

# Longwalls 4 and 5; Maingates 6, 7 and 8

Application for s75W Modification 1  
to MP 10\_0046 – Preliminary Works  
Project

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Prepared for  
Gujarat NRE

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**Report and Appendices A to I**  
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## Executive Summary

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Gujarat NRE Coking Coal Limited (NRE) owns and operates No.1 Colliery at Russell Vale, approximately 8 km North of Wollongong, NSW.

On 13 October 2011, the Project Approval (MP 10\_0046) for the No.1 Colliery Preliminary Works Project was granted by the Minister for Planning under Section 75(J) of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This approval allows NRE to continue its operations at the mine including the extraction of coal up to 1 million tonnes per annum, upgrade of and improvements to surface facilities, in addition to first workings and transport of coal to the Port Kembla Coal Terminal for shipment as required.

NRE intends to expand its mining operations at No.1 Colliery and has submitted an application for a Major Expansion Project (MP 09\_0013) which is currently under assessment by the Department of Planning and Infrastructure (DoP&I).

In order to ensure the ongoing viability of the mine while awaiting the necessary approvals, NRE lodged a concurrent Subsidence Management Plan (SMP) application for the extraction of Longwalls 4 and 5 to the Department of Trade and Investment, Division of Resources and Energy (referred to herein as DRE). The SMP approval for Longwall 4 was granted on 26 March 2012 by DRE, however, approval for Longwall 5 was not granted.

This section 75W (s75W) Modification Application is located within the approved Preliminary Works 'Application Area' and has been prepared to modify the Preliminary Works Approval (MP 10\_0046) to include:

- > Amending the reference to the use of maingates (MGs) 4 and 5 from exploratory driveages to operational gateroads.
- > The extraction of coal using longwall mining techniques from Longwall (LW) 4 in accordance with the approved SMP.
- > The extraction of coal using longwall mining techniques from Longwall (LW) 5.
- > Development of maingates (MGs) 6, 7 and 8.

This Environmental Assessment (EA) reviews and assesses the proposed project modification, in general accordance with relevant legislation and guidance documentation in New South Wales (NSW). This EA utilises the information, documentation and assessments that were compiled to facilitate SMP approval for LWs 4 and 5 and this information has been included in part or in full. The information contained within the SMP documents is appropriate and provides an adequate foundation to describe the existing environment and aspects of the proposed activities in order to assess potential environmental impacts from the proposed activities.

The proposed modification works underlie an area of largely undisturbed native bushland characteristic of the Woronora Plateau. The vegetation includes warm temperate rainforest vegetation along Cataract Creek in the north, grading into Moist Blue Gum-Blackbutt Forest with Tall Open Blackbutt Forest and Exposed Sandstone Scribbly Gum Woodland dominating the area above the longwall panels. Three headwater upland swamps (CRHS1, CCHS3 and CCHS4), as defined in the up to date detailed swamp survey/mapping prepared by Biosis (2012), comprises of Sedge-land Heath and Banksia Thicket and are located within the vicinity of LWs 4 and 5. Upland swamps, CCHS3 and CCHS4 sit above LW 5, occupying an area of approximately 3.5ha out of an approximate 24ha of upland swamp identified in the Wonga East area. These upland swamps are representative of the recently determined final listing of Coastal Upland Swamps in the Sydney Basin Bioregion as an Endangered Ecological Community (EEC) under the *Threatened Species Conservation (TSC) Act 1995*. The ERM (2012) and subsequent detailed swamp survey by Biosis (2012) concludes that the upland swamps CRHS1, CCHS3 and CCHS4 have 'special significance status' (refer to **Section 7.2** and **Table 7-3** below), consistent with the DECCW (2011) guidelines for determination of the significance of upland swamps.

The Ecology Assessment prepared by ERM (2012), attached as **Appendix H** and the most up to date refined ecology mapping undertaken by Biosis (2012) was used for this proposed modification. ERM noted that although native vegetation clearing is not required for the proposed modification works, 'alteration of habitat following subsidence due to longwall mining' is listed as a Key Threatening Process (KTP) under Schedule 3 of the TSC Act. Considering the subsidence predictions modelled by Seedsman, attached as **Appendix A**, and the up-to-date ecology mapping information provided by Biosis, it is anticipated that the

impact/s are likely to be less significant on terrestrial ecosystems than aquatic or aquatic-dependent ecosystems. Accordingly, the upland swamp CCHS3 and the first order stream above LW 5 are more susceptible to change. The assessment provided by Geoterra, attached as **Appendix I**, predicts that the maximum change in grade due to subsidence in upland swamps over LW4 and LW5 is less than the swamp gradient and as a result, subsidence induced erosion is not anticipated, nor is the subsidence likely to generate any significant change in the potential for ponding, scouring or erosion in the swamps above LWs 4 and 5.

Threatened flora and fauna species listed under the TSC Act or *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* were not recorded within the proposed modification works footprint during a recent 2012 survey, with the exception of individuals of the Prickly Bush-pea shrub (*Pultenaea aristata*) listed as vulnerable under the TSC Act identified in upland swamps CRHS1 and CCHS3. Potential habitat for the threatened fauna species including the Giant Burrowing Frog, Heath Frog, Red-crowned Toadlet and Stuttering Barred Frog exists within the proposed modification works footprint.

The topography is undulating marked with the occasional rocky outcrop and traversed by ephemeral first order streams draining into Cataract Creek. LW 5 is located approximately 30m west of the mid channel of Cataract Creek, which flows into Cataract Reservoir. The main channel and tributaries have previously been undermined by LWs in the Balgownie Seam as well as bord and pillar and pillar extraction in the overlying Bulli Seam. The Geoterra (Feb 2011) report, prepared for NRE's Expansion Project (MP09\_0013) including the entire Wonga East area of mining (i.e. LWs 4 and 5), indicates that extraction in this area is not anticipated to be a significant risk to Cataract Creek, as the proposed works incorporate narrow LWs and wide pillars. Modelled subsidence induced cracking could potentially affect streamflow in the reaches overlying and downstream of the proposed workings, although the anticipated stream flow losses would have negligible to nil impact on Cataract Reservoir water storage volume. The impacts are likely to be restricted to short reaches where flow infiltrates into cracks in the bed, then reemerges further downstream.

Unconsolidated, perched ephemeral colluvial aquifers are present within identified upland swamps. Recharge from rainfall produces a highly variable perched water table in the swamps and further perched ephemeral aquifers are present within the dual porosity Hawkesbury Sandstone within 20 m of the ground surface. The regional water table is encountered in deeper basement Hawkesbury Sandstone, which is hydraulically separated from the perched groundwater.

Subsidence fracturing of the base of the undermined swamps is possible. This is a function of the swamps relatively thin, poorly developed, mostly dry soil profiles with limited humic content and exposed sandstone. The Geoterra (Feb 2011) report, prepared for NRE's Expansion Project (MP09\_0013), predicted that minor to no adverse change in flow and duration would be observed in seepage from the directly undermined swamps. Additionally, Geoterra (Feb, 2012), attached as **Appendix I**, indicates that the change in grade due to subsidence associated with LWs 4 and 5 is predicted to be essentially unobservable. As a result, subsidence induced erosion is not anticipated to occur, nor generate any significant change in the potential for ponding, scouring, or erosion.

The revised predictions provided by Seedsman (Feb 2012), attached as **Appendix B**, are that the maximum anticipated vertical subsidence is 1.15 m, maximum tilt is 17 mm/m, and the strains anticipated to be between 12 mm/m compression to 10 mm/m tension due to longwall mining in LWs 4 and 5. Seedsman (July 2011), attached as **Appendix A**, advises that the proposed pillar width to height ratio is 18.6 and that there is not Australian or International database evidence of pillar failure where the pillar width to height ratio is greater than 5.0. The development roadways (i.e. first workings) for maingates 4, 5, 6, 7, and 8 are required as operational roadways to prepare for longwall extraction. As advised by Seedsman (2011), attached as **Appendix C**, these first workings roadways, have been designed to leave the coal pillars intact, the roadways open and the overlying strata supported. This is likely to result in the vertical downward movement of the ground surface of less than 20 mm in these areas.

NRE typically undertake operational investigations to better understand local geological anomalies, such as faulting and/or potential geotechnical matters. Therefore, it may be likely that the proposed start position of LW 5 could be revised. Should LW5 be revised, NRE will reassess the relevant aspects and potential impacts in detail as part of the necessary requirements to develop an extraction plan. The plans of management, attached in **Appendix J**, are a firm representation of what an extraction plan may include.

A risk assessment was undertaken and facilitated by knj Consultants (Mar, 2012) on Pillar Run in the Bulli seam associated with the Wongawilli seam LW 4 and LW 5 extraction. This risk assessment, attached as **Appendix G**, was undertaken 'to identify, analyse, evaluate and treat the risk of subsidence that may extend beyond the predicted footprint as a result of extraction of the Wongawilli seam LWs 4 and 5' (knj March 2012). A conclusion of the risk assessment was that the nominated surface features would not be exposed to the risk of impacts from subsidence from a Pillar Run event. For the remaining surface features, the

likelihood was rare given the nominated risk control measures (i.e. practically impossible, considering the present controls).

A further and subsequent result of the risk assessment, however, was the identification of all key surface features in the vicinity of the proposed modification works area that could be affected, should pillar run occur. These include without limitation, swamps, creeks, Mount Ousley Road, Fire trail No.7d, a 330kV Transmission Line (owned and maintained by Transgrid) as well as 132kV and 33kV Transmission Line (owned and maintained by Endeavour Energy). The remnant bord and pillar mine workings from within the Bulli and Balgownie coal measures are also present together with remaining large coal barriers. According to the assumptions made in the risk assessment, the identified coal pillars have the ability to retard any such Pillar Run mechanism, thus providing the 'Area of Management' outlined in **Figure 3**.

Cultural and historic heritage assessments undertaken by ERM (2011), prepared for NRE's Expansion Project (MP09\_0013), and the recently refined, up-to-date, archaeology mapping and monitoring undertaken by Biosis (2012), identified one known aboriginal site (52-3-0320 Bulli Mine Shaft 25, an axe grinding groove) above LWs 4 and 5, which may be impacted by subsidence. Historical monitoring of subsidence impacts at 14 other axe grinding groove sites indicated that changes in site conditions from subsidence effects are, at most, only likely to result in partial loss of cultural heritage values. The risk of impact to 52-3-0320 Bulli Mine Shaft Site 25 is considered low, as the maximum predicted systematic tensile strains are low. ERM (2009) did not identify historic heritage items within the proposed modification works footprint, with the closest known historic heritage items being the South Bulli Colliery and Cataract Reservoir.

The nearest sensitive receivers, classified as suburban in the DECCW (now OEH) Industrial Noise Policy, are located in Broker and West Streets, Russell Vale and Midgley, Lyndon and Taylor Streets, Corrimal. As the hours of operation, production and transport volumes are not proposed to be modified, noise impacts to identified sensitive receivers are considered to be as per the approved project (MP10\_0046) and the resultant conditions and plans of management.

Visual impacts of the proposed modification are considered to be low, as the proposed modification works are underground and unlikely to result in observable changes in the surface conditions. As the production and transport volumes per annum are to be consistent with the approved project, air quality, greenhouse gas emissions, traffic and transport impacts, on a per annum basis, are to be consistent with the approved project.

NRE has established a Community Consultative Committee (CCC) in accordance with the requirements of the conditions of the Approved Project (MP 10\_0046). An Independent Chair has been appointed and it is anticipated that the CCC will meet for the first time in August 2012. NRE expects that regular quarterly meetings will be held to provide timely and accurate information on major approvals issues and general operational aspects of the Colliery. NRE believes that the CCC, and its interested parties, is intended to be dynamic to ensure that the success of this communication process and dissemination of information is monitored and adapted, if necessary.

At the completion of the project, the site would be rehabilitated in accordance with the Approved Project (MP 10\_0046) conditions. These works include the decommissioning of surface infrastructure and portals as well as making the site 'safe, stable and non-polluting in the long term'.

In summary, the extent of the proposed longwall mining has been designed and refined to minimise environmental impacts and to provide economic benefits through efficient mining. Detailed mitigation and management measures will be consistent with the Approved Project as a minimum and further specific and detailed mitigation and management measures will also be presented in plans of management accordingly. The impacts are likely to be minor in scale resulting in minimal environmental impacts due to the nature of the works, proposed management and mitigation measures, and long-term land use of the project area.

# Table of Contents

|                                                  |             |
|--------------------------------------------------|-------------|
| <b>Executive Summary</b>                         | <b>ii</b>   |
| <b>Glossary and Abbreviations</b>                | <b>viii</b> |
| <b>1 Introduction</b>                            | <b>1</b>    |
| 1.1 Background                                   | 1           |
| 1.2 Purpose of this Environmental Assessment     | 1           |
| 1.3 Proposed Modification                        | 2           |
| 1.4 Document Content                             | 2           |
| <b>2 Regulatory Framework</b>                    | <b>10</b>   |
| <b>3 Project Description and Context</b>         | <b>13</b>   |
| 3.1 Current Project Approval                     | 13          |
| 3.2 Description                                  | 14          |
| 3.3 Current and Surrounding Land Use             | 16          |
| 3.4 Development Constraints                      | 16          |
| 3.5 Characterisation of Underground Workings     | 17          |
| 3.5.1 Mining Method                              | 17          |
| 3.5.2 Systematic and Non-Systematic Subsidence   | 18          |
| 3.5.3 Multi Seam                                 | 18          |
| 3.5.4 Pillar Run                                 | 19          |
| 3.6 Surface Features within the Application Area | 19          |
| <b>4 Justification</b>                           | <b>25</b>   |
| 4.1 Alternatives Considered                      | 25          |
| 4.2 Consequences of Not Proceeding               | 26          |
| 4.3 Timing                                       | 26          |
| <b>5 Consultation</b>                            | <b>29</b>   |
| 5.1 Agency                                       | 29          |
| 5.2 Community                                    | 29          |
| <b>6 Environmental Risk Assessment</b>           | <b>30</b>   |
| 6.1 Risk Assessment Overview                     | 30          |
| 6.2 Risk Categories                              | 30          |
| <b>7 Assessment of Environmental Impacts</b>     | <b>34</b>   |
| 7.1 Subsidence                                   | 34          |
| 7.1.1 Prediction Methodology and Assumptions     | 34          |
| 7.1.2 Previous Mining                            | 34          |
| 7.1.3 Predicted Subsidence Parameters            | 35          |
| 7.2 Flora and Fauna                              | 40          |
| 7.3 Cultural Heritage                            | 49          |
| 7.4 Noise                                        | 51          |
| 7.5 Air Quality                                  | 52          |
| 7.6 Groundwater                                  | 53          |
| 7.7 Surface Water, Topography and Soils          | 55          |
| 7.8 Traffic and Transport                        | 57          |
| 7.9 Visual Amenity                               | 57          |
| 7.10 Waste, Utilities and Hazards                | 58          |
| 7.11 Socio Economic                              | 59          |

|           |                                 |           |
|-----------|---------------------------------|-----------|
| 7.12      | Cumulative Impacts              | 59        |
| 7.13      | Summary of Mitigation Measures  | 60        |
| <b>8</b>  | <b>Statement of Commitments</b> | <b>63</b> |
| <b>9</b>  | <b>Conclusion</b>               | <b>72</b> |
| <b>10</b> | <b>References</b>               | <b>74</b> |

## Tables

|            |                                                                               |    |
|------------|-------------------------------------------------------------------------------|----|
| Table 1-1  | Comparison between the Approved Project and Proposed Modification             | 5  |
| Table 1-2  | Summary of Proposed Modification Works                                        | 9  |
| Table 2-1  | Summary of Regulatory Framework                                               | 10 |
| Table 3-1  | Potentially Sensitive Land Uses                                               | 16 |
| Table 3-2  | Natural Features in the Longwalls 4 and 5 Application Area                    | 20 |
| Table 3-3  | Man-made Features in the Application Area                                     | 22 |
| Table 4-1  | Timing of Proposed Extraction                                                 | 26 |
| Table 6-1  | Environmental Risk Assessment Matrix                                          | 30 |
| Table 6-2  | Environmental Risk Assessment                                                 | 31 |
| Table 7-1  | Maximum Predicted Subsidence Parameters                                       | 35 |
| Table 7-2  | Subsidence Impact Comparison and Mitigation Measures                          | 35 |
| Table 7-3  | Upland Swamps Significant Assessment                                          | 47 |
| Table 7-4  | Flora and Fauna Impact Comparison and Mitigation Measures                     | 48 |
| Table 7-5  | Heritage Impact Comparison and Mitigation Measures                            | 51 |
| Table 7-6  | Noise Impact Comparison and Mitigation Measures                               | 52 |
| Table 7-7  | Air Quality Impact Comparison and Mitigation measures                         | 53 |
| Table 7-8  | Groundwater Impact Comparison and Mitigation Measures                         | 54 |
| Table 7-9  | Surface Water, Topography and Soils Impact Comparison and Mitigation Measures | 56 |
| Table 7-10 | Traffic and Transport Impact Comparison and Mitigation Measures               | 57 |
| Table 7-11 | Visual Impact Comparison and Mitigation Measure                               | 58 |
| Table 7-12 | Waste, Utilities and Hazards Impact Comparison and Mitigation Measures        | 58 |
| Table 7-13 | Cumulative Impacts Summary                                                    | 59 |
| Table 7-14 | Overview of Mitigation Measures                                               | 60 |
| Table 8-1  | Statement of Commitments                                                      | 63 |

## Figures

|                  |                                                |    |
|------------------|------------------------------------------------|----|
| <b>Figure 1.</b> | Location Plan                                  | 3  |
| <b>Figure 2.</b> | Surface Features around Longwalls 4 and 5      | 4  |
| <b>Figure 3.</b> | Longwalls 4 and 5 Subsidence Management Area   | 15 |
| <b>Figure 4.</b> | Zoning Plan                                    | 24 |
| <b>Figure 5.</b> | Alternatives Considered                        | 27 |
| <b>Figure 6.</b> | Longwall Layout Plan                           | 28 |
| <b>Figure 7.</b> | Anticipated Distribution of Vertical Movements | 37 |
| <b>Figure 8.</b> | Anticipated Distribution of Tilt               | 38 |

|                   |                                    |    |
|-------------------|------------------------------------|----|
| <b>Figure 9.</b>  | Anticipated Distribution of Strain | 39 |
| <b>Figure 10.</b> | Fauna Species Plan                 | 42 |
| <b>Figure 11.</b> | Upland Swamps Plan                 | 43 |
| <b>Figure 12.</b> | Vegetation Communities             | 44 |
| <b>Figure 13.</b> | Frog Habitat                       | 45 |
| <b>Figure 14.</b> | Areas of Heritage Significance     | 50 |

## Appendices

|    |                                             |
|----|---------------------------------------------|
| A. | Seedsman Geotechnical Report, 2011          |
| B. | LW 4 and 5 Revised Predictions, 2012        |
| C. | LW 4 and 5 Pillar Stability Letter, 2011    |
| D. | Strata Engineering Report, 2010             |
| E. | Pells Report, 2011                          |
| F. | Stable Strata Report, 2011                  |
| G. | LW 4 and 5 Pillar Run Risk Assessment, 2012 |
| H. | LW 4 and 5 Ecological Assessment, 2012      |
| I. | Subsidence Effects on Swamp CRHS1, 2012     |
| J. | SMP Management Plans                        |

## Glossary and Abbreviations

### Abbreviations

|                    |                                                                             |                  |                                                  |
|--------------------|-----------------------------------------------------------------------------|------------------|--------------------------------------------------|
| AHD                | Australian Height Datum                                                     | ML               | Mining Lease                                     |
| AHIMS              | Aboriginal Heritage Information Management System                           | ML/day           | megalitre per day                                |
| CO <sub>2</sub> -e | carbon dioxide equivalent                                                   | MPL              | Mining Purposes Lease                            |
| Cardno             | Cardno (NSW/ACT) Pty Ltd                                                    | mm/m             | millimetres per metre                            |
| CCC                | Community Consultative Committee                                            | Mtpa             | Million tonnes per annum                         |
| CCL                | Consolidated Coal Lease                                                     | NGER             | National Greenhouse and Energy Reporting         |
| DoP&I              | NSW Department of Planning and Infrastructure                               | NRE              | Gujarat NRE Coking Coal Ltd                      |
| DRE                | NSW Department of Trade and Investment, Division of Resources and Energy    | NSW              | New South Wales                                  |
| DSC                | Dams Safety Committee                                                       | OEH              | Office of Environment and Heritage               |
| EA                 | Environmental Assessment                                                    | PKCT             | Port Kembla Coal Terminal                        |
| EEC                | Endangered Ecological Community                                             | PM <sub>10</sub> | particulate matter less than 10 microns in size  |
| EP&A Act           | Environmental Planning and Assessment Act, 1979                             | ROM              | run-of-mine                                      |
| EP&A Reg.          | Environmental Planning and Assessment Regulation, 2000                      | RMS              | NSW Roads and Maritime Services (previously RTA) |
| EPBC Act           | Commonwealth Environment Protection and Biodiversity Conservation Act, 1999 | SCA              | Sydney Catchment Authority                       |
| EPL                | Environment Protection Licence                                              | SEPP             | State Environmental Planning Policy              |
| LEP                | Local Environment Plan                                                      | SMP              | Subsidence Management Plan                       |
| LGA                | Local Government Area                                                       | TARP             | Trigger Action Response Plan                     |
| km                 | kilometre                                                                   | TSC Act          | Threatened Species Conservation Act, 1995        |
| m                  | metre                                                                       | %                | percent                                          |
| mg/L               | milligram per litre                                                         | °                | degree                                           |

## Glossary

|                                      |                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alluvial                             | A general term for clay, silt, sand and gravel transported by water and deposited, on the bed of a flood plain, river or stream.                                                                                                                                                                                                        |
| Baseline monitoring                  | Monitoring conducted over time to collect a body of information to define specific characteristics of an area (e.g. species occurrence or noise levels) prior to commencement of a specific activity.                                                                                                                                   |
| Coking Coal                          | Self-coking coal with ash of less than 10% and volatile matter of 21-23%, excellent capacity for carrying 'soft' coking coals in a blend.                                                                                                                                                                                               |
| Continuous miner                     | A remote-controlled, tracked, electrically powered coal cutting and loading machine used to form mine roadways and extract coal pillars.                                                                                                                                                                                                |
| Conveyor                             | Fixed mechanical apparatus consisting of a continuous moving belt used to transport coal from one place to another.                                                                                                                                                                                                                     |
| Driveage                             | A horizontal or inclined heading or roadway in the process of construction. The road way will be used to access a new mining area within the lease.                                                                                                                                                                                     |
| Dyke                                 | A sheet like vertical intrusion of igneous rock cutting across the strata of older rocks.                                                                                                                                                                                                                                               |
| Ecosystem                            | An interacting system of animals, plants, other organisms and non-living parts of the environment.                                                                                                                                                                                                                                      |
| Fault                                | Major fracture of the earth's crust caused by the relative movement of the rock masses on either side.                                                                                                                                                                                                                                  |
| First Workings                       | Involves the development headings or roadways which will provide access to the coal resource. They are developed using continuous miners with integrated roof and rib bolting rigs. First workings leave the coal pillars intact and the overlying strata fully supported                                                               |
| Gate roads (maingates and tailgates) | An underground roadway (tunnel) that provides access to a working longwall for continuous mining.                                                                                                                                                                                                                                       |
| Goaf (or goafing)                    | The space left following extraction of the coal seam where the roof material is allowed to collapse.                                                                                                                                                                                                                                    |
| Greenhouse gases                     | Gases with potential to cause climate change (e.g. methane, carbon dioxide and non-methane volatile organic compounds). Usually expressed in terms of carbon dioxide equivalent.                                                                                                                                                        |
| Groundwater                          | All waters occurring below the land surface; the upper surface of the soils saturated by groundwater in any particular area is called the water table.                                                                                                                                                                                  |
| Habitat                              | The particular local environment occupied by an organism.                                                                                                                                                                                                                                                                               |
| Infrastructure                       | The supporting installations and services that supply the needs of the Project.                                                                                                                                                                                                                                                         |
| Longwall                             | A secondary extraction method of mining coal that continuously removes the coal from the working face onto a series of conveyors that transfer the coal to the surface. As the coal is cut away (a 'shear'), both the longwall machine (known as a 'shearer') and the hydraulic roof supports advance forward ready for the next shear. |

|                   |                                                                                                                                                                                       |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Permeability      | The ability of a rock or soil to allow fluid to pass through it.                                                                                                                      |
| Pillar Extraction | A continuous miner system of mining whereby coal pillars are systematically extracted.                                                                                                |
| Pillar Run        | A large scale progressive collapse of coal pillars in a short period of time.                                                                                                         |
| Potable water     | Water of quality suitable for human consumption.                                                                                                                                      |
| Rehabilitation    | The restoration of a landscape and especially the vegetation following its disturbance.                                                                                               |
| Run-of-mine (ROM) | Raw coal that is stockpiled and/or prior to being processed through a coal preparation plant.                                                                                         |
| Strain            | The change in the horizontal distance between two points divided by the original horizontal distance between the points.                                                              |
| Subsidence        | The deformation of the ground mass due to the mining activity, including both vertical and horizontal displacement, tilt, strain and curvature.                                       |
| Terrestrial       | Living or growing on the land.                                                                                                                                                        |
| Tilt              | The difference in subsidence between two points divided by the horizontal distance between the points.                                                                                |
| Upsidence         | Relative upward movement, or uplift, created by the horizontal compression and buckling behaviour of the rock strata in the vicinity of a valley floor                                |
| Valley closure    | A phenomenon whereby one or both sides of a valley move horizontally towards the valley centreline, due to changed stress conditions beneath the valley and its confining land masses |

# 1 Introduction

---

This section describes the background and purpose of the proposed modification.

## 1.1 Background

Gujarat NRE Coking Coal Limited (NRE) own and operate No.1 Colliery, which is located in Russell Vale, approximately 8 km North of Wollongong in NSW. The mine extracts coal from the Bulli and Wongawilli seams for shipment to India via the Port Kembla Coal Terminal (PKCT). A full description of the current operations can be found in the Preliminary Works EA (ERM, 2010).

On 13 October 2011, the Project Approval (MP 10\_0046) for No.1 Colliery Preliminary Works Project was granted by the Minister for Planning under Section 75(J) of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This approval allows NRE to continue its operations at the mine including the extraction of coal up to 1 million tonnes per annum (Mtpa), upgrade of surface facilities and transport of coal to the PKCT.

NRE intends to expand their mining operations into the future and has submitted an application for their Major Expansion Project (MP 09\_0013) which is currently under assessment by the Department of Planning and Infrastructure (DoP&I).

Due to the protracted timeframes in obtaining these types of approvals and to ensure the ongoing viability of the mine, NRE lodged a concurrent Subsidence Management Plan (SMP) application for the extraction of LWs 4 and 5 to the Department of Trade and Investment, Division of Resources and Energy (herein referred to as DRE). NRE received SMP Approval for LW 4 only, on 26 March 2012. However, the approval for LW5 extraction was not granted.

Under this modification proposal, NRE is seeking approval for the following:

- > Amending the reference to the use of Maingates (MGs) 4 and 5 from exploratory driveages to operational gateroads;
- > The extraction of coal using LW mining techniques from LW 4 in accordance with the already approved SMP;
- > The extraction of coal using longwall mining techniques from LW 5; and
- > Development of Maingates (MGs) 6, 7 and 8.

The extraction of coal from LWs 4 and 5 will occur in the Wongawilli Seam in an area referred to as “Wonga East” within Consolidated Coal Lease (CCL) 745. The proposed north east / south west trending “Wonga East” panels are subdivided into Area 1 to the east and Area 2 to the west, of Mount Ousley Road. LWs 4 and 5 as well as maingates 6, 7, and 8 are located in Area 2.

## 1.2 Purpose of this Environmental Assessment

NRE engaged Cardno (NSW/ACT) Pty Ltd (Cardno) to prepare an Environmental Assessment (EA) as part of a s75W modification application under the *Environmental Planning and Assessment Act 1979* (EP&A Act) to the existing NRE No.1 Preliminary Works Project Approval (MP 10\_0046).

The purpose of this modification is to update the Preliminary Works Project Approval (MP 10\_0046) to include the approved LWs as well as three additional gateroads. The majority of the information presented in this EA (including all specialist assessments) has also been provided to DRE in support of the SMP application for LWs 4 and 5. The information utilised within this EA is the same or in addition to the detailed information utilised in support of the SMP documentation submitted to DRE and reference is also made to the relevant reports prepared for NRE’s Expansion Project (MP09\_0013). Where additional information has become available since the submission of the SMP, including modifications to the proposed LW layout, this information is provided as required to support the development of maingates 6, 7 and 8.

This EA follows on from the original EA for the Preliminary Works Project (ERM, 2010) and reviews and assesses the proposed project modification in accordance with relevant legislation and guidance documentation in New South Wales (NSW). The EA describes the existing environment and aspects of the proposed activities in order to assess potential environmental impacts at the designated locations.

The purpose of this EA is to:

- > identify the proposed modifications to the existing Project Approval;
- > describe the proposed additional works and the existing environment of the affected area;
- > assess the environmental impacts resulting from the proposed works in comparison to those identified in the Approved Project EA; and
- > recommend any additional environmental management and mitigation measures to be undertaken to ameliorate potential impacts resulting from the proposed works.

It is noted that, a SMP approval has been granted by DRE, the current and proposed mitigation and management measures will be as documented in the approved Management Plans and in accordance with the requirements of the SMP Approval. Accordingly, the compilation of these management plans is an example of what an 'Extraction Plan' might represent, as attached in **Appendix J**.

### 1.3 Proposed Modification

The proposed modification includes:

- > Amending the reference to the use of Maingates (MGs) 4 and 5 from exploratory driveages to operational gateroads.
- > The extraction of coal using LW mining techniques from LW 4 in accordance with the approved SMP.
- > The extraction of coal using LW mining techniques from LW 5.
- > Development of Maingates (MGs) 6, 7 and 8.

It is noted that the extraction of LWs 4 and 5 has been subject to a Subsidence Management Plan (SMP) application which was approved for LW 4 only on the 26 March 2012 subject to meeting the conditions accordingly. Subsequent approval from DRE to continue LW 4 extraction to its completion was provided on 30 July 2012. LW 5 was not approved by DRE at the time of writing this EA.

The location and an overview of the surface infrastructure associated with the proposed modifications are shown in **Figure 1** and **Figure 2**, respectively.

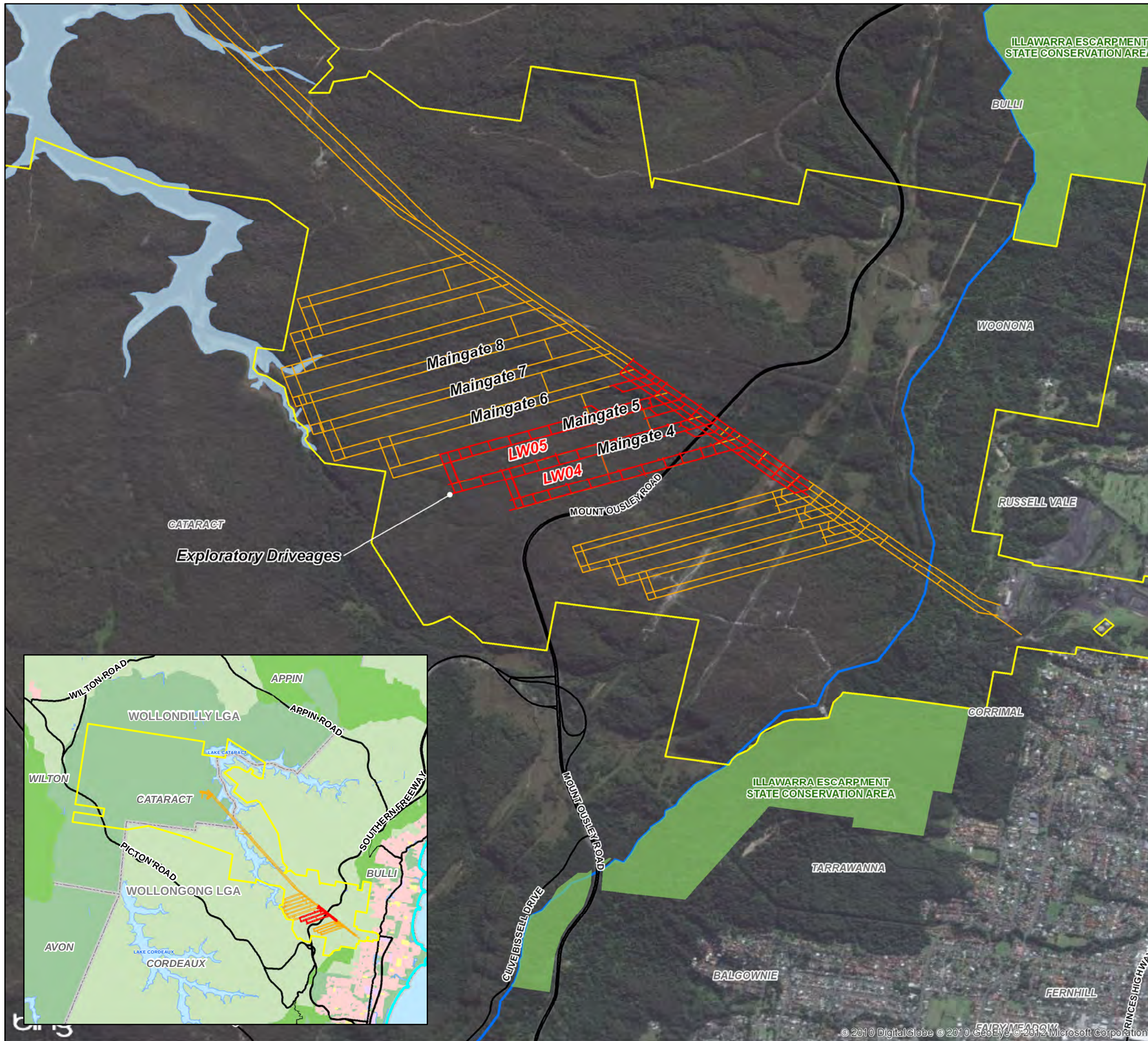
**Table 1-1**, includes a comparison between the approved project infrastructure and proposed modification, with further specific detail of site infrastructure and access provided in **Table 1-2**.

The proposed longwall panels, LWs 4 and 5, represent two, relatively small areas of extraction, approximately 145 m wide with 60 m chain pillars and lengths of approximately 530 m and 115 m respectively. Extraction of LWs 4 and 5 occurs in the Wongawilli seam at a depth of cover between 300 m and 340 m below previously extracted Bulli and Balgownie seams.

### 1.4 Document Content

This environmental assessment (EA) consists of the following sections:

- > **Section 2** – describes the statutory approval framework for the modification;
- > **Section 3** – provides an overview of the Approval (MP10\_0046) and details the proposed modification;
- > **Section 4** – describes the alternatives considered and the justification of the proposed modification;
- > **Section 5** – outlines the consultation associated with the proposed modification;
- > **Section 6** – provides an overview of the environmental risk identified with the proposed modification;
- > **Section 7** – assesses potential environmental impacts from the proposed modification and the proposed measures to mitigate, manage and monitor potential impacts;
- > **Section 8** – identifies the commitments required to effectively implement the mitigation and management measures; and
- > **Section 9** – summarises the proposed modification.



## Location Plan

RUSSELL VALE NSW

### Legend

- Project Application Area
- Longwalls 4 and 5
- Mine Layout (February 2012)
- Major Roads (LPI)
- Watercourses (LPI)
- LGA Boundary (LPI)
- NPWS Reserve (LPI)
- Major Waterbodies (LPI)
- Special Water Catchment Area (SCA)

### Land Use (ABS)

- Agricultural
- Commercial
- Education
- Hospital/Medical
- Industrial
- Parkland
- Residential

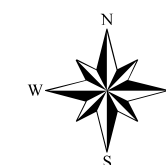
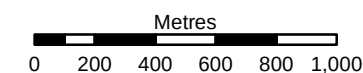


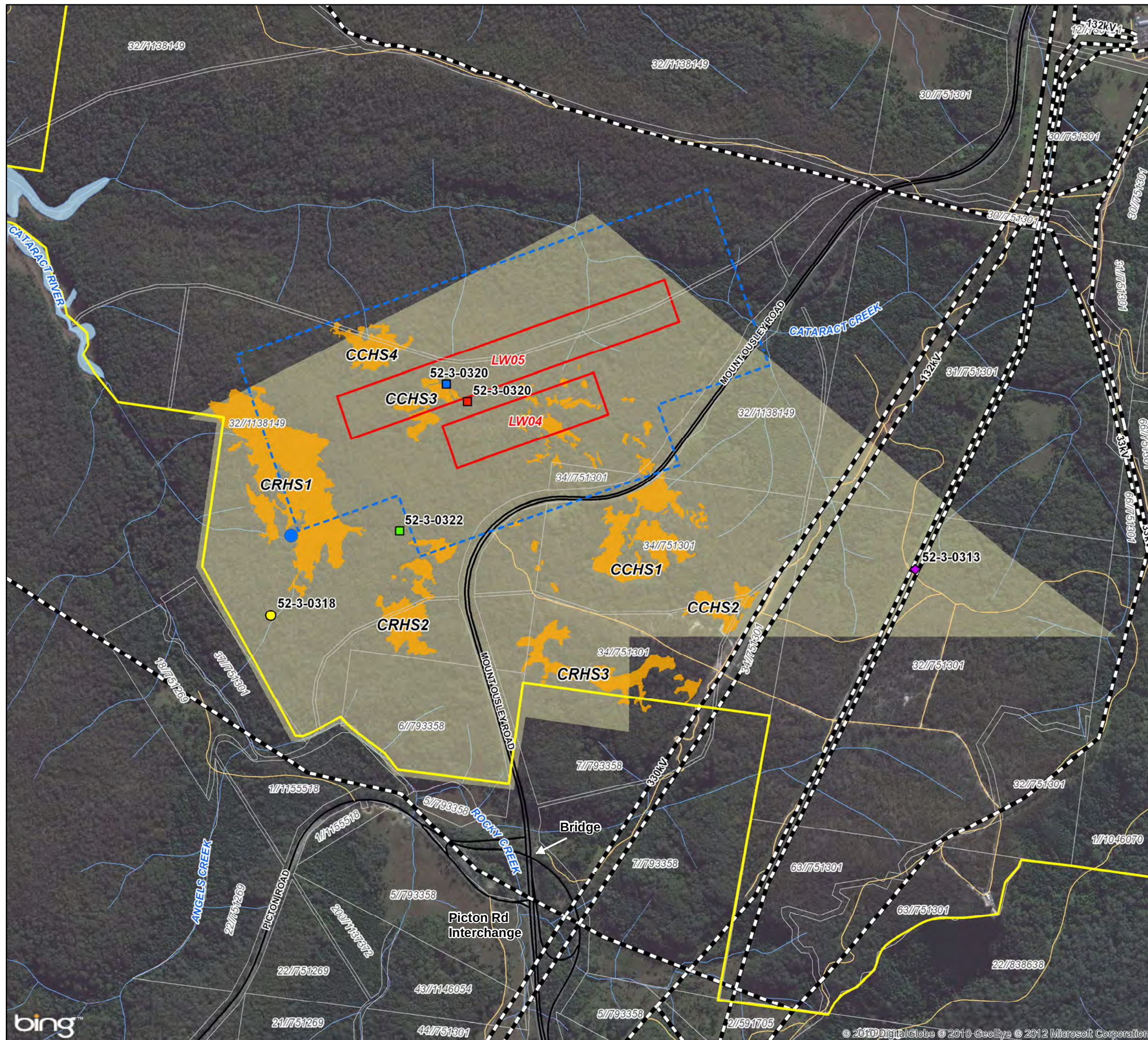
FIGURE 1

1:25,000 Scale at A3



Map Produced by Cardno NSW/ACT Pty Ltd (WOL)  
Date: 2012-08-02  
Coordinate System: GDA 1994 MGA Zone 56  
Project: 112069\_01  
Map: G1001\_LocationPlan.mxd 01

Aerial imagery supplied by Bing Maps and associated third party suppliers



**Table 1-1 Comparison between the Approved Project and Proposed Modification**

(red text shows the proposed modifications)

| Aspect                     | Approved Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Proposed Modification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Project Location</b>    | Russell Vale, approximately 8km North of Wollongong                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | To the west of the Russell Vale site, within the approved project area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Project Summary</b>     | <p>The NRE No.1 Preliminary Works Project (MP10_0046), which includes:</p> <ul style="list-style-type: none"> <li>&gt; Augmenting, upgrading and using the existing infrastructure at the mine;</li> <li>&gt; Extracting up to 1 million tonnes of run-of-mine (ROM) coal a year from the Bulli and Wongawilli coal seams for a period of up to three years using pillar extraction mining methods;</li> <li>&gt; Extracting remnant coal in existing mining areas;</li> <li>&gt; Transporting run-of-mine coal from the mine by road; and</li> <li>&gt; Rehabilitating the site.</li> </ul> | <p>The NRE No.1 Preliminary Works Project (MP10_0046), which includes:</p> <ul style="list-style-type: none"> <li>&gt; Augmenting, upgrading and using the existing infrastructure at the mine;</li> <li>&gt; Extracting up to 1 million tonnes of run-of-mine (ROM) coal a year from the Bulli and Wongawilli coal seams for a period of up to three years using pillar extraction <b>and LW mining methods</b>;</li> <li>&gt; Extracting remnant coal in existing mining areas;</li> <li>&gt; Transporting run-of-mine coal from the mine by road; and</li> <li>&gt; Rehabilitating the site.</li> </ul>                                                                             |
| <b>Mining and Reserves</b> | <ul style="list-style-type: none"> <li>&gt; The project application area covers approximately 6 545 ha, encompassing CCL 745, MPL 271 and ML 1575</li> <li>&gt; Current production at NRE No.1 is approximately 1 Mtpa.</li> <li>&gt; More than 300 Mt of coking coal resources remain within the project application area in the Bulli, Balgownie and Wongawilli Seams.</li> <li>&gt; It is estimated that a total of approximately 2.2 Mt of ROM coking coal will be recovered as part of the preliminary works project.</li> </ul>                                                        | <ul style="list-style-type: none"> <li>&gt; The project application area covers approximately 6 545 ha, encompassing CCL 745, MPL 271 and ML 1575</li> <li>&gt; Current production at NRE No.1 is approximately 1 Mtpa</li> <li>&gt; More than 300 Mt of coking coal resources remain within the project application area in the Bulli, Balgownie and Wongawilli Seams</li> <li>&gt; It is estimated that a total of approximately <b>1.6 Mt</b> of ROM coking coal will be recovered from the Wongawilli seam as part of this modification project, in addition to the 2.2 Mt of total ROM coking coal associated with the original Preliminary Works Project (MP10_0046).</li> </ul> |

| Aspect                         | Approved Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Proposed Modification |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| <b>Coal Production</b>         | The Proponent shall not extract more than 1 million tonnes of ROM coal from the site per calendar.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | No Change             |
| <b>Coal Processing</b>         | <ul style="list-style-type: none"> <li>&gt; The coal washery ceased operation in March 2003, and is no longer in use. All ROM coal is now transported unwashed to PKCT for shipment to India.</li> <li>&gt; There is an emplacement area to the north of the NRE No. 1 site, which operates under a separate development consent from Wollongong Council. This area is outside the project application area.</li> </ul>                                                                                                                                                     | No Change.            |
| <b>Coal Stockpiling</b>        | <ul style="list-style-type: none"> <li>&gt; There are currently two stockpiles onsite – the Bulli bin stockpile and the Wongawilli stockpile, which are managed with dust suppression sprays. The stockpiling capacity is 60 000 to 80 000 tonnes.</li> <li>&gt; A temporary stockpile located to the east of the ROM stockpile is used for the storage of high ash coal which has minimal coking properties. This temporary stockpile is being progressively removed from the site. After its removal, higher ash coal would be stored and blended underground.</li> </ul> | No Change.            |
| <b>Surface Infrastructure</b>  | > In addition to the Russell Vale surface facilities site including coal stockpiling and handling, NRE has surface mining leases at one access shaft (No.4 Shaft) and four ventilation shaft sites (No. 1, 2, 3 and 5 Shafts) and easements for power and water supply.                                                                                                                                                                                                                                                                                                     | No Change.            |
| <b>Product Coal Transport</b>  | <ul style="list-style-type: none"> <li>&gt; All coal is trucked off-site to PKCT.</li> <li>&gt; Trucking would occur between 7 am and 10 pm, Monday to Friday and; 8 am and 6 pm on Saturdays, Sundays and public holidays.</li> </ul>                                                                                                                                                                                                                                                                                                                                      | No Change.            |
| <b>Water Demand and Supply</b> | <ul style="list-style-type: none"> <li>&gt; Potable water demands at the Russell Vale site are met by connection to Wollongong's reticulated water supply.</li> <li>&gt; Water demands at No. 4 Shaft are met by a combination of raw water purchased from SCA and recycled process water.</li> </ul>                                                                                                                                                                                                                                                                       | No Change.            |

| Aspect                    | Approved Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Proposed Modification                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Employment</b>         | <ul style="list-style-type: none"> <li>&gt; Gujarat currently employs approximately 259 permanent staff and 78 contractors. No additional operational staff would be required for the project.</li> <li>&gt; It is estimated that an additional 25 construction contractors would be required during a nine-month construction phase for the proposed capital works.</li> </ul>                                                                                                                                                                                                                                                  | <b>NRE will use their existing workforce, currently 222, to undertake the proposed activity.</b>                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Mine Access</b>        | <ul style="list-style-type: none"> <li>&gt; Personnel and materials would continue to access the underground mine via the No. 4 Shaft and winder and the portals at the Russell Vale site. The No. 4 Shaft would continue to be the primary access for personnel.</li> <li>&gt; NRE will access the Wongawilli seam workings utilising the three portal entries located at the Russell Vale site – one in the Wongawilli Seam and two in the Balgownie Seam.</li> </ul>                                                                                                                                                          | No Change.                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Hours of Operation</b> | > 24 hours a day, 7 days per week.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | No Change.                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Capital Cost</b>       | > \$122,000,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>\$20,000,000</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Rehabilitation</b>     | <ul style="list-style-type: none"> <li>&gt; The proposed mining is not expected to require significant rehabilitation or remediation due to the low predicted subsidence impacts.</li> <li>&gt; Rehabilitation of the surface facilities site would continue to be carried out.</li> </ul>                                                                                                                                                                                                                                                                                                                                       | No Change.                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Project Life</b>       | > Up to 3 years.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | No Change.                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Project Details</b>    | <ul style="list-style-type: none"> <li>&gt; Pillar extraction of remnant coal reserves is proposed in two areas of the Bulli Seam (the V Mains and the 309 Panel) and first workings are proposed in one small panel of the Bulli Seam (the H Panel). First workings are also proposed in the Wongawilli Seam, including the development of gateroads for potential future LW extraction.</li> <li>&gt; The majority of the mining operations proposed in the project are first workings, with two limited areas of pillar extraction (or second workings). There is no LW mining proposed under the current project.</li> </ul> | <p>Pillar extraction of remnant coal reserves is proposed in two areas of the Bulli Seam (the V Mains and the 309 Panel) and first workings are proposed in one small panel of the Bulli Seam (the H Panel). <b>First workings are also proposed in the Wongawilli Seam, including the development of gateroads (i.e. maingates 6, 7 and 8) to de-lineate potential future LW extraction.</b></p> <p><b>A major project submission (MP09_0013) is currently</b></p> |

| Aspect                       | Approved Project                                                                                                                                                                                                                                                                                                                                                                                                                    | Proposed Modification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                              | <p>&gt; The seam thickness in the V Mains and the 309 Panel is 2.5 m and the depth of cover is 450 – 460 m. The V Mains area is 2 km long and between 75 and 300 m wide, while the 309 Panel is 190 m by 290 m. Neither the V Mains nor the 309 Panel are located in areas unaffected by previous mine subsidence.</p>                                                                                                              | <p><b>being assessed by DoP&amp;I for future LW extraction, including LWs 6, 7 and 8.</b></p> <p>The mining operations proposed in the project are first workings, with two limited areas of pillar extraction (or second workings). <b>LW mining would also be undertaken in the Wongawilli seam in LWs 4 and 5.</b></p> <p>The seam thickness in the V Mains and the 309 Panel is 2.5 m and the depth of cover is 450 – 460 m. The V Mains area is 2 km long and between 75 and 300 m wide, while the 309 Panel is 190 m by 290 m. Neither the V Mains nor the 309 Panel are located in areas unaffected by previous mine subsidence.</p> <p><b>The seam thickness in the Wongawilli Seam LWs 4 and 5 is between approximately 2.7 m and 3.2 m with the depth of cover ranging from approximately 320 m to 340 m. LW 4 is approximately 530 m long by 145 m wide, while LW 5 is approximately 1145 m long by 145 m wide.</b></p> |
| <b>Associated Facilities</b> | <p>Gujarat is also currently planning a significant expansion of NRE No. 1 (the 'Major Expansion Project'), MP09_0013, involving LW mining in the western areas of the mining leases (Wonga West) and beneath existing mine workings in the eastern areas (Wonga East). This latter project has an estimated capital investment value of \$250 million and would extend the life of mining by approximately a further 18 years.</p> | <p>No Change.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

**Table 1-2 Summary of Proposed Modification Works**

| Location                                                                          | Infrastructure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Access                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Consolidated Coal Lease (CCL) 745 – Wonga East Area 2 (west of Mount Ousley Road) | <p>The proposed modification works would include:</p> <ul style="list-style-type: none"> <li>&gt; LW4 – longwall panel mining in the Wongawilli Coal Seam; LW 4 is 530 m long by 145 m wide utilizing 65 m wide chain pillars.</li> <li>&gt; LW5 – longwall panel mining in the Wongawilli Coal Seam; LW 5 is approximately 1145 m long by 145 m wide utilizing 65 m wide chain pillars.</li> <li>&gt; MG development for LW 6 in the Wongawilli Coal Seam (MG 6).</li> <li>&gt; MG development for LW 7 in the Wongawilli Coal Seam (MG 7).</li> <li>&gt; MG development for LW 8 in the Wongawilli Coal Seam (MG 8).</li> </ul> | <p>Access will be as per the approved project as follows:</p> <ul style="list-style-type: none"> <li>&gt; Personnel and materials would continue to access the underground mine via the <u>No. 4 Shaft and winder</u> and the portals at the Russell Vale site.</li> <li>&gt; Personnel and materials would continue to access the Wongawilli seam workings utilising the three additional portal entries located at the Russell Vale site – one in the Wongawilli Seam and two in the Balgownie Seam.</li> </ul> |

**Note:** during certain and normal operational investigations, NRE may review mining designs, dimensions and layouts.

## 2 Regulatory Framework

This section describes the statutory approval framework for the proposed modification.

On 13 October 2011, the Project Approval (MP 10\_0046) for the NRE No.1 Preliminary Works Project was granted by the Minister for Planning under Section 75(J) of the EP&A Act. The Minister for Planning subsequently issued a set of approval conditions for the project. Section 75W of the EP&A Act regulates modifications to Minister's approval, where by the proponent (NRE) may request the Minister to modify the Minister's approval for a project. Based on advice received by NRE, confirming that the proposed project works can be prepared, submitted and approved as a modification under s75W of the EP&A Act, this proposed modification works falls under the provisions of the EP&A Act.

This EA forms part of the application for a modification under Section 75W of the EP&A Act to the existing project approval for the NRE No.1 Colliery Preliminary Works (MP 10\_0046). As detailed in this EA, the temporary infrastructure required for the proposed modification works is considered to be consistent with that detailed in the Approved Project. The geographic location of the proposed works is based on geological features identified in the EA of the Approved Project. Accordingly, the proposed works are considered to be an extension of development under an approved project in an existing environment. Hence, modification of the Approved Project is likely to have limited environmental consequences beyond the project's original environmental assessment and is not considered to be a separate project.

An overview of the regulatory framework as it relates to the NRE No.1 Colliery Preliminary Works Project is set out in the original EA for the Project Approval. The proposed modification is consistent with the regulatory framework detailed in the original EA for the Project Approval and additional legislation or planning instruments introduced since this time, as summarised in **Table 2-1** below.

**Table 2-1 Summary of Regulatory Framework**

| Regulatory Instrument                                                       | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>Environment Protection and Biodiversity Conservation Act 1999</i></b> | The proposed modification works will not have a significant impact on the seven matters of national environmental significance. No approval under the EPBC Act is required. ERM (2012) identified that the following threatened species listed under the EPBC Act may be present or potential habitat is present within the application area: Prickly Bush-pea, the Giant Burrowing Frog, Heath Frog and Stuttering Barred Frog. ERM (2012) prepared Assessments of Significance for these species, which concluded that the proposed modification works were unlikely to have a significant impact. No EPBC Act referrals have been submitted for the modification works, noting the conditions of approval to avoid impacts on Dam 6 and potential habitat for the Green and Golden Bell Frog ( <i>Litoria aurea</i> ). |
| <b><i>National Greenhouse and Energy Reporting Act 2008</i></b>             | The National Greenhouse and Energy Reporting Act (NGER Act) establishes a national framework for Australian corporations to report greenhouse gas emissions, reductions, removals and offsets, and energy consumption and production. NRE is a registered corporation under the NGER Act, thereby triggering reporting requirements. The proposed production is likely to exceed the 25 kilotonnes or more of greenhouse gas equivalent (CO <sub>2</sub> ) production per year, thereby triggering the reporting threshold.                                                                                                                                                                                                                                                                                               |
| <b><i>National Environment Protection Council Act 1994</i></b>              | The National Environment Protection Council (NEPC) is a government body with law-making powers under the National Environment Protection Council Act 1994. NEPC produces National Environment Protection Measures (NEPMs). NEPM requirements, as per the approved project also apply to the modified project.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Regulatory Instrument                                                            | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Coal Mine Health and Safety Act 2002</b>                                      | As per the approved project.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Dam Safety Act 1978</b>                                                       | Cataract Dam is a prescribed dam under the Dam Safety Act 1978. No workings fall within the dam notification area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Environmental Planning and Assessment Act 1979</b>                            | The development relates to the mining of a natural resource with the proposed development in accords with the objects of the Act.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Environmental Planning and Assessment Amendment (Part 3A Repeal) Act 2011</b> | The Act is influencing planning within NSW, including State Significant Development in respect of mining operations. Existing Part 3A Projects (including the NRE No.1 Colliery Project as approved) become 'Transitional Part 3A Projects'. Hence, Part 3A will continue to apply to the LWs 4 and 5 and MGs 6, 7 and 8 project including modifications under section 75W.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Environmental Planning and Assessment Regulation 2000</b>                     | The project is progressing in accordance with the clauses in Part 1 A of this regulation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Mining Act 1992</b>                                                           | Russell Vale No.1 Colliery operates under various leases granted under Part 6 of the <i>Mining Act 1992</i> including the terms and conditions of Consolidated Coal Lease (CCL) 745, Mining Purpose Lease (MPL) 271 and Mining Lease (ML) 1575. The proposed modification works are consistent with these documents.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Water Management Act 2000</b>                                                 | <p>The WM Act governs water licensing and approvals in NSW in circumstances where a water sharing plan has commenced for that particular area. The '<i>Water Sharing Plan Greater Metropolitan Region Unregulated River Water Source 2011</i>' and the '<i>Water Sharing Plan for the Greater Metropolitan Region Groundwater Water Sources 2011</i>' commenced on 1 July 2011 and include the project area. The provisions of the WM Act apply to regulation of access to available waters in all rivers, wetlands and groundwater sources in New South Wales. Any extraction, interception or diversion from either surface and/or groundwater requires access licences under the provisions of the WM Act, including the taking of water by means of redistributing or diverting water from a water source, as provided in the definition of take of water in the <i>Water Management Amendment Act, 2010</i>.</p> <p>The NSW Office of Water (NoW) considers the diversion of water from surface water sources to sub-surface fracture zones, or redistribution within groundwater sources as a "take" under the WM Act, and as a result, licences must be obtained to account for the take of water from the respective water source.</p> |
| <b>Protection of the Environment Operations Act 1997</b>                         | Russell Vale Colliery No.1 requires an Environment Protection Licence (EPL) as it meets the criteria to be declared a 'scheduled activity' as per Schedule 1 of the POEO Act. Clause 28 of the POEO Act defines mining for coal as "1) processing or handling coal (including tailings and chitter) at underground or open cut mines. 2) The activity to which this clause applies is declared to be a scheduled activity if it has the capacity to produce more than 500 tonnes of coal per day". Accordingly the proposed modifications would be in general accordance with the existing EPL at the NRE No.1 Colliery (EPL No. 12040).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| Regulatory Instrument                                                                                     | Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>National Parks and Wildlife Act 1974</b>                                                               | This Act does not affect the proposed modification works, because the modification works will not occur in a park, reserve, or heritage area designated under Part 4 of the Act. Provisions of the NPW Act that regulate Aboriginal Cultural Heritage are incorporated into the Project Approval granted in accordance with the EP&A Act.                                                                                                                                                                                               |
| <b>Sydney Catchment Management Act 1998</b>                                                               | As per the Approved Project.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Threatened Species Conservation Act</b>                                                                | Endangered species, populations or communities listed in Schedule 1 of the TSC Act have been identified at the surface in the areas subject to the modification works. Vulnerable species listed in Schedule 2 of the TSC Act were identified in the areas subject to the modification works. ' <i>Alteration of habitat following subsidence due to LW mining</i> ' is listed as a Key Threatening Process in Schedule 3 of the TSC Act.                                                                                               |
| <b>State Environmental Planning Policy (Mining, Petroleum, Production and Extractive Industries) 2007</b> | As per the EA for the Approved Project.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>State Environmental Planning Policy (Infrastructure) 2007</b>                                          | SEPP Infrastructure aims to aid the delivery of infrastructure within NSW.<br><br>Clause 104 of the SEPP (traffic generating development) states that certain traffic generating development is required to be referred to the RTA (now RMS) for comment as per Schedule 3 of the SEPP. The proposed works fall within Column 1 of Schedule 3 "Any other purpose", however as per Column 2 the proposed works are unlikely to generate traffic greater than 200 vehicles per day and therefore is not subject to this clause or Policy. |
| <b>Regional Environmental Plan No. 20 Hawkesbury Nepean River</b>                                         | As per the EA for the Approved Project.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Wollongong Local Environment Plan 2009</b>                                                             | Under the Wollongong Local Environment Plan 2009, the subject land is zoned as environmental conservation.                                                                                                                                                                                                                                                                                                                                                                                                                              |

## 3 Project Description and Context

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This section provides an overview of the Approval (MP10\_0046) and details the context of the proposed modification.

The proposed modification involves extraction of coal from the eastern underground portion of the mine, known as 'Wonga East', in LWs 4 and 5 utilising LW mining methods; and the development of MGs 6, 7 and 8, utilising first workings mining methods to define future LW extraction. There are no upgrades or changes to the surface facilities as part of this proposed modification and all other aspects of the Project as approved, remain unchanged.

### 3.1 Current Project Approval

The longwall area known as 'Wonga East' is approximately 8 km north of Wollongong and 70 km south of Sydney, within the local government area (LGA) of Wollongong in the Illawarra region of NSW. Mining at the Colliery has been undertaken since 1887 and surface facilities have operated at the Russell Vale site since this time. Mining methods at the Colliery have included Bord and Pillar; Pillar Extraction and LW, each with significant differences in production rates.

The Approved Project (MP10\_0046) encompasses the area within Consolidated Coal Lease (CCL) 745 in the Southern Coalfield of NSW. The proposed extraction area (i.e. LWs 4 and 5 and MGs 6, 7 and 8) is entirely within the Project Application Area (PAA) for the approved project.

The general location of the works is shown on **Figure 1**.

Currently, NRE No.1 Colliery operates in accordance with the Approved Project (MP10\_0046) which includes continuation of production of run-of-mine (ROM) coking coal up to 1 Mtpa; augmenting, upgrading and using the existing infrastructure; trucking run-of mine coal from the Colliery to the port; and environmental improvement works to the surface, such as construction of a new channel to better manage stormwater directed through the site.

The ROM coal is processed on site via crushing and sizing which is then exported, utilising the Port Kembla Coal Terminal (PKCT) facilities. There is no increase to the current and approved extraction rate proposed in this modification.

Under the Approved Project, MP10\_0046, the mining aspects, surface infrastructure and environmental improvement works are progressing as follows:

- > Mining in 309 and H panels in the Bulli seam, have been completed;
- > Development of the Wonga Mains driveage continues and is approximately 5km from the surface entry points at NRE No.1 Colliery;
- > The Bulli conveyor, Balgownie conveyor and Balgownie coal bin have been removed from service and/or demolished;
- > A large proportion (approximately 80%) of upgrade works to key surface infrastructure have been completed, including:
  - the Wongawilli decline conveyor and associated plant and equipment;
  - upgrading of the dust suppression system associated with the stockpile area; and
  - further investigations including detailed design for other existing infrastructure operational efficiencies;
- > Other surface improvement works and removal of unused items of infrastructure scheduled to be undertaken within 12 months includes, without limitation, the following:
  - The Bulli coal bin removal;
  - Realignment of Bellambi Gully Creek from the existing pipeline to an open channel;
  - Improvements to existing coal reclaim system to remove unnecessary utilisation of mobile screening campaigns;

- Upgrades and improvements to the existing truck loading system;
- Removal of heavily corroded twin gantry structure.

In summary, noise has been reduced by a number of measures including, the decommissioning, removal and/or demolition of the aged and deteriorating Bulli and Balgownie conveyors and associated feeders; and the commissioning of the Wongawilli decline conveyor as a fully enclosed continuous tube gantry, fitted with low noise rollers in its open portions.

The new design of the tube gantry improves the site in a number of ways including, a fully sealed conduit to assist any spillage material and wash down water being contained and specifically directed away from the clean water system of Bellambi creek, to the designated dirty water collection system; and the elevated design has a significantly smaller footprint than the previous conveyor, therefore, following remediation of the site below the conveyor, the site will return to a more natural state and assist the control of storm water runoff in this area.

### 3.2 Description

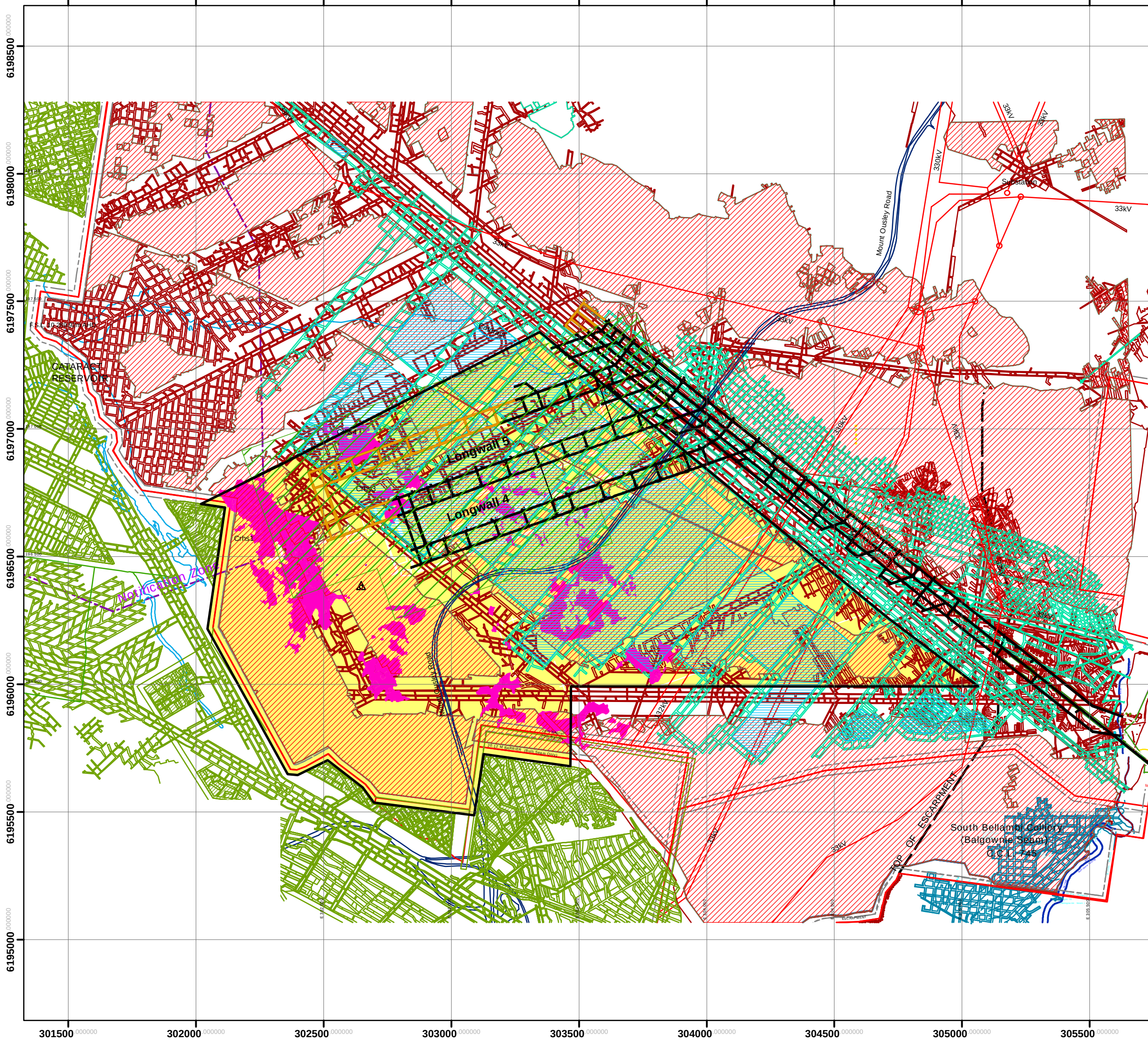
The Application Area is situated within the Metropolitan Special Area designated as Schedule 2 Restricted Access under the *Sydney Water Catchment Management Act 1998* and is managed by the Sydney Catchment Authority (SCA). In accordance with the *SCA Special Areas Strategic Plan of Management 2007*, this land is managed with the aim of protecting water quality and providing high quality raw water in reservoirs, by protecting ecological integrity and natural and cultural values. NRE has existing access agreements in place with the SCA to facilitate access to the surface above the proposed LWs for monitoring purposes and this arrangement is reviewed as required.

The surface is covered by relatively undisturbed natural bushland containing creeks and small wetlands.

The eastern portion of the lease is located on the Illawarra Escarpment. The lip of the Escarpment reaches up to 400m Australian Height Datum (AHD) and slopes steeply down to the foothills at approximately 30 m AHD. The steep slopes of the escarpment are heavily vegetated.

The surface topography comprises of undulating land and dense bushland. All streams and drainage are directed towards Cataract Dam, via Cataract Creek, Cataract River and their tributaries. Surface elevations range from 310m to 390m AHD.

A revised mine plan has been developed by NRE which means that the footprint of LWs 4 and 5 is no longer located within the Notification Area of the NSW Dam Safety Committee (DSC) for Cataract Reservoir and is also not located directly beneath swamp CRHS1. However, ongoing detailed discussions between NRE and DRE required further assessments, resulting in the re-defining of the Area of Subsidence Management, or as referred to by DRE, the 'Application Area' indicated in **Figure 3**. Hereafter, this area will be referred to as the 'Area of Management'. **Section 3.5.4**, below, discusses further the Risk Assessment on Pillar Run and this Risk Assessment report is attached as **Appendix G**.



# Area of Management Subsidence Management Plan 2e

RUSSELL VALE, NSW

## LEGEND

- Existing First Workings
- Proposed First Workings
- Mine Lease Boundary CCL745
- Application Area
- Corral Bulli Seam Workings
- Bulli Seam Workings
- Balgownie Seam Workings
- Dyke
- Fault
- Archeology Sites
- Uplands Swamps (Biosis Research 2012)

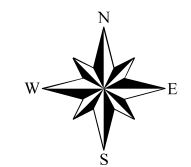
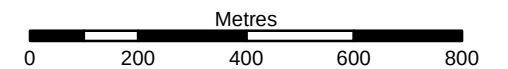


FIGURE 3

1:14,000 Scale at A3



Map Produced by Cardno NSW/ACT Pty Ltd (WOL)  
Date: 2012-07-30  
Coordinate System: GDA 1994 MGA Zone 56  
Project: 112069\_01  
Map: G1010\_AreaOfManagement.mxd 01

### 3.3 Current and Surrounding Land Use

The Application Area lies within the Metropolitan Special Area designated as Schedule 2 Restricted Access under the *Sydney Water Catchment Management Act 1998* and therefore land use is restricted to Conservation Areas aimed at conserving the catchment values of the area. A description of potentially sensitive land uses within the Application Area is provided in **Table 3-1**.

**Table 3-1 Potentially Sensitive Land Uses**

| Land Use Issue                                                                                                                                                               | Comments                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Is the area an area reserved or dedicated under the <i>National Parks and Wildlife Act 1974</i> ?                                                                            | No                                                                                                                                            |
| Is the proposal located within land reserved or dedicated within the meaning of the <i>Crown Lands Act 1989</i> for preservation of other environmental protection purposes? | No                                                                                                                                            |
| Is the area a World Heritage Area?                                                                                                                                           | No                                                                                                                                            |
| Is the area subject to Environmental Protection Zones in environmental planning instruments?                                                                                 | The Wollongong LEP 2009 defines the area as E2 Environmental Conservation. This is aimed at retaining the water catchment values of the area. |
| Are the lands protected under SEPP 14 – Coastal Wetlands?                                                                                                                    | No                                                                                                                                            |
| Are the lands protected under SEPP 26 – Littoral Rainforests?                                                                                                                | No                                                                                                                                            |
| Is the land identified as wilderness under the <i>Wilderness Act 1987</i> or declared as wilderness under the <i>National Parks and Wildlife Act 1974</i> ?                  | No                                                                                                                                            |
| Are there any aquatic reserves dedicated under the <i>Fisheries Management Act 1994</i> ?                                                                                    | No                                                                                                                                            |
| Does the area constitute a wetland area dedicated under the Ramsar Wetlands Convention?                                                                                      | No                                                                                                                                            |
| Is the land subject to a conservation agreement under the <i>National Parks and Wildlife Act 1974</i> ?                                                                      | No                                                                                                                                            |
| Is the land identified as State Forest under the <i>Forestry Act 1916</i> ?                                                                                                  | No                                                                                                                                            |
| Is the land a Western lands lease                                                                                                                                            | No                                                                                                                                            |
| Is the land Freehold or Crown Land. If Crown Land, what type?                                                                                                                | Freehold. Owned by SCA.                                                                                                                       |

Source: OEC, 2012

### 3.4 Development Constraints

Seven upland swamps (referred to as CRHS1, CRHS2, CRHS3, CCHS1, CCHS2, CCHS3 and CCHS4) exist either directly above or in the very near vicinity of the proposed development. In order to minimise impacts to these swamps, specifically, CRHS1, CCHS3 and CCHS4, Gujarat NRE has reduced the length of

LWs 4 and 5, noting mining has previously extracted coal from the Bulli and Balgownie seams at this location.

Three major pieces of surface infrastructure exist in the vicinity of the site and/or in the Area of Management:

> Road/s:

- Mount Ousley Road passes generally to the south east of the mining area; and
- Several fire trails traverse the site.

> Utilities:

- 330 kV, 132kV and 33kV electricity transmission lines are located to the east of the mining area; and
- NRE owns a 33kV powerline traversing the northern portion of the mining area.

> Dam:

- Cataract Dam is located to the north west of the mining area.

The previous mine workings (Bord and Pillar and longwall) within the Bulli and Balgownie coal seams, remains in this footprint.

### 3.5 Characterisation of Underground Workings

The proposed north east / south west trending Wonga East panels are subdivided into Area 1 to the east of, and Area 2 to the west of, Mount Ousley Road. The LW mining layout has been designed specifically to reduce impacts to key surface features and infrastructure, such as Mt Ousley Road and swamps.

NRE currently propose to mine LWs 4 and 5 in Area 2, and then seek additional approvals for other extractions at a later date under the larger Part 3A Expansion Project (MP09\_0013). All panels will be extracted down dip, from south to north.

Based on the current understanding of coal quality, the proposed eastern mining edge is approximately 1000 m from the crest of the Illawarra Escarpment (defined as 320 m ASL).

#### 3.5.1 Mining Method

Mining will utilise LW and First Workings extraction in the lower section of the **Wongawilli Seam** at an approximate 340 m depth of cover. The thickness of the Wongawilli Seam within the application area is approximately 10 m. However, the economical working section is the lower 2.7 m to 3.2 m of the seam. This level of extraction is based upon effective and efficient resource recovery which might otherwise have not been mined and would have potentially been sterilised. As such, mining in this seam is consistent with the mining horizons utilised by other collieries operating in the Wongawilli seam.

The Bulli and Balgownie seams are the overlying seams that have previously been extracted in the 'Wonga East' area and NRE have undertaken a number of impact assessments and reviews of assessments, to better understand mining in this multi-seam environment.

The proposed LW panels have been designed and refined to minimise environmental impacts utilising narrow panel widths (145 m wide), large chain pillars (65 m wide), as summarised in **Table 1-2**, at a depth of cover ranging from 320 m to 340 m.

However, as a result of typical ongoing operational investigations, local geological anomalies, such as faulting and/or potential geotechnical matters, may result in the proposed LW 5 dimensions being revised. As an example, this revision could result in the shortening of LW 5 from the currently proposed length of 1145 m to approximately 845 m. This in turn would reduce the subsidence profile, leading to a reduction in impacts to key surface features such as swamps (CCHS3 and CCHS4). Should LW 5 dimensions be revised, NRE will reassess potential impacts in detail as part of the Extraction Plan requirements. An example of what management plans might be used to form an extraction plan can be viewed in **Appendix J** of this document.

### **3.5.1.1 First Workings**

First workings involve development of roadways and/or headings within the coal seam, and interconnecting cut-throughs with approximate dimensions of 5.5 m wide by 3.2 m high. The purpose of these roadways is to provide access to the coal resource, mine ventilation and corridors for personnel and material movement within the seam and coal conveyor network. MGs 4, 5, 6, 7 and 8 are the first workings proposed as part of this modification document.

First workings will be mined using continuous miners typically with integrated roof and rib bolting rigs. The roadway roof will be supported by installation of steel roof bolts into the stone above the coal seam, and by forming pillars of coal, which are left behind. Coal will be transported from the continuous miners to the conveyor system via shuttle cars.

First workings leave the coal pillars intact and the overlying strata fully supported resulting in 'zero' subsidence, which is defined by the DRE as vertical downward movement of the ground surface that is less than or equal to 20 mm. This assessment is confirmed by Seedsman (2011), attached as **Appendix C**.

### **3.5.1.2 Longwall**

Following the completion of first workings, the retained panels of coal in the Wonga East area (LWs 4 and 5) will be extracted by the retreating LW mining method of secondary extraction. The coal will be continuously removed from the working face onto a series of conveyors that transfer the coal to the surface. As the face is cut away, both the shearer and the hydraulic roof supports advance forward for the next shear, after which the unsupported stratum behind the LW supports collapse, creating an area known as 'goaf'.

## **3.5.2 Systematic and Non-Systematic Subsidence**

Subsidence, typically refers to the vertical movement of a point as a result of the LW extraction, however, subsidence of the ground actually includes both vertical and horizontal movement. Systematic subsidence is the normal ground movements resulting from the extraction of LWs including subsidence, tilt, curvature and strain (both compressive and tensile). Non – systematic subsidence is movements that can include far-field horizontal movements; irregular subsidence movements; and valley related movements. Tilt refers to the difference in subsidence between two points divided by the horizontal distance between the points. Strain refers to the change in the horizontal distance between two points divided by the original horizontal distance between the points.

Additional to the systematic movements that have been predicted for the proposed extraction and the potential for localised upsidence, but negligible closure movements within the alignment of the valleys, it is possible that some regional horizontal movement may also be experienced. This is due to relaxation and redistribution of horizontal stress in the strata. The strata within the application area have already been affected by the previous extraction of LW panels within the overlying Balgownie seam and by the previously extracted workings within the overlying Bulli seam. Any regional horizontal or far field movements that might occur would be expected to be very small and would be regarded as bodily movement towards the extracted goaf areas. The impact of these movements on the natural surface features and items of infrastructure is expected to be insignificant.

## **3.5.3 Multi Seam**

As discussed in **Section 3.5.2** above, the strata within the application area has already been affected by the previous extraction of LW panels within the overlying Balgownie seam and by the previously extracted workings within the overlying Bulli seam. Vertical subsidence was measured following extraction in the Balgownie seam, up to 1.4 m, as being greater than the extraction height (i.e. approximately 1.2 m). This demonstrates that there is a direct relationship between the Bulli seam extraction followed by the Balgownie seam LW extraction, concluding that a significant proportion of the area above the extraction has undergone 'full' subsidence (up to 1.4 m), therefore most, if not all, of the 'goafing' has already occurred. An

assessment of the remaining pillars in the Bulli seam was undertaken by Strata Engineering and Stable Strata in the detailed reports as attached in **Appendix D** and **Appendix F**, respectively.

The report by Professor Nielen van de Merwe (Stable Strata 2011) concluded that:

***“...based on experience, observation and analysis is that the proposed mining of the Wongawilli seam will have no effect on the pillars under the Mount Ousley Road and consequently the surface can likewise be expected to remain stable. In addition the potential for a “pillar run” to occur as a consequence of the proposed Wongawilli LWs is exceedingly low to negligible”.***

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The proposed extraction of LWs 4 and 5 in the Wongawilli seam is predicted to display maximum subsidence parameters of 1.15 m vertical subsidence; up to 17 mm/m tilt; and -10 to +12 mm/m strain (as illustrated on **Figure 7**, **Figure 8** & **Figure 9** respectively). These predictions are associated with a ‘non-conventional’ approach as defined by the Southern Coalfields Inquiry (SCI), however as such, the management of this subsidence is risk based and will be capable of dealing with unexpected changes or uncertainties. This is discussed in more detail in the Seedsman report (2011) attached as **Appendix A**.

#### **3.5.4 Pillar Run**

**Appendix G** includes a risk assessment prepared by knj Consultants (2012) which identifies, analyses, evaluates and treats the risk of subsidence that may extend beyond the predicted footprint as a result of extraction of the Wongawilli Seam LWs 4 and 5. The primary source of risk was nominated as an event known as “Pillar Run”. Pillar run is widely described as “a large scale progressive collapse of coal pillars in a short period of time” (Stable Strata, 2011). For this to occur, however, pillars “**firstly** need to be able to fail and **secondly** there needs to be a loading mechanism that transfers load in excess of their strength to the pillars” (Stable Strata, 2011). Pillar Run has the potential to occur in old Bulli Seam workings that overlie the proposed LW 4 and LW 5 panels, once LW mining operations commence in these panels. The potential consequence of a Pillar Run event is impact to a range of surface features, both natural and man-made as detailed in knj Consultants (2012). The risk assessment was conducted using the Bow Tie methodology, by a team comprised of representatives from NRE, Seedsman Geotechnics and Pells Consulting. This risk assessment was largely built on the predicted subsidence parameters modelling prepared by Seedsman (2011) and a number of other relevant assessments detailed in **Appendix G**.

A significant result of the risk assessment was the identification of key surface features in the vicinity of the proposed modification works area that could be affected, should pillar run occur. These include without limitation, swamps, creeks, Mount Ousley Road, Fire trail No.7d, a 330kV Transmission Line (owned and maintained by Transgrid) as well as 132kV and 33kV Transmission Line (owned and maintained by Endeavour Energy). The remnant bord and pillar mine workings from within the Bulli and Balgownie coal measures are also present with large coal barriers still remaining. According to the assumptions made in the risk assessment, these identified coal pillars have the ability to retard any such ‘pillar run’ mechanism, thus providing the Area of Management outlined in **Figure 3**.

### **3.6 Surface Features within the Application Area**

Through the SMP process, NRE identify potentially sensitive environmental features located within the application area which are all in addition to the surface features included in the approved project.

**Table 3-2** and **Table 3-3** summarise the findings, based on the information provided in the SMP (NRE, 2011) and subsequent applicable documentation including OEC (2012) and ERM (2012).

**Table 3-2 Natural Features in the Longwalls 4 and 5 Application Area**

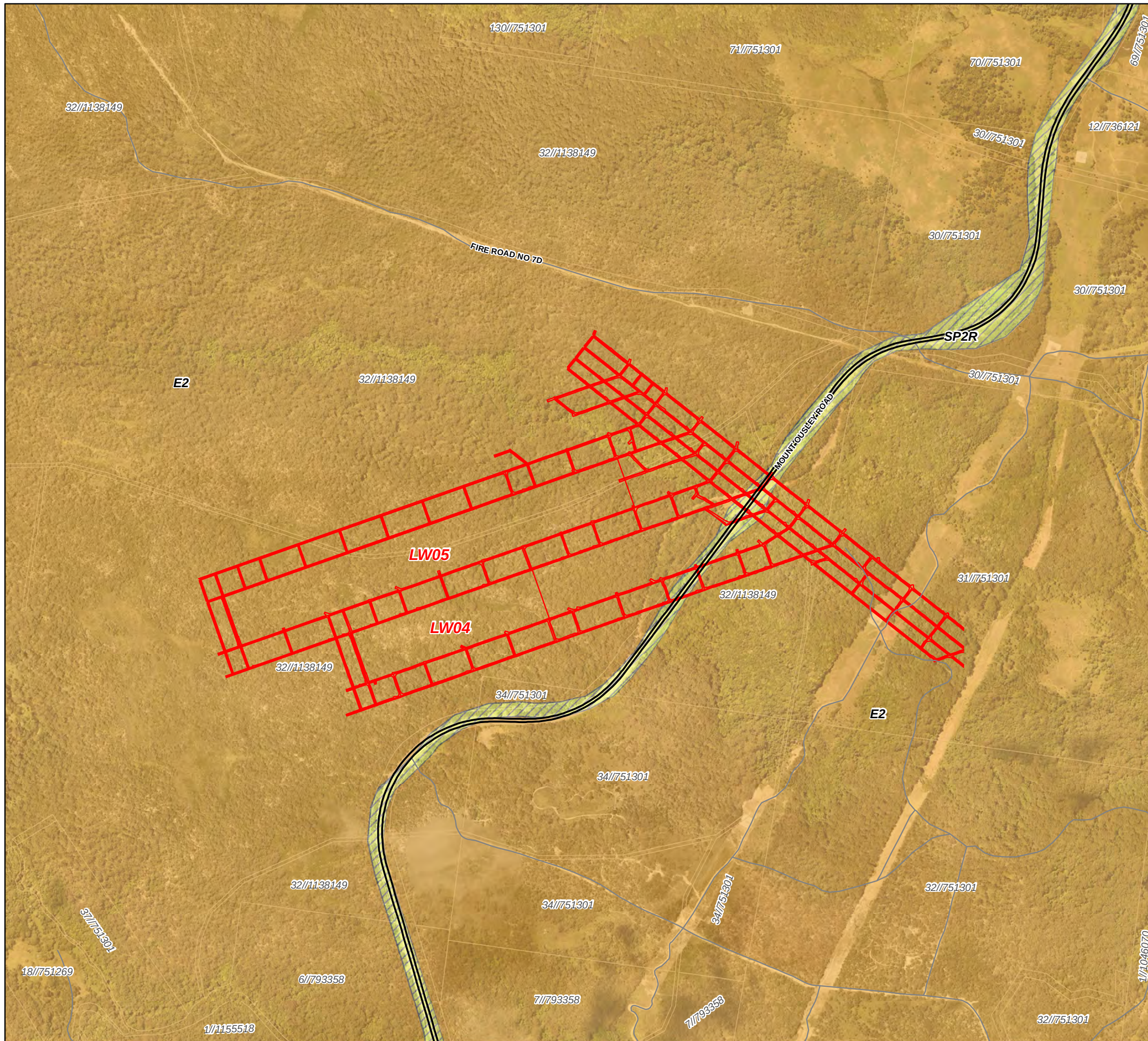
| Feature                                              | Description/Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Catchment Area</b>                                | The application area is located wholly within the Metropolitan Special Area as controlled and managed by the SCA under the <i>Sydney Water Catchment Management Act 1998</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Rivers and Creeks</b>                             | <p>There are no rivers located within the application area. However, there is a permanent flowing river (Cataract River) outside and adjacent to, the application area to the south.</p> <p>Cataract Creek is located specifically above the abutment pillar of LW 5. It is a permanently flowing stream that flows in a westerly direction to Cataract Dam. Cataract Creek is characterised by two steeply sloping headwater valleys. A series of flowing channels, short pools, shallow rock bars and riffle / boulder sections are predominantly developed in a relatively more erosive interspersed shale and sandstone sequence compared to the Hawkesbury Sandstone. Approximately 800 m of Cataract Creek is located within the application area with a total fall of 100 m and average gradient of 5.7 mm/m.</p> |
| <b>Aquifers</b>                                      | Several perched, ephemeral aquifers have been identified within the SMP application area associated with the headwater swamps and local drainage lines. Deeper regional groundwater is located within the Hawkesbury Sandstone.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Springs</b>                                       | There are no known natural springs within the application area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Sea or Lakes</b>                                  | No sea or lake is located within the application area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Cliffs or Pagodas</b>                             | There are no known cliffs or pagodas within the application area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Steep Slopes</b>                                  | The surface lands within the application area exhibit undulating to hilly terrain, with levels varying from a high point of 398 AHD, south of LW 4, to a low point of 300 m AHD, to the north of LW 5, resulting in a gradient approximating 7% (or 4°). For the purposes of this report, a steep slope is defined as having a gradient greater than 1 in 3 (i.e. a grade of 33%, or an angle to the horizontal of 18°). Therefore, no steep slopes are identified within the application area.                                                                                                                                                                                                                                                                                                                          |
| <b>Escarpments</b>                                   | There are no escarpments located within or adjacent to the application area. The escarpment edge is located approximately 560 m east of the application area at its nearest point.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Land Prone to Flooding and Inundation</b>         | The land within the application area is regarded as free draining via the local creeks and there are no areas that would be considered flood prone.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Swamps, Wetlands and Water related Ecosystems</b> | Seven head water upland swamps (CRHS1, CRHS2, CRHS3, CCHS1, CCHS2, CCHS3 and CCHS4) are located in the vicinity of the mining area. The Headwater swamps are present within the first order tributaries of the Wonga East area, specifically above the western most extent of LWs 4 and 5, in elevated ground with relatively flat to gentle slopes, upstream of the Hawkesbury Sandstone incised stream sections. They are predominantly rain-recharged features where total rainfall and shallow sandstone groundwater seepage into the swamps exceeds evaporation. Standing water levels fluctuate in response to changes in rainfall recharge.                                                                                                                                                                       |

| Feature                                                  | Description/Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Threatened, Protected Species or Critical Habitat</b> | <p>There are no lands within the application area that have been declared as critical habitat under the <i>Threatened species Conservation Act 1995</i>.</p> <p>Nineteen (19) threatened plant species as listed on the Threatened Species Conservation Act 1995 and /or the Environment Protection and Biodiversity Conservation Act 1999 were identified or recorded as having potential habitat within 10 km of the application area. Of these plant species <i>Pultenaea aristata</i>, has been recorded in large numbers within and adjacent to the application area. Potential habitat for a further eight threatened species was considered within the application area however only two of these species (<i>Cryptostylis hunteriana</i> and <i>Leucopogon exolasius</i>) were identified in habitat that could be affected by subsidence.</p> <p>A total of 48 threatened animal species listed in the <i>Threatened Species Conservation Act 1995</i> and /or the <i>Environment Protection and Biodiversity Conservation Act 1999</i> were identified as being recorded or having potential habitat within 10 km of the application area. Nine threatened or migratory animal species were recorded in the application area in respect of current or past studies and research undertaken by Biosis Research and subsequent review of Environmental Factors (REF) undertaken by OEC (OEC, 2012). Of these, only those species whose habitat might be directly or indirectly impacted by subsidence were considered with assessments of significance and this particularly relates to the Giant Burrowing Frog, Heath Frog and the Stuttering Barred Frog.</p>                                                                                                                                                                                        |
| <b>Natural Vegetation</b>                                | <p>The application area has been identified as land within the Sydney Catchment Authority's "Special Area" used for the harvesting and supply of bulk drinking water for Sydney and the surrounding suburbs. As such, it is covered largely by undisturbed native vegetation.</p> <p>In summary, five plant communities exist within the application area as: Exposed Sandstone Scribbly Gum Woodland; Sandstone Gully Peppermint Forest; Rock Plate Heath Mallee; Upland Swamps Banksia Thicket; and Upland Swamps Sedge-land Heath Complex.</p> <p><u>Exposed Sandstone Scribbly Gum Woodland</u>: This community typically occurs on infertile skeletal sandstone soils of slopes and ridge-tops, on the Woronora Plateau. It is typically present along main ridgelines and is dissected by fire trails and powerlines.</p> <p><u>Sandstone Gully Peppermint Forest</u>: This community tends to dominate the sheltered slopes and gullies of the Woronora Plateau south of Bulli Tops and Appin Road. It occurs along the main creek lines of the application area and adjacent slopes.</p> <p><u>Rock Plate Heath Mallee</u>: This occurs on massive sandstone outcrops and rock plates and small patches of this community have been mapped on ridge-tops and upper slopes within the application area.</p> <p><u>Upland Swamps Banksia Thicket</u>: This community occurs patchily around the periphery of large swamps on damp soils and is characterised by tall dense shrub stratum of Banksia and Hakea.</p> <p><u>Upland Swamps Sedge-land Heath Complex</u>: This community is characterised by three sub communities in particular Cyperoid Heath, Sedge-land and Restoid Heath. Within the application area Cyperoid Heath dominates the centre of the swamp to a height of 2 m and tends to be associated with local drainage depressions.</p> |

**Table 3-3 Man-made Features in the Application Area**

| Feature                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Railways</b>                                      | There are no railways, operating or otherwise, within the application area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Roads</b>                                         | There are no four wheel drive tracks within the application area; however fire trail No.7D has been identified further to the north. There is also one road immediately south and east of the application area and at two locations where the road crosses the application area. This road, known as 'Mt Ousley Road' is owned and maintained by Roads and Maritime Services (RMS) and includes culverts and associated drainage.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Bridges</b>                                       | There are no bridges identified within close proximity to the mining extraction area. However, there is one bridge located outside the furthest edge of the Area of Management (see <b>Figure 2</b> ) at the Picton Road interchange. This Picton Road interchange bridge is owned and maintained by RMS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Tunnels</b>                                       | There are no tunnels within the application area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Water, Gas, Liquid Fuel or Sewerage Pipelines</b> | There are no water, gas, liquid fuel or sewerage pipelines within the application area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Electrical and Telecommunications Services</b>    | There are no known electrical supply facilities or telecommunication services located within the application area.<br><br>However, there is a 330kV power line (owned by Trans Grid) and 132kV plus 33kV power lines (owned by Integral Energy) that run in an N-E to S-W direction, approximately 600 m to the east of the mining area, partly within the Area of Management (see <b>Figure 2</b> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Dams, Reservoirs and Associated Works</b>         | There are no public dams, reservoirs or associated works directly within the application area. The closest reservoir being Cataract Dam delineates a Dam Safety Committee (DSC) notification zone that crosses the edge of the application area in the south western corner of LW 5.<br><br>There are no dam walls located within the application area with the closest dam wall of Cataract dam, being 5 km N-W of the application area.                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Wells and Bores</b>                               | There are no registered water supply bores within the application area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Known Proposed Development</b>                    | There are no known proposed developments within the application area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Items of Archaeological Significance</b>          | There are no lands within the application area declared as an "Aboriginal Place" under the <i>National Parks and Wildlife Act 1974</i> . The following four items of archaeological significance are located within the vicinity of the application area:<br><br><u>Site 52 – 3 – 0320:</u> this site is recorded to contain one grinding groove and is located on a sandstone outcrop measuring 22 m by 2.5 m. It is recorded as in reasonable condition.<br><br><u>Site 52 – 3 – 0322:</u> this site is recorded to contain a series of two grinding grooves and is located on a sandstone outcrop measuring 11 m by 20 m. It is recorded as in reasonable condition.<br><br><u>Site 52 – 3 – 0318:</u> this site is a rock shelter with art and the sandstone overhang is recorded as possessing dimensions of 10 m long, 3.7 m wide and 4.5m high exhibiting a westerly aspect. |

| Feature                                             | Description                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                     | <u>Site 52 – 3 – 0325</u> : this site is a rock shelter with artifacts and deposits and the sandstone overhang is recorded as possessing dimensions of 3 m in length, 2.5 m in width and 1.2 m in height exhibiting a northerly aspect.                                            |
| <b>Items of Historical or Heritage Significance</b> | There are no items of European historical or heritage significance within the Application area. Similarly while two indigenous archaeological sites have been identified within the application area, they have been assessed as not being of historical or heritage significance. |
| <b>Permanent Survey Control Marks</b>               | There are no survey control marks within the application area.                                                                                                                                                                                                                     |



## Zoning Plan

RUSSELL VALE, NSW

### Legend

- Longwalls 4 and 5
- Major Roads (LPI)
- Local Roads (LPI)
- Cadastral (LPI, 2011)
- Wollongong LEP (WCC, 2009)**
  - E2 - Environmental Conservation
  - SP2R - Infrastructure (Road and Railway)

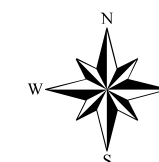
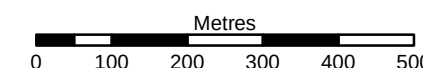


FIGURE 4

1:10,000 Scale at A3



Map Produced by Cardno NSW/ACT Pty Ltd (WOL)  
Date: 2012-07-24  
Coordinate System: GDA 1994 MGA Zone 56  
Project: 112069\_01  
Map: G1003\_ZoningPlan.mxd 01

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(November 2011)

## 4 Justification

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This section describes the alternatives considered and the justification of the proposed modification

A substantial volume of high quality coking coal reserves and some thermal coal by-products are present in the Wongawilli Coal Seam. The Wongawilli Coal Seam sits below the previously mined Bulli and Balgownie coal seams. NRE holds CCL 745 and accordingly seeks to maximise resource recovery subject to prudent economic and environmental limitations.

NRE No. 1 Colliery workings are currently designed to utilise LW mining techniques. The LW method proposed is a mining process that is cost effective, efficient and safe. Bord and Pillar mining techniques, previously used to extract coal from the shallower coal seams, was not considered a sufficiently efficient method to extract coal in a commercially viable manner.

Accordingly, the proposed modification is justified for the following reasons:

1. It will allow mining of a substantial volume of high quality coking coal.
2. It will allow further development of the Wongawilli Coal Seam for future extraction.
3. It will increase the efficiency of mining within the Wongawilli Coal Seam.
4. It will allow NRE to meet customer demand for coal from the Russel Vale No.1 Colliery.

### 4.1 Alternatives Considered

To maximise coal resource recovery NRE investigated a number of longwall layout alternatives, as illustrated in **Figure 5**. NRE undertook a progressive review of LW layouts with consideration given to a number of aspects including, subsidence predictions, assessment of key surface features and mining practicalities.

The alternatives considered by NRE are as follows:

#### > **Version 1**

NRE originally considered a more extensive extraction zone for LWs 4 and 5 to ensure high coal recoveries and high rates of investment return. This alternative involves long panels, both wide (250 m) and narrow (150 m) aligned parallel to the Wonga Mains driveages. The predicted strains, however, under Mount Ousley Road were in the order of 8-10 mm/m. Initial discussions with RMS (formerly RTA) indicated to NRE, a very strong reluctance to pursue this layout.

#### > **Version 2**

Following a review of the mine layout NRE opted for narrow longwalls (145 m) that are angled to the Wonga Mains driveages. These LWs were then aligned parallel to each other and extended from the Wonga Mains driveage through to the mining lease boundary. This alternative predicted vertical subsidence, tilts and strains that had a high potential to impact key features such as swamps and dams. Therefore, this alternative was discounted by NRE.

#### > **Version 3**

NRE considered this alternative to reduce swamp impacts, operational constraints due to localised faulting and to distance the extraction from the DSC notification zone. The most significant change to LW dimensions occurred to LW 4 with only a slight variation to LW 5.

#### > **Version 4**

This review of LW layouts was undertaken to further reduce impacts to swamps, specifically for LW5 and swamp CRHS1. This alternative is the preferred NRE longwall layout and is the layout considered within this EA modification document. The dimensions of these LWs are included in **Table 1-2**.

The final area proposed for extraction is shown in **Figure 6**.

In summary, the commencement point for LW 4 extraction has been moved further to the northeast and the commencement point for LW 5 has been positioned to avoid the subsidence of swamp areas located on the surface above potentially extractable coal.

It should be noted, however, that as a result of typical ongoing geotechnical investigations, local geological anomalies, such as faulting, may result in the proposed LW 5 start position being revised. This revision, therefore, would result in the shortening of LW 5 from the currently proposed length of 1 145 m to approximately 845 m and a reduced subsidence profile leading to a reduction in impacts to key surface features such as swamps (CCHS3 and CCHS4). Should LW 5 be revised, NRE will reassess the relevant aspects and potential impacts in detail, including additional information that might be collected post submission of this EA modification document, as part of the necessary requirements to develop an extraction plan.

## 4.2 Consequences of Not Proceeding

Not proceeding, or in this case the 'do nothing' approach, involves not undertaking longwall mining of LWs 4 and 5 and not installing MGs 6, 7 and 8. This would result in reduced efficiency of current mining operations. The extraction of underground coal reserves in these areas is necessary to ensure continuity of coal supply to customers, consistent with NRE's business requirements. This includes significant ongoing operating investment in the Southern Coalfields of NSW, with flow on benefits including continuity of employment, expendable income, export earnings and government revenue.

Not proceeding would result in reduced employment opportunities, limit the viability of NRE's operations and reduce royalty payments to the state and federal government.

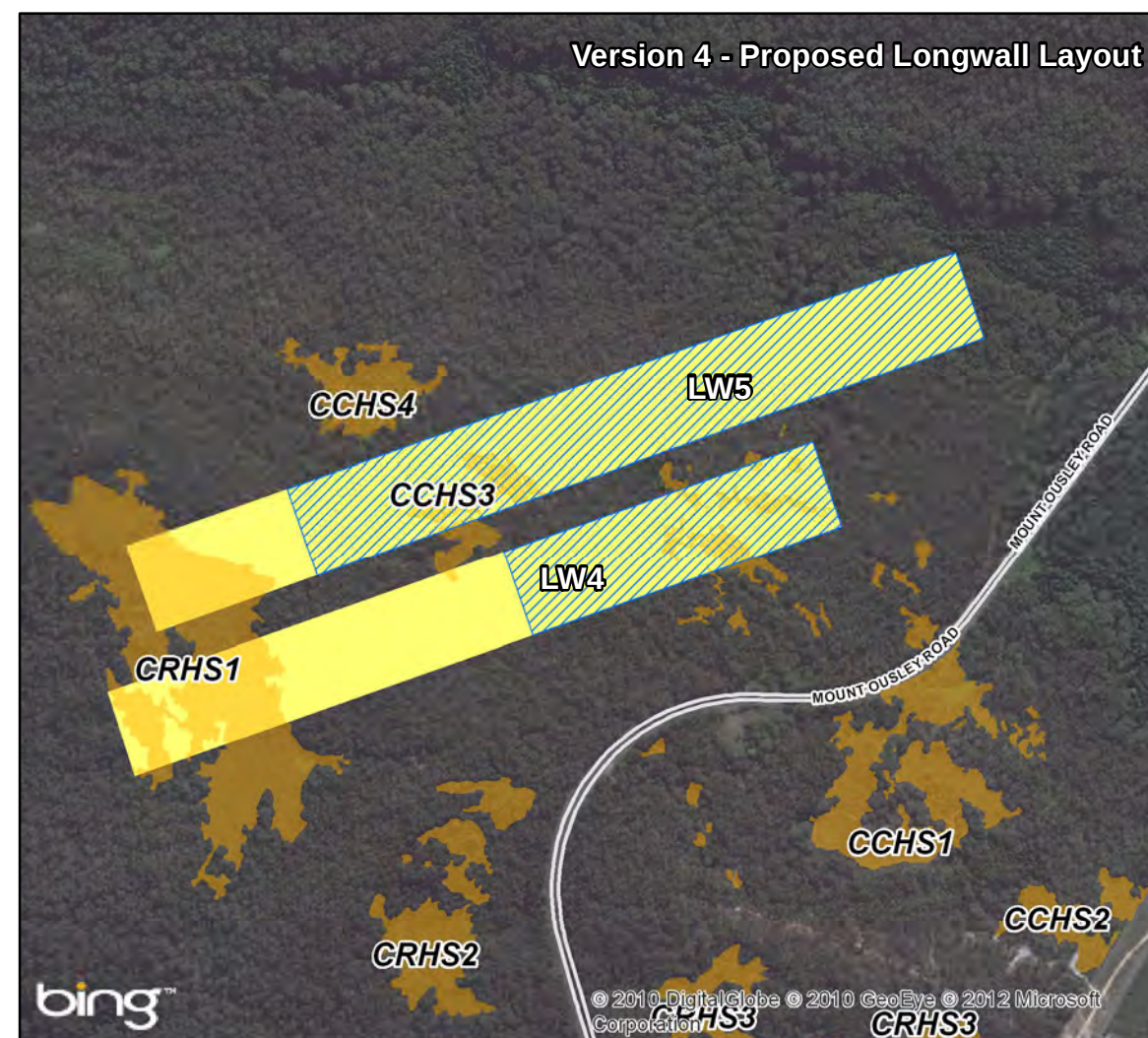
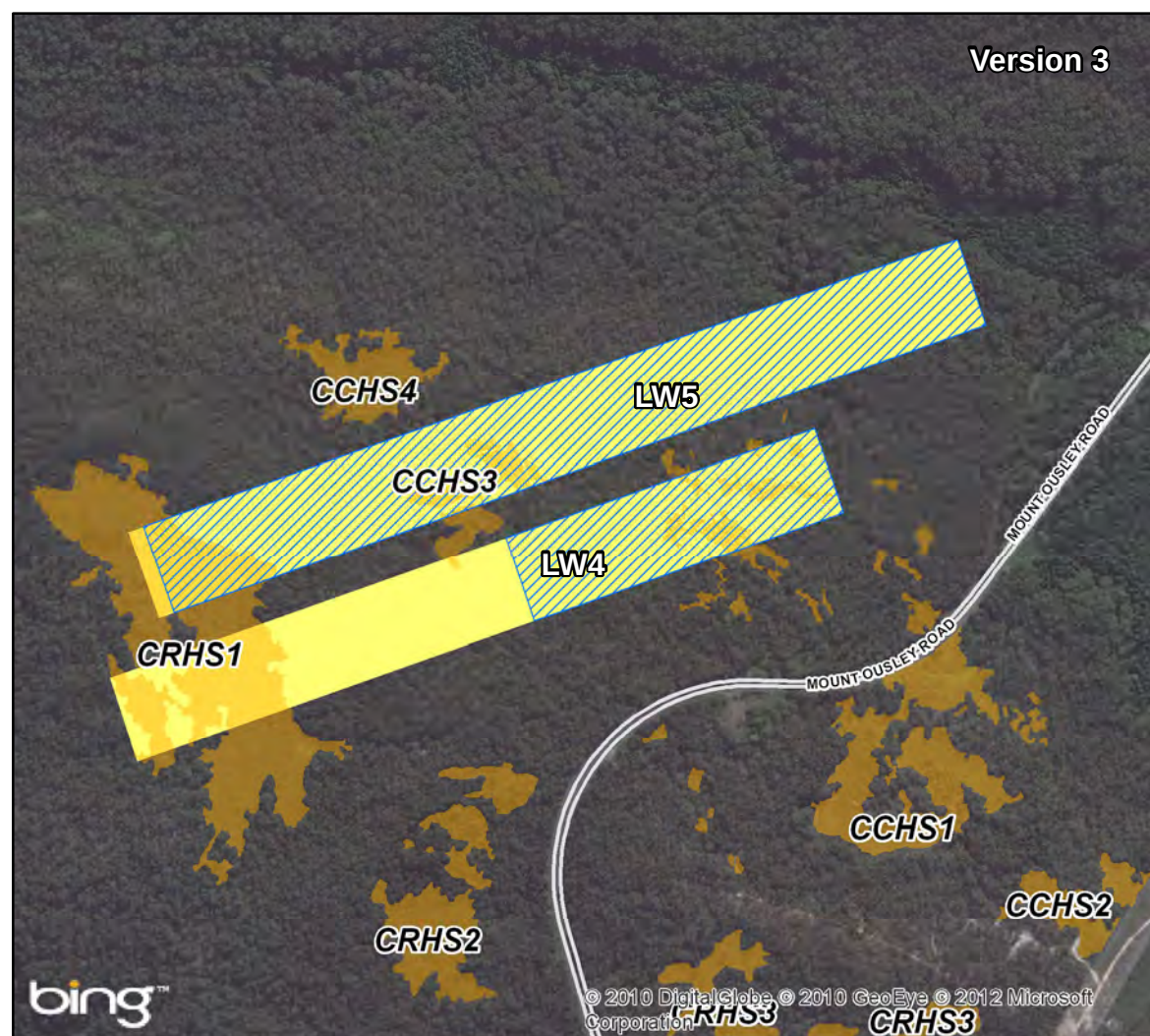
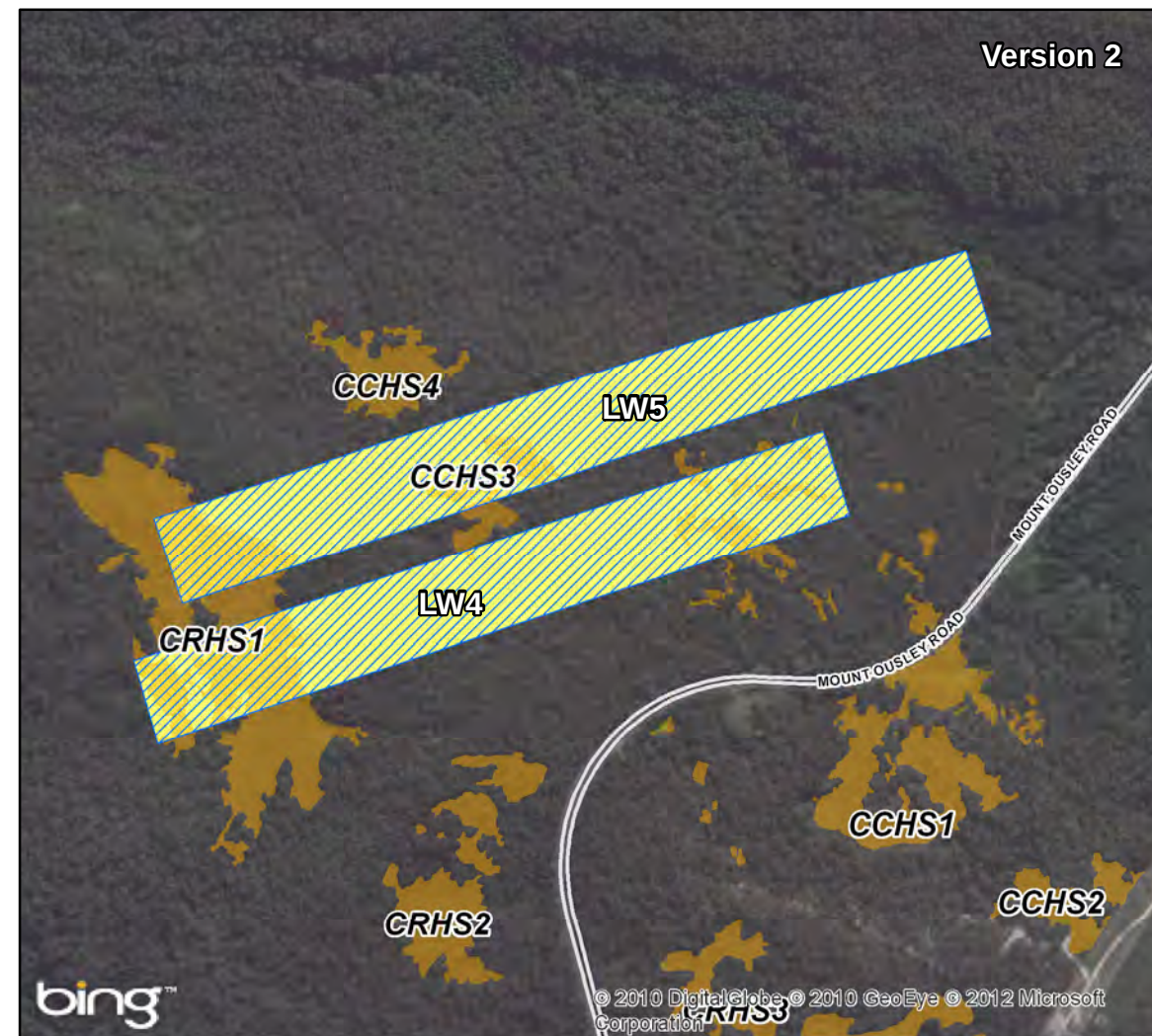
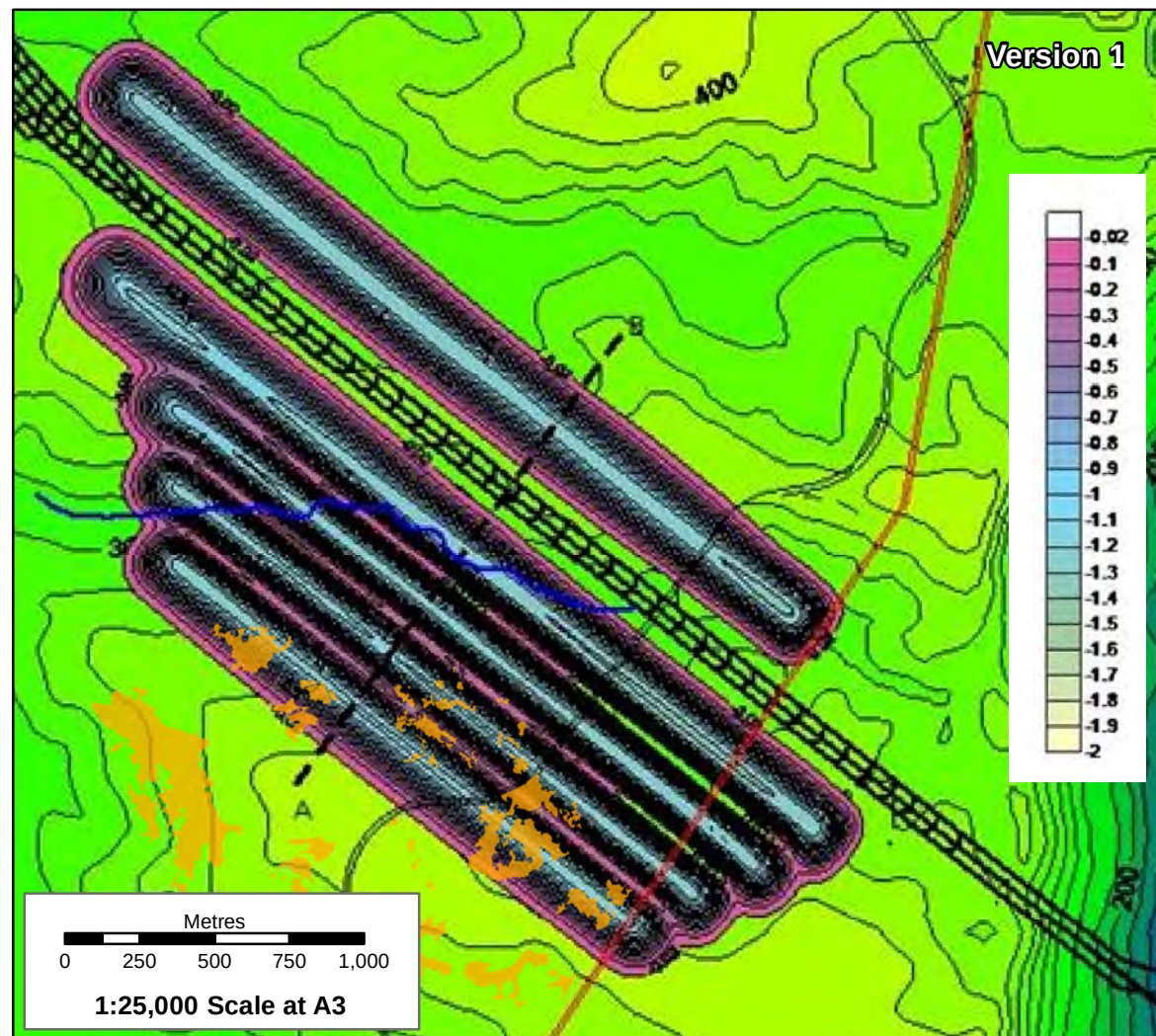
## 4.3 Timing

The development of LW 4 is completed and the extraction started in April 2012 with an expected completion date of August 2012. Development of LW 5 is expected to be completed by end of August 2012 with extraction of LW 5 scheduled to start in September/October 2012 and be completed by January 2013.

Notwithstanding advancements to NRE's development of LW 5 panel, it's expected that there may be a small discontinuity between the end of mining LW 4 and the start of LW 5 extraction.

**Table 4-1 Timing of Proposed Extraction**

| Area of Mining  | Extraction Start Date                 |
|-----------------|---------------------------------------|
| LW4 Development | Complete                              |
| LW4 Extraction  | April 2012 – August 2012              |
| LW5 Development | Complete by August 2012               |
| LW5 Extraction  | September/October 2012 – January 2013 |



# Longwall Layouts Alternatives Considered

RUSSELL VALE, NSW

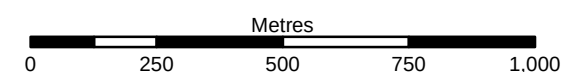
## Legend

- Major Roads (LPI)
- Upland Swamps (Biosis Research 2012)
- Area to be mined
- Area not to be mined



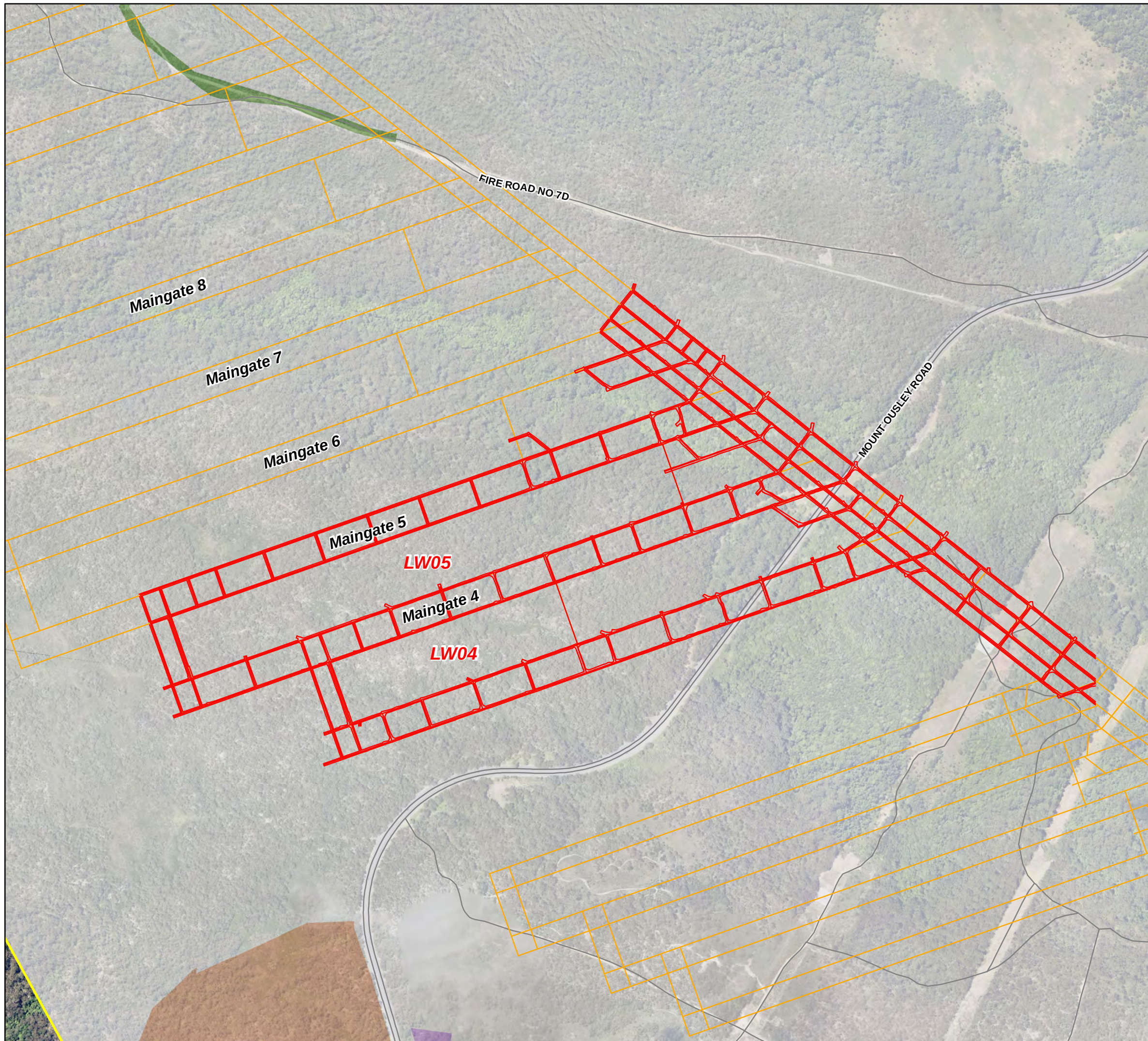
FIGURE 5

1:12,000 Scale at A3



Map Produced by Cardno NSW/ACT Pty Ltd (WOL)  
Date: 2012-08-02  
Coordinate System: GDA 1994 MGA Zone 56  
Project: 112069\_01  
Map: G1009\_AlternativesConsidered.mxd 01

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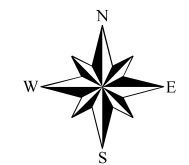


# Longwall Layout Plan

RUSSELL VALE, NSW

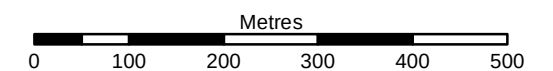
## Legend

-  Project Application
  -  Longwall 4 and 5 Layout (Exploratory Driveages)
  -  Mine Layout (February 2012)
  -  Major Roads (LPI)
  -  Local Roads (LPI)
- Mining Lease Depth**
-  Embraces the Surface
  -  Embraces the surface and land below to a depth of 15.24m
  -  Excepts surface land to depth of 20m
  -  Embraces surface and land below to unlimited depth



**FIGURE 6**

**1:8,000 Scale at A3**



Map Produced by Cardno NSW/ACT Pty Ltd (WOL)  
Date: 2012-07-30  
Coordinate System: GDA 1994 MGA Zone 56  
Project: 112069\_01  
Map: G1004\_Longwall\_LayoutPlan.mxd 01

Aerial imagery supplied by Near Map and associated third party suppliers  
(November 2011)

## 5 Consultation

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This section outlines the consultation associated with the proposed modification

### 5.1 Agency

Consultation with key NSW State Government agencies in relation to NRE's Projects, including this modification, commenced prior to submission of this Project Application in May 2012. NRE will continue to consult with relevant State Government agencies on a regular basis in relation to its current mining operations in the Southern Coalfield and the Project.

Following the submission of the Subsidence Management Plan to DRE (September 2011) for the extraction of LWs 4 and 5, NRE consulted with a number of agency's including, DRE, OEH, Department of Environment Climate Change and Water (DECCW), SCA, Dam Safety Committee (DSC), NoW, RMS, Transgrid and Endeavour Energy.

The consultation undertaken was to ensure that all aspects of the proposed project were conveyed and respective issues identified to be addressed. Mitigation, monitoring and management measures were discussed in detail which form a large proportion of the content included in the respective plans of management and Trigger Action Response Plans (TARPs) accordingly.

Correspondence from the relevant agencies may be provided on request.

### 5.2 Community

NRE has established a Community Consultative Committee (CCC) in accordance with the requirements of the conditions of the Approved Project (MP 10\_0046) which has, without limitation, the following objectives:

- > to develop this CCC with its community;
- > to outline what is planned for Gujarat NRE and its mine sites; and
- > to share information with the CCC to date.

Previous to establishing a CCC, NRE undertook interviews with the community utilising an independent third party to assist in understanding the community's key interests. NRE identified some key steps in Community Engagement as follows:

- > **Step 1** – Identifying stakeholders / community of interest and the role they can play in Gujarat NRE's community engagement.
- > **Step 2** – Interview those key community stakeholders and research / understand their interests and experience of effective community engagement.
- > **Step 3** – Determine from these key community areas/groups, what is believed to constitute effective community engagement and interpret the key messages.
- > **Step 4** – Build community engagement with the community utilising Community Engagement Principles drawn from Step 2 - Community Interviews.
- > **Step 5** – Integrate the above into a Community Consultative Committee.

Communications for this project aim to ensure all local stakeholders are informed of the proposed works and mining processes. Accordingly, NRE interviewed 12 community members from the Wongawilli and Russell Vale / Bellambi areas between 7 and 25 February 2012. A key message identified during these interviews was that effective community engagement is about being a 'good neighbour'. Following from this Gujarat NRE, in conjunction with Twyfords, undertook three co-design community forums in March 2012. These forums identified that the community were seeking further information regarding mining process in particular with respect to dust, noise and legislation.

Finally, an Independent Chair has been appointed to ensure effective and efficient CCC meetings are convened. It is anticipated that the initial meeting of the No.1 Colliery CCC will occur in August 2012. NRE expects that regular quarterly meetings will be held thereafter, to provide timely and accurate information on major approvals issues and general operational aspects of the Colliery. NRE also intends that the CCC and its interested parties be dynamic to ensure this communication process and dissemination of information is maximized.

## 6 Environmental Risk Assessment

This section provides an overview of the environmental risk identified with the proposed modification.

### 6.1 Risk Assessment Overview

The basis for identification of environmental risks/impacts is an appreciation of the site location and an understanding of the technology utilised in LW mining. This understanding is achieved through discussion with operational experts from NRE and associated contractors. This environmental risk assessment provides direction and context for the identification of environmental impacts from the proposed project modification.

This risk assessment is based on an index formed from the perceived likelihood of an occurrence, and the subsequent consequence of that occurrence using the process outlined in the Australian Standard AS/NZS 4360:2004 Risk Management. Both likelihood and consequence are measured on a scale of 1 to 5 (with 1 corresponding to improbable/insignificant and 5 corresponding to frequent/catastrophic). A subsequent index was developed and all identified risks classified as belonging to either 'Low', 'Moderate' or 'High' risk categories in **Table 6-1**. This is a conservative index, emphasising the number of Moderate and High risks identified.

**Table 6-1 Environmental Risk Assessment Matrix**

|            | Consequence   |          |          |          |              |
|------------|---------------|----------|----------|----------|--------------|
| Likelihood | Insignificant | Minor    | Moderate | Major    | Catastrophic |
| Improbable | Low           | Low      | Low      | Moderate | Moderate     |
| Remote     | Low           | Low      | Low      | Moderate | High         |
| Occasional | Low           | Moderate | Moderate | High     | High         |
| Probable   | Moderate      | Moderate | Moderate | High     | High         |
| Frequent   | Moderate      | High     | High     | High     | High         |

### 6.2 Risk Categories

The risk categories and associated environmental risks are summarised in **Table 6-2**.

**Table 6-2 Environmental Risk Assessment**

| Environmental Impact       | Process / Activity                                                                  | Potential Impacts from proposed development                                                                                                                                                                                                                                                                                                                                                                                                                                      | Risk Level (following application of mitigation measures identified in Section 7)                                                                                 |
|----------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subsidence</b>          | LW mining lowering the surface above areas that have been mined.                    | <p>Subsidence may cause cracking of the rock strata underneath the surface and creek lines, thereby altering surface and groundwater flows. Subsequent impacts may include:</p> <ul style="list-style-type: none"> <li>&gt; Loss of surface flows or water levels;</li> <li>&gt; Loss of aquatic or in-stream habitats;</li> <li>&gt; Loss of longitudinal connectivity;</li> <li>&gt; Loss of water quality; and</li> <li>&gt; Release of gas into the water column.</li> </ul> | Moderate – the likelihood of impacts is probable and the consequences considered moderate, however localised.                                                     |
| <b>Topography and Soil</b> | Alteration of the landform from subsidence.                                         | LW mining can change the topography of the land, de-stabilise cliff-lines and increase the probability of localised rock falls and cliff collapse. Predicted changes to the topography are unlikely to be observable, however localised changes to earth surface processes including erosion may occur.                                                                                                                                                                          | Moderate – the likelihood of impact is probable and the consequences considered minor, as the predicted topographic changes are likely to be almost unobservable. |
| <b>Surface Water</b>       | Alteration to the natural flow regimes of drainage lines, creeks and upland swamps. | <p>Loss of biological diversity and ecological function in aquatic ecosystems.</p> <p>Changes to water quality including the potential release of gas into the water column.</p> <p>Changes to surface flows, bank stability, drainage pathways, ponding and erosion.</p>                                                                                                                                                                                                        | Moderate – the likelihood of impacts is probable and the consequences considered moderate, however localised.                                                     |

| Environmental Impact       | Process / Activity                                                                                                                                                              | Potential Impacts from proposed development                                                                                                                                                                                                    | Risk Level (following application of mitigation measures identified in Section 7)                                                                                                                                                                                                        |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Groundwater</b>         | Subsidence-induced changes to the quality and flow of groundwater.<br><br>Operational activities impacting groundwater including increased groundwater inflow to mine workings. | Possible changes to the groundwater levels, flow paths, water chemistry and recharge rates.<br><br>Possible pollution, contamination or diminution of aquifers.                                                                                | Moderate – the likelihood of impacts is occasional and the consequences considered minor. The modification works involve mining small remnant reserves within a larger previously mined domain, where by impacts to groundwater in the various geological units has occurred previously. |
| <b>Terrestrial Ecology</b> | Subsidence-induced cracks to the surface causing changes to earth surface process including drainage and soil moisture conditions.                                              | Alteration of the functioning terrestrial ecosystems, resulting in changes to vegetation communities and the extent of potential habitat for threatened species.                                                                               | Low – the likelihood of impacts is remote and the consequences considered minor, as the terrestrial vegetation is well established with a discernible thickness of soil.                                                                                                                 |
| <b>Aquatic Ecology</b>     | Subsidence induced changes to the flow of groundwater and surface water.                                                                                                        | Alteration of surface water and groundwater flow regimes, leading to changes in the water chemistry (including an increase in the number of iron seeps), the location of ponding and erosion sequences, potentially resulting in habitat loss. | Moderate – the likelihood of impacts is occasional and the consequences considered minor, with impacts likely to be localised.                                                                                                                                                           |
| <b>Aboriginal Heritage</b> | Subsidence resulting in significant cracking of rock.                                                                                                                           | Changes to the integrity of the known Aboriginal heritage sites.                                                                                                                                                                               | Low – the likelihood of impacts is remote and the consequences considered minor.                                                                                                                                                                                                         |
| <b>Historic Heritage</b>   | Alteration to the landform from subsidence.                                                                                                                                     | Changes to the integrity of historic heritage items, noting that historic heritage items have not been identified within the footprint of the proposed modification works.                                                                     | Low – the likelihood of impacts is improbable and the consequences considered minor.                                                                                                                                                                                                     |

| Environmental Impact                 | Process / Activity                                                                                                                                    | Potential Impacts from proposed development                                                                                                         | Risk Level (following application of mitigation measures identified in Section 7)                                                                                                                                                                                                                                       |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Noise and Vibration</b>           | LW mining activities including transportation of equipment and materials to and from the site.                                                        | Noise and vibration levels may affect sensitive receivers near the mining site.                                                                     | Low – the likelihood of the impact is occasional, however mitigation measures currently implemented reduce the consequences to insignificant. Noting that the proposed modification works are underground, while the production / transportation volumes of coal per annum are in accordance with the approved project. |
| <b>Air Quality</b>                   | LW mining activities including the transportation of coal.                                                                                            | Potential increase in dust and particulate emissions.                                                                                               | Low – the likelihood of impacts is remote and the consequences minor, as mitigation measures are currently in place and the proposed underground mining production / transportation volumes of coal per annum are in accordance with the approved project.                                                              |
| <b>Greenhouse Gas</b>                | Greenhouse gas release from mined coal and rock strata, as well as the burning of coal post extraction.                                               | Increase in greenhouse gas emissions through greenhouse gas releases from coal and rock measures during mining or through burning coal post mining. | High – the likelihood of impacts is frequent and the consequences moderate, however the production / transportation volumes of coal per annum are in accordance with the approved project.                                                                                                                              |
| <b>Traffic and Transport</b>         | Haulage and mining vehicles entering and exiting the site.                                                                                            | Potential traffic delays for nearby road users along the haulage route and site access roads.                                                       | Moderate – there may be occasional minor impacts to the local road networks and traffic, however the proposed modification works do not increase the annual production and transportation volumes above the volumes specified in the approved project.                                                                  |
| <b>Visual Amenity</b>                | Subsidence induced changes in the topography and landforms.                                                                                           | Reduction in visual quality.                                                                                                                        | Low – the likelihood of the impact is improbable and the consequences insignificant, as observable impacts at the surface are considered unlikely.                                                                                                                                                                      |
| <b>Wastes, Utilities and Hazards</b> | Interception of utilities during mining operations.<br><br>Subsidence induced pillar run underneath utilities including transmission lines and roads. | Damage to utilities.<br><br>Increased production of waste from mining activities.                                                                   | Moderate – the likelihood of the impact is remote, while the consequence is major. Regular monitoring however is proposed to mitigate potential consequences.                                                                                                                                                           |

## 7 Assessment of Environmental Impacts

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This section assesses potential environmental impacts from the proposed modification and the proposed measures to mitigate, manage and monitor potential impacts

### 7.1 Subsidence

The report prepared by Seedsman Geotechnics (SGPL) July 2011, attached as **Appendix A**, details the methodology used to assess the potential subsidence parameters for LW mining utilising a Risk Management Strategy with a hierarchy of controls such as Elimination, Substitution, Engineering and Administration and possible impacts this might have on the identified significant surface features. A complimentary report prepared by Seedsman (2012), attached as **Appendix C**, advises that the development roadways (i.e. first workings), including maingates 6, 7, and 8, have been designed to leave the coal pillars intact, the roadways open and the overlying strata supported. This is likely to result in the vertical downward movement of the ground surface of less than 20 mm (defined by DRE as 'zero subsidence').

#### 7.1.1 Prediction Methodology and Assumptions

The subsidence assessment undertaken by SGPL, addresses potential subsidence in Wonga East for LWs 4 and 5 utilising extrapolation from extensive subsidence monitoring in adjacent areas of NRE No.1 Colliery. A subsequent review of predictions by SGPL (Feb 2012), attached as **Appendix B**, provides the current and necessary information to support the various assessments undertaken. The charts in Holla and Barclay (2000) provide some basis for the prediction of the LW panels 4 and 5.

Subsidence surveys in the area indicate that sag associated with extraction panels is not measurable with panels less than 120 m wide. For wider panels the sag becomes measurable and it is then, that the subsidence bowl can be visualised using influence function methods such as Surface Deformation Prediction System (SDPS) (Seedsman, 2009). SDPS requires three inputs: inflexion point relative to the goaf edge; maximum subsidence expressed as a percentage of seam thickness; and the influence angle (angle subtended to the horizontal by the point of zero subsidence).

The report prepared by SGPL also utilises a risk management approach to subsidence applying risk management tools by way of elimination, substitution, engineering and administration demonstrated through alternative designs and mine layouts that have transpired and developed to manage subsidence risks. Additionally, NRE engaged Pells Consulting to undertake a review of key aspects relating to mining, attached as **Appendix E**, including the review of Seedsman report (July 2011). Pells (2011) concluded that *"the review was substantially consistent with Seedsman, utilising the factual, computational and independent assessment undertaken"*.

The Wongawilli Seam is typically between 10 – 11 m in height. However, the economical mining section is the lower portion of the seam ranging in height from 2.7 m to 3.2 m. Subsidence estimations included in the assessment have used 2.8 m with a depth of cover being 320 – 340 m.

#### 7.1.2 Previous Mining

NRE undertook considerable review of the previously extracted areas in the Bulli and Balgownie seams with specific reference to mine record tracings to gain a comprehensive understanding of these areas.

The extensive subsidence monitoring of the surface lands for the Balgownie seam LW extraction was also taken into consideration, with the monitoring data showing increased subsidence (i.e. up to 1.4 m) above the Balgownie seam height of 1.2 m. Subsidence was not measured during Bulli seam extraction.

Additional to the systematic movements that have been predicted for the proposed extraction and the potential for localised upsidence, but negligible closure movements within the alignment of the valleys, it is possible that some regional horizontal movement (non-systematic subsidence) may also be experienced. This is due to relaxation and redistribution of horizontal stress in the strata.

The strata within the application area have already been affected by the previous extraction of LW panels within the overlying Balgownie seam and by the previously extracted workings within the overlying Bulli seam. Assessment of the remaining pillars in the Bulli seam was undertaken by Strata Engineering and attached as **Appendix D**. A subsequent detailed report on Pillar stability by Stable Strata, attached as **Appendix F**, concludes that:

*“...any regional horizontal or far field movements that might occur, would be expected to be very small and would be regarded as bodily movement towards the extracted goaf areas. In addition, the potential for ‘pillar run’ to occur as a consequence of the proposed extraction of Wongawilli seam LWs is extremely low to negligible”.*

Therefore, the impact from all of these potential movements/influences on the natural surface features and items of infrastructure is expected to be insignificant.

### 7.1.3 Predicted Subsidence Parameters

The Methodology used to predict the vertical subsidence, tilts and strains over the proposed extraction area (LWs 4 and 5) also included the surface level contours and seam floor contours to assist in determining the predictions.

A summary of the maximum predicted subsidence parameters, vertical subsidence, tilt and strain, resulting from the proposed extraction is provided in **Table 7-1** and illustrated in **Figure 7**, **Figure 8** and **Figure 9**, respectively. This maximum vertical subsidence prediction, as advised by Seedsman (2011) in **Appendix A**, clearly shows that this worst case would be experienced with the extraction of LW 5 occurring above and immediately adjacent to a geological feature, known as a ‘dyke’.

**Table 7-1 Maximum Predicted Subsidence Parameters**

| Longwall   | Maximum Predicted Vertical Subsidence (mm) | Maximum Predicted Tilt (mm/m) | Maximum Predicted Strain (mm/m) |
|------------|--------------------------------------------|-------------------------------|---------------------------------|
| LW 4 and 5 | 200                                        | 2                             | 1                               |
| LW 5       | 1150                                       | 17                            | -10 to +12                      |

Note: the subsidence predictions above have taken previous extraction into consideration

**Table 7-2** below provides a summary of the subsidence impacts when comparing the approved project to the proposed modifications and mitigation measures.

**Table 7-2 Subsidence Impact Comparison and Mitigation Measures**

| Approved Project (as per the Original EA)                                                                                                                                                                                                                                                                                                                                                             | Proposed Modification Additional Impacts and Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Predicted subsidence for the 309 Panel and V mains is similar in magnitude to that which has already developed in the immediately adjacent areas.</p> <p>Predicted strains are within the range +3 mm/m tensile to 6 mm/m compression. This is unlikely to be sufficient to result in tensile cracking of solid rock; however existing jointing may open slightly to relatively shallow depth.</p> | <p>Seedsman (2012) advises that the maximum anticipated vertical subsidence, specifically referring to LW 5 is 1.15 m, maximum tilt is 17 mm/m, and the strains are anticipated to be between 12 mm/m compression to 10 mm/m tension due to LW mining in LWs 4 and 5. Seedsman (2011) advises that the proposed pillar width to height ratio is 18.6 and that there is not Australian or International database evidence of pillar failure where the pillar width to height ratio is greater than 5.0. Accordingly Seedsman advises that the proposed chain pillars with a</p> |

There may be minor cracking and bump formation on the vehicle trail associated with the V mains.

width to height ratio of 18.6 will be long term stable and there will be no measureable subsidence developed above them as they are developed.

First workings for maingates 6, 7, and 8 are designed to leave the coal pillars intact, the roadways open and the overlying strata supported, as advised by Seedsman (2012), attached as **Appendix C**. This is likely to result in the vertical downward movement of the ground surface of less than 20 mm, which is defined by DRE as 'zero subsidence'.

knj Consultants (2012) prepared a risk assessment of Pillar Run in the Bulli Seam associated with the Wongawilli Seam LW 4 and LW 5 extraction. The potential consequence of a Pillar Run event is impact to a range of man-made and natural surface features. The risk assessment concluded that the risk assessment team did not believe that the nominated surface features would be exposed to the risk of impacts from subsidence from a Pillar Run event. For the remaining surface features, the likelihood was rare (Practically impossible, considering the present controls) given the nominated risk control measures.

#### ***Mitigation Measures –***

As per the Approved Project, including without limitation, updating relevant management and monitoring plans as an **Extraction Plan** and ongoing monitoring, with specific reference to the Plans of Management presented in **Appendix J**.

Noting that as a result of the knj (2012) risk assessment, the project application area was extended and NRE has committed to implementing monitoring and management measures to this Area of Management.



## Anticipated Distribution of Vertical Movements

RUSSELL VALE, NSW

### Legend

- Broad headed snake habitat
- Vertical Movements (m)
- Major Roads (LPI)
- Watercourses (LPI)
- Longwalls 4 and 5
- SMP Area
- Upland Swamps (Biosis Research 2012)

### Archaeological Sites (AHIMS)

- Axe Grinding Groove
- Axe Grinding Groove - AHIMS Location - Unrelocated
- Axe Grinding Groove - Monitoring Point
- Open Camp Site
- Shelter with Art

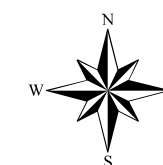


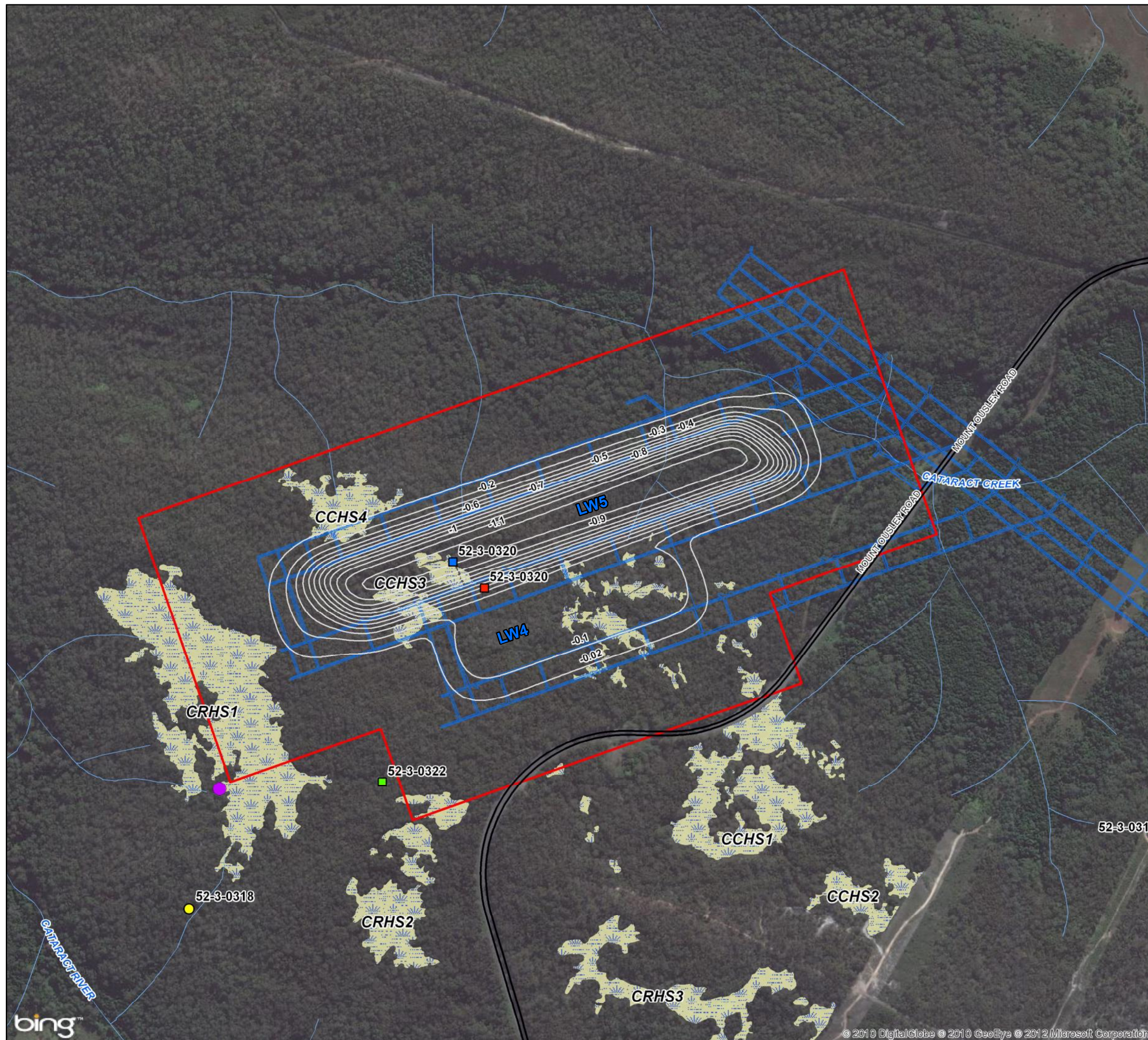
FIGURE 7

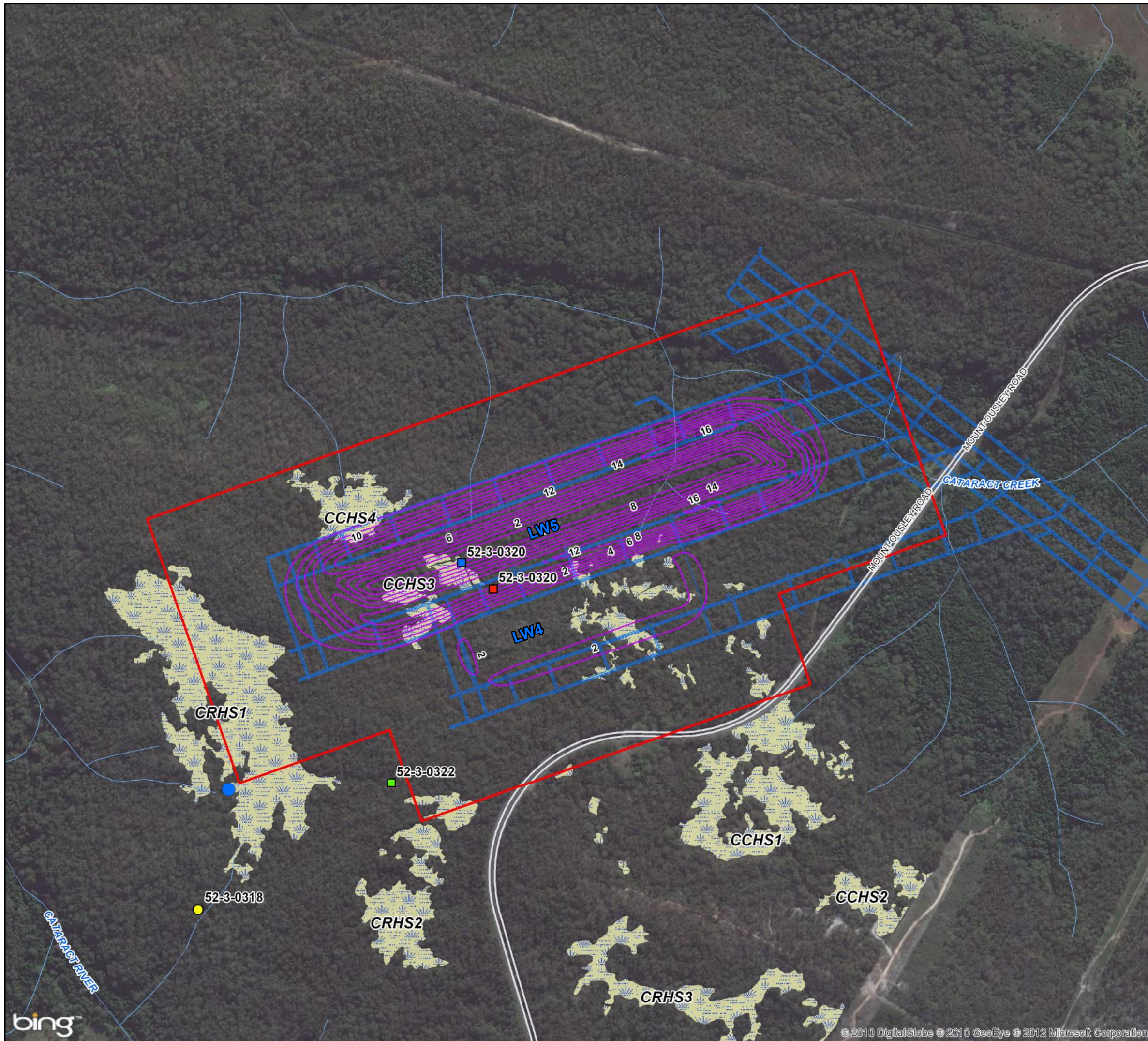
1:8,000 Scale at A3



Map Produced by Cardno NSW/ACT Pty Ltd (WOL)  
Date: 2012-08-08  
Coordinate System: GDA 1994 MGA Zone 56  
Project: 112069\_01  
Map: G1012\_VericalMovements.mxd 02

Aerial imagery supplied by Bing Maps and associated third party suppliers





## Anticipated Distribution of Tilt

RUSSELL VALE, NSW

### Legend

- Broad headed snake habitat
- Tilt (mm/m)
- Watercourses (LPI)
- Longwalls 4 and 5
- Major Roads (LPI)
- SMP Area
- Upland Swamps (Biosis Research 2012)

### Archaeological Sites (AHIMS)

- Axe Grinding Groove
- Axe Grinding Groove - AHIMS Location - Unrelocated
- Axe Grinding Groove - Monitoring Point
- ◆ Open Camp Site
- Shelter with Art

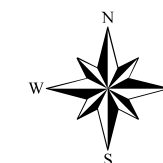
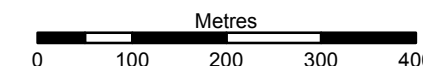


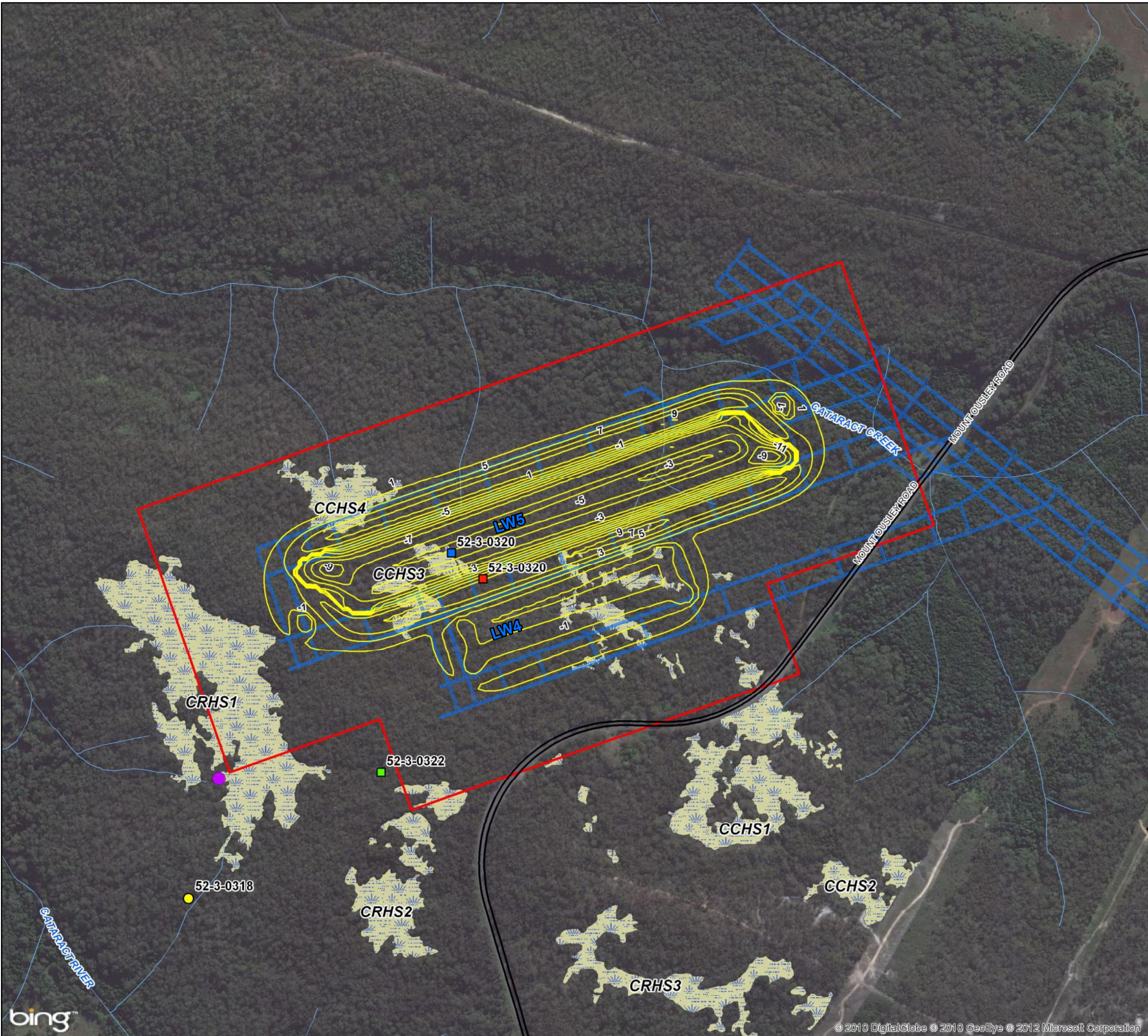
FIGURE 8

1:8,000 Scale at A3



Map Produced by Cardno NSW/ACT Pty Ltd (WOL)  
Date: 2012-08-08  
Coordinate System: GDA 1994 MGA Zone 56  
Project: 112069\_01  
Map: G1013\_Tilt.mxd 02

Aerial imagery supplied by Bing Maps and associated third party suppliers



Aerial imagery supplied by Bing Maps and associated third party suppliers

## 7.2 Flora and Fauna

The following flora and fauna assessments have been prepared for the broader project area and more recently the area above the LW4 and LW5 footprint:

- > ERM (2009) V Mains Terrestrial Flora and Fauna Assessment.
- > Cardno Ecology Lab (2009) NRE No.1 Mine V Mains Area – Effects of mine subsidence on Aquatic Habitats and Biota.
- > ERM (2012) NRE No.1 Colliery Proposed Wongawilli Seam LWs 4 and 5 - Ecological Assessment.
- > Biosis (2012) Vegetation Mapping.

ERM (2009) prepared a “V Mains Terrestrial Flora and Fauna Assessment”, which incorporated a literature review, desktop searches of the broader Russell Vale No.1 Colliery footprint and field survey within the “V Mains” footprint. ERM (2009) concluded that although a number of threatened flora and fauna species are likely or moderately likely to occur within the site, the current proposal (coal extraction within the V mains) was not expected to have significant impact on threatened species. As shown on **Figure 10**, potential habitat for the broad headed snake (*Hoplocephalus bungaroides*) listed as vulnerable under the EPBC Act was identified to the south of LWs 4 and 5.

The Cardno Ecology Lab (2009) aquatic ecology assessment found that water quality (in freshwater creeks) was generally in the acceptable range for potable water, with the exception of pH being slightly lower than the adopted assessment criteria. Filtered aluminium, copper, zinc, total nitrogen and total phosphorous concentrations occasionally exceeded the adopted 95% protection level for freshwater aquatic ecosystems.

The baseline aquatic ecology surveys showed that permanent aquatic habitats in the headwater swamp sections of the creeks support instream aquatic macrophytes. It was considered unlikely that the works would result in observable adverse effects on stream flow or water quality, hence observable flow-on effects to aquatic habitats or their biota within or immediately downstream of the Application Area were considered highly unlikely. Localised changes to stream gradient may occur due to increased tilt through subsidence. This may result in localised increased flow rates, migration of flow channels, bank and bed erosion plus a reduction in the volume and retention time in pools.

ERM (2012), attached as **Appendix H**, prepared an Ecology Assessment to assess the ecological impact of the proposed LW mining of panels four (LW 4) and five (LW 5) in the Wongawilli Seam at NRE No 1 Colliery. As such, this proposed project modification is consistent with that ecology assessment. This assessment built upon previous field surveys (ERM 2009) by undertaking targeted surveys in the following three upland swamps. Subsequent to this, Biosis (2012) have undertaken field surveys and continued monitoring to more accurately determine the extent of these swamps, as shown on **Figure 8** and **Figure 10**.

The additional swamp mapping and field surveys undertaken by Biosis (2012) included detailed ‘Lidar’ data to add further detailed understanding of the swamps. Lidar (Light Detection and Ranging) is an optical remote sensing technology that can measure the distance to, or other properties of a target by illuminating the target with light, often using pulses from a laser. Additionally, this detailed Lidar information may assist to inform NRE’s ongoing management and monitoring in accordance with an approved *Biodiversity Management Plan*.

The accurate and detailed swamp mapping is illustrated on **Figure 11** and the description of the swamps located within the vicinity of the proposed modification works is as follows:

- > **CRHS1** – a large headwater upland swamp, located in the headwaters of a tributary of Cataract River. CRHS1 is approximately 11.4 ha in size, containing the following sub-communities: Upland Swamps: Banksia Thicket, Upland Swamps: Sedge-land Heath Complex and Upland Swamps: Tea-Tree Thicket.
- > **CRHS2** - a small headwater upland swamp, located in the headwaters of a tributary of Cataract River. CRHS2 is approximately 1.9 ha in size, containing the sub-community - Upland Swamps: Sedge-land Heath Complex.
- > **CRHS3** - a small headwater upland swamp, located in the headwaters of a tributary of Cataract River. CRHS3 is approximately 2.1 ha in size, containing the sub-community - Upland Swamps: Sedge-land Heath Complex.

- > CCHS1 - a small headwater upland swamp, located in the headwaters of a tributary of Cataract River. CCHS1 is approximately 3.8 ha in size, containing the sub-community - Upland Swamps: Sedge-land Heath Complex.
- > CCHS2 - a small headwater upland swamp, located in the headwaters of a tributary of Cataract River. CCHS2 is approximately 0.7 ha in size, containing the sub-community - Upland Swamps: Sedge-land Heath Complex.
- > CCHS3 – a small headwater upland swamp, located in the headwaters of a tributary of Cataract Creek. CCHS3 is approximately 1.7 ha in size, containing the sub-communities - Upland Swamps: Banksia Thicket, Upland Swamps: Sedge-land Heath Complex and Upland Swamps: Tea-Tree Thicket.
- > CCHS4 – a small headwater upland swamp, located in the headwaters of a tributary of Cataract Creek. CCHS4 is approximately 1.8 ha in size, containing the following sub-communities - Upland Swamps: Banksia Thicket and Upland Swamps: Tea-Tree Thicket.

The upland swamps within the proposed modification works area (Sedge-land Heath Complex and Banksia Thicket) are representative of the recently determined final listing of Coastal Upland Swamps in the Sydney Basin Bioregion as an Endangered Ecological Community (EEC) under the TSC Act. Approximately 24ha of upland swamp have been identified in the Wonga East area, of which approximately 3.5ha sits above LW 5.

Vegetation mapping of the area (Biosis, 2012), indicates that the following vegetation communities are present (as shown on **Figure 12**):

- > Upland Swamps: Sedge-land Heath Complex.
- > Upland Swamps: Banksia Thicket.
- > Coachwood Warm Temperate Rainforest.
- > Sandstone Gully Peppermint Forest.
- > Exposed Sandstone Scribbly Gum Woodland.
- > Rock Plate Heath-Mallee.
- > Moist Blue Gum-Blackbutt Forest.
- > Tall Open Blackbutt Forest.
- > Weeds and Exotics.
- > Cleared.



## Fauna Species Plan

RUSSELL VALE, NSW

### Legend

-  Broad headed snake habitat
-  Longwalls 4 and 5
-  Major Roads (LPI)
-  Local Roads (LPI)
-  Watercourses (LPI)

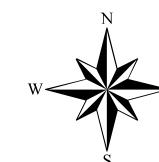
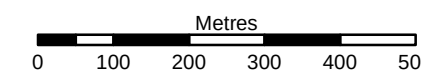


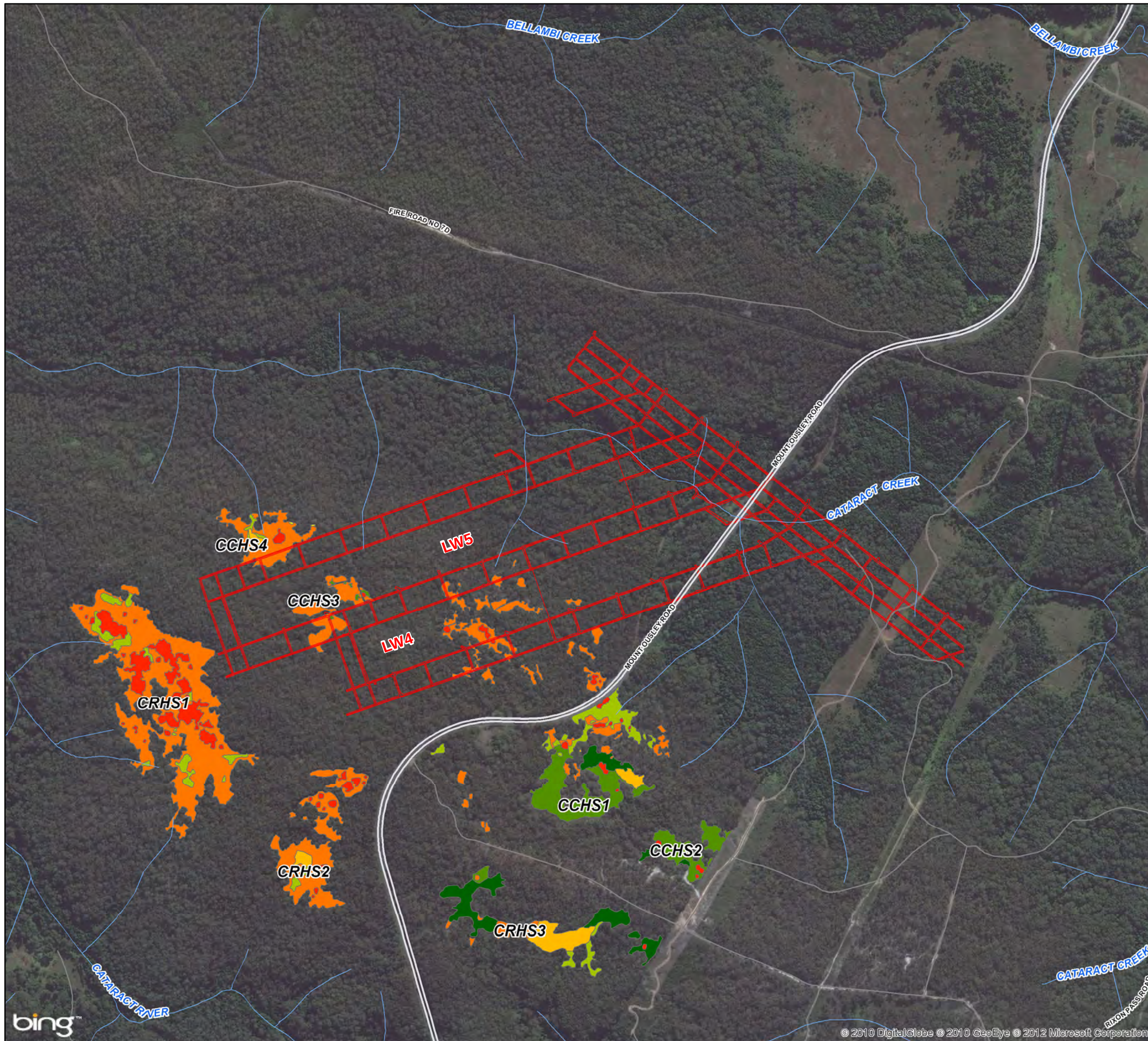
FIGURE 10

1:10,000 Scale at A3



Map Produced by Cardno NSW/ACT Pty Ltd (WOL)  
Date: 2012-07-24  
Coordinate System: GDA 1994 MGA Zone 56  
Project: 112069\_01  
Map: G1005\_FaunaPlan.mxd 02

Aerial imagery supplied by Near Map and associated third party suppliers  
(November 2011)



# Upland Swamps Plan

RUSSELL VALE, NSW

## Legend

- Longwalls 4 and 5
- Major Roads (LPI)
- Local Roads (LPI)
- Watercourses (LPI)

## Upland Swamps (Biosis Research 2012)

- Upland Swamps: Banksia Thicket
- Upland Swamps: Fringing Eucalypt Woodland
- Upland Swamps: Mallee-Heath
- Upland Swamps: Sedgeland-Heath Complex (Cyperoid Heath)
- Upland Swamps: Sedgeland-Heath Complex (Restioid Heath)
- Upland Swamps: Sedgeland-Heath Complex (Sedgeland)
- Upland Swamps: Tea-Tree Thicket

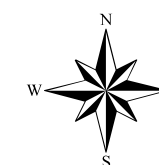
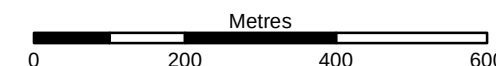


FIGURE 11

1:10,000 Scale at A3



Map Produced by Cardno NSW/ACT Pty Ltd (WOL)  
Date: 2012-07-30  
Coordinate System: GDA 1994 MGA Zone 56  
Project: 112069\_01  
Map: G1006\_UplandSwampsPlan.mxd 02

Aerial imagery supplied by Bing and associated third party suppliers



# Vegetation Communities

RUSSELL VALE NSW

## Legend

- Longwalls 4 and 5
- Watercourses (LPI)
- Major Roads (LPI)
- SMP Area
- Upland Swamps (Biosis Research 2012)

## Vegetation Communities (NPWS 2002)

- MU14 - Tall Open Peppermint-Blue Gum Forest
- MU15 - Tall Open Blackbutt Forest
- MU2 - Coachwood Warm Temperate Rainforest
- MU26 - Sandstone Gully Peppermint Forest
- MU29 - Exposed Sandstone Scribbly Gum Woodland
- MU32 - Escarpment Edge Silvertop Ash Forest
- MU39 - Rock Plate Heath-Mallee
- MU42 - Upland Swamps: Banksia Thicket
- MU44 - Upland Swamps: Sedgeland-Heath Complex
- MU45 - Upland Swamps: Fringing Eucalypt Woodland
- MU49 - Weeds and Exotics
- MU50 - Regenerating Vegetation
- MU53 - Cleared
- MU6 - Moist Blue Gum-Blackbutt Forest
- MU8 - Moist Gully Gum Forest

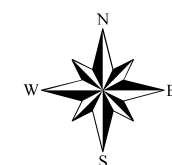
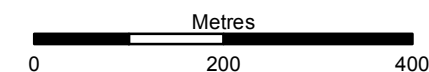
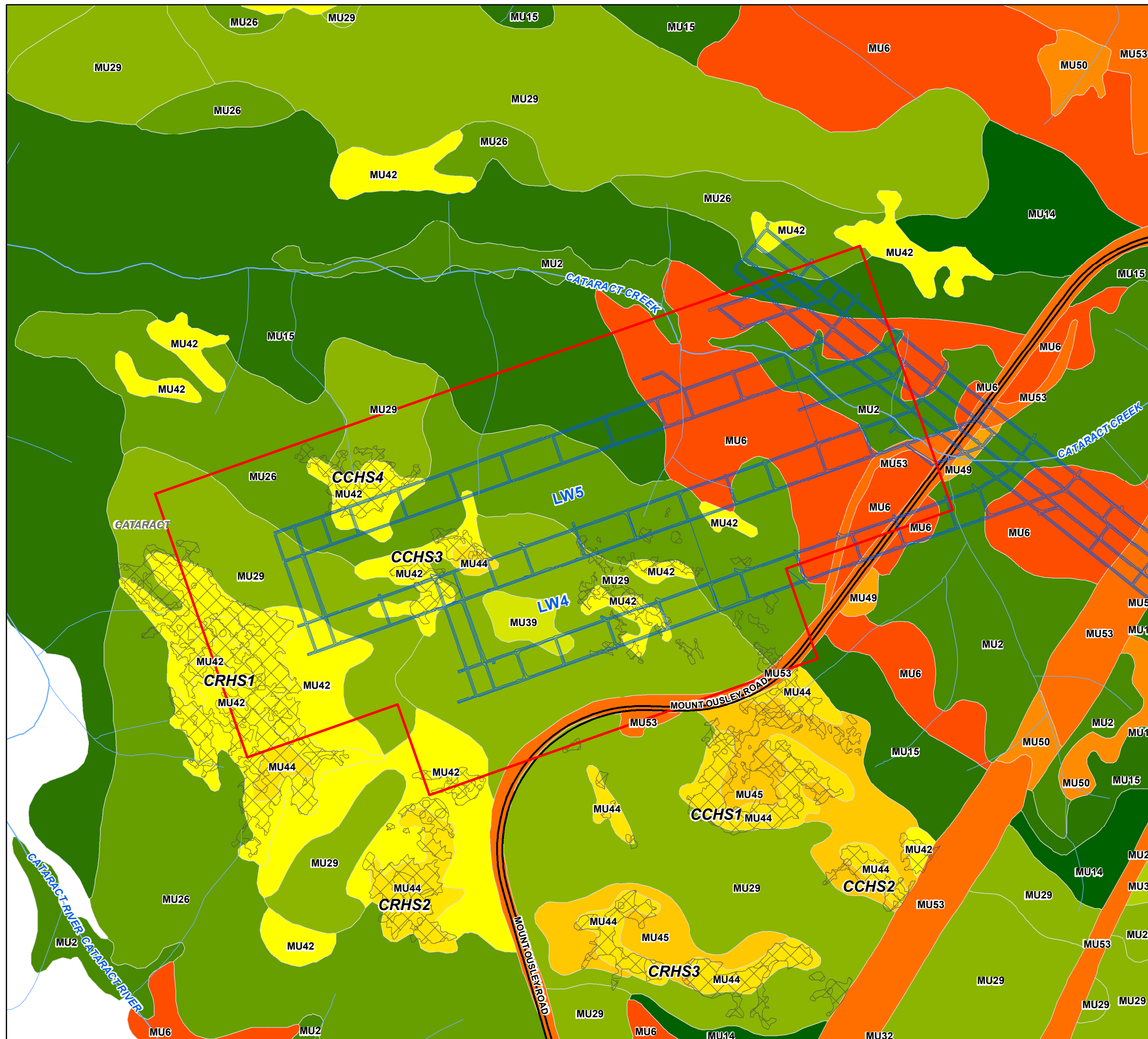


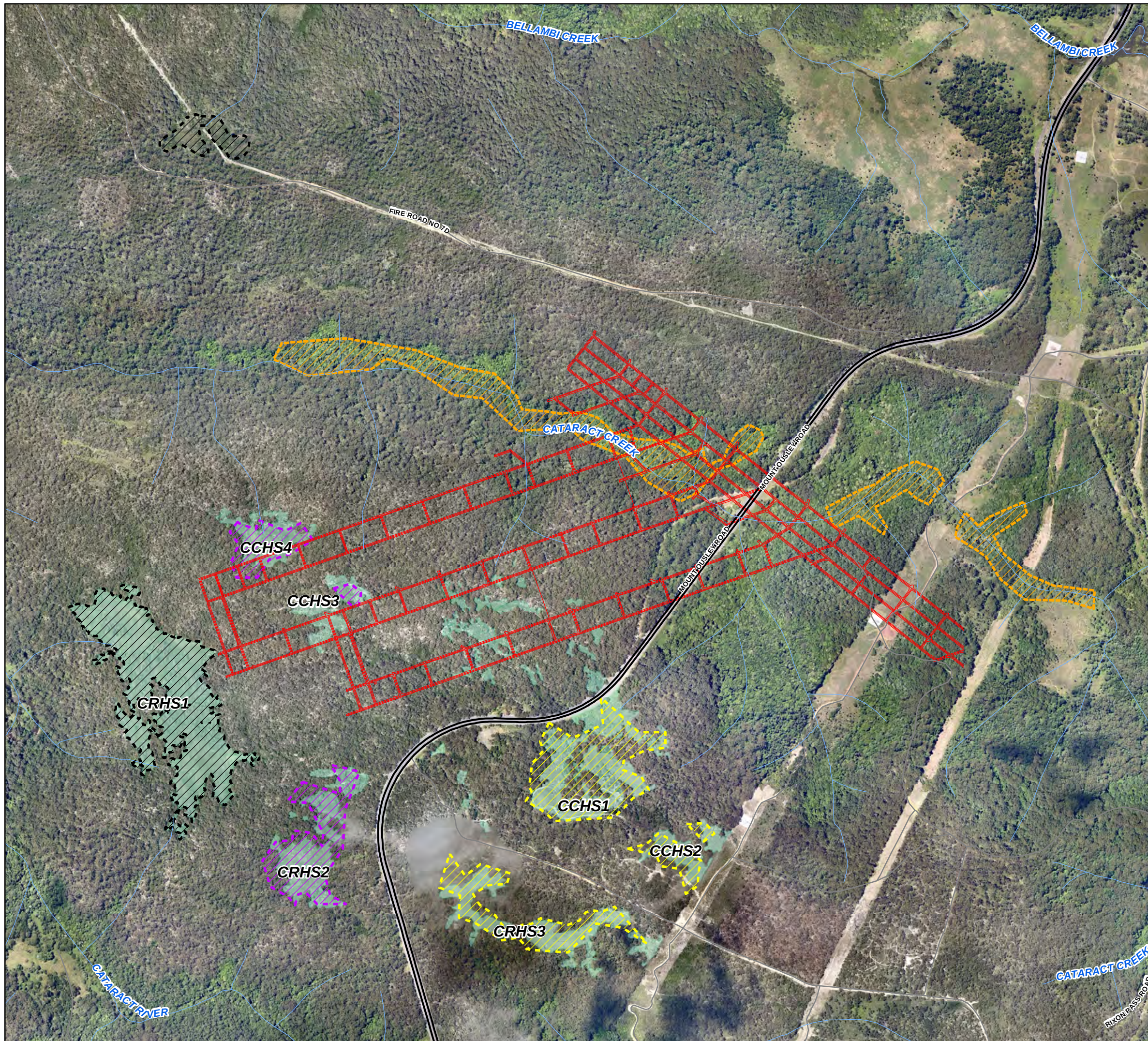
FIGURE 12

1:8,000 Scale at A3



Map Produced by Cardno NSW/ACT Pty Ltd (WOL)  
Date: 2012-08-02  
Coordinate System: GDA 1994 MGA Zone 56  
Project: 112069\_01  
Map: G1011\_VegetationCommunities.mxd 01





## Frog Habitat Plan

RUSSELL VALE, NSW

### Legend

- Longwalls 4 and 5
- Major Roads (LPI)
- Local Roads (LPI)
- Watercourses (LPI)
- Upland Swamps (Biosis Research 2012)
- Potential Stuttering Barred Frog Habitat
- Potential Burrowing Frog Habitat
- Potential Burrowing Frog & Heath Frog Habitat
- Potential Frog Habitat (Burrowing Frog, Heath Frog and Red Crowned Toadlet)

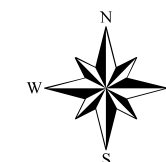
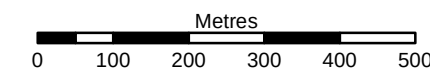


FIGURE 13

1:10,000 Scale at A3



Map Produced by Cardno NSW/ACT Pty Ltd (WOL)  
Date: 2012-08-02  
Coordinate System: GDA 1994 MGA Zone 56  
Project: 112069\_01  
Map: G1007\_FrogHabitatPlan.mxd 02

Aerial imagery supplied by Near Map and associated third party suppliers  
(November 2011)

Threatened flora species listed under the *TSC Act* or *EPBC Act* were not recorded within the proposed modification works footprint during the ERM 2012 survey, with the exception of individuals of the Prickly Bush-pea shrub (*Pultenaea aristata*) listed as vulnerable under the TSC Act identified in the upland swamps CRHS1 and CCHS3. ERM (2012) identified that potential habitat for ten (10) threatened flora species exists within the proposed modification works area.

Five (5) threatened fauna species (Glossy Black-cockatoo *Calyptorhynchus lathamii*; Eastern Freetail-bat *Mormopterus norfolkensis*; Eastern Bentwing-bat *Miniopterus schreibersii oceanensis*; Eastern False Pipistrelle *Falsistrellus tasmaniensis*; and Macquarie Perch *Macquaria australasica*) have been recorded within the general Wonga East domain, however not within the proposed modification works footprint. ERM (2012) identified that there is potential habitat for 24 threatened flora species within the proposed modification works area. These threatened species included the Giant Burrowing Frog (*Heleioporus australiacus*), Heath Frog (*Litoria littlejohni*) or otherwise known as Littlejohn's Tree Frog, Red-crowned Toadlet (*Pseudophryne australis*) and Stuttering Barred Frog (*Mixophyes balbus*). Refer to **Figure 13** for the extent of frog habitats. Cardno notes that the proposed modifications are unlikely to effect the conditions of EPBC Approval (2011/5891), which stipulates that impacts to "Dam 6" and subsequently the Green and Golden Bell Frog (*Litoria aurea*) are to be avoided.

The Wonga East mining domain occurs within the Cataract Creek and Cataract River catchments that drain into Cataract Dam. The Southern Coalfields Inquiry (SCI) [DoP 2008] identifies these areas as high priority for protection. ERM (2012) and the subsequent detailed swamp survey (Biosis, 2012) advises upland swamp CRHS1, CCHS3 and CCHS4 have *special significance status* which is consistent with the final DECCW (2011) guidelines for determination of the significance of upland swamps.

The DECCW (2011) defines criteria for establishing whether Upland Swamps are of *special significance*, and thus whether additional assessment and performance criteria are required. An assessment of the criteria outlined in DECCW (2011) is provided in **Table 7-3**.

CRHS2, CRHS3, CCHS1, CCHS2 and CCHS4 are mapped as providing potential habitat for the Giant Burrowing Frog and Heath Frog. If these species are recorded within these swamps during ecological monitoring or additional assessments, then these swamps would be considered to be of special significance on the basis of meeting statutory thresholds.

Three areas mapped by NPWS (2003) as Upland Swamps: Banksia Thicket includes areas of vegetation dominated by *Banksia ericifolia* grading into Sandstone Scribbly Gum Woodland. However, the subsurface characteristics of these areas were assessed as not being consistent with Upland Swamps, including no humus layer, free moisture and very shallow sandstone (ERM 2012). For these reasons these areas are not considered to represent Upland Swamps (ERM 2012).

**Table 7-3 Upland Swamps Significant Assessment**

| Name and Size (>7.6 ha)    | Statutory Thresholds                                                     | Complexity                                                           | Contiguity                                                                                                                                                                                                                                                                                                                | Cultural Importance                                                                                                                                                     | Scientific Research Importance                                                                                             | Overall Assessment – Special Significance (excl. statutory thresholds) |
|----------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| CRHS1<br>Yes.<br>(11.4 ha) | State significance.<br>Coastal Upland Swamp is listed under the TSC Act. | Yes.<br>Supports three upland swamp sub-communities, including MU44. | Yes.<br><br>All swamps within the Wonga East domain form part of a medium sized swamp cluster occurring between Cataract Creek in the north and Cataract River to the south.<br><br>Contiguity is not used to determine special significance, but is important in assessing importance at a landscape level (DECCW 2011). | Yes.<br><br>Aboriginal site 52-3-0322 is located on the eastern margin of CRHS1.                                                                                        | No.<br><br><br><br><br><br>None of the swamps with the Wonga East domain are considered of scientific research importance. | Yes.<br><br>Size, complexity, cultural importance.                     |
| CRHS2<br>No.<br>(1.9 ha)   | State significance.<br>Coastal Upland Swamp is listed under the TSC Act. | No.<br>Supports Sedge-land Heath Complex.                            |                                                                                                                                                                                                                                                                                                                           | No.                                                                                                                                                                     |                                                                                                                            | No.                                                                    |
| CRHS3<br>No.<br>(2.1 ha)   | State significance.<br>Coastal Upland Swamp is listed under the TSC Act. | No.<br>Supports Sedge-land Heath Complex.                            |                                                                                                                                                                                                                                                                                                                           | No.                                                                                                                                                                     |                                                                                                                            | No.                                                                    |
| CCHS1<br>No.<br>(3.8 ha)   | State significance.<br>Coastal Upland Swamp is listed under the TSC Act. | No.<br>Supports Sedge-land Heath Complex.                            |                                                                                                                                                                                                                                                                                                                           | No.                                                                                                                                                                     |                                                                                                                            | No.                                                                    |
| CCHS2<br>No.<br>(0.7 ha)   | State significance.<br>Coastal Upland Swamp is listed under the TSC Act. | No.<br>Supports Sedge-land Heath Complex.                            |                                                                                                                                                                                                                                                                                                                           | No.                                                                                                                                                                     |                                                                                                                            | No.                                                                    |
| CCHS3<br>No.<br>(1.7 ha)   | State significance.<br>Coastal Upland Swamp is listed under the TSC Act. | Yes.<br>Supports three upland swamp sub-communities, including MU44. |                                                                                                                                                                                                                                                                                                                           | Yes.<br><br>Aboriginal site 52-3-0320 is mapped as occurring on the eastern margin of CCHS3. However, extensive surveys by ERM and Biosis failed to relocate this site. |                                                                                                                            | Yes.<br><br>Complexity and cultural importance.                        |
| CCHS4<br>No.<br>(1.8 ha)   | State significance.<br>Coastal Upland Swamp is listed under the TSC Act. | Yes.<br>Supports two upland swamp sub-communities, including MU42.   |                                                                                                                                                                                                                                                                                                                           | No.                                                                                                                                                                     |                                                                                                                            | Yes.<br><br>Complexity.                                                |

**Table 7-4** below provides a summary of the impacts to flora and fauna when comparing the approved project to the proposed modifications and mitigation measures.

**Table 7-4 Flora and Fauna Impact Comparison and Mitigation Measures**

| Approved Project (as per the Original EA)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Proposed Modification Additional Impacts and Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Threatened flora and fauna species are likely or moderately likely to occur within the site, however the proposed works were not expected to have significant impact on threatened species.</p> <p>Observable adverse effects on stream flow or water quality and flow-on effects to aquatic habitats or their biota within or immediately downstream of the Application Area were considered highly unlikely. However possible localised changes to stream gradient may occur due to increased tilt through subsidence. This may result in localised increased flow rates, migration of flow channels, bank and bed erosion plus a reduction in the volume and retention time in pools.</p> | <p>No clearance of surface vegetation including fauna habitat is required. <i>'Alteration of habitat following subsidence due to LW mining'</i> is listed as a key threatening process (KTP) under Schedule 3 of the TSC Act. Predicted subsidence impacts (Seedsman, 2012) are likely to be less significant on terrestrial ecosystems in comparison to aquatic or aquatic dependent ecosystems.</p> <p>Accordingly upland swamp CCHS3 and the first order stream above LW 5 are more susceptible to change. Geoterra (2012) predicted that the maximum predicted change in grade due to subsidence in upland swamps over LW4 and LW5 is less than the swamp gradient and as a result subsidence induced erosion is not anticipated, nor is the subsidence likely to generate any significant change in the potential for ponding, scouring or erosion in the swamps.</p> <p>Due to the proximity of LW 5 to Cataract Creek, ferruginous seep may develop in the creek after subsidence (Geoterra, 2012). Monitoring of these sites to date has indicated that the release of iron flocculent into streams does not impact on the life cycle of monitored frog species. For these reasons impacts to aquatic biota or their habitats, including the Stuttering Barred Frog and Red-crowned Toadlet are considered unlikely.</p> <p>If these subsidence effects result in changes to groundwater and drying of soils they may result in the loss of wetter sub-communities (Tea-tree Thicket) and contraction of Upland Swamps along with resultant encroachment of surrounding woodland communities).</p> <p><b>Mitigation Measures –</b></p> <p>Mitigation measures provided with this Project approval will apply and be implemented, including without limitation, undertaking and/or implementing the necessary monitoring in accordance with an approved <b>LW 4 and 5 Biodiversity Management Plan</b> (see <b>Appendix J</b>).</p> <p>The proposed modification has reduced the length of LWs 4 and 5 to minimise the risk of potential adverse effects on upland swamp CRHS1.</p> |

### 7.3 Cultural Heritage

ERM (2010) prepared an Aboriginal Heritage Assessment for NRE's Expansion Project (MP09\_0013) and as such, this proposed project modification is consistent with that heritage assessment. This assessment included desktop review, field survey (targeting drainage lines and previously identified sites) and consultation with local aboriginal stakeholders. ERM (2009) undertook a search of the Aboriginal Heritage Information Management System (AHIMS) which identified 254 recorded within the 12 km by 12 km search footprint.

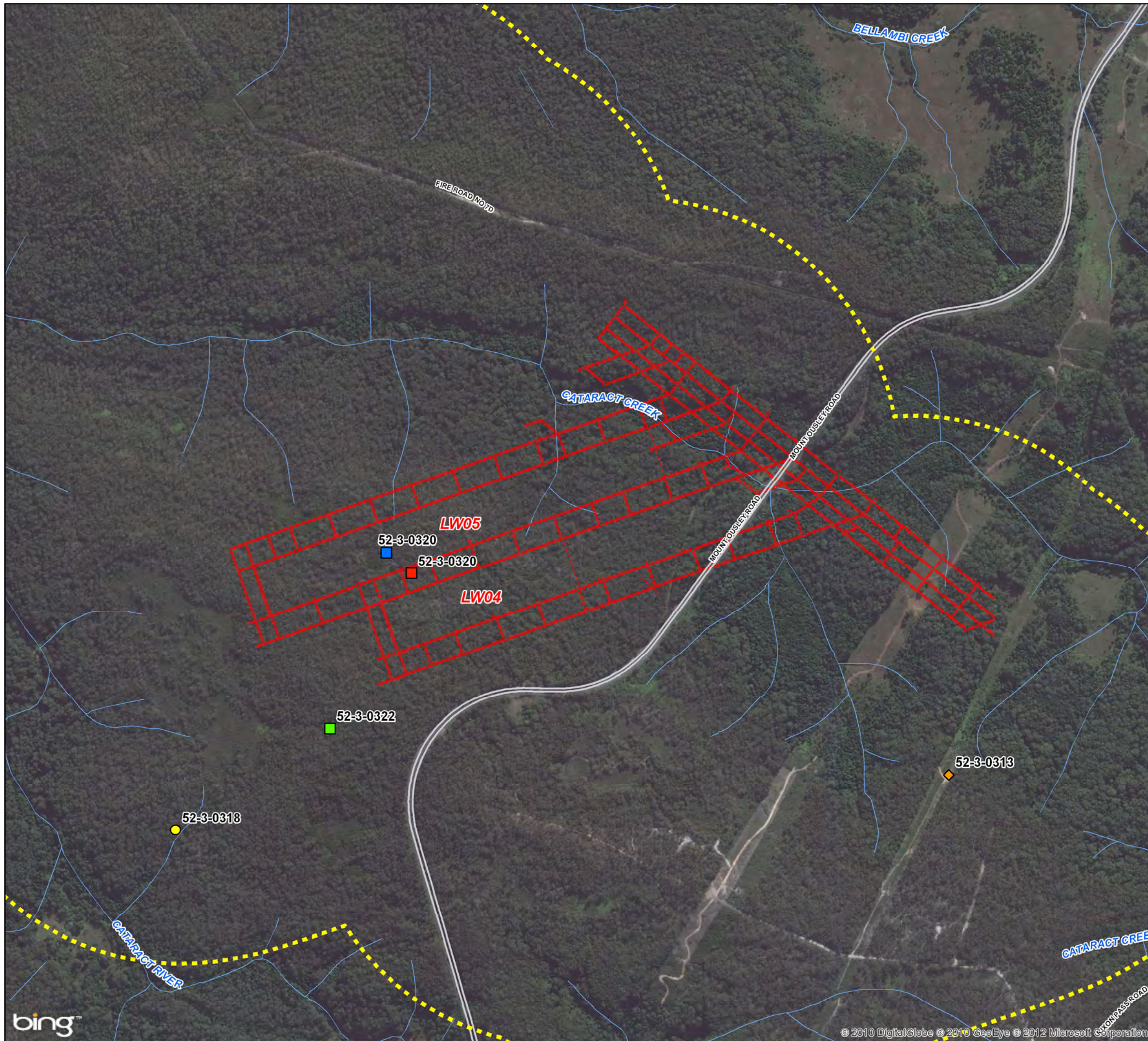
The following eight sites are within close proximity to the proposed modification works:

- > 52-3-0311 (Shelter with deposit).
- > 52-3-0312 (Shelter with deposit).
- > 52-3-0314 (Shelter with art).
- > 52-3-0319 (Shelter with deposit).
- > 52-3-0318 (Shelter with art).
- > 52-3-0320 (Axe grinding groove).
- > 52-3-0322 (Axe grinding groove).
- > 52-3-0325 (Shelter with art).

ERM (2010) identified that the one known aboriginal site (52-3-0320 Bulli Mine Shaft 25, axe grinding groove) located above LWs 4 and 5, had the potential to be impacted by subsidence. Biosis (2012) have undertaken ground truthing and mapping to specifically locate those sites identified and the sites located within the near vicinity of LWs 4 and 5 are shown on **Figure 14**. This axe grinding groove site was recorded in 1985 by the Illawarra Prehistory Group. The site consists of a 22 m by 2.5 m sandstone platform. One axe grinding groove is located in a water seepage area on the edge of the sandstone platform.

To date, 14 axe grinding grooves and engravings on sandstone rock platforms/outcrops have been monitored for changes in site conditions as a result of mine related subsidence effects. Changes in site conditions have been recorded at one site, 52-2-0258 Flat Rock Creek 57, an axe grinding groove and engraving site at the Metropolitan Colliery (Sefton 2003). A 25 m crack running east to west was observed on the northwest section of the rock outcrop on which the site was located, however no impacts were observed to either the axe grinding grooves or the engraving.

ERM (2010) prepared a Historic Heritage Assessment for NRE's Expansion Project (MP09\_0013) over a broader Project Application Area, which identified a number of heritage listed items within the search area. As such, this proposed project modification is consistent with that historic heritage assessment. Although not directly within the proposed modification works footprint, the following two identified historic heritage items are located in close proximity to proposed modification works – i) South Bulli Colliery; and ii) Cataract Reservoir. Based on the ERM (2009) report, the nature of the proposed modification works are unlikely to impact on known historic heritage items.



# Heritage Plan

RUSSELL VALE, NSW

## Legend

- Major Roads (LPI)
- Watercourses (LPI)
- Longwalls 4 and 5
- Heritage Study Area Boundary
- Archaeological Sites (AHIMS)**
  - Axe Grinding Groove
  - Axe Grinding Groove - AHIMS Location - Unrelocated
  - Axe Grinding Groove - Monitoring Point
  - Open Camp Site
  - Shelter with Art

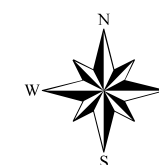
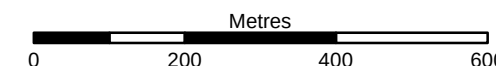


FIGURE 14

1:10,000 Scale at A3



Map Produced by Cardno NSW/ACT Pty Ltd (WOL)  
Date: 2012-07-26  
Coordinate System: GDA 1994 MGA Zone 56  
Project: 112069\_01  
Map: G1008\_HeritagePlan.mxd 01

Aerial imagery supplied by Bing Maps and associated third party suppliers

**Table 7-5** below provides a summary of the impacts to Heritage when comparing the approved project to the proposed modifications and mitigation measures.

**Table 7-5 Heritage Impact Comparison and Mitigation Measures**

| Approved Project (as per the Original EA)                                                                                                                              | Proposed Modification Additional Impacts and Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A number of Aboriginal cultural heritage and historic heritage items are located within the Project Application Area. Significant impacts to these items are unlikely. | <p>Changes to site conditions of axe grinding grooves and engraving sites due to subsidence effects could include cracking of sandstone platforms, tree fall and change in drainage patterns. Subsidence monitoring to date indicates that changes in site conditions from subsidence effects are at most only likely to result in partial loss of cultural heritage values. The risk of impact to 52-3-0320 Bulli Mine Shaft Site 25 is considered low, as the maximum predicted systematic tensile strains are low.</p> <p><b>Mitigation Measures –</b></p> <p>Mitigation measures provided with this Project approval will apply and be implemented, including without limitation, undertaking and/or implementing the necessary monitoring in accordance with an approved <b>LW 4 and 5 Heritage Management Plan</b> (see <b>Appendix J</b>).</p> |

## 7.4 Noise

ERM (2009) prepared a noise assessment for the project, which identified the following four key elements for consideration in the assessment:

- > pit top / operational noise;
- > noise associated with coal haulage;
- > vibration; and
- > construction.

The nearest sensitive receivers, classified as suburban in the DECCW (now OEH) Industrial Noise Policy, are located in Broker and West Streets, Russell Vale and Midgley, Lyndon and Taylor Streets Corrimal. ERM (2009) undertook noise logging to establish background levels, within the acoustic environment classified as *suburban* by the NSW INP. Accordingly adopted assessment criteria at potentially affected receivers are based on a suburban setting. Vehicle movements on existing roadways including Bellambi Lane are considered to be a dominant existing background noise source.

**Table 7.6** below provides a summary of the noise impacts when comparing the approved project to the proposed modifications and mitigation measures.

**Table 7-6 Noise Impact Comparison and Mitigation Measures**

| Approved Project (as per the Original EA)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Proposed Modification<br>Additional Impacts and Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Noise would be generated through the use of dozers, excavators, surface conveyors, truck loaders and stockpile loaders.</p> <p>Construction activities would generally be undertaken between the hours of 7am and 6 pm, Monday to Friday; 8am and 1pm, Saturdays and at no time on Sundays or Public Holidays.</p> <p>Proposed mitigation measures involved the:</p> <ul style="list-style-type: none"> <li>&gt; Decommissioning of the Bulli decline conveyor.</li> <li>&gt; Implementation of a noise monitoring program.</li> </ul> | <p>The proposed modification works include the generation of noise through LW mining activities. The location of the proposed LW mining is underground and approximately 3 km from sensitive receivers. The production volumes and associated transportation activities are as per the approved project. Hence the proposed modification works are unlikely to result in noise impacts beyond those previously assessed.</p> <p><b>Mitigation Measures –</b></p> <p>Mitigation measures specified in the Approved Project (MP10_0046) will continue to apply and be implemented, including orientation of equipment away from sensitive receivers undertaking specified activities within the approved times and implementing the noise monitoring equipment and programs in accordance with NRE's approved <b>Noise Management Plan</b>.</p> |

## 7.5 Air Quality

ERM (2009) prepared an Air Quality Assessment drawing on monitoring data collected that at the closest monitoring point in Wollongong approximately 6km to the south of the site. Modelling results indicated that long term air quality criteria at sensitive receivers would be met for PM<sub>10</sub>, TSP and dust. The maximum 24hr average PM<sub>10</sub> would be exceeded on occasions at one receiver, however the exceedances were within the allowable five day exceedance limit. ERM concluded that exceedances were unlikely to be solely attributable to the NRE operations, rather a combination of windblown salt and other operations in the area. ERM considered the coal stockpiling area and associated activities to represent the greatest potential source of dust emissions onsite.

Greenhouse gas emissions from the Project are comprised of 'direct' and 'indirect' emissions. ERM (2012) estimated that direct greenhouse gas emissions from sources including within the project boundary such as gas venting during extraction, gas venting post extraction and onsite equipment emissions, would be approximately 815,123 t CO<sub>2</sub>-e / annum. While indirect emissions including the consumption of purchased electricity, steam or heat produced by another facility, transport and usage for power generation or steel making would be approximately 2,556,592 t CO<sub>2</sub>-e / annum.

**Table 7-7** below provides a summary of air quality and greenhouse gas impacts when comparing the approved project to the proposed modifications and mitigation measures.

**Table 7-7 Air Quality Impact Comparison and Mitigation measures**

| Approved Project (as per the Original EA)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Proposed Modification<br>Additional Impacts and Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Generation of dust and particulate emissions during construction internal access roads, coal stockpiling, channel works and decline conveyor construction.</p> <p>Odour levels, PM<sub>10</sub>, TSP and dust concentrations predicted at nearby sensitive receivers were modelled to meet the long term air quality criteria.</p> <p>Direct greenhouse gas emissions were estimated at 815,123 t CO<sub>2</sub>e / annum, while indirect greenhouse gas emissions were estimated at 2,556,592 t CO<sub>2</sub>e / annum.</p> | <p>The proposed modification works are underground, with the volume of coal production and transportation per annum as per the approved project. Hence air quality impacts per annum are as per the approved project.</p> <p><b>Mitigation Measures –</b></p> <p>Mitigation measures specified in the Approved Project will continue to apply and be implemented, including undertaking specified activities in accordance with approved operating hours and implementing the air quality monitoring equipment and program in accordance with NRE's approved <b>Air Quality and Greenhouse Gas Management Plan</b>.</p> |

## 7.6 Groundwater

Geoterra prepared a Groundwater Assessment for the broader NRE No.1 Colliery mining area including Wonga East as part of MP09\_0013. As such, this proposed project modification is consistent with that groundwater assessment. Geoterra (2012) also prepared an assessment, attached as **Appendix I**, which more specifically addresses the effects on swamp CRHS1.

Groundwater is encountered in four primary systems as follows:

- > **Unconsolidated, perched ephemeral colluvial aquifers within upland swamps.** Rainfall produces a highly variable perched water table within the swamps and outcropping sandstone, which is independent of the water table within the Hawkesbury Sandstone. Upland swamps CRHS1, CCHS3 and CCHS4 are considered to be groundwater dependent ecosystems located within the proposed modification area.
- > **Perched ephemeral aquifers within the dual porosity Hawkesbury Sandstone,** generally within 20 m of the ground surface.
- > **Deeper basement Hawkesbury Sandstone,** which is hydraulically separated from the perched groundwater. This aquifer system defines the regional water table.
- > **A deep groundwater system below the low permeability Bald Hill Claystone,** which provides a degree of isolation between the Hawkesbury Sandstone and the underlying Bulgo Sandstone and deeper formations in a variable sequence of aquicludes and aquitards of mudstones, shales along with low yielding aquifers in sandstones and coal seams. The Bald Hill Claystone has been eroded away in the valley of Cataract Creek at the eastern end of LW 5, whilst it is present over LW 4, as well as the central and western ends of LW 5

Due to the steep topography and limited alluvium within the Cataract Reservoir Storage, there is little groundwater bearing stream based alluvium within the study area.

Recharge to the groundwater system is from rainfall and lateral groundwater flow. Although groundwater levels are sustained by rainfall infiltration, they are also controlled by ground surface topography and stream flows. A local groundwater mound develops beneath sandstone hills with eventual discharge into incised creeks and water bodies.

Monitoring of perched groundwater within valley fill and upland in the broader study area, has been shown to fluctuate between no standing water after extended dry periods to approximately 1.8 m below ground surface.

Simulated groundwater inflow to Wonga East Areas 1 and 2, which contain LWs 4 and 5, is predicted to rise from the current 0.2 ML/day to 1.4 ML/day, whilst groundwater levels in the upper Hawkesbury Sandstone

are predicted to depressurise by less than 5 m. Flow in Cataract Creek is predicted to decline by approximately 0.07 ML/day once all LWs in Wonga East, Area 2 are completed (Golder Associates, 2011).

Modelling has indicated that at Wonga East, the Bulgo Sandstone has been previously subsided and fractured due to existing workings and that the proposed workings may be depressurised by 10 – 20 m near-surface.

**Table 7-8** below provides a summary of groundwater impacts when comparing the approved project to the proposed modifications and mitigation measures.

**Table 7-8 Groundwater Impact Comparison and Mitigation Measures**

| Approved Project (as per the Original EA)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Proposed Modification Additional Impacts and Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Hydraulic connection of surface water, perched groundwater or regional aquifers within the Hawkesbury sandstone through the Bald Hill claystone into the mine workings (V mains and Panel 309) or underlying aquifers will not occur.</p> <p>Mining induced cracking and vertical subsidence of strata overlying the extraction area can occur up to 20 m below the surface. This can alter the horizontal and vertical flows; however no adverse interconnection of regional aquifers and aquitards is likely within 20 m of the plateau surface. The rate of recharge may increase in the shallow perched aquifer systems.</p> <p>Negligible changes in water levels within the valley fill swamps.</p> <p>Temporary lowering of the piezometric surface, by up to 15 m over the V mains and Panel 309 subsidence area. The effects will dissipate out laterally from the area of greatest subsidence.</p> <p>No significant change to the net groundwater inflow or outflow to or from surface water.</p> <p>Possible iron hydroxide precipitation, lowering of groundwater pH and subtle changes to dissolved metal concentrations.</p> | <p>Geoterra (2012) indicates that modelled subsidence induced cracking could potentially affect stream flow in the reaches overlying and downstream of the proposed workings, although the anticipated stream flow losses would have little impact on the Cataract Reservoir water storage volume. In addition, the impacts would be restricted to short reaches where flow infiltrates into cracks in the bed, then reemerges further downstream. Based on the available subsidence assessments, it is not possible to exactly define the potential magnitude of these losses or the lengths of streams likely to be impacted.</p> <p>The maximum change in grade due to subsidence is less than 0.02, which is substantially less than the minimum swamp gradient of 0.09. As a result, subsidence induced erosion is not anticipated to occur, nor generate any significant change in the potential for ponding, scouring, or erosion in the swamps.</p> <p>Based on the maximum predicted tensile and compressive strains, there is a potential for cracking to develop in the base of the swamps where they are directly undermined. Subsidence cracking may cause some diversion of overland flow into the underlying dilated strata, which, in turn, may lead to limited shallow perched water table depressurisation and possible reduction in overland flow. It is anticipated that any diverted surface water flow or shallow groundwater transfer will re-emerge further down gradient, albeit it with a delay, into the receiving stream catchment.</p> <p>The shallow standing water table reduction and / or surface flow diversion due to increased secondary porosity in the Hawkesbury Sandstone may extend up to approximately 15 m below surface.</p> <p>Surface cracking resulting from mine subsidence within the perched Hawkesbury Sandstone groundwater system may occur, however it is not expected to result in an observable increase in transfer of surface water to the underlying regional aquifer over the proposed panels</p> <p>The Hawkesbury Sandstone has been affected by previous subsidence over the Bulli and Balgownie</p> |

| Approved Project (as per the Original EA) | Proposed Modification Additional Impacts and Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                           | <p>workings, however, Cataract Creek has been observed to contain continuous baseflow since monitoring began in July 2008.</p> <p>At the substantial depths of cover over LWs 4 and 5 (267 m – 288 m), connective cracking from the mined seam to the surface is not anticipated.</p> <p>The depressurisation effect for the deep groundwater system is not anticipated to propagate up through to the Hawkesbury Sandstone, where the Bald Hill Claystone is present and maintains its low permeability. However up to 5m of depressurisation in the Hawkesbury Sandstone is predicted, which may generate up to 0.07 ML/day reduction in flow to Cataract Creek, once all of the proposed panels in Wonga East are mined.</p> <p><b>Mitigation Measures -</b></p> <p>Mitigation measures provided with this Project approval will apply and be implemented, including without limitation, quantitative and qualitative monitoring of shallow and deep groundwater before, during and after the extraction of LWs 4 and 5, undertaking and/or implementing the necessary additional monitoring that may be required in accordance with an approved <b>LW 4 and 5 Water Management Plan</b> (see <b>Appendix J</b>).</p> |

## 7.7 Surface Water, Topography and Soils

The existing topography is undulating rising to the Illawarra Escarpment to the west. Soils are generally comprised of talus, colluvium and residual soils; however some filling occurred as part of development within the broader area.

LW 5 is located approximately 30 m west of the mid channel of Cataract Creek, which flows into Cataract Reservoir. The main channel and tributaries have been undermined by LWs in the Balgownie Seam as well as bord and pillar and pillar extraction in the overlying Bulli Seam. The main channel of Cataract Creek has eroded sequentially into the Newport and Garie Formations, Bald Hill Claystone and upper Bulgo Sandstone, although it does not have steep to vertical incised sandstone valley sides due to the absence of the Hawkesbury Sandstone in the upper to mid sections of the creek. The creek is not regulated by any dams or weirs and is relatively steep particularly in its headwaters, flattening out downstream through short pools, sandy reaches, rock bars and boulder fields. No waterfalls or highly stepped zones are present, with the creek banks well vegetated with grasses, shrubs and trees.

Of the seven swamps identified and assessed in **Section 7.2** and **Table 7-3** (above), located in close proximity to the proposed modification works, the following three upland swamps have been classed as having 'special significance' and have the following characteristics:

- > **CRHS1**, the larger swamp of the three, is located in the headwaters of the Cataract River catchment, drains in a westerly direction towards the Cataract River at an average grade of 0.112. Soils in CRHS1 are described as shallow, moist, humic sandy / clay.
- > **CCHS3** is a small swamp, draining at an average grade of 0.09 to the north, within the south-western headwaters of Cataract Creek. Soils in CCHS3 are described as shallow, generally dry humic material.

- > **CCHS4** is a small swamp / banksia thicket, draining at an average grade of 0.07 to the north, within the south-western headwaters of Cataract Creek. Soils in CCHS4 are described as shallow, generally dry humic material.

In addition to the natural surface water features, ERM (2010) identify the following three categories of water currently being managed at the site:

- > Potable Water – supplied by connection to the Sydney Water reticulation system and is generally not used for mining operations.
- > Mine Water –dewatered from mine workings and reused onsite. Excess mine water is collected with stormwater and processed through the existing water treatment system, before reuse onsite or discharge to Bellambi Gully Creek in accordance with the EPL.
- > Stormwater – clean water diversions are in place at the site, while ‘dirty’ water is captured, treated and either reused onsite or surplus stormwater is discharged in accordance with the EPL.

The EPL (12040) currently permits NRE to discharge 2.5 ML/day under dry weather conditions, from a single licensed discharge point.

**Table 7-9** below provides a summary of the surface water, topography and soils impacts when comparing the approved project to the proposed modifications and mitigation measures.

**Table 7-9 Surface Water, Topography and Soils Impact Comparison and Mitigation Measures**

| Approved Project (as per the Original EA)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Proposed Modification Additional Impacts and Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Under a 1 Mtpa production scenario, discharges from the site are unlikely to significantly impact the water quality and quantity entering Bellambi Gully. Clean water realignment onsite through changing flow from an ‘in pipe’ system to an ‘open channel’ channel system will reduce the risk of blockages. The construction of a dissipation pond at the end of the channel will reduce the storm water energy flowing offsite.</p> <p>The mine upgrade is primarily to underground activities, accordingly a significant change to impervious areas and overland flow paths is not expected. Maintenance and upgrading of clean water diversions from the upper catchment around the operational areas to minimise the volumes of ‘dirty water’ requiring treatment.</p> <p>Localised disturbance of surface soils through the construction of internal haulage roads, the Wongawilli decline conveyor and the Bellambi Gully Creek realignment channel.</p> | <p>The proposed modification works are generally underground and within the previously approved production scenario. Accordingly changes to surface water discharges and soils are unlikely.</p> <p>The extraction of LWs 4 and 5 is not anticipated to be a significant risk to Cataract Creek in regard to its stream, as the proposed works incorporate narrow LWs and wide pillars. Modelled subsidence induced cracking could potentially affect stream flow in the reaches overlying and downstream of the proposed workings, although the anticipated stream flow losses would have very little impact on Lake Cataract water storage volume (Geoterra, 2012). In addition, the impacts would be restricted to short reaches where flow infiltrates into cracks in the bed, then reemerges further downstream.</p> <p>Subsidence fracturing of the base of the undermined swamps, specifically CCHS3 is possible, as they have generally relatively thin, poorly developed, mostly dry soil profiles with limited humic content, as well as significant proportions of exposed sandstone at surface, along with low volume and limited duration seepage after sufficient rain. Geoterra (2012) assessed that minor to no adverse change in flow and duration would be observed in seepage from the directly undermined swamps. The change in grade due to subsidence associated with LWs 4 and 5 is predicted to be essentially unobservable. As a result, subsidence induced erosion is not anticipated to occur, nor generate any significant change in the potential for ponding, scouring, or erosion.</p> <p><b>Mitigation Measures –</b></p> <p>As per the Approved Project, including implementing erosion and sediment controls and ongoing monitoring consistent with</p> |

NRE's approved Surface Facilities Water Management Plan.

Mitigation measures provided with this Project approval to be implemented, including without limitation, undertaking and/or implementing the necessary monitoring in accordance with an approved **LW 4 and 5 Water Management Plan** (see Appendix J).

## 7.8 Traffic and Transport

Existing transport infrastructure within the vicinity of the project area includes Mount Ousley Road, the Southern Freeway and the Princes Highway. Coal is delivered to the Port Kembla Coal Terminal from the NRE No.1 Colliery via Bellambi Lane, Memorial Drive, Southern Freeway, Masters Road, Springhill Road and Port Kembla Road. **Table 7-10** below provides a summary of traffic and transport impacts when comparing the approved project to the proposed modifications and mitigation measures.

**Table 7-10 Traffic and Transport Impact Comparison and Mitigation Measures**

| Approved Project (as per the Original EA)                                                                                                                                                                                                                                                                                                                                                             | Proposed Modification Additional Impacts and Mitigation Measures                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| It is estimated that there are 84 coal truck loads per day, with a peak of 134 loads, with an equivalent of 168 and 268 truck journeys per day respectively. The approved project is not considered to propose any changes to the existing transport arrangements and consequent traffic volumes. It is not considered that the project will impact significantly on the capacity of the road system. | <p>There will be no increase in the number of visitor or employee vehicles to the Colliery and in turn no increase in the volume of related traffic.</p> <p>No additional transportation of coal to PKCT is proposed.</p> <p><b>Mitigation Measures –</b></p> <p>As per the approved project in accordance with the approved <b>Traffic Management Plan</b>.</p> |

## 7.9 Visual Amenity

Visual amenity is primarily influenced by the visual character, the visual catchment (where the proposed works are visible from) and the visual sensitivity. The existing visual character is influenced by the Illawarra Escarpment rising steeply to the west before transitioning to gently undulating heavily vegetated areas across the site. Creeks of varying size traverse the project area, interspersed with fire trails. The eastern portion of the site is more urbanised with the cut and fill of roadways and transmission lines, the predominantly cleared area for coal loading before the suburbs of Bellambi and Russell Vale. The mine at this location predates most of the buildings in the locality, with mining at this location occurring for over 120 years.

**Table 7-11** below provides a summary of the visual impacts when comparing the approved project to the proposed modifications and mitigation measures.

**Table 7-11 Visual Impact Comparison and Mitigation Measure**

| Approved Project (as per the Original EA)                                                                                                                            | Proposed Modification<br>Additional Impacts and<br>Mitigation Measures                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Minimal visual impacts due to the location away from visually sensitive receivers, screening from surrounding vegetation and the relatively small size of equipment. | <p>The proposed modification works relate to underground workings and accordingly are not considered to create additional visual impacts nor impact on scenic areas of the escarpment. Production volumes are as per the approved project and accordingly are not considered to provide additional visual impacts from stockpiling, for example.</p> <p><b>Mitigation Measures –</b></p> <p>As per the Approved Project.</p> |

## 7.10 Waste, Utilities and Hazards

Underground and overhead services in the form of telecommunication cables and electricity lines currently exist in the project area. Potable water, sewage or stormwater infrastructure is not known to be located in the project areas.

Wastes produced by the mining activities are generally grouped into the following three categories:

1. mineral waste (including all non-coal material, noting that no coal washing is undertaken at the No.1 Colliery);
2. non-mineral waste; and
3. waste water.

Waste avoidance, minimisation and material reuse practices are currently implemented at the site.

**Table 7-12** below provides a summary of the waste, utilities and hazards impacts when comparing the approved project to the proposed modifications and mitigation measures.

**Table 7-12 Waste, Utilities and Hazards Impact Comparison and Mitigation Measures**

| Approved<br>(as per the Original EA)                                                                                                                                           | Project<br>Proposed Modification<br>Additional Impacts and<br>Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Utilities are known to exist in the project area, however through consultation with utility owners and monitoring of potential subsidence, impacts are expected to be minimal. | <p>The annual rate of production is as per the approved project. Hence generation of waste streams in excess of those previously approved is unlikely.</p> <p>LW mining may pose additional subsidence risks to existing surface infrastructure and utilities.</p> <p><b>Mitigation Measures –</b></p> <p>As per the approved project including monitoring of potential subsidence impacts on surface infrastructure and the appropriate plans of management, including without limitation, <b>LW 4 and 5 Built Features Management Plan</b> and <b>LW 4 and 5 Electrical Transmission Lines Management Plan</b> (see <b>Appendix J</b>).</p> |

## 7.11 Socio Economic

The communities nearest the proposed modification works are Russell Vale and Corrimal. The report ERM (2009) provided as part of NRE's Expansion Project (MP 09\_0013), advises that these communities were built around mining activities and given their proximity to the site are likely to incur the most direct impacts.

The social and economic impacts from the proposed modification, however, occur within an existing operation and therefore are not expected to dramatically change the existing socio-economic environment

The proposed modification will have a range of positive social and economic impacts to the local area, including:

- > maintaining current employment of approximately 222 employees;
- > providing short term employment for local contractors and suppliers, where feasible, during construction;
- > continuation of businesses and local spending on goods and services;
- > ensuring ongoing employment in the mining sector across NRE operations in the Illawarra;
- > significant flow-on effects into the local, regional, state and national economy; and
- > maintaining community development and ongoing opportunities for NRE to identify and support community development programmes in the local and regional community.

Existing employment opportunities are likely to be maintained, short term contracts potentially created. Visual and noise impacts from the proposed modification are considered to be consistent with the approved project.

## 7.12 Cumulative Impacts

Cumulative impacts involve compounding effects and interaction arising from developments proposed or under implementation within the locality or at a similar time. **Table 7-13** provides a summary of the likely cumulative impacts.

**Table 7-13 Cumulative Impacts Summary**

| Aspect                                | Cumulative Impact                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Flora and Fauna</b>                | Significant cumulative impacts to flora and fauna are considered unlikely given the degree of subsidence modelled, location and small size of upland swamps relative to upland swamps in the Southern Coalfields.                                                                                                                                                                                                                   |
| <b>Cultural and Historic Heritage</b> | Cumulative impacts to cultural and historic heritage are considered unlikely given the location of known heritage items relative to the modelled zone of subsidence.                                                                                                                                                                                                                                                                |
| <b>Noise</b>                          | The proposed modification works are underground and as such cumulative noise impacts are considered to be negligible. Production and associated transportation is considered to be as per the approved project, hence cumulative noise impacts at the surface are as per the approved project.                                                                                                                                      |
| <b>Air Quality</b>                    | <p>Production and transportation volumes are as per the approved project, hence based on previous assessments cumulative impacts are expected to be below the relevant impact assessment criteria for all pollutants and averaging periods.</p> <p>Cumulative impacts in the form of additional greenhouse gas emissions would occur during mining within Australia then later transportation and burning of the coal overseas.</p> |

|                                                        |                                                                                                                                                                                                            |
|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Groundwater</b>                                     | Cumulative impacts to groundwater are unlikely as aquifer depressurisation and alteration of groundwater flow paths has occurred previously as a result of historical mining within the area.              |
| <b>Subsidence, Surface Water, Topography and Soils</b> | Modelled subsidence impacts are considered to be confined to the footprint of the approved project. The localised impacts incurred during the LW mining operations are unlikely to be magnified over time. |
| <b>Traffic and Transport</b>                           | Production and associated transportation is considered to be as per the approved project, hence cumulative traffic and transport impacts are as per the approved project.                                  |
| <b>Visual Amenity</b>                                  | The proposed works are underground with production to be as per the approved project. Hence cumulative impacts on visual amenity are as per the approved project.                                          |
| <b>Waste, Utilities and Hazards</b>                    | Cumulative impacts are considered unlikely given the nature and scale of the works.                                                                                                                        |

## 7.13 Summary of Mitigation Measures

**Section 7** identifies and assesses environmental impacts from the proposed project modifications. Existing and proposed controls or mitigation and management measures are discussed as necessary in relation to the specific impacts. **Table 7-14** lists the existing and/or proposed mitigation and management measures that this EA identifies as required to minimise the environmental impacts from the proposed development. These measures in general are consistent with the Approved Project (MP10\_0046) and will be specifically developed and updated, as required, consistent with the respective plans of management that will be collated to facilitate an *Extraction Plan* (as represented in **Appendix J**).

**Table 7-14 Overview of Mitigation Measures**

| Environmental Impact   | Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subsidence</b>      | <p>As per the Approved Project, including without limitation, updating relevant management and monitoring plans as an Extraction Plan and ongoing monitoring, with specific reference to the Plans of Management presented in <b>Appendix J</b>.</p> <p>Noting that as a result of the knj (2012) risk assessment, the project application area was extended and NRE has committed to implementing monitoring and management measures to this Area of Management.</p> <p>Monitoring will include, without limitation, before, during and after mining:</p> <ul style="list-style-type: none"> <li>&gt; 2D and 3D survey above LW mining and along Mt Ousley road pavement;</li> <li>&gt; Visual observations;</li> <li>&gt; 3D survey of transmission towers;</li> <li>&gt; Regular collection of data from tilt meter; and</li> <li>&gt; Regional 3D surveys.</li> </ul> |
| <b>Flora and Fauna</b> | <p>The lengths of LWs 4 and 5 have been reduced to minimise the risk of potential impacts to ecological aspects, including the upland headwater swamp CRHS1. However, further mitigation measures will be implemented as provided with this Project approval and can include the following:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| Environmental Impact                  | Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                       | <ul style="list-style-type: none"> <li>&gt; If fracturing occurs remediate as soon as possible;</li> <li>&gt; Prioritise remediation to areas where fracturing has resulted in a loss of surface flows;</li> <li>&gt; Implement temporary fencing in areas where surface cracking occurs to prevent injury to fauna; and</li> <li>&gt; Seek advice from an ecologist prior to implementation of remediation works.</li> </ul> <p>Additional measures to mitigate impacts to ecological aspects resulting from subsidence effects include:</p> <ul style="list-style-type: none"> <li>&gt; Undertaking the monitoring as described in detail in section 5 of <b>NRE No.1 Colliery LW4 and 5 Biodiversity Management Plan</b> (attached in <b>Appendix J</b>);</li> <li>&gt; Manage any impacts in accordance with the TARPS associated with the <b>NRE No.1 Colliery LW4 and 5 Biodiversity Management Plan</b> (attached in <b>Appendix J</b>);</li> <li>&gt; If impacts are observed these must be reported as per the contingency plan outlined in <b>NRE No.1 Colliery LW 4 and 5 Biodiversity Management Plan</b> (attached in <b>Appendix J</b>); and</li> <li>&gt; If subsidence effects are observed in other areas, increased monitoring of these areas should be undertaken. If impacts to significant biodiversity features are observed immediate actions should be undertaken to remediate impacts.</li> </ul> |
| <b>Cultural and Historic Heritage</b> | <p>Monitoring of the identified cultural heritage sites within the Area of Management would be undertaken prior to the commencement of mining, following the occurrence of subsidence and following the completion of mining.</p> <p>Possible additional measures to mitigate impacts to Archaeological sites resulting from subsidence effects, as provided with this Project approval, will be included in a <i>Heritage Management Plan</i>. See <b>NRE No.1 Colliery LW 4 and 5 Heritage Management Plan</b> (attached in <b>Appendix J</b>).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Noise</b>                          | <p>In accordance with the mitigation measures specified in the Approved Project (MP10_0046), including orientation of equipment away from sensitive receivers; undertaking specified activities within the approved times and implementing the noise monitoring equipment and programs in accordance with NRE's approved <b>Noise Management Plan</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Air Quality</b>                    | <p>In accordance with the mitigation measures specified in the Approved Project (MP10_0046), including undertaking specified activities in accordance with approved operating hours and implementing the air quality monitoring equipment and programs in accordance with NRE's approved <b>Air Quality and Greenhouse Gas Management Plan</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Groundwater</b>                    | <p>The LW layouts of LWs 4 and 5 have been refined to minimise the risk of potential impacts to ground water.</p> <p>Management and mitigation measures will be implemented as provided with this Project approval within the Area of Management and as described in <b>NRE No.1 Colliery LW 4 and 5 Water Management Plan</b> (attached in <b>Appendix J</b>) including, without limitation, the following:</p> <ul style="list-style-type: none"> <li>&gt; Undertaking the monitoring as described in detail in section 5 of the Management</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| Environmental Impact                | Mitigation Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | <p>Plan, including before, during and following mining as follows:</p> <ul style="list-style-type: none"> <li>- Qualitative and quantitative monitoring in shallow (i.e. swamps) and deep ground water;</li> <li>- Meteorological monitoring and analysis.</li> </ul> <p>&gt; Manage any impacts in accordance with the TARPS and triggers;</p> <p>&gt; If impacts are observed, these must be reported as per the contingency plan; and</p> <p>&gt; If subsidence effects are observed in other areas, increased monitoring of these areas can be undertaken. If impacts significantly exceed predictions, then immediate actions should be undertaken to minimise further ongoing impacts.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Surface Water</b>                | <p>The LW layouts of LWs 4 and 5 have been refined to minimise the risk of potential impacts to ground water.</p> <p>Management and mitigation measures will be implemented as provided with this Project approval within the 'Area of Management and as described in <b>NRE No.1 Colliery LW4 and 5 Water Management Plan</b> (attached in <b>Appendix J</b>) including, without limitation, the following:</p> <ul style="list-style-type: none"> <li>&gt; Undertaking the monitoring as described in detail in section 5 Management Plan, including before, during and following mining as follows: <ul style="list-style-type: none"> <li>- Qualitative and quantitative monitoring in Cataract Creek and Cataract River;</li> <li>- Visual and photographic;</li> <li>- Meteorological monitoring and analysis.</li> </ul> </li> <li>&gt; Manage any impacts in accordance with the TARPS and triggers;</li> <li>&gt; If impacts are observed, these must be reported as per the contingency plan; and</li> <li>&gt; If subsidence effects are observed in other areas, increased monitoring of these areas can be undertaken. If impacts significantly exceed predictions, then immediate actions should be undertaken to minimise further ongoing impacts.</li> </ul> |
| <b>Soils and Topography</b>         | <p>In accordance with the Approved Project (MP10_0046), including implementing erosion and sediment controls and ongoing monitoring consistent with NRE's approved <b>Surface Facilities Water Management Plan</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Traffic and Transport</b>        | <p>In accordance with the Approved Project (MP10_0046) consistent with NRE's approved <b>Traffic Management Plan</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Visual Amenity</b>               | <p>As per the Approved Project.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Waste, Utilities and Hazards</b> | <p>In accordance with the Approved Project (MP10_0046) including monitoring of potential subsidence impacts on surface infrastructure and the appropriate plans of management, including without limitation, <b>LW 4 and 5 Built Features Management Plan</b> and <b>LW 4 and 5 Electrical Transmission Lines Management Plan</b> (attached in <b>Appendix J</b>).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## 8 Statement of Commitments

This section identifies the commitments required to effectively implement the mitigation and management measures.

The statement of commitments made by NRE for the Approved Project has been reviewed, and found to be relevant and directly applicable to the proposed modification works. The existing commitments have been reproduced in **Table 8-1**, and will be applied to the modification works along with additional commitments (shown in **red**) which are appropriate to the modification works.

**Table 8-1 Statement of Commitments**

(additional commitments shown in **red**)

| Objective                                                                                               | Commitment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1. Statutory Requirements</b>                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 1a. Compliance with all conditional requirements in all approvals licences and leases.                  | <p>The works will be carried out as outlined in:</p> <ol style="list-style-type: none"> <li>1. The NRE No.1 Colliery Preliminary Works Environmental Assessment document (ERM, 2010);</li> <li>2. Project Approval (MP10_0046);</li> <li>3. Environment Protection Licence (EPL12040);</li> <li>4. This s75W Modification Application;</li> <li>5. Management Plans approved under the SMP guidelines;</li> <li>6. <b>An Approved Extraction Plan;</b></li> <li>7. Mining Lease(s) conditions;</li> <li>8. Controlled Activity Approval; and</li> <li>9. Any other relevant approvals, licences or leases.</li> </ol> |
| 1b. All operations conducted in accordance with all relevant documentation.                             | <p>Undertake all activities in accordance with the following:</p> <ol style="list-style-type: none"> <li>1. Mining Operations Plan;</li> <li>2. Environmental procedures <b>and Environmental Management Plans;</b></li> <li>3. Safety Management Plans; and/or</li> <li>4. Site-specific documentation in force at that time.</li> </ol>                                                                                                                                                                                                                                                                             |
| <b>2. Stakeholder Consultation</b>                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Effective communication/consultation is undertaken throughout construction and operation of the project | <ol style="list-style-type: none"> <li>1. NRE will undertake regular meetings with the CCC, to provide timely and accurate information on major approvals issues and general operational aspects of the Colliery.</li> <li>2. NRE will continue to consult with relevant State Government agencies on a regular basis in relation to its current mining operations in the Southern Coalfield and the Project.</li> </ol>                                                                                                                                                                                              |
| <b>3. Subsidence</b>                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Potential adverse impacts from subsidence are managed, monitored and                                    | <ol style="list-style-type: none"> <li>1. Implement V Mains <b>and LWs 4 and 5 Management Plans</b> as amended by approval conditions;</li> <li>2. Continuing implementing conditions of T and W Mains as relevant to</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                      |

remediated where necessary.

309 Panel;

3. Implement a subsidence monitoring program that will include:
  - a. Monitoring before, during and after mining;
  - b. A set of pre-determined triggers; and
  - c. Responses and actions that flow from the identification of each trigger.
  - d. Implement mitigation measures for No.8 Fire Trail as detailed in the LWs 4 and 5 SMP;
  - e. Signs erected to warn motorists of potential subsidence impacts, including a recommended speed limit;
  - f. Regular inspections during mining;
  - g. A pre-approved treatment strategy;
  - h. Rehabilitation if required, to affected areas that may include the affected sections of Mt Ousley road in accordance with the RMS agreed and approved processes;
  - i. A management plan has been developed in consultation with Telstra for management of the optical fibre cable during mining of the T and W Mains. NRE will consult with Telstra to have this plan extended to cover the V Mains.

Monitoring of subsidence aspects as detailed in the Gujarat NRE Coking Coal Ltd (2012) **NRE No.1 Colliery Wonga East – LWs 4 and 5 Subsidence Monitoring Plan** (attached in **Appendix J**).

#### 4. Soil and Water

Construction and operations are managed such that adverse impacts to water quality and flows of Bellambi Gully Creek, **Cataract Creek** and surrounding residents are prevented or minimised.

1. Storm water runoff, soil and erosion control measures will be managed in accordance with guidelines detailed in the Landcom Publication *Soils and Construction, Volume 1, 4<sup>th</sup> Edition, dated March 2004*;
2. Dirty storm water from hard surfaces will be diverted into the storm water control dam (SWCD). Water will be held in the SWCD to reduce solids prior to treatment and then discharging via LDP2;
3. Dirty storm water and mine water will be treated on site prior to discharge;
4. The SWCD will be kept at a level that allows 30ML of storm water to be captured on site, reducing the flow and flood potential downstream;
5. Chemicals will be properly stored and banded. Dosing of flocculent will be metered and monitored on site;
6. The underground pipe section of Bellambi Gully Creek will be replaced with a suitably designed and engineered open bypass channel constructed on the southern side of the coal stockpile area. This will include:
7. A dissipation pond will be constructed at the end of the bypass channel to reduce energy flows back into Bellambi Gully Creek;
8. Upgrades to the existing channel including Reno mattresses and Gabion drop structures to reduce the velocity of water flowing down the gully; and
9. Regular maintenance to minimising scouring during major flow events.
10. Preparation of a Construction Management Plan that includes the

following:

11. A dry and wet basin arrangement to minimise sediment transportation to the storm water dam;
12. Works will not take place during heavy rainfall that is likely to contribute to erosion;
13. Undertake stripping of topsoil, if required, immediately before starting bulk earthworks to be used for rehabilitation or re-vegetation works on site;
14. Suitable areas for any temporary stockpiling of excavated soil (on flat ground) will be clearly identified and delineated before the commencement of works;
15. Ensure stockpiles are:
  - a. Constructed on the contour at least two (preferably five) m from hazard areas, particularly likely areas of concentrated water flows or slopes steeper than 10 percent;
  - b. Stabilised if they are to be in place for more than 10 days. The stockpile of VENM excavated from the construction of the bypass channel will be grassed;
  - c. Protected from run-on water by installing water diversions upslope; and
  - d. Installed with sediment filters immediately downslope to protect other lands and waterways from pollution.
16. Construction of Bellambi Gully Creek will be undertaken in accordance with engineering plans prepared in general to meet the design parameters outlined in Coffey (2010); and
17. All erosion, sediment control and runoff diversion measures will be established before any excavation begins. These will be left in place throughout works execution and beyond works completion until all surfaces have been fully restored.

In accordance with the aspects detailed in the NRE No.1 Colliery approved Preliminary Works Project (MP10\_0046) **Surface Facilities Water Management Plan**.

## 5. Surface Water

Operations are managed such that adverse impacts to catchment surface water are prevented or minimised.

1. Implement monitoring program including;
  - a. Daily automated monitoring of selected pool water depths upstream, within and downstream of the V Mains area;
  - b. Water quality monitoring in Wallandoola, Lizard and **Cataract Creeks, as well as Cataract River**:
    - i. Every 2 months prior to mining;
    - ii. Fortnightly during mining; and
    - iii. Monthly post mining;
    - iv. Stream water level, or spot flow monitoring and sampling conducted at all locations on the same day; water depths in the stream monitoring sites should, where practical, be automatically monitored and photographed during the site visits;
2. Potential bedload movement in the downstream of the subsidence area visually monitored during and after significant flow events;
3. Stream bed/bank stability and vegetation will be visually monitored

and photographically recorded prior to, during and post mining;

4. Rainfall monitored daily at the mine's weather station for the duration of mining;
5. An end of panel extraction report will be prepared, which summarises all monitoring over the period. The report will outline any changes in the surface water in the V Mains area; and
6. Results of the monitoring programs will be reviewed one year after pillar extraction has been completed and an updated ongoing monitoring and remediation program will be developed in association with IIN, DWE and the SCA.

Surface water and swamp monitoring as detailed in the Gujarat NRE Coking Coal Ltd (2012) **NRE No.1 Colliery Wonga East – LWs 4 and 5 Water Management Plan** (attached in **Appendix J**).

## 6. Groundwater

Operations are managed such that adverse impacts to local and regional groundwater resources are prevented or minimised

1. Groundwater quality monitoring will be undertaken at P6, NRE-A, NRE-C, NRE-D, NRE-A (vwp), NRE-B (vwp) and NRE-D (vwp):
  - a. Bimonthly prior to mining;
  - b. Monthly during mining; and
  - c. Quarterly post mining.
  - d. Standing water levels will be monitored;
  - e. Daily prior to mining;
  - f. Twice daily (automatic) and monthly (manual) during mining; and
  - g. Quarterly post mining.
2. Mine inflows will be monitored monthly during and post mining;
3. An end of extraction report will be prepared, which summarises all monitoring over the period. The report will outline any changes in the groundwater; and
4. Results of the monitoring programs will be reviewed one year after pillar extraction has been completed and an updated ongoing monitoring and remediation program will be developed in association with IIN, NOW and the SCA.

Groundwater and swamp monitoring as detailed in the Gujarat NRE Coking Coal Ltd (2012) **NRE No.1 Colliery Wonga East – LWs 4 and 5 Water Management Plan** (attached in **Appendix J**).

## 7. Air Quality

Operations are managed to minimise potential adverse impacts to the environment, residences and the community.

1. All conveyors will be covered where practical;
2. Water sprays will continue to be used to minimise air borne dust on an as needs basis;
3. Trucks will be covered before leaving the site;
4. Trucks will be clean prior to leaving the site; and
5. NRE will continue to enforce the Driver's code of Conduct, through continuing driver education (tool box talks) and regular audits.

In accordance with the aspects detailed in the NRE No.1 Colliery approved Preliminary Works Project (MP10\_0046) **Air Quality and Greenhouse Gas Management Plan**.

## 8. Greenhouse Gas Emissions

Manage operations such that greenhouse gas emissions on the environment are minimised

1. Energy audits will be held when practicable to ensure that the mine is using current practice techniques to minimise energy use and is operating at optimum energy levels;
2. Site management will ensure that equipment is maintained to retain energy efficiency;
3. The inventory of emissions developed for this assessment will be maintained;
4. Emissions and abatement strategies will be reported annually as part of the internal environmental reporting and National Greenhouse and Energy Reporting System obligations; and
5. NRE will investigate opportunities to capture and/or reuse ventilation gases.

In accordance with the aspects detailed in the NRE No.1 Colliery approved Preliminary Works Project (MP10\_0046) **Air Quality and Greenhouse Gas Management Plan**.

## 9. Acoustics

Operations are managed to minimise potential adverse impacts on the environment, residences and the community.

Construction activities are managed to minimise potential adverse impacts on the environment, residences and the community.

1. The existing Bulli decline conveyor will be decommissioned and demolished on completion of the new driveage which is likely to start in mid to late 2012;
2. Attended noise monitoring will be undertaken upon commencement of operations to confirm predicted minor exceedances which may occur at some receivers;
3. An operational Noise Management Plan (NMP) will be developed to specifically address potential noise impacts associated with the proposed operations at the nearest receivers. The NMP will outline methods and procedures to manage the following:
  - a. Results of the regular noise monitoring program on site and within the surrounding area
  - b. Response to any complaints or issues raised by the owner of the affected residence;
  - c. Noise monitoring data from the early stages of Project operations will be utilised to calibrate an operation specific noise model, to refine the potential predicted noise impacts during the worst case scenario;
  - d. An operational noise monitoring program will be developed to monitor noise emissions from the proposed operations to determine ongoing compliance with PSNLs and to identify an further feasible noise mitigation measure that can be implemented;
  - e. The results of the noise monitoring program will be reviewed by the operations manager to assess compliance with the PSNLs and reported in accordance with any requirements of the development approval or EPL; and
  - f. Site equipment to be selected to meet appropriate INP noise goals in accordance with the acoustic design parameters for acoustically significant plant and equipment presented in NRE No.1 Colliery Preliminary Work Acoustic Assessment.
  - g. Construction will be limited to 7am to 6pm, Monday to Friday

and 8am to 1pm, Saturdays;

- h. All residents adjacent to the site will be notified of the start of works;
- i. Where feasible, silenced site equipment will be used to minimise environmental noise emissions;
- j. Any complaints regarding environmental noise emissions will be investigated and responded to in an appropriate manner; and
- k. All works will be undertaken in accordance with the DECCW (2009) *Interim Construction Noise Guideline*.

In accordance with the aspects detailed in the NRE No.1 Colliery approved Preliminary Works Project (MP10\_0046) **Noise Management Plan**.

## 10. Aquatic Ecology

Operations are managed such that adverse impacts to native aquatic habitats are prevented or minimised.

- 1. Observations of aquatic habitats and surveys of aquatic macro invertebrates will be undertaken at impact and control locations in the headwater swamp regions during and after mining;
- 2. A survey of aquatic macro invertebrates (at impact and control locations) will be undertaken if the regular water quality monitoring program detects changes in the depth and quality of the water within Wallandoola Creek and Lizard Creek that are greater than anticipated on the basis of the subsidence predictions; and
- 3. Baseline monitoring will continue.

Aquatic biodiversity monitoring as detailed in the Gujarat NRE Coking Coal Ltd (2012) **NRE No.1 Colliery Wonga East – LWs 4 and 5 Biodiversity Management Plan** (attached in **Appendix J**).

## 11. Terrestrial Ecology

Mining operations are managed such that adverse impacts to native flora and fauna are prevented or minimised.

- 1. Monitoring habitat areas including the upland swamps, creeks and rocky habitats of the V Mains as well as LWs 4 and 5 will occur pre, during and post mining;
- 2. Additional fauna surveys in suitable seasons will be undertaken to detect the threatened species in the 309 Panel:

Construction activities at Russell Vale are managed such that adverse impacts to native flora and fauna are prevented or minimised

- a. Red-crowned Toadlet; and
- b. Giant Burrowing Frog;
- 2. Fauna surveys will be undertaken to determine if the following species are present in the areas of V Mains and 309 Panel:
  - a. Red-crowned Toadlet;
  - b. Giant Burrowing Frog;
  - c. Littlejohn's Tree (Heath) Frog; and
  - d. Giant Dragonfly;
- 3. If these species are detected, an Environmental Management Plan (EMP) will be developed in consultation with relevant agencies including OEH and SCA to document contingency measures to mitigate unforeseen impacts from mine related subsidence.
- 4. Targeted surveys for the Green and Golden Bell Frog (GGBF) to be conducted in late 2010 and early 2011 at all potential habitat locations at the Russell Vale site to determine the presence of the species and the extent of their utilisation (e.g. breeding, foraging,

over-winter sites) of the site;

5. Should Dam 6 be verified as actual habitat for GGBF, then enhancement of Dam 5 will be undertaken in consultation with OEH and WCC, to provide suitable breeding, sheltering and foraging habitat;
6. Preparation of a translocation plan, with the intent of moving individuals (if identified) from Dam 6 to Dam 5;
7. Measures that will be implemented to assist in the management of impacts to the riparian areas of Bellambi Gully Creek including the following will be including in a CMP:
8. Demarcation of works area prior to works beginning to avoid impacts to vegetation outside of the works areas;
9. Appropriate sedimentation controls to be implemented prior to works beginning; and
10. Weed removal and ongoing management of the area for weed control.

Terrestrial biodiversity monitoring will be undertaken by a qualified Ecologist and as detailed in the Gujarat NRE Coking Coal Ltd (2012) **NRE No.1 Colliery Wonga East – LWs 4 and 5 Biodiversity Management Plan** (attached in **Appendix J**).

## 12. Aboriginal Heritage

Surface works at the Russell Vale site are managed such that adverse impacts to the archaeology are minimised.

Mining operations are managed such that adverse impacts to Aboriginal heritage items are avoided or minimised.

1. A Protocol for discovery of suspected Aboriginal objects (chance finds) will be included in a CMP. The protocol will include:
  - a. Contact the registered stakeholder groups who participated in fieldwork, Illawarra Local Aboriginal Land Council and the D'harawal Knowledge Holders and have a representative identify if the suspected items is in fact an Aboriginal site or object;
  - b. If the identification is positive, contact a qualified archaeologist to determine the record of the site or object. The archaeologist in consultation with the registered stakeholder groups should provide management and mitigation measures as necessary, and provide a short report of the investigation to NRE and a copy to OEH;
  - c. If human skeletal remains are found the following actions should be immediately undertaken:
  - d. Stop works in the immediate area of the remains;
  - e. Contact the local police contacted and a physical anthropologist or archaeologist;
  - f. If the remains are determined to be antiquity and of Indigenous origin, contact the registered stakeholder groups; and
  - g. Management and mitigations measures are to be drawn up in consultation with the registered stakeholder groups and the archaeologist.

Monitoring will be undertaken by a qualified Archaeologist and Aboriginal community member in accordance with **NRE No.1 Colliery Wonga East – LWs 4 and 5 Heritage Management Plan** (attached in **Appendix J**).

### 13. *Non-Aboriginal Heritage*

Operations are managed such that adverse impacts to significant heritage items are avoided or minimised.

1. A Conservation Management Plan (CMP) or equivalent will be prepared for the project. The CMP will reflect the future need of the site as a continuing mine. The CMP will include, without limitation:
  - a. No items identified as having heritage value or contributing to the heritage value of the site will be demolished as part of the project;
  - b. A photographic recording of the 1887 portal and the site will be undertaken to Heritage Archival Recording standards. Copies of the recording will be lodged with the appropriate Local and State repositories;
  - c. Procedures to follow for any unanticipated impacts to heritage structures and for the discovery of unanticipated 'Relics'; and
  - d. Items of moveable heritage, including historical photos, plans, maps, records and the like will be documented, collated and catalogued records to Heritage Archival Recording standards. A conservator will provide advice regarding the long term storage of the items and an appropriate repository will be identified prior to project works commencing.

### 14. *Traffic and Transport*

Operations are managed to ensure minimal impacts on the local road network

1. NRE will implement a traffic / driver management protocol which includes:
  - a. Trucking during PCKT approved hours;
  - b. Obeying legal speed limits including a self-imposed 50km/hr speed limit along Bellambi Lane;
  - c. Ensuring drivers are vigilant regarding separation distances;
  - d. Avoiding compression braking. Compression brakes must not be used on approach to Port Kembla Rd/Springhill Rd lights with entering or exiting PKCT;
  - e. Covering all loads;
  - f. Washing all trucks prior to leaving the site, that travel on unsealed or dirty roads;
  - g. Reporting all vehicles faults to the owner; and
  - h. Reporting all traffic incidents.

**In accordance with the aspects detailed in the NRE No.1 Colliery approved Preliminary Works Project (MP10\_0046) *Traffic Management Plan*.**

### 15. *Visual Amenity*

Construction and design is managed to ensure minimal visual impacts on local residents.

Operations are managed to ensure minimal visual impacts on local residents.

1. Colour treatments for surface facility components will be selected to match the surrounding environment;
2. The area of disturbance will be restricted to the minimum practicable and Facilities will be placed to minimise disturbance of vegetation;
3. Progressive rehabilitation will be undertaken as required;
4. Routine use of low beam on vehicle headlights by all construction and maintenance personnel;
5. Appropriate use of lighting equipment to limit impacts on sensitive locations. This will be managed through inductions of all construction and operations employees; and

6. Ensuring lighting is directed away from residences through the use of directional lighting and shielding in accordance with safety regulations, and which complies with Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting.

## 16. Waste

Avoidance of unnecessary resource consumption; reuse, reprocessing, recycling and energy recovery wherever possible and, where this is not possible, disposal of wastes in an environmentally responsible manner.

1. All construction materials will be purchased with the aim of reducing waste products;
2. The stockpile of clean excavated material will be seeded with grass to stabilise until it can be reused;
3. All waste material will be disposed of in accordance with the provisions of the *Protection of the Environment Operations Act 1997* and the Waste Classification Guidelines (DECC, 2008);
4. Waste will be recycled where possible or disposed of at an appropriately licensed waste disposal facility;
5. Onsite storage and disposal of different categories of waste will be defined prior to construction. A sufficient number of covered storage bins will be provided for waste disposal on site, with separate bins for recyclable and non-recyclable waste;
6. All records will be retained as proof of correct disposal for environmental audit purposes;
7. At No.4 Shaft, NRE will implement a manual monitoring assessment including visual observation for the presence of ponding of water on the surface of the irrigation area; and
8. A tertiary treatment system will be installed at No.4 Shaft to reduce pathogens to a level resulting in 1mg/L chlorine residual after 30 minutes as required under the OEH reuse guidelines.

## 17. Rehabilitation

Progressive rehabilitation of areas of areas of the colliery that are no longer in use and where safe operational conditions permit.

Rehabilitation at Russell Vale site and within the catchment area to be undertaken in accordance with the Schedules set out in Tables 23.1 and 23.2 in the *NRE No.1 Colliery Preliminary Works Environmental Assessment* document (ERM, 2010).

## 18. Construction Management

Undertake the construction of infrastructure and services as per the approved project and proposed modification.

1. The project would be undertaken by a number of different contractors, however, NRE would maintain responsibility for the environmental management of the proposed project.
2. The contractor(s) appointed to undertake construction works will prepare or update Health, Safety and Environmental documentation as per the Approved Project.
3. It will be a requirement of the project that all contractor environmental documents and management plans are approved by NRE prior to the commencement of any works by the contractor.

## 9 Conclusion

This section summarises and concludes the proposed modification.

This Environmental Assessment forms part of an application for a Section 75(W) modification to the existing Project Approval (MP 10\_0046) for the NRE No.1 Colliery Preliminary Works Project as granted by the Minister for Planning under Section 75(J) of the *Environmental Planning and Assessment Act 1979*.

This proposed modification works can be prepared, submitted and approved as a modification under s75W of the EP&A Act and includes, amending the reference to the use of MGs 4 and 5 from exploratory driveages to operational gateroads; inclusion of the extraction of coal using LW mining techniques from LWs 4 in the Wongawilli Coal Seam in accordance with the DRE Subsidence Management Plan approval; inclusion of the extraction of coal using LW mining techniques from LW5 in the Wongawilli Coal Seam; and the development of MGs 6, 7 and 8 within the Wongawilli Coal Seam.

The proposed modification works underlie an area of largely undisturbed native bushland characteristic of the Woronora Plateau. The detailed survey and mapping, undertaken by Biosis (2012), above and in the near vicinity of the proposed extraction area in Wonga East identified seven swamps (CRHS1, CRHS2, CRHS3, CCHS1, CCHS2, CCHS3, and CCHS4). However, only three of these swamps (CRHS1, CCHS3 and CCHS4) were classed as having 'special significance'. CCHS3 and CCHS4 are two headwater upland swamps overlying LW Panels 4 and 5, while the larger headwater upland swamp, CRHS1, exists to the south of the proposed modification works footprint. The Ecology Assessment (ERM, 2012) identified threatened flora and fauna species listed under the *TSC Act* or *EPBC Act* were not recorded within the proposed modification works footprint during the survey, with the exception of individuals of the Prickly Bush-pea shrub (*Pultenaea aristata*). Although native vegetation clearing is not required for the proposed modification works, 'alteration of habitat following subsidence due to longwall mining' is listed as a Key Threatening Process (KTP) under Schedule 3 of the *TSC Act*.

Subsidence impacts modelled by Seedsman (2012) indicate that impact is likely to be less significant on terrestrial ecosystems in comparison to aquatic or aquatic dependent ecosystems. Accordingly upland swamp CCHS3 and the first order stream above LW 5 are more susceptible to change. Geoterra (2012) predicts that the maximum predicted change in grade due to subsidence in upland swamps over LW4 and LW5 is less than the swamp gradient and as a result subsidence induced erosion is not anticipated, nor is the subsidence likely to generate any significant change in the potential for ponding, scouring or erosion in the swamps. Some ferruginous seeps may occur as a result of the subsidence.

Subsidence fracturing of the base of the undermined swamps is possible. This is a function of the swamps relatively thin, poorly developed, mostly dry soil profiles with limited humic content and exposed sandstone. Geoterra (2012) assessed that minor to no adverse change in flow and duration would be observed in seepage from the directly undermined swamps. The change in grade due to subsidence associated with LWs 4 and 5 is predicted to be essentially unobservable. As a result, subsidence induced erosion is not anticipated to occur, nor generate any significant change in the potential for ponding, scouring, or erosion.

Seedsman's revised predictions (2012), advises that the maximum anticipated vertical subsidence is 1.15 m, maximum tilt is 17 mm/m, and the strains anticipated to be between 12 mm/m compression to 10 mm/m tension due to longwall mining in LWs 4 and 5. Seedsman (2011) notes that the proposed pillar width to height ratio of 18.6 is significantly greater than 5.0, the ratio above which there is no Australian or International database evidence of pillar failure.

First workings for MGs 6, 7, and 8 are designed to leave the coal pillars intact, the roadways open and the overlying strata supported. This is likely to result in the vertical downward movement of the ground surface of less than 20mm in these areas.

knj Consultants (2012) prepared a risk assessment of Pillar Run in the Bulli Seam associated with the Wongawilli Seam LW4 and LW5 extraction. The potential consequence of a Pillar Run event is impact to a range of man-made and natural surface features. The risk assessment concluded that the risk assessment team did not believe that the nominated surface features would be exposed to the risk of impacts from

subsidence from a Pillar Run event. For the remaining surface features, the likelihood was rare (Practically impossible, considering the present controls) given the nominated risk control measures

The risk of subsidence impacts to items of cultural and historic heritage significance is considered low. Cultural and historic heritage assessments undertaken by ERM (2010) identified one known aboriginal (52-3-0320 Bulli Mine Shaft 25, an axe grinding groove site) and no historic heritage items above LWs 4 and 5. The risk of impact to 52-3-0320 Bulli Mine Shaft Site 25 is considered low, as the maximum predicted systematic tensile strains are low and the site is located above a chain pillar.

Longwall 5 is located approximately 30m west of the mid channel of Cataract Creek, which flows into Cataract Reservoir. The main channel and tributaries have previously been undermined by LWs in the Balgownie Seam as well as bord and pillar and pillar extraction in the overlying Bulli Seam. Geoterra (2012) indicates that the extraction of LWs 4 and 5 is not anticipated to be a significant risk to Cataract Creek in regard to its stream, as the proposed works incorporate narrow LWs and wide pillars. Modelled subsidence induced cracking could potentially affect streamflow in the reaches overlying and downstream of the proposed workings, although the anticipated stream flow losses would have very little impact on Cataract Reservoir water storage volume. The impacts are likely to be restricted to short reaches where flow infiltrates into cracks in the bed, then reemerges further downstream.

Air quality, greenhouse gas emissions, noise, traffic and transport as well as visual impacts are considered to be consistent with the approved project on a per annum basis, as the production and transportation volumes per annum for the proposed modification works are as per the approved project.

NRE has implemented a Community Consultative Committee (CCC) and a chairperson has been appointed. Project specific communications will occur regularly, aimed at ensuring all local stakeholders are informed of the proposed works and mining processes. NRE has scheduled an initial CCC meeting for August 2012. Consultation with the community will also extend through the assessment period of this application and during the construction and operational phase of the project.

At the completion of the project, the site would be rehabilitated in accordance with the Approved Project (MP 10\_0046) conditions. These works include the decommissioning of surface infrastructure and portals as well as making the site *'safe, stable and non-polluting in the long term'*.

In summary, the extent of the proposed LW mining has been designed and refined to minimise environmental impacts and to provide economic benefits through efficient mining. The potential environmental impacts and proposed mitigation measures will be consistent with the Approved Project as a minimum with further specific and detailed mitigation and management measures presented in plans of management accordingly. The impacts are likely to be minor in scale resulting in minimal environmental impacts due to the nature of the works, proposed management and mitigation measures, and long-term land use of the project area.

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