STRATFORD COAL MINE
JULY 2010 MODIFICATION

ENVIRONMENTAL ASSESSMENT

STRATFORD
COAL

ResourceStrategies

STRATFORD COAL MINE

JULY 2010 MODIFICATION
ENVIRONMENTAL ASSESSMENT

JULY 2010
Project No. GCL-09-11
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EXECUTIVE SUMMARY

ES1 BACKGROUND

The Stratford Coal Mine is owned and operated by Stratford Coal Pty Ltd a subsidiary of Gloucester Coal Ltd and has been operating since 1995. Stratford Coal Pty Ltd also owns and operates the Bowens Road North Open Cut which is located immediately to the north of the Stratford Coal Mine and commenced operation in 2003 under a separate consent.

Another Gloucester Coal Ltd subsidiary, Duralie Coal Pty Ltd, owns and operates the Duralie Coal Mine, which is located some 20 kilometres to the south. The run-of-mine (ROM) coal produced at the Duralie Coal Mine is railed to the Stratford Coal Mine, where it is unloaded and processed.

ES2 REASON FOR THE MODIFICATION

Additional ROM coal is proposed from a deeper Roseville West Pit (additional 1.4 million tonnes [Mt]) at the Stratford Coal Mine.

In November 2009, Duralie Coal Pty Ltd lodged the Duralie Extension Project Environmental Assessment to facilitate an increase in the ROM coal production rate at the Duralie Coal Mine. This additional Duralie Extension Project coal would be railed to the Stratford Coal Mine. The Duralie Extension Project would, therefore, require an increase in the Coal Handling and Preparation Plant (CHPP) processing rate at the Stratford Coal Mine and would require additional Duralie Extension Project trains to be unloaded on the Stratford rail loop.

Additional ROM coal is also proposed from a Bowens Road North Open Cut pit cutback (additional 1.4 Mt). This coal would also be processed at the Stratford Coal Mine CHPP. Additional Bowens Road North Open Cut ROM coal is the subject of a separate modification application lodged in June 2010.

In order to accommodate these changes, Stratford Coal Pty Ltd proposes a modification of the Stratford Coal Mine Development Consent (the Modification).

This Environmental Assessment has been prepared by Stratford Coal Pty Ltd to support an application to modify the Stratford Coal Mine Development Consent for the Modification.

ES3 DESCRIPTION OF THE MODIFICATION

The Modification at the Stratford Coal Mine comprises:

- an increase in the annual CHPP ROM coal processing rate from approximately 3.4 Mtpa up to approximately 4.6 Mtpa;
- an increase in the number of DCM trains unloaded on the SCM rail loop (i.e. increase of three to four per day, on average);
- alteration to the DCM train unloading times at the SCM;
- an increase in the amount of product coal transported via rail from the SCM from 2.3 to 3.3 Mtpa, to be accommodated by the use of longer product coal trains;
- augmentation of the Stratford Coal Mine rail loop with an additional 400 metre section of track immediately adjacent to the current track;

- a deepening of the Roseville West Pit to facilitate access to an additional 1.4 Mt of ROM coal with an associated additional 8 million bulk cubic metres of waste rock to be mined and backfilled within the Roseville and Stratford Main Pits;
- irrigation of water from the Stratford East Dam on a portion of the rehabilitated Stratford Waste Emplacement; and
- an increase in the volume of CHPP rejects to be deposited in the Stratford Main Pit.

ES4 ENVIRONMENTAL REVIEW

An environmental review has been conducted to evaluate the proposal and has concluded the following:

- Stratford Coal Pty Ltd has committed to significant noise mitigation measures as part of the Modification, including installation of rail noise barriers adjacent to the Stratford Coal Mine rail loop, quieter conveyor idlers and targeted acoustic lining of the CHPP.
- With the implementation of these mitigation measures, noise impacts are generally similar to the existing approved levels, with only one additional receiver predicted to experience noise levels in excess of the noise acquisition criteria.
- Potential rail noise increases are negligible because a longer, larger capacity product coal train would be used, meaning that existing/approved rail movements would not increase.
- The potential air quality emissions of the Modification are expected to continue to comply with applicable dust deposition and suspended particulate criteria at the nearest privately-owned receivers.
- The additional CHPP rejects are likely to be geochemically similar to the existing rejects, and hence the existing management approaches described in the Life of Mine Reject Disposal Plan are expected to be applicable to the Modification.
- Potential impacts to surface water quality and quantity, including erosion and sediment control, would be limited.
- Potential groundwater effects are predicted to continue to be localised and limited in nature.
- The Modification would continue the economic and employment benefits provided by the Stratford Coal Mine. The Modification is necessary to increase the annual production exported over the life of the mine that would, in turn, maintain the generation of export revenue for Stratford Coal Pty Ltd and continue the collection of royalties and taxes by the State of NSW and the Federal Government.

The existing environmental management measures and monitoring programmes at the Stratford Coal Mine would be applied to the Modification.

1 INTRODUCTION

1.1 GENERAL

The Stratford Coal Mine (SCM) is an existing open cut coal mining operation owned and operated by Stratford Coal Pty Ltd (SCPL), a subsidiary of Gloucester Coal Ltd (GCL). The SCM is located approximately 100 kilometres (km) north of Newcastle, New South Wales (NSW) (Figure 1).

GCL also owns the Bowens Road North Open Cut (BRNOC) and Duralie Coal Mine (DCM), which are located to the immediate north and approximately 20 km south of the SCM, respectively (Figure 1).

This Environmental Assessment (EA) has been prepared by SCPL to support a request to modify the SCM Development Consent (Development Application [DA] 23-98/99) under Section 75W of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) (the Modification).

A copy of the SCM Development Consent is provided as Attachment 1.

1.1.1 Existing Operations

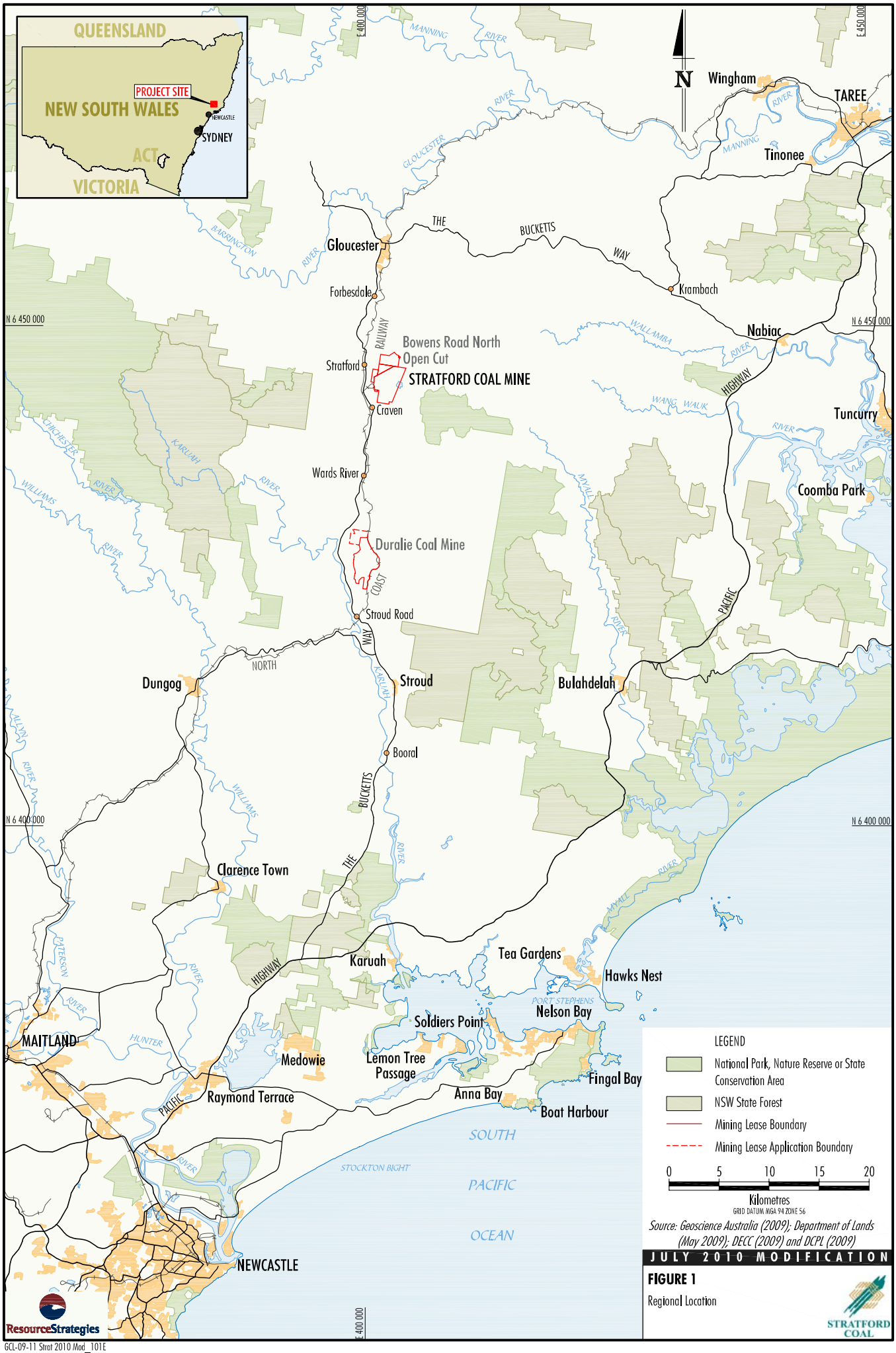
Development History

The SCM was assessed in the *Stratford Coal Project Environmental Impact Statement* (SCP EIS) (SCPL, 1994) and was approved by the NSW Minister for Planning in December 1994 (DA 73/94).

Construction of the SCM commenced in January 1995 and coal production began in June 1995. The SCM was originally an operation producing approximately 1.1 million tonnes per annum (Mtpa) of high quality coking and thermal coal over a 14 year mine life and included an open cut mine, rail loop, rail loading facilities, coal handling and preparation plant (CHPP) and associated facilities.

Since commencement of the operation, a number of alterations to the original SCM have been made (including the issuing of a new Development Consent). A summary of these alterations is provided below:

- In 1996, an application to access the Roseville coal seam, increase the run-of-mine (ROM) coal mining rate from 1.8 to 3.4 Mtpa and increase the saleable coal production rate from 1.1 to 1.7 Mtpa was assessed via the *Proposal to Increase Saleable Coal Production to 1.7 Mtpa* (SCPL, 1996) and associated supporting information. The modification was approved by the NSW Minister for Urban Affairs and Planning in July 1996.
- In 1998, a new DA was lodged to allow the SCM to accept DCM ROM coal for processing through the SCM CHPP and allow disposal of associated CHPP rejects at the SCM. This new DA was assessed by the *Proposed Modifications to the Stratford Coal Mine Statement of Environmental Effects* (SCM Alterations SEE) (SCPL, 1998). The new DA was approved in February 1999 by the NSW Minister for Urban Affairs and Planning (DA 23-98/99).



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- In 2000, a modification to further increase saleable coal production was assessed via the *Stratford Coal Mine – Domestic Production Modification Statement of Environmental Effects* (SCPL, 2000). This modification increased saleable coal production to 2.3 Mtpa by increasing the ash content in the coal product, whilst maintaining the approved ROM mining rate at the SCM at 3.4 Mtpa. The modification to DA 73/94 was approved by the NSW Minister for Urban Affairs and Planning in July 2000.
- In July 2003, DA 73/94 was relinquished and DA 23-98/99 was commenced.
- In 2003, a modification of DA 23-98/99 to extend the approved Roseville Pit by some 600 metres (m) to access approximately 0.25 Mt of additional ROM coal (Roseville Pit Extension) and to reinstate the 2.3 Mtpa saleable coal production rate (as per the 2000 modification to the DA 73/94 consent) was assessed via the *Stratford Coal Mine Modification Statement of Environmental Effects* (SCM 2003 SEE) (SCPL, 2003). As a component of this assessment, a SCM operational noise assessment compliant with the *NSW Industrial Noise Policy* (NSW INP) (EPA, 2000) was conducted. The Roseville Pit Extension was approved under delegation by the NSW Minister for Planning in January 2006.
- In 2006, a modification of DA 23-98/99 to develop a small pit adjacent to and contiguous with the approved Roseville Pit Extension was assessed via the *Stratford Coal Mine Roseville West Pit Modification Statement of Environmental Effects* (RWP SEE) (SCPL, 2006a). The Roseville West Pit was approved by the NSW Minister for Planning on 16 February 2007.
- In 2008, a modification of DA 23-98/99 to augment the ROM and product coal stockpile areas to improve the efficiency of handling and storage of ROM coal and product coal at the SCM was assessed via the *Stratford Coal Mine Coal Handling Modification* (SCM 2008 SEE) (SCPL, 2008). The modification to DA 23-98/99 was approved by the NSW Minister for Planning on 1 September 2008.

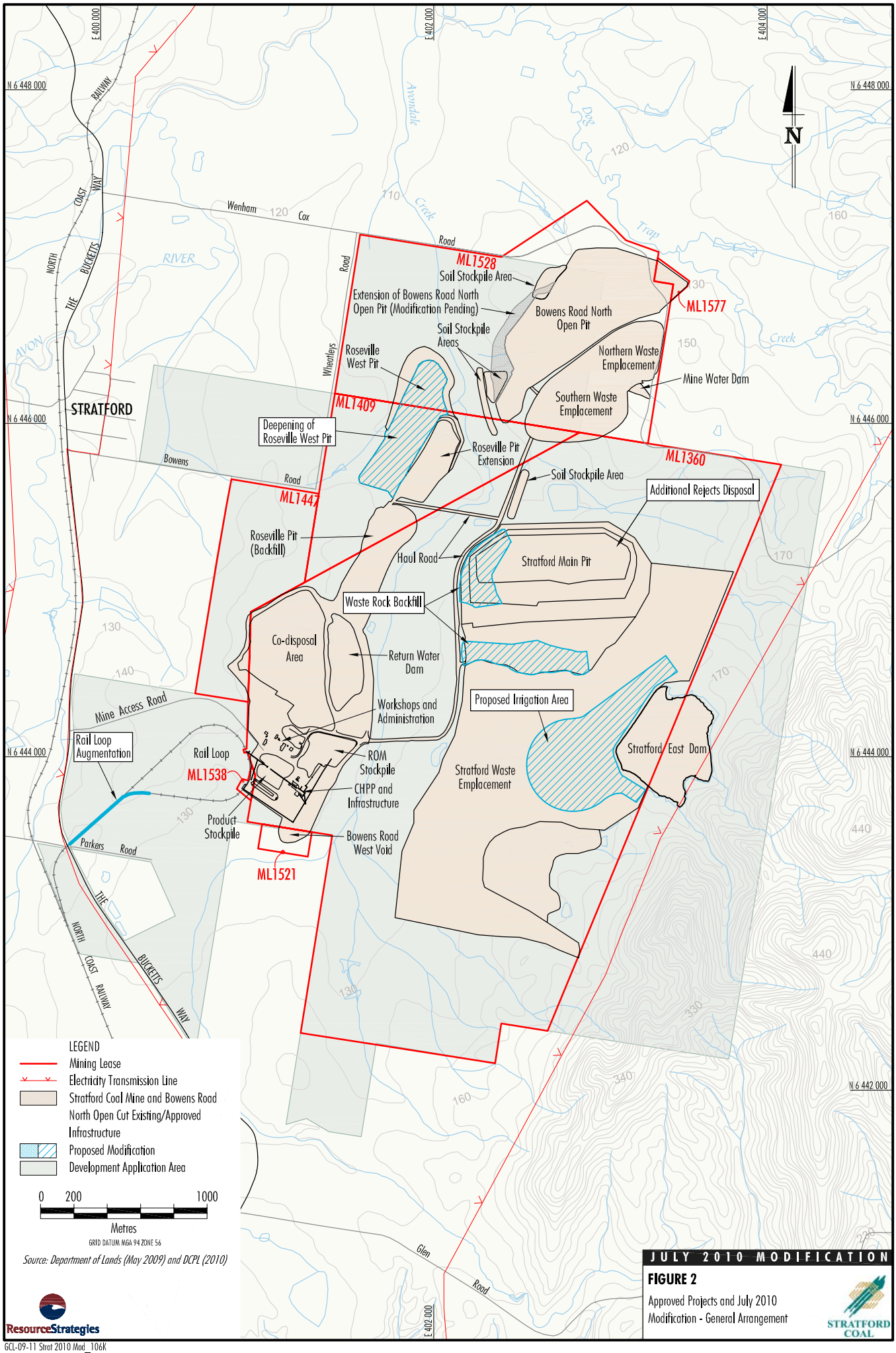
A summary description of the existing SCM is provided in Section 2. The general arrangement of the approved SCM and the Modification is shown on Figure 2. Figure 3 provides an aerial photograph showing the SCM and the Modification.

Interaction with the Bowens Road North Open Cut

The BRNOC is an existing open cut coal mine located to the immediate north of the SCM (Figure 1).

All coal produced at BRNOC is transported via the existing SCM haul road to the SCM ROM pad, where it is blended with SCM and DCM coal before being processed at the SCM CHPP. CHPP rejects associated with BRNOC coal are managed by SCPL in an integrated fashion with other CHPP rejects at the SCM in accordance with SCPL's *Life of Mine Reject Disposal Plan* (SCPL, 2009a).

SCPL has lodged a separate application to modify the BRNOC Development Consent (DA 39-02-01) in June 2010. The June 2010 BRNOC modification relates to a cut-back of the BRNOC pit, including an additional 1.4 Mt of ROM coal, a higher ROM coal production rate and an additional two years of mine life. The environmental assessment component of this EA includes consideration of the potential cumulative impacts of the proposed modification within the BRNOC (including the BRNOC June 2010 modification, where applicable).


E 400 000
E 402 000
E 404 000
N 6 448 000
N 6 446 000
N 6 444 000
N 6 442 000
N
RAILWAY
NORTH COAST WAY
THE BUCKETTS WAY
RIVER
AVON
Avondale
Dog Trap Creek
Wenham Cox Road
Wheatleys Road
Bowens Road
Parkers Road
Glen Road
STRATFORD
ML1528
Soil Stockpile Area
Extension of Bowens Road North Open Pit (Modification Pending)
Bowens Road North Open Pit
ML1577
Soil Stockpile Areas
Roseville West Pit
Northern Waste Emplacement
Mine Water Dam
Southern Waste Emplacement
ML1409
Deepening of Roseville West Pit
Roseville Pit Extension
ML1360
Soil Stockpile Area
Additional Rejects Disposal
ML1447
Roseville Pit (Backfill)
Haul Road
Stratford Main Pit
Waste Rock Backfill
Co-disposal Area
Return Water Dam
Workshops and Administration
Proposed Irrigation Area
Mine Access Road
Rail Loop Augmentation
Rail Loop
ML1538
ROM Stockpile
CHPP and Infrastructure
Stratford East Dam
Stratford Waste Emplacement
Product Stockpile
Bowens Road West Void
ML1521
LEGEND
Mining Lease
Electricity Transmission Line
Stratford Coal Mine and Bowens Road North Open Cut Existing/Approved Infrastructure
Proposed Modification
Development Application Area
0 200 1000
Metres
GRID DATUM MGA 94 ZONE 56
Source: Department of Lands (May 2009) and DCPL (2010)
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JULY 2010 MODIFICATION
FIGURE 2
Approved Projects and July 2010 Modification - General Arrangement
STRATFORD COAL
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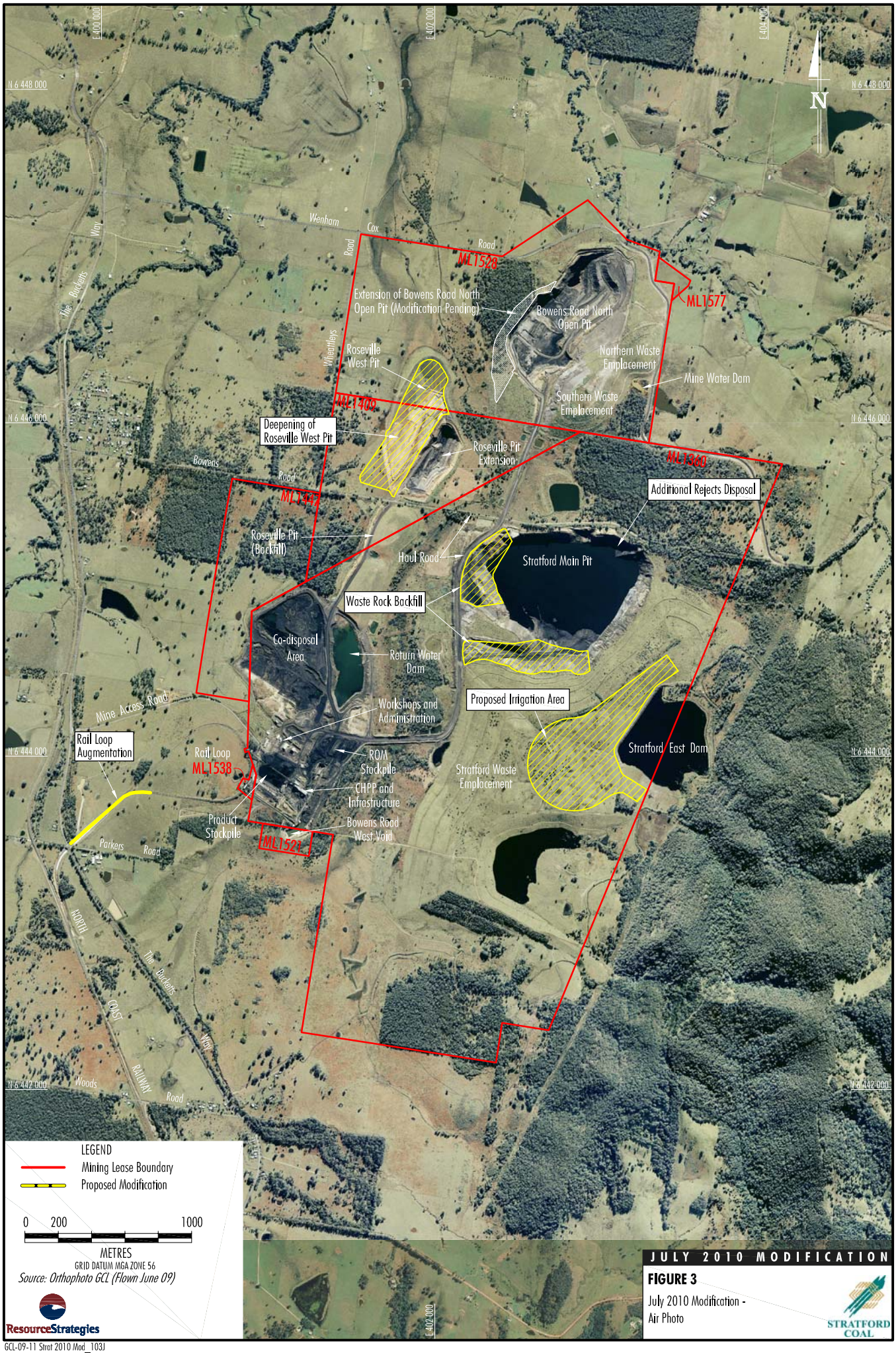

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Interaction with the Duralie Coal Mine and Duralie Extension Project

The DCM commenced coal production in 2003. ROM coal mined at DCM is transported by rail to the SCM on the North Coast Railway. DCM ROM coal is unloaded at the SCM and washed in the CHPP. Blended product coal from SCM, BRNOC and DCM is then railed to Newcastle. The DCM currently produces ROM coal at a rate of up to 1.8 Mtpa and the hours of operation of the DCM train to the SCM are limited to 7.00 am to 10.00 pm.

An Environmental Assessment under Part 3A of the EP&A Act for the Duralie Extension Project (DEP) was lodged in November 2009, which includes a proposed extension to the open cut and an increase of the DCM ROM coal production rate (i.e. an increase in the maximum rate from 1.8 to 3 Mtpa). Determination of the DEP is currently pending.

In order to accommodate the DEP, modifications are sought to the SCM to allow the receipt of the additional ROM coal trains from the DEP and extend the hours of receipt of DEP trains to 2.00 am.

1.1.2 Modification Overview

The Modification would include:

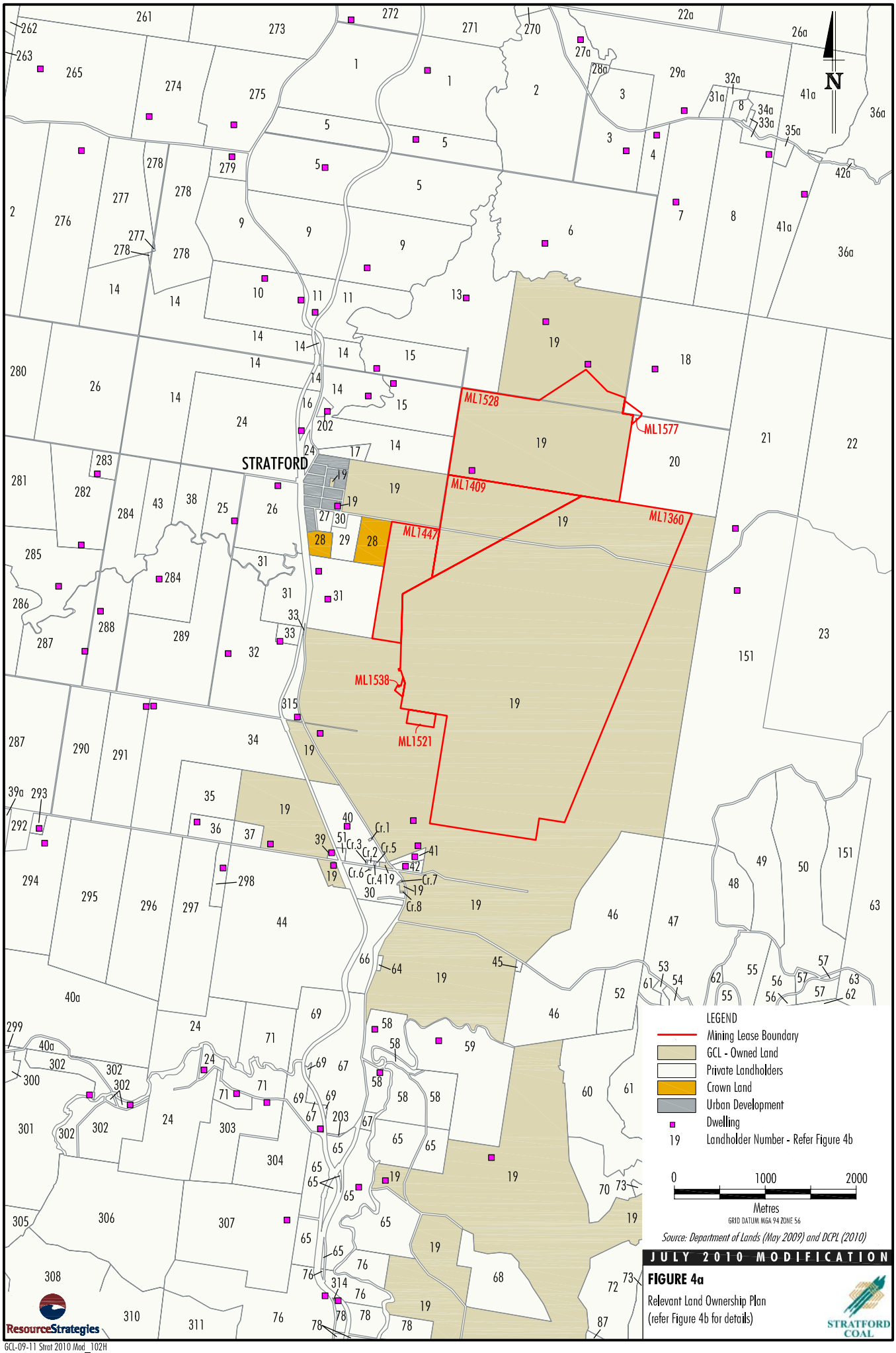
- an increase in the annual CHPP ROM coal processing rate from approximately 3.4 Mtpa up to approximately 4.6 Mtpa;
- an increase in the number of DCM trains unloaded on the SCM rail loop (i.e. increase of three to four per day, on average);
- alteration to the DCM train unloading times at the SCM;
- an increase in the amount of product coal transported via rail from the SCM from 2.3 to 3.3 Mtpa, to be accommodated by the use of longer product coal trains;
- augmentation of the SCM rail loop with an additional 400 metre (m) section of track immediately adjacent to the current track;
- a deepening of the Roseville West Pit to facilitate access to an additional 1.4 Mt of ROM coal with an associated additional 8 million bulk cubic metres (Mbcm) of waste rock to be mined and backfilled within the Roseville and Stratford Main Pits;
- irrigation of water from the Stratford East Dam on a portion of the rehabilitated Stratford Waste Emplacement; and
- an increase in the volume of CHPP rejects to be deposited in the Stratford Main Pit.

The proposed changes to the currently approved SCM are shown on Figures 2 and 3.

The Modification is located on land owned by GCL and within the DA area for the SCM (Figures 2, 4a and 4b).

Table 1 provides a summary comparison of the currently approved SCM and the SCM including the Modification. As shown on Table 1, the Modification **does not** involve any change to the SCM for the following development components: annual ROM coal production rate, Stratford Waste Emplacement, mine fleet, operational workforce, product coal train loading hours and number of product coal train movements, operating hours for open pits or water supply.

A detailed description of the proposed changes to the SCM is provided in Section 3.



GCL-09-11 Strat 2010 Mod_102H

1 Wendy Jane Fraser
2 Farley (Gloucester) Pty. Limited
3 D.J. & D.L. Rosenbaum Pty. Limited
4 Colleen Dawn Crawley & Trevor Allan Crawley
5 Norman Edward Bignell
6 AGL Gloucester Le Pty Ltd& AGL Gloucester MG Pty Ltd
7 Mary Blanche Burrell
8 John Ernest Woodford & Marjorie Annette Woodford
9 Norman John Williams
10 Kenneth James Whatmore & Anne Grace Whatmore
11 Brian Keith Walker, Lesley Jane Walker, Tyson Brian Walker & Lacey Maree Walker
13 AGL Energy Limited
14 Allen James Wenham & Pamela Diane Wenham
15 GS & GL Falla Superannuation Pty Limited
16 Judith Helen Pickett
17 Darren James Fisher & Claire Louise Smith
18 Tanya Louise Denyer
19 Gloucester Coal Ltd
20 Trevor John Ellis
21 Richard Charles Clarke & Carolyn Ann Clarke
22 Michael Burns & Leonie Therese Burns
23 Ross Lewis Bagnall
24 Geoffrey Lawrence Harris
25 Marisa Thompson
26 Kevin John Lowrey & Robyn Lowrey
27 The Council of the Shire of Gloucester
28 Crown Land
29 Edwin Dennis Ward & Rhonda Fay Ward
30 The State of New South Wales
31 Allan Stanley Isaac
32 Eliza Ann Ruth McIntosh & Ronald Keith McIntosh
33 William Joseph Battaglini & Jacklin Maree Battaglini
34 Graham Wesley Hall & Kim Lorraine Hall
35 Leo John Dillon & Isobel Robyn Dillon
36 Graham Lindsay Wallace & Marion Frances Wallace
37 Timothy James Worth
38 Paul Michael Johnson & Judith Anne Johnson
39 Paula Anne Standen
40 Leslie Allenby Blanch
41 Cathryn Louise Devereux
42 Douglas John Blanch
43 Vicki Colleen Moseley
44 Peter Michael Cross & Kylie Jane
45 Megan Jane Ellis
46 Stanley Samuel Ellis
47 David Charles Digges, Carolyn Denise Digges, Timothy Charles Hart & Elizabeth Mary Hart
48 Marion Iris Rounsley
49 Yvonne Carter
50 Neil James Porter
51 Gloucester Printing Services Pty Ltd
52 Christiane Bertolino
53 William Charles Barnes & Cheryl Freda Barnes
54 Kenneth John Hughes & Carrysong Pty Limited
55 Allan James Hancock & Lynda Margret Hancock
58 Douglas William Blanch & Evelyn Fay Blanch
59 Guy William Cassar & Cecile Elizabeth Cassar
60 Philip Weston Greenwood
61 Brian John Allman
63 National Parks and Wildlife Service
64 Gloucester Shire Council
65 Noeline Elizabeth Weismantle
66 Lennard Charles Rogerson
67 Ian Robert Bowen
68 Julie Dawn Lyford
69 Ralph Hooper & Bronwyn Ann Bartholmew
70 Robert George Knight
71 Anthony Douglas Burnet & Robyn Annette Burnet
72 Brooke McRae
73 Rodney John Pearce & Anne Jeanette Pearce
76 Garry Bruce Grant & Terry Paul Grant
78 Barry Anthony Eves
87 Pacific Property Investments Ltd
151 Trevor William Wadland & Yvonne Louise Carter
202 Paul Phillip Wenham
203 Samuel Taylor
261 Frank Murray Hooke & Susan Elizabeth Hooke
262 Noel Albert Davis & Elizabeth Therese O'Sullivan
263 Patrick Michael Ryan
265 Hans Joran Stenstrom & Janete Stenhouse Stenstrom
270 Jason David Collins & Michelle Isobel Barrett
271 William Alexander Tomb
272 Allen Taylor & Company Limited
273 Baker Place Investments Pty Limited & Dr PW Brady Pty Limited
274 Warren Neil Wilson & Colleen Therese Wilson
275 Pace Farm Pty Limited
276 Alan Luscombe & Carol Luscombe
277 John William Farley
278 Mark Anthony Campbell & Roseleen Linette Campbell
279 John Donald Cullum & Rachel Anne Cullum
280 Clifford John Bramley & Terri Louise Bramley
281 Colin William Lewis & Lesley Ann Lewis
282 Peter Stephen Ross
283 Janet Nolan
284 Alec Gregory Perrin & Noreen Nita Jean Perrin
285 Marshall Leon Carter & Theresa Kathleen Carter
286 Gerard Roland Burley
287 Dorothy Kay Sinderberry & Carole Martha Rinkin
288 Alec Gregory Perrin
289 Eliza Ann Ruth Mcintosh
290 Anne Frances Ryan & Darcy Tordoff
291 Angela Lee Stackman & Mark Richard Partridge
292 James Reginald Fisher & Rhonda Patricia Fisher
293 Kerry Elizabeth Braunton
294 Gregory Vincent Morcom & Karen Morcom
295 William John Bush & Danielle Elizabeth Bush
296 Peter Geoffrey Watson & Heather Irene Watson
297 William Marten Bosma
298 Eric Allan Yates
299 Malcolm Ronald Lee
300 Bevan Douglas Hokin & Di Hokin
301 Folio Identifier Pty Limited
302 Edwin John Walton & Wendy Walton
303 JSTC Newcastle Pty Limited
304 Ernie Danzil Abeysekera & Sharee Ann Abeysekera
305 Lymaran Holdings Pty Limited
306 Gregory Hunt & Catherine Hunt
307 Graham John Wolfenden & Rosalind Mary Wolfenden
308 Pierre Marcel Simon Louys & Marie Therese Chantal Louys
310 Toni Unthank & Danny Francis Unthank
311 Paul Berthold & Carolyn Berthold
314 Dataphone Pty Ltd
315 Kenneth Bruce Bagnall
22a R. O. Sansom & Son Pty. Limited
26a Edward John Mckinley & Shirley June Mckinley
27a Douglas Robert Maclean & Janette Ann Maclean
28a Peter Stuart Jackson & Beverley Clair Jackson
29a Mckinleys Lane Pty Limited
31a Terence William Cox & Valerie Rita Cox
32a John Edward Malcom-Coe & Emilia Malcolm-Coe
33a Anthony George Langmead & Elizabeth Anne Langmead
34a Bernard Philip Tresidder
35a Gary Raymond Perkins & Elly Perkins
36a Anthony Stanford Berecry
39a Woods Road Pty Ltd
40a Howard Kerr Williams & Margaret Russell Williams
41a Gary Ronald Ferris & Kathleen Grace Ferris
42a William Rainsford Ribbons
Cr.1 William Deane Wood
Cr.2 Patricia May Black
Cr.3 Yvonne Frances Holden
Cr.4 Susan Frances Hoppe
Cr.5 John Bruce Punchard & Kerry Lewise Green
Cr.6 Rodger Malcolm Boorer
Cr.7 David Robert Pryce-Jones
Cr.8 Douglas John Blanch& Gwenyth Alison Mcnair

Source: Department of Lands (2010) and DCPL (2010) as at 9-3-10

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FIGURE 4b
Relevant Land Ownership List

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STRATFORD COAL

Table 1
Summary Comparison of Approved and Modified Stratford Coal Mine

Development Component	Approved SCM	SCM Including the Modification
Life of Mine ROM Coal	• Up to approximately 24.15 Mt.	• Additional 1.4 Mt from the Roseville West Pit (i.e. total of approximately 25.55 Mt).
Annual ROM Coal Production Rate	• Up to 2.1 Mtpa.	• Unchanged.
Coal Processing Rate	• CHPP processing of up to 3.4 Mtpa of ROM coal (from SCM, BRNOC and DCM).	• CHPP processing of up to approximately 4.6 Mtpa of ROM coal (from SCM, BRNOC and DEP).
Annual Saleable Coal Production	• Up to 2.3 Mtpa.	• Up to 3.3 Mtpa.
CHPP Rejects	• Deposition within Stratford Main Pit.	• Approximately an additional 8 Mt CHPP rejects to be deposited into Stratford Main Pit.
Waste Emplacement	• Combination of in-pit and out-of-pit waste emplacement.	• Unchanged.
Total Waste Mined	• Approximately 74 million bank cubic metres (Mbcm).	• Additional 8 Mbcm from the Roseville West Pit (total of approximately 82 Mbcm).
Mine Fleet	• Excavators, haul trucks, water trucks, dozers, graders, scrapers, drills. Fleet now reduced due to cessation of mining in the Stratford Main Pit.	• Unchanged.
General Infrastructure	• Access roads, electricity supply and distribution, rail loop, CHPP, train loading and unloading infrastructure, ROM coal stockpiles, coal handling equipment.	• Augmentation of an approximate 400 m section of rail at the Stratford rail loop. All other infrastructure unchanged.
Operational Workforce	• Up to 110 people.	• Unchanged.
Life of Mine	• 17 Years from grant of ML 1360 (i.e. 2011).	• Additional 2 years of mining and processing followed by 6 years of ROM coal processing only (i.e. life extended to 2019).
Duralie Coal Train	• Hours of operation 7.00 am to 10.00 pm. • Average of three trains per day. • Train length 560 m.	• Hours of operation 7.00 am to 2.00 am[1]. • Average of four trains per day[1]. • Train length 600 m[1].
Product Coal Trains	• 24 hours per day, seven days per week. • Average of 2.5 trains per day (including BRNOC). • Train length 760 m.	• Unchanged. • Unchanged. • Train length up to 1,300 m.
Open Cut Mine Operating Hours	• Roseville West Pit only mined between 7.00 am and 10.00 pm.	• Unchanged.
Water Supply	• Pit inflows and the on-site water management system.	• Unchanged.
Road Transport	• Road traffic associated with the workforce, consumables, visitors and general deliveries and maintenance vehicles.	• Minor increase in truck deliveries (approximately 10 per week increase).

[1] The transportation period would be extended to 2.00 am, the number of trains increased to four on average per day and the train length would be extended to 600 m upon introduction of the GL class locomotives (or equivalent) as described in the DEP EA.

Section 4 describes the potential environmental impacts of the Modification and discusses how existing environmental management and monitoring programmes at the SCM would be applied to manage potential environmental impacts.

1.2 LEGISLATIVE FRAMEWORK

The EP&A Act and NSW *Environmental Planning and Assessment Regulation, 2000* (EP&A Regulation) set the framework for planning and environmental assessment in NSW. Modification of the SCM Development Consent (DA 23-98/99) is sought under Section 75W of Part 3A of the EP&A Act.

Section 75W of the EP&A Act states:

> **75W Modification of Minister's Approval**
>
> *(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.*
>
> *…*

Accordingly, an approval granted by the Minister under Part 3A of the EP&A Act to carry out a project may be modified under Section 75W.

In addition, Clause 8J(8) of the EP&A Regulation prescribes that development consents issued under Part 4 of the EP&A Act may also be modified under Section 75W of the EP&A Act. Clause 8J(8) of the EP&A Regulation relevantly states:

> **8J Transitional Provisions**
>
> *(8) For the purposes only of modification, the following development consents are taken to be approvals under Part 3A of the Act and section 75W of the Act applies to any modification of such a consent:*
>
> *(a) a development consent granted by the Minister under section 100A or 101 of the Act before 1 July 1998,*
>
> *(b) a development consent granted by the Minister under State Environmental Planning Policy No 34-Major Employment-Generating Industrial Development,*
>
> *(c) a development consent granted by the Minister under Division 4 of Part 4 of the Act (relating to State significant development) before 1 August 2005 or under clause 89 of Schedule 6 to the Act,*
>
> *…*
>
> *The development consent, if so modified, does not become an approval under Part 3A of the Act.*

The original SCM Development Consent (DA 73/94) was granted on 19 December 1994 by the NSW Minister for Planning (Section 1.1.1). The SCM was subsequently modified under Part 2 of Schedule 3 of the EP&A Regulations and a new Development Consent (DA 23-98/99) was approved by the Minister for Urban Affairs and Planning on 5 February 1999. At the time the Minister granted the 1999 Development Consent it was a development application within the scope of State Environmental Planning Policy (SEPP) 34, therefore the 1999 Development Consent is a development consent that falls within clause 8J(8)(b) of the EP&A Regulation.

Accordingly, by operation of Clause 8J(8)(b) of the EP&A Regulation, the existing SCM Development Consent (DA 23-98/99) is taken to be an approval under Part 3A of the EP&A Act for the purposes of the Modification, and Section 75W of the Act applies to the Modification.

1.2.1 Environmental Planning Instruments

Local Environmental Plan

The SCM is located in the Gloucester Local Government Area (LGA). The Gloucester Local Environmental Plan 2010 (LEP) was gazetted on 11 June 2010 under the EP&A Act. The following subsections identify the provisions in the LEP which have some relevance to the Modification.

Land Use Zoning

The SCM is zoned in areas RU1 (Primary Production), IN3 (Heavy Industrial) and E3 (Environmental Management) in the LEP.

The majority of the land covered by the SCM mining leases is within the RU1 zone. The objectives of this 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 encourage eco tourism enterprises that minimise any adverse effect on primary industry production and the scenic amenity of the area.*

The Modification is consistent with the objectives of RU1 (Primary Production) as:

- mining is a primary industry;
- the Modification would not result in the fragmentation and alienation of resource lands;
- mine landforms would be progressively rehabilitated, including areas to be rehabilitated to pasture and therefore potentially being available for agriculture in the medium/long-term (Section 5); and
- mining operations and nearby agricultural enterprises have co-existed since the SCM's inception and this would continue for the Modification.

Under the Land Use Table for the RU1 Zone, "mining" is permissible on lands zoned RU1 (Primary Production) with consent.

The SCM rail loop, the CHPP/infrastructure area, the Bowens Road West void, the Reclaim Water Dam and the co-disposal area are all within the IN3 zone. Zone IN3 also includes parts of MLs 1447 and 1360 and encompasses ML1538. The objectives of this zone are as follows:

- *To provide suitable areas for those industries that need to be separated from other land uses.*
- *To encourage employment opportunities.*
- *To minimise any adverse effect of heavy industry on other land uses.*

The Modification is consistent with the objectives of IN3 (Heavy Industrial) as employment opportunities at the SCM would continue and the Modification includes mitigation measures to minimise impacts on the environment (Section 4).

Although "hazardous industries", "heavy industries" and "light industries" are all permitted with consent in IN3, since "mining" is not specifically mentioned, it is taken to be prohibited. However, the note preceding the land use tables in the LEP states:

> *A type of development referred to in the Land Use Table is a reference to that type of development only to the extent it is not regulated by an applicable State environmental planning policy. The following State environmental planning policies in particular may be relevant to development on land to which this Plan applies:*
> *…*
> *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*

In addition, Clause 4 of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries), 2007* (the Mining SEPP) relevantly provides:

> ***4 Land to which Policy applies***
>
> *This Policy applies to the State.*

Clause 5(3) gives the Mining SEPP primacy where there is any inconsistency between the provisions in the SEPP and the provisions in any other environmental planning instrument (subject to limited exceptions).

Clause 5(3) relevantly provides:

> ***5 Relationship with other environmental planning policies***
>
> *(3) …if this Policy is inconsistent with any other environmental planning instrument, whether made before or after this Policy, this Policy prevails to the extent of the inconsistency.*

The practical effect of clause 5(3) for the Modification is that if there is any inconsistency between the provisions of the Mining SEPP and those contained in the Gloucester LEP, the provisions of the Mining SEPP will prevail.

Clauses 6 and 7 of the Mining SEPP provide what types of mining development are permissible without development consent and what types are permissible only with development consent. In this regard, clause 7(1) states:

> ***7 Development permissible with consent***
>
> *(1)* ***Mining***
>
> *Development for any of the following purposes may be carried out only with development consent:*
>
> *(a) underground mining carried out on any land,*
>
> *(b) mining carried out:*
>
> *(i) on land where development for the purposes of agriculture or industry may be carried out (with or without development consent), or*
>
> *(ii) on land that is, immediately before the commencement of this clause, the subject of a mining lease under the Mining Act 1992 or a mining licence under the Offshore Minerals Act 1999,*
>
> *(c) mining in any part of a waterway, an estuary in the coastal zone or coastal waters of the State that is not an environmental conservation zone,*
>
> *(d) facilities for the processing or transportation of minerals or mineral bearing ores on land on which mining may be carried out (with or without development consent), but only if they were mined from that land or adjoining land,*
>
> ...

The word "mining" in the Mining SEPP is given an extended definition in clause 3(2) as follows:

> ***mining*** *means the winning or removal of materials by methods such as excavating, dredging, or tunnelling for the purpose of obtaining minerals, and includes:*
>
> *(a) the construction, operation and decommissioning of associated works; and*
>
> *(b) the stockpiling, processing, treatment and transportation of materials extracted, and*
>
> *(c) the rehabilitation of land affected by mining.*

All of SCPL's works and activities which occur within the IN3 zone fall within the extended definition of "mining" contained in the Mining SEPP. Under the land use table for the IN3 zone, development for various types of industry are permissible with development consent. Given that clause 7(1)(b)(i) of the Mining SEPP provides that development for the purposes of "mining" may be carried out with development consent on land where development for the purposes of industry may be carried out, it necessarily follows that all of SCPL's works and activities within the IN3 zone are permissible uses with development consent.

A short section of the existing SCM rail loop (near its juncture with the main line) and a portion of the rail loop augmentation are within the E3 zone. The objectives of this zone are:

- *To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values.*
- *To provide for a limited range of development that does not have an adverse effect on those values.*
- *To conserve biological diversity and native vegetation corridors, and their scenic qualities, in a rural setting.*

It is considered that the Modification is generally consistent with the zone objectives. The rail augmentation would not have an adverse effect on environmental values, as it would be located within an area of cleared land with improved pasture.

Under the LEP, mining is prohibited within zone E3. However, within that zone "extensive agriculture" is permissible without development consent. Clause 7(1)(b)(i) of the Mining SEPP provides that development for the purposes of "mining" may be carried out with development consent on land where development for the purposes of agriculture may be carried out with or without development consent. The proposed rail loop augmentation falls within the extended definition of "mining" contained in the Mining SEPP on the ground that it is development for the purpose of transportation of materials extracted. It necessarily therefore follows that the portion of the proposed rail loop augmentation within the E3 zone is permissible with development consent.

Flood Planning Provisions

Part 6, clause 6.1 of the Gloucester LEP contains flood planning provisions with the following objectives:

(a) to minimise the flood risk to life and property associated with the use of land,

(b) to allow development on land that is compatible with the land's flood hazard, taking into account projected changes as a result of climate change,

(c) to avoid significant adverse impacts on flood behaviour and the environment.

The flood planning provisions apply to:

(a) land that is shown as "Flood planning area" on the Flood Planning Map, and

(b) other land at or below the flood planning level.

The Modification is not located within the "Flood planning area" referred to in the Gloucester LEP.

The augmentation of a 400 m section of the SCM rail loop would be located adjacent to the existing rail loop to the west of Avondale Creek (Figure 2) and would be constructed to the same rail standards as the existing rail line. The modified SCM is located within the approved mine development areas. As shown on Figures 4a and 4b, SCPL owns all land within which the Modification is proposed. As such, it is considered that the Modification would not risk the safety of the community or any residents of the land.

Avondale Creek is located to the west of the existing Roseville West Pit. Flows in Avondale Creek would continue to be unimpeded by the Modification. The proposed surface disturbance associated with the modified SCM would not result in any significant impact on surface water resources (Section 4.3.2). No lands would be affected by flood waters in this area of the Avondale Creek floodplain, other than those owned by SCPL (Figures 4a and 4b).

The potential groundwater impacts of the Modification are assessed in Section 4.5. No significant impacts on groundwater levels or quality are expected as a result of the Modification.

SCPL has demonstrated over the life of the SCM that it can operate its mining operation effectively within the floodplain of Avondale Creek. As discussed above, no lands would be affected by flood waters in this section of the Avondale Creek floodplain other than those owned by SCPL. Therefore it is considered that there is no potential for impacts of flooding and flood liability on individual owners, occupiers and the public resulting from the Modification.

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP)

The interaction of the Mining SEPP with the LEP is described above.

Clause 2 of the Mining SEPP outlines a number of aims, the following of which are relevant to the Modification:

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…

Clause 8, subclause (2) of the Mining SEPP provides that:

(2) Without limiting subclause (1), if a local environmental plan provides that development for the purposes of mining, petroleum production or extractive industry may be carried out on land with development consent if the consent authority is satisfied as to certain matters specified in the plan, development for that purpose may be carried out on that land with development consent without the consent authority having to be satisfied as to those specified matters.

Clause 12 of the Mining SEPP requires that 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).

The Modification would not require any significant changes to the existing SCM infrastructure, with the development components of the Modification being generally within or adjacent to the approved mine development areas. Accordingly, the Modification is consistent with, and would not change, the current land use of the area.

Impact assessment for environmental aspects including noise, geochemistry, air quality, water resources, heritage, flora and fauna, hazard, risk, transport and socio-economic considerations have been conducted for the Modification and have indicated that the Modification would not result in significant additional impacts on adjoining land uses (Section 4).

In addition, the SCM would continue to generate a socio-economic benefit to the regional economy, the State of NSW and Australia (Section 4.9).

Clause 14, subclause (1) of the Mining SEPP requires that, before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider whether or not the consent should be issued subject to conditions aimed at ensuring that the development is undertaken in an environmentally responsible manner, including conditions to ensure the following:

(a) that impacts on significant water resources, including surface and groundwater resources, are avoided, or are minimised to the greatest extent practicable,

(b) that impacts on threatened species and biodiversity, are avoided, or are minimised to the greatest extent practicable,

(c) that greenhouse gas emissions are minimised to the greatest extent practicable.

In addition, Clause 14, subclause (2) requires that, without limiting Clause 14, subclause (1), in determining a development application for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider an assessment of the greenhouse gas emissions (including downstream emissions) of the development, and must do so having regard to any applicable State or national policies, programmes or guidelines concerning greenhouse gas emissions.

The potential impacts of the Modification on surface and groundwater resources and measures to minimise potential impacts are discussed in Sections 4.3 and 4.5, respectively. The potential impacts of the Modification on threatened species and biodiversity would be negligible as clearance associated with the rail augmentation would occur in an area of cleared land with improved pasture adjacent to the rail loop as described in Section 4.11.

A greenhouse gas emissions assessment for the modified SCM, including mitigation and management measures, is provided in Section 4.6.

Clause 15 of the Mining SEPP requires that:

(1) Before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider the efficiency or otherwise of the development in terms of resource recovery.

(2) Before granting consent for the development, the consent authority must consider whether or not the consent should be issued subject to conditions aimed at optimising the efficiency of resource recovery and the reuse or recycling of material.

(3) The consent authority may refuse to grant consent to development if it is not satisfied that the development will be carried out in such a way as to optimise the efficiency of recovery of minerals, petroleum or extractive materials and to minimise the creation of waste in association with the extraction, recovery or processing of minerals, petroleum or extractive materials.

As described in Section 1.1.2, SCPL proposes to mine an additional 1.4 Mt of ROM coal from the Roseville West Pit. The Modification would facilitate increased coal resource recovery and would represent the most efficient use of these resources. CHPP rejects from the additional DEP ROM coal would continue to be disposed within the Stratford Main Pit. No additional areas for reject disposal are proposed for the Modification.

Clause 16, subclause (1), of the Mining SEPP requires that before granting consent for development for the purposes of mining or extractive industry that involves the transport of materials, the consent authority must consider whether or not the consent should be issued subject to conditions such as:

a) require that some or all of the transport of materials in connection with the development is not to be by public road,

b) limit or preclude truck movements, in connection with the development, that occur on roads in residential areas or on roads near to schools,

c) require the preparation and implementation, in relation to the development, of a code of conduct relating to the transport of materials on public roads.

Clause 16, subclause (3), requires that the consent authority:

a) must not determine the application until it has taken into consideration any submissions that it receives in response from any roads authority or the Roads and Traffic Authority within 21 days after they were provided with a copy of the application, …

Some minor changes to operational road transport movements would occur as a result of the Modification, as minor changes to consumable usage are proposed as well as a short-term increase in employment associated with construction of the augmented rail loop. These changes are not expected to be material from a road transport perspective (Section 4.8). ROM coal from the DEP and product coal from the SCM would continue to be transported via rail only.

Clause 17 of the Mining SEPP requires that before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider whether or not the consent should be issued subject to conditions aimed at ensuring the rehabilitation of land that would be affected by the development. Relevantly, the consent authority must consider whether conditions of the consent should:

a) require the preparation of a plan that identifies the proposed end use and landform of the land once rehabilitated, or

b) require waste generated by the development or the rehabilitation to be dealt with appropriately, or

c) require any soil contaminated as a result of the development to be remediated in accordance with relevant guidelines (including guidelines under section 145C of the Act and the Contaminated Land Management Act 1997), or

d) require steps to be taken to ensure that the state of the land, while being rehabilitated and at the completion of the rehabilitation, does not jeopardize public safety.

Rehabilitation of the SCM is described in the SCP EIS and subsequent modifications. Rehabilitation progress to date is summarised in Section 2.5. Rehabilitation of the modified SCM is described in Section 5.

CHPP rejects management associated with the Modification is described in Section 3.4 and an assessment of geochemical impacts (including proposed management and mitigation measures) is provided in Section 4.4.

The lands in the rail loop augmentation area are not an “investigation area” defined by a declaration in force under Division 2 of Part 3 of the NSW *Contaminated Land Management Act, 1997* (CLM Act). A review of past land use practices and agricultural improvements in the rail line augmentation area has been completed by SCPL and this review did not identify any potential sources of land contamination within the rail loop augmentation area.

Hazards and risk are assessed in Section 4.7 and the lease relinquishment process is expected to provide for adequate consideration of public safety after rehabilitation works are complete.

State Environmental Planning Policy No. 33 (Hazardous and Offensive Development)

Clause 13 of *State Environmental Planning Policy No. 33 (Hazardous and Offensive Development)* (SEPP 33) requires the consent authority, in considering a development application for a potentially hazardous or a potentially offensive industry, to take into account:

…

(c) in the case of development for the purpose of a potentially hazardous industry—a preliminary hazard analysis prepared by or on behalf of the applicant, and

(d) any feasible alternatives to the carrying out of the development and the reasons for choosing the development the subject of the application (including any feasible alternatives for the location of the development and the reasons for choosing the location the subject of the application)…

The SCM operates in accordance with the environmental management plans and management procedures required by the existing Development Consent (DA 23-98/99) (Attachment 1). These plans and procedures have been developed to minimise the environmental risks associated with operation of the open cut mining activities.

The Modification does not significantly alter the consequences or likelihood of a hazardous event occurring at the SCM, as the operational activities on-site would be generally unchanged. Notwithstanding, environmental management plans and procedures would be updated to include the Modification, where relevant (Section 4).

State Environmental Planning Policy No. 44 (Koala Habitat Protection)

State Environmental Planning Policy No. 44 (Koala Habitat Protection) (SEPP 44) requires the consent authority for any Development Application in certain LGAs (including the Gloucester LGA) to consider whether land subject to a Development Application is "potential Koala habitat" or "core Koala habitat".

SEPP 44 requires that any development proposals affecting one hectare or more of a property must be evaluated for potential and core Koala habitat. Potential Koala habitat is defined as *areas of native vegetation where the trees listed in Schedule 2 of SEPP 44 constitute at least 15% of the total number of trees in the upper and lower strata of the tree component.*

Surface disturbance activities associated with the Modification would be limited to the augmentation of the SCM rail loop. As this land disturbance would be located within a cleared paddock, no clearance of trees would occur as a result of the Modification. It is therefore concluded that the provisions of SEPP 44 do not apply to the Modification.

State Environmental Planning Policy No. 55 (Remediation of Land)

State Environmental Planning Policy No. 55 (Remediation of Land) (SEPP 55) aims to provide a State-wide planning approach to the remediation of contaminated land. Under SEPP 55, planning authorities are required to consider the potential for contamination to adversely affect the suitability of the site for its proposed use.

Clause 7(1) states that a consent authority must not consent to the carrying out of any development on land unless:

(a) it has considered whether land is contaminated, and

(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.

Further under Clause 7(2), before determining an application for consent to carry out development that would involve a change of use on any of the land, the consent authority must consider a report specifying the findings of a preliminary investigation of the land concerned carried out in accordance with the contaminated land planning guidelines.

Clause 7(2) provides that before a consent authority determines an application for Development Consent, a "preliminary investigation" is required where:

- the application for consent is to carry out development that would involve a "change of use"; and
- that "change of use" is to certain land specified in clause 7(4).

The certain land specified in Clause 7(4) on which the "change of use" must relate is either:

- land that is an "investigation area" – defined in SEPP 55 as land declared to be an investigation area by a declaration in force under Division 2 of Part 3 of the CLM Act; or
- land on which development for a purpose referred to in Table 1 of the contaminated planning guidelines (being *Managing Land Contamination – Planning Guidelines SEPP 55 – Remediation of Land* [NSW Department of Urban Affairs and Planning (DUAP) and NSW Environment Protection Agency (EPA), 1998] is being, or is known to have been, carried out.

The majority of the Modification does not involve a "change of use" because the Modification would involve the continuation of mining activities within the existing Mining Leases. The rail loop augmentation would arguably involve a change of use, as it would be located outside of the existing Mining Leases.

As noted above, the lands in the rail loop augmentation area are not an "investigation area" defined by a declaration in force under Division 2 of Part 3 of the CLM Act.

SEPP 55 is therefore not enlivened by this Modification and no preliminary land contamination investigation is required.

Environment Protection and Biodiversity Conservation (EPBC) Act, 1999

The primary objective of the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) is to provide for the protection of those aspects of the environment that are of "national environmental significance". The EPBC Act establishes a scheme requiring environmental assessment and approval of proposals likely to impact significantly upon such matters, which in the EPBC Act are termed "protected matters".

The majority of the aspects of the Modification are alterations to existing mine landforms and activities. No clearance of trees is proposed as a result of the Modification, with the only vegetation clearance being associated with the clearance of an area of cleared land with improved pasture associated with the rail loop augmentation. No threatened species occur in this area. Therefore, the modified SCM would not have a significant impact on any threatened flora or fauna species or communities listed under the Schedules of the EPBC Act.

The Modification has therefore not been referred to the Commonwealth Minister for the Environment, Heritage and the Arts for consideration under the EPBC Act, as no "*controlled action"* is proposed.

1.2.2 Other Approvals

In addition to the modified Development Consent which is required to be obtained from the NSW Minister for Planning, a modification or addendum to the *Mining Operations Plan for Roseville West Open Cut as a satellite pit for the Stratford Coal Mine* (RWP MOP) (SCPL, 2007a) would also be prepared in consultation with Industry & Investment NSW (I&I NSW) (Minerals).

1.3 CONSULTATION

SCPL has developed and implemented a consultation programme for the SCM. The key objectives of the programme are to:

- inform government and public stakeholders about the progress and nature of SCPL's mining operations;
- recognise and respond to local concerns or interests; and
- continue dialogue between SCPL and stakeholders that commenced during the development of the SCP EIS.

This section describes the consultation undertaken prior to and during the preparation of this EA.

A comprehensive summary of the consultation undertaken for the DEP is provided in Section 3 of the DEP EA.

1.3.1 State and Local Government Agencies

Consultation with State and local government agencies about SCPL development planning is ongoing.

Consultation with State Government agencies for the Modification has comprised briefing of senior NSW Department of Planning (DoP) representatives in regards to the Modification and the proposed approval path (i.e. Section 75W of Part 3A of the EP&A Act). In addition, representatives of I&I NSW (Minerals) have also been briefed in regards to the Modification.

SCPL provided an overview of the Modification to the GSC on March 2010. Items discussed included management of CHPP rejects.

1.3.2 Public Consultation

Consultation with the community has been conducted by SCPL since the mid-1990s.

Stratford Community Consultative Committee

A Community Consultative Committee (CCC) is in place at the SCM and meets quarterly to discuss environmental management at the SCM and BRNOC and discuss future developments when relevant. Minutes of the meetings and copies of the newsletters provided to the CCC are available publicly on the GCL website.

The CCC includes representatives from the following organisations:

- GSC;
- SCPL (two representatives); and
- local landholders (six representatives including representatives of a community organisation).

The CCC is regularly briefed regarding SCPL's long-term development plans for SCM and DCM and regional exploration activities and has been informed of the Modification.

The CCC meeting held on 4 February 2010 was attended by I&I NSW (Minerals), who discussed CHPP rejects management requirements in the context of the DEP and site closure.

Website and Community Call Line

SCPL information is made available on the GCL website for members of the public to keep up to date with:

- contact details, including community complaints line;
- environmental management, plans and strategy information;
- CCC meeting minutes and newsletters;
- audit reports;
- monitoring and reporting data; and
- Development Applications.

The SCPL web address is provided below:

http://www.gloucestercoal.com.au/operations-stratford.php

SCPL has also established a dedicated Complaints Line (016 302 013) that is available 24 hours, seven days a week for community members who have enquiries or who wish to lodge a complaint in relation to SCPL's activities. The number is advertised within the Sensis *White Pages Directory* and a local telephone directory (*Pink Pages*).

Sponsorships and Community Funding

GCL supports the local community through sponsorships of community organisations and direct payments to local councils. Recent beneficiaries of funding contributions to community groups include:

- Avon Valley Field Archers.
- Barrington Public School P&C Association.
- Booral Public School.
- The Bucketts Way Neighbourhood Group Inc.
- Dungog National Servicemen's Association.
- Dungog A&H Association Inc.
- Gloucester Show Society.
- Gloucester Little Athletics.
- Gloucester Business Chamber.
- Gloucester Country Club Limited.
- Gloucester Chamber of Commerce.
- Gloucester District Junior Cricket Association.
- Gloucester District Tennis Association Inc.
- Gloucester High School.
- Gloucester Junior Rodeo.

- Gloucester Men's Bowling Club.
- Gloucester Magpies Junior Rugby League Inc.
- Gloucester Public School.
- Gloucester Tourist Office.
- Gloucester Mountain Man Tri Challenge (Major Sponsor).
- GSC Hillcrest Appeal.
- St Joseph's P&F Association. Stratford Public Hall.
- Stratford Public School.
- Stroud Public School P&C Association.
- Stroud Road Community Hall & Progress Association Inc.
- Stroud Rodeo.
- Stroud Rugby League Football Inc.
- Stroud Show Association Inc.

SCPL would continue to provide funding contributions to community groups.

Local Contractors and Suppliers

Local contractors engaged at the existing SCM include:

- Ditchfield Contracting Pty Ltd; and
- Zamaway Pty Ltd.

Wherever practicable, SCPL prefers to utilise the services of local providers. Approval of the Modification would allow SCPL to continue to support local suppliers and contractors to the SCM, providing additional security and longevity of employment in the region.

1.4 STRUCTURE OF THIS EA

This EA is structured as follows:

Section 1	Provides an overview of the current SCM, proposed BRNOC modifications, the DEP and the nature of the Modification, the statutory context and the consultation undertaken in relation to the Modification.
Section 2	Provides a description of the existing SCM.
Section 3	Provides a description of the Modification.
Section 4	Provides a review of the existing environment, assesses the Modification and describes the existing SCPL environmental management systems and measures in place to manage and monitor any potential impacts.
Section 5	Provides a description of rehabilitation, monitoring and management which would be undertaken at the modified SCM.
Section 6	References.

Attachment 1 and Appendices A to D provide supporting information as follows:

Attachment 1	Stratford Coal Mine - Development Consent
Appendix A	Noise Assessment
Appendix B	Air Quality Assessment
Appendix C	Surface Water and Reject Management Assessment
Appendix D	Geochemistry Assessment

2 SUMMARY DESCRIPTION OF EXISTING STRATFORD COAL MINE

This Section provides a description of the existing SCM. A development history of the SCM is provided in Section 1.1.1.

2.1 MINING

Mining at the SCM has been optimised during development of the main deposit where SCPL expertise in mining geologically complex seams was developed. A combination of selective mining using excavators and dozers and bulk mining using dozers is utilised at the SCM. Mining of the Stratford Main Pit ceased in 2003. Since then, mining has focussed on the Roseville, Roseville Extended and Roseville West Pits.

The approved mining rate at the SCM is up to 2.1 Mtpa of ROM coal. The current mobile mining fleet for the SCM is outlined in Table 2.

Table 2
Current Stratford Coal Mine Mobile Fleet

No. of Items	Fleet Item
1	Drills
2	Excavators – Coal
2	Excavators – Waste
6	Caterpillar 789 Rear Dump Truck
6	Caterpillar 785 Rear Dump Truck
2	Dozer In Pit/Dump
1	Dozer (Stockpiles)
1	Front End Loader
1	Grader
1	Water truck

After: Heggies Pty Ltd (2008)

The SCM mine fleet has been reduced significantly since the closure of mining operations in the Stratford Main Pit. Appendix A provides further detail.

SCPL also periodically recovers coal from the previous CHPP rejects co-disposal area (Figure 2) for re-processing of this previous waste material as thermal coal feed to the SCM CHPP.

As the Roseville West Pit seams are thin and steeply dipping, coal is generally mined selectively with the small excavator and truck fleet. Waste rock currently mined at the Roseville West Pit is backfilled into the Roseville Pit Extension and Stratford Main Pit voids.

2.2 COAL PREPARATION PLANT AND RAIL LOADING AND UNLOADING

The SCM CHPP processes SCM, BRNOC and DCM ROM coal to produce saleable thermal and coking coal for domestic and export markets. The CHPP processes up to 3.4 Mtpa of raw coal, producing up to 2.3 Mtpa of thermal and coking coal.

The SCM CHPP is a two stage plant that comprises the following components:

- primary (coking coal) and secondary (thermal coal) circuits;
- coal breaking, coal crushing, dense medium cyclone, classification cyclone, Jameson cell, teetered bed separator, spiral separation equipment and a secondary flotation circuit;
- conveyors, bins and associated monitoring and maintenance equipment;
- internal bypass systems that minimise the washing of thermal coals;
- a partially cladded CHPP building; and
- a co-disposal system for CHPP rejects disposal on-site in the Stratford Main Pit.

The co-disposal system facilitates disposal of CHPP rejects either subaerially or subaqueously in the Stratford Main Pit in accordance with the approved SCM Life of Mine Reject Disposal Plan (SCPL, 2009a).

The existing ROM pad area comprises:

- rail unloading conveyors transporting ROM coal from the rail unloading station to the ROM pad area;
- two ROM stackers and associated conical stockpiles;
- associated mobile equipment that clear the conical stockpiles to allow for stacking of different coal types;
- stockpiling of SCM coal on the ROM pad via haul truck; and
- ROM hopper fed by front-end-loader which distributes ROM coal on a conveyor for transport to the CHPP for processing.

The existing product coal handling system comprises:

- product coal distributing conveyors, discharging product coal from the CHPP at various locations along the product coal stockpile, depending on coal type;
- product coal stockpiles;
- product coal reclaim systems located beneath the product coal stockpiles; and
- rail loading conveyors transporting product coal to the rail loading bin.

Both rail unloading and rail loading conveyor systems are in place at the SCM CHPP to allow unloading of DCM ROM coal for treatment at the CHPP and loading of blended BRNOC, DCM and SCM coals for transport to domestic or export markets. The rail unloading and loading system comprises:

- an unloading facility including rail unloading bin and unloading conveyors to the ROM pad (described above);
- a 2.9 km rail loop; and
- a train loading facility including rail loading bin (receiving product coal from the product coal conveyor) and loading chute, and associated rail loading conveyor (described above).

2.3 WATER SUPPLY AND WATER MANAGEMENT

The SCM and BRNOC have an integrated water management strategy. The key components of the strategy are:

- separation of undisturbed area runoff from disturbed area runoff;
- collection and reuse of surface runoff from disturbed areas (including mining pre-strip areas, waste emplacements and haul roads);
- design of sediment dams to contain runoff generated from the 1 in 20 year, 72 hour rainfall event;
- capture and on-site containment of mine water, consisting of any groundwater inflows and/or surface water collection in the open cuts; and
- reuse of captured and contained mine water for dust suppression and CHPP supply.

The main water supply storage for the SCM CHPP is the 500 megalitre (ML) Return Water Dam (Figure 2), while the major on-site storages comprise the Stratford East Dam (2,850 ML) and Stratford Main Pit (37,000 ML) (Figure 2).

The SCM water management system operates under a surplus water balance, which means that over time there is a trend for increasing water storage on-site. The major water inflow to the site is rainfall-runoff generated from operational areas.

2.4 GENERAL INFRASTRUCTURE

The following summarises general infrastructure at the SCM:

- Access to SCM is via the existing mine access road located off The Bucketts Way (Figure 2).
- The SCM rail loop and associated infrastructure provides a mechanism for the rail transport of DCM ROM coal to SCM and for the transport of product coal from SCM to market.
- The SCM electricity supply and distribution system is fed by two 33 kilovolt (kV) distributor lines running along The Bucketts Way. A private substation provides an 11 kV supply to the SCM which is reticulated around the site at variable voltages according to requirements.
- Primary buildings include the CHPP, administration, workshop, stores and ablution buildings.
- Heavy vehicle servicing, parking and washdown facilities are available.
- Explosives, such as initiating products and detonators, are currently stored offsite and used at the SCM in accordance with existing safety and operational procedures and Australian Standard (AS) 2187: *Explosives – Storage, Transport and Use*.
- The SCM diesel storage tank (110,000 L capacity) is operated in accordance with the requirements of AS 1940: *The Storage and Handling of Flammable and Combustible Liquids*.

In addition, SCPL has recently relocated Bowens Road to the north of the mining operations in order to provide continued access to private land holdings east of the SCM mining leases in accordance with an approval from the GSC.

2.5 REHABILITATION

The primary objectives of the SCM rehabilitation programme are the minimisation of erosion and reinstatement of pre-mining land capability. Other objectives of rehabilitation are:

- the generation of a final rehabilitated landform which is consistent with general landforms in the area and which would blend in with the hills to the east;
- to provide a landform which is suitable for the primary final land uses of grazing, forestry and fauna habitat enhancement;
- to plan mining and overburden handling operations to minimise rehandling, reshaping and contouring;
- to minimise the amount of disturbed land awaiting rehabilitation; and
- to provide for the safe and environmentally acceptable disposal of CHPP rejects.

The relevant Mining Operations Plans (MOPs) and AEMRs describe the on-going rehabilitation programme. A summary of the key elements of the rehabilitation programme is provided below.

Stratford Waste Emplacement

Rehabilitation works on the Stratford Waste Emplacement (Figure 3) have been effectively completed (Plate 1). The Stratford Waste Emplacement is constructed with an overall outer batter slope of 1 vertical (V):6 horizontal (H), while selected areas of the emplacement and low mine landforms are contoured to a 1V:4H outer batter slope. Following the development of drainage structures, the waste rock has been covered with 150 millimetres (mm) to 200 mm of topsoil cover. Following topsoil placement, site preparation works have involved either chisel ploughing or deep ripping along contour, depending on the vegetation type to be established.

The emplacement has been progressively revegetated with a pasture cover crop. Endemic woodland shrubs and trees have been planted on ridgelines and other selected areas with the objective of covering approximately 20% of the emplacement surface with native vegetation. Portions of the rehabilitated emplacement are grazed by cattle.

Co–disposal Area and Return Water Dam

The CHPP rejects co-disposal area (Figure 3) contains mixed fine and coarse rejects from the SCM CHPP. Reclaiming operations to recover thermal coal from the co-disposal area (Section 2.1) would remove a large proportion of the placed material and leave a low mounded landform for final rehabilitation. Rehabilitation concepts for the co-disposal area (post recovery of thermal coal) and the return water dam include reshaping the remaining *in-situ* material/embankment to final grade, capping with a layer of coarse rejects material and topsoiling to a depth of approximately 200 mm. Revegetation would be with pastures or selected woodland species.

Backfilled Roseville Pit

The Backfilled Roseville Pit (Figure 3) was a mined out open cut that was used for the co-disposal of CHPP rejects and for temporary water storage. Following the cessation of use of the void for rejects placement in 2003, the remaining void was backfilled with mine waste rock from the approved Roseville Pit Extension (to an elevation of approximately 140 m relative level [RL]). Co-disposed material was reshaped and capped with inert waste rock and clay. The surface was then topsoiled to a depth of approximately 200 mm and is being revegetated with native woodland and pastures.

Stratford Coal Mine Rehabilitation

Stratford Waste Rock Emplacement Looking South-East - Rehabilitation to Grazing and Woodland

Stratford Eastern Emplacement Looking East South-East (Water Dam) - Rehabilitation to Grazing

Stratford Eastern Emplacement Looking North - Rehabilitation to Grazing

Stratford Waste Rock Emplacement Looking South - Rehabilitation to Grazing and Woodland

Stratford Waste Rock Emplacement - Rehabilitation to Woodland

Stratford Waste Rock Emplacement - Rehabilitation to Grazing and Woodland

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PLATE 1

Stratford Coal Mine Rehabilitation

STRATFORD COAL

GCL-09-11 Strat 2010 Mod_006B

Roseville Pit Extension Final Void

The Roseville Pit Extension final void (Figure 3) has been substantially backfilled, with the void having capacity to store approximately another 150 kilotonnes (kt) of waste (to be deposited from the Roseville West pit). The void would ultimately be backfilled to approximately 122 m RL at natural ground level in the south and 116 m RL in the north (i.e. level with the flood/noise bund to the north). Once the void is backfilled, the surface would be topsoiled to a depth of approximately 200 mm and revegetated with native woodland and pastures.

Roseville West Pit Final Void

Following the completion of mining, the Roseville West Pit final void (Figure 3) would be backfilled with waste rock from one of the other satellite pits that are proposed for future development (subject to future approvals), or in a manner agreed by the DII (Minerals). Should the void be backfilled, the surface would be topsoiled to a depth of approximately 200 mm and revegetated with native woodland and pastures.

Stratford Main Pit

The Stratford Main Pit (Figure 3) is approximately 120 m in depth and currently used for water management, CHPP rejects disposal and placement of waste rock. Rehabilitation concepts for the final void include redirecting upstream drainage that is currently diverted around mine landforms, and runoff from the waste emplacement landform, into the void.

Stratford East Dam

The Stratford East Dam (Figure 3) would most likely be retained after mine closure and final use options would be the subject of consultation. It is anticipated that the dam would provide a significant water resource (e.g. farm dam) post-mining. One rehabilitation option would include the diversion of waters flowing from the dam spillway into the Stratford Main Pit.

Infrastructure Areas

SCM infrastructure including the SCM CHPP area, buildings and electricity lines would be removed and the sites deep-ripped and seeded as required. Some concrete hardstands, site access roads and water management structures may be retained for alternate post mining uses (where agreed in consultation with the relevant landholders).

2.6 ENVIRONMENTAL MONITORING AND MANAGEMENT

GCL's Environmental Policy principles are (GCL, 2008a):

- *To enhance the development and maintenance of high standards of environmental management.*
- *A commitment to the Environmental Management program by all personnel.*
- *Environmental performance shall be regularly assessed and information distributed to the local community through the consultative committees.*
- *Minimisation of areas disturbed by operations.*
- *Minimisation of impact on the surrounding environment.*
- *Application of best practical technologies for rehabilitation, water and environmental protection.*
- *The preservation of fauna and flora.*
- *The preservation of downstream water quality.*
- *The achievement of final land forms that are stable and sustainable.*

GCL's Energy Management Policy principles are (GCL, 2008b):

- *To enhance the development and maintenance of high standards of energy management.*
- *A commitment to the Energy Management program by all personnel.*
- *Energy usage performance shall be regularly assessed and a commitment of continuous improvement.*
- *Application of best practical technologies for the mining and production of the Company's products in the most economic and energy efficient manner.*
- *A goal of reducing the amount of energy per tonne of coal processed, resulting in lower production costs and reduced energy and demands on Electricity Providers, thereby reducing the impact on the environment and green house gas generation.*

SCPL's Environmental Management Strategy has the following objectives (SCPL, 2002a):

- *To ensure compliance with statutory requirements and with reasonable community expectations.*
- *To develop and maintain the most cost effective environmental management for the Stratford Mine.*
- *To provide all employees with the knowledge, skills and equipment necessary to meet their environmental obligations.*
- *To promote an awareness and concern for good environmental management amongst all employees.*
- *To provide a "feed-back loop" so that the results of environmental monitoring are used to assess, and where necessary improve, environmental performance.*

Environmental management at SCM and BRNOC has included the development and implementation of a range of environmental management plans, procedures and environmental monitoring programmes. As the BRNOC consent requires the integration of a number of environmental management aspects of SCM and BRNOC, the SCM operates under relevant BRNOC management plans where practicable (for example the BRNOC *Soil Stripping Management Plan* [SSMP] [SCPL, 2002b] is applied to general SCM operations).

Examples of relevant SCM and BRNOC environmental management plans, procedures and monitoring programmes include:

- BRNOC *Land Management Plan* (LMP) (SCPL, 2001a);
- BRNOC *Flora and Fauna Management Plan* (FFMP) (SCPL, 2002c);
- BRNOC *Erosion and Sediment Control Plan* (ESCP) (SCPL, 2002d);
- *Noise Consent and Management Plan* (NMP) (VIPAC, 2006);
- BRNOC *Lighting Management Plan* (LMP) (SCPL, 2002e);
- BRNOC *Soil Stripping Management Plan* (SSMP) (SCPL, 2002b);
- BRNOC *Site Water Management Plan* (SWMP) (SCPL, 2002f);
- BRNOC *Landscape and Revegetation Management Plan* (LRMP) (SCPL, 2001b);
- BRN Project *Blasting/Vibration Management Plan* (SCPL, 2002g);
- BRN Project *Road Closure Management Plan* (SCPL, 2002h);
- BRN Project *Environmental Management Strategy* (SCPL, 2002a);
- *Stratford Coal Mine: Air Quality Monitoring Program* Stratford Coal Pty Ltd (2007b)*;*
- *Gloucester District Bush Fire Management Plan Operations* (NSW Bush Fire Service, 2003); and
- monitoring results provided annually in AEMRs, where relevant.

SCPL maintains an extensive monitoring network for the SCM and BRNOC, including noise, blasting, meteorology, air quality and surface water. The existing monitoring network is shown on Figure 5.

2.7 COMPLAINTS RECORD

A summary of the SCPL complaints record from January 2003 to December 2009 is provided on Figure 6. Note these complaints relate to both the SCM and the BRNOC, and are based on calendar years to include complaints received up to the end of 2009.

As shown on Figure 6, the number of complaints in 2007 (10 complaints) fell sharply in comparison to the previous years (24 complaints in 2006; 36 complaints in 2005). More recently, complaints have risen, with 20 complaints received in 2008 and 27 in 2009.

As shown on Figure 6, the majority of complaints in the calendar years 2003 to 2009 were about operational noise and rail noise, with the exception of 2006, when the haul road crossing and spontaneous combustion received slightly more complaints.

SCPL has recently relocated Bowens Road to the north of the mining operations in order to provide continued access to areas east of the SCM mining leases in accordance with an approval from the GSC (Section 2.1). In addition, due to the proximity of a small number of private residences to the rail loop and SCM CHPP, SCPL has implemented a range of noise mitigation measures to improve noise performance and address noise complaints from the community. These measures are described in Appendix A.

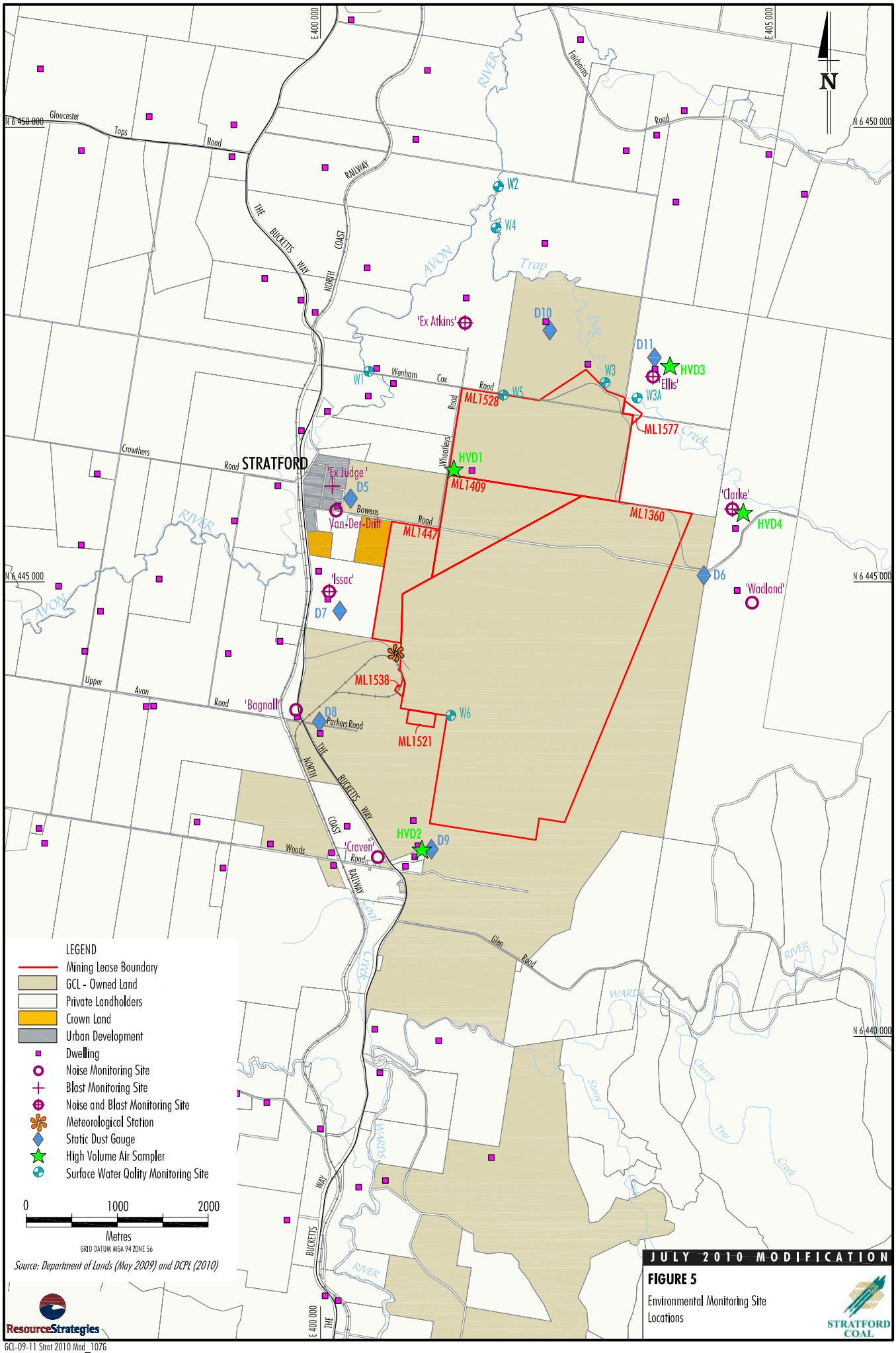
2.8 WORKFORCE

The combined workforce of the BRNOC and SCM operations (SCPL staff and contractors) is currently approximately 84 people.

2.9 INTERACTION WITH APPROVED OPERATIONS

The operation of BRNOC and SCM is integrated from an operational and environmental management perspective. Some of the consent conditions for the SCM (Attachment 1) require integration of environmental management and monitoring with BRNOC. While the two operations are effectively integrated, BRNOC continues to operate under a separate consent and EPL.

Where practicable, environmental management and monitoring of the two operations is integrated, as from an environmental management and community relations perspective the two mines are generally regarded as a single operation.



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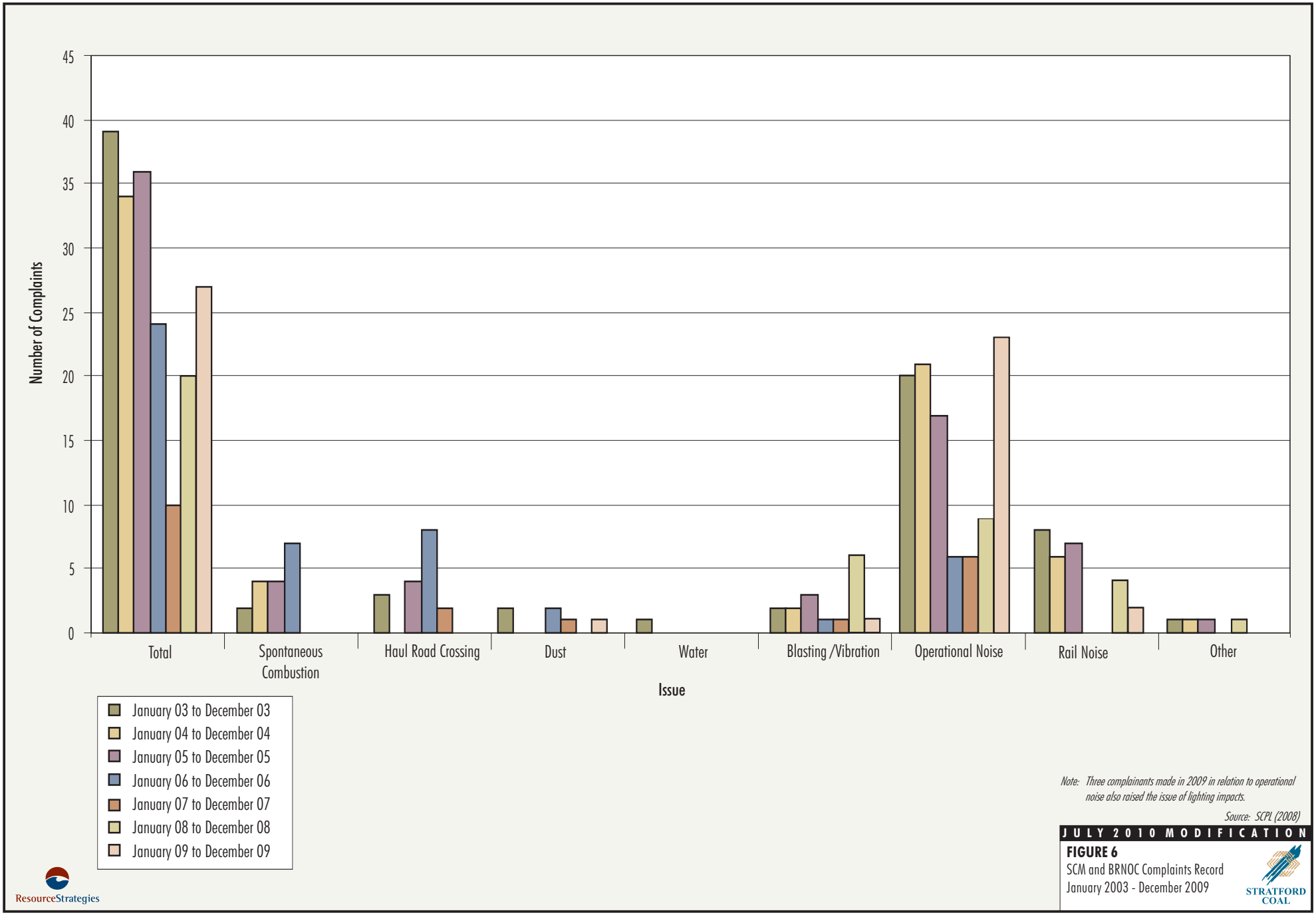

Note: Three complainants made in 2009 in relation to operational noise also raised the issue of lighting impacts.

Source: SCPL (2008)

JULY 2010 MODIFICATION

FIGURE 6
SCM and BRNOC Complaints Record
January 2003 - December 2009

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STRATFORD COAL

GCL-09-11 Strat 2010 Mod_002E

3 DESCRIPTION OF THE PROPOSED MODIFICATION

3.1 MINING METHOD AND SCHEDULE

The Modification would not change the mining method of the approved SCM (i.e. drill and blast, truck and shovel extraction with on-site processing).

SCPL proposes to mine an additional of 1.4 Mt ROM coal from the Roseville West Pit as part of the Modification. The initially estimated amount of ROM coal to be extracted from this pit (0.7 million tonnes [Mt] of ROM coal) was based on resource definition using the best available dataset (e.g. drilling) at the time. As a result of subsequent additional resource definition conducted in accordance with the *Australasian Code for Mineral Resources and Ore Reserves Reporting of Exploration Results* (JORC Code), additional coal resources have been identified in the Roseville West Pit.

A provisional production schedule for the modified SCM is provided in Table 3. SCPL proposes to mine an additional 1.4 Mt of coal and 8 Mbcm of waste from the Roseville West Pit over a period of approximately three years. The footprint of the Roseville West Pit would be unchanged. Roseville West Pit waste rock would be used to continue backfilling the Stratford Main Pit (Figure 2).

The annual ROM coal production rate at the modified SCM would remain unchanged at 2.1 Mtpa. The estimated life of mine ROM coal production would increase by 1.4 Mt (i.e. to approximately 25.55 Mt over the life of the mine) and Roseville West Pit would operate for approximately an additional two years.

In addition, the existing practice (Section 2.1) of recovery of thermal coal from the co-disposal area would continue.

The proposed mobile mining fleet for the modified SCM is outlined in Table 4 below.

Table 4
Modified Stratford Coal Mine Mobile Mining Fleet

Fleet Item	No. of Items
Drills	1
Excavators – Coal	1
Excavators – Waste	1
Excavators – Ripping	1
775 Haul Trucks	4
A40D Haul Trucks	4
Dozers – In-pit	2
Dozers – Dump	1
Water Cart	1
Front-end Loaders (ROM)	1
Graders	1

After: Heggies Pty Ltd (2010)

Table 3
Provisional Production Schedule – Modified Stratford Coal Mine

Year	Financial Year	Coal Source										
		Duralie Extension Project[1]		BRNOC[2]		Roseville West Pit			Co-disposal Area Coal Recovery			Rejects Totals
		ROM (Mt)	Rejects ('000 t)	ROM (Mt)	Rejects ('000 t)	ROM (Mt)	Waste (Mbcm)	Rejects ('000 t)	ROM (Mt)	Waste (Mbcm)	Rejects ('000 t)	
1	FY 2010-11	2	620	1	352	0.5	2.8	250	0.2	NA	120	1,342
2	FY 2011-12	2.2	710	1	374	0.5	3.9	250	0.2	NA	120	1,454
3	FY 2012-13	2.4	750	0.7	256	0.4	1.4	250	0.1	NA	66	1,322
4	FY 2013-14	2.4	750	-	-	-	-	-	-	-	-	750
5	FY 2014-15	3	790	-	-	-	-	-	-	-	-	790
6	FY 2015-16	2.2	750	-	-	-	-	-	-	-	-	750
7	FY 2016-17	2.3	750	-	-	-	-	-	-	-	-	750
8	FY 2017-18	2.5	600	-	-	-	-	-	-	-	-	600
9	FY 2018-19	1.5	300	-	-	-	-	-	-	-	-	300
TOTALS		20.5	6,020	2.7	982	1.4	8.1	750	0.5	0	306	8,058

Source: SCPL (2010).

[1] Subject to approval of the Duralie Extension Project (DCPL, 2009).

[2] Subject to approval of a separate BRNOC Development Consent Modification (SCPL, 2010).

3.2 COAL HANDLING AND PREPARATION PLANT

The installed capacity of the CHPP and coal handling fixed infrastructure would be adequate such that no upgrades to the SCM CHPP or coal handling fixed infrastructure would be necessary for the Modification. The existing CAT788 front-end loader operating on the product coal stockpile would be replaced by a larger capacity CAT992K front-end loader in late 2010 to accommodate the increased coal production. The new front-end loader would have the same sound power level as the current model.

The SCM CHPP is currently approved to process up to 3.4 Mtpa of ROM coal. The annual ROM coal production rate at the modified SCM would remain unchanged, although an increase in annual ROM coal production from the Duralie Coal Mine is proposed as part of the DEP (i.e. up to 3 Mtpa) (DCPL, 2009) and an increase in annual ROM coal production from the BRNOC (i.e. up to 1 Mtpa) is proposed as part of a separate modification (Section 1.1.1). The Modification would involve an increase in the rate of ROM coal processing in the SCM CHPP from approximately 3.4 Mtpa to approximately 4.6 Mtpa. Processing of ROM coal in the SCM CHPP would continue up to 2019 and the SCM CHPP would continue to operate 24 hours per day, seven days per week.

The Modification would also increase the rate of production of saleable product coal by approximately 1.0 Mtpa (to a total of approximately 3.3 Mtpa).

3.3 RAIL LOADING AND UNLOADING

The Modification would not change the method of product coal loading or DEP ROM coal unloading.

3.3.1 Stratford Rail Loop Augmentation – Construction

In order to facilitate improved access to the existing coal loading/unloading infrastructure, a 400 m section of the existing Stratford rail loop would be augmented with a new line immediately adjacent and parallel to sections of the existing rail loop (Figure 2). This augmentation would allow two (72 wagon) export trains to be on the loop at one time (or one export train and one DCM train), increasing operational efficiency of the rail loop and reducing congestion on the main line (North Coast Railway).

Construction of the rail loop augmentation would involve relocation of services in the vicinity of the existing loop, earthworks, ballast placement, line placement, signalling works and points relocation. The earthworks component would involve the most intensive mobile equipment requirement and would take approximately 12 weeks. The typical mobile equipment required comprises:

- D6 dozer;
- 30 t excavator;
- 2 x 30 t articulated dump trucks; and
- water cart (shared with ongoing SCM mining operations).

3.3.2 Stratford Rail Loop Augmentation - Operation

The Modification would involve unloading of an increased number of DCM trains on the SCM rail loop, in line with increased ROM coal production from the DEP. The average number of trains that would be used to haul DEP coal to the SCM would increase from three to four (Table 5), with the peak trains increasing from four to five (following the introduction of GL class locomotives [or similar], as discussed below).

In the first year of the DEP, the existing locomotives that service the DCM and SCM would continue to be used during the existing/approved hours. From Year 2 (or sooner, subject to contract arrangements and availability of locomotives), the existing locomotives would be replaced by GL class locomotives (or equivalent) which are quieter than the existing DCM locomotives (560 m long trains would be replaced with 600 m long trains). Upon their introduction, the existing/approved ROM coal transportation period (7.00 am to 10.00 pm) would be extended to 2.00 am and the average trains per day would increase from 3 to 4 trains. This extension in rail haulage hours is required to facilitate improved access to the ARTC network train paths, as explained in the DEP EA.

In order to accommodate the increased product coal production rates, longer (72 wagon) product coal trains would be introduced at the SCM from the fourth quarter of 2011 (or earlier, subject to contractual arrangements). This means that the average number of trains per day that would be used to haul product coal from the SCM would remain at an average of 2.5 per day and a peak of five per day.

Train loading (for product coal trains) is currently undertaken 24 hours per day for product coal destined for export markets. No change is sought to the existing approved operational hours.

Table 5 presents a summary of train movements required for both ROM coal delivered from the DEP to the SCM and product coal leaving the SCM.

Table 5
Approved and Modified Train Movements

Scenario	Train Type	Period	Train Pass-bys				Train Length (m)	Train Speed (km/h)
			Daytime/evening[1]		Night-time[1]			
			Average Pass-bys	Peak Pass-bys	Average Pass-bys	Peak Pass-bys		
Approved SCM	SCM (Product Coal)	Monday to Saturday	4	8	1	2	760	60
		Sunday	4	8	1	2		
SCM Modification	SCM (Product Coal)	Monday to Saturday	3	6	2	4	Up to 1,300	60
		Sunday	3	6	2	4		
Duralie Extension Project Year 1	DCM (ROM Coal)	Monday to Saturday	6	8	0	0	560	60
		Sunday	0	0	0	0		
Duralie Extension Project (from Year 2)	DCM (ROM Coal)	Monday to Saturday	6	8	2	2	600	60
		Sunday	0	0	0	0		

Source: SCPL (2010).

[1] Daytime/evening 7.00 am to 10.00 pm; Night-time 10.00 pm to 7.00 am.

3.4 REJECTS MANAGEMENT

The planned CHPP rejects production over the modified SCM life of mine is provided in Table 3.

Additional CHPP rejects resulting from processing additional ROM coal would continue to be disposed using the current infrastructure within the Stratford Main Pit in accordance with the approved SCM Life of Mine Reject Disposal Plan (SCPL, 2009a). An additional rejects pipeline from the CHPP to the Stratford Main Pit as well as a return water pipeline from the Stratford Main Pit to the Return Water Dam would be required in late 2010. The additional reject pipeline would run immediately adjacent and parallel to the existing reject pipeline from the CHPP across the ROM pad, along the main haul road and into the Stratford Main Pit. The additional return water pipeline would also run immediately adjacent and parallel to the existing pipeline from the Stratford Main Pit Disposal of CHPP rejects would continue to occur either subaerially or subaqueously in the Stratford Main Pit in accordance with the approved SCM Life of Mine Reject Disposal Plan (SCPL, 2009a).

An assessment of the geochemistry of the rejects is provided in Appendix D and summarised in Section 4.4.

3.5 WATER SUPPLY AND WATER MANAGEMENT

Gilbert & Associates (Appendix C) has undertaken a revision of the SCM water balance to incorporate the Modification and estimate that a total of up to 2,800 ML per year would be required (i.e. total SCM water demand incorporating the Modification). Gilbert & Associates (Appendix C) has assessed that there is sufficient excess water to supply this demand and it would continue to be supplied from on-site sources.

Irrigation of water from the Stratford East Dam over a rehabilitated portion of the Stratford Waste Emplacement area is proposed as part of the Modification. It is proposed to irrigate approximately 34 ha of the existing rehabilitated waste emplacement area adjacent to the Stratford East Dam (Figure 2). Irrigation would occur within the catchment of the Stratford East Dam. Irrigation would be governed by soil moisture content, with irrigation suspended during wet weather or in periods following rain until soil moisture levels fell to levels low enough such that irrigation would not lead to direct runoff. All runoff from the irrigation areas would be directed back to the Stratford East Dam.

Irrigation would be used to reduce stored water on-site and to assist the current pasture cropping programme on the rehabilitated emplacement. The existing SWMP would be updated to include the proposed waste emplacement irrigation area.

3.6 POWER SUPPLY

No changes to the existing SCM power supply or on-site reticulation system would be required. Due to the increase in CHPP throughput, power usage would increase by approximately 6,300 MWh (or an approximate 30% increase).

3.7 WORKFORCE

A civil contractor would be engaged to construct the SCM rail loop augmentation, over a period of approximately 24 weeks. The civil contractor would employ approximately 10 additional people during this time.

No changes to the SCM operational workforce would be required for the Modification.

4 ENVIRONMENTAL ASSESSMENT

The existing environment within and surrounding the SCM and BRNOC has been comprehensively surveyed and assessed and is described in detail in the SCP EIS (SCPL, 1994), BRN EIS (SCPL, 2001c) and various modification SEEs (SCPL, 2002j; 2003; 2006; 2008). A review of the potential environmental impacts of the Modification is provided in the following subsections.

4.1 NOISE

A Noise Assessment of the Modification was conducted by Heggies (2010) and is presented in Appendix A. The assessment was conducted in accordance with the NSW *Industrial Noise Policy* (INP) (EPA, 2000).

The Modification would result in a change to the on-site operational noise environment because of the unloading of additional ROM coal trains from the DEP, deepening the Roseville West Pit and disposal of waste rock from the Roseville West Pit to the Stratford Main Pit void. There would also be a change in the off-site rail noise due to the use of longer product coal trains at the SCM.

4.1.1 Existing Environment

Background

The noise emissions of the original SCM were assessed in the SCP EIS by Richard Heggie Associates (1994). The assessment was conducted in accordance with the requirements of the Environmental Noise Control Manual (EPA, 1994).

As a component of the BRN EIS, Richard Heggie Associates (2001) completed an assessment of the cumulative intrusive SCM and BRNOC daytime noise emissions, in accordance with the INP. Subsequent to the BRN EIS, a number of modifications have been assessed that involved re-assessment of predicted noise levels from the SCM and BRNOC:

- As a component of the Roseville Pit Extension SEE, Heggies Australia (2005) conducted the *Stratford Coal Mine Operating Noise Impact Assessment* in accordance with the requirements of the INP.
- As a component of the Roseville West Pit SEE, Heggies Australia (2006) completed the *Stratford Coal Mine Roseville West Pit Modification Operating Noise and Blasting Impact Assessment* in accordance with the requirements of the INP.
- In 2008, Heggies Pty Ltd (Heggies) completed the *Stratford Coal Mine Coal Handling Modification Noise Impact Assessment* in accordance with the requirements of the INP.

Operational Noise Performance

Noise monitoring is undertaken at locations surrounding the SCM (Figure 5). A review of SCM routine noise monitoring results by Heggies (2010) (Appendix A) indicated:

- SCPL's (2009b) 2009 AEMR states: *Full daytime, evening and night-time noise compliance was achieved for all noise surveys. The September 2008 results concluded that excursions from the noise criteria were measured, however a moderate temperature inversion was predicted during the entire survey, potentially causing significant noise reinforcement.*

- Routine noise monitoring was conducted in September 2009, December 2009 and March 2010 in accordance with SCPL's Noise Management Plan (Vipac, 2006):
  - The September report confirms noise compliance was achieved during the daytime, evening and night-time periods at all eight monitoring locations, except at (21) Clarke (south) (Figure 4a) where a marginal (2 'A'-weighted decibels [dBA]) exceedance was recorded during the daytime survey when light to moderate westerly winds prevailed. These winds fluctuated around 3 m/s (and often above) (which is the maximum wind speed relevant to SCPL's noise limits) on the day of monitoring.
  - The December report confirms noise compliance was achieved during the daytime, evening and night-time periods at all eight monitoring locations.
  - The March 2010 report confirms noise compliance was achieved during the daytime, evening and night-time periods at all monitoring locations, with the exception of (31) Isaac (south) (Figure 4a) where noise levels in excess of criteria during the evening survey under noise enhancing weather (i.e. prevailing wind and temperature inversion) were recorded.

SCM operational noise complaints varied from six to 23 during the period 2004 to 2009 (Figure 6). Seven operational noise complaints have been received in 2010 to date.

No on-site rail noise complaints were received in calendar years 2006 or 2007 (Section 2.7). SCPL recorded four complaints in 2008 and two complaints in 2009 in relation to rail noise (Figure 6). No rail noise complaints have been received in 2010 to date.

4.1.2 Potential Impacts

Construction Noise

Heggies (2010) completed a construction noise assessment of the proposed augmentation of 400 m of the SCM rail loop. This assessment was undertaken in accordance with the NSW Department of Environment, Climate Change and Water's (DECCW) Interim Construction Noise Guidelines (ICNG) (DECCW, 2009) and focused on the bulk earthworks component of the construction works that would involve the highest intensity of mobile fleet use. This phase would be undertaken during daytime hours and take approximately 12 weeks to complete. The assessment found:

- Generally, noise levels would be below the corresponding operational noise level predicted for the Modification (with the exception of one privately-owned receiver).
- The noise levels would be less than the 'highly noise affected' Construction Noise Management Level (CNML) stipulated in the ICNG.
- One privately-owned noise received (315 Bagnall) would exceed the 'noise affected' CNML. This receiver is located in close proximity to the North Coast Railway, The Bucketts Way and the SCM rail spur and would be in close proximity to rail loop construction activities.
- Whilst it is noted that this receiver is located within the 'acquisition upon request' condition in the SCM Development Consent (DA 23-98/99), SCPL would keep the owner of the receiver 315 Bagnall informed of the timing and progress of construction activities and, in general accordance with the ICNG, would provide periods of respite during potential rockbreaking activities generally in accordance with the recommended procedures in the ICNG.

Cumulative Operational Noise

The potential for machinery to emit noise is quantified as the sound power level (SWL). A comparative assessment of the overall SCM mine site L_{eq} SWL for the mine fleet and on-site fixed equipment described in the SCM Alterations SEE, Roseville West Pit modification, Coal Handling Modification and the Modification are provided below (Appendix A):

- SCM (DA 23-98/99) - SWL 136 dBA.
- SCM with Roseville Pit Extension - SWL 130 dBA.
- SCM with Roseville West Pit - SWL 130 dBA.
- SCM with Coal Handling Modification - SWL 130 dBA.
- SCM with the Modification - SWL 131 dBA.

The comparison demonstrates that the SWL of the SCM incorporating the Modification is very similar to the SCM with the Coal Handling Modification as previously modelled in 2008. The minor (1 dBA) increase in overall SWL is due to the potential presence of two trains on the rail loop at once, which would be possible because of the proposed augmentation of the rail loop. In addition, the comparison demonstrates the significant reduction in the SWL of the SCM, when compared to the Project as approved in 1999.

Investigation of Noise Mitigation Measures

Heggies conducted an investigation of feasible and reasonable noise mitigation measures. Given that mining operations at the SCM and BRNOC are undertaken during daytime and evening hours only, night-time noise investigations have focussed only on the CHPP and coal loading/unloading facilities. A number of iterative steps were undertaken to develop noise mitigation measures for the Modification, including:

1. Preliminary noise modelling of scenarios representative of the maximum noise emissions from the Modification to identify the potential for noise exceedances.
2. Evaluation of various combinations of noise management and mitigation measures to assess their relative effectiveness.
3. Review of the effectiveness of these measures and assessment of their feasibility by SCPL.
4. Adoption by SCPL of a range of noise management and mitigation measures (including low noise equipment and operational controls) to appreciably reduce noise emissions associated with the Modification, including:

   Stratford Rail Loop (loading and unloading)

   Installation of two adjacent acoustic barriers approximately 60 m in length, 5 m in height above rail level and with an offset distance no greater than 3 m from the nearest outer rail. The barriers would be located adjacent to the “at rest location” of idling locomotives on the southern (i.e. inbound) side of the rail loop.

   Coal Handling

   Installation of low noise idlers on existing conveyors CV18 and CV17 consistent with current (super) low noise conveyor system technology, procured and commissioned in accordance with an acoustic design specification.

Coal Loading and Unloading Stations

Partial enclosure of the eastern and western wings sides of the coal loader comprising 0.47 millimetres (mm) (TCT) Colorbond Profile Steel Iron Cladding (or equivalent) extending from ground level up to a minimum height of 10 m. The coal unloader would be enclosed to ground level using iron cladding.

Coal Handling and Preparation Plant

Partial enclosure of the ground and first floor levels of the CHPP and acoustic lining of 50% of the total interior surface area.

The mitigation measures described above would be progressively implemented. Implementation of the partial enclosure and lining of the CHPP would be dependent on the site noise performance (i.e. the CHPP mitigation measures would be implemented to facilitate compliance with the relevant noise limits).

Noise Modelling Results

Cumulative noise modelling (i.e. the SCM inclusive of the BRNOC) was conducted for the Modification and was compared against the relevant SCM noise limits (Attachment 1 – Consent Condition 5.3). Receiver locations are shown on Figure 4a. Key findings of the operational noise assessment for the Modification are presented in Table 6 (Appendix A).

Table 6
Modification Noise Modelling Results Key Findings

Daytime (7.00 am to 6.00 pm)	Evening (6.00 pm to 10.00 pm)	Night-time (10.00 pm to 6.00 am)
• The cumulative daytime noise levels are expected to meet the relevant noise limits, except at 315 Bagnall (moderate 3 dBA exceedance), 33 Battaglini (minor 1 dBA exceedance) and 13 AGL Energy Limited (minor 1 dBA exceedance). • Of these receivers, 315 Bagnall and 33 Battaglini are already subject to acquisition upon request clauses in the SCM Development Consent, whilst the noise level at 13 AGL Energy Limited would be elevated by 1 dBA to 38 dBA.	• The cumulative evening noise levels are expected to meet the relevant noise limits, except at 315 Bagnall (moderate 4 dBA exceedance), 33 Battaglini (moderate 3 dBA exceedance) and 32 McIntosh (minor 2 dBA exceedance). • Of these receivers, 315 Bagnall and 33 Battaglini are already subject to acquisition upon request clauses in the SCM Development Consent, whilst the noise level at 32 McIntosh would be elevated to 37 dBA. • These results are considered to be conservative as they include operations at BRN, even though these operations would cease at 7.00 pm daily (i.e. BRNOC operations only occur for the first hour of the evening period).	• The cumulative night-time noise levels are expected to meet the relevant SCM noise limits, except at 315 Bagnall (moderate 5 dBA exeedance), 32 McIntosh (moderate 3 dBA exceedance), 33 Battaglini (minor 2 dBA exceedance), 36 Wallace (minor 2 dBA exceedance), 25 Thompson (minor 1 dBA exceedance), 291 Stackman & Partridge (minor 1 dBA exceedance), 34 Hall (minor 1 dBA exceedance) and 298 Yates (minor 1 dBA exceedance). • Of these receivers, 315 Bagnall and 33 Battaglini are already subject to acquisition upon request clauses in the SCM Development Consent. The night-time noise level at 32 McIntosh is elevated to 42 dBA and would constitute an exceedance of the affectation criteria in the SCM Development Consent (Attachment 1). • The night-time noise level at 36 Wallace would be elevated by 2 dBA to 37 dBA, whilst the noise levels at 25 Thompson, 291 Stackman & Partridge, 34 Hall and 298 Yates would be elevated by 1 dBA to 36 dBA.

Source: Appendix A.

Predicted night-time noise contours (SCM incorporating the Modification) for adverse inversion and inversion plus drainage meteorological conditions are shown on Figures 7 and 8.

Stratford Coal Mine Operational Noise Discussion

The proposed augmentation of a 400 m section of the Stratford rail loop would enable two trains to operate on the rail loop at once. The effect of this change on the noise environment would be mitigated by the proposed installation of two 60 m long acoustic barriers adjacent to the rail loop. Additional mitigation measures include further enclosure of the CHPP, installation of absorptive lining on the interior walls of the CHPP, the replacement of idlers on selected conveyors with current low noise conveyor system technology and further enclosure of the loading and unloading stations.

Cumulative noise modelling (i.e. the SCM inclusive of the BRNOC) was conducted for the Modification and was compared against the relevant SCM noise limits. The effect of the mitigation measures is that that predicted noise levels associated with the Modification are generally similar to the existing approved levels. A total of nine receivers are predicted to experience noise levels in excess of the current SCM noise limits. Of these, two are already subject to acquisition request clauses, one would constitute a new exceedance of the affectation zone criteria in the SCM Development Consent and the predicted noise levels at the remaining six would only marginally (i.e. 1 to 2 dBA) exceed currently approved limits.

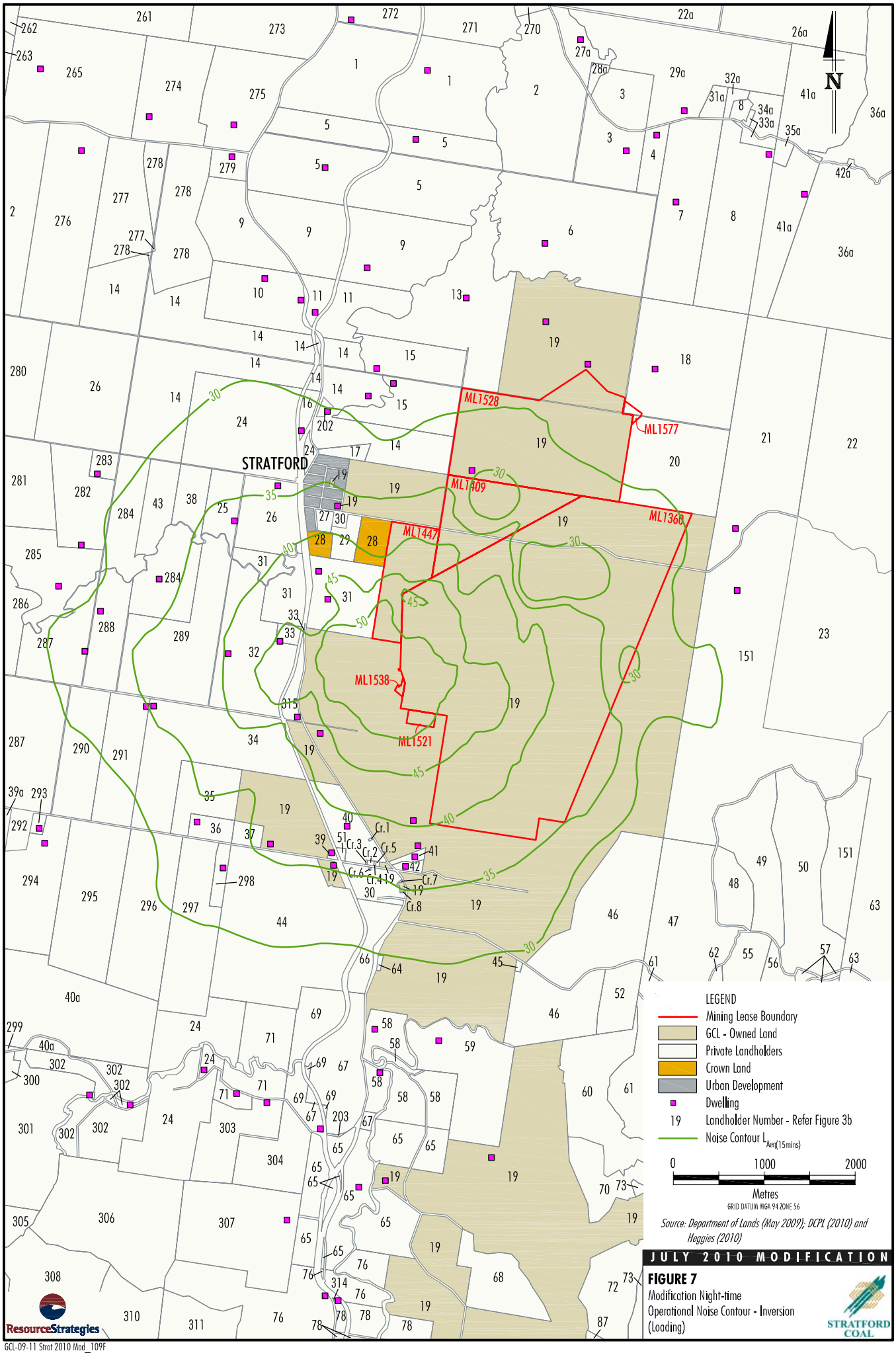
With the implementation of the feasible and reasonable noise mitigation measures proposed by SCPL, it is concluded by Heggies (2010) would require only minor alterations to the existing SCM noise limits in the Development Consent DA 23-98/99.

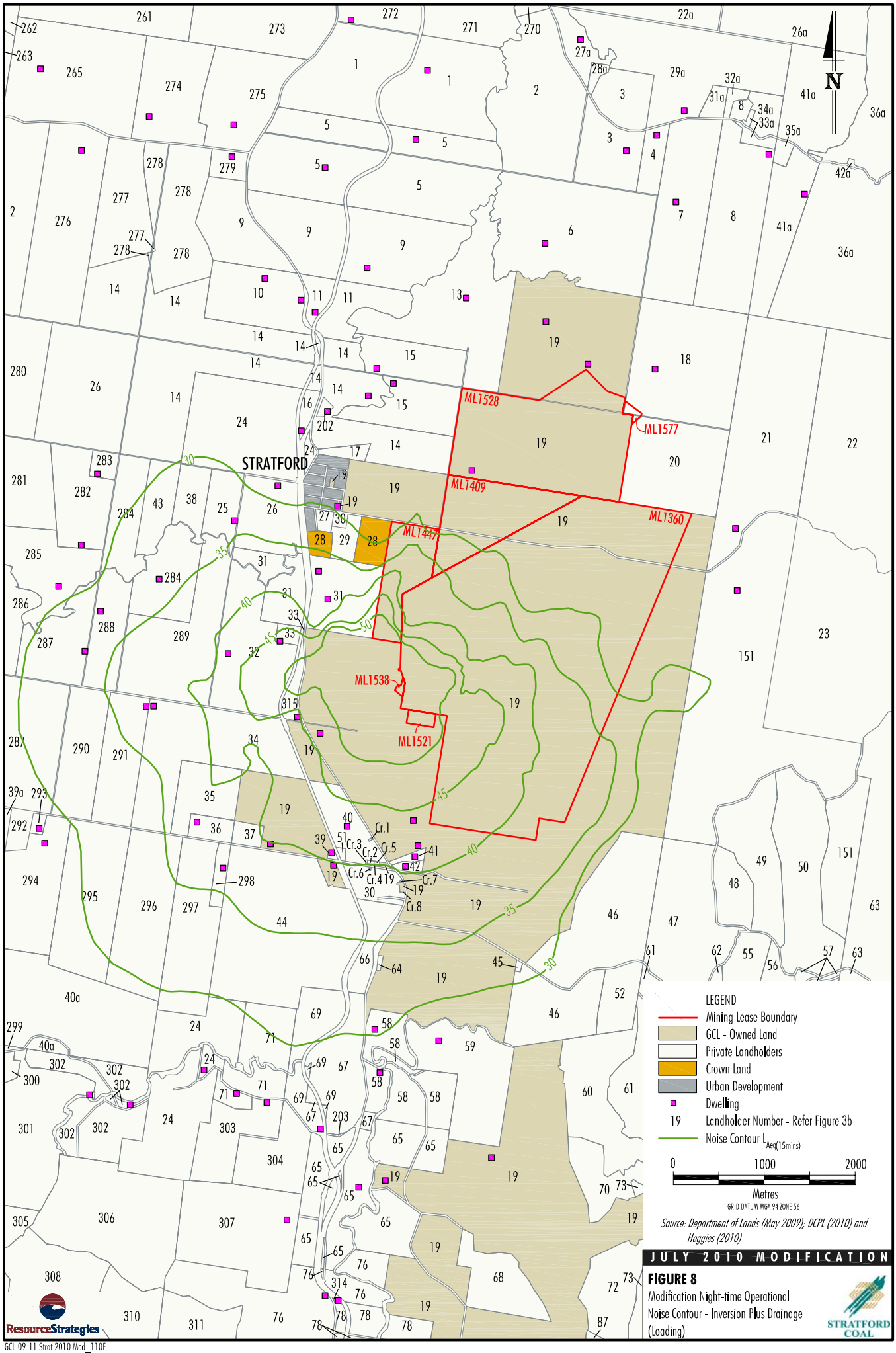
Rail Noise

The additional DCM train noise emissions are assessed in the DEP EA.

The average and peak existing, additional and cumulative train movements and associated rail noise levels have been determined by Heggies (2010) for communities neighbouring the North Coast Railway between the DCM and the SCM in accordance with the DECCW's "Environmental Assessment Requirements for Rail Traffic-Generating Developments" (update March 2010). Appendix A also includes an assessment against the Australian Rail Track Corporation's (ARTC) Environment Protection Licence (EPL) criteria.

In order to accommodate the increased product coal production rates, longer (72 wagon) product coal trains would be introduced from the fourth quarter of 2011 (or earlier, subject to contractual arrangements) (Section 3.3). The use of these longer trains means that the average number of trains per day that would be used to haul product coal from the SCM would remain unchanged at an average of 2.5 per day and a peak of 5 per day.


STRATFORD
ML1528
ML1577
ML1409
ML1360
ML1447
ML1538
ML1521
N
LEGEND
Mining Lease Boundary
GCL - Owned Land
Private Landholders
Crown Land
Urban Development
Dwelling
19 Landholder Number - Refer Figure 3b
Noise Contour $L_{Aeq(15mins)}$
0
1000
2000
Metres
GRID DATUM MGA 94 ZONE 56
Source: Department of Lands (May 2009); DCPL (2010) and Heggies (2010)
JULY 2010 MODIFICATION
FIGURE 7
Modification Night-time Operational Noise Contour - Inversion (Loading)
ResourceStrategies
STRATFORD COAL
GCL-09-11 Strat 2010 Mod_109F



GCL-09-11 Strat 2010 Mod_110F

The following assessments are derived from the predicted rail traffic noise levels and the DECCW's rail noise assessment trigger levels (60 dBA $L_{Aeq(24hour)}$ and maximum pass-by 85 dBA) (Appendix A):

- The existing/approved rail movements meets the $L_{Aeq(24hour)}$ criterion at a distance of 60 m from the rail line. This would not change for the Modification (and cumulatively with the DEP) as the use of longer trains proposed for the Modification would not materially alter the noise levels when averaged over a 24 hour period (i.e. $L_{Aeq(24hour)}$ noise).
- The maximum pass-by noise is currently determined by the existing DCM train and meets the criterion at a distance of 60 m from the rail line.
- The DCM train would be replaced by a quieter model as part of the DEP, meaning that the distance to meet the maximum pass-by noise criterion would be reduced from 60 to 50 m.

4.1.3 Mitigation Measures and Management

As described in Appendix A, SCPL has already implemented a range of physical and operational noise mitigation measures to reduce noise emissions from the SCM operations and would incorporate further measures as part of the Modification.

SCPL manages its SCM mining operations in accordance with the requirements of the NMP (Vipac, 2006).

The NMP describes measures to manage noise emissions from the SCM operation, including:

- proactive/predictive and reactive mitigation measures to limit noise emissions, including (Vipac, 2006):
  - *An awareness and understanding of noise issues will be included in site inductions for all staff, contractors and visitors to the SCM;*
  - *The use of significant noise generating equipment simultaneously will be avoided wherever possible;*
  - *The noisiest activities will be scheduled where practicable to the least sensitive times of the day;*
  - *Weather conditions will be monitored and where adverse conditions are experienced or predicted operational changes will be made to avoid or reduce noise impacts;*
  - *All machinery and plant used on site will be maintained regularly to minimise noise generation;*
  - *All valid noise complaints will be responded to and acted on as per provisions in this NMP;*
  - *Strategies and targets will be developed as part of the annual review of noise monitoring results and the review of valid noise complaints. These strategies will be reported in the annual report and their effectives will be reported on in subsequent reports; and*
  - *If valid complaints regarding specific pieces of machinery or equipment are received, a maintenance inspection will be undertaken and if required works will be undertaken.*
- long term strategies to address exceedances of applicable noise levels at private residences;
- complaints handling and on-site responsibilities; and
- quarterly noise monitoring and equipment plant noise surveys.

These noise management and mitigation measures would continue to be applied for the Modification. The SCPL noise monitoring programme would be continued and results reported in the AEMR.

The existing SCM Development Consent (Attachment 1) provides a mechanism for landholders (outside of the existing acquisition zone) to request an independent investigation of noise levels at their residence. If an exceedance is demonstrated by such an investigation, the Development Consent provides a mechanism for acquisition of the property, if a noise management solution or negotiated agreement cannot be reached and subsequent monitoring indicates the exceedance is continuing. This process is also outlined in the NMP.

In addition, the existing SCM Development Consent also provides for receivers experiencing 38 dBA L_{Aeq} noise levels to be entitled to 'feasible and reasonable' mitigation measures at the receiver (such as such as double glazing, insulation and/or air conditioning).

It is anticipated that, if approved, the Modification would result in minor amendments to the existing operational noise limits, including the inclusion of 32 McIntosh in the 'acquisition upon request' list.

In relation to construction noise impacts and in general accordance with ICNG procedures, SCPL would keep the owner of the receiver 315 Bagnall informed of the timing and progress of rail loop augmentation construction activities of the rail loop augmentation and, in general accordance with the ICNG, would provide periods of respite during potential rock-breaking activities.

4.2 AIR QUALITY

4.2.1 Existing Environment

Air Quality Management Regime

Air quality management and monitoring at the SCM is described in the Air Quality Monitoring Program (AQMP) (SCPL, 2007b). The locations of air quality monitoring sites are shown on Figure 5 and air quality monitoring data are reflective of cumulative emissions of the SCM and BRNOC.

In the last seven years of complaint records (January 2003 to December 2009), only six air quality related complaints have been received by SCPL for both the SCM and BRNOC operations (Figure 6) (Section 2.7).

Air Quality Criteria

Dust Deposition

The DECCW amenity criteria for dust deposition seeks to limit the maximum increase in the mean annual rate of dust deposition from a new development to 2 grams per square metre per month (g/m^2/month) and total dust deposition (i.e. including background air quality) to 4 g/m^2/month.

Concentrations of Suspended Particulate Matter

Suspended particulate matter (referred to as total suspended particles [TSP]) is typically less than 50 micrometres (μm) in size and can be as small as 0.1 μm. Fine particles less than 10 μm are referred to as PM_{10}. Details of the air quality criteria for concentrations of suspended particulate matter are provided in Table 7.

Table 7
Air Quality Assessment Criteria for Suspended Particulate Matter Concentrations

Pollutant	Criterion/Goal	Agency
TSP Matter	90 µg/m^3 (annual mean)	National Health and Medical Research Council
PM_{10}	50 µg/m^3 (24 hour average – maximum)[1]	DECCW assessment criterion
	30 µg/m^3 (annual mean)	DECCW assessment criterion

Source: after Appendix B.
[1] SCM and BRNOC emissions only.
µg/m^3 micrograms per cubic metre.

Previous Assessments

Holmes Air Sciences (HAS) (now PAE Holmes) (2001) prepared an air quality impact assessment which assessed cumulative emissions from the SCM and the BRNOC. This assessment concluded that no residences were predicted to experience annual average dust deposition or TSP levels above the applicable assessment criteria (HAS, 2001). It was predicted that compliance with the short-term PM_{10} criterion of 50 µg/m^3 would be achieved with the implementation of air quality management measures (HAS, 2001). It should be noted that the findings of HAS (2001) were based on higher coal and waste rock production rates from the SCM (due to the operation of the Stratford Main Pit) than presently occurs at the SCM.

Air Quality Monitoring Results

Air quality monitoring at the SCM and BRNOC is conducted in accordance with the AQMP. Monitoring is conducted at seven dust gauges and four high volume air samplers (Figure 5).

All monitoring results from 2001 to 2009 indicate that annual average dust deposition in the vicinity of the SCM and BRNOC has been within the DECCW criterion (i.e. 4 g/m^2/month).

All annual average PM_{10} concentration results from May 2001 to December 2009 have been low and within the DECCW annual average PM_{10} criterion (i.e. 30 µg/m^3) (Appendix B).

The majority of recorded 24 hour PM_{10} concentration are less than 20 µg/m^3. There has been nine days since monitoring commenced in May 2001 when the 24 hour PM_{10} concentrations were above the DECCW criterion (i.e. 50 µg/m^3). These exceedances were attributed to agricultural activities, fires or regional dust storm events, not SCPL mining operations (Appendix B).

PAE Holmes (Appendix B) concludes that the results correlate well with modelling predictions made in HAS (2001) and indicate that the existing SCM and BRNOC together are not resulting in nuisance dust impacts in the area surrounding the SCM and BRNOC.

4.2.2 Potential Impacts

PAE Holmes (2010) has prepared an assessment of potential air quality impacts associated with the Modification and is provided in Appendix B.

Proposed activities that could potentially increase emissions from the modification include:

- An increase in the total amount of ROM coal and waste rock mined from the Roseville West Pit.
- An increase in the annual CHPP processing rate from up to approximately 3.4 Mtpa to up to approximately 4.6 Mtpa.
- An increase in the amount of product coal transported via rail from the SCM from 2.3 to 3.3 Mtpa.

Mining and CHPP Operations

Emissions from the CHPP account for less than 1% of total estimated emissions from the SCM and BRNOC (Appendix B). The Modification would result in an increase in dust emissions due to the increased coal handling and processing at the CHPP. However, dust emissions from the CHPP are expected to remain below 1% of the total estimated emissions from the SCM and BRNOC and are considered insignificant (Appendix B).

The proposed maximum ROM coal and waste rock annual production rates (and therefore dust emissions) from the SCM are significantly less than the rates which formed the basis for the HAS (2001) air quality assessment. This is because the Stratford Main Pit was operating at the time of the HAS (2001) assessment. Emissions from coal and waste rock production account for the large majority of the total estimated emissions.

Based on the above and monitoring data collected to date (Section 4.2.1), dust emissions and associated potential impacts would be significantly less than what was originally predicted by HAS (2001) (i.e. annual average PM_{10} concentrations of 8 $\mu g/m^3$ and annual average dust deposition levels of 0.5 g/m^2/month at the most affected residences) (Appendix B). The HAS (2001) assessment concluded that no residences would exceed relevant air quality criteria (Appendix B).

PAE Holmes (2010) concludes that *the proposed modification is unlikely to result in any adverse impacts in terms of dust and particulate impacts at the nearest private residences.*

Transportation of Product Coal

The DEP provides an assessment of potential additional dust emissions associated with the additional DCM ROM coal trains.

PAE Holmes (2010) concluded the following with regard to the potential impact of transporting additional product coal from the SCM:

> *The increase in the amount of product coal transported via rail (i.e. from 2.3 Mtpa to 3.3 Mtpa) would be expected to result in a small increase in cumulative emissions of dust from trains on the North Coast Railway (i.e. additional to that assessed by Heggies [2009]). However, based on the marginal levels of predicted coal dust emissions, this increase is expected to be minor, and the conclusions presented in Heggies (2009) (i.e. "it is not considered that exceedances of the cumulative air quality criteria would generally occur") would not change.*

4.2.3 Mitigation Measures and Management

Air quality management procedures used at the SCM are described in the AQMP and include (SCPL, 2007b):

- regular watering of in-service haul roads in dry weather;
- generally restricting open areas that have the potential for dust generation;
- regular maintenance of haul roads; and
- prompt rehabilitation of disturbed ground.

The dust control measures and management practices described above and outlined in the AQMP would continue for the Modification.

4.3 SURFACE WATER RESOURCES

4.3.1 Existing Environment

Regional Hydrology

The SCM is located approximately 3 km south-east of the Avon River (Figure 2). The Avon River has a catchment area of some 290 square kilometres (km^2) and is one of approximately 30 tributary rivers contributing to the greater Manning River system. The Manning River system drains some 8,000 km^2 and extends from the Great Dividing Range to the coast near Taree (Figure 1).

Local Hydrology

Local hydrology comprises a number of drainage lines and creeks flowing west and north-west towards the Avon River (Figure 2). Avondale Creek is a tributary of Dog Trap Creek and drains the SCM area, joining Dog Trap Creek approximately 1 km north of the SCM.

As the drainage lines within the SCM area have small catchments, they typically exhibit low to zero flow for extended periods during dry weather, while heavy rainfall events result in short duration, high flow events. Groundwater seepage provides minor contributions to flows in Dog Trap Creek and Avondale Creek during periods of elevated groundwater levels that follow extended rainfall events.

Surface Water Management

Surface water management at the SCM and BRNOC is conducted in accordance with the SWMP (including site water balance and surface water monitoring programme) and the ESCP. Water management is undertaken in an integrated fashion with the SCM and BRNOC.

Surface water quality and flow monitoring in the vicinity of the SCM and BRNOC is described in the 2009 AEMR (SCPL, 2009b), and sites are shown on Figure 5.

4.3.2 Potential Impacts

Site Water Balance

The Modification would include the following alterations to the water management regime (Appendix C):

- An increase in CHPP water demand to process the additional ROM coal (up to a total of approximately 2,800 ML per year).
- Commencement of irrigation on areas of the Stratford Waste Emplacement.
- An increase in the volume of coal rejects to be deposited in the Stratford Main Pit and a consequent reduction in its water storage capacity.

Gilbert & Associates (2010) updated the site water balance model for the SCM and BRNOC to incorporate the components of the Modification listed above (Appendix C). Gilbert & Associates (2010) concluded that:

> *Water balance model results indicate that, even with the proposed increase in the CHPP processing rate the site would still operate with a water surplus on average. There were no simulated water supply shortfalls in any of the climatic sequences modelled. The implied water supply reliability is therefore greater than 99%.*

CHPP Rejects Disposal

As described in Section 3.4, the Modification would include an increase in the volume of CHPP rejects to be deposited in the Stratford Main Pit. Gilbert & Associates (2010) prepared a rejects disposal schedule for the Modification and concluded:

> *… the additional rejects generated as a result of the proposed modification and the June 2010 BRNOC modification application would be able to be stored within the Stratford Main Pit below the estimated pre-mine groundwater level (i.e. RL 114 m).*

As the Stratford Main Pit is filled with CHPP rejects, less space becomes available for the storage of mine water. Water balance model results indicate that, even with the addition of the planned tonnage of CHPP rejects at an assumed (conservatively low) rejects density of 0.8 t/m^3, no spills were simulated from the Stratford Main Pit in any of the climatic sequences modelled, and therefore the implied spill risk is less than 1% (Appendix C).

Stratford Waste Emplacement Irrigation

The Modification would include irrigation of water from the Stratford East Dam over areas of the Stratford Waste Emplacement to enhance evaporation and evapotranspirative losses and consequently reduce water volumes held in the Stratford East Dam, so that the dam may provide contingency storage for mine water, should this be required in the future.

Irrigation would be conducted on the rehabilitated portion of the Stratford Waste Emplacement adjacent to the Stratford East Dam. Irrigation would be conducted such that it would reduce stored volumes whilst not leading to direct runoff. Soil moisture monitoring would be conducted to guide irrigation management, with irrigation suspended during wet weather or in periods following rain until soil moisture levels fell to levels low enough such that irrigation would not lead to direct runoff.

As runoff from rainfall events from the Stratford Waste Emplacement irrigation areas would report to the Stratford East Dam, it is considered that potential impacts from the proposed irrigation on local watercourses would be negligible (Appendix C).

Erosion and Sedimentation

The proposed deepening of the Roseville West Pit is not expected to materially alter erosion and sediment control requirements. The proposed rail augmentation would include the use of silt fences on batters/windrows to control sediment migration until such time as the bunds have been stabilised/revegetated.

4.3.3 Mitigation Measures and Management

Surface water management (including erosion and sediment control) at the SCM would continue to be undertaken in accordance with the SWMP and ESCP. The SWMP and ESCP would be updated to include the Modification, including the proposed irrigation of the Stratford Waste Emplacement. In particular, the SWMP would be updated to include the details relevant to the proposed irrigation including soil moisture measurements, runoff quality monitoring, groundwater monitoring and site water balance review and the ESCP would include the details of the rail loop augmentation.

4.4 GEOCHEMISTRY

4.4.1 Existing Environment

Waste Rock

Several geochemical and geotechnical investigations of SCM waste rock were conducted at the SCM prior to construction of the SCM (Woodward-Clyde, 1994; Dames and Moore, 1984; Golder Associates, 1981 and 1982). These investigations, along with operational experience gained at the SCM indicate that overburden materials at the SCM are generally benign as evidenced by low total sulphur content and an excess of neutralising capacity (Resource Strategies, 2001). Water quality results and on-going confirmatory geochemical testwork confirms that waste rock management strategies at the SCM have been effective and no significant acid mine drainage issues have been reported.

CHPP Rejects

CHPP rejects from the washing of SCM, BRNOC and DCM ROM coal in the CHPP are currently disposed within the Stratford Main Pit in accordance with the approved SCM Life of Mine Reject Disposal Plan (SCPL, 2009a).

4.4.2 Potential Impacts

Waste Rock

A total of approximately 8 Mbcm of additional waste rock would be mined for the Modification. The waste rock types would be the same as those from the existing Roseville West Pit, which are characterised by SCPL as NAF. It is anticipated that the additional waste rock would have the same geochemical characteristics as existing waste rock. In the unlikely event that PAF material is identified by in-pit geological mapping, this material would be placed below the post-mining groundwater table (as backfill to the open cut pits) as per the SCM Waste Management Strategy.

CHPP Rejects

The Modification would include the disposal of CHPP rejects from the washing of ROM coal from SCM, BRNOC and the DEP. These additional CHPP rejects would continue to be disposed within the Stratford Main Pit using existing infrastructure in accordance with the SCM Life of Mine Reject Disposal Plan (SCPL, 2009a).

Geochemical assessment of CHPP rejects was conducted by Environmental Geochemistry International (EGi) (2010) and is presented in Appendix D. The assessment included consideration of previous geochemical testing at the SCM and the DCM as well as experience and performance results from the existing SCM.

EGi (2010) concluded that the additional CHPP rejects from the DEP are likely to be geochemically similar to the existing rejects.

4.4.3 Mitigation Measures and Management

Waste Rock

As discussed in Section 4.4.2, no specific management measures are proposed for the additional waste rock to be excavated as part of the Modification.

CHPP Rejects

In accordance with the Life of Mine Reject Disposal Plan (SCPL, 2009a), the CHPP rejects from the Modification would be disposed either subaqueously or subaerially in the Stratford Main Pit. The CHPP rejects that would be disposed subaerially in the Stratford Main Pit would be treated with limestone at a rate of 80 tonnes of calcium carbonate per hectare (t $CaCO_3$/ha) (as 4 mm limestone). The limestone would be incorporated into the top 300 mm layer of the CHPP rejects.

In addition to the above, regular monitoring would be conducted to confirm the appropriateness of the above treatment for the management of CHPP rejects. Monitoring that would be conducted would include:

- water quality in the Stratford Main Pit; and
- pH measurements of deposited CHPP rejects.

In the event that monitoring indicates that additional management measures are required, the following measures could be implemented:

- increasing limestone dosage rates;
- increasing blending depth;
- optimising limestone incorporation methods;
- decreasing limestone size fraction;
- reducing lift heights; and
- use of more direct effort in control of convection/advection (such as compaction).

Ongoing characterisation of deposited CHPP rejects would also be carried out to better define the geochemical variation of the rejects and confirm the validity of the treatment rates. Leach column testing of blended CHPP rejects materials may also be considered to help determine optimal treatment rates, and help demonstrate the adequacy of the management approach.

The existing SCM Life of Mine Reject Disposal Plan (SCPL, 2009a) would be reviewed and revised to incorporate the Modified SCM.

4.5 GROUNDWATER RESOURCES

Australasian Groundwater and Environmental Consultants (AGE) (2001) assessed the potential cumulative impacts of the SCM and BRNOC on local groundwater systems using numerical modelling techniques.

The main aquifers in the Gloucester Basin are associated with the coal seams which are intersected by faults that compartmentalise groundwater flow. Groundwater at the BRNOC occurs predominantly within coal seams and is recharged from overlying colluvium. The direction of groundwater flow is from the south-east to the north-west and the main groundwater discharge zones are Avondale and Dog Trap Creeks, Avondale Swamp and Avon River. A groundwater divide is located between the Stratford Main Pit and the BRNOC.

SCPL has conducted a monitoring programme of groundwater levels and quality within its MLs and regional registered and unregistered bores since 1993/1994. The monitoring programme has indicated that the pit dewatering has not had any appreciable impact upon regional groundwater levels or quality. In addition, groundwater levels in the vicinity of the Roseville Pit to date are consistent with the drawdown predictions made by AGE (2001) (Gilbert & Associates, 2009).

Groundwater quality and level monitoring in the vicinity of the BRNOC is described in the 2009 AEMR (SCPL, 2009b).

Potential groundwater impacts of the Modification would be related to the deepening of the Roseville West Pit and would include continued groundwater extraction associated with dewatering and groundwater inflows to the Roseville West Pit for an extra two years. Experience with mining at SCM to date indicates that the groundwater aquifers contained in the coal seams are generally confined and that drawdown effects are localised in nature. As stated in Gilbert & Associates (2006):

> *…experience at the Roseville Pit and Roseville Pit Extension suggests that groundwater inflows* [to the Roseville West Pit] *are likely to be small and insignificant in terms of the overall site water balance.*

As described above, groundwater monitoring undertaken since 1994 indicates that development of the SCM has not led to any significant impacts on groundwater levels or quality. This is expected to remain the case for the modification.

Local and regional groundwater levels and quality would continue to be monitored and reported in accordance with the SWMP. Groundwater inflow rates into the open pits would also continue to be monitored.

4.6 GREENHOUSE GAS EMISSIONS

In accordance with the *National Greenhouse Accounts Factors* (DCC, 2008), direct greenhouse emissions are referred to as Scope 1 emissions, and indirect emissions are referred to as Scopes 2 and 3 emissions.

The major sources of greenhouse gas emissions at the SCM include:

- combustion of diesel during mining operations (Scope 1);
- use of explosives (Scope 1);
- fugitive emissions of methane (Scope 1);
- off-site generation of electricity consumed at the SCM (Scope 2); and
- off-site transport and combustion of product coal (Scope 3).

The existing major sources of greenhouse gas emissions from the SCM would remain unchanged for the Modification.

Incremental greenhouse gas emissions associated with the modified SCM would be related to:

- extension of mining operations in the Roseville West Pit (i.e. additional fugitive emissions and diesel and explosive consumption);
- increased consumption of electricity in the CHPP due to the increased processing rate and an extension of the duration of operations;
- increased off-site transport; and
- combustion of approximately 0.9 Mt of additional product coal (this is the total product coal expected after washing the total 1.4Mt of additional SCM ROM coal).

An assessment of the incremental greenhouse gas emissions (Scopes 1, 2 and 3) for the Modification was conducted using empirical emission factors provided by the *National Greenhouse Accounts Factors* (DCC, 2008, 2009). Incremental greenhouse gas emissions associated with the Modification (over the life of modified SCM) would be related to the increased:

- combustion of diesel during mining operations (approximately 12 kt carbon dioxide equivalent (CO_2-e) of Scope 1 and 1 kt CO_2-e of Scope 3 emissions);
- fugitive emissions (approximately 63 kt CO_2-e of Scope 1 emissions);
- use of explosives (0.0001 kt CO_2-e of Scope 1 emissions);
- consumption of electricity (approximately 196 kt CO_2-e of Scope 2 and 40 kt CO_2-e of Scope 3 emissions);
- combustion of a total of 0.9 Mt of additional Roseville West Pit product coal[1] (approximately 2,174 kt CO_2-e of Scope 3 emissions); and
- combustion of diesel during transport of product coal to Newcastle (approximately 44 kt CO_2-e of Scope 3 emissions).

SCPL has implemented a number of measures to minimise to the greatest extent practicable greenhouse gas emissions from the SCM and the BRNOC. Relevant measures are described below.

- Maximising energy efficiency as a key consideration in the development of the mine plan. For example, significant savings of greenhouse gas emissions (through increased energy efficiency) are achieved by mine planning decisions which minimise haul distances for ROM coal and waste rock transport and therefore fuel use.
- GCL (2006) has prepared and implemented an Energy Savings Action Plan (ESAP) in accordance with the NSW *Energy Administration Amendment (Water and Energy Savings) Act, 2005*. GCL has conducted a comprehensive analysis of energy usage and management strategies at the SCM, and has identified cost-effective energy saving opportunities, including (GCL, 2006):
  - installation of power factor correction equipment to reduce the maximum electricity demand at the SCM by an estimated 10%;
  - replacement of existing pumps in the CHPP with more efficient models;
  - potential replacement of an existing compressor in the CHPP with a more efficient model;
  - potential replacement of the CHPP rejects pipeline to increase pumping efficiency; and
  - potential adjustment of the number and location of lights in mining and infrastructure areas.

[1] A total of 0.9 Mt of additional product coal is expected after washing the total 1.4 Mt of additional ROM coal from the Roseville West Pit. Scope 3 product coal combustion emissions from BRNOC and DEP product coal are addressed separately in relevant approval documentation.

4.7 HAZARD AND RISK

All hazardous materials at the SCM are stored and used in accordance with the relevant material safety data sheets (MSDS). The MSDS register is updated when new materials or chemicals are brought to site. SCPL is responsible for the Dangerous Goods Licence for the Fuel Farm.

A Preliminary Risk Assessment (PRA) was conducted for the SCM (Australian Nuclear Science and Technology Organisation, 1998). Relevant hazard prevention and mitigation measures from this assessment have been implemented for the SCM.

The Modification would not introduce any new hazardous materials to the SCM. The Modification would involve an increase in the amount of process consumables (i.e. limestone, magnetite, Nalflote, Optimer and Scaleguard) used at the SCM due to the increased CHPP processing tonnages. However, no changes to the existing on site handling, storage or management of these reagents would be required and all materials would continue to be stored and used in accordance with the relevant MSDSs. The road transport requirements (e.g. deliveries) for process consumables to the SCM would involve a minor increase in the number of deliveries to the SCM (Section 4.8).

Overall, the Modification would not increase the risks to the off-site environment, members of the public and private property to the extent that the risk rankings would increase from those previously assessed in the SCM PRA. Subsequently, there would be no increase to the overall PRA risk assessment findings as a result of the Modification.

The existing management and mitigation measures at the SCM (including the site water management systems) would continue to be implemented for the Modification to minimise the risks associated with the Modification (e.g. off-site spill release). The site water management system would continue to provide an efficient barrier to the off-site release of any spills that might occur on-site. Road transport mitigation measures are discussed in Section 4.8.

4.8 ROAD TRANSPORT

The Bucketts Way comprises the principal road servicing the SCM area and runs approximately 40 km west from Nabiac on the Pacific Highway to Gloucester and then south to rejoin the Pacific Highway approximately 8 km south of Karuah (Figure 1).

The local minor road network in the SCM area comprises a grid of unsealed roads, running approximately east-west and north-south. The local minor road network primarily provides property access for local landholders and generally does not carry through traffic. Bowens Road, which was previously located across SCM mining leases is now closed (SCPL, 2009b).

The maximum workforce for the SCM and the BRNOC previously described is 110 people. Currently, there are approximately 84 employees at the SCM and BRNOC.

Operational Traffic

The current workforce (approximately 84 employees) would not change for the Modification and as such, there would be no changes in light vehicle movements or traffic flows accessing the SCM.

The proposed modification would result in a minor increase in the number of deliveries to the SCM. The additional deliveries (an additional 10 heavy vehicle movements per week) would be associated with an increase in consumption of reagents in the CHPP. While these additional deliveries would be measureable, it is unlikely that they would be outside existing seasonal and daily variations in traffic movements on the surrounding road network.

Whilst there would be a minor increase in limestone usage due to the Modification, this increase would not result in an increase in deliveries of limestone.

Construction Traffic

The augmentation of the SCM rail loop would involve some minor increases in traffic movements associated with deliveries and construction workforce movements (up to 10 people) during the 24 week construction period. Up to approximately 20 additional heavy vehicle movements per week during the construction period may be expected.

The augmentation of the SCM rail loop may therefore contribute approximately 100 light vehicle movements and 20 heavy vehicle movements per week on the SCM access road and The Bucketts Way. While these construction movements would be measureable, it is unlikely that they would be outside existing seasonal and daily variations in traffic movements on these routes.

Additionally, the SCM and BRNOC workforce has been previously described as up to 110 people. Currently the SCM and BRNOC operations employ a lower number than this (i.e. approximately 84 people, because mining of the Stratford Main Pit has been completed). The current SCM and BRNOC workforce, combined with the additional 10 people required for the augmentation of the SCM rail loop would be less than the maximum workforce of the SCM of up to 110 people. Accordingly, traffic movements associated with the Modification are expected to be less than those movements previously contemplated for the SCM and BRNOC.

4.9 SOCIAL AND ECONOMIC ASPECTS

The SCM forms a major part of GCL's future business strategy. The Modification would continue the economic and employment benefits provided by the SCM. The Modification is necessary to allow for the acceptance of additional ROM coal from the DEP as well as the development of additional coal resources identified in the Roseville West Pit that in turn would increase the estimated product coal production over the life of the SCM. This would, in turn, increase the generation of export revenue for SCPL and continue the collection of royalties and taxes by the State of NSW and the Federal Government.

The SCP EIS described an operational workforce of approximately 110 personnel for a mine life of up to 17 years. Based on this workforce, the SCP EIS predicted positive socio-economic effects, including: flow-on employment; offsetting the loss of jobs in an economic decline; increased demand for goods and services; and a boost to the housing industry due to an increased demand for accommodation. The workforce of approximately 110 personnel was not predicted to have any significant detrimental effects. Additionally, the SCM and BRNOC workforce has been previously described as up to 110 people.

As noted in Section 4.8, currently the SCM and BRNOC operations employ a lower number than this (i.e. approximately 84 people, because mining of the Stratford Main Pit has been completed). The current SCM and BRNOC workforce, combined with the additional 10 people required for the augmentation of the SCM rail loop would be less than the workforce of the approved SCM up to 110 people.

As reported in the 2009 AEMR (SCPL, 2009b) approximately 51% of all employees (including BRNOC) reside in the local area.

SCPL would continue to provide annual community infrastructure contributions to the GSC, until the cessation of coal mining on the site, in accordance with the SCM Development Consent.

As described in Section 3, the Modification would result in an additional 2 years of mining, processing of ROM coal and export of product coal; followed by 6 years of processing of ROM coal and export of product coal only. The modified SCM would continue to provide economic and employment benefits provided by the approved SCM. The SCM (including the BRNOC) currently employs some 84 operational personnel. This level of employment would continue for the life of the modified SCM. A large proportion of these employees (approximately 51%) would continue to be sourced from the local area.

The operation of the modified SCM would continue to result in the collection of royalties and taxes by the State of NSW and the Commonwealth Government.

4.10 OTHER ENVIRONMENTAL ISSUES

Surface disturbance associated with the Modification would be limited to the 400 m rail loop augmentation in an area of cleared paddock adjacent to the existing rail loop (Figure 3). No Aboriginal heritage, European heritage or threatened species occur in this area and no trees would be removed. Therefore, potential impacts in relation to Aboriginal heritage, European heritage, threatened species or other flora and fauna would be negligible.

The proposed acoustic rail barriers (Section 4.1.2) would be visible to those viewsheds with existing views of the SCM rail loop and coal handling areas (particularly from the south). Although the barriers would be visible, the typical distance from the viewpoint to the barriers (i.e. approximately 200 m or more) would mean that the barriers would comprise a minor proportion of existing viewsheds. This visual impact would be minimised by colouring the barriers (e.g. green or similar) to minimise colour contrast.

5 REHABILITATION, MONITORING AND MANAGEMENT

5.1 REHABILITATION

The rehabilitation objectives for the SCM are provided in Section 2.5. General rehabilitation principles applicable to the modified SCM would be consistent with those presented in the BRN EIS (SCPL, 2001c) and include:

- Preservation of areas of existing vegetation and landforms wherever possible.
- Progressive rehabilitation of landforms in accordance with approved plans.
- Stabilisation of newly prepared (i.e. topsoiled) landforms prior to establishment of long-term vegetation using moisture retaining passive drainage systems, water holding structures and where appropriate, authorised hybrid cover crops to provide initial erosion protection.
- Exclusion of livestock from rehabilitation areas through the use of fencing and/or bunding.
- Development of flexible rehabilitation concepts that facilitate trial-based improvements to the programme.
- Preparation of the annual rehabilitation programme and budget by site management.

The relevant MOPs and AEMRs describe the rehabilitation programme. A summary of the key elements of the rehabilitation programme is provided in Section 2.5.

The augmentation of the rail loop section and deepening of the Roseville West Pit for the modified SCM are located adjacent to the existing rail loop and within approved Roseville West Pit disturbance areas, respectively, and therefore no alteration to the SCM rehabilitation programme is required.

Figure 9 provides the provisional post-mining SCM and BRNOC integrated revegetation plan.

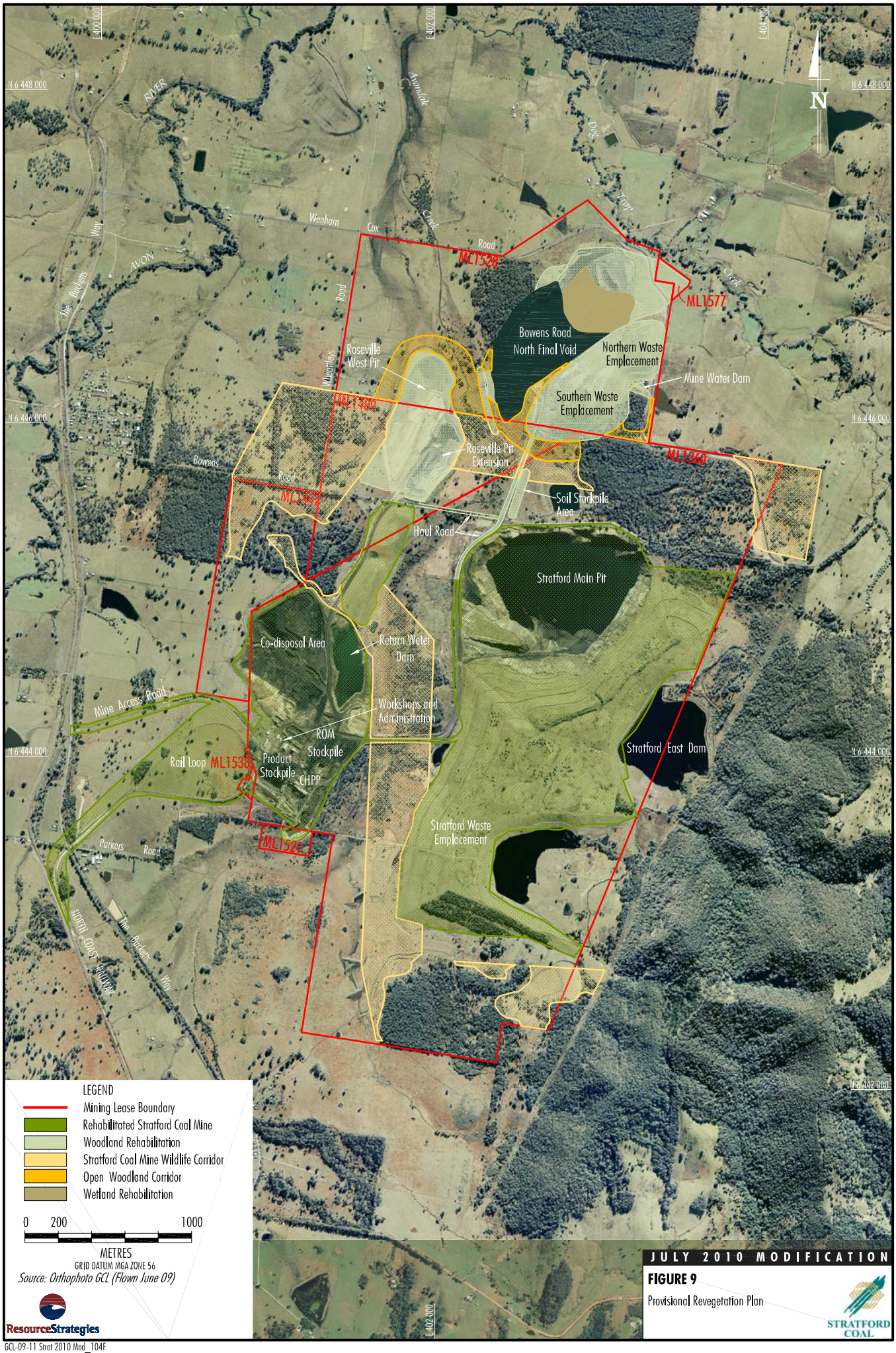
5.2 ENVIRONMENTAL MONITORING AND MANAGEMENT

5.2.1 Environmental Monitoring

The SCPL monitoring programme includes monitoring sites and monitoring frequencies for all major environmental parameters. The Modification is located within and adjacent to current operational areas and therefore the existing SCPL monitoring programme already covers all issues or requirements relevant to the Modification.

5.2.2 Environmental Management

Existing environmental management plans that would be updated to address the Modification would include the MOP, SWMP and ESCP. The Modification would be within the requirements of the existing SWMP, AQMP and NMP. Environmental monitoring and management of SCM operations would continue to be reported in the AEMR.



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ATTACHMENT 1

STRATFORD COAL MINE – DEVELOPMENT CONSENT

Notice of Modification

Section 96(2) of the *Environmental Planning and Assessment Act 1979*

Under Section 96(2) of the *Environmental Planning and Assessment Act 1979*, I, the Acting Deputy Director-General, Office of Sustainable Assessments and Approvals, Department of Planning, modify the development consent referred to in Schedule 1, as set out in Schedule 2.

Yolande Stone
Acting Deputy Director-General
(as delegate for the Minister for Planning)

SIGNED YOLANDE STONE 18 JANUARY 2006

Sydney 2005

Red text represents Roseville West Pit Modification – 16 February 2007

Blue text represents the Coal Handling Infrastructure Modification – 1 September 2008

SCHEDULE 1

The development consent (DA No. 23-98/99) for the Stratford coal mine, which was granted by the Minister for Urban Affairs and Planning on 5 February 1999.

SCHEDULE 2

1. Replace “Schedule 2” of the Minister’s consent with the following text.

SCHEDULE 2

DEFINITIONS

AEMR	Annual Environmental Management Report
Applicant	Stratford Coal Pty Limited
Council	Gloucester Shire Council
DA	Development Application
Day	Day is defined as the period from 7am to 6pm on Monday to Saturday, and 8am to 6pm on Sundays and Public Holidays
Department	Department of Planning
DEC	Department of Environment and Conservation
DNR	Department of Natural Resources
DPI	Department of Primary Industries
Director-General	Director-General of the Department of Infrastructure Planning & Natural Resources, or delegate
DST	Daylight Standard Time
EIS	Environmental Impact Statement
EST	Eastern Standard Time
Evening	Evening is defined as the period from 6pm to 10pm
Land	Land means the whole of a lot, or contiguous lots owned by the same landowner, in a current plan registered at the Land Titles Office at the date of this consent
Night	Night is defined as the period from 10pm to 7am on Monday to Saturday, and 10pm to 8am on Sundays and Public Holidays;
Privately-owned land	Land that is not owned by a public agency, a mining company or its subsidiary; or where relevant, land that is not covered by a private agreement between the Applicant and the land owner that specifically allows for variances to criteria for environmental performance in this consent.
Site	Land to which the DA applies
SEE	Statement of Environmental Effects

1. GENERAL

1.1 Obligation to Minimise Harm to the Environment

The Applicant shall implement all practicable measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the development.

1.2 Terms of Approval

(a) The Applicant shall carry out the development generally in accordance with the:
- DA 23-98/99;
- EIS titled *Stratford Coal Project*, dated September 1994, and prepared by Peter Ryan and Chris Ellis;
- SEE titled *Proposal to Increase Saleable Coal Production to 1.7 Mtpa,* and associated documents, dated April 1996, and prepared by Stratford Coal Pty Limited;
- SEE titled *Proposed Modifications to the Stratford Coal Mine*, dated August 1998, and prepared by Resource Strategies Pty Ltd;
- SEE titled *Stratford Coal Mine Modification,* dated July 2003, and prepared by Resource Strategies Pty Ltd, including the *Stratford Coal Mine Operating Noise Impact Assessment*, dated August 2005, prepared by Heggies Australia Pty Ltd;
- SEE titled *Stratford Coal Mine Roseville West Pit Modification,* dated October 2006, and prepared by Resources Strategies Pty Ltd;
- SEE titled *Stratford Coal Mine Coal Handling Modification*, dated June 2008, and prepared by Stratford Coal Pty Ltd; and
- conditions of this consent.

(b) If there is any inconsistency between the above documents, the latter document shall prevail over the former to the extent of the inconsistency. However, the conditions of this consent shall prevail over all other documents to the extent of any inconsistency.

(c) The Applicant shall comply with any reasonable requirement/s of the Director-General arising from the Department's assessment of:
- any reports, plans or correspondence that are submitted in accordance with this consent; and
- the implementation of any actions or measures contained in these reports, plans or correspondence.

1.3 Period of Approval

In respect of the right to conduct coal mining operations, this consent is limited to a period of 17 years from the date of grant of the mining lease ML 1360 for the Stratford coal mine.

Note: Under this consent, the Applicant is required to rehabilitate the site to the satisfaction of the DPI and the consent will continue for this and related purposes.

1.4 Limits on Approval

(a) The Applicant shall not transport more than 2.3 million tones of coal a year from the Stratford coal mine (including coal from the Bowens Road North mining operations).

(b) The Applicant shall not carry out any development at the Roseville Pit (including the Roseville West Pit) to the north of Bowens Road at night.

1.5 Contributions to Council

The Applicant shall pay a community infrastructure contribution of $86,000 a year (payable quarterly and indexed to CPI Sydney [all groups] index from 1998) to the Council until the completion of mining activities.

2. MINE MANAGEMENT

2.1 Rejects from Duralie

The Applicant shall ensure that all rejects associated with the coal from the Duralie mine are managed to the satisfaction of the DPI.

2.3 Mining Operations, Waste Management and Rehabilitation

The Applicant shall:
- prepare a Mining Operations Plan for all mining operations on the site;

- dispose of coarse and fine rejects on the site; and
- rehabilitate the site,

to the satisfaction of the DPI.

3. LAND AND SITE ENVIRONMENTAL MANAGEMENT

3.1 Appointment of Environmental Officer

The Applicant shall appoint an Environmental Officer whose qualifications are acceptable to the DPI to oversee the environmental management, monitoring, auditing and reporting on the site.

3.2 Heritage Assessment and Management

The Applicant shall:
- protect Aboriginal artefact scatter No. 31.1.8;
- monitor topsoil removal; and if any Aboriginal objects are found or observed,
- immediately advise DEC and carry out any requirements DEC may have,

to the satisfaction of the DEC.

3.3 Flora and Fauna Assessment and Management

(a) The Applicant shall:
- implement the approved plan of management for the proposed Wildlife Corridor as proposed in the EIS (see condition 1.2);
- protect the remnant Squirrel Glider habitat ; and
- carry out flora and flora monitoring within the Wildlife Corridor,

to the satisfaction of the Director-General.

(b) The Applicant shall carry out a range of measures to improve the riparian vegetation in Avondale Creek to the north of the mine to the satisfaction of the Director-General to compensate for the removal of riparian vegetation associated with the extension of the Roseville Pit to the north of Bowens Road. By the end of April 2007, the Applicant shall prepare (and subsequently implement) a Compensatory Habitat Plan to the satisfaction of the Director-General. This plan must:
- describe the measures that would be implemented to improve the riparian vegetation in Avondale Creek; and
- describe how the performance of the measures would be monitored.

3.4 Visual Amenity & Landscaping

The Applicant shall:
- implement the approved Landscaping Plan for the site; and
- carry out any supplementary tree planting or visual enhancement works that are required by Council to maintain the visual amenity of the local area,

to the satisfaction of Council.

3.5 Bushfire and Other Fire Controls

The Applicant shall:
- provide adequate fire protection works on site, including one fully equipped fire fighting unit on stand-by (or alternative facilities specified by the Council); and
- undertake annual hazard reduction works in accordance with Council's Bushfire Management Plan,

to the satisfaction of Council.

4. WATER MANAGEMENT

4.1 Water Discharges

The Applicant shall only discharge water from the site in accordance with the provisions of a DEC Environment Protection Licence.

4.2 Site Water Balance

The Applicant shall:
- prepare a detailed site water balance for the development;
- measure:
  - water use on site; and

- water transfers across the site;
- review the site water balance for the development annually; and
- report the results of this review in the AEMR,

to the satisfaction of the Director-General.

4.3 Erosion and Sediment Control

The Applicant shall implement a range of standard erosion and sediment controls on the site to the satisfaction of the Director-General, in general accordance with the requirements of the Department of Housing's *Managing Urban Stormwater: Soils and Construction* manual.

4.4 Surface Water Monitoring

The Applicant shall regularly monitor:
- the volume and quality of water discharged from the site;
- surface water quality upstream and downstream of the development in Avondale Swamp, Avondale Creek, Dogtrap Creek and the Avon River; and
- report the results of this monitoring in the AEMR,

to the satisfaction of the Director-General.

4.5 Ground Water Monitoring

The Applicant shall regularly monitor:
- the volume of ground water seeping into the open cut mine workings;
- regional groundwater levels and quality in the vicinity of the site; and
- report the results of this monitoring in the AEMR,

to the satisfaction of the Director-General.

4.6 Setback From Avondale Creek

The Applicant shall ensure that all the development associated with the Roseville Pit (including the Roseville West Pit) to the north of Bowens Road is located at least 40 metres from the bank of Avondale Creek, or as otherwise agreed by the Director-General.

4.7 Water Management Plan

By the end of May 2006, the Applicant shall prepare (and subsequently implement) a Water Management Plan for the Stratford coal mine, including the Bowens Road North operations, in consultation with the DNR, and to the satisfaction of the Director-General. This plan must include:
- a site water balance;
- an Erosion and Sediment Control Plan;
- a Surface Water Monitoring Program;
- a Ground Water Monitoring Program; and
- a Surface and Ground Water Response Plan, to address any potential adverse impacts associated with the development such as the reduction or loss of groundwater in bores in the vicinity of the mine.

4.8 Final Void Management Plan

By the end of September 2009, unless otherwise directed by the Director-General, the Applicant shall prepare (and subsequently implement) a Final Void Management Plan for the site, in consultation with the DPI and DNR, and to the satisfaction of the Director-General. This plan must:
- investigate options for the future use of the final void; and
- describe what actions and measures would be implemented to:
  - minimise any potential adverse impacts associated with the final void; and
  - manage and monitor the potential impacts of the final void over time.

5. AIR QUALITY, BLAST, NOISE AND LIGHT MANAGEMENT

5.1 Acquisition Upon Request

(a) Upon receiving a written request for acquisition from the landowner listed in Table 1, the Applicant shall acquire the land in accordance with the procedures in condition 6.3 of this consent.

90b - Bagnall	49 - Isaac (s)	68 - Devereaux
58 - Bramley	48 - Isaac (n)	90a - Battaglini

69 - D Blanch	93a - Blanch	24 - Ellis

Table 1: Land subject to acquisition upon request
Note: For more information on the numbering and identification of properties used in this consent, see Appendix 2.

(b) By the end of May 2006, the Applicant shall notify the owners of the land listed in Table 1 that they have voluntary acquisition rights.

5.2 Noise and Dust Limits in the Acquisition Zone

While the land listed in Table 1 is privately-owned, the Applicant shall ensure that the noise generated by the development does not exceed the noise limits in Table 2, and the dust emissions generated by the development do not cause additional exceedances of the air quality impact assessment criteria in Tables 7, 8, and 9 at any residence on the land.

Day $L_{Aeq(15\ minute)}$	Evening $L_{Aeq(15\ minute)}$	Night $L_{Aeq(15\ minute)}$	Land Number
41	41	47	58 – Bramley (deleted by Feb 07 Modification)
37	37	45	90b - Bagnall
37	36	43	93a - Blanch
37	36	42	48 – Isaac (north) 49 – Isaac (south) 68 – Devereaux 69 – D Blanch 90a – Battaglini 93a – Blanch (deleted by Feb 07 Modification)

Table 2: Noise limits for land in the acquisition zone

Notes:
- *If the Applicant has a written agreement with any landowner of the land listed in Table 1, and a copy of this agreement has been forwarded to the Department and the DEC, then the Applicant may exceed the noise limits in Table 2 or the air quality impact assessment criteria in Tables 7, 8, and 9 in accordance with the negotiated noise agreement.*
- *See notes in condition 5.3 for more detail on how to interpret these limits.*

5.3 Noise Limits

The Applicant shall ensure that the noise generated by the development does not exceed the noise limits set out in Table 3.

Day $L_{Aeq(15\ minute)}$	Evening $L_{Aeq(15\ minute)}$	Night $L_{Aeq(15\ minute)}$	Land Number
37	35	40	Craven Village
37	35	40	93c – Standen 93 - Campbell
37	35	39	95 – Smith 89 - McIntosh
37	35	35	18 – Atkins 13 – Teidman 46 - Wadland
35	35	35	All other privately-owned land excluding the land in Table 1

Table3: Noise limits

Notes:

- *If the Applicant has a written negotiated noise agreement with any landowner of the land listed in Table 2, and a copy of this agreement has been forwarded to the Department and the DEC, then the Applicant may exceed the noise limits in Table 2 in accordance with the negotiated noise agreement.*
- *Noise from the development is to be measured at the most affected point or within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary, to determine compliance with the $L_{Aeq(15\ minute)}$ noise limits in the above table.*
- *Where it can be demonstrated that direct measurement of noise from the development is impractical, the DEC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*
- *Noise from the development is to be measured at 1 metre from the dwelling façade to determine compliance with the $L_{A1(1\ minute)}$ noise limits in the above table. Where it can be demonstrated that direct measurement of noise from the development is impractical, the DEC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy).(this note deleted by February 2007 Modification)*
- *The noise emission limits identified in the above table apply under meteorological conditions of:*
  - *Wind speeds of up to 3 m/s at 10 metres above ground level; or*
  - *Temperature inversion conditions of up to 3ºC/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.*

5.3A Roseville West Pit Noise Limits

During the commencement of the Roseville West Pit until mining operations are 10 metres below natural ground level, the Day noise limits applicable for:

- Stratford rural residences in Table 3 are increased by 2 dB(A);
- Stratford village residences in Table 3 are increased by 1 dB(A); and
- Issac (south) residence in Table 2 is increased by 1 dB(A).

5.3B Coal Handling Modification Noise Limits

The day noise limit (Table 2) applicable for the Bagnall residence is increased by 2 dB(A), until the construction of the new coal stockpile and coal ROM stacker is complete, or 30 June 2009, whichever is the sooner.

5.4 Noise Acquisition Criteria

If the noise generated by the development exceeds the criteria in Table 4 at any privately-owned land, the Applicant shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in condition 6.3 of this consent.

Day $L_{Aeq(15\ minute)}$	Evening $L_{Aeq(15\ minute)}$	Night $L_{Aeq(15\ minute)}$	***Land***
42	*41*	*40*	Craven Village 93c – Standen 93 – Campbell 95 – Smith 89 – McIntosh 18 – Atkins 13 – Teidman 46 - Wadland
40	*41*	*40*	*All other privately-owned land excluding the land in Table 1*

Table 4: Land acquisition criteria dB(A)

Note: Noise generated by the development is to be measured in accordance with the notes presented below Table 3.

Additional Noise Mitigation Measures

5.5 Upon receiving a written request from:

- a landowner of the land listed in Table 1; or
- the owner of any residence where noise monitoring shows the noise generated by the development is greater than, or equal to, $L_{Aeq(15\ minute)}$ 38 dB(A) at night,

the Applicant shall implement additional noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at any residence on the land in consultation with the landowner. These additional mitigation measures must be reasonable and feasible. If within 3 months of receiving this request from the

landowner, the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

5.5A

Prior to the operation of the new coal stockpile or new coal ROM stacker at the coal handling facility, the Applicant shall fully implement the additional noise mitigation measures described in Section 4.2 of the SEE titled *Stratford Coal Mine Coal Handling Modification*, dated June 2008.

5.6 Noise Monitoring

By the end of May 2006, the Applicant shall prepare (and subsequently implement) a Noise Monitoring Program for the Stratford coal mine, including the Bowens Road North operations, to the satisfaction of the Director-General. This program shall include a noise monitoring protocol for evaluating compliance with the noise limits and acquisition criteria in this consent.

5.7 Noise - Continuous Improvement

The Applicant shall:

- investigate ways to reduce the noise generated by the development, including maximum noise levels which may result in sleep disturbance;
- investigate ways to transport as much coal as possible during the day and evening;
- implement all reasonable and feasible noise mitigation measures on the site; and
- report on these investigations and the implementation of any new noise mitigation measures on site in the AEMR,

to the satisfaction of the Director-General.

5.7 Airblast Overpressure Criteria

The Applicant shall ensure that the airblast overpressure level from blasting at the development does not exceed the criteria in Table 4 at any residence on privately owned land or noise sensitive location as defined in the DEC's *Industrial Noise Policy*.

Airblast overpressure level (dB(Lin Peak))	Allowable exceedance
115	5% of the total number of blasts over a period of 12 months
120	0%

Table 5: Airblast overpressure impact assessment criteria

5.8 Ground Vibration Impact Assessment Criteria

The Applicant shall ensure that the ground vibration level from blasting at the development does not exceed the criteria in Table 5 at any residence on privately owned land or noise sensitive location as defined in the DEC's *Industrial Noise Policy*.

Peak particle velocity (mm/s)	Allowable exceedance
5	5% of the total number of blasts over a period of 12 months
10	0%

Table 6: Ground vibration impact assessment criteria

5.9 Blasting Hours

The Applicant shall only carry out blasting at the development between 9 am and 5 pm (EST) and 9 am and 6 pm (DST) Monday to Saturday inclusive. No blasting is allowed on Sundays, public holidays, or at any other time without the written approval of the DEC.

5.10 Blasting - Operating Conditions

(a) The Applicant shall ensure that all blasting at the site is carried out in accordance with best practice to:
- ensure the safety of people, property, and livestock; and
- minimise the dust and fume emissions from blasting, particularly during adverse meteorological conditions,

to the satisfaction of the Director-General.

(b) If established by an expert , whose appointment has been approved by the Director-General, that blasting at the site causes damage to property or structures, the Applicant shall rectify the damage in consultation with the landowner, and to the satisfaction of the Director-General. The Applicant is to pay any costs associated with the appointment and assessment undertaken by the appointed expert.

5.11 Blast Monitoring

Prior to carrying out any blasting in the Roseville Pit to the north of Bowens Road, the Applicant shall prepare (and subsequently implement) a Blast Monitoring Program for the Stratford coal mine, including the Bowens Road North operations, to the satisfaction of the Director-General.

5.12 Air Impact Assessment Criteria

The Applicant shall ensure that the dust emissions generated by the development do not cause additional exceedances of the air quality impact assessment criteria listed in Tables 7, 8, and 9 at any residence on any privately owned land, excluding the land listed in Table 1.

Pollutant	Averaging period	Criterion
Total suspended particulate (TSP) matter	Annual	90 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	30 µg/m^3

Table 7: Long-term Impact Assessment Criteria for Particulate Matter

Pollutant	Averaging period	Criterion
Particulate matter < 10 µm (PM_{10})	24 hour	50 µg/m^3

Table 8: Short-term impact assessment criterion for particulate matter

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited dust	Annual	2 g/m^2/month	4 g/m^2/month

Table 9: Long-term impact assessment criteria for deposited dust

Note: Deposited dust is assessed as insoluble solids as defined by Standards Australia, 2003, AS 3580.10.1-2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulates - Deposited Matter - Gravimetric Method.

5.13 Air Quality - Operating Conditions

The Applicant shall:
- ensure any visible air pollution generated by the development is assessed regularly, and that mining operations are relocated, modified, and/or stopped as required to minimise air quality impacts on privately owned land and public roads, such as Bowens Road and Bucketts Way; and
- implement all reasonable and feasible measures to minimise the off-site odour and fume emissions generated by any blasting or spontaneous combustion at the development,

to the satisfaction of the Director-General.

5.14 Air Quality Monitoring

By the end of May 2006, the Applicant shall prepare (and subsequently implement) a detailed Air Quality Monitoring Program for the Stratford coal mine, including the Bowens Road North operations to the satisfaction of the Director-General. This program shall include a protocol for evaluating compliance with the air quality impact assessment criteria in Tables 7, 8 and 9.

5.15 Lighting Emissions

The Applicant shall:

- take all feasible and reasonable measures to mitigate off-site lighting impacts from the development; and
- ensure that all external lighting associated with the development complies with *Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting*,

to the satisfaction of the Director-General.

6. ADDITIONAL PROCEDURES FOR AIR QUALITY AND NOISE MANAGEMENT

6.1 Notification of Landowners

If the results of the air quality and/or noise monitoring required in this consent identify that the air pollution and/or noise generated by the development is greater than any of the air quality and/or noise criteria in section 5 of this consent, excluding the landowners in Table 1, then the Applicant shall notify the Director-General and the affected landowners accordingly, and provide quarterly monitoring results to each of these parties until the results show that the development is complying with the air quality and/or noise criteria in section 5 of this consent.

6.2 Independent Review

(a) If a landowner considers the development to be exceeding the air quality and/or noise criteria in section 5 of this consent, excluding the landowners in Table 1, then he/she may ask the Applicant in writing for an independent review of the air pollution and/or noise impacts of the development on his/her land.

If the Director-General is satisfied that an independent review is warranted, the Applicant shall within 3 months of the Director-General advising that an independent review is warranted:

- consult with the landowner to determine his/her concerns;
- commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Director-General, to conduct air quality and/or noise monitoring on the land, to determine whether the development is complying with the relevant air quality and/or noise criteria in section 5 of this consent; and
- give the Director-General and landowner a copy of the independent review.

(b) If the independent review determines that the development is complying with the relevant air quality and/or noise criteria in section 5 of this consent, then the Applicant may discontinue the independent review with the approval of the Director-General.

(c) If the independent review determines that the development is not complying with the relevant air quality and/or noise criteria in section 5 of this consent, then the Applicant shall:

- take all reasonable and feasible measures, in consultation with the landowner, to ensure that the development complies with the relevant air quality and/or noise criteria; and
- conduct further air quality and/or noise monitoring to determine whether these measures ensure compliance; or
- secure a written agreement with the landowner to allow exceedances of the air quality and/or noise criteria in section 5 of this consent,

to the satisfaction of the Director-General.

If the additional monitoring referred to above subsequently determines that the development is complying with the relevant air quality and/or noise criteria in section 5 of this consent, then the Applicant may discontinue the independent review with the approval of the Director-General.

If the measures referred to in above do not achieve compliance with the noise land acquisition criteria in section 5 of this consent, and the Applicant cannot secure a written agreement with the landowner to allow these exceedances within 3 months, then the Applicant shall, upon receiving a written request from the landowner, acquire the landowner's land in accordance with the procedures in condition 6.3 of this consent.

(d) If the landowner disputes the results of the independent review, either the Applicant or the landowner may refer the matter to the Director-General for resolution.

6.3 Land Acquisition

(a) Within 3 months of receiving a written request from a landowner with acquisition rights, the Applicant shall make a binding written offer to the landowner based on:

- the current market value of the landowner's interest in the property at the date of this written request, as if the property was unaffected by the development the subject of the DA, having regard to the:
  - existing and permissible use of the land, in accordance with the applicable planning instruments at the date of the written request; and
  - presence of improvements on the property and/or any approved building or structure which has been physically commenced at the date of the landowner's written request, and is due to be completed subsequent to that date;
- the reasonable costs associated with:
  - relocating within the Gloucester local government area, or to any other local government area determined by the Director-General;

- obtaining legal advice and expert advice for determining the acquisition price of the land, and the terms upon which it is required; and
- reasonable compensation for any disturbance caused by the land acquisition process.

However, if at the end of this period, the Applicant and landowner cannot agree on the acquisition price of the land, and/or the terms upon which the land is to be acquired, then either party may refer the matter to the Director-General for resolution.

Upon receiving such a request, the Director-General shall request the President of the NSW Division of the Australian Property Institute to appoint a qualified independent valuer or Fellow of the Institute, to consider submissions from both parties, and determine a fair and reasonable acquisition price for the land, and/or terms upon which the land is to be acquired.

If either party disputes the independent valuer's determination, then the independent valuer should refer the matter back to the Director-General.

Upon receiving such a referral, the Director-General shall appoint a panel comprising the:
(i) appointed independent valuer;
(ii) Director-General and/or nominee/s; and
(iii) President of the Law Society of NSW or nominee,
to consider submissions from both parties, including meeting with the parties individually if requested, and to determine a fair and reasonable acquisition price for the land, and/or the terms upon which the land is to be acquired.

Within 14 days of receiving the panel's determination, the Applicant shall make a written offer to purchase the land at a price not less than the panel's determination.

If the landowner refuses to accept this offer within 6 months of the date of the Applicant's offer, the Applicant's obligations to acquire the land shall cease, unless otherwise agreed by the Director-General.

(b) The Applicant shall bear the costs of any valuation or survey assessment requested by the independent valuer, panel, or the Director-General and the costs of determination referred above.

(c) If the Applicant and landowner agree that only part of the land shall be acquired, then the Applicant shall pay all reasonable costs associated with obtaining Council approval for any plan of subdivision, and registration of the plan at the Office of the Registrar-General.

7. TRANSPORT AND UTILITIES

7.1 Rail Transport

(a) The Applicant shall only transport coal from the site by rail.

(b) The Applicant shall only receive and unload coal from the Duralie mine between 7am and 10pm.

7.2 Monitoring of Coal Transport

The Applicant shall:
- keep records of the:
  - amount of coal transported from the site each year; and
  - number of coal haulage train movements generated by the development (on a daily basis); and
- include these records in the AEMR.

7.3 Crossing of Bowens Road

(a) The Applicant shall construct, maintain, and operate the proposed crossing of Bowens Road to the satisfaction of Council.

(b) Prior to constructing the proposed crossing, the Applicant shall prepare (and subsequently implement) a Traffic Management Plan for a sealed crossing to the satisfaction of Council. This plan must describe the measures that would be implemented to:
- maintain the proposed crossing in a safe and serviceable condition during all weather conditions; and
- operate the proposed crossing safely to ensure there is no danger to other road users.

(c) By the end of 2011, unless otherwise agreed to by the Director-General, the Applicant shall close the proposed crossing of Bowens Road, and rehabilitate the road and adjoining land to the satisfaction of Council.

8. MONITORING, AUDITING, AND REPORTING

8.1 Environmental Management Strategy

(a) By the end of May 2006, the Applicant shall prepare (and subsequently implement) an Environmental Management Strategy for the Stratford coal mine, including the Bowens Road North operations, to the satisfaction of the Director-General. This strategy must:
- provide the strategic context for the environmental management of the development at the mine;
- describe the procedures that would be implemented to:
  - keep the local community and relevant agencies informed about the operations at the mine;
  - receive, handle, respond to, and record complaints;
  - resolve any disputes that may arise during the course of the development;
  - respond to any non-compliance; and
  - respond to emergencies; and
- describe the role, responsibility, authority, and accountability of all key personnel involved in the environmental management of the development with contact details.

(b) Within 3 months of the completion of each Independent Environmental Audit required in this consent, the Applicant shall review, and if necessary revise, the Environmental Management Strategy to the satisfaction of the Director-General.

8.2 Environmental Monitoring Program

(a) By the end of May 2006, the Applicant shall prepare (and subsequently implement) an Environmental Monitoring Program for the Stratford coal mine, including the Bowens Road North operations, to the satisfaction of the Director-General. This program must consolidate the various monitoring requirements in this consent into a single document.

(b) Within 3 months of the completion of the Independent Environmental Audit required in this consent, the Applicant shall review, and if necessary revise, the Environmental Monitoring Program to the satisfaction of the Director-General.

8.3 Annual Reporting

Each year, the Applicant shall prepare an AEMR to the satisfaction of the Director-General. This report must:
- identify the standards and performance measures that apply to the development;
- include a summary of the complaints received during the past year, and compare this to the complaints received in the previous 5 years;
- include a summary of the monitoring results on the development during the past year;
- include an analysis of these monitoring results against the relevant:
  - limits/criteria in this consent;
  - monitoring results from previous years; and
  - relevant predictions in the EIS and SEEs for the document;
- identify any trends in the monitoring over the life of the development;
- identify and discuss any non-compliance during the previous year; and
- describe what actions were, or are being, taken to ensure compliance.

8.4 Independent Environmental Audit

(a) By the end of 2006, and every three years thereafter, unless the Director-General directs otherwise, the Applicant shall commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:
- be conducted by a suitably qualified, experienced, and independent person whose appointment has been endorsed by the Director-General;
- be consistent with *ISO 19011:2002 – Guidelines for Quality and/or Environmental Systems Auditing*, or equivalent updated versions of these guidelines;
- assess the environmental performance of the development, and its effects on the surrounding environment;
- assess whether the development is complying with the relevant standards, performance measures, and statutory requirements;
- review the adequacy of the Applicant's Environmental Management Strategy and Environmental Monitoring Program; and
- if necessary, recommend measures or actions to improve the environmental performance of the development, and/or the environmental management strategy or monitoring systems.

(b) Within 3 months of commissioning this audit, the Applicant shall submit a copy of the audit report to the Director-General, with a response to any of the recommendations contained in the audit report.

8.5 Community Consultative Committee

(a) The Applicant shall ensure that there is a Community Consultative Committee to oversee the environmental performance of the development. This committee shall:

- be comprised of:
  - 2 representatives from the Applicant, including the person responsible for environmental management at the mine;
  - at least 1 representative from Council; and
  - at least 5 representatives from the local community, including 2 representatives from community groups,

  whose appointment has been approved by the Director-General in consultation with the Council;
- be chaired by the representative from Council;
- meet at least four times a year, or as determined by the Director-General; and
- review and provide advice on the environmental performance of the development, including any management plans, monitoring results, audit reports, or complaints.

(b) The Applicant shall, at its own expense:

- ensure that 2 of its representatives attend the Committee's meetings;
- provide the Committee with regular information on the environmental performance and management of the development;
- provide meeting facilities for the Committee;
- arrange site inspections for the Committee, if necessary;
- take minutes of the Committee's meetings;
- make these minutes available on the Applicant's website within 14 days of the Committee meeting, or as agreed to by the Committee;
- respond to any advice or recommendations the Committee may have in relation to the environmental management or performance of the development;
- forward a copy of the minutes of each Committee meeting, and any responses to the Committee's recommendations to the Director-General within a month of the Committee meeting; and
- reimburse the Council and representatives from the local community for all reasonable expenses incurred in attending the Committee's meetings.

8.6 Access to Information

(a) Within 1 month of the approval of any management plan or monitoring program required under this consent (or any subsequent revision of these management plans or monitoring programs), the completion of the independent audits required under this consent, or the completion of the AEMR, the Applicant shall:

- provide a copy of the relevant document/s to the Council, relevant agencies and the CCC; and
- ensure that a copy of the relevant documents is made publicly available at the mine,

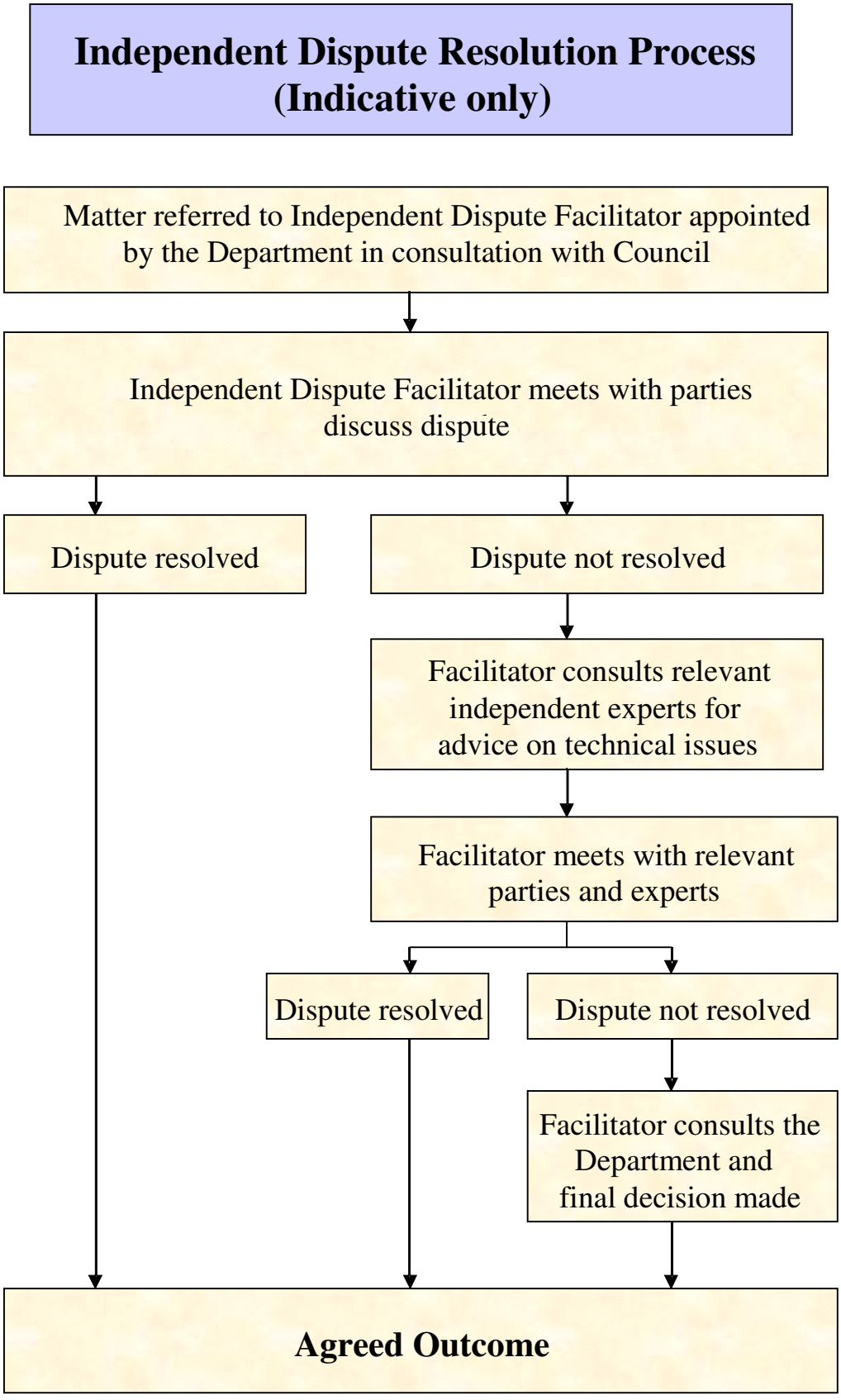
to the satisfaction of the Director-General.

(b) During the life of the development, the Applicant shall:

- make the results of the monitoring required under this consent publicly available at the Council and the mine; and
- update these results on a regular basis (at least every 4 months),

to the satisfaction of the Director-General.

APPENDIX 1
INDEPENDENT DISPUTE RESOLUTION PROCESS



APPENDIX A

NOISE AND BLASTING ASSESSMENT

HEGGIES

REPORT 10-3140-R4

Revision 0

Stratford Coal Mine
Section 75W Modification
Mine Operating and Rail Transport
Noise Impact Assessment

PREPARED FOR

Stratford Coal Pty Ltd
PO Box 168
GLOUCESTER NSW 2422

9 JUNE 2010

HEGGIES PTY LTD
ABN 29 001 584 612

Stratford Coal Mine

Section 75W Modification

Mine Operating and Rail Transport

Noise Impact Assessment

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10-3140-R4	Revision 0	9 June 2010	Glenn Thomas	Yang Liu	Glenn Thomas

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1 INTRODUCTION

1.1 Background

In December 1994, Stratford Coal Pty Ltd (SCPL), a wholly owned subsidiary of Gloucester Coal Ltd (GCL), was granted approval to develop the Stratford Coal Mine (SCM), an open cut mine utilising drill and blast, truck and shovel extractive methods with on-site processing. A summary of the SCM approvals history is provided in the main text of the Section 75W Modification report. The mine is situated between the villages of Stratford and Craven, New South Wales (NSW), with consent to operate for a period of 17 years.

The approved SCM includes:

- An open cut coal mine based on the Stratford Main Deposit (the SCM Main Pit operations were completed in August 2003) with existing and approved open cut mining in the Roseville Pit, the Roseville Pit Extension (RPE) and the Roseville West Pit (RWP).
- A coal handling and preparation plant (CHPP) and run-of-mine (ROM) and product coal stockpiles.
- A rail loop to facilitate transport of product coal to Newcastle and ROM coal from the Duralie Coal Mine (DCM).
- ROM coal production at a rate of up to 3.4 million tonnes per annum (Mtpa), including ROM coal from the DCM.
- Unloading, loading, processing and washing of coal from the DCM.
- Emplacement of CHPP rejects, including those generated by the processing of DCM ROM coal, within the SCM site.
- Mining of ROM coal from the Roseville Seam between the hours of 7.00 am and 10.00 pm.

In 2001, the Bowens Road North (BRN) coal mine was granted development consent with operations commencing in early 2003. The cumulative daytime and evening mine operating noise, rail transportation noise and blasting emissions associated with the simultaneous operation of the BRN and the SCM were presented in the BRN Environmental Impact Statement (EIS).

1.2 Proposed Modification and Noise Assessment

In November 2009, GCL (through its other subsidiary Duralie Coal Pty Ltd [DCPL]) lodged the Duralie Extension Project Environmental Assessment (DCPL, 2009) to facilitate an increase in ROM coal production rate at the DCM. This additional DCM ROM coal would be railed to the SCM. Additional ROM coal is also proposed from a deeper RWP (additional 1.4 Mt) and BRN pit cutback (additional 1.4 Mt). Additional BRN ROM coal is the subject of a separate modification application lodged in June 2010. These changes would, in-turn, require an increase in the CHPP processing rate at the SCM and would require additional DCM trains to be unloaded on the Stratford rail loop. In order to accommodate this, SCPL proposes a modification of the SCM Development Consent.

Heggies Pty Ltd (Heggies) has been engaged by SCPL to evaluate and assess the cumulative mine operating and rail transport noise impacts associated with the modification to the SCM, herein referred to as the proposed Modification. This noise assessment includes consideration of the potential cumulative impacts associated with the June 2010 BRN modification application, where applicable.

A detailed comparison of the approved and modified Projects is presented in **Appendix A**.

The assessment of on-site mine operating noise impact has been guided by the *NSW Industrial Noise Policy* (INP) (Environment Protection Authority [EPA], 2000) and associated application notes dated 21 February 2008. The assessment of off-site rail transport noise impact has been guided by NSW Department of Environment, Climate Change and Water (DECCW) *Environmental Assessment Requirements for Rail Traffic-Generating Developments.* The assessment of construction noise has been conducted in accordance with the DECCW's *Interim Construction Noise Guidelines* (ICNG).

1.3 Existing Approvals and Assessment Requirements

The SCM incorporates the existing RWP and operates (with respect to noise and vibration emissions) in accordance with the following approvals:

- Environment Protection Licence (EPL) No 5161 anniversary date 30 June, review date 24 April 2011 (relevant sections attached as **Appendix B1**).
- Development Consent (DA 23-98/99) dated 5 February 1999 (relevant sections attached as **Appendix B2**).

Relevant previous noise impact assessments are listed below. The relevant assessments include the BRN assessments because the two mines are in close physical proximity to each other and operate in an integrated fashion, with some mobile equipment being common to both mines and BRN ROM coal being processed at the SCM CHPP:

- Heggies Report 10-1033-R1 Bowen Road North Project Operating and Transportation Noise and Blasting Impact Assessment dated 17 January 2001 - including predictive daytime and evening noise emissions from the cumulative SCM and BRN operations.
- Heggies Report 10-3140-R1 Stratford Coal Mine Operating Noise Impact Assessment dated 19 August 2005 - including predictive daytime, evening and night-time noise emissions from the cumulative SCM/RPE and BRN operations.
- Heggies Report 10-3140-R2 Stratford Coal Mine Roseville West Pit Modification Operating Noise and Blasting Impact Assessment dated 4 October 2006 - including predictive daytime and evening noise emissions from the cumulative SCM/RPE/RWP and BRN operations. This modification is referred to herein as the 2006 RWP Modification.
- Heggies Report 10-3140-R3 Stratford Coal Mine Coal Handling Modification Noise Impact Assessment dated 2 June 2008 - including predictive daytime, evening and night-time noise emissions from the cumulative SCM/RPE/RWP and BRN operations. This modification is referred to herein as the 2008 Coal Handling Modification.

In view of the foregoing, the purpose of this noise impact assessment is as follows:

- Review existing mine noise emissions presented in recent quarterly monitoring reports and assess compliance with the approved noise limits.
- Review the status of the SCM noise mitigation programme.
- Investigation of feasible and reasonable noise mitigation measures and recommendation of additional noise mitigation measures with the aim of reducing predicted noise levels from the proposed Modification.
- Assess the daytime, evening and night-time cumulative mine operating and rail transport noise impacts associated with the proposed Modification.
- Assess the daytime construction noise impact associated with the loop augmentation.

Blasting operations at the SCM would remain generally unchanged as a result of the proposed modification. On this basis, a quantitative blasting assessment is not required as blasting emissions are not expected to change relative to the existing situation.

2 PROJECT OVERVIEW

2.1 Noise Sensitive Receivers

The SCM and surrounding area are shown on the Land Ownership Plan attached as **Appendix C**. The nearest potentially affected privately-owned residential and rural dwellings beyond the Mine Lease boundary are presented in **Table 1** including property numbers, landholder names, dwelling locations and coordinates.

2.2 Comparative Plant and Equipment Schedules

The potential for machinery to emit noise is quantified as the sound power level (SWL) expressed in A-weighted decibels (dBA) re 1 pW. At the receptor, the received noise is quantified as the sound pressure level (SPL) expressed in dBA re 20 µPa. The INP's energy equivalent (L_{eq}) assessment parameters has introduced greater mathematical rigour to the prediction of received noise levels as it enables the use of L_{eq} SWL as noise model inputs. In general terms, any variation in mine site L_{eq} SWL will produce a similar variation in the $L_{eq(15minute)}$ sound pressure level at the receiver.

Comparative plant and equipment fleets are presented in **Table 2** together with the overall mine site L_{eq} SWLs from the SCM as approved in 1999 (DA 23-98/99), the approved SCM/RWP Modification (September 2008) and the proposed Modification.

As shown above, the overall site L_{eq} SWL from the proposed Modification (131 dBA) is marginally (1 dBA) greater than the approved SCM/RWP (130 dBA) and significantly lower by comparison with the SCM as approved in 1999 (DA 23-98/99) (136 dBA).

Table 1 Nearest Potentially Affected Residential and Rural Dwellings

Locality	Property Number/ Landholder	Previous Notation[4]	Description	ENM Dwelling Coordinates[1]		
				East (m)	North (m)	Elevation (m)
Stratford/ Craven Residential	315 Bagnall[2,3]	90b Bagnall	The Bucketts Way, Craven	8278	12300	125
	31 Isaac (south)[2]	49 Isaac (south)	The Bucketts Way, Stratford	8680	13520	130
	31 Isaac (north)[2]	48 Isaac (north)	The Bucketts Way, Stratford	8550	13850	130
	Craven Village	Craven Village	The Bucketts Way, Craven	9276	10578	130
	42 Blanch[2]	69 Blanch	The Bucketts Way, Craven	9450	10575	140
	41 Devereaux[2]	68 Devereaux	The Bucketts Way, Craven	9575	10700	145
	39 Standen	93c Standen	Off Woods Road, Craven	8675	10665	138
	Stratford Village	Stratford Village	The Bucketts Way, Stratford	8650	14775	130
	33 Battaglini[2]	90a Battaglini	Off The Bucketts Way, Stratford	8100	13150	130
	26 Lowrey	84 Lowrey	Off The Bucketts Way, Stratford	8100	14800	120
	40 Blanch[2]	93a Blanch	The Bucketts Way, Craven	8800	11050	133
Stratford/ Craven Rural	18 Denyer[2,3]	24 Ellis	Off Wenhams Cox Road, Stratford	12250	16000	130
	13 AGL Energy Limited	18 Atkins	Wheatleys Road, Stratford	10284	16560	110
	32 McIntosh	89 McIntosh	Off Upper Avon Road, Stratford	7500	12950	145
	151 Wadland[3]	46 Wadland	Off Bowens Road, Stratford	13258	13328	252
	6 AGL Gloucester Le Pty Ltd & AGL Gloucester MG Pty Ltd	13 Tiedeman	Off Fairbairns Lane, Stratford	11150	17450	120
	9 Williams	16 Williams	Off the Bucketts Way, Stratford	9100	17140	130
	25 Thompson	83 Thompson	Off The Bucketts Way, Stratford	7600	14400	140
	11 Walker	29 Walker	Off The Bucketts Way, Stratford	8575	16700	130
	5 Bignell	10 Bignell	Off The Bucketts Way, Stratford	8750	18300	130
	7 Burrel	6 Burrel	Off Fairbairns Lane, Stratford	12575	17925	125
	21 Clarke	26 Clarke	Off Bowens Road, Stratford	13175	14250	150
	15 GS & GL Falla Superannuation Pty Ltd (north)	19 Wadland	Off Wenhams Cox Road, Stratford	9159	15990	120
	14 Wenham	31 Wenham	Off Wenhams Cox Road, Stratford	9032	15718	120
	15 GS & GL Falla Superannuation Pty Ltd (south)	33 Wadland	Off Wenhams Cox Road, Stratford	9302	15856	120
	10 Whatmore	78a Whatmore	Off The Bucketts Way, Stratford	8352	17022	145
	10 Whatmore	78b Whatmore	Off The Bucketts Way, Stratford	7954	17278	140
	202 Wenham	31a Wenham	Off The Bucketts Way, Stratford	8287	15573	128
	16 Pickett	82a Pickett	Off The Bucketts Way, Stratford	8950	15773	120
	291 Stackman & Partridge	N/A	Off Upper Avon Road, Craven	6639	12377	140
	34 Hall	N/A	Off Upper Avon Road, Craven	6713	12380	140
	36 Wallace	N/A	Off Woods Road, Craven	7270	11195	155
	298 Yates	N/A	Off Woods Road, Craven	7543	10686	152

Note 1: To convert to ISG coordinates add 380,000 mE and add 1,430,000 mN.
Note 2: Properties identified in the SCM Consent as being in the Noise Acquisition (Affectation) Zone.
Note 3: Properties identified in the BRN Consent as being in the Noise Acquisition (Affectation) Zone.
Note 4: Previous Notation taken from Coal Handling Modification (Heggies, 2008).
.

Table 2 Approved SCM and Proposed Modification Equipment Fleet

Equipment Description	SCM (July 1999 Approval)		Approved SCM/RWP (September 2008 Modification)		SCM/RWP Coal Haulage Scenario				BRN Coal Haulage Scenario			
					SCM Modification		BRN Modification		SCM Modification		BRN Modification	
	No Items	SWL	No Items	SWL	No Items	SWL	No Items	SWL	No Items	SWL	No Items	SWL
Drills	1	116	1	119	1	119	-	-	1	119	-	-
Excavators (Coal)	2	115	1	108	1	108	-	-	-	-	1	115
Excavators (Waste)	2	120	2	116	1	109	2	116	2	112	-	-
Excavators (Ripping)	-	108	-	108	1	108	1	107	1	108	1	107
789 Haul Trucks	6	132	-	-	-	-	-	-			-	-
785 Haul Trucks	6	131	-	-	-	-	-	-			-	-
775 Haul Trucks	-	-	4	126	4	126	7	128	4	126	7	128
A40D Haul Trucks	-	-	3	117	4	118	-	-	4	118	-	-
A30D Haul Trucks	-	-	-	-	-	-	-	-			-	-
Dozers (Inpit)	1	114	-	-	2	124	2	124	2	124	2	124
Dozers (waste)	1	119	2	120	1	120	1	120	1	120	1	120
Water Cart	1	120	1	113	1	120	1	112	1	112	1	120
Loaders (ROM)	1	117	1	110	1	110	-	-	1	110	-	-
Graders	1	115	1	112	1	112	1	112	1	112	1	112
Mobile Fleet	**22**	**135**	**16**	**129**	**18**	**130**	**15**	**130**	**18**	**130**	**14**	**131**
Primary Crusher		107		107		107		-		107		-
Secondary Crusher		113		106		106		-		106		-
CHPP		122		122		122		-		122		-
Stockpile Dozer	1	120	1	112	1	112		-	1	112		-
Coal Stockyard		109		111		111		-		111		-
Trains/Rail Loadout		114		114		113		-		113		-
Rail Loading		112		113		118		-		118		-
Coal Handling		**125**		**124**		**124**		**-**		**124**		**-**
Overall Total		**136**		**130**		**131**		**130**		**131**		**131**

Note 1: SWL (dB re 1 pW).

Note 2: Two scenarios (SCM/RWP Coal Haulage and BRN Coal Haulage scenario) have been modelled to account for operational constraints that mean that when one pit is producing coal, the other is producing waste rock only.

2.3 Proposed Modification

Summary

The proposed Modification is limited by comparison to the approved development with only minor changes to active mining and waste areas, coal handling and preparation plant (CHPP) and coal handling, stock pile and rail loop areas are proposed (**Appendix D**).

The proposed Modification comprises:

- an increase in the annual CHPP ROM coal processing rate from approximately 3.4 Mtpa up to approximately 4.6 Mtpa;
- an increase in the number of DCM trains unloaded on the SCM rail loop (i.e. increase of three to four per day, on average);
- alteration to the DCM train unloading times at the SCM;
- an increase in the amount of product coal transported via rail from the SCM from 2.3 to 3.3 Mtpa, to be accommodated by the use of longer product coal trains;
- augmentation of the SCM rail loop with an additional 400 metre (m) section of track immediately adjacent to the current track;
- a deepening of the Roseville West Pit to facilitate access to an additional 1.4 Mt of ROM coal with an associated additional 8 million bulk cubic metres (Mbcm) of waste rock to be mined;
- irrigation of water from the Stratford East Dam on a portion of the rehabilitated Stratford Waste Emplacement; and
- an increase in the volume of CHPP rejects to be deposited in the Stratford Main Pit.

The proposed SCM and BRN provisional development schedule is presented in **Table 3**.

Table 3 SCM and BRN Approved and Modified Provisional Development Schedule

Year End	SCM		BRN	SCM and BRN
	Main Deposit	RWP		Coal Handling
June 2001	7	-	0	SCM coal
June 2002	8	-	1[2]	SCM and BRN coal
June 2003	9	-	2	SCM, BRN and DCM coal
June 2004	Closed	-	3	
June 2005	-	-	4	
June 2006	-	-	5	
June 2007	-	0	6	
June 2008	-	1[1]	7	
June 2009	-	2[1]	8	
June 2010	-	3	9	
June 2011	-	**4**	10	
June 2012	-	**5**	**11**	
June 2013	-	**6**	**12**	
June 2014	-	**Closed**	**Closed**	DCM coal only
June 2015	-	-	-	
June 2016	-	-	-	
June 2017	-	-	-	
June 2018	-	-	-	
June 2019	-	-	-	

Note 1: RWP Year 1 (Phase 1) and Year 2 (Phase 2) in accordance with existing approvals.
Note 2: Actual operations did not commence until 2003.

The approved SCM and BRN hours of operation are presented in **Table 4**.

Table 4 SCM and BRN Approved and Modified Hours of Operation

Phase	Approved SCM	Modified SCM	Approved BRN	Modified BRN[3]
Mine Operation	24 hours[1]	As per SCM[1]	0700 hrs to 1900 hrs	As per BRN
Coal handling, processing and stockpiling	24 hours	24 hours	n/a	As per BRN
On-site train unloading	0700 hrs to 2200 hrs	0700 hrs to 0200 hrs 7 days per week	n/a	As per BRN
On-site train loading	24 hours	As per SCM	24 hours	As per BRN
Export Coal Off-site rail transportation	24 hours	As per SCM	24 hours	As per BRN
Domestic Coal Off-site rail transportation	24 hours	As per SCM	0700 hrs to 2200 hrs[2]	As per BRN
Blasting	0900 hrs to 1700 hrs Monday to Saturday (EST) 0900 hrs to 1800 hrs Monday to Saturday (DST)	As per SCM	0900 hrs to 1700 hrs Monday to Saturday	As per BRN

Note 1: RWP Approved and Modified hours of operation 0700 hrs to 2200 hrs 7 days per week only.
Note 2: Unless loading outside these hours is determined to be unavoidable by the Rail Access Corporation, National Rail and/or FreightCorp.
Note 3: Refer to separate BRN Modification (SCPL, 2010).

Roseville West Pit (RWP)

The ROM coal production rate at the modified SCM would remain unchanged at up to 2.1 Mtpa. An additional 1.4 million tonnes (Mt) of ROM coal would be mined from the RWP over a period of approximately two years (mining to cease in approximately 2013). The additional coal would be mined via a deepening of the Roseville West Pit.

Total waste rock would increase by approximately 8 million bank cubic metres (Mbcm). No changes to the mining method would be necessary and the mining fleet would be generally unchanged.

Coal Handling and Preparation Plant (CHPP)

No change (apart from increased utilisation) to the SCM CHPP or coal handling fixed infrastructure would be necessary for the Modification. The existing CAT988 front end loader operating on the product coal stockpile would be replaced by a CAT992K front end loader in late 2010 to accommodate increased coal production.

The proposed Modification would involve an increase in the maximum rate of processing in the SCM CHPP from approximately 3.4 Mtpa to 4.6 Mtpa, mostly due to the additional DCM ROM coal (1.2 Mtpa), as a result of the proposed Duralie Extension Project. The proposed Modification would result in an increase in the maximum rate of production of saleable product coal of 1.0 Mtpa (ie an increase from 2.3 Mtpa to 3.3 Mtpa). Processing of ROM coal in the SCM CHPP would continue up to 2019 and the SCM CHPP would continue to operate 24 hours per day, seven days per week.

Stratford Rail Loop (loading and unloading)

The proposed Modification would involve unloading of an increased number of DCM trains on the SCM rail loop, in line with increased ROM coal production at the DCM. The average number of trains that would be used to haul DCM coal to the SCM would increase from three to four, with the peak trains increasing from four to five (following the introduction of GL class locomotives [or equivalent], as discussed below).

In the first year of the Duralie Extension Project[1], the existing locomotives that service the DCM and SCM would continue to be used during the existing/approved hours. From Year 2 (or sooner, subject to contract arrangements and availability of locomotives), the existing locomotives would be replaced by GL class locomotives (or equivalent) which are quieter than the existing DCM locomotives (560 m long trains would be replaced with 600 m long trains). Upon their introduction, the existing/approved ROM coal transportation period (7.00 am to 10.00 pm) would be extended to 2.00 am and the average trains per day would increase from 3 to 4 trains. This extension would facilitate improved access to the Australian Rail Track Corporation (ARTC) network train paths.

In order to accommodate the increased product coal production rates, longer (72 wagon) product coal trains would be introduced from the fourth quarter of 2011 (or earlier, subject to contractual arrangements). These larger trains would involve an additional locomotive (ie three 81/81 class locomotives would be used instead of the current two). This means that the average number of trains per day that would be used to haul product coal from the SCM would remain at an average of 2.5 per day and a peak of 5 per day.

A 400 m section of the existing Stratford rail line would be augmented to facilitate improved access to the existing coal loading/unloading infrastructure. This augmentation would allow two long (72 wagon) export trains to be on the loop at one time, increasing operational efficiency of the rail loop and reducing congestion on the main line (Mid Coast Railway).

Rail Loop Augmentation Construction

Construction or the rail loop augmentation would involve relocation of services in the vicinity of the existing loop, earthworks, ballast placement, line placement, signalling works and points relocation. The earthworks component would involve the most intensive mobile equipment requirement and would take approximately 12 weeks. The typical mobile equipment required comprises:

- D6 dozer
- 30 t excavator
- 2 x 30 t articulated dump trucks
- Water cart (shared with ongoing SCM mining operations)

In addition, limited use of a rock breaker may be required subject to the geotechnical conditions encountered below ground level. Spoil removed from the cutting would be used as fill for other parts of the rail loop duplication, or placed as windrows to the east of the cutting.

2.4 Bowens Road North Open-cut Modification

A cutback of the existing BRN open cut pit is proposed as part of a separate Modification (Bowens Road North Open Cut June 2010 Statement of Environmental Effects, SCPL [2010]). The pit cutback would involve mining of the same coal seams as the existing BRN open cut pit. No changes to the mining method would be necessary and the mining fleet would be generally unchanged with mining anticipated to cease in approximately 2013.

[1] Duralie Extension Project Environmental Assessment, November 2009 (DCPL, 2009) approval currently pending.

The proposed Modification to the BRN open cut pit would result in the additional mining of 1.4 Mt of ROM coal (ie total of 5.4 Mt over the life of mine). An additional 0.5 Mbcm of waste rock would be mined at the BRN (ie total of approximately 8.6 Mbcm of waste rock over the life of mine).

Although approval of this cutback is pending, the BRN operations are included in this assessment for the purposes of cumulative assessment.

3 ACOUSTICAL AND METEOROLOGICAL ENVIRONMENT

3.1 Pre-mining Background Noise Environment

Previous studies detail the background noise environment in the absence of mining operations as being a rural noise environment, with rating background levels (RBLs) ranging from 30 dBA to 32 dBA during the daytime, evening and night-time with insignificant industrial noise contributions. These noise levels have previously formed the basis for the assessment of intrusive mine emissions against the relevant project specific noise levels and the determination of the consented noise limits.

3.2 Mine-inclusive Ambient Noise Environment

Annual Environmental Management Report (AEMR) June 2009

SCPL's 2009 AEMR presents a summary of SCM and BRN noise monitoring results during the reporting period, other noise investigations and control measures and community complaint details. The AEMR states: *"Full daytime, evening and night-time noise compliance was achieved for all noise surveys. The September 2008 results concluded that excursions from the noise criteria were measured, however a moderate temperature inversion was predicted during the entire survey, potentially causing significant noise reinforcement."*

In addition to the routine quarterly monitoring, SCPL regularly undertakes mobile equipment source noise monitoring. The measurements are generally conducted in April (or May) each year however due to adverse weather conditions were deferred to August 2009.

September and December 2009 and March 2010 Noise Monitoring Summary

Routine noise monitoring was conducted in September 2009, December 2009 and March 2010 in accordance with the current SCPL Noise Management Plan (Vipac, 2006). The September report confirms noise compliance was achieved during the daytime, evening and night-time periods at all eight monitoring locations, except at (21) Clarke (south) where a marginal (2 dBA) exceedance was recorded during the daytime survey. Wind speeds on this day fluctuated around 3 metres per second (m/s) (and often above) (which is the maximum wind speed relevant to SCPL's noise limits) on the day of monitoring. The December report confirms noise compliance was achieved during the daytime, evening and night-time periods at all eight monitoring locations.

The March report confirms noise compliance was achieved during the daytime, evening and night-time periods at all eight monitoring locations, except at (31) Issac (south) where a significant (> 5dBA) exceedance was recorded during the evening survey under noise enhancing weather (ie prevailing wind and temperature inversion).

3.3 Noise Complaint Records

Twenty-three complaints were received in 2009 relating to on-site operational noise. This was an increase on previous years, where nine complaints were received in 2008, and six complaints were received in both 2007 and 2006. To date (May 2010) seven operational noise complaints have been received by SCPL in 2010.

In addition to the above, a small number of on-site rail noise complaints were also received, with two received in 2009, four in 2008 and none in 2007.

3.4 Meteorological Environment

The prevailing SCM meteorological conditions have been previously determined in accordance with the INP and for the purposes of this assessment (and for consistency with previous studies) remain unchanged as presented in **Table 5**.

Table 5 Calm and Noise Enhancing Meteorological Modelling Parameters

Period	Meteorological Parameter	Air Temp	Relative Humidity	Wind Velocity	Temperature Gradient
Daytime	Calm	18°C	60%	0 m/s	0°C/100 m
Evening	Calm	14°C	75%	0 m/s	0°C/100 m
Night-time[1]	Wind only	10°C	90%	North north-east 3 m/s	0°C/100 m
Night-time[2]	Inversion only Winter	10°C	90%	0 m/s	3°C/100 m
Night-time[3]	Inversion and Drainage	10°C	90%	North north-east 2 m/s	3°C/100 m

Note 1: INP default wind speed 3 m/s.
Note 2: INP default temperature inversion 3°C/100 m.
Note 3: INP default temperature inversion 3°C/100 m and 2 m/s north north-east drainage flow.

3.5 Off-site Construction Noise Assessment Criteria

As discussed in **Section 2.3**, the initial stage of the rail augmentation construction would involve some earthworks. DECCW's ICNG has been used for this assessment.

The use of the ICNG is considered appropriate as the rail construction is a discrete, short-term activity (involving a modest bulk earthworks fleet anticipated to take approximately 12 weeks) that would be undertaken by a separate construction contractor, is located on the western extremity of the rail loop, relatively remote from mining activities and is not located on SCPL's mining leases.

The ICNG recommends a construction noise management level (CNML) equivalent to the daytime RBL plus 10 dBA within standard hours (ie daytime) and RBL plus 5 dBA outside standard hours (ie evening and night-time). The ICNG also contains "highly noise affected" daytime CNMLs which are set at 75 dBA $L_{Aeq(15minute)}$. As the rail siding construction will be limited to daytime only, the ICNG construction noise management levels are presented in **Table 6**.

Table 6 Modification ICNG $L_{Aeq(15minute)}$ Construction Noise Management Levels (dBA re 20 µPa)

Locality	Rated Background Level RBL[1]			Daytime CNML (noise affected) RBL plus 10 dBA	Daytime CNML (highly noise affected)
	Daytime	Evening	Night-time		
Stratford/Craven Residential	32	31	30	42	75
Stratford/Craven Rural	30	31	30	40	75

Note 1: Refer Heggies Report 10-3140-R2 Stratford Coal Mine Roseville West Pit Modification Operating Noise and Blasting Impact Assessment dated 4 October 2006.

4 NOISE MITIGATION AND MODELLING METHODOLOGY

4.1 Approved Mine Mitigation

An appreciable level of effort has been applied by SCPL to identify and implement reasonable and feasible on-site noise controls since the commencement of mining, particularly to minimise the impact of night-time noise emissions from the SCM. The noise controls identified as reasonable and feasible in the 2008 Coal Handling Modification and their implementation status is described in **Table 7**.

Table 7 Implementation Status of 2008 Coal Handling Modification Noise Mitigation Measures

Noise Control	**Implementation Status**
Installed ROM front-end loader (FEL) CAT988 (or equivalent) with maximum Leq operating SWL of 110 dBA.	Completed - SWL testwork indicates that the FEL is operating at approximately 107 dBA.
Installed 5 m high ROM hopper barrier. ROM coal stockpiles to be maintained at 5 m height whenever possible and FEL to be operated generally within the ROM coal stockpile area.	Completed.
Installed secondary crusher SWL 106 dBA. Note, the RWP noise assessment identified a 10 dBA noise reduction requirement for the crusher with 7 dBA achieved to date.	Ongoing - crushing tower to be completely replaced; replacement structure to be fully cladded to achieve 106 dBA.
The new coal stockpile would replace approximately 150 m of a visual/noise bund wall located to the west of the CHPP. The primary purpose of the bund (relative level [RL] 137 m) was to provide a modest level of noise attenuation from the ground levels of the CHPP, particularly for dwellings located to the south-west (ie Craven village). The new coal stockpile would retain a minimum RL 137 (even when empty) and the effective height of the barrier (provided by the existing bund) would not be compromised.	Completed.
The remaining southern length of the visual/noise bund wall adjacent to the CHPP would be increased in height by approximately 3 m to RL 140 m.	Completed.
Installed coal stockpile CAT D10 Dozer (or equivalent) with an operating Leq SWL of 110 dBA.	Completed.
Installed new conveyors and drives (new product stockpile and ROM conveyor/stacker) to be consistent with current low noise conveyor system technology and commissioned in accordance with an acoustic design specification. Hence, the new conveyor systems would be installed with lower noise emissions by comparison with the existing conveyor systems.	Ongoing - implementation of new equipment substantially completed with noise testwork and verification to be completed.

Source: SCPL (2010).

4.2 Proposed Modification Mitigation

SCPL is obligated under the current Development Consent requirements to implement all reasonable and feasible noise mitigation measures. The mitigation measures described in **Section 4.1** have been adopted in this noise assessment. In addition, Heggies conducted an investigation of reasonable and feasible noise mitigation measures, particularly in relation to night-time operations. A number of iterative steps were undertaken to develop noise mitigation measures for the proposed Modification, including:

1. Preliminary noise modelling of scenarios representative of the maximum noise emissions from the proposed Modification to identify the potential for noise exceedances.
2. Evaluation of various combinations of noise management and mitigation measures to assess their relative effectiveness.
3. Review of the effectiveness of these measures and assessment of their feasibility by SCPL.
4. Adoption by SCPL of a range of noise management and mitigation measures (including low noise equipment and operational controls) to appreciably reduce noise emissions associated with the proposed Modification, including (refer to **Table 8**).

Table 8 Proposed Modification Mitigation Measures

Component	Description of Mitigation Measure
Coal Handling and Preparation Plant	Partial enclosure of the ground and first floor levels of the CHPP and acoustic lining of 50% of the interior and commissioned in accordance with an acoustic design specification. Heggies Report 5083-R12 Stratford Coal Mine Coal Crushers and Preparation Plant Noise Impact dated 16 July 1997 presents a detailed assessment of alternative CHPP noise reduction measures involving partial enclosure of the CHPP building. The enclosure would comprise additional 0.47 millimetres (mm) (TCT) Colorbond Profile Steel Iron Cladding on the ground and first floor level excluding the northern facade (ie adjacent to the hardstand area). In addition, to reduce the internal reverberant sound level within the CHPP building, absorptive lining would be applied to 50% of the total internal surface area comprising of 50 mm rockwool sealed in a thin Mylar film and perforated steel sheeting or equivalent treatment (eg QUASH Acoustic Absorber or equivalent).
Stratford Rail Loop	Install two adjacent acoustic barriers approximately 60 m in length, with an elevation of 5 m above rail level and an offset distance no greater than 3 m from the nearest outer rail. The barriers would be located adjacent to the "at rest location" of idling locomotives on the southern (ie inbound) side of the rail loop. The barriers to be constructed from a material with surface density not less 18 kilograms (kg) per square metre (eg CSR Hebel Sound Barrier or equivalent materials).
Coal Handling	Install low noise idlers on conveyors CV18 and CV17 consistent with current (super) low noise conveyor system technology and commissioned in accordance with an acoustic design specification.
Coal Loading and Unloading Stations	Partial enclosure of the eastern and western wings of the coal loader comprising 0.47 millimetres (mm) (TCT) Colorbond Profile Steel Iron Cladding (or equivalent) extending from ground level up to a minimum height of 10 m. Similarly, enclosure of the coal unloader comprising iron cladding extending from rail down to ground level

4.3 Mine Noise Modelling Procedure

The SCM and BRN validated mine computer model was modified to incorporate the noise sources associated with the proposed Modification. The surrounding terrain and nearby potentially affected residential receivers were also included in the model. In addition, the model was updated and calibrated using recent on-site noise monitoring of SWLs of on-site equipment (refer VIPAC report dated 29 August 2009).

The computer model was prepared using RTA Technology Pty Ltd software Environmental Noise Model (ENM for Windows, Version 3.06), a commercial software system developed in conjunction with the (then) NSW Environmental Protection Agency (EPA). The acoustical algorithms utilised by this software have been endorsed by the Australian and New Zealand Environment Council and all State Environmental Authorities throughout Australia as representing one of the most appropriate predictive methodologies currently available.

There are two relevant operating scenarios for the Modification:

1. RWP ROM coal and waste rock haulage with simultaneous BRN waste haulage.
2. BRN ROM coal and waste rock haulage with simultaneous RWP waste haulage.

The cumulative mobile equipment and fixed plant associated with these two scenarios are summarised in **Table 9**.

Table 9 Proposed Modification Operating Scenarios

Mining Activity	Proposed Modification (RWP Coal Haulage)	Proposed Modification (BRN Coal Haulage)
RWP	RWP coal haulage to SCM ROM stockpile, waste haulage to Stratford Pit waste emplacement	RWP waste haulage to Stratford Pit waste emplacement
BRN	BRN waste haulage to in-pit waste emplacement	BRN coal haulage to SCM ROM stockpile, waste haulage to in-pit waste emplacement
CHPP and Coal Stockpiling	Operating	Operating
Train Loading or Train Unloading	Operating	Operating

Modelling of mining operations included all existing and proposed plant items operating concurrently to simulate the overall maximum energy equivalent (ie $L_{Aeq(15minute)}$) intrusive noise level. Specific assessment against the $L_{Aeq(period)}$ amenity project specific noise levels is not required for this assessment as the $L_{A15(minute)}$ intrusive noise limits are more stringent and determine compliance.

The model includes both coal loading or coal unloading operations and train movements on the rail loop. A large proportion of the mobile equipment is operated in repeatable routines and a relatively smaller proportion of the emissions emanate from continuous fixed plant items.

The L_{Aeq} SWLs given for each item of mobile equipment do not include noise emissions which emanate from alarms. In the event that alarm noise is considered to be a source of disturbance, the alarm noise level should be checked against the appropriate Australian Standard and/or requirements and the necessary mitigating action taken to achieve an acceptable noise reduction without compromising safety standards. It is noted that SCPL have installed broad-band "quacker" reversing alarms on the mobile equipment fleet.

5 CONSTRUCTION NOISE IMPACT ASSESSMENT

5.1 Daytime - Modification Construction

The daytime rail augmentation construction $L_{Aeq(15minute)}$ intrusive emissions to the nearest residential receivers are presented in **Table 10** together with the CNMLs nominated in **Section 3.5**.

This assessment indicates that noise levels would be within the "highly noise affected" CNML stipulated in the ICNG.

One privately-owned noise received (315 Bagnall) would exceed the "noise affected" CNML. This receiver is located in close proximity to the North Coast Railway, the Bucketts Way and the SCM rail spur and would be in close proximity to rail construction activities.

It is noted that the predicted construction noise levels are lower than the corresponding predicted operational noise levels (**Section 6**) with the exception of 315 Bagnall.

Table 10 Daytime Construction LAeq(15minute) Noise (dBA re 20 µPa)

Locality	Land Owner	Intrusive Level Calm[1]		Daytime CNML (noise affected)	Daytime CNML (highly noise affected)
		Rail Loop Construction without Rockbreaking	Rail Loop Construction with Rockbreaking		
Stratford/ Craven Residential	315 Bagnall[2,3]	**58**[4]	**65**[4]	42	75
	31 Isaac (south) [2]	26	30		
	31 Isaac (north) [2]	24	28		
	Craven Village	15	17		
	42 Blanch[2]	14	17		
	41 Devereaux[2]	15	17		
	39 Standen	15	20		
	Stratford Village	17	22		
	33 Battaglini[2]	29	33		
	26 Lowrey	17	22		
	40 Blanch[2]	19	24		
Stratford/ Craven Rural	18 Denyer[2,3]	4	12	–[5]	75
	13 AGL Energy Limited	4	7	40	
	32 McIntosh	28	33		
	151 Wadland[3]	6	13		
	6 AGL Gloucester Le Pty Ltd	2	8		
	9 Williams	7	11		
	25 Thompson	18	23		
	11 Walker	9	13		
	5 Bignell	2	6		
	7 Burrel	0	3		
	21 Clarke	0	6		
	15 Falla (north)	9	14		
	14 Wenham	11	16		
	15 Falla (south)	9	15		
	10 Whatmore	8	14		
	10 Whatmore	3	9		
	202 Wenham	13	18		
	16 Pickett	11	16		
	291 Stackman & Partridge	21	25		
	34 Hall	22	25		
	36 Wallace	24	27		
	298 Yates	21	25		

Note 1: Meteorological modelling parameters as described in **Table 5**.

Note 2: Properties identified in the SCM Consent as being in the Noise Acquisition (Affectation) Zone.

Note 3: Properties identified in the BRN Consent as being in the Noise Acquisition (Affectation) Zone.

Note 4: Construction Noise Level above the CNML (noise affected).

Note 5: Currently subject to commercial agreement between SCPL and the landowner.

6 MINE NOISE IMPACT ASSESSMENT

6.1 Daytime - Modification Operation

The cumulative daytime proposed Modification operating $L_{Aeq(15minute)}$ intrusive emissions to the nearest dwellings are presented in **Table 11** together with the consented noise limits.

Table 11 Cumulative Daytime Operation $L_{Aeq(15minute)}$ Noise (dBA re 20 µPa)

Locality	Land Owner	Intrusive Level Calm[1]				SCM Consented Noise Limits
		RWP Coal Haulage		BRN Coal Haulage		
		Train Loading	Train Unloading	Train Loading	Train Unloading	
Stratford/ Craven Residential	315 Bagnall[2,3]	**39**[4]	**40**[4]	**39**[4]	**40**[4]	37
	31 Isaac (south)[2]	36	34	36	33	37
	31 Isaac (north)[2]	36	33	36	33	37
	Craven Village	32	33	32	33	37
	42 Blanch[2]	31	31	31	31	37
	41 Devereaux[2]	34	33	34	33	37
	39 Standen	32	33	32	33	37
	Stratford Village	33	33	33	32	35
	33 Battaglini[2]	**38**[4]	32	**38**[4]	32	37
	26 Lowrey	28	28	28	27	35
	40 Blanch[2]	34	35	34	35	37
Stratford/ Craven Rural	18 Denyer[2,3]	45	45	42	42	–[5]
	13 AGL Energy Limited	**38**[4]	**38**[4]	36	36	37
	32 McIntosh	37	34	37	34	37
	151 Wadland[3]	33	33	32	32	37
	6 AGL Gloucester Le Pty Ltd	35	35	33	33	37
	9 Williams	33	33	32	32	35
	25 Thompson	31	30	30	29	35
	11 Walker	32	32	31	31	35
	5 Bignell	29	29	27	27	35
	7 Burrel	28	28	26	26	35
	21 Clarke	24	24	23	23	35
	15 Falla (north)	34	34	32	32	35
	14 Wenham	32	32	31	31	35
	15 Falla (south)	34	34	32	32	35
	10 Whatmore	32	32	30	30	35
	10 Whatmore	21	21	20	20	35
	202 Wenham	32	32	31	31	35
	16 Pickett	31	31	30	30	35
	291 Stackman & Partridge	27	25	27	25	35
	34 Hall	27	25	27	25	35
	36 Wallace	29	29	29	29	35
	298 Yates	26	26	27	26	35

Note 1: Meteorological modelling parameters as described in **Table 5**.
Note 2: Properties identified in the SCM Consent as being in the Noise Acquisition (Affectation) Zone.
Note 3: Properties identified in the BRN Consent as being in the Noise Acquisition (Affectation) Zone.
Note 4: Noise level above consented noise limits.
Note 5: Currently subject to commercial agreement between SCPL and the landowner.

The cumulative daytime noise levels are expected to meet the relevant noise limits, except at 315 Bagnall (moderate 3 dBA exceedance), 33 Battaglini (minor 1 dBA exceedance) and 13 AGL Energy Limited (minor 1 dBA exceedance).

Of these receivers, 315 Bagnall and 33 Battaglini are already subject to acquisition upon request clauses in the SCM Development Consent, whilst the noise level at 13 AGL Energy Limited would be elevated by 1 dBA to 38 dBA.

6.2 Evening - Modification Operation

The cumulative evening Modification operating $L_{Aeq(15minute)}$ intrusive emissions to the nearest dwellings are presented in **Table 12** together with the consented noise limits.

Table 12 Cumulative Evening Operation $L_{Aeq(15minute)}$ Noise (dBA re 20 µPa)

Locality	Land Owner	Intrusive Level Calm[1]				SCM Consented Noise Limits
		RWP Coal Haulage		BRN Coal Haulage		
		Train Loading	Train Unloading	Train Loading	Train Unloading	
Stratford/ Craven Residential	315 Bagnall[2,3]	**39**[4]	**41**[4]	**39**[4]	**41**[4]	37
	31 Isaac (south)[2]	36	33	36	33	36
	31 Isaac (north)[2]	36	32	36	32	36
	Craven Village	33	34	32	33	35
	42 Blanch[2]	31	31	31	31	36
	41 Devereaux[2]	34	34	34	33	36
	39 Standen	33	33	33	33	35
	Stratford Village	32	30	31	30	35
	33 Battaglini[2]	**39**[4]	32	**38**[4]	32	36
	26 Lowrey	27	26	26	25	35
	40 Blanch[2]	35	36	35	36	36
Stratford/ Craven Rural	18 Denyer[2,3]	30	30	29	29	–[5]
	13 AGL Energy Limited	31	31	31	31	35
	32 McIntosh	**37**[4]	34	**37**[4]	34	35
	151 Wadland[3]	31	31	30	29	35
	6 AGL Gloucester Le Pty Ltd	27	27	26	26	35
	9 Williams	28	28	28	28	35
	25 Thompson	30	28	30	27	35
	11 Walker	27	27	27	27	35
	5 Bignell	23	23	23	23	35
	7 Burrel	22	22	21	21	35
	21 Clarke	20	20	19	19	35
	15 Falla (north)	30	29	29	29	35
	14 Wenham	29	29	29	29	35
	15 Falla (south)	30	30	30	30	35
	10 Whatmore	28	27	27	27	35
	10 Whatmore	18	18	18	18	35
	202 Wenham	29	29	29	28	35
	16 Pickett	29	28	28	28	35
	291 Stackman & Partridge	27	25	27	24	35
	34 Hall	28	25	27	25	35
	36 Wallace	30	29	30	29	35
	298 Yates	26	26	26	26	35

Note 1: Meteorological modelling parameters as described in **Table 5**.
Note 2: Properties identified in the SCM Consent as being in the Noise Acquisition (Affectation) Zone.
Note 3: Properties identified in the BRN Consent as being in the Noise Acquisition (Affectation) Zone.
Note 4: Noise level above consented noise limits.
Note 5: Currently subject to commercial agreement between SCPL and the landowner.

The cumulative evening noise levels are expected to meet the relevant noise limits, except at 315 Bagnall (moderate 4 dBA exceedance), 33 Battaglini (moderate 3 dBA exceedance) and 32 McIntosh (minor 2 dBA exceedance).

Of these receivers, 315 Bagnall and 33 Battaglini are already subject to acquisition upon request clauses in the SCM Development Consent, whilst the noise level at 32 McIntosh would be elevated by 2 dBA to 37 dBA.

These results are considered to be conservative as they include operations at BRN, even though these operations would cease at 1900 hours daily (ie BRN operations only occur for one hour of the evening period of 1800 hours to 2200 hours).

6.3 Night-time - Modification Operation

The cumulative night-time Modification operating $L_{Aeq(15minute)}$ intrusive emissions to the nearest dwellings are presented in **Table 13** together with the consented noise limits.

Table 13 Cumulative Night-time Operation $L_{Aeq(15minute)}$ Noise (dBA re 20 µPa)

Locality	Land Owner	Intrusive Level NNE Wind[1]		Intrusive Level Inversion[1]		Intrusive Level Inversion & Drainage[1]		SCM Consented Noise Limits
		Loading	Unloading	Loading	Unloading	Loading	Unloading	
Stratford/ Craven Residential	315 Bagnall[2,3]	**49**[4]	44	43	43	**50**[4]	**46**[4]	45
	31 Isaac (south)[2]	32	29	42	39	37	35	42
	31 Isaac (north)[2]	31	28	42	39	36	34	42
	Craven Village	40	40	36	36	40	40	40
	42 Blanch[2]	40	40	36	36	40	40	42
	41 Devereaux[2]	40	40	37	37	41	41	42
	39 Standen	39	39	35	35	40	40	40
	Stratford Village	24	21	35	32	28	24	35
	33 Battaglini[2]	39	31	**44**[4]	38	**44**[4]	38	42
	26 Lowrey	20	18	31	28	24	22	35
	40 Blanch[2]	42	42	38	38	42	42	43
Stratford/ Craven Rural	18 Denyer[2,3]	15	14	25	24	18	17	–[5]
	13 AGL Energy	12	12	24	24	14	15	35
	32 McIntosh	**40**[4]	37	**41**[4]	39	**42**[4]	**40**[4]	39
	151 Wadland[3]	23	23	29	29	27	26	35
	6 AGL Gloucester	12	11	23	23	14	14	35
	9 Williams	15	13	25	24	17	16	35
	25 Thompson	26	23	**36**[4]	33	34	31	35
	11 Walker	17	15	27	26	20	17	35
	5 Bignell	10	9	21	20	13	12	35
	7 Burrel	7	8	19	19	11	11	35
	21 Clarke	8	8	23	22	12	12	35
	15 Falla (north)	14	13	26	26	17	16	35
	14 Wenham	16	15	28	28	19	18	35
	15 Falla (south)	15	14	28	26	18	17	35
	10 Whatmore	18	16	26	25	21	19	35
	10 Whatmore	7	6	19	16	10	9	35
	202 Wenham	17	15	29	28	20	17	35
	16 Pickett	19	16	30	28	22	19	35
	291 Stackman & Partridge	34	31	33	31	**36**[4]	33	35
	34 Hall	35	32	34	32	**36**[4]	34	35
	36 Wallace	**36**[4]	35	33	32	**37**[4]	**36**[4]	35
	298 Yates	**36**[4]	35	32	32	**36**[4]	**36**[4]	35

Note 1: Meteorological modelling parameters as described in **Table 5**.

Note 2: Properties identified in the SCM Consent as being in the Noise Acquisition (Affectation) Zone.
Note 3: Properties identified in the BRN Consent as being in the Noise Acquisition (Affectation) Zone.
Note 4: Noise level above consented noise limits.
Note 5: Currently subject to commercial agreement between SCPL and the landowner.

The cumulative night-time noise levels are expected to meet the relevant noise limits, except at 315 Bagnall (moderate 5 dBA exceedance), 32 McIntosh (moderate 3 dBA exceedance), 33 Battaglini (minor 2 dBA exceedance), 36 Wallace (minor 2 dBA exceedance), 25 Thompson (minor 1 dBA exceedance), 291 Stackman & Partridge (minor 1 dBA exceedance), 34 Hall (minor 1 dBA exceedance) and 298 Yates (minor 1 dBA exceedance).

Of these receivers, 315 Bagnall and 33 Battaglini are already subject to acquisition upon request clauses in the SCM Development Consent. The night-time noise level at 32 McIntosh is elevated to 42 dBA and would constitute an exceedance of the affectation zone criteria in the SCM Development Consent.

The night-time noise level at 36 Wallace would be elevated by 2 dBA to 37 dBA, whilst the noise levels at 25 Thompson, 291 Stackman & Partridge, 34 Hall and 298 Yates would be elevated by 1 dBA to 36 dBA.

The proposed Modification operating night-time $L_{Aeq(15minute)}$ intrusive noise contours during inversion only and inversion with drainage are presented as **Appendices E1** and **E2**, respectively. Note, the calculation of the noise contours involves numerical interpolation of a noise level array with a graphical accuracy of up to approximately ±2 dBA. This means that in some cases the contour locations will differ from the values in **Table 12**, particularly where topographic effects are prominent.

7 OFF-SITE RAIL TRANSPORT NOISE

7.1 Railway Noise Criteria

The ARTC controls and operates the North Coast Railway in NSW. Noise emissions from the railway are regulated via the ARTC's EPL (EPL No 3142).

Section L6 of the EPL nominates general airborne noise limits at residential receivers as follows:

L6.1.1 General Noise Limits

It is an objective of this Licence to progressively reduce noise levels to the goals of 65 dB(A)Leq, (day time from 7am - 10pm), 60 dB(A)Leq, (night time from 10pm - 7am) and 85dB(A) (24 hr) max pass-by noise, at one metre from the façade of affected residential properties through the implementation of the Pollution Reduction Program.

The goals do not represent unobtrusive noise levels. Rather, the objectives recognise that railway operations are inherently noisy and represent a compromise between what may be desirable from a community point of view (ie maintaining amenity) and what is necessary to enable trains to continue to operate.

Based on the foregoing, the general noise limits for the North Coast Railway are presented in **Table 14** and form the basis of guideline noise assessment criteria.

Table 14 ARTC's Guideline Noise Assessment Criteria

Railway	Licence Holder	Descriptor	Rail Traffic Goal
North Coast Railway	ATRC EPL 3142	Daytime/evening $L_{Aeq(15hour)}$	65 dBA
		Night-time $L_{Aeq(9hour)}$	60 dBA
		Maximum Pass-by L_{Amax}	85 dBA

The DECCW has recently released "Environmental Assessment Requirements for Rail Traffic-Generating Developments" (update March 2010). Rail noise assessment trigger levels are provided in the DECCW requirements and are reproduced in **Table 15**.

Table 15 DECCW Rail Noise Assessment Trigger Levels for Rail Traffic Generating Developments

Descriptor	**Rail Traffic Goal**
$L_{Aeq(24hour)}$	60 dBA
Maximum Pass-by L_{Amax} (95th percentile)	85 dBA

Note: 95th percentile equates to the 5% exceedance value.

The DECCW rail noise assessment trigger levels are similar to the ARTC's EPL noise goals, however the DECCW trigger levels have an averaging period of 24 hours, rather than daytime (15 hours) and night-time (9 hours) for the ARTC's goals. Potential rail noise for the Modification has been assessed against both sets of criteria (ie ARTC's EPL and the DECCW requirements).

7.2 Rail Traffic Movements

The existing, additional and cumulative daytime/evening, night-time and 24 hour train movements are presented in **Table 16** together with the estimated operating conditions on the portion of the North Coast Railway between the DCM and the SCM.

Table 16 Existing, Additional and Cumulative 24 Hour Train Movements

Scenario	**Train Type**	**Period**	**Train Pass-bys**						**Train Length (m)**	**Train Speed (kph)**
			Daytime/Evening		**Night-time**		**24 Hours**			
			Average Passby	**Peak Passby**	**Average Passby**	**Peak Passby**	**Average Passby**	**Peak Passby**		
Existing/ Approved	Passenger trains	Monday to Saturday	5	5	1	1	6	6	205	60
		Sunday	5	5	1	1	6	6		
	Freight trains	Monday to Saturday	7	9	3	4	10	13	1500	60
		Sunday	9	9	2	2	11	11		
	SCM (Product Coal)	Monday to Saturday	4	8	1	2	5	10	760	60
		Sunday	4	8	1	2	5	10		
Proposed Modification	SCM & DCM (Product Coal)	Monday to Saturday	3	6	2	4	5	10	Up to 1,300	60
		Sunday	3	6	2	4	5	10		
Approved and Duralie Extension (Year 1)	DCM (ROM Coal)	Monday to Saturday	6	8	0	0	6	8	560	60
		Sunday	0	0	0	0	0	0		
Proposed Duralie Extension (from Year 2)	DCM (ROM Coal)	Monday to Saturday	6	8	2	2	8	10	600	60
		Sunday	0	0	0	0	0	0		
Cumulative Monday to Saturday existing/approved plus Duralie Extension Year 1			22	30	5	7	27	37		
Cumulative Sunday existing/approved plus Duralie Extension (Year 1)			18	22	4	5	22	27		
Cumulative Monday to Saturday existing (non-mine) plus proposed Modification plus Duralie Extension (from Year 2)			21	28	8	11	29	39		
Cumulative Sunday existing (non-mine) plus proposed Modification plus Duralie Extension (from Year 2)			17	20	5	7	22	27		

The calculation of the daytime/evening and night-time equivalent continuous noise levels and the maximum pass-by levels have been conducted using a computer prediction model developed by Heggies. This model has previously been accepted by the DoP and DECCW and has been further validated against the field measurements of rail noise on the North Coast Railway as presented in the Duralie Extension Project Environmental Assessment.

The prediction model uses characteristic noise levels for the various sources (locomotive engine and exhaust noise as a function of throttle notch, wheel/rail noise as a function of train speed, and wagon type, etc.) at a fixed reference distance. The model then makes adjustments for the train length and distance from the track (assuming no barriers) and façade reflection (2.5 dBA).

Parameters including the $L_{Aeq(24hour)}$ and maximum pass-by levels can then be determined by summing the effects of the individual noise sources and by incorporating the number of train events as appropriate.

As noted in **Section 2.3** the existing DCM locomotives would be replaced by GL Class locomotives from Year 2 of the Duralie Extension Project. The GL Class locomotives are the same (or equivalent) in terms of noise in operation at the SCM and are relatively quieter than the existing DCM trains. During Year 1 of the Duralie Extension Project, the existing DCM locomotives would be used during the existing approved hours (ie no movements of DCM trains at night-time). The rail traffic noise assessment presented below presents the noise levels for these two scenarios for the daytime/evening periods.

7.3 Rail Traffic Noise Assessment - ARTC Criteria

The daytime/evening $L_{Aeq(15hour)}$ and maximum (5% exceedance) passby noise levels for the existing and approved rail traffic (DCM Year 1) are presented in **Table 17** together with cumulative trains (DCM Year 2) following the introduction of "GL" class locomotives and the larger SCM product coal trains. Train movements are considered on an average and peak basis.

Table 17 Daytime/Evening Predicted Train Noise Emissions (dBA re 20 µPa)

Distance to Receiver[3]	**Receivers**	**Existing and Approved Rail Movements[1] and Duralie Extension Year 1**			**Cumulative Rail Movements[2] from Duralie Extension Year 2**		
		Average $L_{Aeq(15hour)}$	**Peak $L_{Aeq(15hour)}$**	**Pass-by Maximum**	**Average $L_{Aeq(15hour)}$**	**Peak $L_{Aeq(15hour)}$**	**Pass-by Maximum**
0-20 m	Nil	65	66	96	64	65	93
20-40 m	R1-R3	62	63	90	61	62	87
40-60 m	R4-R12	60	62	85	60	61	83
60-80 m	R13-R33	59	60	83	58	60	81
80-100 m	R34-R35	58	60	81	58	59	79

Note 1: Rail traffic noise from existing passenger/freight trains and approved SCM and DCM coal trains.
Note 2: Rail traffic noise from existing passenger/freight trains, approved SCM coal trains and Duralie Extension Project from Year 2.
Note 3: Train noise level calculated to the maximum distance within the receiver range. Receivers are shown in **Appendix F**.

The following assessments are derived from the predicted rail traffic levels and the ARTC's guideline noise assessment criteria of daytime/evening 65 $L_{Aeq(15hour)}$ and maximum pass-by 85 dBA:

- The existing/approved peak $L_{Aeq(15hour)}$ rail noise for Duralie Extension Project Year 1 is predicted to meet the 65 dBA criterion at a distance of 25 m (and greater).
- From Duralie Extension Project Year 2, the cumulative peak $L_{Aeq(15hour)}$ rail noise would decrease by approximately 1 dBA and meet the daytime 65 dBA criterion at a distance of 20 m (and greater).

- The existing/approved maximum pass-by noise level for Duralie Extension Project Year 1 is predicted to meet the criterion of 85 dBA at a distance of 60 m (and greater). Approximately 12 receivers (R1 to R12 as shown in **Appendix F**) currently exceed the maximum pass-by criterion of 85 dBA as a result of existing/approved rail movements.
- A comparison of the existing/approved maximum pass-by rail noise for Duralie Extension Project Year 1 with the cumulative level (Duralie Extension Project from Year 2) indicates that with the introduction of the "GL" class locomotives for the DCM trains, the maximum pass-by rail noise would decrease and meet the 85 dBA criterion at a distance of 50 m (and greater). Five receivers (R8 to R12 as shown in **Appendix F**) that previously exceeded the 85 dBA maximum pass-by criterion would meet the criterion.

The night-time $L_{Aeq(9hour)}$ and maximum (5% exceedance) pass-by noise levels for the existing and approved rail traffic (Duralie Extension Project Year 1) are presented in **Table 18** together with cumulative trains (Duralie Extension Project Year 2) following the introduction of "GL" class locomotives. Train movements are considered on an average and peak basis. As no DCM trains would operate at night-time during Year 1, this assessment applies from Duralie Extension Project Year 2.

Table 18 Night-time Predicted Train Noise Emissions (dBA re 20 µPa)

Distance to Receiver[3]	**Receivers**	**Existing and Approved Rail Movements[1]**			**Cumulative Rail Movements[2] from Duralie Extension Year 2**		
		Average $L_{Aeq(9hour)}$	**Peak $L_{Aeq(9hour)}$**	**Pass-by Maximum**	**Average $L_{Aeq(9hour)}$**	**Peak $L_{Aeq(9hour)}$**	**Pass-by Maximum**
0-20 m	Nil	60	62	93	62	64	93
20-40 m	R1-R3	58	59	87	59	61	87
40-60 m	R4-R12	56	57	83	58	59	83
60-80 m	R13-R33	55	56	81	57	58	81
80-100 m	R34-R35	54	55	79	56	57	79

Note 1: Rail traffic noise from existing passenger/freight trains and approved SCM coal trains.
Note 2: Rail traffic noise from existing passenger/freight trains, approved SCM coal trains and Duralie Extension Project from Year 2.
Note 3: Train noise level calculated to the maximum distance within the receiver range. Receivers are shown in **Appendix F**.

The following assessments are derived from the predicted rail traffic levels and the ARTC's EPL noise assessment criteria presented in **Table 18**:

- The existing/approved peak $L_{Aeq(9hour)}$ rail noise for Duralie Extension Project Year 1 is predicted to meet the 60 dBA criterion at a distance of 30 m (and greater). Two receivers (R1 and R2 as shown in **Appendix F**) currently exceed the night-time 60 dBA criterion as a result of existing/approved peak rail movements.
- From Duralie Extension Project Year 2, the cumulative peak $L_{Aeq(9hour)}$ rail noise would increase marginally (up to 2 dBA) and meet the night-time 60 dBA criterion at a distance of 50 m (and greater). Five additional receivers (R3 to R7 as shown in **Appendix F**) are predicted to exceed the night-time 60 dBA criterion as a result of cumulative rail movements.
- The existing/approved maximum pass-by rail traffic noise meet the 85 dBA criterion at a distance of 50 m (and greater). Approximately seven receivers (R1 to R7 as shown on in **Appendix F**) currently exceed the maximum pass-by criterion of 85 dBA as a result of existing/approved rail movements. This would remain unchanged for the Modification.

7.4 Rail Traffic Noise Assessment - DECCW Criteria

The $L_{Aeq(24hour)}$ and maximum (5% exceedance) pass-by noise levels for the existing and approved rail traffic are presented in **Table 19** together with together cumulative trains (DCM Year 2) following the introduction of "GL" class locomotives and the larger SCM product coal trains. Train movements are considered on an average and peak basis.

Table 19 24 Hour Predicted Train Noise Emissions (dBA re 20 µPa)

Distance to Receiver[1]	**Receivers**	**Combined Existing/Approved and Project Rail Movements - Duralie Extension Year 1**			**Combined Existing/Approved and Project Rail Movements from Duralie Extension Year 2**		
		Average $L_{Aeq(24hour)}$	**Peak $L_{Aeq(24hour)}$**	**Passby Maximum**	**Average $L_{Aeq(24hour)}$**	**Peak $L_{Aeq(24hour)}$**	**Passby Maximum**
0-20 m	Nil	64	65	96	63	65	93
20-40 m	R1-R3	61	62	90	61	62	87
40-60 m	R4-R12	59	60	85	59	60	83
60-80 m	R13-R33	58	59	83	58	59	81
80-100 m	R34-R35	57	58	81	57	58	79

Note 1: Rail traffic noise from existing passenger/freight trains and approved SCM coal trains.
Note 2: Rail traffic noise from existing passenger/freight trains, approved SCM coal trains and Duralie Extension Project from Year 2.
Note 3: Train noise level calculated to the maximum distance within the receiver range. Receivers are shown in **Appendix F**.

The following assessments are derived from the predicted rail traffic levels and the DECCW's rail noise assessment trigger levels presented in **Table 19**:

- The existing/approved (and Duralie Extension Project Year 1) peak $L_{Aeq(24hour)}$ rail noise is predicted to meet the 60 dBA criterion at a distance of 60 m (and greater). Twelve receivers (R1 to R12 as shown on in **Appendix F**) currently exceed the $L_{Aeq(24hour)}$ 60 dBA criterion as a result of existing/approved peak rail movements.
- From Duralie Extension Project Year 2, the cumulative peak $L_{Aeq(24hour)}$ rail noise would be similar to the existing/approved situation. This is because whilst two additional train pass-bys would be introduced, "GL" class locomotives (or equivalent) would be used which are relatively quieter than the existing DCM trains. In addition, the larger SCM product coal trains do not materially increase the $L_{Aeq(24hour)}$ rail noise.
- The existing/approved (and Duralie Extension Project Year 1) maximum pass-by rail traffic noise would meet the 85 dBA criterion at a distance of 60 m (and greater). Approximately 12 receivers (R1 to R12 as shown in **Appendix F**) currently exceed the maximum pass-by criterion of 85 dBA as a result of existing/approved rail movements.
- From Duralie Extension Project Year 2, maximum pass-by rail traffic noise would exceed the 85 dBA criterion at a distance of 50 m (and greater). Five receivers (R8 to R12 as shown in **Appendix F**) where the maximum pass-by criterion is currently exceeded are predicted to meet the criterion.

8 SUMMARY OF FINDINGS

8.1 Modification Noise Assessment Procedure

In November 2009, GCL (through its other subsidiary DCPL) lodged the Duralie Extension Project Environmental Assessment (DCPL, 2009) to facilitate an increase in ROM coal production rate at the DCM. This additional DCM ROM coal would be railed to the SCM. Additional ROM coal is also proposed from a deeper RWP (additional 1.4 Mt) and BRN pit cutback (additional 1.4 Mt). Additional BRN ROM coal is the subject of a separate modification application lodged in June 2010. These changes would, in-turn, require an increase in the CHPP processing rate at the SCM and would require additional DCM trains to be unloaded on the Stratford rail loop. In order to accommodate this, SCPL proposes a modification of the SCM Development Consent.

Current noise limits (ie Development Consent and EPL) for the SCM/RPE/RWP mining operations were determined from previous noise impact assessments. Each noise impact assessment was conducted in accordance with the requirements of the INP (or applicable criteria at the time of assessment).

8.2 Modification Noise Mitigation

SCPL is obligated under the current Development Consent requirements to implement all reasonable and feasible noise mitigation measures. In addition to the mitigation measures described in **Section 4.1**, Heggies conducted an investigation of feasible and reasonable noise mitigation measures, particularly in relation to night-time operations. A number of iterative steps were undertaken to develop noise mitigation measures for the proposed Modification, including:

1. Preliminary noise modelling of scenarios representative of the maximum noise emissions from the proposed Modification to identify the potential for noise exceedances.
2. Evaluation of various combinations of noise management and mitigation measures to assess their relative effectiveness.
3. Review of the effectiveness of these measures and assessment of their feasibility by SCPL.
4. Adoption by SCPL of a range of noise management and mitigation measures (including low noise equipment and operational controls) to appreciably reduce noise emissions associated with the proposed Modification, including:

Component	Description of Mitigation Measure
Coal Handling and Preparation Plant	Partial enclosure of the ground and first floor levels of the CHPP and acoustic lining of 50% of the interior and commissioned in accordance with an acoustic design specification. Heggies Report 5083-R12 Stratford Coal Mine Coal Crushers and Preparation Plant Noise Impact dated 16 July 1997 presents a detailed assessment of alternative CHPP noise reduction measures involving partial enclosure of the CHPP building. The enclosure would comprise additional 0.47 millimetres (mm) (TCT) Colorbond Profile Steel Iron Cladding on the ground and first floor level excluding the northern façade (ie adjacent to the hardstand area). In addition, to reduce the internal reverberant sound level within the CHPP building, absorptive lining would be applied to 50% of the total internal surface area comprising of 50 mm rockwool sealed in a thin Mylar film and perforated steel sheeting or equivalent treatment (eg QUASH Acoustic Absorber or equivalent).
Stratford Rail Loop	Install two adjacent acoustic barriers approximately 60 m in length, with an elevation of 5 m above rail level and an offset distance no greater than 3 m from the nearest outer rail. The barriers would be located adjacent to the "at rest location" of idling locomotives on the southern (ie inbound) side of the rail loop. The barriers to be constructed from a material with surface density not less 18 kilograms (kg) per square metre (eg CSR Hebel Sound Barrier or equivalent materials).
Coal Handling	Install low noise idlers on conveyors CV18 and CV17 consistent with current (super) low noise conveyor system technology and commissioned in accordance with an acoustic design specification.

Component	Description of Mitigation Measure
Coal Loading and Unloading Stations	Partial enclosure of the eastern and western wings of the coal loader comprising 0.47 millimetres (mm) (TCT) Colorbond Profile Steel Iron Cladding (or equivalent) extending from ground level up to a minimum height of 10m. Similarly, enclosure of the coal unloader comprising iron cladding extending from rail down to ground level

8.3 Modification Construction Noise Impact Assessment

Noise associated with construction of the rail augmentation was undertaken and assessed against the ICNG. Generally, noise levels are well below the corresponding operational noise level predicted for the proposed Modification (with the exception of one privately-owned receiver).

This assessment concluded that noise levels would be within the "highly noise affected" CNML stipulated in the ICNG.

One privately-owned noise received (315 Bagnall) would exceed the "noise affected" CNML. This receiver is located in close proximity to the North Coast Railway, the Bucketts Way and the SCM rail spur and would be in close proximity to rail loop construction activities.

Whilst it is noted that this receiver is located within the "acquisition upon request" condition in the SCM Development Consent (DA 23-98/99), it is recommended that SCPL keeps the owner of the receiver 315 Bagnall informed of the timing and progress of construction activities and provides periods of respite during rockbreaking activities (should it be required).

8.4 Modification Operating Noise Impact Assessment

8.4.1 Cumulative Assessment SCM and BRN

The cumulative Modification operating intrusive noise emissions were predicted via computer modelling using plant and equipment schedules anticipated for use and updated (where available) with recent noise data collated from the SCPL noise monitoring programme and application of SCPL agreed noise mitigation measures. In conclusion:

Daytime

- The cumulative daytime noise levels are expected to meet the relevant noise limits, except at 315 Bagnall (moderate 3 dBA exceedance), 33 Battaglini (minor 1 dBA exceedance) and 13 AGL Energy Limited (minor 1 dBA exceedance).
- Of these receivers, 315 Bagnall and 33 Battaglini are already subject to acquisition upon request clauses in the SCM Development Consent, whilst the noise level at 13 AGL Energy Limited would be elevated by 1 dBA to 38 dBA.

Evening

- The cumulative evening noise levels are expected to meet the relevant noise limits, except at 315 Bagnall (moderate 4 dBA exceedance), 33 Battaglini (moderate 3 dBA exceedance) and 32 McIntosh (minor 2 dBA exceedance).
- Of these receivers, 315 Bagnall and 33 Battaglini are already subject to acquisition upon request clauses in the SCM Development Consent, whilst the noise level at 32 McIntosh would be elevated to 37 dBA.
- These results are considered to be conservative as they include operations at BRN, even though these operations would cease at 1900 hours daily (i.e. BRN operations only occur for one hour of the evening period of 1800 to 2200 hours).

Night-time

- The cumulative night-time noise levels are expected to meet the relevant noise limits, except at 315 Bagnall (moderate 5 dBA exceedance), 32 McIntosh (moderate 3 dBA exceedance), 33 Battaglini (minor 2 dBA exceedance), 36 Wallace (minor 2 dBA exceedance), 25 Thompson (minor 1 dBA exceedance), 291 Stackman & Partridge (minor 1 dBA exceedance), 34 Hall (minor 1 dBA exceedance) and 298 Yates (minor 1 dBA exceedance).
  Of these receivers, 315 Bagnall and 33 Battaglini are already subject to acquisition upon request clauses in the SCM Development Consent. The night-time noise level at 32 McIntosh is elevated to 42 dBA and would constitute an exceedance of the affectation zone criteria in the SCM Development Consent.
- The night-time noise level at 36 Wallace would be elevated by 2 dBA to 37 dBA, whilst the noise levels at 25 Thompson, 291 Stackman & Partridge, 34 Hall and 298 Yates would be elevated by 1 dBA to 36 dBA.

With the implementation of the feasible and reasonable noise mitigation measures proposed by SCPL, it is concluded that predicted noise levels are generally acceptable and would require only minor alterations to the existing consented cumulative SCM noise limits.

8.4.2 BRN Component

A proposed modification to the BRN open cut would result in a minor change to the footprint of the BRN and has been separately assessed by SCPL. Given that the existing fleet would remain generally unchanged, it is considered that there would be minimal change to the existing noise emissions associated with the BRN. Therefore, the BRN modification is considered to be of minimal noise impact.

8.5 Modification Rail Transport Noise Impact Assessment

The average and peak existing, additional and cumulative train movements and associated rail noise levels have been determined for communities neighbouring the North Coast Railway between the DCM and the SCM.

The existing DCM locomotives would be replaced by GL Class locomotives from approximately Year 2 the Duralie Extension Project. The GL Class locomotives are the same (or equivalent) model in operation at the SCM and are relatively quieter than the existing DCM trains and increased in length to accommodate the increased product coal production.

In order to accommodate the increased product coal production rates, longer (72 wagon) product coal trains would be introduced from the forth quarter of 2011 (or earlier, subject to contractual arrangements). This means that the average number of trains per day that would be used to haul product coal from the SCM would remain at an average of 2.5 per day and a peak of 5 per day.

The following assessments are derived from the predicted rail traffic noise levels and the DECCW's rail noise assessment trigger levels (60 dBA $L_{Aeq(24hour)}$ and maximum pass-by 85 dBA):

- The existing/approved (and Duralie Extension Project Year 1) peak $L_{Aeq(24hour)}$ rail noise is predicted to meet the 60 dBA criterion at a distance of 60 m (and greater). Twelve receivers (R1 to R12 as shown on in **Appendix F**) currently exceed the $L_{Aeq(24hour)}$ 60 dBA criterion as a result of existing/approved peak rail movements.
- From Duralie Extension Year 2, the cumulative peak $L_{Aeq(24hour)}$ rail noise would be similar to the existing/approved situation. This is because whilst two additional train pass-bys would be introduced, "GL" class locomotives (or equivalent) would be used which are relatively quieter than the existing DCM trains. The longer SCM product coal trains also do not materially increase the $L_{Aeq(24hour)}$ rail noise.

- The existing/approved (and Duralie Extension Project Year 1) maximum pass-by rail traffic noise would meet the 85 dBA criterion at a distance of 60 m (and greater). Approximately 12 receivers (R1 to R12 as shown in **Appendix F**) currently exceed the maximum pass-by criterion of 85 dBA as a result of existing/approved rail movements.
- From Duralie Extension Year 2, maximum pass-by rail traffic noise would exceed the 85 dBA criterion at a distance of 50 m (and greater). Five receivers (R8 to R12 as shown in **Appendix F**) where the maximum pass-by criterion is currently exceeded are predicted to meet the criterion.

COMPARISON OF THE APPROVED AND MODIFIED PROJECTS

Table A1
Comparison of the Approved and Modified Stratford Coal Mine

Development Component	Approved SCM	SCM Including the Modification
Life of Mine ROM Coal	• Up to approximately 24.15 Mt.	• Additional 1.4 Mt from the Roseville West Pit (i.e. total of approximately 25.55 Mt).
Annual ROM Coal Production Rate	• Up to 2.1 Mtpa.	• Unchanged.
Coal Processing Rate	• CHPP processing of up to 3.4 Mtpa of ROM coal (from SCM, BRNOC and DCM).	• CHPP processing of up to approximately 4.6 Mtpa of ROM coal (from SCM, BRNOC and DCM).
Annual Saleable Coal Production	• Up to 2.3 Mtpa.	• Up to 3.3 Mtpa.
CHPP Rejects	• Deposition within Stratford Main Pit.	• Approximately an additional 8 Mt CHPP rejects to be deposited into Stratford Main Pit.
Waste Emplacement	• Combination of in-pit and out-of-pit waste emplacement.	• Unchanged.
Total Waste Mined	• Approximately 74 million bank cubic metres (Mbcm).	• Additional 8 Mbcm from the Roseville West Pit (total of approximately 82 Mbcm).
Mine Fleet	• Excavators, haul trucks, water trucks, dozers, graders, scrapers, drills. Fleet now reduced due to cessation of mining in the Stratford Main Pit.	• Unchanged.
General Infrastructure	• Access roads, electricity supply and distribution, rail loop, CHPP, train loading and unloading infrastructure, ROM coal stockpiles, coal handling equipment.	• Augmentation of an approximate 400 m section of rail at the Stratford rail loop. All other infrastructure unchanged.
Operational Workforce	• Up to 110 people.	• Unchanged.
Life of Mine	• 17 Years from grant of ML 1360.	• Additional 2 years m**ining and processing** followed by 6 years processing of ROM coal and export of product coal only
Duralie Coal Train	• Hours of operation 7.00 am to 10.00 pm. • Average of three trains per day. • Train length 560 m.	• Hours of operation 7.00 am to 2.00 am[1]. • Average of four trains per day[1]. • Train length 600 m[1].
Product Coal Trains	• 24 hours per day, seven days per week. • Average of 2.5 trains per day (including BRNOC). • Train length 760 m.	• Unchanged. • Unchanged. • Train length up to 1,300 m.
Open Cut Mine Operating Hours	• Roseville West Pit only mined between 7.00 am and 10.00 pm.	• Unchanged.
Water Supply	• Pit inflows and the on-site water management system.	• Unchanged.
Road Transport	• Road traffic associated with the workforce, consumables, visitors and general deliveries and maintenance vehicles.	• Minor increase in truck deliveries (approximately 10 per week increase).

[1] The transportation period would be extended to 2.00 am, the number of trains increased to four on average per day and the train length would be extended to 600 m upon introduction of the GL class locomotives (or equivalent) as described in the Duralie Extension Project EA.

ENVIRONMENT PROTECTION LICENCE NO 5161 - STRATFORD COAL MINE

L6 Noise Limits

L6.1 Noise from the premises must not exceed:

Land Holder	Daytime (7.00 am to 7.00 pm	Evening (7.00 pm to 10.00 pm)
	Stage 1: Cumulative Bowens Road North and Stratford LAeq(15minute)	**Stage 1: Cumulative Bowens Road North and Stratford LAeq(15minute)**
McIntosh	39	39
Atkins	38	35
Tiedeman	38	35
Campbell	37	37
Thompson	36	36
Williams	35	35
Bowen	35	35
Clarke	35	35
Bignell	35	35
Morgan	35	35
Isaac (South)	41	41
Isaac (North)	40	40
Craven Village	40	40
Grono/DBlanch	40	40
Blanch	40	40
Standen/Mulliett	39	39
Stratford Village	38	36
Van Der Drift	38	38
Battaglini	38	38
Lowrey	36	36
All Other Craven Village Residential Properties	40	40
All Other Stratford Village Residential Properties	38	36
All Other Stratford/ Craven Rural Properties	35	35

L6.2 Noise from the premises is to be measured or computed at the most noise-affected point at the property boundary of the receptors listed in L6.1, or a distance within 30 metres of the residence where the boundary is more than 30 metres from the residence of the most affected receiver to determine compliance with this condition.

Noise Measurement:

For the purpose of noise measures required for this condition, the LAeq noise level must be measured or computed for the required period (ie, 15 minutes or full day, evening or night) using "FAST" response on the sound level meter.

For the purpose of the noise limits for this condition, 5 dB (A) must be added to the measured level if the noise is substantially tonal, impulsive, intermittent or low frequency in nature. Where two or more of these characteristics are present the maximum addition to the measured noise level is limited to 10 dB(A).

L6.3 The noise emission limits identified in this licence apply under all meteorological conditions except:

a. during rain and wind speeds (at 10 m height) greater than 3m/s; and
b. under “non-significant weather conditions”.

Note: Field meteorological indicators for non-significant weather conditions are described in the NSW Industrial Noise Policy, Chapter 5 and Appendix E in relation to wind and temperature inversions.

DEVELOPMENT CONSENT (DA NO 23-98/99) - STRATFORD COAL MINE

5.1 AIR QUALITY, BLAST, NOISE AND LIGHT MANAGEMENT

5.1 Acquisition Upon Request

a. Upon receiving a written request for acquisition from the landowner listed in Table 1, the Applicant shall acquire the land in accordance with the procedures in Condition 6.3 of this consent.

90 b - Bagnall	49 - Isaac (s)	68 - Devereaux
58 - Bramley	48 - Isaac (n)	90a - Battaglini
69 - D Blanch	93a - Blanch	24 - Ellis

Table 1: Land subject to acquisition upon request
Note: For more information on the numbering and identification of properties used in this consent, see Appendix 2.

b. By the end of May 2006, the Applicant shall notify the owners of the land listed in Table 1 that they have voluntary acquisition rights.

5.2 Noise and Dust Limits in the Acquisition Zone

While the land listed in Table 1 is privately-owned, the Applicant shall ensure that the noise generated by the development does not exceed the noise limits in Table 2, and the dust emissions generated by the development do not cause additional exceedances of the air quality impact assessment criteria in Tables 7, 8, and 9 at any residence on the land.

Day LAeq(15minute)	**Evening LAeq(15minute)**	**Night LAeq(15minute)**	**Land Number**
37	37	45	90 b - Bagnall
37	36	43	93 a - Blanch
37	36	42	48 - Isaac (north) 49 -Isaac (south) 68 - Devereaux 69 - D Blanch 90 a - Battaglini

Table 2: Noise limits for land in the acquisition zone
Notes:
- If the Applicant has a written agreement with any landowner of the land listed in Table 1, and a copy of this agreement has been forwarded to the Department and the DEC, then the Applicant may exceed the noise limits in Table 2 or the air quality impact assessment criteria in Tables 7, 8, and 9 in accordance with the negotiated noise agreement.
- See notes in Condition 5.3 for more detail on how to interpret these limits.

5.3 Noise Limits

The Applicant shall ensure that the noise generated by the development does not exceed the noise limits set out in Table 3.

Table 3: Noise limits

Day LAeq(15minute)	**Evening LAeq(15minute)**	**Night LAeq(15minute)**	**Land Number**
37	35	40	Craven Village
37	35	40	93 c - Standen 93 - Campbell
37	35	39	95 - Smith 89 - McIntosh
37	35	35	18 - Atkins 13 - Teidman 46 - Wadland
35	35	35	All other privately-owned land excluding the land in Table 1

Notes:

- If the Applicant has a written negotiated noise agreement with any landowner of the land listed in Table 2, and a copy of this agreement has been forwarded to the Department and the DEC, then the Applicant may exceed the noise limits in Table 2 in accordance with the negotiated noise agreement.
- Noise from the development is to be measured at the most affected point or within the residential boundary, or at the most affected point within 30 metres of a dwelling (rural situations) where the dwelling is more than 30 metres from the boundary, to determine compliance with the $L_{Aeq(15\ minute)}$ noise limits in the above table.
- Where it can be demonstrated that direct measurement of noise from the development is impractical, the DEC may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.
- The noise emission limits identified in the above table apply under meteorological conditions of:
  - Wind speeds of up to 3 m/s at 10 metres above ground level; or
  - Temperature inversion conditions of up to 3ºC/100m, and wind speeds of up to 2 m/s at 10 metres above ground level.

5.3A Roseville West Pit Noise Limits

During the commencement of the Roseville West Pit until mining operations are 10 metres below natural ground level, the Day noise limits applicable for:

- Stratford rural residences in Table 3 are increased by 2 dB(A);
- Stratford village residences in Table 3 are increased by 1 dB(A); and
- Issac (south) residence in Table 2 is increased by 1 dB(A).

5.3B Coal Handling Modification Noise Limits

The day noise limit (Table 2) applicable for the Bagnall residence is increased by 2 dB(A), until the construction of the new coal stockpile and coal ROM stacker is complete, or 30 June 2009, whichever is the sooner.

5.4 Noise Acquisition Criteria

If the noise generated by the development exceeds the criteria in Table 4 at any privately-owned land, the Applicant shall, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in Condition 6.3 of this consent.

Day $L_{Aeq(15minute)}$	**Evening $L_{Aeq(15minute)}$**	**Night $L_{Aeq(15minute)}$**	**Land Number**
42	41	40	Craven Village 93 c - Standen 93 - Campbell 95 - Smith 89 - McIntosh 18 - Atkins 13 - Teidman 46 - Wadland
40	41	40	All other privately-owned land excluding the land in Table 1

Table 4: Land acquisition criteria dB(A)
Note: Noise generated by the development is to be measured in accordance with the notes presented below in Table 3.

Additional Noise Mitigation Measures

5.5 Upon receiving a written request from:

- a landowner of the land listed in Table 1; or
- the owner of any residence where noise monitoring shows the noise generated by the development is greater than, or equal to, $L_{Aeq(15\ minute)}$ 38 dB(A) at night.

The Applicant shall implement additional noise mitigation measures (such as double glazing, insulation, and/or air conditioning) at any residence on the land in consultation with the landowner. These additional mitigation measures must be reasonable and feasible. If within 3 months of receiving this request from the landowner, the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Director-General for resolution.

5.5A

Prior to the operation of the new coal stockpile or new coal ROM stacker at the coal handling facility, the Applicant shall fully implement the additional noise mitigation measures described in Section 4.2 of the SEE titled Stratford Coal Mine Coal Handling Modification, dated June 2008.

5.6 Noise Monitoring

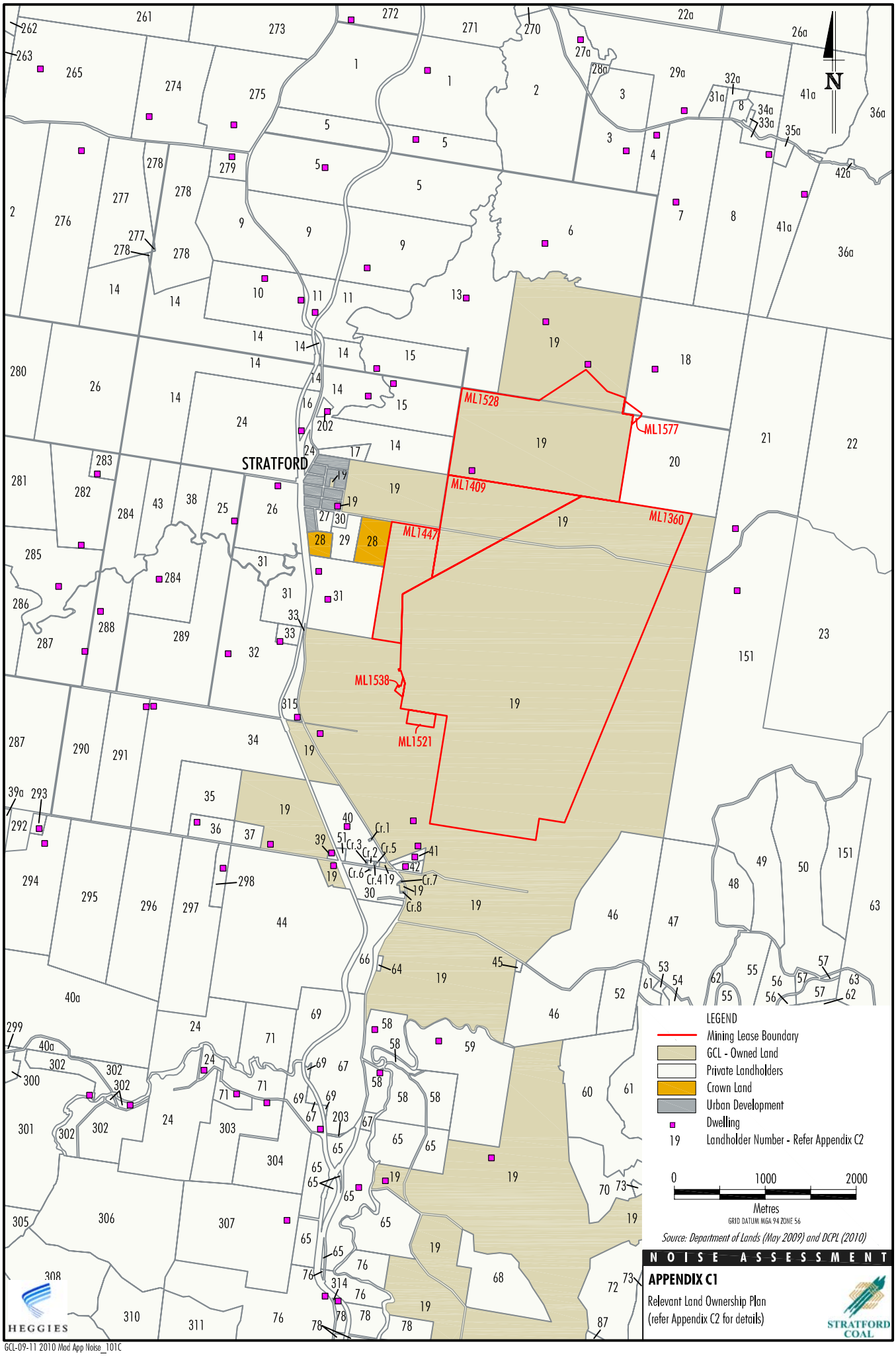
By the end of May 2006, the Applicant shall prepare (and subsequently implement) a Noise Monitoring Program for the Stratford coal mine, including the Bowens Road North operations, to the satisfaction of the Director-General. This program shall include a noise monitoring protocol for evaluating compliance with the noise limits and acquisition criteria in this consent.

5.7 Noise - Continuous Improvement

The Applicant shall:

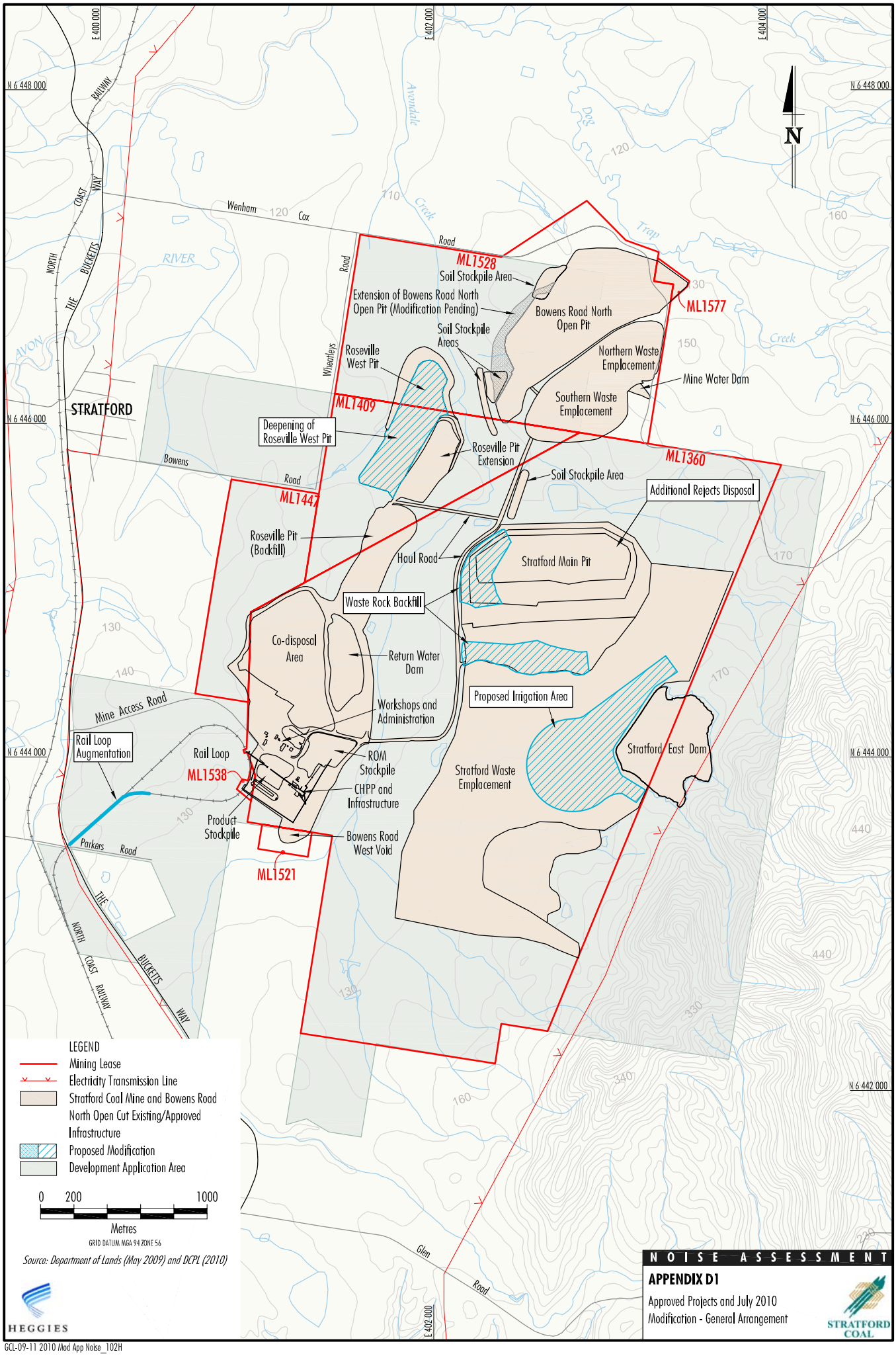
- investigate ways to reduce the noise generated by the development, including maximum noise levels which may result in sleep disturbance;
- investigate ways to transport as much coal as possible during the day and evening;
- implement all reasonable and feasible noise mitigation measures on the site; and
- report on these investigations and the implementation of any new noise mitigation measures on-site in the AEMR,

to the satisfaction of the Director-General.

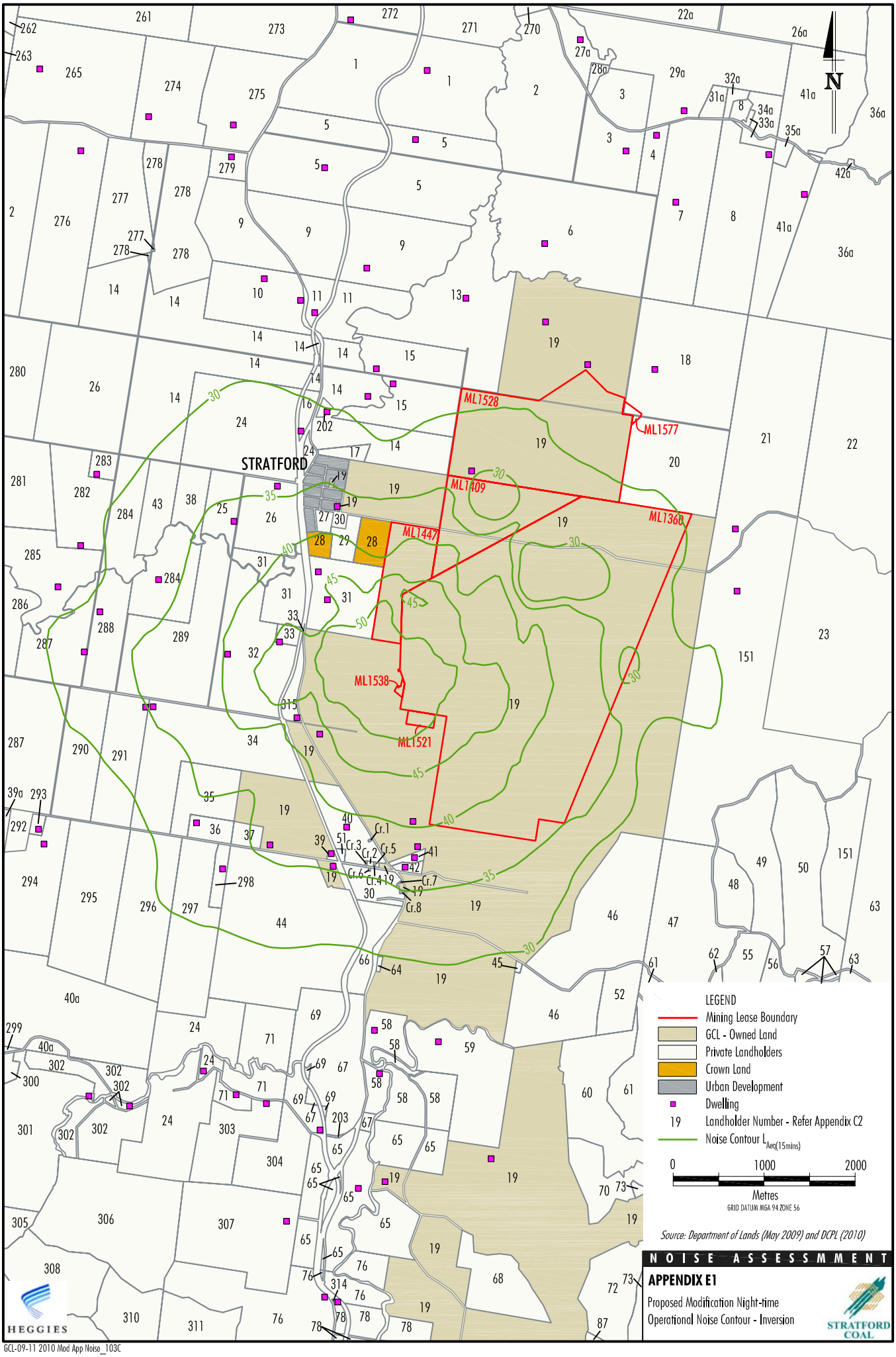

STRATFORD
ML1528
ML1577
ML1409
ML1360
ML1447
ML1538
ML1521
N
LEGEND
Mining Lease Boundary
GCL - Owned Land
Private Landholders
Crown Land
Urban Development
Dwelling
19 Landholder Number - Refer Appendix C2
0
1000
2000
Metres
GRID DATUM MGA 94 ZONE 56
Source: Department of Lands (May 2009) and DCPL (2010)
NOISE ASSESSMENT
APPENDIX C1
Relevant Land Ownership Plan
(refer Appendix C2 for details)
HEGGIES
STRATFORD COAL

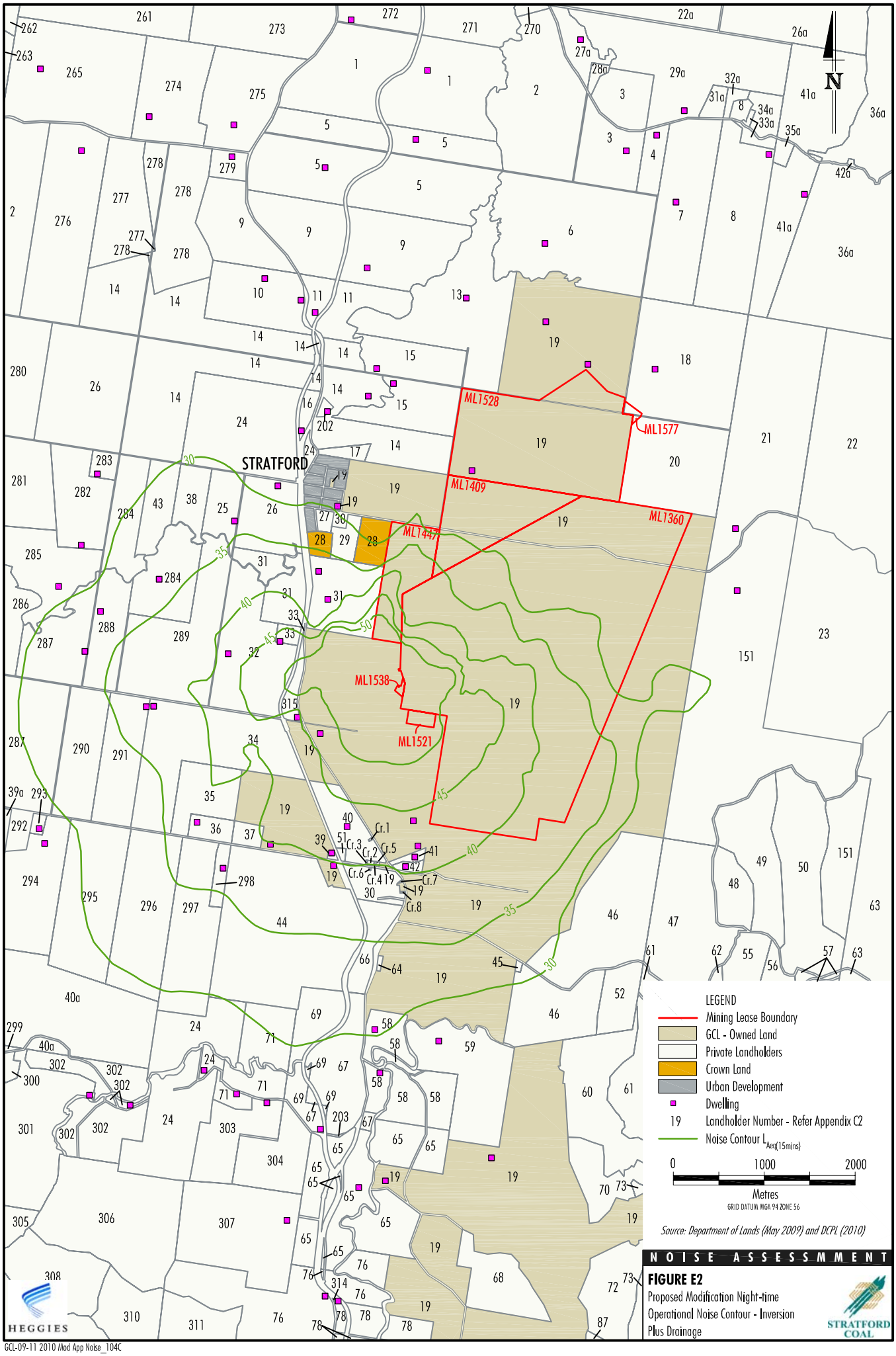
1 Wendy Jane Fraser
2 Farley (Gloucester) Pty. Limited
3 D.J. & D.L. Rosenbaum Pty. Limited
4 Colleen Dawn Crawley & Trevor Allan Crawley
5 Norman Edward Bignell
6 AGL Gloucester Le Pty Ltd& AGL Gloucester MG Pty Ltd
7 Mary Blanche Burrell
8 John Ernest Woodford & Marjorie Annette Woodford
9 Norman John Williams
10 Kenneth James Whatmore & Anne Grace Whatmore
11 Brian Keith Walker, Lesley Jane Walker, Tyson Brian Walker & Lacey Maree Walker
13 AGL Energy Limited
14 Allen James Wenham & Pamela Diane Wenham
15 GS & GL Falla Superannuation Pty Limited
16 Judith Helen Pickett
17 Darren James Fisher & Claire Louise Smith
18 Tanya Louise Denyer
19 Gloucester Coal Ltd
20 Trevor John Ellis
21 Richard Charles Clarke & Carolyn Ann Clarke
22 Michael Burns & Leonie Therese Burns
23 Ross Lewis Bagnall
24 Geoffrey Lawrence Harris
25 Marisa Thompson
26 Kevin John Lowrey & Robyn Lowrey
27 The Council of the Shire of Gloucester
28 Crown Land
29 Edwin Dennis Ward & Rhonda Fay Ward
30 The State of New South Wales
31 Allan Stanley Isaac
32 Eliza Ann Ruth McIntosh & Ronald Keith McIntosh
33 William Joseph Battaglini & Jacklin Maree Battaglini
34 Graham Wesley Hall & Kim Lorraine Hall
35 Leo John Dillon & Isobel Robyn Dillon
36 Graham Lindsay Wallace & Marion Frances Wallace
37 Timothy James Worth
38 Paul Michael Johnson & Judith Anne Johnson
39 Paula Anne Standen
40 Leslie Allenby Blanch
41 Cathryn Louise Devereux
42 Douglas John Blanch
43 Vicki Colleen Moseley
44 Peter Michael Cross & Kylie Jane
45 Megan Jane Ellis
46 Stanley Samuel Ellis
47 David Charles Digges, Carolyn Denise Digges, Timothy Charles Hart & Elizabeth Mary Hart
48 Marion Iris Rounsley
49 Yvonne Carter
50 Neil James Porter
51 Gloucester Printing Services Pty Ltd
52 Christiane Bertolino
55 Allan James Hancock & Lynda Margret Hancock
58 Douglas William Blanch & Evelyn Fay Blanch
59 Guy William Cassar & Cecile Elizabeth Cassar
60 Philip Weston Greenwood
61 Brian John Allman
63 National Parks and Wildlife Service
64 Gloucester Shire Council
65 Noeline Elizabeth Weismantle
66 Lennard Charles Rogerson
67 Ian Robert Bowen
68 Julie Dawn Lyford
69 Ralph Hooper & Bronwyn Ann Bartholmew
70 Robert George Knight
71 Anthony Douglas Burnet & Robyn Annette Burnet
72 Brooke McRae
73 Rodney John Pearce & Anne Jeanette Pearce
76 Garry Bruce Grant & Terry Paul Grant
78 Barry Anthony Eves
87 Pacific Property Investments Ltd
151 Trevor William Wadland & Yvonne Louise Carter
202 Paul Phillip Wenham
203 Samuel Taylor
261 Frank Murray Hooke & Susan Elizabeth Hooke
262 Noel Albert Davis & Elizabeth Therese O'Sullivan
263 Patrick Michael Ryan
265 Hans Joran Stenstrom & Janete Stenhouse Stenstrom
270 Jason David Collins & Michelle Isobel Barrett
271 William Alexander Tomb
272 Allen Taylor & Company Limited
273 Baker Place Investments Pty Limited & Dr PW Brady Pty Limited
274 Warren Neil Wilson & Colleen Therese Wilson
275 Pace Farm Pty Limited
276 Alan Luscombe & Carol Luscombe
277 John William Farley
278 Mark Anthony Campbell & Roseleen Linette Campbell
279 John Donald Cullum & Rachel Anne Cullum
280 Clifford John Bramley & Terri Louise Bramley
281 Colin William Lewis & Lesley Ann Lewis
282 Peter Stephen Ross
283 Janet Nolan
284 Alec Gregory Perrin & Noreen Nita Jean Perrin
285 Marshall Leon Carter & Theresa Kathleen Carter
286 Gerard Roland Burley
287 Dorothy Kay Sinderberry & Carole Martha Rinkin
288 Alec Gregory Perrin
289 Eliza Ann Ruth Mcintosh
290 Anne Frances Ryan & Darcy Tordoff
291 Angela Lee Stackman & Mark Richard Partridge
292 James Reginald Fisher & Rhonda Patricia Fisher
293 Kerry Elizabeth Braunton
294 Gregory Vincent Morcom & Karen Morcom
295 William John Bush & Danielle Elizabeth Bush
296 Peter Geoffrey Watson & Heather Irene Watson
297 William Marten Bosma
298 Eric Allan Yates
299 Malcolm Ronald Lee
300 Bevan Douglas Hokin & Di Hokin
301 Folio Identifier Pty Limited
302 Edwin John Walton & Wendy Walton
303 JSTC Newcastle Pty Limited
304 Ernie Danzil Abeysekera & Sharee Ann Abeysekera
305 Lymaran Holdings Pty Limited
306 Gregory Hunt & Catherine Hunt
307 Graham John Wolfenden & Rosalind Mary Wolfenden
308 Pierre Marcel Simon Louys & Marie Therese Chantal Louys
310 Toni Unthank & Danny Francis Unthank
311 Paul Berthold & Carolyn Berthold
314 Dataphone Pty Ltd
315 Kenneth Bruce Bagnall
22a R. O. Sansom & Son Pty. Limited
26a Edward John Mckinley & Shirley June Mckinley
27a Douglas Robert Maclean & Janette Ann Maclean
28a Peter Stuart Jackson & Beverley Clair Jackson
29a Mckinleys Lane Pty Limited
31a Terence William Cox & Valerie Rita Cox
32a John Edward Malcom-Coe & Emilia Malcolm-Coe
33a Anthony George Langmead & Elizabeth Anne Langmead
34a Bernard Philip Tresidder
35a Gary Raymond Perkins & Elly Perkins
36a Anthony Stanford Berecry
39a Woods Road Pty Ltd
40a Howard Kerr Williams & Margaret Russell Williams
41a Gary Ronald Ferris & Kathleen Grace Ferris
42a William Rainsford Ribbons
Cr.1 William Deane Wood
Cr.2 Patricia May Black
Cr.3 Yvonne Frances Holden
Cr.4 Susan Frances Hoppe
Cr.5 John Bruce Punchard & Kerry Lewise Green
Cr.6 Rodger Malcolm Boorer
Cr.7 David Robert Pryce-Jones
Cr.8 Douglas John Blanch& Gwenyth Alison Mcnair

Source: Department of Lands(2010) and DCPL (2010) as at 9-3-10

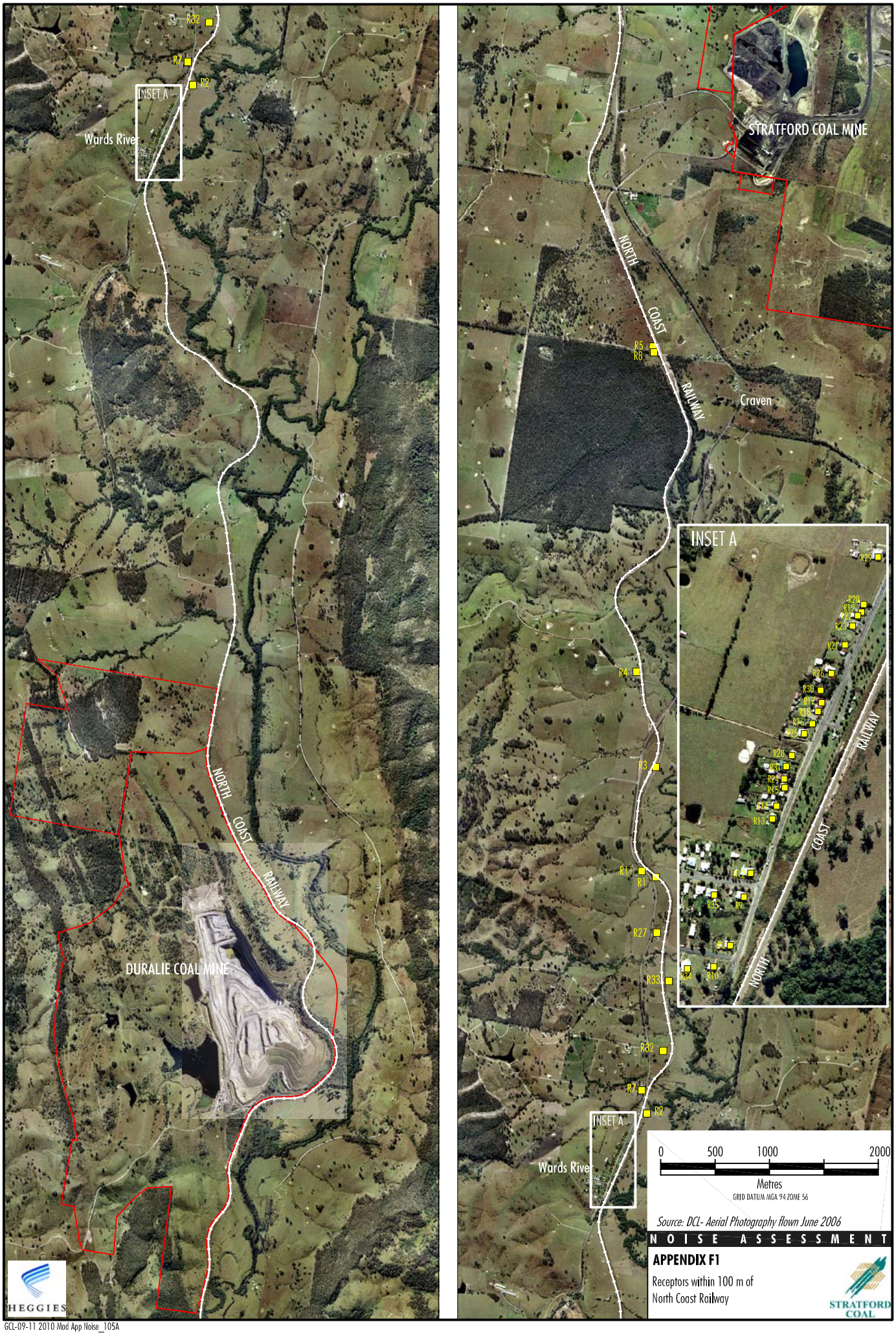


GCL-09-11 2010 Mod App Noise_102H


STRATFORD
ML1528
ML1577
ML1409
ML1360
ML1447
ML1538
ML1521
N
LEGEND
Mining Lease Boundary
GCL - Owned Land
Private Landholders
Crown Land
Urban Development
Dwelling
19 Landholder Number - Refer Appendix C2
Noise Contour $L_{Aeq(15mins)}$
0
1000
2000
Metres
GRID DATUM MGA 94 ZONE 56
Source: Department of Lands (May 2009) and DCPL (2010)
NOISE ASSESSMENT
APPENDIX E1
Proposed Modification Night-time
Operational Noise Contour - Inversion
HEGGIES
STRATFORD COAL



GCL-09-11 2010 Mod App Noise_104C


R32
R7
R2
INSET A
Wards River
DURALIE COAL MINE
NORTH COAST RAILWAY
STRATFORD COAL MINE
R5
R8
Craven
R4
R3
R11
R1
R27
R33
R32
R7
R2
INSET A
Wards River
INSET A
R29
R24
R23
R21
R22
R30
R17
R18
R14
R19
R28
R16
R20
R15
R12
R13
R35
R9
R34
R10
RAILWAY
COAST
NORTH
0
500
1000
2000
Metres
GRID DATUM MGA 94 ZONE 56
Source: DCL- Aerial Photography flown June 2006
HEGGIES
NOISE ASSESSMENT
APPENDIX F1
Receptors within 100 m of North Coast Railway
STRATFORD COAL

APPENDIX B

AIR QUALITY ASSESSMENT

17 June 2010

Tony Dwyer
Manager – Approvals and Environment
Stratford Coal Pty Ltd
PO Box 168
GLOUCESTER NSW 2422

STRATFORD COAL MINE MODIFICATION – AIR QUALITY IMPACT ASSESSMENT

Dear Tony,

Please find below our assessment of the potential air quality impacts of the proposed modification to the Stratford Coal Mine (SCM).

1 INTRODUCTION

The SCM is an existing open cut coal mining operation owned and operated by Stratford Coal Pty Ltd (SCPL) a subsidiary of Gloucester Coal Ltd (GCL). The SCM is located approximately 100 kilometres (km) north of Newcastle, New South Wales (NSW). SCPL is seeking approval for a modification to the SCM Development Consent (DA 23-98/99) under Section 75W of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) (the proposed modification).

An additional 1.4 million tonnes (Mt) of run-of-mine (ROM) coal production is proposed at the SCM from a deepened Roseville West Pit (**Figure 1.1**).

In November 2009, GCL (through its other subsidiary Duralie Coal Pty Ltd [DCPL]) lodged the Duralie Extension Project Environmental Assessment (DCPL, 2009) to facilitate an increase in ROM coal production rate at the Duralie Coal Mine (DCM). This additional Duralie Extension Project ROM coal would be railed to the SCM and processed at the SCM coal handling and preparation plant (CHPP) necessitating a change to the SCM CHPP processing rate.

The BRNOC (also owned and operated by SCPL) is located to the immediate north of the SCM (Figure 1.1). An additional 1.4 Mt of BRNOC ROM coal would be processed at the SCM CHPP and would result in an increase in the amount of rejects disposed at the SCM. The extension to the BRNOC is the subject of a separate modification application lodged by SCPL in June 2010 (herein referred to as the June 2010 BRNOC modification).

Potential cumulative air quality impacts from the simultaneous operation of the SCM, BRNOC and the Duralie Extension Project are considered in this report.

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BRISBANE

GOLD COAST

TOOWOOMBA

A PEL COMPANY

Queensland Environment Pty Ltd
Trading as PAEHolmes
ABN: 86 127 101 642

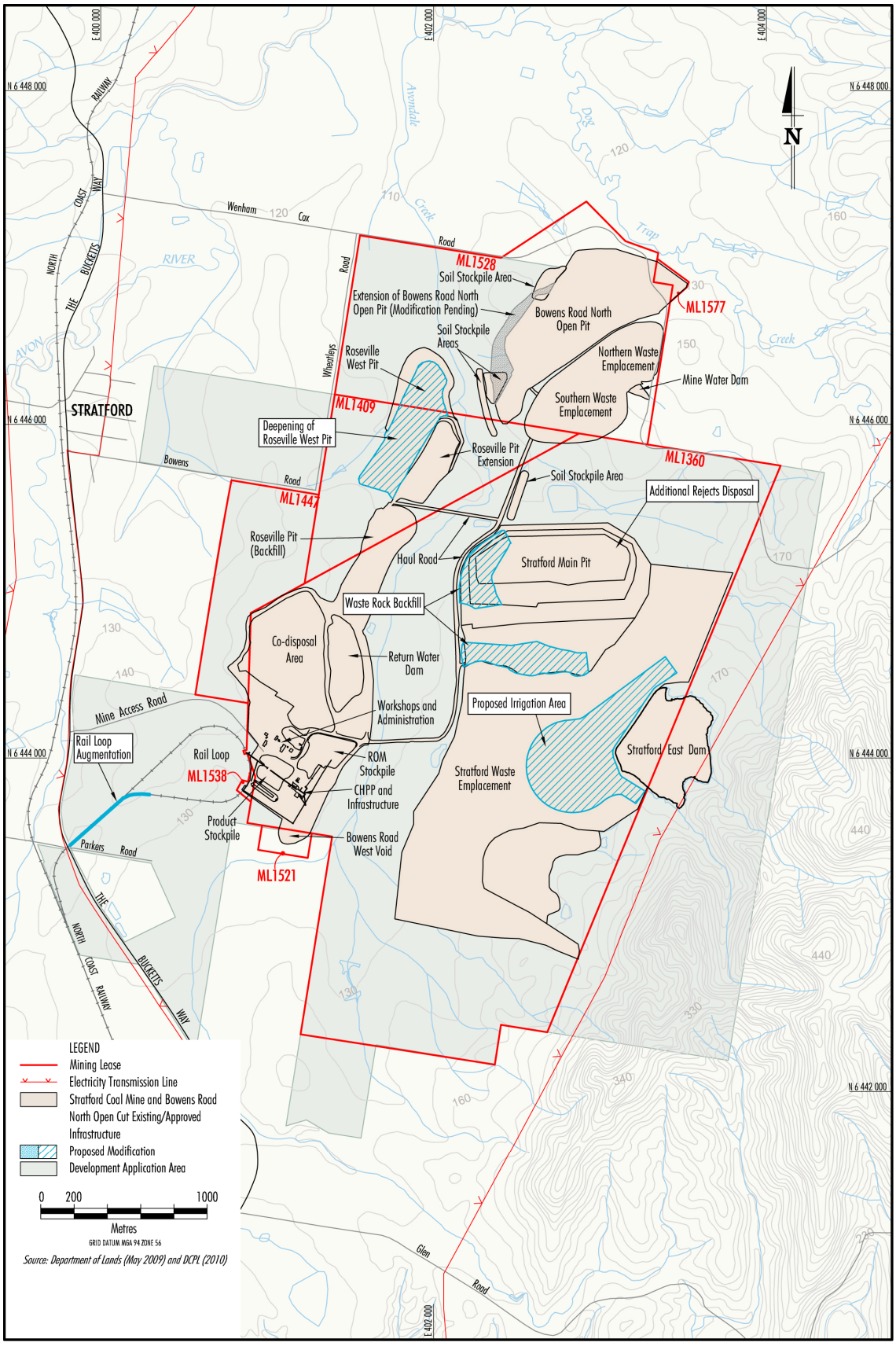

Figure 1.1: Approved SCM and Proposed Modification

1.1 Previous Air Quality Assessments

An air quality assessment for the SCM was prepared in 1994 (**P. Zib & Associates, 1994**) and assessed emissions from mining the SCM Main Pit. The assessment concluded that the SCM would operate within applicable guideline values.

In 2001, Holmes Air Sciences (HAS) (now PAEHolmes) prepared an air quality impact assessment which assessed emissions from mining in the BRNOC cumulatively with emissions from the SCM Main Pit (**HAS, 2001**). This assessment concluded that no residences were predicted to experience annual average dust deposition or total suspended particulate (TSP) levels above the applicable assessment criteria. It was predicted that compliance with the short-term particulate matter less than 10 microns (PM_{10}) criterion of 50 micrograms per cubic metre ($\mu g/m^3$) would be achieved with the implementation of air quality management measures.

HAS conducted an air quality assessment for the Roseville West Pit modification, which included the addition of a small satellite pit adjacent to the existing Roseville Pit Extension **(HAS, 2006**). The assessment indicated that the Roseville West Pit modification would comply with contemporary NSW Department of Environment, Climate Change and Water (DECCW) assessment criteria and would not significantly increase the cumulative emissions from the SCM and BRNOC. Finally, in 2008 an air quality assessment was conducted for minor modifications to the SCM, including an additional ROM coal conveyor, stacker and storage area and a product coal stockpile extension. The assessment concluded that the modifications were minor and would not increase the cumulative air quality emissions of the SCM and the BRNOC (**HAS, 2008**).

2 OVERVIEW OF MODIFICATION

A summary of the proposed modifications to the SCM is provided below:

- an increase in the annual CHPP coal processing rate from approximately 3.4 Mtpa up to approximately 4.6 Mtpa;
- a deepening of the Roseville West pit to facilitate access to an additional 1.4 Mt of ROM coal with an associated additional 8 million bulk cubic metres of waste rock to be mined and backfilled within the Roseville and Stratford Main Pits;
- an increase in the volume of CHPP rejects to be deposited in the Stratford Main Pit void;
- an increase in the number of DCM trains unloaded on the SCM rail loop (i.e. increase of three to four, on average);
- alteration to the DCM train unloading times at the SCM;
- an increase in the amount of product coal transported via rail from the SCM from 2.3 Mtpa to 3.3 Mtpa, to be accommodated by the use of longer product coal trains;
- augmentation of the SCM rail loop with an additional 400 metre section of track immediately adjacent to the current track (**Figure 1.1**); and
- irrigation of water from the Stratford East Dam on a portion of the rehabilitated Stratford Waste Emplacement (**Figure 1.1**).

The existing approved production rate of ROM coal from the SCM of approximately 2.1 Mtpa and supporting infrastructure at the SCM would remain unchanged. Reprocessing of rejects from the co-disposal area (**Figure 1.1**) would also continue. Waste rock would be used as backfill of the Stratford Main Pit.

No upgrades to the existing CHPP or general coal handling and stockpiling systems would be required.

3 OVERVIEW OF EXISTING ENVIRONMENT

3.1 Dispersion Meteorology

Meteorological data collected at the SCM meteorological station (**Figure 3.1**) for 2009 have been analysed and annual and seasonal wind roses for the area are presented in **Figure 3.2**. On an annual basis, the most common winds are from the northeast quadrant. This is a reflection of the local topography, with the alignment of the valley along the northeast – southwest axis. This wind pattern is strongly reflected in summer and spring while autumn shows winds from all directions and winter has a dominant southeast flow.

3.2 Ambient Air Quality

Ambient air quality monitoring at the SCM and BRNOC is conducted in accordance with the *Air Quality Management Plan* (**SCPL, 2007a**). The monitoring network consists of seven dust deposition gauges and four high volume air samplers (HVAS), measuring PM_{10} (**Figure 3.1**).

3.2.1 Dust Deposition

The results of dust deposition monitoring conducted between 2001 and 2009 are presented in **Table 3.1**. Monitoring results indicate that annual average dust deposition in the vicinity of the SCM is within the DECCW criterion (i.e. 4 grams per square metre per month [g/m^2/month]).

Table 3.1: Annual Average Dust Deposition (g/m^2/month) Monitoring Results

Year	D5	D6	D7	D8	D9	D10	D11	DECCW Criterion
2001	0.5	0.6	0.8[1]	3.2	1.0	3.7	-	4
2002	1.2	1.1	0.7	2.5	1.8	3.0	-	4
2003	1.0	0.7	1.2	1.2	1.8	-	1.1	4
2004	0.5	0.6	0.5	1.0	1.2	1.4[1]	1.1	4
2005	0.7	0.6	1.4	0.8	0.8	0.6	1.0	4
2006	0.5	0.6	1.1	0.6	0.6	0.5	1.2	4
2007	0.4	0.5	1.1	0.8	0.4	0.5	1.0	4
2008	0.3	0.2	0.4	0.2	0.3	0.2	0.3	4
2009	0.2	0.2	0.3	0.2	0.2	0.3	0.3	4
Average	**0.6**	**0.6**	**0.8**	**1.2**	**0.9**	**1.3**	**0.9**	4

[1] Excluding results contaminated by bird droppings, insects and plant material.

The annual average dust deposition data presented in **Figure 3.3** also indicates a general downward trend from 2001 to 2009, with recent monitoring results (2008 and 2009) being less than 0.5 g/m^2/month at all sites. The results clearly indicate that the current SCPL operations are not resulting in nuisance dust impacts at any area surrounding the SCM and the BRNOC. The monitoring data also correlates well with modelling predictions made in **HAS** (**2001**).

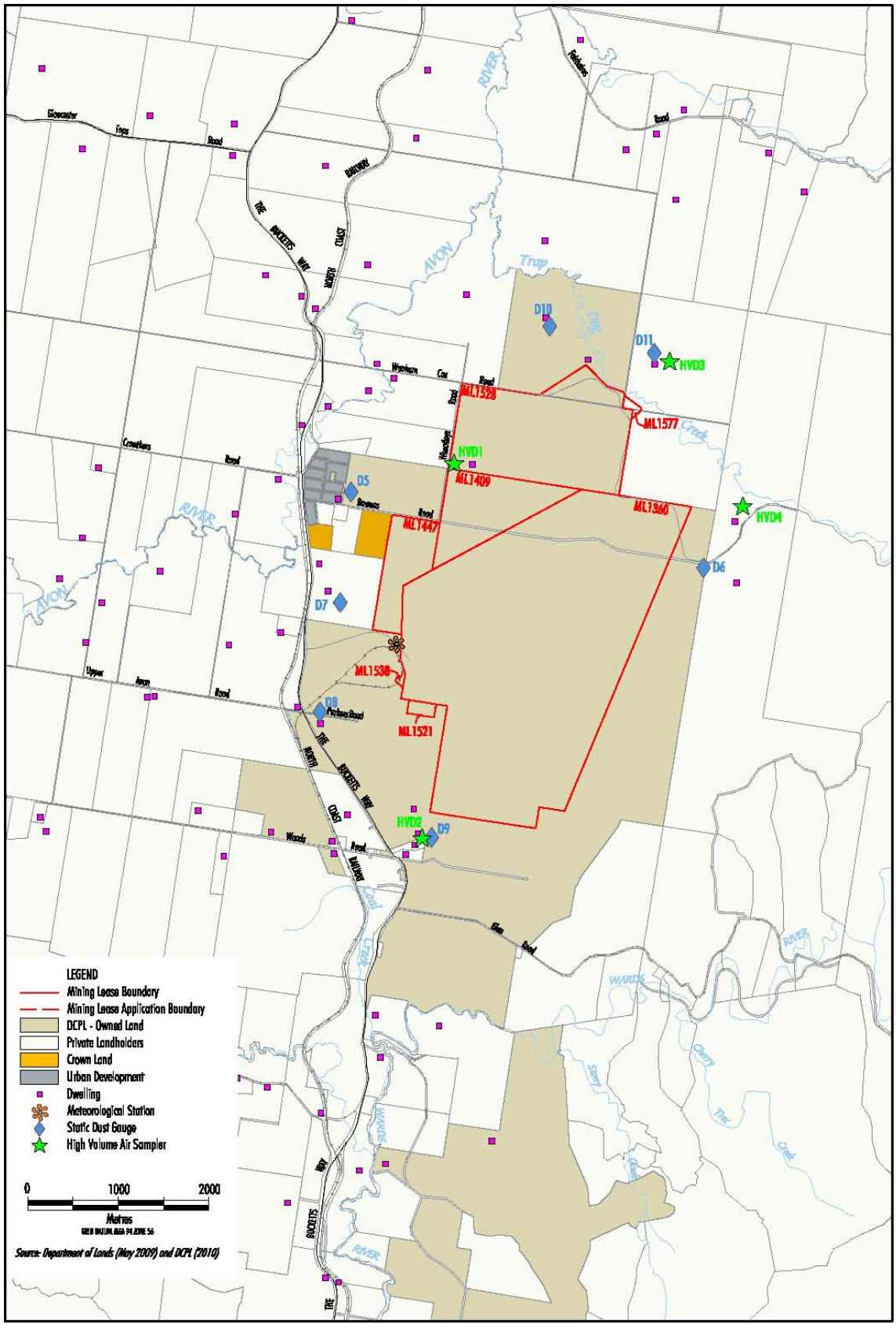

Figure 3.1: Location of Air Quality Monitoring Sites

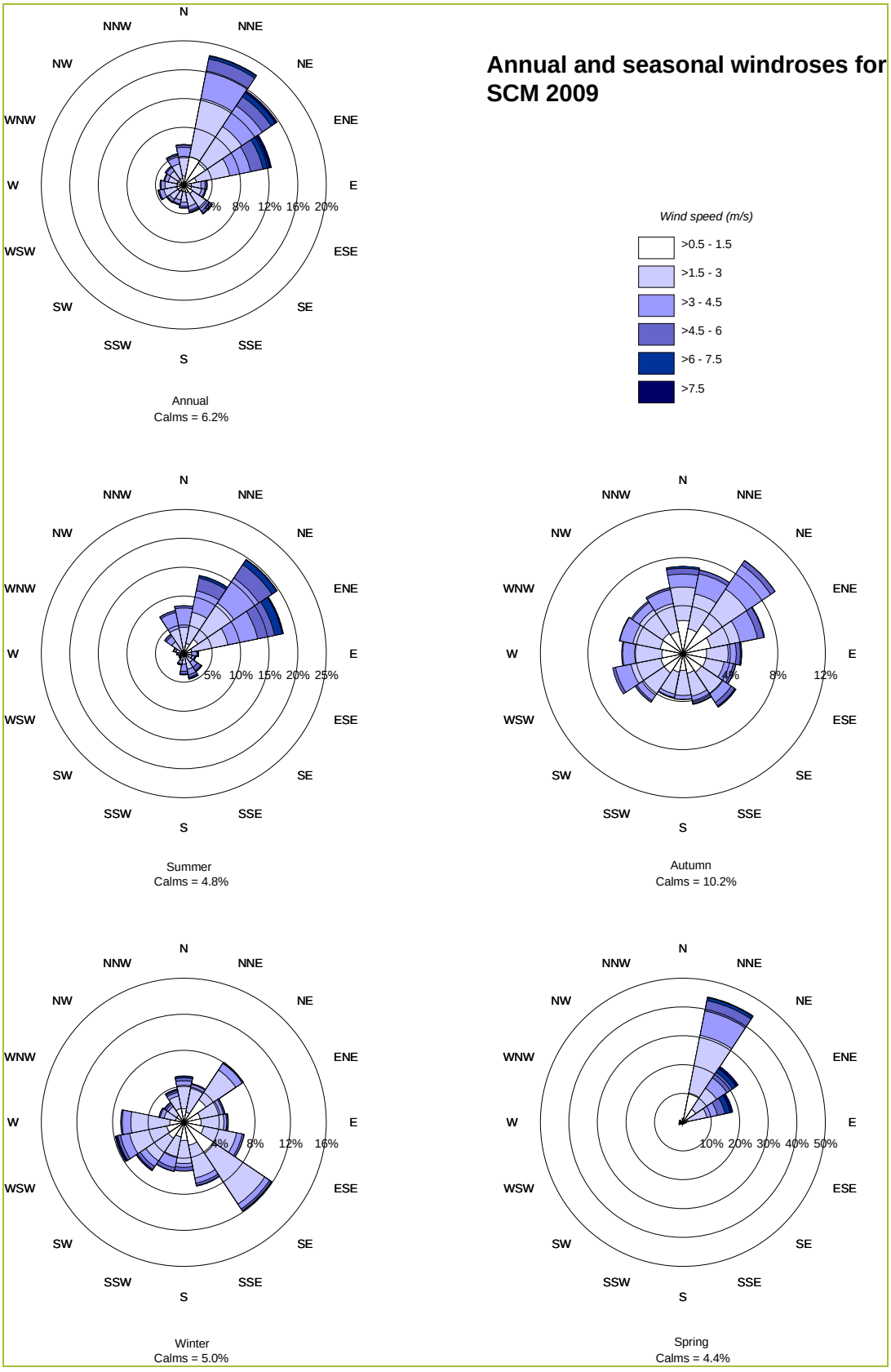

Figure 3.2: Wind Roses for SCM – 2009

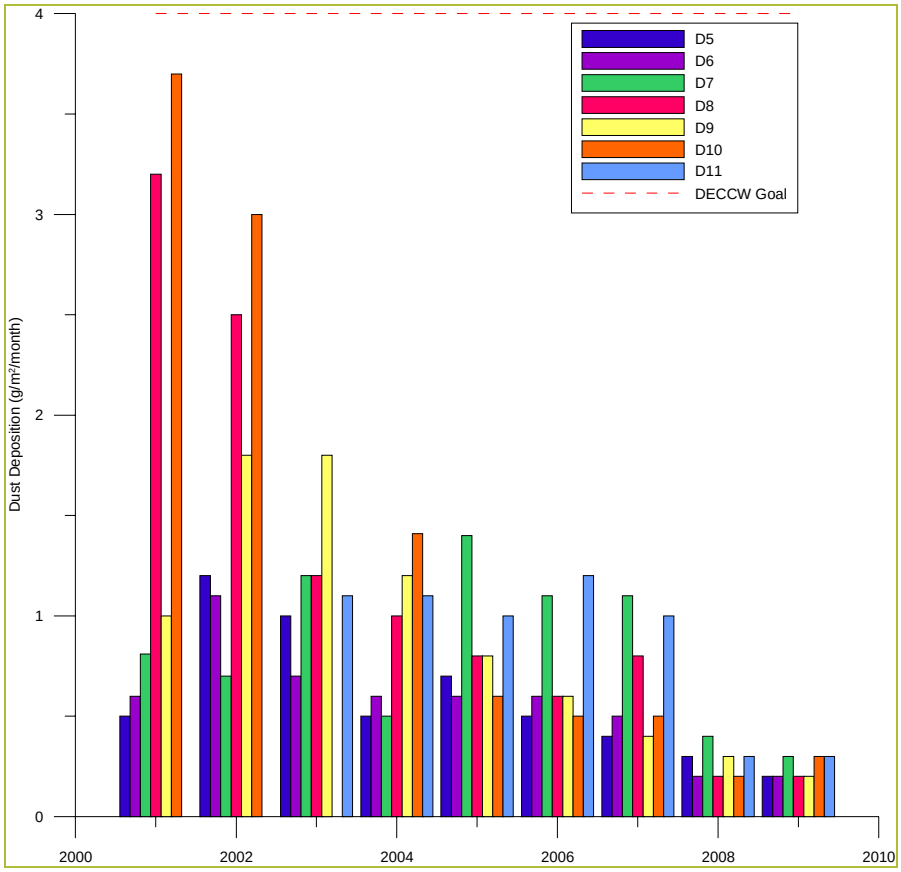

Figure 3.3: Annual Average Dust Deposition

3.2.2 Annual Average PM_{10}

A measurement of the 24-hour average PM_{10} concentration is made every sixth day at four locations (**Figure 3.1**). Annual average PM_{10} concentrations recorded at each site from May 2001 to December 2009 are shown in **Table 3.2** and on **Figure 3.4**.

Table 3.2: Annual Average PM_{10} Concentration (µg/m^3) Monitoring Results

Year	HVD1 (Stratford)	HVD2 (Craven)	HVD3 (Ellis)	HVD4 (Clarke)	DECCW Criterion
2001	7.3	9.3	-	-	30
2002	11.6	14.6	-	-	30
2003	11.6	12.2	14.6	12.3	30
2004	10.6	10.6	13.2	9.9	30
2005	13.0	10.7	15.4	8.8	30
2006	8.4	8.4	12.1	6.1	30
2007	10.3	10.7	15.3	8.9	30
2008	10.6	10.5	12.2	8.3	30
2009	12.9	14.4	15.6	11.5	30
Average	**10.7**	**11.3**	**14.1**	**9.4**	30

All results are low and demonstrate compliance with the DECCW annual average PM_{10} criterion (i.e. 30 µg/m^3) by a significant margin.

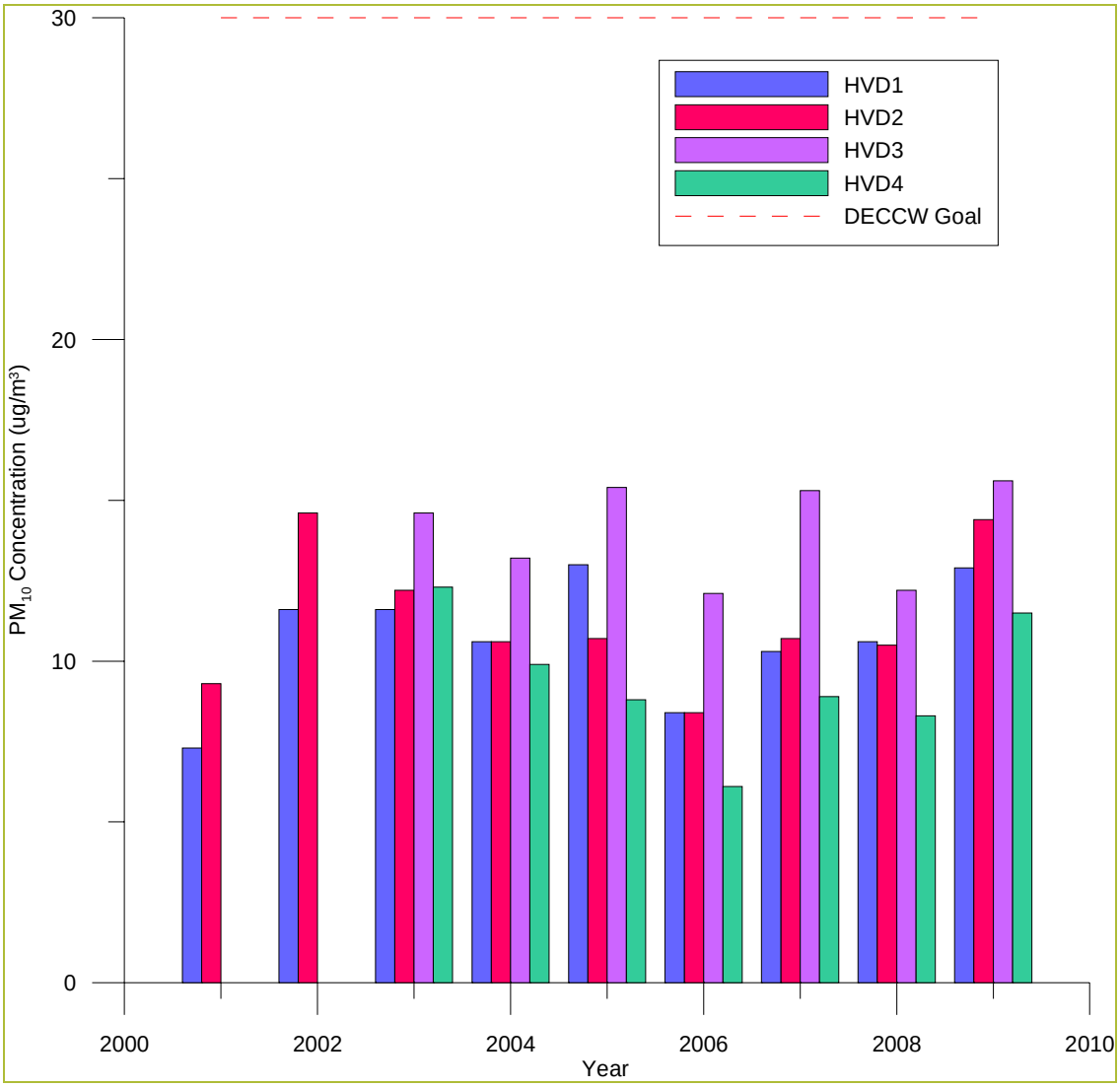

Figure 3.4: Annual Average PM_{10} Concentrations

The highest recorded concentrations are at the HVD3, which is the located closest to the BRNOC, although upwind of the 2009 annual prevailing wind direction (**Section 3.1**). The lowest recorded concentrations are at the HVD4 which is located to the east of the 2009 annual prevailing wind direction (i.e. is not downwind of the SCM and BRNOC). Based on the prevailing wind direction, HVD3 and HVD4 are located where relatively less of the dust generated at the SCM and the BRNOC would be expected, when compared with the HVD1 (which is closer to the active Roseville West Pit) or the HVD2 (which is typically downwind of the SCM and the BRNOC).

As HVD3 and HVD4 are not located downwind of the prevailing wind direction, they may not be heavily influenced by SCPL activities and therefore could potentially be considered representative of background concentrations of PM_{10}. Based on this and the low results obtained at the two HVAS located downwind of the prevailing wind direction, there is no clear indication of significant PM_{10} contributions from the SCPL mining activities in the data. The incremental increase in annual average PM_{10} concentrations, resulting from current operations at the SCM and BRNOC, is therefore likely to be minor. This monitoring data also correlates well with modelling predictions made in **HAS** (**2001**).

3.2.3 24-Hour PM_{10}

There has been nine days since May 2001 when the 24 hour PM_{10} concentrations were above the DECCW 24 hour PM10 criterion (i.e. 50 µg/m^3). These exceedances were attributed to agricultural activities, fires or regional dust storm events, not SCPL mining operations (**SCPL, 2007b, 2008** and **2009**).

A plot of the 24-hour PM_{10} concentrations are shown in **Figure 3.5**. The data indicates that the majority (70% to 90%) of the recorded concentrations are less than 20 µg/m^3 across all sites with just a small number of higher concentrations occurring across this monitoring period.

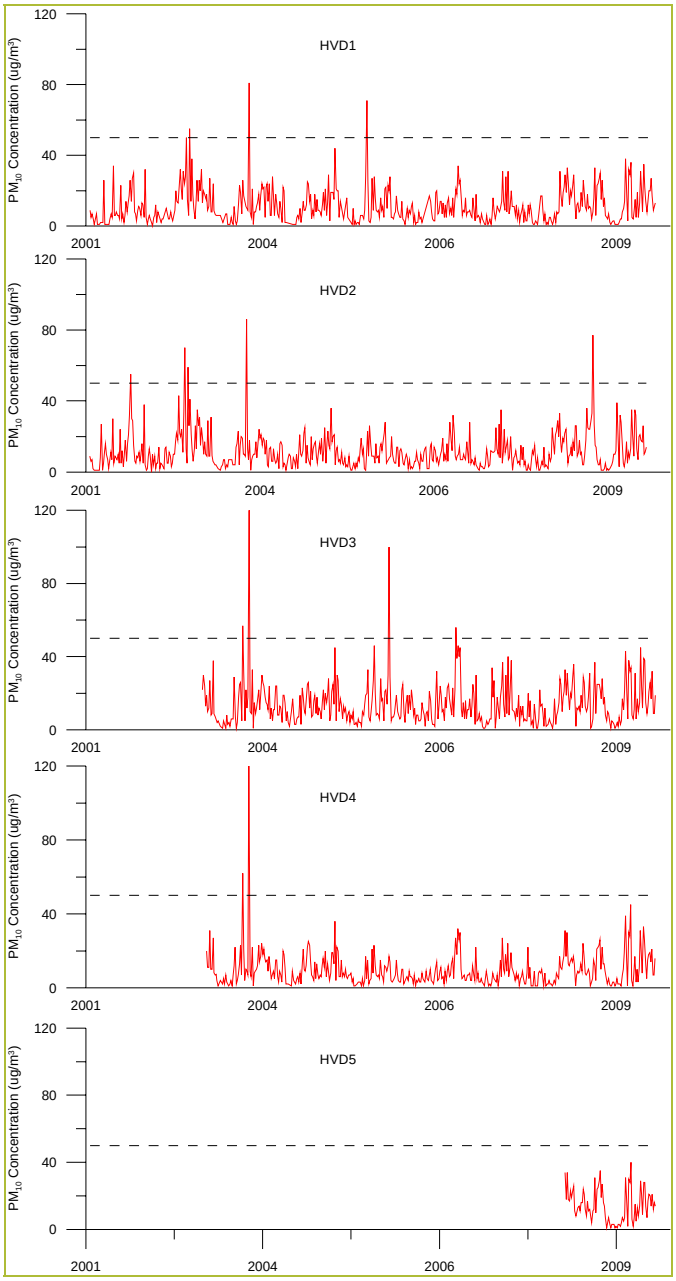

Figure 3.5: 24-hour Average PM_{10} Concentrations

4 IMPACT ASSESSMENT

4.1 Mining Operations

The proposed maximum cumulative ROM coal and waste rock annual production rates (i.e. including the June 2010 BRNOC modification) are significantly less than what has been assessed previously in **HAS** (**2001**). The production schedule for the proposed modification and the June 2010 BRNOC modification is shown in **Table 4.1**.

Table 4.1: Indicative Production Schedule

Year	Roseville West Pit		Co-Disposal Area Reject Re-Processing		BRNOC[1]	
	ROM (Mt)	Waste (Mbcm)	ROM (Mt)	Waste (Mbcm)	ROM (Mt)	Waste (Mbcm)
2010-2011	0.5	2.8	0.2	0	1.0	1.9
2011-2012	0.5	3.9	0.2	0	1.0	1.8
2012-2013	0.4	1.4	0.1	0	0.7	0.6

Source: SCPL (2010).

[1] Subject to a separate approval under Section 96(2) of the EP&A Act.

As described in **Section 1.1**, a quantitative air quality impact assessment (emission estimates and modelling) was conducted for the SCM by **HAS** (**2001**) and included mining operations in the SCM Main Pit and the BRNOC. Since this time mining operations in the SCM Main Pit have ceased and the nearby Roseville West Pit is now operational, albeit at a lower rate of coal production. Predictions made in **HAS** (**2001**) assessment can be used to assess the potential cumulative impacts resulting from the proposed modification and the June 2010 BRNOC modification, on the basis that if SCPL complied with relevant air quality criteria while operating the SCM Main Pit and the BRNOC at a significantly higher production rate, then compliance would also be likely for the proposed modification and the June 2010 BRNOC modification (with the continued implementation of management measures). **Table 4.2** shows the maximum annual mining rates previously modelled in the **HAS** (**2001**) assessment and for the proposed modification and the June 2010 BRNOC modification.

Table 4.2: Maximum Mining Rates for Proposed Modification and HAS (2001) Assessment

Activity	HAS (2001) (SCM Main Pit plus BRNOC)	Proposed Modification and the June 2010 BRNOC Modification[1] (Roseville Pit, Co-Disposal Area Reject Re-Processing and BRNOC)	% Change
ROM Coal Production (Mtpa)	2.3	1.7	-26%
Waste Rock Production (Mbcm/year)	11.5	5.7	-50%

[1] Subject to a separate approval under Section 96(2) of the EP&A Act.

The maximum cumulative annual ROM coal and waste rock mining rates for the proposed modification and the June 2010 BRNOC modification are approximately 26% and 50% (respectively) less than those assessed in **HAS** (**2001**). The emissions of TSP associated with these dust sources would therefore be expected to be reduced by a similar amount. The proposed modification would include the haulage of waste rock from the Roseville West Pit to the SCM Main Pit (approximately 2 km) which is a similar haul distance to that assessed in the **HAS** (**2001**) (i.e. the haul distance from the SCM Main Pit to the Stratford Waste Emplacement).

Dust emission estimates and modelling is not considered to be warranted for the simultaneous operation of the Roseville West Pit and the BRNOC for this assessment, on the basis that the cumulative maximum annual mining rate would not exceed the maximum annual mining rate assessed in **HAS** (**2001**) which predicted that no residences would experience exceedances of relevant air quality criteria (**Section 1.1**). In addition, monitoring data collected to date supports the **HAS** (**2001**) predictions (**Section 3.2**).

While there would be a significant reduction in the dust emissions generated due to mining, the proposed modification would result in minor increases in dust emissions from activities at the CHPP, primarily as a result of an increase in the rate of coal handling. Dust emissions (TSP) from coal processing have been estimated based on the proposed CHPP processing rate of 4.6 Mtpa, which includes coal from the SCM, BRNOC and the Duralie Extension Project, and are presented in **Table 4.3**. The emissions estimation techniques used are consistent with those presented in **HAS** (**2001**).

Table 4.3: Emissions Estimates for CHPP

Activity	Existing TSP (kg/annum)	Modified TSP (kg/annum)
Coal Processing (Total)	6,997	9,467
Loading Trains (Total)	676	970
DCM Train Unloading	450	1,395
Total	**8,123**	**11,832**

The total emissions from coal processing as a result of the proposed modification would result in a marginal increase in total annual SCM TSP emissions. For example, TSP emissions of 11,832 kilograms per annum (kg/annum) from the CHPP is less than 1% of the total estimated emissions from the operation of the SCM and the BRNOC (1,640,238 kg/annum – **HAS [2001]**). Based on the above, the expected increase in emissions from the CHPP is considered insignificant.

Based on the above, dust emissions and associated potential impacts would be significantly less than what was originally predicted by **HAS** (**2001**) (i.e. annual average PM_{10} concentrations of 8 µg/m^3 and annual average dust deposition levels of 0.5 g/m^2/month at the most affected residences).

Annual average PM_{10} concentrations and dust deposition levels resulting from the proposed modification and the June 2010 BRNOC modification are expected to be lower than these predictions, and would comply with relevant DECCW criteria even when background levels are taken into account. This is supported by the results of monitoring conducted which do not reveal any discernable impact due to the SCM and the BRNOC (**Section 3.2**).

4.2 Rail Transportation

The proposed modification would involve an increase in the number of trains accepted at the SCM from the Duralie Extension Project and an increase in the amount of product coal transported via rail from the SCM to Newcastle. The increased amount of product coal transported (2.3 Mtpa to 3.3 Mtpa) would be achieved by increasing the length of the existing trains (i.e. no increase in the number of product coal trains).

The potential air quality impacts of the increase in rail transportation of ROM coal from the Duralie Extension Project were assessed by **Heggies** (**2009**), using the transportation dispersion model CAL3QHCR, developed by the USEPA, to determine the potential impact of coal dust emissions along the rail route from the DCM.

Peak 24-hour average PM_{10} and TSP concentrations close to the release point were predicted to be in the order of 7 µg/m^3 and 14 µg/m^3, respectively. For both PM_{10} and TSP, concentrations quickly decreased to negligible levels as distance from the track increases (approximately 0.8 µg/m^3 and 1.6 µg/m^3 at 100 m from the track, respectively) (**Heggies**, **2009**).

The assessment concluded that there is unlikely to be a significant impact associated with coal dust emissions from uncovered wagons. The potential cumulative impacts of rail transportation on the North Coast Railway (including trains transporting product coal from the SCM) were also assessed. **Heggies** (**2009**) concluded that based on the frequency of trains (i.e. a maximum of approximately 10 coal trains per day), exceedances of the cumulative air quality criteria would generally not occur.

The increase in the amount of product coal transported via rail (i.e. from 2.3 Mtpa to 3.3 Mtpa) from the SCM would be expected to result in a small increase in cumulative emissions of dust from trains on the North Coast Railway (i.e. additional to that assessed by **Heggies** [**2009**]). However, based on the marginal levels of predicted coal dust emissions, this increase is expected to be minor, and the conclusions presented in **Heggies** (**2009**) (i.e. "it is not considered that exceedances of the cumulative air quality criteria would generally occur") would not change.

5 CONCLUSIONS

An assessment has been conducted for the proposed modification including an assessment of potential cumulative impacts associated with the June 2010 BRNOC modification. The proposed modification seeks approval for the receipt, processing and export of additional coal from the Duralie Extension Project and deepening of the existing Roseville West Pit.

The mining schedule for the proposed modification and the June 2010 BRNOC modification was compared to previous operations at the site which showed that cumulative ROM coal and waste rock production would be significantly less than what has been previously assessed (**HAS 2001**). The proposed modification and the June 2010 BRNOC modification are therefore expected to comply with relevant DECCW air quality criteria based on predictions made previously for SCM and BRNOC.

The increase in the amount of product coal transported via rail (i.e. from 2.3 Mtpa to 3.3 Mtpa) from the SCM would be expected to result in a small increase in cumulative emissions of dust from trains on the North Coast Railway (i.e. additional to that assessed by **Heggies** [**2009**]). However, based on the marginal levels of predicted coal dust emissions, this increase is expected to be minor, and the conclusions presented in **Heggies** (**2009**) (i.e. "it is not considered that exceedances of the cumulative air quality criteria would generally occur") would not change.

Recent air quality monitoring results indicate that current SCM and BRNOC operations are complying with ambient air quality goals for dust and particulate matter and when compared to the modelling predictions, the data correlates well. On the basis of current monitoring data and the modelling predictions made for a higher mine production rate, the proposed modification is unlikely to result in any adverse impacts in terms of dust and particulate impacts at the nearest private residences.

6 REFERENCES

Duralie Coal Pty Ltd (DCPL) (2009) "Duralie Extension Project Environmental Assessment".

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P. Zib & Associates (1994) "Assessment of Air Quality Resulting from the Proposed Opencut Coal Mine near Stratford, N.S.W.".

Stratford Coal Pty Ltd (SCPL) (2007a) "Air Quality Management Plan".

Stratford Coal Pty Ltd (SCPL) (2007b) "Annual Environmental Management Report". June 2007.

Stratford Coal Pty Ltd (SCPL) (2008) "Annual Environmental Management Report". June 2008.

Stratford Coal Pty Ltd (SCPL) (2009) "Annual Environmental Management Report". June 2009.

APPENDIX C

SURFACE WATER AND REJECT MANAGEMENT ASSESSMENT

Gilbert & Associates Pty Ltd

23 July 2010

Tony Dwyer
Manager – Approvals and Environment
Stratford Coal Pty Ltd
PO Box 168
GLOUCESTER NSW 2422

RE: STRATFORD COAL MINE MODIFICATION – SURFACE WATER AND REJECT MANAGEMENT ASSESSMENT

Tony,

Please find below our assessment of the potential surface water and reject disposal impacts of proposed modifications to the Stratford Coal Mine (SCM).

Introduction and Background

The SCM is an existing open cut coal mining operation owned and operated by Stratford Coal Pty Ltd (SCPL) a subsidiary of Gloucester Coal Ltd (GCL). The SCM is located approximately 100 kilometres (km) north of Newcastle, New South Wales (NSW) (Figure 1). SCPL is seeking approval for a modification to the SCM Development Consent (DA 23-98/99) under Section 75W of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) (the proposed modification).

An additional 1.4 million tonnes (Mt) of run-of-mine (ROM) coal production is proposed at the SCM from a deepened Roseville West Pit (Figure 2). This additional ROM coal would be processed at the SCM coal handling and preparation plant (CHPP) and the additional rejects produced would be disposed at the SCM.

In November 2009, GCL (through its other subsidiary Duralie Coal Pty Ltd [DCPL]) lodged the *Duralie Extension Project Environmental Assessment*. As part of the Duralie Extension Project an increase in ROM coal production rate at the Duralie Coal Mine (DCM) is proposed. This additional Duralie Extension Project ROM coal would be railed to the SCM and processed at the SCM CHPP necessitating a change to the SCM CHPP processing rate. The additional rejects produced would be disposed at the SCM.

The Bowens Road North Open Cut (BRNOC), also owned and operated by SCPL, is located to the immediate north of the SCM (Figure 2). An additional 1.4 Mt of BRNOC ROM coal would be processed at the SCM CHPP and would result in an increase in the amount of rejects disposed at the SCM. The extension to the BRNOC is the subject of a separate modification application lodged by SCPL in June 2010 (herein referred to as the June 2010 BRNOC modification).

Potential cumulative surface water and reject disposal impacts from the simultaneous operation of the proposed modification, June 2010 BRNOC modification and the Duralie Extension Project are considered in this report.

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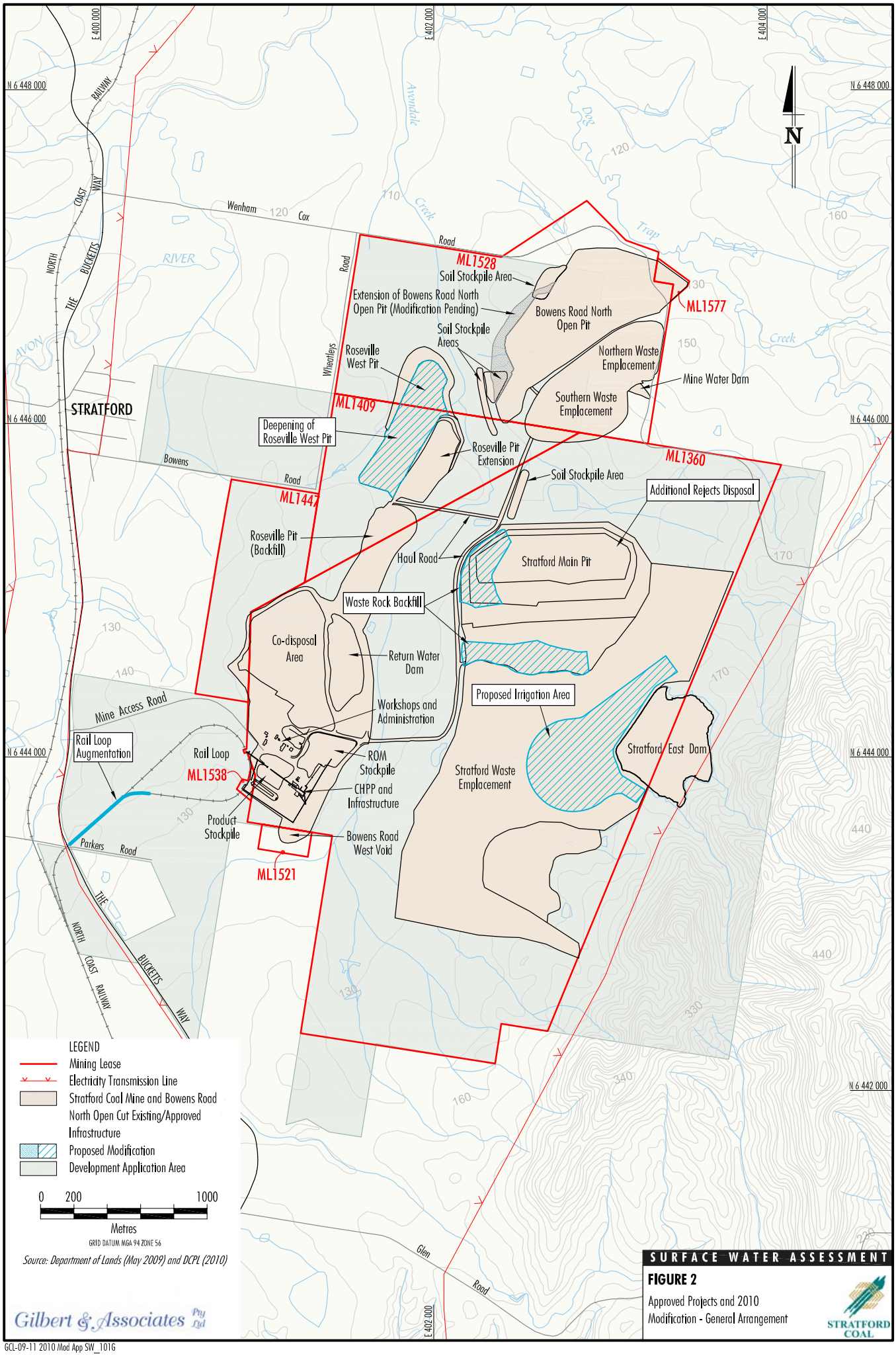
GCL-09-11 2010 Mod App SW_102A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RAILWAY
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THE BUCKETTS WAY
RIVER
AVON
Avondale
Dog Trap Creek
Wenham Cox Road
Wheatleys Road
Bowens Road
Parkers Road
Glen Road
STRATFORD
ML1528
Soil Stockpile Area
Extension of Bowens Road North Open Pit (Modification Pending)
Bowens Road North Open Pit
ML1577
Soil Stockpile Areas
Roseville West Pit
Northern Waste Emplacement
Mine Water Dam
Southern Waste Emplacement
ML1409
Deepening of Roseville West Pit
Roseville Pit Extension
ML1360
Soil Stockpile Area
Additional Rejects Disposal
ML1447
Roseville Pit (Backfill)
Haul Road
Stratford Main Pit
Waste Rock Backfill
Co-disposal Area
Return Water Dam
Workshops and Administration
Proposed Irrigation Area
Mine Access Road
Rail Loop Augmentation
Rail Loop
ML1538
ROM Stockpile
CHPP and Infrastructure
Stratford East Dam
Stratford Waste Emplacement
Product Stockpile
Bowens Road West Void
ML1521
LEGEND
Mining Lease
Electricity Transmission Line
Stratford Coal Mine and Bowens Road North Open Cut Existing/Approved Infrastructure
Proposed Modification
Development Application Area
0 200 1000
Metres
GRID DATUM MGA 94 ZONE 56
Source: Department of Lands (May 2009) and DCPL (2010)
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SURFACE WATER ASSESSMENT
FIGURE 2
Approved Projects and 2010 Modification - General Arrangement
STRATFORD COAL
GCL-09-11 2010 Mod App SW_101G

Modification Overview

A summary of the proposed modifications to the SCM is provided below:

- an increase in the annual CHPP ROM coal processing rate from approximately 3.4 Mtpa up to approximately 4.6 Mtpa;
- a deepening of the Roseville West pit to facilitate access to an additional 1.4 Mt of ROM coal with an associated additional 8 million bulk cubic metres of waste rock to be mined and backfilled within the Roseville and Stratford Main Pits;
- an increase in the volume of CHPP rejects to be deposited in the Stratford Main Pit;
- irrigation of water from the Stratford East Dam on a portion of the rehabilitated Stratford Waste Emplacement;
- an increase in the number of DCM trains unloaded on the SCM rail loop (i.e. an increase of three to four per day, on average);
- alteration to the DCM train unloading times at the SCM;
- an increase in the amount of product coal transported via rail from the SCM from 2.3 Mtpa to 3.3 Mtpa, to be accommodated by the use of longer product coal trains; and
- augmentation of the SCM rail loop with an additional 400 m section of track immediately adjacent to the current track.

The existing approved production rate of ROM coal from the SCM of approximately 2.1 Mtpa and supporting infrastructure at the SCM would remain unchanged. Reprocessing of rejects from the co-disposal area (Figure 2) would also continue. No upgrades to the existing CHPP or general coal handling and stockpiling systems would be required.

Existing Water Management System

The water management system at the SCM is based on the following principles:

- Runoff from undisturbed and rehabilitated areas is diverted around areas disturbed by mining activity.
- Runoff from disturbed areas on site and process water is collected and re-used in the CHPP and for dust suppression.

The majority of water used on-site is in the CHPP and recovery of water for re-use in the CHPP (i.e. recycling of CHPP process waters) is the single largest component of the overall supply system. On average the site has operated in surplus with more water on average being yielded from the mine and mine infrastructure catchments than has been needed in supply for the mining and processing operations. Management of this excess has been by way of containment in the Stratford East Dam, storage in Stratford Main Pit and historically controlled release to Avondale Creek under Environment Protection Licence No. 5161. A schematic of the water management system, showing all pumped transfer paths, is shown on Figure 3. The risk of spill, particularly from the Stratford Main Pit, is very low over the remaining mine life.

Since the commissioning of reject disposal in the Stratford Main Pit in 2003, transfer of mine water to Stratford East Dam has ceased as have controlled releases of water to Avondale Creek.

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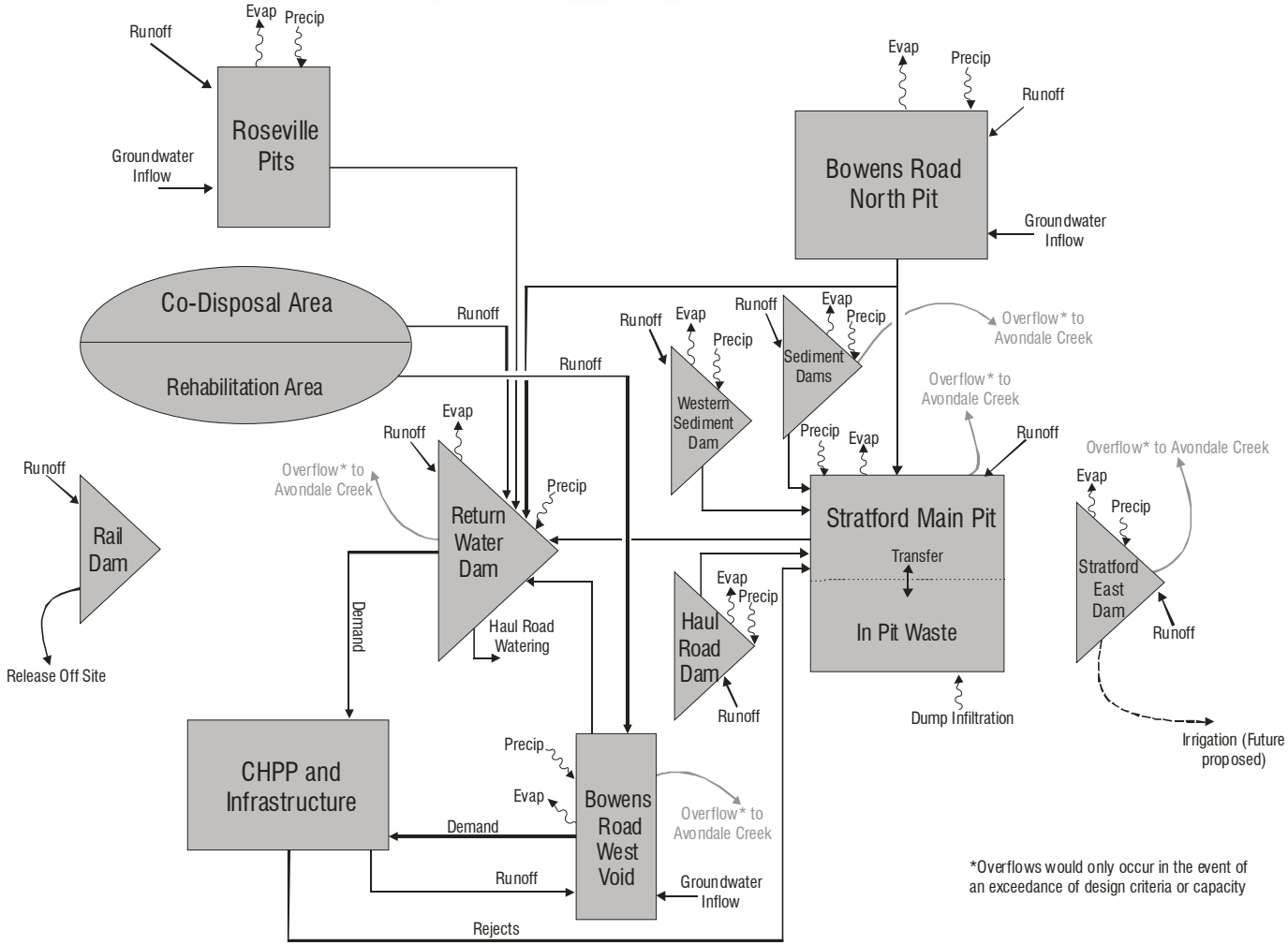

Figure 3 – Existing and Proposed SCM and BRNOC Water Management System Schematic

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The Bowens Road West Void is used as a transient storage for runoff from the CHPP and coal stockpile area. Any water which accumulates in the void is transferred directly to the CHPP for re-use or is transferred to the Return Water Dam.

The Return Water Dam continues to receive local runoff from the adjacent Co-disposal area and associated reprocessing operations. This water is used in the CHPP and for dust suppression on haul roads. It is understood that build up of excess water in this storage is avoided by maintaining an adequate freeboard against rainfall runoff from its catchment.

Stratford East Dam contains fresh water runoff, water previously sourced from mine de-watering, and past transfer of excess water from the Co-disposal area. Since commissioning of reject disposal in the Stratford Main Pit, the pit has been used for storage of excess water on site and Stratford East Dam has not been used for this purpose. Stratford East Dam remains as a contingency storage for mine water in the future.

Roseville West Pit and the BRNOC are de-watered to the Return Water Dam for reuse in the CHPP. Water from Bowens Road North Pit can also be pumped to the Stratford Main Pit.

Water accumulating in sediment dams on site is either pumped to the Stratford Main Pit or, after settlement is discharged.

Reject Disposal

The proposed modification would result in the disposal of approximately 8 Mt (including an additional 4.5 Mt) of rejects from the CHPP in the Stratford Main Pit over the remaining life of the modified SCM. The annual reject production schedule for the proposed modification incorporating the Duralie Extension Project and the June 2010 BRNOC modification is provided in Table 1.

Table 1
Annual Reject Production Schedule

Project Year	Financial Year	Coal Source				Totals (kt)
		Duralie Extension Project[1] (kt)	Bowens Road North[2] (kt)	Roseville West (kt)	Co-Disposal Area Reject Re-Processing (kt)	
1	2010-11	620	352	250	120	1,342
2	2011-12	710	374	250	120	1,454
3	2012-13	750	256	250	66	1,322
4	2013-14	750	-	-	-	750
5	2014-15	790	-	-	-	790
6	2015-16	750	-	-	-	750
7	2016-17	750	-	-	-	750
8	2017-18	600	-	-	-	600
9	2018-19	300	-	-	-	300
TOTALS		6,020	982	750	306	8,058

Source: SCPL (2010).

[1] Subject to separate approval under Section 75E of the EP&A Act.

[2] Subject to separate approval under Section 75W of the EP&A Act.

kt = kilotonnes

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Based on the reject production schedule in Table 1, a reject disposal schedule has been prepared for the Stratford Main Pit (Table 2). The rate of filling of the Stratford Main Pit depends on the density of the deposited reject. The reject disposal schedule for the Stratford Main Pit has therefore been calculated for two densities (0.8 and 1.0 tonnes per cubic metre [t/m^3])[1]. The lower 0.8 t/m^3 density is considered to be conservatively low (i.e. at the low end of the expected range, based on the experience of reject disposal at the Roseville Pit and other coal mining operations), whilst 1.0 t/m^3 is nearer the middle of the expected range of densities.

Table 2
Stratford Main Pit Reject Disposal Schedule

Timing (End of Year)	0.8 t/m^3 Reject Density			1.0 t/m^3 Reject Density		
	In-Pit Reject Volume (ML)	Remaining Pit Capacity[1] (ML)	Reject RL[2] (m AHD)	In-Pit Reject Volume (ML)	Remaining Pit Capacity[1] (ML)	Reject RL[2] (m AHD)
2010	10,873	29,641	61.0	8,979	31,536	56.0
2011	12,621	27,894	65.5	10,377	30,138	60.0
2012	14,356	26,159	69.5	11,765	28,750	63.5
2013	15,651	24,864	72.5	12,801	27,714	66.0
2014	16,613	23,901	74.5	13,571	26,944	67.5
2015	17,576	22,939	76.5	14,341	26,174	69.5
2016	18,513	22,001	78.5	15,091	25,424	71.0
2017	19,357	21,157	80.0	15,766	24,749	72.5
2018	19,919	20,595	81.0	16,216	24,299	73.5
2019	20,107	20,407	81.5	16,366	24,149	74.0

[1] To RL 116 m

[2] Approximate – assuming a flat reject surface.

Rejects are currently placed in the Stratford Main Pit below the pre-mine groundwater level (estimated[2] to be equal to the level of the adjacent Avondale Creek at approximately RL 114 m) to maintain reject saturation and limit potential for oxidation of the rejects.

Based on the annual reject disposal schedule (Table 2), the total additional rejects generated as a result of the proposed modification would be able to be stored within the Stratford Main Pit below the estimated pre-mine groundwater level (i.e. RL 114 m).

Stratford Waste Emplacement Irrigation

The proposed modification would include irrigation of water from the Stratford East Dam over areas of the Stratford Waste Emplacement to reduce water volumes held in the Stratford East Dam to provide contingency storage for mine water should this be required in the future.

Irrigation would be conducted on approximately 35 hectares of the rehabilitated portion of the Stratford Waste Emplacement adjacent to the Stratford East Dam. Irrigation would be conducted such that it

[1] Calculated as dry density

[2] Gilbert and Sutherland Pty Ltd (1998). "Stratford Coal Project – Life of Mine Rejects Disposal Plan". Report prepared for Stratford Coal Pty Ltd, September.

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would not lead to direct runoff. Soil moisture monitoring would be conducted to guide irrigation management.

As runoff from rainfall events from the Stratford Waste Emplacement irrigation areas would report to the Stratford East Dam, it is considered that potential impacts from the proposed irrigation on local watercourses would be negligible.

Site Water Balance

An integrated site water balance simulation model has been developed for the SCM and the BRNOC as the SCM and BRNOC have a shared water management system. The model simulates daily changes in stored volumes of water at the SCM in response to inflows (rainfall, groundwater and water contained in rejects) and outflows (evaporation, CHPP use, dust suppression use, irrigation loss and spill [if any]). Modelling includes simulation of storage in the Return Water Dam, Stratford East Dam, Bowens Road West Void, Stratford Main Pit and in-pit waste rock emplacements (pore water storage) and active mine open pits (refer Figure 2). For each storage, the model simulates:

Change in Storage = *Inflow – Outflow*

Where:

Inflow includes rainfall runoff (for surface storages), seepage (from waste rock emplacements), groundwater inflow (for open pits) and all pumped inflows from other storages.

Outflow includes evaporation, seepage, spill (if any) and all pumped outflows to other storages or to a water use.

The model is run over a series of forward planning sequences, which have been formulated using a long (120 year) historical rainfall data set. The forward planning sequences are formulated starting with first 10 years in the historical data set (simulating the forward period from 2010 to 2019 inclusive) which becomes the first sequence and formulating the other sequences by moving along the historical sequence a year at a time for each new sequence. Running these 111 sequences through the model provides a basis for assessing the performance of the water management system for a wide range of climatic conditions.

Although the proposed modification or the June 2010 BRNOC modification would not require any change to the existing SCM/BRNOC water management system, the following would result in changes to the site water balance:

- An increase in CHPP water demand to process the additional ROM coal (up to a total demand of approximately 2,800 ML per year).
- Commencement of irrigation on areas of the Stratford Waste Emplacement.
- An increase in the volume of co-disposed coal rejects to be deposited in the Stratford Main Pit.
- Increased size of the BRNOC catchment area.

The integrated water balance model for the SCM and the BRNOC has been updated to incorporate these changes associated with the proposed modification. Key outputs of the site water balance are discussed below.

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Water Supply Reliability

Water balance model results indicate that, even with the proposed increase in the CHPP processing rate the site would still operate with a water surplus on average. There were no simulated water supply shortfalls in any of the climatic sequences modelled. The implied water supply reliability is therefore greater than 99%.

Spill Potential – Stratford Main Pit

As the Stratford Main Pit is filled with reject, less space becomes available for the storage of mine water. Water balance model results indicate that, even with the addition of the planned tonnage of rejects shown in Table 1 up until mid-2019 and at an assumed (conservatively low) rejects density of 0.8 t/m^3, no spills were simulated from the Stratford Main Pit in any of the climatic sequences modelled, and therefore the implied spill risk from the Stratford Main Pit is less than 1%.

It is expected that the Stratford Main Pit would be able to store the additional rejects associated with the proposed modification and the June 2010 BRNOC modification. Notwithstanding the above, periodic survey of the in-pit reject surface, together with monitoring of reject tonnages should allow reject densities to be verified to refine the above estimates in the future.

Please contact the undersigned on (07) 3367 2388 should you have any queries.

Yours sincerely,

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APPENDIX D

GEOCHEMISTRY ASSESSMENT

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Geochemical Assessment of Co-Disposed Rejects and Tailings from the Duralie Extension Project and the Stratford Coal Mine

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1.0 Introduction

Environmental Geochemistry International Pty Ltd (EGi) was commissioned by Stratford Coal Pty Ltd (SCPL) to conduct a geochemical assessment of co-disposed rejects and tailings from the processing of run-of-mine (ROM) coal from the proposed Duralie Extension Project and the Stratford Coal Mine (SCM). The Duralie Coal Mine (DCM) and the SCM are located in the Gloucester Valley in New South Wales (NSW), approximately 40 kilometres (km) and 20 km south of Gloucester, respectively. The objectives of this geochemical assessment were to assess the acid rock drainage (ARD) potential of co-disposed rejects and tailings at the SCM, identify the main ARD issues, and provide recommendations for materials management. Geochemical assessment of overburden and floor rock from the Duralie Extension Project has been reported separately[1] for inclusion in the *Duralie Extension Project Environmental Assessment*[2].

ROM coal from the DCM is currently transported to the SCM where it is blended with SCM ROM coal and washed in the SCM Coal Handling and Preparation Plant (CHPP). The rejects and tailings from the SCM CHPP are co-disposed in the Stratford Main Pit in accordance with the *Life of Mine Reject Disposal Plan* (RDP)[3]. Co-disposed rejects and tailings will be placed as an advancing deposition head, establishing a beach 2-3 m above water level. Deposition will be managed so that that the beaches are significantly inundated by rising pit waters within 6-12 months of placement to help control acid generation.

The Weismantel Seam is currently mined at the DCM, but the Duralie Extension Project would also include mining of the Clareval Seam, resulting in transport of up to 1.2 million tonnes per annum (Mtpa) of additional ROM coal for washing in the SCM CHPP. The coal to be mined during the Duralie Extension Project is expected to have similar characteristics to the coal currently mined at the DCM (see Section 7). The geochemical properties of the rejects generated from the washing of this coal at the SCM CHPP should therefore be similar to those already deposited in the Stratford Main Pit and hence the results of existing geochemical investigations are relevant to the assessment of rejects from the Duralie Extension Project.

This report reviews testing of SCM and DCM rejects carried out between 1995 and 1998 and details the geochemical characteristics of SCM and DCM co-disposed rejects and tailings in the Stratford Main Pit conducted in 2008.

[1] EGi Document No 6902/869, "Duralie Extension Project Geochemical Assessment of Overburden and Floor Rock", November 2009.

[2] Duralie Coal Pty Ltd, "Duralie Extension Project Environmental Assessment", November 2009.

[3] Stratford Coal Pty Ltd, "Life of Mine Reject Disposal Plan", 2010.

2.0 Review of 1995 to 1998 Geochemical Assessment

Previous geochemical investigations of rejects and tailings from the washing of DCM and SCM ROM coal include:

- *Duralie Coal Project, Environmental Geochemistry of Mine Rock and Coal Reject. Implications for Mine Operation and Waste Management – Final Report*[4].
- *Stratford Coal Mine, Geochemical Assessment of Coal Reject Disposal Options, Stage 1: Geochemical Characterisation of Coal Reject and Spoil*[5].
- *Stratford Coal Mine, Geochemical Assessment of Coal Reject Disposal Options, Stage 2: Leaching Behaviour of Coal Reject*[6].

These investigations included geochemical characterisation and leach column testing and a review of this work is provided below.

2.1 DCM Test Work

Preliminary geochemical testing of DCM washery wastes was carried out in 1995 and 1996 (prior to mine development) on laboratory generated materials. These investigations formed part of a broader geochemical investigation of the Duralie Coal Project[4], which also included testing of overburden and floor rock. The assessment was used to assist the preparation of the *Duralie Coal Environmental Impact Assessment*[7].

The test samples comprised coarse rejects (+1 millimetre [mm]), fine rejects (0.125 to 1 mm) and tailings (-0.125 mm), and were supplied by the Australian Coal Industry Research Laboratories Ltd (ACIRL), Maitland. The acid forming characteristics of these samples are compiled in Table 1. Results show that all three samples have high sulphur (S), low acid neutralising capacity (ANC), positive net acid producing potential (NAPP) values of 45 to 71 kilograms of sulphuric acid per tonne (kg H_2SO_4/t), and net acid generation pH values (NAGpH) of 2.5 or less. All samples were classified potentially acid forming (PAF).

[4] EGi Document No 6902/1/280, "Duralie Coal Project, Environmental Geochemistry of Mine Rock and Coal Reject. Implications for Mine Operation and Waste Management – Final Report", June 1996.

[5] EGi Document No 6903/332, "Stratford Coal Mine, Geochemical Assessment of Coal Reject Disposal Options, Stage 1: Geochemical Characterisation of Coal Reject and Spoil", November 1997.

[6] EGi Document No 6903/362, "Stratford Coal Mine, Geochemical Assessment of Coal Reject Disposal Options, Stage 2: Leaching Behaviour of Coal Reject", July 1998.

[7] Woodward-Clyde Doc No. R004-E.DOC, "Duralie Coal Environmental Impact Statement (EIS)", September 1996.

Multi-element analysis was carried out on the sample solids. Table 2 shows the multi-element results compared to the median soil abundance (from Bowen, 1979[8]) to highlight enriched elements. The extent of enrichment is reported as the Geochemical Abundance Index (GAI), which relates the actual concentration with an average abundance on a log 2 scale. The GAI is expressed in integer increments where a GAI of 0 indicates the element is present at a concentration similar to, or less than, average abundance; and a GAI of 6 indicates approximately a 100-fold enrichment above average abundance. As a general rule, a GAI of 3 or greater signifies enrichment that warrants further examination. Results show significant enrichment in S (related to pyrite content), and slight enrichment of beryllium (Be) and selenium (Se), although Be and Se values are within normal ranges for soils.

Leach column testing was carried out on an untreated coarse rejects sample, and duplicate coarse rejects samples treated with limestone at varying addition rates. Leach column operations involved subjecting 2 kilogram (kg) samples of crushed rejects to weekly wet-dry cycles and leaching cycles of 1 to 4 weeks. The samples were wetted by applying deionised water to the surface, and the resulting leachates were collected through the funnel at the base. Heat lamps were used to dry the samples between water additions to promote oxidation.

A total of five columns were operated comprising the following samples:

- CR-1 - untreated coarse rejects.
- CR-2 - coarse rejects blended with -4 mm crushed limestone at a rate of 5 kilograms of calcium carbonate per tonne (kg $CaCO_3$/t).
- CR-3 - coarse rejects blended with -4 mm crushed limestone at a rate of 10 kg $CaCO_3$/t.
- CR-4 - coarse rejects blended with -4 mm crushed limestone at a rate of 20 kg $CaCO_3$/t.
- CR-5 - coarse rejects blended with -1 mm crushed limestone at a rate of 20 kg $CaCO_3$/t.

Results are shown in Tables 3 to 7 and Figures 1 and 2. Figure 1 is a plot of pH and Figure 2 is a plot of sulphate (SO_4) concentration trends in leachate for the rejects columns at the treatment rates and limestone size fractions outlined above. The plots confirm the untreated rejects are strongly acid forming and fast to react, with a pH of 2.2 in the first collection. The -4 mm crushed limestone was not effective in controlling the pH at rates applied, although some reduction in SO_4 load occurred. However, addition of -1 mm limestone at a rate of 20 kg $CaCO_3$/t was effective in maintaining the pH above 6 and significantly reducing the SO_4 concentration and load. Results indicated that treatment of coal rejects with -1 mm limestone at a rate of 20kg $CaCO_3$/t would provide a short to medium term lag (6 months or more) before the onset of acid conditions.

[8] Bowen, H.J.M. (1979) Environmental Chemistry of the Elements. Academic Press, New York, p 36-37.

2.2 SCM Test Work

Geochemical testing of SCM rejects were carried out in 1997 and 1998[5,6] on deposited coal washery materials. Samples comprised three samples each of scalped coarse rejects (DMB-rejects), beach deposited co-disposed rejects and tailings, and tailings from the toe of the beach. Scalped coarse rejects consisted of materials scalped off the feeder before it reached the SCM CHPP. This material was trucked to the co-disposal area for use in wall construction. Beach deposited co-disposed rejects and tailings consisted of tailings and coarse rejects pumped together to the co-disposal area for beach deposition. The tailings were materials that separated out from the co-disposed materials near the toe of the beach.

The acid forming characteristics of the SCM washery waste samples are compiled in Table 1. Sulphur concentrations ranged from 0.22 to 1.34% S, and the ANC was low to moderate ranging from 9 to 37 kg H_2SO_4/t. The co-disposed beach deposited rejects samples had the highest average S contents (0.90%S), followed by the tailings samples (0.69%). NAPP values ranged from -23 to 9 kg H_2SO_4/t. All scalped coarse rejects samples were NAPP negative, and the other material types had both NAPP positive and NAPP negative samples. NAGpH values were mostly above 4.5, except for co-disposed beach samples CDB2 and CDB3. Comparison of NAPP and NAG results indicates that most samples are likely to be non acid forming (NAF), however two of the co-disposed beach samples are likely to be PAF with a low acid generating capacity.

Multi-element analysis was carried out on one selected sample from each rejects material type. Table 8 shows the multi-element results and corresponding GAI for all three samples. Results show enrichment in S (related to pyrite content), and slight enrichment of Be, but again Be values are within normal ranges for soils.

Four leach column tests of SCM washery waste materials were carried out, comprising one column for each material type, plus an additional limestone treated column of the co-disposed beach deposit sample, as follows:

- Scalpings column, comprising sample DMB2 and DMB3 mixed in equal proportions
- Untreated co-disposed beach deposit column, using sample CDB2
- Limestone treated co-disposed beach deposit column, using sample CDB2 blended with -4 mm crushed limestone at a rate of 10 kg $CaCO_3$/t
- Co-disposed tailings column, using sample CDS1

Results are shown in Tables 9 to 12 and Figures 3 and 4. Figure 3 is a plot of pH and Figure 4 is a plot of SO_4 concentration trends in leachate for the four columns. The plots confirm the untreated co-disposed beach deposit sample is acid forming, but with a lag of 16 weeks before producing acid leachate (pH less than 4). Treatment of the co-disposed beach deposit sample with -4 mm crushed limestone increased the lag by at least 8 weeks, and also reduced the SO_4 loadings. The other two columns maintained circum-neutral pH trends, consistent with the NAF classification of these samples. Results indicated that treatment of SCM low capacity PAF co-disposed beach deposit materials with -4 mm limestone at a rate of 10 kg $CaCO_3$/t can be used for short-term control of pH.

2.3 Summary of Previous Test Work

Results of the work described above suggest that materials represented by the DCM washery waste samples tested are likely to be acid forming with a short lag before onset of acid conditions. The SCM washery waste samples tested had lower acid forming potential, with only the co-disposed coarse rejects and tailings likely to be acid forming, but with a low acid generating capacity.

Leach column testing of limestone treated PAF and PAF-LC washery waste materials from DCM and SCM showed that control of acid generation and reduction of SO_4 loadings during operations could be achieved with limestone addition. Note that although SCM washery wastes could be effectively controlled with -4 mm sized limestone, DCM washery wastes (i.e. not blended with SCM washery wastes) were fast reacting and required fine crushed limestone (-1 mm) for effective control.

3.0 Sample Description and Test Methodology

A geochemical assessment of SCM and DCM co-disposed rejects and tailings in the Stratford Main Pit was conducted in 2007 and 2008[9]. A total of 24 deposited co-disposed rejects and tailings samples were collected by SCM personnel from three beach areas in late 2007 (Figure 5), representing different ages of exposure ranging from less than 3 months to approximately 3 years. Samples from Area 1 had been exposed for approximately 3 years, those from Area 2 for 1.5 years, and those from Area 3 were deposited relatively recently and were exposed for less than 3 months when sampled. Each sample was collected as a bulk composite from the top 0.3 metres (m). The samples were selected to provide a broad coverage of the exposed rejects/tailings from the SCM and the DCM.

Sample preparation was arranged by EGi and carried out by Sydney Environmental and Soil Laboratory (SESL), and included drying, crushing to -4 mm, and pulverising a 300 gram (g) split to -75 micrometres (µm).

[9] EGi Document No 6902/800, "Geochemical Assessment of Deposited Rejects from the Duralie/Stratford Disposal Area", March 2008.

All samples were tested by standard geochemical characterisation tests, comprising the following:

- $pH_{1:2}$ and electrical conductivity $(EC)_{1:2}$ on deionised water extracts;
- Leco total S;
- ANC;
- NAPP calculated from total S and ANC results; and
- single addition NAG test.

The following specialised tests were carried out on selected samples to better define total acid generating capacities, relative reactivities of sulphides and neutralising components, and multi-element compositions:

- extended boil and calculated NAG testing to account for high organic carbon contents;
- acid buffering characteristic curve (ABCC) tests;
- kinetic NAG;
- multi-element scans of solids; and
- multi-element scans of water extracts at a ratio of 1:2 (w/w) solid to deionised water.

A general description of ARD test methods and calculations used is provided in Appendix A.

Water extracts for pH, EC, and multi-elements were carried out on crushed samples. All other test work was carried out on pulverised samples.

Leco total sulphur assays were carried out by SESL. Multi-element analyses of solids were carried out by Genalysis Pty Ltd (Perth). Multi-element analyses of water extracts were carried out by ALS Laboratory Group (Sydney), and multi-element analyses of repeat water extracts were carried out by Genalysis Pty Ltd (Perth). Analysis of NAG solutions was carried out by Levay & Co. Environmental Services (Adelaide). All other analyses were carried out by EGi.

4.0 Geochemical Characterisation of Deposited Rejects and Tailings

Results of standard geochemical characterisation testing of combined SCM and DCM co-disposed rejects and tailings deposited in the Stratford Main Pit are presented in Table 13, comprising pH and EC of water extracts, total S, maximum potential acidity (MPA), ANC, NAPP, ANC/MPA ratio and single addition NAG.

4.1 pH and EC

The $pH_{1:2}$ and $EC_{1:2}$ tests were carried out by equilibrating crushed solid sample in deionised water for approximately 16 hours at a solid to water ratio of 1:2 (w/w). This gives an indication of the inherent acidity and salinity of the waste material when initially exposed in a waste emplacement area.

Figure 6 is a box plot showing the distribution of extract pH for the co-disposed rejects and tailings samples, split by area. Results are similar for each area and show that the samples are generally acidic, ranging from pH 3.1 to 6.5, with median values less than 4.5.

Figure 7 is a box plot showing the distribution of extract EC for the co-disposed rejects and tailings samples, with most samples being moderately saline (0.8-1.6 deci-Siemens per meter [dS/m]) to saline (>1.6 dS/m). The Area 3 samples appear to have higher salinities than the other two areas.

Results show that most of the co-disposed rejects and tailings samples were acid at the time of sampling with low pH and high EC, most likely related to pyrite oxidation since placement. The acidic pH in the recently deposited co-disposed rejects and tailings from Area 3 suggests these materials have low effective acid buffering and fast rates of pyrite oxidation, consistent with materials previously tested from the DCM (see Section 2.1).

4.2 Acid Base (NAPP) Results

Total S values range from of 0.23-2.22%S, with most samples having moderate to high S of greater than 0.5%S. ANC values are generally low at less than 10 kg H_2SO_4/t, apart from samples REP 7 and REP 8 from Area 1, which have moderate ANC values of 24 kg H_2SO_4/t and 16 kg H_2SO_4/t, respectively.

The NAPP value is an acid-base account calculation using measured total S and ANC values. It represents the balance between the MPA and ANC. A negative NAPP value indicates that the sample may have sufficient ANC to prevent acid generation. Conversely, a positive NAPP value indicates that the material may be acid generating.

Figure 8 is an acid base accounting (ABA) plot showing total S versus ANC, with NAPP positive and NAPP negative domains indicated. The plot shows that the 2 higher ANC samples are NAPP negative, but that the remaining 22 samples are NAPP positive.

4.3 Single Addition NAG Results

Single addition NAG test results are used in conjunction with NAPP values to help classify samples according to acid forming potential. A NAGpH <4.5 indicates the sample may be acid producing. Single addition NAGpH values ranged from 2.2 to 7.9, and all except one sample (REP 7 from Area 1) had NAGpH values of less than 4.5.

Figure 9 is an ARD classification plot showing NAGpH versus NAPP value. PAF, NAF and uncertain (UC) classification domains are indicated. A sample is classified PAF when it has a positive NAPP and NAGpH < 4.5, and NAF when it has a negative NAPP and NAGpH 4.5. Samples are classified UC when there is an apparent conflict between the NAPP and NAG results, i.e. when the NAPP is positive and NAGpH 4.5, or when the NAPP is negative and NAGpH < 4.5.

Figure 9 shows that all but two samples plot in the PAF domain. Sample REP 7 from Area 1 plots in the NAF domain, and also had the highest ANC. Sample REP 8 from Area 1 plots in the bottom left hand UC domain, with a negative NAPP but a slightly acidic NAGpH of 4.3. The UC sample shows a large difference between the $NAG_{(pH4.5)}$ and $NAG_{(pH7.0)}$ values, typical of carbonaceous samples, in which organic acids can be generated in NAG tests due to partial oxidation of carbonaceous materials. This can lead to low NAGpH values and high acidities in standard single addition NAG tests that are unrelated to acid generation from sulphides.

In addition to the UC sample, three of the NAPP positive samples (plotting in the PAF domain) also show organic acid effects in the NAG test (large difference between the $NAG_{(pH4.5)}$ and $NAG_{(pH7.0)}$ values, and $NAG_{(pH4.5)}$ values that exceed NAPP and MPA values), indicating that the standard NAG overestimates the acid potential in these cases. Standard NAG test results affected by organic acids are highlighted in yellow in Table 13.

5.0 Specialised Geochemical Test Results

5.1 Extended Boil and Calculated NAG

Coal rejects and tailings samples have high organic carbon contents, which can cause interference with standard NAG tests due to partial oxidation of carbonaceous materials. This can lead to low NAGpH values and high acidities in standard single addition NAG tests unrelated to acid generation from sulphides. Hence standard NAGpH values of 4.5 are an indication that samples are NAF, but NAGpH values less than 4.5 for carbonaceous samples may be inconclusive in isolation due to potential organic acid effects.

Extended boil and calculated NAG testing was carried out on the 4 samples with evidence of organic acid effects to help resolve the uncertainty in ARD classification based on standard NAG test results. Results are presented in Table 13.

The NAGpH value increases after the extended boiling step for all samples, confirming the effects of organic acids. Note that the extended boil NAGpH value can be used to confirm samples are PAF, but does not necessarily mean that samples with a pH greater than 4.5 are NAF, due to some loss of free acid during the extended boiling procedure. To address this issue, a calculated NAG value is determined from assays of anions and cations released to the NAG solution. A calculated NAG value of less than or equal to 0 kg H_2SO_4/t indicates the sample is likely to be NAF, and a value of more than 0 kg H_2SO_4/t indicates the sample may be PAF.

The calculated NAG values for three samples (REP 3 from Area 1, and REP 6 and REP 7 from Area 2) are positive, indicating that these samples are likely to be acid producing. The calculated NAG value for sample REP8 from Area 1 is negative, consistent with the NAPP result, indicating that all acid generated in the standard NAG test for this sample is organic, and that the sample is unlikely to generate acid.

5.2 ABCC Results

An ABCC profile is produced by slow titration of a sample with acid, and provides an indication of the relative reactivity of the ANC measured. The acid buffering of a sample to pH 4 can be used as an estimate of the proportion of readily available ANC.
ABCC testing was carried out on 3 selected samples to evaluate the availability of the ANC measured. Results are presented in Figures 10 to 12, with calcite, dolomite, ferroan dolomite and siderite standard curves as reference. Calcite and dolomite readily dissolve in acid and exhibit strongly buffered pH curves in the ABCC test, rapidly dropping once the ANC value is reached. The siderite standard provides very poor acid buffering, exhibiting a very steep pH curve in the ABCC test. Ferroan dolomite is between siderite and dolomite in acid buffering availability.

The ABCC profiles for samples REP 7 from Area 3 (Figure 10) and REP 8 from Area 1 (Figure 11) plot close to the siderite standard curve, and indicate that generally less than 20% of the total ANC measured is readily available. Sample REP 7 from Area 1 has a profile that plots close to the ferroan dolomite curve (Figure 12) indicating that the buffering is slow reacting, with approximately 60% of the total ANC is effective.

ABCC results suggest that the acid buffering minerals within the samples are partly sideritic and poorly reactive, and hence may not provide buffering at the same rates as pyrite oxidation.

5.3 Kinetic NAG Testing

Kinetic NAG tests provide an indication of the kinetics of sulphide oxidation and acid generation for a sample. Figures 13 to 16 present kinetic NAG test results for 4 selected samples with S values greater than 0.7%S.

All four of these samples produced acid pH water extracts, and the pH profiles confirm the rapid rates of pyrite oxidation.

Typically, there will be a distinct temperature peak of greater than 50°C in the kinetic NAG profile for samples with pyritic S greater than 0.7%S. Two of the kinetic NAG profiles (Figure 13 and 14) do not show this peak, despite total S values of approximately 0.9%S. This indicates that a proportion of the total S measured in these samples is likely to be in non-pyrite form, and supports the findings of lower NAG values compared to NAPP values. The remaining two samples have distinct temperature peaks consistent with most of the S being present as pyrite (or associated acid producing oxidation products).

5.4 Elemental Enrichment and Solubilities

Results of multi-element scans for 5 selected samples were compared to the median soil abundance (from Bowen, 1979[8]) to highlight enriched elements.

Results of multi-element analysis and the corresponding GAI values are presented in Table 14. Results show significant enrichment in S (related to pyrite content), and slight enrichment of Be. Although enriched, Be values are within normal ranges for soils. These elemental enrichments are consistent with results of previous testing of DCM and SCM washery waste samples (see Section 2).

The same 5 samples were subjected to deionised water extraction at a solids:liquor ratio of 1:2, and the resulting liquors were analysed for multi-elements. The compositions of the water extracts are given in Tables 15.

All sample extracts have pH values less than 7, with four of the five having pH values less than 4.5. The liquors have elevated concentrations of dissolved Al and Fe, with slightly elevated Mn, Ni and Zn in one or two of the lower pH samples.

Water extract results show that pyrite oxidation and acid release is likely to be associated with elevated metal concentrations, including Al, Fe, Mn, Ni and Zn. Selected element testing of leachates from previous DCM and SCM washery waste columns supports release of Al, Fe, Mn and Zn from acidic rejects. The solubility of these elements will largely be determined by pH and therefore control of acid generation will effectively control metal leaching. Re-flooding of exposed rejects is likely to result in some mobilisation of metals/metaloids, which may require lime treatment to mitigate potential water quality impacts.

Results of multi-element testing suggest that materials represented by these samples have no significant elemental enrichment apart from S, but will mobilise significant concentrations of metals at low pH.

6.0 Sample Classification

The ARD classification of samples is shown in Table 13 based on the following criteria:

Non Acid Forming (NAF)

- NAPP 0 kg H_2SO_4/t and NAGpH 4.5; or
- NAPP 0 kg H_2SO_4/t and Calculated NAG 0 kg H_2SO_4/t

Potentially Acid Forming (PAF)

- NAPP > 0 kg H_2SO_4/t and NAGpH < 4.5.

Potentially Acid Forming - Lower Capacity (PAF-LC)

- PAF samples with Standard NAG or Calculated NAG acidities to pH 4.5 5 kg H_2SO_4/t.

Only two samples were classified NAF, and the remaining 22 samples were classified either PAF or PAF-LC. Results of previous testing (see Section 2) suggest that coal from the DCM is the main source of pyritic washery wastes.

7.0 Comparison of Raw Coal Sulphur Data for Duralie Coal Mine and Duralie Extension Project

Raw (pre-washing) coal seam S data was provided from the following drillholes collared in the mined and unmined portions of the existing DCM, and in the Weismantel Extension Pit and Clareval North West Pit proposed in the Duralie Extension Project:

Mine Area	Seam	Drillholes
Existing DCM - Mined	Weismantel	WC101, WC102, WC103, WC104, WC106, WC107, WC110, WC111, WC112, WC113, WC114, WC115, WC116, WC119, WC120, WC206C, WC207C, WC208C, WC212, WC214 and WC216
Existing DCM - Unmined	Weismantel	WC209, WC211 andWC210
Weismantel Extension Pit	Weismantel	WC217AC, WC219AC andWC218C
Clareval North West Pit	Clareval	DU009C, DU86C, DU85C, DU84C, DU110C, DU112C, DU116C, DU117C, DU150C, DU118C, DU161C, DU181C and DU177C

Figure 17 is a box plot comparing the distribution of S in raw coal for each of the main existing and proposed mine areas. Results show that S distributions are similar for the existing mine area and the unmined approved area with median S values of 1.7%S and 1.8%S, respectively. The S data for the Clareval North West Pit (Clareval Seam) has a lower median S of 1.1%S, but shows a similar range of values. Results for the Weismantel Extension Pit suggest that the overall S distribution may be significantly lower than that of the existing pit, with a median of 0.9%S.

Results indicate that the pyrite content in raw coal to be extracted from the proposed Clareval North West Pit and Weismantel Extension Pit is unlikely to exceed (and may even be less than) pyrite contents in raw coal from the existing DCM operations. Hence, washery waste materials derived from the Duralie Extension Project are likely to have similar ARD potential to those currently produced, and the results discussed in the previous sections can be used as an indication of the ARD potential of future washery waste materials.

Note that this raw S comparison can only be used as an indication of the likely overall similarity of the distributions in past and future washery wastes. Regular testing of deposited rejects would be required to confirm this (Section 8).

8.0 Conclusions and Recommendations

Results of the geochemical investigations to date show that most co-disposed rejects and tailings materials represented by the samples tested from the Stratford Main Pit deposition area are PAF or PAF-LC, with low ANC and fast rates of reaction. Multi-element analysis suggests that materials represented by the samples tested would have no significant elemental enrichment (except for S), but would mobilise metals at low pH. Pyrite oxidation and acid release is likely to be associated with elevated metal concentrations, including Al, Fe, Mn, Ni and Zn. These results indicate that without the implementation of appropriate management measures, the existing and proposed co-disposed rejects and tailings materials pose a significant ARD hazard.

Inundation effectively halts pyrite oxidation and generation of ARD, and represents the most secure long-term management option for the co-disposed rejects and tailings. It is understood that at closure all deposited co-disposed rejects and tailings would be below the standing water level in the Stratford Main Pit, providing long term ARD control. However, during operations some exposure of the co-disposed rejects and tailings to atmospheric oxidation conditions would occur.

The co-disposal deposition method[3] would result in placement of most co-disposed rejects and tailings directly below the water level, with the upper 2-3m of active benches located above the water level for a period of time. Inundation of this top zone would occur approximately 6 to 12 months after completion of the bench. It is recommended that crushed limestone be used to control ARD generation in the upper unsaturated beach materials during the period (6 to 12 months) before the bench is inundated. It is the preference of SCM CHPP personnel that limestone addition be carried out by surface broadcast or spreading of limestone on beach surfaces, followed by incorporation into the co-disposed rejects and tailings by ripping with appropriate equipment.

Inspection of the deposited materials on the beach exposures at the Stratford Main Pit indicated they were relatively fine grained and reasonably well graded, and it is expected that diffusion, rather than convection or advection, would be the main mechanism controlling oxidation in these materials after deposition. Diffusion control would result in a gradually downward migrating oxidation front as pyritic materials are progressively consumed, rather than deep penetration of oxygen into all materials above water.

Since diffusion is likely to be the main oxidation mechanism, it is not expected to be necessary to incorporate limestone into the full 2-3m beach. Blending limestone into the surface 300-500 mm should provide sufficient control of ARD from exposed materials until they are inundated. In addition to direct neutralisation of acid generated in the blending zone, the limestone may also provide a source of alkalinity for deeper portions of the lift as infiltrating water passes through the limestone. The mechanisms, efficiency and rates of reaction of limestone blending for these materials under the beach deposition system has not been directly assessed, but it is understood that the management of these materials can be readily modified if required, and it is suggested that limestone blending of the surface be trialled in conjunction with monitoring to check performance. Surface conditioning (such as traffic compaction) may be required after ripping to ensure that any open zones produced by ripping do not lead to increased oxidation rates.

There has not been any direct kinetic testing on the currently deposited co-disposed rejects and tailings, and the variation of the ARD potential has not been comprehensively defined. However, geochemical characterisation carried out to date and the leach column testing carried out between 1995 and 1998 on unblended and limestone blended washery waste samples from the SCM and DCM provide a guide to the limestone addition rates required. The recent testing on deposited beach rejects and tailings from the Stratford Main Pit indicates that the combined washery wastes from the DCM and SCM have total S values (average 0.9%S from 24 samples tested) closer to the SCM columns than the DCM columns. Addition of -4 mm limestone at a rate of 10kg $CaCO_3$/t maintained circum-neutral pH for over 6 months in the SCM column, and increasing the application rate to 20kg $CaCO_3$/t is likely to provide sufficient buffering to maintain a lag for at least 12 months.

It is recommended that a treatment rate of 80 tonnes of calcium carbonate per hectare (t $CaCO_3$/ha) (as -4 mm limestone) incorporated into the surface 300 mm of each lift be initially adopted, which is equivalent to a rate of 20kg $CaCO_3$/t (assuming a density of 1.3 tonnes per cubic metre). Regular monitoring would be required to confirm the effectiveness of these ARD mitigation measures. It is recommended that surface field pH measurements (approximately 1 part solid to 2 parts deionised water) of deposited co-disposed rejects and tailings be carried out for varying durations of exposure after deposition to check for evidence of acid formation. Values of less than pH 5.5 indicate the limestone dosage rate may be insufficient or the surface incorporation method ineffective. The pH and alkalinity of the free water alongside the beach should also be monitored. It is recommended that an alkalinity of at least 30 milligrams of calcium carbonate per litre (mg $CaCO_3$/L) be maintained in the pond. If the alkalinity decreases below 30 mg $CaCO_3$/L it may be necessary to modify the limestone treatment strategy and/or directly lime dose the pond or process liquor.

There are a number of possible approaches to improving ARD mitigation performance if required, including:

- increasing limestone dosage rates;
- increasing blending depth;
- optimising limestone incorporation methods;
- decreasing limestone size fraction;
- reducing lift heights;
- use of more direct effort in control of convection/advection (such as compaction); and
- blending of limestone into the process stream in addition to surface treatment.

On-going characterisation of deposited co-disposed rejects and tailings should be carried out to better define the geochemical variation of the rejects and confirm the validity of the treatment rates. Leach column testing could also be considered to help determine optimal treatment rates, and help demonstrate the adequacy of the management approach.

Table 1: Acid forming characteristics of previously tested laboratory generated DCM and deposited SCM washery waste samples.

Mine Site	EGi Sample Number	Site Sample Number	Sample Description	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS					STANDARD NAG TEST			ARD Classification	
						Total %S	MPA	ANC	NAPP	ANC/MPA	NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$		
Duralie	4947		Coarse Reject	7.5	0.63	2.40	73	4	69	0.06	2.2	24	33	PAF	
Duralie	4948		Fines Reject	6.1	0.47	2.40	73	2	71	0.03	2.1	31	40	PAF	
Duralie	4949		Tailings	6.7	0.28	1.50	46	1	45	0.03	2.5	14	26	PAF	
Stratford	10572	DMB1	Scalpings (DMB-Rejects)	7.7	0.35	0.36	11	34	-23	3.09	5.6	0	2	NAF	
Stratford	10573	DMB2	Scalpings (DMB-Rejects)	7.7	0.30	0.26	8	16	-8	2.01	5.7	0	2	NAF	
Stratford	10574	DMB3	Scalpings (DMB-Rejects)	7.8	0.30	0.22	7	18	-11	2.67	6.3	0	0	NAF	
Stratford	10578	CDB1	Co-Disposed Beach Deposit	8.1	0.57	1.34	41	35	6	0.85	4.8	0	3	UC(NAF)	
Stratford	10579	CDB2	Co-Disposed Beach Deposit	8.2	0.63	0.79	24	32	-8	1.32	3.2	0.5	6	UC(PAF-LC)	
Stratford	10580	CDB3	Co-Disposed Beach Deposit	8.3	0.35	0.57	17	9	8	0.52	3.6	0.4	5	PAF-LC	
Stratford	10581	CDS1	Tailings	8.1	0.61	0.79	24	15	9	0.62	5.5	0	2	UC(NAF)	
Stratford	10582	CDS2	Tailings	8.3	0.79	0.65	20	37	-17	1.86	7.8	0	0	NAF	
Stratford	10583	CDS3	Tailings	8.1	0.83	0.63	19	15	4	0.78	5.6	0	2	UC(NAF)	

KEY

$pH_{1:2}$ = pH of 1:2 extract

$EC_{1:2}$ = Electrical Conductivity of 1:2 extract (dS/m)

MPA = Maximum Potential Acidity (kgH_2SO_4/t)

ANC = Acid Neutralising Capacity (kgH_2SO_4/t)

NAPP = Net Acid Producing Potential (kgH_2SO_4/t)

NAGpH = pH of NAG liquor

$NAG_{(pH4.5)}$ = Net Acid Generation capacity to pH 4.5 (kgH_2SO_4/t)

$NAG_{(pH7.0)}$ = Net Acid Generation capacity to pH 7.0 (kgH_2SO_4/t)

NAF = Non-Acid Forming

PAF = Potentially Acid Forming

PAF-LC = PAF - lower capacity

UC = Uncertain Classification

(expected classification in brackets)

Table 2: Multi-element composition (mg/kg except where shown) and geochemical abundance indices for laboratory generated DCM washery waste samples.

Element	Detection Limit	Sample Description			Median Soil Abundance*	Sample Description		
		Coarse Reject	Fines Reject	Tailings		Coarse Reject	Fines Reject	Tailings
Ag	0.1	<	0.1	<	0.05	-	-	-
Al	0.002%	10.00%	8.00%	7.40%	7.1%	-	-	-
As	1	4.0	4.0	6.5	6	-	-	-
B	50	<	<	<	20	-	-	-
Ba	0.1	72	90	104	500	-	-	-
Be	0.1	1.3	1.4	1.8	0.3	2	2	2
Ca	0.001%	0.19%	0.14%	0.14%	1.5%	-	-	-
Cd	0.1	0.2	0.1	0.2	0.35	-	-	-
Co	0.1	15	31	24	8	-	1	1
Cr	2	14	24	50	70	-	-	-
Cu	1	50	78	120	30	-	1	1
F	50	200	100	100	200	-	-	-
Fe	0.01%	1.02%	1.80%	4.50%	4.0%	-	-	-
Hg	0.01	<	0.2	0.1	0.06	-	1	-
K	0.002%	0.07%	0.07%	0.10%	1.4%	-	-	-
Mg	0.002%	0.08%	0.06%	0.14%	0.5%	-	-	-
Mn	1	48	68	120	1000	-	-	-
Mo	0.1	1.0	2.0	3.0	1.2	-	-	1
Na	0.002%	0.04%	0.02%	0.02%	0.5%	-	-	-
Ni	1	22	46	50	50	-	-	-
P	20	280	360	500	800	-	-	-
Pb	2	24	28	26	35	-	-	-
S	0.001%	2.40%	2.40%	1.50%	0.07%	**5**	**5**	**4**
Sb	0.05	0.80	1.00	1.00	1	-	-	-
Se	0.01	1.85	0.54	1.80	0.4	2	-	2
Si	0.1%	11.2%	8.4%	8.2%	33.0%	-	-	-
Sn	0.1	1.0	2.0	5.0	4	-	-	-
Sr	0.05	114.0	175.0	205.0	250	-	-	-
Zn	1	104	145	520	90	-	-	2

< element at or below analytical detection limit.

* Bowen H.J.M.(1979) Environmental Chemistry of the Elements.

Table 3: Column leach test results for DCM unblended coarse rejects (CR-1), operated in 1995 and 1996.

Parameters		Week									
		1	2	3	4	6	8	12	16	20	24
Vol. Leached (ml)	ml	299	215	206	198	350	387	779	740	734	786
pH	-	2.2	2.0	2.0	2.1	2.2	2.3	2.3	2.3	2.2	2.4
EC (dS/m)	dS/m	4.21	3.55	4.29	3.82	4.57	4.34	4.67	4.72	4.08	3.06
Alkalinity ($CaCO_3$)	mg/L										
Acidity ($CaCO_3$)	mg/L	3331	3339	5049	4910	5762	4610	4601	3266	2706	1764
Al	mg/L	64	72	92	98	155	170	235	270	180	140
Ca	mg/L	330	215	190	150	150	118	130	130	104	116
Cl	mg/L	<5	<5	<5	5	<5	<5	<5	<5	<5	<5
Fe	mg/L	800	1020	1500	1550	1900	1300	1300	900	560	285
Mg	mg/L	145	94	90	88	90	60	66	44	31	19
Mn	mg/L	10.4	7.8	8.6	8.8	8.2	6.0	7.4	5.4	3.3	3.8
Na	mg/L	66	34	30	30	17.5	5.0	4.0	1.5	5.6	3.8
SO4	mg/L	4100	4200	5200	5200	6000	4300	5000	3900	2850	2150
Zn	mg/L	125	80	78	74	74	48	52	32	21	12.5

Table 4: Column leach test results for DCM coarse rejects blended with -4 mm limestone at a rate of 5 kg CaCO3/t (CR-2), operated in 1995 and 1996.

Parameters		Week									
		1	2	3	4	6	8	12	16	20	24
Vol. Leached (ml)	ml	271	248	107	126						
pH	-	2.3	2.1	2.2	2.2						
EC (dS/m)	dS/m	3.82	3.30	3.23	3.34						
Alkalinity ($CaCO_3$)	mg/L										
Acidity ($CaCO_3$)	mg/L	2627	2601	2321	3629						
Al	mg/L	56	56	52	84						
Ca	mg/L	370	295	145	145						
Cl	mg/L	<5	<5	<5	<5						
Fe	mg/L	540	620	660	940						
Mg	mg/L	160	130	66	82						
Mn	mg/L	10.6	9	5.6	7.2						
Na	mg/L	70	42	20	21						
SO4	mg/L	3700	3600	2650	3500						
Zn	mg/L	130	98	49	60						

Table 5: Column leach test results for DCM coarse rejects blended with -4 mm limestone at a rate of 10 kg CaCO3/t (CR-3), operated in 1995 and 1996.

Parameters		Week									
		1	2	3	4	6	8	12	16	20	24
Vol. Leached (ml)	ml	258	162	97	98						
pH	-	2.4	2.2	2.3	2.3						
EC (dS/m)	dS/m	3.46	3.02	2.99	2.95						
Alkalinity ($CaCO_3$)	mg/L										
Acidity ($CaCO_3$)	mg/L	1870	1745								
Al	mg/L	40	39	36	54						
Ca	mg/L	380	295	200	215						
Cl	mg/L	<5	<5	<5	<5						
Fe	mg/L	310	350	340	520						
Mg	mg/L	145	130	88	104						
Mn	mg/L	9.6	9.6	6.8	8.2						
Na	mg/L	66	45	27	24						
SO4	mg/L	2850	2700	2100	2750						
Zn	mg/L	116	92	58	64						

Table 6: Column leach test results for DCM coarse rejects blended with -4 mm limestone at a rate of 20 kg CaCO3/t (CR-4), operated in 1995 and 1996.

Parameters		Week									
		1	2	3	4	6	8	12	16	20	24
Vol. Leached (ml)	ml	260	93	100							
pH	-	2.2	2.3	2.4							
EC (dS/m)	dS/m	2.58	3.08	3.38							
Alkalinity ($CaCO_3$)	mg/L										
Acidity ($CaCO_3$)	mg/L	5298		2197							
Al	mg/L	116	58	60							
Ca	mg/L	420	235	215							
Cl	mg/L	<5	<5	<5							
Fe	mg/L	1300	540	400							
Mg	mg/L	190	104	96							
Mn	mg/L	17	8.2	7.4							
Na	mg/L	42	18.5	8.6							
SO4	mg/L	6400	2850	2450							
Zn	mg/L	160	72	62							

Table 7: Column leach test results for DCM coarse rejects blended with -1 mm limestone at a rate of 20 kg CaCO3/t (CR-5), operated in 1995 and 1996.

Parameters		Week									
		1	2	3	4	6	8	12	16	20	24
Vol. Leached (ml)	ml	372	114	105	120	225	243	736	863	687	535
pH	-	7.2	6.5	6.8	6.6	6.7	6.7	7.6	7.5	6.7	6.6
EC (dS/m)	dS/m	2.39	1.46	1.67	2.57	2.41	2.28	2.62	2.30	2.01	2.13
Alkalinity ($CaCO_3$)	mg/L	61	42	13	-	20	1	25	29	22	14
Acidity ($CaCO_3$)	mg/L										
Al	mg/L	0.19						0	0		0
Ca	mg/L	580	390	450	580	600	540	540	520	520	440
Cl	mg/L	<5	<5	<5	5	<5	<5	<5	<5	<5	<5
Fe	mg/L	0.96						0	0		1
Mg	mg/L	150	72	68	80	66	54	60	47	37	28
Mn	mg/L	9.8	0.64	0.44	0.5	0.4	0.2	0.1	0.1	0.3	0.1
Na	mg/L	15	8.6	8.2	9	7.4	7.0	8.6	10.0	7.2	4.6
SO4	mg/L	2000	1250	1500	1900	1650	1600	1450	1400	1450	1140
Zn	mg/L	3.6	1.55	1.95	3	1	2	2	1	1	0.9

Table 8: Multi-element composition (mg/kg except where shown) and geochemical abundance indices for SCM washery waste samples.

Element	Detection Limit	Sample Description			Median Soil Abundance*	Sample Description		
		DMB2	CDB2	CDS3		DMB2	CDB2	CDS3
		Scalpings	Co-Disposed Beach Deposit	Tailings		Scalpings	Co-Disposed Beach Deposit	Tailings
Ag	0.1	<	<	<	0.05	-	-	-
Al	0.002%	6.00%	4.60%	2.50%	7.1%	-	-	-
As	1	5	10	11	6	-	-	-
B	50	<	<	<	20	-	-	-
Ba	0.1	1250	1020	285	500	1	-	-
Be	0.1	2.1	2.5	1.0	0.3	2	2	1
Ca	0.001%	0.90%	0.54%	0.39%	1.5%	-	-	-
Cd	0.1	0.2	0.2	0.2	0.35	-	-	-
Co	0.1	2	9	3	8	-	-	-
Cr	2	12	16	6	70	-	-	-
Cu	1	14	32	10	30	-	-	-
F	50	600	350	350	200	1	-	-
Fe	0.01%	8.20%	1.55%	1.85%	4.0%	-	-	-
Hg	0.01	<	0.2	0.2	0.06	-	1	1
K	0.002%	0.84%	1.00%	0.49%	1.4%	-	-	-
Mg	0.002%	0.30%	0.17%	0.10%	0.5%	-	-	-
Mn	1	2100	330	175	1000	-	-	-
Mo	0.1	1.0	2.5	1.0	1.2	-	-	-
Na	0.002%	0.22%	0.14%	0.10%	0.5%	-	-	-
Ni	1	6	8	1	50	-	-	-
P	20	4300	960	900	800	2	-	-
Pb	2	16	16	6	35	-	-	-
S	0.001%	0.26%	0.79%	0.63%	0.07%	**1**	**3**	**3**
Sb	0.05	<	<	<	1	-	-	-
Se	0.01	0.88	0.78	0.76	0.4	1	-	-
Si	0.1%	16.0%	15.0%	11.8%	33.0%	-	-	-
Sn	0.1	2.0	4.0	1.0	4	-	-	-
Sr	0.05	800.0	175.0	145.0	250	1	-	-
Zn	1	50	72	38	90	-	-	-

< element at or below analytical detection limit.

* Bowen H.J.M.(1979) Environmental Chemistry of the Elements.

Table 9: Column leach test results for composite SCM scalpings samples DMB2 and DMB3, operated in 1997 and 1998.

Parameters		Week					
		4	8	12	16	20	24
Vol. Leached (ml)	ml	367	423	439	442	432	445
pH	-	7.8	7.5	8.0	7.8	8.0	8.2
EC (dS/m)	dS/m	1.05	1.46	1.48	1.06	1.18	1.11
Alkalinity ($CaCO_3$)	mg/L	34	30	55	63	123	100
Acidity ($CaCO_3$)	mg/L						
Ca	mg/L	19	27	39	26	29	19
Fe	mg/L	<	<0.01	<0.01	<0.01	<0.01	<0.01
K	mg/L	3	3	4	3	3	2
Mg	mg/L	13	20	29	19	21	14
Na	mg/L	170	200	250	175	180	135
SO4	mg/L	265	380	494.3	282	240	162

Table 10: Column leach test results for SCM co-disposed beach deposit sample CDB2, operated in 1997 and 1998.

Parameters		Week					
		4	8	12	16	20	24
Vol. Leached (ml)	ml	415	483	477	470	462	467
pH	-	6.9	6.2	7.3	6.3	3.9	3.5
EC (dS/m)	dS/m	2.21	2.38	2.08	1.97	2.41	2.61
Alkalinity ($CaCO_3$)	mg/L	30		19	10		
Acidity ($CaCO_3$)	mg/L		5			16	18
Ca	mg/L	235	225	275	290	300	285
Fe	mg/L	2.30	3.30	0.01	<0.01	0.48	0.94
K	mg/L	5	4	5	30	5	4
Mg	mg/L	86	78	90	90	100	102
Na	mg/L	205	170	185	145	140	98
SO4	mg/L	1250	1140	1348.1	1258	1258	1198

Table 11: Column leach test results for SCM co-disposed beach deposit sample CDB2 treated with -4 mm crushed limestone at a rate of 10 kg $CaCO_3$/t, operated in 1997 and 1998.

Parameters		Week					
		4	8	12	16	20	24
Vol. Leached (ml)	ml	431	493	509	493	480	482
pH	-	7.5	7.0	7.5	7.2	7.1	6.2
EC (dS/m)	dS/m	1.21	0.90	1.42	1.09	1.05	1.06
Alkalinity ($CaCO_3$)	mg/L	31	17	30	17	18	
Acidity ($CaCO_3$)	mg/L						5
Ca	mg/L	92	72	130	98	96	70
Fe	mg/L	0.05	<0.01	0.01	<0.01	<0.01	<0.01
K	mg/L	3	2	4	4	3	2
Mg	mg/L	36	29	58	49	41	29
Na	mg/L	110	66	140	88	70	48
SO4	mg/L	520	340	748.9	554	464	389

Table 12: Column leach test results for SCM tailings sample CDS1, operated in 1997 and 1998.

Parameters		Week						
		0	4	8	12	16	20	24
Vol. Leached (ml)	ml	467	445	402	411	410	411	396
pH	-	8.3	7.4	8.9	7.5	7.4	7.0	6.9
EC (dS/m)	dS/m	4.81	3.31	2.38	2.47	1.81	1.72	1.36
Alkalinity ($CaCO_3$)	mg/L	123	33	31	43	26	35	25
Acidity ($CaCO_3$)	mg/L							
Ca	mg/L	490	350	310	300	180	230	180
Fe	mg/L	<	<0.01	0.10	0.01	<0.01	<0.01	0.05
K	mg/L	10	22	5	5	3	4	3
Mg	mg/L	205	135	100	104	50	72	50
Na	mg/L	660	370	220	170	80	106	62
SO4	mg/L	2250	1900	1558	1198	554	809	689

Table 13: Acid forming characteristics of deposited co-disposed rejects and tailings samples.

EGi Sample Number	Sample Location	Approximate Sample Exposure Time	Sample Site	$pH_{1:2}$	$EC_{1:2}$	ACID-BASE ANALYSIS					STANDARD NAG TEST			Extended Boil NAGpH	Calculated NAG	ARD Classification
						Total %S	MPA	ANC	NAPP	ANC/MPA	NAGpH	$NAG_{(pH4.5)}$	$NAG_{(pH7.0)}$			
34355	Area 1	3 Years	REP 1	4.3	0.97	0.87	27	6	21	0.23	2.6	11	22			PAF
34356	Area 1	3 Years	REP 2	4.1	0.80	0.93	28	6	22	0.21	2.7	10	23			PAF
34357	Area 1	3 Years	REP 3	3.5	0.71	0.91	28	5	23	0.18	2.5	25	43	3.8	13	PAF
34358	Area 1	3 Years	REP 4	3.7	1.88	0.99	30	0	30	0.00	2.4	23	27			PAF
34359	Area 1	3 Years	REP 5	3.9	1.08	0.33	10	7	3	0.69	3.6	3	12			PAF-LC
34360	Area 1	3 Years	REP 6	4.0	1.26	1.52	47	0	47	0.00	2.6	11	21			PAF
34361	Area 1	3 Years	REP 7	6.5	0.63	0.25	8	24	-16	3.14	7.9	0	0			NAF
34362	Area 1	3 Years	REP 8	5.1	0.43	0.23	7	16	-9	2.27	4.3	2	19	6.5	-1	NAF
34363	Area 2	1.5 Years	REP 1	3.7	1.56	0.62	19	0	19	0.00	2.6	15	24			PAF
34364	Area 2	1.5 Years	REP 2	3.9	1.63	0.90	28	1	27	0.04	2.7	9	17			PAF
34365	Area 2	1.5 Years	REP 3	4.4	1.17	0.53	16	3	13	0.18	3.7	2	8			PAF-LC
34366	Area 2	1.5 Years	REP 4	4.3	0.96	0.35	11	4	7	0.37	3.0	6	17			PAF-LC
34367	Area 2	1.5 Years	REP 5	4.1	0.90	0.69	21	3	18	0.14	2.9	8	18			PAF
34368	Area 2	1.5 Years	REP 6	3.2	0.46	0.37	11	2	9	0.18	2.3	49	84	6.6	5	PAF-LC
34369	Area 2	1.5 Years	REP 7	3.1	0.12	0.41	13	2	11	0.16	2.2	67	104	6.4	5	PAF-LC
34370	Area 2	1.5 Years	REP 8	3.9	1.09	0.86	26	7	19	0.27	3.7	2	10			PAF-LC
34371	Area 3	<3 Months	REP 1	4.2	1.49	0.87	27	4	23	0.15	3.1	3	14			PAF-LC
34372	Area 3	<3 Months	REP 2	4.4	1.84	1.44	44	4	40	0.09	2.6	11	17			PAF
34373	Area 3	<3 Months	REP 3	4.5	1.75	1.08	33	3	30	0.09	2.6	9	17			PAF
34374	Area 3	<3 Months	REP 4	5.2	1.42	0.98	30	2	28	0.07	2.7	9	16			PAF
34375	Area 3	<3 Months	REP 5	4.1	1.35	1.85	57	2	55	0.04	2.5	17	21			PAF
34376	Area 3	<3 Months	REP 6	3.7	1.29	2.22	68	2	66	0.03	2.7	8	16			PAF
34377	Area 3	<3 Months	REP 7	5.5	0.62	0.47	14	8	6	0.56	3.5	2	9			PAF-LC
34378	Area 3	<3 Months	REP 8	3.6	1.21	1.93	59	3	56	0.05	2.7	11	20			PAF

KEY

$pH_{1:2}$ = pH of 1:2 extract

$EC_{1:2}$ = Electrical Conductivity of 1:2 extract (dS/m)

MPA = Maximum Potential Acidity (kgH_2SO_4/t)

ANC = Acid Neutralising Capacity (kgH_2SO_4/t)

NAPP = Net Acid Producing Potential (kgH_2SO_4/t)

NAGpH = pH of NAG liquor

$NAG_{(pH4.5)}$ = Net Acid Generation capacity to pH 4.5 (kgH_2SO_4/t)

$NAG_{(pH7.0)}$ = Net Acid Generation capacity to pH 7.0 (kgH_2SO_4/t)

Extended Boil NAGpH = pH of NAG liquor after extended heating

Calculated NAG = The net acid potential based on assay of anions and cations released to the NAG solution (kgH_2SO_4/t)

NAF = Non-Acid Forming

PAF = Potentially Acid Forming

PAF-LC = PAF - lower capacity

UC = Uncertain Classification

(expected classification in brackets)

Standard NAG results overestimate acid potential due to organic acid effects

Table 14: Multi-element composition of selected sample solids (mg/kg except where shown) and corresponding geochemical abundance indices (GAI).

Element	Detection Limit	Sample Number					Element	Median Soil Abundance*	Sample Number				
		Area 1 REP 3	Area 1 REP 7	Area 2 REP 7	Area 3 REP 2	Area 3 REP 8			Area 1 REP 3	Area 1 REP 7	Area 2 REP 7	Area 3 REP 2	Area 3 REP 8
Ag	0.1	<0.1	0.1	<0.1	0.2	<0.1	Ag	0.05	-	-	-	1	-
Al	0.002%	7.5%	7.6%	5.9%	15.6%	15.4%	Al	7.1%	-	-	-	1	1
As	1	9	6	3	8	9	As	6	-	-	-	-	-
Ba	0.1	105.5	293.9	216.7	74.2	62.3	Ba	500	-	-	-	-	-
Be	0.1	1.3	2.6	2.0	2.6	3.0	Be	0.3	2	3	2	3	3
Ca	0.001%	0.08%	0.47%	0.18%	0.16%	0.09%	Ca	1.5%	-	-	-	-	-
Cd	0.1	0.1	0.2	0.1	0.2	0.2	Cd	0.35	-	-	-	-	-
Co	0.1	5.1	7.8	3.6	6.1	7.5	Co	8	-	-	-	-	-
Cr	2.0	6	21	7	5	10	Cr	70	-	-	-	-	-
Cu	1.0	45	33	28	56	63	Cu	30	-	-	-	-	-
F	50	378	548	390	527	412	F	200	-	1	-	1	-
Fe	0.0001%	0.0001%	0.0004%	0.00004%	0.0001%	0.0001%	Fe	4.0%	-	-	-	-	-
Hg	0.01	0.13	0.04	0.07	0.09	0.13	Hg	0.06	1	-	-	-	1
K	0.002%	0.15%	1.38%	0.31%	0.24%	0.15%	K	1.4%	-	-	-	-	-
Mg	0.002%	0.06%	0.43%	0.04%	0.08%	0.06%	Mg	0.5%	-	-	-	-	-
Mn	1.0	117	508	20	43	40	Mn	1000	-	-	-	-	-
Mo	0.1	3.1	3.1	3.2	3.0	3.8	Mo	1.2	1	1	1	1	1
Na	0.002%	0.08%	0.40%	0.10%	0.15%	0.07%	Na	0.5%	-	-	-	-	-
Ni	1.0	11	17	13	13	12	Ni	50	-	-	-	-	-
P	20	231	380	312	193	226	P	800	-	-	-	-	-
Pb	2.0	16	18	19	18	16	Pb	35	-	-	-	-	-
S	0.001%	0.91%	0.25%	0.41%	1.44%	1.02%	S	0.07%	3	1	2	4	3
Sb	0.05	0.34	0.55	0.42	0.52	0.50	Sb	1	-	-	-	-	-
Se	0.01	1.02	0.68	0.91	0.84	1.23	Se	0.4	1	-	1	-	1
Si	0.1%	11%	22%	13%	19%	18%	Si	33.0%	-	-	-	-	-
Sn	0.1	2.4	3.7	3.2	2.5	2.4	Sn	4	-	-	-	-	-
Sr	0.05	97	149	206	68	86	Sr	250	-	-	-	-	-
Th	0.01	7.3	10.8	8.1	6.3	5.4	Th	9	-	-	-	-	-
U	0.01	2.3	2.9	2.3	2.9	2.6	U	2	-	-	-	-	-
Zn	1.0	42	61	19	25	48	Zn	90	-	-	-	-	-

< element at or below analytical detection limit.

*Bowen H.J.M.(1979) Environmental Chemistry of the Elements.

Table 15: Chemical composition of water extracts for selected samples.

Parameter		Detection Limit	Sample				
			Area 1 REP 3	Area 1 REP 7	Area 2 REP 7	Area 3 REP 2	Area 3 REP 8
pH		0.10	3.4	6.3	3.0	4.2	3.5
EC	dS/m	0.01	0.71	0.63	0.12	1.84	1.93
Ag	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Al	mg/l	0.01	0.75	1.18	2.73	0.53	0.32
As	mg/l	0.001	0.002	<0.001	<0.001	0.001	0.002
B	mg/l	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ba	mg/l	0.001	0.030	0.079	0.032	0.042	0.039
Be	mg/l	0.001	0.004	<0.001	<0.001	0.007	0.003
Ca	mg/l	1	11	24	5	27	20
Cd	mg/l	0.0001	0.0008	0.0001	0.0001	0.0010	0.0006
Cl	mg/l	1	1.2	1.2	2.7	2.1	2.7
Co	mg/l	0.001	0.029	<0.001	0.001	0.076	0.037
Cr	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cu	mg/l	0.001	0.070	0.005	0.004	0.037	0.023
F	mg/l	0.1	<0.1	<0.1	<0.1	0.1	<0.1
Fe	mg/l	0.05	8.45	0.37	0.49	40.20	15.00
Hg	mg/l	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
K	mg/l	1	<1	3	<1	<1	<1
Mg	mg/l	1	3	10	<1	5	4
Mn	mg/l	0.001	1.190	0.180	0.033	0.273	0.183
Mo	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Na	mg/l	1	<1	3	2	12	11
Ni	mg/l	0.001	0.065	0.001	<0.001	0.100	0.051
P	mg/l	1	<1	<1	<1	<1	<1
Pb	mg/l	0.001	0.016	0.001	0.004	0.016	0.01
Sb	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Se	mg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Si	mg/l	0.10	1.11	0.51	0.75	0.86	0.66
Sn	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
SO_4	mg/l	1	96	91	15	203	116
Sr	mg/l	0.001	0.117	0.385	0.019	0.408	0.231
Zn	mg/l	0.005	0.175	0.008	0.018	0.127	0.083

< element at or below analytical detection limit.

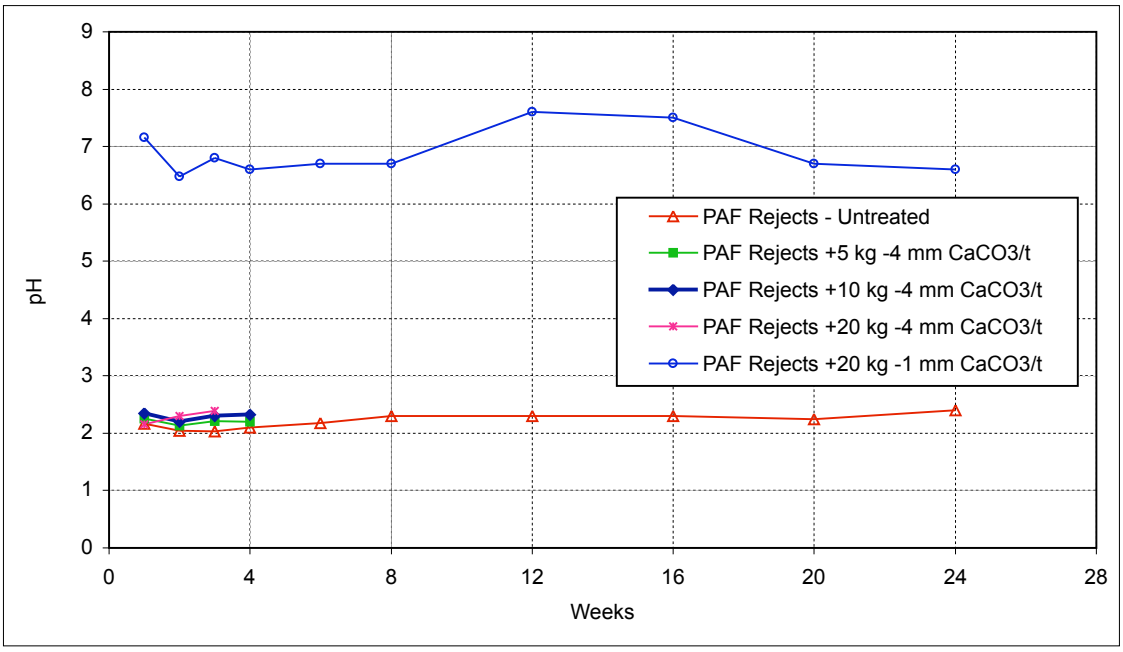


Figure 1: pH trends for treated and untreated DCM rejects columns.

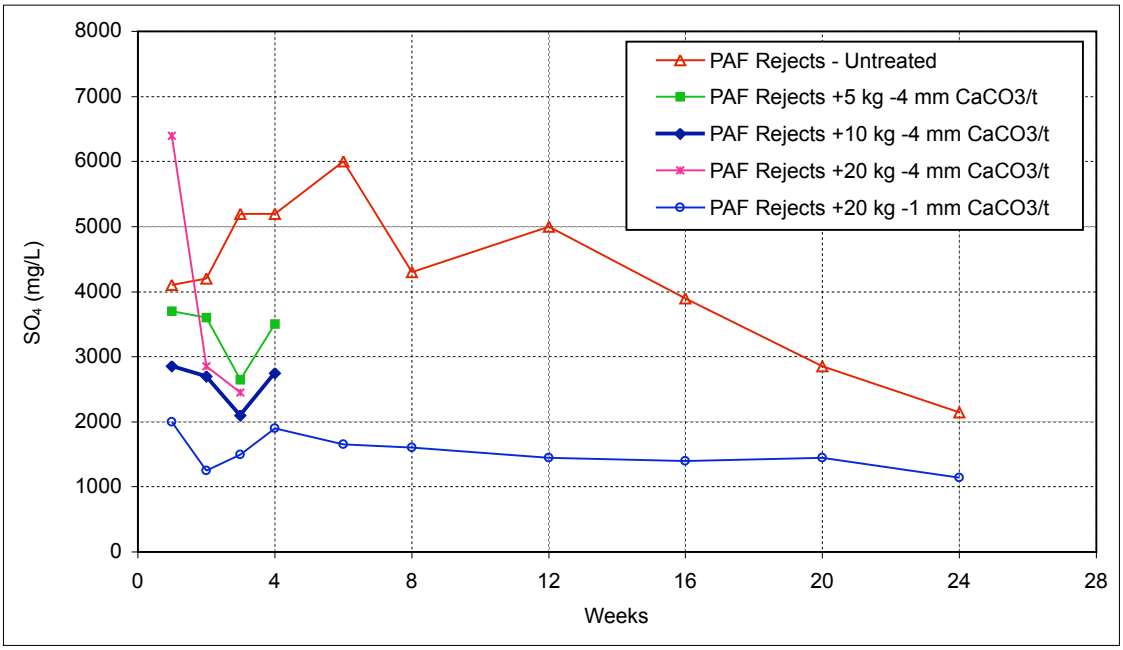


Figure 2: SO_4 trends for treated and untreated DCM rejects columns.

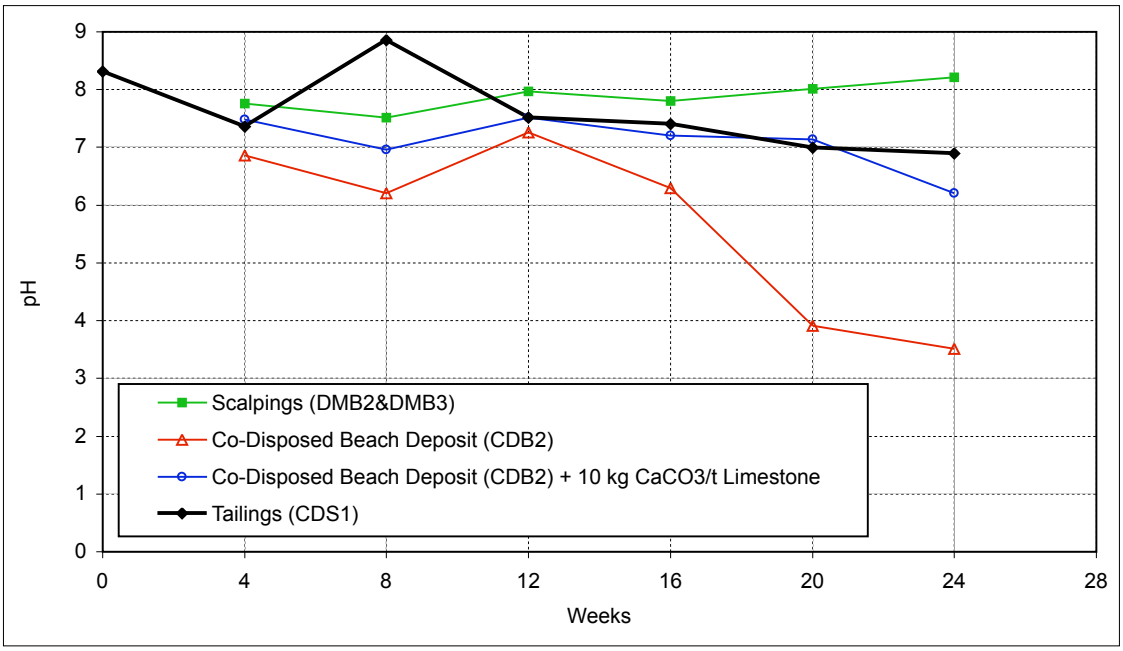


Figure 3: pH trends for treated and untreated SCM washery waste columns.

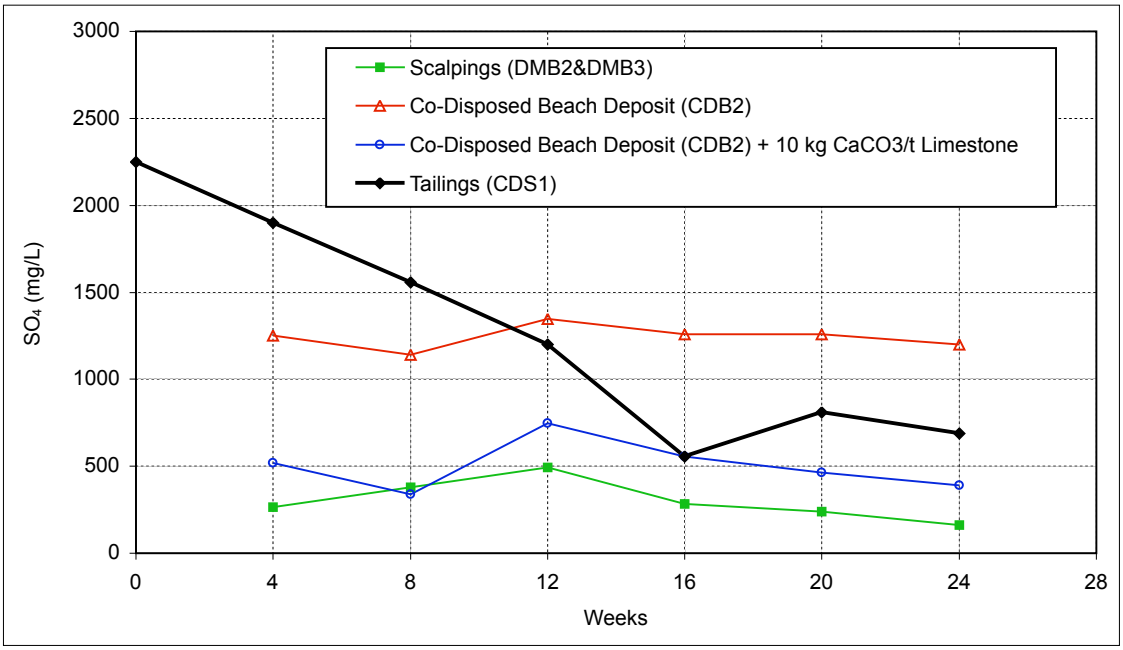
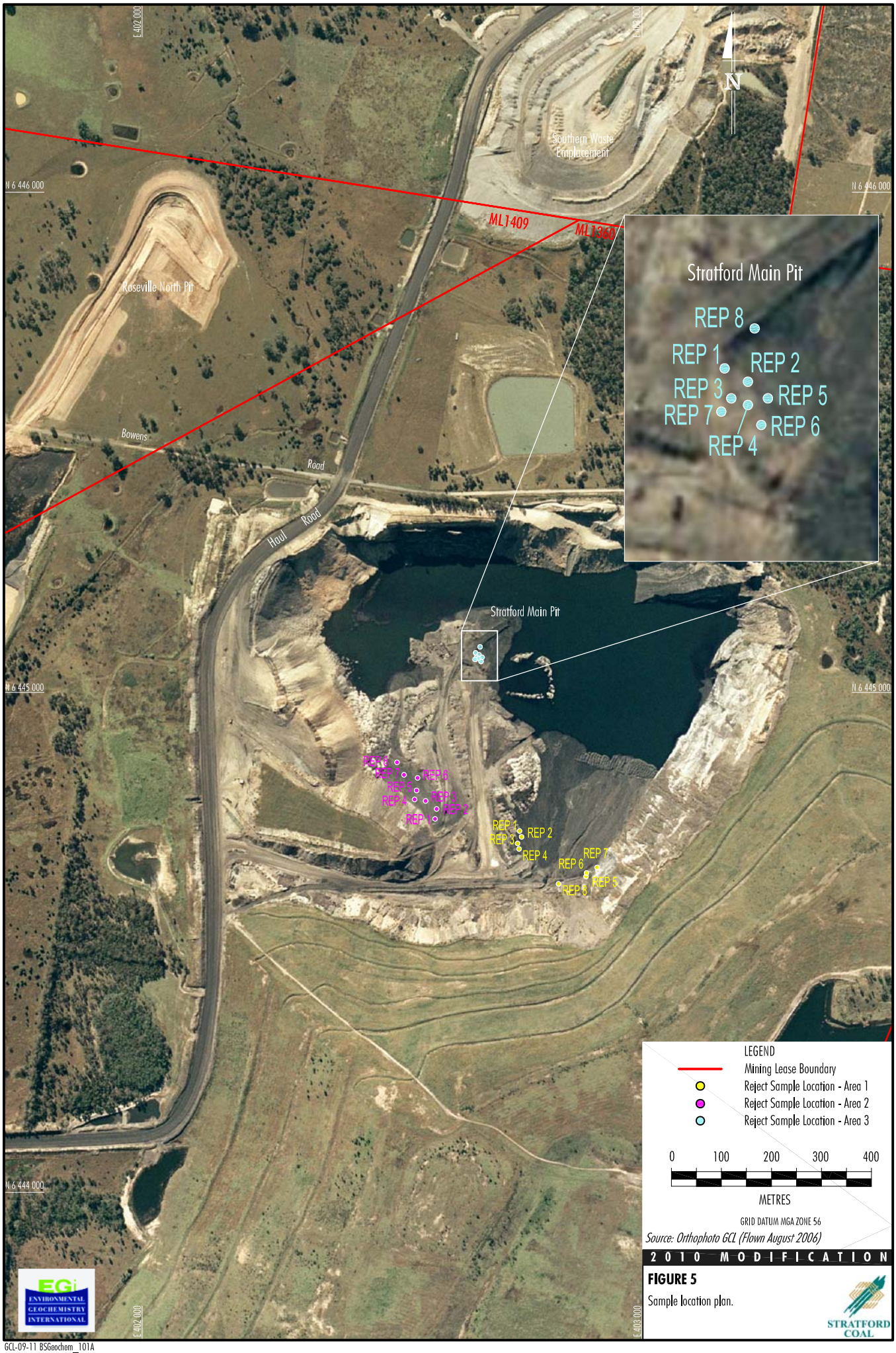


Figure 4: SO_4 trends for treated and untreated SCM washery waste columns.



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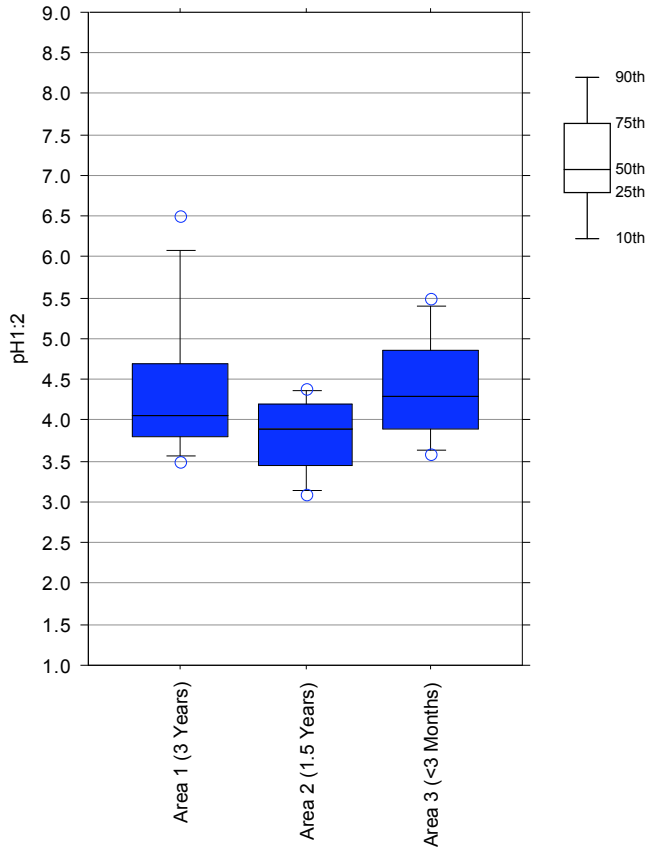

Figure 6: Box plot showing the distribution of $pH_{1:2}$. Box plots have 10th, 25th, 50th (median), 75th and 90th percentiles marked.

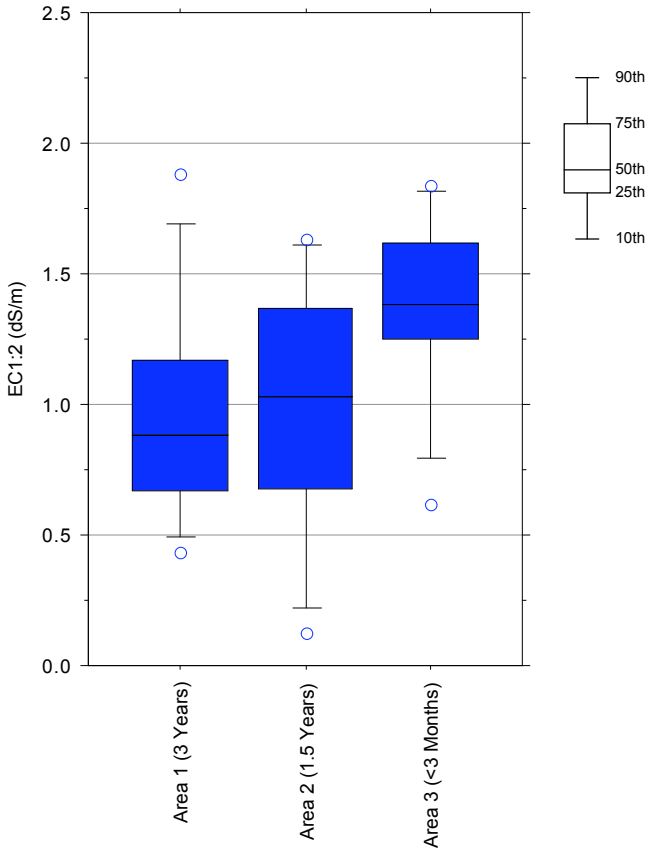

Figure 7: Box plot showing the distribution of $EC_{1:2}$. Box plots have 10th, 25th, 50th (median), 75th and 90th percentiles marked.

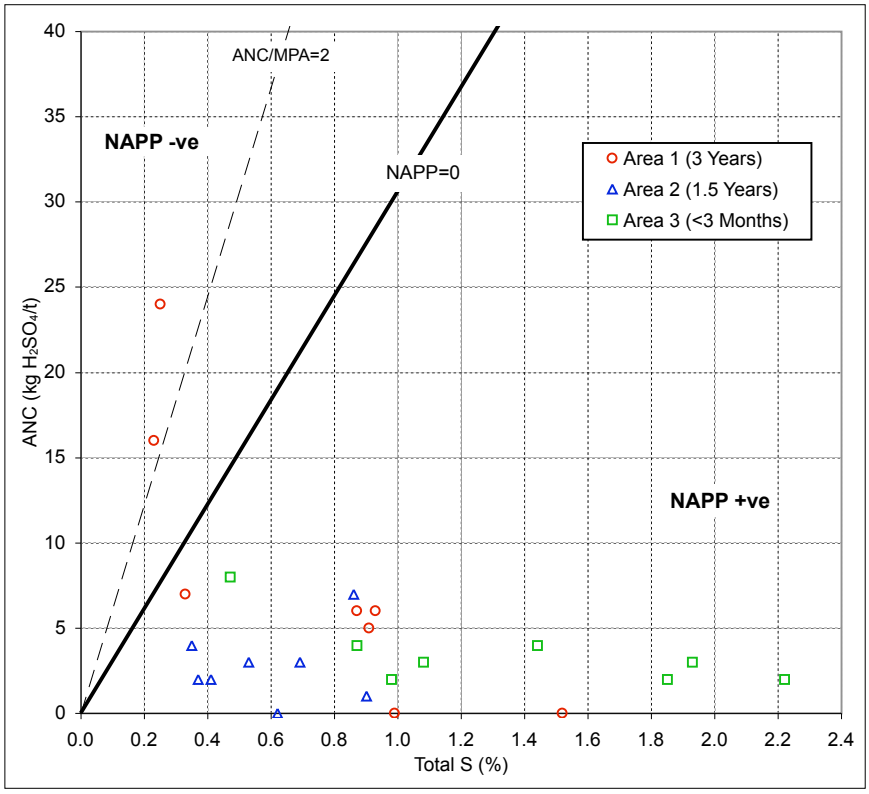

Figure 8: Acid-base account (ABA) plot showing ANC versus total S, split by sample area.

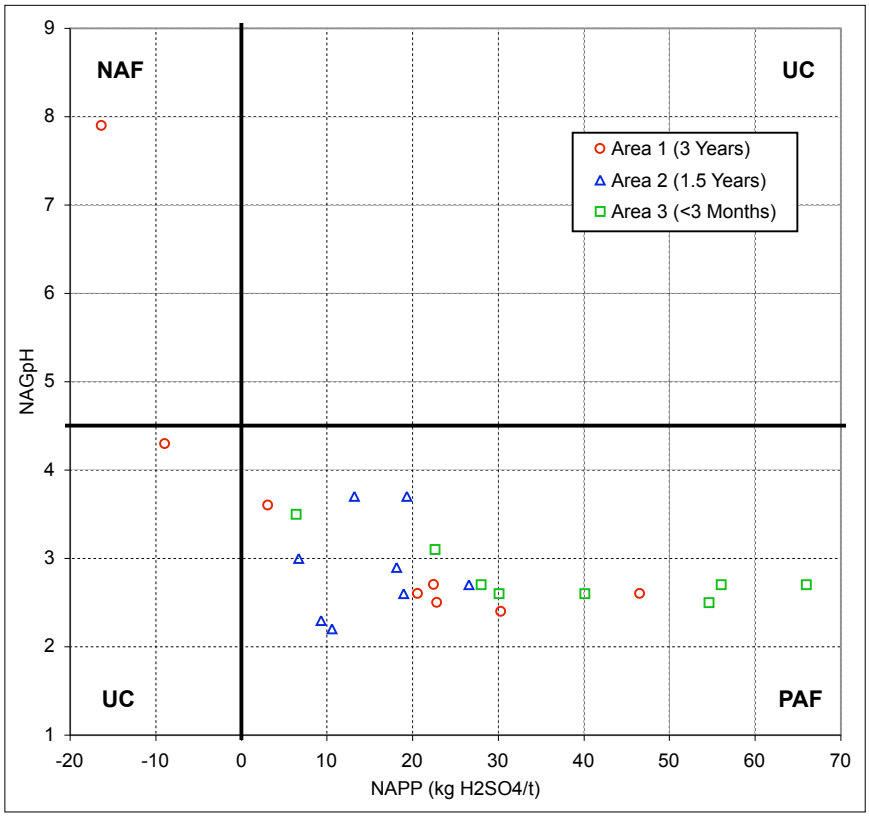

Figure 9: ARD classification plot showing NAGpH versus NAPP, split by sample area, with ARD classification domains indicated.

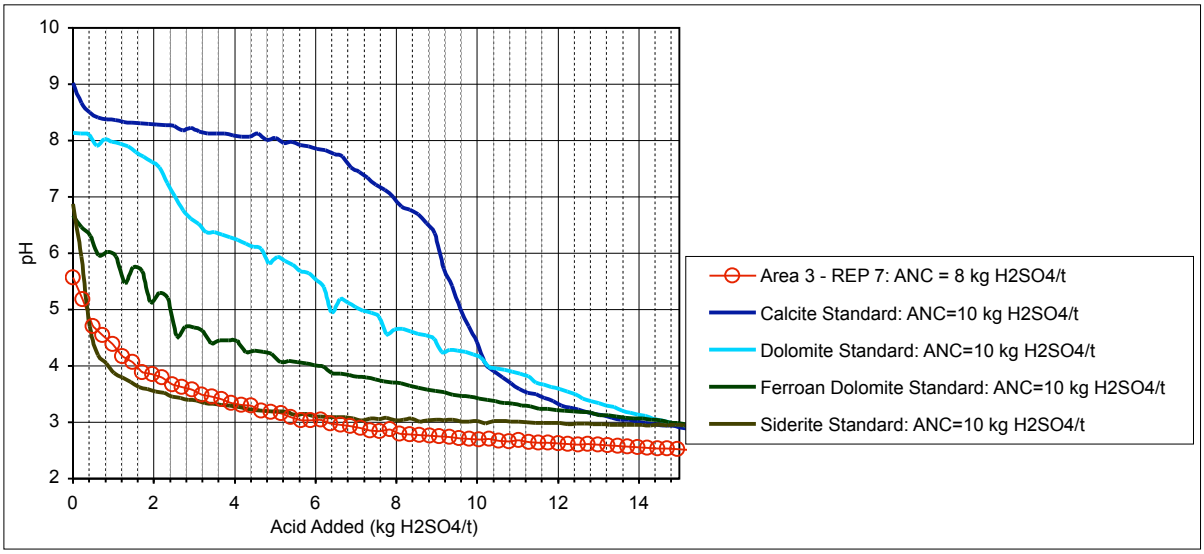

Figure 10: ABCC profile for sample REP 7 from Area 3 with an ANC value close to 10 kg H_2SO_4/t. Carbonate standard curves are included for reference.

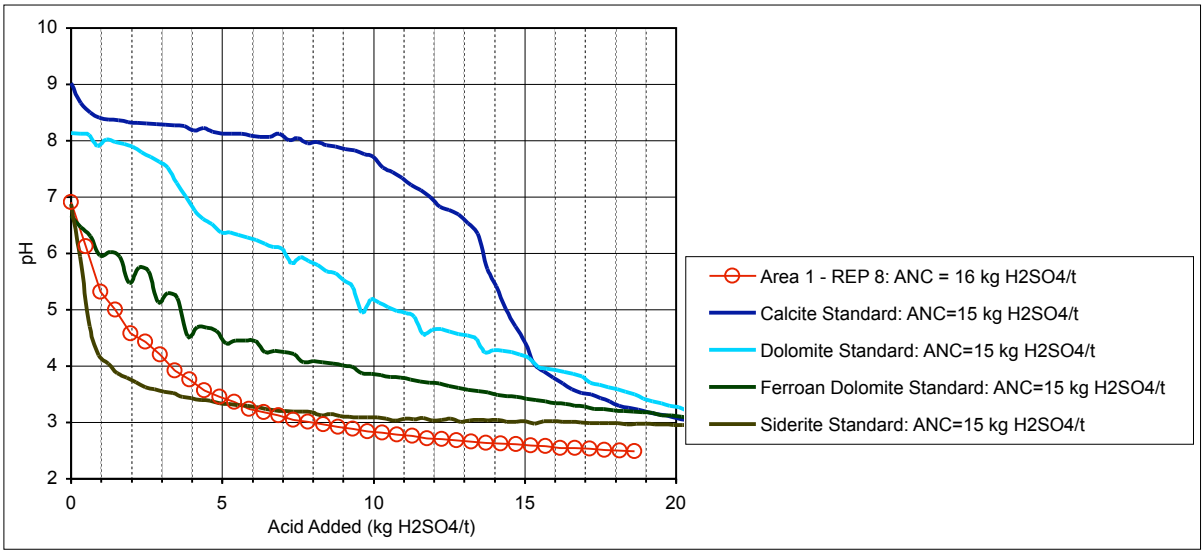

Figure 11: ABCC profile for sample REP 8 from Area 1 with an ANC value close to 15 kg H_2SO_4/t. Carbonate standard curves are included for reference.

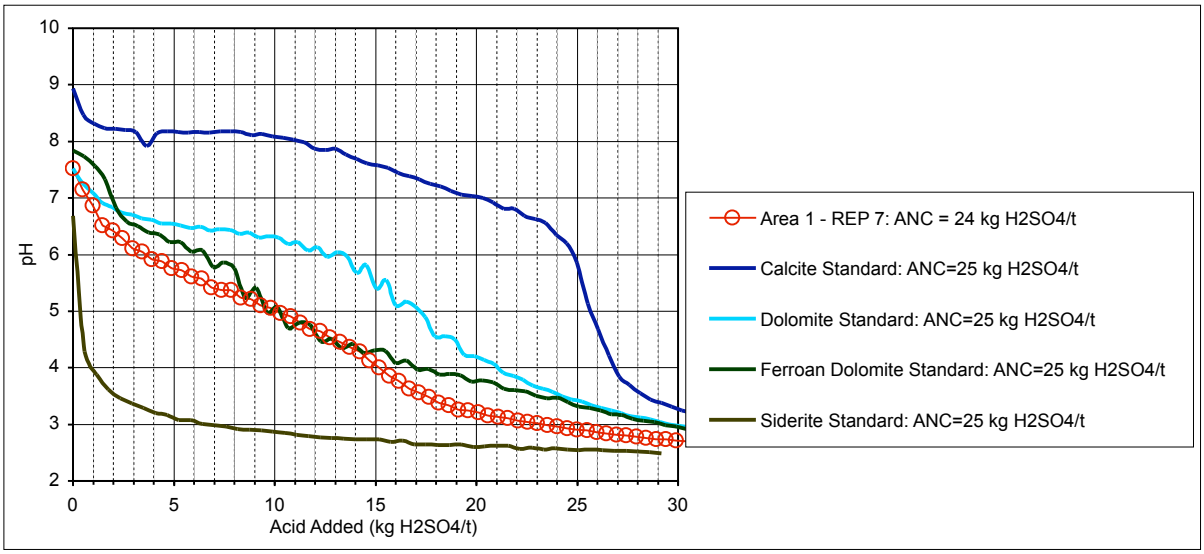

Figure 12: ABCC profile for sample REP 7 from Area 1 with an ANC value close to 25 kg H_2SO_4/t. Carbonate standard curves are included for reference.

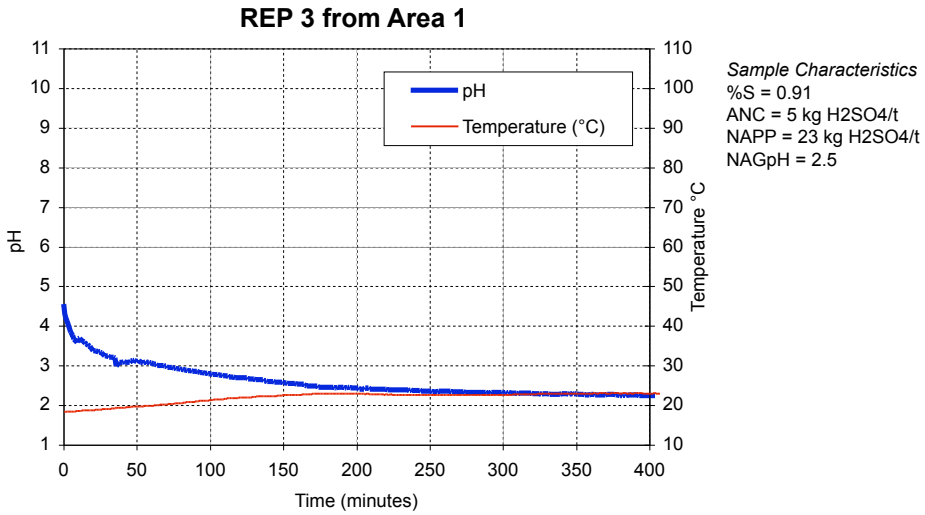

Figure 13: Kinetic NAG graph for sample REP 3 from Area 1.

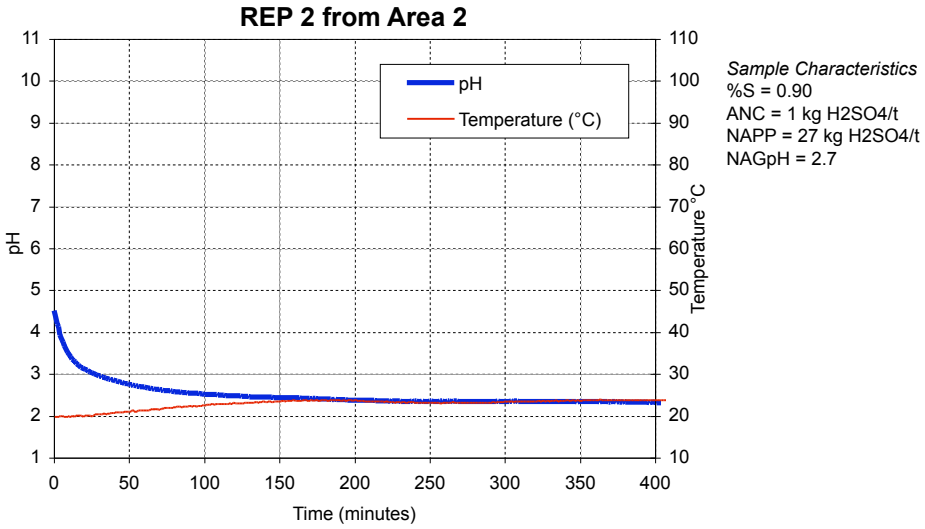

Figure 14: Kinetic NAG graph for sample REP 2 from Area 2.

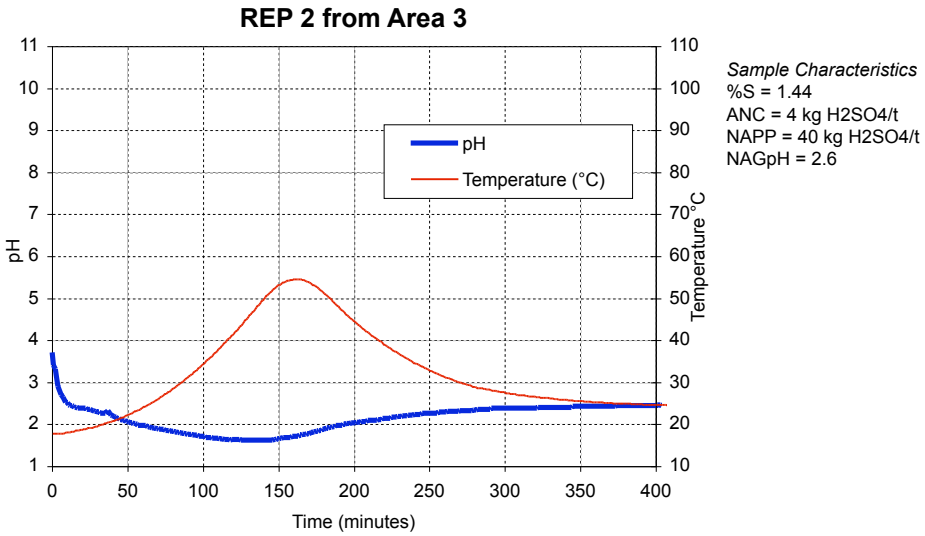

Figure 15: Kinetic NAG graph for sample REP 2 from Area 3.

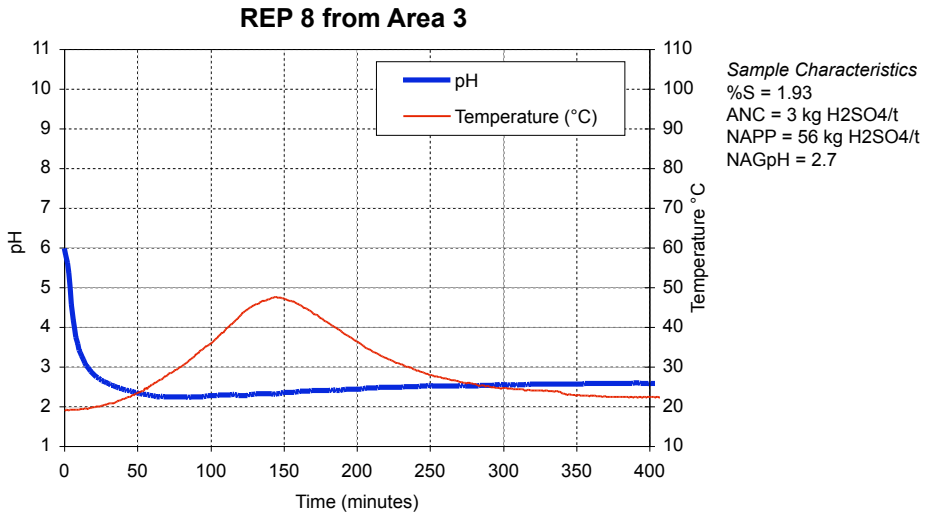

Figure 16: Kinetic NAG graph for sample REP 8 from Area 3.

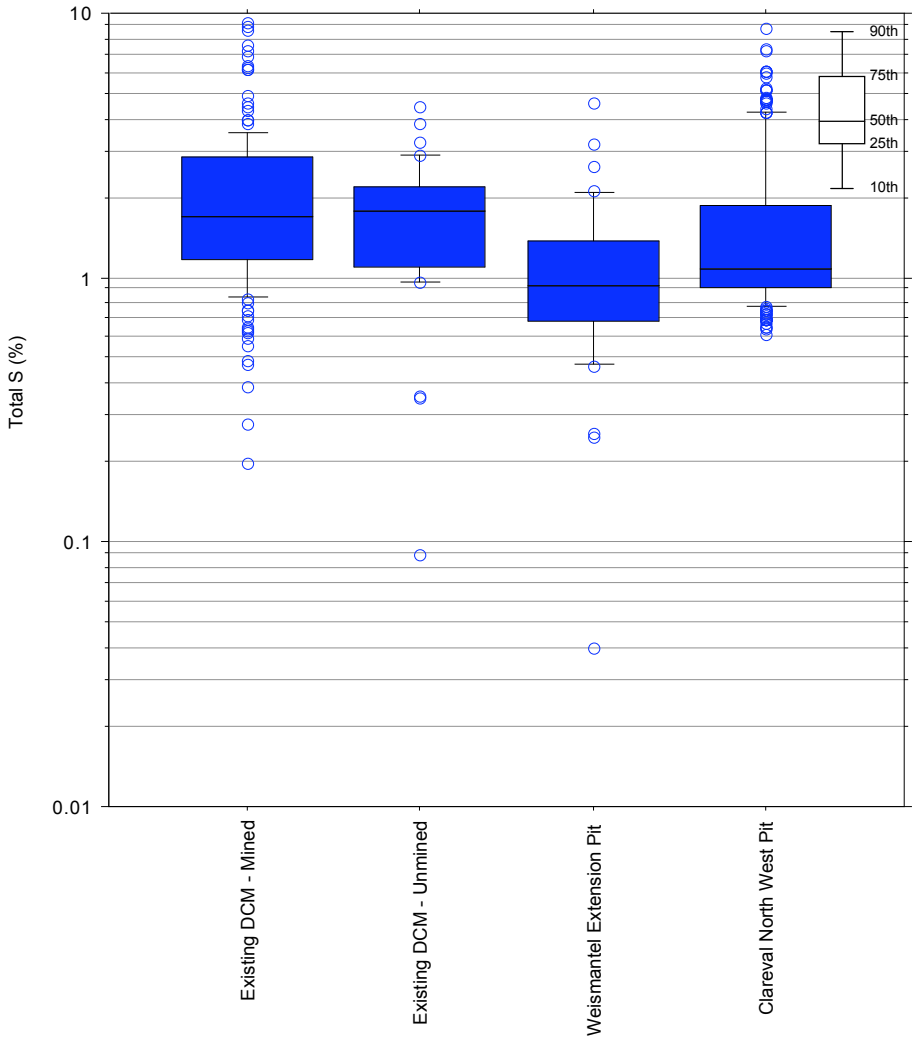

Figure 17: Box plot showing the distribution of raw coal S for selected drillholes within the main existing DCM and Duralie Extension Project mine areas. Box plots have 10th, 25th, 50th (median), 75th and 90th percentiles marked.

APPENDIX A

Assessment of Acid Forming Characteristics

Assessment of Acid Forming Characteristics

Introduction

Acid rock drainage (ARD) is produced by the exposure of sulphide minerals such as pyrite to atmospheric oxygen and water. The ability to identify in advance any mine materials that could potentially produce ARD is essential for timely implementation of mine waste management strategies.

A number of procedures have been developed to help assess the acid forming characteristics of mine waste materials. The most widely used assessment methods for ARD characterisation are the Acid-Base Account (ABA) and the Net Acid Generation (NAG) test. These methods are referred to as static procedures because each involves a single measurement in time.

Acid-Base Account

The acid-base account involves static laboratory procedures that evaluate the balance between acid generation processes (oxidation of sulphide minerals) and acid neutralising processes (dissolution of alkaline carbonates, displacement of exchangeable bases, and weathering of silicates).

The values arising from the acid-base account are referred to as the maximum potential acidity (MPA) and the acid neutralising capacity (ANC), respectively. The difference between the MPA and ANC value is referred to as the net acid producing potential (NAPP).

The chemical and theoretical basis of the ABA are discussed below.

Maximum Potential Acidity

The MPA that can be generated by a sample is determined from the sample sulphur content. The total sulphur content of a sample is commonly determined by the Leco high temperature combustion method. The calculation assumes that all the sulphur measured in the sample occurs as pyrite (FeS_2) and that the pyrite reacts under oxidising conditions to generate acid according to the reaction:

$$FeS_2 + 15/4\ O_2 + 7/2\ H_2O \Rightarrow Fe(OH)_3 + 2\ H_2SO_4$$

According to this reaction, the MPA of a sample containing 1 %S as pyrite would be 30.6 kilograms of H_2SO_4 per tonne of material (*i.e.* kg H_2SO_4/t). Hence the MPA of a sample is calculated from the total sulphur content using the following formula:

$$\text{MPA (kg } H_2SO_4\text{/t)} = \text{(Total \%S)} \times 30.6$$

The use of the total sulphur assay to estimate the MPA is a conservative approach because some sulphur may occur in forms other than pyrite. Sulphate-sulphur and native sulphur, for example, are non-acid generating sulphur forms. Also, some sulphur may occur as other metal sulphides (*e.g.* covellite, chalcocite, sphalerite, galena) which yield less acidity than pyrite when oxidised or, in some cases, may be non-acid generating.

The total sulfur content is commonly used to assess MPA because of the difficulty and costs involved in routinely determining the speciation of sulfur forms within samples and determining reactive sulphide-sulfur contents. However, if the sulphide mineral forms are known then allowance can be made for non- and lesser acid generating sulfur forms to provide a better estimate of the MPA.

Acid Neutralising Capacity

The acid formed from pyrite oxidation will to some extent react with acid neutralising minerals contained within the sample. This inherent acid buffering is quantified in terms of the ANC.

The ANC is commonly determined by the Modified Sobek method. This method involves the addition of a known amount of standardised hydrochloric acid (HCl) to an accurately weighed sample, allowing the sample time to react (with heating), then back-titrating the mixture with standardised sodium hydroxide (NaOH) to determine the amount of unreacted HCl. The amount of acid consumed by reaction with the sample is then calculated and expressed in the same units as the MPA, that is kg H_2SO_4/t.

Net Acid Producing Potential

This is a theoretical calculation commonly used to indicate if a material has potential to produce acidic drainage. It represents the balance between the capacity of a sample to generate acid (MPA) and its capacity to neutralise acid (ANC). The NAPP is also expressed in units of kg H_2SO_4/t and is calculated as follows:

$$NAPP = MPA - ANC$$

If the MPA is less than the ANC then the NAPP is negative, which indicates that the sample may have sufficient ANC to prevent acid generation. Conversely, if the MPA exceeds the ANC then the NAPP is positive, which indicates that the material may be acid generating.

ANC/MPA Ratio

The ANC/MPA ratio is frequently used as a means of assessing the risk of acid generation from mine waste materials. The ANC/MPA ratio is another way of looking at the acid base account. A positive NAPP is equivalent to an ANC/MPA ratio less than 1, and a

negative NAPP is equivalent to an ANC/MPA ratio greater than 1. A NAPP of zero is equivalent to an ANC/MPA ratio of 1.

The purpose of the ANC/MPA ratio is to provide an indication of the relative margin of safety (or lack thereof) within a material. Various ANC/MPA values are reported in the literature for indicating safe values for prevention of acid generation. These values typically range from 1 to 3. As a general rule, a ANC/MPA ratio of 2 or more generally signifies that there is a high probability that the material will remain circum-neutral in pH and thereby should not be problematic with respect to acid rock drainage.

Acid-Base Account Plot

Sulphur and ANC data are often presented graphically in a format similar to that shown in Figure 1. This figure includes a line indicating the division between NAPP positive samples from NAPP negative samples. Also shown are lines corresponding to ANC/MPA ratios of 2 and 3.

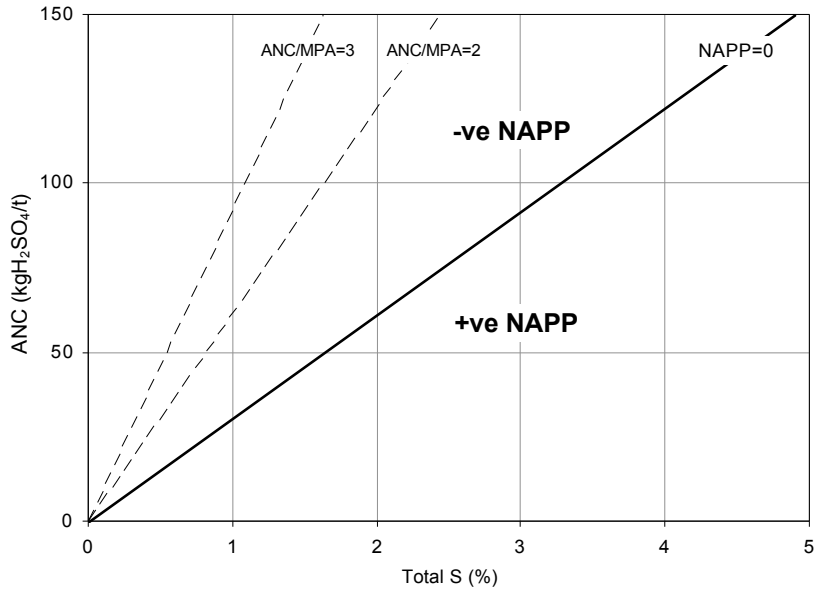

Figure A-1. Acid-base account (ABA) plot

Net Acid Generation (NAG) Test

The NAG test is used in association with the NAPP to classify the acid generating potential of a sample. The NAG test involves reaction of a sample with hydrogen peroxide to rapidly oxidise any sulphide minerals contained within a sample. During the NAG test both acid generation and acid neutralisation reactions can occur simultaneously. Therefore, the end result represents a direct measurement of the net amount of acid generated by the sample. This value is commonly referred to as the NAG capacity and is expressed in the same units as NAPP, that is kg H_2SO_4/t.

Several variations of the NAG test have been developed to accommodate the wide geochemical variability of mine waste materials. The three main NAG test procedures currently used by EGi are the single addition NAG test, the sequential NAG test, and the kinetic NAG test.

Single Addition NAG Test

The single addition NAG test involves the addition of 250 mL of 15% hydrogen peroxide to 2.5 gm of sample. The peroxide is allowed to react with the sample overnight and the following day the sample is gently heated to accelerate the oxidation of any remaining sulphides, then vigorously boiled for several minutes to decompose residual peroxide. When cool, the pH and acidity of the NAG liquor are measured. The acidity of the liquor is then used to estimate the net amount of acidity produced per unit weight of sample.

An indication of the form of the acidity is provided by initially titrating the NAG liquor to pH 4.5, then continuing the titration up to pH 7. The titration value at pH 4.5 includes acidity due to free acid (*i.e.* H_2SO_4) as well as soluble iron and aluminium. The titration value at pH 7 also includes metallic ions that precipitate as hydroxides at pHs between 4.5 and 7.

Sequential NAG Test

When testing samples with high sulphide contents it is not uncommon for oxidation to be incomplete in the single addition NAG test. This can sometimes occur when there is catalytic breakdown of the hydrogen peroxide before it has had a chance to oxidise all of the sulphides in a sample. To overcome this limitation, a multi-stage sequential NAG test is often carried out. This test may also be used to assess the relative geochemical lag of PAF samples with high ANC.

The sequential NAG test is a multi-stage procedure involving a series of single addition NAG tests on the one sample (*i.e.* 2.5 g of sample is reacted two or more times with 250 mL aliquots of 15% hydrogen peroxide). At the end of each stage, the sample is filtered and the solution is used for measurement of NAGpH and NAG capacity. The NAG test is then repeated on the solid residue. The cycle is repeated until such time that there is no further catalytic decomposition of the peroxide, or when the NAGpH is greater than pH 4.5. The overall NAG capacity of the sample is then determined by summing the individual acid capacities from each stage.

Kinetic NAG Test

The kinetic NAG test is the same as the single addition NAG test except that the temperature, pH and sometimes EC of the liquor are recorded. Variations in these parameters during the test provide an indication of the kinetics of sulphide oxidation and acid generation during the test. This, in turn, can provide an insight into the behaviour of the material field under field conditions. For example, the pH trend gives an estimate of

relative reactivity and may be related to prediction of lag times and oxidation rates similar to those measured in leach columns. Also, sulphidic samples commonly produce a temperature excursion during the NAG test due to the decomposition of the peroxide solution, catalysed by sulphide surfaces and/or oxidation products.

Sample Classification

The acid forming potential of a sample is classified on the basis of the acid-base and NAG test results into one of the following categories:

- Barren,
- Non-acid forming (NAF),
- Potentially acid forming (PAF), and
- Uncertain (UC).

Barren

A sample classified as barren essentially has no acid generating capacity and no acid buffering capacity. This category is most likely to apply to highly weathered materials. In essence, it represents an 'inert' material with respect to acid generation. The criteria used to classify a sample as barren may vary between sites, but for hard rock mines it generally applies to materials with a total sulfur content $\leq$ 0.1 %S and an ANC $\leq$ 5 kg H_2SO_4/t.

Non-acid forming (NAF)

A sample classified as NAF may, or may not, have a significant sulfur content but the availability of ANC within the sample is more than adequate to neutralise all the acid that theoretically could be produced by any contained sulphide minerals. As such, material classified as NAF is considered unlikely to be a source of acidic drainage. A sample is usually defined as NAF when it has a negative NAPP and the final NAG pH $\geq$ 4.5.

Potentially acid forming (PAF)

A sample classified as PAF always has a significant sulfur content, the acid generating potential of which exceeds the inherent acid neutralising capacity of the material. This means there is a high risk that such a material, even if pH circum-neutral when freshly mined or processed, could oxidise and generate acidic drainage if exposed to atmospheric conditions. A sample is usually defined as PAF when it has a positive NAPP and a final NAGpH < 4.5.

Uncertain (UC)

An uncertain classification is used when there is an apparent conflict between the NAPP and NAG results (*i.e.* when the NAPP is positive and NAGpH > 4.5, or when the NAPP is

negative and NAGpH ≤ 4.5). Uncertain samples are generally given a tentative classification that is shown in brackets *e.g.* UC(NAF).

Figure A-2 shows the format of the classification plot that is typically used for presentation of geochemical data. Marked on this plot are the quadrats representing the NAF, PAF and UC classifications.

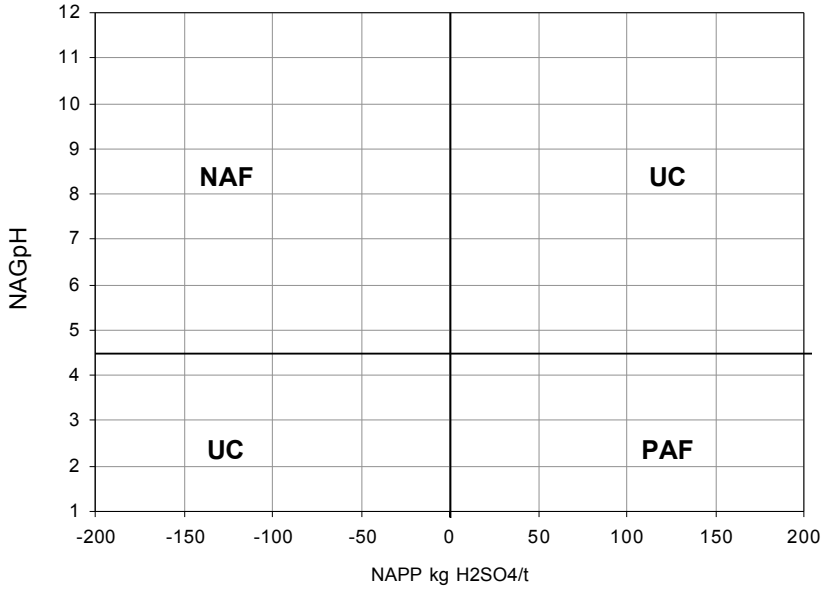

Figure A-2 Geochemical classification plot

Other Methods

Other test procedures may be used to define the acid forming characteristics of a sample.

pH and Electrical Conductivity

The pH and electrical conductivity (EC) of a sample is determined by equilibrating the sample in deionised water for a minimum of 1 hour, typically at a solid to water ratio of 1:2 (w/w). This gives an indication of the inherent acidity and salinity of the waste material when initially exposed in a waste emplacement area.

Acid Buffering Characteristic Curve (ABCC) Test

The ABCC test involves slow titration of a sample with acid while continuously monitoring pH. This data provides an indication of the portion of ANC within a sample that is readily available for acid neutralisation.