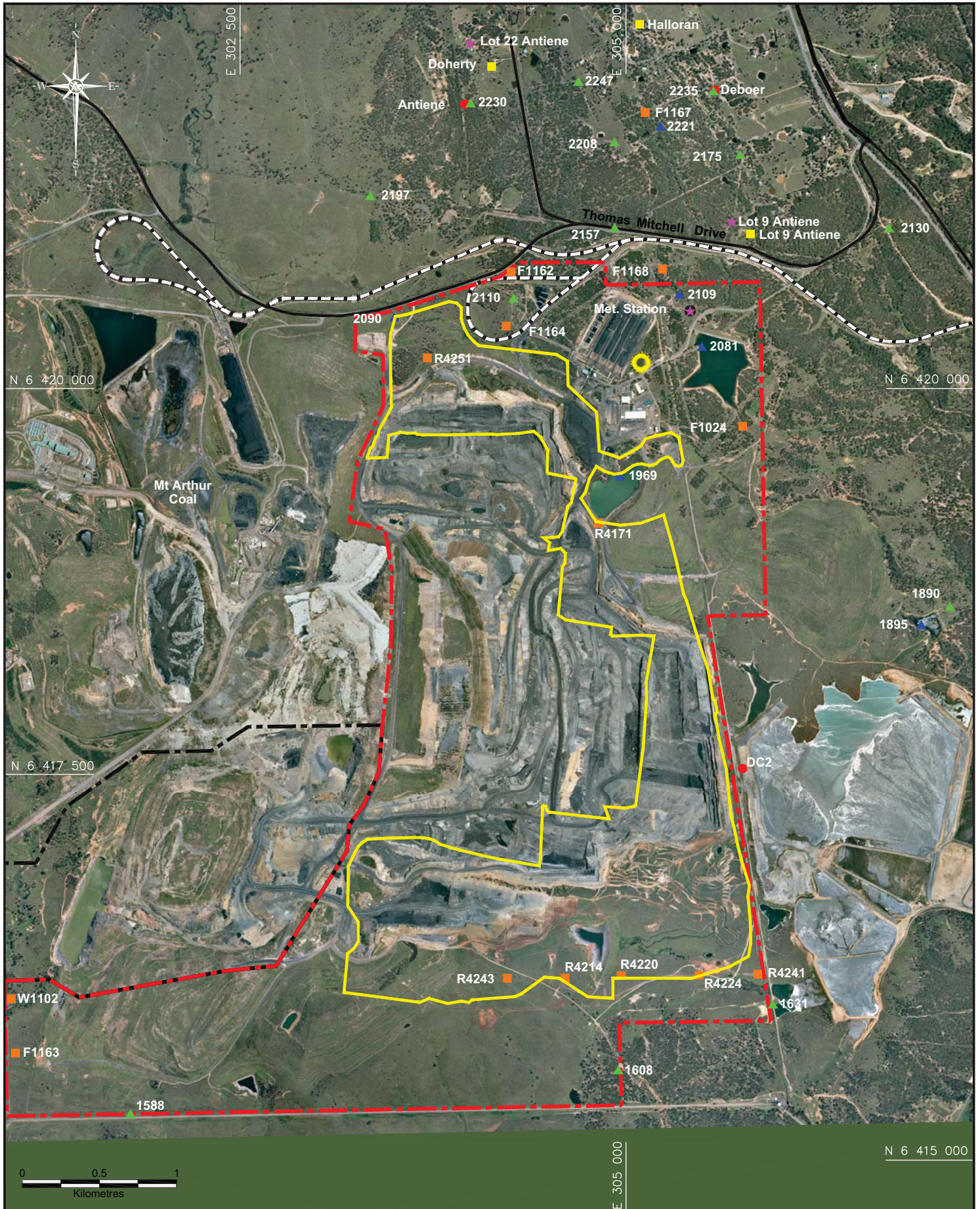
Approved Mining Operations

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Date: 23.11.2010

Drawn: CP

Figure
2



Legend

- EA Boundary
- MAC Sub-lease
- Approved Mining Disturbance Footprint
- Background Noise Monitor
- Blast Monitor
- ▲ Monthly Water Sampling Site
- ▲ Dust Deposition Gauge
- ★ High Volume Air Sampling Site
- ★ Meteorological Station
- Ground Water Monitor

Hansen Bailey

AngloAmerican

Co-ordinate system: MGA Zone 56
Aerial: May 2009

DRAYTON MINE MODIFICATION

Environmental Monitoring Network

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Date: 23.11.2010

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Figure
3

Drayton's EMS comprises a number of management documents which have been approved by DP&I and include the following:

- Noise Monitoring Program;
- Road Closure Management Plan for Thomas Mitchell Drive;
- Blast Monitoring Program;
- Spontaneous Combustion Management Plan;
- Air Quality Monitoring Program;
- Site Water Management Plan;
- Aboriginal Archaeology and Cultural Heritage Management Plan;
- Flora and Fauna Management Plan;
- Greenhouse and Energy Efficiency Plan;
- Mine Closure Plan (as part of the overall Landscape Management Plan);
- Final Void Management Plan (as part of the overall Landscape Management Plan);
- Consolidated Offset Strategy (presenting both offset areas for the Drayton Extension EA and the Drayton Modification EA); and
- Rehabilitation and Offset Management Plan.

2.4 LAND OWNERSHIP

Table 1 lists property ownership within and surrounding the EA Boundary and indicates if a receiver (residence) is located on the property with a square. **Table 1** should be read in conjunction with **Figure 4** which illustrates land ownership and receivers within and adjacent to the EA Boundary.

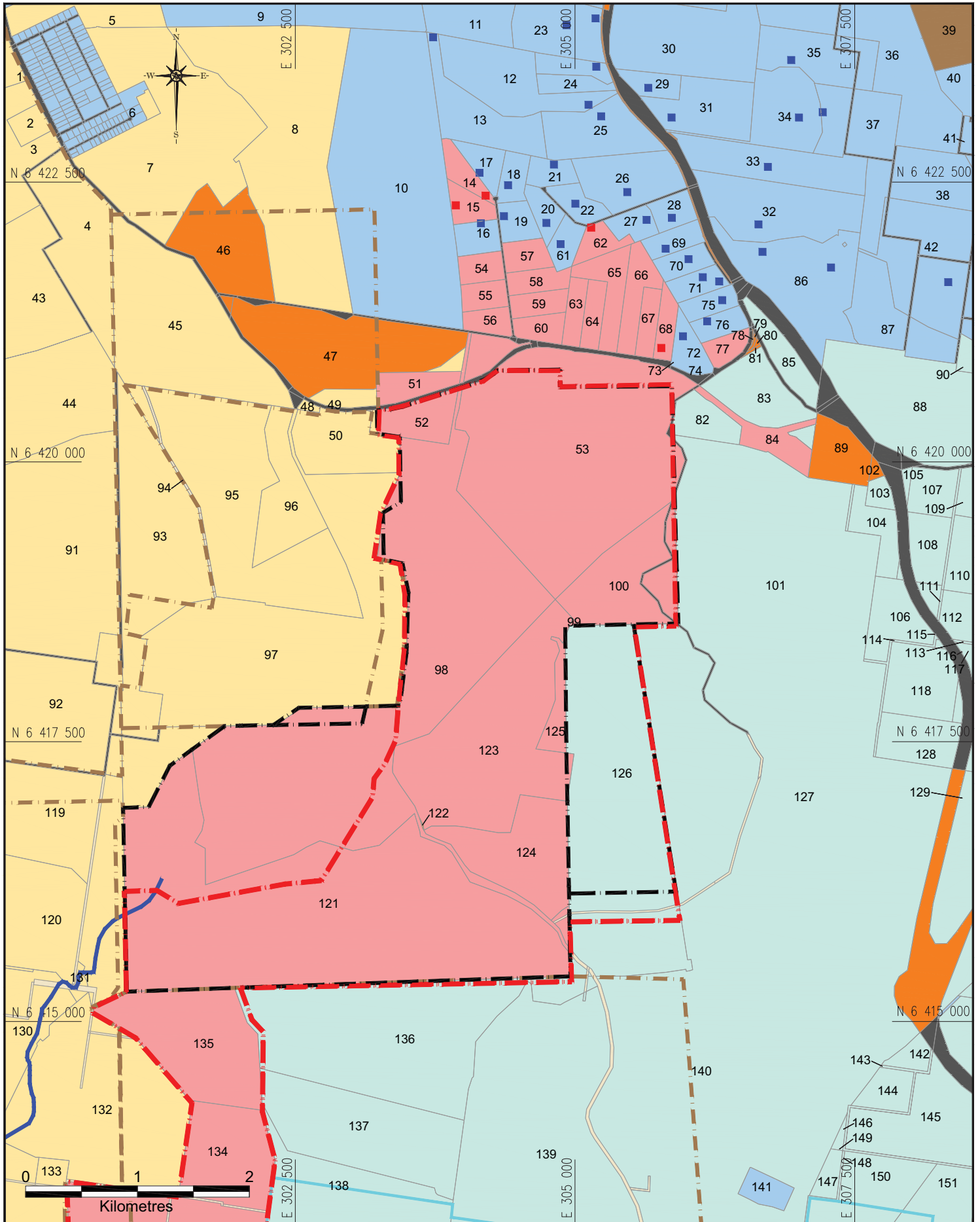
The majority of land within the EA Boundary is owned by Drayton (and its subsidiaries). A small area of land in the south-east of the EA Boundary, and the area within which the East Pit is located is owned by Macquarie Generation.

Table 1
Land Ownership

ID	Name	Receiver	ID	Name	Receiver	ID	Name	Receiver
1	Coal Operations Australia		54	Drayton Coal		106	Macquarie Generation	
2	Coal Operations Australia		55	Drayton Coal		107	Macquarie Generation	
3	Coal Operations Australia		56	Drayton Coal		108	Macquarie Generation	
4	Coal Operations Australia		57	Drayton Coal		109	Macquarie Generation	
5	Coal Operations Australia		58	Drayton Coal		110	Macquarie Generation	
6	Muswellbrook Shire Council		59	Drayton Coal		111	Macquarie Generation	
7	Coal Operations Australia		60	Drayton Coal		112	Macquarie Generation	
8	Coal Operations Australia		61	RC & LT Skinner	■	113	Macquarie Generation	
9	F & I Webber		62	Anglo Coal (Drayton Management) Pty Limited	■	114	Macquarie Generation	
10	EM Casben		63	Drayton Coal		115	Macquarie Generation	
11	Yarramalong Stud Pty Ltd		64	Drayton Coal		116	Macquarie Generation	
12	K Newton	■ ■	65	Drayton Coal		117	Macquarie Generation	
13	CS Jacobsen	■	66	Drayton Coal		118	Macquarie Generation	
14	Anglo Coal (Drayton Management) Pty Limited	■	67	Drayton Coal & Anglo Coal		119	Hunter Valley Energy Coal Ltd	
15	Drayton Coal	■	68	Drayton Coal	■	120	Hunter Valley Energy Coal Ltd	

ID	Name	Receiver	ID	Name	Receiver	ID	Name	Receiver
16	MF & AV Doherty	■	69	P & K Clifton	■	121	Drayton Coal & Anglo Coal	
17	BC & SR Page	■	70	BD & B Jones	■	122	Drayton Coal	
18	SR Page	■	71	DW & LM Hunter	■ ■	123	Drayton Coal & Anglo Coal	
19	CJ & LE Duck	■	72	BJ & NH Robertson	■	124	Drayton Coal	
20	RD & DA Osborn	■	73	Muswellbrook Shire Council		125	Drayton Coal	
21	WJ Reynolds	■	74	Muswellbrook Shire Council		126	Macquarie Generation	
22	RB & LJ Halloran	■	75	EJ & MC Sharman	■	127	Macquarie Generation	
23	SJ & J Jackson	■ ■	76	PG Horder	■	128	Macquarie Generation	
24	J Newton		77	Drayton Coal		129	Macquarie Generation	
25	PJ & KJ Collins	■	78	Crown land		130	Hunter Valley Energy Coal Ltd	
26	RE & ID Baxter	■	79	Crown land		131	Hunter Valley Energy Coal Ltd	
27	GJ & PH De Boer	■	80	Crown land		132	Hunter Valley Energy Coal Ltd	
28	MJ Bird	■	81	Crown land		133	Hunter Valley Energy Coal Ltd	
29	MJ & EJ Wallman	■	82	Macquarie Generation		134	Anglo Coal Australia Pty Ltd	
30	JM & BB & PS Mitchelhill & HB Rivett & IB Vineburg		83	Macquarie Generation		135	Anglo Coal Australia Pty Ltd	
31	RJ & IA Summerville	■	84	Drayton Coal		136	Macquarie Generation	
32	K & KI Cross	■	85	Macquarie Generation		137	Macquarie Generation	
33	CL & JA Fisher & CI Dennis	■	86	Wild Group Pty Ltd	■	138	Macquarie Generation	
34	BT & JE Davis	■	87	P Wild		139	Macquarie Generation	
35	GM Wilson	■	88	Macquarie Generation		140	Macquarie Generation	
36	JM Mitchelhill & HB Rivett & IB Vineburg		89	Crown land		141	TransGrid	
37	BJ & TL King	■	90	Macquarie Generation		142	Macquarie Generation	
38	NP & CJ O'Brien		91	Coal Operations Australia		143	Macquarie Generation	
39	Xstrata Coal Pty Limited		92	Coal Operations Australia		144	Macquarie Generation	
40	PS & TG Adams		93	Hunter Valley Energy Coal Ltd		145	Macquarie Generation	
41	M & P Clifton		94	Bayswater Colliery Company		146	Macquarie Generation	
42	H Ray	■	95	Bayswater Colliery Company		147	Macquarie Generation	
43	Coal Operations Australia		96	Bayswater Colliery Company		148	Macquarie Generation	
44	Coal Operations Australia		97	Bayswater Colliery Company		149	Macquarie Generation	
45	Coal Operations Australia		98	Drayton Coal & Anglo Coal		150	Macquarie Generation	
46	Crown land		99	Drayton Coal		151	Macquarie Generation	
47	Crown land		100	Drayton Coal				
48	Hunter Valley Energy Coal Ltd.		101	Macquarie Generation				
49	Hunter Valley Energy Coal Ltd.		102	Crown land				
50	Coal Operations Australia		103	Macquarie Generation				
51	Drayton Coal		104	Macquarie Generation				
52	Drayton Coal		105	Macquarie Generation				
53	Drayton Coal & Anglo Coal							

* A coloured square denotes a receiver on the property.
Each colour correlates to the shading used on **Figure 4**.



DRAYTON MINE MODIFICATION

Land Ownership

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Date: 18.01.12

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Figure
4

3 THE MODIFICATION

This section provides a description of all of the components of MOD 3 for which Drayton is seeking approval under Section 75W of the EP&A Act.

3.1 OVERVIEW

Drayton proposes to extend its operations into three small areas collectively known as the Modification Areas.

One of these areas is to the east of the Approved Mining Disturbance Footprint (the Eastern Modification Area) within the EA Boundary presented in the Drayton EA and approved by PA 06_0202.

Minor extensions to the Approved Mining Disturbance Footprint are also proposed in the North and South pits (Northern and Southern Modification Areas) to facilitate the development of a more environmental sustainable and safer final highwall. In achieving this outcome there will be limited coal extraction activities in these areas which will enhance coal recovery without additional environmental effects and will prevent the sterilisation of a known coal resource. **Figure 5** illustrates these areas which are also within a current mining lease held by Drayton Mine. A revised final landform for Drayton following proposed closure in 2017 is also presented.

A minor variation to the equipment fleet is also proposed due to operational constraints.

3.2 EASTERN MODIFICATION AREA

The proposed Eastern Modification Area includes an extension of the Approved Mining Disturbance Footprint (as shown in Figure 21 of the Drayton Extension EA, Figure 5A of the Drayton Modification EA and **Figure 2** of this EA) by approximately 20.3 ha, adjacent to existing infrastructure. **Figure 7** presents a cross section of the Eastern Modification Area as approved and proposed.

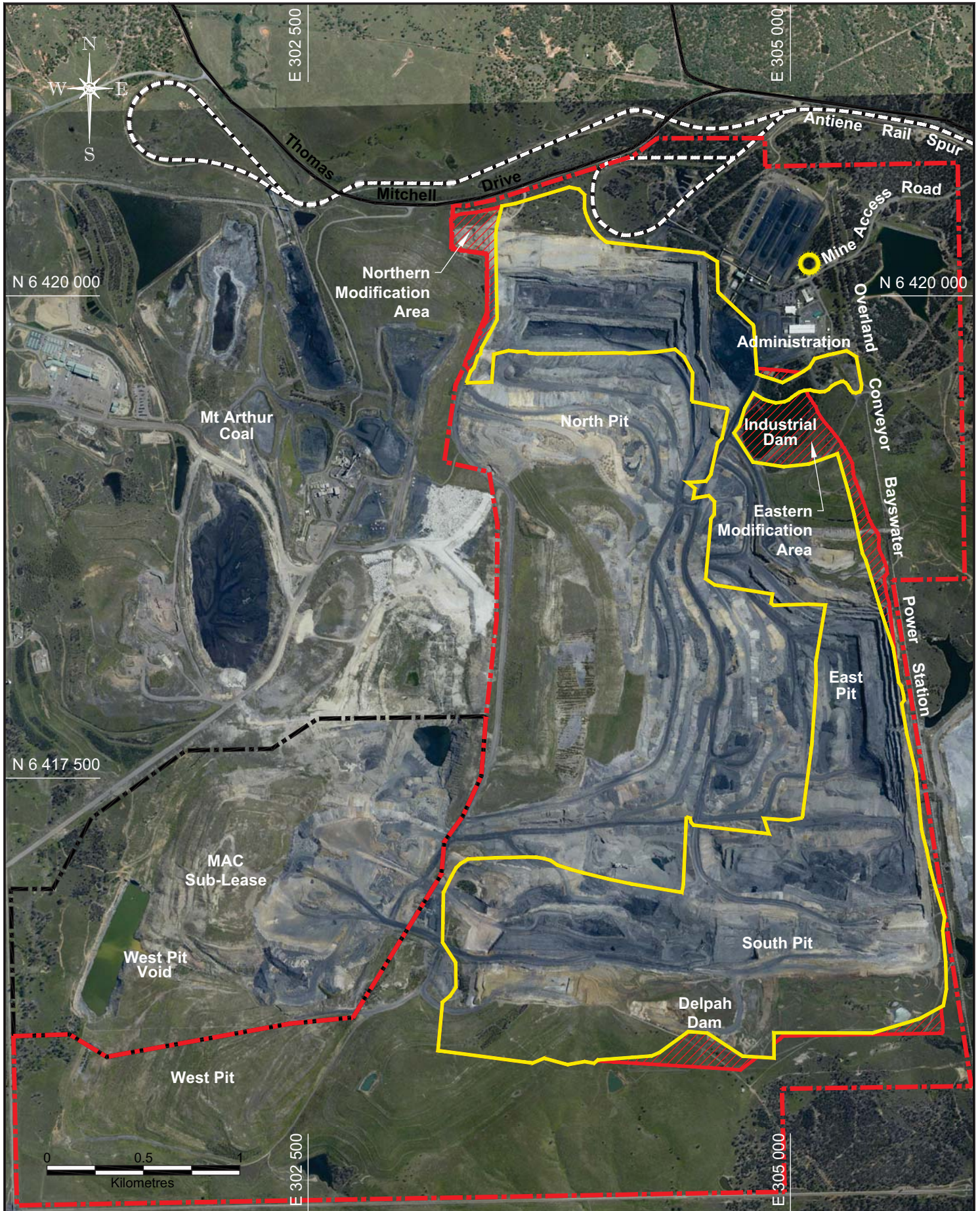
Mining in the Eastern Modification Area will result in the extraction of approximately 1.4 Million tonnes of remnant coal beneath the mine-water Industrial Dam and previous mine rehabilitation. The water from this dam will be stored within the southern portion of the East Pit void and any potential contaminated materials (i.e. hydrocarbons) will be appropriately removed and treated. This area will be sealed from the active mining area in the East South pit by a hard rock barrier pillar up to 50 m high and up to 50 m wide. The barrier pillar has been designed according to geotechnical requirements and has been endorsed by the NSW Chief Inspector of Mines. Mining in the Eastern Modification Area will not be any closer to private residences than that presented in the Drayton EA and approved under PA 06_0202.

The proposed Eastern Modification Area represents an additional 4.2% disturbance to the Approved Mining Disturbance Footprint at Drayton. The proposed mining method of this additional area will be the same as that described in the Drayton Extension EA and Drayton Modification EA.

3.3 NORTHERN AND SOUTHERN MODIFICATION AREAS

The proposed Northern and Southern Modification Areas are an extension of the Approved Mining Disturbance Footprint of approximately 8.8 ha and 7.4 ha, respectively. The minor extensions of the North Pit and South Pit are both sought to allow a more sustainable closure plan for the cessation of mining at Drayton and a safer highwall to be developed for the end of approved mining at Drayton in 2017.

Figure 8 provides cross sections of the North Pit and South Pit highwall as approved and proposed.



Legend

- - - EA Boundary
- - - MAC Sub-lease
- Approved Mining Disturbance Footprint
- ▨ Modified Mining Disturbance Footprint



Co-ordinate system: MGA Zone 56
Aerial: Oct 2010

DRAYTON MINE MODIFICATION

Modification Overview

Cad File: 07945B.dwg

Date: 28.11.2011

Drawn: NM

Figure
5

As shown on **Figure 8**, the South Pit highwall has been redesigned to develop a straight highwall so as to improve geotechnical stability and reduce highwall failure. The North Pit highwall has been extended by appropriately 30 m to the west so as to increase working room in the North Pit and to reduce the load on the highwall, thereby reducing highwall failure.

The proposed Northern Modification Area represents an additional 1.8% disturbance to the Approved Mining Disturbance Footprint at Drayton. The proposed Southern Modification Area represents an additional 1.5% disturbance to the Approved Mining Disturbance Footprint at Drayton. The proposed mining method used in these areas will be the same as that described in the Drayton Extension EA and Modification EA.

3.4 EQUIPMENT FLEET MODIFICATION

The Drayton EA describes an equipment fleet of 25 haul trucks (consisting of 14 x 280 tonne trucks and 11 x 180 tonne trucks). Due to both equipment availability in the market place and operational constraints, in particular restricted working room (which is worsening towards the end of mine life), Drayton is seeking approval to modify the equipment fleet to accommodate 30 x 180 tonne trucks and to retire the few larger less flexible trucks on the mine site. An assessment of the environmental impacts of this minor aspect of the proposal is presented in **Section 7**.

As specified in the Drayton EA, all of Drayton's 180 tonne truck fleet will be fitted with exhaust silencers.

3.5 REVISED FINAL LANDFORM

MOD 3 will not extend the life of approved mining at Drayton, which PA 06_0202 requires to cease on 31 December 2017.

Over the last five years, Drayton has been designing their final landform plan to ensure a successful and safe mine closure, in the absence of any additionally approved mining proposals. **Figure 6** presents the revised final landform and highlights the main modifications as proposed.

MOD 3 is integral to achieving this final landform plan, as the Northern and Southern Modification Areas will ensure sufficient room is available to backfill and develop safer and more sustainable final voids. The backfilling of the voids will ensure that all overburden or coal seams which are prone to spontaneous combustion are covered with an inert material and adequately capped to prevent future heating.

3.5.1 Final Void Uses

The proposed final void uses are discussed below, as relevant to each mining area.

East Pit

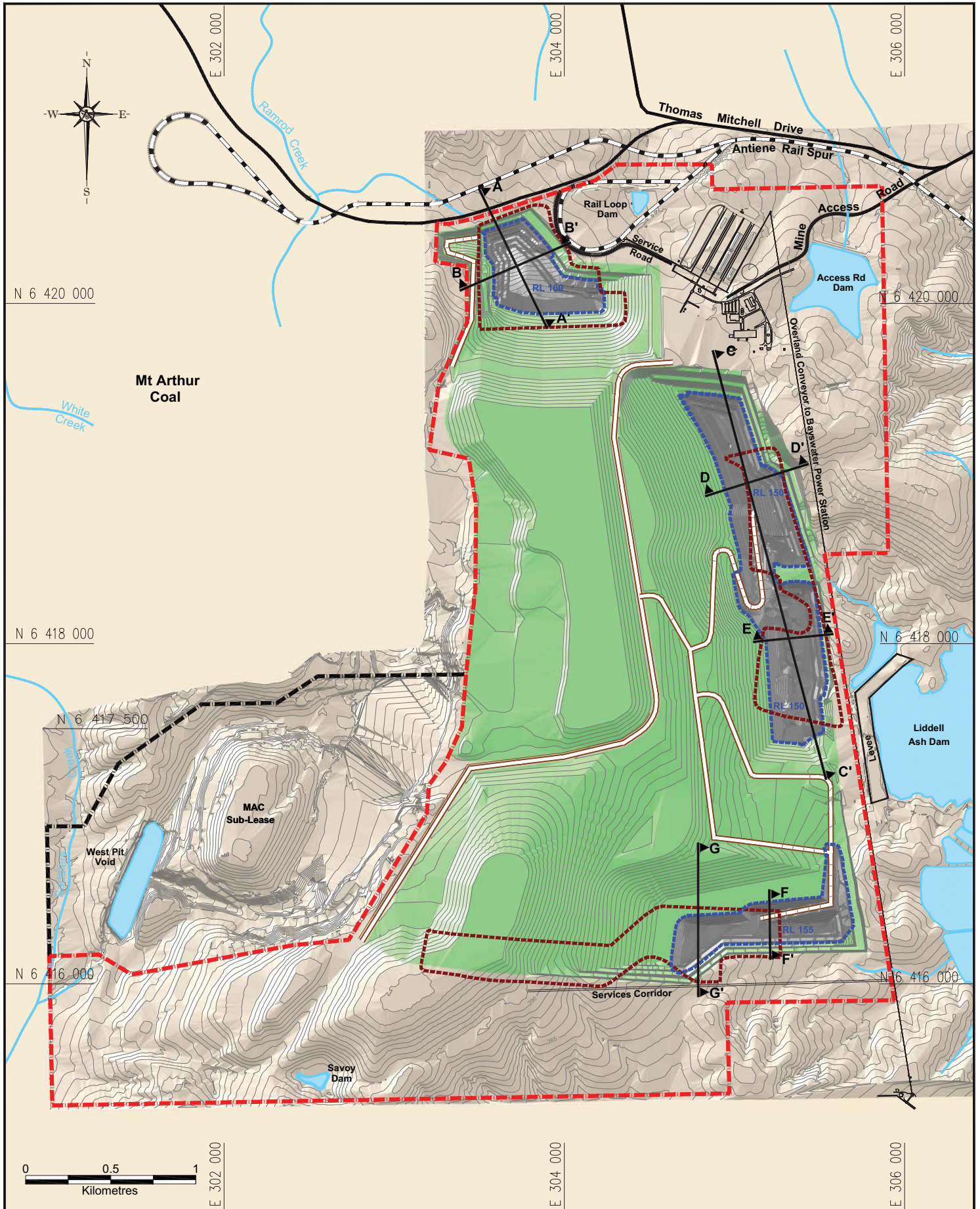
The East Pit will be comprised of two final voids – East North (EN) void and East South (ES) void.

The EN void is located on Drayton land and will be utilised for water storage once mining is completed. The EN void will be separated from the ES void by an insitu hard rock barrier pillar up to RL 114. This is illustrated on the cross section presented in **Figure 7**.

The ES void is located on land owned by Macquarie Generation (Mac Gen).

A legal Deed of Agreement exists between Mac Gen and Drayton in regard to the use of the ES void after approved mining (i.e. 2017). This agreement requires that Drayton makes the ES void available to Mac Gen to utilise for fly ash storage if they wish, subject to gaining of the appropriate approvals. This option would likely require Mac Gen to increase the height of the barrier pillar to ensure the fly ash emplacement is contained within the ES void.

Figure 7 (Scenario 1) provides a cross section illustrating the use of the ES void, should Mac Gen take the option to emplace fly ash within the ES void.



Legend

- EA Boundary
- MAC Sub-Lease
- Haul Roads
- Approved Voids
- Revised Voids
- Proposed Rehabilitation

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Co-ordinate system: MGA Zone 56

DRAYTON MINE MODIFICATION

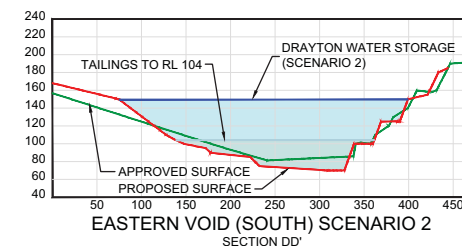
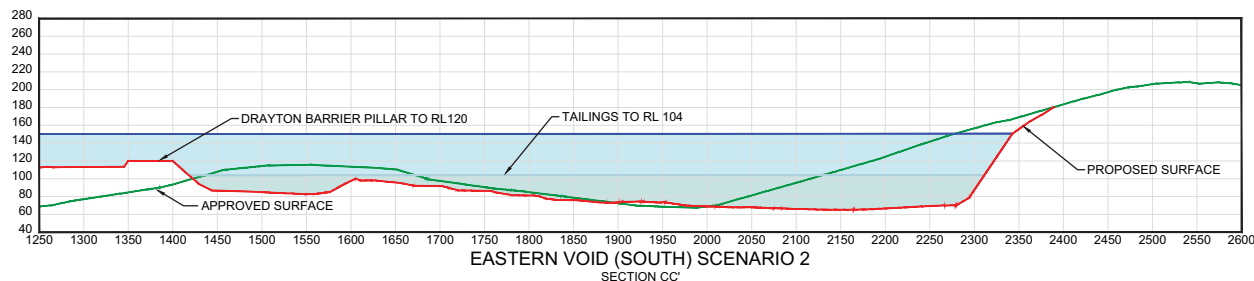
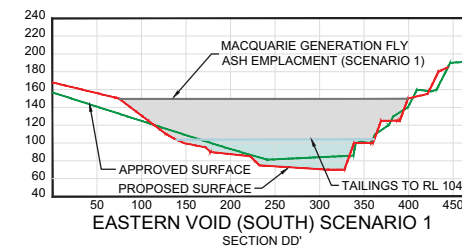
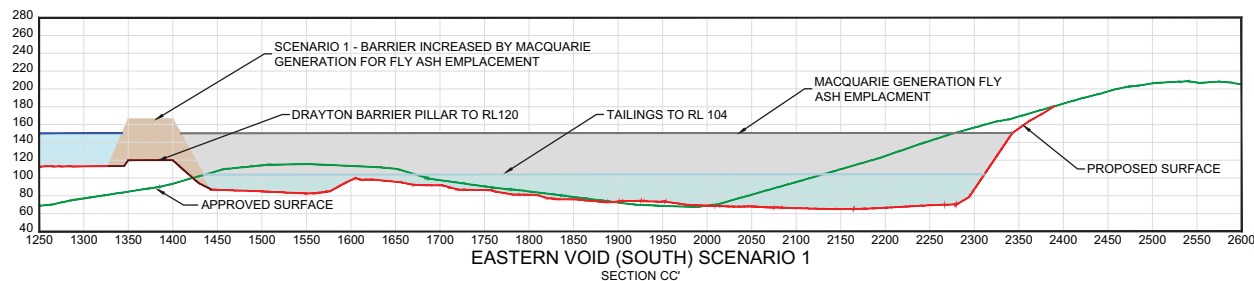
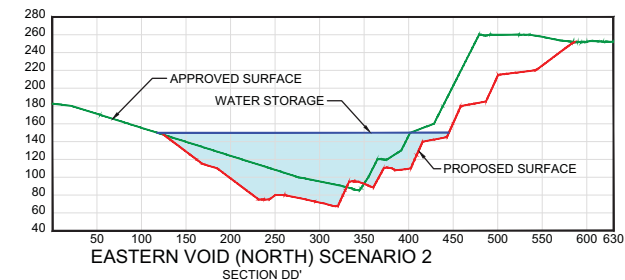
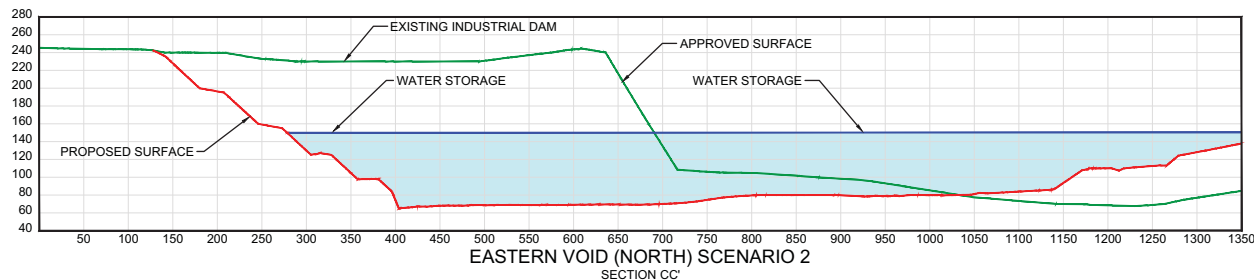
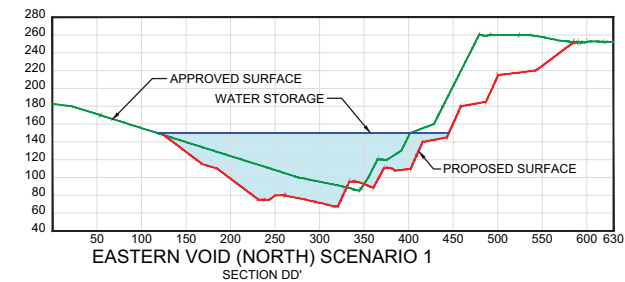
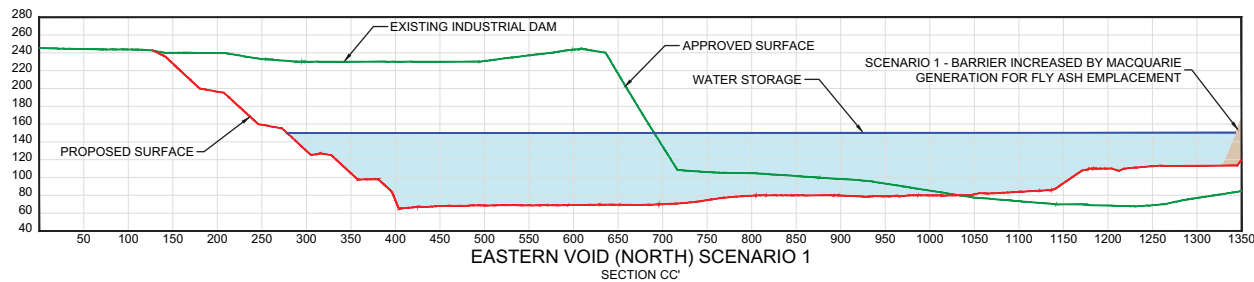
Revised Final Landform Void Comparisons

Cad File: 08159B.dwg

Date: 10.04.12

Drawn: JD

Figure
6



NOTE: These drawings are conceptual only. Any future use of the void and associated ash emplacement would be determined by Macquarie Generation and would be subject to additional, separate approvals.

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Co-ordinate system: MGA Zone 56

DRAYTON MINE MODIFICATION

Eastern Void Sections

Cad File: 08160C_1.dwg

Date: 04.04.12

Drawn: JD

Figure
7

If Mac Gen decide not to pursue their option to emplace fly ash within the ES void (Scenario 2), then Drayton (with agreement of Mac Gen as the landholder) would utilise the void for water storage. This is illustrated on the cross section presented in **Figure 7**.

It should be noted that the cross-sections presented in **Figure 7** are conceptual only. Any future use of the void and associated ash emplacement would be determined by Macquarie Generation and would be subject to additional, separate approvals.

North Pit

The North Pit void is proposed to be used for coarse rejects storage from the future Drayton South project. Rejects are proposed to be placed in the void up to RL 178, with an additional 3 m of inert material capping. Approval for this activity will be sought separately as required by the Drayton South project. The future use of this void is illustrated on the cross section presented in **Figure 8**.

It should be noted that the cross-sections presented in **Figure 8** are conceptual only. Any future use of the voids by the Drayton South Project would be subject to additional, separate approvals.

South Pit

The South Pit void will be used for water storage. The final steady state water level in the void is predicted to be RL 140. The use of this void is illustrated on the cross section presented in **Figure 8**.

It should be noted that the cross-sections presented in **Figure 8** are conceptual only. Any future use of the voids by the Drayton South Project would be subject to additional, separate approvals.

3.6 ALTERNATIVES CONSIDERED

The following alternatives were considered.

3.6.1 Option 1 – Do Nothing

The Do Nothing approach would result in the loss of a coal resource able to be recovered without additional material environmental effects, the sterilisation of recoverable coal and the loss of social benefits such as employment and royalty payments to both the Federal and NSW State Government.

This alternative may also result in the early closure of Drayton and would not allow Drayton to successfully implement their revised, more sustainable final landform and mine closure plan for Drayton Mine.

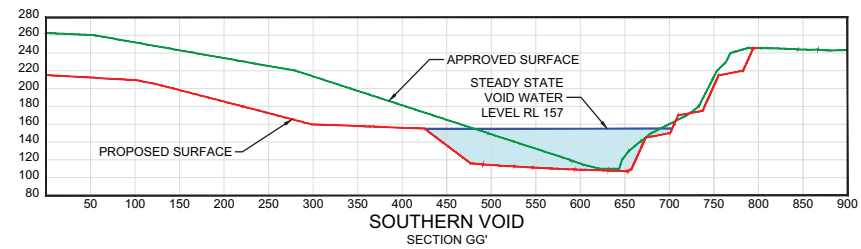
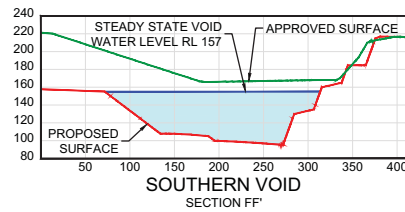
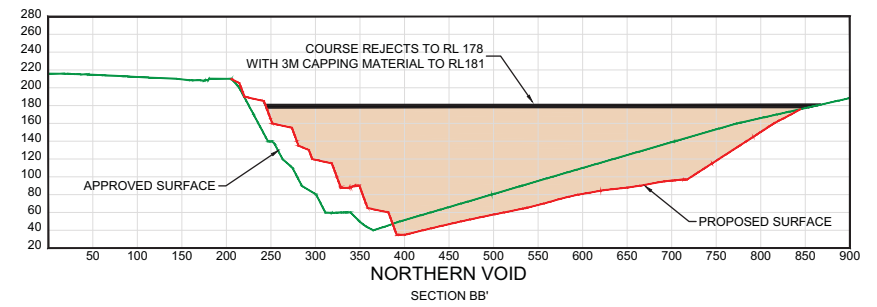
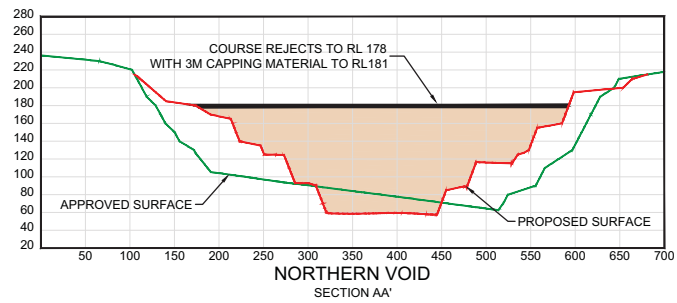
The Do Nothing alternative would fail to maximise resource recovery of the existing coal resource for the benefit of the community in an environmentally acceptable manner and by methods that address the principles of ESD. Consequently, Drayton would not be appropriately addressing the 'objects' of the EP&A Act in that it would not be promoting social and economic welfare to the community.

3.6.2 Option 2 – MOD 3

Option 3 (the Modification) is required primarily to allow for the effective and efficient extraction of an identified remnant coal resource beneath a mine-water dam and existing mine rehabilitation adjacent to Drayton's Approved Mining Disturbance Footprint that would otherwise be sterilised.

The Modification will also ensure that Drayton has sufficient working room to develop safe, sustainable final highwalls in the North Pit and South Pit voids so as to be suitable for mine closure in 2017.

When applying the principle of ESD, Option 3 is considered to be the appropriate option as it will facilitate the production of additional coal, whilst ensuring an improved safety outcome for the final voids. This option was considered to be the best alternative in terms of meeting the principles of ESD and objects of the EP&A Act.



NOTE: These drawings are conceptual only. Any future use of the voids by the Drayton South Project would be subject to additional, separate approvals.

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Co-ordinate system: MGA Zone 56

DRAYTON MINE MODIFICATION

Northern & Southern Void Sections

Cad File: 08160C_2.dwg

Date: 04.04.12

Drawn: JD

Figure
8

4 REGULATORY FRAMEWORK

This section of the EA describes the regulatory framework relevant to the modification of PA 06_0202 as sought and provides detail in relation to the legislative considerations relevant to the Modification.

4.1 CONTEXT

To authorise the long standing mining operation, Drayton presently holds PA 06_0202 for the operation of the Drayton Mine along with a suite of approved management and other plans required by that approval which was granted in 2008 by the then Minister for Planning under Section 75J of the EP&A Act. In addition, Drayton holds all of the ancillary approvals required for the operation of the Drayton mine as is listed in **Table 2**.

Table 2
Drayton Mine Existing Licences and Approvals

Approval Document	Approval Authority	Approval Term
ML 1531	DTIRIS	26/02/2003 - 25/02/2024
CL 229	DTIRIS	03/02/1982 - 02/02/2024
CL 395	DTIRIS	23/06/1992 - 21/01/2029
A 173	DTIRIS	31/08/1979 - 31/08/2013
Drayton Mine Extension PA 06_0202	DP&I	01/02/2008 - 31/12/2017
Drayton Mine Extension PA 06_0202 MOD1 & MOD 2	DP&I	16/10/2009 - 31/12/2017
Antiene Joint User Rail Facility (DA) 106-04-00	DP&I	02/11/2000 - 02/11/2025
Bore Licence 20BL111869	NOW	24/04/2005 - 23/04/2010
Bore Licence 20BL171953	NOW	27/08/2008 - Perpetuity
Bore Licence 20BL171954	NOW	27/08/2008 - Perpetuity
Bore Licence 20BL171955	NOW	27/08/2008 - Perpetuity
Bore Licence 20BL171956	NOW	27/08/2008 - Perpetuity
Bore Licence 20BL171957	NOW	27/08/2008 - Perpetuity
Fixed Radiation Gauge Registration: 10952	OEH	20/06/2011-30/06/2013
Fixed Radiation Gauge Registration: 11555	OEH	08/03/2010 - 08/02/2012
Fixed Radiation Gauge Registration: 939	OEH	02/02/2010 – 02/02/2014
Licence to Sell / Possess Radioactive Substances 31157	OEH	29/02/2008 – 10/03/2011
Environmental Protection Licence 1323	OEH	21/12/2011 - 21/12/2016
Dangerous Goods Notification Acknowledgement 35/019387	WorkCover NSW	Expires 18/03/2012
Dangerous Goods Licence to Store 07-100017-005	WorkCover NSW	Expires 08/05/2016
Emplacement Area Approval 317541026001	DTIRIS	23/04/2007 - Not applicable
Prescribed Dams (Liddell Ash Dam Levee, Access Road Dam, Delpah Dam)	DSC	Not applicable

PA 06_0202 has been modified on two previous occasions which effected (in summary the following):

- MOD 1 - On 16 October 2009 to allow an 8 ha extension of the Approved Mining Disturbance Footprint to the north and the establishment of a new conservation area to provide an appropriate offset for this additional disturbance; and
- MOD 2 – On 17 February 2012 to allow for the emplacement of raw tailings in the Drayton East Pit void and the construction and operation of an explosives storage facility.

Drayton seeks to add three small areas of coal recovery to its approved mining and to make a change to its truck fleet by using a greater number of smaller trucks replacing a smaller number of larger trucks.

To authorise these changes to the Drayton Mine, Drayton seeks the approval of this modification application (MOD 3) under Section 75W of the former Part 3A of the EP&A Act.

4.2 STANDING

PA 06_0202 was granted under Part 3A of the EP&A Act by the then Minister for Planning on 1 February 2008. Part 3A of the EP&A Act was repealed by *EP&A Act Amendment (Part 3A Repeal) Act 2011* (Part 3A Repeal Act) which commenced on 1 October 2011.

The Part 3A Repeal Act provided for the continuation of the operation of the former Part 3A in respect of “*transitional Part 3A projects*” and that continuation is preserved in Schedule 6A of the EP&A Act.

A *transitional Part 3A project* includes “*an approved project*” (as defined under the former section 75A EP&A Act). An *approved project* is defined as a *project to the extent that it is approved by the Minister under this Part*. Drayton mine is an *approved project* as defined and therefore Drayton mine is a *transitional Part 3A project*.

Clause 3 of the Schedule 6A of the EP&A Act provides:

Part 3A of this Act (as in force immediately before the repeal of that Part and as modified under this Schedule after that repeal) continues to apply to and in respect of a transitional Part 3A project.

As the Drayton Mine is a “*transitional Part 3A project*” this application seeks to modify PA 06_0202 under Section 75W of the former Part 3A of the EP&A Act.

4.2.1 Landowner Consent and Notification

Under clause F of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation), the consent of the landowners is not required.

All land the subject of MOD 3 is owned by entities associated with the applicant.

Under clause 8F of the EP&A Regulation, it is a requirement that notice of the application is given “*to the public by advertisement published in a newspaper circulating in the area of the project before the end of the period of 14 days after the application is made.*” Due notice of the application will be provided in the Muswellbrook Chronicle.

4.2.2 Section 75W of the EP&A Act

(1) *In this section:*

Minister's approval means an approval to carry out a project under this Part, and includes an approval of a concept plan.

modification of approval means changing the terms of a Minister's approval, including:

- (a) *revoking or varying a condition of the approval or imposing an additional condition of the approval, and*
 - (b) *changing the terms of any determination made by the Minister under Division 3 in connection with the approval.*
- (2) *The proponent may request the Minister to modify the Minister's approval for a project. The Minister's approval for a modification is not required if the project as modified will be consistent with the existing approval under this Part.*
- (3) *The request for the Minister's approval is to be lodged with the Director-General. The Director-General may notify the proponent of environmental assessment requirements with respect to the proposed modification that the proponent must comply with before the matter will be considered by the Minister.*
- (4) *The Minister may modify the approval (with or without conditions) or disapprove of the modification.*
- (5) *The proponent of a project to which section 75K applies who is dissatisfied with the determination of a request under this section with respect to the project (or with the failure of the Minister to determine the request within 40 days after it is made) may, within the time prescribed by the regulations, appeal to the Court. The Court may determine any such appeal.*

In Barrick Australia Limited v Williams 2009 (Williams Case), Justice Basten found that Section 75W “confers on the Minister an implicit obligation to be satisfied that the request falls within the scope of the section”.

In the Williams Case it was accepted that to engage *the power to modify* under Section 75W of the EP&A Act, the Minister is called upon to form a view as to whether the proposed changes amount “... to a radical transformation of the terms of the existing development consent”. In the Williams Case it was found that this finding is a question of jurisdictional fact for the Minister.

In making that comparison between what is proposed and what is already approved the Minister will compare what is proposed in this application with “...the approval, with any earlier modifications, as it stood at the time of the modification request. The relevant comparison ... is with the modified development consent as at the date of the modification request.” (Williams v Minister for Planning 2009 BC 200900319, page 54).

What is proposed under this Modification is not a “radical transformation” of what has been already approved under PA 06_0202 for Drayton Mine. The following essential elements of Drayton Mine will remain unaltered by MOD 3:

- Total tonnes of coal to be extracted, processed or transported does not change;
- Total annual extraction, processing and transportation of coal does not change;
- Manning levels remain the same;
- Methodology of mining, processing and transportation of coal does not change; and
- The disturbance limit is extended by 36.5 ha (constituting a 7.7% increase from what is already approved).

It is thus evident that the Minister for Planning has the power to modify the Development Consent under Section 75W of the EP&A Act.

4.2.3 Consistency of the Modification with Objects of the EP&A Act

This EA has been prepared to ensure that the Modification is consistent with the objects as specified in Section 5 of the EP&A Act.

Section 7 of this EA provides consideration of the management, development and conservation of resources to promote social and economic welfare of the community; the orderly and economic use of the land; and the protection of the environment. Stakeholder involvement for the Modification has been encouraged throughout the preparation of this EA, with a summary of key issues provided in **Section 5**.

The key principles of Ecologically Sustainable Development (ESD) have also been considered throughout the EA process and the Modification is consistent with these principles.

4.2.4 Approvals that do not Apply

Section 75U (former) of the EP&A Act provides that certain authorisations normally required under various statutes are not required for “*an approved project*” and that the provisions of any Act that prohibit an activity without such an authority do not apply to “*an approved project*”.

Accordingly, the following (relevant) authorisations will not be required for the Drayton Mine as modified (if this application is approved:

- An Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974*;
- An authorisation referred to in section 12 of the *Native Vegetation Act 2003* (or under any Act to be repealed by that Act) to clear native vegetation or State protected land;
- A bushfire safety authority under section 100B of the *Rural Fires Act 1997*;
- A water use approval under section 89, a water management work approval under section 90 or an activity approval under section 91 of the *Water Management Act 2000* (WM Act); and
- Prohibitions under Division 8 of Part 6 of the *Heritage Act 1977*.

The impacts and relevant considerations pertaining to the matters which would ordinarily be addressed in connection with applications for these authorisations have been dealt with and considered in the environmental assessment process which has been undertaken in connection with this application.

4.2.5 Approvals Which Must Be Granted

Section 75V (former) of the EP&A Act provides that “*An authorisation of the following kind cannot be refused if it is necessary for carrying out an approved project and is to be substantially consistent with the approval under this Part:*

- (a) *An aquaculture permit under section 144 of the Fisheries Management Act 1994;*
- (b) *An approval under section 15 of the Mine Subsidence Compensation Act 1961;*
- (c) *A mining lease under the Mining Act 1992;*
- (e) *An environment protection licence under Chapter 3 of the Protection of the Environment Operations Act 1997 (for any of the purposes referred to in section 43 of that Act); and*
- (f) *A consent under section 138 of the Roads Act 1993.*

Applications for these approvals (to the extent that they are required for the development the subject of the modification) will be made after any approval of the modification application is granted.

The impacts and relevant considerations pertaining to the matters which would ordinarily be addressed in connection with applications for these authorisations have been dealt with and considered in the environmental assessment process which has been undertaken in connection with this application.

4.3 RELEVANT PLANNING INSTRUMENTS

Under Section 75J(3) (former) of the EP&A Act, the Minister for Planning “*may (but is not required to) take into account the provisions of the environmental planning instrument that would not (because of Section 75R) apply to the project, if approved*”.

Modification sought under this Application is not prohibited under the Muswellbrook Local Environmental Plan (see below) and therefore it is not prohibited by reason of clause 8O of the EP&A Regulations.

The following sections provide a review of the environmental planning instruments that are relevant to the Modification.

4.3.1 Hunter Regional Environmental Plan 1989

The *Hunter Regional Environmental Plan 1989* (Heritage) (Hunter REP) applies to this Modification. Clause 13 of the Hunter REP deals with development in the vicinity of heritage items and requires an assessment of the effects the development will have on the heritage significance.

There is no item of heritage significance which will be actually or potentially impacted by the development the subject of the modification application.

4.3.2 Muswellbrook Local Environmental Plan 2009

This Modification is located entirely on land zoned within the *Muswellbrook Local Environmental Plan 2009* (Muswellbrook LEP) as within Zone RU1 (Primary Production).

Zone RU1 (Primary Production)

In the RU1 zoning:

- Mining is a permissible land use; and
- The objectives of the zone are as follows:
 - “To encourage sustainable primary industry production by maintaining and enhancing the natural resource base;
 - To encourage diversity in primary industry enterprises and systems appropriate for the area;
 - To minimise the fragmentation and alienation of resource lands;
 - To minimise conflict between land uses within the zone and land uses within adjoining zones;
 - To protect the agricultural potential of rural land not identified for alternative land use, and to minimise the cost to the community of providing, extending and maintaining public amenities and services;
 - To maintain the rural landscape character of the land in the long term;
 - To ensure that development for the purpose of extractive industries, underground mines (other than surface works associated with underground mines) or open cut mines (other than open cut mines from the surface of the floodplain), will not:
 - (a) Destroy or impair the agricultural production potential of the land or, in the case of underground mining, unreasonably restrict or otherwise affect any other development on the surface, or

- (b) *Detrimentially affect in any way the quantity, flow and quality of water in either subterranean or surface water systems, or*
 - (c) *Visually intrude into its surroundings, except by way of suitable screening.*
- *To protect or conserve (or both):*
 - (a) *Soil stability by controlling development in accordance with land capability, and*
 - (b) *Trees and other vegetation, and*
 - (c) *Water resources, water quality and wetland areas, and their catchments and buffer areas, and*
 - (d) *Valuable deposits of minerals and extractive materials by restricting development that would compromise the efficient extraction of those deposits.”*

4.3.3 SEPP (Mining, Petroleum and Extractive Industries) 2007

The aims of SEPP (Mining Petroleum & Extractive Industries) 2007 (SEPP Mining) are:

- (a) *“...to provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State, and*
- (b) *to facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources, and*
- (c) *to establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources”.*

As stated above, all of the land for which the Modification is sought is zoned RU1 – Primary Production under the Muswellbrook LEP.

In accordance with clause 7 of SEPP (Mining), the carrying out of development on the land the subject of the modification application for the purpose of mining is permissible with development consent.

The Modification as sought will meet the objectives of SEPP Mining.

Clause 12 of SEPP (Mining) provides:

“Before determining an application for consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must:

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

Land uses in the vicinity of the development are described in **Section 2** of this EA. The respective public benefits of the development and whether the development is likely to have any significant impact on the adjoining lands preferred land uses and any potential incompatibility therewith are examined and analysed in **Section 6** and **Section 8** of this EA.

This Modification sought will meet the objects of the SEPP Mining.

4.3.4 SEPP 33 (Hazardous and Offensive Development)

SEPP Hazardous and Offensive Development applies to the State of NSW. An assessment has been undertaken for this Modification, which has confirmed that the activities as proposed by this Modification are not potentially hazardous or offensive. As such, SEPP 33 does not apply to this Modification.

4.3.5 SEPP 55 (Remediation of Land)

This SEPP applies to the State of NSW. SEPP Remediation makes provisions in respect of development assessment in connection with “contaminated land” as defined under the EP&A Act – namely:

Under section 145A of the EP&A Act contaminated land means land in, on or under which any substance is present at a concentration above the concentration at which the substance is normally present in, on or under (respectively) land in the same locality, being a presence that presents a risk of harm to human health or any other aspect of the environment.

Clause 7 provides as follows:

“A consent authority must not consent to the carrying out of any development on land unless:

- (a) It has considered whether the land is contaminated,*
- (b) If the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and*
- (c) If the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.”*

There are no lands within the area the subject of this Modification which are contaminated (in accordance with the definition under SEPP Remediation), in a manner which would render the land unsuitable for the purpose for which the development is proposed to be carried out.

4.3.6 SEPP 44 – Koala Habitat Protection

SEPP Koalas applies within the Shire of Muswellbrook. SEPP Koalas provides that before a planning approval can be granted for any development the consent authority must satisfy itself as to whether the land on which the development is to be carried out is koala habitat. None of the land within the area affected by this Modification is potential koala habitat.

4.4 OTHER REGULATORY REQUIREMENTS

4.4.1 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) provides for licensing of pollution by the NSW Environment Protection Authority (a branch of the Office of Environment and Heritage (OEH) (formerly Department and Climate Change and Water (DECCW)) which administers the POEO Act.

Drayton holds EPL 1323 in respect to its currently approved mining operations. A variation to the EPL 1323 may be sought under the POEO Act for this Modification, as required.

As mentioned above, S75V(i)(e) provides that an EPL cannot be refused if it is necessary for the carrying out of an approved project and is to be substantially consistent with the approval under this part.

4.4.2 Mining Act 1992

The mining of coal in NSW is also regulated under the *Mining Act 1992* (Mining Act) administered by the Minister for Industry and Investment. The various components of this Modification lie entirely within the boundaries of Drayton's existing Mining Leases (ML 1531, CL 229 and CL 395) which have been granted under the provisions of the Mining Act.

Under Section 5 of the Mining Act, a person must not mine any publically owned mineral otherwise than in accordance with an authority. Under Section 73 of the Mining Act the holder of a mining lease may carry out any mining purpose on the land the subject of the lease in accordance with the conditions of the lease.

Drayton holds all necessary mining leases for the operations proposed under this Modification and none of the conditions of those leases will be breached by the operations proposed by this Modification.

The Mining Operations Plan (MOP) for Drayton as required by the conditions of its mining tenements will be updated as required to incorporate details of mining operations associated with this Modification. The updated MOP will be prepared and submitted to Department of Trade, Investment, Regional Infrastructure & Services (DTIRIS) (Division of Resources and Energy) for approval.

4.4.3 Coal Mine Health and Safety Act 2002

The *Coal Mine Health and Safety Act 2002* (CMHS Act) came into effect on 23 December 2006. At the same time, the *Coal Mine Health and Safety Regulations 2006* (CMHSR) was enacted, repealing the *Coal Mines Regulation Act 1982* and *Coal Mine Regulations 1999*, subject to transitional provisions.

Division 3, Section 100 of the CMHS Act states that Ministerial approval must be obtained to establish an emplacement area where reject material is to be deposited or placed.

Drayton's existing approval under Section 100 of the CMHS Act will be reviewed in respect of this Modification and updated as required.

4.4.4 Water Management Act 2000

The WM Act regulates access and management of water resources under its licensing and approvals conditions. The Water Sharing Plan for the Hunter Regulated River Water Source 2003 as established under the WM Act applies to the area of (and water sources within) Drayton Mine.

This Water Sharing Plan outlines water sharing rules for the allocation of water from the Hunter River and requires that Water Access Licences are obtained by all water users.

The Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 was gazetted on 24 July 2009. The introduction of this resulted in various water licences held within the Hunter River alluvial floodplain under the *Water Act 1912* (Water Act) are converted to Water Access Licences (WALs) and Water Supply Works and Use Approvals under the WM Act.

Drayton will continue to consult with NSW Office of Water over matters related to the WM Act and Water Act.

This Modification will include works which are a "controlled activity" as defined under the WM Act. Accordingly, but for Section 75U of the EP&A Act a "controlled activity" approval would be required under Section 91 of the WM Act.

Drayton has consulted with the NSW Office of Water (NOW) in relation to this Modification and provided detailed information regarding the proposal. It is expected that NOW will be a submitting authority in respect of this application.

4.4.5 Environment Protection and Biodiversity Conservation Act 1999

Under Section 68 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), a person proposing to take an “action” which the person thinks may be or is a “controlled action” is required to refer the proposal to the Minister for the Minister’s decision as to whether the proposal is a “controlled action”.

A “controlled action” is defined under the EPBC Act to be an action the taking of which without approval under Part 9 of the EPBC Act would be prohibited.

In summary, if the proposal will have or be likely to have a significant impact on a matter of national environmental significance which are set out in Part 3 of the EPBC Act, then it is prohibited without an approval (subject to a few exceptions).

Drayton has reviewed the proposal and is satisfied that the proposal does not constitute a “controlled action”. There is therefore no need to refer the proposal under Section 68 of the EPBC Act and no need for an approval under Part 9 of the EPBC Act.

5 STAKEHOLDER ENGAGEMENT

A relevant consultation program was undertaken with the aim of identifying stakeholder issues in relation to MOD 3 and ensuring that these issues were addressed as part of the assessment of the application.

5.1 REGULATORY ENGAGEMENT

During the preparation of this EA, Drayton has consulted with DP&I with the aim of identifying specific issues and developing appropriate mitigation strategies to manage impacts associated with various components of MOD 3.

Drayton will continue to consult with regulators through its environmental management and reporting processes, in accordance with the requirements of PA 06_0202. This includes regular contact with regulators and the preparation of the Drayton Annual Environmental Management Report (AEMR) which provides detailed information on environmental performance.

5.2 COMMUNITY ENGAGEMENT

Notification of MOD 3 was provided to Drayton's near neighbours shown on **Figure 4** via the distribution of a brief letter outlining the proposal and providing relevant contact details to discuss the proposal further. Notification also provided to Drayton's Community Consultative Committee (CCC). MOD 3 was discussed with the Mayor and General Manager of Muswellbrook Shire Council (MSC) at a meeting on the 14 November 2011 and 17 April 2012.

Drayton also maintains a number of formal and informal methods for community consultation to provide ongoing updates on environmental and operational performance. Consultation with the local community is generally undertaken through:

- Quarterly meetings of Drayton's CCC;
- The Drayton AEMR document (discussed with the CCC and released publicly) and community newsletters;
- Presenting environmental data, reports and CCC meeting minutes on the Drayton website;
- A 24-hour hotline for all environmental enquiries; and
- Drayton's involvement in and support of a variety of community-based events.

Drayton will continue to engage with all relevant stakeholders.

6 RISK ASSESSMENT

A preliminary Environmental Risk Assessment was undertaken to identify potential environmental issues.

The key risks identified were analysed in accordance with the Anglo American risk matrix and best practice standards, based on probability and potential consequences. Each potential environmental issue was ranked as either being high, medium, low or very low risk to the environment.

The environmental issues considered and their respective environmental impact risk rankings are presented in **Table 3** and below in **Section 7**.

Table 3
Environmental Impact Risk Rankings

Significant Risk	High Risk	Medium Risk	Low Risk
None	Air Quality and Greenhouse Gas	Groundwater	Traffic and Transport
	Noise and Blasting	Surface Water	Waste
	Ecology	Rehabilitation and Final Landform	Visual
		Spontaneous Combustion	Socio-Economics
		Soils and Land Capability	Aboriginal Heritage
			Non-Aboriginal Heritage

7 IMPACTS, MANAGEMENT AND MITIGATION

This section provides detail on the potential environmental impacts, from the continued operation of Drayton Mine as proposed to be modified, and discusses measures for their management and mitigation.

7.1 AIR QUALITY

An air quality impact assessment was undertaken by PAE Holmes and is included in **Appendix A**.

The assessment reviewed the meteorological conditions in the local area and compared the locations of dust generating activities for the Modification with the locations of equivalent dust sources in Year 10 of the approved mine plan in the Drayton EA. An assessment of air quality impacts for the operation of Drayton Mine as proposed to be modified was undertaken and its results compared the air quality effects of Drayton Mine as presently approved and presented in the Drayton EA. Year 10 of the Drayton EA was selected for this comparison as this is the most relevant year for assessing the effects of mining in the extension area.

An analysis of meteorological data was undertaken for the Drayton EA, with annual and seasonal wind roses prepared from the available hourly meteorological data. The analysis found that over the year, winds are predominantly aligned along a north-west / south-east direction, with winds in summer and autumn being mostly from the south-east. In winter and spring, winds are more frequently from the north-west although south-east winds are still a significant feature in the wind roses. The meteorological analysis indicates that, given the prevailing winds, the Modification Areas are favourably located in relation to the nearby private receivers. Little of the dust liberated while working in these areas would be transported towards the residential area of Antiene (as shown on **Figure 4**).

The assessment of air quality impacts of Drayton Mine operation as proposed by MOD 3 was undertaken assuming that mining methods, mining equipment and the rate of coal and overburden production in the Modification area will be similar to the levels assumed for Year 10 in the Drayton EA (apart from the proposed variation in the configuration of the overburden truck fleet).

A review of modelling results concluded that there would be no predicted exceedances of the Office of Environment & Heritage (OEH) assessment air quality criteria in Year 10 at the nearby privately owned receivers as a result of extending mining areas proposed by MOD 3 and that the operation of Drayton Mine as proposed by MOD 3 would be within the air quality goals in PA 06_0202.

An assessment of the change in overburden truck size to 180 tonne was also undertaken. Whilst the change in truck size will have some additional air quality impacts, the assessment confirmed that this would not result in any exceedance of the OEH assessment air quality criteria.

As the proposal does not involve any increase in the approved maximum ROM coal production at Drayton Mine from 8 Mtpa, there will be no additional greenhouse gases liberated in any one year beyond those approved under PA 06_0202.

Drayton will continue to manage air quality and greenhouse gas emissions in accordance with the SHECMS, approved Air Quality Monitoring and Management Program and Greenhouse and Energy Efficiency Plan. The Air Quality Monitoring and Management Program is scheduled to be reviewed in 2012. Details of MOD 3 and relevant management measures will be included in this revision. Drayton will continue to monitor and manage spontaneous combustion in accordance with the approved Spontaneous Combustion Management Plan detailed further in **Section 2.3**.

7.2 NOISE AND BLASTING

A noise and blasting impact review was undertaken for the Modification by Bridges Acoustics and is included in **Appendix B**. This review considered all environmental noise issues associated with the operation of Drayton Mine as proposed by MOD 3 and was based on the following:

- The currently approved operation as assessed in the Drayton EA and the Drayton Modification EA;
- Plans of the mining disturbance area illustrated in the Drayton EA and the Modification extension area, including a terrain file in Autocad format showing the mine plan for the Modification; and
- The operation of Drayton Mine as proposed by MOD 3 and as described in **Section 3** of this EA.

The nearest privately owned receivers to the Modification Areas were assessed to determine the level of noise impacts likely to be experienced by the operation of Drayton Mine as proposed by MOD 3 at surrounding locations, as compared to those affected by noise when Drayton Mine operates as currently approved under PA 06_0202. This comparison identified receivers 11 to 14, 16 to 23, 25 to 29, 31 to 35, 37, 42, 61, 69 to 72, 75, 76, and 86 (shown on **Figure 4**) as those relevant for consideration.

Assuming no changes in acoustic shielding, topographic or atmospheric effects outlined in the Drayton EA and that all equipment operates at the most northerly point of the Modification extension area, the Modification will result in the following:

- A maximum increase of approximately 0.2 $LA_{eq,15min}$ at receiver 42 to result on a maximum noise level of 32 $LA_{eq,15min}$, which is within the adopted noise criterion (35 $LA_{eq,15min}$); and
- No change or a decrease in the range of 0.1 – 0.7 $LA_{eq,15min}$ to the mining noise from Drayton Mine as proposed by MOD 3 at all other receivers when compared to the assessment of noise impacts in the Drayton EA and the Drayton Modification EA and the noise limits required by PA 06_0202.

An assessment of the change in noise effects from the operation of Drayton Mine due to changes in the truck fleet at Drayton was also undertaken to understand any changes to noise impacts. Drayton's existing 180 tonne trucks are fitted with upgraded exhaust silencers following a commitment in the Drayton EA. On-site noise measurement results provided by Spectrum Acoustics in 2008 indicate a truck sound power level of 116.7 dBA averaged over six machines and averaged over both uphill and downhill operation.

Calculations in the noise assessment (**Appendix B**) indicate the approved truck fleet is actually 0.4 dBA quieter than assumed in the Drayton EA while the MOD 3 proposed truck fleet (with more trucks) would be 0.1 dBA louder (cumulatively) than assessed in the Drayton EA. An increase of 0.1 dBA in truck fleet noise would apply with the fleet working in the operation of Drayton Mine as proposed by MOD 3 which is considered too small for residents or noise survey equipment to detect.

Therefore, no significant additional noise impacts are predicted to result from the operation of Drayton Mine as proposed by MOD 3, as compared to the operation of Drayton Mine presently approved under PA 06_0202. **Appendix B** provides a detailed table of predicted noise levels from the operation of Drayton Mine as proposed by MOD 3 compared to the predicted noise levels of Drayton Mine as reported part of the Drayton EA.

Drayton will continue to manage its operations to ensure that the operation of Drayton Mine as proposed by MOD 3 will comply with the noise criteria listed in the PA 06_0202.

As the Modification Areas are at a similar distance from closest receivers, vibration and overpressure levels from blasting would be similar to those from adjacent mining areas approved in PA 06_0202.

The blasting of overburden material and coal required for the Modification extension area will continue to be conducted as approved under the Drayton EA. Drayton currently has a network of blast monitors in place within the Antiene residential area north east of the EA Boundary as shown on **Figure 3**, which is used to provide reporting on ground vibration and overpressure levels for each blast event.

This existing monitoring network will continue to be utilised for the operation of Drayton Mine as proposed by MOD 3 in accordance with the approved Blast Management Plan (Anglo Coal, 2008) to ensure the implementation of appropriate blast designs that will minimise the potential for any exceedances of noise and vibration criteria.

The operation of Drayton Mine as proposed by MOD 3 is assessed to produce noise levels and blasting impacts within those currently approved under PA 06_0202 and currently resulting from Drayton Mine. Drayton Mine, as proposed by MOD 3 will continue to operate in accordance with the noise management and mitigation measures described in the Drayton EA and listed in PA 06_0202.

Drayton will continue to manage noise and blasting impacts in accordance with the SHECMS, approved Blast Monitoring Program, Noise Monitoring Program and mitigation measures outlined in the Drayton EA which are managed and implemented by PA 06_0202.

Drayton will continue to notify residents of pending blasting events as requested. Drayton will also continue to plan blasting activities in liaison with the Mt Arthur Coal Complex to minimise cumulative impacts on their neighbours.

7.3 GROUNDWATER

The proposed extension of the Approved Mining Disturbance Footprint and the revision of the conceptual final landform proposed by MOD 3 will not result in any significant additional impacts to the groundwater systems surrounding Drayton in addition to those resulting from the operation of Drayton Mine as currently approved under PA 06_0202 and considered in the Drayton EA.

The existing groundwater monitoring network in place at Drayton as displayed in **Figure 3** would not be affected by the modified operation of Drayton Mine and will not need to be expanded or adjusted to fulfil its objectives.

Groundwater monitoring and management will continue to be undertaken at Drayton consistent with the management commitments of the SHECMS and as required by the Drayton Water Management Plan under PA 06_0202.

As required by PA 06_0202, and as committed to in the Drayton EA, Drayton holds all the necessary licences, authorities and approvals under the Water Act and the WM Act for the operation of the Drayton mine as authorised by PA 06_0202. As it has been determined that the modified operation of the Drayton Mine will not have any different effect on the groundwater regime when compared to the effects of the Drayton mine as presently approved and operating, no additional licences, authorities or permits will be required under those Acts.

7.4 SURFACE WATER

A surface water study has been carried out by WRM Water & Environment to determine the impacts of the proposed modified operation of the Drayton Mine on the surface water environment and surrounds. This report is presented in **Appendix D**.

7.4.1 Methodology

A computer-based simulation model (OPSIM) was used to assess the dynamics of the site water balance under conditions of varying rainfall and catchment conditions. The model has been configured to simulate the operations of all major components of the water management system including:

- Climatic variability – rainfall and evaporation;
- Catchment runoff and collection;
- Pit dewatering;
- Pump and gravity transfers;
- Water storage filling, spilling and leaking;
- Industrial water extraction, usage and return; and
- Controlled and uncontrolled releases.

The calibrated model was used to assess the impact of the operation of Drayton Mine as proposed by MOD 3 on the mine site water balance over the final five years of mine life (2012 to 2016) assuming the mine site catchments change over that time.

Greater detail of the model design and its assumptions is provided in **Appendix D**.

7.4.2 Results

The model assessed the cumulative off-site water requirements for the modified Drayton Mine for 50th Percentile (median) conditions over the next five years as well as the 90th (dry) and 10th (wet) percentile confidence limits of the estimate. The results show the following:

- No off-site water would be required for the 10th percentile wet year;
- Under median rainfall conditions, some off-site water may be required. A total of 200 ML/yr would need to be sourced externally over the last two years of the life of the mine; and
- Under 90th percentile (dry) conditions, off site water supplies would be required from 2014 with a total of 350 ML/yr required over the remaining life of the mine.

It should be noted that the OPSIM model has considerable conservatism built into it as the model assumed full production (8 Mtpa ROM) until the end of the mine life and conservative industrial usage and haul road suppression requirements at this production rate. However, it is likely that Drayton will curtail operations towards the end of the mine life and reduce usage demands accordingly.

Nonetheless, any required make-up water will be sourced from the Drayton West Pit void, adjacent mines or power stations. Appropriate additional water licences would be sourced if required. In the unlikely event that sufficient water is not available, coal beneficiation will be modified or curtailed. Further, Drayton may utilise dust suppressants to reduce the industrial usage and haul road suppression requirements and further investigate the use of flocculants to increase tailings water recovery.

The OPSIM model also assessed the possibility of controlled and uncontrolled discharges. The model found that Drayton should investigate options to ensure no uncontrolled discharges from the Rail Loop Dam.

Surface water monitoring and management will continue to be undertaken at Drayton consistent with the management commitments of the SHECMS and as required by the Drayton Water Management Plan under PA 06_0202.

7.5 SPONTANEOUS COMBUSTION

The operation of Drayton Mine as proposed by MOD 3 will be carried out in a manner consistent with current approvals and methods, targeting five seams within the Greta coal measures, which are known to be susceptible to spontaneous combustion.

Drayton has implemented a range of measures for the management of spontaneous combustion on site in accordance with the SHECMS and a Spontaneous Combustion Management Plan. These techniques for the management of spontaneous combustion will continue to be used for the modified operation of Drayton Mine.

In accordance with Drayton EPL 1323 and regulatory reporting requirements under PA 06_0202, Drayton will continue to provide regular reports to OEH on the extent of spontaneous combustion and on the methods being implemented to reduce occurrences of spontaneous combustion and their respective effectiveness.

Further, the revised final landform and mine closure plan (see **Section 3**) ensures that all overburden or coal seams which are prone to spontaneous combustion are covered with an inert material and adequately capped to prevent future heating after mine closure.

The existing Spontaneous Combustion Management Plans required under PA 06_0202 will continue to apply to the modified operation of the mine and is considered to be appropriate for the proper and effective management of spontaneous combustion.

7.6 VISUAL

The Drayton EA assessed the visual impacts associated with the mine plans approved under PA 06_0202. This assessment was reviewed for the proposed modification of Drayton Mine to determine the potential for any changes to visual impacts at surrounding visual receivers in addition to those currently experienced as a result of the approved mining operations at Drayton.

The Eastern Modification Area will not be visible to private receivers due the existing topography, tree screening and existing infrastructure. The Southern Modification Area will not be visible to any private receivers.

The Northern Modification Area will be visible along Thomas Mitchell Drive, consistent with the North Pit visual impacts as approved in the Drayton EA. The Thomas Mitchell Drive viewing location from the Drayton EA was re-assessed to quantify if any additional visual impacts would result from the proposed modification of Drayton Mine. The assessment demonstrates a minimal visual impact from the proposed modification of Drayton Mine when compared to results from operations as approved in PA 06_0202 and as described in the Drayton EA.

As reported in the Drayton EA, it is anticipated that dense vegetation and undulating topography will continue to screen the majority of the receivers in the rural residential areas to the north and north-east from the operation of Drayton Mine as proposed to be modified.

All visual and lighting impacts created by Drayton will continue to be managed in accordance with the SHECMS.

The existing management plans under PA 06_0202 will continue to apply to the modified operation of the mine and are considered to be appropriate for the proper and effective management of visual issues related to the proposal.

7.7 ECOLOGY

An ecological assessment of areas proposed for vegetation clearing as a result of MOD 3 was undertaken by Cumberland Ecology and is included in **Appendix C**. This assessment included:

- A review of the baseline ecological information that exists for the proposed disturbance area and offset areas as presented in the Drayton EA;
- Database analysis of both Commonwealth and State listed threatened flora and fauna species in the local area; and
- A site inspection by Cumberland Ecology in September 2011, including both flora and fauna investigations, to confirm the current condition of the Modification areas.

No threatened flora species have been recorded in the areas proposed for clearing as a result of MOD 3 and none are considered likely to occur within the vicinity. Habitat within the areas proposed for clearing as a result of MOD 3 are considered unsuitable for the target threatened species due to the degraded nature of the grassland, a high level of disturbance caused by past clearing and surrounding mining activities, the impacts of grazing by native and exotic herbivores and significant weed infestation.

No species listed by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were assessed as being likely to make significant use of the areas proposed for disturbance by MOD 3 and the vegetation of this area does not conform to any threatened listing under the EPBC Act.

The area proposed for disturbance by MOD 3 contains 0.44 ha of degraded Hunter Lowland Redgum Forest (HLRF) regrowth adjacent to the Industrial Dam in the Eastern Modification Area, which is listed as an Endangered Ecological Community (EEC) under the NSW *Threatened Species Conservation Act 1995* (TSC Act). The removal of such a small patch of modified regrowth is not considered likely to result in a significant impact to the local occurrence of the EEC. Further, an area of 88 ha to the south-west of the Drayton Wildlife Refuge that is being protected for conservation as a consequence of a commitment in the Drayton EA also contains areas of high quality HLRF and other related forest and woodland types. This area will also assist in ensuring the long term sustainability of the HLRF.

The ecological assessment determined that the proposed Modification areas consisted of the following:

- 0.44 ha of HLRF regrowth;
- 1.24 ha of low quality Acacia vegetation;
- 17.5 ha of various low quality and highly modified open grassland communities; and
- 17 ha of disturbed areas (including the Industrial Dam).

Considering the existing offset areas and existing native vegetation, there are large areas of habitat remaining in the locality for fauna species likely to utilise the Modification extension area. The removal of a small area of degraded vegetation for the Modification is not anticipated to negatively affect these species.

To address the impacts upon HLRF, future rehabilitation of the Modification areas will include woodland species rather than Rhodes Grass and other exotic herbaceous plants. In particular, the rehabilitation will include at least 1.3 ha (3:1 ratio) of HLRF trees, shrubs, herbs and grasses.

The Industrial Dam is considered unlikely to support any aquatic fauna such as fish or amphibians due to the poor quality of the water. As it is a mine water dam, the chemical composition, acidity, turbidity and oxygen levels of water in the dam are likely to be unsuitable for aquatic fauna. Also, the dam lacks fringing vegetation that could provide suitable shelter.

No significant impacts are predicted to occur to threatened amphibians or aquatic environments as a result of the Modification, however, a drainage protocol for aquatic fauna will be prepared and implemented to protect aquatic fauna and water fowl that might be impacted by the drainage of the dam and to relocate them safely offsite where necessary.

Drayton will continue to manage flora and fauna in accordance with the SHECMS and approved Flora and Fauna Management Plan required under PA 06_0202.

The existing management plans under PA 06_0202 will continue to apply to the modified operation of the mine and are considered to be appropriate for the proper and effective management of ecological issues related to the proposal.

7.8 ABORIGINAL ARCHAEOLOGY AND CULTURAL HERITAGE

The Aboriginal archaeological impact assessment for the Drayton EA identified a number of sites within and surrounding the EA Boundary. The approved Drayton *Aboriginal Cultural Heritage Management Plan* (ACHMP) established mechanisms for the salvage and excavation of all Aboriginal sites identified within or adjacent to the Approved Mining Disturbance Footprint.

The Drayton EA identified Aboriginal heritage sites within the proposed North Pit (called the Ramrod area) and the South Pit extension areas (called the Delpah area). Archaeological Risk Assessment Services (ARAS) completed a salvage of all Aboriginal sites identified within and adjacent to the Approved Mining Disturbance Footprint in July 2010. This included the Modification Areas.

As the areas proposed for disturbance due to MOD 3 have been previously cleared for Aboriginal archaeology, no impacts or management processes due to the proposed modification of Drayton Mine are required. Consistent with the ACHMP, Drayton will implement its procedures should any unidentified sites of Aboriginal heritage be found.

7.9 NON-ABORIGINAL HERITAGE

An assessment was undertaken for the Drayton EA to identify any non-Aboriginal heritage items remaining within the EA Boundary and to determine the potential for impacts to these sites due to that Project (Veritas Archaeology & History Service, 2005).

A review of this assessment found that none of the non-Aboriginal heritage sites previously identified at Drayton are located in the vicinity of the areas proposed for disturbance as the result of the modified operation of the Drayton mine. As such, no additional management or mitigation measures will be required.

7.10 TRAFFIC AND TRANSPORT

As stated in **Section 3**, the operation of Drayton Mine as proposed by MOD 3 will be undertaken generally in accordance with those described in the Drayton EA and approved under PA 06_0202, with no increase in road or rail traffic movements sought.

Therefore, no impacts to the transport networks surrounding the EA Boundary will result from the Modification.

7.11 SOCIO-ECONOMICS

The Modification will not result in any increase in the maximum coal extraction rate, life of mine, or the level of employees in addition to those approved under PA 06_0202. Therefore, no negative socio- economic impacts will result from the Modification.

The extraction of the remnant coal will result in additional royalty and other payments to both the Federal and NSW State governments.

The operation of the Drayton Mine as proposed by MOD 3 will result in the increased recovery of the in situ coal resource at Drayton Mine, using the existing infrastructure and methods of operation without any significant change to social impacts and environmental effects.

The recovery of this coal, that would otherwise not be recovered and thereby sterilised, will produce additional royalty income for the State of New South Wales that would otherwise not be received.

Whilst no increase in the approved life or annual production rate of Drayton Mine is proposed, the recovery of this additional coal will proportionately extend the employment and flow on benefits for the community.

The recovery of this additional coal will be achieved with the existing infrastructure thus optimising the return for the community on the already expended capital.

7.12 WASTE AND HAZARDOUS MATERIALS

Drayton has a comprehensive Waste, Overburden and Hazardous Materials Management System in place which addresses all issues relevant to the management of waste and hazardous materials from its operations.

The current waste management measures in place at Drayton will continue to be utilised as no additional demands will be created by the modified operation of Drayton Mine.

7.13 REHABILITATION AND FINAL LANDFORM

In accordance with current practice at Drayton and its SHECMS, the rehabilitation of land disturbance associated with the modified operation of Drayton Mine will be undertaken progressively as an integral component of mining operations. Progressive rehabilitation is scheduled to take place as soon as practical after mining disturbance is completed.

As discussed in **Section 3**, the Modification Areas are integrated into the continuing mine plans and the revised final landform and mine closure plan for the site. The revised final landform and mine closure plan will result in a more sustainable landscape consistent with the *Department of Mineral Resources Synoptic Plan (1999)* that aims to link existing woodland with rehabilitation areas to provide corridors for the movement of flora and fauna.

8 STATEMENT OF COMMITMENTS

Management commitments to be implemented for the Modification in addition to those already made in respect of PA 06_0202 are listed in **Table 4**.

Table 4
Statement of Commitments

Ref	Description	EA Section
1.	The existing SHECMS will continue to be used for the management, mitigation and monitoring of environmental issues at Drayton	2.3
2.	Drayton will continue to manage its operations (including the Modification) to meet the currently approved Project-specific noise criteria listed in PA 06_0202	7.2
3.	Future rehabilitation of the Modification areas will include woodland species, rather than Rhodes Grass and other exotic herbaceous plants. The rehabilitation will include at least 1.3 ha (3:1 ratio) of Hunter Lowland Redgum Forest trees, shrubs, herbs and grasses	7.7
4.	A drainage protocol for aquatic fauna will be prepared and implemented to protect aquatic fauna that might be impacted by the drainage of Industrial Dam and to relocate them offsite where necessary	7.7

9 JUSTIFICATION

The modified operation of Drayton Mine involves the incorporation of an additional three small areas into the Drayton mine plan. This would be achieved by the same mining methods and scheduling, with the same workforce, using the same existing infrastructure, at no greater production rates than are already approved within the life of Drayton Mine as provided in PA 06_0202.

MOD 3 seeks approval to mine minor extension areas of the Approved Mining Disturbance Footprint which will be undertaken in accordance with the approved open cut mining activities at Drayton. This will allow the extraction of an identified coal resource in a small area adjacent to Drayton's Approved Mining Disturbance Footprint that would otherwise be sterilised. The extension areas being within and adjacent to the currently approved mining area will allow Drayton to effectively integrate them with the existing mine plan, mining method and schedules and include those areas in a conceptual rehabilitation and final landform design for the site to meet current requirements and standards and achieve more sustainable and satisfactory outcomes than are provided for in the existing approvals..

MOD 3 will be undertaken in areas suitable for mining activities located in an area of disturbed and fragmented vegetation adjacent to existing Drayton Mine infrastructure and mining operations. The environmental assessment of the modified operation of Drayton Mine have confirmed that the impacts from the activities described in this EA are minor in nature and are consistent with those already approved by PA 06_0202 and as described in the Drayton EA. Generally the result would be that the modified mining operations would be capable of being conducted under the conditions already comprised within PA 06_0202 and the management plans implemented under that approval.

The operation of the Drayton Mine as proposed by MOD 3 will result in the increased recovery of the in situ coal resource at Drayton Mine using the existing infrastructure, mining methods and operation and without any change to social impacts and environmental effects.

The recovery of this coal, which would otherwise not be recovered and thereby sterilised, will produce additional royalty income for the State of New South Wales that would otherwise not be received.

The recovery of this additional coal will be achieved with the existing infrastructure thus optimising the return for the community on the already expended capital.

The maximisation of the coal recovery from existing infrastructure with minimal additional environmental impacts and no additional social costs, along with increasing the economic benefits for the community, appropriately addresses the principles of 'ecologically sustainable development' and addresses appropriately the 'objects' of the EP&A Act.

10 ABBREVIATIONS

Abbreviation	Description
ACHMP	Aboriginal Cultural Heritage Management Plan
Anglo American	Anglo American Metallurgical Coal Pty Limited
CCC	Community Consultative Committee
CL	Coal Lease
DP&I	NSW Department of Planning and Infrastructure
Drayton EA	Drayton Mine Extension Environmental Assessment (Hansen Bailey, 2007)
DTIRIS-MR	Department of Trade, Investment, Regional Infrastructure & Services– Mineral Resources
EA	Environmental Assessment
EEC	Endangered Ecological Community
EMP	Environmental Management Program
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPL	Environmental Protection Licence
ESD	Ecologically Sustainable Development
ERA	Environmental Risk Assessment
ha	hectare
HLRF	Hunter Lowland Redgum Forest
LA _{eq}	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period
LEP	Local Environment Plan
ML	Mining Lease
MOD 1	Drayton Mine Project Approval Modification Environmental Assessment (Hansen Bailey, 2009)
MSC	Muswellbrook Shire Council
Mtpa	Million tonnes per annum
NOW	NSW Office of Water
OEH	Office of Environment and Heritage
PA	Project Approval
Receiver	Property adjacent the EA Boundary containing a residence
SEPP	State Environmental Planning Policy
SHECMS	Safety, Health, Environment and Community Management System
TSC Act	<i>NSW Threatened Species Conservation Act 1995</i>

11 REFERENCES

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APPENDIX A
Air Quality Impact Assessment

31 January 2012

Melissa Walker
Hansen Bailey Pty Ltd
Via email: mwalker@hansenbailey.com.au

Re: Drayton Industrial Dam Modification - Air Quality Assessment

Dear Mel

It is understood that Drayton is preparing a minor Modification to extend its operations into three small areas collectively known as the Modification Areas. This letter provides an assessment of the potential for air quality impacts due to the proposed Modification.

1 INTRODUCTION

The specific details of the Modification are as follows:

- The Modification to Drayton's existing Project Approval 06_0202 will be sought under Section 75W of the *Environmental Planning and Assessment Act 1979*.
 - The proposed Modification is 36.5 ha additional disturbance than that approved (as shown on **Figure 1**). This is comprised of:
 - 8.8 ha additional disturbance for the Northern Modification Area
 - 7.4 ha additional disturbance for the Southern Modification Area Pit; and
 - 20.3 ha additional disturbance for the Eastern Modification Area.
- All Modification areas have been previously disturbed due to mining operations and rehabilitated.
- The proposed Modification represents an additional 7.7% disturbance to that approved.
 - Active mining will not be closer to private residences than that approved.
 - No increase in production levels, employee numbers or extension of mine life are proposed.
 - The Modification areas were surveyed in the 2007 Drayton Extension EA.
 - Drayton has approval for 14 X 280t trucks and 11 x180t trucks. They do not have any 280t trucks and need approval for use of 30 x180t trucks.

The air quality effects of the Drayton Extension were considered in detail in a report prepared in 2007 (**Holmes Air Sciences, 2007**). In 2009, a review of the potential air quality impacts was completed for a Modification to increase the approved mining disturbance footprint by 8 ha (**Hansen Bailey, 2009**). The approach taken is this assessment follows the same process as the 2009 Modification, as detailed in **Section 2**.

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2 ASSESSMENT

2.1 Introduction

The Drayton EA air quality assessment analysed Drayton's operations for three years - Years 1, 5 and 10. Model predictions of the maximum 24-hour PM₁₀, annual average PM₁₀, annual average TSP and annual average dust (insoluble solids) deposition levels were provided for each of these years for both Drayton considered in isolation and Drayton considered with other sources of dust, i.e. a cumulative assessment.

The air quality assessment completed for the Drayton EA identified the area of land that would experience particulate matter concentration and deposition levels above the impact assessment criteria defined by Office of Environment and Heritage (OEH) for PM₁₀, TSP and dust (insoluble solids) deposition.

This assessment makes use of information provided in the Drayton EA air quality assessment and the 2009 Modification to show that the area of land affected by the Modification (with respect to air quality) does not expand beyond the area already identified in the Drayton EA.

In order to ascertain this, a number of steps were completed:

- (1) A review of the meteorological conditions in the area;
- (2) A comparison of the locations of dust generating activities required to increase the disturbance areas compared with the locations of equivalent dust sources in Years 1, 5 and 10 considered in the Drayton EA; and
- (3) A reviewing of the areas identified to be impacted during Years 1, 5 and 10 in the Drayton EA.

Presented in **Section 2.2**, is a review of the location of the dust generating activities in relation to the dust sensitive areas (residences located generally to the north of the mine), and consideration of the prevailing wind directions.

2.2 Meteorology

Figure 2 shows annual and seasonal wind roses for the area prepared from the hourly meteorological data used in the Drayton EA (**Holmes Air Sciences, 2007**). Over the year, winds are predominantly aligned along a northwest-southeast direction, with winds in summer and autumn being mostly from the southeast. In winter and spring winds are more frequently from the northwest although southeast winds are still a significant feature in the wind roses.

If **Figure 1** is inspected, it can be seen that for dust to be transported from the proposed Modification areas towards any of the residences to the north it would require the wind to be from the following sectors:

- Northern Modification Area (marked red on **Figure 1**):
 - in the 60°-wide sector from 195° clockwise to 255°. Thus winds in the sectors SSW, SW and WSW are required to transport dust from the Northern Modification Area to the residences.
- Eastern and Southern Modification Areas (marked red on **Figure 1**):
 - in the 50°-wide sector from 160° clockwise to 210°. Thus winds in the sectors SSE, S, and SSW are required to transport dust from the Eastern and Southern Modification Areas to the residences.

Table 1 shows an analysis of the 1996 meteorological data set as used in the Drayton EA assessment. The relevant directions are shown in bold print. The table shows that over the year approximately 5.9% of winds lie in the three sectors (SSW, SW and WSW) relevant to the Northern Modification Area and approximately 7.7% of winds lie in the three sectors (SSE, S and SSW) relevant to the Eastern and Southern Modification Areas.

A more detailed analysis of the data confined to the precise sectors for the Northern Modification Area (defined by "195° clockwise to 255°") and for the Eastern and Southern Modification Areas (defined by "160° clockwise to 210°") show only 381 and 262 hours, respectively, of the 7080 hours of valid data in the 1996 dataset were in the direction that would carry dust from the new mining area to the residences. This is 5.4% (Northern Modification Area) and 3.7% (Eastern and Southern Modification Areas) of hours in the year.

This analysis indicates that, given the prevailing winds, the Modification Areas are very favourably located in relation to the nearby residences and very little of the dust liberated while working in this area would be transported towards the residential area of Antiene.

Table 1: Analysis of winds for Drayton area showing fractional occurrence of winds in indicated wind direction and wind speed classes

ALL PASQUILL STABILITY CLASSES									
Wind Speed Class (m/s)									
WIND SECTOR	0.50 TO 1.50	1.50 TO 3.00	3.00 TO 4.50	4.50 TO 6.00	6.00 TO 7.50	7.50 TO 9.00	9.00 TO 10.50	GREATER THAN 10.50	TOTAL
NNE	0.036864	0.026554	0.001977	0.000424	0.000282	0.000141	0.000000	0.000000	0.066243
NE	0.024294	0.009040	0.000565	0.000141	0.000000	0.000000	0.000000	0.000000	0.034040
ENE	0.012712	0.002966	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.015678
E	0.008757	0.007203	0.001554	0.000424	0.000282	0.000000	0.000000	0.000000	0.018220
ESE	0.010734	0.026695	0.019915	0.015819	0.008192	0.002825	0.000565	0.000141	0.084887
SE	0.010734	0.025424	0.064831	0.073305	0.051977	0.021186	0.004520	0.000847	0.252825
SSE	0.008475	0.007486	0.011158	0.011582	0.006921	0.003107	0.000424	0.000000	0.049153
S	0.007910	0.004661	0.000847	0.000000	0.000424	0.000000	0.000000	0.000000	0.013842
SSW	0.009887	0.002825	0.000424	0.000282	0.000141	0.000000	0.000141	0.000000	0.013701
SW	0.011158	0.003955	0.000424	0.000282	0.000424	0.000141	0.000000	0.000000	0.016384
WSW	0.014407	0.010452	0.002260	0.000989	0.000847	0.000141	0.000141	0.000000	0.029237
W	0.012429	0.015254	0.008051	0.005367	0.004237	0.002684	0.003107	0.001412	0.052542
WNW	0.013701	0.015960	0.016243	0.021751	0.015395	0.011299	0.005367	0.002401	0.102119
NW	0.019915	0.018927	0.021610	0.013701	0.007345	0.002542	0.001130	0.000706	0.085876
NNW	0.022175	0.024153	0.013701	0.006356	0.005367	0.001554	0.000706	0.000424	0.074435
N	0.032627	0.036582	0.013842	0.004944	0.001836	0.000847	0.000141	0.000000	0.090819
CALM									0.000000
TOTAL	0.256780	0.238136	0.177401	0.155367	0.103672	0.046469	0.016243	0.005932	1.000000
MEAN WIND SPEED (m/s) = 3.59									
NUMBER OF OBSERVATIONS = 7080									

2.3 Comparison of proposed mining in the Modification area with areas covered in previous modelling work

When the original Drayton EA air quality impact report is reviewed, it is easy to see that of the three years modelled, it is Year 10 that is the most relevant year for assessing the effects of mining in the Modification areas.

Figure 3 shows the locations of mining equipment as envisaged in Year 10 (see **Holmes Air Sciences (2007)**) and the predicted annual average PM₁₀ concentrations for the same year and

equipment deployment. The numbered dots on the figure denote the locations of dust generating equipment over Year 10.

With respect to the Northern Modification area, the dots numbered 17 to 21 show working positions for the shovel/excavator in the northern pit.

With respect to the Eastern Modification area, the dots numbered 26 to 27 show working positions for the haulage of ROM coal and rejects, and the handling of ROM coal at stockpiles.

In the Drayton EA assessment this scenario (Year 10) showed no exceedences of any of the OEH's impact assessment criteria at the privately owned residences to the north. This approved scenario envisages mining equipment located closer to the residences than will be required when the Northern and Eastern Modifications are undertaken.

Assuming mining takes place at the same rate (i.e. coal and overburden are generated at the same rate) then a good indication as to the likely effects of dust emissions from the Modification Areas can be obtained by sliding the contours and numbered source location markers to the southeast. To represent the effects when activity is taking place in the Northern Modification Area, the dot marked 17 should be located slightly south west in the Northern Modification Area. To represent the effects when activity is taking place in the Eastern Modification Area, the dots marked 26 and 27 should be located in the Eastern Modification Area. . To represent the effects when activity is taking place in the Southern Modification Area, the dot marked 2 would be located slightly south. The other dots would retain their same relative position as should the contours. If this is done it can be seen that no residences would experience higher predicted annual average PM_{10} levels than would arise in Year 10. If this is the case for annual average PM_{10} concentrations then it can be concluded that this will also apply to the contours for the other assessment criteria.

2.4 Change to overburden truck capacity

In the Drayton EA assessment, it was assumed that overburden trucks would have a carrying capacity of 280 tonnes per load (t/load). The actual capacity of the overburden trucks in use is 180 t/load.

The use of 180 t trucks increases the total emissions from year 10 operations by approximately 11%. However it is our experience that the change in impacts is not directly proportional to the increase in emissions. Further, even if it were, an 11% increase in impacts would still not result in any exceedence of the OEH's impact assessment criteria.

3 CONCLUSIONS

This report has assessed the effects on air quality of additional disturbance at Drayton Mine and the use of 180t trucks for overburden transport. Previous air quality impact assessment work undertaken as part of the Drayton EA examined the effects of mining for three scenarios in Years 1, 5 and 10. A review of meteorological conditions indicates that, given the prevailing winds, the Modification Areas are favourably located relative to the nearby Antiene residential area. A review of the modelling results for Year 10 shows that there would be no predicted exceedences of the OEH's assessment criteria at the nearby privately owned residences as a result of the Modification. This conclusion of course assumes that mining methods, other mining equipment (excluding the assessed change in the change to overburden trucks) and the rate of coal and overburden production in the Modification Area are similar to the levels assumed for Year 10.

4 REFERENCES

Hansen Bailey (2009)

"Appendix B. Air Quality Impact Assessment. Drayton Mine. Project Approval Modification Environmental Assessment" prepared for Anglo Coal (Drayton Management) Pty Limited. July 2009.

Holmes Air Sciences (2007)

"Air Quality Impact Assessment: Extension of Drayton Open Cut Mine" Prepared for Hansen Bailey by Holmes Air Sciences, Suite 2B, 14 Glen Street, Eastwood, NSW 2122 (also published as Appendix E to the EA).

Please do not hesitate to contact me should you require any further information.

Kind regards



Judith Cox
Senior Air Quality Engineer

FIGURES



Figure 1: Modification overview

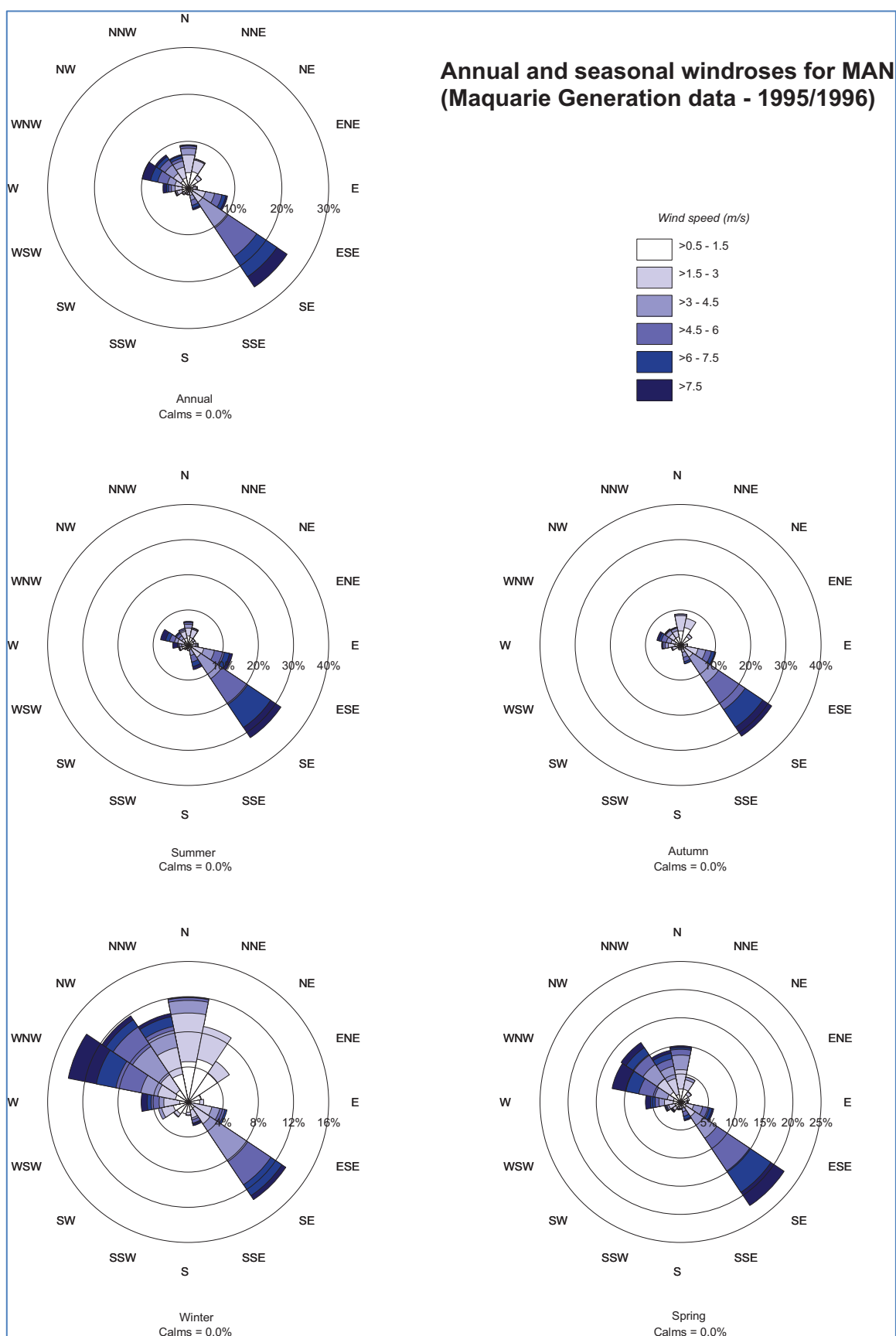


Figure 2: Annual and seasonal windroses of meteorological data used in EA

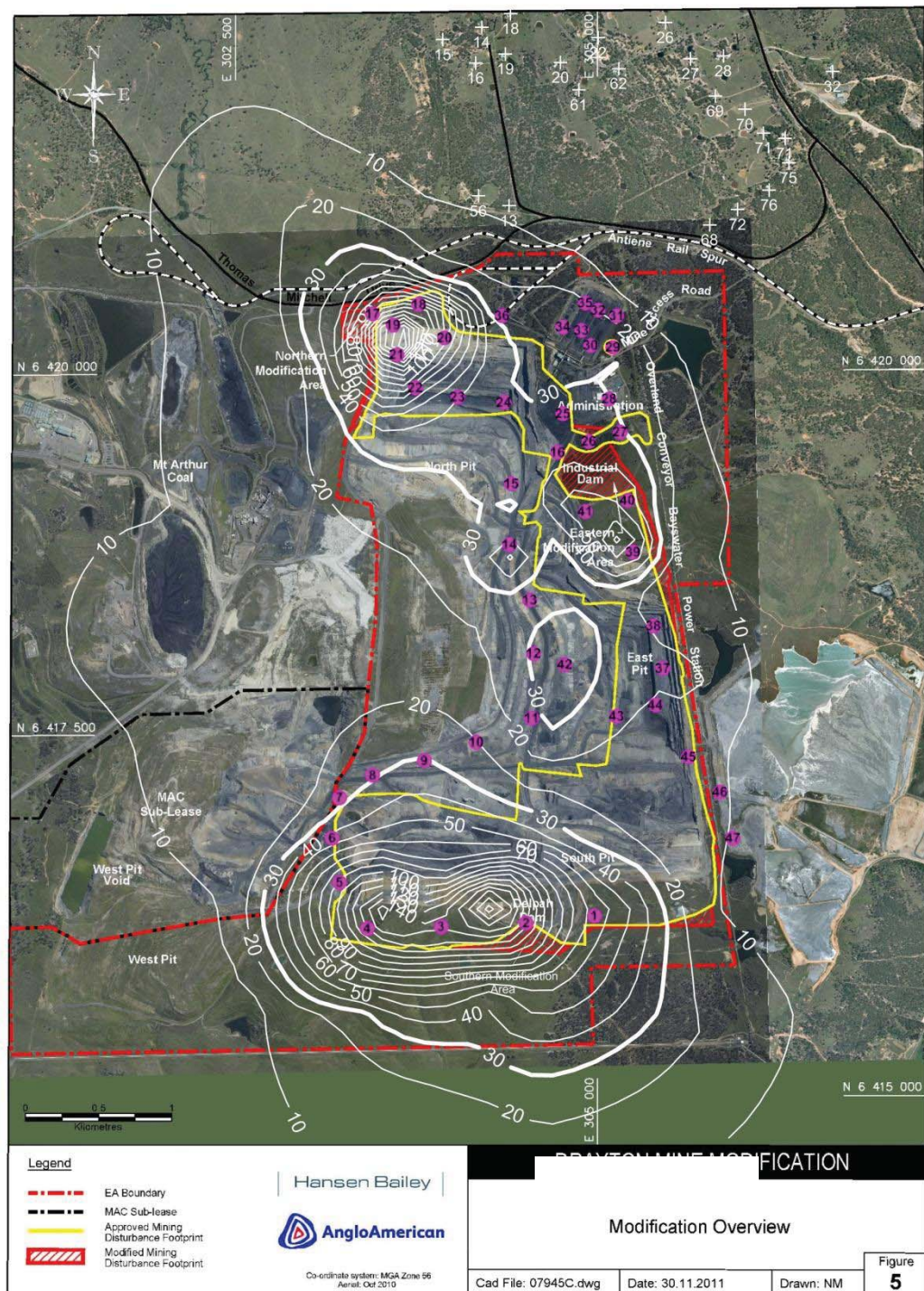


Figure 3: Location of dust sources in Year 10, resulting annual average PM_{10} concentration ($\mu g/m^3$) and the location of new disturbance areas

APPENDIX B

Noise Impact Assessment

3 January 2012
Ref: J0130-51-L3

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SINGLETON NSW 2330

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PATERSON NSW 2421

Phone : (02) 4938 5866
Mobile: (0407) 38 5866

E-mail: bridgesacoustics@bigpond.com

Attn: Mr Daniel Sullivan

Dear Daniel,

**RE: DRAYTON MINE –
MODIFICATION TO DEVELOPMENT CONSENT
ENVIRONMENTAL NOISE REVIEW**

Thank you for your instructions to review environmental noise issues associated with the proposed Modification to the Drayton Mine Project Approval 06_0202. The Modification is sought to allow a 36.5 hectare extension of the Approved Mining Disturbance Footprint to recover an additional 2 million tonne remnant coal resource and to provide additional working room to develop more sustainable final highwalls. This review is based on the following data:

- Drayton Mine Extension Environmental Assessment (Hansen Bailey, August 2007);
- A plan of the existing approved and the proposed disturbance areas (Hansen Bailey, October 2011) attached as Appendix A;
- A terrain file in Autocad format showing the anticipated final landform within the proposed disturbance area; and
- A description of the proposed Modification (Hansen Bailey, November 2011).

CURRENTLY APPROVED MINE

Anglo American Metallurgical Coal (AAMC) currently operates Drayton Mine under Project Approval 06_0202 granted on 1 February 2008, which allows up to 8 million tonnes of Run of Mine (ROM) coal to be extracted each year until 2017. The mine uses a combination of dragline and truck/shovel operations to uncover and extract coal from mining areas in the northern, southern and eastern portions of the lease. The existing Project Approval includes a number of conditions to control the operation and protect the environment, including intrusive noise criteria at a number of residential receivers in Antiene located generally north of the site.

The Environmental Assessment prepared in 2007 described a number of noise control measures that were adopted by AAMC to minimise environmental noise levels at nearest residential properties. Adopted noise control measures were primarily designed to control noise from the North Pit and the Coal Handling and Preparation Plant (CHPP) and included:

- Only one loading unit (excavator or front end loader) would work in the North Pit during the evening or night, primarily to minimise exposed truck movements associated with overburden or coal haulage from the North Pit;
- North and East Pit overburden trucks would dump in shielded locations during the evening and night;

- North Pit prestrip haul roads would be shielded by the pit walls or a berm in the direction of residences, at least during the evening and night;
- Loading units within the North Pit prestrip area would be located in a shielded area below the natural surface during the evening and night;
- The coal haul road from the South Pit would be realigned to the lowest possible elevation, with minimal long straight sections of road directly in line with a residence and effective shielding with earth berms along the sides of the road where possible;
- The proposed ROM stockpile south of the workshop would have a 5 m wall or equivalent berm on the northern side and returned along part of the eastern and western sides to minimise noise from the loader and trucks working on the stockpile;
- A 4 m berm and/or wall would be constructed along the eastern side of the coal haul road from the ROM stockpile to meet the existing ROM hopper wall, including returns along side roads to minimise the effect of gaps in the barrier;
- A sound power limit of 103 dBA each for the three new reclaimers and one ROM coal stacker;
- Steel sheeting would be installed on the northern face of the secondary crusher building after removal of the rotary breaker and installation of the new screen and crusher; and
- Upgraded exhaust mufflers on some trucks with the exception of the South Pit overburden fleet.

PROPOSED MODIFICATION

Drayton proposes to extend its operations into three small areas collectively known as the Modification Areas, as shown on Figure 1 in Appendix A, including the:

- Eastern Modification Area, which includes 20.3 ha or 4.2% additional disturbance to the Approved Mining Disturbance Footprint;
- Northern Modification Area, which includes 8.8 ha or 1.8% additional disturbance to the Approved Mining Disturbance Footprint; and
- Southern Modification Area, which includes 7.4 ha or 1.5% additional disturbance to the Approved Mining Disturbance Footprint.

AAMC is also seeking approval to modify the approved equipment fleet to utilise 30 x 180 tonne trucks (instead of the previously proposed 25 trucks of 180 tonne and 280 tonne capacity) due to operational constraints.

No other changes to Drayton Mine's operations, production limits or approved mine life are proposed. The Modification would be developed generally in accordance with Project Approval 06_0202.

NOISE ASSESSMENT

Proposed Modification Areas

Inspection of the terrain between the Modification area and closest privately owned properties indicates similar terrain features, with the Northern Modification Area at a similar elevation as the adjoining approved mining area and the Eastern and Southern Modification Areas at a lower elevation than adjacent areas. Differences in terrain would therefore not affect, or would if anything reduce, noise levels from the Modification Areas compared to noise from adjacent mining areas.

In the absence of any other differences, any changes in noise level due to the Modification would primarily be due to variations in distance from the existing approved area and the Modification Areas to each receiver property.

The noise assessment included in the Drayton Mine Extension Environmental Assessment (2007) included tables of predicted noise levels to nearby receiver properties under acoustically neutral and prevailing weather conditions. Table 11 from that noise assessment, showing predicted noise levels under prevailing weather conditions, is reproduced below along with the predicted difference in noise level due to mining and use of haul roads within the proposed Modification Areas, with the primary focus being the Northern Modification Area. Predicted noise level differences due to the Modification Areas have been determined based on the following strategy:

- Assume a reasonable worst case assessment with one half of the site's noise emissions originating from within the Northern Modification Area and the other half from elsewhere within the mine, typically within the eastern or southern pits;
- Assuming all equipment working within the Northern Modification Area would otherwise have been working at the closest point within the currently approved mining area;
- Applying a correction for differences in distance from the existing approved mine or the Northern Modification Area to each residence and applying that correction to half of the total received noise level while leaving noise levels from the remaining equipment fleet unmodified; and
- Reporting the overall difference in mining noise levels by combining corrected noise levels from the northern half of the mine with uncorrected noise levels from the remainder of the mine.

Table 1: Predicted Received Noise Levels, Prevailing Weather Conditions, LAeq,15min

Receivers	Predicted Received Noise Levels, LAeq,15min									Adopted Noise Criteria	Difference due to Modification
	Year 1			Year 5			Year 10				
	Day	Even	Night	Day	Even	Night	Day	Even	Night		
11 Yarramolong	34	34	33	34	33	32	32	32	32	35	-0.2
12 Newton	35	36	36	36	35	35	34	35	35	37	-0.4
13 Jacobson	35	36	34	36	36	34	35	34	33	35	-0.1
14 Budd	38	39	38	40	39	37	38	39	38	37	-0.4
16 Doherty	40	41	39	41	41	39	40	41	39	37	-0.5
17 Page	37	38	36	37	37	36	36	37	36	37	-0.3
18 Page	38	39	38	38	39	37	37	38	37	37	-0.4
19 Duck	40	40	39	40	40	39	39	40	39	37	-0.5
20 Osborn	39	40	39	39	39	39	38	39	39	35	-0.6
21 Reynolds	37	38	38	38	38	37	36	37	37	35	-0.4
22 Halloran	37	38	38	38	38	38	36	37	37	35	-0.6
23 Jackson	34	34	34	34	34	33	32	33	33	37	-0.2
25 Collins	35	37	37	36	36	36	34	35	35	37	-0.4
26 Baxter	35	37	38	36	36	38	34	36	37	37	-0.6
27 de Boer	35	37	39	36	36	39	34	36	38	37	-0.7
28 Bird	34	37	40	35	36	39	33	36	39	37	-0.6
29 Wallman	34	35	36	34	34	35	32	33	34	37	-0.4
31 Summerville	33	35	37	34	34	36	32	34	35	37	-0.4
32 Cross	31	34	40	32	33	39	30	33	39	37	-0.3
33 Fisher	30	33	38	31	32	37	<30	32	36	35	-0.3
34 Davis	<30	31	36	<30	30	35	<30	<30	34	35	-0.3
35 Wilson	<30	31	35	30	30	35	<30	30	34	35	-0.3
37 King	<30	30	35	<30	<30	34	<30	<30	33	35	-0.2
42 Smith	<30	<30	31	<30	<30	32	<30	<30	31	35	0.2
61 Skinner	38	40	39	39	39	39	37	39	39	35	-0.7
69 Clifton	35	37	41	35	37	41	34	36	40	37	-0.7
70 Jones	34	36	41	35	36	41	33	36	40	37	-0.5
71 Hunter	33	35	41	34	35	40	32	35	40	37	-0.4

Receivers	Predicted Received Noise Levels, LAeq,15min									Adopted Noise Criteria	Difference due to Modification
	Year 1			Year 5			Year 10				
	Day	Even	Night	Day	Even	Night	Day	Even	Night		
72 Robertson	35	37	42	36	37	42	34	36	42	37	-0.4
75 Sharman	33	35	41	34	35	40	32	34	40	37	-0.3
76 Horder	34	36	42	35	36	41	33	35	42	37	-0.3
86 Wild Group	30	31	38	31	31	38	30	31	38	35	0.0

Table 1 shows a maximum increase of 0.2 dBA at Receiver 42 compared to currently approved noise levels would occur if the Modification proceeds, with no change to noise levels at Receiver 86 and slightly lower noise levels at all other receivers. As predicted noise levels at Receiver 42 are well within the criterion, the Modification would not contribute to any exceedances of the noise criteria at any receiver.

Proposed Truck Fleet Changes

Noise level differences due to the proposed changes to the truck fleet have also been calculated based on the following strategy:

- Review available sound power data for 180 tonne and 280 tonne trucks, particularly those used on the Drayton Mine site, to determine relevant sound power levels;
- Calculate the truck fleet's total sound power level for the approved and proposed situations; and
- Assuming overburden trucks contribute half of all received noise levels, which is considered reasonable for Drayton Mine, calculate the likely change in received noise due to the proposed truck fleet.

Drayton Mine's 180 tonne trucks are fitted with upgraded exhaust silencers following a commitment in the 2007 EA. On-site noise measurement results provided by Spectrum Acoustics in 2008 indicate a truck sound power level of 116.7 dBA averaged over 6 machines and averaged over both uphill and downhill operation. This result should be compared with the 2007 EA which assumed an average sound power level of 118.3 dBA for uphill and downhill operation and small and large trucks. This indicates each 180t truck is approximately 1.6 dBA quieter than assumed in the EA.

Noise measurement data for 280 tonne trucks fitted with upgraded exhaust silencers are not available, as machines in that configuration are not known to exist. A typical difference of 2 dBA from small to large trucks in standard configuration, which is assumed to also apply to trucks fitted with upgraded exhaust silencers, has therefore been adopted. Table 2 shows the approved, actual and proposed truck fleet sound power levels.

Table 2: Calculated Truck Fleet Sound Power Levels, dBA

Scenario	2007 EA Assumed		2007 EA Units 'Actual' Noise Levels		Proposed	
	Small 180t	Large 280t	Small 180t	Large 280t	Small 180t	Large 280t
Unit Sound Power Level	118.3	118.3	116.7	118.7	116.7	118.7
Number of Units	11	14	11	14	30	0
Total Sound Power Level	128.7	129.8	127.1	130.2	131.5	0
Fleet Sound Power Level	132.3		131.9		131.5	

Calculations in Table 2 indicate the approved truck fleet would actually be 0.4 dBA quieter than assumed in the EA while the proposed truck fleet, with more of the smaller capacity trucks, would be 0.8 dBA quieter than assumed in the EA and 0.4 dBA quieter than the approved truck fleet. As trucks are not the only sources of noise associated with Drayton Mine, total mining noise levels at all receivers would reduce by approximately 0.2 dBA which is insignificant and unlikely to be measurable.

BLASTING ASSESSMENT

Blasting is expected to be required within the Modification Areas to loosen overburden and coal for removal or extraction. Drayton Mine currently has a network of blast monitors within the Antiene residential area which are used to provide feedback on ground vibration and blast noise (overpressure) levels for each blast. Data collected from the monitors is correlated with blast parameters such as charge weight and location and used to ensure future blasts are adequately designed to avoid exceedances of appropriate noise and vibration criteria. This feedback and design process would continue and remains appropriate for future blasts within the Modification area.

As the Modification areas are at a similar distance or, if anything, further from closest receivers, vibration and overpressure levels from blasts within the Modification area would be similar to those from adjacent approved mining areas.

CONCLUSION

Results in Table 1 lead to the conclusion that proposed mining and associated activity within the Modification Areas would produce similar or slightly lower noise levels compared to approved operations in the adjacent mining areas, provided the adopted noise mitigation and management measures described in the 2007 EA are also applied to proposed operations in the Modification Areas where appropriate.

The proposed changes to the truck fleet, including additional trucks, would also result in a slight reduction in noise levels although the difference is considered insignificant and impossible to confirm by noise monitoring. This conclusion assumes the additional trucks, except those used for overburden haulage in the south pit, would be fitted with upgraded exhaust silencers similar to the silencers fitted to existing trucks.

Blasts within the Modification Areas would produce similar, or slightly lower, vibration and overpressure levels compared to blasts within currently approved mining areas, provided the current monitoring and blast design procedures also apply to blasting within the Modification Areas.

We trust this review satisfies your requirements. Please contact the undersigned for any further information or discussion.

Yours faithfully,

BRIDGES ACOUSTICS



MARK BRIDGES BE (Mech) (Hons) MAAS
Principal Consultant

APPENDIX A: SITE PLAN



Site plan prepared by Hansen Bailey

APPENDIX C

Ecological Impact Assessment



2 December 2011

Environmental Scientist
Belinda Hale
Hansen Bailey Environmental Consultants
6/127-129 John Street
Singleton NSW 2330

ECOLOGICAL ASSESSMENT - DRAYTON MINE SECTION 75W MODIFICATION

Dear Belinda

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Anglo Coal (Drayton Management) Pty Limited (Drayton) was granted Project Approval (PA 06_0202) by the Minister for Planning on 1 February 2008 for the Drayton Mine Extension.

Drayton is currently preparing a Modification to their Project Approval (MOD 3) under Section 75W of the *Environmental Planning & Assessment Act 1979*, to extend their operations into four areas: an area to the north (Northern Modification Area), an area to the east (Eastern Modification Area), and two areas to the south (Southern Modification Areas) of the currently approved Mining Disturbance Footprint (the Modification).

The purpose of this letter is to present an assessment of the ecological impacts of the proposed Modification. The full report is contained within **Appendix A**.

1.1 Key Findings

The Modification will result in additional surface disturbance beyond the approved Mining Disturbance Footprint at Drayton totalling 36.5 hectares. The Modification will require removal of heavily modified vegetated areas, existing cleared land and the drainage of the Industrial Dam in the Eastern Modification Area.

The vegetation within the proposed Modification areas mainly comprise rehabilitated grassland sown with exotic grasses. To a lesser extent there is also some low diversity Derived Native Grassland and a narrow band of young

regrowth woodland (0.44 ha). In total, 19.3 hectares of vegetation are proposed to be cleared due to the Modification.

The young regrowth woodland area is located in the Eastern Modification area and is a small 0.44 ha strip of land that was previously identified as Three-awned Grass Open Grassland, a form of Derived Native Grassland, in earlier studies but has since regenerated to immature woodland corresponding to Hunter Lowland Redgum Forest (HLRF). Hunter Lowland Redgum Forest is listed as an Endangered Ecological Community (EEC) under the *Threatened Species Conservation Act 1995* (TSC Act).

1.1.1 Vegetation

The original vegetation within the Modification area was eucalypt forest and woodland. Consequently, the threatened species known from the locality are forest or woodland dependent.

The occurrence of the narrow strip of HLRF in the proposed Eastern Modification area is considered to have little ecological significance. It has minimal value as habitat for flora and fauna species due to its young age and lack of structural integrity. It has little to no understorey and contains no hollows for fauna. Therefore, the net impact to the EEC in the locality due to the proposed Modification is not considered significant.

The rehabilitated, exotic grassland and the low diversity grassland in the Modification areas are highly disturbed and are considered to have minimal conservation significance.

1.1.2 Flora and Fauna

During the site inspection, no threatened flora or fauna were recorded and given the highly modified nature of the Modification areas, none are likely to make significant use of the area. The grassland areas, like the regenerated woodland, have little habitat value for fauna and flora and are unlikely to support threatened species.

The mine water dam (known as the Industrial Dam) represents low value habitat for some fauna species and is unlikely to support a substantial diversity or abundance of animals. The Industrial Dam is artificial and was constructed to support the current mining operations. It receives run off from the mine and is likely to contain a high concentration of salts and pollutants. Regardless, the dam habitat could support turtles, eels and aquatic birds despite the limited fringing habitat. For this reason, measures will be implemented to manage the impacts upon such species as the dam is drained prior to mining.

1.2 Conclusion

No significant impacts are predicted on threatened flora, fauna or ecological communities listed by either the TSC Act or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The removal of 0.44 hectares of degraded regrowth HLRF is not likely to have a negative effect on the ecological values of the area or put the community at risk.

Threatened fauna species previously recorded within the approved Mining Disturbance Footprint are unlikely to utilise or rely on the Modification areas due to the degraded and fragmented nature of these areas, small size and proximity to active mining and infrastructure. Those threatened species that have been recorded are highly mobile species able to utilise large areas of habitat remaining in the locality including the Drayton Wildlife Refuge located to the north of the existing mine and mine rehabilitation. The removal of a small area of approximately 19.3 hectares of degraded vegetation is not likely to negatively affect these species or the ecological values of the area.

The Industrial Dam habitat could potentially support turtles, eels and aquatic birds however these animals are unlikely to occupy the dam in large numbers. Impacts due to the drainage of the dam for the proposed Modification are unlikely.

Notwithstanding this, the following mitigation measures are proposed:

- A drainage protocol for aquatic fauna should be prepared and implemented to protect aquatic fauna and water fowl that might be impacted by the drainage of the Industrial Dam and to relocate them safely offsite where necessary; and
- To address the minor impacts upon HLRF, future rehabilitation of the Modification areas should include woodland species rather than Rhodes Grass and other exotic herbaceous plants. In particular, the rehabilitation should include at least 1.3 hectares (3:1 ratio) of HLRF trees, shrubs, herbs and grasses.

If you would like to discuss any aspects of this letter report, please do not hesitate to contact either myself or Lauren Ooi on 9868 1933.

Yours sincerely



Dr David Robertson

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Appendix A

Ecological Assessment - 75W Modification
for Drayton Mine

A.1 Background

Drayton Coal Mine commenced production in 1983 to provide predominantly steaming coal to export and domestic markets at a maximum of 8 Million tonnes per annum (Mtpa) of Run-of-Mine (ROM) coal.

Anglo Coal (Drayton Management) Pty Limited (Drayton) was granted Project Approval (PA) 06_0202 by the then Minister for Planning on 1 February 2008 for the Drayton Mine Extension, which was assessed under Part 3A of *Environmental Planning & Assessment Act 1979* (EP&A Act). A modification to PA 06_0202 under Section 75W of the EP&A Act was approved on 1 February 2009 to extend operations into an 8 hectares area to the north of the approved Mining Disturbance Footprint and the establishment of a new 12 hectares conservation area adjacent to the Drayton Wildlife Refuge to provide an appropriate offset for this additional disturbance.

In July 2011, Drayton submitted a second modification to PA 06_0202 under Section 75W of the EP&A Act to facilitate the emplacement of raw tailings within the East Pit Void and the construction and operation of an explosives storage facility.

Drayton is now seeking approval to extend their operations via a third modification to PA 06_0202 under Section 75W (the "Modification"). The Modification will facilitate an extension of mining operations into three key areas around the currently approved Mining Disturbance Footprint: the Northern Modification Area, the Eastern Modification Area and the Southern Modification Area.

The purpose of this report is to assess the ecological impacts of the proposed Modification, including threatened flora, fauna and endangered ecological communities (EEC). The report focuses on the impacts of the Modification on threatened flora and fauna listed by the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

A.2 Proposed Modification

The proposed Modification seeks approval for the disturbance of 36.52 hectares of highly disturbed land located within Drayton's existing Mining Lease (**Figure 1**). The Modification comprises three key areas which have been subjected to previous mine related disturbances:

- An area to the north totalling 8.84 hectares (Northern Modification Area);
- An area to the east totalling 20.30 hectares (Eastern Modification Area); and
- Two small areas to the south totalling 7.38 hectares (Southern Modification Areas).

The proposed mining method of the Modification will be consistent with that described in the Drayton Extension (Hansen Bailey 2007) and Modification Environmental Assessment reports (Cumberland Ecology 2009) and as approved in Project Approval 06_0202.

The Modification will not extend Drayton's currently approved mine life or result in an increase in coal production levels to that approved.

A.2.1 Northern Modification Area

The proposed Northern Modification area is located to the immediate west of the approved North Pit. It includes an extension of Drayton's approved Mining Disturbance Footprint by approximately 8.84 hectares. The North Pit Modification area will allow the 'laying back' of the highwall to improve safety whilst opportunistically extracting steep dip barrier coal that may exist. The existing erection pad (approximately 2.63 hectares of previously disturbed land) will also be removed as part of the North Pit Extension.

A.2.2 Eastern Modification Area

The proposed 'Eastern Modification area is located to the north of the approved East Pit, adjacent to the existing infrastructure. It includes an extension of Drayton's approved Mining Disturbance Footprint by approximately 20.30 hectares. The Industrial Dam (approximately 6.5 hectares) will also be removed as part of the Eastern Modification Area.

A.2.3 Southern Modification Areas

The proposed Southern Modification Areas comprise two small areas that will extend Drayton's approved Disturbance Footprint to the south by a total of 7.38 hectares.

A.3 Methods

A.3.1 Literature Review

The flora and fauna of the Modification areas are known via previous studies that took place for the Drayton EA. This includes a site inspection conducted in May 2009 by Cumberland Ecology as part of a previous modification application.

This ecological assessment utilised the following reports to gain an understanding of the potential flora, fauna and vegetation communities present within the Modification areas and for data relevant to the current assessment:

- Hansen Bailey (2011) Drayton South Coal Project Preliminary Environmental Assessment (PEA) prepared for Anglo American;
- Cumberland Ecology (2009) Ecological Assessment of Section 75W Modification for Drayton Mine;
- Hansen Bailey (2007) Drayton Mine Extension Flora and Fauna Impact Assessment;
- Cumberland Ecology (2007) Drayton Mine Fauna Surveys; and
- Saunders, T (2006) Bird Surveys of the Proposed Drayton Mine Extension.

A.3.2 Database Analysis

Other existing information on biodiversity values of the area were obtained from the OEH Atlas of NSW Wildlife database (OEH 2011), SEWPaC Protected Matters Search Tool (PMST) (SEWPaC 2011) and Royal Botanic Gardens PlantNet (Royal Botanic Gardens 2011) to assess the likelihood of threatened species occurring within the Modification areas and surrounds.

The Wildlife Atlas search was used to generate records of threatened flora and fauna species listed under the State *Threatened Species Conservation Act 1995* (TSC Act) known to occur within the Muswellbrook LGA. The PMST generated a list of flora, fauna and ecological communities listed under the EPBC Act predicted to occur within a 10 km radius of the Modification areas based on the availability of suitable habitat.

A.3.3 Site Inspection

A site inspection was conducted by Cumberland Ecology on 30 September 2011 for the current Modification. The inspection involved an assessment of:

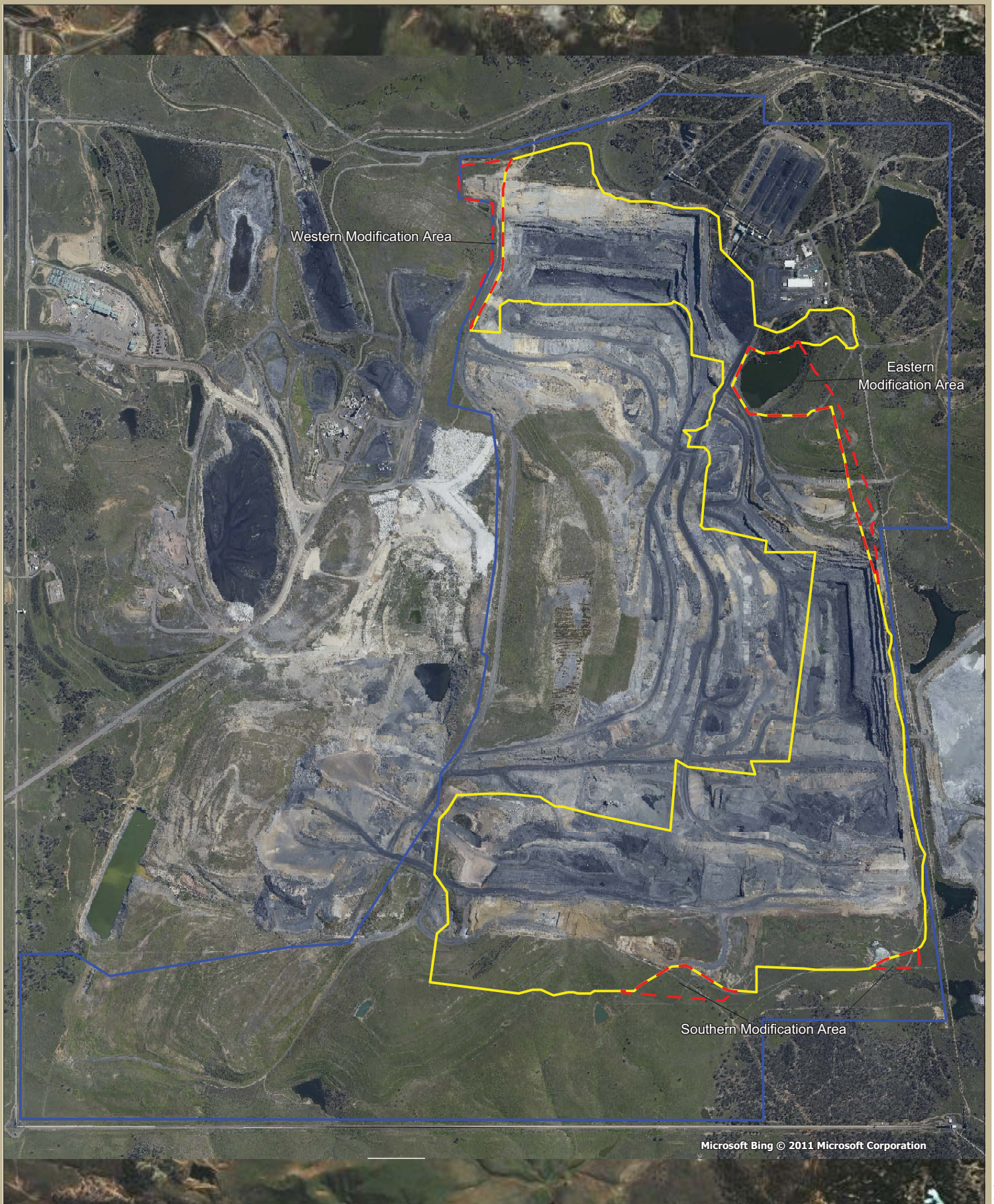
- Surrounding land use and extent of human disturbance;
- Type, condition and age structure of vegetation;
- The presence of threatened flora species;
- Availability of fauna habitat and microhabitat features; and
- Assessment of potential impacts of the Modification on biodiversity values.

Photographs were taken in order to provide an indication of the current condition of the habitat.

A.3.4 Limitations

Due to the small scale of the Modification, the highly disturbed nature of habitats within the Modification areas and the existence of good baseline information for flora and fauna within the Drayton lease, detailed surveys of the Modification areas were not deemed necessary.

Targeted threatened fauna surveys of the Modification area were not undertaken during the current site inspection as the environment on and around Drayton Mine has been extensively surveyed in recent years and the threatened fauna with potential to occur are well known, and can be predicted with confidence based on the results of previous surveys and fauna habitat assessments.



Legend

- EA Boundary
- Drayton Modification Area
- Project Disturbance Boundary



Figure 1. Drayton Mine Section 75W Proposed Modification Areas



A.4 Results

A.4.1 Vegetation

Vegetation within the Modification areas is highly modified and the original forest and woodland communities have been almost entirely cleared. Some areas of “Derived Native Grassland” exist, which have been created by the clearance of the original forest and woodland. However, these have been invaded by exotic weeds and pasture species. Vegetation communities within the Modification areas and surrounds are shown in **Figure 2**.

i. Northern Modification Area

The majority of the Northern Modification area comprises exotic grassland; and an existing gravel-based erection pad and associated disturbances which are devoid of vegetation (**Figure 1**).

The remaining northern portion of the Northern Modification area has been rehabilitated in the past and has been mapped as Three-awned Grass Open Grassland, a form of Derived Native Grassland that is not listed under either State or Commonwealth threatened species legislation. This vegetation is of low quality that primarily consists of exotic groundcovers including improved pasture species and exotic grasses for soil stabilisation. A number of invasive weed species not sown as part of rehabilitation are also present, having colonised the open and frequently disturbed areas (**Photographs 1 – 3**).

This community is dominated by grasses and forbs, although a high proportion is exotic. The native component of the community consists of *Aristida ramosa* (Threeawn Wiregrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Chloris ventricosa* (Windmill Grass), *Calotis lappulacea* (Yellow Burr-daisy), *Dichondra repens* (Kidney Weed), *Desmodium varians* (Variable Tick-trefoil) and *Einadia nutans* (Climbing Saltbush).

Rehabilitated areas were found to contain the following exotic species; *Galenia pubescens* (Galenia), *Melinis repens* (Red Natal Grass), *Pennisetum clandestinum* (Kikuyu), *Vicia* sp. (Vetch), *Cynodon dactylon* (Couch), *Bromus* spp., *Avena* spp. (Oats), *Medicago sativa* (Lucerne), *Sorghum* spp. (Sorghum), *Chloris gayana* (Rhodes Grass), *Phalaris* sp. (Canary Grass), *Trifolium repens* (Clover), *Anagallis arvensis* (Scarlet Pimpernel), *Senecio madagascariensis* (Fireweed), *Carthamnus lanatus* (Saffron Thistle), *Taraxacum officinale* (Dandelion), *Plantago lanceolata* (Lamb’s Tongues), *Sida rhombifolia* (Paddy’s Lucerne) and *Opuntia* sp. (Prickly Pear).

The nearest treed or woodland patch is a narrow strip of trees planted as a visual screen along Thomas Mitchell Drive to the north of the Modification. This does not contain value of any conservation significance.



Photograph 1 Open Grassland at the proposed Northern Modification Area, facing Thomas Mitchell Drive.



Photograph 2 Open Grassland in the proposed Northern Modification Area.



Photograph 3 The existing erection pad which will be removed as part of the Modification.

ii. *Eastern Modification Area*

Vegetation at the Eastern Modification area consists of two portions separated by the mine-related Industrial Dam (**Figure 2**). The majority of the vegetation has been mapped as Three-awned Grass Open Grassland and Acacia revegetation, although a narrow band of young regrowth woodland totalling 0.44 hectares that corresponds to Hunter Lowland Redgum Forest (HLRF) exists adjacent to the dam.

The 0.44 hectares of young regrowth HLRF conforms to an Endangered Ecological Community (EEC) listing under the TSC Act. The occurrence of the narrow strip of HLRF in the proposed Modification area is considered to have little ecological significance. It holds minimal value as habitat for flora and fauna species due to its young age and lack of structural integrity. It has little to no understorey and contains no hollows for fauna (**Photograph 4**). The community is bounded by a mine haul road and is adjacent to the existing ROM stockpile to the north and the Industrial Dam to the south. Therefore, the impact to EEC due to the proposed Modification is unlikely to be significant.

A narrow strip of young acacias, generally Cooba (*Acacia salicina*), Golden Wreath Wattle (*Acacia saligna*) and Western Silver Wattle (*Acacia decora*) (pers. comm P. Simpson), line the road edge that runs along the south-eastern side of the Industrial Dam (**Photograph 5**). Beyond these planted trees is degraded open grassland, with some scattered trees and shrubs, which was rehabilitated with a seed mix of exotic groundcovers including Kikuyu, Couch, Rhodes Grass, Vetch and pasture-improved herbs (**Photograph 6**).



Photograph 4 Narrow strip of regrowth Hunter Lowland Red Gum Forest (HLRF) in the proposed Eastern Modification area.



Photograph 5 Young Acacia regeneration planted along the road in the proposed Eastern Modification area.



Photograph 6 Grassland rehabilitation area containing a high proportion of exotic ground cover species at the proposed Eastern Modification area.

iii. Southern Modification Areas

The Southern Modification Areas have been rehabilitated in the past and has been mapped as Three-awned Grass Open Grassland a form of Derived Native Grassland that is not listed under either State or Commonwealth threatened species legislation. The areas of Derived Native Grassland in these Modification Areas are of similar nature to that found in the Northern Modification Area and contain a number of weed species.

The low condition native grasslands are dissected by areas of exotic grassland rehabilitation. These areas of exotic grassland rehabilitation contain Kikuyu and Rhodes Grass, presumably for soil stabilisation and pasture improvement.



Legend

- EA Boundary
- Project Disturbance Boundary
- Drayton Modification Area

Vegetation Community

- Spotted Gum-Grey Box Open Forest
- Hunter Lowland Red Gum Forest EEC
- Central Hunter Box-Ironbark Woodland
- Spiky Rush-Kikuyu Grass
- Narrow-leaved Ironbark Woodland
- Grey Box Forest
- Acacia Revegetation Area
- Rhodes Grass Rehabilitation Area
- Derived native grassland

Microsoft Bing © 2011 Microsoft Corporation

Figure 2. Mapped Vegetation Communities

A.4.2 Flora

Threatened flora surveys that included targeted searches in 2006 (as a component of the EA) and quadrats in 2009 (as a component of the previous modification application) did not identify any threatened flora species within the Drayton mining lease.

Similarly, no threatened flora species were found during the most recent site inspection of 2011. During the 2011 site inspection, searches were conducted for threatened flora species recorded in the vicinity of the existing mine that have potential to occur within the rehabilitated Modification areas. These included the threatened terrestrial orchids *Diuris tricolor* (Painted Diuris/ Pine Donkey Orchid) and *Prasophyllum sp. Wybong* which are highly detectable when in flower in late September and the grass *Bothriochloa biloba* (Lobed Blue Grass).

A.4.3 Fauna

During the 2011 site inspection, no mammals, amphibians or reptiles were observed in the Modification areas. The Australian Raven and Australian Magpie, common bird species that are well adapted to disturbed environments, were observed flying overhead. Given the predominance of grassland areas, it is expected that the fauna of the Modification areas would be typical of Hunter Valley farmland and consist of hardy native species, as described below for previous survey work on the Drayton lease.

i. Previously Conducted Fauna Surveys

a. Drayton Mine

Previous fauna surveys within the approved Mining Disturbance Footprint have recorded a very low diversity and abundance of native species. No threatened species have been recorded within the proposed Modification areas.

Commonly recorded mammals are the Eastern Grey Kangaroo (*Macropus giganteus*) across all grassland sites; Red-necked Wallaby (*Macropus rufogriseus*) in woodland; and the introduced pest species Rabbit (*Oryctolagus cuniculus*) widespread across all vegetation types, especially in open grassy areas.

During 2007 surveys for the Drayton Mine Extension EA, five Squirrel Gliders (*Petaurus norfolcensis*) were captured in arboreal traps in woodland dominated by Spotted Gum. Several threatened microchiropteran (microbat) bat species were also recorded during this survey period within woodland and forest areas including:

- Yellow-bellied sheath-tailed bat (*Saccolaimus flaviventris*);
- Eastern bent-winged bat (*Miniopterus schreibersii*);
- Greater broad-nosed bat (*Scoteanax rueppellii*); and
- Eastern cave bat (*Vespadelus troughtoni*).

Several bird species that are relatively common and well adapted to disturbed environments have been recorded at Drayton, including the: White-plumed Honeyeater, Superb Fairywren, Zebra Finch, Australian Raven, Yellow-faced Honeyeater, Red Wattlebird, Noisy Friarbird, Eastern Rosella, Australian Magpie, Buff-rumped Thornbill, and Brown Falcon.

Four bird species of conservation significance have been recorded from previous Drayton Mine surveys within larger blocks of relatively undisturbed woodland (Saunders 2006, Cumberland Ecology 2009), including:

- Diamond Firetail (*Stagonopleura guttata*) – listed as Vulnerable under the TSC Act;
- White-throated Needletail (*Hirundapus caudacutus*) – listed as a Migratory/Marine species under the EPBC Act;
- Rainbow Bee-eater (*Merops ornatus*) - listed as a Migratory/Marine species under the EPBC Act; and
- Speckled Warbler (*Pyrholaemus sagittatus*) – listed as Vulnerable under the TSC Act.

b. Drayton South Project Environmental Assessment

The Drayton South Project is located adjacent to the south of Drayton Mine and a number of fauna and flora surveys have recently been conducted at the site. A total of 21 threatened and/or migratory fauna species comprising highly mobile birds and bats were recorded at Drayton South (**Table A.1**). Due to the proximity of Drayton South to Drayton Mine, there is potential for these species and others known to occur in the locality to overfly the Modification areas. However, a lack of suitable habitat makes it highly unlikely that any of these species would utilise vegetation within the Modification areas.

Table A.1 Threatened fauna species recorded at Drayton South

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Likelihood of Occurrence at Drayton Modification areas
<i>Pyrholaemus sagittatus</i>	Speckled Warbler	V		No suitable habitat
<i>Circus assimilis</i>	Spotted Harrier	V*		No suitable habitat
<i>Hieraaetus morphinoides</i>	Little Eagle	V		No suitable habitat
<i>Hirundapus caudacutus</i>	White-throated Needletail		M	No suitable habitat
<i>Climacteris picumnus</i>	Brown Treecreeper	V		No suitable habitat
<i>Stagonopleura guttata</i>	Diamond Firetail	V		No suitable habitat
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V		No suitable habitat

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Likelihood of Occurrence at Drayton Modification areas
<i>Merops ornatus</i>	Rainbow Bee-eater		M	No suitable habitat
<i>Melanodryas cucullata</i>	Hooded Robin	V		No suitable habitat
<i>Petroica boodang</i>	Scarlet Robin	V		No suitable habitat
<i>Lathamus discolor</i>	Swift Parrot	E	E; M	No suitable habitat
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V		No suitable habitat
<i>Ninox connivens</i>	Barking Owl	V		No suitable habitat
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail- bat	V		No suitable habitat
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V		No suitable habitat
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	No suitable habitat
<i>Miniopterus orianae oceanensis</i>	Eastern Bentwing-bat	V		No suitable habitat
<i>Myotis adversus</i>	Large-footed Myotis	V		Potential – aquatic forage habitat present
<i>Nyctophilus timoriensis</i>	Greater Long-eared Bat	V	V	No suitable habitat
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V		No suitable habitat
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	V		No suitable habitat

ii. Habitat Assessment

The Modification areas constitute poor habitat for native fauna. The patches of vegetation that occur are small, lack structural complexity, have limited connectivity to surrounding woodland offsets and there is an absence of important shelter features such as logs, hollows and bush rock. The Modification areas are characterised by disturbed open grassland and immature regrowth vegetation as a result of past rehabilitation efforts (see **Photographs 1 to 6**) and continue to be affected by surrounding land use including the Industrial Dam, erection pad and proximity to access roads.

No hollows were recorded in the Modification areas; most of the canopy trees have a low 'diameter at breast height' (DBH) and are not old enough to provide substantial hollows. Ground debris and fallen hollow logs are also absent and do not provide habitat for ground dwelling fauna.

The understorey is limited and dense shrubby vegetation is non-existent. This significantly limits the habitat amenity of the Modification areas for species such as woodland birds that depend on dense understorey for foraging resources and shelter. Foraging resources for microbats, birds and arboreal mammals is also limited due to the immaturity of trees as they

produce a lower quantity and consistency of flowers and fruit than large mature trees. While some woodland birds, including the threatened species Diamond Firetail and Speckled Warbler may periodically utilise habitat elsewhere in the approved Mining Disturbance Footprint, the Modification areas do not provide enough suitable habitat for these species.

A.4.4 Aquatic Environment

The Industrial Dam is unlikely to support much fauna such as amphibians, reptiles and waterbirds due to the lack of fringing vegetation and shelter and the quality of the water (**Photograph 7**). The quality of the water is generally very poor as it is located within an active mine site and receives dirty mine water. The dam is turbid, has experienced silt-laden runoff and is potentially slightly acidic as a result of dust and run off pollutants.

The dam habitat is artificial habitat and unlikely to support substantial fauna species; also, surrounding land use and infrastructure and the lack of permanent watercourses and ephemeral drainage lines would limit fauna movement through the surrounding grassland landscape. However, the dam could potentially support common turtles, eels and aquatic birds.

No threatened frogs have been found on the Drayton site during past surveys, which have included the Industrial Dam. It is unlikely that species such as the Green and Golden Bell Frog (*Litoria aurea*) occurs.



Photograph 7 Edge of the existing Industrial Dam showing a lack of fringing vegetation for aquatic fauna.

A.5 Impact Assessment

A.5.1 Vegetation Communities

The vegetation to be cleared by the Modification is summarised in **Table A.2** below. The majority of the Modification area is either totally cleared or comprised of open water within the Industrial Dam.

Table A.2 Areas of vegetation to be impacted by the Modification

Vegetation Community	Area of Site Vegetation (ha) (including offset areas and excluding areas in existing approvals)	Total Disturbance due to Modification (ha)
Acacia Revegetation Area	3.29	1.24
Central Hunter Box-Ironbark Woodland	4.73	
Derived native grassland	167.71	7.43
Grey Box Forest	0.15	
Hunter Lowland Red Gum Forest EEC	130.43	0.44
Narrow-leaved Ironbark Woodland	20.8	
Rhodes Grass Rehabilitation Area	248.05	9.68
Spiky Rush-Kikuyu Grass	2.94	0.49
Spotted Gum-Grey Box Open Forest	75.55	
TOTAL Vegetation	653.63	19.28
Industrial Dam	-	6.55
North Pit Erection Pad	-	2.63
Cleared Land	-	8.06
TOTAL Area	-	36.52

The Modification will result in the removal of 0.44 hectares of young regrowth HLRF; however the removal of such a small patch of modified regrowth is not considered likely to result in a significant impact to the local occurrence of the EEC. An Assessment of Significance for this community is provided in **Appendix B**.

Taking into consideration the small, fragmented size of the Modification areas, their degraded condition and close proximity to an active open cut mining operation; it is considered unlikely that the Modification will result in any significant impacts to other vegetation communities in the approved Mining Disturbance Footprint.

A.5.2 Flora

No threatened flora species have been recorded in the Modification areas despite multiple surveys. None are considered likely to occur within the vicinity of the Modification areas or be impacted by the Modification. Habitat within the Modification areas is unsuitable for the target threatened species due to the degraded nature of the grassland; a high level of disturbance caused by past clearing and surrounding mining activities; the impacts of grazing by native and exotic herbivores; and significant weed infestation which can smother natives or out-compete them for resources such as space and nutrients.

A.5.3 Fauna

The recent site inspection did not record any threatened species within the Modification areas or identify any evidence of recent use (e.g. nests, scats, burrows). Several threatened fauna species have previously been recorded within the approved Mining Disturbance Footprint and the following impacts section is based on these known species records.

The Modification will result in the removal of approximately 0.44 hectares of regrowth HLRF; 1.24 hectares of low quality Acacia revegetation; and 17.6 hectares of various low quality and highly modified open grassland communities. All of these communities are extensively disturbed and surrounded by active mine infrastructure and roads. Due to the small size and fragmented nature of vegetation in the Modification areas and lack of suitable habitat features such as flowering resources, ground debris, hollows and rocks that may provide forage resources, shelter or breeding habitat, no threatened species are likely to be dependent on the Modification areas to be removed for their ongoing survival.

As no significant impact is likely to occur to threatened species as a result of the Modification, no further assessments of significance have been prepared.

Drayton has previously offered large areas of onsite and offsite vegetation offsets including 131 hectares protected within and adjacent to the Drayton Wildlife Refuge and 88 hectares of woodland in the Northern Offset Area. These areas represent significantly higher quality habitat than that to be removed. Microchiropteran bats and birds, the type of threatened fauna previously recorded at Drayton, are highly mobile species that, if present, will be able to utilise these other habitat areas.

i. Microchiropteran Bats

Database records and previous fauna survey results indicate that several threatened microchiropteran bat species have been known to utilise habitat within the Drayton approved Mining Disturbance Footprint and the locality, including the Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*), Eastern Freetail-bat (*Mormopterus norfolkensis*), Eastern Bentwing bat (*Miniopterus schreibersii oceanensis*), Greater broad-nosed bat (*Scoteanax rueppellii*), and Eastern cave bat (*Vespadelus troughtoni*) and Large-footed Myotis (*Myotis adversus*).

The Large-footed Myotis is a fishing bat that requires large dams or creeks to forage over for insects. It has not been recorded during surveys of the Drayton approved Mining

Disturbance Footprint but is known from the locality and was recently recorded as part of the Drayton South Project environmental assessment. As the large Industrial Dam will be drained and removed as part of the Modification, potential forage habitat for this species will be removed. However, as this is a highly mobile species that travels large distances to forage and roost, and as other water bodies will still remain within both the approved Mining Disturbance Footprint and locality, the Modification is unlikely to have a significant impact on the Large-footed Myotis. An Assessment of Significance for this species is provided in **Appendix B**.

The small Modification areas are not considered to provide suitable forage habitat, where they typically feed on insects above the tree canopy, or roosting habitat, as there are no hollows, decorticated bark or caves present, for the other threatened bat species. No significant impact is predicted to occur to these microbat species as a result of the Modification.

ii. Squirrel Glider

Squirrel Gliders were recorded within Spotted Gum Forest in the northern portion of the Drayton approved Mining Disturbance Footprint, adjacent to the administration buildings, during the 2007 EA surveys.

It is likely that this species would utilise other areas of habitat on Drayton at different times of the year, when different forage resources such as gum, sap, pollen and invertebrates become available. However, as the Modification areas are small and fragmented by surrounding roads and the existing mine; do not contain mixed species forest and woodland with a shrubby understorey; or large mature trees that have abundant tree hollows and forage resources, they do not support suitable habitat for Squirrel Gliders.

As such, no significant impact is predicted to occur to Squirrel Gliders as a result of the Modification.

iii. Birds

Several threatened species of birds have previously been recorded within the approved Mining Disturbance Footprint area and are species that are commonly found within the locality, including: Speckled Warbler (*Pyrrholaemus sagittatus*), Brown Treecreeper (*Climacteris picumnus*), Diamond Firetail (*Stagonopleura guttata*), and Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*).

The Modification areas offer very limited habitat for these species as they are small, fragmented, lacking structural complexity and highly degraded. Large areas of higher quality potential habitat for these species will remain in the locality, including the Drayton Wildlife Refuge.

The removal of a small area of native vegetation is not expected to have a significant effect on these species. Although not recorded from the Modification areas, the Speckled Warbler (*Pyrrholaemus sagittatus*) has been recorded within the offset area. This area will not be disturbed and will continue to provide habitat for this species.

Two species listed as Migratory/Marine under the EPBC Act have been recorded from Drayton; the White-throated Needletail (*Hirundapus caudacutus*) and Rainbow Bee-eater (*Merops ornatus*). These species would only periodically utilise foraging resources that are present at Drayton, and would not nest on the site. This habitat is unlikely to be important for these species, and the minor reduction in vegetation that is not considered to provide suitable foraging habitat would not have a deleterious effect on them. Large areas of vegetation remain in the locality as outlined above, and these would continue to provide habitat for these species.

As such, no significant impact is predicted to occur to threatened birds as a result of the Modification.

A.5.4 Aquatic Environment

The Industrial Dam is considered unlikely to support any fauna such as fish or amphibians due to the poor quality of the water. As it is a mine water dam the chemical composition, acidity, turbidity and oxygen levels of water in the dam are likely to be unsuitable for aquatic fauna. Also, the dam lacks fringing vegetation that could provide suitable shelter.

The nearest watercourse is Ramrod Creek, an ephemeral drainage line that occurs close to the north-eastern boundary of the North Pit. The headwaters of this creek begin near the southern extent of the rail loop and travel north-west under Thomas Mitchell Drive.

This creek is predominantly dry (pers. comm. P. Simpson), and does not offer suitable habitat for fish or amphibians. It does not have fringing vegetation such as reeds and rushes preferred by amphibians for shelter.

As such, no significant impacts are predicted to occur to threatened amphibians or aquatic environments as a result of the Modification

A.6 Conclusion & Recommendations

No significant impacts are predicted on threatened communities, flora and fauna listed by either the TSC Act or the EPBC Act as a result of the proposed Modification. The areas are very highly modified and apart from narrow strips on the edges of treed communities that fall just within the new Modification boundary, retain almost no woodland or open forest.

The proposed Modification will result in additional impacts of approximately 36.52 hectares to that already approved as part of the approved Mining Disturbance Footprint. Of this area, approximately 19.3 hectares of vegetation will be removed by the Modification, comprising approximately 0.44 hectares of regrowth HLRF; 1.24 hectares of low quality acacia revegetation; and 17.60 hectares of various low quality open grassland communities.

The removal of 0.44 hectares of regrowth HLRF EEC is considered to have little conservation significance due to its small size and degraded nature. Neither Modification area provides suitable habitat for native flora or fauna, including threatened species. This is due to the small size of the areas; being set within an active mine and close to infrastructure

and roads; the lack of woodland; fragmented nature of vegetation; and out competition from invasive weed species.

No threatened flora species have been recorded from the Modification area and none will be impacted by the Modification. No fauna were observed during the site inspection; however the majority of fauna species likely to occur in these areas of the approved Mining Disturbance Footprint are common and widespread species that are able to exist in highly disturbed environments. None of these species will be impacted by the Modification. Several threatened species have previously been recorded from Drayton; however based on the lack of suitable habitat, are also unlikely to be impacted by the Modification.

The removal of small, already modified areas of poor quality habitat will not impact on the ecological values of Drayton or remove critical habitat. Other areas of native woodland to be retained in the locality will continue to provide higher quality habitat than that to be removed. This includes the proximate Drayton Wildlife Refuge which is actively managed to maintain and increase its conservation value and provide habitat for flora and fauna.

There are two recommendations arising from this assessment:

- A drainage protocol for aquatic fauna should be prepared and implemented to protect aquatic fauna and water fowl that might be impacted by the drainage of the dam and to relocate them safely offsite where necessary; and
- To address the minor impacts upon HLRF, future rehabilitation of the Modification areas should include woodland species rather than Rhodes Grass and other exotic herbaceous plants. In particular, the rehabilitation should include at least 1.3 hectares (3:1 ratio) of HLRF trees, shrubs, herbs and grasses.

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Appendix B

Assessments of Significance

B.1.1 Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions

Approximately 0.44 ha of Hunter Lowland Redgum Forest (HLRF) occurs as a narrow band adjacent to the existing Industrial Dam in the proposed Eastern Modification area. It is proposed to be removed as part of the Modification.

During past surveys the area in question was previously identified as Derived Native Grassland. However, it has since regenerated to immature woodland corresponding to the Endangered Ecological Community (EEC) Hunter Lowland Redgum Forest in the Sydney Basin and NSW North Coast Bioregions under the NSW *Threatened Species Conservation Act 1995* (TSC Act). The band of Hunter Lowland Redgum Forest being assessed is a small, degraded remnant of this forest community and is characterised by relatively low species diversity. It is immature vegetation comprised mostly of regrowth that lacks structural complexity and contains a number of invasive plant species.

Hunter Lowland Redgum Forest occurs on gentle slopes arising from depressions and drainage flats on permian sediments of the Hunter Valley floor in the Sydney Basin and NSW North Coast Bioregions. The community is generally an open forest with most common canopy trees species being *Eucalyptus tereticornis* and *Eucalyptus punctata* although other frequently occurring canopy species are *Angophora costata*, *Corymbia maculata*, *Eucalyptus crebra* and *Eucalyptus moluccana*, with a number of other eucalypts being less frequently recorded. The mid stratum is characterised as open with sparse shrubs of *Breynia oblongifolia*, *Leucopogon juniperinus*, *Daviesia ulicifolia* and *Jacksonia scoparia*. There is consistently a ground layer of grasses and herbs, characterised by *Microlaena stipoides* var. *stipoides*, *Cymbopogon refractus*, *Echinopogon caespitosus* var. *caespitosus*, *Cheilanthes sieberi* subsp. *sieberi* and *Pratia purpurascens* (NSW Scientific Committee 2011).

a) *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

Not applicable to threatened communities.

b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

Not applicable to threatened communities.

c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Approximately 0.44 ha of regrowth Hunter Lowland Redgum Forest that occurs as a narrow band along a small portion of the Industrial Dam within the Eastern Modification area is proposed to be removed. This community conforms to an Endangered Ecological Community (EEC) listing under the TSC Act.

The occurrence of the narrow strip of HLRF in the proposed Modification area is considered to have little conservation significance. This woodland remnant is highly degraded due to its size, proximity to existing infrastructure and level of isolation from other patches of significant woodland and forest. It holds minimal value as habitat for flora and fauna species due to its young age, lack of habitat features and lack of structural integrity. It has little to no understorey and what is present in the ground stratum comprises many exotic flora species.

Approximately 130 ha of this woodland community will remain within the Drayton approved Mining Disturbance Footprint, Northern Offset Area and Drayton Wildlife Refuge to the north. These areas of Hunter Lowland Redgum Forest are of higher quality and are substantially larger than that to be removed as part of the Modification. They are to be conserved in the long-term which will ensure that the local occurrence of the community will not be placed at risk of extinction. Active management of these areas to maintain and increase conservation value will also provide important habitat for native flora and fauna, including threatened species.

(d) *In relation to the habitat of a threatened species, population or ecological community:*

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The Modification will result in the removal of 0.44 ha of regrowth Hunter Lowland Redgum Forest. This community exists as an isolated, narrow band along the Industrial Dam, located within an active mine site.

Although much of the pre-1750 extent of this community has been cleared and approximately 27% (less than 500 ha) of the original distribution survives and is highly fragmented (NSW Scientific Committee 2011), the Modification is unlikely to impact on the long-term survival of the community. In its current state, the community requires active management to counter the effects of continued degradation.

This remnant is currently subject to fragmentation in the landscape and isolation which may impact on recruitment capabilities and genetic viability in the locality. The EEC is also subject to significant edge effects including weed and feral animal invasion and pollution and runoff from the mine and dam access road. The noxious weed Prickly Pear and a variety of exotic grasses and herbs were observed in the community.

The Hunter Lowland Redgum Forest is not considered likely to provide important habitat for fauna due to its small size, degraded form and as trees do not support hollows or important forage resources. The removal of immature trees will reduce poor quality vegetation that is not important habitat for native fauna. Large areas of higher quality habitat remain in the locality, particularly in the Drayton Wildlife Refuge.

The small area of Hunter Lowland Redgum Forest habitat to be removed is not considered to be important to the long term survival of the community in the locality or provide significant fauna habitat. The project will not affect the long-term viability of this community in the locality.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

No critical habitat for Hunter Lowland Redgum Forest has currently been identified by the Director-General of OEH.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

No recovery plan for Hunter Lowland Redgum Forest has been prepared by the NSW National Parks and Wildlife Service to date.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

The following Key Threatening Processes are relevant to Hunter Lowland Redgum Forest:

- Clearing of native vegetation;
- Invasion of native plant communities by exotic perennial grasses as this impacts regeneration capabilities and results in loss of structural complexity and of key food plants and habitat;
- Competition and grazing by the feral European rabbit *Oryctolagus cuniculus* as they alter the structure and composition of vegetation, and degrade the land;
- Anthropogenic climate change as this can reduce the geographic range of species and alter the structure and composition of communities

Conclusion

Approximately 0.44 ha of degraded EEC Hunter Lowland Redgum Forest is proposed to be removed as part of the Modification. Due to the small size of the regrowth vegetation; location adjacent to an Industrial Dam and access track within an active mine; highly modified and structurally simplified structure; and invasion by exotic flora species, the removal of this community is not considered to be significant for the long-term survival of the community in the locality. In its current state and without active management, this remnant is expected to continue to be subject to edge effects and degradation that will impact on its viability.

B.1.2 Large-footed Myotis (Myotis adversus)

The Large-footed Myotis is listed as Vulnerable under the TSC Act. The Large-footed Myotis has not been recorded during surveys of Drayton Mine; however it is known from the locality and has previously been recorded at Drayton South. There are 7 records of the species within the Muswellbrook LGA (OEH, 2011). This species is being assessed due to the presence of the large Industrial Dam that is proposed to be drained, as it offers limited but potential aquatic forage habitat for the Large-footed Myotis.

The Large-footed Myotis is a water-foraging, cave-dependent. The species is primarily distributed along the east coast of Australia to the Kimberley, and along major rivers in south-eastern Australia. Colony size can range from less than 15 to hundreds, in caves, mine shafts, hollow-bearing trees, storm-water channels, buildings, under bridges and in dense foliage (Churchill, 2008). Day-roost sites are often close to water where the species can forage over streams and pools to catch insects, prawns and small fish (DEC (NSW), 2005).

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

This species roosts in caves and hollow-bearing trees, none of which were recorded within the Modification areas. The large dam may on occasion provide forage resources for locally occurring Large-footed Myotis. However, as the Large-footed Myotis is highly mobile and regularly flies large distances to forage, the removal of degraded and generally open grassland and the polluted dam are not considered to be critical habitat for the species. The drainage of the dam and removal of vegetation for the Modification will not have an adverse effect on the life cycle of the species.

Larger areas of higher quality habitat that contain tree hollows, cave, streams and ponds will remain available elsewhere within the locality, including the large Drayton Wildlife Refuge. Any bats likely to utilise the Modification areas would also utilise these offset areas and therefore, a viable local population is unlikely to be placed at risk of extinction as a result of the proposed development.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

No endangered populations of the Large-footed Myotis are listed under the TSC Act.

c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

d) *In relation to the habitat of a threatened species, population or ecological community:*

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Potential forage habitat in the form of the existing Industrial Dam is proposed to be removed as part of the Modification. This may reduce the availability of aquatic forage habitat for the species; however as the species has not been recorded despite multiple past surveys, the dam is not considered to provide important habitat for the species or be critical to a local population's survival.

The Modification areas do not contain suitable roosting habitat for this species. No caves or hollow-bearing trees occur within the Modification areas and as such, will not support a population of the Large-footed Myotis. As the species is highly mobile and is known from records elsewhere in the LGA, it will still be able to forage and roost in more suitable habitat that exists elsewhere in the locality.

The impacts of the project are not expected to have a deleterious impact upon habitat corridors or habitat connectivity for dispersal of the species. Drayton Wildlife Refuge will continue to provide flyway corridors for the Large-footed Myotis. The extent of clearing will not cause any further isolation of potential foraging habitat for this species. Thus, the local population of Large-footed Myotis will not be placed at risk because of the Modification.

e) *Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)*

No critical habitat for the Large-footed Myotis has currently been identified by the Director-General of OEH.

f) *whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan*

The Action Plan for Australian Bats recovery plan published in 1999 is applicable to the Large-footed Myotis and outlines actions to promote the recovery of these species and the abatement of key threatening processes affecting their occurrence.

- g) *whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process*

The proposed project will involve three Key Threatening Processes under the TSC Act:

- Clearing of native vegetation;
- The removal of dead trees, dead wood and logs; and
- Anthropogenic climate change as this can reduce the geographic range of species and alter the structure and composition of communities.

Conclusion

The Large-footed Myotis has not been recorded within the Drayton Mine, despite multiple surveys. However, as the species is known from the locality, including Drayton South, and the Eastern Modification area contains a large dam, it was considered possible that the species could potentially forage over the water body for insects.

While the species may utilise the dam on occasion, the location of the dam within an active mine site and the lack of site records indicate they are not reliant on it. As the species is highly mobile and travels large distances to forage and roost, dams and watercourses elsewhere in the locality will still provide aquatic forage habitat for the Large-footed Myotis. As such, the Project is not considered likely to have a significant impact on the local occurrence of the Large-footed Myotis.

APPENDIX D
Surface Water Impact Assessment

SURFACE WATER IMPACT ASSESSMENT FOR DRAYTON MINE CONSENT MODIFICATION

HANSEN BAILEY
December 2011

REPORT TITLE: Surface Water Impact Assessment for Drayton Modification**CLIENT:** Hansen Bailey**REPORT NUMBER:** 0770-02-B

Revision Number	Report Date	Report Author	Reviewer
0	20 December 2011	GR	DN

For and on behalf of
WRM Water & Environment Pty Ltd



Greg Roads
Principal Engineer

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1 INTRODUCTION

Anglo Coal (Drayton Management) Pty Ltd (Anglo) operates the Drayton open cut coal mine (Drayton) located in the Hunter Valley, approximately 12 km south of Muswellbrook. The location of Drayton is shown in Figure 1.1.

Anglo is applying for project approval as a Section 75W Modification under the EP&A Act to recover additional coal reserves within its mining lease and optimise the configuration of the final landform of the existing pits. The Modification consists of three minor extension areas – the Northern Modification Area, Southern Modification Area and Eastern Modification area.

- The northern modification area is 8.84 ha in area and is mainly required to facilitate greater working room and ‘laying down’ of the highwall within the approved North Pit.
- The eastern modification area is 20.3 ha and will extend the existing East Pit. This will remove the mine Industrial Dam and existing rehabilitation.
- The southern modification area is 7.38 ha and is to facilitate ‘laying down’ of the highwall and final void in the South Pit to a safe and workable area.

A total additional disturbance of 36.5 ha is proposed. No increases in production levels, employee numbers or extension of mine life are proposed. The three modification areas have been previously disturbed and rehabilitated. The locations of the three modification areas are shown in Figure 1.2.

This report, prepared by WRM Water & Environment Pty Ltd, presents the methodology and results of surface water investigations undertaken to assess the potential impacts of the Modification on local surface hydrology and the Drayton water management system.

This report includes a further six sections:

- Section 2 describes the existing environment with respect to surface water resources and the existing minesite water management system;
- Section 3 describes the potential impacts of the Modification on surface water resources;
- Section 4 assesses the impacts of the Modification on the minesite water balance.
- Section 5 presents a summary of the conclusions of the surface water assessment studies; and
- Section 6 provides a list of references.

The report also includes an appendix describing the calibration of the water balance model.

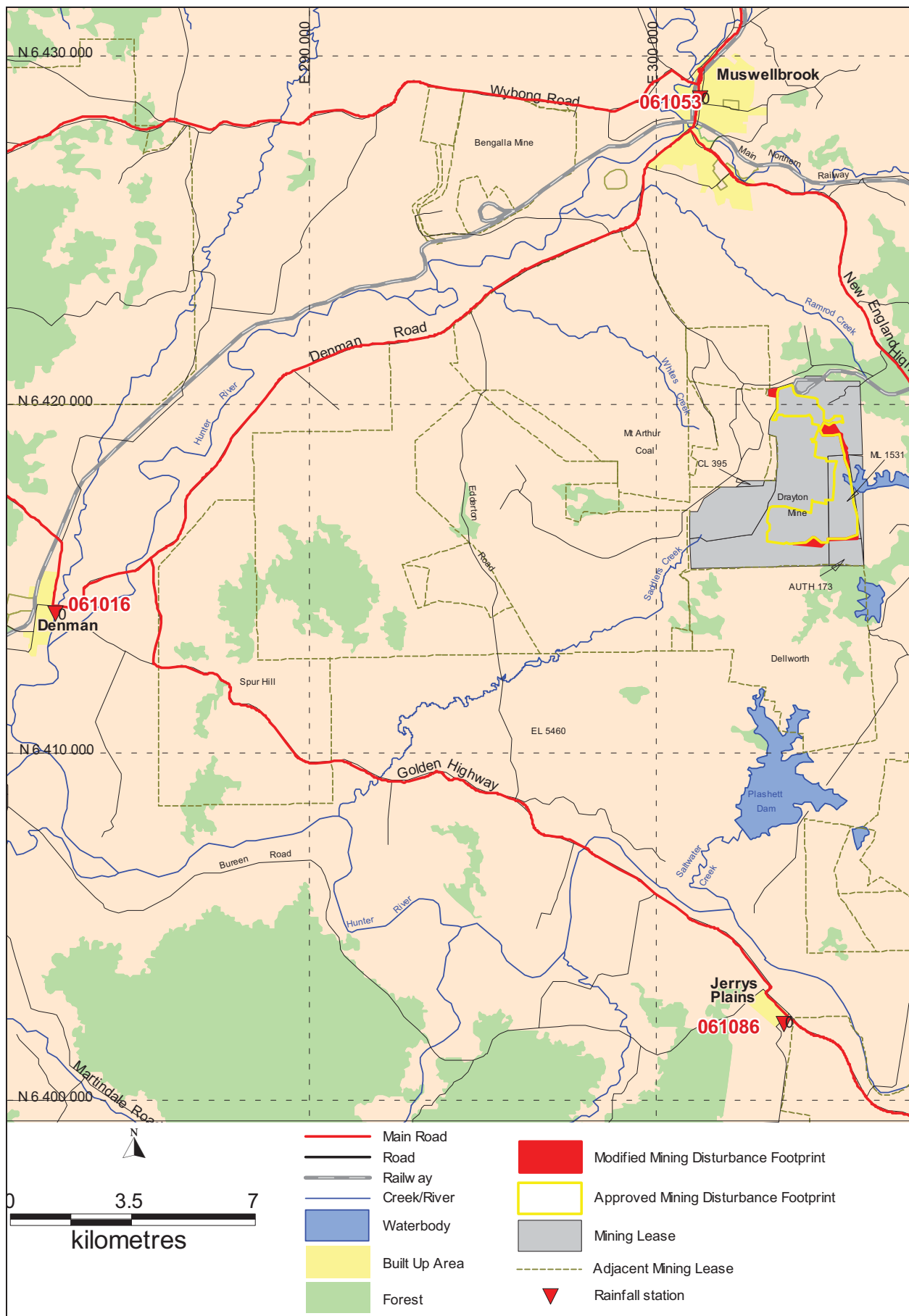


Figure 1.1 Locality Plan, Drayton Coal Mine

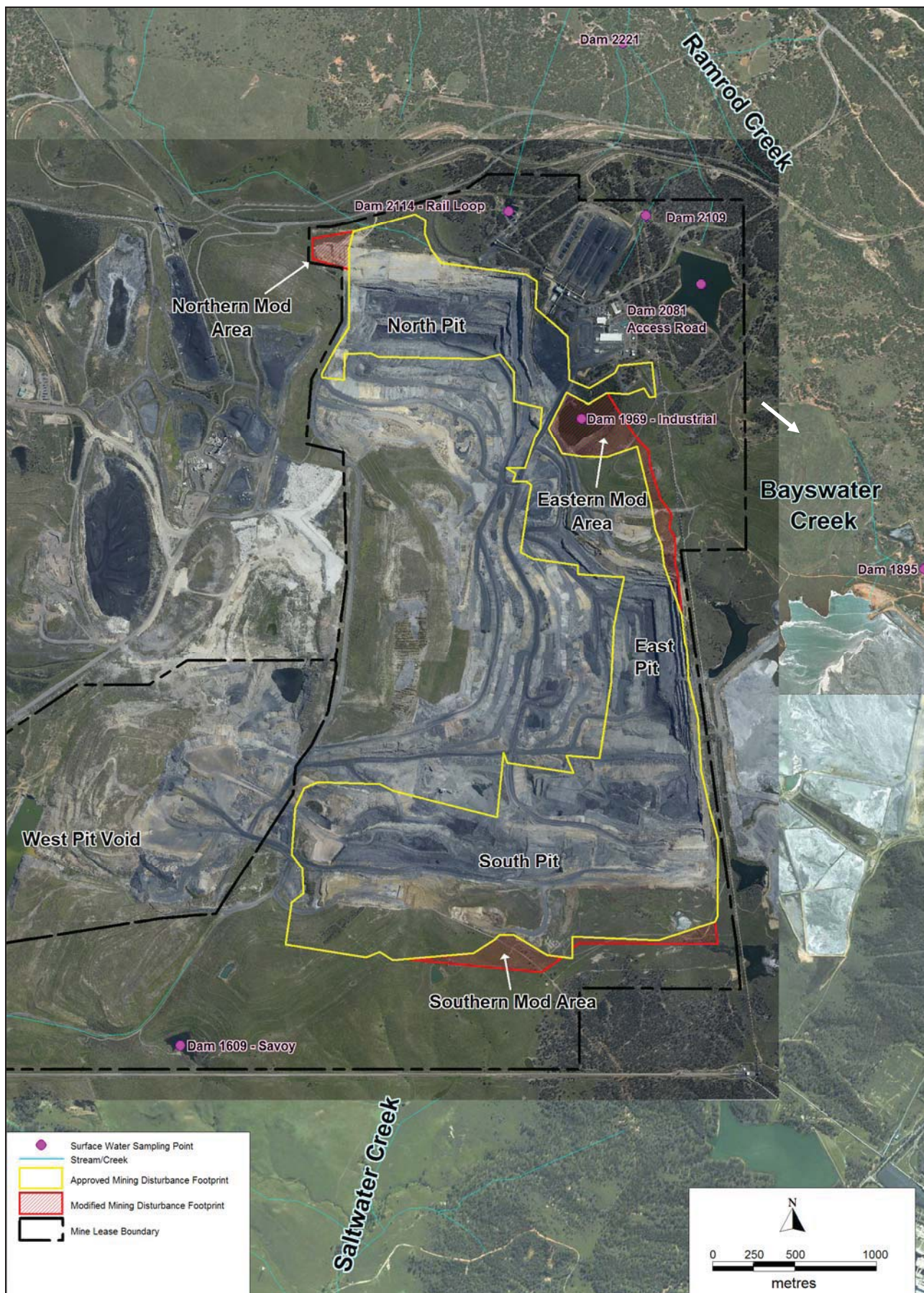


Figure 1.2 Proposed Drayton Modifications

2

EXISTING SURFACE WATER ENVIRONMENT

2.1 REGIONAL DRAINAGE NETWORK

The regional drainage network in the vicinity of Drayton Mine is shown in Figure 1.1. Drayton is located to the north and east of the Hunter River between Jerrys Plains, Denman and Muswellbrook. The Hunter River has a catchment area of approximately 13,400km² to Jerrys Plains immediately downstream of Drayton Mine. The catchment extends some 110km to the north and 140km to the west and includes the major tributaries of the Pages River, Dart Brook and the Goulburn River.

The Hunter River is a regulated river supplying water from Glenbawn Dam to a range of industrial and agricultural users as well as town water supplies. Glenbawn Dam is located on the upper headwaters of the Hunter River.

Two major tributaries, Glennies Creek and Wollombi Brook, drain into the Hunter River some 10km downstream of the mine. The total catchment area of the Hunter River to Singleton, located 30km downstream, which includes these two tributaries is 16,400km².

2.2 LOCAL DRAINAGE NETWORK

Figure 1.2 shows the topography and the location of tributaries draining the Drayton Mine. Drayton Mine is located in the upper headwaters of four minor watercourses;

- Ramrod Creek;
- Bayswater Creek;
- Saltwater Creek; and
- Saddlers Creek.

The northern areas of Drayton Mine drain via four minor gullies to the Ramrod Creek catchment. Three of the gullies converge some 1.5km downstream of Drayton Mine and the fourth converges some 6km downstream. Ramrod Creek drains into the Hunter River some 10km to the north west of the mine immediately downstream of Muswellbrook.

The eastern areas of Drayton Mine drain to or used to drain to Bayswater Creek. Almost all of the Bayswater Creek catchment within the Drayton Mine is active pit area and does not drain off site. Bayswater Creek drains into Lake Liddell and the headwater dams upstream of the Ash Dam on land owned and operated by Macquarie Generation.

The southern areas of Drayton Mine are located within the Saltwater Creek and Saddlers Creek catchments. The Saddlers Creek and Saltwater Creek catchments on the Drayton Mine site are either active pit area and do not drain off site or are undisturbed. Saltwater Creek drains into

Plashett Reservoir on land owned by Macquarie Generation. Saddlers Creek drains to the Hunter River.

2.3 RAINFALL AND EVAPORATION

Table 2.1 shows summary details of Bureau of Meteorology rainfall recording stations in the vicinity of Drayton. The locations of the various stations are shown in Figure 1.1.

Table 2.1 Rainfall Stations

Station No.	Station Name	Elevation (m)	Lat. (°S)	Long. (°E)	Distance from Site (km)	Opened	Closed
061086	Jerrys Plains Post Office	90	32.497	150.909	12	1884	-
061053	Muswellbrook (Lower Hill St)	143	32.261	150.885	15	1870	-
061016	Denman (Palace Street)	105	32.388	150.689	19	1883	-

Table 2.2 shows mean monthly rainfalls for the three rainfall stations shown in Table 2.1. Note that the mean monthly values are for different periods. The mean annual rainfall in the area of interest ranges from 594 to 644mm, with maximum monthly rainfalls occurring during the summer months.

Table 2.2 also shows mean monthly evaporation (based on a Class A evaporation pan) recorded at Jerry's Plains Post Office (Station No. 61086), located some 16km to the south of Drayton mine. Mean annual evaporation is 1613mm, which is more than double mean annual rainfall.

Figure 2.1 shows the annual distribution of average monthly rainfall and evaporation in the local area. Mean evaporation is similar to mean rainfall in the winter months, but substantially exceeds rainfall for the remainder of the year.

Table 2.2 Mean Monthly Rainfall and Evaporation

Month	Mean Monthly Rainfall (mm)			Mean Monthly Evap'n (mm)
	Muswellbrook (Lower Hill St) (061053) [1870 -]	Jerrys Plains Post Office (061086) [1884 -]	Denman (Palace Street) (061016) [1887 -]	Jerrys Plains Post Office (061086) [8 years data]
January	69.8	77.0	72.4	212
February	66.9	72.5	66.5	165
March	52.8	58.3	53.0	143
April	43.7	44.6	40.4	113
May	41.8	40.7	36.9	86
June	51.6	48.3	42.4	59
July	48.7	42.5	39.0	68
August	39.4	36.4	34.8	81
September	40.5	41.4	39.0	112
October	48.9	52.3	49.1	169
November	55.2	61.1	54.5	196
December	67.5	68.9	66.0	210
Total	627	644	594	1613

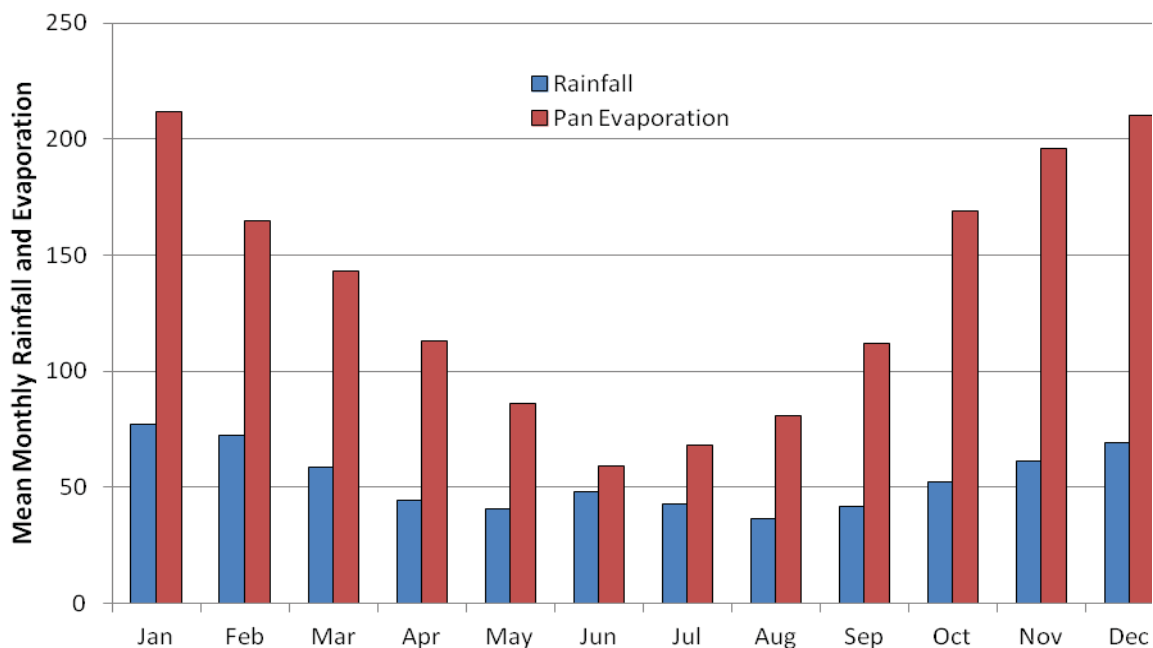


Figure 2.1 Distribution of Monthly Rainfall and Evaporation (Jerrys Plains Post Office)

2.4 SURFACE WATER QUALITY

Anglo monitors water quality in all minesite water storages on Drayton Mine and in the downstream catchments. A summary of the water quality tested in the downstream catchments is given in Table 2.3. Drayton does not discharge water to any of these catchments. Rather the catchments are mostly undisturbed with small areas of previously rehabilitated mining areas. The following is of note:

- Runoff is generally saline with electrical conductivity (EC) ranging from 2,000 to 8,000 $\mu\text{S}/\text{cm}$. The highest EC's are found in Saddlers Creek reflecting highly saline natural catchment runoff. The EC of Bayswater Creek and Ramrod Creek is measured in dams, which would elevate recorded levels above background.
- pH is slightly alkaline ranging from 7.6 to 9.2.
- Total suspended solids (TSS) is generally low.

Table 2.3 Downstream Drayton Mine Water Quality

Parameter		Bayswater Dam	Ramrod Ck	Saddlers Ck
pH	10%ile	9.20	8.48	8.6
	Median	8.80	7.9	8.32
	90%ile	8.21	7.52	7.6
EC ($\mu\text{S}/\text{cm}$)	10%ile	4774	3296	8382
	Median	3310	2220	5495
	90%ile	2045	1742	1201.8
TSS (mg/l)	10%ile	20	60.4	78.6
	Median	6	19	8
	90%ile	1	4	3

A summary of the water quality tested in the various water storages on the minesite is given in Table 2.4. The summary is based on monthly samples collected between January 2008 and July 2011. The results indicate that runoff draining the minesite catchments has similar water quality characteristics to the natural catchments with runoff that is saline and slightly alkaline.

Table 2.4 Drayton Mine Water Quality Data

Parameter		Savoy Dam	Industrial Dam	Access Rd Dam	Rail Loop Dam	West Pit Void
pH	10%ile	8.28	8.60	8.6	8.3	8
	Median	8.00	8.20	8.2	8.1	7.85
	90%ile	7.70	7.90	7.64	7.7	7.6
EC ($\mu\text{S}/\text{cm}$)	10%ile	6440	5710	5404	5864	8335
	Median	5240	4720	4780	4990	7805
	90%ile	4580	4010	4354	2990	6865
TSS (mg/l)	10%ile	14.8	47.6	85.4	57.8	15
	Median	6	16	12	12	7
	90%ile	2.2	6	4	4.4	3.5

2.5 EXISTING MINE WATER MANAGEMENT SYSTEM

The existing Drayton mine water management system is operated in accordance with the Drayton Water Management Plan (WMP) (Anglo, 2009) and the Anglo Environment Way Management System.

Figure 2.2 shows the locations and catchments of the major water storages and the three active pits; East Pit, North Pit and South Pit on the Drayton Mine. The catchment areas are based on the aerial photo taken in October 2010. Figure 2.3 shows a schematic of Drayton's mine water management system and the various connection and flow paths between the water storages. Drayton's water management system is based on a closed system, as Drayton does not possess a discharge licence. All mine water is stored on-site in established dams and voids and is utilised by the mining operation primarily for coal processing and dust suppression purposes.

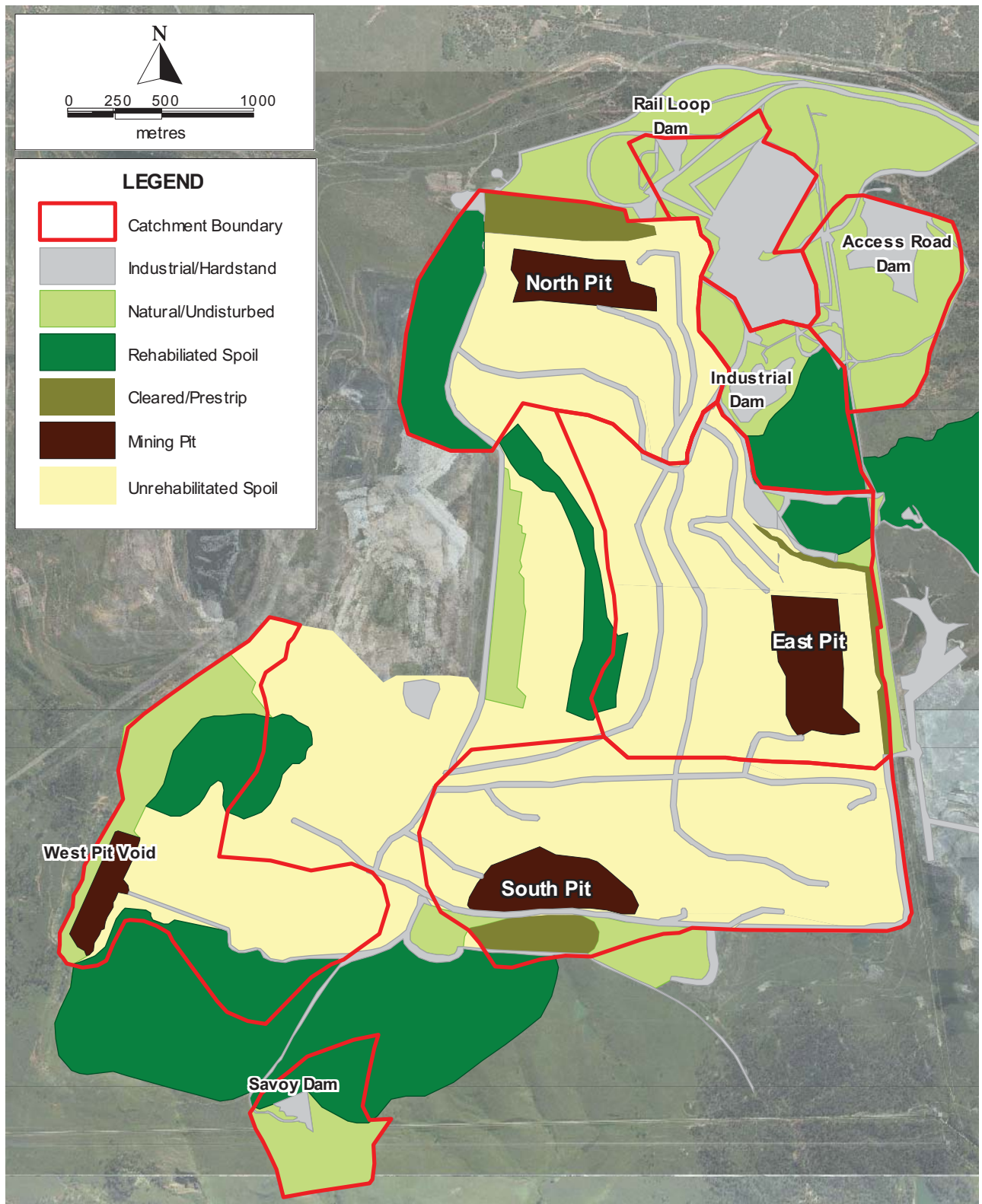


Figure 2.2 Drayton Mine Water Management System

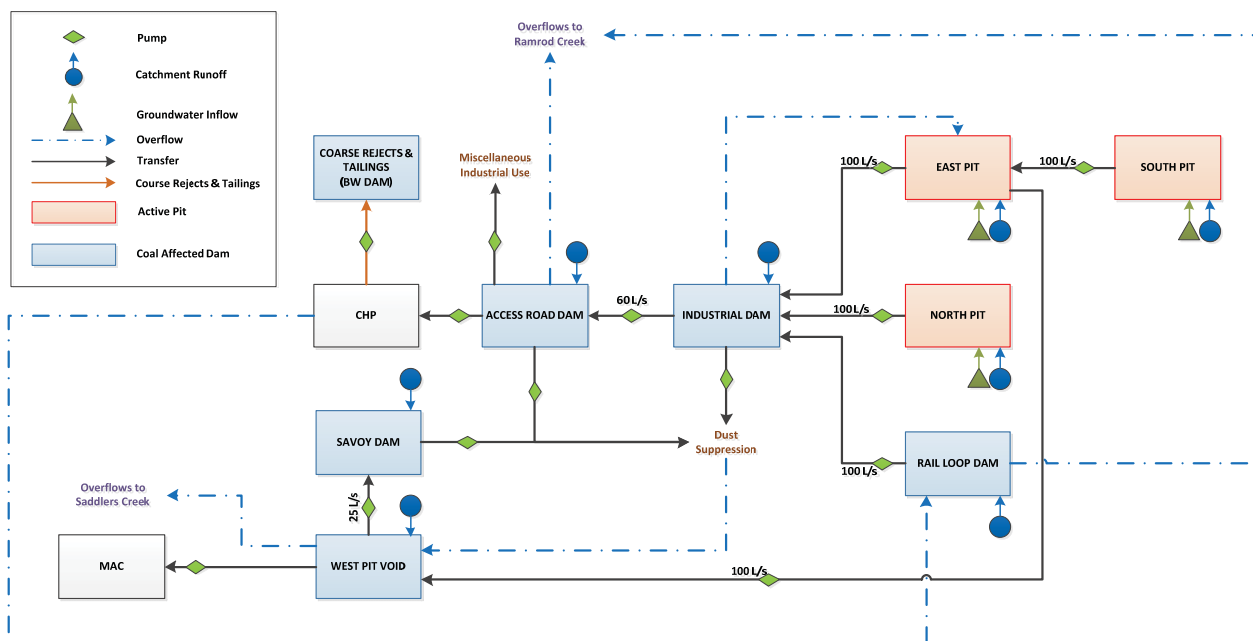


Figure 2.3 Drayton Mine Water Management System Schematic

2.6 MINE WATER STORAGES

Table 2.5 shows details of the main water management storages on the Drayton minesite. The catchment areas and landuse draining to the various dams are given in Appendix A. The dams are connected by a pipe network, which enables a transfer of water according to mine operational requirements. The West Pit Void, currently subleased to Mount Arthur Coal (MAC), is used as a repository for excess water on the mine for later reuse. The agreement allows Drayton to store water within the West Pit Void until January 2017, upon which time any stored water has to be removed back to the Drayton Mine. The agreement also allows 600 ML per annum to be transferred to MAC when required.

Table 2.5 Capacities of Site Mine Water Storages

MINE WATER STORAGE	Storage Capacity (ML)	Supply Source	Water Use
Access Road Dam (2081)	750	- o Pumped transfers from Industrial Dam - o Natural and rehabilitated catchment runoff	- o CHP Use - o Industrial Use - o Stockpile and haul road dust suppression
Industrial Dam (1969)	750	- o Pumped transfers from active pits and Rail Loop Dam - o Natural and rehabilitated catchment runoff	- o Pumped transfers to Access Road Dam - o Haul Road dust suppression - o Industrial washdown
Rail Loop Dam (2114)	18	o Industrial and natural areas catchment runoff	- o Pumped transfers to Industrial Dam - o Stockpile and haul road dust suppression
Savoy Dam (1609)	140	o Natural and rehabilitated catchment runoff	- o Pumped transfers to Industrial Dam - o Haul road dust suppression
West Pit Void (SW13)	4043	- o Natural, rehabilitated and spoil catchment runoff - o Pumped transfers of excess water from active pits	- o Pumped transfers to Industrial Dam - o Pumped to MAC

2.7 TAILINGS DISPOSAL SYSTEM

Anglo Australia has submitted an application under 75W of the Environment Planning and Assessment Act 1979 to place raw tailings within the East Pit Void, rather than a co-disposal dry tailings product. The East Pit will be separated into the East Pit South, which will store tailings and mining will continue in East Pit North.

Approximately 3 million m³ of dewatered tailings is proposed to be placed in the East Pit South to 2017. Tailings emplacement will be up to RL 104. Subsequently, 1,500 ML of water will be stored to increase the in-pit level to RL114 behind an in situ pillar to enable mining to the north. Following the tailings placement, Macquarie Generation may then complete filling the void to the currently approved design level with fly ash material or alternatively the void will be capped to DTIRIS-MR standards. It has been assumed that the application to place tailings within the East Pit South Void will be approved in this assessment.

3

POTENTIAL IMPACTS AND MITIGATION MEASURES

3.1 POTENTIAL IMPACTS

The potential impacts of the project are as follows:

- Reduction in off-site catchment flows;
- Potential impact of the removal of the Industrial Dam on minesite water management;
- Potential to increase overflows of poor quality mine water;
- Potential to increase sedimentation of the waterways;
- Potential to impact on mining operations due to the build up of water in the active pits; and
- Potential to require off site water supplies.

3.2 REDUCTION IN CATCHMENT FLOWS

The Modification will result in an additional 36.5ha of disturbed area at Drayton that will require runoff to be captured within the water management system.

3.2.1 Northern Modification Area

The northern modification area is 8.84 ha in area and is mainly required to facilitate greater working room and 'laying down' of the highwall within the approved North Pit.

The northern modification area is located in the upper headwaters of Ramrod Creek. The catchment area of Ramrod Creek to the lease boundary under the currently approved final landform is 184 ha. The northern modification area will reduce the Ramrod Creek catchment draining to the lease boundary by only 1.7ha to 182.3 ha. Under current conditions, the majority of the northern modification area drains directly to the North Pit. The loss of an additional 1.6 ha as a result of Drayton Mine is not significant when compared to the total catchment area of Ramrod Creek to the Hunter River of 3,978ha.

3.2.2 Eastern Modification Area

The eastern modification area is 20.3 ha and will extend the existing East Pit northward to remove the mine Industrial Dam and existing rehabilitation. Under existing conditions and the currently approved final landform, the Industrial Dam and the rehabilitation area drains to the East Pit. Therefore, the proposed eastern modification does not change the catchment area draining off site.

3.2.3 Southern Modification Area

The southern modification area is 7.38 ha and is to facilitate 'laying down' of the highwall and final void in the South Pit to a safe and workable area. The southern modification area drains to Saltwater Creek or the headwater dams upstream of the Liddell Ash Dam on land owned by Macquarie Generation.

The proposed final landform would increase the catchment draining to Saltwater Creek by 0.6 ha and would reduce some 40.1 ha of catchment draining to the headwater dams upstream of the Liddell Ash Dam on the Macquarie Generation site when compared to the existing approved final landform. It appears that a significant area of rehabilitated dump drained to these headwater dams under the previously approved final landform. It is expected that the removal of catchment draining to the headwater dams would reduce the potential for clean water to overflow into the Ash Dam and thereby reduce the Ash Dam's potential for overflowing.

3.3 REMOVAL OF THE INDUSTRIAL DAM

The Industrial Dam is a 750 ML storage currently used as a pit water repository to supply water for haul road dust suppression, industrial wash down and as a back up to the Access Road Dam to supply water to the CHP. It is proposed to shift the current functions from the Industrial Dam to the Access Road Dam. That is:

- pit water will be pumped directly to the Access Road Dam;
- pit water will be transferred to the West Pit void if the Access Road Dam is full;
- haul road dust suppression will be taken from the Access Road Dam, with back up from the Savoy Dam and the ES Pit tailings water recovery system;
- industrial wash down water will be taken from the Access Road Dam; and
- the Rail Loop dam will be pumped to the Access Road Dam.

An assessment of the impact of these changes on the minesite water balance is given in Section 4.

3.4 INCREASED SEDIMENTATION OF WATERWAYS

The proposed Modification would not increase the sediment loads draining to the downstream waterways because the disturbance areas drain into the open-cut-pits. Additional sediment control measures around the workings are not required.

3.5 OVERFLOWS OF POOR QUALITY MINE WATER

An assessment of the impact of these changes on overflows from the minesite storages is given in Section 4.

4 MINE WATER BALANCE

4.1 OVERVIEW

A computer-based simulation model (OPSIM) was used to assess the dynamics of the site water balance under conditions of varying rainfall and catchment conditions. The OPSIM model works to dynamically simulate the operation of the site's water management system and in doing so keeps complete account of all site water and representative water quality on a daily time step.

The model has been configured to simulate the operations of all major components of the water management system including:

- climatic variability – rainfall and evaporation;
- catchment runoff and collection;
- pit dewatering;
- pump and gravity transfers;
- water storage filling, spilling and leaking;
- industrial water extraction, usage and return; and
- controlled and uncontrolled releases.

4.2 METHODOLOGY

The OPSIM water balance model of the Drayton Mine water management system, previously developed to assess the impact of the proposed changes to the tailings disposal system (Water Solutions, 2011), was used as the basis for the assessment. For this study, the runoff parameters in the previous OPSIM model were recalibrated to match the recorded and predicted storage volumes over the period 2007 to 2011. Details of the OPSIM model configuration and calibration is given in Appendix A.

The calibrated model was used to assess the impact of the proposed modification on the mine site water balance over the final five years of mine life (2012 to 2016) assuming the minesite catchments change over that time. Two different stages of mine life were included in the model.

- It was assumed that the existing catchments represent the minesite conditions from 2012 to 2014 inclusive; and
- The final void catchments represent the minesite conditions from 2015 to 2016 inclusive.

Although the catchment areas are expected to continuously change as the minesite is continually rehabilitated, the simplification is expected to reasonably represent minesite conditions over the 2012 to 2016 period.

The model simulates the operation of the mine water management system over the different mine stages sequentially from 2012 to 2016, a period of 5 years. To assess the effects of varying climatic conditions, the model was run for multiple cycles with a different rainfall input sequence for each cycle. The first cycle of the model used rainfall data commencing in 1889 and ending in 1893. The second cycle of the model uses a 5 year period of rainfall data offset by one year, commencing in 1890. For each subsequent cycle of the model, the rainfall data used is offset by one year until the mine water system has been tested for 118 cycles against 122 years of rainfall data. The initial storage conditions in all dams at the start of each model cycle have been assigned the values recorded by the site water management team at or near July 2011. Under this scenario, the model provides a probabilistic approach to predicting the behaviour of the minesite water management system over the remaining five years of mine life.

The adopted rainfall sequence for the simulations was based on a synthetic rainfall data set interpolated from point observations by the Bureau of Meteorology (SILO Data Drill, Jeffrey et al., 2001). A comparison of Silo data against recorded data is given in Appendix A.

4.3 MINESITE WATER MANAGEMENT SYSTEM

Figure 4.1 and Figure 4.2 show the locations and catchments of the various dams and pits on the Drayton Mine under proposed mining conditions (2012 to 2014) and proposed final void (2015 to 2016). A schematic of the minesite water management system over both periods is given in Figure 4.3.

For the proposed mining conditions, the only difference from existing approved conditions, given in Figure 2.2, is that the Industrial Dam catchment will drain to East Pit North. The changes to the water management system as a result of the removal of the Industrial Dam are given in Section 3.3. The operating rules for the remaining dams are given in Table A 3 in Appendix A.

For the final void conditions (2015 to 2016) the same operational rules are applied until the completion of mining but the catchment areas draining to the open cut pits change. At the end of mining, any water remaining in the West Pit Void, in excess of MAC requirements will be pumped back to the South Pit and all pumping will cease.

4.4 SITE WATER REQUIREMENTS

Table 4.1 shows the expected water demands over the five year life of the project. CHP makeup demand has been taken from a previous report (Water Solutions, 2011) and is based on a 4.8 million tonnes per annum (Mtpa) washed raw feed rate, a 60% plant efficiency rate, 14% fine tailings split and a 40% decant return rate.

Table 4.1 Site Water Demands

Demand	Demand	
	ML/yr	kl/d
CHP Makeup	640	1,750
Haul Road Watering	600	1,643
Stockpile Dust Suppression	50	137
Industrial Use	400	1,095
Total	1,690	4,625

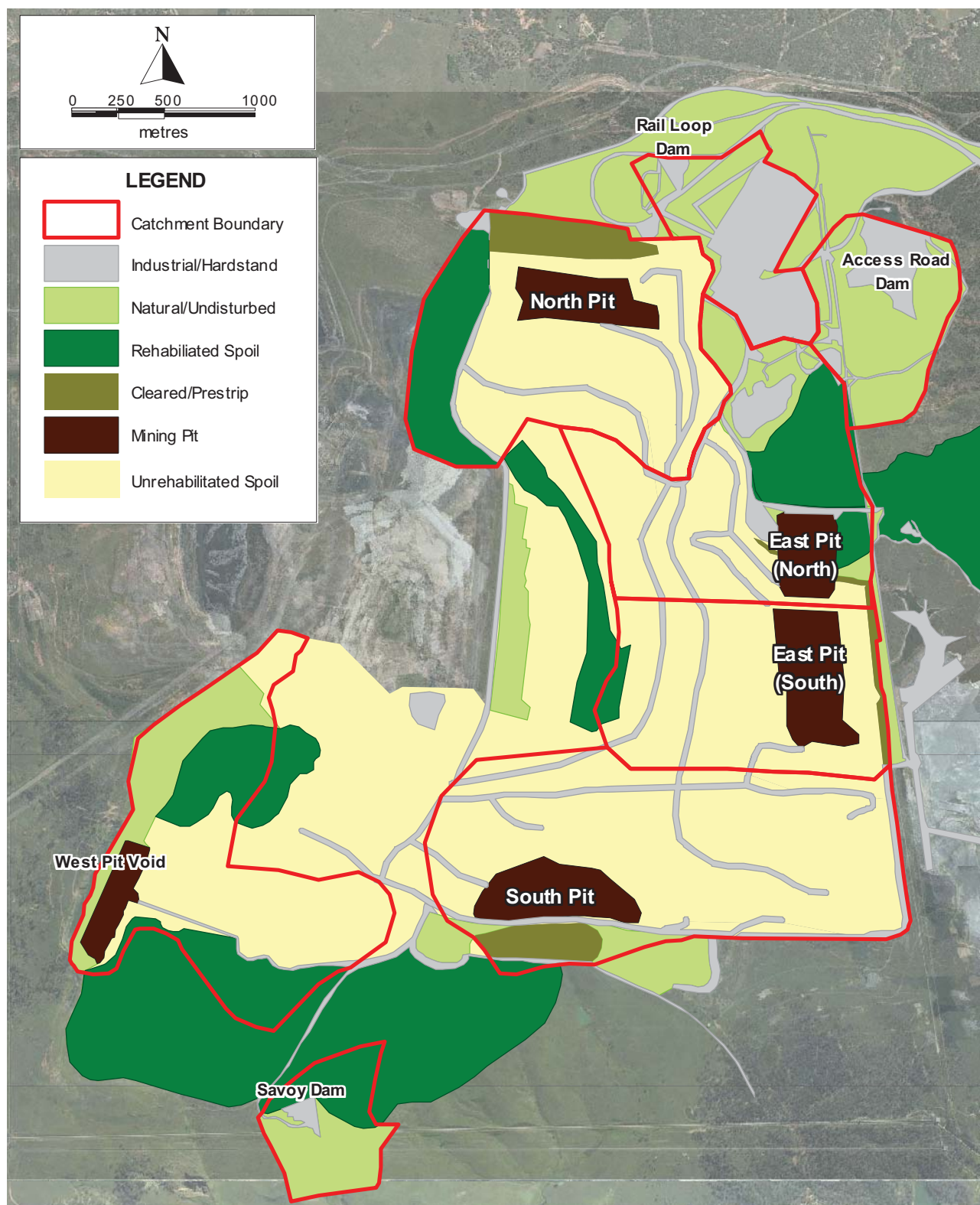


Figure 4.1 Existing Conditions Minesite Catchments (With Industrial Dam Removed)

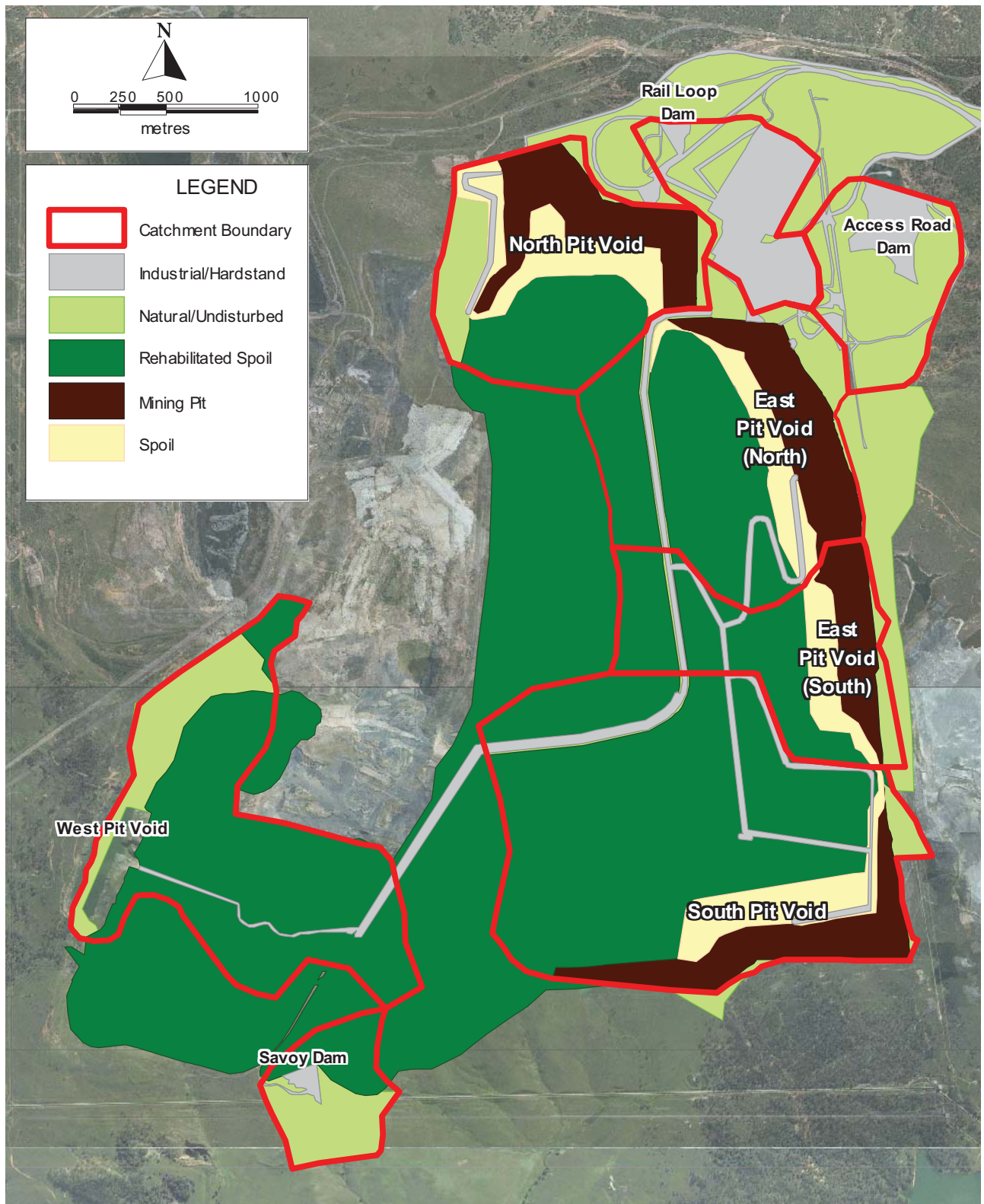


Figure 4.2 Final Void Minesite Catchments

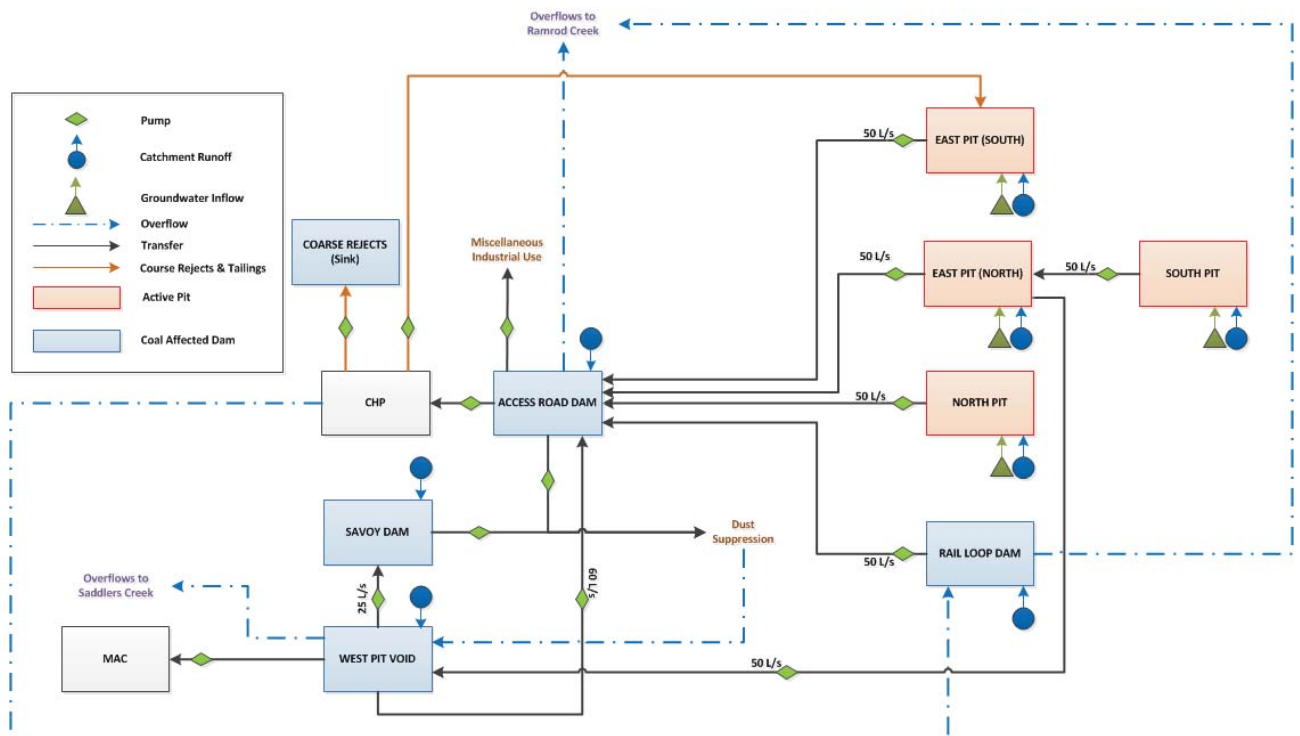


Figure 4.3 Minesite Water Management Schematic

4.5 GROUNDWATER INFLOWS

Table 4.2 shows the estimated groundwater inflow to the three active pits on the Drayton Mine over the remaining five year life estimated by AGE (2006). The proposed Modification is not expected to change the rates of groundwater inflows from the AGE estimates.

Table 4.2 Drayton Mine Groundwater Inflows

Year	ML/yr	kL/d
North Pit	390	1,070
South Pit	165	350
East Pit	400	1,143

4.6 MINESITE CATCHMENT CHANGES

Table 4.3 shows the catchment areas draining to the various open-cut-pits and mine water dams under the approved conditions (with the East Pit Void tailings dam in place) for both existing (mining) conditions and for the final void. The catchment areas proposed under this modification for both existing (mining) conditions and for the final void are also shown. The following is of note:

- The catchment area of the Industrial Dam drains to the East Pit North under proposed conditions.
- Substantial changes to catchment areas are proposed between the existing approved final void and the proposed final void.

- North Pit catchment area reduces by 18%.
- East Pit North catchment increases due to the inclusion of the Industrial Dam catchment.
- The South Pit catchment area increases substantially. The final void has moved to the eastern lease boundary taking in catchment that was to drain to the headwater dams upstream of the Ash Dam on the Macquarie Generation site. As discussed in Section 3.2.3, the removal of this catchment is expected to improve the performance of the Macquarie Generation Ash Dam.
- East Pit South tailings dam catchment reduces substantially, which will improve the operation of the tailings dam under mining conditions and improve the ability to rehabilitate the site post mining.

Table 4.3 Existing and Proposed Pit and Dam Catchment Areas, Mining and Final Void Conditions

Pit/Dam	Catchment Areas (ha)			
	Mining Conditions		Final Void	
	Existing	Proposed	Existing	Proposed
North Pit	187.5	187.5	173.1	141.6
East Pit North	103.7	162.1	155.4	188.5
South pit	244.5	244.5	162.2	317.9
West Pit Void	165.3	165.3	165.3	165.3
Industrial Dam	58.4	0.0	38.4	0.0
Access Road Dam	68.2	68.2	68.2	68.2
Rail Loop Dam	62.9	62.9	62.9	62.9
Savoy Dam	40.6	40.6	40.6	40.6
East Pit South	134.0	134.0	204.3	109.6

4.7 WATER BALANCE MODEL RESULTS

4.7.1 Minesite Storage Volume

Figure 4.4 and Figure 4.5 show the predicted in-pit and out-of-pit storage volume on the Drayton Mine (50th percentile) as well as the 90th and 10th percentile confidence limits of the estimate. The active pits include East Pit North, North Pit and South Pits. The out-of-pit storages include the West Pit Void, Access Road Dam, Rail Loop Dam and Savoy Dam. The following is of note:

- Under median rainfall conditions, there would be no build up of water in the active pits and a general draw down of water from the out of pit storages with total minesite inventory falling from 3,550ML to 2,420ML over the five year period.
- Under 10th percentile (wet) conditions, there would be no draw down of water in the out-of-pit storages and a moderate build up of water in the active pits. A maximum of 500 ML of water would build up in the active pits for the 10th percentile wet conditions. Given that the excess water can be spread over the three pits or temporarily pumped to the Savoy Dam, the build-up of water is not expected to significantly impact on mining.
- Under the 90th percentile (dry) conditions, on-site inventories fall to 2,000 ML after two years of mining. It has been assumed that 2,000 ML in the West Pit Void is owned by Mount Arthur Coal and is not available for mine site use. Off site supplies would be required should 90th percentile (dry) conditions prevail over the next 5 years.

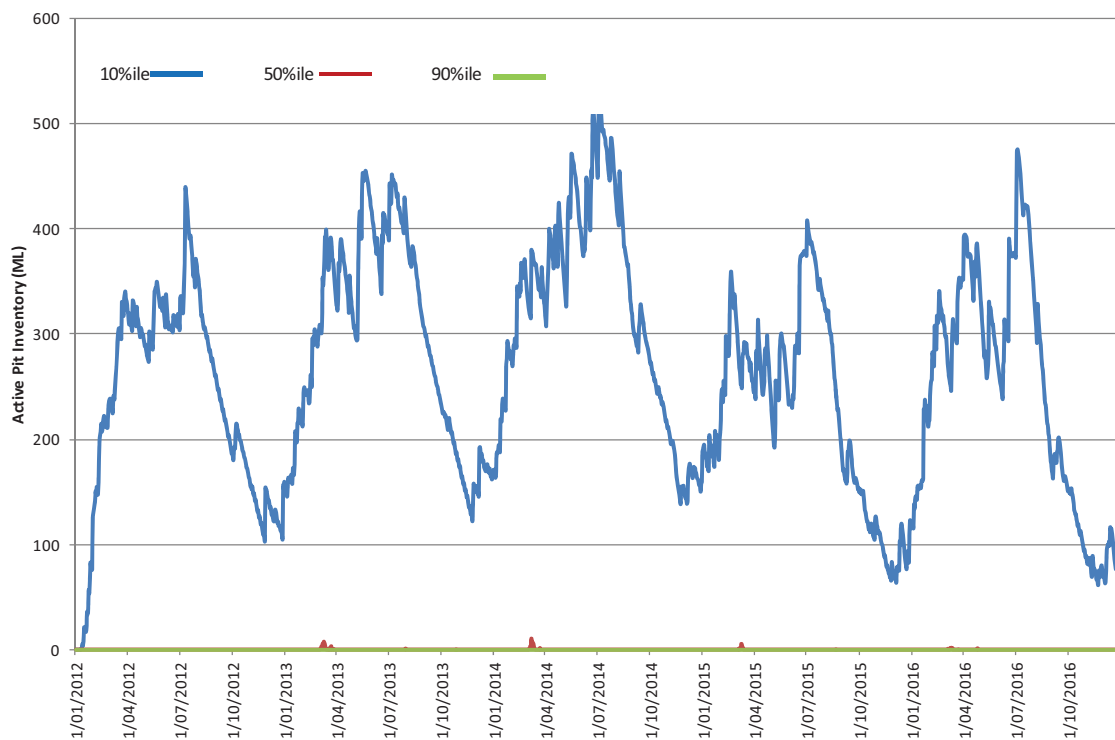


Figure 4.4 Simulated In-Pit Storage Inventory, 90th Percentile (dry), 50th Percentile (median) and 10th percentile (wet) conditions, 2012 to 2016.



Figure 4.5 Simulated Out-of-Pit Storage Inventory, 90th Percentile (dry), 50th Percentile (average) and 10th percentile (wet) conditions, 2012 to 2016.

4.7.2 Makeup Water Requirements

Figure 4.6 shows the cumulative off-site water requirements for the Drayton Mine for 50th Percentile (median) conditions over the next five years as well as the 90th and 10th percentile confidence limits of the estimate. The results show the following:

- No off-site water would be required for the 10th percentile wet year.
- Under median rainfall conditions, some off-site water may be required in year 4 and year 5. A total of 400 ML would need to be sourced externally over the last two years of the life of the mine.
- Under 90th percentile (dry) conditions, off site water supplies would be required from year 2 with a total of 1,750ML required over the 5 year period.

Historically, Drayton has been able to source sufficient water from on-site to supply all minesite water requirements. The additional coal washing and associated losses in the tailings circuit has lead to an increase in off-site requirements. It is expected that a reduction in coal washing and reduced coal production would occur if very dry conditions occur over the next five years.

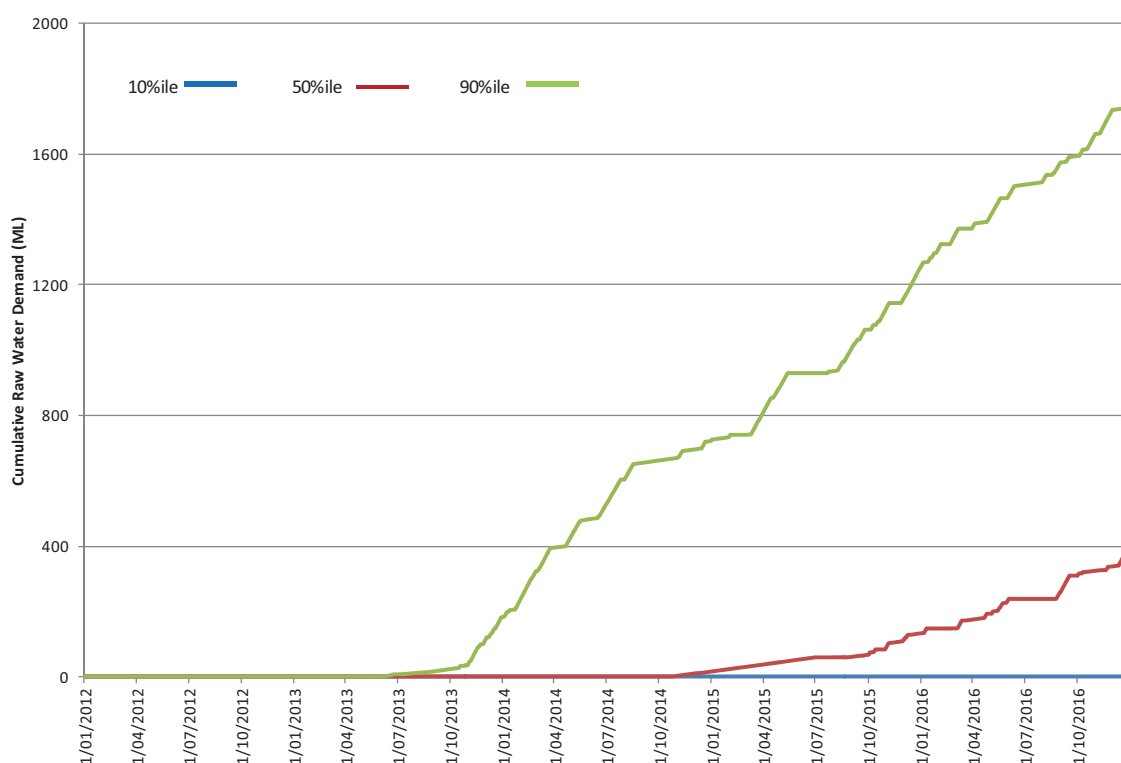


Figure 4.6 Offsite Make-up Water Requirements, 90th Percentile (dry), 50th Percentile (median) and 10th percentile (wet) conditions, 2012 to 2016

4.7.3 Uncontrolled Spills

Table 4.4 shows the predicted spills from the minesite storages over the 5 year period for the median conditions as well as the 90th and 10th percentile confidence limits of the estimate. The results show that the main minesite storages, Access Road Dam, Savoy Dam and the West Pit void do not spill over the final five year mine life. Under median conditions, two spills are predicted from the Rail Loop Dam. The Rail Loop dam is only 18 ML, which is considered too

small for its catchment. To prevent spills during the 10th percentile year, it is recommended to increase the capacity of the Rail Loop Dam by 50 ML.

Table 4.4 Predicted Spills from Minesite Storages

Dam	Simulation	No. Days of Spill	Max Vol Spill
Rail Loop Dam	10%ile	5	78.5
	50%ile	2	14.0
	90%ile	0	0
Access Road Dam	10%ile	0	0
	50%ile	0	0
	90%ile	0	0
Savoy Dam	10%ile	0	0
	50%ile	0	0
	90%ile	0	0
West Pit Void	10%ile	0	0
	50%ile	0	0
	90%ile	0	0

5 CONCLUSIONS

The proposed Modification at Drayton represents a relatively minor change to the drainage network and the existing water management system. Although an additional 36.5 ha of disturbance is proposed as part of the modification, the majority of this disturbance drained in-pit. As such, the proposed modification is not expected to increase the sediment loads draining to the downstream waterways or reduce downstream catchment flows.

The proposed final landform would increase the catchment draining to Saltwater Creek by 0.6 ha and would reduce some 40.1 ha of catchment draining to the headwater dams upstream of the Liddell Ash Dam on the Macquarie Generation site when compared to the existing approved final landform. It appears that a significant area of rehabilitated dump drained to these headwater dams under the previously approved final landform. It is expected that the removal of catchment draining to the headwater dams would reduce the potential for clean water to overflow into the Ash Dam and thereby reduce the Ash Dam's potential for overflowing.

Water balance modelling of the proposed Modification was undertaken to assess the impact on the minesite water management system. The results of the water balance modelling are as follows:

- Under median rainfall conditions, there would be no build up of water in the active pits and a general draw down of water from the out of pit storages with total minesite inventory falling from 3,550ML to 2,420ML over the five year period.
- Under 10th percentile (wet) conditions, there would be no draw down of water in the out-of-pit storages and a moderate build up of water in the active pits. A maximum of 500 ML of water would build up in the active pits for the 10th percentile wet conditions. Given that the excess water can be spread over the three pits or temporarily pumped to the Savoy Dam, the build-up of water is not expected to significantly impact on mining.
- Under the 90th percentile (dry) conditions, on-site inventories fall to 2,000 ML after two years of mining. It has been assumed that 2,000 ML in the West Pit Void is owned by Mount Arthur Coal and is not available for mine site use. Off site supplies would be required should 90th percentile (dry) conditions prevail over the next 5 years or production will reduce.
- No off-site water would be required for the 10th percentile wet year.
- Under median rainfall conditions, some off-site water may be required in year 4 and year 5. A total of 400 ML would need to be sourced externally over the last two years of the life of the mine under median rainfall conditions.
- Under 90th percentile (dry) conditions, off site water supplies would be required from year 2 with a total of 1,750ML required over the 5 year period.
- The main minesite storages, Access Road Dam, Savoy Dam and the West Pit void do not spill over the final five year mine life. Under median conditions, two spills are predicted from the Rail Loop Dam. The Rail Loop dam is only 18 ML, which is considered too small for its catchment. To prevent spills during the 10th percentile year, it is recommended to increase the capacity of the Rail Loop Dam by 50 ML.

6 REFERENCES

- | | |
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APPENDIX A

WATER BALANCE MODELLING

A.1 METHODOLOGY

An OPSIM water balance model of the Drayton Mine water management system, previously developed to assess the impact of the proposed changes to tailings disposal system (Water Solutions, 2011), was used for the assessment. The model was updated by recalibrating the runoff parameters to match the storage volumes over the period 2007 to 2011 using available meteorological data for the site. The model was also updated to include a salt balance. The model was then modified to include the final landform on the Drayton Mine.

The updated model of the Drayton Mine Water Management System was used to determine:

- The frequency and volume of potential spills from various dams;
- The reliability of the storages to supply the mine site water requirements; and
- The ability to dewater the pit.

A.2 THE OPSIM MODEL

The OPSIM model estimates runoff and evaporation at each of the site water storages on a daily basis using historical climate data. It also simulates the transfer of water between storages, the harvesting of water and the controlled discharge of water if required.

Table A 1 provides a summary of the inflows and outflows included in the OPSIM model. Details of the model configuration, input data and results are provided in the following sections.

Table A 1 Simulated Inflows and Outflows to Mine Water Management System	
Inflows	Outflows
Direct rainfall on water surface of storages	Evaporation from water surface of storages
Catchment runoff	CHPP demand
Groundwater inflows to Open Cut Pit	Dust suppression demand
Raw water supply	Vehicle washdown
	Off site spills from storages
	Controlled Releases

A.3 METEOROLOGY

A.3.1. Site Rainfall

A representative long-term rainfall sequence for Drayton Mine was obtained from the Bureau of Meteorology's SILO Data Drill. These synthetic data are derived by interpolation of recorded rainfall data between stations as described by Jeffreys *et al* (2001). Rainfall data from the SILO Data Drill is available from the late 1800s and is corrected for missing data and accumulated totals. Hence, this data is more reliable and easier to use for computer modelling than raw recorded rainfall data.

Figure A 1 shows a comparison of mean monthly rainfall recorded at the Jerrys Plains Post Office rainfall station (#061086), Denman Palace St Gauge (#061016) and the Muswellbrook Lower Hill St gauge (#061053) with the SILO Data Drill rainfalls over the project area from 1889 to

2010. The comparison indicates that the SILO data provides a good representation of recorded rainfall data at Drayton.

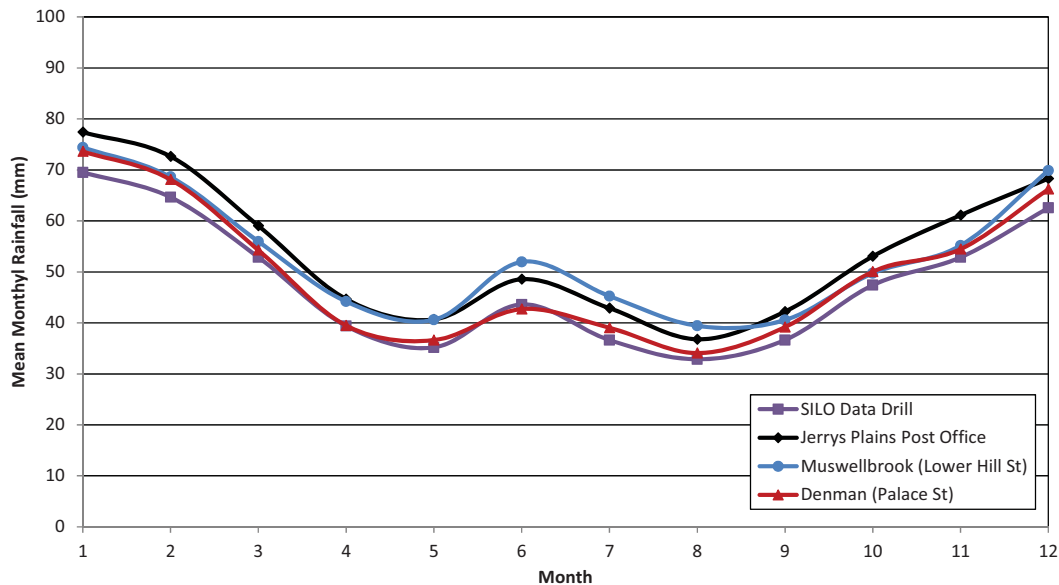


Figure A 1 Comparison of Mean Monthly Rainfalls of Surrounding Rainfall Stations with SILO Data Drill, 1889 to 2010

A.3.2. Evaporation

The pan evaporation data for the area was obtained from the SILO Data Drill database (Jeffrey et al., 2001). Pan factors were applied to the pan evaporation data to match Morton's lake evaporation (Morton, 1983). Morton's method is regarded as suitable for the estimation of lake evaporation in non-arid areas (Mulder, 1997). Table A 2 shows the adopted pan evaporation and pan factors used to estimate evaporation from the onsite storages.

Table A 2 Adopted Monthly Lake Evaporation Factors

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Average	211	167	148	106	71	53	62	87	117	156	182	215
Monthly Lake Pan Factors	0.9	0.92	0.93	0.87	0.83	0.77	0.78	0.84	0.88	0.92	0.92	0.89

For the mining pits, the values shown in Table A 2 were factored by 0.7 to reflect the likely reduction in evaporation due to the depth of the open cut below surface level. For AWBM soil moisture evapotranspiration, the values shown in Table A 2 were factored by 0.99 to convert to areal evapotranspiration.

A.4 DRAYTON MINE WATER BALANCE MODEL CALIBRATION

A.4.1. Methodology

The calibration model was run over the period Jan 2007 to mid-2011, for which stored water volumes in the minesite storages were available. It was assumed that catchment areas draining to the active pits do not change over the calibration period. The change in catchment area over this period is only minor when compared to the total mine site catchment so the impact on the water balance of this assumption is not expected to be significant.

A.4.2. Water Management System

Figure A 2 shows a schematic of the Drayton water management system over the calibration period. The locations of the various storages and active working areas are shown in Figure A 3. A summary of the main features of the water management system is as follows:

- Active pits are dewatered to the Industrial Dam at a nominal pump rate of 100 L/s;
- CHP make-up demand is sourced from the Access Road Dam;
- The Rail Loop Dam receives runoff from the CHP and industrial areas;
- Coal stockpile dust suppression is sourced from the Access Road Dam, which is topped up by water in the Industrial Dam;
- The Industrial Dam supplies the East Pit fill point for haul road dust suppression;
- The Savoy Dam supplies the West Pit fill point for haul road dust suppression (via the Turkeys Nest Dam which is not explicitly modelled);
- West Pit Void receives inflows from the active pits should additional dewatering be required.

Full details of the operational rules adopted over the calibration period are given in Table A 3.

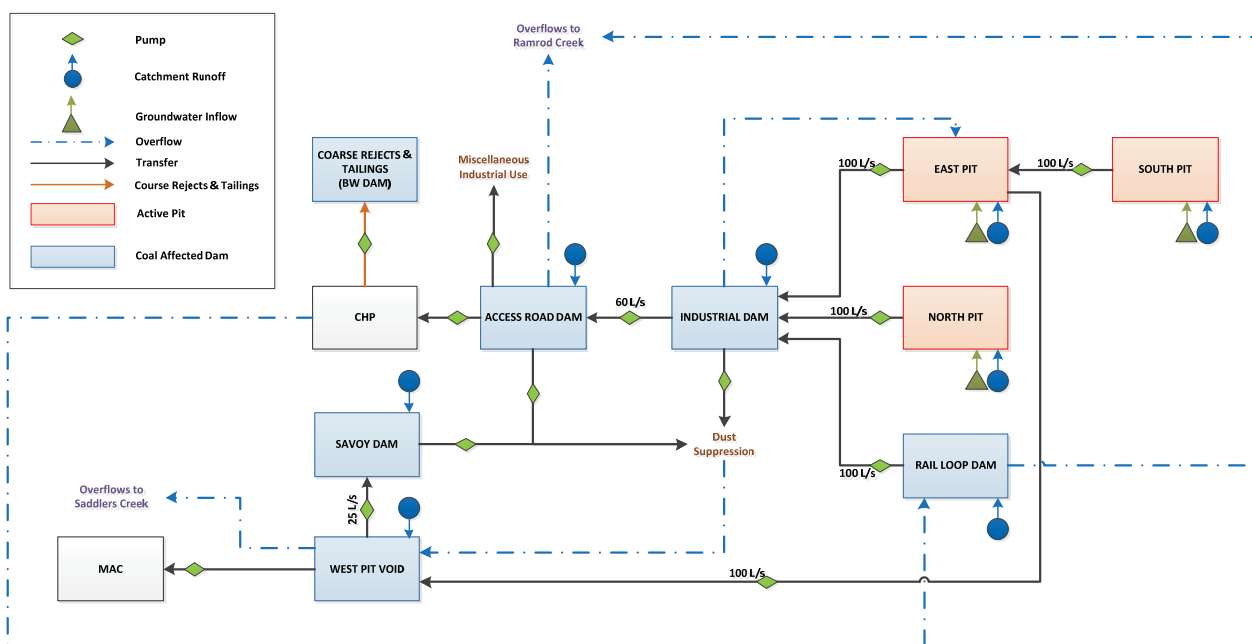


Figure A 2 OPSIM Model Schematic of Drayton Surface Water Management System for the Calibration Period (Jan 2007-May 2011)



Figure A 3 Existing Drayton Mine Site Storages and Active Working Areas

Table A 3 Adopted Drayton Operational Guidelines for Calibration Period 2007-2010

	Operational Description	Operating Rules
1	Supply to Demands	
1.1	CHP Make Up	Supplied from the Access Rd dam at a rate of 237kL/d 100% loss assumed.
1.2	Miscellaneous Industrial use	Sourced from the Access Road Dam at a rate of 650kL/d. 100% loss assumed.
1.3	Haul Road Dust Suppression	2 Haul Road Fill locations: - West Pit Fill Point: 15% of haul road dust suppression demand is sourced from Savoy Dam at a rate of 292kL/d. - East Pit Fill Point: 85% of haul road dust suppression is sourced from the Industrial Dam at a rate of 1,660kL/d. 100% loss assumed.
1.4	Stockpile Dust Suppression	- Supplied from the Access Rd dam at a rate of 42kL/d. 100% loss assumed.
2	Transfer of Mine Waters	
2.1	North Pit	- Continuous pumping from pit dewatering pumps (when required) at a nominal maximum rate of 100L/s. - Pit dewatering directed to Industrial Dam. - Received groundwater inflows at a rate of 550kL/d (200ML/yr).
2.2	South pit	- Continuous pumping from pit dewatering pumps (when required) at a nominal maximum rate of 100L/s. - Pit dewatering directed to East Pit. - Received groundwater inflows at a rate of 450kL/d (164ML/yr).
2.3	East Pit	- Continuous pumping from pit dewatering pumps (when required) at a nominal maximum rate of 100L/s. - Pit dewatering directed to Industrial Dam. - Received groundwater inflows at a rate of 1,100kL/d (400ML/yr). - If pit water increases above 310 ML then additional direct transfer to West Pit Void at 100L/s
3	Operation of Key Storages	
3.1	Access Road Dam	- Primary mine water storage for CHP and industrial use. - Receives inflows from the following locations: - Pumped transfers from Industrial Dam at 60L/s when required. - Supplies to the following locations: - Drayton CHP - Industrial Area - Stockpile Dust Suppression - Storage overflows to Ramrod Creek
3.2	Industrial Dam	- Receives inflows from the following locations: - Pumped transfers from East Pit - Pumped transfers from North Pit - Pumped transfers from Rail Loop Dam - Supplies to the following locations: - East Pit Fill Point for haul road dust suppression. - Pumped transfers to the Access Road Dam at 60L/s when required. - Storage overflows to East Pit.
3.3	Rail Loop Dam	- Mine water collection and transfer storage. - Receives catchment runoff inflows from the CHP and industrial areas. - Supplies to the Industrial Dam at 100L/s. - Maintained at empty to prevent uncontrolled spills. - Storage overflows to Ramrod Creek.
3.4	Savoy Dam	- Mine water collection and transfer storage. - Supplies to West Pit Fill Point for haul road dust suppression. - Receives pumped transfers from West Pit Void at 25 L/s (when required to ensure supply of water for dust suppression).
3.5	West Pit Void	- Receives pumped inflows from East Pit when stored water exceeds 90m AHD. - Supplies to Savoy Dam when required. - Storage overflows to Saddlers Creek. - No other transfers to or from West Pit Void over calibration period.
4	General	All storages and pits receive local catchment runoff and lose water through evaporation.

A.4.3. Storages and Mining Pits

The adopted capacities of minesite storages included in the OPSIM calibration model are shown in Table A 4. The full supply volume is the nominal volume available below the spillway crest. The operating volume is the target maximum storage volume to minimise uncontrolled spills. The initial free volume is the observed volume recorded in each storage, applied at the start of the modelling period, ie January 2007.

Table A 4 Capacities of Site Mine Water Storages

MINE WATER STORAGE	Full Supply Volume (ML)	Operating Volume (ML)	Initial Free Volume (ML)
Access Road Dam (2081)	750	600	310
Industrial Dam (1969)	750	596	555
Rail Loop Dam (2114)	18	0	11
Savoy Dam (1609)	140	50	140
West Pit Void (SW13)	4043	4043	412

Note that Delpah Dam and A Transfer Dam were included in the previous water balance modelling of the Drayton Mine (Water Solutions, 2011). Advice from personnel on site suggests that these dams do not play a role in the water balance and as such were excluded from the model.

The operating volume of the Rail Loop Dam was set to zero in an attempt to match the number of modelled spills with the actual spills over the calibration period.

The adopted capacities of the active pits are shown in Table A 5. The full supply volume is the nominal volume available, above which uncontrolled spills would occur.

Table A 5 Capacities of Site Mine Water Pits

PIT STORAGE	Full Supply Volume (ML)	Initial Free Volume (ML)
North Pit	17905	0
East Pit	17138	0
South Pit	993	0

The locations of these storages and pits are shown in Figure A 3.

A.4.4. Catchment Areas and Land Use Classifications

The adopted catchment areas reporting to each of the existing Drayton storages are presented in Figure A 4 and detailed in Table A 6.

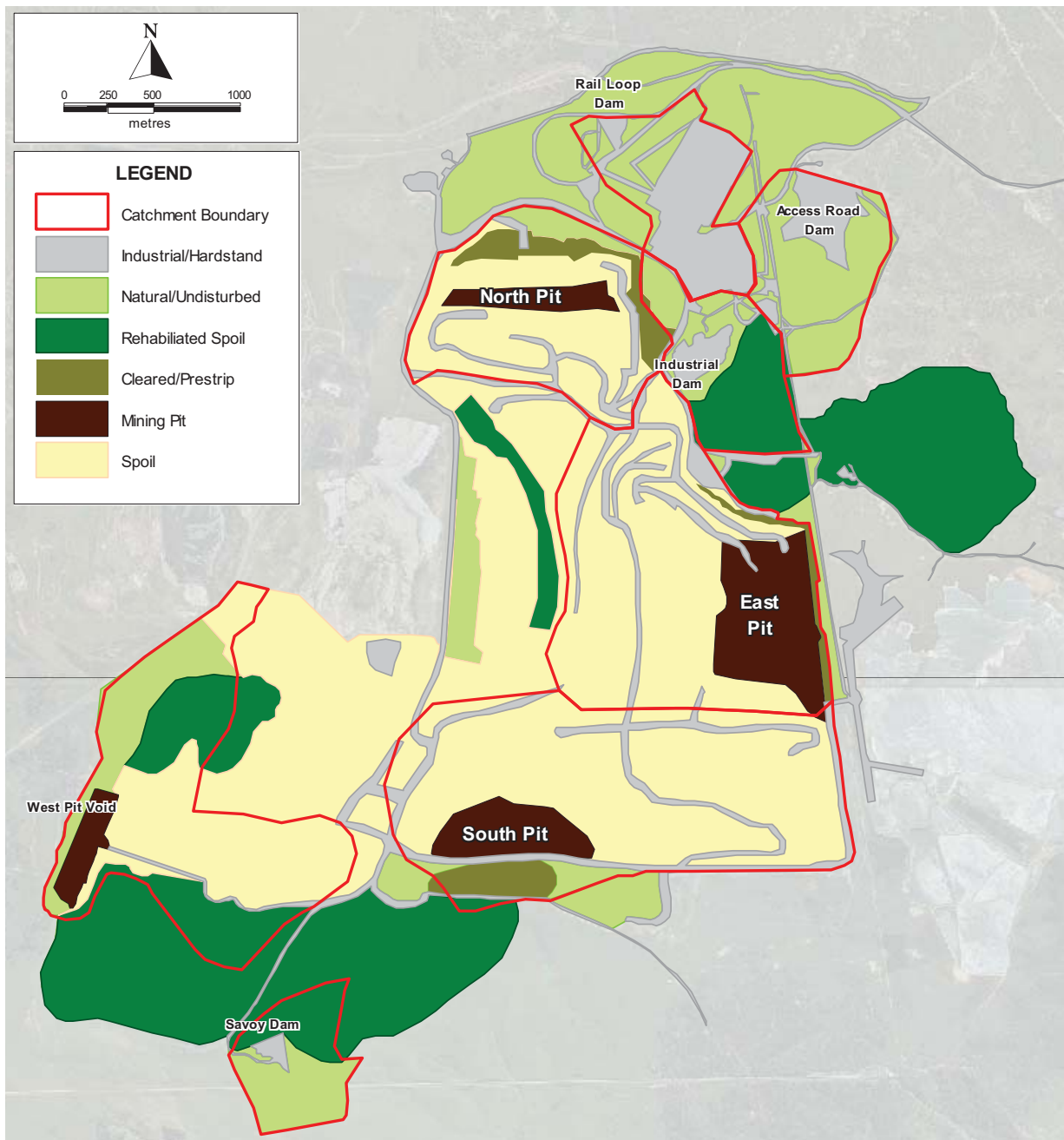


Figure A 4 Existing Drayton Mine Catchments and Land Use Classifications

Table A 6 Existing Drayton Catchment Areas

Storage Name	Catchment Area (ha)						Total
	Natural	Cleared	Mining Pit	Hardstand	Rehab	Spoil	
North Pit	7.6	14.7	10.9	15.0	0.0	84.5	132.7
South Pit	6.3	11.4	22.2	31.6	0.0	71.4	143.0
East Pit	0.0	5.9	44.4	24.9	0.0	139.1	214.3
Access Rd Dam	48.1	0.0	0.0	19.3	0.6	0.0	68.0
Rail Loop Dam	18.5	0.0	0.0	44.7	0.0	0.0	63.2
Savoy Dam	23.2	0.0	0.0	2.3	15.1	0.0	40.6
Industrial Dam	17.3	0.0	0.0	10.4	29.9	0.0	57.6
West Pit Void	31.4	0.0	9.7	2.2	45.2	76.6	165.2

A.4.5. Demands

The adopted total demand over the calibration period is 2,720 kL/d, consisting of the CHP makeup demand, industrial usage and dust suppression of haul roads and coal stockpiles. Each of these demands are detailed below.

Annual values of the CHP makeup requirements for 2007-2009 were obtained from previous calibration modelling of the Drayton minesite (Water Solutions, 2011), listed in Table A 7.

The volume of water required for CHP makeup is generally related to the annual coal production tonnages. Insufficient production data was available to conduct a net water balance over the CHPP to assess the net water requirements, so it was assumed that the CHP Makeup requirement would provide an accurate representation.

Table A 7 Drayton CHP Makeup Requirements

Year	ML/yr	kL/d	Source
2007	63	170	Drayton Mine Extension (Water Solutions, 2011)
2008	166	450	Drayton Mine Extension (Water Solutions, 2011)
2009	25*	91	Drayton Mine Extension (Water Solutions, 2011)
Average		237	

* January 2009 - to September 2009

Annual values of industrial usage for 2007-2010 are provided in Table A 8. The average industrial demand of 650 kL/d was adopted over the calibration period. The industrial usage demand is sourced from the Access Road Dam and is assumed to be 100% lost.

Table A 8 Drayton Industrial Usage

Year	ML/yr	kL/d	Source
2007	130	356	Drayton Mine Extension (Water Solutions, 2011)
2008	272	745	Annual Environment Management Report 2008 (Anglo Coal)
2009	360	986	Annual Environment Management Report 2009 (Anglo Coal)
2010	188	515	Annual Environment Management Report 2010 (Anglo Coal)
Average	238	650	

Annual rates of coal stockpile dust suppression for 2007-2010 are provided in Table A 9. The average coal stockpile dust suppression demand of 50 kL/d was adopted over the calibration period, sourced from the Access Road Dam and assumed to be 100% lost.

Table A 9 Drayton Coal Stockpile Dust Suppression Usage

Year	ML/yr	kL/d	Source
2007	27	74	Drayton Mine Extension (Water Solutions, 2011)
2008	2	5	Annual Environment Management Report 2008 (Anglo Coal)
2009	6	16	Annual Environment Management Report 2009 (Anglo Coal)
2010	38	104	Annual Environment Management Report 2010 (Anglo Coal)
Average	18	50	

Annual rates haul road dust suppression for 2007-2010 are provided in Table A 10. The average haul road dust suppression demand of 1786 kL/d was adopted over the calibration period. Based on advice from on-site personnel, 85% is sourced from East Pit Fill Point (Industrial Dam) and 15% from the West Pit Fill Point (Savoy Dam).

Table A 10 Drayton Haul Road Dust Suppression Usage

Year	ML/yr	kL/d	Source
2007	470	1288	Drayton Mine Extension (Water Solutions, 2011)
2008	603	1652	Annual Environment Management Report 2008 (Anglo Coal)
2009	814	2230	Annual Environment Management Report 2009 (Anglo Coal)
2010	720	1973	Annual Environment Management Report 2010 (Anglo Coal)
Average	652	1786	

A.4.6. Groundwater Inflows

The rates of groundwater inflow into the active pits were adopted from the previous calibration modelling (Water Solutions, 2011), detailed in Table A 11.

Table A 11 Drayton Groundwater Inflows

Year	ML/yr	kL/d
North Pit	200	550
South Pit	165	450
East Pit	400	1100

A.4.7. AWBM Calibration

The OPSIM model uses the AWBM model to estimate runoff volumes from on-site catchments, based on available rainfall and evaporation data. The AWBM (Boughton, 2003) is a saturated overland flow model which allows for variable source areas of surface runoff. The model uses daily rainfalls and estimates of catchment evapotranspiration to calculate daily values of runoff using a daily water balance of soil moisture. The model has a baseflow component which simulates the recharge and discharge of a shallow groundwater store. Runoff depth calculated by the AWBM model is converted into runoff volume by multiplying by the contributing catchment area. The various parameters of the AWBM model are shown in Table A 12.

Table A 12 Summary of AWBM Model Parameters

Parameter Specification	Description
Partial Area Fractions	Parameters A1, A2 & A3. Fraction of catchment area represented by surface storages No. 1, 2 & 3.
Soil Store Capacities	Parameter C1, C2 & C3. Soil moisture storage capacities for smallest store (No. 1), middle store (No. 2) and largest store (No. 3).
Base Flow Index	Parameter BFI. Proportion of runoff directed to baseflow store.
Daily Baseflow Recession Constant	Parameter K. Rate at which water discharges from baseflow store.
Lake to Evapotranspiration Factor	Factor to convert open water evaporation to evapotranspiration.

To estimate catchment runoff inflows to the OPSIM model, separate AWBM model parameters were developed for the following catchment types:

- Natural/undisturbed;
- Industrial/hardstand/roads;
- Spoil, unrehabilitated;
- Spoil, rehabilitated;
- Mining Pit;
- Cleared/Prestrip.

In the absence of recorded runoff data for the different catchment types, reasonable parameter values were selected based on experience in similar previous studies and expected values of volumetric runoff coefficients. Adopted AWBM model parameter values are shown Table A 13. The overall representation of catchment runoff was validated by matching the stored volume in all storages on the minesite over the calibration period.

Table A 13 Adopted AWBM Model Parameters for Various Catchment Types

AWBM Model Parameter		Natural	Industrial/ Hardstand	Unrehab Spol	Rehab Spoil	Mining Pit	Cleared/ Prestrip
Surface Store Depth (mm)	C1	40	4.08	13	7.7	3	2.4
	C2	85	12.96	48	77	11.75	10.8
	C3	145	0	0	0	0	9.96
	Avg.	100	12.07	41	70.7	10	0.1
Partial Areas	A1	0.2	0.1	0.2	0.1	0.2	0.1
	A2	0.4	0.9	0.8	0.9	0.8	0.9
	A3	0.4	0	0	0	0	0
Base flow index	BFI	0	0	0.85	0.15	0	0
Base flow recession constant	K	1	1	0.7	0.98	1	1
Lake to Evapotranspiration Factor		0.99	0.99	0.99	0.99	0.99	0.99
Long Term Runoff Coefficient	RC	0.048	0.312	0.138	0.085	0.348	0.344

A.4.8. Water Quality Parameters

Water quality was modelled in OPSIM as Total Dissolved Solids (TDS) in mg/L. The adopted salinity concentrations of the various catchment types included in the calibration model are provided in Table A 14. These values are based on the assessment of water quality information currently collected for a number of storages (with non-homogenous catchments) across the Drayton minesite and experience at similar minesites. The results of the calibration of the catchment runoff salinities are provided in Section A.4.10. The equivalent electrical conductivity (EC) values assuming a typical conversion of 0.75 are also given.

Table A 14 Catchment Inflow Salinity Concentrations (TDS and EC)

Catchment Type	TDS (mg/L)	EC (μ S/cm)
Cleared/Prestrip	2000	2667
Mining Pit	4000	5333
Natural/Undisturbed Catchment	200	267
Indsutrial/Harstand	2000	2667
Spoil	2000	2667
Rehabilitated Spoil	1000	1333
Groundwater	4720	6300

A.4.9. Storage Volume Calibration Results

The modelled AWBM parameters were calibrated using known site performance and operations from January 2007 to May 2011 at the existing Drayton mine. The modelled total site inventory for the Industrial Dam, Savoy Dam, Access Road Dam, Rail Loop Dam and the North, South, East and West Pits were compared to the recorded total inventory. The results of the calibration are shown in Figure A 5.

SILO Data Drill rainfall was selected for this calibration as it was found that the provided Drayton site data showed consistently higher daily values than surrounding Bureau of Meteorology stations, potentially indicating an incorrectly calibrated on-site gauge.

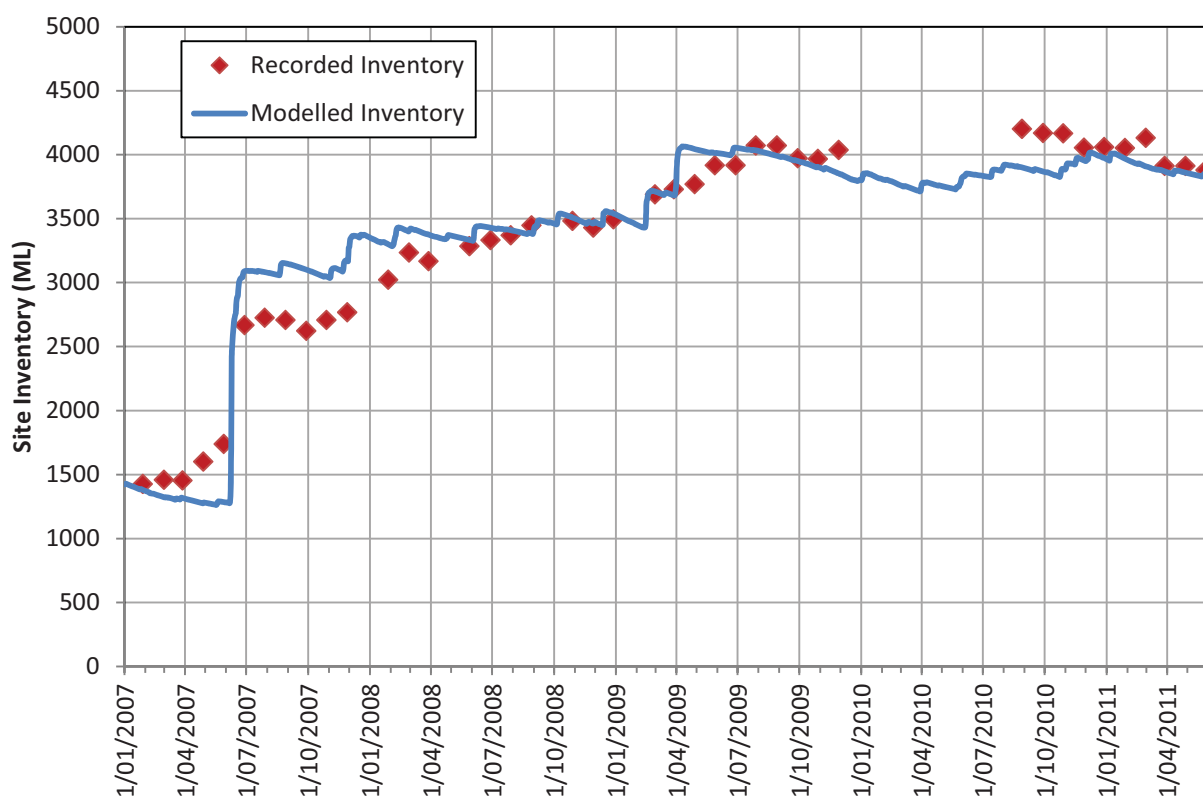


Figure A 5 Modelled and Recorded Total Inventory (Stored Volume)

The following is of note with the calibration of the AWBM parameters for the OPSIM model:

- The behaviour of the modelled site inventory over January 2007 to May 2011 is in good agreement with the recorded inventory;
- In September 2009, 2000ML stored in the West Pit Void was transferred to the ownership of MAC. This 2000ML has not been removed from the recorded total site inventory to allow direct comparison with the modelled results;
- All demands are met 100% of the time over the calibration period;
- No controlled discharges occurred over the calibration period;
- The modelled results showed one spill from the Rail Loop Dam in conjunction with the June 2007 rainfall event.

The calibration results are marginally different to the calibration given in Water Solutions (2011) due to the use of more up to date storage volume information. The current calibration parameters generate more runoff than what was proposed by Water Solutions (2011).

A.4.10. Water Quality Calibration Results

The concentration of salts assigned to the various catchment types was calibrated using recorded salinities in on-site storages with non-homogenous catchments from January 2007 to May 2011. Initial salinities were estimated from a linear interpolation of the recorded site data. The modelled water quality for the Industrial Dam, Savoy Dam and Access Road Dam were each compared to the recorded storage salinities. Recorded storage salinities were converted from EC ($\mu\text{S}/\text{cm}$) to TDS (mg/L) assuming a typical conversion of 0.75. The results of the calibration are shown in Figure A 6, Figure A 7 and Figure A 8.

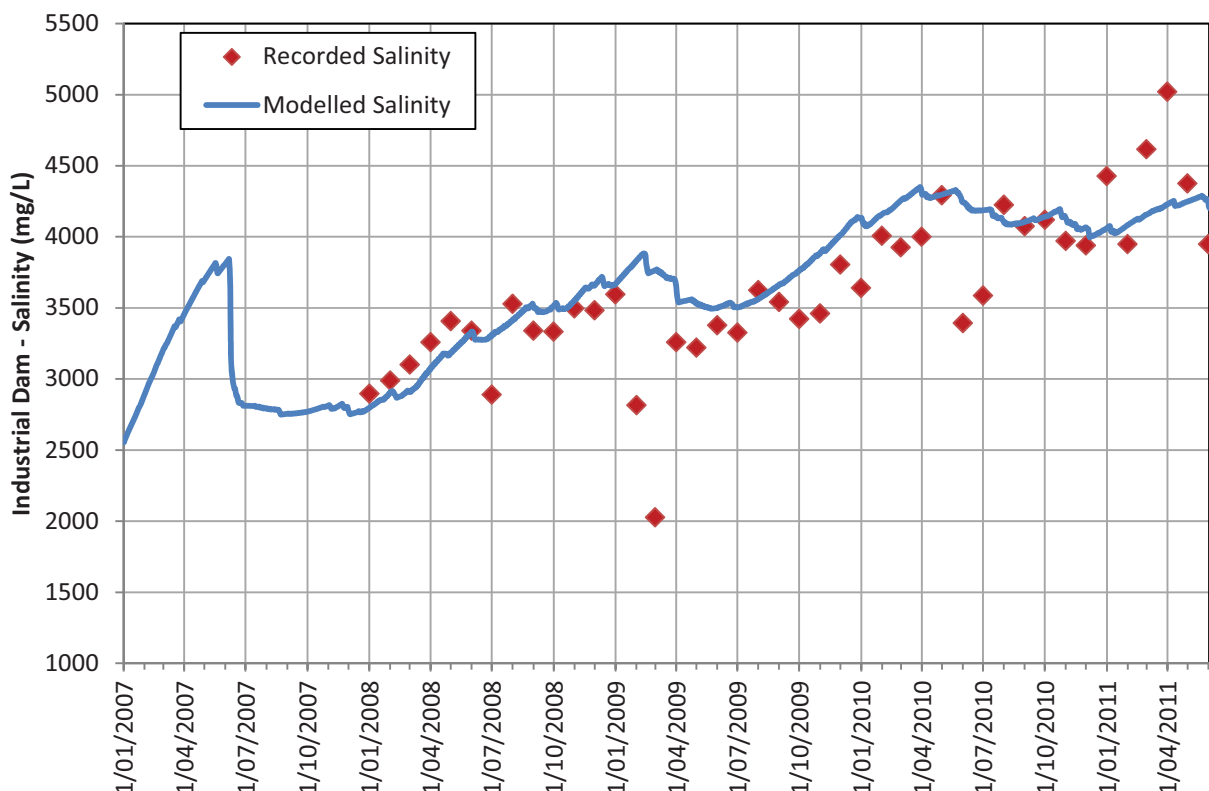


Figure A 6 Modelled and Recorded Industrial Dam TDS, Jan 2007 to May 2011

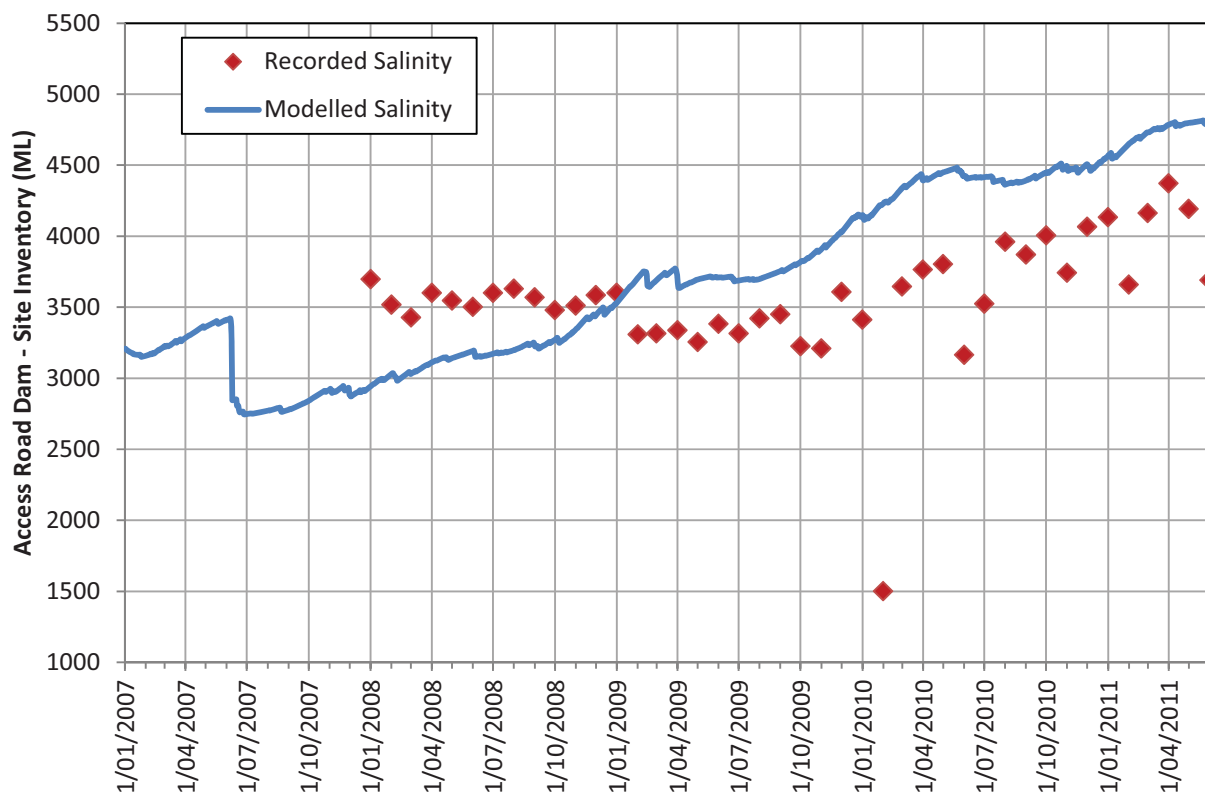


Figure A 7 Modelled and Recorded Access Road Dam TDS, Jan 2007 to May 2011

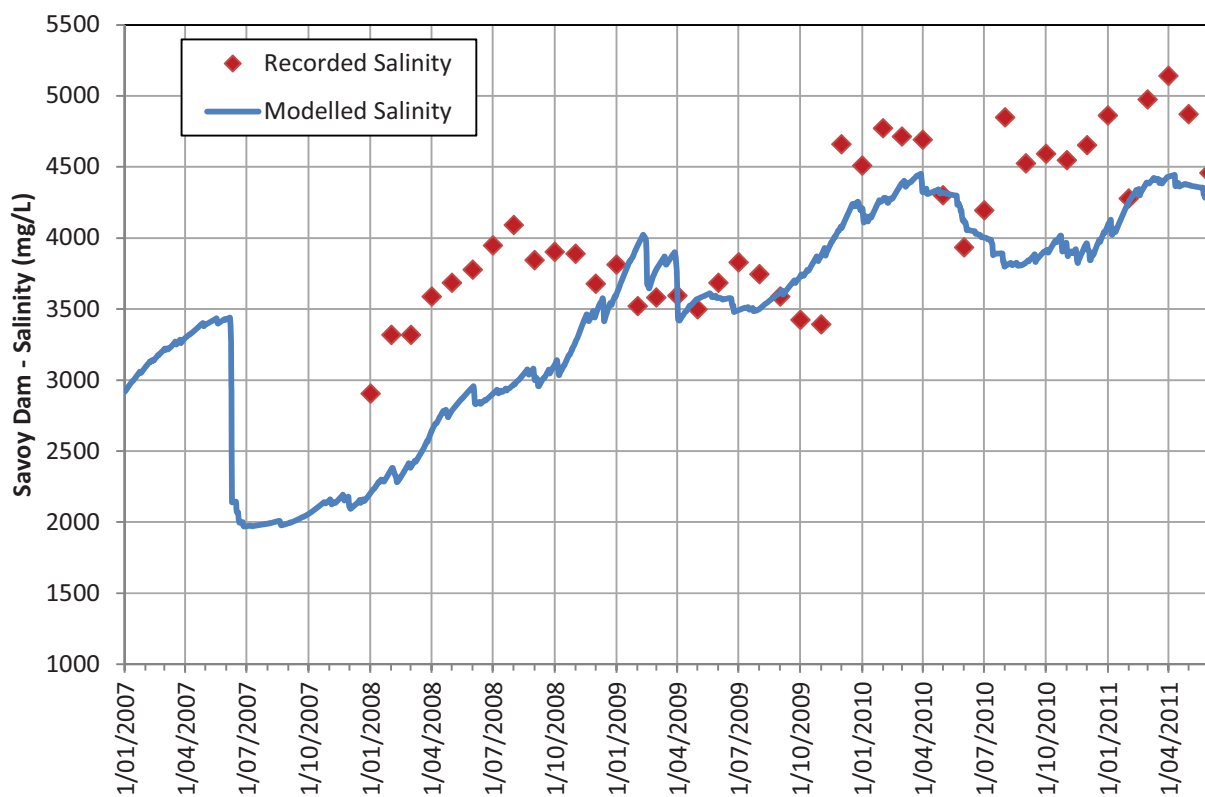


Figure A 8 Modelled and Recorded Savoy Dam TDS, Jan 2007 to May 2011

The following is of note with the calibration of the catchment runoff salinities for the OPSIM model:

- The overall TDS calibration in the three storages appears reasonable.
- It is expected that TDS concentrations in the Industrial Dam and Access Road Dam would reflect the pit and spoil runoff TDS as well as groundwater TDS as they mostly contain pumped inflows from the open cut pits
- Runoff from natural catchments vary greatly with high TDS concentrations measured to the south and lower concentrations in the north.

A.4.11. Limitations of the Water Balance Model Calibration

The results of the OPSIM modelling need to be interpreted with caution. Key limitations of the OPSIM model and known discrepancies between the model and water management practice are outlined below:

- The AWBM parameters adopted for the model appear reasonable based on past experience and the available calibration data for Drayton Mine.
- TDS concentrations applied to minesite catchments are based on past experience and the limited water quality data available to date. More water quality information is required to accurately calibrate the water balance model to observed site data.
- TDS is not necessarily the critical contaminant that will control the operation of the water management system and the site water management system will need to evolve and be operated to recognise the results of future water quality and quantity monitoring programs.