ULAN COAL

GLENCORE

Ulan West Modification

ENVIRONMENTAL ASSESSMENT

umwelt

MARCH 2015

ULAN COAL

GLENCORE

ULAN WEST MODIFICATION ENVIRONMENTAL ASSESSMENT

March 2015

Prepared by
Umwelt (Australia) Pty Limited

on behalf of
Ulan Coal Mines Limited

Project Director:	**Barbara Crossley**
Project Manager:	**Kirsty Davies**
Report No.	**3363/R01/V3**
Date:	**March 2015**

umwelt

Newcastle

75 York Street
Teralba NSW 2284

Ph. 02 4950 5322

www.umwelt.com.au

Executive Summary

Ulan Coal Mines Limited (UCML) seeks to modify the approved Ulan West underground operation (which forms part of the Ulan Coal Complex) to provide access to additional coal resources within existing mining leases and exploration licences, and allow for a realignment of approved longwall panels to provide for the current mine plan.

Since the granting of Project Approval (PA) 08_0184 in 2010, exploration activities have been undertaken within existing mining leases and the southern portion of an existing exploration licence (EL 7542). This exploration process has further characterised the coal resource as well as provided additional detailed information on other geological features within this area. At Ulan West, a fault had previously been interpreted close to the western boundary of the existing mining lease. The location of this east-west trending fault was previously interpreted to limit the ability to mine south of the currently approved main headings of Ulan West. The further exploration activities completed in the southern portion of EL7542 have more accurately mapped the location of the fault and determined that the feature lies further south than previously interpreted.

UCML have determined that there is a valuable minable resource within the southern portion of EL7542 and seek to modify the current project approval to enable access to this coal resource by extending the longwall panels in this area. A mining lease application (MLA475) has been lodged for the southern portion of the EL 7542 with the NSW Trade and Investment – Division of Resources and Energy (DRE) (hereafter referred to as MLA475).

The proposed modification includes the repositioning of longwall panels LW 5 to LW12 which is required as a result of the previous approved changes to LW 3 and LW 4. Some minor changes to the northern extent of the Ulan West longwall panels are also required through this realignment process. The proposed repositioning to the west, for LW 5 to LW 12 will generally be within the existing mining footprint and present minimal change to approved environmental impacts.

PA 08_0184 was granted under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2010 for the Ulan Coal Complex. The proposed modification to PA 08_0184 is being sought under Section 75W of the EP&A Act. The Department of Planning and Environment (DP&E) has confirmed that they are satisfied that the proposed modification can be assessed and determined under Section 75W of the EP&A Act.

The proposed modification will result in an approximately 13 per cent increase in the total area of subsidence affectation associated with the *Ulan Coal – Continued Operations Project* (UCCO Project). The range of predicted subsidence impacts within this additional area of subsidence affectation are generally consistent with those approved under Project Approval 08_0184. The proposed modification is not anticipated to have a significant adverse impact on the land surface or natural features located within the modified Ulan West mining area, and will not have a significant adverse impact on existing land uses. Impacts of the proposed modification on built features are predicted to be consistent with the UCCO Project Environmental Assessment (EA) and PA 08_0184. The Cockabutta Creek rock shelter sites are located outside of the currently approved Ulan West mine plan, and were not previously proposed to be impacted. Impact to these sites is likely as a result of the proposed modification. Specific management measures have been proposed for these sites, in consultation with the Aboriginal community.

The existing suite of approved management measures will be applied to the proposed modification and will be updated as required to incorporate the proposed modification.

The proposed modification maximises the efficient recovery of an additional approximately 13 million tonnes of high quality coal resource that can be undertaken without significantly increasing the environmental impacts of the existing approved Ulan Coal Complex operations. The proposed modification allows for the continued employment of approximately 340 people for an additional two years at Ulan West as well as ongoing economic benefits including mining royalties to the NSW government. On this basis, it is considered that with the implementation of the approved and proposed management and mitigation measures, the proposed modification will result in a net benefit to both the local and NSW communities.

TABLE OF CONTENTS

FIGURES

APPENDICES

1.0 Introduction

Ulan Coal Mines Limited (UCML) is a joint venture between Glencore Coal Assets Australia Pty Limited (Glencore) (90 per cent) and Mitsubishi Development (10 per cent). The Ulan Coal Complex is located approximately 38 kilometres north-north-east of Mudgee and 19 kilometres north-east of Gulgong in New South Wales (refer to **Figure 1.1**). Operations at the Ulan Coal Complex are located approximately 1.5 kilometres east of the village of Ulan and entirely within the Mid-Western Regional Council Local Government Area (LGA).

Coal mining has been undertaken in the Ulan area since the 1920s. UCML was granted Project Approval (PA) 08_0184 under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 15 November 2010 for the *Ulan Coal – Continued Operations Project* (UCCO Project). This Project Approval provides a single, modern project approval for continued operations, which has enabled UCML to surrender a number of historical development consents and other approvals that the site has previously operated under. Approved mining operations within the Ulan Coal Complex consist of underground mining in the Ulan No.3 and Ulan West areas as well as open cut mining, and associated coal handling and processing, and transport through to August 2031. UCML also has an existing approval (EPBC No 2009/5252) under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) which was granted on 30 November 2010.

UCML is seeking to modify the approved Ulan West underground operations to provide access to additional coal resources within existing mining titles and allow for a realignment of approved longwall panels to provide for the current mine plan.

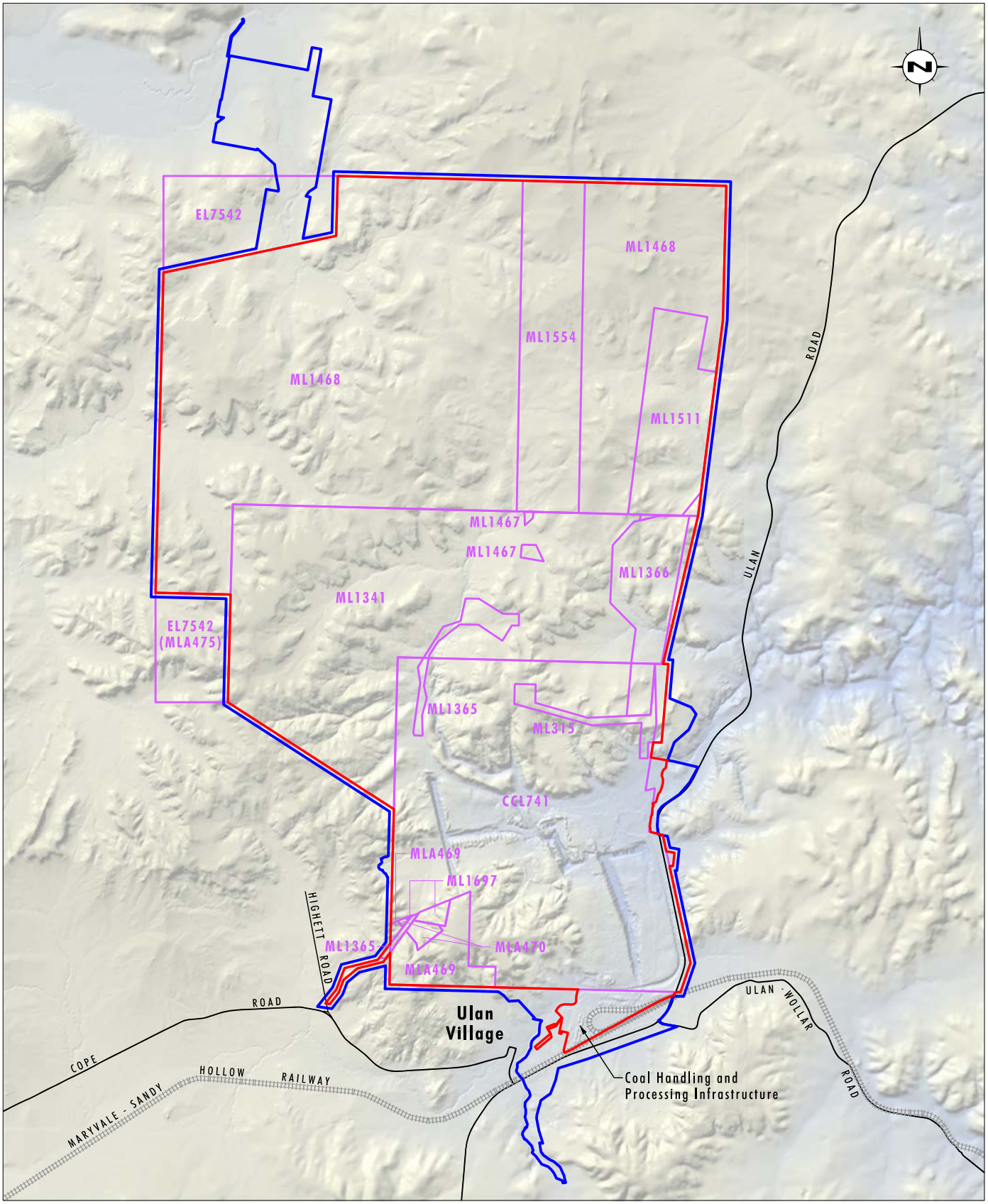
UCML has an existing exploration licence (EL 7542) which covers an area south west and an area to the north of the currently approved Ulan West mine plan (refer to **Figure 1.2**). Since the granting of PA 08_0184 in 2010, exploration activities have been undertaken within existing mining leases and the southern portion of EL 7542. This exploration process has further characterised the coal resource as well as provided additional detailed information on other geological features within this area. At Ulan West a fault had previously been interpreted close to the western boundary of the existing mining lease. The location of this east-west trending fault was previously interpreted to limit the ability to mine south of the currently approved main headings of Ulan West. The further exploration activities completed in the southern portion of EL7542 have more accurately mapped the location of the fault and determined that the feature lies further south than previously interpreted.

UCML have determined that there is a valuable minable resource within the southern portion of EL7542 and seek to modify the current project approval to enable access to this coal resource by extending the longwall panels in this area. A mining lease application (MLA475) has been lodged for the southern portion of the EL 7542 with the NSW Trade and Investment – Division of Resources and Energy (DRE) (hereafter referred to as MLA475) (refer to **Figure 1.2**).

During 2013, UCML was granted approval by the NSW Department of Planning & Environment (DP&E) and the DRE under Condition 25 of PA 08_0184 to undertake first workings to widen longwall panels LW 3 and LW 4 from 300 metres to 400 metres wide. The proposed modification includes the repositioning of longwall panels LW 5 to LW12 which is required as a result of the previous approved changes to LW 3 and LW 4. Some minor changes to the northern extent of the Ulan West longwall panels are also required through this realignment process. The proposed repositioning to the west of LW 5 to LW 12 will generally be within the existing mining footprint and present minimal change to approved environmental impacts.

FIGURE 1.1

Locality Map



Data Source: Ulan Coal (2014)

0 1.0 2.5 5.0km
1:100 000

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- Mine Lease Boundary

FIGURE 1.2

Existing Mining and Exploration Lease Titles

The changes to the Ulan West mine plan will also require repositioning of approved ventilation shafts and dewatering bores as well as the installation of additional ventilation shaft and associated infrastructure to provide ongoing support to underground mining operations.

PA 08_0184 was granted under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2010. The proposed modification to PA 08_0184 is being sought under Section 75W of the EP&A Act. The Department of Planning and Environment (DP&E) has confirmed that they are satisfied that the proposed modification can be assessed and determined under section 75W of the EP&A Act (refer to **Appendix 1**).

Umwelt (Australia) Pty Limited (Umwelt) has prepared this Environmental Assessment (EA) on behalf of UCML to assess the potential environmental, economic and social impacts of the proposed modification to PA 08_0184 for changes to the Ulan West mine plan and associated infrastructure (the proposed modification).

1.1 History of Mining Operations

Mining in the Ulan area has been undertaken since the early 1920s, initially as Ulan No. 1 Colliery Holding for the supply of coal to local markets. The distance to major markets prohibited the continuation of mining and operation ceased. The mine reopened in 1942 and continued operations until 1950. A new mine was developed by Hogan & Gorman further east creating the Ulan Colliery Holding No. 2 to supply coal to the new power station that was built to the north of the Ulan Village as well as supplying local markets. This mine is referred to as the Ulan No. 2 mine. When the power station closed in 1969, mining at Ulan No. 2 mine continued on a small scale to supply other domestic markets (Connell Wagner 1992).

In the late 1970s Hogan & Gorman registered UCML and ownership transferred to White Industries. Part ownership was later transferred on to Mitsubishi Operations and NSW State Super Board. An exploration program undertaken in 1976 in the Ulan area proved the existence of extensive coal reserves, and mining operations at the Ulan Coal Complex expanded substantially in the 1980s with the establishment of the open cut mine. This expansion included the construction of the coal preparation plant and rail loading facility and augmentation of the Ulan No. 2 underground in 1982. Traditional board and pillar underground mining methods were used from the mid 1970s to mid 1980s prior to longwall methods being introduced in 1986 with the commencement of Ulan No. 3. In the mid 1990s UCML successfully introduced highwall mining. Glencore (formerly Xstrata Coal Pty Limited) purchased 90 per cent of UCML in 2001. Mining within the open cut continued until mid 2008, when approved reserve recovery areas were exhausted.

UCML was granted PA 08_0184 under Part 3A of the EP&A Act on 15 November 2010 for the UCCO Project. This Project Approval is a single, modern Project Approval for continued operations and enabled the surrender of a number of development consents and other approvals that UCML had previously operated under. Approved mining operations at the Ulan Coal Complex consist of underground mining in the Ulan No.3 and Ulan West areas as well as open cut mining. PA 08_0184 provides for:

- mining operations at the Ulan Coal Complex until 2031;
- continued longwall mining of Ulan No.3 underground;
- longwall mining of the Ulan West area;
- recommencement of open cut operations;

- upgrade and continued use of the existing Coal Handling and Preparation Plant (CHPP) and rail loading facilities to cater a total coal production capacity of 20 million tonnes per annum (Mtpa) product coal; and

- continued use of existing surface facilities and ancillary activities, and construction and use of approved and new surface facilities and ancillary activities to support the abovementioned operations.

Following granting of PA 08_0184, there have been two approved modifications to the UCML project approval. One related to minor changes to the Ulan No.3 mine plan and the other related to minor changes to the Ulan West mine plan (refer to **Section 2.2** for further details).

Operations at the Ulan Coal Complex are being progressed in accordance with PA 08_0184 as modified.

1.2 Site Context

The Ulan Coal Complex is in the Mid Western Regional Council LGA, with the village of Ulan located 1.5 kilometres west of the Coal Handling and Preparation Plant (CHPP). The Ulan Complex straddles the Great Dividing Range and is located at the headwaters of the Goulburn River catchment (draining to the east) and the Talbragar River catchment (draining to the west). The key features of the region surrounding the Project are illustrated in **Figure 1.3**.

The proposed Ulan West mine plan changes occur within existing mining leases or exploration licences being EL7542 (currently subject to mining lease application MLA475), ML1341 and ML1468 (refer to **Figure 1.2** and **Figure 1.4**). The proposed Ulan West mine plan incorporates the extension into the southern portion of EL7542 in the area subject to MLA475, the changes within the existing Ulan West mining footprint and the minor extension of longwall panels to the north to cater for the realignment of longwall panels.

1.2.1 Environmental Setting and Land Use

The topography of the Ulan Complex is a combination of undulating valley floor to steeper slopes and rocky escarpments. This is typical of the landforms evident in the eastern uplands of the Great Dividing Range.

The Ulan Coal Complex straddles the Great Dividing Range and is located at the headwaters of the Goulburn River system (which drains to the east to the Hunter River catchment) and the Talbragar River system (which drains to the west to the Macquarie River catchment). Ulan West is located within the catchments of Cockabutta Creek and Mona Creek. MLA475 includes an unnamed tributary of Cockabutta Creek which flows in an approximately north-west direction over the proposed southern extension to longwall panels LW 10, LW 11 and LW 12.

The landforms surrounding the proposed modification can be characterised into three broad groups; broad valleys, transitional rocky uplands, and areas of elevation. The broad valleys in this area have been almost entirely cleared for agricultural activity. This is typical of the landforms evident in the western uplands of the Great Dividing Range.

Above the Ulan West underground mining area the landforms consist of both transitional rocky uplands and areas of elevation. Both areas have had significantly less vegetation clearance than the broad valleys; however historical logging has occurred in both landform areas.

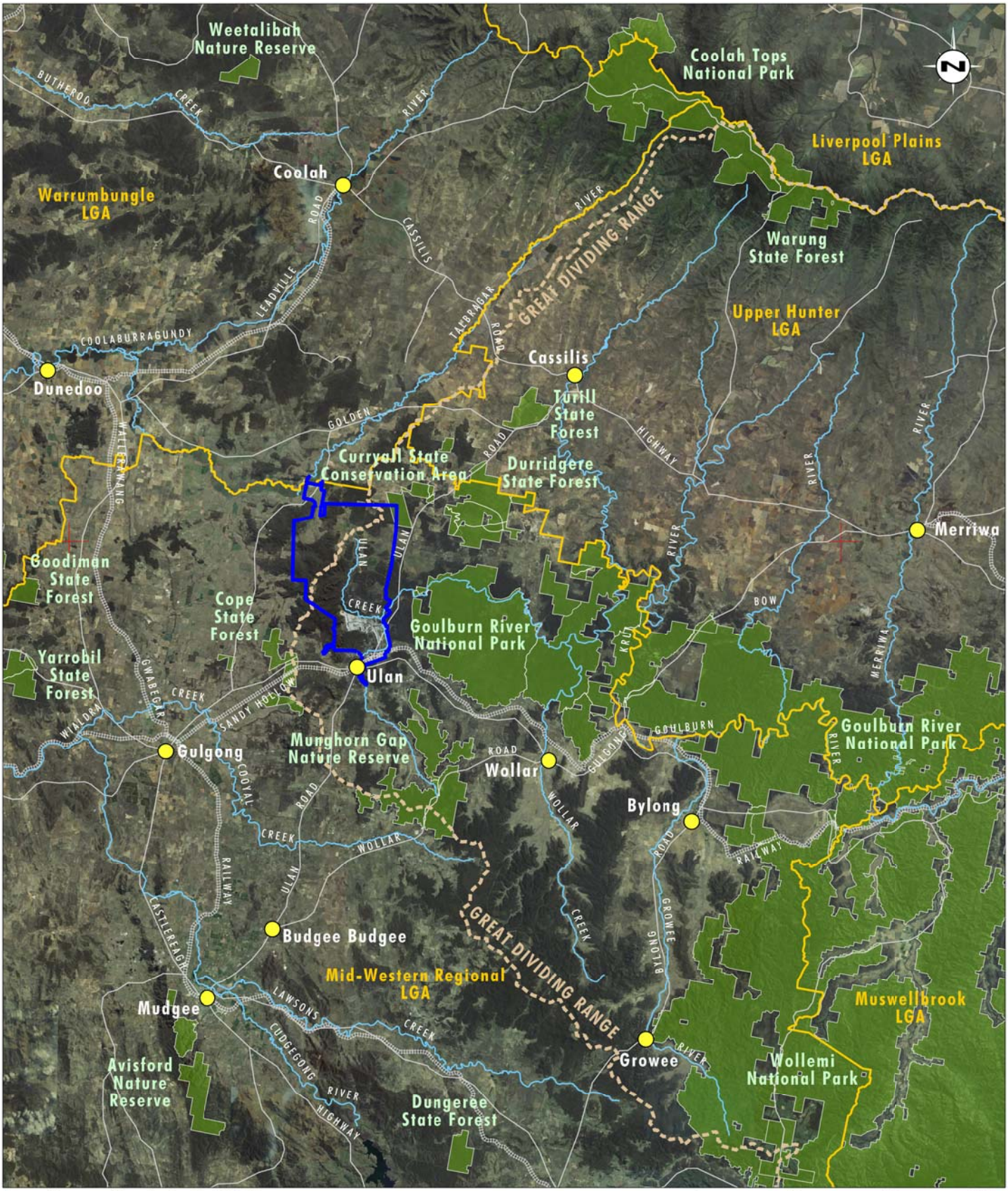


Image Source: Google Earth (2009)
Data Source: Department of Lands (2003)

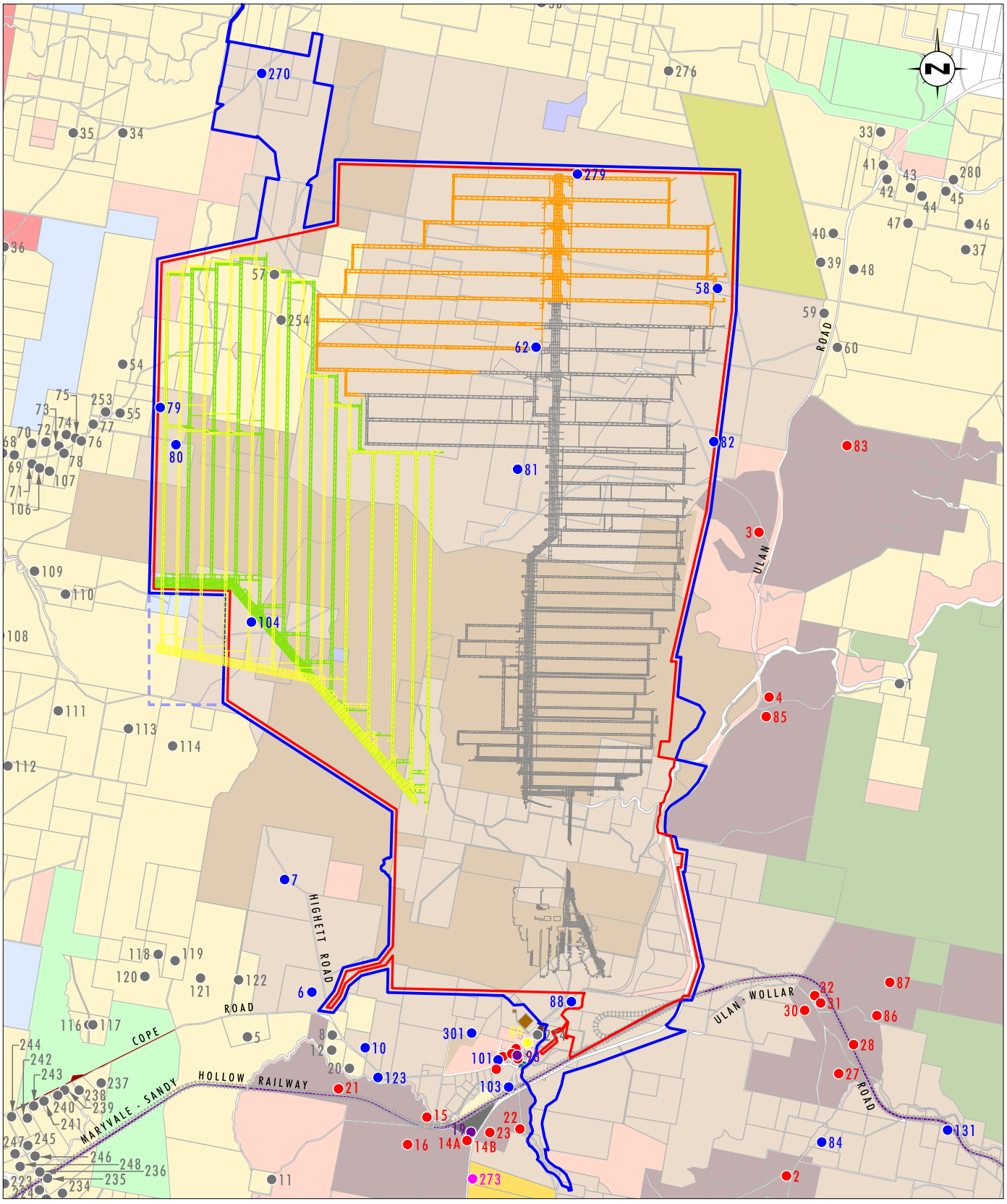
0 10 20 30km
1:550 000

Legend

- UCML Continued Operations Project Approval Area
- Conservation Reserves
- Local Government Boundary
- Rivers and Creeks

FIGURE 1.3

Regional Features Surrounding the Ulan Coal Complex



Data Source: Ulan Coal (2014)

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- MLA 475
- Approved Ulan West Mine Plan
- Proposed Ulan West Mine Plan
- Approved Ulan No.3 Underground Mine Plan
- Previous Underground Mining Operations
- NE Wiradjuri Wilpinjong Community Fund Ltd
- Birkalla Pty Ldt
- Country Energy
- Crown Land
- Crown Land Leased (UCML)
- Crown Land Leased (Private)
- Department of Education and Training
- Industrial
- Mid Western Regional Council
- Mined Owned (UCML)
- Mined Owned (Moolarben)
- National Park
- Orica Australia Pty Limited
- Private
- State Conservation Area
- State Rail Authority of NSW
- State Forests of NSW
- The State Of NSW
- Mine Owned Residence (Moolarben)
- Mine Owned Residence (UCML)
- Private Residence
- Ulan Community House
- Industrial
- Orica Australia Pty Ltd

FIGURE 1.4

Land Ownership

File Name (A4): R01/3363_018.dgn
20150304 15.34

The Ulan Coal Complex is situated in a rural area, primarily surrounded by rural landholdings, native bushland and primary industries including agriculture, forestry, mining and extractive industries. The area to the south and south-west is dominated by rural residential landholdings. Grazing is widespread throughout the surrounding area. The land within MLA475 is dominated by remnant vegetation, with some cleared areas. Limited agricultural activities, primarily grazing, currently occur in MLA475.

The land capability of the Ulan Coal Complex is of low to moderate grazing lands with varying soil quality, depth/rockiness and erosion hazard. Better quality soils are found on land associated with the Bobadeen Irrigation Scheme. The Bobadeen Irrigation Scheme is located to the east of Ulan West within the Ulan No.3 Underground mining area.

The Talbragar River alluvial lands are approximately 3 kilometres to the north-west of the Ulan Coal Complex northern mining boundary, and are used for grazing and cropping. This area is mapped as Biophysical Strategic Agricultural Land (BSAL) under the NSW Government's Strategic Regional Land Use Policy (DP&I, 2012), however, is not located within the Ulan West underground mining area or MLA475 (refer to **Section 5.9**). Grazing activities are also undertaken throughout the area to the north-east of the Ulan Coal Complex from the Golden Highway to Ulan Road.

1.2.2 Land Ownership

Land ownership within the Ulan Coal Complex and surrounds is shown on **Figure 1.4**. As indicated on **Figure 1.4**, UCML is a major landholder in the Ulan region. The proposed Ulan West underground mining area is situated beneath UCML owned land, private land and Crown land. The Crown land located within Ulan West is the subject of long term licence to UCML.

There are three landholders located within the approved Ulan West mining area that may be affected by the minor mine plan changes to the north. There will be one additional private landholder affected in the southwest of the proposed Ulan West underground mine plan modification, as compared to existing approved operations.

MLA475 is primarily situated beneath UCML owned land or Crown Land (refer to **Figure 1.4**). There are three private landholders within MLA475, one of which will be affected by the proposed modification. Current ventilation studies do not envisage any need for surface ventilation and associated infrastructure located on privately owned land within MLA475. The closest private residences associated with the southern extension of Ulan West are approximately 2 kilometres from underground mining activities and the nearest proposed upcast ventilation shaft.

1.2.3 Existing Environmental Management System

UCML has a comprehensive Environmental Management System (EMS) in place for its existing mining operations, which is consistent with PA 08_0184. UCML is committed to effective environmental management, sound environmental performance and transparent community liaison. The EMS is developed to meet Glencore requirements and is generally in accordance with ISO 14001. The EMS provides a risk based platform on which relevant environment and community controls, procedures and management plans have been established and are regularly reviewed.

The EMS contains procedures to minimise, monitor and report the overall performance of the Ulan Coal Complex operations. Operational procedures are developed to appropriately manage environmental impacts, with relevant site personnel trained in relation to these procedures. Existing EMS procedures will be applied to environmental management of the Ulan West underground mining area. Additional procedures specific to the proposed modifications will be developed as required.

As part of its EMS, UCML conducts regular environmental monitoring and auditing to gauge performance, compliance with regulatory requirements, and to minimise impacts on the surrounding community and the environment. The proposed modification will be incorporated into the EMS.

1.3 Overview of Planning Approval Process and Environmental Assessment Requirements

UCML seeks a modification to PA 08_0184 pursuant to Section 75W of the EP&A Act to provide for the proposed changes to the Ulan West mine plan and associated infrastructure. The Minister for Planning is the consent authority for the modification application. A detailed discussion of the planning context for the proposed modification is included in **Section 4.0**.

DP&E have confirmed that Section 75W is the appropriate approval path for the proposed modification to PA 08_0184 (refer to **Appendix 1**).

1.4 Project Team

This EA was prepared by Umwelt on behalf of UCML. Specialist studies undertaken as part of the EA process include:

- Subsidence Assessment – Strata Control Technologies Pty Ltd (SCT);
- Groundwater Assessment – Mackie Environmental Research;
- Aboriginal Cultural Heritage Assessment – South East Archaeology Pty Limited;
- Surface Water Resources, Noise, Greenhouse Gas and Energy, and Ecology assessments have been undertaken by Umwelt.

Further details of the Project Team are provided in **Appendix 1**.

1.5 Environmental Assessment Structure

The purpose of this EA is to identify and assess the potential environmental and social impacts associated with the proposed modification. This EA has been prepared in accordance with the requirements of the EP&A Act and the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) (refer to the EA Statement of Authorship in **Appendix 1**). An overview of the structure of this EA is provided below.

The **Executive Summary** provides a brief overview of the proposed modification and the major outcomes of the EA.

Section 1.0 provides the background and context for the proposed modification, an overview of the existing environment and approval process, and outlines the EA project team and the EA structure.

Section 2.0 contains a detailed description of the proposed modification, including existing and approved operations.

Section 3.0 describes the consultation process and the environmental and community issues identified as part of this process for detailed assessment in the EA.

Section 4.0 describes the planning context for the proposed modification, including the applicability of Commonwealth and State legislation.

Section 5.0 contains the environmental assessment of the proposed modification, including the project specific and cumulative impacts as a result of the proposed modification.

Section 6.0 details the Statement of Commitments proposed to be adopted for the proposed modification in order to mitigate impacts.

Section 7.0 provides a conclusion for the environmental assessment, justification for the proposed modification and assesses consistency with the principles of Ecologically Sustainable Development (ESD).

Section 8.0 and **Section 9.0** provide a list of references cited in the EA, and a list of abbreviations and a glossary of technical terms.

2.0 Description of Approved Operations and the Proposed Modification

2.1 Description of Existing and Approved Operations

PA 08_0184 provides for continued underground and open cut mining activities at the Ulan Coal Complex for a period of 21 years from the date of approval being August 2031. The approved mining operations at Ulan Coal Complex are shown on **Figure 2.1** and consist of Ulan West underground mine, Ulan No.3 underground mine, open cut mining operations and associated surface operations. The approved infrastructure associated with Ulan West is shown on **Figure 2.2**.

Following granting of PA 08_0184, there have been a two approved modifications to the UCML project approval, details of these modifications are outlined in **Table 2.1**.

Table 2.1 – Approved Modification to Project Approval 08_0184

Modification	Description of Modification
MOD 1 (December 2011)	Longwall extraction in the North 1 mining area. Modification of the Approved Ulan No.3 and Ulan West Mine Plans. Construction and operation of a Concrete Batch Plant.
Court Proceedings (November 2011)	Conditions modified by the November 2011 court judgement and associated Orders
MOD 2 (May 2012)	Modify Ulan West Longwalls 1-5. Remove restrictions on construction blasts. Minor amendments to European and natural heritage sites where blasting performance measures are applicable.
First Workings Approvals*	Removal of coal barrier from Ulan No.3 mine plan. Change to the first workings to increase the width of Ulan West LW 3 and LW 4. Change to extend Ulan No.3 LW 28 and LW 29. Change to width of development panels at Ulan No.3.

* Approved under Condition 25 of PA 08_0184, which states, 'The Proponent shall not carry out any first workings on site that are inconsistent with the approved mine plan without the written approval of the Director-General'.

Coal extracted at the Ulan Coal Complex is processed at the CHPP (apart from low ash coal that bypasses the CHPP), stockpiled and loaded via the dedicated Ulan Coal Complex rail loading facility for transport by rail to domestic markets or to the Port of Newcastle. The majority of coal is sold to the thermal coal export market, with the higher ash content coal from the open cut previously supplying the domestic market for power generation. The Ulan Coal Complex currently operates 24 hours per day, seven days per week, including construction and maintenance activities. UCML currently employs approximately 680 personnel.

In accordance with PA 08_0184, first longwall coal was extracted from the Ulan West area at the end of May 2014 and underground mine development on future panels is continuing.

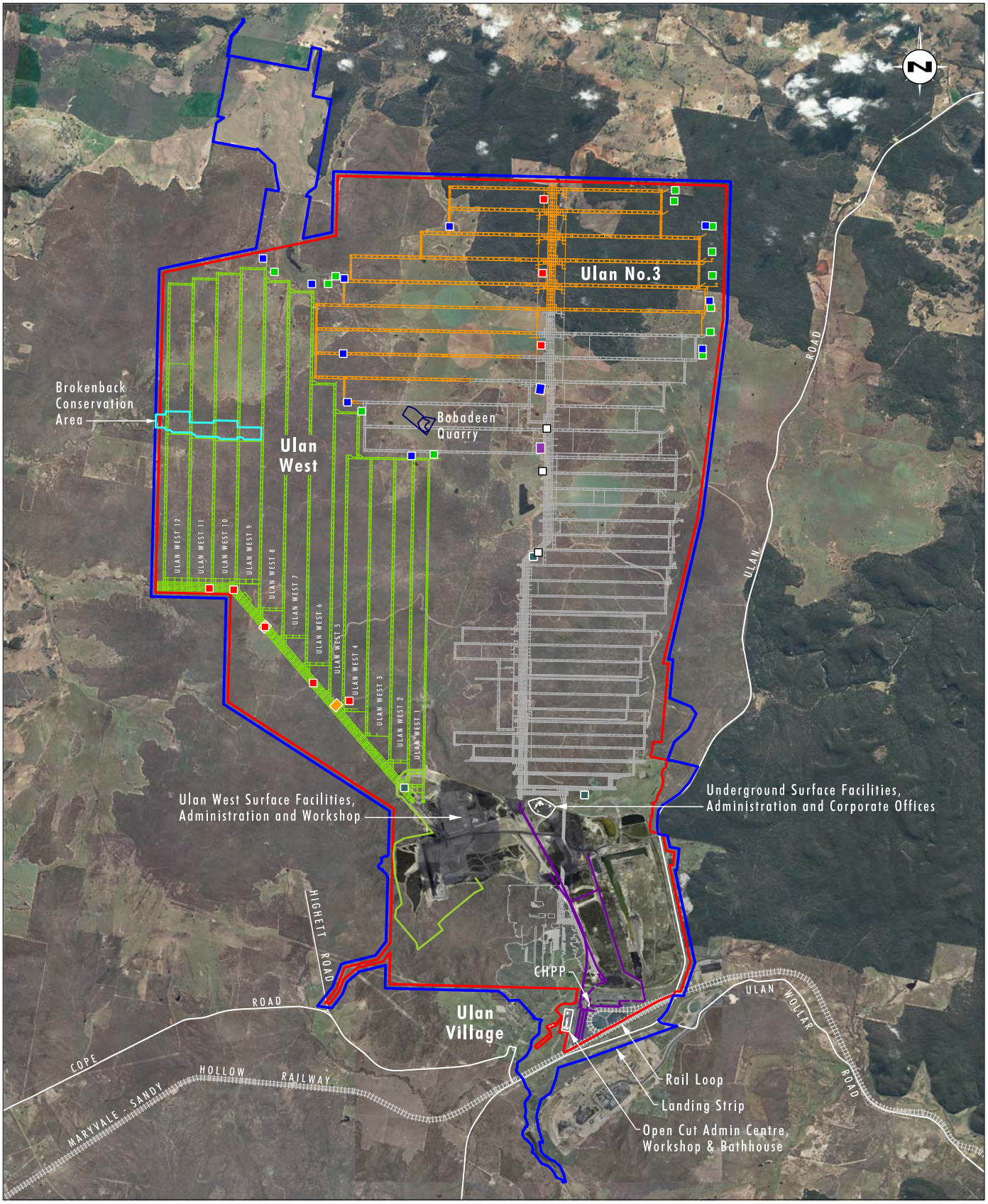


Image Source: Ulan Coal (2008, 2010, 2012, 2014)
Data Source: Ulan Coal (2013)

0 1.0 2.5 5.0km
1:100 000

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- Approved Open Cut Extension
- Approved Brokenback Conservation Area
- Bobadeen Quarry
- Approved Ulan West Mine Plan
- Approved Ulan No.3 Underground Mine Plan
- Previous Underground Mining Operations
- Conveyors
- Approved Upcast Ventilation Shaft
- Approved Downcast Ventilation Shaft
- Approved Service Borehole Facility
- Approved Man Riding Shaft
- Approved Dewatering Bore
- Existing Ventilation Shaft
- Existing Service Borehole

FIGURE 2.1

Approved Ulan Complex Operations

File Name (A4): R01/3363_019.dgn
20141015 16.31

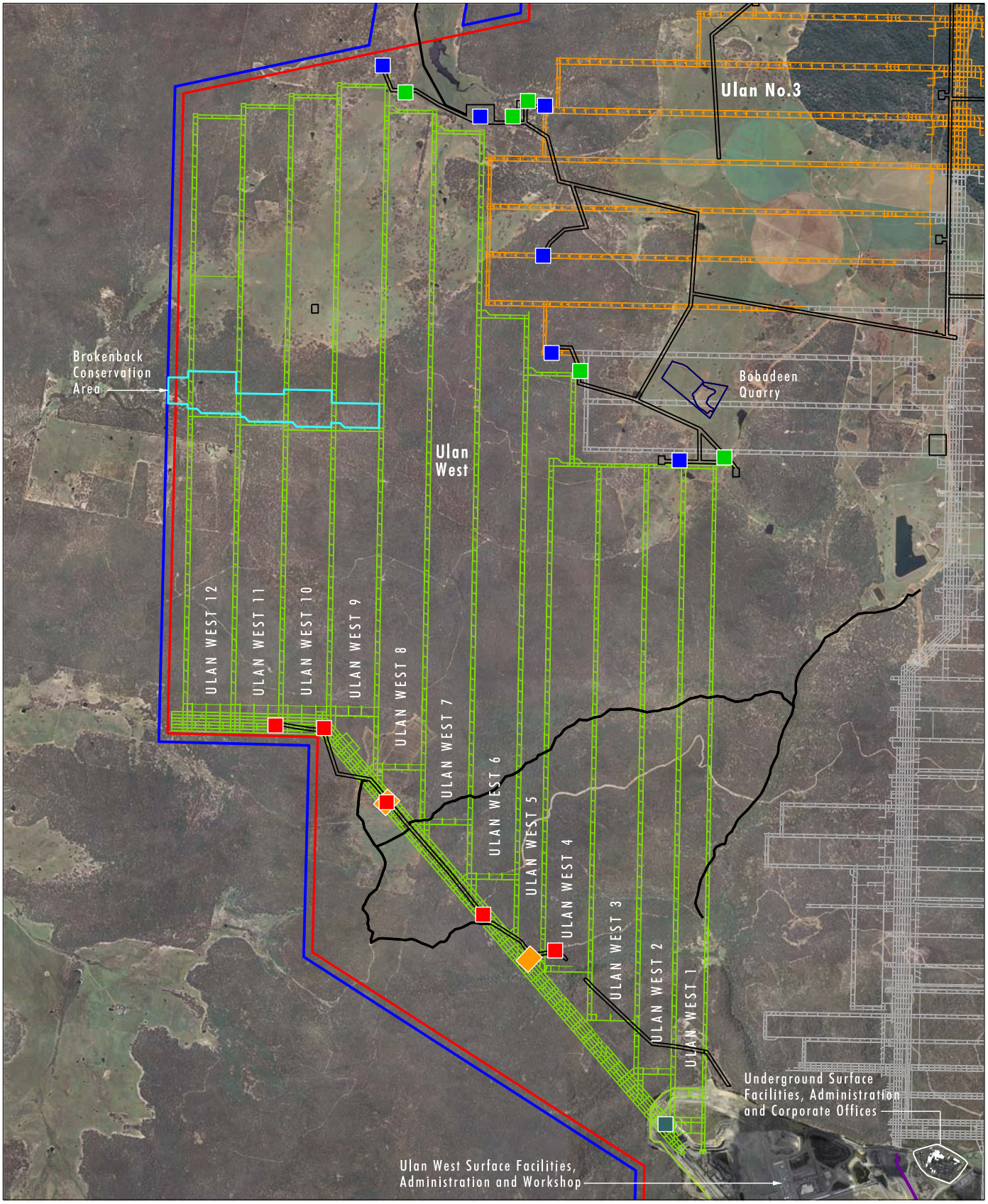


Image Source: Ulan Coal (2008, 2010, 2012, 2014)
Data Source: Ulan Coal (2013)

0 1.0 2.0 2.5km
1:50 000

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- Approved Open Cut Extension
- Approved Brokenback Conservation Area
- Bobadeen Quarry
- Approved Ulan West Mine Plan
- Approved Ulan No.3 Underground Mine Plan
- Previous Underground Mining Operations
- Conveyors
- Approved Upcast Ventilation Shaft
- Approved Downcast Ventilation Shaft
- Approved Service Borehole Facility
- Approved Man Riding Shaft
- Approved Dewatering Bore
- Existing Ventilation Shaft
- Existing Service Borehole
- Approved Infrastructure Corridor
- Existing Access Road

FIGURE 2.2

Approved Ulan Complex Operations

File Name (A4): R01/3363_054.dgn
20141029 15.39

Approved and existing on-site facilities associated with the existing Ulan Coal Complex mining operations include:

- underground mine accesses;
- CHPP and other coal processing infrastructure such as crushers and sizing stations;
- ROM and product coal stockpiles;
- train loading facilities and rail refuelling facility;
- overland and underground conveyors;
- tailings emplacement areas;
- mine ventilation infrastructure;
- service and distribution boreholes;
- administration buildings;
- workshops and stores;
- office facilities and bathhouses;
- bulk fuel and oil storage areas;
- a basalt quarry;
- various water management structures and works, including dewatering facilities, water storages, pipelines, the Bobadeen Irrigation Scheme and water treatment plants;
- power supply infrastructure;
- communications infrastructure and monitoring equipment; and
- access roads and other minor infrastructure.

As part of the ongoing development of underground mining at Ulan West there is a range of approved surface infrastructure, some of which is yet to be constructed, including:

- upcast ventilation shafts;
- downcast ventilation shafts;
- service borehole locations, one of which is co-located with a upcast ventilation shaft; and
- infrastructure corridors which allow for services including powerlines and access roads.

Approved surface infrastructure associated with Ulan West is shown on **Figure 2.2**.

2.2 Description of Proposed Modification

As described in **Section 1.0**, UCML has an existing exploration licence (EL 7542) over an area south west and an area to the north of the currently approved Ulan West mine plan (refer to **Figure 1.2**). UCML has applied for a mining lease in respect of the southern portion of EL7542 (MLA475). Since the approval of PA 08_0184 in 2010, exploration activities have been undertaken within existing mining leases and MLA475. Further exploration activities have more accurately mapped the location of a geological fault that was previously interpreted as a constraint to mining in MLA475. This exploration has determined that the feature lies further south than previously interpreted. UCML has determined that there is a viable resource within this area that can be efficiently extracted through a change to the existing Ulan West mine plan.

UCML is proposing to modify PA 08_0184 to allow for changes to the Ulan West mine plan to ensure efficient and optimised extraction of the coal resource. More specifically these changes include re-orientating the main headings and the extension of longwalls LW 6 to LW 12 by between approximately 900 and 1300 metres within existing mining leases and MLA 475. The main headings need to be re-orientated further south to access the proposed mining area after longwall LW 5 as opposed to the approved turn at longwall LW 9 (refer to **Figure 2.2**).

During 2013, UCML was granted approval by DP&E and DRE under the provisions of Condition 25 of PA 08_0184 to undertake first workings to widen longwall panels LW 3 and LW 4 from 300 metres to 400 metres wide. The proposed modification includes the repositioning of longwall panels LW 5 to LW12 which is required as a result of the previous approved changes to LW 3 and LW 4, as shown on **Figure 2.3**. The proposed repositioning to the west for LW 5 to LW 12 will generally be within the existing mining footprint and present minimal change to approved environmental impacts.

The proposed modification will produce approximately an additional 13 million tonnes of run of mine (ROM) coal and extend the life of the Ulan Coal Complex by approximately 2 years. The currently approved Ulan West mining area covers approximately 3060 ha. The proposed modification will extend this by approximately 275 ha.

The key components of the proposed modification are outlined in **Table 2.1**.

Table 2.1 – Proposed Ulan West Modification

Aspect	Currently Approved	Proposed Modification
Mine Life	21 year life until 30 August 2031	Additional 2 years until 30 August 2033
Limits on Extraction	20 million tonnes of coal per annum (including maximum of 4.1 Mtpa ROM from Open Cut)	No change
Operating Hours	24 hours per day, 7 days per week	No change
Workforce Numbers	Approximately 931 people (Complex)	No change
Mine Plan	As shown in **Figure 2.2**	Realignment of LW 5 to LW 12 including a reduction of LW 5 by approximately 170 metres and an extension of LW 6 to LW 12 between approximately 900 and 1300 metres as shown in **Figure 2.3**

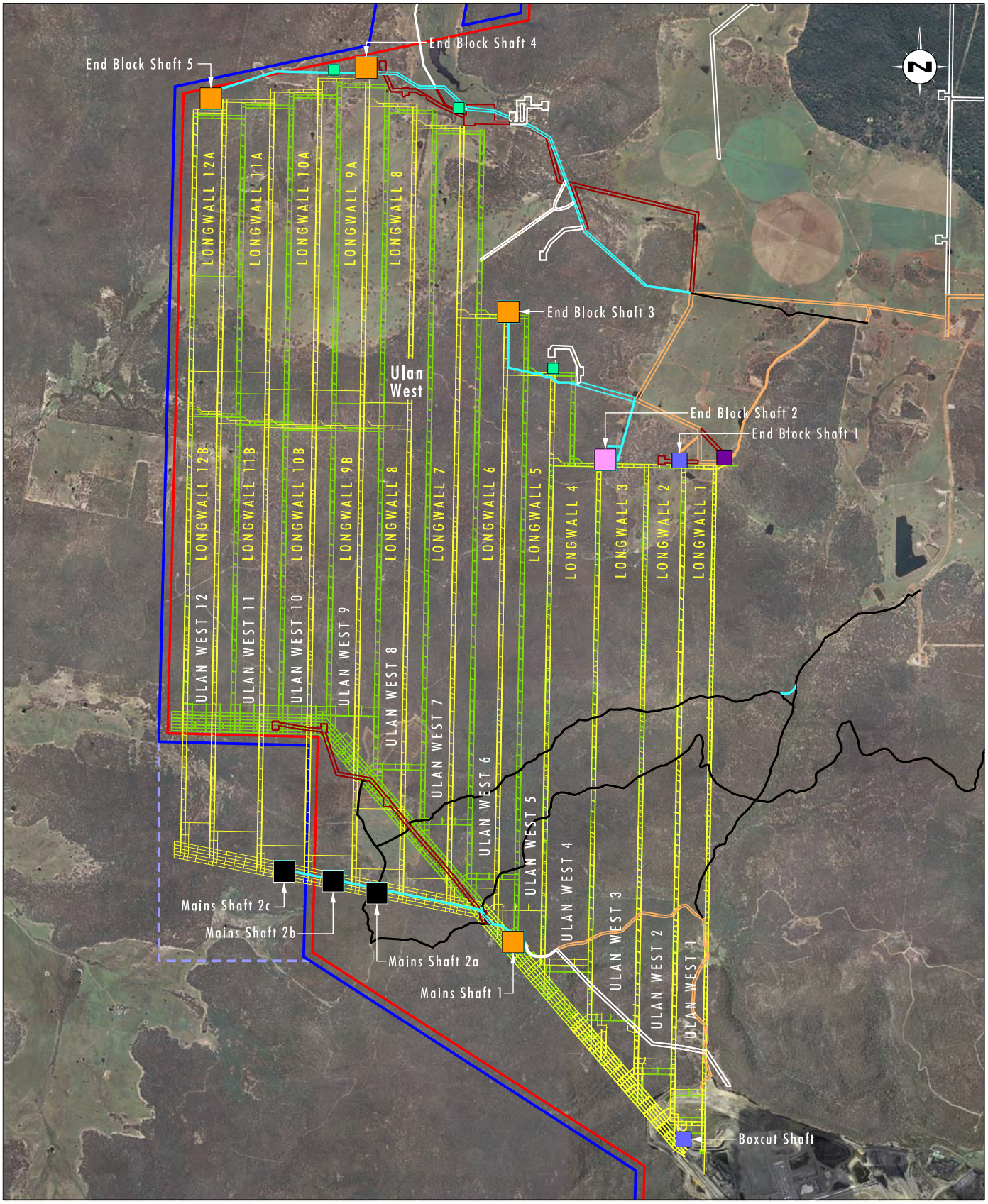


Image Source: Ulan Coal (2008, 2010, 2014)
Data Source: Ulan Coal (2014)

0 1.0 2.0 2.5km
1:50 000

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- MLA 475
- Approved Ulan West Mine Plan
- Proposed Conceptual Ulan West Mine Plan
- Approved Infrastructure Corridor
- Approved Infrastructure Corridor Not to be Constructed
- Proposed Infrastructure Corridor
- Constructed Infrastructure Corridor
- Existing Access Road
- Existing Vent Shaft Compound
- Existing Dewatering Bore Compound
- Proposed Realigned Dewatering Bore Compound
- Proposed New Ventilation Shaft Compound
- Proposed Realigned Ventilation Shaft Compound
- Potential Location of Realigned Ventilation Shaft Compound

FIGURE 2.3

Proposed Ulan West Modification

Aspect	Currently Approved	Proposed Modification
Mining Method	Ulan West – retreat longwall method	No change
Surface Infrastructure	As per Continued Operations Project EA	Changes to Ulan West infrastructure including repositioning of approved dewatering bores and ventilation shafts, and additional shafts and associated infrastructure for Ulan West mine plan
Ulan Complex Coal Handling and Preparation Plant	As per Continued Operations Project EA	No change
Coal Transportation	All coal transported from the site by rail. No more than 10 laden trains leave the site each day.	No change
Brokenback Conservation Area	As shown on **Figure 2.2**	No change

Further details of the proposed modification being sought are outlined below.

2.3 Ulan West Mine Plan

UCML is proposing to modify the Ulan West mine plan to reduce the length of LW 5 by approximately 170 metres, and reposition and extend LW 6 to LW 12 in the order of 900 to 1300 metres within existing mining leases and MLA 475 (refer to **Figure 2.3**). The proposed modification will increase the Ulan West underground mining area by approximately 275 ha.

The first workings approval to LW 3 and LW 4 resulted in the widening of longwall panels LW 3 and LW 4 by approximately 100 metres from 300 metres to 400 metres wide. Accordingly, the remaining Ulan West longwall panels are proposed to be repositioned to the west to accommodate the widening of LW 3 and LW 4. This current modification proposes to address the repositioning to the west that will be required from the previous changes to LW 3 and LW 4, as shown on **Figure 2.3**. Some minor change to the northern extent of the Ulan West longwall panels is required to accommodate the western shift (refer to **Figure 2.3**). The proposed repositioning to the west of LW 5 to LW 12 will generally be within the existing mining footprint and present minimal change to approved environmental impacts.

The proposed modification will not result in any impact on Brokenback Conservation Area. The conservation values of the area, including cliff lines that contain rockshelters that are significant from a cultural heritage perspective and significant habitat for cave dwelling bats are protected in a manner consistent with the existing project approval requirements.

UCML is proposing to modify PA 08_0184 to allow for mine plan changes to Ulan West. In order to accommodate the proposed changes to the Ulan West longwall layout, the main headings need to be turned after LW 5 (refer to **Figure 2.3**).

The proposed modification will produce approximately an additional 13 million tonnes of ROM coal and extend the life of the Ulan Coal Complex by approximately 2 years.

The proposed modification to Ulan West, specifically the realignment of LW5, would potentially result in a small area of coal resource currently approved for extraction by Ulan West, not being mined. The proposed modification does not intend to sterilise this coal resource. The area of coal (referred to as the Interaction Zone) is located between the Ulan West and Ulan No.3 underground mining operations (refer to **Figure 2.4**). The coal may be

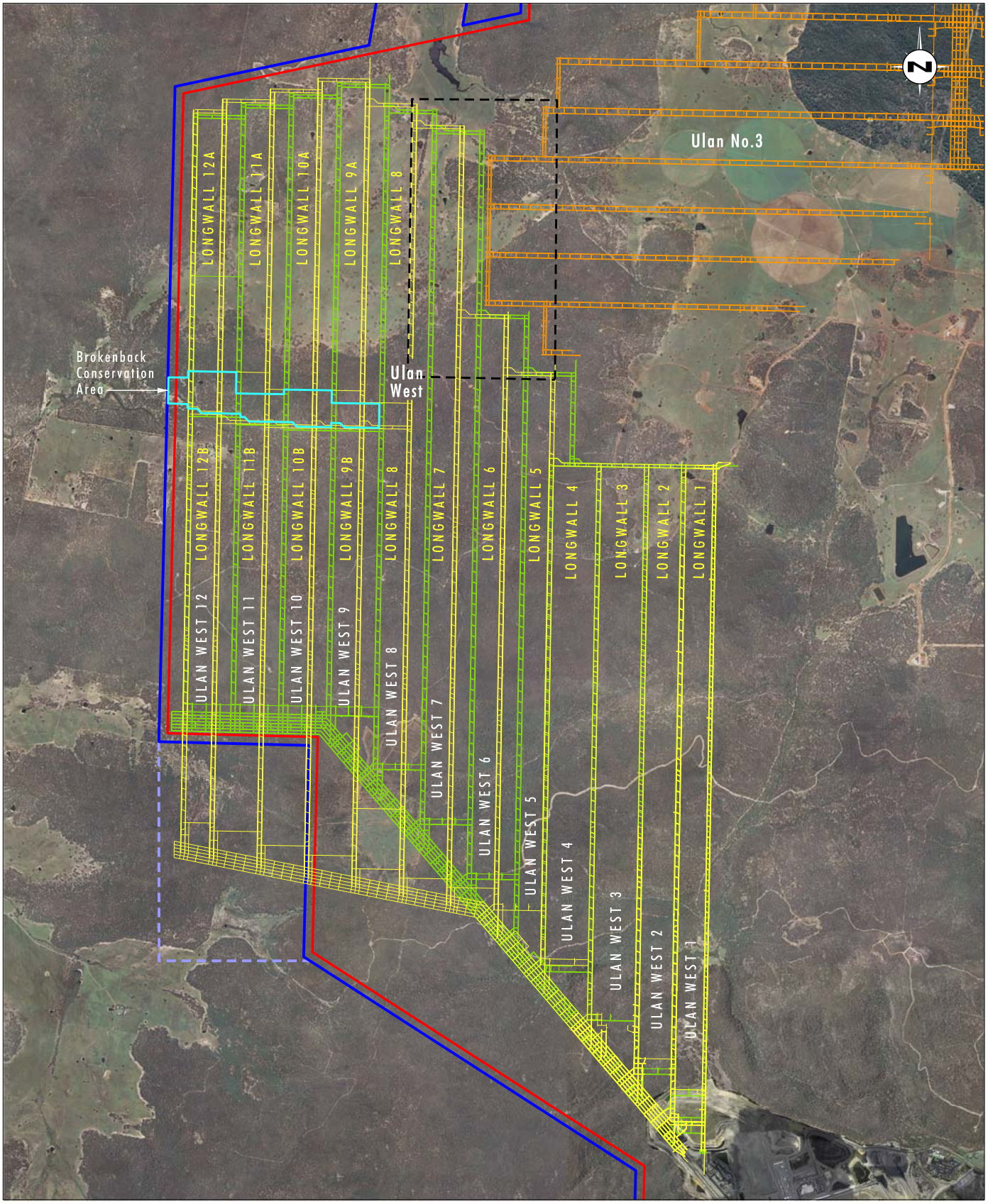


Image Source: Ulan Coal (2008, 2010, 2014)
Data Source: Ulan Coal (2014)

0 1.0 2.0 2.5km
1:50 000

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- MLA 475
- Approved Brokenback Conservation Area
- Approved Ulan West Mine Plan
- Proposed Conceptual Ulan West Mine Plan
- Approved Ulan No.3 Underground Mine Plan
- Interaction Zone

FIGURE 2.4

Ulan West - Ulan No.3 Interaction Zone

File Name (A4): R01/3363_076.dgn
20150217 10.35

accessed by either Ulan West or Ulan No.3 depending on operational needs and detailed scheduling of the two underground mining operations (refer to **Section 2.8**).

The environmental impacts within the Interaction Zone were assessed as part of the UCCO Project EA and subsequently approved within PA 08_0184. The potential environmental impacts associated with the proposed modification within the Interaction Zone are consistent with the approved operations, apart from impact to one archaeological site (ID#822 (refer to Appendix 6 of **Appendix 6**)) located within the Interaction Zone. Further details are provided in **Section 5.6**.

The proposed modification intends to preserve the previously approved level of impact. Refinements to the mine plan will be in response to geotechnical, coal marketing and operational logistical factors, the timing of which cannot be predicted currently. Consequently, the provisions of Schedule 3, Condition 25 of the PA 08_0184 will be applied to seek approval for the refinements to the mine plans to access the coal resources within the Interaction Zone.

2.3.1 Approved Conservation Areas

The purpose of the 58 hectare Brokenback Conservation Area is to avoid impact on significant rock shelter sites within this area. The Brokenback Conservation Area is currently located across four longwall panels, Ulan West LWs 9 to 12 as shown on **Figure 2.1**. The mechanism for ensuring the long term conservation of the Brokenback Conservation Area is currently being considered by DP&E and the Commonwealth Department of the Environment (DoE).

The Brokenback Conservation Area was established to protect rock shelters that are significant from a cultural heritage perspective and results in ecological benefit in terms of reducing the extent of impact on cliff lines which have been confirmed to provide habitat for threatened cave dwelling bats. The Brokenback Conservation Area focused on the protection of six high significance rock shelter sites that would be susceptible to impacts.

The proposed Ulan West mine plan has been designed to maintain the Brokenback Conservation Area and in doing so protect the cliff line features located within it, including protecting high significance archaeological sites that would be susceptible to impacts.

2.4 Surface Infrastructure

As a result of the proposed changes to the mine plan, the location of approved ventilation and dewatering infrastructure will need to be modified to align with the proposed changes to the main headings and longwall locations. In addition, further ventilation studies undertaken have indicated that an additional ventilation shaft will be required in order to safely operate Ulan West and have been included as part of the proposed modification.

2.4.1 Ventilations Shafts and Service Boreholes

There are currently seven ventilation shafts, five service boreholes and four dewatering boreholes approved for Ulan West (refer to **Figure 2.2**). Approved ventilation shafts, service boreholes and dewatering boreholes yet to be constructed will require relocation as part of the proposed changes to the Ulan West Mine plan. The proposed modification includes the installation of an additional one ventilation shaft to service Ulan West based on the review of ventilation requirements (refer to **Figure 2.3**). There will be no change to constructed ventilation shafts, service boreholes and dewatering boreholes.

There are currently five service boreholes and three upcast ventilation shafts approved in the southern portion of Ulan West, primarily situated along the main headings (refer to **Figure 2.2**). One ventilation shafts has been constructed at the southern end of LW 1 (refer to **Figure 2.3**) to support the current Ulan West operations. The proposed modification will not require any additional ventilation shafts in the southern portion of Ulan West, rather realignment of two approved ventilation shafts that are yet to be constructed. One ventilation shaft is to be constructed at the southern end of LW 5, while there are three potential locations for the remaining ventilation shaft (refer to **Figure 2.3**). The final location of the third ventilation shaft will be dependent on ventilation requirements as Ulan West progresses. Service boreholes may be co-located within the proposed ventilation shaft compounds where practicable to minimise surface disturbance.

There are currently four downcast ventilation shafts approved at the northern end of longwalls in Ulan West (refer to **Figure 2.2**). One ventilation shaft has been constructed at the northern end of LW 2 to support the current Ulan West operations. The proposed modification will require the remaining three ventilation shafts to be relocated to service the proposed realigned longwall panels as well as an additional ventilation shaft (refer to **Figure 2.3**).

The conceptual location of the ventilation shafts are presented in **Figure 2.3**. UCML has designed the ventilation infrastructure to avoid significant environmental features, where practicable, including threatened ecological communities and Aboriginal archaeological sites.

Construction of the proposed Ulan West ventilation shafts will require a construction footprint of approximately 200 metres by 200 metres. Following construction of the ventilation shafts the area required to service the ventilation shafts is expected to reduce to approximately 170 metres by 100 metres during the sites operational phase. Following completion of mining within the longwall subject to ventilation, the shafts will be decommissioned to maintain underground safety by preventing unwanted air from entering the goaf. Upon decommissioning of the ventilation infrastructure site the disturbance footprint will be rehabilitated in accordance with UCML's approved rehabilitation strategies as provided in the Ulan Coal Complex Integrated Mining Operations Plan (IMOP) and Biodiversity Management Plan (BMP).

End block ventilation shafts are proposed to be down-cast ventilation (passive) sites throughout the operating lifespan. Up-cast ventilation shafts will include the installation of fans and associated infrastructure. The fan modules will extract air from the underground mining areas via the ventilation shafts to maintain safe underground conditions. The down-cast sites are proposed to be operated without fan infrastructure and will provide fresh air to the mine ventilation system to maintain suitable ventilation.

The duration of construction related disturbance for each ventilation shaft will be relatively short (i.e. in the order of five to seven months) and directly linked to the progression of underground mining in Ulan West. The number of ventilation shafts operating at any one time as upcast ventilation sites will be typically no more than two, with no more than an additional two downcast ventilation shaft operating in concurrence.

2.4.2 Dewatering Bores

There are four dewatering bores currently approved for Ulan West (refer to **Figure 2.2**). One dewatering bore has been installed and is in operation. The location of the remaining three dewatering bores will be modified to accommodate the change to the Ulan West mine plan. The footprint of the dewatering bores is likely to be approximately 100 metres by 100 metres during construction. The footprint of the dewatering bore during operation, once construction activities have been rehabilitated, is likely to be smaller.

2.4.3 Supporting Infrastructure

To facilitate development of the proposed additional ventilation infrastructure in Ulan West, ancillary infrastructure is required for both construction and operation of ventilation infrastructure. Ancillary infrastructure will include:

- access tracks;
- water supply pipelines; and
- electricity transmission lines.

Proposed supporting infrastructure will be located within the previously approved disturbance footprint and/or will be co-located to reduce additional disturbance, where possible (refer to **Figure 2.3**).

An infrastructure corridor is currently approved to align with the approved Ulan West main headings. The proposed modification will result in the Ulan West main headings being turned after LW 5. As a result, the infrastructure corridor which accommodates services required to support ventilation fans, will need to be realigned to service the location of the modified main headings (refer to **Figure 2.3**). The proposed infrastructure corridors have been designed to consolidate and minimise impact footprints where practicable. Minor refinement of these locations may be required during the detailed design phase of the proposed modification. Where surface infrastructure is required to be moved as a result of the detailed design process, it will be relocated to ensure that the impacts associated with the final design and location are not significantly greater or different than that associated with the conceptual locations.

As outlined in **Table 2.1**, there are no changes to other surface infrastructure as a result of the proposed modification.

In order to accommodate the changes to the ventilation shafts, upgrades to existing access tracks will be required for LW 1 to LW 8 as well as additional access for end of longwall ventilation shafts from LW 9 to LW 12 (refer to **Figure 2.3**). Development of new ventilation infrastructure in Ulan West requires the upgrading of existing access roads to allow heavy vehicle access during the construction phase and light service vehicles during operation of the proposed ventilation infrastructure. The alignment of access tracks will be located within designated infrastructure corridors (refer to **Figure 2.3**), where practicable.

The ventilation shaft construction process requires a continuous supply of water to support shaft stability during ventilation shaft boring. Process water for blind boring operations will be sourced primarily from groundwater make during the construction process, with additional water to be supplemented with water sourced from the broader Ulan Coal Complex water management system.

Recycling of process water will be employed where possible, with continuity of supply assured through laying water pipelines to link to the existing Ulan Coal Complex water management system. The water pipelines will be above ground and located within previously approved disturbance corridors and/or within the access track corridors. Water infrastructure associated with the ventilation constructions sites will be designed to suitably manage surplus process water.

The modified ventilation infrastructure requires amendments to the configuration of electricity transmission lines within Ulan West. The proposed configuration will include both 66 kV and 11 kV transmission lines. The alignment of electricity transmission lines will be located within designated infrastructure corridors (refer to **Figure 2.3**).

The construction process will include appropriate pre-clearance inspections in accordance with the Environmental Management Plans, specifically the Heritage Management Plan (HMP) and the Biodiversity Management Plan (BMP) to ensure that supporting infrastructure minimises surface disturbance and environmental impact as far as practicable and in accordance with project approval requirements.

2.5 Mine Workforce and Hours of Operations

There will be no change to the approved Ulan Coal Complex workforce as a result of the proposed modification and mining operations will continue to operate 24 hours per day, seven days per week.

2.6 Environmental Management

UCML has an Environmental Management System (EMS) in place for the existing underground and open cut mining operations. The Ulan Coal Complex EMS includes environmental management plans and procedures that have been developed to satisfy the requirements of Glencore policies and relevant legislative requirements. These documents provide the strategic context for the environmental management of the Ulan Coal Complex.

The EMS has been developed generally in accordance with ISO 14001. The EMS includes a number of environmental management plans that have been prepared to assist in the management of key environmental issues. Many of these plans have been prepared to satisfy the requirements of PA 08_0184 and have therefore been prepared in consultation with relevant government agencies and approved for implementation by DP&E.

The proposed modification is a continuation of the existing Ulan West operation integrated with the existing Ulan Coal Complex management system will be updated to address issues specific to the proposed modification.

The EMS contains procedures which provide directions for the successful implementation of the EMS, including aspects such as monitoring, external communication, environmental risk assessment and training. Operational procedures have also been developed to appropriately manage areas of residual risk, with all relevant site personnel trained in relation to these procedures. Where appropriate, existing EMS and operating procedures will be applied for the proposed modification, with additional procedures developed as required.

The key existing management plans for the Ulan Coal Complex that will assist in the management of mining operations undertaken for the proposed Ulan West operations include the:

- Biodiversity Management Plan – discusses management and enhancement of remnant vegetation and habitat areas and describes in detail the rehabilitation processes and management of protected and offset areas;
- Bushfire Management Plan – defines procedures and hazard mitigation measures;
- Heritage Management Plan (HMP) – outlines the programs and procedures for management of Aboriginal cultural heritage and European heritage sites;
- Noise Management Plan – defines noise mitigation and monitoring measures, and specifies noise controls;

- Water Management Plan – outlines design criteria and specifies controls to be implemented;
- Erosion and Sediment Control Plan – describes the measures to minimise soil erosion;
- Waste Management Plan – outlines the waste management principles and program for the site; and
- Social Involvement Plan – outlines the approach to community involvement and stakeholder engagement.

Details of how these plans will be applied to the proposed modification, including required revisions or updates, are discussed in the relevant environmental assessment section of this report (refer to **Section 5.0**).

2.7 Need for and Benefit of Proposed Modification

The proposed modification to the Ulan West mine plan will allow efficient access to additional coal resources within MLA475 and existing mining leases that otherwise are unlikely to be recovered. These additional resources are primarily located within UCML owned land or Crown land. There will be one additional private landholder affected by the proposed modification, as compared to existing approved operations.

As previously discussed, an east-west trending fault was thought to limit the ability to mine south of the currently approved main headings of Ulan West. Further exploration activities have more accurately mapped the location of the fault and determined that the feature lies further south than previously interpreted. The proposed modification to the Ulan West mine plan would allow UCML to access known coal reserves within MLA475. If the Ulan West mine plan is not modified, these resources are not of sufficient scale to support a separate mining proposal and therefore are unlikely to be recovered.

The proposed modification to the Ulan West mine plan has been designed to result in minimal additional environmental impacts and integrate efficiently with the existing approved operations at the Ulan Coal Complex. The proposed modification will provide access to an additional 13 Mt ROM coal resource that will extend the approved life of Ulan West and the broader Ulan Coal Complex for an additional two years. The proposed modification will optimise the use of existing infrastructure, including coal handling and preparation, water management systems and infrastructure, offices and ancillary facilities, without requiring any further modifications to this existing infrastructure. The proposed modification will be managed in accordance with the existing EMS, as outlined in **Section 2.6** and **Section 5.0**.

The extension of the approved mine life to provide for the recovery of additional coal resources as part of Ulan West operations, enables UCML to continue to provide the following benefits to the community (Umwelt, 2009):

- average annual economic contribution of approximately $214 million to the NSW economy during the additional two years of mining operations at Ulan West;
- continued employment for a further two years of up to approximately 340 employees for Ulan West operations, with many more indirect jobs created through flow-on effects;
- payment of significant royalties to the State of NSW; and
- significant export earnings for Australia.

2.8 Alternatives to the Proposed Modification

The main alternative to the proposed modification is a 'do nothing' scenario. If UCML were to not pursue a modification to the existing Ulan West mine plan, approximately 13 million ROM tonnes of mineable coal resource would be sterilised because it would most likely be uneconomic to recover that coal resource at a future point in time when the Ulan West mine and associated infrastructure did not exist. The 'do nothing' approach would result in loss of economic and social benefits for the local area, region and State of NSW.

The proposed mine plan is predicated on turning the main headings after LW5. If UCML are unable to secure approval in time, an alternate mine plan would need to be developed. An alternate mine plan would result in a substantial loss in coal reserves that could be accessed. The proposed mine plan is considered the most economic efficient means to access the known coal reserves.

The project design has attempted to limit the potential environmental impacts associated within the proposed modification. Alteration to the originally proposed layout of the proposed surface infrastructure area was made in order to avoid areas of White Box Woodland Threatened Ecological Community (TEC). This was completed in a number of phases throughout the project design phase, with infrastructure overlain on vegetation mapping and where possible, infrastructure moved to avoid areas of White Box Woodland TEC. Priority was placed on avoiding the treed variants of White Box Woodland TEC where possible, with impact focused on grassland variants where impact to the TEC was unavoidable in certain areas.

The proposed modification to the Ulan West mine plan has been designed to result in minimal additional environmental impacts and integrate efficiently with the existing approved operations at the Ulan Coal Complex.

Conceptual alternatives for mining the Interaction Zone are shown on **Figure 2.5**. Detailed mine planning and operational requirements will determine the most efficient means of extracting the coal from within the indicated Interaction Zone. This would involve either extending Ulan No.3 longwall panels to the west or extending the panels of Ulan West to the north (refer to **Figure 2.5**) , or a combination of longwall extensions from both Ulan No.3 and Ulan West that is efficient and maintains a 50 metre barrier between the two underground operations.

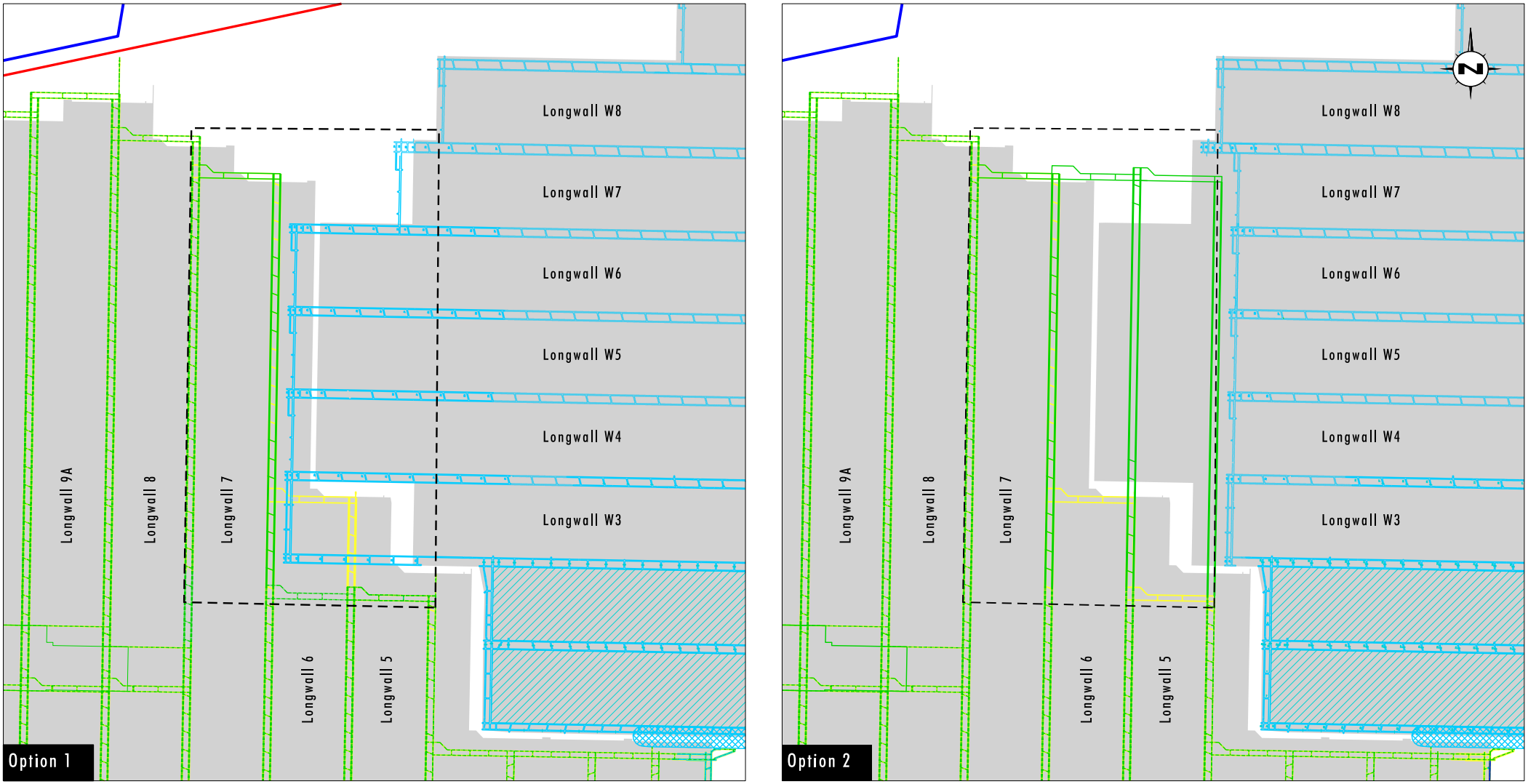


Image Source: Ulan Coal (2008, 2010, 2014)
Data Source: Ulan Coal (2014)

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- Interactive Zone
- Proposed Conceptual Ulan West Mine Plan
- Approved Underground Mining Area
- Ulan West Conceptual Mine Plan Option
- Ulan No.3 Conceptual Mine Plan Option
- Previous Underground Mining

FIGURE 2.5

Alternative Mine Plans to Access the Interaction Zone

3.0 Stakeholder Consultation and Identification of Key Environmental Issues

UCML has an established relationship with the surrounding community and other stakeholders and has implemented a process for ongoing engagement regarding its mining operations. As part of the proposed modification, UCML is committed to working with the community to ensure it can continue to coexist with the local community.

The purpose of the engagement process is to provide the opportunity for the community and other stakeholders:

- to provide information to UCML for consideration in its project planning for the Ulan Complex;
- to identify community and other stakeholder needs, concerns and opportunities; and
- to be involved in the environmental and social assessment process.

3.1 Agency and Local Government Consultation

The following Federal, NSW State and Local Government agencies have been consulted on the proposed modification:

- DP&E - meeting was held between the project team and DP&E on 30 April 2014 to discuss the proposed modification;
- DRE - a Conceptual Mine Plan Meeting was held on 1 May 2014 . A letter was received from DRE on 6 May 2014 stating:

  > DRE supports the proposed Ulan West Mine Plan Extension Project as a responsible utilisation of the State's valuable coal resources and supports the project proceeding through the State's comprehensive development assessment and approval process.

- Mid Western Regional Council – a meeting was held on 14 May 2014 to discuss the proposed modification. A further briefing was presented on 4 June 2014 at an Ordinary Meeting of Mid Western Regional Council. A pre-lodgement briefing outlining the impact assessment outcomes was provided to the Manager of Planning on 13 January 2015. This presentation was then circulated by the Manager of Planning to council representatives;
- DoE – a meeting was held between the project team and DoE on 14 August 2014 to discuss the proposed modification and initial assessment findings. Correspondence was provided on 12 October outlining the proposed modification and the results of the groundwater and ecological assessment; and
- Crown Lands – a meeting was held in late 2013 in regards to the MLA475 application and the proposed modification. Further correspondence has also been provided to Crown Lands providing further details in relation to the MLA475 application and the proposed modification during December 2014;
- OEH – ongoing consultation in relation to the site verification process has been undertaken during late 2014 and early 2015; and

- NOW – a meeting was held between the project team and NOW on 22 January 2015 to discuss the proposed modification and the results of the groundwater and surface water impact assessments. The meeting also included a discussion of ongoing water licensing requirements.

The briefings to Mid Western Regional Council and agencies have outlined the key aspects of the modification in terms of project design and the approach to the environmental assessments and stakeholder engagement program.

3.2 Community and Other Stakeholder Engagement

Consultation with the community and other stakeholders was undertaken through newsletters, the Ulan Coal Complex Community Consultative Committee (CCC) meetings and individual landholder meetings.

Members of the Ulan Coal Complex CCC were first briefed on the proposed modification during May 2014. As a CCC meeting was not scheduled during this time, members were consulted individually by a representative of UCML. Further details were provided to the Ulan Coal Complex CCC during a scheduled meeting on 5 June 2014, including details on the proposed modification, including an update on environmental studies. Assessment findings were presented at a CCC meeting on 4 December 2014 which was attended by key project team members. Additional information was provided at the request of some CCC members.

The Ulan Coal Complex Newsletter issued in August 2014 contained a description of the proposed modification and information on how members of the community could obtain more information. The Ulan Coal Complex Newsletter was sent to approximately 500 residences and businesses in the local area.

Correspondence, including project details, was also provided to all landholders located within the Ulan West mining area and MLA475. The opportunity to meet with UCML in regards to the proposed modification was offered to these landholders. Individual meetings were requested and have been held with landholders to discuss the existing operations at the Ulan Coal Complex, the mining lease application and the proposed modification. Other landholders requested consultation via telephone. These meetings and conversations were held during April and May 2014. Some landholders located within the Ulan West mining area and MLA475 did not request a meeting with UCML. .

The same landholders, as well as the broader community, were also consulted during the mining lease application process for MLA475. This included landholder meetings with two private residences located within MLA475.

The key issues raised by the community relating to the proposed modification included:

- water resources, including groundwater and surface water;
- subsidence;
- biodiversity;
- property value; and
- visual impacts associated with ventilation infrastructure.

These are consistent with the types of matters raised by the community in relation to the current approved operations at the Ulan Coal Complex.

All landholders located within the subsidence affectation zone of the proposed modification and/or within the MLA475 footprint have been consulted to discuss the assessment outcomes. This has included meeting with five landholders and corresponding with a further one via telephone and email. The majority of landholders had no concerns with the proposed modification. Specific landholder's raised concerns in relation to their properties with respect to subsidence impacts, property value and the ability to sell their property, visual impacts associated with ventilation infrastructure and the integrity of their water bore. UCML are continuing to consult with landholders in relation to their concerns. A full copy of this EA will also be provided to all potentially impacted landholders.

UCML also consulted with registered Aboriginal stakeholders as part of Aboriginal Cultural Heritage Assessment for the proposed modification. Further details of the consultation undertaken with the registered Aboriginal stakeholders are provided in **Section 5.6** and **Appendix 6**.

The key community issues raised for existing and future operations have been subject to detailed environmental assessments as part of this EA detailed further in **Section 5.1**.

4.0 Planning Considerations

The following section identifies the relevant Commonwealth and State planning and environmental legislation, including the relevant planning approval process applicable to the proposed modification.

4.1 Commonwealth Legislation

Table 4.1 provides a review of the relevant Commonwealth environment and planning legislation and its relevance to the proposed modification.

Table 4.1 – Summary of Commonwealth Legislation and Relevance to the Proposed Modification

Planning Provision	Comments	Further Approval Required
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Under the EPBC Act, approval from the Minister for the Environment is required for any action that would result in a significant impact to Matters of National Environmental Significance (MNES). MNES are defined in the following categories: • World Heritage property; • National Heritage place; • Wetlands of international importance (Ramsar wetland); • Threatened species and communities listed under the EPBC Act; • Migratory species listed under the EPBC Act; • Nuclear actions; • Marine areas or reserves; • a water resource, in relation to coal seam gas development and large coal mining development; and • Commonwealth land. As outlined in **Section 5.5**, an ecological assessment was undertaken within the proposed modification which identified species and communities listed under the EPBC Act that would potentially be impacted by the proposed modification. The proposed modification was assessed to not have a significant impact on any species and communities listed under the EPBC Act. The proposed modification was also assessed to not result in a significant impact on water resources, as discussed in **Section 5.3** and **Section 5.4**.	No, subject to confirmation by DoE

Planning Provision	Comments	Further Approval Required
Native Title Act 1993	The *Native Title Act 1993* is administered by the National Native Title Tribunal who is responsible for maintaining a register of Native Title claimants and bodies to whom Native Title rights have been gained. The Act prescribes that Native Title can be extinguished under certain circumstances, including the granting of freehold land. The proposed Ulan West underground mining area consists of UCML owned land, freehold land and Crown owned land. Native Title is not applicable to the freehold land but may be applicable to the Crown land. There is currently no known Native Title claim on the Crown Land within the proposed Ulan West underground mining area.	No

4.2 New South Wales Legislation

4.2.1 *Environmental Planning and Assessment Act 1979*

As discussed in **Section 1.0**, it is proposed to modify PA 08_0184 pursuant to section 75W of the EP&A Act. Further details of this approval path are provided below.

Part 3A of the EP&A Act has been repealed, however, Schedule 6A, Clause 3 of the EP&A Act provides for the continued use of Section 75W to modify the project approval granted under Part 3A of the Act (known as Transitional Part 3A Projects). Schedule 6A, Clause 3(1) of the EP&A Act states:

3 Continuation of Part 3A—transitional Part 3A projects

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

DP&E have confirmed that section 75W of the EP&A Act is the appropriate approval path for the proposed modification.

4.2.1.1 Permissibility

UCML's operations are wholly located within the area to which the Mid Western Regional Local Environmental Plan 2012 (Mid Western Regional LEP) applies.

The land which is the subject of the proposed modification is within the Mid Western Regional LGA Zone RU1 Primary Production and E3 Environmental Management. Underground mining is permitted with consent in the RU1 Primary Production zone but prohibited in the E3 Environmental Management zone.

Clause 7 of State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP) provides that development for the purposes of underground mining may be carried out on any land with development consent. The Mining SEPP prevails over the Mid Western Regional LEP as Clause 5 of the Mining SEPP states:

> *'(3) Subject to subclause (4), if this Policy is inconsistent with any other environmental planning instrument, whether made before or after this Policy, this Policy prevails to the extent of the inconsistency.'*

Subclause 4 lists the policies that Subclause (3) does not apply to and does not include the Mid Western Regional LEP. Accordingly under the Mining SEPP, underground mining is permissible with consent and the Minister can approve the application.

4.2.2 Other State Legislation

4.2.2.1 Mining Act 1992

Under the *Mining Act 1992* (Mining Act) a Mining Lease is required before any mining or specified mining purpose can be carried out on the land. The Ulan West mine plan area is currently covered by ML1341, ML1468 and CCL741. The proposed modification will continue to operate within these leases.

Part of the proposed modification is located within EL 7542. An application to convert the southern portion of EL 7542 to a Mining Lease has been lodged with DRE (MLA 475). A Mining Lease cannot be granted until development consent or a project approval has been granted over the area.

All mining operations must be subject to a Mining Operations Plan (MOP) approved by the Director General of DRE.

A summary of the other State environmental and planning legislation potentially relevant to the proposed modification is provided in **Table 4.2**.

Table 4.2 – Summary of State Legislation and Relevance to the Proposed Modification

Act	Comment	Further Approval Required for Proposed Modification
Coal Mine Health and Safety Act 2002	The principal aim of the *Coal Mine Health and Safety Act 2002* is to secure the objectives of the *Work Health and Safety Act 2011* in relation to coal operations. It does this by imposing certain specific safety requirements on coal mines. This includes the requirement to comply with minimum barriers for underground mining workings and the requirement to obtain consent from the Minister for Mineral Resources for the establishment of emplacement areas. No new emplacement areas will be required as a result of the proposed modification.	No
Protection of the Environment Operations Act 1997 (PoEO Act)	The PoEO Act is administered by Office of Environment and Heritage (OEH) and requires licences for environmental protection including waste, air, water and noise pollution control. UCML currently holds EPL 394. UCML will seek a variation to EPL 394 to provide for any changes resulting from the proposed modification as required.	Yes

Act	Comment	Further Approval Required for Proposed Modification
Water Management Act 2000	This Act regulates the taking, interception, storage and use of surface water and groundwater within areas subject to water sharing plans. Part of the proposed modification is located within the Water Sharing Plan for the NSW Murray-Darling Basin Porous Rock Groundwater Sources 2011. An increase to the existing licence allocation may be required. The proposed modification will not require approval under sections 89, 90 or 91 of the WM Act due to the operation of section 75U of the EP&A Act.	Yes
Water Act 1912	This Act has been largely replaced by the Water Management Act 2000; however, some of the licensing provisions remain in force where the water source is not covered by a water sharing plan. A variation to the existing Part 5 licences may be required as a result of the proposed modification in relation to volume of extraction.	Yes
Environmentally Hazardous Chemicals Act 1985	The OEH is granted power under the *Environmentally Hazardous Chemicals Act 1985* to assess and control chemicals and declare substances to be chemical wastes. A licence is required for any storage, transport or use of prescribed chemicals. The proposed modification will not result in any changes to the storage, transport or use of prescribed chemicals. No further approvals will be required.	No
National Parks and Wildlife Act 1974 (NPW Act)	This Act is the principle legislation dealing with the management of Aboriginal heritage and protection of native flora and fauna. A detailed Aboriginal Cultural Heritage Assessment has been undertaken for the proposed modification (refer to **Section 5.6**). No further approvals are required under the NPW Act.	No
Heritage Act 1977	The *Heritage Act 1977* provides for the conservation and management of the state's built, marine, moveable and natural heritage. The proposed modification will not result in any additional impact to heritage items.	No
Threatened Species Conservation Act 1995 (TSC Act)	Under the EP&A Act, impacts on threatened species listed under the TSC Act are required to be assessed. All threatened species listed in the TSC Act potentially located within the existing Ulan West mine plan or proposed Ulan West mine plan have been assessed by the Ecological Assessment (refer to **Section 5.5**). No further approvals are required under the TSC Act.	No

Act	Comment	Further Approval Required for Proposed Modification
Roads Act 1993	The *Roads Act 1993* is administered by Roads and Maritime Services (RMS), local council or the Department of Lands depending on the classification of the road; the RMS has jurisdiction over major roads, the local council over minor roads, and the Department of Lands over road reserves. The Act requires that applications for the closure of Crown roads be made to the Minister. Consent under Section 138 of the *Roads Act 1993* is required in order to undertake works within a road reserve. The proposed modification does not require any works to or the closure of any roads. No further approvals will be required under this Act.	No
Crown Lands Act 1989	The Act provides for the administration and management of Crown land in the eastern and central divisions of the State. Crown land may not be occupied, used, sold, leased, dedicated, reserved or otherwise dealt with unless authorised by this Act or the *Crown Lands (Continued Tenures) Act* 1989. The proposed modification will be undertaken within Crown Land (refer to **Figure 1.4**). UCML currently holds a licence or access authority for the Crown Land within the proposed Ulan West underground mining area. UCML has submitted an application to extend the authority to access a portion of Crown Land within MLA475. Once the Mining Lease is granted, UCML plans to proceed towards securing a Land Access Licence as currently held for other parcels of Crown Land within UCML's project boundary.	Yes
Dams Safety Act 1978	The *Dams Safety Act 1978* requires that large dams that may constitute a hazard to human life and property must be periodically reviewed by the NSW Dams Safety Committee. These dams are known as prescribed dams and are listed in Schedule 1 of the Act. The proposed modification will not require the construction of any new dams. No further approvals will be required under this Act.	No

4.2.3 State Environmental Planning Policies

Table 4.3 outlines the relevant State Environmental Planning Policies (SEPP) required to be considered in relation to the proposed modification.

Table 4.3 – Relevant SEPPs for Consideration in Relation to the Proposed Modification

NSW Legislation – Environmental Planning Instruments		
Planning Provision	**Comment**	**Relevance**
State Environmental Planning Policy (Mining, Petroleum Production & Extractive Industries) 2007	Regulates the permissibility of mining and related development and specifies matters that must be considered in assessing mining developments requiring consent under Part 4 of the EP&A Act.	The majority of the proposed modification is not considered exempt or complying development and therefore requires consent.
State Environmental Planning Policy 33 (Hazardous & Offensive Development) 1992	SEPP No. 33 requires the consent authority to consider whether an industrial proposal is a potentially hazardous industry or a potentially offensive industry. A hazard assessment is completed for potentially hazardous development to assist the consent authority to determine acceptability.	The existing Ulan Coal Complex operations are not considered as hazardous or offensive. The proposed modification will not result in any changes to the existing Ulan Coal Complex operations which would alter this classification. No further consideration of SEPP No. 33 will be required.
State Environmental Planning Policy 44 (Koala Habitat Protection)	SEPP No. 44 restricts a Council from granting development consent for proposals on land identified as core koala habitat without preparation of a plan of management.	One koala (Phascolarctos cinereus) has been recently identified in the proposed Ulan West underground mining area and has not been previously identified in the Approved Project Area despite considerable levels of survey effort. The Ecological Assessment has determined SEPP 44 does not place any constraints on the proposed modification (refer to **Section 5.5** for further details).

4.2.4 Strategic Regional Land Use Plan

The Strategic Regional Land Use Plan (SRLUP) aims to protect the State's agricultural and water resources from the potential impacts of mining. The SRLUP identifies areas of land as biophysical strategic agricultural land (BSAL) as well as viticulture and equine critical industry cluster land (CIC land).

Under the amendments to *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) and of relevance to the proposed modification, the Gateway process applies to the following State Significant Development located wholly or partially on BSAL:

- State significant mining development that requires a new mining lease.

BSAL is land with a rare combination of natural resources highly suitable for agriculture. These lands intrinsically have the best quality landforms, soil and water resources which are naturally capable of sustaining high levels of productivity and require minimal management practices to maintain this high quality. BSAL is able to be used sustainably for intensive purposes such as cultivation. Such land is inherently fertile and generally lacks significant biophysical constraints (DP&I 2012).

Maps accompanying the Mining SEPP amendment show BSAL at a regional scale. Due to the regional scale of the maps, it is important that appropriate processes are in place to provide for verification that particular sites are in fact BSAL. Verification can apply to both mapped and unmapped BSAL area.

The SRLUP has not previously applied to the Ulan Coal Complex as it post dated the current approval and all approved modifications have occurred within the existing mining leases. Part of the proposed modification is located outside of existing mining leases and as a result the SRLUP applies to this area.

A review of the SRLUP has identified that, at the regional scale, no BSAL or CIC land is located within MLA475, however this requires verification through a site verification process as requested by DP&E. The proposed modification will not interact with land identified by the SLURP as CIC land. In accordance with the SRLUP, if a site is not mapped as biophysical strategic agricultural land, an applicant for a State significant mining proposal must verify whether or not the land meets the criteria for BSAL. If it does not meet the criteria, the proposal can proceed directly to the development application stage. If the land meets the criteria for BSAL, then the proposal will be subject to the Gateway process.

UCML lodged a site verification certificate application on 3 September 2014. An assessment of MLA475 has been undertaken in accordance with the requirements of the *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (NSW Government, 2013). Based on the assessment, it is considered that there is no BSAL located within MLA475. The assessment concluded there is no BSAL within MLA475 based on landscape and soil information, specifically:

- slope;
- soil fertility; and
- lack of contiguous areas equal to or greater than 20 hectares that met specific BSAL requirements.

The site verification certificate was issued on 12 February 2015. Further details are provided in **Section 5.9.3**.

5.0 Environmental Assessment

5.1 Preliminary Environmental Assessment

A preliminary assessment of potential environment and community issues associated with the proposed modification was completed (Umwelt, 2014) based on consideration of:

- detailed knowledge of the existing environment of the proposed modification area;
- the nature of the proposed modification; and
- the likelihood of changed environmental impacts relative to the approved Ulan West mine operations.

The Preliminary Environmental Assessment was provided to DP&E to confirm key issues for further assessment in this EA and the approach to assessment of these issues. **Table 5.1** provides an outline of the potential key environment and community issues associated with the proposed modification to the Ulan West mine plan and identifies the key issues that have been subject to further assessment.

Table 5.1 – Preliminary Environmental Assessment for Proposed Modification

Environmental Aspect	Preliminary Environmental Assessment
Subsidence	The proposed modification will result in extending LW 6 to LW 12 in the order of 900 to 1300 metres within existing mining titles and MLA 475 and a change to the configuration of the approved longwall layout which will result in changes to the current predicted subsidence profile. A detailed subsidence impact assessment has been undertaken for the proposed modification and has been included as **Appendix 2**. Generally, the nature of predicted subsidence levels remains consistent with predictions for current approved mining, with an increase in the extent of the area affected by subsidence impacts. A summary of the findings of the subsidence assessment is provided in **Section 5.2**. The subsidence assessment provides the predicted subsidence impacts as a result of the changes to mining at Ulan West and details the management measures proposed to be implemented to manage subsidence from the proposed modification.
Groundwater	The proposed modification will include an extension of the currently approved mining area of approximately 275 hectares in an area currently not approved for mining. The currently approved mining footprint of Ulan West is approximately 3060 ha. The proposed modification has the potential to result in a minor increase to the groundwater impacts associated with Ulan West. A detailed groundwater impact assessment has been undertaken for the proposed modification and has been included as **Appendix 3**. Generally, the nature of predicted groundwater impacts remains consistent with current approved mining. A summary of the findings of the groundwater assessment is provided in **Section 5.3**.

Environmental Aspect	Preliminary Environmental Assessment
Surface Water and Water Balance	The proposed modification will result in a change to the subsidence profile within the approved Ulan West mine plan which may impact on surface water features. An additional unnamed tributary of Cockabutta Creek is located within the modified Ulan West mine plan. Potential for additional groundwater make will require management as part of existing water management system at the Ulan Coal Complex. A detailed surface water assessment has been undertaken for the proposed modification and has been included as **Appendix 4**. A summary of the findings of the surface water assessment is provided in **Section 5.4**.
Ecology	Further to the additional underground mining area, clearing associated with the proposed changes to ventilation infrastructure and associated supporting infrastructure requirements will be required. A detailed ecological impact assessment has been undertaken for the proposed modification and has been included as **Appendix 5**. A summary of the findings of the ecological impact assessment is provided in **Section 5.5**.
Aboriginal Heritage	A number of known Aboriginal sites are located within the existing Ulan West mine plan. Changes to the subsidence profile may result in changes to the predicted impacts to known sites. The proposed modification includes underground mining in an additional area which has not previously been assessed. Some of the Cockabutta Creek rock shelter sites located outside of the currently approved Ulan West mine plan that were not previously proposed to be impacted will be impacted as a result of the proposed modification. A detailed Aboriginal Cultural Heritage assessment has been undertaken for the proposed modification and has been included as **Appendix 6**. A summary of the findings of the Aboriginal Cultural Heritage assessment is provided in **Section 5.6**.
European and Natural Heritage	There are no known European heritage items located in MLA475. There are six known European heritage sites located within the approved Ulan West mine plan. It is anticipated that there will be no additional impact to known European heritage sites as a result of the proposed modification. A natural heritage item, the Talbragar Fish Fossil Reserve is located within the approved Ulan West mine plan. The changes to the mine layout associated with the proposed modification are not expected to have any significantly different impact on the Talbragar Fish Fossil Reserve compared to the impacts of the mining layout described in the UCCO Project. Given the fragmented nature of the chert beds and the low strength nature of the underlying strata, it is considered likely that mining subsidence movements would be accommodated without significant disturbance to the fish fossil beds. A discussion of potential subsidence impacts on known European and Natural Heritage items is provided within the detailed subsidence impact assessment (refer to **Appendix 2** and **Section 5.2**).
Greenhouse and Energy	The proposed modification will result in an increase of 2 years to the mine life and an additional 13 Mt of ROM coal produced from Ulan West. A detailed Greenhouse Gas and Energy Assessment has been undertaken for the proposed modification and has been included as **Appendix 8**. A summary of the findings of the assessment is provided in **Section 5.8**.

Environmental Aspect	Preliminary Environmental Assessment
Air Quality	Air quality impacts associated with the proposed modification are expected to be similar to the existing approved operations as there will be no change to approved coal production rates. The proposed modification will not result in any changes to open cut mining operations or Ulan No.3 underground mining operations. There are no changes to any other surface activities that would result in a significant increase to potential air quality impacts from the Ulan Coal Complex, including the CHPP. Dust generated from construction activities will be managed through the incorporation of standard dust control methods in accordance with the existing Air Quality Management Plan. Based on this preliminary assessment, no further assessment of air quality impacts has been undertaken.
Noise	As Ulan West is an underground mine, there is limited potential for noise impacts associated with the proposed changes to the Ulan West mine plan. Potential noise impacts are associated with the proposed changes to ventilation infrastructure. This includes potential noise related impacts from construction and operation of ventilation infrastructure and particularly the operation of upcast ventilation infrastructure. There are no changes to any other surface activities that would result in a material increase to potential noise impacts from the Ulan Coal Complex. A detailed noise impact assessment has been undertaken for the proposed modification and has been included as **Appendix 7**. A summary of the findings of the assessment is provided in **Section 5.7**.
Traffic	There are no proposed changes to workforce numbers, operating hours or product volumes or transport routes. Additionally, construction activities will be limited to the construction of ventilation shafts for the operation of Ulan West. Traffic impacts associated with the additional two years of operations resulting from the proposed modification are expected to be consistent with the existing approved development and as such no further assessment of traffic impacts has been undertaken.
Land Use, including Agriculture	A site verification process was undertaken for MLA475. There is no BSAL located within the approved Ulan West mine plan or MLA475. The proposed surface infrastructure associated with Ulan West is not anticipated to significantly impact on the agricultural suitability of the land. Similarly, underground mining within Ulan West is not anticipated to impact on the agricultural value of the land within the proposed modification area. An assessment of land use and agricultural impacts is provided in **Section 5.9**.
Visual	As the proposed modification involves underground mining, there is limited potential for visual impacts. Potential visual impacts are limited to proposed additional ventilation infrastructure. Potential visual impacts from the proposed ventilation infrastructure are considered to be low given the location of proposed infrastructure relative to surrounding areas. A visual assessment was completed for the proposed modification with the findings provided in **Section 5.10**.
Socio-economic impacts	There are no proposed changes to workforce numbers or operating hours. The proposed modification will result in the recovery of an additional 13 Mt of coal and extend the life of the mine by up to 2 years providing a positive economic benefit. A discussion of the potential socio-economic benefits of the proposed modification is provided in **Section 5.11**.

As indicated in **Table 5.1**, the remainder of **Section 5.0** provides further assessment in relation to the following key environment and community issues for the proposed modification:

- subsidence;
- groundwater;
- surface water;
- ecology;
- Aboriginal archaeology;
- greenhouse gas and energy;
- noise;
- agriculture;
- visual; and
- socio-economics.

5.2 Subsidence

SCT have completed an assessment of the potential impacts of the proposed modification compared to the previously approved subsidence predictions and impact assessment prepared by STC (2009) for the UCCO Project (refer to **Appendix 2**). This section provides an overview of the main findings of the subsidence assessment.

5.2.1 Subsidence Processes

Longwall mining is a form of underground coal mining where coal is removed from a selected mining horizon within the coal seam. Longwall panels are mined sequentially with adjacent panels separated by a barrier of coal that is permanently left behind called chain pillars.

As longwall mining progresses underground the area behind the face, i.e. the goaf, increases. The roof behind the face is allowed to collapse causing the overlying rock to fracture and settle, i.e. subside. This settlement progresses up through the overlying strata resulting in subsidence of the ground surface immediately above and surrounding the longwall panels.

5.2.2 Subsidence Prediction Methodology

The subsidence movements expected above the longwall panels at Ulan West are predicted on the basis of site specific monitoring at the Ulan Coal Complex over 33 previous longwall panels at Ulan No. 3 Mine.

Previous subsidence monitoring indicates that the longwall panels are likely to be of supercritical width with the maximum subsidence controlled primarily by overburden caving behaviour and not panel geometry.

Predictions of strains and tilts are based on the empirical relationships developed from the results of subsidence monitoring at the Ulan Coal Complex and in the Western Coalfield (Holla 1991) more generally. Maximum strains and tilts are determined on the basis of proportionality to maximum subsidence and inverse proportionality to overburden depth (depth of cover above underground workings). Previous monitoring experience provides a cross-check on the values determined and the approach appears to provide a reasonable basis for estimating the maximum values.

Individual longwall panels are the same width as those considered in the UCCO Project assessment and in general, as discussed previously, these subsidence predictions have now been extended to relate to the additional mining area associated with the proposed modification. The subsidence predictions presented are similar to those presented in the UCCO Project assessment.

Compared to the UCCO Project assessment, the main changes to the subsidence predictions included in this assessment have been refinement of the subsidence profiles around the pillar edges; an increase in the magnitude of subsidence at overburden depths of less than about 130m where the bulking characteristics of the Triassic Sandstone are less dominant or completely absent; and recognition of the possibility of a step forming mechanism that was observed in recent mining in the Ulan No 3 underground are (North 1 Longwalls C, E and F), subsequent to the UCCO Project assessment being completed.

5.2.3 Subsidence Predictions

The area predicted to be affected by subsidence due to the proposed modification is shown in **Figure 5.1**. The subsidence affectation area for the proposed modification has been defined by the following parameters:

- the conceptual mine plan for the proposed modification;
- the area bounded by the 26.5 degree angle of draw (i.e. the typical angle of the line connecting the edge of the goaf and the limit of subsidence at the surface); and
- the predicted vertical limit of measurable subsidence, taken as the 20 millimetre subsidence contour.

Subsidence within the proposed Ulan West underground mining area is expected to be generally consistent with subsidence experienced in the previously mined longwall panels within Ulan No.3 subject to the prediction estimates discussed in **Section 5.2.2**. The key subsidence impact parameter prediction results are outlined in **Table 5.2**.

Table 5.2 – Ulan West Predicted Subsidence Parameters

Parameter	Maximum	Typical
Vertical Subsidence (m)	2.1 (1.6)	0.9-1.5 (0.9-1.5)
Tilt (mm/m)	120 (120)	15-40 (10-40)
Horizontal Movement (mm)	500 (500)	150-200 (150-200)
Strain (mm/m)	50 (50)	15-20 (5-15)
Crack width (mm)	250 (250)	20-100 (40-100)
Goaf Edge Subsidence (mm)	130 (130)	130 (130)
Angle of Draw (°)	45 (41)	20-30 (10-30)

Note: The approved UCCO Project subsidence predictions are provided in brackets.

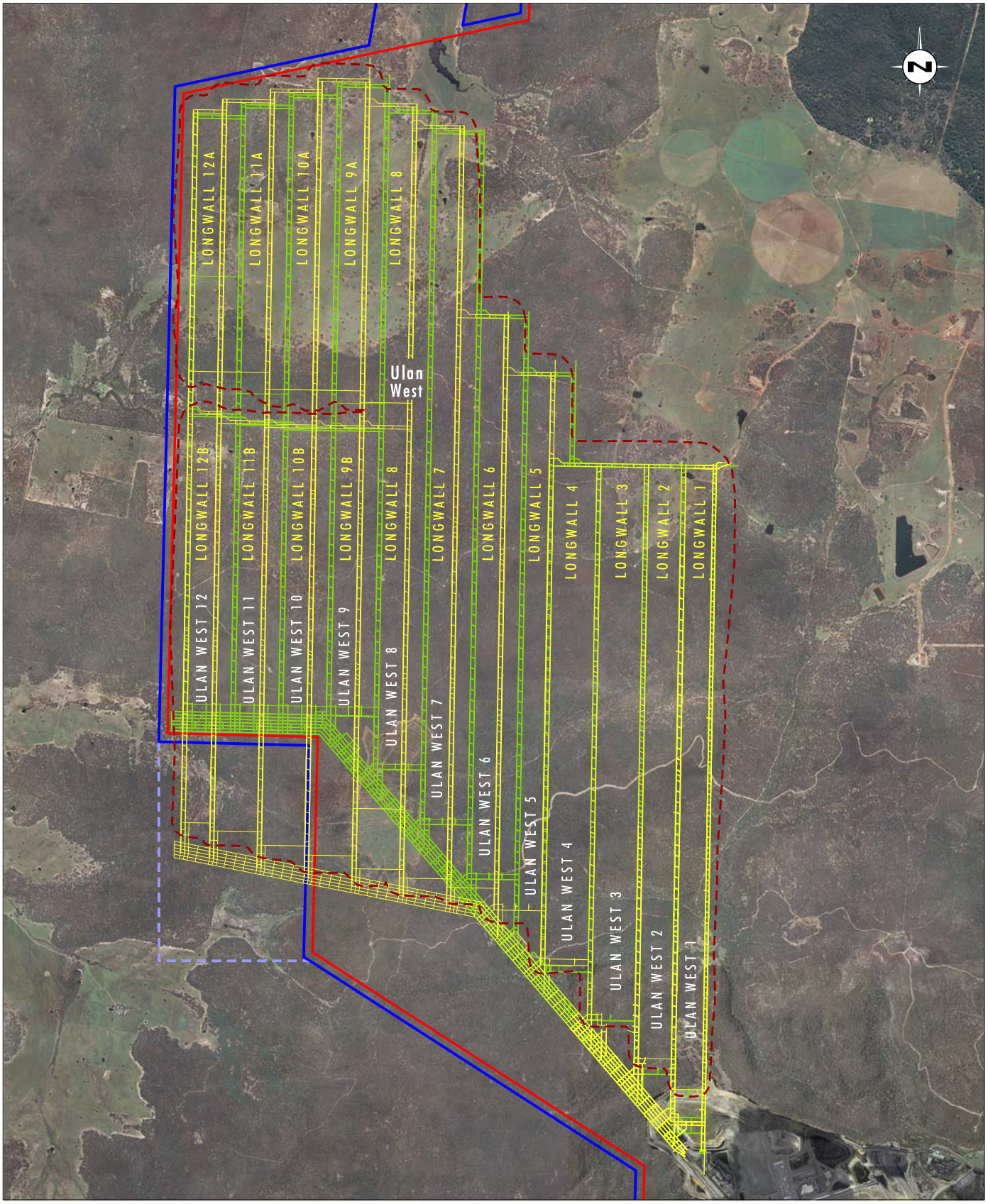


Image Source: Ulan Coal (2008, 2010, 2014)
Data Source: Ulan Coal (2014)

0 1.0 2.0 2.5km
1:50 000

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- MLA 475
- Approved Ulan West Mine Plan
- Proposed Conceptual Ulan West Mine Plan
- Maximum Subisidence Affectation Area (20 mm Subsidence Contour)

FIGURE 5.1

Proposed Maximum Subsidence Affectation Area

The maximum vertical subsidence prediction has increased from the UCCO Project assessment. The magnitude of subsidence is greater in the lower depth of cover areas associated with the modified Ulan West mining area and the nominal mining height used for assessment purposes has increased from 2.9 metres in the UCCO Project assessment to 3.2 metres in the modification assessment.

The maximum predictions provided in **Table 5.2** are considered unlikely to be exceeded except under exceptional circumstances. Actual subsidence and subsidence parameters are expected to be generally less and in most cases significantly less than the upper limit values provided by an empirical approach. Nevertheless, an upper limit estimate of subsidence movements is considered appropriate for assessment purposes.

The approach taken in this assessment has been to provide conservative estimates of subsidence, recognising that in the particular circumstances at Ulan West, none of the impacts are likely to be particularly sensitive to the specific magnitude of subsidence, but rather to the general nature of the subsidence expected.

5.2.4 Subsidence Impact Assessment

Subsidence impact assessment involves using the subsidence predictions to forecast the level of impact on natural and man-made surface features within the subsidence affectation area. A comprehensive review of all relevant natural features, archaeological sites and items of surface infrastructure potentially impacted by subsidence has been completed with detailed subsidence predictions and impact assessment provided for each aspect (refer to **Appendix 2**).

Sections 5.2.4.1 to **5.2.4.6** provide a description of the subsidence impacts as expressed on the surface of the ground and the physical impact of such on the natural features, archaeological sites and surface infrastructure. **Sections 5.2.4.1** to **5.2.4.6** demonstrate that subsidence associated with the proposed modification will be consistent with and will not cause any exceedances of the performance measures to the approved mining area outlined in Table 14 of Project Approval 08_0184 which is reproduced (refer to **Table 5.3**). The proposed modification does not alter the commitment to protecting the medium to high significance rock shelters within the Brokenback Conservation Area, as described in Umwelt (2009) and more particularly in SCT (2009) and Kuskie (2009).

Table 5.3 – Project Approval 08_0184 Subsidence Performance Measures

Requirement	Outcome	Comment regarding proposed modification
Water		
Ulan, Mona and Cockabutta Creek	No greater environmental consequence than predicted in the EA	The proposed modification includes an additional second order unnamed tributary of Cockabutta Creek within the predicted subsidence affectation area. As discussed in **Section 5.4**, the proposed will have no additional environmental consequence to that specified in the EA.
Biodiversity		
Threatened species, populations, habitat or ecological communities	Negligible Impacts	As discussed in **Section 5.5** the proposed modification will have negligible biodiversity impacts on threatened species within the proposed underground mining area.

Requirement	Outcome	Comment regarding proposed modification
Land		
Cliffs in the Brokenback Conservation Area	Nil environmental consequences	Brokenback Conservation Area retains its extent and protection afforded under Project Approval 08_0184.
Other Cliffs	Minor environmental consequences	The proposed modifications are consistent with Project Approval 08_0184 and will result in no more than minor environmental consequence.
Heritage		
Aboriginal Sites	Nil impact in the Brokenback Conservation Area, Grinding Groove Conservation Areas; and on Mona Creek/Cockabutta Creek Rock Shelter Sites	The extent and level of protection established by the Brokenback Conservation Area and the Grinding Groove Conservation areas is the same as that provided by Project Approval 08_0184 As discussed in **Section 5.6**, the proposed modification will impact on Cockabutta Creek Rock Shelter Sites.
Talbragar Fish Fossil Reserve	Negligible Impact	The proposed modification which includes reconfiguration of Ulan West mine plan will not cause any additional impact upon the Talbragar Fish Fossil Reserve and will retain the performance outcome of negligible impact.
Other Heritage Sites	No greater impact than predicted in the EA	The impacts of the proposed modifications are not greater than those predicted in the UCCO Project EA.
Built Features		
All built features	Safe, serviceable and repairable unless the owner agrees otherwise in writing	The proposed modifications will have no additional impact on built facilities to those previously addressed in the UCCO Project EA.
Public Safety		
Public Safety	No additional risk due to mining	The proposed modifications will have no additional public safety impacts to those previously addressed in the UCCO Project EA.

Further assessment in relation to key subsidence assessment matters is provided below.

5.2.4.1 Sandstone Cliff Formations

The extent of cliff lines across the Ulan Coal Complex and immediate surrounds were identified as part of the UCCO Project through a combination of digital elevation modelling, comparison with 1:25,000 series topographical maps, and field observations. Cliffs are defined for the purposes of this assessment as being greater than 10 metres in height and these are shown on **Figure 5.2** within the approved and proposed Ulan West mining area. A digital elevation model (DEM) was developed based on airborne laser scanning (ALS) survey data (prepared in 2007) of the Ulan Complex. Slope analysis of the DEM was used to identify the steeper sections of terrain and estimated heights of these sections. Field observations, height resolution contours and previous mapping of cliff lines on 1:25,000 series topographical maps were used to cross check the locations and heights of the identified cliff lines

There are numerous sandstone cliff formations located within the proposed Ulan West mining area (refer to **Figure 5.2**). Many of these were assessed as part of the approved UCCO Project (SCT, 2009). Most of the cliffs in the additional Ulan West mining area (MLA 475) are in the range of 3 to15 metres high and are associated with one of four cliff forming sandstone units within the Triassic Sandstone strata. There are no cliffs greater than 20 m

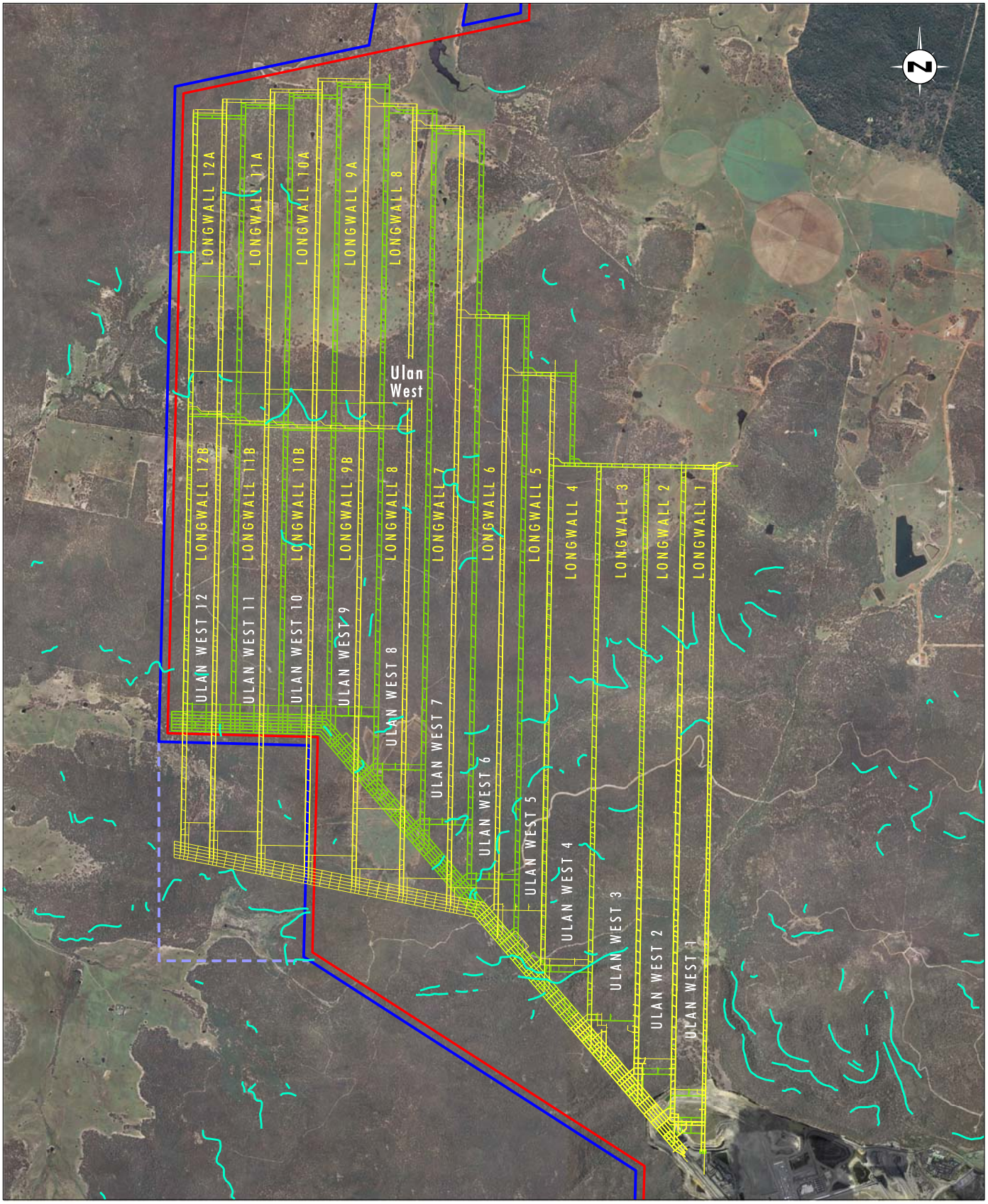


Image Source: Ulan Coal (2008, 2010, 2014)
Data Source: Ulan Coal (2014)

0 1.0 2.0 2.5km
1:50 000

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- MLA 475
- Approved Ulan West Mine Plan
- Proposed Conceptual Ulan West Mine Plan
- Modelled Clifflines

FIGURE 5.2

Modelled Clifflines

high within the modified Ulan West mining area that were not assessed as part of the approved UCCO Project.

Experience at the Ulan Coal Complex and other sites indicates that rock falls are likely along 10-20 per cent of the length of cliff formations located directly above longwall panels and the intermediate chain pillars. Cracking and other subsidence related disturbance is typically perceptible on 70 per cent of cliff formations directly under mined. In general, cliff formations that are high, overhanging and laterally extensive are impacted more than low, isolated features such as boulders or pagoda formations particularly when these isolated features are less than 20 metres in lateral dimension and less than 3 metres high.

Most of the major cliff formations over the Ulan West mining area are formed within the main sandstone cliff forming unit located at 60-90 metres above the base of the Triassic sandstones equivalent to depths of cover above the mining seam of 160 metres to 190 metres. The large formations in the southwest of the proposed Ulan West mining area and those around the Brokenback Conservation Area are formed within this unit. Cliff formations in these units are expected to sustain mining related rock falls along about 20 per cent of the length directly under mined and perceptible changes such as cracking along up to 70 per cent of their length. Those located within the Brokenback Conservation Area are expected to be protected, in accordance with the mine plan design.

5.2.4.2 Watercourses

There are numerous watercourses and drainage lines located within the proposed Ulan West mining area, but because the area straddles the Great Dividing Range, these are all headwater catchments and of an ephemeral nature. The changes in mine layout have the effect of impacting a tributary of Cockabutta Creek in the southwest of the proposed Ulan West mining area that was not previously impacted. Ulan Creek is located immediately to the east of Ulan West Longwall 1 and is well outside the proposed Ulan West mining area. Impacts to other watercourses and drainage lines for the proposed mining layout are not expected to be any greater than described in the UCCO Project assessment (refer to **Section 5.4**).

In creeks with a rock base, mining subsidence is expected to cause fracturing of the bedrock strata with potential for flow diversion into the substrata with the effect that pools of water in ephemeral streams will tend to drain away more quickly after rainfall events than prior to mining and low flows may not be evident as surface flow. In creeks with alluvial bases, a similar trend is likely, but the surface cracking is less likely to be evident because of the presence of the surface alluvium. In both cases, downstream flows are likely to be reduced as some surface flow is lost into the sub-surface fracture network, either directly through occasional surface cracks or indirectly as a result of reduced water tables. Further discussion on potential surface water impacts and proposed management to minimise impacts is provided in **Section 5.4**.

5.2.4.3 Archaeological Sites

Revised subsidence impact assessment of the proposed UIan West mining area considers the probability of perceptible impacts. Probability of perceptible impacts refers to any changes to rock formations that are associated with mining activity and subsidence movements. Such impacts include tensile cracking ranging from fine cracks to major fractures, shear movements on bedding planes and through intact strata, perceptible disturbance to any formations and rock falls ranging from minor dislocation of materials through to major falls.

Subsidence movements are not expected to have any practical effect on artefact scatters and isolated finds in open terrain. These types of sites are not considered in the subsidence assessment. The main potential impact relates to sites associated with rock shelters, as described below.

The revised assessment indicates that there will be an increase in probability of perceptible impacts due to subsidence to 19 rock shelter sites, the ochre quarry and two grinding groove sites within the existing and proposed Ulan West mining area. The proposed modification will result in a decrease in probability of perceptible impacts on 16 rock shelter sites, one including grinding grooves.

The probability of perceptible change is a generic estimate based on the stratigraphic horizon in which the rock shelters are formed, rather than the specific geometries of individual sites. Large, continuous, overhanging formations are likely to be more susceptible to rock falls than pagoda features and isolated rocks, so there may be significant differences in potential impacts at individual sites that cannot be captured without a specific site assessment. Site specific subsidence assessments were undertaken for four rock shelter sites of high cultural significance identified as 161, 162, 284 and C28 (for further detail of the assessment, refer to **Section 5.6** and **Appendix 6**).

The Brokenback Conservation Area provides a high level of protection for significant archaeological sites based on a solid coal barrier equivalent to an angle of draw of 26.5° from each of the sites. Predicted impact on the Brokenback Conservation Area has not changed from that shown in the UCCO Project and the archaeological sites identified by South East Archaeology and UCML will remain protected under the modified mine plan.

Further assessment in relation to potential impacts on cultural heritage is provided in **Section 5.6**.

5.2.4.4 European Heritage

European heritage features within the approved and proposed Ulan West mining area are listed in **Table 5.4**.

Table 5.4 – European Heritage Sites Located within the Proposed Ulan West Mining Area

Site	Site Description
ID191	Overhang with historical artefacts
HS96/D	Overhang with historical artefacts
HS63	Timber Mill
MM273	Logging Mill
HS135	Bottles
RV4	Old stockyard with adjacent current stockyard

The changes to the mine layout from the layout assessed in the UCCO Project are expected to slightly reduce the likelihood of perceptible impacts to ID191 and HS96/D and significantly reduce the likelihood of perceptible impacts to HS63. The impacts to the other sites remain unchanged.

No additional European heritage sites were identified within MLA475.

5.2.4.5 Talbragar Fish Fossil Reserve

The changes to the mine layout associated with the proposed modification are not expected to have any significantly different impact on the Talbragar Fish Fossil Reserve compared to the impacts of the mining layout described in the approved UCCO Project. Mining subsidence is expected to cause lowering of the ground surface and possible surface cracking. However, given the fragmented nature of the chert beds and the low strength nature of the underlying strata, it is considered likely that mining subsidence movements would be accommodated without significant disturbance to the fish fossil beds.

5.2.4.6 Private Residences

There are two private residences located within the proposed Ulan West mining area being residences R57 and R254. Residences R57 and R254 are located in the northern portion of Ulan West. The subsidence impacts to these dwellings from the proposed modification are consistent with those described in the UCCO Project EA.

Ground strains of 5 to 15 mm/m and tilts of 10 to 20 mm/m are expected at residences R57 and R254. Given the proximity of both dwellings to longwall panel edges, most of the strains and tilts are likely to be permanent. Strains and tilts of these magnitudes are expected to cause perceptible damage to the structures and remedial work is likely to be required to maintain the structures in a serviceable condition.

5.2.5 Subsidence Monitoring and Management

UCML currently operates in accordance with an approved Extraction Plan for Ulan West LW1 and Subsidence Management Plan for Longwall Ulan No.3 27-29 and Longwall W4 – W5. Longwall extraction in Ulan West will be undertaken in accordance with an approved Extraction Plan as required by Project Approval 08_0184 Condition 26. Subsidence monitoring will be undertaken in accordance with an Extraction Plan, including pre, during and post mining survey of monitoring lines and surface and landscape feature visual monitoring inspections.

As per the UCCO Project, private property management plans will be prepared for each private property and agreed with the landowner at least 12 months prior to commencement of longwall mining beneath such properties. These plans will include requirements for:

- assessing private infrastructure prior to mining to establish baseline condition;
- notifying landowners of the advance mining schedule for each longwall;
- providing landowners with revised subsidence predictions, based on a comparison of actual versus predicted subsidence levels within the project area;
- a monitoring program for assessment of infrastructure damage;
- a schedule for repair works to private infrastructure, if required; and
- an agreement on compensation, if required.

The specific measures to be adopted at each building will be developed in consultation with the owner and the Mine Subsidence Board prior to undermining, as part of the Extraction Plan or other relevant approval process. Council approved structures located outside of proclaimed mine subsidence districts are covered for compensation by the Mine Subsidence Board in the event of any structural damage caused by mine subsidence. Consultation has

been undertaken with the individual landholders regarding the timing and magnitude of potential impact mining will have on their residences.

5.3 Groundwater

A comprehensive assessment of the potential groundwater impacts associated with the proposed modification has been undertaken by MER. The Groundwater Assessment contained in **Appendix 3** builds upon recent studies completed by MER (2009) for the UCCO Project. An overview of the key findings of the groundwater assessment is provided below.

5.3.1 Existing Groundwater System

The major geological units at the Ulan Coal Complex from the surface are the:

- Jurassic sandstones and siltstones - this unit pre mining is mostly unsaturated within the proposed mining area;
- Triassic sandstones - this unit pre mining is variably saturated; and
- Permian coal measures - this unit pre mining comprises sandstones, siltstones, shales and coal seams which remain saturated across the Ulan Coal Complex.

The regional sedimentary hard rock system constitutes the primary groundwater flow system. Shallow alluvial deposits and the regolith constitute a secondary aquifer system in so far as they are more localised, comprising unconsolidated materials that tend to rapidly respond to climatic changes.

As detailed in MER (2014), the hydraulic property of each geological unit varies significantly. The Ulan seam exhibits a hydraulic conductivity that is several orders of magnitude higher than Permian overburden strata. Core tests support very low conductivities for Permian non-coal strata which will not easily drain. The overlying Triassic sandstones are more conductive and porous and are regarded as a regional groundwater store by virtue of their uniformity and favourable properties. The Jurassic rocks are more variable with generally reduced conductivities when compared to the underlying Triassic strata. Shallow alluvial deposits along the major drainages tend to be mixed assemblages of clayey silts and sands with occasional coarser gravel layers and of limited extent.

5.3.1.1 Existing Groundwater Monitoring Network

A network of groundwater piezometers are located within and outside the Ulan Coal Complex and the systems relevant to this assessment include:

- The North Monitoring Network (NMN) which supports regional scale monitoring of the impacts of mining on groundwater systems. The NMN monitors groundwater levels at relatively discrete horizons in the Permian strata and the overlying Triassic and Jurassic strata. The NMN monitoring data facilitates an assessment of the piezometric head distribution in the hardrock groundwater system. The network currently comprises more than 45 locations where strata piezometric levels or pore pressures are monitored.
- The Intermittent Monitoring Network (IMN) comprises bores or piezometers that either have been installed for specific purposes, and/or have extensive screens (and so measure a depth-averaged or composite hydraulic head). The network is monitored intermittently for groundwater levels and quality to provide additional data to complement the NMN monitoring data.

- The Goulburn River and Ulan Creek Alluvium Monitoring Network (AMN) comprises nine locations associated with the Goulburn River or Ulan Creek.

5.3.1.2 Regional Groundwater Flows

The water table or phreatic surface within the hard rock system resides in the Triassic strata over most of the Ulan Coal Complex operations footprint but migrates into Jurassic strata to the north east (down dip). Contours close to extracted panels reflect dewatering within the subsidence zone while elsewhere the contours support a north-easterly groundwater flow direction which trends easterly near the northern end of Ulan No.3 then south-easterly under the influence of the Goulburn River drainage system. These regional flow directions support recharge to the Triassic strata where it subcrops and outcrops to the southwest of Ulan West. In this Ulan West area there is minimal or no overlying Jurassic strata present.

5.3.1.3 Groundwater Quality

Groundwater sampling data collected over the last 10 years, but particularly over the annual water quality monitoring rounds, reveal distinctive water types for the Jurassic, Triassic, Permian strata and the Ulan seam with respect to basic water quality parameters EC and pH while ionic speciation suggests broader similarities.

At the Ulan Coal Complex, 104 groundwater samples were collected from the Jurassic, Triassic, Permian strata and Ulan seam between 2002 and 2013 and analysed for pH and electrical conductivity. Results indicate that overall, the groundwater salinity (as EC) of the Triassic (Wollar) Sandstone is typically around half the salinity of Permian strata sampling and less than one fifth the salinity of Jurassic sampling (refer to **Table 5.5**). The pH measurements support a weakly alkaline signature for Permian groundwaters, a neutral signature for Triassic groundwaters and a weakly acidic signature for the Ulan seam. It is also noted that the EC of groundwater of the quartzose strata of the Triassic Sandstone is comparable to the EC of Goulburn River surface water and is significantly lower than the average value of EC for surface water of the Talbragar River at Elong Elong.

Table 5.5 – Electrical Conductivity and pH of Undisturbed Strata

	Jurassic	Triassic	Permian	Ulan seam
Electrical Conductivity (µS/cm)				
Average	2554	471	1151	1310
Standard Deviation	1148	326	626	1939
pH				
Average	7.61	7.50	9.53	6.47
Standard Deviation	1.17	1.64	1.62	0.31

5.3.2 Groundwater Impact Assessment

A computer based mathematical model was developed in order to understand the likely groundwater impacts on the Ulan Coal Complex operations as a part of the UCCO Project (MER, 2009). The proposed modification will induce additional change to the local groundwater environment when compared to the approved mine plan. Potential impacts arising from the proposed modification include:

- sustained reduction in regional hard rock aquifer pressures;

- loss of groundwater yield at some existing bore locations;

- change in groundwater quality in the strata; and
- impact on the groundwater dependent ecosystems.

5.3.2.1 Reduction in Hard Rock Pressures and Baseflow Impacts

Groundwater seepage to Ulan West operations associated with the approved mine plan is predicted to rise steadily to a peak inflow rate of about 11.3 ML/day in 2022 while seepage associated with the modified mine plan is predicted to peak at about 12.5 ML/day in 2023.

The total volume of groundwater reporting to the proposed modification is estimated to be 52.3 GL compared to a total volume of 51.2 GL for the approved operations. This represents an increase of about 2.1 per cent which is considered to be minor. The additional groundwater will be drawn almost entirely from Permian strata. Since the Permian strata also exhibit low hydraulic conductivities and porosities, and relatively high salinity, they are considered to have low utility value for groundwater supply purposes.

The reduction in aquifer pressures caused by the approved Ulan West and Ulan No.3 operations is predicted to have an impact on groundwater baseflows within the catchments. At the close of mining it is predicted that losses to the Goulburn River catchment may be of the order of 0.039 ML/day while losses to the Talbragar River catchment may be of the order of 0.185 ML/day. Analysis of baseflow impacts indicates losses of 0.185 ML/day for the modified mine plan and 0.183 ML/day for the approved mine plan within the Talbragar River system, with the highest contribution attributed to Mona Creek catchment. Groundwater modelling has indicated that there will be no change to the predicted baseflow impacts on the Goulburn River system. Additional losses attributed to the proposed modification are negligible.
The Drip is recognised as an important natural feature which sustains groundwater dependent ecosystems. It is sustained by surficial and relatively shallow groundwater storage which is governed mostly by short term rainfall events that surcharge the shallow strata. No impacts are likely as a result of future Ulan West operations which are moving northward and westward away from the Drip.

5.3.2.2 Potential Impact on Groundwater Bores

Relatively shallow groundwater resources have been exploited by the construction of bores and wells throughout the region. The locations of existing structures have been determined from a records search on the NOW database. This database contains all registered structures and includes both pumping bores and wells, and exploration/test wells which may have been completed as monitoring bores.

There are no boreholes located within or in proximity to the proposed modification that will be impacted by the proposed modification (refer to **Appendix 3**).

5.3.2.3 Potential Impact on Groundwater Quality

It is unlikely that any regional change in groundwater quality will be observed in hard rock strata as pressures decline above and adjacent to mined panels within the modified mine plan. Localised change in salinity at depth may be observed as groundwaters contained within different stratigraphic horizons, mix within goaves and cracked areas, as is already evident from historical monitoring at Ulan No.3.

Similarly, it is unlikely that any measurable change in water quality will be observed in the shallow unconsolidated alluvial aquifer systems (e.g. Talbragar River alluvium) since these are either remote from the proposed modification and/or they are actively recharged by rainfall.

5.3.2.4 Potential Impact on Groundwater Dependent Ecosystems

There are no identified groundwater dependent ecosystems within or nearby the proposed modification area that may be impacted by the predicted groundwater impacts.

5.3.3 Groundwater Impact Mitigation and Monitoring Commitments

UCML will continue to maintain the established groundwater monitoring program which in accordance with Project Approval 08_0184 condition 39 provides for:

a) detailed baseline data of groundwater levels, yield and quality in the region, and particularly any groundwater bores, springs and seeps (including spring and seep fed dams) that may be affected by mining operations on site;
b) a program to augment the baseline data over the life of the project;

c) groundwater assessment criteria, including trigger levels for investigating any potentially adverse groundwater impacts;

d) a program to monitor and/or validate
   - groundwater inflows to the open cut and underground mining operations;
   - the impacts of the project on:
     - o the alluvial, Triassic, coal seam and interburden aquifers;
     - o base flows to the Goulburn and Talbragar Rivers and associated creeks;
     - o any groundwater bores, springs and seeps on privately-owned land;
     - o the "Drip"; and
     - o riparian vegetation along the Goulburn and Talbragar Rivers and associated creeks; and
   - the seepage/leachate from any tailings dams, water storages or backfilled voids on site; and
e) a program to validate the groundwater model for the project, and calibrate it to site specific conditions.

Further, the requirement for an on-site Surface and Ground Water Response Plan (required by Condition 40 of Project Approval 08_0184) describes measures and/or procedures implemented to:

a) respond to any exceedances of the surface water, stream health, and groundwater assessment criteria;

b) offset the loss of any base flow to the Goulburn and/or Talbragar Rivers and/or associated creeks caused by the project;

c) compensate landowners of privately-owned land whose water supply is adversely affected by the project; and

d) mitigate and/or offset any adverse impacts on riparian vegetation.

The proposed modification will be managed as part of continued operations, in accordance with these existing monitoring and impact verification management process.

5.4 Surface Water

A detailed Surface Water Assessment has been undertaken for the proposed modification to assess the potential impact on surface water quality and quantity and is included in **Appendix 4**. A summary of the key findings is provided below.

5.4.1 Surface Water Catchments

Both the approved and proposed Ulan West underground mining areas are located within the Mona Creek, Cockabutta Creek and Ulan Creek catchments (refer to **Figure 5.3**). The Ulan Creek catchment is part of the Goulburn River system while the Mona Creek and Cockabutta Creek catchments are part of the Talbragar River system. The Great Dividing Range separates the Goulburn River and Talbragar River systems, with the Goulburn River system draining east to the Hunter River Catchment and the Talbragar River system draining west to the Macquarie River Catchment and eventually the Murray River. All of the tributaries within the approved and proposed Ulan West underground mining areas are ephemeral by nature.

A number of unnamed tributaries of Mona Creek, Cockabutta Creek and Ulan Creek lie within the predicted subsidence affectation area of the approved Ulan West underground mining area (refer to **Figure 5.3**), however the main channels of each of these watercourses are all outside of the predicted subsidence affectation area.

Numerous first order and two second order unnamed tributaries of Mona Creek lie within the predicted subsidence affectation area of the Ulan West underground mining area (refer to **Figure 5.3**). No additional tributaries of Mona Creek are expected to be impacted as a result of the proposed modification.

Numerous first order and two second order unnamed tributaries of Cockabutta Creek lie within the predicted subsidence affectation area of the approved Ulan West underground mining area (refer to **Figure 5.3**). The proposed modification includes an additional second order unnamed tributary of Cockabutta Creek within the predicted subsidence affectation area.

Numerous first order, three second order and two third order unnamed tributaries of Ulan Creek lie within the predicted subsidence affectation area of the approved Ulan West underground mining area (refer to **Figure 5.3**). No additional tributaries of Ulan Creek are expected to be impacted as a result of the proposed modification.

5.4.2 Surface Water Impact Assessment

5.4.2.1 Catchment and Watercourse Impacts

The predicted subsidence has the potential to impact surface cracking within watercourses, on remnant ponding, as well as changing catchment boundaries and watercourse longsections.

It is considered that the proposed modification to the Ulan West mine plan will have impacts comparable to those previously assessed as a part of UCCO Project EA (Umwelt, 2009).

The analysis indicates that the predicted subsidence associated with the proposed modification to the Ulan West mine plan results in minor changes to the pattern of remnant ponding compared to the approved Ulan West mine plan (refer to **Figure 5.4**) within the catchment areas of Mona Creek, Cockabutta Creek and Ulan Creek. Historical and recent site inspections indicate that in the majority of areas where the topographical survey indicates existing remnant ponding, water does not pond in these areas as the soils are sandy and relatively free draining. As such, it is considered unlikely, based on the analysis

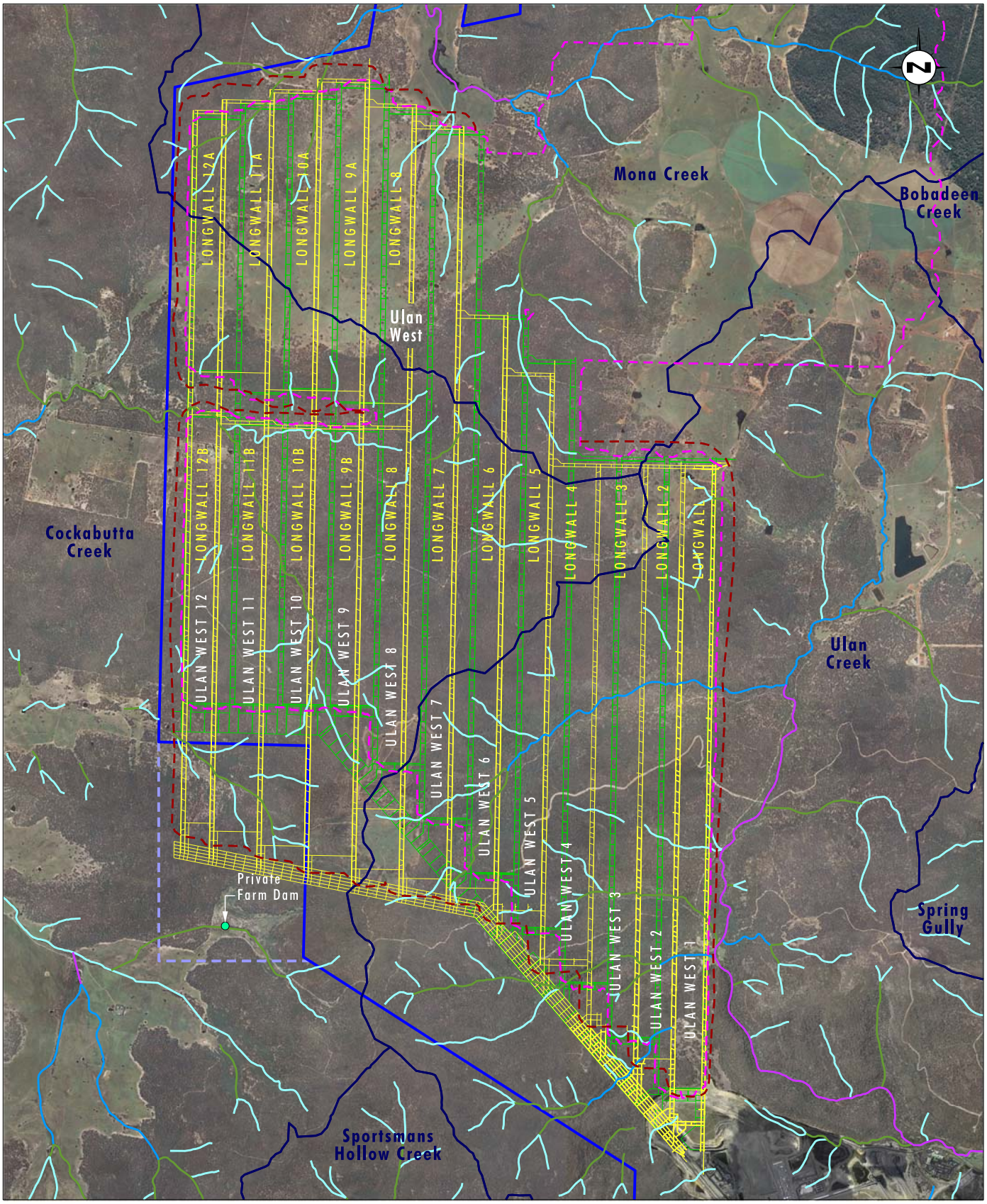


Image Source: Ulan Coal (2008, 2010, 2014)
Data Source: Ulan Coal (2014), LPI (2012)

0 1.0 2.0 2.5km
1:50 000

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- MLA 475
- Approved (November 2010) Ulan West Mine Plan
- Proposed Conceptual Ulan West Mine Plan
- Catchment Area
- Predicted 20 mm Subsidence Contour (Approved November 2010)
- Predicted 20 mm Subsidence Contour (Proposed)

Stream Order:
- 1st Order
- 2nd Order
- 3rd Order
- 4th Order

FIGURE 5.3

Catchments and Watercourses

File Name (A4): R01/3363_065.dgn
20141111 14.24

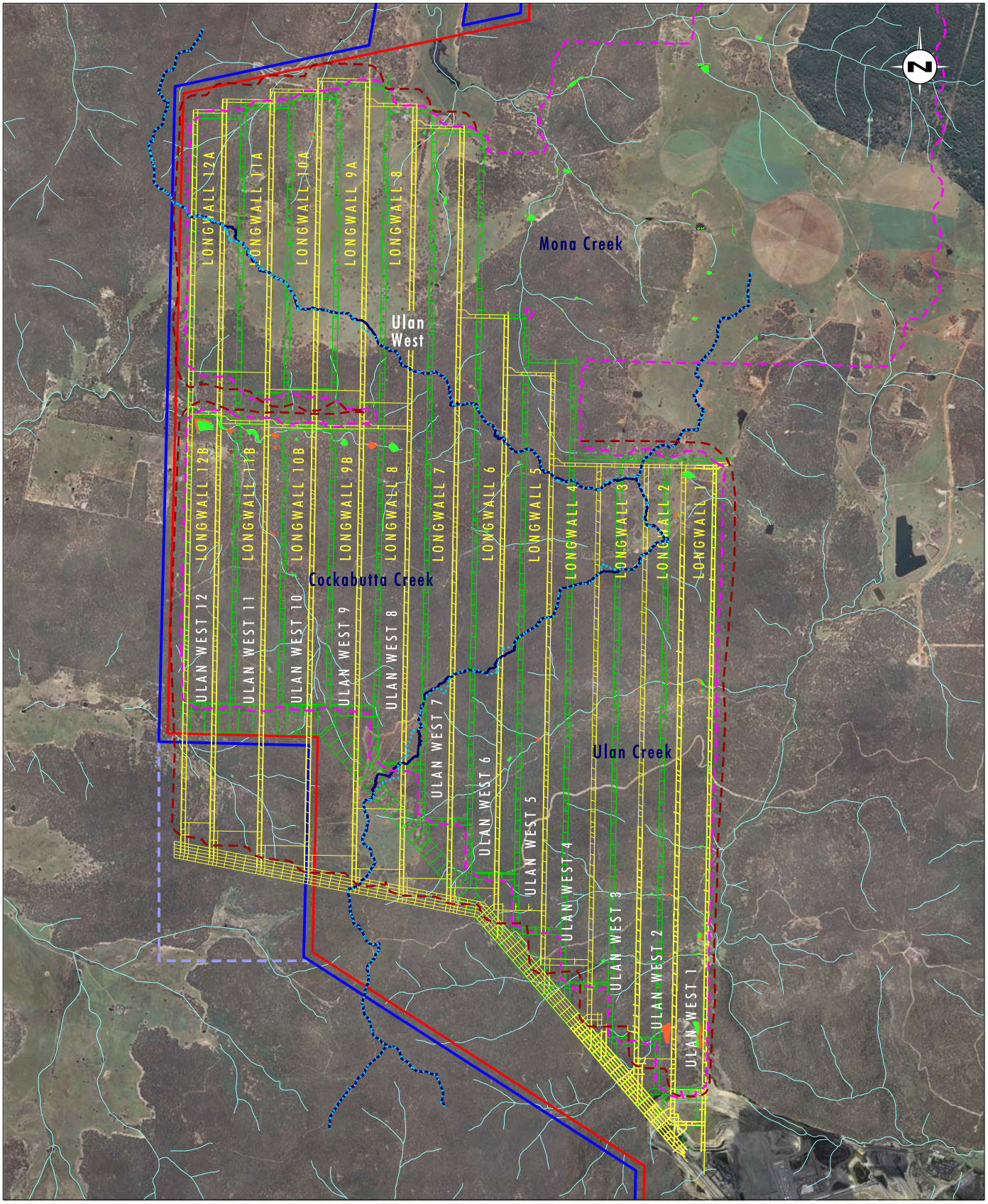


Image Source: Ulan Coal (2008, 2010, 2014)
Data Source: Ulan Coal (2014), LPI (2012)

0 1.0 2.0 2.5km
1:50 000

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- MLA 475
- Approved (November 2010) Ulan West Mine Plan
- Proposed Conceptual Ulan West Mine Plan
- Approved Major Catchment Boundary
- Proposed Major Catchment Boundary
- Approved Remnant Ponding
- Proposed Predicted Remnant Ponding
- Predicted 20 mm Subsidence Contour (Approved November 2010)
- Predicted 20 mm Subsidence Contour (Proposed)

FIGURE 5.4

Catchment Boundaries and Remnant Ponding Impacts

File Name (A4): R01/3363_063.dgn
20141010 13.25

of the predicted subsidence that any additional remnant ponding will occur within the predicted subsidence affectation area. This is due to both the steepness of the existing landform and sandy soils.

The predicted subsidence will result in local changes to the longitudinal slope of watercourses within the subsidence affectation zone. Whilst the magnitude of these changes is consistent with the previously approved subsidence, such changes have the potential to result in local changes to watercourse stability.

It is considered that the predicted subsidence impacts will not result in any substantial changes to watercourse stability relative to the current approved impacts. An active head cut has been observed within an unnamed tributary of Cockabutta Creek within the proposed additional mining area. Changes to the longitudinal gradients of watercourses (due to subsidence) have the potential to impact on the occurrence and mobility of head cuts. In accordance with existing monitoring and management plans, UCML proposes to continue to monitor areas where potential ponding, bank slumping, head cut erosion or drainage realignment may occur to determine the need for any further erosion control measures at these locations If monitoring indicates that remediation works are required, remediation works will need to maintain channel grades and take into consideration channel stabilities and existing channel characteristics.

If remediation works are required, these works have the potential to generate short term impacts in terms of water quality while the remediation works are being undertaken and stable vegetated post mining landforms are being achieved. Potential water quality impacts in terms of downstream users and downstream ecosystems will principally be due to the potential for increased sediment generation and export of sediment off site. Erosion and sediment control measures will be developed in accordance with the existing Erosion and Sediment Control Plan.

5.4.2.2 Downstream Water Users

As discussed in the UCCO Project EA (Umwelt, 2009), the regions downstream of the Project Approval area are primarily forested within the Goulburn River catchment but also include irrigated pasture/fodder crops within the Talbragar River catchment. Irrigation water along the Talbragar River is primarily sourced from the river, when flowing, and alluvial systems.

The UCCO Project EA (Umwelt, 2009) predicted potential impacts on baseflows with the Goulburn and Talbragar River systems. UCML has approval to offset the predicted losses to the baseflows of the Goulburn and Talbragar River system by retired licences or other means of treated surplus mine water to both river systems. Groundwater modelling (MER, 2014) has indicated that there are negligible changes to the baseflow impacts expected as a result of the proposed modification.

During the time between mining and completion of any required surface remediation works some minor stream capture may occur during rainfall events. As such there is potential to influence the volume of runoff available for harvestable rights at downstream properties. It is considered that this potential is limited as the catchment areas upstream of the mining areas are small, sequential mining will affect only short sections of creek at any time, runoff rates are relatively low and as such only a relatively low volume of runoff could be captured during storm events due to surface cracking.

Cracking will appear rapidly on the surface after longwall mining. Regular checking and as necessary, resealing of in channel cracks will be undertaken. These progressive resealing works will reduce the potential for loss of surface flows due to subsidence cracking.

It is also considered that the proposed modification will not adversely impact on the potential use of water for downstream users on the local creek systems or rivers, including the quantity and quality of flows into the privately owned farm dam located on an unnamed tributary of Cockabutta Creek. A farm dam is located on a second order tributary of Cockabutta Creek. The farm dam is located on a private property within MLA475 but outside of the proposed Ulan West underground mining area. No other privately owned farm dams were identified within the proposed modification area that may be impacted by the proposed modification.

5.4.2.3 Surface Infrastructure

The proposed modifications to the surface infrastructure are considered to be generally in accordance with the existing approved development and are not expected to result in appreciable changes to the quantity or quality of surface water. Each surface infrastructure component will require erosion and sediment controls to manage sediment laden water generated both during construction and operational phases of the surface infrastructure component. The required management measures are set out in detail in the approved Water Management Plan.

5.4.3 Mine Water Management System

UCML has an extensive mine water management system, which includes mine dewatering systems, water storages, the Bobadeen Irrigation Scheme, water treatment facilities, sedimentation and retention basins, settlings and tailings ponds, drains, levee banks and earth bunding around the main stockpile, laydown hardstand areas and fuelling areas.

All groundwater inflows to the proposed Ulan West underground mining area will be managed within the existing mine water management system.
The proposed modification will extend the life of the mine water management system by 2 years. Otherwise, no other changes to the approved mine water management system are proposed.

5.4.4 Water Balance

A predictive water balance model was developed for the Ulan Coal Complex as part of the 2009 UCCO approval process. The water balance model was then subsequently modified to include the changes proposed by the North 1 Modification (Umwelt, 2011). The site water balance model comprises a series of modules that represent the catchments and major components of the mine water management system. Each module is balanced individually and then brought together to represent the total water balance for the Ulan Coal Complex. The predicted water balance provides information on the demand and supply peaks for the operation and identifies the storage and discharge requirements for the mine water management system over the life of the mine. It is the primary water accounting mechanism for the site.

As discussed in Section 5.3, the most recent calibrated Ulan West groundwater model indicates that the approved Ulan West mine plan will result in peak groundwater inflows of approximately 11.3 ML per day (MER, 2014). The groundwater modelling of the proposed modification of the Ulan West mining area indicates that the peak groundwater inflows are likely to increase to approximately 12.5 ML per day (MER, 2014).

Total groundwater reporting to the Ulan West underground mining area over the life of the mine is estimated to increase from approximately 51.2 GL for the approved mine plan to approximately 52.3 GL for the proposed modification (MER, 2014). The additional 1.2 GL of

water reporting to the Ulan West mining area represents an increase of approximately 2.1 per cent.

The site water balance has been updated to incorporate the predicted changes to groundwater inflows resulting from the proposed modification to the Ulan West underground mining area.

Groundwater modelling predicts the maximum water surplus for the Ulan Coal Complex, including the proposed modification, is predicted to occur during Year 13 with a maximum modelled water surplus of approximately 10,106 ML per year (i.e. 27.7 ML per day). This is approximately 684 ML per year (i.e. 1.9 ML per day) higher than the maximum modelled water surplus (occurring in Year 13) for the approved Ulan West mine plan.

UCML proposes to maintain a neutral site water balance by utilising existing and approved discharge facilities in accordance with the conceptual water discharge management strategy outlined in the UCCO Surface Water Assessment (Umwelt, 2009). There is sufficient capacity within the existing approved system to achieve this outcome, as the approved discharge strategy provides a maximum discharge capacity of approximately 52 ML per day based on 100 per cent utilisation of the water discharge facilities. All discharges will be undertaken in accordance with the site Environment Protection Licence (EPL).

It is considered that the predicted water surplus can be managed within the site water management system while still retaining significant flexibility and contingency capacity.

5.4.5 Cumulative Impacts

UCML will continue to discharge surplus mine water to the Goulburn River system and in the future to the Talbragar River system if required and as approved. Any mine water discharges from the site will continue to be managed under EPL 394.

The proposed modification will result in no changes to the catchment area of the water collected, re-used and/or treated in the mine water management system and will have no impact on surface water runoff to downstream catchment areas.

The surface water assessment of the predicted subsidence impacts indicates that the catchment boundaries of the creek systems to be undermined will not change significantly. It is also considered unlikely that the proposed modification will significantly alter the approved impacts to watercourse stability and remnant ponding. The watercourses in the predicted subsidence affectation area will be monitored as part of the Ulan Coal Complex Surface Water Monitoring Program and subsequent Extraction Plans as longwall extraction advances.

Erosion and sediment control measures, consistent with those currently utilised by site as provided in the Erosion and Sediment Control Plan, are proposed to ensure that there will be no significant impact on downstream water qualities if subsidence remediation works are required.

On this basis it is considered that the proposed development will not result in significant adverse cumulative impacts on water use, flows or qualities in the surrounding areas.

5.4.6 Surface Water Monitoring and Remediation

The monitoring and reporting program is outlined within the Water Management Plan (UCML, 2014) and will be updated to include the areas of the proposed modification, as required, if approved.

Monitoring results will, as per the Water Management Plan, be reported in the Ulan Coal Complex Annual Review which is distributed to DP&E, Environment Protection Authority (EPA), the NSW Office of Water (NOW) and other relevant government agencies and made available to the community through UCML's website.

The results of the water quality monitoring will be used to review the effectiveness of the Ulan Coal Complex mine water management system on an ongoing basis.

As outlined in the Water Management Plan, water usage, rainfall, dam volumes and discharges (including transfers) at the Ulan Coal Complex will continue to be monitored for the entire operation to assist in the management of the mine water management system.

In accordance with the existing monitoring program, watercourse stability monitoring of second order and higher watercourses is proposed to continue. Watercourse stability monitoring will assist in ensuring that the subsidence associated with the Ulan West mine plan does not result in increased rates of erosion and scouring within the overlying watercourses. The watercourse stability monitoring will also specifically include the active head cut in the unnamed tributary of Cockabutta Creek.

Where monitoring indicates a potential increase in the rates of erosion and scouring within the affected watercourses, stabilisation works may be required within the affected watercourses.

5.5 Ecological Assessment

A comprehensive ecological assessment has been prepared by Umwelt for the potential ecological impacts of the proposed modification to the Ulan West mine plan, including associated changes to surface infrastructure (refer to **Appendix 5**). An overview of the key findings of the ecological assessment is provided in this section.

5.5.1 Iterative Project Design

The ecological assessment addresses the actual and potential impacts of the proposed modification, being the potential changes to impacts relating to the alteration of proposed surface infrastructure and changes to subsidence-related impacts as a result of the proposed modification to the Ulan West underground mine plan, including subsidence impacts associated with the additional mining area.

UCML have sought to firstly avoid and then minimise potential impacts on the ecological values of the proposed modification areas throughout the project planning process, where possible. A number of strategies have been adopted to avoid or minimise ecological impact as part of the project design phase, these being:

- Alteration to the originally proposed layout of the proposed surface infrastructure area (as much as feasible) in order to avoid areas of White Box Woodland Threatened Ecological Community (TEC). This was completed in a number of phases throughout the project design phase, with infrastructure overlain on vegetation mapping and where possible, infrastructure moved to avoid areas of White Box Woodland TEC. Priority was placed on avoiding the treed variants of White Box Woodland TEC where possible, with impact focused on grassland variants where impact to the TEC was unavoidable in certain areas;

- Where moving infrastructure was not possible (due to need for it to be located according to the underlying longwalls), the size of the disturbance footprint for the pipelines, transmission lines, access tracks, ventilation shafts etc was minimised as much as possible. Infrastructure will be co-located as much as possible to minimise disturbance footprints;

- Existing access tracks were used as much as possible in the project planning; and

- Progressive decommissioning and rehabilitation of infrastructure as longwall mining progresses.

The proposed modification has been designed in a manner that aims to avoid disturbance to the ecological features of the proposed modification areas where possible, whilst maintaining the economic feasibility and practicality of all components of the proposed modification.

5.5.2 Methodology

There is a large amount of existing ecological data relating to the Ulan Coal Complex and therefore the initial phase of work focused on literature reviews and database searches. This information was then used to design a field survey program to ground-truth and refine existing vegetation mapping within the proposed modification areas, and to complete targeted surveys for threatened and migratory species, endangered populations, TECs, or their habitats across the proposed modification areas. This methodology took into account all relevant existing ecological data gained as part of the UCCO Project Ecological Assessment (Umwelt 2009a), as well as relevant subsequent surveys such as those completed by BMS (2014). Further survey work focused on the proposed additional underground mining areas and the proposed surface disturbance associated with the alterations to the surface infrastructure required to support the modified Ulan West underground mine plan (referred to the proposed modification areas).

Full details of the methodology for this assessment are provided in **Appendix 5**, and a summary of the results is contained below.

5.5.3 Flora Results

5.5.3.1 Flora Species

A comprehensive quantitative field survey was completed as part of the UCCO Project Ecological Assessment (Umwelt 2009a) across the entire UCCO Project Area; which resulted in the identification of 634 flora species. It is anticipated that many of these species occur within the proposed modification areas. The current surveys completed for the proposed modification areas resulted in the identification of a total of 191 flora species. Of these, 18 (9%) are non-native species. Plants were recorded from all four major vascular plant classes: cycads, conifers, ferns and flowering plants and included trees, tree mallees, shrubs, forbs, grasses, sedges, rushes, reeds, ferns, lithophytes, epiphytes, mistletoes, vines and twiners.

An updated flora species list including the results of the floristic plots and rapid vegetation assessments conducted during the most recent field survey of the proposed modification areas is provided within **Appendix 5**.

While it is not assumed that all of these species occur within the proposed modification areas, this list provides a detailed representation of the species recorded from the local area. None of the threatened flora species recorded within the Ulan Coal Complex as part of the UCCO Project Ecological Assessment (Umwelt 2009a) were recorded within the proposed modification areas.

5.5.3.2 Vegetation Communities

A detailed vegetation map of the Ulan Coal Complex was produced for the UCCO Project Ecological Assessment (Umwelt 2009a). A total of 37 vegetation communities were delineated in this area as a result of the comprehensive field survey that was completed.

The field survey that was conducted as part of the Ecological Assessment for the proposed modification ground-truthed the vegetation communities that were previously mapped within MLA475 (refer to **Figure 5.5**). In total 23 vegetation communities including vegetation community variants were delineated within the proposed modification areas following survey (refer to **Figure 5.5** and **Table 5.6**). **Figure 5.5** identifies each of these vegetation communities, in addition to cleared areas devoid of vegetation. All of the mapped vegetation communities except three (Improved Pasture, Derived Native Grasslands and Unimproved Pasture) are naturally-occurring, although most have been significantly modified during the past two centuries through extensive management, including clearing and regeneration.

Table 5.6 identifies the extent of each of these vegetation communities within the proposed modification areas, the extent is separated into those communities that occur within the maximum subsidence affectation area (refer to **Figure 5.1**) and those that occur within the proposed surface infrastructure area (refer to **Figures 2.3** and **5.5**).

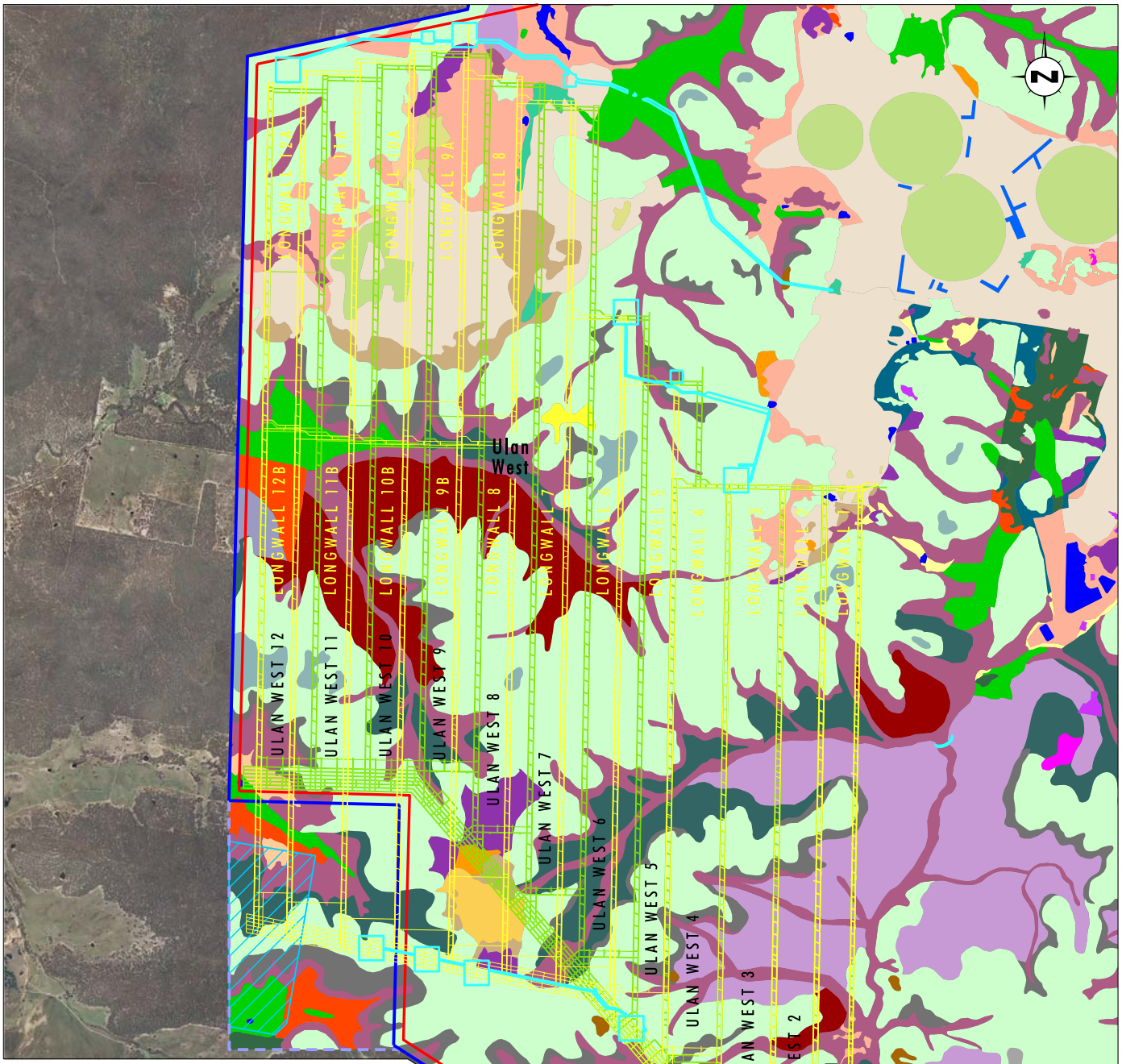


Image Source: Ulan Coal (2008, 2010, 2014)
Data Source: Ulan Coal (2014)

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- MLA 475
- Approved Ulan West Mine Plan
- Proposed Conceptual Ulan West Mine Plan
- Proposed Surface Infrastructure Corridor
- Black Cypress Forest on Sandstone
- Blakelys Red Gum Open Forest
- Blakelys Red Gum Open Forest Grassland
- Blakelys Red Gum Open Forest (regenerating)
- Cleared Land
- Derived Native Grassland
- Dry Heathland on Rocky Outcrops
- Grey Box Woodland
- Improved Pasture
- Ironbark Open Forest Complex Grassland
- Ironbark Open Forest Complex on Sandstone
- Ironbark Open Forest Complex on Sandstone (regenerating)
- Ironbark Open Forest Complex on Sandstone & Dry Heathland on Rocky Outcrops
- Modified White Box Woodland
- Narrow-leaved Ironbark Open Forest & Scribbly Gum Woodland Heathland on Sand Plateaux
- Narrow-leaved Ironbark Open Forest on Alluvium/Colluvium
- Narrow-leaved Ironbark Open Forest on Alluvium/Colluvium (regenerating)
- Planted Area
- Rehabilitation Pre 1997
- Rehabilitation Post 1997
- Water Body
- White Box Woodland
- Unimproved Pasture
- White Box Woodland (regenerating)
- Yellow Box - Red Gum Woodland
- Rough-barked Apple Open Forest Grassland
- Rough-barked Apple Open Forest Alluvium/Colluvium
- Scribbly Gum Woodland Heathland on Sand Plateaux
- She-oak Low Forest on Sandstone Crests
- She-oak Low Forest on Sandstone Crests & Dry Heathland on Rocky Outcrops
- Rough-barked Apple Open Forest Alluvium/Colluvium (regenerating)
- Stringybark-Ironbark Open Forest on Sandstone Slopes
- Access for Survey not available

FIGURE 5.5

Vegetation Communities Within and Surrounding Proposed Ulan West Modification Areas

File Name (A4): R01/3363_061.dgn
20141208 15.28

Table 5.6 – Vegetation Communities and Formations of the Proposed Modification Areas

Vegetation Community	Maximum Subsidence Affectation Area	Proposed Surface Infrastructure Area	Total
Forest/Open Forest Formation			
Blakely's Red Gum Open Forest	41.4	5.9	47.3
Blakely's Red Gum Open Forest (regenerating)	29.2	0.0	29.2
Ironbark Open Forest Complex on Sandstone	1469.2	38.61 – 38.08	1507.8
Ironbark Open Forest Complex on Sandstone (regenerating)	48.7	1.0 – 0.35	49.7
Narrow-leaved Ironbark Open Forest on Alluvium/Colluvium	225.2	0.18 – 0.14	225.4
Narrow-leaved Ironbark Open Forest on Alluvium/Colluvium (regenerating)	10.8	0.0	10.8
Rough-barked Apple Open Forest on Alluvium/Colluvium	419.9	3.7	423.6
Rough-barked Apple Open Forest on Alluvium/Colluvium (regenerating)	36.4	2.1	38.6
She-oak Low Forest on Sandstone Crests	39.4	0.0	39.4
Stringybark-Ironbark Open Forest on Sandstone Slopes	104.5	1.6	106.2
Woodland Formation			
Grey Box Woodland	5.3	0.0	5.3
Modified White Box Woodland	12.7	0.0	12.7
Scribbly Gum Woodland – Heathland on Sand Plateaux	164.0	0.7	164.7
White Box Woodland	83.2	0.0	83.2
White Box Woodland (regenerating)	25.7	0.0	25.7
Yellow Box - Red Gum Woodland	12.6	0.0	12.6
Heathland Formation			
Dry Heathland on Rocky Outcrops	0.6	0.1	0.7
Narrow-leaved Ironbark Open Forest + Scribbly Gum Woodland – Heathland on Sand Plateaux	202.8	0.0	202.8
She-oak Low Forest on Sandstone Crests + Dry Heathland on Rocky Outcrops	6.3	0.0	6.3
Grassland Formation			
Derived Native Grassland	224.6	2.5	227.1
Improved Pasture	26.7	0.0	26.7
Rough-barked Apple Open Forest Grassland	1.1	0.0	1.1
Unimproved Pasture	131.7	2.1	133.7
Cleared			
Cleared	0.6	0.0	0.6
Water Bodies			
Water Bodies	0.8	0.0	0.8
TOTAL	**3323.4**	**58.7**	**3382.2**

Most vegetation communities are widespread in the local area, while some occur much more extensively across a broader range of over 100 kilometres. Some communities, however, have a more restricted local occurrence. In general, communities occurring on Triassic conglomerate are well represented in the local area, while those restricted to riparian zones and occurring on basalt-derived soils are less well represented.

Vegetation communities were grouped into five vegetation formations for the purpose of field survey design, analysis and impact assessment, being:

- Forest/Open Forests;
- Woodlands;
- Heathland;
- Grasslands; and
- Cleared.

The majority of the mapped vegetation communities were classified into the Forest/Open Forests formation.

Further information regarding vegetation communities present in the proposed modification areas is detailed in **Appendix 5**.

5.5.3.3 Threatened Flora Species

No threatened flora species were recorded in the proposed modification areas during the field survey completed for this assessment. Although threatened flora species have been recorded in the Ulan Coal Complex as part of the UCCO Project Ecological Assessment (Umwelt 2009a), none of these records fall within (or near to) the proposed modification areas, or would have the potential to be impacted by the proposed modification.

Those species considered to have potential habitat within the proposed modification areas are listed in **Table 5.7**.

Table 5.7 - Threatened Flora Species with Potential to occur in Modified Ulan West Mining Area

Species	Status	Likelihood of Occurrence in Proposed Modification Area
Ausfeld's wattle *Acacia ausfeldii*	V (TSC)	Moderate. Previously recorded within the Ulan Coal Complex, however not within the proposed modification area.
painted diuris *Diuris tricolor*	V (TSC)	Low. Previously recorded in local area, however not within the Ulan Coal Complex or proposed modification area.
Cannon's stringybark *Eucalyptus cannonii*	V (TSC)	Low. Previously recorded in local area, however not within the Ulan Coal Complex or proposed modification area.
Homoranthus darwinioides	V (TSC) V (EPBC)	Moderate. Previously recorded within the Ulan Coal Complex, however not within the modification area.

Species	Status	Likelihood of Occurrence in Proposed Modification Area
hoary sunray *Leucochrysum albicans* var. *tricolor*	E (EPBC)	Moderate. Previously recorded within the Ulan Coal Complex, however not within the proposed modification area.
scant pomaderris *Pomaderris queenslandica*	E (TSC)	Moderate. Previously recorded within UCML Complex, however not within the proposed modification areas.

Key: E = Endangered
V = Vulnerable
TSC = *Threatened Species Conservation Act* 1995
EPBC = *Environment Protection and Biodiversity Conservation Act* 1999

No endangered flora populations have been recorded, or are likely to occur within the proposed modification areas.

5.5.3.4 Threatened Ecological Communities

A number of TECs have distributions that include the Ulan Coal Complex (refer to **Appendix 5**), and each has been assessed for potential habitat within the proposed modification areas. Those TECs considered to occur within the proposed modification areas are listed in **Table 5.8**.

Table 5.8 - Threatened Ecological Communities (TECs) within the Proposed Modification Areas

TEC	Status	Presence in Proposed Modification Areas and Potential to be Impacted
White Box – Yellow Box – Blakely's Red Gum Woodland	EEC (TSC)	Recorded during surveys of proposed modification areas. Previously recorded within the Ulan Coal Complex, as well as extensively throughout local area.
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CEEC (EPBC)	Recorded during surveys of proposed modification areas. Previously recorded within the Ulan Coal Complex, as well as extensively throughout local area.

Key: EEC = Endangered Ecological Community
CEEC = Critically Endangered Ecological Community
TSC = *Threatened Species Conservation Act* 1995
EPBC = *Environment Protection and Biodiversity Conservation Act* 1999

One TEC, being White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands (listed as an EEC under the TSC Act and as CEEC under the EPBC Act) has been previously recorded within the Ulan Coal Complex (Umwelt 2009a).

As detailed in **Section 5.5.1**, early iterative project design has minimised the potential surface infrastructure impact on this community.

5.5.4 Fauna Results

5.5.4.1 Fauna Species

A total of 132 vertebrate fauna species were recorded during surveys of the proposed modification areas. This included 85 bird species, 14 reptile species, four amphibian species and 29 mammal species. Of these recorded species, eight (6 per cent) were introduced species (mammals). An outline and discussion of the species recorded within each of the four major fauna groups is presented in the following sections. A list of all fauna species recorded within the proposed modification areas is presented in **Appendix 5**.

Records of species within a particular area do not suggest it only occurs within that specific part of the proposed modification areas, and not within other parts. The high levels of mobility of many fauna species (particularly many birds and mammals) mean that those species could readily occur in areas other than where they were recorded. For this reason, significant fauna records obtained from surveys throughout the Ulan Coal Complex have been considered within the impact assessment where they have the potential to occur in the habitats of the proposed modification areas.

A full list of species considered to have potential habitat within the proposed modification areas is provided in **Appendix 5**.

The UCCO Project Ecological Assessment (Umwelt 2009a) identified a total of 33 threatened fauna species occurring throughout the Ulan Coal Complex. The potential for occurrence of these species has been addressed in detail in **Appendix 5**. Ten threatened fauna species were recorded during field surveys completed of the proposed modification areas. This included eight bird species listed as vulnerable under the TSC Act, being:

- glossy black-cockatoo (*Calyptorhynchus lathami*);
- brown treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*);
- speckled warbler (*Chthonicola sagittata*);
- black-chinned honeyeater (eastern subspecies) (*Melithreptus gularis gularis*);
- scarlet robin (*Petroica boodang*);
- grey-crowned babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*);
- varied sittella (*Daphoenositta chrysoptera*); and
- diamond firetail (*Stagonopleura guttata*).

Two threatened mammal species were additionally recorded, being the eastern bentwing-bat (*Miniopterus schreibersii oceanensis*) and the koala (*Phascolarctos cinereus*); both are listed as vulnerable under the TSC Act, with the koala also listed as vulnerable under the EPBC Act. One migratory species listed under the EPBC Act was additionally recorded, being the rainbow bee-eater (*Merops ornatus*).

Figure 5.6 shows the threatened fauna species previously recorded (Umwelt 2009a) and recently recorded during the field surveys completed for this assessment occurring within and around the proposed modification areas. Further discussion of the threatened fauna species recorded in the proposed modification areas can be found in **Appendix 5**.

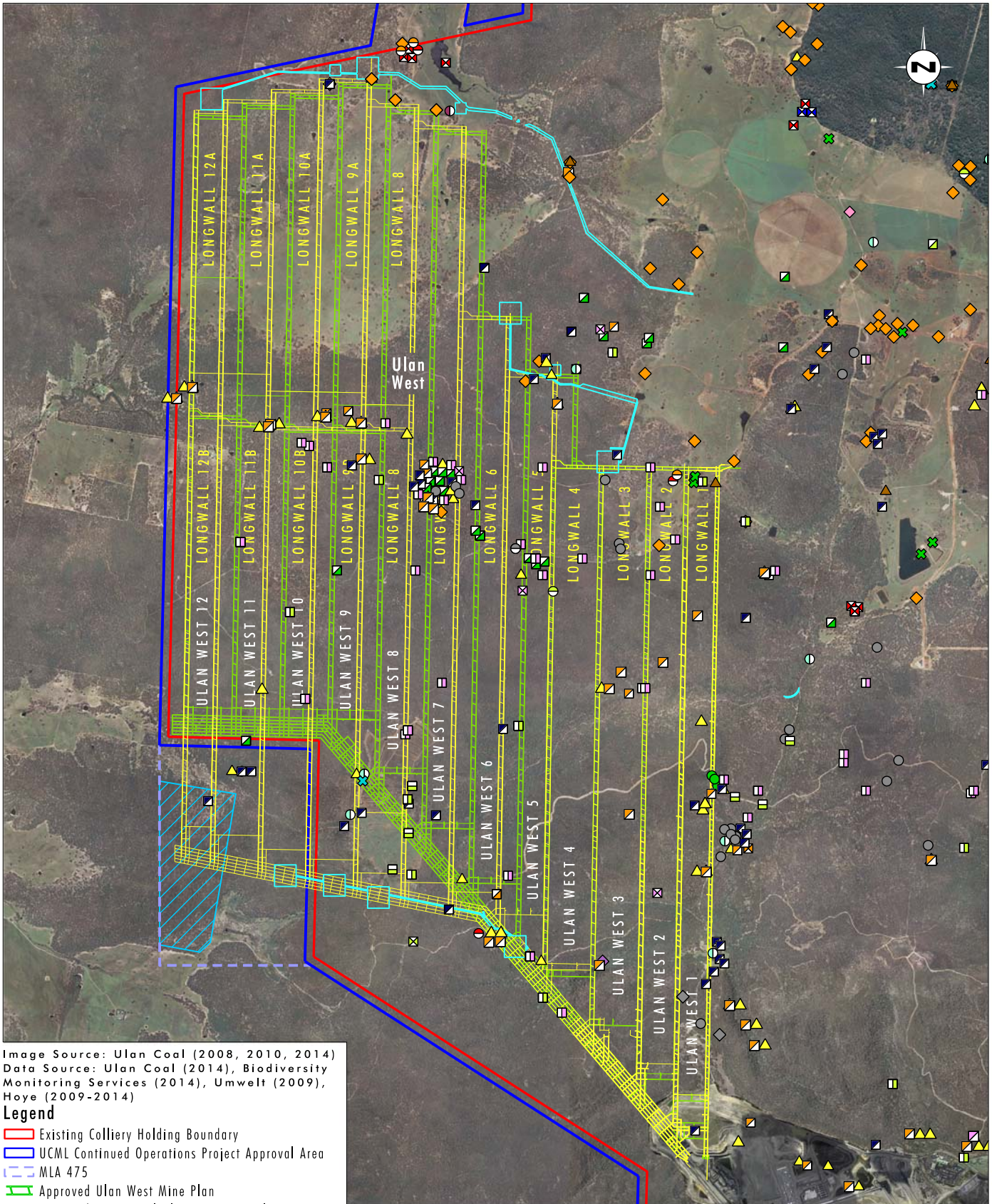


Image Source: Ulan Coal (2008, 2010, 2014)
Data Source: Ulan Coal (2014), Biodiversity Monitoring Services (2014), Umwelt (2009), Hoye (2009-2014)

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- MLA 475
- Approved Ulan West Mine Plan
- Proposed Conceptual Ulan West Mine Plan
- Proposed Surface Infrastructure Area
- Black-breasted Buzzard
- Black-chinned Honeyeater (eastern subspecies)
- Blue-billed Duck
- Brown Treecreeper (eastern subspecies)
- Diamond Firetail
- Eastern Bentwing-bat
- Flame Robin
- Glossy Black-Cockatoo
- Greater Long-eared Bat (south eastern form)
- Grey-crowned Babbler (eastern subspecies)
- Greater Broad-nosed Bat
- Grey-headed Flying-fox
- Hooded Robin (south-eastern form)
- Koala
- Large-eared Pied Bat
- Large-footed Myotis
- Little Lorikeet
- Little Pied Bat
- Painted Honeyeater
- Powerful Owl
- Scarlet Robin
- Speckled Warbler
- Spotted Harrier
- Squirrel Glider
- Swift Parrot
- Turquoise Parrot
- Varied Sittella
- Yellow-bellied Sheathtail-bat
- *Homoranthus darwinioides*
- Access for Survey not available

0 1.0 2.0 2.5km
1:50 000

FIGURE 5.6

Recorded Threatened Species

File Name (A4): R01/3363_062.dgn
20141208 15.33

No endangered fauna populations occur or are likely to occur within the proposed modification areas.

5.5.5 Impact Assessment

A number of significant ecological features were recorded or have potential to occur within the proposed modification areas, and therefore have the potential to be impacted by the proposed modification. The ecological impact assessment addresses those direct and indirect impacts that may result on significant ecological features within the proposed modification areas. Direct impacts, in this case, relate to the removal of vegetation (and associated habitat) for the construction of surface infrastructure facilities.

Potential indirect impacts relate to the Ulan West underground mining area, where subsidence-related impacts may include cracking or rock fall along cliff lines, potential tree fall as a result of rock fall and possible changes to surface hydrology.

5.5.5.1 Direct Impacts

The proposed modification seeks to alter the existing Approved Surface Infrastructure Area to reposition a number of key features which (while approved) have not yet been constructed, and also to add others not originally approved. **Table 5.9** identifies the total area of each vegetation community that falls within the proposed surface infrastructure area and compares this to the Approved Surface Infrastructure Area to provide a net change in impact area which is the subject of the current modification application.

As discussed in **Section 2.4**, there are three potential locations being considered for one of the ventilation shafts that requires construction as part of this proposed modification (refer to **Figure 2.3**). The final site for this shaft is yet to be defined, as it will be dependent on the ventilation requirements of the progressing Ulan West longwalls. In relation to direct impacts, **Table 5.9** below provides the maximum and minimum impact range for the relevant communities, taking into account the three Main Shaft 2 options.

For the purposes of this assessment, the highest potential impact that relates to the three options for Main Shaft 2 has been assessed. This has been included in the overall net change values provided in **Table 5.9**. This conservative approach has been adopted to ensure that the maximum impact has been considered throughout this impact assessment.

Table 5.9 – Impacts of Proposed Surface Infrastructure Area Compared to Approved Surface Infrastructure Area

Vegetation Community	Proposed Surface Infrastructure Area (ha)	Approved Surface Infrastructure Area (ha)	Net Change in Area of Impact (ha)
Blakely's Red Gum Open Forest*	5.9	7.3	-1.4
Derived Native Grassland*	2.6	13.6	-11.1
Grey Box Woodland	0.0	0.6	-0.6
Dry Heathland on Rocky Outcrops	0.1	0.0	0.1
Ironbark Open Forest Complex on Sandstone	38.61 – 38.08	18.1	20.51
Ironbark Open Forest Complex on Sandstone (regenerating)	1.0	0.7	0.3
Narrow-leaved Ironbark Open Forest on Alluvium/Colluvium	0.18	0.5	-0.32
Rough-barked Apple Open Forest on Alluvium/Colluvium	3.7	4.7	-1.0
Rough-barked Apple Open Forest on Alluvium/Colluvium (regenerating)	2.1	2.1	0.0

Vegetation Community	Proposed Surface Infrastructure Area (ha)	Approved Surface Infrastructure Area (ha)	Net Change in Area of Impact (ha)
Scribbly Gum Woodland – Heathland on Sand Plateaux	0.7	0.8	-0.1
Stringybark-Ironbark Open Forest on Sandstone Slopes	1.6	0.6	1.0
Unimproved Pasture	2.1	5.2	-3.1
Water Bodies	0.0	0.2	-0.2
White Box Woodland*	0.0	1.4	-1.4
White Box Woodland (regenerating)*	0.0	0.3	-0.3
Yellow Box - Red Gum Woodland*	0.0	0.3	-0.3
TOTAL	**58.7**	**56.5**	**2.1**

Notes: Values have been rounded up to nearest single decimal place and are approximate only. All values subject to minor mapping/GIS-based discrepancies.

* White Box Woodland TEC variant

It is assumed that all vegetation within the proposed surface infrastructure area will be removed as part of construction. This is considered to be an upper limit in regards to impact, as ancillary infrastructure such as access tracks, pipelines and transmission lines will be co-located or located in already approved disturbance footprints, where possible. These will also be decommissioned progressively (as mining progresses to the west) and, where possible, disturbance footprints will be rehabilitated in accordance with UCML's approved rehabilitation strategies as provided in the UCML Integrated Mining Operations Plan (IMOP) and BMP.

Table 5.9 identifies that the total area of the proposed surface infrastructure area for proposed modification is approximately 58.7 hectares. The approved surface infrastructure area for the corresponding part of Ulan West is 56.5 hectares, thus making a net difference of approximately 2 hectares.

Vegetation Removal

The proposed modification will involve the removal of all vegetation within the proposed surface infrastructure area, which relates to a net increase of approximately 2 hectares of vegetation subject to direct impact. The vegetation communities that will be impacted by the net impact from the proposed surface infrastructure area includes (in order of decreasing magnitude):

- Ironbark Open Forest Complex on Sandstone (approximately 20.51 hectare net impact);
- Ironbark Open Forest Complex on Sandstone (Regenerating) (approximately 0.3 hectare net impact);
- Stringybark-Ironbark Open Forest on Sandstone Slopes (approximately 1.0 hectare net impact);
- Dry Heathland on Rocky Outcrops (approximately 0.1 hectare net impact); and
- Rough-barked Apple Open Forest on Alluvium/Colluvium (regenerating) (approximately 0.0 hectare net impact).

The remaining vegetation communities listed in **Table 5.9** were originally approved for impact, however will no longer be impacted as a result of the proposed surface infrastructure area. Of particular importance is the proposed reduction in impact to the White Box Woodland TEC, whereby the existing approval envisaged impact to approximately 22.9 hectares of this TEC compared to the currently predicted impact of approximately 8.5 ha in

accordance with the proposed modification. This results in a potential reduction of impact to approximately 14.4 hectares of this TEC. The existing EPBC Approval allows for 69 hectares of White Box Woodland disturbance across the Ulan Coal Complex. The proposed modification will not result in a greater impact to White Box Woodland TEC than that currently approved. UCML will continue to manage their operations in accordance with their EPBC Approval in order to not clear more than 69 hectares of White Box Woodland across the Ulan Coal Complex.

The proposed modification is not likely to result in a loss of native flora species that form these communities such that the biodiversity value of the area will be reduced.

Habitat Loss

The removal of vegetation within the proposed surface infrastructure area will result in the loss of habitat from a number of formations. These are identified within **Table 5.10**, along with the amount of each formation to be impacted.

Table 5.10 – Impacts of Proposed Surface Infrastructure Area In Relation to Habitat Formations

Habitat Formation	Proposed Surface Infrastructure Area (ha)	Approved Surface Infrastructure Area (ha)	Net Change in Area of Impact (ha)
Forest	53.2	33.9	19.3
Woodland	0.7	3.5	-2.8
Grassland	4.6	18.9	-14.3
Heathland	0.1	0	0.1
Other	0.0	0.2	-0.2
TOTAL	**58.6**	**56.5**	**2.1**

Notes: Values have been rounded up to nearest single decimal place and are approximate only. All values subject to minor mapping/GIS-based discrepancies.

The proposed surface infrastructure area supports foraging and nesting resources for a range of fauna species, particularly within the forest formation. The forest formation will experience an increase in impact (from that already approved) of approximately 19.3 hectares of vegetation. The remaining formations will experience a reduced or negligible net chance in impact as a result of the proposed modification.

It is unlikely that the habitat features found within the proposed surface infrastructure area are essential to the survival of any fauna species within the local area. Fauna species utilising the habitat within the proposed surface infrastructure area would be doing so as part of a wider habitat range, and would not rely specifically or solely on the habitats of the proposed surface infrastructure area for survival.
Potential subsidence movements within the maximum subsidence affectation area may result in rock fall within the cliff line areas, as well as the potential loss of small amounts of vegetation associated with rock fall sites. This potential impact is not expected to result in the loss of large amounts of vegetation, nor result in a significant loss in habitat for native fauna species.

5.5.5.2 Indirect Impacts

The proposed underground mining operations will result in subsidence above the extracted longwall panels. Subsidence itself does not typically adversely impact on ecological values, however subsidence can lead to surface cracking, rock fall and changes to surface drainage that may impact on ecological values.

Impact on Vegetation Communities

The detailed subsidence modelling completed for the proposed modification have identified a maximum subsidence affectation area (refer to **Figure 5.1**). **Table 5.11** identifies those vegetation communities (and the areas of each) located within the maximum subsidence affectation area. It is noted that this table does not include vegetation within the proposed surface infrastructure area, as this has been assessed as a direct impact in **Section 5.5.5.1** above. Vegetation located within the Brokenback Conservation Area has also been excluded from this table, as this Conservation Area will remain protected from subsidence impacts in accordance with the existing Project Approval commitments.

Table 5.11 – Vegetation Communities within Maximum Subsidence Affectation Area

Vegetation Community	Amount within Maximum Subsidence Affectation Area (Ha)
Forest/Open Forest Formation	
Blakely's Red Gum Open Forest	41.4
Blakely's Red Gum Open Forest (regenerating)	29.2
Ironbark Open Forest Complex on Sandstone	1469.2
Ironbark Open Forest Complex on Sandstone (regenerating)	48.7
Narrow-leaved Ironbark Open Forest on Alluvium/Colluvium	225.2
Narrow-leaved Ironbark Open Forest on Alluvium/Colluvium (regenerating)	10.8
Rough-barked Apple Open Forest on Alluvium/Colluvium	419.9
Rough-barked Apple Open Forest on Alluvium/Colluvium (regenerating)	36.4
She-oak Low Forest on Sandstone Crests	39.4
Stringybark-Ironbark Open Forest on Sandstone Slopes	104.5
Woodland Formation	
Grey Box Woodland	5.3
Modified White Box Woodland	12.7
Scribbly Gum Woodland – Heathland on Sand Plateaux	164.0
White Box Woodland	83.2
White Box Woodland (regenerating)	25.7
Yellow Box - Red Gum Woodland	12.6
Heathland Formation	
Dry Heathland on Rocky Outcrops	0.6
Narrow-leaved Ironbark Open Forest + Scribbly Gum Woodland – Heathland on Sand Plateaux	202.8
She-oak Low Forest on Sandstone Crests + Dry Heathland on Rocky Outcrops	6.3
Grassland Formation	
Derived Native Grassland	224.6
Improved Pasture	26.7
Rough-barked Apple Open Forest Grassland	1.1
Unimproved Pasture	131.7
Cleared	
Cleared	0.6
Water Bodies	
Water Bodies	0.8
TOTAL	**3323.4**

Notes: Values have been rounded up to nearest single decimal place and are approximate only. All values subject to minor mapping/GIS-based discrepancies.

There are not expected to be any impacts to the condition or viability of these vegetation communities, based on subsidence-related impacts as predicted in SCT (2014), or as has been observed during extensive ecological monitoring of previous underground mining.

Detailed monitoring surveys of fauna species and habitat values of the vegetation above underground mining areas have been completed in the Ulan West area commencing in 2006. These surveys have been completed before, during and after underground mining in various locations across the Ulan Coal Complex. The statistical analyses completed on the data collected concluded that:

> *there have been no discernible impacts from subsidence upon threatened species, populations, habitats or ecological communities associated with the terrestrial environment" (BMS 2013).*

Given that detailed subsidence predictions are comparable between these previously mined areas and the currently proposed mining areas (SCT 2014), this conclusion from BMS (2013) is expected to be applicable to the maximum subsidence affectation area (refer to **Figure 5.1**).

Impact on Cliff Lines

Cliff line modelling was used to identify the amount of cliff line that may be subject to potential impact as a result of the proposed modification. The probability of impact on these cliff lines was calculated, based on advice from SCT (2014), which provided generic probabilities for rock fall and perceptible impact for cliff lines within each of the five units within the Triassic sandstone sequence. The assessment of potential impact has taken a conservative approach and assumed a 20 per cent probability of rock fall across all cliff lines within the Triassic sandstone sequences above the maximum subsidence affectation area.

The cliff formations in the maximum subsidence affectation area are mainly of relatively low height (i.e. 50 per cent of cliff lines are less than 15 metres high) and are a minor portion of the cliff formations that occur extensively across the region, including in the nearby Goulburn River National Park.

Predicted impacts to cliff line habitat in the maximum subsidence affectation area are provided in **Table 5.12.** The proposed modification will not impact cliff lines in the Brokenback Conservation Area.

Table 5.12 – Predicted Cliff Line Impacts within Maximum Subsidence Affectation Area

	Modelled Cliff Line Length (m)		
	Proposed Modification	**Approved Development**	**Net Change**
Proposed Surface Infrastructure Area	35.2	105	-69.8
Maximum Subsidence Affectation Area	12,659.5	11,263.1	1396.4
Predicted Cliff Line Impact (20%)	2,538.9	2273.6	265.3

Notes: Values have been rounded up to nearest single decimal place and are approximately only. All values subject to minor mapping/GIS-based discrepancies.

Modelling from Umwelt (2009) has shown that there is a total of approximately 12,659.5 metres of cliff line within the maximum subsidence affectation area. When applying the 20 per cent probability of rock fall to this area, it is expected that in the order of approximately 2,539 metres of cliff line within the maximum subsidence affectation area may be subject to rock fall impact. This is approximately 265 metres longer than the currently approved cliff line impact.

Where rock fall occurs, it is likely that small amounts of vegetation in the immediate area will be damaged, and further damage may be sustained to vegetation below the rock fall area. Previous longwall mining of the Ulan No. 3 has undermined approximately 8 kilometres of sandstone cliffs. It is estimated that approximately 1.6 kilometres (20 per cent) of these cliff lines have experienced rock falls. This indirect impact, however, has not resulted in the loss of significant amounts of vegetation. It expected that the proposed modification will not alter the level of indirect impact when compared to that observed in the previously mined parts of the mine site.

Results of monitoring indicated 60 metres of rock fall had occurred within recent mining in the approved Ulan No 3 Underground mining area (specifically, the North 1 mining area). This was considered a direct result of mining as the control sites were shown to have experienced negligible rock fall. This was the equivalent of 6.0 percent of the total length of cliff line within the North 1 mining area, which was less than the subsidence impact performance measure of 20 per cent. It is anticipated that similar mining-induced subsidence will result from the proposed modification. This monitoring did not identify any vegetation loss as a result of rockfall experienced in this area.

Rock fall is expected to be most prevalent in weak points in the cliff line, such as existing caves, cracks and overhangs which may provide roosting habitat for cave-dependant micro-bat species. Any vegetation associated with rock fall areas is likely to be damaged; however this impact is likely to be confined to these specific areas only. Subsidence is not expected to cause significant cracking or alteration to hydrology that is likely to be reflected in impacts on vegetation.

Potential Tree Fall

It is expected that subsidence movements as a result of longwall mining will not cause significant tree fall or failure. This is supported by observations of the previously-mined parts of the mine site, where tree failure as a result of vertical subsidence has not been common. Cliff line monitoring has not identified any vegetation loss as a result of rockfall experienced at the Ulan No.3 mining area.

Impacts to Surface Drainage

The Surface Water Assessment (refer to **Appendix 4**) has determined that the predicted subsidence impacts will result in negligible changes to watercourse stability when compared to the current approved impacts.

In addition to this, the predicted subsidence impacts are deemed to have limited potential to result in increased remnant ponding, both in or out of the drainage lines. As a consequence, there is expected to be negligible impact on vegetation in and adjacent to drainage lines for the proposed modification.

Impacts to Groundwater Dependent Ecosystems

Some of the red gum-dominated riparian communities mapped within the Ulan Coal Complex have the potential to be classified as GDEs, according to the Groundwater Dependent Ecosystem Policy (DLWC 2002) as either:

- wetlands and red gum forests;
- other terrestrial vegetation; or
- ecosystems in streams fed by groundwater.

While there are potentially several examples of these ecosystems throughout the Ulan Coal Complex, these are generally not well-defined, blend into adjacent drier communities and are not significant GDEs such as hanging swamps and limestone cave systems, which are not present in the Ulan Coal Complex. There have been no records of significant known GDEs from ecological surveys completed within the Ulan Coal Complex or proposed modification areas to date.

Impact on Threatened Cliff Line and Cave-Dependent Species

The impact of subsidence on cliff line habitat within the proposed modification areas could potentially involve impacts on cave habitats, and therefore potential impact on cave-dependent species. Current and previous surveys have identified a number of cave-dependent species occurring within the Ulan Coal Complex, including the following threatened micro-bat species:

- eastern bentwing-bat (*Miniopterus schreibersii oceanensis*);
- large-eared pied bat (*Chalinolobus dwyeri*);
- southern myotis (*Myotis macropus*);
- little pied bat (*Chalinolobus picatus*); and
- eastern cave bat (*Vespadelus troughtoni*).

Additionally, the brush-tailed rock-wallaby (*Petrogale penicillata*) is reliant on rocky cliff line areas as refuge habitat from predators.

If micro-bat species are breeding or roosting within the cliff lines of the proposed modification areas, there is potential that subsidence-related rockfall could impact on breeding or roosting caves (if present). If so, two scenarios could occur:

- Breeding cave (depending on the timing of the impact) – rockfall could destroy a cave that is suitable for breeding. These are rare in the landscape as they require very specific temperature and microclimate parameters. The loss of such a cave could prevent breeding in the area (or possibly a larger area) if no other suitable caves were present. Pregnant or lactating females and young could be injured or killed, or juveniles left in crèches could be injured or killed (while females are foraging). Such impacts could significantly impact the ability of the local population to breed and persist in the area.
- Roosting cave (depending on the time of year) – may cause injury or death to colonies of males or females (usually roost in single-sex colonies). Such impacts could significantly impact the ability of the local population to breed and persist in the area.

Specialised micro-bat monitoring has been occurring across the Ulan Coal Complex since 1994. This has included monitoring of offset areas, rehabilitation, non-impacted areas and areas subject to underground mining. Particular attention has been paid to the three cave-dependant species that are regularly recorded throughout the Ulan Coal Complex and are considered potentially vulnerable to underground mining impacts. These are the large-eared pied bat (*Chalinolobus dwyeri*), eastern bentwing-bat (*Miniopterus schreibersii oceanensis*) and eastern horseshoe bat (*Rhinolophus megaphyllus*) (although not threatened is locally significant).

Within the limitations of the works completed thus far, monitoring has identified no evidence of micro-bat species being impacted by subsidence within the Ulan Coal Complex. Further, this monitoring indicates that populations of the three target cave-roosting species appear to be stable (Fly By Night 2014b).

While there is evidence of two confirmed and one highly likely maternity roost for the large-eared pied bat (*Chalinolobus dwyeri*) within the Ulan Coal Complex, these do not fall within the proposed surface infrastructure area or maximum subsidence affectation area for Ulan West. However it is not possible to exclude the possibility of the presence of such caves in the proposed modification areas and maximum subsidence affectation area. The potential for the eastern bentwing-bat breeding in the Ulan Coal Complex is lower, due to its preference for limestone breeding caves, and its ability to travel relatively large distances.

As there is no way to conclusively exclude the potential for breeding and/or roosting of these species in the cliff lines of the proposed modification areas, the ecology assessment assumes their potential presence, and assesses potential impacts accordingly. The assessment does, however recognise the extensive monitoring works completed for these species (including within the maximum subsidence affectation area) and the lack of current evidence of subsidence-related impacts on populations of these species (Fly By Night 2014b).

5.5.5.3 Impacts on Threatened Species, Migratory Species and Endangered Populations and Threatened Ecological Communities

Environmental Planning and Assessment Act 1979

The EP&A Act requires a Test for Ecological Significance relating to the potential impacts of the proposed modification on listed threatened species, endangered populations or TECs. A detailed assessment of threatened species, endangered populations and TECs listed under the TSC Act with potential to occur within the proposed modification areas is included in **Appendix 5.**

No threatened flora species were recorded within the proposed modification areas during the field survey completed for this assessment; however four were considered to have the potential to occur being Ausfeld's wattle (*Acacia ausfeldii*), painted diuris (*Diuris tricolor*), Cannons stringybark (*Eucalyptus cannoni*), scant pomaderris (*Pomaderris queenslandica*) and *Homoranthus darwinioides*. Each of these species is listed as vulnerable under the TSC Act and was tested for Ecological Significance in accordance with the EP&A Act in **Appendix 5.**

Ten threatened fauna species listed under the TSC Act were identified within the proposed modification areas during surveys completed by BMS (2014), and a further 12 have been recorded within the maximum subsidence affectation area previously (Umwelt 2009a). A number of other threatened fauna species listed under the TSC Act were considered to have potential to be impacted by the proposed modification and were tested for Ecological Significance in **Appendix 5**. Due to the nature of the predicted impacts from the proposed modification, those fauna species subject to further assessment focused on those recorded in the vicinity and are dependent on hollows (to be removed as part of direct clearing for the proposed surface infrastructure), are cave-dependent (thus vulnerable to subsidence-related cliff fall) or are habitat specialists. Threatened fauna subject to assessment were the:

- glossy black-cockatoo (*Calyptorhynchus lathami*);
- gang-gang cockatoo (*Callocephalon fimbriatum*);
- little lorikeet (*Glossopsitta pusilla*);

- swift parrot (*Lathamus discolor*);
- turquoise parrot (*Neophema pulchella*);
- powerful owl (*Ninox strenua*);
- barking owl (*Ninox connivens*);
- brown treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*);
- regent honeyeater (*Anthochaera phrygia*);
- koala (*Phascolarctos cinereus*);
- squirrel glider (*Petaurus norfolcensis*);
- brush-tailed rock-wallaby (*Petrogale penicillata*);
- yellow-bellied sheathtail bat *(Saccolaimus flaviventris*);
- little bentwing-bat (*Miniopterus australis*);
- eastern bentwing-bat (*Miniopterus schreibersii oceanensis*);
- south-eastern long-eared bat (*Nyctophilus corbeni*);
- little pied bat *(Chalinolobus picatus)*;
- large-eared pied bat (*Chalinolobus dwyeri*);
- eastern false pipistrelle (*Falsistrellus tasmaniensis*);
- southern myotis (*Myotis macropus*); and
- eastern cave bat (*Vespadelus troughtoni*).

There are no endangered flora or fauna populations known to occur within the proposed modification areas or considered likely to occur.

One TEC listed under the TSC Act was subject to a Test for Ecological Significance under the EP&A Act, being White Box - Yellow Box – Blakely's Red Gum Woodland EEC. Of particular importance is the proposed reduction in impact to the White Box Woodland TEC, whereby the existing approval envisages impact to approximately 22.9 hectares of this TEC compared to approximately 8.5 ha as a result of the proposed modification. This results in a reduction of impact to approximately 14.4 hectares of this TEC.

This assessment has been made without consideration of the mitigation, ameliorative or offset measures. Rather, the conclusion on impacts is based purely on the anticipated effects that the proposed modification would have on the ecological features of the area if the proposed modification were implemented without any form of mitigation or offsetting.

These assessments determined that the proposed modification is unlikely to result in a significant impact on threatened flora or fauna species, TECs, or their habitats. This is primarily a result of:

- the relatively minor area of direct impact (being loss of vegetation and fauna habitat within approximately 58.7 hectares);
- the negligible indirect impacts expected to occur to vegetation communities and fauna habitat within the Maximum Subsidence Affectation area;
- where impacts to cliff lines are anticipated as a result of subsidence, these are reliably predicted to be less than 20% of cliff lines within the maximum subsidence affectation area; and
- ongoing ecological monitoring (focusing on fauna, fauna habitat, flora, cliff lines and micro-bats) identifying no evidence (to date) of subsidence-related impacts to fauna assemblages, fauna habitat, vegetation communities and micro-bat populations.

Environment Protection and Biodiversity Conservation Act 1999

Under the Commonwealth EPBC Act, approval of the Commonwealth Minister for the Environment is required for any action that may have a significant impact on matters of national environmental significance (MNES).

An Assessment of Significance was required for the following eight threatened species, one migratory species and one CEEC:

- hoary sunray (*Leucochrysum albicans* var. *tricolor*);
- *Homoranthus darwinioides*;
- swift parrot (*Lathamus discolor*);
- regent honeyeater (*Anthochaera phrygia*);
- koala (*Phascolarctos cinereus*);
- brush-tailed rock-wallaby (*Petrogale penicillata*);
- south-eastern long-eared bat (*Nyctophilus corbeni*);
- large-eared pied bat (*Chalinolobus dwyeri*);
- rainbow bee-eater (*Merops ornatus*); and
- *White Box* – Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland CEEC.

The EPBC Act lists criteria which are used to determine whether an action is likely to have a significant impact on MNES. These criteria are addressed in the detailed Assessment of Significance provided in **Appendix 5**. The Assessments of Significance completed for the eight threatened species, one migratory species and one CEEC concluded that the proposed modification was unlikely to result in a significant impact.

5.5.6 Impact Mitigation Measures

5.5.6.1 Avoidance of Impacts

As described in **Section 5.5.1**, UCML have sought to firstly avoid and then minimise potential impacts on the ecological values of the proposed modification areas throughout the project planning process, where possible. A number of strategies have been adopted to avoid or minimise ecological impact as part of the project design phase, these being:

- Alteration to the originally proposed layout of the proposed surface infrastructure area (as much as feasible) in order to avoid areas of White Box Woodland TEC where practicable. This was completed in a number of phases throughout the project design phase, with infrastructure overlain on vegetation mapping and where possible, infrastructure moved to avoid areas of White Box Woodland TEC. Priority was placed on avoiding the treed variants of White Box Woodland TEC where possible, with impact focused on grassland variants where impact to the TEC was unavoidable in certain areas;

- Where moving infrastructure was not possible (due to need for it to be located according to the underlying longwalls), the size of the disturbance footprint for the pipelines, transmission lines, access tracks, ventilation shafts etc was minimised as much as possible. Infrastructure will be co-located as much as possible to minimise disturbance footprints;

- Existing access tracks were used as much as possible in the project planning; and

- Progressive decommissioning and rehabilitation of infrastructure as longwall mining progresses.

The proposed modification has been designed in a manner that aims to avoid disturbance to the ecological features of the proposed modification areas where possible, whilst maintaining the economic feasibility and practicality of all components of the proposed modification.

5.5.6.2 General Mitigation Measures

UCML currently operates under a Biodiversity Management Plan (BMP) in accordance with PA 08_0184. The BMP provides the ecological management strategies, procedures, controls and monitoring programs that are to be implemented for the management of flora and fauna across the Ulan Coal Complex. The BMP will continue to be applied to the Ulan Coal Complex, including the proposed modification areas and updated where relevant.

The following general mitigation measures will be implemented (as much as possible), in order to minimise impacts resulting from the proposed modification:

- maximise the use of existing disturbed areas within the proposed modification areas for the placement of infrastructure and to avoid impact on surrounding vegetation;

- implementation of a detailed pre-clearing and tree felling supervision program for proposed surface infrastructure areas. This will follow the existing procedures currently implemented by UCML under the current BMP;

- installation of nest boxes to replace the hollow lost as a result of the clearing activities. A record of hollows in the proposed surface infrastructure area will be obtained during the pre-clearing process, and these will be replaced with nest boxes of comparable design (based on hollow size class recorded). Nest boxes will be installed in nearby secure habitats to compensate for hollows lost as a result of the proposed modification. These nest boxes will be subject to the detailed monitoring and maintenance program that is currently being implemented as part of the BMP; and

- current weed management and feral fauna management activities (in accordance with current BMP) will cover the areas subject to the proposed modification.

5.6 Aboriginal Archaeology

The term Aboriginal heritage refers to both archaeological sites and to sites and/or places of cultural value to the present-day Aboriginal community. Archaeological sites contain material evidence of Aboriginal occupation such as stone artefacts, rock shelters, and grinding grooves. Places of cultural significance can only be identified by Aboriginal stakeholders, and encompass places with traditional, historic, religious or spiritual meanings (NPWS, 1997:3). An Aboriginal Cultural Heritage Assessment was completed in consultation with the registered Aboriginal stakeholders for the proposed modification by South East Archaeology. The draft Aboriginal Cultural Heritage Assessment is included in **Appendix 6** and summarised below.

5.6.1 Aboriginal Stakeholder Consultation

The approved UCCO Project (Kuskie 2009) involved a comprehensive program of Aboriginal community consultation in accordance with the *Interim Community Consultation Requirements for Applicants* (DEC 2004) and ongoing consultation has subsequently occurred in accordance with the approved Heritage Management Plan (HMP) which is consistent with relevant OEH guidelines.

An important part of UCML operations has included ongoing consultation with the registered Aboriginal stakeholders for the UCCO Project (Warrabinga Native Title Claimants Aboriginal Corporation, North East Wiradjuri Company Ltd, Mudgee Local Aboriginal Land Council, Murong Gialinga Aboriginal and Torres Strait Islanders Corporation and Warranha Ngumbaay) in accordance with the approved Heritage Management Plan (HMP). The Wellington Valley Wiradjuri Aboriginal Corporation registered an interest in being consulted on UCML operations and projects in March 2014 and has been consulted with since that time, including participation in field survey, relevant meetings and review of the draft Cultural Heritage Assessment report. Details of the Aboriginal stakeholder consultation for the proposed modification are provided in **Appendix 6** and are summarised below:

- all registered Aboriginal parties (RAPs) were informed of the proposed modification by correspondence of 2 May 2014 and invited to participate in the fieldwork and consultation program, to provide input to the cultural heritage assessment;

- representatives of Wellington Valley Wiradjuri Aboriginal Corporation met with UCML on 16 May to discuss UCML projects, the proposed modification and undertook an inspection of Ulan Grinding Groove conservation areas and Brokenback Conservation Area;

- representatives of each organisation attended the fieldwork program for the proposed modification, on a daily basis for each of the five days of the field survey (26 to 30 May 2014);

- the proposed modification, and initial fieldwork findings, were discussed as part of a regular heritage meeting (attended by Warrabinga Native Title Claimants Aboriginal Corporation, Mudgee Local Aboriginal Land Council, Murong Gialinga Aboriginal and Torres Strait Islanders Corporation and Wellington Valley Wiradjuri Aboriginal Corporation) on 12 June 2014;

- a meeting was held at the Ulan mine site on 25 November 2014, to discuss the cultural significance, impact assessment and mitigation options in relation to the Cockabutta Creek rock shelter sites (refer to **Section 5.6.4** for further details in relation to these sites). The meeting included a site inspection and discussion of potential mitigation measures. Participants at the meeting included Warrabinga Native Title Claimants Aboriginal Corporation, Mudgee Local Aboriginal Land Council, North East Wiradjuri Company Ltd, Murong Gialinga Aboriginal and Torres Strait Islanders Corporation and Wellington Valley Wiradjuri Aboriginal Corporation;

- a draft version of the Cultural Heritage Assessment report was forwarded to the Aboriginal stakeholders for review on 2 December 2014 and a minimum 15 working days was allowed for comment;

- all RAPS attended a regular heritage meeting on 11 December 2014, during which the draft Cultural Heritage Assessment report and the process for providing further input and feedback was discussed;

- feedback on the draft Cultural Heritage Assessment report has been provided to date by Murong Gialinga Aboriginal and Torres Strait Islanders Corporation, and Wellington Valley Wiradjuri Aboriginal Corporation. All feedback received will be considered in the final Cultural Heritage Assessment. Correspondence received to date has generally been supportive of the proposed cultural heritage management strategy for the proposed modification;

- a final version of the Cultural Heritage Assessment report will be provided to the registered Aboriginal stakeholders within 30 working days of completion.

Further details of Aboriginal stakeholder consultation are provided in **Appendix 6**.

5.6.2 Assessment Methodology

The additional survey focussed on the areas of proposed surface infrastructure and modified Ulan West underground mining area, that had not been previously subject to detailed investigation.

A comprehensive field survey was undertaken with assistance from representatives of the registered Aboriginal stakeholders over a period of five days in May 2014. The assessment built upon a substantive 104 day, 4785 hectare study carried out for the UCCO Project.

The extent of the survey coverage was considered satisfactory to present an effective assessment of the Aboriginal heritage resources identified and potentially present within the study area. The coverage was comprehensive for obtrusive site types, such as rock shelters, grinding grooves and scarred trees. Due to surface visibility constraints, the coverage was limited to some extent for the less obtrusive stone artefacts. Nevertheless, South East Archaeology concluded that the survey provides a valid basis for determining the probable impacts of the proposed modification and providing recommendations for the management of identified and potential Aboriginal heritage resources.

In assessing the impacts to Aboriginal Heritage resulting from the proposed Ulan West mine plan changes, review has also been conducted of the relevant approved impacts on the basis of revised subsidence predictions by SCT.

5.6.3 Survey Results

The survey for the proposed modification has resulted in the recording of an additional 22 Aboriginal sites, comprising 13 artefact scatters, seven isolated finds and two rock shelters with artefacts, along with five rock shelter with PADs (refer to **Figure 5.7**). Full descriptions of all newly identified sites and PADs recorded during the current survey are presented in **Appendix 6**.

Excluding artefact scatters and isolated finds (as subsidence associated with the proposed modification will have no material impact on these site types), the key sites of interest in relation to the proposed modification are summarised in **Table 5.13** below. The sites listed in **Table 5.13** include all relevant previously recorded sites in the currently approved Ulan West mining area, in addition to those sites recorded in the modification areas.

Table 5.13 – Known Aboriginal Sites Within the Approved and Proposed Ulan West Mining Area

Site Type	Approved	Proposed Additional Sites to be Impacted	Total
Grinding Grooves	2	0	2
Ochre Quarry	0	1	1
Rockshelters with Art	3	0	3
Rockshelters with Art and Artefacts	3	1	4
Rockshelters with Art and Grinding Grooves and Artefacts	1	0	1
Rockshelters with Artefacts	76	4	78[1]
Rockshelters with Grinding Grooves	2	0	2
Rockshelters with Grinding Grooves and Artefacts	2	0	2
Rockshelters with PAD	200	13	210[2]
Scarred Tree	4	0	4
Stone Arrangement	1	0	1
TOTAL	**294**	**19**	**308***

[1] Two rockshelter sites with artefacts will no longer be impacted as a result of the proposed modification.
[2] Three rockshelter sites with PADs will no longer be impacted as a result of the proposed modification.

As shown in **Table 5.13**, there are an additional 19 sites that will be impacted as a result of the proposed modification. However, there will be five sites that will no longer be impacted as a result of the proposed modification including three rock shelter with PADs and two rock shelters with artefacts.

There are also a number of sites that will have a change to the level of impact (both increased and decreased) as a result of the proposed modification. Further details on potential changes to impacts as a result of the proposed modification are provided in Section 9 of **Appendix 6**.

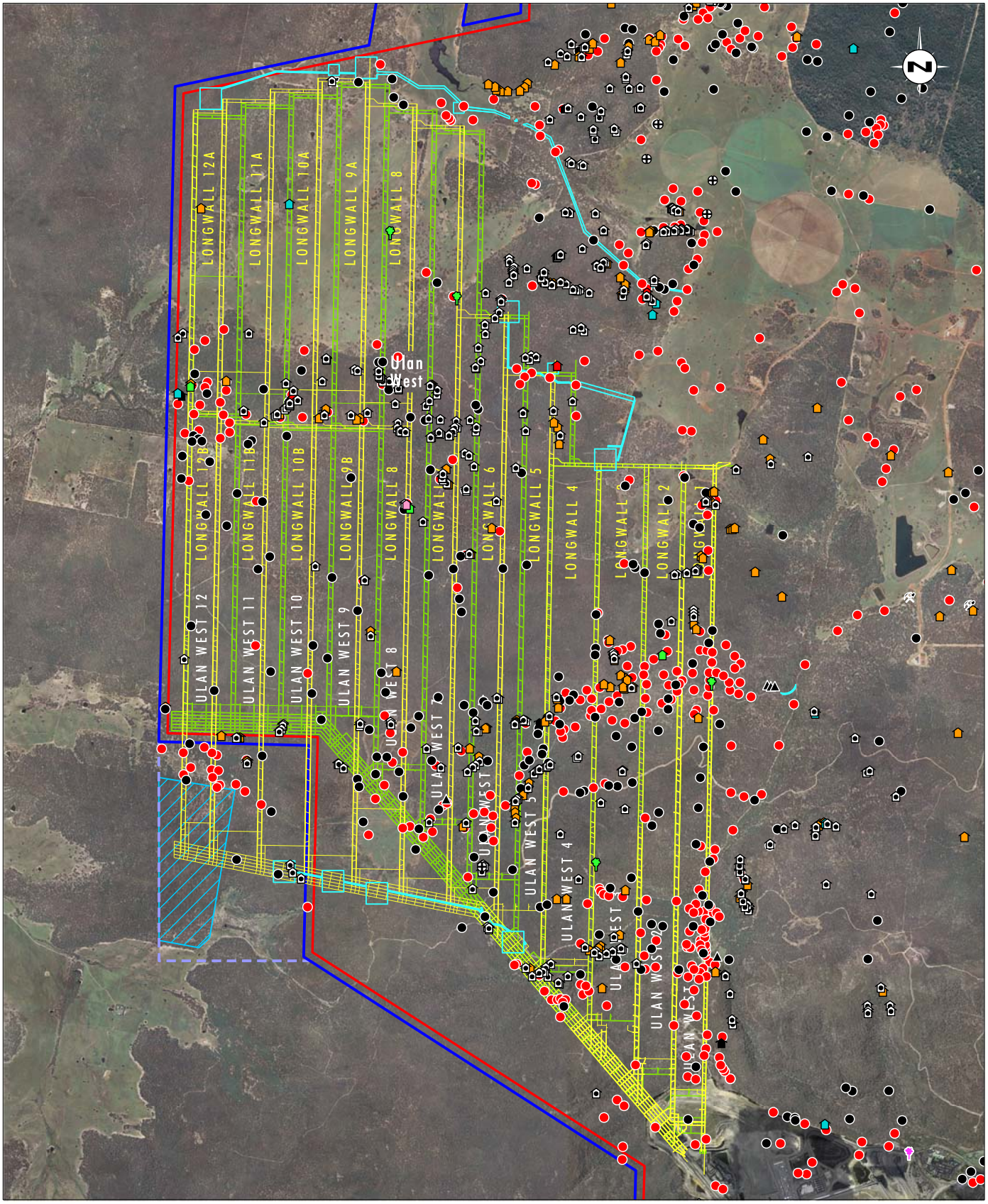


Image Source: Ulan Coal (2008, 2010, 2014)
Data Source: Ulan Coal (2014), Biodiversity Monitoring Services (2014), Umwelt (2009), Hoye (2009-2014)

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- MLA 475
- Approved Ulan West Mine Plan
- Proposed Conceptual Ulan West Mine Plan
- Proposed Surface Infrastructure Area
- Artefact Scatter
- Grinding Groove
- Isolated Find
- Ochre Quarry
- Rockshelter with Art
- Rockshelter with Art and Artefacts
- Rockshelter with Art and Grinding Grooves and Artefacts
- Rockshelter with Artefacts
- Rockshelter with Grinding Grooves
- Rockshelter with Grinding Grooves and Artefacts
- Rockshelter with PAD
- Scarred Tree
- Scarred Tree and Artefact Scatter
- Stone Arrangement

FIGURE 5.7

Known Archaeological Sites

File Name (A4): R01/3363_069.dgn
20141215 14.41

5.6.4 Significance Assessment

The assessment of significance of Aboriginal sites has two defined components: cultural significance, which is determined by the Aboriginal community, and archaeological/scientific significance, which is determined by an archaeologist based on the ability of the site to contribute to the scientific understanding of Aboriginal culture. Table 9 in **Appendix 6** sets out the significance assessment of Aboriginal sites, cultural areas/values and archaeological deposits within or immediately adjacent to the modification investigation area that have not previously been reported. A full list of Site ID's is provided in Appendix 6 of **Appendix 6.**

5.6.4.1 Aboriginal Cultural Significance

Aboriginal cultural significance refers to the value placed upon Aboriginal heritage evidence by the local Aboriginal community. All heritage evidence tends to have some contemporary significance to Aboriginal people, because it represents an important tangible link to their past and to the landscape. Heritage evidence may be part of contemporary Aboriginal culture or be significant because of its connection to spiritual beliefs or as a part of recent Aboriginal history.

The Aboriginal community themselves are in the best position to identify the levels of cultural significance and the stakeholders have been invited throughout the course of the assessment, the field investigation and stakeholder meetings to provide input into the cultural significance of the specific sites and areas.

The response of several Aboriginal stakeholders is that all identified sites and cultural values in the proposed Ulan West mining area, along with the modification area itself, are of cultural significance. Some Aboriginal stakeholders prefer to identify all sites and the investigation area as being of cultural significance rather than engaging in any comparative or ranking process (as is inherent within any system of significance assessment). Nevertheless, a specifically high value has been noted for the large pagodas and sandstone formations within the valley adjacent to the main Cockabutta Creek tributary and the large sandstone formation in which rock shelters referred to as ID# 161 and 162 are situated (refer to Table 9 of **Appendix 6**).

5.6.4.2 Archaeological/Scientific Significance

There are 73 Aboriginal heritage sites that have been recorded within or adjacent to the investigation area that includes the approved existing and proposed modified Ulan West modification area. These sites comprise:

a) Sites/PADs within the zone of potential impact (subsidence and direct) for the proposed modification but outside of the zone of potential impact for the approved UCCO Project for which the significance was not reported in Kuskie (2009). These sites/PADs include those recorded during the present survey and those previously recorded during the UCCO Project survey (Kuskie 2009: refer to Volume B) or recently during other ongoing UCML heritage management activities; and

b) Sites/PADs recorded during the present survey that are located in land now *outside of* the zone of potential subsidence or surface impacts of the proposed modification (or the originally approved UCCO Project), due to subsequent refinements to the impact area after completion of the survey (these sites are included for completeness).

The key conclusions of the significance assessment are presented below for each site type for the 73 sites not previously assessed. In overall terms:

- 69.9% of the sites are assessed as being of low significance within a local context (compared with 74.8% for the much larger sample of 1,005 sites assessed in the UCCO Project);
- 9.6% of sites assessed as being of low to moderate or 'low to possibly moderate' significance (compared with 10.7% for the overall UCCO Project);
- 6.8% of moderate significance (6.3% for the overall UCCO Project), 8.2% of moderate to high or 'moderate to possibly high' or 'possibly moderate to high' significance (4.9% for the overall UCCO Project); and
- 5.5% of high significance (3.3% for the overall UCCO Project).

5.6.5 Impacts

The impacts of the proposed modification on Aboriginal heritage may be as result of:

- direct surface impacts associated with surface infrastructure; and
- indirect impacts to the ground surface through underground mining induced subsidence.

In relation to known Aboriginal sites, the key areas of interest in relation to the proposed modification are the zones of potential impact for Ulan West, both for the approved UCCO Project and for the proposed modification. Three potential changes may occur from the proposed modification to Aboriginal sites:

a) impacts that may have occurred under the approved UCCO Project will no longer occur under the proposed modification (decrease in impacts);

b) impacts that would not have occurred under the approved UCCO Project will now occur under the proposed modification (increase in impacts); and

c) impacts that may have occurred under the approved UCCO Project will also occur under the proposed modification, but with an altered level of potential impact.

At the conclusion of the present survey for the proposed modification, excluding artefact scatters and isolated finds (as subsidence associated with the proposed modification will have no material impact on these site types), a total of 315 Aboriginal sites/PADs are known to occur within the zones of potential subsidence impact, both for the approved UCCO Project (Ulan West area only) and for the proposed modification.

5.6.5.1 Direct Impacts

With respect to identified Aboriginal sites/PADs and the proposed changes to the zone of potential surface impacts for the proposed modification compared with the approved UCCO Project, the key changes to impacts comprise:

a) Sites/PADs with a decrease in impacts (ID# 602, 606, 634, 635, 800, 804, 1194, 1195, 1201 and 1204 (refer to Appendix 6 of **Appendix 6**)), as surface impacts that may have occurred under the approved UCCO Project will no longer occur under the proposed modification;

b) Sites/PADs with an increase in impacts (ID# 462, 825, 826 and 827, and CC 45, 46 and 48 (refer to Appendix 6 of **Appendix 6**)), as surface impacts that would not have occurred under the approved UCCO Project will now occur under the proposed modification; and

c) Sites/PADs with an altered level of impacts (for example, ID# 512, 791 and 796 (refer to Appendix 6 of **Appendix 6**)), where surface impacts that may have occurred under the approved UCCO Project will also occur under the proposed modification, but either at a different level or within a different portion of the site.

The proposed changes to the surface impact area affect seven rock shelters with PADs, one rock shelter with grinding grooves, six artefact scatters and three isolated artefacts. Most of these sites/PADs are of low significance, however impacts will increase to three of the four sites of low to possibly moderate significance (rock shelter with grinding grooves ID# 462 and rock shelter with PAD ID# 825 and CC45 (refer to Appendix 6 of **Appendix 6**)), while impacts will reduce for the one site of moderate to high significance (artefact scatter ID# 804).

5.6.5.2 Subsidence Impacts

As for the UCCO Project EA, the assessment of potential subsidence impacts for each rock shelter site or PAD relates to the potential for rock falls and the probability of 'perceptible impacts'. 'Perceptible impact' is taken to refer to any changes in the rock formations that are associated with mining activity and subsidence movements. Such impacts may include tensile cracking, ranging from fine cracks to major fractures, shear movements on bedding planes and through intact strata, perceptible disturbance of any formations, and rock falls, ranging from minor dislocation of material through to major falls.

In terms of subsidence impacts and identified Aboriginal sites/PADs, the changes from the approved UCCO Project with respect to the proposed modification relate to:

- site types that may be affected by subsidence (particularly rock shelters and grinding grooves); and
- sites where the potential impacts from subsidence have moved above or below the 10% threshold of probability of perceptible impacts (consistent with the UCCO EA and monitoring observations to date).

Of the sites for which potential subsidence impacts will decrease, four are rock shelters with PADs of low significance (ID# 331, 333, 339 and 859 (refer to Appendix 6 of **Appendix 6**)), two are rock shelters with artefacts of low to moderate significance (ID# 334 and 336 (refer to Appendix 6 of **Appendix 6**)), one is a rock shelter with artefacts of moderate to high significance (ID# 335 (refer to Appendix 6 of **Appendix 6**)) and one is a rock shelter with grinding grooves of low to moderate significance (ID# 462 (refer to Appendix 6 of **Appendix 6**)).

Of the sites for which potential subsidence impacts will increase as a result of the proposed modification, one is an ochre quarry of high significance (ID# 807 (refer to Appendix 6 of **Appendix 6**)), 12 are rock shelters with PADs of low significance (CC29 and ID# 919, 1182, 1183, 1194-1200 and 1574 (refer to Appendix 6 of **Appendix 6**)), one is a rock shelter with artefacts of low significance (ID# 1575 (refer to Appendix 6 of **Appendix 6**)), one is a rock shelter with artefacts of moderate significance (CC28 (refer to Appendix 6 of **Appendix 6**)), one is a rock shelter with artefacts of high significance (ID# 284 (refer to Appendix 6 of **Appendix 6**)) and two are rock shelters with art and artefacts of high significance (ID# 161 and 162 (refer to Appendix 6 of **Appendix 6**)). Most of these are located in the extension area south of the existing approved Ulan West mine plan.

The three rock shelters of high significance and one of moderate significance, ID# 161 (CC19), 162 (CC20) and 284 (CC21) and CC28 (refer to Appendix 6 of **Appendix 6**), represent several of the Cockabutta Creek rock shelter sites, an area of archaeological sensitivity identified by Haglund (1999a). No impacts were proposed in this area as part of the UCCO Project Approval, and under the current Project Approval, avoidance of impacts to these sites is required.

As discussed in **Section 2.3**, there is one rock shelter with PAD (#ID822 (refer to Appendix 6 of **Appendix 6**)) that is located within the Interaction Zone between Ulan No.3 and Ulan West mine plans. Under the approved UCCO Project, the rock shelter site was considered to have a 50 per cent risk of subsidence impact. This level of impact would be preserved under the proposed modification, although the rock shelter site is currently not located within the proposed Ulan West mine plan. The rock shelter site was assessed as being of low significance. If potential impacts to this rock shelter site increase as part of future refinements to mine planning in this area, this will be further assessed at that time, in consultation with the Aboriginal stakeholders and as part of the process described in **Section 5.6.6.1**.

5.6.6 Management Strategy and Impact Mitigation Measures

Assessment of potential management strategies for the identified Aboriginal sites and cultural values that are subject to either a material change in potential subsidence impacts or surface impacts from the proposed modification has been undertaken consistent with the UCCO Project EA and approved Heritage Management Plan (HMP).

Following consultation with the local Aboriginal community, the following management and mitigation measures are proposed:

1) Management provisions relating to Aboriginal heritage in the HMP for the approved UCCO Project will continue to be implemented, with revisions and additional actions implemented where necessary that are relevant to the proposed modification. In particular, these revisions and additional actions include but are not limited to:

    a) management strategies for individual sites as outlined in **Appendix 6**;

    b) amendment of the avoidance of impact provisions to several of the Cockabutta Creek sites in the HMP to allow subsidence impacts to occur to these sites subject to implementation of:

        i) addition of the Cockabutta Creek rock shelter sites to the HMP and provision for:

            - undertaking an initial small test excavation in each rock shelter in accordance with the HMP;

            - undertaking more detailed salvage excavation in each rock shelter as determined by an appropriately qualified and experienced archaeologist, in consultation with the registered Aboriginal stakeholders; and

            - undertaking more detailed recording of Sites 161, 162, 284 and CC28 including photography and accurate surveying and where feasible, removal of samples for further analysis;

2) UCML will continue consultation with the Aboriginal stakeholders in relation to identification of an agreement on other culturally acceptable mitigation and offsetting measures for the Cockabutta Creek rock shelter sites.

5.6.6.1 Heritage Management Plan

In accordance with condition 47, Project Approval 08_0184, a HMP has been prepared in consultation with OEH and Aboriginal stakeholder groups to facilitate ongoing management of the Ulan Coal Complex's Aboriginal and European/Natural heritage resources. The HMP provides for the management of heritage sites, timing and methodology for the salvage of sites, the preparation of a management strategy for sites in the proposed Brokenback Conservation Area and the ongoing management of sites within the Ulan Coal Complex.

The HMP also includes provisions to:

- guide the assessment of any future alterations that may be proposed to the mine plan;
- guide the management of any previously unrecorded Aboriginal heritage sites, including skeletal remains, within the Project Approval Area; and
- ensure that Aboriginal community representatives are permitted access to the Conservation Areas or other identified sites in the Ulan Coal Complex lease area when requested.

The HMP will be regularly reviewed at an interval agreed with OEH and the Aboriginal stakeholders. Management strategies outlined in **Section 5.5.2** will be incorporated into the HMP as a part of the HMP's regular review.

5.7 Noise

A detailed Noise Impact Assessment (NIA) has been undertaken to assess the potential noise impacts of the proposed modification and is included in **Appendix 8**. A summary of the key findings is provided below.

5.7.1 Assessment Methodology

The NIA for the proposed modification has been undertaken in accordance with the following policies and guidelines:

- *NSW Industrial Noise Policy* (INP) [Environment Protection Authority (EPA) 2000];
- INP Application Notes (as at September 2014); *and*
- *Interim Construction Noise Guideline* (ICNG) (DECC 2009).

As an approved operation, PA 08_0184 and Environment Protection License (EPL) 394 specify noise limits for the Ulan Coal Complex operations. The objective of the proposed modification is to meet the current approval and EPL noise limits. Where this is not achievable, the potential noise impacts have been assessed in accordance with the objectives of Section 10 of the INP.

5.7.1.1 Existing Approved Noise Criteria for Ulan West

As part of the 2009 EA for the UCCO Project, the noise assessment evaluated the potential noise and vibration impacts for the construction of the infrastructure, mining operations and rehabilitation activities; blasting; and transportation activities associated with the UCCO Project.

The subsequent conditions of approval regarding noise and EPL conditions relating to noise (PA 08_0184 and EPL 394) for the approved UCCO Project are presented in **Table 5.14**.

Table 5.14 – Development Consent and EPL Noise Limits, dB(A)

Location	Day $L_{Aeq,15\ minute}$	Evening $L_{Aeq,15\ minute}$	Night $L_{Aeq,15\ minute}$	Night $L_{A1,1\ minute}$
R254	38	38	37	45
R57	37	37	36	45
R7	36	36	36	45
All privately owned land	35	35	35	45
Ulan Public School	35 (Internal) when in use			-
Ulan Anglican Church Ulan Catholic Church	40 (Internal) 40 (Internal) when in use			-

Note1: For Monday to Saturday, Day-time 7.00 am – 6.00 pm; Evening 6.00 pm – 10.00 pm; Night-time 10.00 pm – 7.00 am. On Sundays and Public Holidays, Day-time 8.00 am – 6.00 pm; Evening 6.00 pm – 10.00 pm; Night-time 10.00 pm–8.00 am.

Note2: Property #7 can be found in the EPL and Development Consent Noise Limits but has since been acquired by UCML.

5.7.1.2 Predicted Noise Levels

The surface activities for the proposed modification are relatively discrete and of comparatively low overall noise emission levels compared to total operations.

A three step process was used for assessing the noise impacts associated with the proposed modification. The three steps are outlined as follows:

1. Undertake a screening assessment of the activities associated with the proposed modification only. Where the worst case predicted noise levels are less than 30 dB(A) then no further assessment is required.

2. Where the worst case noise predicted impacts from the activities associated with the proposed modification only are greater than 30 dB(A) the worst case predicted noise levels have been added to the maximum predicted 10th percentile noise levels predicted in the UCCO Noise and Vibration Assessment (NVA). If the summation of the worst case noise impacts are less than the project noise limits in **Table 5.16** then no further assessment is required.

3. Where the summation of the worst case noise impacts exceed the project noise limits in **Table 5.16**, the specific details of the noise contribution made by activities associated with the proposed modification only have been investigated to determine if there are reasonable and feasible measures that could be employed to reduce the noise impacts from the proposed modification. Where practical, measures are proposed to reduce the noise impacts from the proposed modification to seek compliance with the project noise limits in **Table 5.16**.

The computer-based modelling software package Environmental Noise Model (ENM) was used to predict the noise levels produced by the proposed modification in the surrounding environment. The ENM noise models were based on machine and plant sound power level data obtained from UCML or collected by Umwelt, digital terrain maps of the region surrounding the proposed modification prepared by Umwelt and the layout of the existing and proposed operations provided by UCML.

The NIA was based on the noise levels predicted by the ENM model of the various phases of construction and operation associated with the proposed modification under the meteorological conditions described in **Appendix 8**.

5.7.2 Existing Acoustic Environment

The existing noise environment for the area surrounding the proposed modification was investigated in the UCCO Project. The UCCO NVA used previously measured background noise levels around Ulan Village and other residential areas, as well as additional background noise measurements to measure background noise levels at sensitive residential receivers located to the northern end of the Ulan West underground mining area.

As the region surrounding the proposed modification consists primarily of rural and mining land uses, it is considered that the background monitoring undertaken in support of the UCCO Project is representative of the background noise environment for the proposed modification in the absence of mining related noise impacts and therefore suitable for the purposes of this NIA.

Table 5.15 provides a summary of the background noise levels based on historical monitoring data.

Table 5.15 – Summary of Measured Background Noise Levels

	Background Noise Levels (RBLs)		
Monitoring Location	**Day (7am–6pm)**	**Evening (6pm-10pm)**	**Night (10pm-7am)**
Ulan Village	39	39	42
Rural Residential Areas	30	30	30

Additional background noise monitoring was undertaken for the UCCO Project to assess the existing noise environment at rural residential receivers located to the north of the Ulan West underground mining area. The results indicated the background noise levels were typically less than 30 dB(A), consistent with a rural environment in the absence of other industrial, road or rail influence.

5.7.3 Predicted Impacts

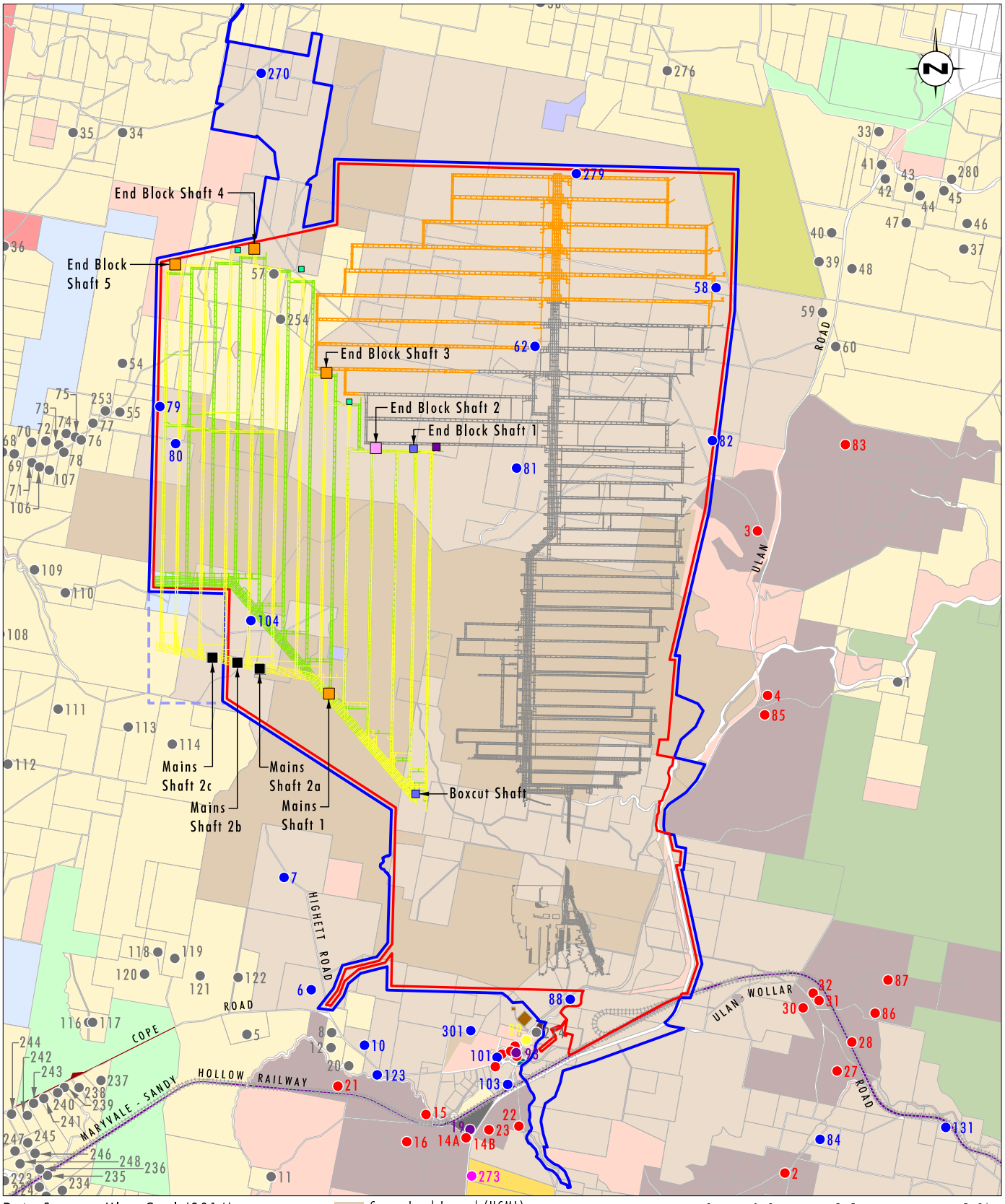
5.7.3.1 Operational Noise

Table 5.16 presents the predicted noise levels for the operational phase for each of the ventilation fans under the meteorological conditions described in **Appendix 8**. **Figure 5.8** illustrates the potential noise sources in relation to potential sensitive receivers.

Table 5.16 – Ventilation Fan Operational Noise Levels

Shaft	**Indicative Start Date**	**Indicative End Date**	**Predicted Noise Levels dB(A)**
Box Cut Shaft	-	Mid 2020	All receivers <30
Mains Shaft 1	Mid 2015	Life of Mine	R114 <30 to 32 R113 <30 to 30 All other receivers <30
Mains Shaft 2c [1]	Mid 2020 Mid 2021 Mid 2022	Life of Mine	R108 <30 to 31 R109 <30 to 31 All other receivers <30

Note 1: Only one “Shaft 2” will be constructed in either position 2a, 2b or 2c. Predicted noise levels are for location 2c which is considered to represent the worst case potential noise impacts of the three potential Shaft 2 site location options.



Data Source: Ulan Coal (2014)

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- MLA 475
- Approved Ulan West Mine Plan
- Proposed Ulan West Mine Plan
- Approved Ulan No.3 Underground Mine Plan
- Previous Underground Mining Operations
- NE Wiradjuri Wilpinjong Community Fund Ltd
- Birkalla Pty Ldt
- Country Energy
- Crown Land
- Crown Land Leased (UCML)
- Crown Land Leased (Private)
- Department of Education and Training
- Industrial
- Mid Western Regional Council
- Mined Owned (UCML)
- Mined Owned (Moolarben)
- National Park
- Orica Australia Pty Limited
- Private
- State Conservation Area
- State Rail Authority of NSW
- State Forests of NSW
- The State Of NSW
- Mine Owned Residence (Moolarben)
- Mine Owned Residence (UCML)
- Private Residence
- Ulan Community House
- Industrial
- Orica Australia Pty Ltd
- Existing Vent Shaft
- Existing Dewatering Station
- Proposed Realigned Dewatering Bore
- Proposed New Ventilation Shaft
- Proposed Realigned Ventilation Shaft
- Potential Realigned Ventilation Shaft

FIGURE 5.8

Potential Noise Sources and Sensitive Receivers

File Name (A4): R01/3363_064.dgn
20150309 14.06

The maximum noise level due to the operation of the ventilation shaft fans at the Box Cut Shaft, Mains Shaft 1 and Mains Shaft 2, as shown in **Table 5.16**, is predicted to be 32 dB(A) under the worst case meteorological scenarios modelled. In the UCCO NVA the predicted worst case noise level at receiver R114 was 28 dB(A). The cumulative noise level from the approved UCCO Project and the proposed modification is less than the Ulan Coal Complex noise criteria of 35 dB(A). For receivers R108, R109 and R113 the summation of the worst case predicted noise level in the UCCO NVA and the worst case noise levels predicted for the proposed modification are less than the Ulan Coal Complex noise criteria of 35 dB(A).

On this basis, no further assessment of the operation of the ventilation fans is required, as it is predicted that these operations, together with other approved Ulan Coal Complex operations will continue to meet relevant current approval limits.

5.7.3.2 Construction Noise

Specific noise assessment has been conducted for the construction of each of the proposed ventilation shafts. These activities are expected to occur for approximately 6 months. The assessment of construction noise has considered the worst case option for Main Shaft 2, that being Main Shaft 2c (refer to **Figure 5.8**).

The noise level due to the construction of the ventilation shafts could exceed 35 dB(A) at two receivers, receivers R57 and R254 (refer to **Figure 5.8**), under the worst case meteorological scenarios modelled. For residential receiver R57 noise levels are predicted to range, depending on the location and source of the noise, from less than 30 dB(A) to 39 dB(A) day time and are predicted to be less than 30 dB(A) during the evening and night time. For residential receiver R254 noise levels are predicted to range, depending on the location and source of the noise, from less than 30 dB(A) to 36 dB(A) day time and are predicted to be less than 30 dB(A) during the evening and night time.

The established day/evening noise limits at residential receivers R57 and R254 are 37 dB(A) and 38 dB(A) respectively and the PSNL in the UCCO NVA for the two receiver locations was 35 dB(A). The maximum predicted noise level at R57 of 39 dB(A) is 2 dB above the established noise limits for the receiver and exceeds the original PSNL by 4 dB. As a result, additional assessment of the noise impacts on residential receiver R57 was completed and specific further noise mitigation measures are proposed, as discussed in **Section 5.7.3.3**.

The maximum predicted noise level at R254 of 36 dB(A) is 2 dB less than the approved established noise limits for this location. Therefore, no additional assessment of the noise impacts on residential receiver R254 is required.

For residential receivers R34 and R55 the summation of the worst case predicted noise level in the UCCO NVA and the worst case noise levels predicted for the proposed modification are less than the Ulan Coal Complex noise criteria of 35 dB(A) therefore no additional assessment is required.

5.7.3.3 Control Measures

The predicted noise levels at residential receiver R57 are based on the sound power levels which represent the equipment required for the each phase of construction of the ventilation shafts. It has been assumed that the equipment will be well maintained and operated in accordance with the manufacturer's recommendations.

The worst case noise levels at residential receiver R57 of 39 dB(A) is due to the proximity of the shaft construction activities, the nature of daytime activities, and the propagation of the worst case meteorological conditions during the day time. The application of additional control measures such as the use of mobile noise barriers could be used to provide up to 6

dB of noise attenuation from fixed plant. There is limited opportunity for application of additional control measures to mobile plant working which will be operating in and around each ventilation shaft site during construction. If the noise impacts exceed the established noise limit at residential receiver R57 management options are limited to ceasing the construction activities during worst case meteorological conditions. Alternatively, UCML could enter into a commercial agreement with the affected residents for the period where the noise levels exceed the UCML noise criteria.

During the evening and night time noise levels from the construction phase of bore raising are predicted to not exceed 30 dB(A) at any residential receiver.

5.7.3.4 Summary of Findings

The proposed modification will have little to no impact on surrounding sensitive receivers with the exception of residential receivers R57 and R254 (refer to **Figure 5.8**).

Residential receiver R57 is predicted to experience noise levels that exceed the current Ulan Coal Complex noise criteria by up to 2 dB and are up to 4 dB above the original PSNL reported in the UCCO NVA during the construction of End Block Shafts 4 and 5 during the day time period (refer to **Figure 5.8**).

If the noise barriers are utilised for all night time bore raising activities, noise levels at all residential receivers should be maintained at less than 30 dB(A) during evening and night time worst case meteorological conditions.

With noise barriers in place on fixed equipment, the noise impacts at residential receiver R57 will still need to be managed during day time operations. If it is demonstrated that the noise levels reach the predicted maximum noise level of 39 dB(A), UCML will implement additional noise control measures, such as ceasing construction activities during adverse weather conditions, to maintain the noise levels at or below the established noise limit of 37 dB(A) unless an alternative noise management agreement is reached with this landowner.

It is noted that the predicted noise impacts should only occur during the construction phases only (approximately 6 months per ventilation shaft) as the End Block Shafts will operate in passive mode with only minor powered supporting surface infrastructure and therefore should emit little to no noise once operational.

5.7.3.5 Sleep Disturbance

The worst case modelling results for potential sleep disturbance under prevailing source to receiver winds indicate that noise levels due to the operation of ventilation fans will not exceed 32 dB(A), L_{Amax} at the closest residential receiver locations. This is below the relevant sleep disturbance criteria of 45 dB(A).

The raise boring phase of the construction of End Block Shafts 2 to 5is not predicted to exceed the sleep disturbance criteria of 45 dB(A).

5.7.4 Cumulative Noise Impact Assessment

The proposed modification is located in an area generally consisting of rural and rural residential developments. Potential sources of industrial noise within the vicinity of the proposed modification are primarily limited to the Ulan Coal Complex and other mining operations, with the closest being Moolarben.

It is unlikely that these sources of industrial noise will cumulatively add to noise emissions from the proposed modification due to the combined effects of:

- the relative locations of the sensitive receivers to the proposed modification and the cumulative noise sources in the surrounding region; and

- the extremely low noise levels predicted for both construction and operational phases of the proposed modification at sensitive receivers that may be affected by other industrial noise sources in the surrounding region.

Due to the above reasons, the cumulative noise impact assessment criteria will not be exceeded due to the proposed modification and noise contribution from the relevant surrounding industrial operations.

5.7.5 Noise Management and Monitoring

The results indicate that with appropriate control measures in place, the predicted noise levels from the proposed modification would not exceed the target PSNLs, during both construction and operational phases, at all of the receiver locations utilised in the calculations with the exception of residential receiver R57.

Residential receiver R57 is predicted to exceed the original PSNL and established noise limits during the construction of End Block Shafts 4 and 5 during the day time period. With the use of mobile noise barriers and managing construction activities during adverse weather conditions, UCML will be able to maintain the noise levels at or below the established noise limit of 37 dB(A). Alternatively, UCML will seek to establish a noise management agreement with this landowner.

UCML have an existing Noise Management Plan, in accordance with PA 08_0184. The Noise Management Plan includes a noise monitoring program. All noise monitoring undertaken by UCML is to be performed in accordance with the requirements of the Project Approval and the INP.

In addition to the Ulan Coal Complex's existing noise monitoring program, supplementary noise monitoring will be undertaken at residential receiver R57during construction activities at End Block Shafts 4 and 5 (R57). Additionally, noise monitoring will be undertaken at residential receiver R254 during construction at End Block Shaft 5.

The program should be based around an attended monitoring program that:

- measures $L_{A90,15\ minute}$ and $L_{Aeq,15\ minute}$ ambient noise levels during the hours of construction;

- measures and/or calculates the contributed noise level from the construction activities;

- measures other statistical noise levels representative of the noise environment including the maximum and minimum noise levels measured during the interval; and

- records weather conditions at the monitoring site.

5.8 Greenhouse Gas

A detailed greenhouse gas and energy assessment (GHGEA) has been prepared for the proposed modification and is included as **Appendix 7**. An overview of the key findings of the GHGEA is provided in this section.

Three 'Scopes' of emissions (Scope 1, Scope 2 and Scope 3) are defined for GHG accounting and reporting purposes. These scopes are briefly outlined below:

Scope 1 emissions are direct emissions which occur from sources owned or controlled by the reporting entity, over which they have a high level of control (such as fuel use).

Scope 2 emissions are those generated from purchased electricity consumed by the reporting entity, which can be easily measured and can be influenced through energy efficiency measures. Scope 2 emissions physically occur at the facility where electricity is generated i.e. the power station.

Scope 3 emissions are indirect emissions that are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another reporting entity (e.g. outsourced services). Scope 3 emissions can include emissions generated upstream of the Project by providers of energy, materials and transport. Scope 3 emissions are only estimates and may have a relatively high level of uncertainty, unreliability and variability.

5.8.1 Assessment Methodology

The GHGEA framework is based on the methodologies and emission factors contained in the National Greenhouse Accounts (NGA) Factors 2013. The assessment framework also incorporates the principles of The Greenhouse Gas Protocol 2004.

The Greenhouse Gas Protocol (The GHG Protocol) provides an internationally accepted approach to greenhouse gas accounting. The Protocol provides guidance on setting reporting boundaries, defining emission sources and dealing with issues such as data quality and materiality.

Scope 1 and 2 emissions were calculated based on the methodologies and emission factors contained in the National Greenhouse Accounts (NGA) Factors 2013 (DCCEE 2013). Consistent with the National Inventory Report (2011), ventilation fugitive emissions were forecast using an implied emissions factor, which was derived from site specific National Greenhouse and Energy Reporting data.

Scope 3 emissions associated with product transport were calculated based on emission factors contained in the National Greenhouse Gas Inventory: Analysis of Recent Trends and Greenhouse Gas Indicators (AGO 2007). Other Scope 3 emissions were calculated using methodologies and emission factors contained in the National Greenhouse Accounts (NGA) Factors 2013 (DCCEE 2013).

Emission factors for the consumption of construction materials were sourced from the Inventory of Carbon and Energy, Version 2.0 (Hammond, G and Jones, C. 2011).

5.8.2 Assessment Results

5.8.2.1 Construction Phase

The proposed modification will involve the construction of additional ventilation infrastructure.

The construction of the ventilation system is forecast to be associated with approximately 920 t CO_2-e of Scope 3 emissions. Scope 3 emissions will be generated by third parties in the process of producing and transporting construction materials. Scope 3 emissions will also be generated by contractors consuming energy during the construction projects.

The breakdown of construction related emissions demonstrates that approximately 93 per cent of forecast construction related emissions are attributable to the consumption of construction materials. The consumption of energy during construction contributes 6 per cent of construction emissions, while 1 per cent of construction emissions are attributable to the transport of construction materials.

5.8.2.2 Operational Stage

Greenhouse gas emission forecasts are based on the proposed modification recovering an additional 13 million ROM tonnes over 2 years.

To provide some context, the greenhouse gas assessment completed in 2009 for the UCCO Project, found that the Ulan Complex was associated with approximately 575 million t CO_2-e, from the recovery of approximately 214 million tonne of ROM coal.

The additional emissions associated with the proposed modification can be allocated as follows:

- approximately 369,000 t CO_2-e of Scope 1 emissions from combusting diesel and releasing fugitive emissions;
- approximately 126,000 t CO_2-e of Scope 2 emissions from consuming electricity; and
- approximately 31,082,000 t CO_2-e of Scope 3 emissions generated by third parties who transport and consume coal products.

It is noted that due to evolving greenhouse gas calculation methodologies and site based assumptions, the scope 1 and 2 emissions forecast for the proposed modification do not change proportionally from those estimated in 2009.

Scope 3 emissions dominate the greenhouse gas emissions attributable to the proposed modification. Approximately 98 per cent of the proposed modification's greenhouse gas emissions will occur either upstream or downstream of the Ulan West site and outside the direct operational control of UCML. Approximately 2 per cent of the greenhouse gases associated with the proposed modification are related to on-site energy use and fugitive emissions (Scope 1 and 2 emissions).

Scope 1 emissions are only expected to contribute 1.2 per cent of total emissions due to the relatively low diesel demands of an underground mine and the non-gassy nature of the Ulan West coal reserves. The Western Coalfield in NSW is characterised by a very low fugitive gas content, which is primarily carbon dioxide (National Inventory Report 2011).

Scope 2 emissions are expected to be relatively low compared with other underground operations due to the following:

- a large proportion of ROM coal is product quality and bypasses the coal handling and preparation plant;
- all underground equipment is new and inherently energy efficient; and
- Ulan West has very long panels, which reduces the inefficiencies associated with longwall change outs.

5.8.2.3 Energy Use

In addition to the energy use approved for the UCCO Project, the proposed modification is forecast to require approximately 667,000 GJ of energy from diesel and grid electricity.

5.8.3 Impact Assessment

The greenhouse gas emissions generated by the proposed modification have the potential to impact the environment and the greenhouse gas reduction objectives of national and international governing bodies.

The proposed modification is expected to increase the emissions approved under the UCCO Project by approximately 185,000 t CO_2 –e per annum of Scope 2 emissions. To put the proposed modification's emissions into perspective, global greenhouse gas emissions are forecast to be 46,000,000,000 t CO_2-e by 2020 (Sheehan *et al*. 2008). During operation, the proposed modification will contribute approximately 0.000040 per cent to global emissions per annum (based on its projected Scope 1 emissions). The Scope 2 and 3 emissions associated with the proposed modification should not be considered in a global context, as global projections only represent Scope 1 emissions (i.e. the sum of all individual emission sources).

5.8.3.1 Impact on Climate Change

The Intergovernmental Panel on Climate Change (IPCC) define climate change as a change in the state of the climate that can be identified by changes in the mean and/or variability of its properties, and persists for an extended period, typically decades or longer (IPCC 2007).

Climate change is caused by changes in the energy balance of the climate system. The energy balance of the climate system is driven by atmospheric concentrations of greenhouse gases and aerosols, land cover and solar radiation (IPCC 2007).

Climate change models forecast many different climate change impacts, which are influenced by future greenhouse gas emission scenarios. Climate change forecasts also vary significantly from region to region. Any increase in atmospheric greenhouse gas emissions can therefore generate many different climate change impacts, depending on future greenhouse gas scenarios and regional location.

The extent to which global emissions and atmospheric concentrations of greenhouse gases have a demonstrable impact on climate change will be largely driven by the global response to reducing total global emissions that includes all major emission sources and sinks.

5.8.3.2 Impact on National Policy Objectives

The Australian Government has committed to reduce Australia's greenhouse gas emissions by 5 per cent from 2000 levels by 2020 irrespective of what other countries do, and by up to 15 or 25 per cent depending on the scale of global action.

If Australia is able to meet the 5 per cent reduction target by 2020, the nation will be generating approximately 525,000,000 t CO_2-e per annum (Australian Government 2013). The proposed modification is expected to increase the previously approved (PA 08_0184) emissions by approximately 185,000 t CO_2 –e per annum, if emissions are not mitigated. The addition of 185,000 t CO_2-e per annum, in the national context, is unlikely to prevent the Federal Government achieving its national greenhouse gas objectives.

The proposed modification's Scope 2 and 3 emissions should not be considered against national objectives, as national emissions only include Scope 1 emissions.

5.8.3.3 Impact on International Objectives

International policy makers are yet to reach a comprehensive global agreement on greenhouse gas reduction targets that includes commitments from all major emitters such as China, India and the United States of America.

The Seventeenth Conference of the Parties (COP17) climate change negotiations in Durban, however, provides some direction for international greenhouse gas objectives. Countries agreed in Durban to begin work on a new climate change agreement that will cover all countries. The intention is to develop an agreement, including emission reduction commitments, by 2015 to come into effect from 2020. Countries also agreed that there would be a second commitment period of the Kyoto Protocol from 1 January 2013 (DCCEE 2012a).

The United Nations Framework Convention on Climate Change (UNFCCC) conference held in Cancún 2010 achieved important progress towards a comprehensive post-2012 international agreement to address climate change (DIICCSRTE 2013). Under the Cancun Agreements, Australia has committed to reducing its 2020 national greenhouse gas inventory by 5 per cent (based on the 2000 inventory) (DCCEE 2012b).

Australia's international objectives align with its national objectives. The proposed modification is unlikely to prevent the Federal Government achieving its national/international 5 per cent greenhouse gas reduction target.

5.8.4 Mitigation Measures

All mining operations located within the Ulan Coal Complex are owned by subsidiary companies of Glencore. UCML is committed to the Glencore Code of Conduct, which specifically requires on-going consideration of greenhouse gas emissions and energy use. To assist Glencore in meeting its Code of Conduct, UCML must prepare Annual Sustainability Plans and adhere to Sustainable Development Standards and Protocols.

UCML has incorporated a range of measures into the proposed modification's design, with the aim of minimising potential greenhouse gas emissions and improving energy efficiency. Energy efficiency was a key driver for the design of the mine plan as energy usage is a direct driver of cost as well as greenhouse gas emissions. The proposed modification's design inherently minimises greenhouse gas emissions from the mining operations.

UMCL will continue to implement the approved UCCO Greenhouse Gas Management Plan to ensure all reasonable and feasible measures are employed to minimise the release of greenhouse gas emissions.

5.9 Land Resources and Agriculture

As discussed in **Section 4.2.4**, a site verification process was undertaken for MLA475. This section discusses the soils, land capability and outcomes of the site verification process completed for the proposed modification.

5.9.1 Land Use

The Ulan Coal Complex is situated in a rural area, primarily surrounded by rural landholdings, native bushland and primary industries including agriculture, forestry, mining and extractive industries. The dominant land uses within and adjacent to the Ulan Coal Complex are mining and primary industries. The area to the south and south-west is dominated by rural residential landholdings. The Moolarben Coal Mine is located adjacent to the southern and eastern boundary of the Ulan Coal Complex and the Wilpinjong Coal Mine is located approximately 7 kilometres to the south-east of the Ulan Coal Complex. Private quarrying activities for minerals also occur immediately east of and within the Ulan Coal Complex. Grazing is widely spread throughout the surrounding area. The land within MLA475 is dominated by remnant vegetation, with some cleared areas. Limited agricultural activities, primarily grazing, currently occur in MLA475.

The Talbragar River alluvial floodplains are approximately 3 kilometres to the north-west of the Ulan Coal Complex northern mining boundary, and are used for intensive cropping. This area is mapped as BSAL under the NSW Government's Strategic Regional Land Use Policy (DP&I, 2012), however, is not located within the Ulan West underground mining area or MLA475. Grazing activities are also undertaken throughout the area to the north-east of the Ulan Coal Complex from the Golden Highway to Ulan Road.

Significant areas of National Park and conservation areas also exist in close proximity to the Ulan Coal Complex with the Goulburn River National Park immediately east and the Curryall State Conservation Area to the north-east of the Ulan Coal Complex. The Munghorn Gap Nature Reserve is located approximately 20 kilometres to the south-east.

The proposed modification will result in underground mining beneath one additional private property. It is understood that there are currently no agricultural activities undertaken on that property. There are an additional two private properties located within MLA475. The land within MLA475 is dominated by remnant vegetation, with some cleared areas. Limited agricultural activities, primarily grazing, currently occur in MLA475.

The proposed modification is not anticipated to impact on current land uses of any private land within MLA475.

5.9.2 Land Capability

Land capability is the ability of the land to maintain its productive potential under a specified use, without degradation. Climate, soils, geology, geomorphology, soil erosion, site and soil drainage characteristics and current land use data are all considered in determining land capability (Emery, 1986). Eight classes of Rural Land Capability were defined by the then Soil Conservation Service for mapping rural lands (refer to **Table 5.22**). Land Capability in Ulan West and surrounding areas is shown on **Figure 5.9**.

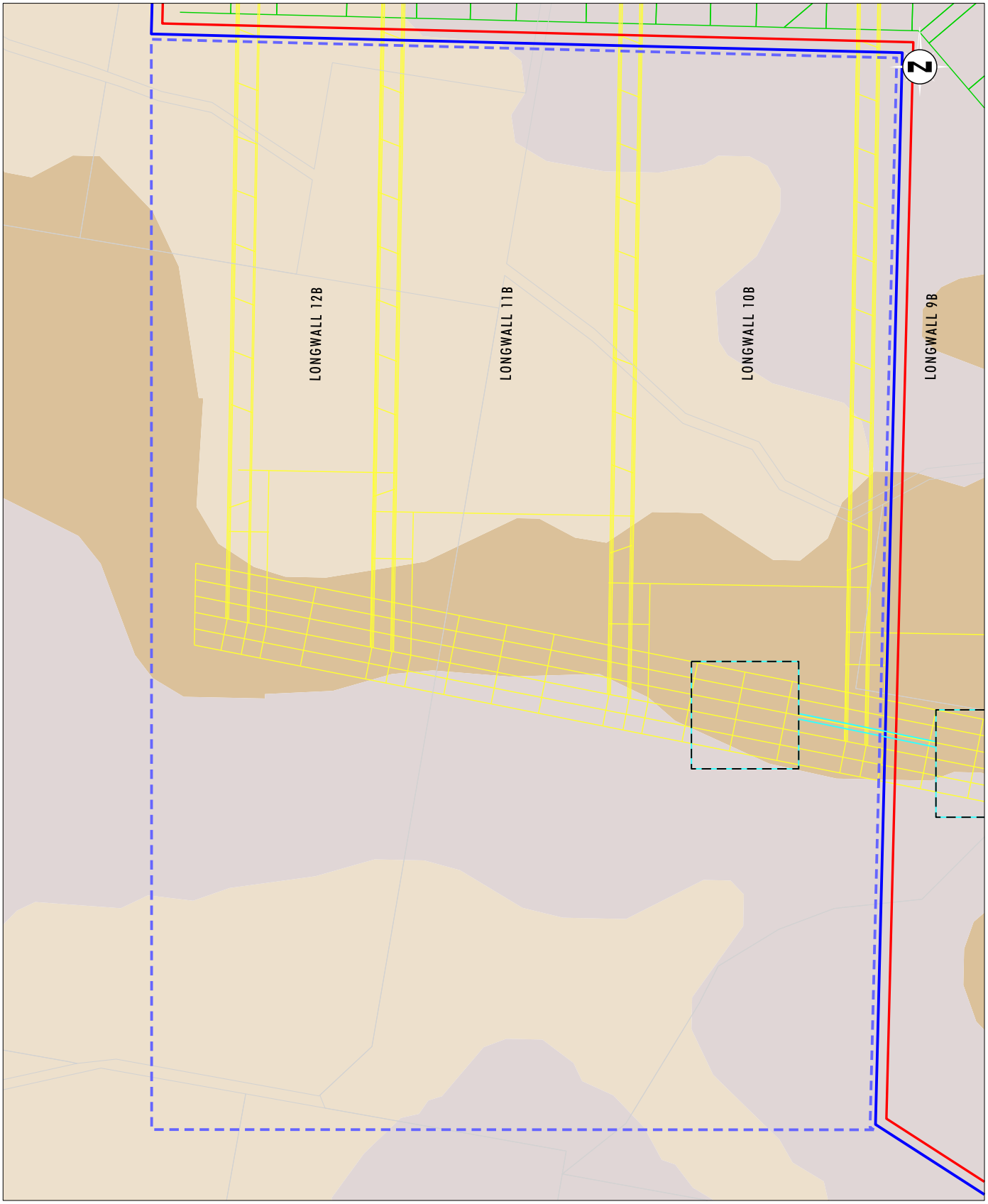


Image Source: Ulan Coal (2008, 2010)
Data Source: Ulan Coal (2014)

0 100 250 500m
1:10 000

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- MLA 475
- Approved Ulan West Mine Plan
- Proposed Conceptual Ulan West Mine Plan
- Proposed New Ventilation Shaft
- IV Suitable for Grazing with Occasional Cultivation
- VI Suitable for Grazing with No Cultivation
- VII Other (Land Best Protected by Green Timber)
- Proposed Infrastructure Corridor

FIGURE 5.9

Land Capability

File Name (A4): R01/3363_068.dgn
20141112 14.38

Table 5.22 – Rural Land Capability Classes

General Capability	Land Capability Classes	Interpretations and Implications
Suitable for regular cultivation	I	Suitable for a wide variety of uses. Where soils are fertile, has the highest potential for agriculture. Includes 'prime agricultural land'.
	II	Usually gently sloping land suitable for a wide variety of agricultural uses. Includes "prime agricultural land".
	III	Sloping land suitable for cropping on a rotational basis. Soil erosion problems are often severe. Generally fair to good agricultural land.
Suitable for grazing and occasional cultivation	IV	Land not suitable for cultivation on a regular basis owing to limitations of slope gradient, soil erosion, shallowness or rockiness, climate, or a combination of these factors. Comprises the better classes of grazing land.
	V	Land not suitable for cultivation on a regular basis owing to considerable limitations of slope gradient, soil erosion, shallowness or rockiness, climate, or a combination of these factors. Soil erosion problems are often severe. Production is generally lower than for grazing lands in Class IV.
Suitable for grazing but not for cultivation	VI	Productivity will vary due to soil depth and fertility. Comprises the less productive grazing lands.
Land best protected by green timber	VII	Generally comprises areas of steep slopes, shallow soils and/or rock outcrop.
Unsuitable for agricultural or pastoral uses	VIII	Cliffs, lakes or swamps and other lands unsuitable for agricultural and pastoral production.

The proposed modification has the potential to impact on land capability through ground disturbance associated with construction of mining infrastructure.

Land within the modified Ulan West mining area contains three land capability classes, these being Class IV, VI and VII. These land capability classes are not suitable for regular cultivation but may be suitable for grazing. Following underground mining, the land capability within the subsidence affectation zone will remain unchanged. Surface infrastructure is located within agricultural and forested areas but will only result in the disturbance of small areas which are unlikely to have a significant impact on overall land capability.

5.9.3 Biophysical Strategic Agricultural Land

As discussed in **Section 4.2.4**, the SRLUP aims to protect the State's agricultural and water resources from the potential impacts of mining. BSAL is land with a rare combination of natural resources highly suitable for agriculture. These lands intrinsically have the best quality landforms, soil and water resources which are naturally capable of sustaining high levels of productivity and require minimal management practices to maintain this high quality. BSAL is able to be used sustainably for intensive purposes such as cultivation. Such land is inherently fertile and generally lacks significant biophysical constraints (DP&I 2012).

A review of the SRLUP has identified that, at the regional scale, no BSAL or CIC land is located within MLA475, however this required verification through a site verification process as requested by DP&E. The proposed modification will not interact with land identified by the SLURP as CIC land that requires a new mining lease. In accordance with the SRLUP, if a site is not mapped as biophysical BSAL, an applicant for a State significant mining proposal must verify whether or not the land meets the criteria for BSAL.

Ten site verification criteria have been identified in the *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (the Protocol) (NSW Government, 2013), with the easy to measure criteria assessed first. These are:

- slope;
- rock outcrop;
- surface rock fragments;
- gilgai;
- soil fertility (soil type);
- effective rooting depth to a physical barrier;
- soil drainage;
- soil pH;
- salinity; and
- effective rooting depth to a chemical barrier.

Based on the site verification process undertaken in accordance with the Protocol, it has been determined that there is no BSAL located within MLA475. The assessment concluded there is no BSAL within MLA475 based on landscape and soil information, specifically:

- slope;
- soils; and
- lack of contiguous areas equal to or greater than 20 hectares that met specific BSAL requirements.

Further details on slope and soil analyses undertaken within MLA475 are provided in **Sections 5.9.3.1** and **5.9.3.2** below.

5.9.3.1 Slope

An assessment of slope was undertaken within MLA475 to characterise areas having a slope of less than or equal to 5 per cent (refer to **Figure 5.10**). Under the Protocol, land is not considered BSAL if the slope is greater than 5 per cent.

The assessment determined that there are minimal areas of slope with less than 5 per cent slope within MLA (refer to **Figure 5.10**). Of these areas, the only contiguous area greater than or equal to 20 hectares is located in the south of MLA475. While the area of less than 5 per cent slope is less than 20 hectares within MLA475, the contiguous area including that

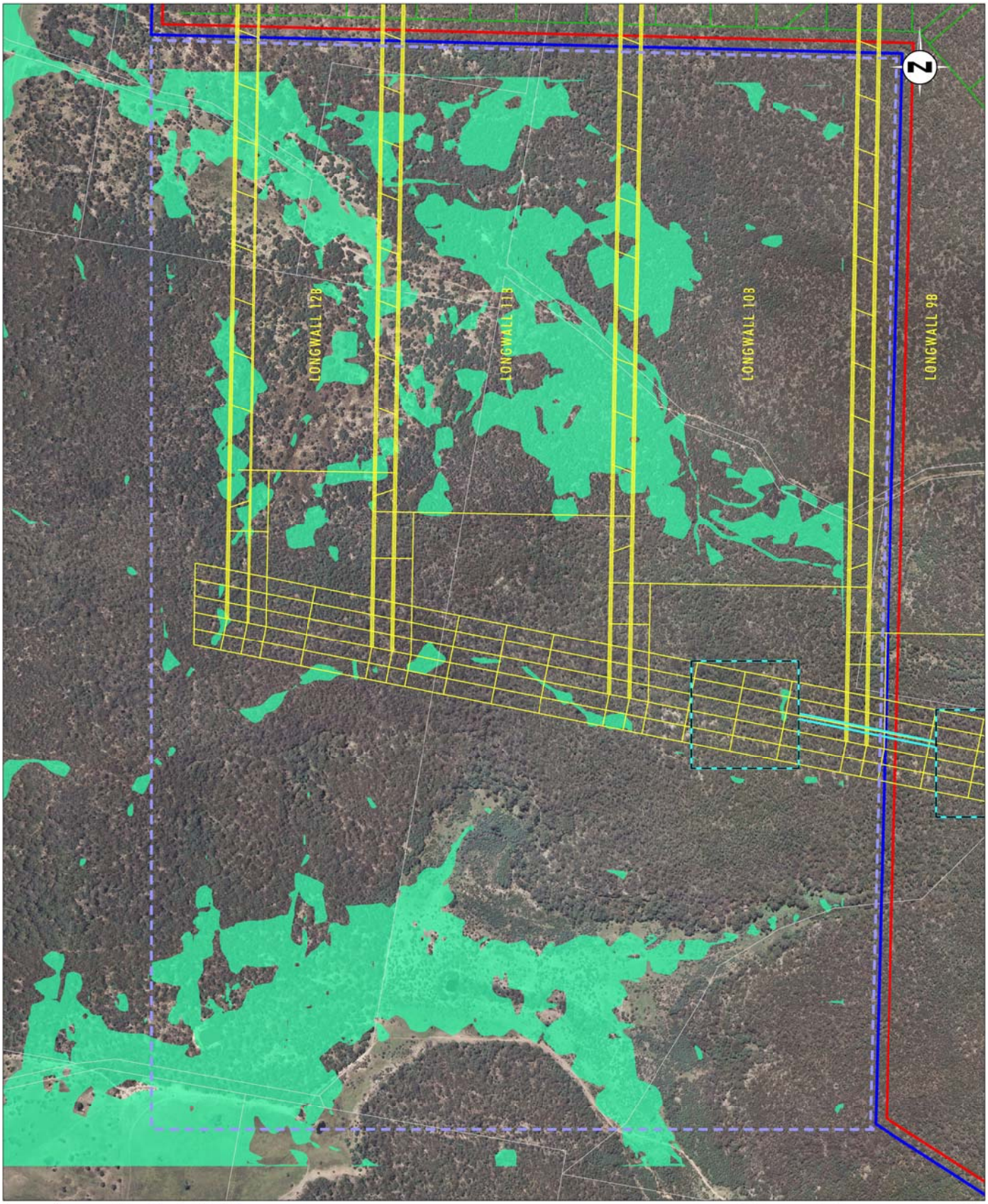


Image Source: Ulan Coal (2010)
Data Source: Ulan Coal (2013)

0 100 250 500m
1:10 000

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- MLA 475
- Approved Ulan West Mine Plan
- Proposed Conceptual Ulan West Mine Plan
- Areas with Slope less than 5% within the Project Area
- Proposed New Ventilation Shaft
- Proposed Infrastructure Corridor

FIGURE 5.10

Areas with Slope less than 5%

File Name (A4): R01/3363_066.dgn
20141112 16.09

outside MLA475 is greater than 20 hectares. Further soils assessment was completed on this basis.

5.9.3.2 Soils

Based on the Office of Environment and Heritage's (OEH) Inherent Fertility of Soils in NSW mapping, MLA475 consists of Low and Moderate Low soil fertility (refer to **Figure 5.11**). Specifically, there are no areas of moderate high or high fertility within MLA475 that have a slope of less than 5 per cent.

Further soil samples were taken to demonstrate that MLA475 did not contain BSAL. The BSAL verification fieldwork undertaken by SLR in October 2014 mapped 14 soil observations where access was possible within MLA475, of which five were detailed soil pits and nine were checked sites.

The soil type at three of the five detailed sample sites within MLA475 is a Black-Orthic Tenosol, whilst the remaining two detailed sites were a Grey-Orthic Tenosol. Tenosols comprise three major soil horizons and the profile is characterised by a sandy to sandy loam texture throughout. Soil pH ranges from very strongly acidic to slightly acidic. All sites are non-saline, non-sodic, with low to extremely low cation exchange capacity (SLR, 2014). In accordance with the Protocol, both a Black-Orthic Tenosol and a Grey-Orthic Tenosol of soil depth less than 1,000 mm which is sandy to sandy loam in texture, has Moderately Low Inherent Fertility. This confirms the OEH mapping for the area.

In conclusion, the proposed modification area in MLA475 does not contain BSAL. The Site Verification Certificate was issued on 12 February 2015. DP&E certified that the land within MLA475 was not BSAL as:

- approximately 50% of the subject site is excluded as BSAL by virtue of being over 10% gradient;
- approximately 7% of the subject sites is excluded as BSAL by virtue of not having a contiguous area greater than 20 hectares; and
- the remaining areas consist of soils of the Tenesol order, which do not meet the criteria to be considered BSAL.

5.10 Visual

As the proposed modification involves underground mining, there is limited potential for visual impacts. Potential visual impacts are limited to proposed additional ventilation infrastructure and ancillary surface activities. A visual assessment was completed to identify potential visual impacts associated with the proposed modification.

5.10.1 Existing Visual Amenity

The visual character of the region is diverse, with a range of landforms, vegetative cover patterns and land uses resulting in considerable variations in scenic quality. The Ulan Coal Complex is a mixture of undulating valley floor to steeper slopes and rocky escarpments. This is typical of the landforms evident in the eastern uplands of the Great Dividing Range.

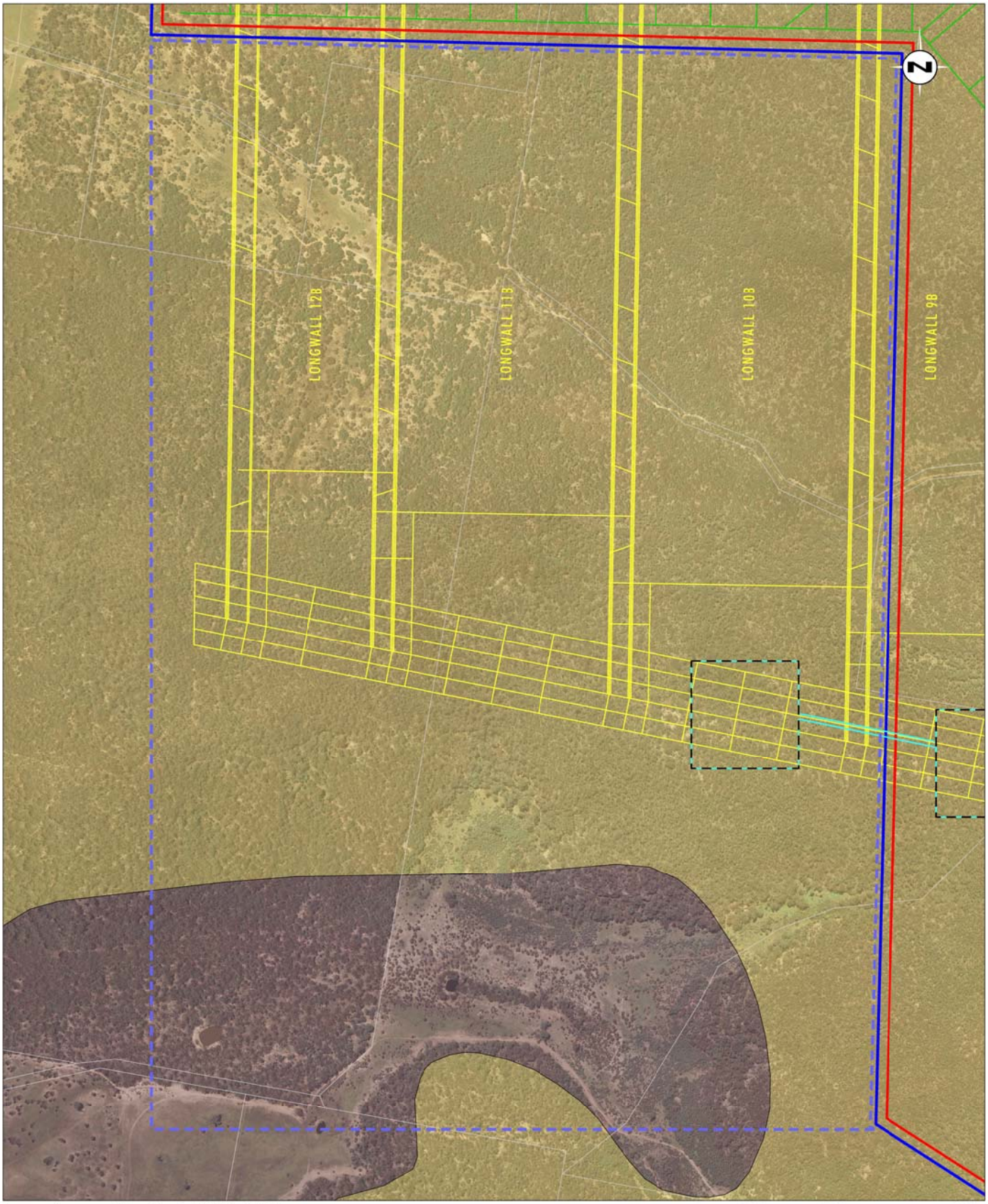


Image Source: Ulan Coal (2008, 2010)
Data Source: Ulan Coal (2014)

0 100 250 500m
1:10 000

Legend

- Existing Colliery Holding Boundary
- UCML Continued Operations Project Approval Area
- MLA 475
- Approved Ulan West Mine Plan
- Proposed Conceptual Ulan West Mine Plan
- Proposed New Ventilation Shaft
- Soil Fertility (Low)
- Soil Fertility (Moderate Low)
- Proposed Infrastructure Corridor

FIGURE 5.11

Inherent Fertility of Soils

File Name (A4): R01/3363_067.dgn
20141112 14.24

The dominant land uses within and adjacent to the Ulan Coal Complex are mining and primary industries. The area to the south and south-west is dominated by rural residential landholdings. The Moolarben Coal Mine is located adjacent to the southern and eastern boundary of the Ulan Coal Complex and the Wilpinjong Coal Mine is located approximately 7 kilometres to the south-east of the Ulan Coal Complex. Private quarrying activities for minerals also occur immediately east of and within the Ulan Coal Complex. Grazing is widely spread throughout the surrounding area. The Talbragar River alluvial flood plains to the north of the Ulan Coal Complex are used for intensive cropping. Cropping activities are also undertaken throughout the area to the north-east of the Ulan Coal Complex.

Significant areas of National Park and conservation areas also exist in close proximity to the Ulan Coal Complex with the Goulburn River National Park immediately east and the Curryall State Conservation Area to the north-east of the Ulan Coal Complex. The Munghorn Gap Nature Reserve is located approximately 20 kilometres to the south-east.

Views of the Ulan Coal Complex's existing operations are possible to varying degrees from a number of surrounding residential receivers. However, the local topography and vegetation heavily restrict the visibility of the mine. Therefore, any views of the Ulan Coal Complex operations from private residences are either obstructed or long distance views. Unobstructed views of parts of the mining operations are predominantly available from local transport corridors including Ulan Road, Ulan-Wollar Road and Cope Road.

As part of its existing mining operations, UCML is currently completing vegetation planting to screen views of mining operations as part of its progressive rehabilitation program. Extensive vegetation planting has been undertaken on the southern boundary along Ulan Road.

5.10.2 Visibility of the Proposed Modification

The focus of the proposed modification involves underground mining, which has very little surface visibility, other than relatively minor components of infrastructure required to support underground mining such as ventilation fans, service boreholes and power infrastructure (refer to **Figure 2.3**).

It is noted that the construction of the ventilation infrastructure will cause a visual impact. The construction activities will be approximately six months in duration per ventilation shaft. Construction of the ventilation shafts through blind boring will involve the temporary instatement of an approximately 32 metre high drill rig. Upon completion of drilling, the ventilation shafts will have infrastructure installed with a maximum height of approximately 12 metres. Once operational, the ventilation infrastructure will not be visually obtrusive and the disturbance area will be rehabilitated in accordance with Project approval and management plan requirements. It is also noted that the ventilation shafts will be progressively constructed and decommissioned as operations advance to the west.

There are no other changes associated with the proposed modification that will have the potential for visual impacts.

5.10.3 Visual Assessment

There will be limited potential for additional visual impact associated with the proposed modification given that it predominantly involves underground mining.

A radial topographic analysis technique was used at the proposed ventilation infrastructure to confirm the visibility of the proposed modification based on ground topography alone (i.e. no allowance was included for screening vegetation).

The initial assessment found that based on topography alone, views of the proposed ventilation infrastructure are not available to sensitive viewing locations (i.e. residences or roads) other than at two private residences.

Residence 57 and Residence 254 will have restricted views of a proposed ventilation shaft at the northern end of LW9. The ventilation shaft will be located approximately 500 metres to the north west from Residence 57 and one kilometre to the north of Residence 254 and at that distance is not considered to be visually obtrusive.

5.10.4 Proposed Visual Controls

UCML will continue to implement a range of visual controls to screen views of the proposed modification and minimise the visual impacts. These controls will include:

- all infrastructure potentially visible to the public to be coloured in suitable natural tones, where practicable; and
- progressive rehabilitation of disturbed areas associated with ventilation requirements will be undertaken to reduce visual impacts.

5.11 Socio-Economic

A comprehensive Socio-Economic Impact Assessment was completed for the UCCO Project. This assessment has drawn on this previous work to consider an additional two years of employment at Ulan West and the capital investment associated with the modified supporting surface infrastructure.

5.11.1 Social

5.11.1.1 Community Issues

The Socio-Economic Assessment for the UCCO Project identified key issues and perceived impacts associated with the Ulan Coal Complex's operations. Many community members recognise the Ulan Coal Complex as an existing operation and their concerns are largely related to ensuring that current impacts associated with mining are not exacerbated.

The most frequently identified issues by stakeholders in the 2009 Socio-Economic Assessment were the benefits to the local economy and employment opportunities associated with the UCCO Project. Water impacts, increases in road traffic, general environmental concerns and the potential for cumulative impacts with other mines were the most frequently identified concerns. Other issues raised included changes to people's quality of life and sense of community, dust and vibration associated with blasting.

Issues raised throughout the consultation program were closely associated with the geographic location of the respondents. For example, those residents located in close proximity to underground operations were more concerned with subsidence issues than the broader community. Residents located nearer to the proposed open cut activities and surface infrastructure were more interested in potential impacts associated with noise, dust and blasting.

For this proposed modification, potential impacts associated with subsidence and employment are most relevant.

5.11.1.2 Community Needs

The perceived needs of the community in relation to services and facilities in the MWRC area were assessed as part of the UCCO Project Assessment. This included a review of relevant council plans and strategies, the MWRC Community Survey and the local media.

The review of local media, council plans and strategies and broader community views identified the following focus areas of need:

- supporting infrastructure, particularly roads;
- improved service provision across the community, with particular emphasis on the provision of general and specialist health services;
- crime reduction, particularly in the area of domestic violence;
- development and support for tourism; and
- preservation of recreational areas and maintenance of associated infrastructure.

The primary needs identified by the community for the MWRC area overall include:

- improved supporting infrastructure, especially roads;
- increased service provision, particularly the need for more General Medical Practitioners; and
- increased activities for local youth.

Since Project Approval was granted, UCML have implemented strategies, primarily through their Social Involvement Plan (SIP) to address community needs. Notably, the Ulan Road Strategy has recently been finalised in consultation with MWRC and local mining companies which will aim to improve roads within the Ulan area. Further support is provided to local community programs on an ongoing basis, in accordance with the SIP. During the last two years, this has included support for local schools (in Ulan, Mudgee, Gulgong, Dunedoo, Merriwa and Cassilis), Talbragar River Care, local Wild Dog Associations, Mudgee Emergency Rescue Van, Mudgee playgroup, and regional shows.

The proposed modification will not increase employment numbers at the Ulan Coal Complex and therefore is not anticipated to place further demand on services and facilities in the MWRC area.

5.11.1.3 Population Impacts

A population impact projection assessment was undertaken for the UCCO Project to determine projected population impacts associated with both the construction and ongoing operation of the UCCO Project. Changes in population can cause a range of social impacts that could affect individuals, families and even communities.

The total operational workforce associated with the UCCO Project is estimated to peak at approximately 931 workers. Of UCML's existing workforce, 65 per cent had already been living in the local area when they commenced their employment with UCML.

In addition to the impacts on housing, the Socio-economic Assessment for the UCCO Project assessed the impact of the projected population changes on existing service capacity within Mudgee and surrounds, including impacts on health, education and childcare.

The population impact assessment identified that Mudgee and surrounding areas were likely to be able to absorb the predicted population impacts arising from the construction and operational phases of the UCCO Project across the education and housing sectors. However, health services and childcare may find it more difficult to cope with the additional population associated with the UCCO Project. A Voluntary Planning Agreement (VPA) was established in 2013 between MWRC and UCML to address local community infrastructure and road improvements.

The proposed modification will result in up to an additional two years of operations for Ulan West and does not propose to increase employment numbers. As a result, the proposed modification is not expected to increase population impacts associated with the existing operations.

5.11.1.4 Ongoing Mitigation Measures

The Ulan Coal Complex is an established operation and UCML have a number of existing strategies in place to minimise social impacts and provide benefits back to the community that they operate within.

UCML currently aims to maximise local employment and provide training and education opportunities through:

- advertising employment, apprenticeships and traineeships in local media;
- providing an employment pack that allows local residents to register their interest in employment opportunities at the Ulan Coal Complex office;
- sharing information about mining careers at the Ulan Coal Complex and the corporate entity with local schools;
- offering training opportunities through partnerships with local tertiary education providers;
- participating in the corporate school scholarship program; and
- continued implementation of Glencore and UCML Corporate Social Involvement (CSI) programs.

As part of previous approval processes, UCML have committed to developing additional residential capacity in the Gulgong area. The works to develop Stages 1 and 2 of the Hollingsworth Estate at Gulgong were completed in 2013, with additional stormwater upgrade in 2014. Lots in Stage 1 (19 lots), are currently being offered for sale, with 13 sold by the end of 2014 and several homes complete in the subdivision. Stage 2 consists of 15 lots which are developed but have not yet been released. A further 47 allotments will be developed in the last three Stages (3-5) at an appropriate time to meet market demand.

UCML review their social involvement program three yearly in consultation with key stakeholders such as the Community Consultative Committee (CCC) and MWRC to ensure the program's focus areas remain relevant and address issues of greatest community need and challenge. UCML will continue to implement a social involvement program for the life of their operations.

UCML will continue to reduce the impacts of its workforce on local health services by continuing current activities such as:

- running an in-house annual influenza vaccination program;

- providing in-house employee medical assessments every three years;
- offering First Aid training to employees;
- delivering a health promotion program for UCML employees; and
- encouraging fundraising for health-related causes (e.g. hospital equipment, the Cancer Foundation etc) through staff volunteering and fund raising activities.

In addition, UCML will continue to work with representatives from neighbouring mines to discuss and address issues of common concern in relation to management of cumulative impacts, in accordance with project approval requirements.

5.11.2 Economic Assessment

The proposed modification will produce approximately an additional 13 million tonnes of ROM coal and extend the life of the Ulan Coal Complex by approximately 2 years which will have a positive socio-economic benefit. An assessment of the potential economic benefits of the proposed modification is provided below.

5.11.2.1 Existing Economic Benefits

The key benefits of the existing Ulan Coal Complex operations include the significant economic benefit to the region and state associated with job creation, capital expenditure, ongoing operational expenditure, employee expenditure and contributions to community enhancement programs.

During operation, the UCCO Project projected a peak workforce of approximately 931 people and a total operational expenditure of approximately $14.3 billion over the life of the UCCO Project. In addition to the direct employment created by the UCCO Project, it was estimated that the UCCO Project would create an additional 2562 flow on jobs during construction and operation, of which approximately 1523 would be within the Mudgee region (Coakes, 2009). It is recognised that the UCCO Project includes all of the Ulan Coal Complex operations, including Ulan No.3, open cut and Ulan West.

Ulan Coal Complex's operations have significant economic benefits for the MWRC LGA as a result of employee and operational expenditure. Ulan Coal Complex's operations provide significant economic benefits for Mudgee, with the average annual direct economic contribution predicted to be approximately $95 million due to employee and operating expenditure (approximately $2.3 billion over the life of the Project). The majority of employee household expenditure is predicted to be spent in the MWRC LGA (Coakes, 2009).

In addition to the substantial economic contributions due to employee and operating expenditure, Ulan Coal Complex's operations contribute approximately $2 billion to the state government through royalties on coal and state taxes, and approximately $392 million to the Commonwealth Government in taxes (Coakes, 2009).

5.11.2.2 Economic Impacts of Employee Expenditure

UCML employees working in the extended operations of Ulan West will continue to have an economic impact through their weekly expenditures. It is assumed that the workforce will spend their incomes mainly in the towns where they reside. There will be some spillovers in spending between towns and this will be, to an extent, self compensating as the flow of spending will be both into and out of each town. The majority of UCML employees live within the MWRC LGA (approximately 90 per cent) (Coakes, 2009). Based on the assumptions of the 2009 assessment, the local employee spend as a result of the proposed modification is

estimated at $38.3 million annually within the MWRC LGA. For the additional two years of operations associated with the proposed modification, this would equate to approximately $76.6 million of increased expenditure within the MWRC LGA.

While the majority will be spent locally, not all expenditure is in the local area, and this is especially the case with the multiplier effect – which has ripple effects going beyond the immediate area. Every dollar that is spent by households has a multiplier effect through the local and more distant economies. The multipliers for any local area are smaller than for a more widely defined area. This means that there will be flow-on impacts of expenditures in the towns within the wider MWRC LGA, but there will be significant impacts beyond the LGA – in other major NSW centres such as Lithgow, Dubbo, Newcastle and Sydney.

Based on the assumptions of the 2009 assessment, the multiplier impacts associated with the proposed modification is expected to generate an additional $80.6 million a year. While the total direct expenditure for the rest of Australia, beyond the MWRC LGA totals only $5.2 million during operations, it is estimated that the flow-on effects of employee expenditures will have a total annual impact on the Australian economy of $144.9 million. This means expenditure by UCML employees may add an additional $144.9 million to the national economy annually as a result of the proposed modification.

5.11.2.3 Employment

As previously discussed, there is no change to employee numbers as a result of the proposed modification. Employee numbers are expected to be maintained in varying capacity depending on the timing of the operations and the additional length of service will depend on the final scheduling and timing of the operations. It is anticipated that the proposed modification will allow for the ongoing employment of approximately 340 people for an additional two years.

Just as there are flow on benefits in increased economic activity for areas outside the immediate locality, so too are jobs created outside the immediate area (Coakes, 2009). After taking account of the multiplier impacts of the proposed modification, there will be significant numbers of jobs created outside of the local area. For example, based on the assumptions of the 2009 assessment, it is estimated that the total number of jobs generated throughout Australia, directly and indirectly, by the proposed modification will be 2,429 from an additional year of operations.

5.11.2.4 Impacts on Government Finances

From a NSW perspective, the most significant impact on government finances will come in the form of royalties and payroll tax. From a Commonwealth point of view there will also be significant personal income tax and company tax payments.

In NSW the current rate of payroll tax is 5.45 per cent on all salaries paid above a threshold of $750,000. The additional pay roll tax collections associated with the proposed modification is estimated to have an undiscounted value of $2.8 million. At a discount rate of 7 per cent, payroll tax collections have a net present value of $1.2 million.

The mine will also generate significant royalty collections for the State as the proposed modification operations are estimated at $11.5 million. Without the proposed modification being approved it is unlikely that these royalties would ever be received as the resource would not be recovered.

Royalty collections on coal production for the State of NSW are currently set at ad valorem rates of 7.2 per cent for underground mines. Royalties have been calculated on the basis of real prices outlook for thermal coal produced by the Australian Government Treasury forecast. The estimated value of royalties generated from the additional coal sales has a value of $76.3 million. At a discount rate of 7 per cent, this value is reduced to $31.7 million in NPV terms.

Based on the assumptions of the 2009 assessment it is estimated that the total direct revenue benefits of the proposed modification to the State of NSW will be approximately $79.1 million. These revenue flows do not include revenues that will flow from the business that will be generated as a consequence of market opportunities arising from the proposed modification (the multiplier impacts).

6.0 Ecologically Sustainable Development and Conclusion

6.1 Overview of Environmental Impacts

The potential environmental impacts of the proposed modification have been identified through an environmental assessment process involving:

- assessment of the site characteristics;
- review of existing expert technical assessments, management plans and historical monitoring data;
- consultation with government agencies; and
- expert technical assessments.

The key issues identified were the subject of comprehensive technical assessment to identify and assess the potential impacts of the proposed modification on the existing environment and community. The results of these assessments are detailed in **Section 5.0**.

The characteristics of the modified Ulan West mining area and experience from previous underground mining operations enable the proposed modifications to occur with minimal environmental impacts. In addition, as the Ulan Coal Complex has a range of well established and effective measures to minimise and manage impacts associated with the proposed modification, it is anticipated that the proposed modification can proceed within acceptable environmental standards.

6.2 Suitability of the Site

The proposed modification involves extending the length of existing approved longwalls into adjacent coal reserves. The modified Ulan West mining area is located in an area with an extensive history of underground and open cut coal mining. The Ulan Coal Complex is a well established mining operation situated within the Western Coalfields of NSW.

The extent of additional impacts on public and private assets, infrastructure or environmental features is limited and consistent with those previously approved under PA 08_0184. The proposed modification will not limit the continued use of private landholdings for agricultural or residential purposes, nor will it significantly impact the biodiversity values of the area. Existing management and monitoring programs are in place to identify and manage the potential impacts on these land uses.

The modified Ulan West mine plan allows for the efficient recovery of a valuable resource by maximising resource utilisation and use of existing infrastructure, thereby reducing capital costs and minimising environmental impacts.

6.3 Ecologically Sustainable Development

The EP&A Act aims to encourage ESD within NSW. As outlined in **Section 4.0**, the proposed modification requires approval from the Minister under Section 75W of the EP&A Act. As such, the Minister needs to be satisfied that the project is consistent with the principles of ESD. This section provides an assessment of the proposed modification in relation to the principles of ESD.

To justify the proposed modification with regard to the ESD principles, the benefits of the project in an environmental and socio-economic context should outweigh any negative impacts. The ESD principles, as outlined in Section 6 of the *Protection of the Environment Administration Act 1991* encompass the following:

- the precautionary principle;
- inter-generational equity;
- conservation of biological diversity; and
- valuation and pricing of resources.

6.3.1 The Precautionary Principle

The EP&A Regulation defines the precautionary principle as:

> Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
>
> In the application of the precautionary principle, public and private decisions should be guided by:
>
> (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and
> (ii) an assessment of the risk-weighted consequences of various options.

In order to achieve a level of scientific certainty in relation to potential impacts associated with the proposed modification, this EA has undertaken an extensive evaluation of all the key components of the project. Detailed assessment of all key issues and necessary management procedures has been conducted and is comprehensively documented in this EA.

The assessment process has involved a detailed study of the existing environment and the use of engineering and scientific modelling to assess and determine potential impacts as a result of the proposed modification (refer to **Section 5.0**). To this end, there has been careful evaluation to avoid, where possible, irreversible damage to the environment.

The decision making process for the design, impact assessment and development of management processes has been transparent in the following respects:

- government authorities, landholders potentially affected by the proposed modification, the local community and other stakeholders were consulted during EA preparation (refer to **Section 3.0**). This enabled comment and discussion regarding potential environmental impacts and proposed environmental management procedures;

- the community was initially consulted through a range of mechanisms which provided details and an opportunity for the community to provide feedback on the proposed modification;

- UCML has designed and implemented a comprehensive Environmental Management System (EMS), and related environmental management programs, that seek to implement best practice management. The proposed modification will incorporate the practices implemented and demonstrated to be effective at the Ulan Complex and the existing EMS will be revised to incorporate any additional controls outlined in this EA; and

- the EA has been undertaken on the basis of the best available scientific information for the study area. Where uncertainty in the data used in the assessment has been identified, a conservative worst-case analysis has been undertaken and contingency measures have been identified to manage that uncertainty.

6.3.2 Intergenerational Equity

The EP&A Regulation defines intergenerational equity as:

> Intergenerational equity namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

Social equity involves concepts of justice and fairness so that the basic needs of all sectors of society are met and there is a fairer distribution of costs and benefits to improve the well being and welfare of the community, population or society (DUAP 1997).

Intergenerational equity refers to equality between generations. It requires that the needs and requirements of today's generations do not compromise the needs and requirements of future generations in terms of health, biodiversity and productivity.

The objective of the proposed modification is to allow for an efficient recovery of the resource in a manner that achieves the best practical safety, environmental, social and economic outcomes while aiming to minimise any associated environmental impacts. The environmental management measures discussed in **Section 5.0** and **Section 6.0** have been developed to minimise the impact on the environment to the greatest extent reasonably possible.

The management of environmental issues as outlined in the EA will maintain the health, diversity and productivity of the environment for future generations. The proposed modification will also contribute to maintaining services in the community through the direct and flow on effects of employee and operational expenditure.

6.3.3 Conservation of Biological Diversity

The conservation of biological diversity refers to the maintenance of species richness, ecosystem diversity and health and the links and processes between them. All environmental components, ecosystems and habitat values potentially affected by the proposed modification are described in the EA. Potential impacts and measures to ameliorate any negative impact are outlined in **Section 5.5**.

UCML has sought to avoid and minimise potential adverse impacts on the conservation and ecological values throughout the project planning process. This has included relocation of proposed ventilation infrastructure to avoid areas of threatened ecological communities. In addition, UCML has committed to meeting their existing approval criteria and commitments.

6.3.4 Valuation and Pricing of Resources

The principle of improved valuation and pricing refers to the need to determine proper values of services provided by the natural environment. The objective is to apply economic terms and values to the elements of the natural environment. This is a difficult task largely due to the intangible comparisons that need to be drawn in order to apply the values.

UCML has intrinsically valued the environmental resources by designing the proposed modification to avoid and minimise potential environmental impacts as much as possible. For example, the proposed ventilation requirements have been designed to avoid areas of threatened ecological communities and known Aboriginal archaeological sites.

Where residual impacts remain, mitigation measures (refer to **Section 5.0** and **Section 6.0**) are proposed to further reduce potential impacts on the environment.

6.4 Conclusion

The proposed modification maximises the efficient recovery of an additional 13 million tonnes of ROM coal resource that can be undertaken without significantly increasing the environmental impacts of the existing approved Ulan Coal Complex operations.

The proposed modification will result in a minor increase of in the total area of subsidence affectation associated with the UCCO Project. The range of predicted subsidence impacts within this additional area of subsidence affectation are consistent with those approved under Project Approval 08_0184, with no significant increase in environmental impacts predicted. The proposed modification is not anticipated to have a significant adverse impact on the land surface or natural features located within the modified Ulan West mining area, and will not have a significant adverse impact on existing land uses. Impacts of the proposed modification on built features are predicted to be consistent with the UCCO Project EA and PA 08_0184. The existing suite of approved management measures will be applied to the proposed modification.

The comprehensive environmental impact assessment therefore demonstrates that with the continued implementation of existing management and mitigation measures, it is anticipated that the proposed modification can proceed within acceptable environmental standards, without significantly increasing the environmental impacts of the UCCO Project.

7.0 References

Australian Geological Survey Organisation (AGSO) (2000). Energy/Greenhouse Benchmarking Study of Coal Mining Industry.

Australian Government: Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education (2013). Australian National Greenhouse Accounts - National Inventory Report 2011.

Australian Greenhouse Office (2007). National Greenhouse Gas Inventory: Analysis of Recent Trends and Greenhouse Gas Indicators.

Bureau of Meteorology and CSIRO (2014). State of the climate 2014.

Clean Energy Regulator (2012). National Greenhouse and Energy Reporting (Measurement) Determination 2008.

Coakes Consulting 2009. *Ulan Coal Continued Operations Project Socio-economic Impact Assessment and Community Consultation Program*.

Department of Climate Change and Energy Efficiency (2012a). International climate change negotiations, Durban 2011.

Department of Climate Change and Energy Efficiency (2012b). Fact Sheet: Australia's emission reduction targets. Commonwealth of Australia, Canberra.

Department of Climate Change and Energy Efficiency (2013). National Greenhouse Accounts (NGA*)* Factors, Department of Climate Change, Canberra.

Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education (2013). Key outcomes for the Australian Government from the Cancun Conference. DIICCSRTE website.

Emery, 1986. *Rural Land Capability Mapping*. Soil Conservation Service of NSW.

Fly By Night 2014, *Microbat Monitoring of the Ulan Coal Mine Lease during 2013*. Prepared for Ulan Coal Mines Ltd

Haglund L, 1996. *Salvage Excavation Completed for Ulan Coal Mines Ltd: NPWS Site 36-3-117, Ulan Heritage Identifier 116*. Unpublished report Ulan Coal Mines Limited.

Haglund L, 1999. *Ulan Coal Mines Second Longwall Project Environmental Impact Statement (Expanded Version): Preliminary Survey for Aboriginal Sites, Parts I-III.* unpublished report to Kinhill Engineers Pty Ltd.

Hammond, G and Jones, C. (2011). *Inventory of Carbon and Energy*, Version 2.0, January 2011. University of Bath.

Hunter Environment Lobby Inc v Minister for Planning (2011) NSWLEC 221.

Glencore Coal (2013). Code of Conduct

Intergovernmental Panel on Climate Change (IPCC) (2007). Climate Change 2007: Synthesis Report.

Intergovernmental Panel on Climate Change (IPCC) (2013). Climate Change 2013: Working Group I: The physical science basis.

International Energy Agency (IEA) (2012). World Energy Outlook 2012.

Mackie Environmental Research 2014. *Assessment of Groundwater Related Impacts Arising from Modifications to the Ulan West Mine Plan*

National Greenhouse Gas Inventory (2011). National Greenhouse Gas Inventory. http://ageis.climatechange.gov.au/

NSW Department of Environment and Climate Change 2009. *Interim Construction Noise Guideline*.

NSW Department of Planning and Infrastructure 2012. *Strategic Regional Land Use Policy*, State of New South Wales through the Department of Planning and Infrastructure

NSW Environmental Protection Authority 1985. *Environmental Noise Control Manual*.

NSW Environment Protection Authority 2000. *New South Wales Industrial Noise Policy.*

NSW Environmental Protection Authority 2012. *Application Notes – NSW Industrial Noise Policy*.

NSW Office of Environment & Heritage and the Office of Agricultural Sustainability & Food Security 2013. *Interim Protocol for site verification and mapping of biophysical strategic agricultural land*, published by the NSW Government

South East Archaeology 2009. *Ulan Coal Continued Operations: Aboriginal Heritage Assessment*

South East Archaeology 2014. *Ulan Coal Mines Limited, Central Tablelands of New South Wales: Ulan West Modification – Aboriginal Cultural Heritage Assessment*

Strata Control Technologies 2009. *Part 3A Subsidence Assessment Ulan Coal – Continued Operations*

Strata Control Technologies 2014. *Subsidence Assessment for Proposed Ulan West Mine Modification – Longwalls 3 to 12*

SLR Consulting Australia Pty Ltd 2014. *Ulan West Mine Expansion BSAL Verification Assessment*.

Umwelt (Australia) Pty Limited 2009. *Ulan Coal – Continued Operations Environmental Assessment*

Umwelt (Australia) Pty Limited 2014a, *Ulan West Modification Preliminary Environmental Assessment*

Umwelt (Australia) Pty Limited 2014b, *Ulan West Modification Ecological Impact Assessment*

Umwelt (Australia) Pty Limited 2014c, *Ulan West Modification Surface Water Assessment*

Umwelt (Australia) Pty Limited 2014d, *Ulan West Modification Noise Impact Assessment*

Umwelt (Australia) Pty Limited 2014e, *Ulan West Modification Greenhouse Gas and Energy Assessment*

Wilkinson Murray Pty Limited, 2009. *Ulan Coal – Continued Operations Noise & Vibration Assessment*.

WRI/WBCSD (2004). The Greenhouse Gas Protocol: The GHG Protocol for Modified RDC Accounting. World Resources Institute and the World Business Council for Sustainable Development, Switzerland.

8.0 Abbreviations and Glossary

8.1 Abbreviations

AGO	Australian Greenhouse Office
ALS	Airborne Laser Scanning
AMN	Goulburn River and Ulan Creek Alluvium Monitoring Network
BMP	Biodiversity Management Plan
BMS	Biodiversity Monitoring Services
BSAL	Biophysical Strategic Agricultural Land
CCC	Community Consultative Committee
CEEC	Critically Endangered Ecological Community
CHPP	Coal Handling and Preparation Plant
CIC	Critical Industry Cluster
dB	Decibel
dBA	A-weighted Decibel
DECC	Department of Environment and Climate Change
DEM	Digital Elevation Model
DoE	Department of the Environment
DP&E	Department of Planning and Environment
DRE	NSW Trade and Investment – Division of Resources and Energy
EA	Environmental Assessment
EARs	Environmental Assessment Requirements
EC	Electrical Conductivity
EEC	Endangered Ecological Community
EL	Exploration Licence
EMS	Environmental Management System
ENM	Environmental Noise Model
EPA	Environment Protection Authority of NSW

EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EP&A Regulation	Environmental Planning and Assessment Regulation 2000 (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
EPL	Environment Protection Licence
GHG	Greenhouse gas
Glencore	Glencore Coal Assets Australia
HMP	Heritage Management Plan
IMN	Intermittent Monitoring Network
INP	NSW Industrial Noise Policy
IMOP	Integrated Mining Operations Plan
LEP	Local Environmental Plan
LGA	Local Government Area
MCP	Moolarben Coal Project
MER	Mackie Environmental Research Pty Ltd
ML	Megalitres
MLA	Mining Lease Application
MNES	Matters of National Environmental Significance
MOP	Mining Operations Plan
MSB	Mine Subsidence Board
Mt	million tonnes
Mtpa	million tonnes per annum
MWRC	Mid-Western Regional Council
NMN	North Monitoring Network
NOW	NSW Office of Water
NVA	Noise and Vibration Assessment
OEH	Office of Environment and Heritage
PA	Project Approval
PAD	Potential Archaeological Deposit

PoEO Act	*Protection of the Environment Operations Act 1997*
PRP	Pollution Reduction Program
RBL	Rating Background Level
ROM	Run-of-mine
RMS	Roads and Maritime Service
SCA	State Conservation Area
SCT	SCT Operations Pty Ltd
SEA	South East Archaeology
SEPP	State Environmental Planning Policy
SIA	Socio-economic impact assessment
SMP	Subsidence Management Plan
SRLUP	Strategic Regional Land Use Plan
TDS	Total Dissolved Solids
TEC	Threatened Ecological Community
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
UCCO	Ulan Coal Continued Operations
UCML	Ulan Coal Mines Limited
Umwelt	Umwelt (Australia) Pty Limited
WSP	Water Sharing Plan

8.2 Glossary

Alluvium:	Sediment deposited by a flowing stream, e.g., clay, silt, sand, etc.
Amenity:	An agreeable feature, facility or service which makes for a comfortable and pleasant life.
Aquifer:	A water-bearing rock formation.
Arboreal:	Adapted for living and moving around in trees.
Archaeological:	Pertaining to the study of culture and description of its remains.
Attenuation:	The reduction in magnitude of some variable in a transmission system, for example, the reduction of noise with distance as it travels through air.

Background Noise:	Existing noise in the absence of the sound under investigation and all other extraneous sounds.
Catchment Area:	The area from which a river or stream receives its water.
Coal Reserves:	Those parts of the Coal Resources for which sufficient information is available to enable detailed or conceptual mine planning and for which such planning has been undertaken.
Coal Resources:	All of the potentially useable coal in a defined area, based on geological data at certain points and extrapolations from these points.
Conservation:	The management of natural resources in a way that will preserve them for the benefit of both present and future generations.
dB (Decibel):	A unit for expressing the relative intensity of sounds on a logarithmic scale from zero (for average least perceptible sound) to about 130 (for the average pain level).
dBA:	A modified decibel scale which is weighted to take account of the frequency response of the normal human ear.
Dip:	The direction in which rock strata is inclined.
Drift:	A tunnel used to access coal resources.
Ecology:	The science dealing with the relationships between organisms and their environment.
Ecosystem:	Organisms of a community together with its non-living components through which energy and matter flow.
Electrical Conductivity:	The measure of electrical conduction through water or a soil-water suspension generally measured in millisiemens per centimetre or microsiemens per centimetre. An approximate measure of soil or water salinity.
Environmental Planning and Assessment Act 1979:	NSW Government Act to provide for the orderly development of land in NSW.
Environment Protection and Biodiversity Conservation Act 1999:	Commonwealth legislation that regulates development proposals that have an actual or potential impact on matters of national environmental significance.
Fault:	A fracture or fracture zone along which there has been displacement of the sides relative to one another. Displacement can be vertical and/or horizontal.
Fauna:	All vertebrate animal life of a given time and place.

Floodplain: Large flat area of land adjacent to a stream which has been deposited during previous stream flow events and is inundated during times of high flow.

Flora: All vascular plant life of a given time and place.

Geology: Science relating to the earth, the rocks of which it is composed and the changes it undergoes.

Geomorphic: Relating to the formation of the earth's surface features.

Geotechnical: Relates to the form, arrangement and structure of geology.

Groundwater: Sub-surface water which is within the saturated zone and can supply wells and springs. The upper surface of this saturated zone is called the water table.

Habitat: The environment in which a plant or animal lives; often described in terms of geography and climate.

***In situ*:** In its original place.

Indigenous: Native to, or originating in, a particular region or country.

L_{A1} Noise Level: The noise level exceeded for one per cent of the time. It is used in assessment of sleep disturbance.

L_{A90} Noise Level: The noise level, measured in dB(A), exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. The L_{90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes.

L_{Aeq} Noise Level: The equivalent continuous noise level, measured in dB(A), during a measurement period.

L_{AMax} Noise Level: The maximum noise energy, measured in dB(A), during a measurement period.

Land Capability: The ability of a parcel of land to be used in a sustainable manner (that is without permanent damage) for a given land use.

Landform: Sections of the earth's surface which have a definable appearance (e.g. cliff, valley, mountain range, plain, etc).

Longwall Mining: A form of underground mining. A panel of coal is removed by shearing machinery, which travels back and forth across the coal face. The area immediately in front of the coal face is supported by a series of hydraulic roof supports providing working space.

Mean: The average value of a particular set of numbers.

Megalitre (ML): One million litres.

Meteorology: Science dealing with atmospheric phenomena and weather.

Mitigate:	To lessen in force, intensity or harshness. To moderate in severity.
Native:	Belonging to the natural flora or fauna in a region.
Outcrop:	Bedrock exposed at the ground surface.
Overburden Emplacement:	An area for placing overburden or waste rock, removed from above and between the coal seams.
Particulates:	Fine solid particles which remain individually dispersed in gases.
pH:	Scale used to express acidity and alkalinity. Values range from 0-14 with seven representing neutrality. Numbers from seven to zero represent increasing acidity whilst seven to fourteen represent increasing alkalinity.
Piezometer:	A small diameter bore lined with a slotted tube used for determining the standing water level of groundwaters.
Protection of the Environment Operations Act 1997:	NSW legislation administered by DECC that regulates discharges to land, air and water.
Rating Background Level (RBL):	A period (day, evening or night) background noise level determined in accordance with chapter 3 of the NSW Industrial Noise Policy (EPA, 2000).
Rehabilitation:	The process of restoring to a condition of usefulness. In regard to mining, relates to restoration of land from a degraded or mined condition to a stable and vegetated landform.
Revegetation:	The process of re-establishing vegetation cover.
Run-of-mine (ROM):	Bulk material extracted from a mine, before it is processed in any way.
Salinity:	A measure of the concentration of dissolved solids in water.
Seam:	An identifiable discrete coal unit.
Sedimentation:	Deposition or settling of materials by means of water, ice or wind action.
Sediment Dam:	A dam built to retard dirty runoff to allow sediment to settle out before allowing clean water discharge.
Site Specific:	Relating to conditions existing at a particular location.
Socio-economic:	Combination of social and economic factors.
Spontaneous Combustion:	Spontaneous ignition of some or all of a combustible material.
Subsidence:	The vertical movement of a point on the surface of the ground as it settles above a coal panel extracted by underground mining.

Subsidence affectation area:	The ground surface area affected by subsidence, defined by: • the area bounded by the 26.5 degree angle of draw (i.e. the angle of the line connecting the edge of underground workings and the limit of subsidence at the surface); and • the predicted vertical limit of measurable subsidence, taken as the 20 mm subsidence contour.
Surface Infrastructure:	Any manmade object, facility or structure on the surface of the land.
Tailings:	Fine residual waste material separated in the coal preparation process.
Thermal Coal:	Includes medium to high ash, low sulphur coals used for domestic power generation and medium to low ash energy coals which are exported.
Topography:	Description of all the physical features of an area of land and their relative positions, either in words or by way of a map.
Total Dissolved Solids (TDS):	A measure of salinity expressed in milligrams per litre (mg/L).
Total Suspended Particulates (TSP):	A measure of the total amount of un-dissolved matter in a volume of water or air usually expressed in milligrams per litre (mg/L) (for water) or micrograms per cubic metre ($\mu g/m^3$) for air.
Woodland:	Land covered by trees that do not form a closed canopy.

ULAN COAL

GLENCORE

Ulan Coal Mines Limited

Private Mail Bag 3006
Mudgee NSW 2850

Ph. 02 6372 5300

umwelt

Newcastle

Umwelt (Australia) Pty Limited

75 York Street
Teralba NSW 2284

Ph. 02 4950 5322

www.umwelt.com.au