# APPENDIX 7

Noise Impact Assessment

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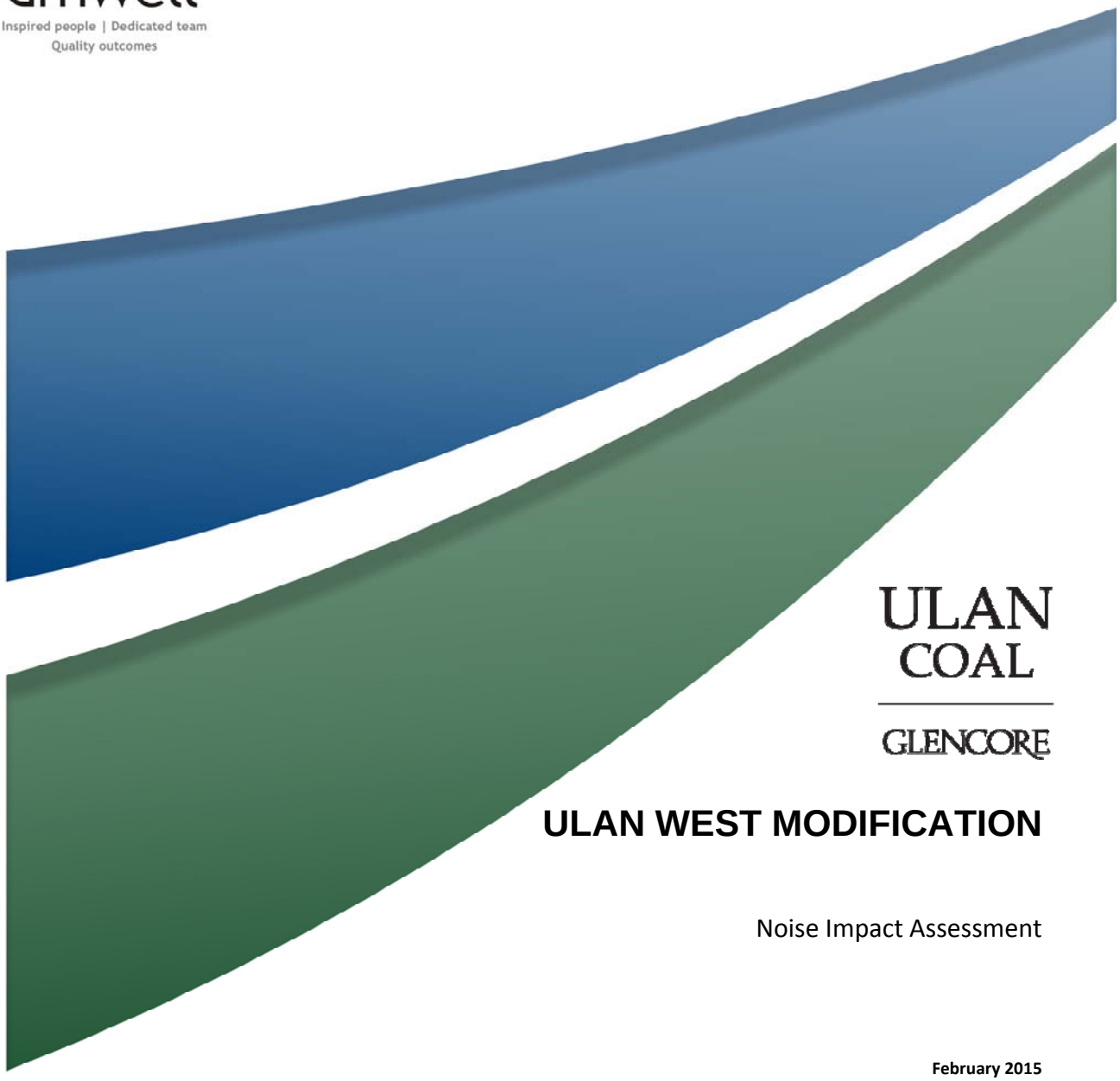
Inspired people | Dedicated team
Quality outcomes



ULAN COAL

GLENCORE

# ULAN WEST MODIFICATION

Noise Impact Assessment

**February 2015**

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Noise Impact Assessment

**February 2014**

Prepared by
Umwelt (Australia) Pty Limited

on behalf of
Ulan Coal Mines Limited

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Report No. **3363/R06/Final**
Date: **February 2015**

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# 1.0 Introduction

Ulan Coal Mines Limited (UCML) is a joint venture between Glencore Coal Assets Australia Pty Limited (Glencore) (90 per cent) and Mitsubishi Development (10 per cent). The Ulan Coal Complex is located approximately 1.5 kilometres east of the village of Ulan and entirely within the Mid-Western Regional Council Local Government Area (LGA). The Ulan Coal Complex is located approximately 38 kilometres north-north-east of Mudgee and 19 kilometres north-east of Gulgong in New South Wales (refer to **Figures 1.1** and **1.2**).

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

UCML is seeking to modify the approved Ulan West underground operations to provide access to additional coal resources within an existing exploration lease and allow for a realignment of approved longwall panels as a result of previous modifications.

UCML has an existing exploration licence (EL 7542) which covers an area south-west and an area to the north of the currently approved Ulan West mine plan (refer to **Figure 1.3**). Since PA 08_0184 was issued in 2010, exploration activities have been undertaken within existing mining leases and the southern portion of EL 7542. This exploration process has further characterised the coal resource as well as provided additional detailed information on other geological features within this area.

UCML has determined that there is a valuable minable resource within the southern portion of EL 7542 and seek to modify the current project approval to enable access to this coal resource by extending the longwall layout in this area.

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

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

The proposed modification is being sought under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act).


FIGURE 1.1

Locality Map

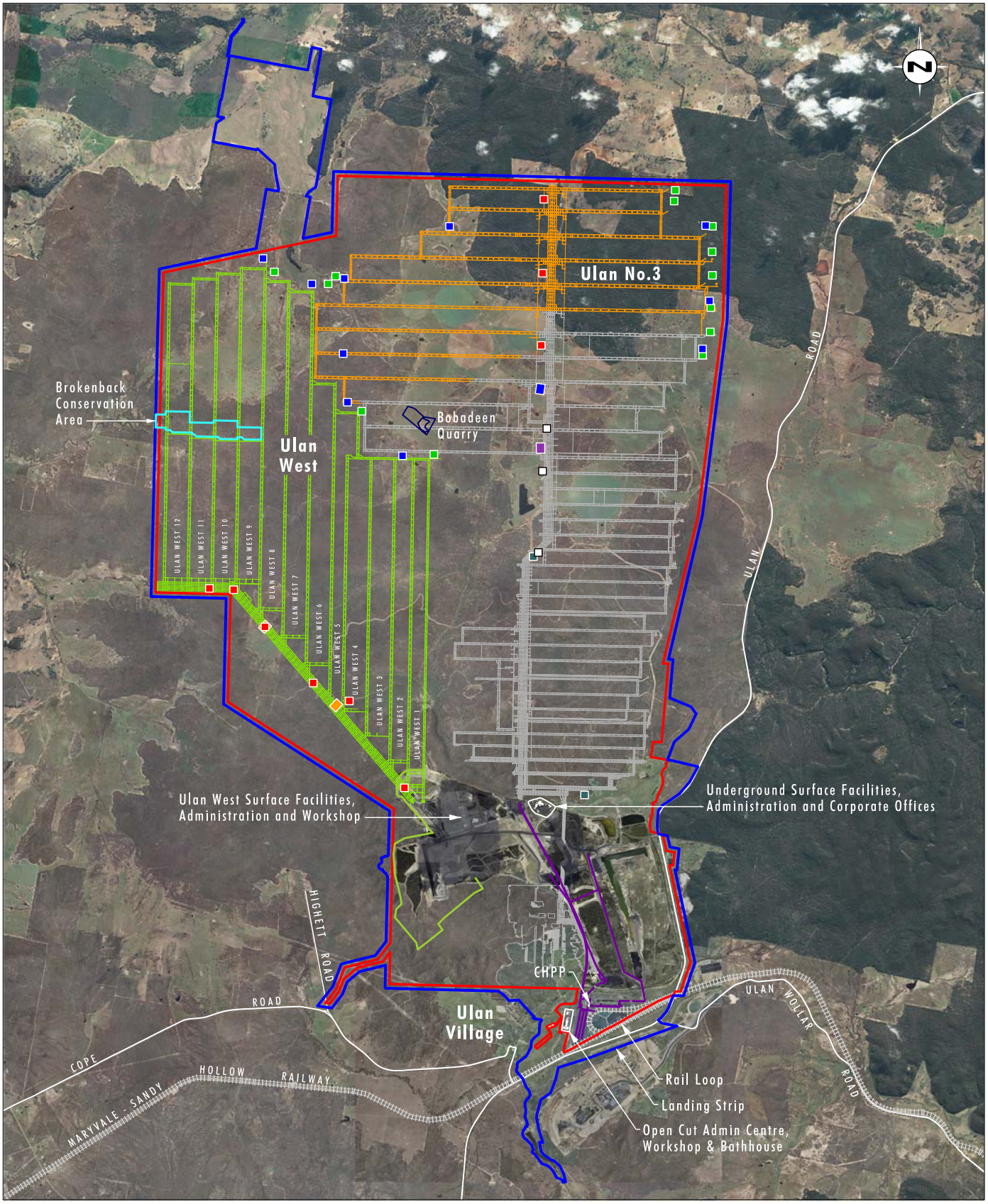


Image Source: Ulan Coal (2008, 2010, 2012, 2014)
Data Source: Ulan Coal (2013)

0 1.0 2.5 5.0km
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## Legend

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

FIGURE 1.2

**Approved Ulan Complex Operations**

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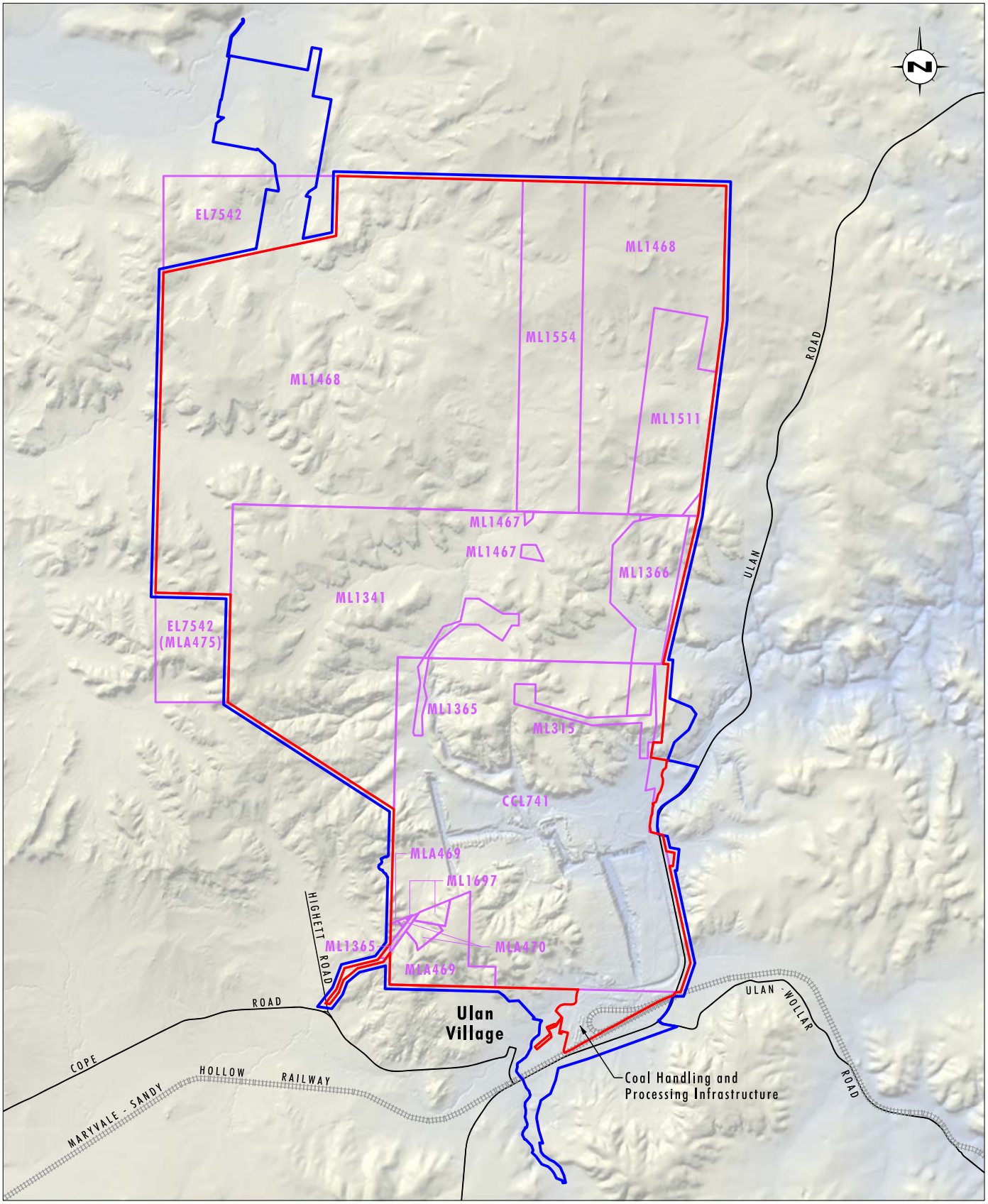
20141112 12.46




Data Source: Ulan Coal (2014)

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**Legend**

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

FIGURE 1.3

## Existing Mining and Exploration Lease Titles

Umwelt (Australia) Pty Limited (Umwelt) has prepared this Noise Impact Assessment (NIA) as part of an Environmental Assessment (EA) on behalf of UCML to assess the potential noise impacts of the proposed modification to Ulan West (proposed modification).

The NIA has been undertaken in accordance with the NSW Environment Protection Authority (EPA) NSW *Industrial Noise Policy* (INP) (EPA 2000) with the objective of addressing the key issues relating to noise as required by the relevant statutory requirements (refer to **Section 2.1**).

## 1.1 Site Context

The Ulan Coal Complex is shown in **Figure 1.3** and depicts both the existing and approved operations along with the proposed modification. The Ulan Coal Complex is located within in the Mid Western Regional Council LGA, with the village of Ulan located 1.5 kilometres west of the Coal Handling and Preparation Plant (CHPP). The Ulan Complex straddles the Great Dividing Range with the topography being a combination of undulating valley floor to steeper slopes and rocky escarpments.

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

Mining has been undertaken in the Ulan area since the early 1920s with underground operations at the Ulan Coal Complex being significantly expanded and developed in the late 1970s. From the mid 1990s through to mid 2008, UCML operated a high wall open cut mining operation at the site. In November 2010, UCML was granted PA 08_0184 which consolidated a number of existing consents and approvals as well allowing for underground mining in Ulan No.3 and Ulan West areas as well as open cut mining. Following granting of PA 08_0184, there have been a number of approved modifications to the Ulan Coal Complex. In relation to Ulan West, modifications to the mine plan to allow for a realignment of approved longwall panels have been previously approved. Current Ulan West operations are being developed in accordance with PA 08_0184 as modified.

### 1.1.1 Land Ownership and Sensitive Receivers

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

The proposed modification area is primarily situated beneath UCML owned land or Crown Land licensed and managed by UCML (refer to **Figure 1.4**). There are three private landholders within the proposed modification area, only one of which is proposed to be undermined by Ulan West. There will be no surface ventilation and associated infrastructure located on privately owned land within the proposed modification area. The closest private residences associated with the southern extension of Ulan West are approximately 2 kilometres from underground mining activities and the nearest proposed upcast ventilation shaft (refer to **Figure 1.4**).

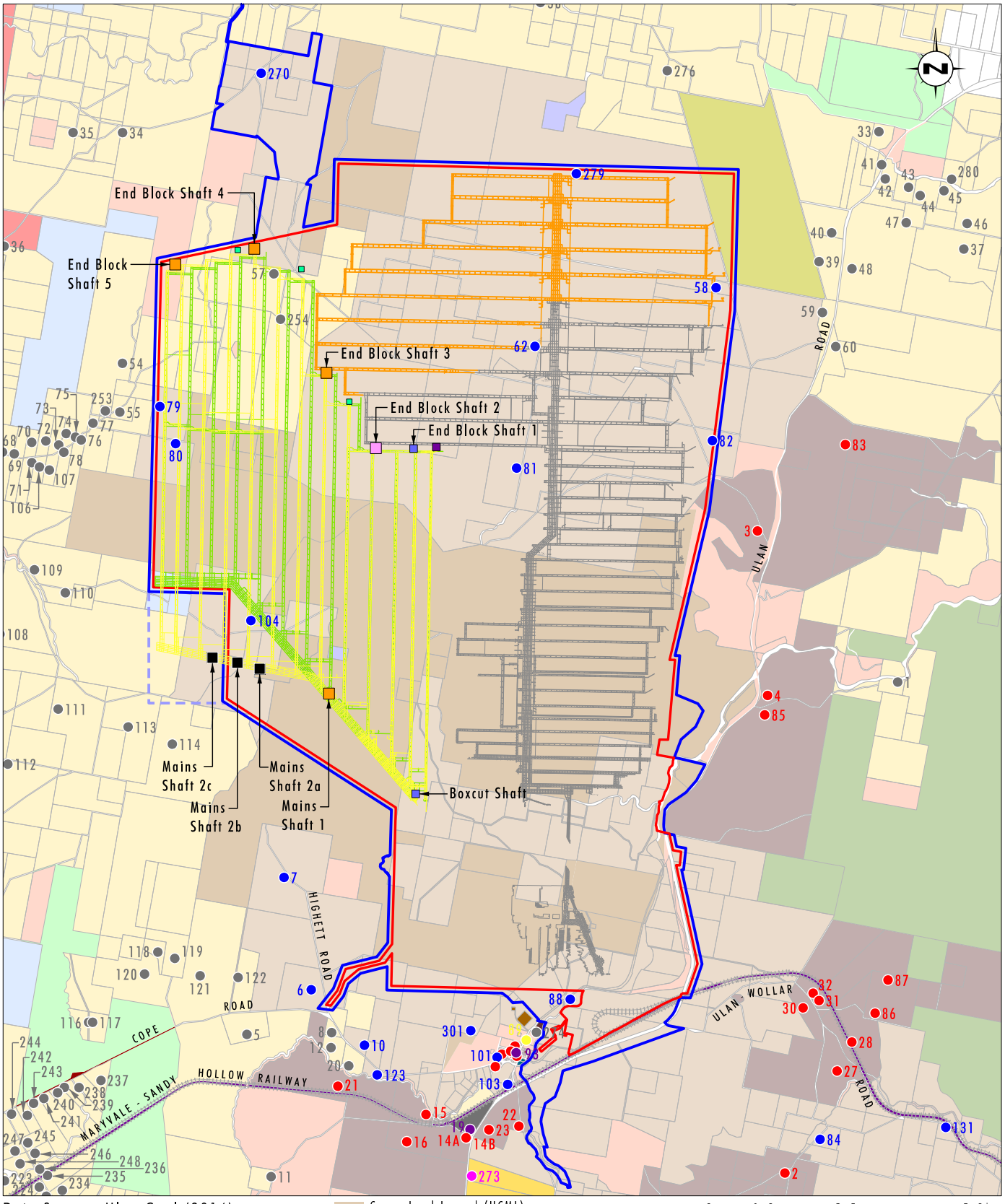


FIGURE 1.4

**Land Ownership**

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20150304 15.30

There are three landholders located within the approved Ulan West mining area that will be affected by the minor mine plan changes to the north. Approved and proposed surface ventilation and associated infrastructure is located on private owned land within this area.

## 1.2 Description of Existing and Approved Operations

PA 08_0184 provides for continued underground and open cut mining activities at the Ulan Coal Complex for a period of 21 years from approval through to August 2031. The approved operations at Ulan Coal Complex and major associated infrastructure are shown on **Figure 1.2** and consist of Ulan West underground mine, Ulan No.3 underground mine, open cut mining operations and associated surface infrastructure.

Following granting of PA 08_0184, there have been a number of approved modifications to the UCML project approval. Details of these modifications are outlined in **Table 1.1**.

**Table 1.1 – Approved Modifications and Changes to PA 08_0184**

| Modification | Description of Modification |
|---|---|
| MOD 1 | Longwall extraction in the North 1 mining area.<br>Modification of the approved Ulan No.3 and Ulan West mine plans.<br>Construction and operation of a concrete batch plant. |
| MOD 2 | Modify Ulan West longwalls 1-5.<br>Remove restrictions on construction blasts.<br>Minor amendments to European and natural heritage sites where blasting performance measures are applicable. |
| First Workings Approvals | Removal of barrier from Ulan No.3 mine plan<br>Change to the first workings to increase the width of Ulan West LW 3 and LW 4.<br>Change to extend Ulan No.3 LW 28 and LW 29.<br>Change to width of development panels at Ulan No.3. |

Coal extracted at the Ulan Coal Complex is processed at the CHPP (apart from low ash coal that bypasses the CHPP), stockpiled and loaded via the dedicated Ulan Coal Complex rail loading facility for transport by rail to domestic markets or to the Port of Newcastle. The majority of coal is sold to the thermal coal export market, with the higher ash content coal from the open cut previously supplying the domestic market for power generation. The Ulan Coal Complex currently operates 24 hours per day, seven days per week, including construction and maintenance activities. UCML currently employs approximately 500 personnel.

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

## 1.3 Description of the Proposed Modification

As described in **Section 1.0**, UCML has an existing exploration lease (EL 7542) over an area south-west and an area to the north of the currently approved Ulan West mine plan (refer to **Figure 1.5**). Since the approval of PA 08_0184 in 2010, exploration activities have been undertaken within existing mining leases and the southern portion of EL 7542. Further exploration activities have more accurately mapped the location of a geological fault that was previously interpreted as a constraint to mining in the southern portion of EL 7542. This exploration has determined that the feature lies further south than previously interpreted.

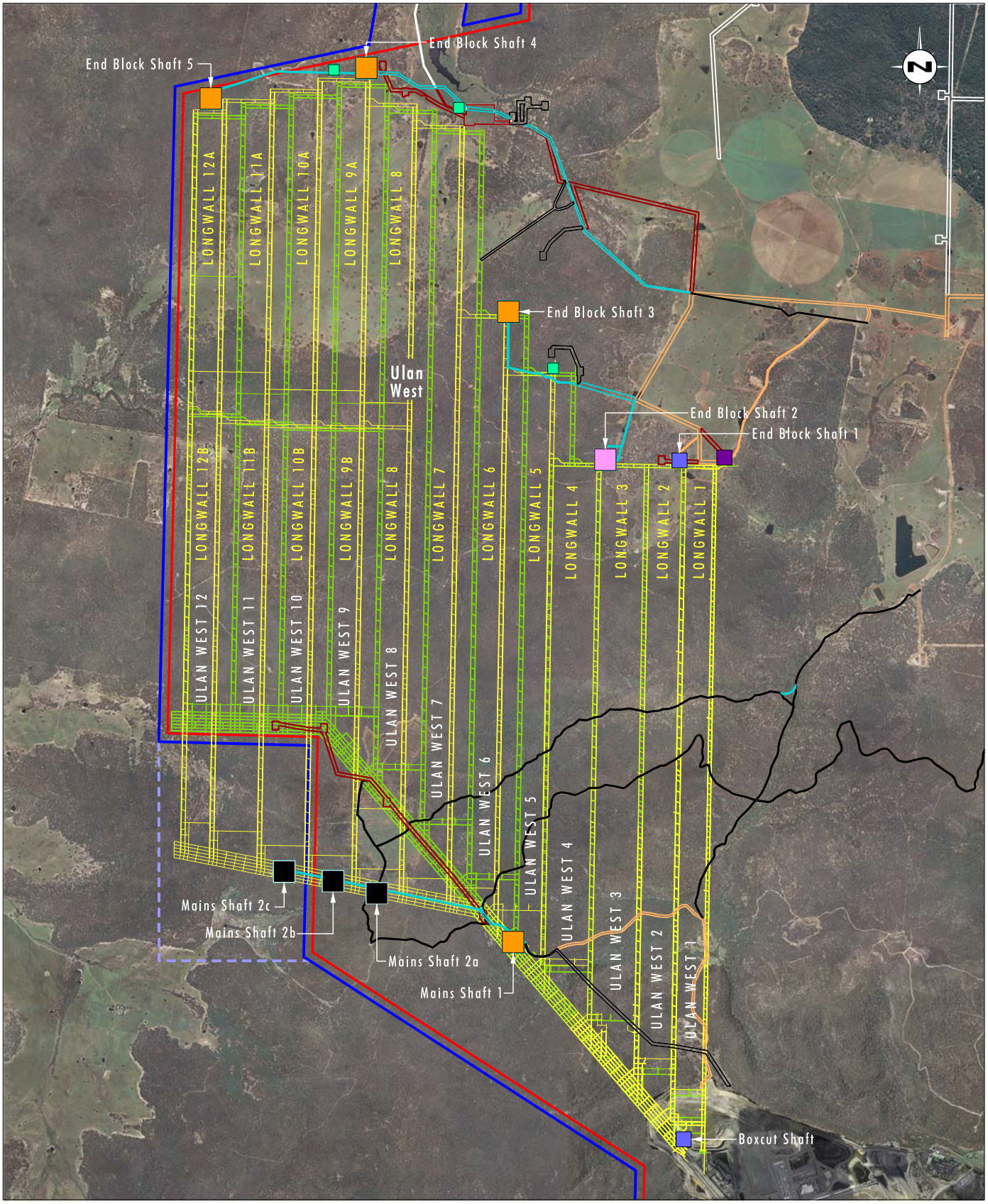



Image Source: Ulan Coal (2008, 2010, 2014)
Data Source: Ulan Coal (2014)

0 1.0 2.0 2.5km
1:50 000

## Legend

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

FIGURE 1.5

**Proposed Ulan West Modification**

File Name (A4): R06/3363_032.dgn
20141211 15.37

UCML has determined that there is a viable resource within this area that can be efficiently accessed through a change to the existing Ulan West mine plan.

UCML is proposing to modify PA 08_0184 to allow for mine plan changes to Ulan West to ensure efficient and optimised extraction of the coal resource. In order to accommodate the proposed changes to the Ulan West longwall layout, the main headings need to be turned after longwall LW 5 (refer to **Figure 1.5**). Based on the current progress of underground development at Ulan West, it is estimated that the main headings will need to be turned in approximately September 2015.

The proposed modification to the Ulan West mine plan includes extension of seven longwall mining panels in order to access additional resources, realignment of longwall panels to accommodate for previous modifications, and changes to the ventilation configuration (refer to **Figure 1.5**).

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

The key components of the proposed modification are outlined in **Table 1.2**.

**Table 1.2 – Proposed Ulan West Modification**

| Aspect | Currently Approved | Proposed Modification |
|---|---|---|
| Mine Life | 21 year life until 30 August 2031 | Additional 2 years until 30 August 2033 |
| Limits on Extraction | 20 million tonnes of coal per annum (including maximum of 4.1 Mtpa ROM from Open Cut) | No change |
| Operating Hours | 24 hours per day, 7 days per week | No change |
| Workforce Numbers | Approximately 931 people (Complex) | No change |
| Mine Plan | As shown in **Figure 1.5** | Realignment of LW 5 to LW 12 including a reduction of LW 5 by approximately 170 metres and an extension of LW 6 to LW 12 between 900 and 1300 metres as shown in **Figure 1.5** |
| Mining Method | Ulan West – retreat longwall method | No change |
| Surface Infrastructure | As per Continued Operations Project EA | Changes to Ulan West infrastructure including repositioning of approved dewatering bores and ventilation shafts, and additional shafts and associated infrastructure for Ulan West mine plan as shown in **Figure 1.5** |
| Ulan Complex Coal Handling and Preparation Plant | As per Continued Operations Project EA | No change |
| Coal Transportation | All coal transported from the site by rail. No more than 10 laden trains leave the site each day. | No change |

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

There are currently seven ventilation shafts, five service boreholes and four dewatering boreholes approved for Ulan West (refer to **Figure 1.5**). Approved ventilation shafts, service boreholes and dewatering boreholes yet to be constructed will require relocation as part of the proposed changes to the Ulan West Mine plan. The proposed modification includes the installation of an additional one ventilation shaft to service Ulan West based on the review of ventilation requirements (refer to **Figure 1.5**). There will be no change to constructed ventilation shafts, service boreholes and dewatering boreholes.

There are currently five service boreholes and three upcast ventilation shafts approved in the southern portion of Ulan West, primarily situated along the main headings (refer to **Figure 1.2**). One ventilation shafts has been constructed at the southern end of LW 1 (refer to **Figures 1.2** and **1.5**) to support the current Ulan West operations. The proposed modification will not require any additional ventilation shafts in the southern portion of Ulan West, rather realignment of two ventilation shafts that are yet to be constructed. One ventilation shaft is to be constructed at the southern end of LW 5, while there are three potential locations for the remaining ventilation shaft (refer to **Figure 1.5**). The final location of the third ventilation shaft will be dependent on ventilation requirements as Ulan West progresses. For noise assessment purposes, the potential worst case location in terms of proximity to nearest residences has been used. Service boreholes will be co-located within the proposed ventilation shaft compounds where practicable to minimise surface disturbance.

There are currently four downcast ventilation shafts approved at the northern end of longwalls in Ulan West (refer to **Figure 1.5**). One downcast ventilation shaft has been constructed at the northern end of LW 2 to support the current Ulan West operations. The proposed modification will require the remaining three ventilation shafts to be relocated to service the proposed realigned longwall panels as well as an additional ventilation shaft (refer to **Figure 1.3**).

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

The duration of operation for each ventilation shaft will be relatively short and directly linked to the progression of underground mining in Ulan West. The number of ventilation fans operating at any one time as upcast ventilation sites will be typically no more than two, with no more than an additional two downcast ventilation shaft (end block shaft) operating in concurrence.

Other features of the proposed modification include realignment of an infrastructure corridor, access tracks, water supply and electricity transmission lines associated with the additional and relocated ventilation shafts.

# 2.0 Assessment Methodology

## 2.1 Introduction

This assessment of noise impacts for the proposed modification has been undertaken in accordance with the following policies and guidelines:

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

As an approved operation, PA 08_0184 and Environment Protection License (EPL) 394 specify noise limits for the Ulan Coal Complex operations (refer to **Section 2.2**). The objective of the proposed modification is to meet the current approval/EPL noise limits. Where this is not achievable, the potential noise impacts have been assessed in accordance with the objectives of Section 10 of the INP (refer to **Section 2.3**).

A glossary of terms and abbreviations used in this report is provided in **Appendix A**. A summary of the INP (EPA, 2000) assessment methodology is provided in **Appendix B**.

## 2.2 Existing Approved Noise Criteria for Ulan West

Wilkinson Murray Pty Limited (Wilkinson Murray) was engaged in 2009 to assess and evaluate the potential noise and vibration impacts for the construction of the infrastructure, mining operations and rehabilitation activities; blasting; and transportation activities associated with the *Ulan Coal - Continued Operations Project* (UCCO Project). The UCCO Project was classified as a 'Major Project' as defined by the *State Environment Planning Policy (SEPP)* (Major Projects) 2005, and therefore required approval from the NSW Minister for Planning under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The summary of the target Project-specific Noise Levels (PSNL) presented in the Wilkinson Murray report, *Ulan Coal – Continued Operations Noise & Vibration Assessment* (UCCO NVA) (Wilkinson Murray, 2009) is reproduced in **Table 2.1**. It was found that for Ulan Village and the surrounding rural residential receivers the intrusiveness criterion was more stringent than the amenity criteria for all time periods and for all the receivers

**Table 2.1 - Summary of Target Project-specific Noise Levels**

| Location | Time Period | Noise Criterion, dB(A) |
|---|---|---|
| Ulan Village | Day | 35 $L_{Aeq,15min}$ |
| | Evening | 35 $L_{Aeq,15min}$ |
| | Night | 35 $L_{Aeq,15min}$ |
| Rural Residential Areas | Day | 35 $L_{Aeq,15min}$ |
| | Evening | 35 $L_{Aeq,15min}$ |
| | Night | 35 $L_{Aeq,15min}$ |
| School | When in use | $L_{Aeq}$ 50 dB(A) |
| Church | When in use | $L_{Aeq}$ 50 dB(A) |
| Commercial Premises (Pub) | When in use | $L_{Aeq}$ 65 dB(A) |

Source: Table 4.2 UCCO NVA (Wilkinson Murray, 2009)

The UCCO NVA investigated potential noise impacts for five progressive operational scenarios (Years 1, 5, 7, 12 and 17) of the UCCO Project. The noise impacts were determined for 77 different meteorological conditions at a total of 180 residential receivers up to 17 kilometres surrounding the project plus two churches and a school. The noise models incorporated fixed and mobile plant with sound power levels ranging from 95 dB(A) to 125 dB(A).

The calculated noise levels for the 77 meteorological conditions were used to prepare a statistical data set from which the noise level exceeded for 10 per cent or more during each of the day, evening and night time periods could be determined.

The maximum predicted 10th percentile noise levels predicted in the UCCO NVA for the properties located in the region surrounding the Ulan West underground mining area are presented in Appendix F of the UCCO NVA. The UCCO NVA identified:

- Eight residential receivers (7, 15, 19, 22, 57, 93, 254 and 274) where the predicted noise levels would potentially exceed the recommended $L_{Aeq,15minutes}$ noise criterion of 35 dB(A).

- Of the eight residential receivers predicted to be impacted, four receivers (19, 22, 93, and 274) were already impacted by Ulan Coal Complex's existing operations. Two receivers (19 and 22) were identified as within the Moolarben Coal Project (Moolarben) acquisition area.

- Of the eight residential receivers predicted to be impacted, three residential receivers (7, 15 and 57) were predicted to have 10th percentile noise levels with a minor exceedance of the noise criterion (i.e. < 2 dB).

- Of the eight residential receivers predicted to be impacted, two additional residential receivers (19 and 254) were predicted to have 10th percentile noise levels with a marginal exceedance of the noise criterion (i.e. between 2 to 5 dB). Receiver 254 was noted to only be impacted by ventilation fans and Bobadeen quarry.

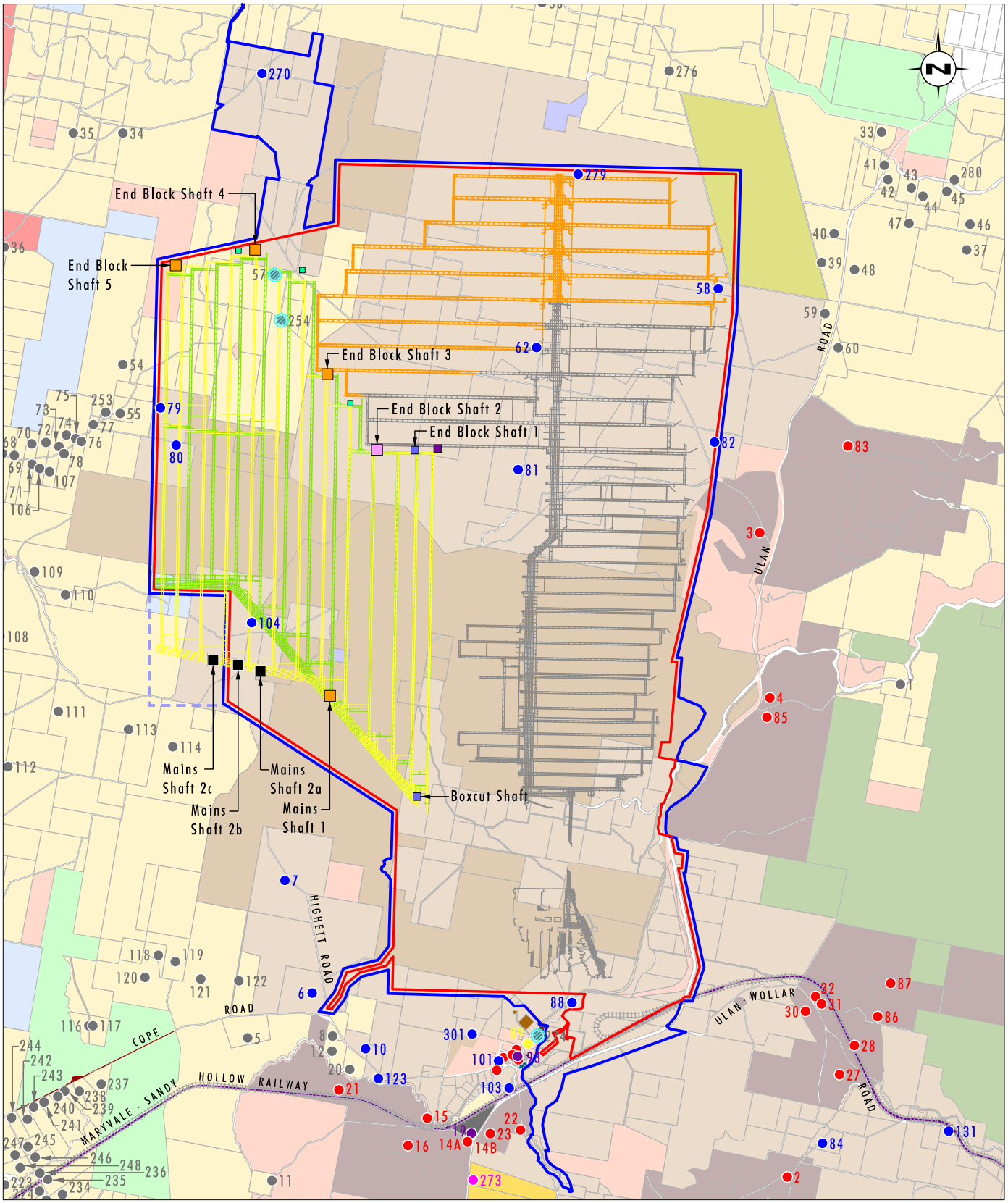
- Of the eight residential receivers predicted to be impacted, three residential receivers (22, 93 and 274) were predicted to have 10th percentile noise levels with a significant exceedance of the noise criterion (i.e. > 5 dB). It was noted that receiver 274 (North Eastern Wiradjuri Wilpinjong Community Residence) consists of two transportable dwellings approved by Mid Western Regional Council for a period of two years and one permanent residence.

Table 8.5 of the UCCO NVA, reproduced as **Table 2.2**, identified the residential receivers where operational noise levels were predicted to exceed the criteria at any stage of the UCCO Project (refer to **Figure 2.1**).

**Table 2.2 – EPL and Development Consent Noise Limits, dB(A)**

| | Private Residences with Predicted Noise Levels Exceeding Criteria | | |
|---|---|---|---|
| | **36-37 dB(A)** | **38-40 dB(A)** | **> 40 dB(A)** |
| **All Years** | R7 | R19 | R22 |
| | R15 | R254 [1] | R93 |
| | R57 [1] | - | R274 |

Source: Table 8.5 NVA (Wilkinson Murray, 2009)
Note 1: Impacted by ventilation fans and Bobadeen quarry only.




Data Source: Ulan Coal (2014)

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## Legend

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

FIGURE 2.1
**UCCO Project Predicted Noise Affected Residences**

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20150304 15.35

The subsequent conditions of approval regarding noise and EPL conditions relating to noise (PA 08_0184 and EPL 394) for the approved UCCO Project are presented in **Table 2.3**.

**Table 2.3 – Development Consent and EPL Noise Limits, dB(A)**

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

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

Note2: Property #7 can be found in the EPL and Development Consent Noise Limits but has since been acquired by UCML, therefore is not included in the table above.

## 2.3 Section 10 of the Industrial Noise Policy

The approach taken in *Section 10 – Applying the policy to existing industrial premises* of the INP was designed to allow established industries to achieve a balance between the noise expectations of the community while remaining economically viable. Section 10 of the INP is applicable to the noise assessment of the proposed modification where the noise impacts are predicted to exceed the current approval/EPL noise limits (refer to **Section 2.2**).

At residential receivers 7, 57 and 254 the current noise limits (refer to **Table 2.3**) are above the target PSNL for the UCCO Project (refer to **Table 2.1**). At all other residential receivers the noise limits are set at the target PSNL. If the proposed modification cannot achieve the current noise limits then the proposed modification would need to be assessed against the target PSNL in **Table 2.1** in accordance with Section 10 of the INP. As the target PSNL have already been defined for the UCCO Project, the relevant components of Section 10 of the INP applicable to the noise assessment of the proposed modification are as follows:

- identify all noise sources from the proposed modification and determined the expected noise levels and noise characteristics (e.g. tonality, impulsiveness, etc.) likely to be generated from the noise sources;
- identify the times of operation of the proposed modification and all related noise producing activities;
- determine the noise levels likely to be received at the most sensitive locations under neutral meteorological conditions and relevant gradient winds;
- consider the influence of existing meteorological conditions such as wind and temperature inversions in the predictive noise model so as to provide a true representation of actual noise levels;

- compare the predicted noise levels with the target PSNLs determined for the proposed modification. The assessment of the predicted noise levels against PSNL was undertaken in accordance with Section 10 of the INP (EPA, 2000);

- discuss the findings from the predictive noise modelling and, where predicted noise levels exceeded the relevant PSNL, recommended additional mitigation measures to be applied to the proposed modification;

- determine the achievable project noise levels that would form the basis of project-specific noise criteria in accordance with the requirements of Section 10 of the INP (EPA, 2000); and

- provide details of any additional noise monitoring to be undertaken at noise sensitive locations (subject to the agreement of the owners/occupiers) for the duration of the proposed modification.

A summary of the INP (EPA, 2000) assessment methodology is provided in **Appendix B**.

## 2.4 Predicted Noise Levels

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

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

2. Where the worst case noise predicted impacts from the activities associated with the proposed modification only are greater than 30 dB(A) the worst case predicted noise levels have been added to the maximum predicted 10th percentile noise levels predicted in the UCCO NVA. If the summation of the worst case noise impacts is less than the project noise limits in **Table 2.3** then no further assessment is required.

3. Where the summation of the worst case noise impacts exceed the project noise limits in **Table 2.3** two options exist:

    a. Investigate the specific details of the noise contribution made by activities associated with the proposed modification only and determine if there are reasonable and feasible measures that could be employed to reduce the noise impacts from the proposed modification. The objective would be to, where practical, reduce the noise impacts from the proposed modification to ensure compliance with the project noise limits in **Table 2.3**; and/or

    b. Re-model the entire Ulan Coal Complex operation with the objective of investigating if there are reasonable and feasible measures that could be employed to reduce the noise impacts from the Ulan Coal Complex operations. The objective would be to, where practical, reduce the noise impacts from the overall operation of the Ulan Coal Complex to ensure compliance with the project noise limits in **Table 2.3** or to establish new noise limits for the Ulan Coal Complex.

For this project, Option 3.a. has been used for predictive modelling on the basis of the activities being relatively discrete and of comparatively low overall noise emission levels compared to total operations.

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

The NIA was based on the noise levels predicted by the ENM model of the various phases of construction and operation associated with the proposed modification under the meteorological conditions described in **Section 4**.

# 3.0 Existing Acoustic Environment

The existing noise environment for the area surrounding the proposed modification was investigated in the UCCO Project (Umwelt, 2009). The UCCO NVA used previously measured background noise levels around Ulan Village and other residential areas, as well as additional background noise measurements to measure background noise levels at sensitive residential receivers located to the northern end of the Ulan West underground mining area.

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

**Table 3.1** provides a summary of the background noise levels based on historical monitoring data.

**Table 3.1 – Summary of Measured Background Noise Levels**

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

At Ulan Village, the background noise levels for day, evening and night-time range between 39 dB(A) and 42 dB(A). Analysis of directional noise monitoring results from Ulan Village, undertaken for the UCCO Project, confirmed that the higher day, evening and night-time noise levels at Ulan Village are due largely to noise from the Ulan Coal Complex and other nearby mining operations. The INP requires the PSNL to be developed in the absence of the existing premises operating. Therefore, the UCCO Project adopted a background level in Ulan Village of 30 dB(A). This is consistent with the background noise levels at the rural residential locations away from the mine (i.e. not affected by mine noise) were the existing background noise levels are typically 30 dB(A) or less during the day, evening and night-time period.

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

Based on the above, the intrusiveness criterion for Ulan Village and the surrounding rural residential receivers for all time periods and for all the receivers was reported in the UCCO NVA as 35 dB(A) $L_{Aeq,15minute}$.

With respect to the assessment of the Amenity Criteria the UCCO NVA notes that: "*If Ulan mine did not exist there would not be any industrial noise from any premises. Under this circumstance the amenity criterion for a 24 hour operation would be 50dBA $L_{Aeq,day}$, 45dBA $L_{Aeq,evening}$ and 40 dB(A) $L_{Aeq,night}$.*"

Target Project-specific Noise Criteria

**Table 3.2** details target Project-specific Noise Criteria derived from the intrusiveness and amenity criterion and presented in the UCCO NVA for the UCCO Project.

**Table 3.2 - Summary of Target Project-specific Noise Criteria**

| Location | Time Period | Noise Criterion, dB(A) |
|---|---|---|
| Ulan Village | Day | 35 $L_{Aeq,15min}$ |
| | Evening | 35 $L_{Aeq,15min}$ |
| | Night | 35 $L_{Aeq,15min}$ |
| Rural Residential Areas | Day | 35 $L_{Aeq,15min}$ |
| | Evening | 35 $L_{Aeq,15min}$ |
| | Night | 35 $L_{Aeq,15min}$ |
| School | When in use | $L_{Aeq}$ 50 dB(A) |
| Church | When in use | $L_{Aeq}$ 50 dB(A) |
| Commercial Premises (Pub) | When in use | $L_{Aeq}$ 65 dB(A) |

Source: Table 4.2 NVA (Wilkinson Murray, 2009)

Two places of worship, Ulan Anglican Church and Ulan Catholic Church, are located in the vicinity of the Ulan Coal Complex. The NSW INP recommends an acceptable internal noise level of 40 dB(A) $L_{Aeq,1hr}$ (when in use) for places of worship without speech amplification systems. Internal noise levels are generally 10 dB below external noise levels with windows open to a normal extent. The INP would therefore imply a recommended external noise level of 50 dB(A) $L_{Aeq,1hr}$ (when in use) at the location of Ulan Anglican Church and Ulan Catholic Church.

One school, Ulan Public School, is located in the vicinity of the Ulan Coal Complex. The INP recommends a an acceptable internal noise level of 35 dB(A) $L_{Aeq,1hr}$ (when in use). Internal noise levels are generally 10 dB below external noise levels with windows open to a normal extent. The INP would therefore imply a recommended external noise level of 45 dB(A) $L_{Aeq,1hr}$ (when in use) at Ulan Public School.

The INP recommends an acceptable levels of 65 dB(A) $L_{Aeq,1hr}$ (when in use) for commercial premises and 70 dB(A) $L_{Aeq,1hr}$ (when in use) for industrial premises affected by noise from existing industrial noise sources.

Sleep Disturbance Criteria

The sleep disturbance criteria presented in the UCCO NVA for the monitoring locations are presented in **Table 3.3**.

**Table 3.3 –Sleep Disturbance Criteria, dB(A)**

| Monitoring Location | Time Period | RBL | Sleep Disturbance Criteria, $L_{A1,1\ minute}$ |
|---|---|---|---|
| Privately owned residential receivers in Ulan Village | Night | 30 | 45 |
| All other privately owned residential receivers | Night | 30 | 45 |

Note: 1 For Monday to Saturday Night-time is defined as 10.00 pm – 7.00 am. On Sundays and Public Holidays Night-time is defined as 10.00 pm–8.00 am.

The INP Application Notes state that the sleep disturbance criteria are normally assessable for the night time period only (10:00 pm to 7:00 am).

# 4.0 Modelling Parameters

## 4.1 Prediction of Project Noise Levels

To enable the initial screening assessment of the proposed modification, as outlined in **Section 2.4**, noise models were prepared using all possible noise sources that may reasonably be expected for each of the phases of the proposed modification. The schedule of equipment (or their equivalent) that will normally be used for each of the phases of the proposed modification is described in **Section 4.2**. The ENM models were prepared assuming that all the equipment available was operational for durations of time representative of the typical construction and operational phases considered. Noise sources were located in representative locations based on the locations of the ventilation shafts at the Box Cut Shaft, Mains Shaft 1 and Mains Shaft 2c, and End Block Shafts 2 to 5 (refer to **Figure 1.3**). Mains Shaft 2c is considered to be representative of the worst case potential noise impacts from the three potential site location options of Mains Shaft 2a, 2b and 2c (refer to **Figure 1.3**).

One operational phase was modelled for the operation of ventilation fans at the Box Cut Shaft, Mains Shaft 1 and Mains Shaft 2c. Four construction phases were modelled for each of the ventilation shafts to be constructed as a part of the proposed modification. It should be noted that the construction phases of each of the ventilation shafts is an operational activity associated with the progression of the Ulan West underground mine, therefore the construction phase of each of the ventilation shafts is assessed as an operational activity under the INP.

The noise modelling was based on a range of weather conditions, as specified in **Section 4.4**, including calm neutral, 3 m/s gradient source to receiver winds and F class temperature inversions under calm conditions and with drainage flow, to investigate potential worst case noise impacts.

An analysis of the predicted noise level results for the inclusion of ‘modifying factors’ was conducted in accordance with Section 4 of the INP and the INP Application Notes (refer to **Appendix B**). With consideration of good work practices during operation and construction phases, tonal noise, impulsive noise, intermittent noise during the night time and single event duration noise as defined by the INP were not found to be a feature of the proposed modification. Therefore, modification factors for the predicted noise impacts were not required to be applied to the predicted noise levels.

## 4.2 Modelled Noise Sources

Noise sources representative of the acoustically significant plant and equipment proposed for use in the construction and operational activities associated with the proposed modification are provided in **Table 4.1.** The SWL adopted are based on manufacturer’s specifications and currently feasible, reasonable and achievable noise emissions levels for equivalent equipment. The list of equipment modelled as detailed in **Table 4.1**, is considered to represent a number of broad construction and operational scenarios that will be indicative of the noise impacts from the proposed modification.

The type and quantity of equipment, as well as the level of equipment attenuation, as indicated by the SWLs presented in **Table 4.1** are considered indicative. The actual performance of the construction and operation of the proposed modification will be determined by monitoring the environmental noise levels over the life of the proposed modification. While **Table 4.1** provides a guide to equipment selection, the actual performance of the proposed modification and the mine as a whole will dictate equipment selection criteria.

It is noted that after construction and establishment of End Block Shafts 2 to 5, little to no noise should be emitted from these sites as these ventilation shafts will be operated in passive mode without powered fan infrastructure.

Construction noise impacts generated by the development of the proposed infrastructure corridors and access tracks are considered to be minor and consistent with, or less than, the modelled noise sources for the construction phases of the ventilation shafts.

**Table 4.1 – Modelled Equipment SWL, dB(A)**

| Equipment | SWL, dB(A) |
|---|---|
| **Operational Phase for Box Cut Shaft and Mains Shaft 1 and 2** | |
| Ventilation Fan | 105 |
| **Construction Phase 1 - Site Establishment** | |
| Excavator/ Front end loader | 95 |
| Agitator (Concrete) Truck | 111 |
| **Construction Phase 2 - Pilot hole boring and pre grouting** | |
| Drill Rig with associated other plant | 105 |
| Forklift and Semi Trailer Truck | 108 |
| Agitator (Concrete) Truck | 111 |
| **Construction Phase 3 - Raise Boring** | |
| Electrically Powered Hydraulic Raise Boring Rig and associated equipment | 104 |
| **Construction Phase 4 - Shaft Lining and where applicable fan installation** | |
| 500 Tonne Crane | 95 |
| Mobile Compressor | 104 |
| Forklift and Semi Trailer Truck | 108 |

## 4.3 Sensitive Receivers

The Ulan West underground mine is located in a rural environment as defined by the INP. The majority of sensitive receivers surrounding the Ulan West underground mine are residential. The two places of worship, school and a small number of commercial and industrial premises are located to the south in Ulan Village. The noise models of the proposed modification consider the noise sensitive receivers shown in **Figure 1.4** and model 92 individual receiver locations**.**

## 4.4 Meteorological Conditions

The consideration of meteorological effects, including gradient winds and temperature inversions, on the propagation of noise source to the receiver utilises the simple approach as outlined in Section 5 of the INP (EPA, 2000). This methodology considers the default INP worst case conditions being:

- Calm neutral conditions for model comparison;
- 3 m/s winds from the source to the receiver;
- F class stability category inversions without drainage flow; and
- F class stability category inversions with drainage flow of 2 m/s from the source to the receiver.

Due to the geographical spread of noise sources and the large number of receivers, 16 point compass directions were utilised to represent source to receiver winds and drainage flow.

The INP notes that the simple approach assumes that the meteorological conditions modelled are present for a significant amount of the time and therefore the assessment of predicted noise levels is conservative and likely to predict the upper range of noise levels. It should be noted that actual noise levels may be less than the maximum noise levels predicted for a significant proportion of the time.

# 5.0 Predicted Impacts

ENM was used to determine initial screening noise levels at the nearest sensitive receiver locations from each of the ventilation shaft sites during the operational phase for each of the ventilation fans and during the construction phase of the fan/ventilation shafts.

## 5.1 Operational Noise Levels – Ventilation Fans

**Table 5.1** presents the predicted noise levels for the operational phase for each of the ventilation fans under the meteorological conditions described in **Section 4.4**.

**Table 5.1 Ventilation Fan Operational Noise Levels**

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

Note 1: Only one "Shaft 2" will be constructed in either position 2a, 2b or 2c. Predicted noise levels are for location 2c which is considered to represent the worst case potential noise impacts of the three potential Shaft 2 site location options.
Note 2: Residential Receiver PSNL as set out in Section 3.3 are: Day 35 Evening 35 Night 35

The maximum noise level due to the operation of the ventilation shaft fans at the Box Cut Shaft, Mains Shaft 1 and Mains Shaft 2, as shown in **Table 5.1**, is predicted to be 32 dB(A) under the worst case meteorological scenarios modelled. In the UCCO NVA the predicted worst case noise level at Receiver R114 was 28 dB(A). The cumulative noise level from the UCCO Project and proposed modification is less than the Ulan Coal Complex noise criteria of 35 dB(A). This analysis assumes the original noise impacts were not associated with the ventilation fans. If the original noise impacts were associated with the ventilation fans than the more likely impact is an increase in noise levels from 28 dB(A) to 32 dB(A) not a summation of the noise levels as has been considered. For Receivers R108, R109 and R113 the summation of the worst case predicted noise level in the UCCO NVA and the worst case noise levels predicted for the proposed modification are less than the Ulan Coal Complex noise criteria of 35 dB(A).

In accordance with the second of the three steps outlined in **Section 2.4**, as the summation of the worst case noise impacts are less than the project noise limits in **Table 2.3** no further assessment of the operation of the ventilation fans is required.

## 5.2 Operational Noise Levels – Ventilation Shaft Construction

### 5.2.1 Predicted Noise Levels

**Table 5.2** presents the predicted noise levels for the four construction phases of the proposed modification at Mains Shafts 1 and 2 and End Block Shafts 2 to 5.

## Table 5.2 - Ventilation Shaft Construction Noise Levels dB(A)

| Shaft | Indicative duration of activities | Mains Shaft 1 | Mains Shaft[1] 2a, 2b, 2c | End Block Shaft 2 | End Block Shaft 3 | End Block Shaft 4 | End Block Shaft 5 |
|---|---|---|---|---|---|---|---|
| **Indicative Year** | **-** | **2015** | **2020 to 2022[1]** | **2015** | **2017** | **2021** | **2023** |
| **Construction Phase 1 Site Establishment** | < 1 Month Day Time Activities Only | -<br>-<br>-<br>All receivers <30 | -<br>-<br>-<br>All receivers <30 | -<br>-<br>-<br>All receivers <30 | -<br>-<br>-<br>All receivers <30 | -<br>R57 <30 to 38<br>-<br>All other receivers <30 | R55 <30 to 30<br>R57 <30 to 39<br>R254 <30 to 35<br>All other receivers <30 |
| **Construction Phase 2 Pilot hole boring and pre grouting** | 2-3 Months Day Time Activities Only | **-**<br>-<br>-<br>-<br>All receivers <30 | **-**<br>-<br>-<br>-<br>All receivers <30 | -<br>-<br>-<br>R254 <30 to 31<br>All receivers <30 | -<br>-<br>R57 <30 to 30<br>-<br>All other receivers <30 | R34 <30 to 31<br>-<br>R57 <30 to 38<br>R254 <30 to 31<br>All other receivers <30 | R34 <30 to 31<br>R55 <30 to 31<br>R57 <30 to 39<br>R254 <30 to 36<br>All other receivers <30 |
| **Construction Phase 3 Raise Boring** | < 1 Month 24 Hour Operation | All receivers <30 | All receivers <30 | All receivers <30 | All receivers <30 | All receivers <30 | All receivers <30 |
| **Construction Phase 4 Liner Installation and where applicable fan installation** | 1-2 Months Day Time Activities Only | -<br>-<br>All receivers <30 | -<br>-<br>All receivers <30 | -<br>-<br>All receivers <30 | -<br>-<br>All receivers <30 | R57 <30 to 34<br>-<br>All other receivers <30 | R57 <30 to 36<br>R254 <30 to 33<br>All other receivers <30 |

Note 1: Only one “Shaft 2” will be constructed in either position 2a, 2b or 2c in either 2020, 2021 or 2022. Predicted noise levels are for location 2c which is considered to represent the "worst case" potential noise impacts from potential site location options.

The noise level due to the construction of the ventilation shafts, as shown in **Table 5.2**, could exceed 35 dB(A) at two receivers, Receivers R57 and R254, under the worst case meteorological scenarios modelled. For residential receiver R57 noise levels are predicted to range, depending on the location and source of the noise, from less than 30 dB(A) to 39 dB(A) day time and are predicted to be less than 30 dB(A) during the evening and night time. For residential receiver R254 noise levels are predicted to range, depending on the location and source of the noise, from less than 30 dB(A) to 36 dB(A) day time and are predicted to be less than 30 dB(A) during the evening and night time.

The established noise limits at residential receivers R57 and R254 are 37 dB(A) and 38 dB(A) respectively and the PSNL in the UCCO NVA for the two receiver locations was 35 dB(A). The maximum predicted noise level at R57 of 39 dB(A) is 2 dB above the established noise limits for the receiver and exceeds the original PSNL by 4 dB. As a result, additional assessment of the noise impacts on residential receiver R57 is required.

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

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

In accordance with the second of the three steps outlined in **Section 2.4** no further assessment of the noise impacts from the construction of the ventilation shafts is required for receiver location where the noise impacts from the proposed modification are below 30 dB(A).

### 5.2.2 Control Measures

The predicted noise levels at residential receiver R57 in **Table 5.2** are based on the sound power levels presented in **Section 4.2**, which are representative of the general construction equipment and activities required for the each phase of construction of the ventilation shafts. It has been assumed that any equipment used as part of the construction of the ventilation shafts will be well maintained and operated in accordance with the manufacturer's recommendations.

The worst case noise levels at residential receiver R57 of 39 dB(A)is due to the proximity of the shaft construction activities and the propagation of the worst case meteorological conditions during the day time. The application of additional control measures such as the use of mobile noise barriers could be used to provide up to 6 dB of noise attenuation from fixed plant. There is limited opportunity for application of additional control measures to mobile plant working which will be operating in and around each ventilation shaft site during construction. If the noise impacts exceed the established noise limits at residential receiver R57 management options are limited to ceasing the construction activities during worst case meteorological conditions. Alternatively, UCML could investigate remedial treatment of the effected dwelling if it is demonstrated that the noise levels reach the predicted maximum noise level of 39 dB(A).

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

It should be noted that the worst case operational noise levels in the UCCO NVA at residential receivers R57 and R254 are associated with the operations of fans on the End Block Shafts (i.e. at the northern end of the longwall) and the operation of Bobadeen Quarry. The proposed modification does not include ventilation fans operating on the End Block Shafts. Therefore the worst case predicted noise levels for the UCCO Project in the northern extent of the Ulan West underground operations is only associated with the day time operation of Bobadeen Quarry.

As a guide, it is suggested the control measures recommended in Sections 5 and 6 of the Interim Construction Noise Guideline (DECC, 2009) should be addressed as a part of the noise management plan from the construction phase of the ventilation shafts.

### 5.2.3 Summary of Findings

The proposed modification will have little to no impact on surrounding sensitive receivers with the exception of residential receivers R57 and R254.

With the control measures discussed in **Section 5.2.2** in place, the number of potential exceedances of the UCML noise criteria in **Table 5.2** are summarised in **Table 5.3**.

**Table 5.3 Summary of Predicted Noise Impacts**

| Receiver | Indicative Year | Shaft | Day time construction duration approximately 6 months of each year | Evening and Night time construction duration approximately 1 month of each year |
|---|---|---|---|---|
| R57 | 2017 | End Block Shaft 3 | Below existing criteria | Below existing criteria |
| | 2021 | End Block Shaft 4 | Up to 38 dB(A)<br>Up to 3 dB above PSNL<br>Up to 1 dB above existing criteria | Below existing criteria |
| | 2023 | End Block Shaft 5 | Up to 39 dB(A)<br>Up to 4 dB above PSNL<br>Up to 2 dB above existing criteria | Below existing criteria |
| R254 | 2017 | End Block Shaft 3 | Below existing criteria | Below existing criteria |
| | 2021 | End Block Shaft 4 | Below existing criteria | Below existing criteria |
| | 2023 | End Block Shaft 5 | Below existing criteria | Below existing criteria |

Residential receiver R57 is predicted to experience noise levels that exceed the current Ulan Coal Complex noise criteria by up to 2dB(A) and are up to 4 dB above the original PSNL reported in the UCCO NVA during the construction of End Block Shafts 4 and 5 during the day time period. With noise barriers in place on fixed equipment, the noise impacts at residential receiver R57 will still need to be managed. If it is demonstrated that the noise levels reach the predicted maximum noise level of 39 dB(A) UCML should:

- implement additional noise control measures, such as ceasing construction activities during adverse weather conditions, to maintain the noise levels at or below the established noise limit of 37 dB(A); or

- investigate remedial treatment of the effected dwelling or alternative noise management agreement with the resident, if it is demonstrated that the noise levels reach the predicted maximum noise level of 39 dB(A).

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

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

Section 10 of the INP (EPA, 2000) notes that when the predicted noise impacts exceed the target PSNLs, noise mitigation strategies should be assessed and implemented where practicable. The control measures outlined above in **Section 5.2.2** address noise control at the source. The INP also outlines a range of strategies for the control of the transmission of the noise and control of the noise at the receiver. The strategies that have been considered for the proposed modification include:

- Controlling noise at the source through the elimination of noisy equipment and relocating equipment or reorienting equipment to reduce the noise impacts. Where practical, this has been included in the control measures outlined above in **Section 5.2.2** and includes the use of the bore raising technique for constructing the shafts compared to relatively noisier traditional surface drilling techniques.

- Controlling the transmission of noise through the use of mobile construction noise barriers during raise boring activities.

- Controlling noise at the receiver has not been investigated as a part of this assessment. If it is demonstrated that the noise levels reach the predicted maximum noise level of 39 dB(A) a commercial agreement between UCML and significantly affected residential receivers may be considered and include provisions for mitigation options such as the installation of noise attenuation architectural treatments to affected residences such as window treatments, building insulation and air conditioning.

## 5.3 Sleep Disturbance

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

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

## 5.4 Cumulative Noise Impact Assessment

The proposed modification is located in an area generally consisting of rural and rural residential developments. Potential sources of industrial noise within the vicinity of the proposed modification are limited to other mining operations such as Moolarben.

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

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

- the relative direction of significant meteorology for the area that is unlikely to enhance the propagation of noise from more than one operation at a time; and

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

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

# 6.0 Conclusion and Recommendations

## 6.1 Conclusion

Umwelt has undertaken this NIA of the proposed modification in accordance with Section 10 of the INP (EPA, 2000). Five phases of the proposed modification were modelled to represent the construction and operation of the proposed and relocated ventilation shafts and fans.

The results in **Section 5.0** indicate that with appropriate control measures in place, the predicted noise levels from the proposed modification would not exceed the target PSNLs, during both construction and operational phases, at all of the receiver locations utilised in the calculations with the exception of residential receiver R57.

Residential receiver R57 is predicted to exceed the original PSNL and established noise limits during the construction of End Block Shafts 4 and 5 during the day time period. The INP (EPA, 2000) notes that when predicted noise levels exceed the target PSNL a range of strategies should be considered to reduce the noise impact on offsite receivers. A range of strategies has been considered including controlling noise at the source, controlling the transmission of noise and controlling noise at the receiver.

In addition to utilising best practice noise management measures, for residential receiver R57, UCML will need to either:

- implement additional noise control measures to maintain the noise levels at or below the established noise limit of 37 dB(A); or
- seek a noise management agreement with the resident which may include investigating remedial treatment of the effected dwelling if it is demonstrated that the noise levels reach the predicted maximum noise level of 39 dB(A).

The results in **Section 5.0** indicate that the proposed construction and operation of the ventilation shafts should not result in noise levels that exceed the sleep disturbance criterion.

## 6.2 Recommended Monitoring Program

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

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

- measures $L_{A90,15\ minute}$ and $L_{Aeq,15\ minute}$ ambient noise levels during the hours of construction;
- measures and/or calculates the contributed noise level from the construction activities;
- measures other statistical noise levels representative of the noise environment including the maximum and minimum noise levels measured during the interval; and
- records weather conditions at the monitoring site.

Should compliance not be achieved any feasible and reasonable noise mitigation measures should be considered and implemented.

As part of the compliance noise monitoring program, the contractor will confirm that mitigation measures are being investigated and implemented when reasonable and feasible to do so.

# 7.0 References

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# APPENDIX A

Glossary of Terms

# Appendix A – Glossary and Abbreviations

| | |
|---|---|
| 1/3 Octave | Single octave bands divided into three parts. |
| Octave | A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit. |
| ABL | Assessment background level – A single-figure background noise level representing each assessment period – day, evening and night (that is, three assessment background levels are determined for each 24-hr period of the monitoring period). It is determined by taking the lowest 10th percentile of the $L_{90}$ level for each assessment period. |
| Ambient Noise | The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant. |
| A Weighting | A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise. |
| dB(A), dBA | Decibels A-weighted. |
| dB(Z), dB(L) | Decibels Linear or decibels Z-weighted. |
| Decibel (dB) | The units of sound level and noise exposure measurement where a step of 10 dB is a ten-fold increase in intensity or sound energy and actually sounds a little more than twice as loud. |
| Hertz (Hz) | The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz. |
| $L_{A10}$ | The percentile sound pressure level exceeded for 10% of the measurement period with 'A' frequency weighting calculated by statistical analysis. Typically used to assess the impact of an existing operation on a receiver area and is referred to as the cumulative noise levels at the receiver attributable to the noise source. |
| $L_{A90}$ | Background Noise Level. The percentile sound pressure level exceeded for 90% of the measurement period with 'A' frequency weighting calculated by statistical analysis. |
| $L_{Amax}$ | The maximum of the sound pressure levels recorded over an interval of 1 second. |
| $L_{A1,1minute}$ | The measure of the short duration high-level noises that cause sleep arousal. The noise level is measured as the percentile sound pressure level that is exceeded 1 per cent of measurement period with 'A' frequency weighting calculated by statistical analysis during a measurement time interval of 1 minute. |
| $L_{Aeq,t}$ | Equivalent continuous sound pressure level - The value of the sound pressure level of a continuous steady noise that, a measurement interval of time (t), has the same mean square sound pressure as the sound under consideration whose level varies with time. Usually measured in dB with 'A' weighting. |

$L_{An}$ Percentile level - A measure of the fluctuation of the sound pressure level which is exceeded ‘n’ per cent of the observation time.

RBL Rating background level - The overall single figure background level representing each assessment period over the whole monitoring period determined by taking the median of the ABLs found for each assessment period.

SPL (dBA) Noise: Sound pressure level - The basic measure of noise loudness. The level of the root-mean-square sound pressure in decibels given by:

$$SPL = 10.\log10\ (p/po)^2$$

where p is the rms sound pressure in pascals and po is the sound reference pressure at 20 μPa. decibels.

SWL Sound power level - a measure of the energy emitted from a source as sound and is given by:

$$SWL = 10.\log10\ (W/W_o)$$

where W is the sound power in watts and $W_o$ is the sound reference power at $10^{-12}$ watts.

# APPENDIX B

INP Assessment Methodology

# Appendix B – INP Assessment Methodology

## Industrial Noise Policy

Responsibility for the control of noise emissions in NSW is vested in Local Government and the Environment Protection Authority (EPA). The *NSW EPA Industrial Noise Policy* (INP), 2000, provides a framework and methodology for deriving limit conditions for consent and licence conditions. Using this policy the OEH regulates premises that are scheduled under the *Protection of the Environment Operations Act 1997* (POEO Act).

The specific INP (EPA 2000) objectives are:

- to establish noise criteria that would protect the community from excessive intrusive noise and preserve the noise amenity for specific land uses;
- to use the criteria as the basis for deriving project-specific noise levels;
- to promote uniform methods to estimate and measure noise impacts, including a procedure for evaluating meteorological effects;
- to outline a range of mitigation measures that could be used to minimise noise impacts;
- to provide a formal process to guide the determination of feasible and reasonable noise limits for consent or licence conditions that reconcile noise impacts with the economic, social and environmental considerations of industrial development; and
- to carry out functions relating to the prevention, minimisation and control of noise from premises scheduled under the POEO Act.

The INP (EPA 2000) is designed for large and complex industrial sources and outlines processes designed to strike a feasible and reasonable balance between the operation of industrial activities and the protection of the community from noise levels that are intrusive or unpleasant.

The application of the INP (EPA 2000) involves the following processes:

- determining the project-specific noise levels (PSNL) from intrusiveness and amenity based measurement of the existing background and ambient noise levels. For existing industrial operations, the underlying level of noise present in the ambient noise, should be determined excluding the noise source under investigation;
- predicting or measuring the noise levels produced by the development; and
- comparing the predicted noise levels with the project-specific noise levels and assessing the impacts.

Where the project-specific noise levels are predicted to be exceeded the INP (EPA 2000) provides guidelines on the assessment of feasible and reasonable noise mitigation strategies, including:

- ‘weighing up’ the benefit of the development against the social and environmental costs resulting from the noise impacts;
- establishment of achievable and agreed noise limits for the development in consultation with the consent authority; and
- undertaking performance monitoring of environmental noise levels to determine compliance with the consent and licence conditions.

## INP Assessment Methodology

There are two criteria to consider when establishing project-specific noise levels for the assessment of industrial noise sources. These criteria are:

- **the intrusive noise criterion**, which is based on the background noise level plus 5 dB. The background noise level, or Rating Background Level (RBL), is determined in accordance with Section 3 of the INP (EPA 2000) and is based on the use of noise monitoring data or INP default RBLs (refer to INP (EPA 2000)), to establish the assessable background noise levels; and

- **the noise amenity criterion**, which is based on the recommended noise levels in the INP (EPA 2000) for prescribed land use. The recommended acceptable and maximum ambient noise levels are outlined in Table 2.1 of the INP (EPA 2000). Table 2.2 of the INP (EPA 2000) outlines the requirements for developments where the existing noise level from industrial noise sources is close to the acceptable noise level.

The relevant tables in Section 2 of the INP relating to the amenity criteria relevant to the Project are presented in **Table B.1** and **Table B.2**.

**Table B.1 – Amenity Criteria – Recommended $L_{Aeq}$ Noise Levels from Industrial Noise Sources**

| Type of Receiver | Indicative Noise Amenity Area | Time of Day | Recommended $L_{Aeq}$ Noise Level | |
|---|---|---|---|---|
| | | | Acceptable | Recommended Maximum |
| Residence | Rural | Day | 50 dB(A) | 55 dB(A) |
| | | Evening | 45 dB(A) | 50 dB(A) |
| | | Night | 40 dB(A) | 45 dB(A) |
| | Suburban | Day | 55 dB(A) | 60 dB(A) |
| | | Evening | 45 dB(A) | 50 dB(A) |
| | | Night | 40 dB(A) | 45 dB(A) |
| | Urban | Day | 60 dB(A) | 65 dB(A) |
| | | Evening | 50 dB(A) | 55 dB(A) |
| | | Night | 45 dB(A) | 50 dB(A) |
| | Urban/Industrial Interface - for existing situations only | Day | 65 dB(A) | 70 dB(A) |
| | | Evening | 55 dB(A) | 60 dB(A) |
| | | Night | 50 dB(A) | 55 dB(A) |
| Area specifically reserved for passive recreation | All | When in use | 50 dB(A) | 55 dB(A) |
| Active recreation area (School playground, golf course) | All | When in use | 55 dB(A) | 60 dB(A) |
| Commercial premises | All | When in use | 65 dB(A) | 70 dB(A) |
| Industrial premises | All | When in use | 70 dB(A) | 75 dB(A) |

Source: Table 2.1, INP (EPA 2000)

Note 1: For Monday to Saturday, Daytime 7.00 am-6.00 pm; Evening 6.00 pm-10.00 pm; Night-time 10.00 pm-7.00 am. On Sundays and Public Holidays, Daytime 8.00 am-6.00 pm; Evening 6.00 pm-10.00 pm; Night-time 10.00 pm-8.00 am.

Note 2: The LAeq index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

**Table B.2 – Modification to Acceptable Noise Level (ANL) to Account for Existing Levels of Industrial Noise**

| Total Existing LAeq Noise Level from Industrial Noise Sources | Maximum LAeq Noise Level for Noise from New Sources Alone, dB |
|---|---|
| ≥ Acceptable noise level plus 2 dB | If existing noise level is likely to decrease in future acceptable noise level minus 10 dB<br>If existing noise level is unlikely to decrease in future existing noise level minus 10 dB |
| Acceptable noise level plus 1 dB | Acceptable noise level minus 8 dB |
| Acceptable noise level | Acceptable noise level minus 8 dB |
| Acceptable noise level minus 1 dB | Acceptable noise level minus 6 dB |
| Acceptable noise level minus 2 dB | Acceptable noise level minus 4 dB |
| Acceptable noise level minus 3 dB | Acceptable noise level minus 3 dB |
| Acceptable noise level minus 4 dB | Acceptable noise level minus 2 dB |
| Acceptable noise level minus 5 dB | Acceptable noise level minus 2 dB |
| Acceptable noise level minus 6 dB | Acceptable noise level minus 1 dB |
| < Acceptable noise level minus 6 dB | Acceptable noise level |

Source: Table 2.2, INP (EPA 2000)

Note 1: ANL = recommended acceptable $L_{Aeq}$ noise level for the specific receiver.

In assessing the noise impacts from industrial sources at residential receivers both the intrusive and amenity criteria are considered. For each period (day, evening and night) the most stringent of either the intrusive or amenity criteria becomes the limiting criterion and forms the project-specific noise level for the industrial source.

If the existing ambient noise level is close to the acceptable noise level, a new source must be controlled to preserve the amenity of the surrounding area. If the overall noise level from the industrial source already exceeds the acceptable noise level for the affected area, the $L_{Aeq}$ noise level from a new source should meet the conditions set out in **Table B.2** above.

## INP Project-Specific Criteria

The INP (EPA, 2000) states that the criteria outlined in Tables 2.1 and 2.2 (refer to **Tables B.1** and **B.2** above) have been selected to protect at least 90 per cent of the population living in the vicinity of industrial noise sources from the adverse effects of noise for at least 90 per cent of the time. Provided the criteria in the INP (EPA 2000) are achieved, it is unlikely that most people would consider the resultant noise levels excessive.

**Table B.3** presents the methodology for assessing noise levels which may exceed the INP (EPA, 2000) project-specific noise assessment criteria.

**Table B.3 – Noise Impact Assessment Methodology**

| Assessment Criterion | Project-Specific Criteria | Noise Management Zone | Noise Affectation Zone |
|---|---|---|---|
| Intrusive | Rating background level plus 5 dB | ≤ 5 dB above project-specific criteria | ≥ 5 dB above project-specific criteria |
| Amenity | INP based on existing industrial level | ≤ 5 dB above project-specific criteria | ≥ 5 dB above project-specific criteria |

For the purposes of assessing the potential noise impacts the project-specific, management and affectation criteria are further defined in the following sections.

Project-Specific Criteria

Most people in the broader community would generally consider exposure to noise levels that achieve the project-specific criteria to be acceptable.

Noise Management Zone

Depending on the degree of exceedance of the project-specific criteria (1 dB to 5 dB) noise impacts in this zone could range from negligible to moderate. It is recommended that management procedures be implemented including:

- prompt response to any issues of concern raised by community;
- noise monitoring on-site and within the community;
- refinement of on-site noise mitigation measures and plant operating procedures where practical;
- consideration of acoustical mitigation at receivers; and
- consideration of negotiated agreements with property holders.

Noise Affectation Zone

Exposure to noise levels corresponding to this zone (more than 5 dB above project-specific criteria) may be considered unacceptable by some property holders and implementation of the following measures may be required:

- discussions with relevant property holders to assess concerns and provide solutions;
- implementation of acoustical mitigation at receivers; and
- negotiated agreements with property holders.

## Industrial Noise Policy - Application Notes

The EPA has provided a number of application notes to assist industry and acoustical consultants with interpretation and use of the NSW Industrial Noise Policy (INP) (EPA 2000). The application notes below are reproduced from the EPA web site during July 2014. The EPA web site is:

http://www.epa.nsw.gov.au/noise/applicnotesindustnoise.htm

**Identifying the existing level of noise from industry**
(see INP Section 2.2 and 3.2)

Table 2.1 Amenity Criteria (INP p. 16) sets out recommended cumulative noise levels for industry. In assessing the amenity effects of noise from a new development, it is essential to determine the level of noise already present.

Where the ambient noise levels are below the Acceptable Noise Level (ANL), then ideally the measurement of the existing level of noise should include only noise from industrial sources.

In these situations, however, it may be acceptable to include noise from other sources (for example, roads, neighbourhoods). The reasons for this are that:

- including noise from other sources typically results in assessing the worst case for impacts on amenity; and

- strictly excluding noise from sources other than industry can be difficult and costly and may not be necessary if the development meets the criteria.

However, where ambient noise levels are above the ANL then noise from other sources should be excluded in establishing existing levels of industrial noise. Where the level of road traffic noise is high enough to make noise from an industrial source inaudible for the majority of the time or difficult to measure directly, it may be necessary to consider applying the assessment for areas of high traffic noise. (Application Note Amenity criteria in high traffic noise areas provides further guidance on this).

**Assessing Noise at Industrial/Commercial Receivers**
(see INP Section 2.2)

The INP does not require that intrusive noise be assessed at industrial or commercial premises. For industrial/commercial receivers, only the amenity criteria apply. Amenity noise levels should be assessed at the most affected point on or within the property boundary. This approach also applies to other non-residential receivers, such as educational facilities, hospitals and places of worship.

**When to Apply the Urban/Industrial Interface Amenity Category**
(see INP Section 2.2.1)

The urban/industrial interface category in the INP recognises that the availability of noise mitigation measures might be limited for existing premises where residences are close to existing industries.

The urban/industrial interface amenity category applies only for existing situations (that is, an existing receiver near an existing industry) and only for those receivers in the immediate area surrounding the existing industry, that is, the region that extends from the boundary of the existing industry to the point where the noise level of the existing industry (measured at its boundary) has fallen by 5 decibels.

Beyond the interface region (that is, beyond the point where noise has fallen by 5 decibels) the receiver category that most describes the area (rural, suburban or urban) would apply. (Note: the wording on pages 18 and 67 of the INP does not fully clarify this and the word 'urban' should be deleted and replaced with the word 'applicable' on page 18 at line 6 of the 'Urban/industrial interface' category and on page 67 at line 9 of the first paragraph).

For new developments of a limited nature (such as an extension to existing process or plant or when replacing part of an existing process or plant with new technology) on existing sites (where the urban/industrial amenity category applies) then the urban/industrial amenity category is the appropriate amenity category for the new development. However, where a new development on an existing site is of a substantial nature (such as demolition of the existing plant and replacement with current technology or different type of plant) and where replacement of the existing plant has a realistic potential to significantly reduce receiver noise levels through using feasible and reasonable noise mitigation (i.e. where the existing plant is the dominant or a significant contributor to receiver noise levels) then the applicable noise criteria for the new development is the appropriate (rural, suburban or urban) amenity criteria for the location.

In most cases the situation will be apparent but in some cases careful judgement will be required to determine whether the new development is of sufficient magnitude to effectively replace the existing plant. In situations where no clear conclusion on the magnitude of change created by the new development is possible then the urban/industrial amenity category should apply.

**Identifying the Appropriate Receiver Amenity Category**
(see INP Section 2.2.2)

Amenity criteria in Table 2.1 of the INP vary depending on the type of receiver. INP Section 2.2.2 provides guidance on identifying the appropriate receiver type. Where there is doubt or debate over which receiver category is appropriate, the proponent needs to seek the views of the relevant land use manager (e.g. Council or Department of Planning and Infrastructure). Once the land use manager has identified the land use (e.g. zone, allowable density of development and land use patterns), the appropriate amenity criteria can be assigned.

**Amenity Criteria in High Traffic Noise Areas**
(see INP Section 2.2.3)

In areas where traffic flow is continuous and noise from industrial sources is inaudible or difficult to measure due to a high level of road traffic noise, and where the $L_{Aeq}$, (period), traffic noise level is more than 10 dB above the ANL presented in Table 2.1, the ANL is replaced by $L_{Aeq}$, (period), traffic minus 10 dB. This becomes the new ANL for the receiver area.

Once the new ANL is determined, the project-specific amenity criterion can be determined by following the modification process given in Table 2.2.

**Example**: An industrial development is proposed adjacent to several existing industrial facilities. The measured ambient night-time $L_{Aeq}$ noise level is 60 dB(A) at a receiver potentially affected by noise from the proposed industrial development. The residential receiving area of the assessment location has been identified as 'urban'. A nearby road dominates the night-time acoustic environment at the receiver and there are no other environmental or extraneous local noise sources. In these circumstances, the measured ambient $L_{Aeq}$ noise level of 60 dB(A) can be taken to represent the $L_{Aeq}$, (period), traffic. The night-time noise contribution from existing industry is estimated to be 46 dB(A). What is the project-specific amenity (night-time) noise criterion for the proposed industrial development?
**Solution**: The $L_{Aeq}$, (period), traffic minus 10 dB is greater than the night time ANL of 45 dB(A) as determined from Table 2.1 for urban areas not significantly affected by traffic noise. Therefore, the approach described in Section 2.2.3 of the INP can be applied and the new ANL becomes $L_{Aeq}$, (period), traffic minus 10 dB. As the $L_{Aeq}$, (period), traffic is 60 dB(A), then the new ANL becomes 50 dB(A). This is the amenity noise criterion for the total industry $L_{Aeq}$ noise in the area. The project-specific amenity (night-time) noise criterion for the proposed industrial development is then determined by comparing the existing industry $L_{Aeq}$ of 46 dB(A) to the new ANL of 50 dB(A) with respect to the modification process given in Table 2.2. This gives the project-specific amenity (night-time) noise criterion of 48 dB(A), that is, new ANL minus 2 dB(A).

**Dealing With Cumulative Noise from Multiple Developments**
(see INP Section 2.2.4)

The intrusive and amenity criteria outlined in Section 2 of the INP were established primarily to deal with individual development applications for industrial sites in the vicinity of existing sensitive receivers with stable background noise levels. In Section 2.2.4 the INP recognises

that for multiple developments, such as a new industrial area, a strategic approach can be implemented to ensure the amenity objectives are not compromised and an equitable share of the remaining available allocation of amenity-related noise for each industrial development is achieved.

**Identifying Which of the Amenity or Intrusive Criteria Apply**
(see INP Section 2.4)

The INP notes that the Project-Specific Noise Levels (PSNL) are the more stringent of either the amenity or intrusive criteria. This is not necessarily just a matter of comparing the magnitude of the amenity criteria to the intrusive criteria because different time periods apply (intrusive criteria uses 15 minutes while the amenity criteria are over the day, evening or night period).

For example, where the same number applies to both the amenity and intrusive criteria, the intrusive criteria would typically be more stringent because it is determined over a much shorter period.

Where the predicted amenity noise level is lower than the intrusive level for the proposed development, the proponent needs to ensure that both levels will be satisfied. In this situation, noise limits specified in the licence conditions will include both the intrusive and amenity noise levels predicted to be achieved by the proposal to ensure that the community is protected from intrusive noise impacts at all times.

**Assessing Background Noise Levels**
(see INP Section 3.1)

To determine the Rating Background Level (RBL) and existing industry-contributed $L_{Aeq}$, the measurement of ambient noise levels should be undertaken in the absence of noise from the development under consideration.

**When the RBL for Evening or Night Is Higher Than the RBL for Daytime**
(see INP Section 3.1)

The results of long term unattended background noise monitoring can sometimes determine that the calculated Rating Background Level (RBL) for the evening or night period is higher than the RBL for the daytime period. These situations can often arise due to increased noise from, for example, insects or frogs during the evening and night in the warmer months or due to temperature inversion conditions during winter. The objective of carrying out long-term background noise monitoring at a location is to determine existing background noise levels that are indicative of the entire year.

In determining project-specific noise levels from the RBLs, the community's expectations also need to be considered. The community generally expects greater control of noise during the more sensitive evening and night-time periods than the less sensitive daytime period. Therefore, in determining project-specific noise levels for a particular development, it is generally recommended that the intrusive noise level for evening be set at no greater than the intrusive noise level for daytime. The intrusive noise level for night-time should be no greater than the intrusive noise level for day or evening. Alternative approaches to these recommendations may be adopted if appropriately justified.

**Maximum Noise Levels during Shoulder Periods**
(see INP Section 3.3)

Noise levels in limit conditions for sleep disturbance would typically be set as a maximum noise level. The approach noted in the INP for developing intrusive criteria for the shoulder period is not appropriate for determining maximum noise levels for the shoulder period. That is, assigning a background noise level based on averaging daytime and night-time RBLs may be appropriate for determining intrusive criteria but it is not appropriate for assigning maximum noise levels. The reason for this is that the day or night RBL is based around the 90th percentile of LA90s, which is quite different to an RBL based on an average. (Additionally, setting maximum noise levels for the shoulder period based on the lowest $L_{A90}$ during the period is not practical as it can result in the maximum noise limit being set lower than the intrusive noise limit).

In order to generate a statistically valid data set to derive the 90th percentile of LA90s for the shoulder period, a much larger sampling time (than the one week typically applied) would be required, with associated cost and practicality implications. Therefore, a statistical approach to calculating the RBL for shoulder periods is not required by the INP.

It is the intention of the INP that appropriate noise targets for the shoulder period be negotiated with the regulatory/consent authority on a case-by-case basis. The focus of the INP is on avoiding or minimising noise of a high level and/or with intrusive characteristics, during the shoulder period, through the use of best practice.

Options available to the proponent for managing maximum noise levels during the shoulder period are to:

- avoid noise events during the shoulder period (or at least during the first half and then to meet RBL(shoulder period) +15 dB(A) during the second half of the shoulder period);

- collect sufficient data to calculate a statistically robust 90th percentile-based RBL for the shoulder period and use this to determine RBL+15 dB(A) as the maximum noise level limit; and

- conduct a detailed analysis of the number and noise level of noise events, and the exceedance of the background noise level, then, present a case comparing the results of the analysis and the research results contained in the NSW Road Noise Policy.

**Tonality - Sliding Scale Test**
(see INP Section 4.2)

The sliding scale test for tonality outlined in Section 4 of the INP uses a linear (z-weighted) spectrum (that is, no frequency weighting on each of the octave or third octave bands).

**Duration Correction**
(see INP Section 4.2)

Section 4 of the INP provides guidance on the use of modifying factors to account for certain characteristics of a noise source. The duration factors in Table 4.2 are intended to increase the criterion that is acceptable, whereas the modifying factor corrections in Table 4.1 are intended to increase the measured or predicted level.

**Determining What Weather Conditions Should Be Used When Predicting Noise**
(see INP Section 5)

Background

The INP intends that the noise levels used in assessing noise impacts at the consent stage include the effects of any weather conditions that are a feature of the area when the development operates. This means that the effects of weather conditions such as temperature inversions and wind on the noise level experienced at sensitive receivers should be adequately assessed at the consent stage.

Wind can enhance noise propagation compared with calm conditions (where there is no wind). When a wind blows, friction causes the air to move more slowly close to the ground than at higher altitudes. This phenomenon of wind speed increasing with height is termed 'wind shear'. The increase in noise occurs because sound waves from the source are bent through this 'wind shear' back towards the ground.

Unlike temperature inversions, wind can enhance propagation during any time of the day, evening or night. Wind does not increase noise in all directions and can also reduce noise. For example, wind blowing from the south to the north (termed a 'southerly' wind) increases noise to the north of an industrial premise and also reduces noise to the south of that premise.

In some instances, where one or more significant weather conditions have been identified as part of a noise assessment, noise levels from the industrial premises under only these significant weather conditions have been assessed, but noise levels under calm conditions have not.

The INP describes in Section 5 when weather is 'significant' (i.e. it occurs more than 30 per cent of the relevant time period) and how to apply this in the noise assessment. This approach may result in noise levels at some receivers being underestimated, as in the southerly prevailing wind scenario described above.

Recommended approach

This application note clarifies that in all cases at each receiver:

- noise levels from the premises under calm conditions as well as any significant weather conditions as defined in the INP should be predicted or measured; and

- the highest of the noise levels from Step 1 is to be used in the assessment for that receiver.

The intent of the INP is not to require that these conditions should be applied exclusively where the significant weather conditions act to reduce noise at a sensitive receiver.

For example, where a significant prevailing wind of speed less than 3 metres per second increases noise levels at a receiver to the north of a development (compared with those predicted under calm conditions), the noise levels predicted under that prevailing wind should be used at that receiver. For receiver(s) to the south of the same development, if the noise levels predicted under calm wind conditions are higher than those predicted under the significant prevailing wind, the noise levels predicted under calm wind conditions should be used at the southern receiver(s).

The EPA has previously accepted (and will accept) noise predictions based on modelling noise emissions using long term weather data, as it can present a higher level of analysis than that required under the INP.

**How Calm is Defined**
(see INP Section 5.1)

In the assessment of wind effects, the INP requires the assessment of wind speeds of up to 3 metres per second where these speeds are a feature of the area (they occur for 30 per cent of the time or more) but does not specify the minimum wind speed that needs to be assessed. The calm condition is typically represented by wind speeds less than or equal to 0.5 metres per second as this is likely to be the lower limit of measurement.

**Presenting Predicted Noise Impacts**
(see INP Section 6.3)

In carrying out noise impact predictions for a particular development, predicted noise levels for calm conditions as well as any significant adverse weather conditions should generally be provided. It is particularly useful to provide predicted noise impacts for calm weather conditions where predicted noise impacts under adverse weather conditions exceed the project-specific noise levels. This allows for a better understanding of potential noise impacts from the development.

**Noise Impact Assessment for the Modification of Existing Industrial Premises**
(see INP Section 10)

Background

Section 10 of the INP outlines the application of the policy to existing industrial premises.

As well as being used to assess noise emissions from new industrial premises, the INP is also applied to situations where existing industrial premises are modified, expanded or upgraded.

Where a modification is proposed, the noise level targets for the premises (termed Project Specific Noise Levels) are to be determined firstly excluding any noise from the subject premises. The noise from the existing premises is then assessed against these targets to determine if there is a need to consider noise mitigation for existing operations. The predicted noise level from the proposed modification is then assessed, both in isolation and in combination with noise from the existing premises.

The total noise emissions from the modified premises should ideally not exceed the Project Specific Noise Levels. If the existing premises cannot achieve these targets, the allowable noise emissions from the proposed modification will be set so that the modification does not significantly increase the existing noise emissions.

Recommended approach

This application note outlines these processes together with the degree of information required to support a proper assessment of modifications to an existing industrial premises.

A noise impact assessment for the modification of existing industrial premises should include, as a minimum:

- existing noise criteria contained in consents, approvals or licences, that are applicable to the premises;

- Project Specific Noise Levels (PSNLs) for the premises determined in accordance with the INP and relevant application notes (see, for example, Appendix A4 of the INP). Note: care should be taken to exclude noise from the existing premises when quantifying background and existing industrial noise levels (further guidance is in the INP in Section 11.1.2);

- where application of the INP results in a PSNL more stringent than existing noise criteria, the PSNL should be adopted for noise assessment purposes. Note: the INP acknowledges that the PSNL is a goal sought to be achieved through the application of feasible and reasonable noise mitigation measures and is not necessarily applied as a statutory limit by default;

- measured or predicted noise levels from the existing premises at noise sensitive receiver locations;

- predicted noise contribution from the proposed modification, in isolation, at noise sensitive receiver locations; and

- cumulative noise levels from the entire premises (i.e. combined level from existing and proposed modification) compared to the PSNL.

Where noise from the existing premises exceeds the PSNL

Where it can be determined that noise from the existing premises alone is currently exceeding the PSNL, a preliminary analysis of potential noise mitigation measures, and conceptual noise reductions, needs to be undertaken for the existing premises. Note: this does not mean that in all circumstances noise mitigation to existing premises will be required as part of a modification. Decisions of this nature will be determined on a case-by-case basis, taking into account various factors, for example, feasible and reasonable mitigation options, the absolute level of noise and existing measures of community impact, including complaints.

Once the conceptual mitigated level of noise performance of the existing premises (i.e. what can be achieved) has been determined, the contribution noise level goal for the modification can be determined. The noise level goal for the modification should be set at least 10 dB below the PSNL, or where it has been determined that the existing premises cannot achieve the PSNL, it should be set at least 10 dB below the conceptual mitigated noise performance of the existing premises.

This approach is designed to ensure that noise from the modification does not become the limiting factor in noise from the entire premises potentially meeting the PSNL.

**Prosecution Guidelines**
(see INP Section 11.1)

EPA's approach to prosecuting offences is described in EPA prosecution guidelines 2012, particularly Sections 2.2.3 to 2.2.7 under 'Discretion' which states that 'not every breach of the criminal law is automatically prosecuted - the laying of charges is discretionary' and 'The EPA has a discretion as to how to proceed in relation to environmental breaches' and 'Each case will be assessed to determine whether prosecution is the appropriate strategic

response'. Sections 2.2.8 under 'Factors to be considered' in the Guidelines describe factors that are considered when determining whether prosecution is required, such as 'whether the breach is a continuing or second offence', 'the availability and efficacy of any alternatives to prosecution' and 'the prevalence of the alleged offence and the need for deterrence, both specific and general'.

**Using Appendix D**

Appendix D of the INP provides a rough guide for predicting the increase in noise due to inversion effects. The data provided is based on simple calculations performed using the Environmental Noise Model (ENM), assuming flat ground and no barriers.

The use of this Appendix may underestimate the effects of temperature inversions where a barrier or intervening topography is present. For detailed noise impact assessments, a more thorough analysis of noise impacts under temperature inversions is expected. Where a noise model such as SoundPlan or ENM is used to determine noise impacts from a development under calm conditions or during wind conditions, the model should also be used to determine potential noise impacts under inversion conditions, rather than using Appendix D.

**How to Account For Operations That Only Occur For Part of the Day, Evening or Night**

If a plant operates throughout the day and evening but only part of the night, the assessment and applicable criteria are based on the period that the plant operates. For example, if the night operation occurs between 10.00 pm and 3.00 am the assessment of background noise and existing noise from industry would cover only those 5 hours and the applicable criteria would be derived from this period. The same applies for part operation during the day or evening.

The basic inputs needed to establish the amenity criteria are the existing industrial noise and the ANLs for different types of receivers. The amenity criterion is then obtained by a process that seeks to limit continuing increases in noise levels from industrial sources. The amenity criterion is equally applicable to a development that operates only for a portion of the relevant assessment period.

During the impact prediction phase, determining whether an industrial activity meets the amenity criteria entails assessing the noise level emissions from the activity over the period it takes place. Typically this would correspond to the times during which the industrial operation has approval to operate as specified in a licence or consent.

For example, where an industrial operation commences at 5.00 am, the period during which to assess night-time amenity would be from 5.00 am to 7.00 am. A noise impact assessment should not include the period during which the industrial operation does not operate (the night-time hours of 10.00 pm to 5.00 am).

The basic premise of assessing noise over the period that an activity occurs has and continues to be the standard approach.

The existing industrial noise should be used in conjunction with the appropriate ANL to establish the amenity criteria applicable. The criteria are applicable to the hours the development operates.

If there were a disparity between the approved operating hours and the actual period over which industrial activities take place then the appropriate period to apply to assessing amenity would need to be assigned with the aim of assessing noise over the time in which

industrial activities take place. In practice, it is expected that this is unlikely to be a significant issue as most industrial operations conduct industrial activities during their approved operating hours.

In situations where high levels of ambient noise occur the INP provides a mechanism to adjust the applicable noise criteria so as not to impose overly stringent criteria. For example, if an industry operates from 5.00 am to 7.00 am and the receiver premises experience high levels of existing traffic noise at this time, the ANL used to derive the amenity criteria can be adjusted on the basis of the high existing traffic noise. If the existing industrial noise is low, then the traffic-modified ANL becomes the amenity criterion.

**Sleep Disturbance**

Peak noise level events, such as reversing beepers, noise from heavy items being dropped or other high noise level events, have the potential to cause sleep disturbance. The potential for high noise level events at night and effects on sleep should be addressed in noise assessments for both the construction and operational phases of a development. The INP does not specifically address sleep disturbance from high noise level events.

Research on sleep disturbance is reviewed in the NSW Road Noise Policy. This review concluded that the range of results is sufficiently diverse that it was not reasonable to issue new noise criteria for sleep disturbance.

From the research, the EPA recognised that the current sleep disturbance criterion of an $L_{A1}$, (1 minute) not exceeding the $L_{A90}$, (15 minute) by more than 15 dB(A) is not ideal. Nevertheless, as there is insufficient evidence to determine what should replace it, the EPA will continue to use it as a guide to identify the likelihood of sleep disturbance. This means that where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required.

The detailed analysis should cover the maximum noise level or $L_{A1}$, (1 minute), that is, the extent to which the maximum noise level exceeds the background level and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the NSW Road Noise Policy. Other factors that may be important in assessing the extent of impacts on sleep include:

- how often high noise events will occur;
- time of day (normally between 10.00 pm and 7.00 am); and
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods).

The $L_{A1}$, (1 minute) descriptor is meant to represent a maximum noise level measured under 'fast' time response. The EPA will accept analysis based on either $L_{A1}$, (1 minute) or $L_A$, (Max).

**Addressing Privately Owned Haul Roads**

Noise from privately owned haul roads is to be assessed as an industrial noise source according to the INP. The practice of treating access roads as part of the industrial premises with which they are associated is a long established part of noise management in NSW, which the INP has not changed. The basis for treating vehicles on private access roads as part of an industrial noise source lies in the relationship between the enterprise and the noise, and the community's response to noise from vehicles operating on private roads.

The character of the noise is different to general road traffic noise

Traffic on access roads is solely related to the operation of the site served by the access road and is usually composed almost entirely of heavy vehicles, producing noise of a different character to the typical public roadway where smaller vehicles typically predominate.

Factors that influence community response are different compared to public roads

The distribution of benefits from the operation of a private access road is typically perceived as different than from a public road. Affected members of the public have been reported as questioning the equity of truck noise degrading their amenity for the benefit of others.

The degree of control possible for traffic on a private access road is typically perceived as greater than for a public road. The result is a higher level of expectations that more can and should be done to reduce noise from the private road (than from a public one).

**Determining Noise Limits for Licence Conditions**

Where the proponent predicts that noise levels from the industrial development would be below the project-specific noise levels, then the noise limits specified in the licence/consent conditions should reflect the noise levels that the proponent states would be achieved (that is, the predicted noise levels, however a minimum intrusive criterion of 35 dB(A) still applies). This is for a number of reasons:

- to ensure that the best-management practices and best available technology described in the noise impact assessment report are actually adopted by the proponent;
- to ensure that the level of achievable performance presented by the proponent to the public, though public documentation such as Environmental Impact Statements, is achieved;
- to optimise the opportunity for further industrial development in the area without an unacceptable degradation of the acoustic amenity of the area; and
- to fulfil a general aim of the environmental assessment process to minimise environmental impacts.

It should be noted that noise limits would apply to the contributed noise levels from only the premises or site of concern. In setting noise limits, judgement needs to be made as to whether the predicted noise levels warrant noise limits on the licence/consent. Where the predicted noise levels from the premises of concern are well below the project-specific noise levels, there may be no need for noise limit conditions.

Any tolerances to the predicted noise levels should be addressed in the proponent's assessment of impacts so that the predicted noise levels can be applied in conditions.

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