5.6 Aboriginal Archaeology

A comprehensive Aboriginal heritage assessment was undertaken for the Project by South East Archaeology (SEA) in consultation with the four registered Aboriginal stakeholder groups and one registered individual. The detailed assessment report is included as **Appendix 9**, with a summary included in this section.

The principal aims of the Aboriginal heritage assessment were to identify and record any evidence of Aboriginal heritage or cultural values within the project area, assess the significance and any potential impacts of the proposal on this evidence, and provide appropriate management recommendations, in consultation with the local Aboriginal community to mitigate any such impacts.

The Aboriginal heritage assessment and consultation program was undertaken in accordance with DECC *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DECC 2005). The registered Aboriginal community groups are Warrabinga Native Title Claimants Aboriginal Corporation, Murong Gialinga Aboriginal and Torres Strait Islanders Corporation, North East Wiradjuri and Mudgee Local Aboriginal Land Council. One individual, Warranha Ngumbaay, also registered an interest in the Project. The registered Aboriginal community stakeholders were involved in all facets of the assessment including consultation during development of the survey strategy and participation in field survey, site identification and recording, provision of information regarding cultural heritage values and review and comment on the draft report. Aboriginal stakeholder feedback and comments from the review were considered and incorporated in the development of the conservation and management strategy.

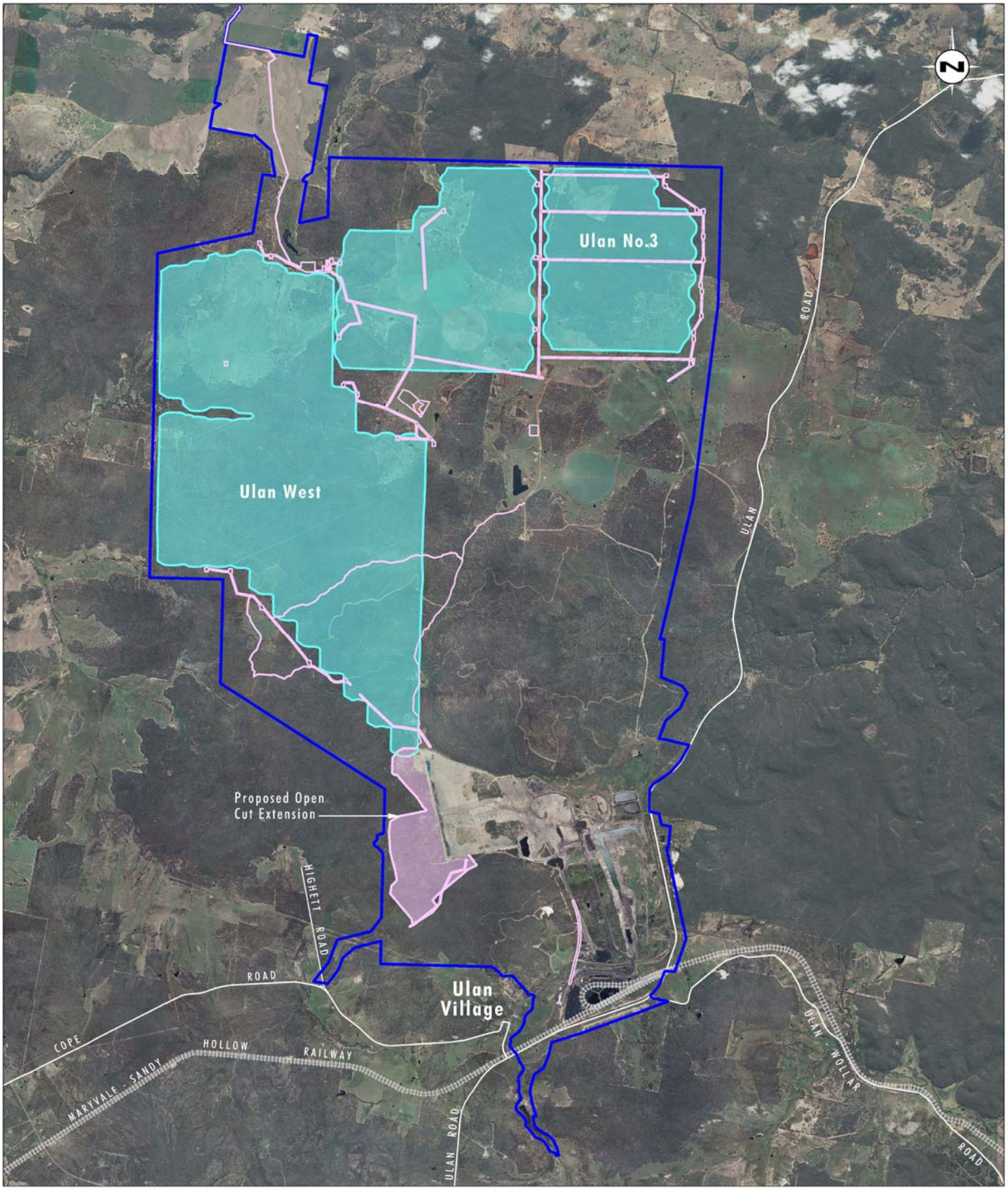
The draft Aboriginal heritage assessment report was provided to the registered stakeholders for comment in June 2009. In July, a detailed presentation was made to the Aboriginal stakeholders on the results of the survey, the significance assessment (including any Aboriginal community comments provided during fieldwork), the impact assessment findings, the proposed management measures and the proposed conservation package.

Each of the registered Aboriginal stakeholders provided comments on the draft Aboriginal heritage assessment and these comments are outlined in the detailed report in **Appendix 9**. The stakeholders were generally supportive of the draft assessment, its findings and recommendations. Minor modifications to the Aboriginal heritage assessment have been undertaken to address the issues raised by the Aboriginal stakeholders, where relevant.

5.6.1 Survey Methodology

A comprehensive field survey was undertaken with assistance from representatives of the registered Aboriginal stakeholders over a period of 104 days from February to November 2008. The assessment inspected 1888 discrete areas, covering a survey area of approximately 4785 hectares. The surveys carried out by SEA sampled approximately 88 per cent of the original study area. The study area includes the areas within the Project boundary (refer to **Figure 5.6.1**) in which Aboriginal heritage may exist and may be subject to impacts from the Project. The study area did not include areas within the Project boundary that will not be impacted by the Project or that have already been significantly modified as a result of existing approved mining operations.

As a result of property access constraints and revisions to the project area, approximately 660 hectares of the project area has not been subject to archaeological survey. The areas that have not been surveyed are mostly within potential subsidence affectation zones on the private properties in the north-western portion of the Ulan West area. It should be noted that these areas are of relatively high depth of cover and there is only minor occurrence of cliff



Source: Umwelt (2009), Lands NSW (2007)

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Legend
- Project Boundary
- Potential Surface Impacts
- Potential Subsidence Impacts

FIGURE 5.6.1

Aboriginal Heritage Study Area

lines in this area. Access was gained to survey the surface infrastructure corridors on these private properties.

The extent and nature of survey coverage are 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, SEA concluded that the survey provides a valid basis for determining the probable impacts of the Project and providing recommendations for the management of identified and potential Aboriginal heritage resources.

5.6.2 Survey Results

A total of 709 Aboriginal heritage sites are known to occur in or within approximately 50 metres of the study area. These sites consist of:

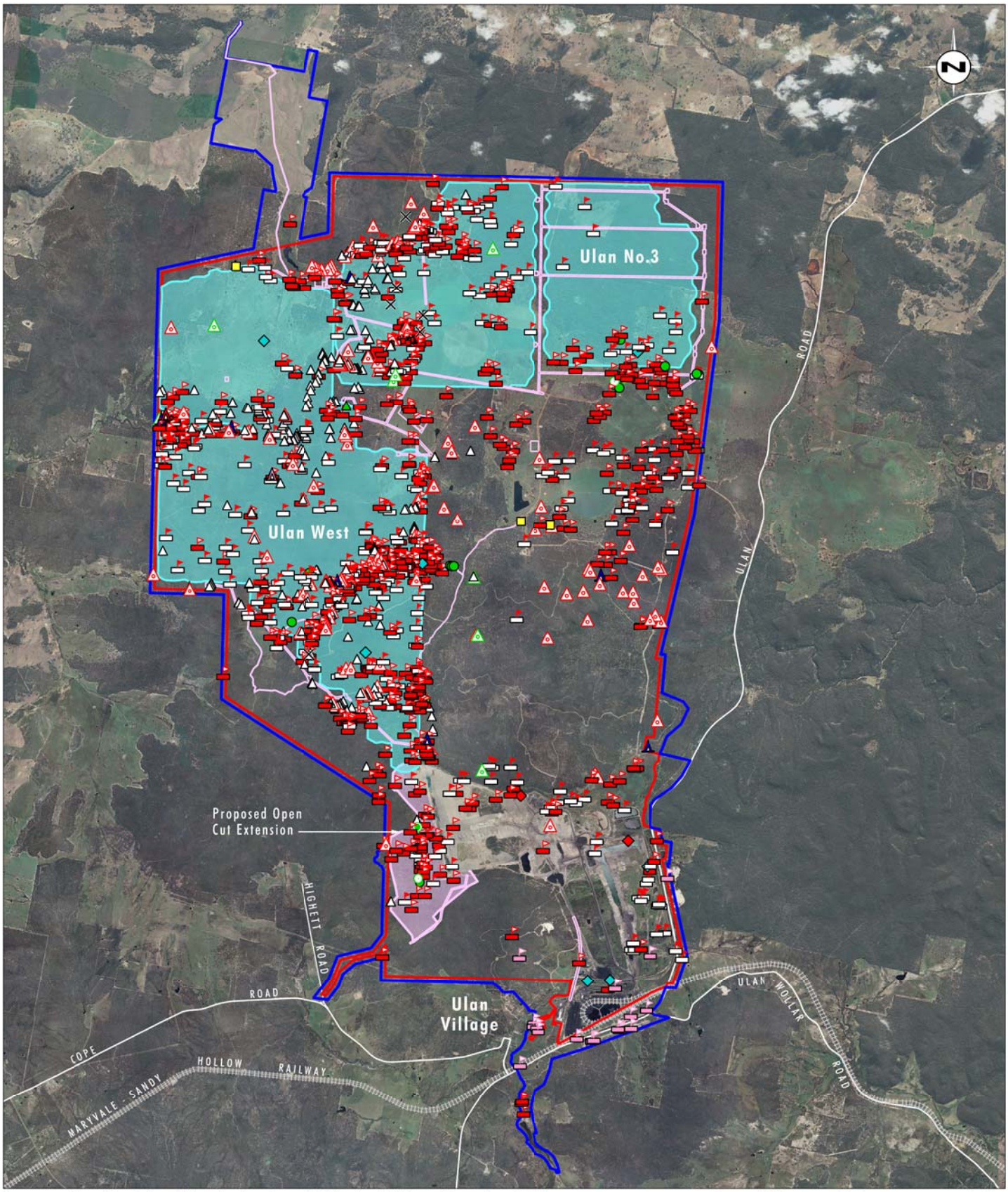
- 558 open artefact sites (8774 stone artefacts were recorded in detail during the survey);
- nine open grinding groove sites;
- one combined groove and artefact scatter site;
- 128 rock shelters with artefacts, art and/or grinding grooves;
- five scarred trees;
- five stone arrangements;
- two ochre quarries; and
- one waterhole/well.

In addition, 296 rock shelters with Potential Archaeological Deposits (PADs) occur within the study area. The sites recorded within the survey area are shown on **Figure 5.6.2**.

A detailed occupation model for the Ulan area and a predictive model of site location were assessed as part of the Project. Within the study area, artefacts occur at a very low mean density of 0.0176 artefacts per square metre. The evidence indicates that Aboriginal utilisation of the study area was generally of a low intensity with focalised areas of higher density where activities or repeated activities occurred. The low intensity of utilisation is likely to relate to the limited presence of higher order watercourses.

5.6.3 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. These two components are not always interrelated, with sites potentially having different cultural and scientific values.



Source: Ulan Coal, SouthEast Archaeology 2009, Aerial Photo December 2007

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Legend

- Colliery Holding Boundary
- Project Application Area
- Potential Surface Impacts
- Potential Subsidence Impacts
- Artefact Scatter
- Grinding Grooves
- Grinding Grooves and Artefact Scatter
- Isolated Find
- Ochre Quarry
- Open Site
- 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 PAD
- Scarred Tree
- Scarred Tree and Artefact Scatter
- Stone Arrangement
- Waterhole/Well

FIGURE 5.6.2

Aboriginal Site Locations

File Name (A4): R05_V1/2423_327.dgn

5.6.3.1 Aboriginal Cultural Significance

The Aboriginal representatives disclosed a number of associations with the study area of contemporary significance and identified the contemporary value of the archaeological evidence. However, the representatives did not provide any specific knowledge of sites or places associated with ceremonies, spiritual/mythological beliefs or traditional knowledge within the study area. Similarly, the Aboriginal representatives did not provide any specific knowledge of sites or places associated with historical associations within the study area.

5.6.3.2 Archaeological/Scientific Significance

The significance of the Aboriginal heritage evidence has been assessed against criteria derived from the relevant aspects of the ICOMOS Burra Charter. The Aboriginal community has also reviewed the scientific findings and either endorsed or not contradicted the scientific significance assessment. Therefore, based on scientific and cultural criteria, the significance of the sites and PADs had been assessed. In overall terms:

- 3.3 per cent of the sites are assessed as being of high significance;
- 4.9 per cent of the sites are assessed as being of moderate to high significance;
- 6.3 per cent of the sites are assessed as being of moderate significance;
- 10.7 per cent of the sites are assessed as being of low to moderate significance; and
- 74.8 per cent of the sites are assessed as being of low scientific significance.

Five of the sites have been assessed as being potentially significant within a regional context. The five sites include four stone arrangements (Site ID # 589, 603, 697 and 700) and one large artefact scatter at Old Ulan Village (Site ID # 79). Further sites may be considered of regional significance if evidence of occupation deposits greater than 5000 years of age are identified in rock shelters or open contexts during the proposed salvage program outlined in **Section 5.6.5**. The staged salvage program, together with the establishment of the conservation areas discussed in **Section 5.6.5** are considered appropriate to mitigate potential impacts on such regionally significant sites.

5.6.4 Impacts

The Project has the potential to impact on Aboriginal sites through both direct and indirect impacts. Direct impacts will result from surface works, such as open cut mining and surface infrastructure. Indirect impacts will be associated with ground surface impacts through underground mining induced subsidence.

The greatest potential impact of the Project on Aboriginal heritage, both in terms of site numbers and significant sites, is from underground mining induced subsidence. Approximately 35 per cent of the total number of sites in the study area may be subject to subsidence impacts however such impacts are proposed to be managed through the implementation of mitigation measures.

In the absence of appropriate management and mitigation measures, it is concluded that the impacts of the Project on Aboriginal heritage will be high within a local context, but relatively low within a regional context.

5.6.5 Management Strategy

A range of options were considered when developing an appropriate management strategy for the Project. These include:

- further investigation;
- conservation/avoidance of impacts;
- mitigation;
- unmitigated impact; and
- monitoring.

Each site is considered in relation to criteria such as the nature of the heritage evidence, its significance, the nature of the potential impacts, and the views of the registered Aboriginal stakeholders.

As identified in **Section 5.6.3.2**, there are five sites assessed as potentially significant in a regional context. Specific management strategies for these five sites are presented in **Table 5.7**. Where appropriate, the sites will be fenced to minimise risk of inadvertent disturbance.

Table 5.7 – Management Strategies for Potentially Regional Significant Sites

Site ID	Site Description	Management Strategy
79	Artefact Scatter	• Avoid impacts off road. • Minimise ground disturbance associated with road works, fully implement existing section 90 AHIP for road works and drilling, monitor in future with additional surface collections if required .
589	Stone Arrangement	• Record in detail. • Ensure impacts avoided.
603	Stone Arrangement	• Record in detail. • Ensure impacts avoided.
697	Stone Arrangement	• Record in detail. • Ensure impacts avoided.
700	Stone Arrangement	• Record in detail. • Ensure impacts avoided.

Specific management strategies for all individual sites are documented in detail in **Appendix 9**. The key management and mitigation measures proposed for the Project are summarised as follows:

- establishment of the Brokenback Conservation Area in the area shown on **Figure 5.5.5**. The Brokenback Conservation area consists of an area of approximately 58 hectares within the Ulan West underground mining area. The Conservation area will result in avoiding impact on 27 rock shelter sites, including six of the 11 high significance sites that would be susceptible to impacts. The Brokenback Conservation Area will also conserve four sites of moderate to high significance and three sites of moderate significance. The establishment of the Brokenback Conservation Area within the Ulan West mine plan will

sterilise approximately 6.7 million tonnes of coal and impose significant operational costs due to the need to decommission and reinstall the longwall miner around the conservation zones;

- establishment of two Grinding Groove Conservation Areas in the area shown on **Figure 5.5.5**. Three grinding groove sites of high significance (ID#1074-1096) are located to the east of the Ulan West underground mining area and a further one (ID#323) is located marginally east of Ulan No. 3. These grinding groove sites will not be subject to direct or indirect impacts from the Project. Two Grinding Groove Conservation Areas will be established to encompass these sites to offset impacts of the Project on other grinding groove sites and to ensure the long-term conservation of these significant sites;

- avoidance of impacts from the Project to the Mona Creek 23 – 30 and Cockabutta Creek 18 – 20 rock shelter sites (refer to **Figure 5.5.5**). These are located outside the subsidence zone of impact and will not be impacted by surface infrastructure;

- implementation of appropriate site-specific precautionary measures for sites which will not be impacted by the Project, but where works will occur in close proximity to the sites;

- Aboriginal heritage awareness training for all relevant contractors and employees;

- continued maintenance of the UCML Aboriginal Database. Additionally site records will be lodged in a timely manner with DECC for any previously unrecorded Aboriginal heritage evidence that is identified within the project area;

- further investigations will occur for specific heritage sites or areas, including:

  - detailed recording of the stone arrangements;
  - detailed recording of larger artefact scatter sites that were not fully recorded during the current investigation, should any future impacts be proposed to those sites;
  - review of the management approach for sites that may be affected by small-scale high impact works, once detailed design plans are available;
  - implementation of procedures outlined in the UCML *Proposed Works Application/Review* form followed by implementation of strategies for individual sites should any other small-scale impacts be proposed in future, such as those associated with exploratory drilling, other minor works involving ground disturbance, or any post-mining subsidence repair works to surface infrastructure;
  - archaeological survey of all remaining potential impact areas and unformed or lightly formed vehicle tracks with heritage potential that could not be sampled during the present investigation, with the registered Aboriginal stakeholders and using the same methodology as for the present investigation.

- in order to mitigate the impacts of the Project on scientific and cultural values and to retrieve and conserve samples of any Aboriginal heritage evidence, mitigation measures will be implemented prior to any impacts occurring, as outlined for individual sites, including:

  - salvage of the waterhole/well site and one open grinding groove site;
  - temporary removal of the portable rocks hosting grinding grooves in relevant shelters prior to undermining, with these rocks being replaced after subsidence impacts have occurred;
  - salvage of stone artefacts by systematic surface collection from specified open artefact sites, as outlined in **Appendix 9**;

  - salvage by broad-area hand excavation of specified open artefact sites, as outlined in **Appendix 9**;
  - salvage by mechanical surface scrapes, and localised hand excavation of any features of significance identified during the scrapes, of specified open artefact sites, as outlined in **Appendix 9**; and
  - mitigation of subsidence impacts to the 77 rock shelter sites of low to moderate or higher significance that are susceptible to impacts, through a four stage process involving selection of a representative sample, an initial small excavation in each shelter within the selected sample to identify the nature of deposits and research potential, revision of the sample and further, more detailed salvage excavation of this revised sample;

- all Aboriginal heritage mitigation and monitoring measures will be adequately documented and reports provided to relevant stakeholders within appropriate timeframes;

- all Aboriginal heritage evidence salvaged will be curated in an appropriate manner as determined in consultation with the registered Aboriginal stakeholders and DECC during preparation of the Aboriginal Heritage Management Plan (outlined in **Section 5.6.6**), with the appropriate permit from DECC;

- an educational video will be produced in consultation with the Aboriginal community to showcase the heritage resources and cultural background of the study area, and UCML's management of those resources;

- archaeological investigations will only be undertaken by archaeologists qualified and experienced in Aboriginal heritage, in consultation with the registered Aboriginal stakeholders, and will occur prior to any development impacts occurring to the relevant areas or sites;

- the registered Aboriginal stakeholders will be afforded the opportunity to be involved in any further archaeological field studies as per the DECC *Interim Community Consultation Requirements for Applicants* policy; and

- monitoring of subsidence impacts will be conducted for a number of rock shelter sites and open grinding groove sites, along with one stone arrangement site, as outlined in **Appendix 9**.

5.6.6 Aboriginal Heritage Management Plan

An Aboriginal Heritage Management Plan (AHMP) will be developed in consultation with DECC and Aboriginal stakeholder groups to facilitate ongoing management of the 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 project area.

The AHMP will also include 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 area; and

- ensure that Aboriginal community representatives are permitted access to the Conservation Areas or other identified sites in the UCML lease area when requested.

The AHMP will be regularly reviewed at an interval agreed with DECC and the Aboriginal stakeholders.

5.7 European and Natural Heritage

A European and natural heritage assessment was undertaken for the Project by Umwelt. The assessment has been undertaken in accordance with guidelines set out in the *NSW Heritage Manual 1996*, produced by the Heritage Branch, Department of Planning (DoP), including *Archaeological Assessments* and *Assessing Heritage Significance* and with consideration of the principles contained in the *Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance*. The assessment included a review of:

- the Australian Heritage Database maintained by the Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA);
- the State Heritage Register (SHR) and State Heritage Inventory maintained by the NSW Heritage Council;
- the Register of the National Trust (NSW);
- the Mid-Western Regional Interim Local Environmental Plan 2008 (note the Mid-Western Regional Council area consists of 100 per cent of the former Mudgee Shire Council, 70 per cent of the former Rylstone Shire Council and 10 per cent of the former Merriwa Shire Council);
- the Mudgee Local Environmental Plan 1998;
- the Merriwa Local Environmental Plan 1992; and
- the Register of the National Estate (RNE).

A number of European and natural heritage sites have been identified within the project area. The level of impact on European and natural heritage sites is dependent on their location within the project area and is associated with mining method. Sites located within the proposed open cut extension footprint will be destroyed, while sites located within the underground mining footprint will have varying levels of impact depending on subsidence impacts.

The European and natural heritage assessment report is included as **Appendix 10**, with a summary provided in this section.

5.7.1 Historical Context

The project area forms part of a landscape that was used by traditional Aboriginal owners prior to European contact and continues to be highly valued by Aboriginal people. The project area is included within the Wiradjuri traditional lands which are close to Kamilaroi to the north, the Geawegal to the north-east and the Wonnarua to the east (Kuskie 2008). The Aboriginal Heritage Assessment is discussed further in **Section 5.6**.

In 1813 George Evans (1780-1852) crossed the Blue Mountains and reached the Macquarie River beyond Bathurst, noting the well watered open plains suitable for grazing. The subsequent colonisation of the tablelands and the establishment of the early towns came as a direct response to the new colonies' need for expansive grazing land. The major stimulus

for European entry into the Mudgee/Gulgong area in particular may have been due to a shortage of feed for stock in the Bathurst region in the early 1800s (Godden Mackay 1992). European contact with the region had profound effects on the Wiradjuri with the introduction of agriculture, pastoralism and later mining. In the Ulan area, fighting between European and Aboriginal people occurred in the 1820s as settlers sought to establish grazing runs (Haglund 1999). The dramatic increase in the number of European settlers around Mudgee, Bathurst and Gulgong from the 1850s to the 1870s (during the gold rush) resulted in the further displacement of the Aboriginal people (Burless 1997).

In the early 1820s James Blackman (1792?-1868) and William Lawson (1774-1850) led separate exploration parties to the Mudgee area. In 1820 Blackman marked out a road from Bathurst to Wallerawang and in 1821 explored a route from Bathurst to the Cudgegong River. William Lawson followed Blackman's route later in the year and is thought to have discovered the site of Mudgee approximately 16 kilometres from the furthest point reached by Blackman earlier in the year. The first settlers started to arrive the following year. In 1822 Blackman and Lawson traced out a route from Wallerawang to Dabee, near Rylstone (Greaves 1966). From the 1820s the number of settlers moving to the area greatly increased and the Mudgee and Gulgong district was settled around 1822 (Haglund 1996).

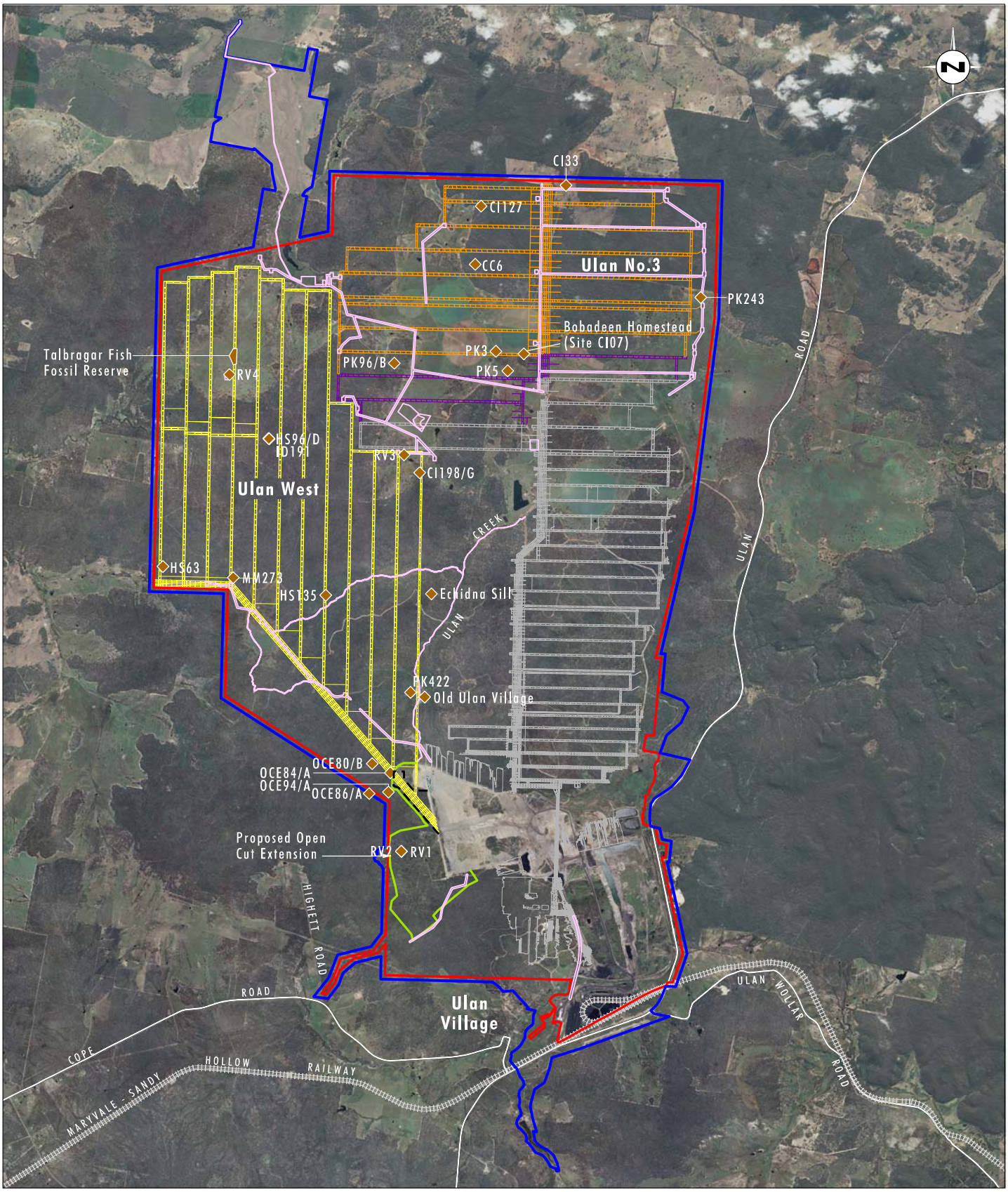
The earliest land taken up in the Ulan area was that of settlers John McDonald and William Robinson. Robinson and McDonald selected land where there was good water and suitable crossings of the Goulburn River and its tributary creeks; Ulan, Moolarben and Sportsman Hollow. These selections became the sites of inns and staging posts. Other early selectors chose places that had good water and reasonable soil, in an area characterised by a lack of fertility (Tickle 2005).

The village of Ulan was proclaimed on 21 August 1897 on the west bank of the Goulburn River where Moolarben Creek joins Sportsman Hollow Creek, resulting in the formation of the Goulburn River. The current Ulan Village was named after Old Ulan where William Robinson first settled. The village of Ulan formerly included buildings such as churches, a hotel, a hall, butcher shop and general store. A couple of original buildings are still standing including the Anglican Church and the old General Store (which closed in 1999), in addition to the cemetery.

5.7.2 Survey Results

A total of 26 European and natural heritage items are located within the project area. The locations of the sites are illustrated in **Figure 5.7.1**. In general terms, the identified and potential heritage components of the site are of nil to low local significance with nil to low research potential. The most significant European and natural heritage items are Old Ulan Village, Bobadeen Station and the Talbragar Fish Fossil Reserve. Further details of these sites are presented in **Sections 5.7.2.1** to **5.7.2.3**. The remaining European heritage sites consist of:

- timber getting sites;
- rock overhangs/shelters;
- former stockyards;
- a rural farm complex;
- a homestead complex;
- a metal windmill;



Source: Ulan Coal, Aerial Photo December 2007, Mount King (2008), Umwelt (2009), Kuskie (2008)

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Legend

- Colliery Holding Boundary
- Project Boundary
- Proposed Open Cut Extension
- Proposed Ulan West Mine Plan
- Ulan No.3 Underground Mine Plan
- Previous Underground Mining Operations
- Current Mining and SMP Approved Area
- Historical Sites/Items
- Infrastructure Footprint
- Box Cut Option

FIGURE 5.7.1

European and Natural Heritage Sites/Items within Project Area

File Name (A4): R05_V1/2423_177.dgn

- unidentified, out of context, coins; and
- out of context bottles.

Of the 26 recorded European and natural heritage sites, 18 are predicted to be impacted by subsidence, two will be impacted by the proposed open cut extension and six are not predicted to be impacted by the Project.

The heritage resource of the project area generally reflects the documented history of the area which indicates that the land has predominantly been utilised by graziers, agriculturalists, timber getters and miners. The heritage evidence of the project area demonstrates the documented pattern of settlement and use from the mid nineteenth century, including its settlement by Europeans and subsequent use of the land for pastoral, timber getting, mining and agricultural activities. Evidence of extant houses and former house sites, former timber getting camps, shelters and dumps of artefacts, demonstrate the pattern of land use and historical development of the area.

Sheep and cattle grazing was undertaken across the project area and supplemented with cultivation of wheat and oat crops on the fertile alluvial flats and Jurassic based soils. The areas of timber clearing identified across the project area reflect both the early land clearing activities and timber getting likely undertaken for building materials, fence posts, mine props and sleepers. While the gold rush had little direct impact on the Ulan area, mining has played an important part in the history of the area since the 1920s.

Any additional, as yet unidentified, heritage items that may be present on the site are likely to be similar to those items described above.

5.7.2.1 Old Ulan Village

Old Ulan is the location of early European settlement near Ulan Creek, approximately 5 kilometres north-west of Ulan. The site of Old Ulan now consists of the remains of a number of structures (including a hotel, a potential small outbuilding formerly used for storage and another potential dwelling), a ford and roadway, a graveyard, two sets of stockyards and associated fence lines (Haglund 1999) (refer to **Plates 5.1** and **5.2**).

Godden Mackay prepared a conservation study of Old Ulan in 1992. Although likely to have suffered from natural degradation and potentially also human interference, the site appears to have remained how it was when assessed in 1992. The sites are located generally in two discrete areas separated by a small unnamed tributary of Ulan Creek. To the south of the unnamed tributary Godden Mackay identified the remains of several structures including the former hotel, the remains of which include two stone chimneys and some *in situ* and relocated structural timbers. Other structural remains associated with Old Ulan include the remains of a former outbuilding comprising wooden upright posts and postholes. The following structures are located to the north of the unnamed tributary, a potential former residence, two timber stockyards (one with a gallows), two fords (one over Ulan Creek and the other a small unnamed creek), a graveyard consisting of three graves and timber post and rail fence lines (Godden Mackay 1992).

5.7.2.2 Bobadeen Station

Bobadeen Station is located on the low undulating hills of the dividing range, approximately 6 kilometres north-west of the Cassilis to Mudgee Road. Aitken & Broadley prepared a Statement of Cultural Significance for Bobadeen Station in 1997 (Aitken & Broadley 1997).

PLATE 5.1
Aerial photograph of project area showing location of Old Ulan Village
(Photo supplied by SCT Operations Pty Ltd 2008)

PLATE 5.2
View of Old Ulan Village
(Photo supplied by Southeast Archaeology 2008)

The property consists of a number of isolated dwellings and buildings related to the former operation of this large station. The main homestead (refer to **Plate 5.3**) and associated outbuildings are located on a low treed hill and are accessed from the east. The homestead group of buildings comprises the original slab timber residence, a former kitchen and laundry block, stables, workshop, toilet, carport and a number of other associated structures. The structures are predominantly of slab or timber construction with corrugated galvanised iron roofs (Aitken & Broadley 1997). The buildings are described in detail in the Aitken & Broadley 1997 report.

While not carrying out a full structural assessment, in 1997 the Aitken & Broadley assessment described the homestead as being in:

> …fair to good condition with only minor moisture and damp problems leading to localised damage to some internal walls (Aitken & Broadley 1997:14-15).

The original homestead structure is further described as being:

> …intact, in good condition and unusual for the extensive use of sawn slab timbers for a building of this period (Aitken & Broadley 1997:27)

The homestead has deteriorated from when it was last occupied and is considered to be uninhabitable in its current state. The electrical wiring is sub standard and not compliant. In certain rooms the ceiling has collapsed or the cornices have come away. The moisture and damp problems have increased and there is water damage to parts of the house as a result of the roof leaking. In addition there is evidence of white ants throughout approximately 25 per cent of the house. UCML has maintained an active maintenance program around the grounds of the homestead, however age and fatigue in the building fabric is starting to show.

5.7.2.3 Talbragar Fish Fossil Reserve

The Talbragar Fish Fossil Reserve is listed on the Register of National Estate. National heritage places are recognised as a matter of national environmental significance under the Commonwealth EPBC Act. Consequently, any action that is likely to have a significant impact on heritage properties and places are protected by the EPBC Act and must be referred to the Commonwealth Minister for the Environment, Heritage and the Arts for approval.

Australian Museum Business Services (AMBS) prepared an assessment of the Talbragar Fish Fossil Reserve in 1996.

The reserve includes the majority of a deposit of Jurassic age sediments that contain an abundance of extremely well preserved fish, plant and invertebrate fossils (refer to **Plates 5.4** and **5.5**). The fossils were first discovered in 1889. Collection has taken place ever since and over 100 years a large amount of rock has been removed. The deposit covers an area of approximately 4 hectares (550 by 100 metres) (AMBS 1996). The site is thought to be the erosional remnant of the margin of a small fresh water lake bed deposit, with a thickness no greater than 60 centimetres.

The site itself is inconspicuous, forming a north to south orientated low ridge on the side of a small hill. It is made up of hard cherty shales, characteristically weathered into rectangular slabs (the fossil bearing rock) with concentric iron stained bands. These slabs float over the soil and part readily along bedding planes to reveal perfectly preserved plant and fish fossils. The first fossil to be described from the locality was an insect specimen, *Cicada Lowei*. A further twelve species of plant fossils have been described from the site, as well as eight species of fish fossils, all of which are unique to the locality (DEWHA RNE listing 465).

PLATE 5.3
View of site/item C107 – Bobadeen Homestead
(Photo supplied by Southeast Archaeology 2008)

PLATE 5.4
View of Talbragar Fish Fossil Reserve
(Photo supplied by SCT Operations Pty Ltd 2008)

PLATE 5.5
Detail of Talbragar Fish Fossil Reserve showing the fragments of chert that make up the fossil beds overlying softer strata
(Photo supplied by SCT Operations Pty Ltd 2008)

The site has been significantly disturbed as a result of two major trenches that have been excavated across the deposit by tertiary education institutions as part of field investigations in the earlier part of this decade. Artefacts from this survey are now contained within the Gulgong Pioneer museum which houses an exhibit dedicated to the Fish Fossil Reserve and describes the University field trip.

An assessment of the impact of underground mining on the Talbragar Fish Fossil Reserve was undertaken by Australian Museum Business Solutions (AMBS) in 1996, prior to the grant of development consent (DA 113-12-98) for longwall mining beneath this site. **Sections 5.3** and **5.7** provide further assessment of the impact of underground mining in relation to the currently proposed Ulan West mine plan.

While the subsidence movements will result in a change in elevation to the location of the Talbragar Fish Fossil Reserve and possible cracking of the ground surface, these movements are expected to be accommodated without significant disturbance to the fish fossil beds because of their already fragmented nature. These changes are not predicted to be important, notable or of consequence or result in either direct or indirect impacts on the existing character or heritage values of the site. The impacts on the Talbragar Fish Fossil Reserve are not considered to be significant, and therefore do not constitute a controlled action as defined by the EPBC Act.

5.7.3 Significance Assessment

The project area is typical of a rural landscape within the Central Tablelands of NSW. The history of the area from the mid nineteenth century, including its settlement by Europeans and subsequent use as cleared pastoral and agricultural land through to its exploitation for timber and mineral resources is reflected in the low potential of the archaeological resource and in the evidence of houses and other structures/shelters, timber getting sites, and dumps of artefacts present within the project area.

In general terms, with the exception of Old Ulan Village, Bobadeen Station/Homestead and Talbragar Fish Fossil Reserve, the identified and potential heritage components of the site are of nil to low local significance with nil to low research potential. Old Ulan and Bobadeen Station/Homestead have been assessed as being of local significance. Talbragar Fish Fossil Reserve has been assessed as being of State or National significance.

5.7.4 Management Strategy

A number of management strategies will be implemented to ensure that impacts associated with the Project on sites of European and natural heritage significance are mitigated.

Old Ulan Village and Bobadeen Homestead have been identified as locally significant European heritage items. Both sites will be archivally recorded to Heritage Branch, Department of Planning standards prior to longwall mining works commencing.

A Conservation Management Strategy will be prepared for the site of Old Ulan Village to ensure appropriate short and long term management strategies are determined. This will include a maintenance strategy for Old Ulan Village, including routine inspections by the UCML Environment and Community Manager or delegate, during the mining period. Routine inspections will be carried out when mining the first longwall of Ulan West, when the longwall is within 100 metres of the site. The archival record will be used as a maintenance guide should degradation be observed during the mining period.

The Talbragar Fish Fossil Reserve has been identified as a site of state and/or National significance. Mining subsidence movements will be accommodated without significant

disturbance to the fossil beds or their heritage significance during the proposed mining period. Subject to landowner approval, the Talbragar Fish Fossil Reserve will be secured with appropriate fencing and suitable signage prior to underground mining occurring within 100 metres of the site.

In the unlikely event that unexpected archaeological remains not identified as part of this report are discovered during the Project (for example during works associated with the construction of surface infrastructure or the proposed open cut extension), all works in the immediate area will cease, the remains and potential impacts will be assessed by a qualified archaeologist and, if necessary, the Heritage Branch, Department of Planning will be notified.

No other heritage items discussed in **Appendix 10** are likely to be significantly impacted by the Project. No further management strategies are required as a result of the Project.

5.8 Air Quality

The DGRs raised the need for the EA to include a detailed air quality assessment.

A comprehensive air quality assessment was completed for the Project by PAE Holmes in accordance with relevant DECC guidelines. A summary of the key findings of the assessment is provided below, with the full assessment report included in **Appendix 11**.

5.8.1 Air Quality Criteria

The following section summarises the current air quality assessment criteria specified by DECC for assessing impacts from mining activities. These criteria relate to dust deposition and dust concentration.

Dust deposition levels refer to the quantity of dust particles that settle out of the air as measured in grams per square metre per month (g/m²/month) at a particular location. DECC expresses dust deposition criteria in terms of an acceptable increase in dust deposition over the existing background deposition levels as shown in **Table 5.8**.

Table 5.8 - DECC Criteria for Dust Deposition

Pollutant	Averaging Period	Maximum Increase in Deposited Dust Level	Maximum Total Deposited Dust Level
Deposited dust	Annual	2 g/m^2/month	4 g/m^2/month

Dust concentration refers to airborne dust and is measured in micrograms per cubic metre (µg/m³). Criteria for dust concentration are defined as total suspended particulates (TSP) and PM_{10}.

TSP relates to all suspended particles which are up to 50 micrometres (µm) in size. Particle sizes larger than 50 µm are measured in dust deposition levels.

PM_{10} refers to particulate matter with a diameter less than 10 µm. TSP measurements include PM_{10} particles.

Goals for dust concentration are referred to as long term (annual average) and short term (24 hour maximum) goals. The air quality goals (excluding 24 hour PM_{10} which is project specific) relate to the total dust contained in the air and not just the dust from the Project.

Therefore, some consideration of background levels needs to be made when using these goals to assess impacts (refer to **Section 5.8.2**).

Relevant goals for TSP and PM_{10} are outlined in **Table 5.9**.

Table 5.9 - DECC Assessment Criteria for Particulate Matter Concentrations

Pollutant	Standard/Goal	Averaging Period	Agency	Goal Type
Total suspended particulate matter (TSP)	90 $\mu g/m^3$	Annual mean	National Health & Medical Research Council	Cumulative
Particulate matter <10 μm (PM_{10})	50 $\mu g/m^3$	24-hour maximum	DECC	Project Specific
	30 $\mu g/m^3$	Annual mean	DECC long-term reporting goal	Cumulative
	50 $\mu g/m^3$	(24-hour average, 5 exceedances permitted per year)	National Environment Protection Council	Project Specific

5.8.2 Existing Air Quality Environment

UCML operates a total of eight depositional dust gauges, two high volume samplers measuring TSP (HV1 and HV2) with one also measuring PM_{10} TEOM (HV1). The current air quality monitoring network is shown on **Figure 5.8.1**.

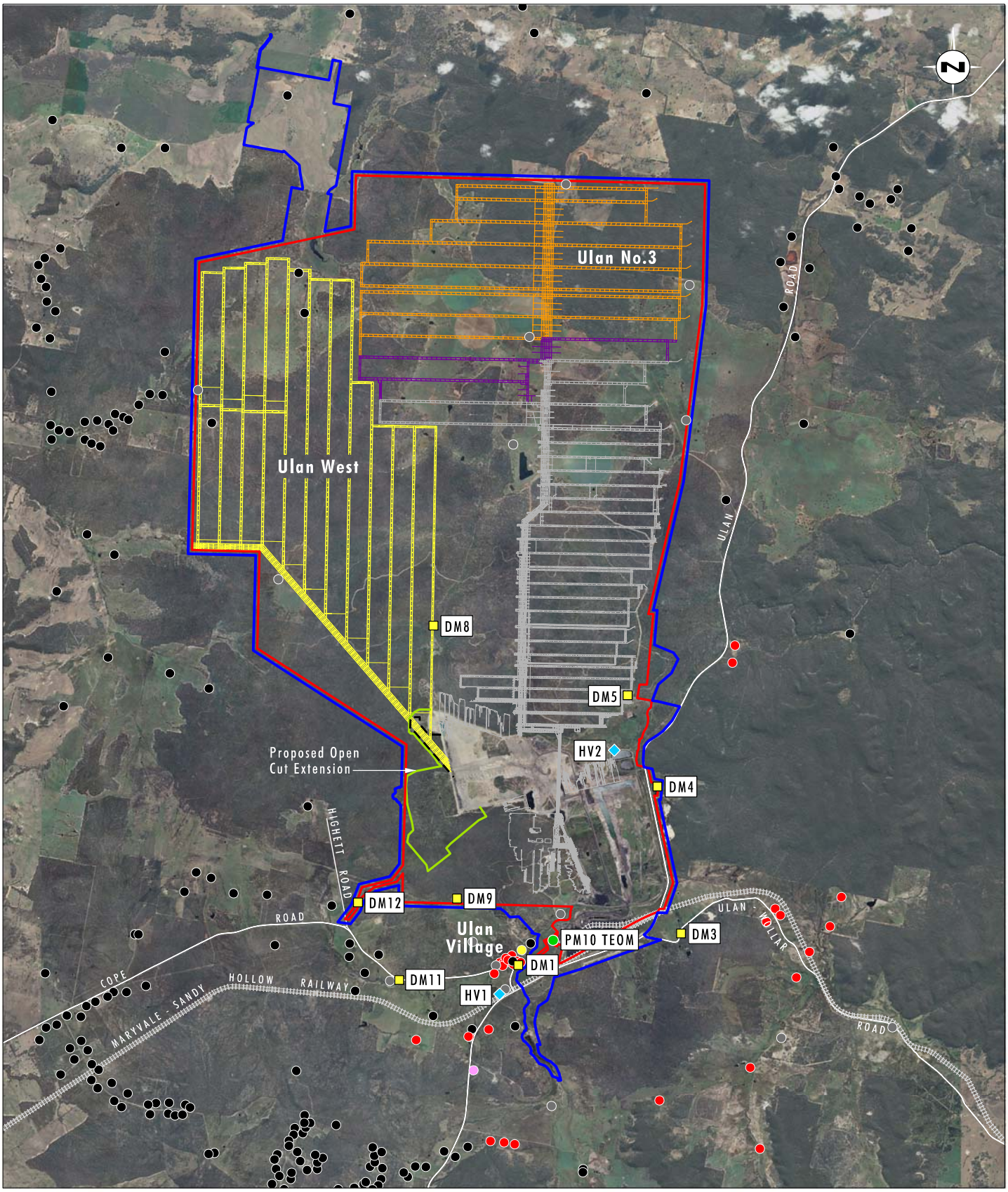
Air quality information has been recorded on a regular basis from 1981 up until the present, although several of the original monitoring locations have been modified over time in consultation with DECC. Annual average calculations indicate dust deposition levels typically ranged between 0.6 and 7.7 g/m^2/month in 1981; 0.9 and 3.1 g/m^2/month in 1997; and 0.6 and 1.5 g/m^2/month in 2007, demonstrating a decreasing trend since monitoring began.

TSP has been monitored by UCML using two high volume air samplers since 1983, with annual averages of 25.7 $\mu g/m^3$ for the HV1 location and 24.6 $\mu g/m^3$ for the HV2 location recorded up until September 2008.

UCML has monitored PM_{10} at HV1 since September 2006, with the annual average PM_{10} for December 2006 to December 2007 being 20.6 $\mu g/m^3$, and 18.7 $\mu g/m^3$ for January 2008 to September 2008.

5.8.3 Assessment Methodology

The Air Quality Impact Assessment (**Appendix 11**) is based on procedures outlined in the 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW' (DEC, 2005). The assessment uses a modified version of the computer-based dispersion model, US EPA ISCST3, to predict off-site dust concentration and dust deposition levels, due to the existing and proposed mining operations. The dispersion modelling takes into account local meteorology and terrain information, and uses dust emission factors to predict air quality impacts for each stage of the Project.



Source: Ulan Coal, Aerial Photo December 2007

0 2.0 4.0 6km
1:110 000

Legend

- Colliery Holding Boundary
- Project Boundary
- Proposed Open Cut Extension
- Proposed Ulan West Mine Plan
- Ulan No.3 Underground Mine Plan
- Previous Underground Mining Operations
- Current Mining and SMP Approved Area
- Box Cut Option
- Depositional Dust Monitoring Location
- High Volume Air Sampler (HVAS)
- Met and TEOM Station
- Mine Owned Residence (UCML)
- Mine Owned Residence (Moolarben)
- Privately Owned Residence
- Ulan Community House
- Orica Residence

FIGURE 5.8.1

Air Monitoring Network and Receivers

File Name (A4): R05_V1/2423_183.dgn

The dust emissions for the Project have been calculated for:

- the surface operations from the Project which includes the open cut, and the underground mines Ulan West and Ulan No. 3;
- the upcast ventilation shafts and portal fans from the underground operations; and
- Bobadeen Quarry.

The assessment has considered five representative mining scenarios throughout the 21 year life of the Project, to ensure that the range and extent of proposed activities are considered. The five mining scenarios are as follows:

- Year 1 (nominally 2010) – construction of infrastructure, mining in the open cut and Ulan No. 3;
- Year 5 – mining in the open cut, Ulan No. 3 and Ulan West;
- Year 7 – mining in the open cut, Ulan No. 3 and Ulan West;
- Year 12 – mining in Ulan West; and
- Year 17 – mining in Ulan West.

Bobadeen quarry was assessed as a maximum production scenario during Year 5, which represents the period with most surface activity. The assessment examines the impacts of the Project alone, and also considers the cumulative impact of the surrounding approved mining operations, including the MCP Stage 1 and Wilpinjong operations. MCP Stage 2, while not yet approved, has also been considered separately in the air quality assessment.

5.8.4 Air Quality Impact Assessment

5.8.4.1 Project Specific Emissions

The results of the predictive air quality modelling have identified that the Project will meet the relevant air quality criteria at all residential receiver locations. The dust emissions from the Project are relatively small due to the high proportion of coal production being sourced from the underground operation. Emissions from underground operations are typically lower than open cut mines due to:

- the minimal ground disturbance area associated with the underground operation;
- the minor intensity of surface operations required, i.e. earthworks; and
- the higher coal moisture content of underground coal when delivered to the surface.

As noted in **Section 5.8.3**, ventilation points and the Bobadeen Quarry have been considered in the model. Emissions from these locations are minor in comparison to other surface activities and therefore do not significantly contribute to the dust emission levels for the Project.

A summary of the predicted maximum air quality emissions for the modelled years is as follows:

- the maximum annual average dust deposition contribution from the Project predicted at a privately owned residence is in the order of 0.9 g/m^2/month, significantly less than DECC criterion of 4 g/m^2/month;

- the maximum 24-hour average PM_{10} concentration contribution from the Project predicted at a privately owned residence is in the order of 39 μg/m^3. This is less than DECC criterion of 50 μg/m^3;

- the maximum annual average PM_{10} concentration contribution from the Project predicted at a privately owned residence is up to 8 μg/m^3, significantly less than DECC criterion of 30 μg/m^3; and

- the maximum annual average TSP concentration contribution from the Project at a privately owned residence is up to 9 μg/m^3, significantly less than DECC criterion of 90 μg/m^3.

To provide an assessment of the incremental impact of the predicted dust emissions from the Project on total local dust levels, the calculated dust levels for each mining scenario were added to the measured background dust levels for the local area. These background levels include dust contributions from existing operations as well as other approved and proposed mining operations. The cumulative assessment is presented in **Section 5.8.4.2**.

5.8.4.2 Cumulative Impacts

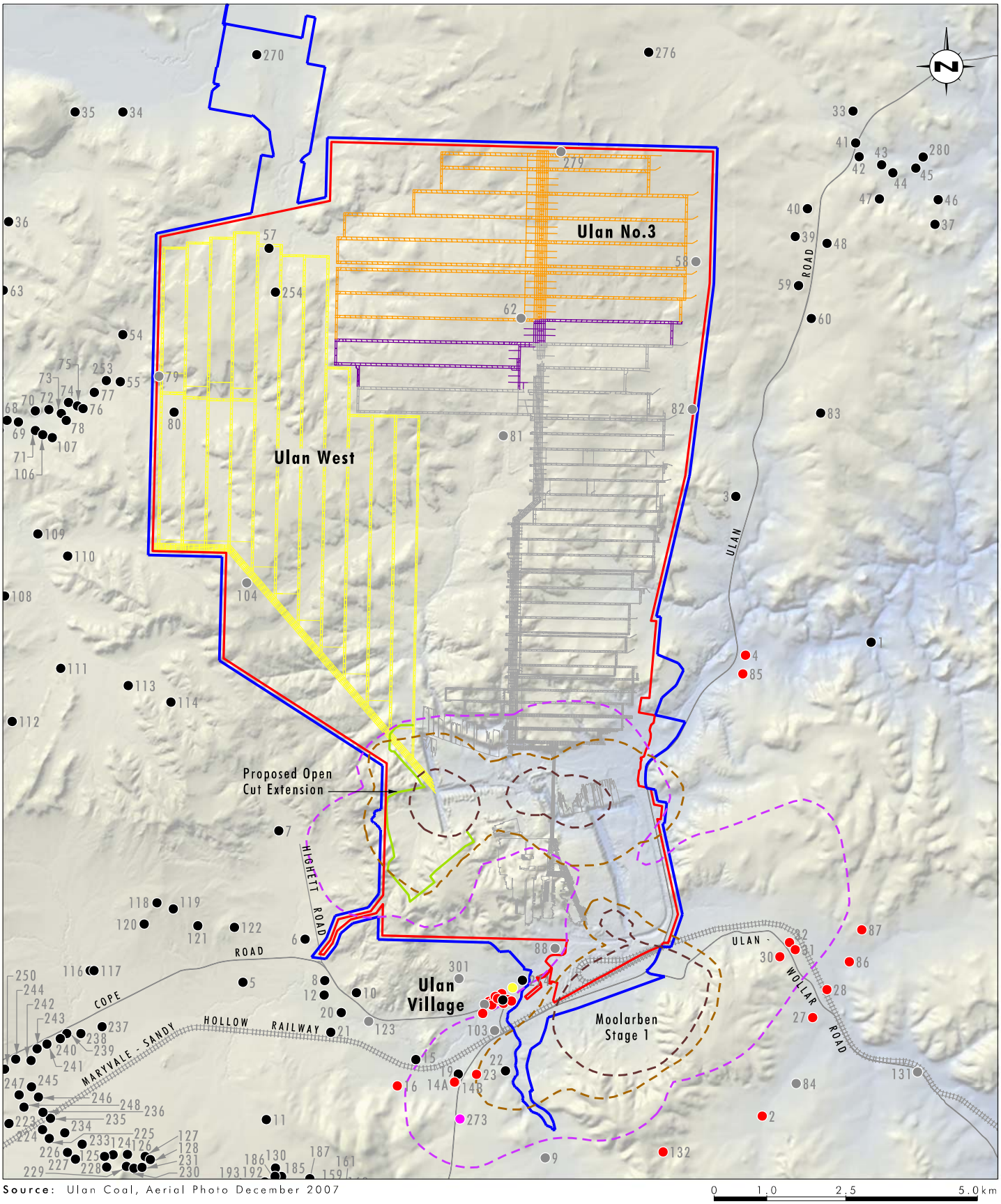
An assessment of the cumulative air quality impacts associated with the Project and other major approved or proposed mining operations was undertaken as part of the air quality assessment.

When the approved MCP Stage 1 and Wilpinjong operations are included in the cumulative impact assessment, two private residences would be impacted by dust levels exceeding the annual average PM_{10} assessment criterion of 30 μg/m^3 (refer to **Table 5.10**). One of these residences is predicted to be impacted from Year 7 of the Project onwards and the other residence is predicted to be impacted for all of the modelled years. The residence expected to be impacted for all of the modelled years is within the MCP acquisition zone. One of these private residences will also be impacted by dust levels exceeding the annual average 4 g/m^2/month deposition level assessment criteria, for all modelled years. These residences are located to the south of the project area.

Table 5.10 – Worst Case Cumulative Impact at Private Residences from Approved Mining Operations (MCP Stage 1 Only)

Residence	PM_{10} (μg/m^3)	TSP (μg/m^3)	Dust Deposition (g/m^2/month)
	Impact Assessment Criteria		
	30	***90***	***4***
19	38	48	2.9
22	57	76	7.6

The results for each modelled year are included in **Appendix 11**, including representative worst case dust contours for each DECC criteria. **Figure 5.8.2** considers all modelled years to produce the worst-case scenario for the entire project life.



Source: Ulan Coal, Aerial Photo December 2007

0 1.0 2.5 5.0km
1:100 000

Legend

- Colliery Holding Boundary
- Project Boundary
- Proposed Open Cut Extension
- Proposed Ulan West Mine Plan
- Ulan No.3 Underground Mine Plan
- Previous Underground Mining Operations
- Current Mining and SMP Approved Area
- PM_{10} Mining Annual 30$\mu g/m^3$
- Dust Deposition Annual 4g/m^2/month
- TSP Annual 90$\mu g/m^3$
- Private Residence
- Orica Residence
- Ulan Community House
- Mine Owned Residence (UCML)
- Mine Owned Residence (Moolarben)

FIGURE 5.8.2

Annual Worst Case Cumulative Air Quality Levels (Approved Operations only)

File Name (A4): R05_V1/2423_271.dgn

A number of other residences owned by mining companies, or other non-private entities, are also predicted to have annual average PM_{10} cumulative levels in excess of the criteria, depending on the modelled year.

When the proposed MCP Stage 2 operations are included in the cumulative impact assessment, an additional seven private residences (nine in total) would be impacted by dust levels exceeding the annual average PM_{10} assessment criterion of 30 $\mu g/m^3$. These residences are located south of Ulan and are primarily affected by contributions from MCP Stage 2 operations. One of these residences will also be impacted by depositional dust levels exceeding the annual average 4 g/m^2/month.

A number of other residences owned by mining companies or other entities are also predicted to have annual average PM_{10}, TSP and dust deposition levels from the Project and other sources in excess of the criteria.

5.8.5 Air Quality Management

Measures to minimise dust emissions from the operation have been included in the project design including:

- enclosures on top of overland conveyors;
- spray systems for permanent coal stockpiles where required;
- progressive site rehabilitation and revegetation; and
- haul road dust suppression.

The project design has also sought to minimise the total disturbance footprint and to minimise the area of untreated hardstand areas that may generate dust.

In addition to these project specific controls, UCML also has existing management measures that will be applied to the Project including:

- ongoing dust monitoring and reporting of results;
- watering of active mining areas, active spoil emplacement areas and haul roads that are subject to frequent vehicle movements;
- all drill rigs are equipped with dust control systems and are regularly maintained for effective use. These systems include dust curtains and water injection sprays;
- automatic sprays fitted to dump hopper and crushing plant to minimise dust from coal processing activities;
- topsoil stripping is preferably undertaken when there is sufficient moisture content in the soil;
- minimising the area of disturbance by restricting vegetation clearing ahead of mining operations, rehabilitating mine spoil dumps as soon as practicable after mining and using existing facilities and infrastructure where possible;

- ensuring that all equipment is used and maintained in an efficient and effective manner; and

- restricting blasting activities during temperature inversions, high wind speeds and adverse wind directions.

5.8.6 Spontaneous Combustion

Spontaneous combustion has the potential to result in air quality and odour impacts where it is not effectively managed. To determine the potential risk of spontaneous combustion occurring in the project area, spontaneous combustion propensity testing has been undertaken for Ulan No. 3 and Ulan West. Spontaneous combustion test results of the Ulan Seam vary considerably and indicate the coal has a moderate to high propensity to spontaneously combust.

Management of spontaneous combustion during mining operations is a key safety issue for this Project, as for all coal mining operations. Ulan Coal Mines has an effective spontaneous combustion management system currently in place, to address the coal's susceptibility to spontaneous combustion. The spontaneous combustion management system includes:

- prevention measures to limit the potential for incidences of spontaneous combustion. This includes the identification of carbonaceous material with spontaneous combustible properties during the mine planning process. The results of these investigations are taken into account during the mine planning process to minimise the extent of carbonaceous material mined and therefore the risk of incidents;

- management measures to allow timely and effective management of any events that do occur. This includes methods for handling and disposing of material which has ignited; and

- inspection and monitoring is undertaken as part of the Shift Supervisor's shift inspection and regularly reported.

5.9 Noise and Vibration

As discussed in **Section 1.0**, the village of Ulan is located approximately 1.5 kilometres west of the nearest coal handling infrastructure. Smaller rural holdings are located immediately to the north, north-west and west of the underground mining area. Three areas of higher density rural residential landholdings are located to the south, west and south-west of the Project along Ridge Road (approximately 7 kilometres south of the project area); Cope Road (approximately 6 kilometres to the south-west of the project area); and Wongaroo Road (immediately adjacent to the western project boundary).

Ulan Village has recently seen a major change in land ownership with the Moolarben Coal Project undertaking an active acquisition program in relation to private residences (refer to **Figure 1.6**). At present, there is only one privately owned residence within Ulan Village. There are a further two private landholdings within the village owned by a single landowner. A primary school, two churches, a hotel, a Rural Fire Service fire shed and a temporary accommodation facility are also located in the village of Ulan.

A comprehensive noise and blasting assessment was completed for the Project by Wilkinson Murray Pty Limited. A summary of the key findings of the assessment is provided below, with the full assessment report included in **Appendix 12**.

5.9.1 Noise

5.9.1.1 Existing Acoustic Environment

UCML currently undertakes regular noise monitoring concentrated to the south of the project boundary, representative of Ulan Village and surrounding rural residences. Further noise monitoring was also undertaken to the north of the project area as part of the noise assessment for the Project to gain an understanding of the noise environment in this area. The noise monitoring locations are shown on **Figure 5.9.1**.

The background noise levels based on monitoring results are presented in **Table 5.11**. The results are expressed in terms of Rating Background Levels (RBL) which is a standard measure of background noise levels.

Table 5.11 - Measured Background Noise Levels

Location	Background Noise Levels (RBLs) (dBA)		
	Day	Evening	Night
Ulan Village	39	39	42
Rural Residential Areas	30	30	30

* Day period is 7.00 am – 6.00 pm; Evening is 6.00 pm – 10.00 pm; Night is 10.00 pm – 7.00 am

Monitoring has confirmed that the existing acoustic environment in the southern part of the project area, nearest to UCML's surface operations, is heavily influenced by mining activities and other natural sources such as birds and insects. The mining noise sources include mine truck haulage, mine dozer activities, coal processing and handling, and rail transport.

Directional noise monitoring results indicated that the background noise levels at Ulan Village typically range between 39 and 42 dBA during the day, evening and night periods. In comparison, the background noise levels away from the mine site are typically 30 dBA or less during the daytime, evening and night periods. The high night time monitoring results indicated in **Table 5.11** may also be a result of temperature inversion conditions. High noise levels during the night time period are likely to be a result of noise levels being enhanced due to extreme meteorological conditions such as temperature inversions.

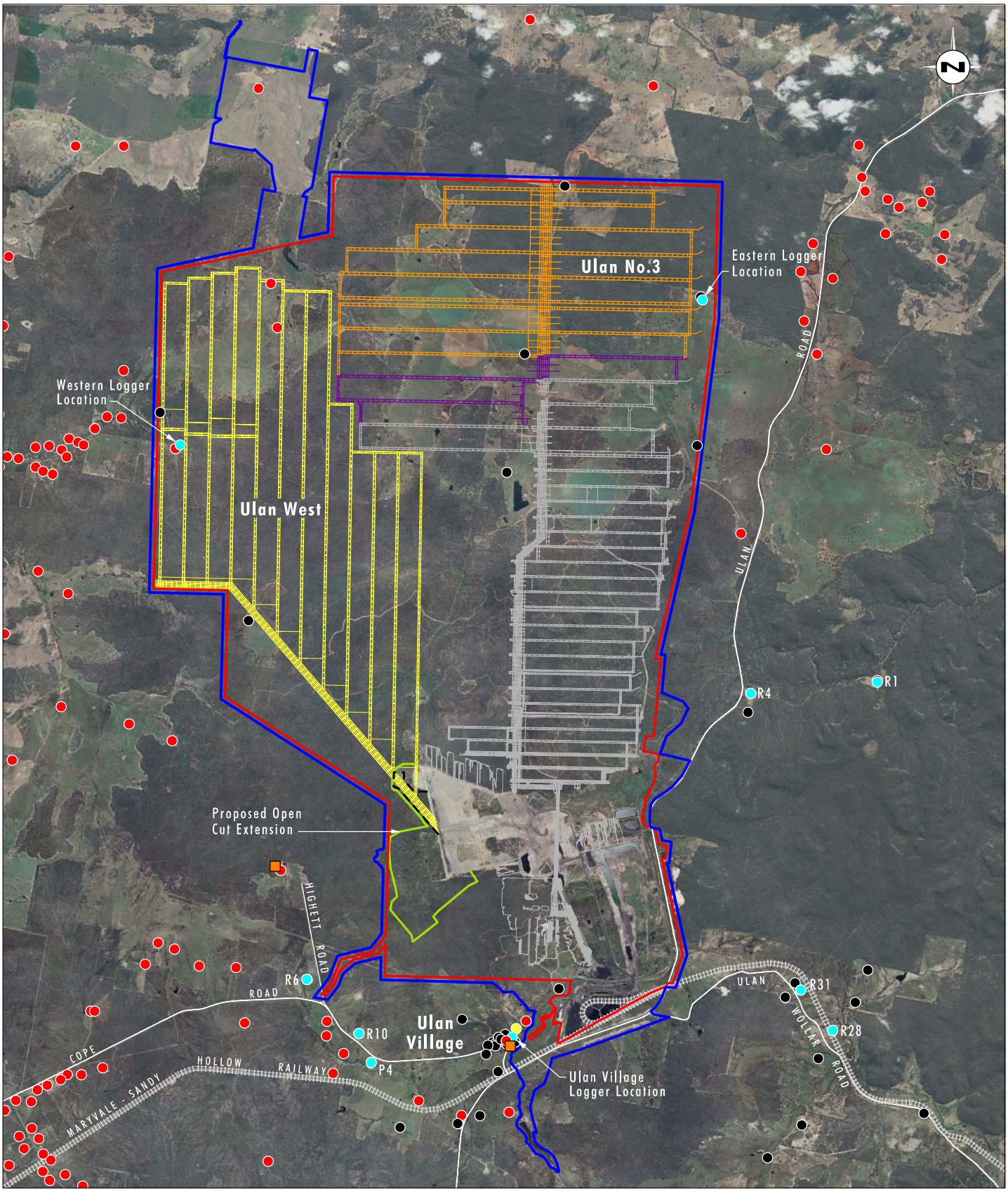
Noise monitoring at the other rural residential locations around the project area typically show levels from mining activities to be between 30 dBA and 35 dBA.

The higher noise levels measured at Ulan Village are due largely to noise generated by mining activities. The background noise levels typically measured at rural residential locations was conservatively assumed to reflect background levels at the township without any mine noise.

5.9.1.2 Assessment Criteria

Operational Noise

The Industrial Noise Policy (INP) sets out two forms of noise criterion; intrusiveness and amenity. The intrusiveness criterion specifies that the L_{Aeq} 15 minute noise level from any new source should not exceed the RBL by more than 5 dBA. The RBL is defined as the overall single-figure background level representing each measurement period (day, evening and night) over the whole monitoring period.



Source: Ulan Coal, Aerial Photo December 2007

0 1.0 2.5 5.0km
1:100 000

Legend

- Colliery Holding Boundary
- Project Boundary
- Proposed Open Cut Extension
- Proposed Ulan West Mine Plan
- Ulan No.3 Underground Mine Plan
- Previous Underground Mining Operations
- Current Mining and SMP Approved Area
- Box Cut Option
- Noise Monitoring Location
- Mined Owned Residence
- Privately Owned Residence
- Ulan Community House
- Blast Monitoring Location

FIGURE 5.9.1

Noise and Blast Monitoring Locations

File Name (A4): R05_V1/2423_293.dgn

Amenity criteria is intended to ensure that the total L_{Aeq} noise level from all industrial sources does not exceed specified levels. For rural residences, the relevant recommended acceptable amenity levels are:

- Daytime (7.00am – 6.00pm) 50 dBA L_{Aeq}
- Evening (6.00pm – 10.00pm) 45 dBA L_{Aeq}
- Night (10.00pm – 7.00am) 40 dBA L_{Aeq}.

The project specific intrusive criteria derived from the assessed RBLs are presented in **Table 5.12** below along with the relevant amenity criteria.

Table 5.12 - Intrusive and Amenity Assessment Criteria

Location	Time Period	Noise Criterion (dBA)	
		Intrusiveness $L_{Aeq, 15min}$	Amenity $L_{Aeq, Period}$
Ulan Village	Day	35	50
	Evening	35	45
	Night	35	40
Rural Residential Areas	Day	35	50
	Evening	35	45
	Night	35	40

* Day period is 7.00 am – 6.00 pm; Evening is 6.00 pm – 10.00 pm; Night is 10.00 pm – 7.00 am

There are also two churches and a school located in proximity to the project area. The INP recommends an acceptable internal level of L_{Aeq} 40 dBA for places of worship without speech amplification systems and for schools affected by noise from existing industrial noise sources. Generally internal noise levels are approximately 10 dBA below external noise levels with windows open to a normal extent. Therefore, the INP would imply a recommended external noise level of L_{Aeq} 50 dBA at the two churches and Ulan Public School.

The project-specific noise criteria for the Project, as defined by the INP, are the more stringent of the intrusive and amenity criteria. Therefore, in this case, the project-specific noise criteria for the Project are the intrusive criteria at all locations.

In those cases where the INP project-specific assessment criteria are exceeded, it does not automatically follow that all people exposed to the noise would find it noticeable or unacceptable. In subjective terms, exceedances of the criteria can be generally described as follows:

- negligible noise level increase (less than 1 dBA) (not noticeable by all people);
- marginal noise level increase (between 1 dBA and 2 dBA) (not noticeable by most people);
- moderate noise level increase (between 3 dBA and 5 dBA) (not noticeable by some people and may be noticeable by others); and
- appreciable noise level increase (greater than 5 dBA) (noticeable by most people).

It should be noted that the INP does not set mandatory limits, but requires operations to seek to achieve the criteria. Where INP criteria cannot be achieved by applying feasible and reasonable measures, there is scope to apply alternative criteria.

Recent mining project approvals have required that any landholders with a residence or vacant land where greater than 25 per cent is predicted to experience exceedance of the INP criteria by more than 5 dBA, are offered the opportunity to sell their properties to the mining company. Based on these precedents, the assumed project specific acquisition criteria are outlined in **Table 5.13**.

Table 5.13 - Project Specific Noise Criteria and Assumed Acquisition Criteria

Location	Time Period	Project Specific Noise Criteria (dBA)	Assumed Acquisition Criteria (dBA)
Ulan Village	Day	35 $_{LAeq, 15 min}$	40 $_{LAeq, 15 min}$
	Evening	35 $_{LAeq, 15 min}$	40 $_{LAeq, 15 min}$
	Night	35 $_{LAeq, 15 min}$	40 $_{LAeq, 15 min}$
Rural Residential Areas	Day	35 $_{LAeq, 15 min}$	40 $_{LAeq, 15 min}$
	Evening	35 $_{LAeq, 15 min}$	40 $_{LAeq, 15 min}$
	Night	35 $_{LAeq, 15 min}$	40 $_{LAeq, 15 min}$

* Day period is 7.00 am – 6.00 pm; Evening is 6.00 pm – 10.00 pm; Night is 10.00 pm – 7.00 am

Construction Noise Criteria

The INP and DECC's NSW Environmental Noise Control Manual contain noise criteria for construction activities that are limited to 26 weeks or less. The construction activities associated with the Project are projected to last for approximately 48 months. In this case, the construction activities may be considered a phase of the Project and therefore, the operational noise criteria, as outlined previously, may also be used to assess construction activities.

Cumulative Noise Criteria

To limit continuing increases in noise levels, DECC has established the amenity criteria as the maximum ambient noise level goal from all industrial sources within an area. The limiting amenity criteria applicable to cumulative noise impacts from all industrial operations is during the night time period and is 40 dBA for all residential locations.

Sleep Disturbance

DECC has not developed a specific criteria to address sleep disturbance. However, in a noise guide for local government, DECC identified that sleep may be disturbed if the $L_{A1,60\ seconds}$ or L_{Amax} noise level exceeds the L_{A90} background noise level by more than 15 dBA when measured outside the bedroom window. Further guidance on the potential for 'awakening reactions' is provided in DECC's Environmental Criteria for Road Traffic Noise (EPA, 1999), which states that internal maximum noise levels below 50-55 dBA are unlikely to cause awakening reactions. Based on the adopted night time RBL, the sleep disturbance criterion is 45 dBA L_{Amax} for the Project.

Road Traffic Noise

The criteria for the assessment of noise from traffic on public roads are set out in DECC's Environmental Criteria for Road Traffic Noise (ECRTN) (EPA, 1999). To apply these criteria, the classification of the road needs to be determined. In terms of the ECRTN, Ulan Road and Cope Road are both considered arterial roads. Arterial roads are those which carry predominantly through-traffic from one region to another, forming principal avenues of communication for urban traffic movements (EPA, 1999).

Under the ECRTN, the Project would be considered land use development with potential to create additional traffic on existing arterial roads. Where criteria are already exceeded, the redevelopment should be designed so as not to increase existing noise levels by more than 2 dB. The ECRTN also suggests where feasible and reasonable, noise levels from existing roads should be reduced to meet the noise criteria. In many instances this may be achievable only through long-term strategies. Based on the ECRTN, the daytime noise level criterion for the Project will be 60 dBA $L_{Aeq,1hr}$ and the night time criterion will be 55 dBA $L_{Aeq,1hr}$.

Rail Traffic Noise

Australian Rail Track Corporation (ARTC) operates the Maryvale - Sandy Hollow and Main Northern Railway lines. Noise emissions from ARTC operated rail lines are regulated under the ARTC's EPL. EPL 3142 does not nominate specific environmental noise limits, however it does require the ARTC to progressively reduce noise levels of railway operations to appropriate goals through the implementation of Pollution Reduction Programs (PRP).

The Maryvale - Sandy Hollow and Main Northern Railway lines are not currently subject to a PRP. The EPL provides that in developing the PRPs, the licensee must work towards the goals of 65 dBA L_{Aeq} (daytime), 60 dBA L_{Aeq} (night time) and 85 dBA (24 hr) maximum pass-by noise, at 1 metre from the façade of affected residential properties (EPL 3142).

Therefore, based on the provisions of the ARTC EPL, the following noise criteria have been adopted for the Project:

- Night time - $L_{Aeq, 9hr}$ 60 dBA;
- Daytime - $L_{Aeq, 15hr}$ 65 dBA; and
- Maximum pass-by noise - L_{Amax} 85 dBA.

5.9.1.3 Noise Modelling

Noise Modelling Methodology

Noise levels for the Project have been calculated using the Environmental Noise Model (ENM) predictions. The model included noise generated from the Project alone and also combined with noise generated from surrounding mining operations including the existing and approved Wilpinjong and Moolarben Coal Projects. The assessment has considered five representative mining scenarios throughout the 21 year life of the Project, to ensure that the range and extent of proposed activities are considered. The five mining scenarios are as follows:

- Year 1 – construction of infrastructure, mining in the open cut and Ulan No. 3;
- Year 5 – mining in the open cut, Ulan No. 3 and Ulan West;

- Year 7 – mining in the open cut, Ulan No. 3 and Ulan West;
- Year 12 – mining in Ulan West; and
- Year 17 – mining in Ulan West.

As opposed to the other conceptual mine years which only assess operational noise, Year 1 includes construction works associated with establishment of Ulan West and infrastructure upgrades. The noise model for all subsequent years assumes the new infrastructure is operating. All calculations were performed under adverse meteorological conditions. Key noise controls included in the modelling are discussed in **Section 5.9.1.5**.

Validation of the Noise Model

The noise model was validated using 10 per cent exceedance noise levels from the existing operations. The 10 per cent exceedance levels are the levels exceeded only 10 per cent of the time across the whole year and are representative of noise predictions during typical worst case weather conditions.

The predicted 10 per cent exceedance levels were found to be within 1 to 2 dBA of the measured 10 per cent exceedance noise levels. Therefore, the model is considered to be an accurate prediction of future likely noise levels from the Project.

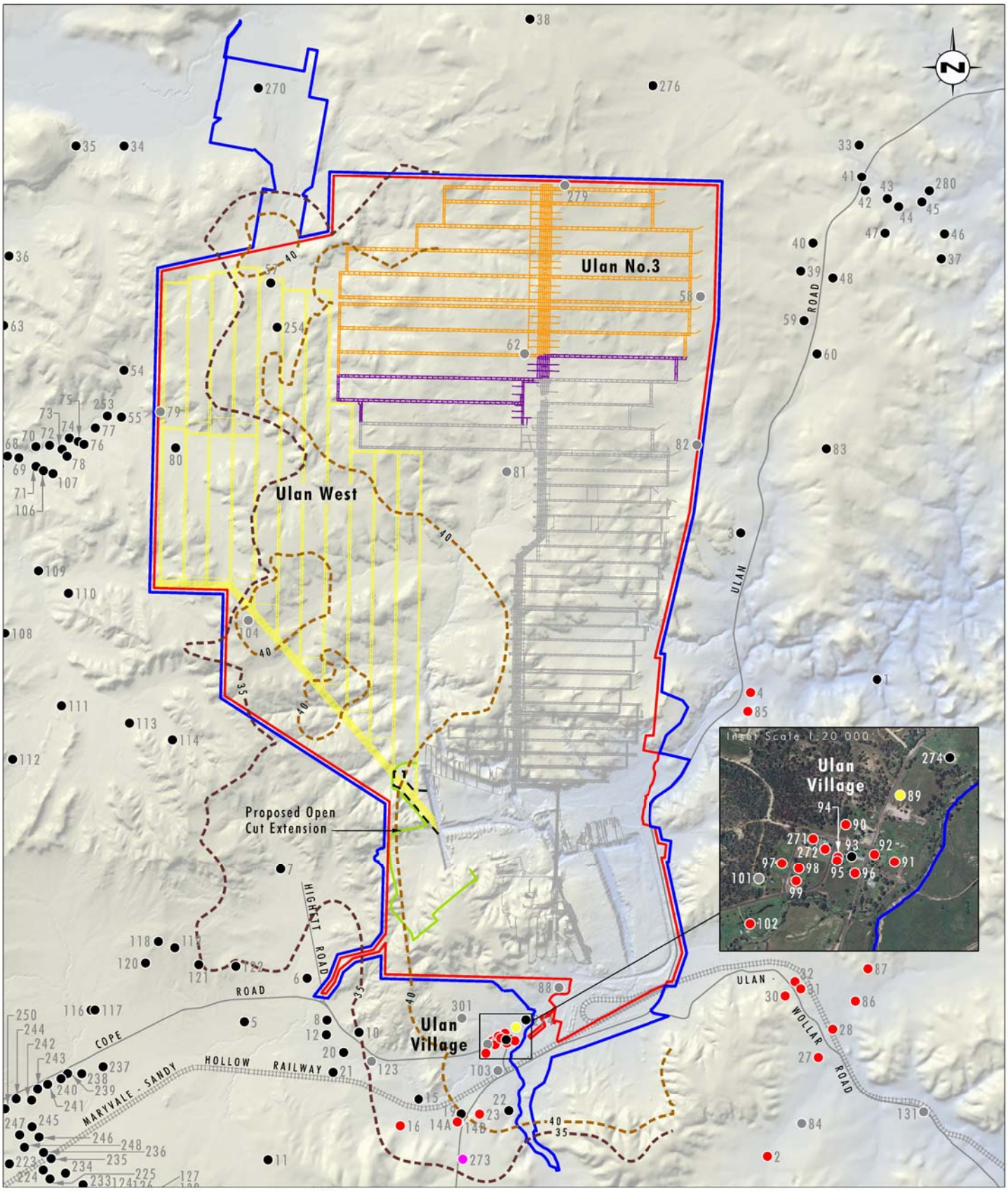
5.9.1.4 Noise Impact Assessment

Noise management has been a key focus for UCML's existing operations and potential noise impacts associated with the Project were a key consideration in project design. UCML currently operates under a Pollution Reduction Program to reduce noise levels arising from UCML's operations. The key potential operational noise impacts associated with the Project were identified as the open cut operations, coal handling chain (ROM facilities, washery, rail loading facility, etc.) and the location of surface facilities (e.g. pit top facilities, ventilation fans, etc.).

Operational Noise Impacts

The worst case 10^{th} percentile noise levels for each of the residences surrounding the Project were calculated for day, evening and night time operations for each of the modelled years. Noise levels were predicted for private residences surrounding the Project, including the residences that are already predicted to be impacted by other existing approved operations, such as Receivers 19 and 22.

There are eight private residences (Receivers 7, 15, 19, 22, 57, 93, 254 and 274) where operational noise levels are predicted to exceed the criteria at some stage during the Project. Two residences, 19 and 22, are also impacted by noise from the Moolarben Coal Mine. Of the seven private residences there are predicted to be two residences (Receivers 7 and 15) with levels between 36 and 37 dBA, two residences (Receivers 57 and 254) between 38 and 40 dBA, and three greater than 40 dBA (Receivers 19, 22 and 93). In addition, there is a temporary accommodation facility (Receiver 274) that is predicted to have exceedances greater than 40 dBA. The development approval for residence 274 includes an expiry clause which states that the use of the residence is to cease two years from the date the buildings were established on site, i.e. by mid 2010. Private residences where predicted noise levels exceed the noise criteria are shown on **Figure 5.9.2**. Of the residences with predicted noise levels above the criteria as a result of the Project, two residences (Receivers 19 and 22) are already predicted to be impacted by other existing approved operations.



Source: Ulan Coal, Aerial Photo December 2007

0 1.0 2.5 5.0km
1:100 000 (Main)

0 0.2 0.5 1.0km
1:20 000 (Inset)

Legend

- Colliery Holding Boundary
- Project Boundary
- Proposed Open Cut Extension
- Proposed Ulan West Mine Plan
- Ulan No.3 Underground Mine Plan
- Previous Underground Mining Operations
- Current Mining and SMP Approved Area
- 35dBA Noise Contour
- 40dBA Noise Contour
- Box Cut Option
- Private Residence
- Orica Residence
- Ulan Community House
- Mine Owned Residence (UCML)
- Mine Owned Residence (Moolarben)

FIGURE 5.9.2

Worst Case Noise Contour (all years and time periods)

File Name (A4): R05_V1/2423_308.dgn

The predicted worst case daytime/evening noise levels for the two churches in Ulan Village are expected to comply with the adopted criterion of 50 dBA under worst case conditions.

The predicted worst case daytime noise level at Ulan Public School is expected to comply with the adopted external criterion of 50 dBA. Compliance with the recommended internal noise level is also expected to be achieved.

A discussion on low frequency noise is contained in the noise and blast assessment in **Appendix 12**. The assessment of low frequency noise indicates that the Project is likely to meet the criteria at the most affected receiver.

Cumulative Noise Impacts

The DGRs for the Project require an assessment of potential cumulative noise impacts to take into account noise generated from relevant existing and approved development within the local area. Apart from UCML operations, the two main existing or approved developments within the vicinity of the project area are the Wilpinjong Coal Mine and Stage 1 of the Moolarben Coal Project. Moolarben Coal management have also lodged an application with DoP for Stage 2 of the Moolarben Coal Project. While this project application has not yet been approved, the proposed Stage 2 project has also been considered in the cumulative assessment for this Project.

The critical period for assessing compliance with amenity goals is during night time periods. The worst case scenario is determined by combining the predicted noise levels (worst case) of the surrounding mining operations.

The cumulative assessment assumes that all mines simultaneously emit their maximum noise levels to a common receiver and therefore it is considered a worst case assessment.

The cumulative noise levels from UCML, Wilpinjong and the Moolarben Coal Project (Stage 1) are predicted to exceed the amenity criteria at three residential receivers, one located in Ulan Village (Receiver 93) and two to the south of the Project (Receivers 19 and 22). Receiver 93, located in Ulan Village, is predicted to experience exceedances during the evening period of 2 dBA and up to 8 dBA in the night time period. Receivers 19 and 22 are also expected to experience exceedances of the night time amenity criterion of 40 $L_{Aeq,\ 9\ hours}$. These residences are already impacted by UCML's operations and no additional residences will be impacted as a result of the Project. **Table 5.14** summarises the worst case cumulative noise impact at private residences from the approved mining operations.

Table 5.14 - Worst Case Cumulative Noise Impact at Private Residences from Approved Mining Operations (MCP Stage 1 Only)

	Private Residences (Receiver No.) with Predicted Noise Levels Exceeding Criteria		
	36-37 dBA	**38-40 dBA**	**>40dBA**
Daytime	22		93, 274
Evening	57*	19, 254*	22, 93, 274
Night	7, 15, 57*, 254*	19	22, 93, 274

Note: * Impacted by ventilation fans and Bobadeen Quarry only.

The predicted worst-case noise level at Church 2 (Receiver 283) will marginally exceed the criterion by 2 dBA as a result of cumulative noise impacts from the approved mining operations.

Additional locations that could potentially be affected by cumulative mine noise from the operation of the Moolarben Stage 2 project are:

- Receivers 93, 282 School, 283 Church and 286 Church which are located in Ulan Village;
- Receivers 15, 19 and 22 which are located to the south of UCML;
- Receivers 8, 10, 11, 12, 20 and 21 which are located to the south-west of UCML; and
- Receiver 1 which is located to the east of UCML.

Of the additional locations identified above, only receivers 93, 22 and 283 Church will exceed the amenity noise level criterion. The remaining receivers will experience increased noise levels which do not exceed the amenity noise level criterion.

Rail Traffic Noise Impacts

The Project will generate additional rail movements on both the Gulgong to Maryvale rail line between Ulan and Muswellbrook and the Main Northern Railway line to the Port of Newcastle. The rail lines service a number of existing mining operations including:

- Cobar Mine;
- Ulan Mine;
- Bengalla Mine; and
- Wilpinjong Coal Project.

The rail lines will also service general freight and a number of additional mining operations that are approved but not yet operating. The noise assessment has assumed that these mining operations would be operating at the same time as the Project. The additional mining operations assessed include:

- Mount Pleasant Coal Mine;
- Moolarben Coal Project (Stage 1 and 2); and
- Mangoola (formerly Anvil Hill).

The Project will generate an average of 14 train movements (7 trains) and a maximum of 20 train movements per day (10 trains) from the UCML complex along this line. This equates to an increase in train movements of approximately 8 per day, i.e. an additional 4 trains.

Using freight movement data, based on the maximum approved train movements for all operating sites and approved but not operating sites, it is possible to calculate the distance from the rail line at which ARTC criteria are exceeded, using predicted energy average L_{Aeq} and SEL noise levels.

The assessment of rail noise has identified an exceedance of the ARTC criteria at one private residence as a result of increases in train movements associated with the Project. The additional private residence that will be impacted is located along the railway line between the Mangoola and Mount Pleasant operations. Using data on freight movements it is possible to calculate the distance from the rail line at which ARTC criteria are exceeded.

As a result of the increased train movements associated with the Project, the maximum increase in distance from the track to meet the ARTC criteria on any part of the Muswellbrook to Ulan line is 5 metres for daytime peak operations and 10 metres for peak night time operations. ARTC is responsible for working towards the appropriate noise goals through the implementation of Pollution Reduction Programs.

Road Traffic Noise Impacts

For the purposes of assessing road traffic noise impacts, it has been assumed that all mine employees live in the Mudgee and Gulgong directions, most heavy vehicles delivering goods to site are expected to use Ulan Road and estimated 25 per cent of employee vehicles are assumed to travel on Cope Road.

UCML currently employs 530 personnel. The future staffing levels at UCML are expected to peak in Year 4 of operations with 1084 employees on site, including 270 construction employees, and decline thereafter as construction activities are completed. As discussed in **Section 2.0**, existing UCML approvals include provision for 979 employees which is not significantly different from employee numbers proposed for the project.

The increase of vehicle movements on an average weekday has been estimated based on 0.89 trips per additional employee. The traffic noise assessment addresses the traffic noise impacts along each of the following portions of road:

- Ulan Road – south of Cope Road, i.e. towards Mudgee; and
- Cope Road – west of Ulan Village, i.e. towards Gulgong.

Along Ulan Road, there are five private residences within 30 metres of the road and 10 residences located between 30 and 50 metres from the road. The predicted increase in traffic noise levels associated with the Project will result in exceedances of up to 7.8 dBA of the recommended night-time noise criteria at houses within 30 metres of Ulan Road in Year 4 during a few months when the operational and construction workforces peak. This equates to a 3.1 dBA increase above existing noise levels. Minor exceedances are also expected in the night time period in Year 5, however they are considered a marginal exceedance. Traffic noise levels are expected to reduce to below existing noise levels by Year 14 as UCML employee numbers will fall below current levels.

There is one residence located within 30 metres of Cope Road and an additional three located between 30 and 50 metres from the road. The predicted increase in traffic noise levels will result in one exceedance of the recommended noise criteria on Cope Road. The traffic noise levels are expected to exceed the recommended noise criteria by 1.4 dBA during the night time period at the affected residence. The recommended traffic criteria for daytime and night time periods will be met at all other residential receivers on Cope Road. Studies have shown that changes in noise levels of 2-3 dB or less are not typically detectable by the average human ear.

A traffic noise assessment has also been undertaken for Wongaroo Road. Use of this road will be predominantly for exploration related activities and access to UCML land for ongoing land management and inspection purposes. It is expected that use of the road would be infrequent and when in use will typically involve less than ten vehicles per day.

All exploration traffic movements, i.e. concrete trucks, will occur outside school bus times, i.e. between 9.00 am and 3.30 pm. Light vehicle access for inspection purposes may occur once a fortnight and can occur during any time but most likely during daylight hours, and would typically be only one vehicle movement.

The assessment assumes:

- the existing peak hour traffic flow of 15 vehicles per hour occurs between 4.00 pm and 5.00 pm. The vehicle movements are associated with school bus time pickups (4.15 pm and 4.30 pm) and people arriving home from work; and

- all UCML vehicles will also travel this road during the same one hour period.

The existing and proposed future traffic noise levels for Wongaroo Road are below the recommended daytime traffic noise criteria of $L_{Aeq,1hr}$ 55 dBA at all residential receivers along Wongaroo Road.

5.9.1.5 Noise Management and Mitigation

UCML has an existing noise management program in place for its current operations. UCML will continue implementing the noise management program to limit potential operational noise impacts associated with the combined underground and open cut operations through continued application of appropriate noise management measures. Key measures currently being implemented at UCML and that will be applied to future operations include:

- planning controls, such as locating infrastructure or consideration of seasonal influences on noise impacts, to avoid or otherwise minimise noise impacts to sensitive receivers;

- operational controls such as the placement of mobile plant and equipment;

- engineering controls including noise attenuation, where feasible, on mobile and stationary equipment that is potentially generating significant noise. Equipment attenuation, including installation of poly rollers (or similar) and covering conveyors, will be used as required to achieve off-site noise levels in combination with other planning and operational controls; and

- attended noise monitoring to assess compliance and assist with minimising impacts.

In addition to these noise controls, there are a number of control measures also considered under the Noise Reduction Plan (NRP) to minimise the impact of emissions from UCML's operations. These measures include:

- ensuring infrastructure design considers the noise environment in which UCML operates; and

- generally restricting the movement of trucks and intrusive plant to day and evening times where possible.

Given the recent changes in land ownership in Ulan Village and changes to UCML operations associated with the Project, UCML will review the current NRP in consultation with DECC and DoP. This may involve negotiating noise agreements with affected private landholders.

UCML will also continue its existing noise monitoring system, to provide adequate coverage to manage and assess compliance of the Project operational noise with project specific noise goals. The monitoring system will be subject to ongoing reviews over the life of the Project, with any changes undertaken in consultation with DECC and DoP. In order to assess the compliance of road noise with the assumed project specific goals, UCML will undertake annual noise monitoring and consultation with those residents where exceedances have been predicted during the relevant phases of the Project.

UCML will also continue to operate a 24 hour community contact line. The local community is encouraged to use this point of contact to report any instances of excessive noise. All enquiries are recorded and the subsequent investigation, action and response logged. The action taken is also communicated to the person who made the enquiry.

5.9.2 Blasting Assessment

5.9.2.1 Proposed Blasting Practices

Explosives are used in open cut mining in order to dislodge overburden and coal to enable the extraction of the resource. Explosives may also be used to fracture the basalt resource at the Bobadeen Quarry to enable the extraction of the resource by earth moving equipment. To achieve this, holes are drilled in a designed pattern giving strict attention to their angle, depth and spacing. These holes are then filled with an explosive and the charge is initiated with the aid of primers and detonators. The detonation of each hole is delayed in a pre-designed sequence to ensure that each hole is fired individually in close succession. This delayed firing technique improves the efficiency of the blast and also reduces its environmental impacts.

The design of a blast depends on its location, geological structures in that area, volume of resource in the target area and any limiting factors in relation to potentially sensitive locations (including residences, church, school and infrastructure). Blast design is therefore completed on a blast by blast basis, ensuring that all these factors are considered to achieve blast levels within acceptable limits. Open cut mining associated with the Project will occur for up to approximately 11 years, while blasting at the quarry will be undertaken on a campaign basis over the life of the Project. The blast designs associated with open cut mining and the quarry will be refined during detailed mine planning, with technological advances and as further site specific knowledge becomes available, as mining and quarrying progresses.

Discrete small scale blasting activities may also occur during specific construction activities, i.e. ventilation shafts. These events typically involve low MIC volumes and may occur outside normal blasting periods if negligible impact to receivers can be demonstrated.

The blast monitoring locations are shown on **Figure 5.9.1**.

5.9.2.2 Prediction of Vibration Levels

Peak overpressure and vibration levels from blasting are influenced by the Maximum Instantaneous Charge (MIC) used in the blast and the distance to the receiving location. Other factors that may affect peak overpressure and vibration levels are stemming depth, type of initiation and meteorological conditions.

In the blast impact assessment for the Project, the peak overpressure and vibration levels are predicted using defined equations developed based on blasting data recorded from previous UCML open cut mining operations. The predictions for the blast impact assessment for the open cut and quarry have assumed an MIC of 3000 kg and 900 kg respectively. The open cut MIC is considered conservative as it would be a maximum rather than a typical value and the predictions are therefore considered to be worst case and based on an unmitigated scenario for blasting. The quarry MIC is the maximum blast that could be undertaken without exceeding the overpressure and vibration criterion at the nearest receivers.

The predictions calculated were validated against data collected from previous UCML open cut mining operations (refer to **Appendix 12**).

5.9.2.3 Blast Assessment Criteria

Annoyance and Discomfort

For assessment of annoyance due to blasting, DECC adopts guidelines produced by the Australian and New Zealand Environment and Conservation Council (ANZECC 1990). The fundamental criteria are that at any residence or other sensitive location:

- the maximum overpressure due to blasting should not exceed 115 dB for more than 5 per cent of blasts in any year, and should not exceed 120 dB for any blast; and

- the maximum vibration (peak particle ground velocity) should not exceed 5 mm/s for more than 5 per cent of blasts in any year, and should not exceed 10 mm/s for any blast.

Structural Damage

At sufficiently high levels, blast overpressure may in itself cause structural damage to some building elements such as windows. However, this occurs at peak overpressure levels of approximately 133 dB and above, well in excess of criteria for annoyance (Wilkinson Murray, 2009).

For the assessment of damage due to ground vibration, Australian Standard *AS2187.2 1993 Explosives – Storage, Transport and Use* specifies levels for peak particle vibration velocity (PPV) to protect typical buildings from damage. These levels range from 5 mm/s to 25 mm/s PPV according to building type and use. The criterion for residences is 10 mm/s.

5.9.2.4 Blast Impacts

Annoyance and Discomfort – Open Cut

The vibration levels from blasting associated with the Project are predicted to be below the 5 mm/s criterion at all dwellings with the exception of Receivers 6 and 7, with predictions of 6.62 mm/s and 5.55 mm/s predicted at these receivers, respectively, based on a maximum MIC. It is also noted that Receiver 7 will experience noise levels above the project specific noise goal. These elevated levels are predicted to occur only during Year 7 of the open cut operation when mining is at its closest point to these residences. With the exception of the nearest residences to the south-west of the project area, the recommended long term regulatory target of 2 mm/s would be achieved at all dwellings. The vibration levels from blasting are not predicted to exceed 10 mm/s at any private residences throughout the life of the Project.

The airblast levels associated with the Project are predicted to be below the 120 dBL airblast criterion at all residences with the exception of Receivers 6, 7, 8, 10 and 12. The airblast levels are below the 115 dBL airblast criterion at all residences except at the nearest residences to the south-west. While the predictions in the blast assessment have identified exceedances of the criteria, the predictions have been based on a worst case unmitigated blasting scenario. UCML will manage blasting through ongoing monitoring and review of blast designs so that the criteria are not exceeded at private residences unless agreed with the resident.

Annoyance and Discomfort - Bobadeen Quarry

The closest residential receivers to the quarry are:

- Receiver No. 254 at a distance of 3150 metres;
- Receiver No. 57 at a distance of 3750 metres;
- Receiver No. 80 at a distance of 4500 metres; and
- Receiver No. 55 (Wongaroo Road) at a distance of 5530 metres.

The overpressure and vibration levels associated with a blast MIC of 900 kg at the nearest dwelling (Receiver 254) would be 115 dBL and 1 mm/s. The overpressure and vibration levels for all receiver locations are therefore expected to comply with the blasting criterion.

Structural Damage

The blast emission levels from UCML's operations (open cut and quarry) are expected to be well below the structural damage criteria of 10 mm/s for ground vibration and 133 dBL overpressure at all dwellings.

5.9.2.5 Blast Management

UCML will design and undertake blasts to ensure the relevant vibration and blast overpressure criteria are met at private residences, unless there is an agreement with these residents in relation to blast impacts above the relevant criteria. Techniques that will be used to minimise blast impacts may include blast initiation using electronic detonation techniques, limiting blast MIC, consideration of wind speed and direction prior to blasting, use of adequate stemming, and careful drilling and hole loading to ensure that the required blast design is implemented.

Blasting will typically be undertaken between the hours of 9.00 am and 5.00 pm, Monday to Saturday. No blasts will be undertaken on Sundays or public holidays. Ulan Coal Mines will undertake no more than one blasting event per day. A blasting event may involve a number of blasts within a very short time separation typically less than 2 minutes (except in the circumstance of a misfire), during a designated blasting shutdown period. For example, consistent with current approved practice, a pre-split and a coal blast maybe undertaken during a single blast event.

UCML will consult with residents surrounding the project area prior to the first blast on site and identify those residents that may wish to be notified of blasting times on an ongoing basis. Should any residents wish to be notified of blasting dates and times on an ongoing basis, UCML will determine, in consultation with these residents an appropriate mechanism for undertaking this notification. UCML will also consult with MCP regarding blasting times to minimise concurrent blasting by UCML and MCP.

In addition, UCML has existing management measures that will be applied to the Project, including:

- all relevant open cut personnel will be trained on environmental obligations in relation to blasting controls;
- the date, location of blast holes and quantity of explosive used each day will be documented;

- monitoring will be undertaken at locations representative of surrounding nearest private residences and other sensitive locations to verify compliance with the relevant criteria;

- blast monitoring data will be used on an ongoing basis to further refine blast design and management;

- blast management procedures will be periodically reviewed to evaluate performance and identify corrective action, if required.

UCML will manage blasting through ongoing monitoring and review of blast designs so that the criteria are not exceeded at private residences unless agreed with the resident.

5.10 Traffic and Transport

An assessment of the traffic impacts associated with the Project was undertaken by Transport and Urban Planning. The full assessment report is included in **Appendix 13**, with a summary provided below.

5.10.1 Existing Traffic Conditions

The existing road network surrounding and servicing the project area is shown on **Figure 5.10.1** and a brief description of the relevant roads is provided below. Traffic volume data for the local road system has been determined by traffic counts undertaken during December 2008 as part of the traffic assessment. The RTA data has also been sourced for traffic volumes on the roads surrounding the UCML complex.

5.10.1.1 Ulan Road

Ulan Road is a two lane main road to the east and south of the UCML complex, linking the townships of Mudgee and Cassilis. It is a rural road of sealed pavement and is between 6.6 metres and 7.5 metres wide with variable shoulder widths, and has a speed limit of 100 km/h for the majority of the road.

Ulan Road is generally flat and straight with intersection crossings and overtaking opportunities along parts of the road. There are four major roads intersecting Ulan Road: Lue Road; Henry Lawson Drive; Wollar Road; and Cope Road. Ulan Road intersects with:

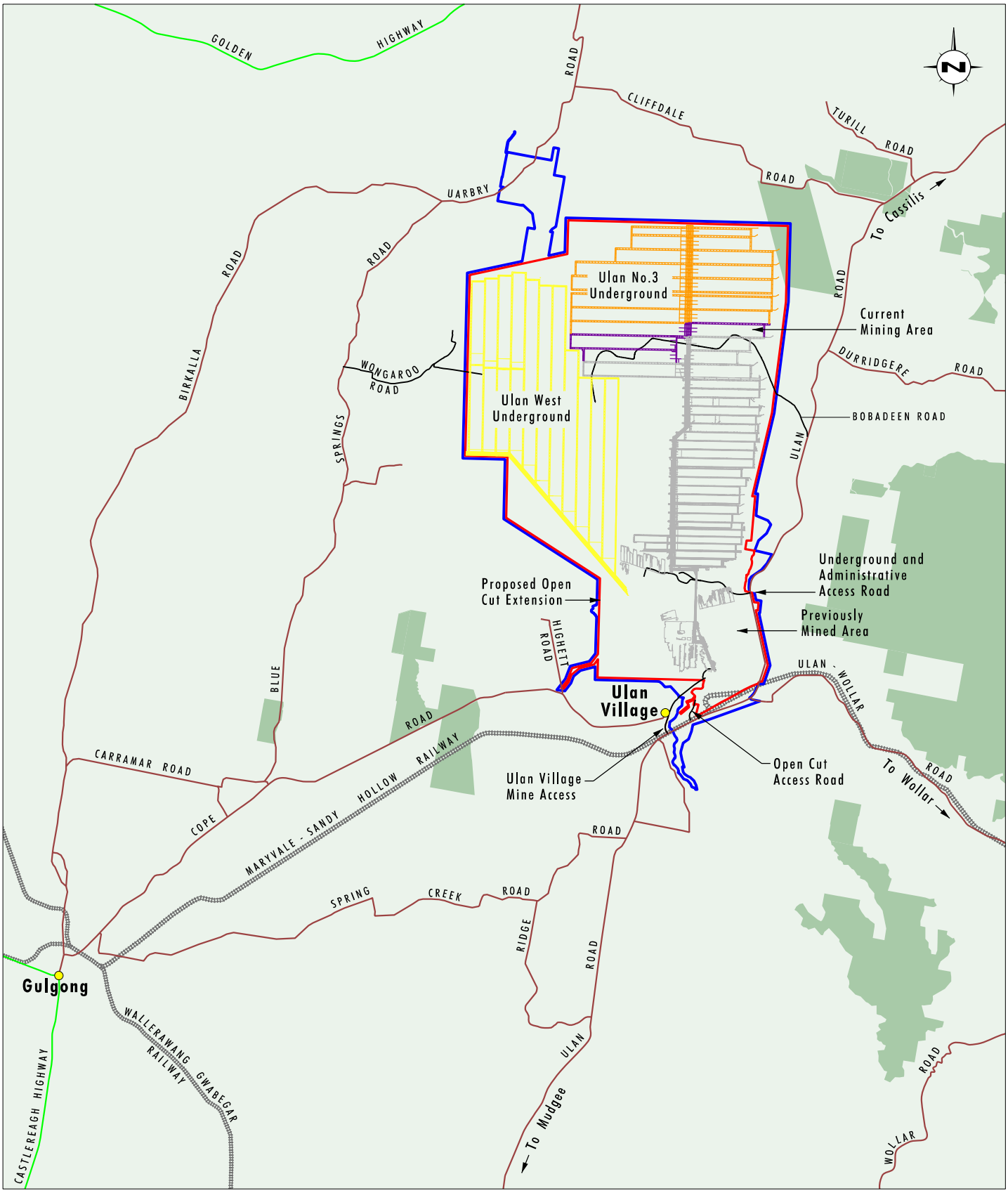
- Lue Road approximately 0.5 kilometre north of Mudgee;

- Henry Lawson Drive is approximately 1.8 kilometres north of Mudgee which provides an alternative access to Gulgong and to the vineyards and rural properties in the area;

- Wollar Road approximately 9.6 kilometres north of Mudgee where Wollar Road becomes the main road to Mudgee from this intersection; and

- Cope Road which is approximately 40 kilometres north of Mudgee (access to Ulan Village) and intersects with Ulan Road to the south of UCML.

The Annual Average Daily Traffic volume (AADT), as recorded south of Cope Road, shows that on a typical weekday (5 day average), Ulan Road carries two way traffic volumes of 1271 vehicles per day (vpd). Heavy vehicles total 171 vpd and comprise approximately 13.5 per cent of the total weekday volumes. Typical 7 day average two way traffic volumes in this section of Ulan Road are 1090 vpd.



Source: Ulan Coal, Department of Lands (2006)

0 2.0 4.0 8km
1:175 000

Legend

- Colliery Holding Boundary
- Project Boundary
- Proposed Open Cut Extension
- Proposed Ulan West Mine Plan
- Ulan No.3 Underground Mine Plan
- Previous Underground Mining Operations
- Current Mining and SMP Approved Area
- National Park and Conservation Areas
- Major Road
- Secondary Road
- Site Access Road
- Railway Line

FIGURE 5.10.1

Existing Road Network

File Name (A4): R05_V1/2423_268.dgn

5.10.1.2 Cope Road

Cope Road connects Ulan Village with Gulgong. The speed limit of Cope Road is 100 km/h outside Ulan Village to Gulgong, and 50 km/h within Ulan Village.

Cope Road is a generally flat and straight road, similar to Ulan Road. The width of the pavement is between 6.2 metres and 7.5 metres. There are numerous overtaking opportunities on Cope Road.

There is also a railway line running parallel to Ulan Road near the intersection with Cope Road. This railway line services UCML, other coal mines and general freight users. There has been a level crossing provided on Cope Road, approximately 40 metres from Ulan Road, which has been signposted appropriately with the addition of flashing lights and road markings for extra safety.

The AADT data shows that two way traffic volumes using Cope Road west of Ulan Village on a typical weekday (5 day average) is in the order of 611 vpd. Heavy vehicles total 98 vpd and comprise approximately 16 per cent of the total vehicles. Typical 7 day average two way volumes on Cope Road are 547 vpd.

5.10.1.3 Ulan-Wollar Road

Ulan Village and Wollar Village are connected by a minor rural road known as Ulan-Wollar Road which intersects Ulan Road approximately 3 kilometres north of Cope Road. Ulan-Wollar Road is sealed from Ulan Road to the vehicle entrance of Wilpinjong Mine. Further modifications and upgrades have been proposed for this road as part of the Moolarben Coal Project.

Christopher Hallam and Associates undertook traffic counts in Ulan-Wollar Road, east of Ulan Road in June 2004 (TAUP, 2009). These results are prior to the commencement of the Wilpinjong Coal Mine. Results indicated that two way weekday (5 day average) traffic volumes using Ulan-Wollar Road were 99 vpd and typical 7 day average volumes were 98 vpd.

5.10.1.4 Ulan Mine Access Roads

In addition to the road network discussed above, there are a number of roads surrounding the Project, used to access UCML's operations. These include the following:

- Ulan Open Cut Mine Access road – approximately 1 kilometre north of Cope Road;
- Ulan Underground and Administration Access road – approximately 6.6 kilometres north of Cope Road;
- Bobadeen Road – approximately 11.4 kilometres north of Cope Road and providing access to some of the surface facilities associated with Ulan No. 3;
- Ulan Village Mine Access – located off Cope Road via Main Street in Ulan Village and proposed to provide access primarily for construction contractors; and
- Wongaroo Road Access – located to the west of the project area and providing periodic access for exploration, security and other land management activities.

5.10.1.5 Principal Intersections

The principal intersections associated with the Project include:

- Ulan Road / Cope Road;
- Ulan Road / UCML Open Cut Access Road;
- Ulan Road / UCML Underground and Administration Access Road.

Ulan Road/Cope Road

Cope Road forms a T intersection with Ulan Road near Ulan Village, where Cope Road is subject to Give Way Control.

A rail level crossing is located in Cope Road, approximately 40 metres from Ulan Road. Both approaches are treated with flashing lights, signposting (including advance warning signs) and road marking.

Sight distance at this intersection is good, generally exceeding 250 metres to and from the south and 300 metres to and from the north.

Ulan Road/UCML Open Cut Access Road

UCML Open Cut Access Road intersects with Ulan Road to form a T Junction approximately 1 kilometre north of Cope Road. The Open Cut Access Road is subject to Give Way Control and street lighting is provided at the intersection.

A rail level crossing is situated approximately 30 metres from the Open Cut Access Road and Ulan Road intersection.

Sight distances at the intersection are good and exceed 250 metres to and from the north and 300 metres to and from the south in Ulan Road.

Ulan Road/UCML Underground and Administration Access Road

UCML Underground and Administrative Access Road (Underground Access Road) forms a T junction with Ulan Road approximately 6.6 kilometres north of Cope Road. The Underground Access Road is subject to Give Way Control and street lighting is provided at the intersection.

Sight distance at the intersection is good and exceeds 250 metres to the north and 400 metres to the south.

5.10.1.6 Other Intersections

Ulan Road/Ulan-Wollar Road

Ulan-Wollar Road forms a T junction with Ulan Road approximately 2.95 kilometres north of Cope Road. Ulan-Wollar Road is subject to Give Way Control at the intersection. Sight distance at the intersection is good and exceeds 250 metres to and from the north and south in Ulan Road.

Ulan Road/Bobadeen Road

Bobadeen Road intersects with Ulan Road to form a T junction approximately 11.4 kilometres north of Cope Road. The sight distance at the intersection is satisfactory.

Cope Road/Main Road/McKay Street (Ulan Village)

The Cope Road, Main Road and McKay Street intersection is located in Ulan Village, where the speed limit is 50 kilometres per hour. Main Street is the continuation of Cope Road from Ulan Road. McKay Street forms a T junction with Main Street 700 metres west of Ulan Road. The route follows McKay Street and Robison Street where it becomes Cope Road west of Ulan Village. Sight distance at the intersection is good and exceeds 120 metres.

Ulan Road / Moolarben Coal Project Access Road

This intersection was constructed recently as part of the MCP Stage 1, and is located on Ulan Road approximately 1 kilometre north of Ulan-Wollar Road. This intersection channelisation includes auxiliary lanes in Ulan Road (right and left turn bays) for turning traffic including a 'CHR' right turn bay treatment.

5.10.1.7 Traffic Contribution of Existing Operations

The section of Ulan Road with the highest traffic volumes is located between the Cope Road intersection and the access road to the existing underground mine (north of Cope Road) and currently has in the order of 1719-1777 vpd. Traffic generated by UCML consists of employee, contractor, visitor and supply delivery traffic. The site currently generates an estimated total of 952 vpd, which includes 64 heavy vehicle movements. When averaged over the 7 days (AADT) the traffic generation per day is 760 vehicles (two way trips), including 48 heavy vehicles movements. Peak traffic generation from the existing UCML operations occur between 6.00 am and 7.00 am and 3.00 pm and 4.00 pm, coinciding with shift time changes. UCML traffic currently comprises a maximum of approximately 55 per cent of the traffic on Ulan Road.

5.10.2 Operational and Construction Traffic Impacts

5.10.2.1 Project Traffic Impacts

The maximum traffic generation for the Project will occur during Year 4 of operations, when there will be a peak workforce of 1084, including both construction (270) and operational (814) employees and contractors. Year 4 has been adopted and assessed as the worst case scenario for the Project. As discussed in **Section 2.0**, existing UCML approvals permit a maximum provision of 979 employees at UCML which is not significantly different from employee numbers proposed for the Project. The traffic impact assessment has been based on traffic movements over and above those relating to UCML operational workforce of 530 at the time of the assessment.

The additional mining workforce associated with Ulan West will generally work three shifts per day on weekdays and two shifts per day on a weekend. The finish times of the various weekday shifts will not coincide with the start times of the next shift, therefore overlap on arrival and departure times will be minimal. The traffic associated with the Project is expected to peak between 6.00 am and 7.00 am.

At maximum production levels, the Project is expected to generate the following approximate traffic volumes:

- an additional 782 two way trips to and from the mine on an average day;
- an additional 984 two way trips to and from the mine on a weekday (5 day average); and
- an additional 440 vehicle trips during the 6.00 am to 7.00 am period on a Friday (assuming 100 per cent of construction traffic arrive during this time), which will be the peak hour for the mine, due to the overlap between weekday and weekend shift start times for the open cut, Ulan West and Ulan No. 3.

The predicted traffic volumes include deliveries, visitor trips and heavy vehicles. At peak levels, the expected traffic volumes will include 8 delivery and visitor movements on an average day and 72 heavy vehicle movements on an average day.

Of the additional traffic associated with the Project, the increase in daily traffic volumes on the local road network is predicted to be as follows:

- an additional 680 vehicle movements on a weekday on Ulan Road between Mudgee and Ulan, consisting of an additional 229 vehicles northbound and 6 vehicles southbound in the 6.00 am to 7.00 am peak hour;
- an additional 256 vehicle movements on a weekday on Cope Road, consisting of an additional 113 vehicles east bound and 2 vehicles westbound in the 6.00 am to 7.00 am peak hour; and
- an additional 30 vehicle movements on a weekday on Ulan Road north of UCML, consisting of an additional 13 vehicles southbound in the 6.00 am to 7.00 am peak hour.

The RTA's Guide to Traffic Generating Developments (RTA, 2002) indicates that a level of service of C or better (i.e. A, B or C) is considered satisfactory operation for two lane rural roads where heavy vehicles comprise 10-15 per cent of the vehicle numbers. Based on the predicted traffic volumes, the level of service along Ulan Road ranges between A and B, i.e. well within the RTA guidelines, and therefore a satisfactory to good level of service would be achieved by the Project.

While a significant increase from current levels, the additional traffic associated with the Project is well within the volume of traffic specified by a road of Level of Service C. The Project will not have a significant impact on the performance of the surrounding road network, including intersections, with the intersections continuing to operate at a level of service of A or B. The existing road network has sufficient capacity to cater for the predicted construction and operational traffic volumes.

It is also important to note that, as mentioned previously, the peak number of Project related traffic movements will occur between 6.00 am and 7.00 am when traffic from other sources is expected to be minimal. Project related traffic outside of this peak period will be less at times when traffic from other sources is likely to be greater.

5.10.2.2 Cumulative Traffic Impacts

An assessment of the cumulative traffic impacts associated with the Project and other major approved or proposed mining operations was undertaken as part of the traffic assessment (refer to **Appendix 13**).

The cumulative assessment includes both approved and proposed mining operations surrounding the project area, including the Wilpinjong Coal Project, Moolarben Coal Project Stage 1 and Moolarben Coal Project Stage 2. The Wilpinjong Coal Project was operational when the traffic count data was collected and is included in the existing traffic volumes.

Table 5.15 presents the worst case predicted weekday (5 day average) two way traffic volumes using the road network surrounding the project area. While there is a significant increase in the cumulative traffic volumes using the road network, the total daily traffic volumes are still within the capacity of the roads with a Level of Service of C, which is considered the appropriate criteria for a two lane rural road such as Ulan and Cope Roads. As outlined in **Table 5.15**, UCML's proportional contribution to traffic on Ulan Road is not significantly different to the current UCML traffic contributions, i.e. a slight increase from 55 per cent (current) to approximately 57 per cent.

Table 5.15 – Predicted Weekday (5 day average) Two Way Traffic Volumes

	Two way weekday traffic volumes (vpd)
Existing Traffic Volume	1719 – 1777*
Ulan (Proposed Project)	984
Moolarben Stage 1	436
TOTAL	3139 – 3197
Ulan Contribution (%)	**60.5 – 61.7**
Moolarben Stage 2	244
TOTAL	3383 – 3441
Ulan Contribution (%)	**56.2 – 57.2**

NB * Include Existing Ulan and Wilpinjong traffic movements

There is expected to be a significant increase in peak hour traffic volumes, however traffic conditions are expected to remain satisfactory to good. The section of Ulan Road north and south of Cope Road will operate at a Level of Service of B. Cope Road and the section of Ulan Road north of UCML will both operate at a Level of Service A during the worst case peak hour.

The additional traffic generation associated with the Project will have minor impacts on a number of intersections on the road network surrounding the UCML complex. The highest vehicle delay will be experienced by the left turn from Cope Road into Ulan Road. The average vehicle delays range between 1.5 and 17 seconds per vehicle. These delays are considered satisfactory and are consistent with a Level of Service A if 14 seconds or less and Level of Service B if greater than 15 seconds.

The assessment concluded that the additional traffic associated with the Project will not increase delays at the intersections surrounding the UCML complex to the extent that it would result in a substantial change to level of service at the intersections. Notwithstanding this, the additional traffic associated with the Project in combination with the Wilpinjong Coal Project and Moolarben (Stages 1 and 2) is likely to reinforce the existing need to upgrade auxiliary lanes in Ulan Road at the Cope Road intersection. The intersections of Ulan Road / Wollar-Ulan Road and Ulan Road / Mud Hut Creek, are minor intersections due to the low traffic usage rates and therefore the level of service is not expected to be adversely impacted. SKM identified the need to provide improved delineation at the Mud Hut Creek intersection, a recommendation which is supported by this assessment. The Ulan Road / Wollar Road intersection is required to be upgraded as part of MCP and Wilpinjong approval conditions.

5.10.3 Traffic Management

The assessment found that although the Project will result in a substantial increase in local traffic volumes during the construction and operation phases of the Project, traffic conditions are expected to remain satisfactory with relatively good conditions being maintained on the road network and at principal intersections.

To improve road safety, delineation and road edge formation improvements and shoulder provision including shoulder maintenance is recommended for Ulan Road and Cope Road. Some of these works are currently in progress. Additionally, it is recommended that the existing auxiliary right turn lane at the intersection of Ulan Road and Cope Road be upgraded to a right turn lane treatment due to the increase in traffic associated with the three mines. UCML is currently consulting with MWRC in regard to its contribution towards the upgrade of the Ulan Road and Cope Road intersection and timing of such works. UCML expects to have reached an agreement with Council by the end of 2009. It is anticipated that the upgrade would be undertaken as part of Council's annual road works improvement program and would be completed prior to the peak traffic impact associated with the Project, i.e. 2013.

A Construction Traffic Management Plan will be developed for the Project to minimise potential impacts associated with the construction phase.

The objectives of the Construction Traffic Management Plan would include:

- the scheduling of heavy vehicle movements, particularly any oversized loads, to minimise any disruption to local traffic and, where possible, avoid school arrival and departure times; and

- regular liaison with the local traffic authorities and the police during the construction phase.

In addition to the above measures, UCML will liaise with other surrounding mines regarding shift start and end times in order to minimise peak traffic where possible.

5.10.4 Rail Infrastructure

5.10.4.1 Maryvale to Sandy Hollow Rail Line

The Maryvale to Sandy Hollow rail line is a freight rail line that connects to the Main Northern Railway line near Muswellbrook in the Upper Hunter Valley. The Maryvale to Sandy Hollow rail line is used by mining operations to transport coal to the Port of Newcastle and other domestic customers within the Hunter Region. The line is also used for other general freight.

The Muswellbrook to Ulan section of the rail line was opened in about 1982 and the Ulan to Gulgong section was completed in the late 1980s. This section of the track has no constraints in regard to locomotives and rolling stock configurations accommodating 1.6 kilometre long coal trains at 30 tonne axle loads (TAUP, 2009).

Currently UCML loads an average of four coal trains per day and has an approved limit of 28 rail movements per week over an annual period. All UCML trains operate between the mine at Ulan and the Port of Newcastle via Muswellbrook, including delivery to domestic power generation customers.

Other coal mines that are approved to use this line to transport coal to the Port of Newcastle via Muswellbrook are:

- Bengalla – average 3 trains per day (6 train movements);
- Mt Pleasant – average 3 trains per day (6 train movements);
- Mangoola (previously Anvil Hill) – average 4 trains per day (8 train movements);
- Wilpinjong – average 6 trains per day (12 train movements); and
- Moolarben (Stage 1) – average 4 trains per day (8 train movements).

Moolarben Stage 2, if approved, would increase the number of loaded trains from Moolarben by an average of 1 train per day (2 train movements).

There are 18 level crossings located between UCML and Muswellbrook. All roads at these crossings are classified as public roads. The traffic assessment for the Project considered the impact of increased train movements on the level crossings along the rail line between UCML and where the line meets the Main Northern Railway line near Muswellbrook. Previous assessments have found that the majority of the public road level crossings are surfaced with bitumen and are fitted with automatic warning lights and bells (TAUP, 2009). The delay times at level crossings will be impacted by the additional train movements associated with the Project. In the absence of any standards, a delay of up to approximately three minutes is considered acceptable (TAUP, 2009). The delays expected per train would be approximately two minutes. The proposed additional train movements will increase the delay at the 18 level crossings by a total of approximately 24 minutes per day, assuming peak train movements. The increase in trains will be distributed throughout the day, and therefore any further delays resulting from the Project would be relatively minor.

Coal from the Project will continue to be transported from the site to markets via the Maryvale to Sandy Hollow railway line and Main Northern Railway line. The Project does not seek to rail coal to the west through Mudgee. The Project will generate an average of 14 train movements (7 trains) and a maximum of 20 train movements per day (10 trains) from the UCML complex along this line. This equates to an increase in train movements of approximately 8 per day, i.e. an additional 4 trains.

The efficient transportation of coal by rail is fundamental to the success of the Project. The rail network is operated by ARTC. The ARTC issued the Hunter Valley Corridor 2007 – 2012 Capacity Strategy Consultation Document in November 2007 and the 2009-2018 Hunter Valley Corridor Capacity Strategy Consultation document in June 2009, which describes a series of enhancement strategies for the Hunter Valley rail corridor. These enhancement strategies aim at upgrading the rail corridor to meet the forecasted rail traffic volume increase.

XCN consults with ARTC on behalf of Ulan Coal Mines to ensure adequate rail capacity is available for the mine's future production. As part of this process, XCN has provided ARTC a 10 year production forecast (which includes Ulan Coal Mines). This forecast has been incorporated into the ARTC 2009 – 2018 capacity strategy.