





| Report Title: Noise Assessment<br>Job Title: Bindaree Beef EIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                 |                          |                  |             |                 |         |             |                      |   |                   |                          |   |             |              |   |             |            |   |             |              |   |              |              |
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## EXECUTIVE SUMMARY

Vipac Engineers & Scientists Ltd (Vipac) was commissioned by Mitchel Hanlon Consulting Pty Ltd (Mitchel Hanlon) to prepare a noise impact assessment for the proposed bio-digestion plant at Bindaree Beef, Inverell, NSW. This report has assessed the noise levels from the existing and future operational activities of Bindaree Beef using approved methodologies and software in accordance to the NSW legislation and guidelines.

Noise monitoring was carried out at site to determine the existing noise environment near three sensitive receptors and to obtain sound pressure levels of the external noise sources at the plant. The background noise data obtained from site was used to determine the appropriate noise criteria for each sensitive receptor during the day time and night time period.

Three scenarios were modelled, the existing scenario, the existing scenario with construction works and the future scenario. Terrain and weather conditions were incorporated into the noise model to allow for more accurate prediction.

The predicted noise levels for the existing scenario correlated well to the background noise levels recorded at site, which provided confidence that the existing plant operations have been correctly modelled and analysed. The data showed that the difference in noise levels between the neutral weather conditions and the worst-case conditions is up to 6 dB(A) increase depending on the receptor distance from the source and topographical features between source and receptor. The noise levels during the daytime and night time periods for the existing scenario comply with the project specific criteria.

The construction of the new plant will occur during the daytime, whilst the existing plant will be operational. The predicted  $L_{Aeq, day}$  noise levels during the construction phase are predicted to comply with the relevant criteria at all sensitive receptors. The results evaluate that the highest noise level will be 42 dB(A) at 7360 Gwydir Highway during worst-case meteorological weather conditions, which comply with the 54 dB(A) criteria during the construction phase. A review of the data identified that the difference in noise levels between the neutral weather conditions and the worst-case conditions is 4-5 dB(A) increase depending on the receptor.

The future noise sources were modelled to represent operating hours of the plant. In addition, some existing noise sources were also modelled, specifically forklift and truck movements, dam pump, town water pump house, irrigation pump, manure store and cattle unloading activities. The predicted  $L_{Aeq, night}$  noise levels showed that the highest noise level will be 34 dB(A) at 7360 Gwydir Highway during worst-case meteorological weather conditions. These noise levels comply with the night time criterion of 41 dB(A) at night. The noise levels at each sensitive receptor are predicted to comply with the appropriate night time criteria with the future plant in operation.

A review of the data identified that the difference in noise levels between the neutral weather conditions and the worst-case conditions is up to 7 dB(A) increase depending on the receptor distance from the source and topographical features between source and receptor. The future  $L_{Amax}$  noise levels are well below the night time criteria are not expected to cause sleep disturbance.

Whilst all the criteria are met for all scenarios, the difference between the existing and future operations of the plant will become less audible for some sensitive receptors and more audible for other sensitive receptors. This change is due to the noise sources moving away from the main road and closer to different sensitive receptors. The greatest change in noise level is 10 dB(A) increase at 60 Ditzells during worst case weather conditions, whilst a reduction of 10 dB(A) in noise level is predicted to occur at 221 Copeton Dam Road during neutral and worst-case weather conditions.

Overall, the noise levels from the future plant may increase at some receptors, however due to distances involved; this increase is unlikely to be intrusive. The ambient noise environment is dominated by a range of farming related activities, insects, birdsong or traffic. These sources are likely to continue being the dominant noise sources for the majority of the sensitive receptors.

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## 1 INTRODUCTION

Vipac Engineers & Scientists Ltd (Vipac) was commissioned by Mitchel Hanlon Consulting Pty Ltd (Mitchel Hanlon) to prepare a noise impact assessment for the proposed bio-digestion plant at Bindaree Beef, Inverell, NSW.

The purpose of this report is to evaluate the potential impacts of noise generated from various activities associated with the bio-digestion plant and to provide recommendations to mitigate and minimise any potential impacts that might have an effect on the surrounding community.

## 2 PROJECT DESCRIPTION

### 2.1 Overview

Bindaree Beef is one of Australia's largest meat processors and a prominent leader in the Australian meat industry. Located west of Inverell in northern NSW, the plant is capable of processing 1,100 cattle per day.

Currently Bindaree Beef annually emits approximately 29,000 tonnes of carbon from the burning of coal and the releasing of bio-gas from an uncovered anaerobic lagoon. With the introduction from 1 July 2012 of the carbon pricing regime by the Australian Federal Government, Bindaree Beef has become liable for a significant additional annual expense through carbon taxes. As a result, Bindaree Beef have sought funding for a new rendering plant and bio-digester plant.

The bio-digester generates bio-gas from waste product and effluent, utilising this gas for creating energy. This process eliminates the need for coal and reduces electricity needs. The net result is zero discharge of waste, improved environmental outcomes and a significant reduction in carbon emissions.

Inverell has a favourable strategic position as a livestock and freight hub. There is also a need to create process efficiencies that support future processing of meat packaged for the domestic and international markets. The facility includes:

- Unloading yards and holding pens;
- Boning rooms;
- A rendering plant for processing animal by-products into tallow and meat/blood/bone meal;
- Cold storage and freezer areas;
- Slaughter floor;
- Workshops;
- Boiler;
- Car parking; and
- Administration buildings.

### 2.2 Site Location

Bindaree Beef is located approximately 3 km west of the township of Inverell in northern NSW within the Inverell Shire Council local government area. The area of the abattoir and surrounding holding pens is 143 ha, whilst the adjoining farm "Alsace" is 491 ha which is also owned by Bindaree Beef.

Figure 2-1 provides a locality plan of the existing Bindaree Beef abattoir site.

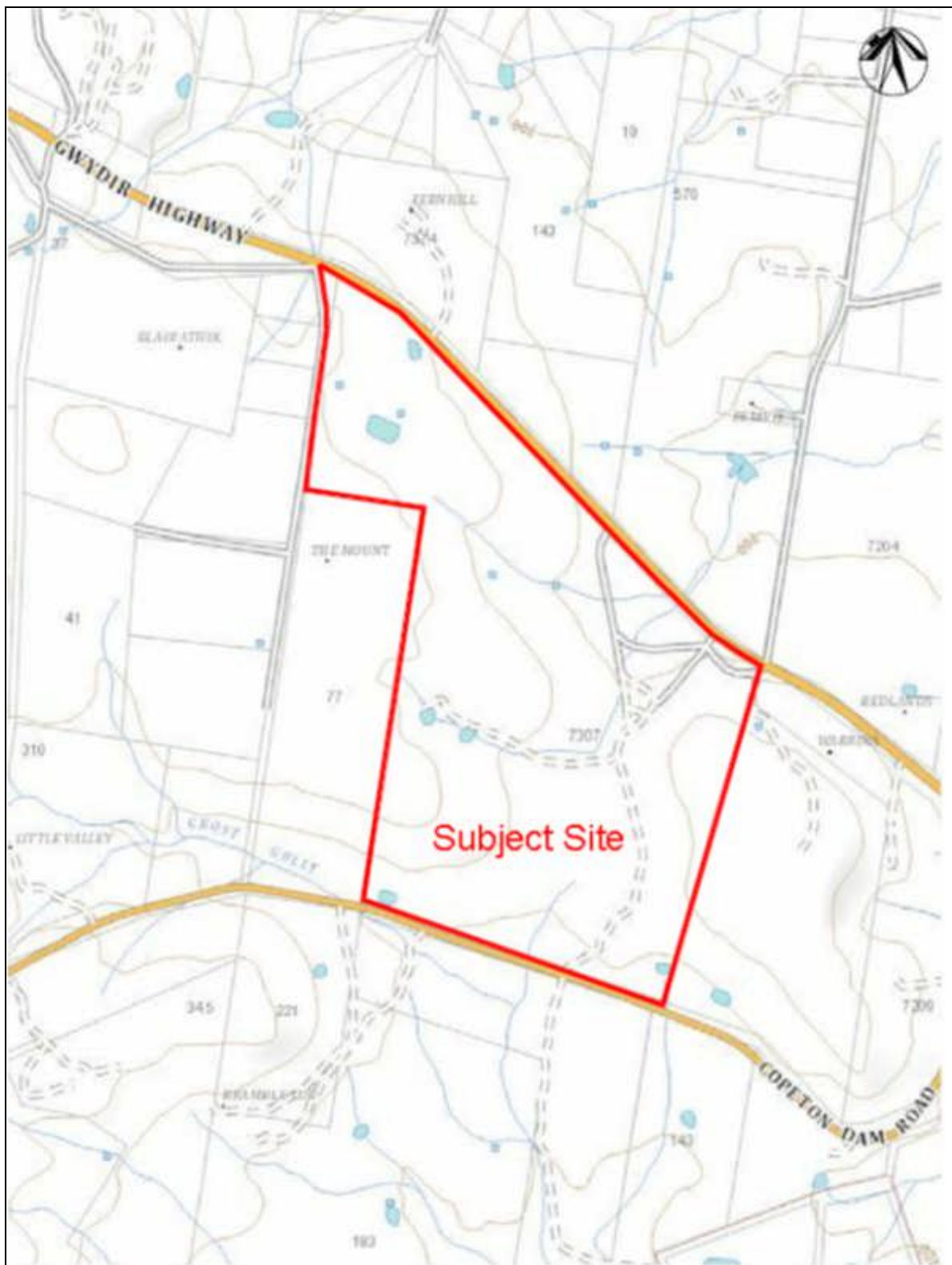


Figure 2-1: Site Location

## 2.3 Sensitive Receptors

Bindaree Beef is largely surrounded by rural land, with a number of smaller rural holdings to the western side of the subject property on McNeils Lane and Wattle Hill Road. The Department of Environment and Climate Change has a depot approximately 2.3 km to the east of the subject site along Gwydir Highway.

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The sensitive receptors, of which the majority are residential premises, within the vicinity of Bindaree Beef are detailed in Table 2-1 and Figure 2-2.

Table 2-1: Sensitive Receptors

| Receptor ID | Address                           | Coordinates    |                 |
|-------------|-----------------------------------|----------------|-----------------|
|             |                                   | Eastern (m)    | Northing (m)    |
| 1           | 13 Blair Athol Road, Inverell     | X = 311270.583 | Y = 6706637.968 |
| 2           | 37 Blair Athol Road, Inverell     | X = 311040.514 | Y = 6706528.987 |
| 3           | 32 McNeils Road, Inverell         | X = 311284.225 | Y = 6706407.975 |
| 4           | 42 McNeils Road, Inverell         | X = 311310.783 | Y = 6706272.626 |
| 5           | 42 Wattle Hill Road, Inverell     | X = 310822.567 | Y = 6706313.386 |
| 6           | 41 Wattle Hill Road, Inverell     | X = 310888.276 | Y = 6706051.444 |
| 7           | 11 Wattle Hill Road, Inverell     | X = 311230.191 | Y = 6705958.655 |
| 8           | 77 McNeils Road, Inverell         | X = 311461.410 | Y = 6705981.216 |
| 9           | 118 McNeils Road, Inverell        | X = 311229.395 | Y = 6705537.167 |
| 10          | 345 Copeton Dam Road, Inverell    | X = 310829.873 | Y = 6704599.897 |
| 11          | 221 Copeton Dam Road, Inverell    | X = 311196.270 | Y = 6704598.408 |
| 12          | 183 Copeton Dam Road, Inverell    | X = 311314.866 | Y = 6704528.071 |
| 13          | 216 Minnamurra Road, Auburn Vale  | X = 310853.029 | Y = 6702332.683 |
| 14          | 226 Minnamurra Road, Auburn Vale  | X = 310794.400 | Y = 6701946.583 |
| 15          | 209 Minnamurra Road, Auburn Vale  | X = 311134.961 | Y = 6701697.842 |
| 16          | 98 Minnamurra Road, Auburn Vale   | X = 312298.545 | Y = 6702236.813 |
| 17          | 71 Minnamurra Road, Auburn Vale   | X = 312319.783 | Y = 6701987.783 |
| 18          | 67 Minnamurra Road, Auburn Vale   | X = 312460.018 | Y = 6701956.946 |
| 19          | 54 Minnamurra Road, Auburn Vale   | X = 312619.845 | Y = 6702038.075 |
| 20          | 55 Minnamurra Road, Auburn Vale   | X = 312654.556 | Y = 6701920.399 |
| 21          | 31 Minnamurra Road, Auburn Vale   | X = 312915.288 | Y = 6701842.248 |
| 22          | 51 Penola Lane, Auburn Vale       | X = 313089.977 | Y = 6702409.394 |
| 23          | 24 Penola Lane, Auburn Vale       | X = 313160.733 | Y = 6702190.055 |
| 24          | 448 Auburn Vale Road, Auburn Vale | X = 313370.017 | Y = 6702040.512 |
| 25          | 391 Auburn Vale Road, Inverell    | X = 313962.229 | Y = 6702024.471 |
| 26          | 390 Auburn Vale Road, Auburn Vale | X = 313898.406 | Y = 6702217.699 |
| 27          | 396 Auburn Vale Road, Auburn Vale | X = 313531.736 | Y = 6702753.455 |
| 28          | 60 Kerri Road, Inverell           | X = 313505.901 | Y = 6704318.198 |
| 29          | 36 Kerri Road, Inverell           | X = 313332.003 | Y = 6704562.305 |
| 30          | 95 Copeton Dam Road, Inverell     | X = 312791.864 | Y = 6704488.767 |
| 31          | 143 Copeton Dam Road, Inverell    | X = 312441.824 | Y = 6704749.017 |
| 32          | 7209 Gwydir Highway, Inverell     | X = 312908.393 | Y = 6704981.403 |
| 33          | 7186 Gwydir Highway, Inverell     | X = 313253.011 | Y = 6705503.645 |
| 34          | 7204 Gwydir Highway, Inverell     | X = 312981.629 | Y = 6705554.447 |
| 35          | 44 Copeton Dam Road, Inverell     | X = 312932.610 | Y = 6705242.324 |
| 36          | 84 Ditzells Drive, Inverell       | X = 313655.529 | Y = 6706809.434 |
| 37          | 76 Ditzells Drive, Inverell       | X = 313560.853 | Y = 6706761.091 |
| 38          | 64 Ditzells Drive, Inverell       | X = 313472.864 | Y = 6706706.530 |
| 39          | 60 Ditzells Drive, Inverell       | X = 313434.607 | Y = 6706533.377 |
| 40          | 35 Ditzells Drive, Inverell       | X = 313104.644 | Y = 6706828.591 |
| 41          | 581 Fernhill Road, Inverell       | X = 312795.227 | Y = 6706550.574 |
| 42          | 7360 Gwydir Highway, Inverell     | X = 311909.053 | Y = 6706487.525 |
| 43          | 7374 Gwydir Highway, Inverell     | X = 311642.738 | Y = 6706867.527 |
| 44          | 22 McNeils Road, Inverell         | X = 311344.576 | Y = 6706525.985 |

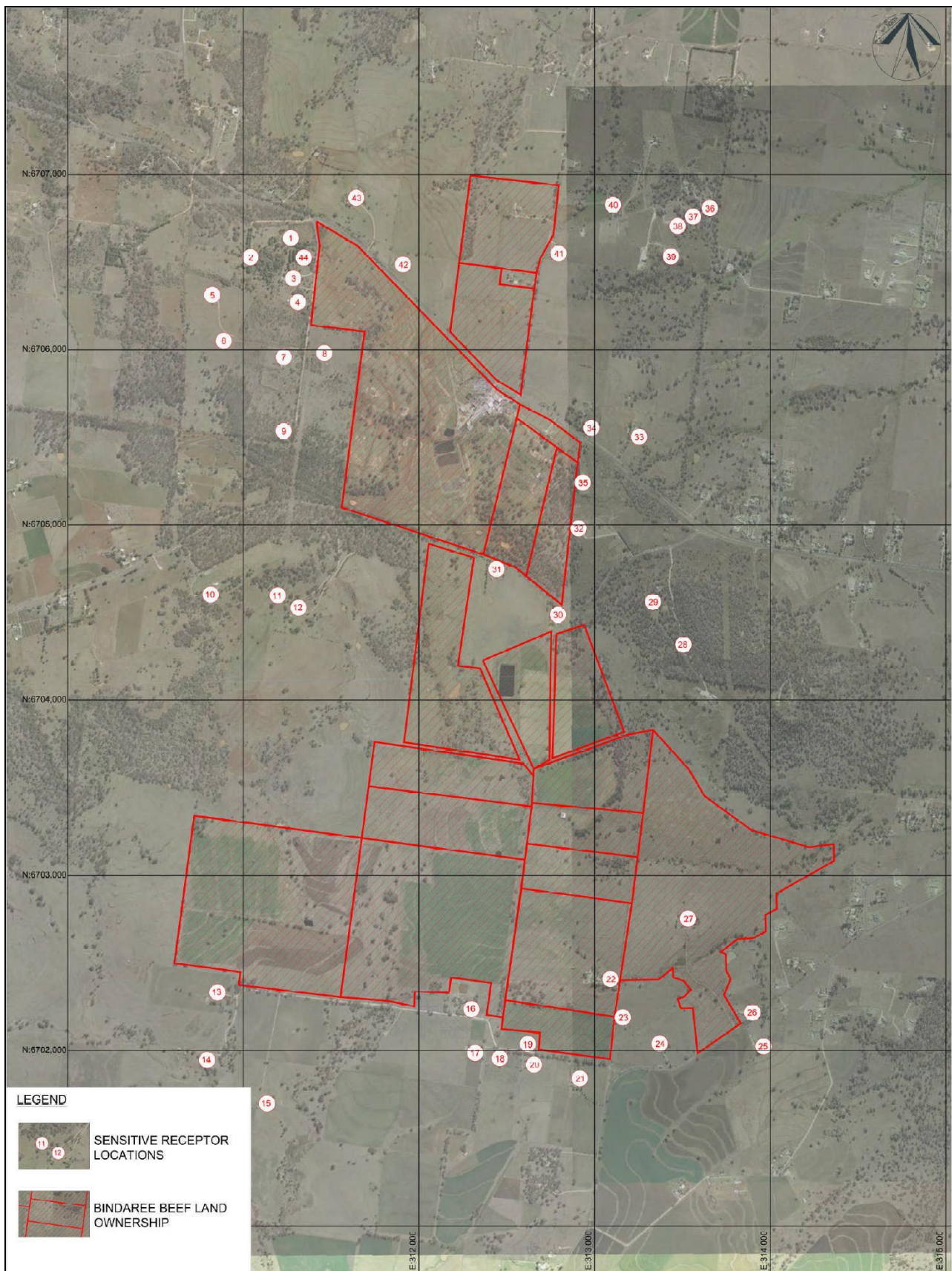


Figure 2-2: Sensitive Receptor Map [Mitchel Hanlon]

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## 2.4 Existing Operations

The current waste processing process at Bindaree Beef involves:

- Waste effluent travels through a trommel and flotation tank before entering an anaerobic lagoon and irrigated onto land;
- Paunch material is separated at trommel and trucked to the farm as land fill;
- Steam (for render cooking and heating) is produced by two coal-fired boilers; and
- All animal by-products from the processing areas are cooked up in two cookers using steam generated by the coal fired boiler, flowing into four meal presses. From here it is loaded out as meat meal or tallow.

## 2.5 Proposed operations

In its simplest form, the Bindaree Beef project will comprise:

- New, highly effective wastewater treatment system that will produce biogas, low strength effluent and solid fertiliser;
- Biogas utilisation system that will generate power and steam for onsite use; and
- New state-of-the-art energy efficient render plant that will use less electricity and steam.

There will be no modifications to how the cattle are processed, apart from the wastewater (red and green stream waste) being redirected to the bio-digester. The waste streams are:

- Paunch and manure (green waste stream);
- Inedible animal by-products; and
- Blood and wash down water (red waste stream).

The Project will have a significant impact on the manufacturing process by transforming what were previously considered waste products into new energy sources. This Project will reduce the taxable carbon footprint (coal and wastewater emissions) by 95% and will reduce the overall emissions by 61%. It will also dramatically reduce the abattoir's operating costs while generating new sources of income.

Figure 2-3 shows the waste generated from the manufacturing operations at Bindaree Beef.

## 2.6 Bio-digester Plant

All Bindaree Beef's red and green waste streams will be diverted from high-emitting anaerobic lagoons into an on-site state-of-the-art anaerobic Mesophilic Bio-digester. The process will have zero discharge within a "closed loop" system. The Bio-digester will be installed near the current processing plant. All waste effluent (red stream, green stream, paunch and cattle yards material) will be directed through the digester process. All emissions (biogas) will be captured and stored in domes for use. Biogas from the bio-digester will be used to run boilers to create hot water and steam, for use within the rendering plant. Biogas will also be used to generate electricity to power the bio-digester. The switch to renewable energy generated by the bio-digester means the abattoir will eliminate 100% of the current 7,200 tonnes of coal needed to fire the render plant boilers.

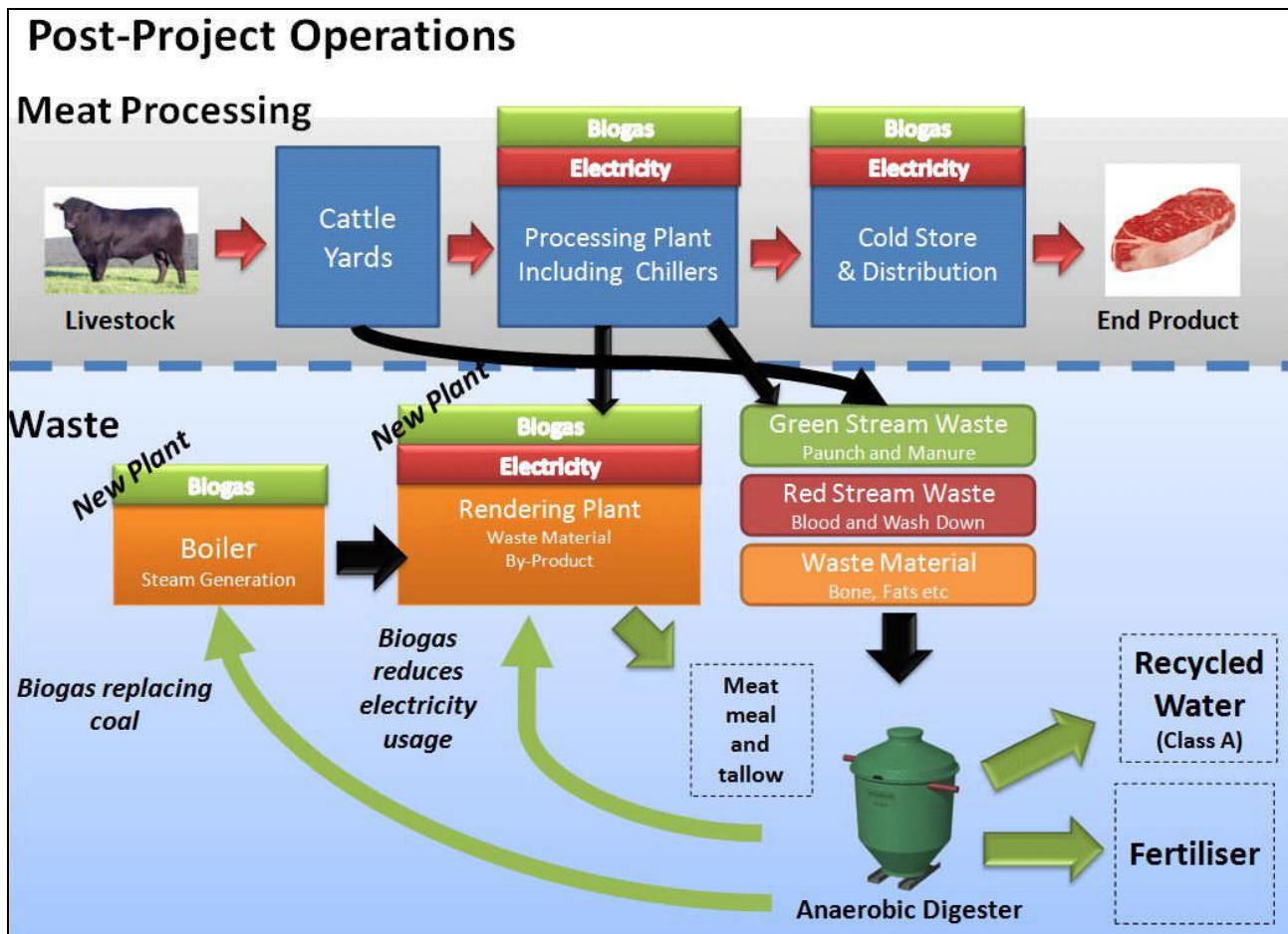


Figure 2-3: Waste Streams from the Proposed Operations

Figure 2-4 shows the proposed layout for the new rendering plant and bio-digester plant, displayed in orange.

## 2.7 Biogas Storage

The bio-digester plant will store gas in a standalone biogas storage holder. The storage holder comprises and outer membrane designed to provide protection against external climatic loads and an inner membrane separated by a pressurised air space between them. The inner membrane is free to inflate and deflate, depending on the amount of gas stored, however the outer membrane at all times remains fully inflated. The pressurised airspace between the membranes allows the gas stored in the tank to vary while providing a consistent positive pressure on the stored gas.

At full storage capacity will be approximately 9,000 m<sup>3</sup> of Biogas with a methane content of approximately 65%-70%. The storage will generally be at full capacity at the beginning of the week and will decrease in volume towards the end of the week then return to full capacity over the weekend.



Figure 2-4: Site Layout [MEATENG Drawing Number P115 dated Feb 2014]

## 2.8 Rendering Plant

A rendering plant processes inedible cattle by-products from the abattoir and converts this waste material into tallow and meat meal products. The rendering plant will be upgraded to the latest energy efficient technology that is more efficient in the use of electricity and generation of steam. The building will be fully enclosed, well ventilated with point source extraction for odour control. The rendering plant will have three separate process areas:

- Raw material receipt;
- Wet area for cooking and pressing; and
- Dry product and storage areas.

An integral part of the new rendering plant is the use of renewable energy source (methane gas from the bio-digester plant) as a fuel source for the steam boilers. The existing plant has two coal fired boilers for generating steam, primarily for heating the continuous cookers. The proposed render plant has reduced thermal loading and will rely upon steam generated by a single Bio-gas fired boiler. There will be no operational down time with the commissioning of the new plant as the existing plant will continue to operate in the interim.

### 3 REGULATORY FRAMEWORK

#### 3.1 Overview

The following section discusses the relevant noise and vibration criteria applicable in New South Wales. The relevant Environmental Protection Authority (EPA) legislation and guidelines relevant to this assessment are:

- Industrial Noise Policy (INP) (published in 2000);
- Interim Construction Noise Guidelines (published in 2009);
- Environmental Criteria for Road Traffic Noise (published in 1999); and
- Assessing Vibration: A Technical Guideline (published by DEC in 2006).

Vibration is not an issue at Bindaree Beef due to the type of development and therefore will not be assessed.

#### 3.2 Construction Noise

The Interim Construction Noise Guidelines provide the recommended standard hours for construction work are:

- Monday to Friday – 07:00-18:00 hours
- Saturday – 08:00-13:00
- No work on Sundays or public holidays.

There are some situations, such as delivery of oversized plant or structures, where construction work may need to be undertaken outside of these hours.

Table 3-1 sets out management levels for noise at residences and how they are to be applied. Restrictions to the hours of construction may apply to activities that generate noise at residences above the 'highly noise affected' noise management level.

In Table 3-1 the Rating Background Level (RBL) is used when determining the management level. The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the NSW Industrial Noise Policy (EPA 2000).

As stated in the Interim Construction Noise Guidelines, the difference between the internal noise level and the external noise level is typically 10 dB with windows open for adequate ventilation.

Table 3-1: Noise Criteria during Construction [Interim Construction Noise Guidelines, 2009]

| Time of Day                        | Management Level<br>( $L_{Aeq,15\text{ min}}$ )* | Comments                                                                                                                                                                               |
|------------------------------------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Recommended Standard Hours         | Noise affected<br>RBL +10 dB                     | Noise affected level represents the point above which there may be some community reaction to noise.                                                                                   |
|                                    | Highly noise affected<br>75 dB                   | The highly affected level represents the point above which there may be strong community reaction to noise.                                                                            |
| Outside Recommended Standard Hours | Noise affected<br>RBL +5 dB                      | A strong justification would be required for works outside of recommended standard hours. All feasible and practicable work practices should be used to meet the noise affected level. |

\* Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence.

### 3.3 Operational Noise – Industrial Noise Policy

The Industrial Noise Policy sets two separate noise criteria to meet environmental noise objectives: one to account for intrusive noise and the other to protect the amenity of particular land uses. Both criteria are applicable to this development. The lowest of the two noise levels are adopted as the final criterion, as discussed in Section 5.4.

#### 3.3.1 Intrusiveness Criteria

The intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the  $L_{Aeq}$  descriptor), measured over a 15-minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB.

To account for the temporal variation of background noise levels, the INP recommends the background noise level (rating background level—RBL) to be used in the assessment. This approach aims to result in the intrusive noise criterion being met for at least 90% of the time periods over which annoyance reactions can occur (taken to be periods of 15 minutes).

The intrusiveness criterion is summarised as follows:

$$L_{Aeq, 15 \text{ minute}} \leq \text{rating background level plus 5 dB}$$

#### 3.3.2 Protecting Noise Amenity

To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 3-2. Meeting the acceptable noise levels in Table 3-2 will protect against noise impacts such as speech interference, community annoyance and, to some extent, sleep disturbance.

Table 3-2: Amenity Criteria [NSW Industrial Noise Policy]

| Type of Receiver    | Time of Day           | Recommended $L_{Aeq}$ Noise Level (dB) |         |
|---------------------|-----------------------|----------------------------------------|---------|
|                     |                       | Acceptable                             | Maximum |
| Residence (Rural)   | Day (7am to 6pm)      | 50                                     | 55      |
|                     | Evening (6pm to 10pm) | 45                                     | 50      |
|                     | Night (10pm to 7am)   | 40                                     | 45      |
| Commercial Premises | When in Use           | 65                                     | 70      |
| Industrial Premises | When in Use           | 70                                     | 75      |

### 3.4 Sleep Disturbance

Peak noise level events, such as reversing beepers, truck pass-bys etc. have the potential to cause sleep disturbance. The INP does not specifically address sleep disturbance from high noise level events, a review of sleep disturbance was carried out in the ‘Environmental Criteria for Road Traffic Noise’ (NSW EPA, 1999).

The EPA recognises that the sleep disturbance criterion of an  $L_{A1, (1 \text{ minute})}$  not exceeding the  $L_{A90, (15 \text{ minute})}$  by more than 15 dB(A) is not ideal, however the methodology is accepted by the EPA as a means to determine 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.

### 3.5 Designated Buffer

Under the Inverell Local Environmental Plan 2012 (LEP 2012) the site is zoned with a designated buffer area. This buffer is primarily to protect the operational environment of a livestock processing industry, a stock and sale yard, a sewage treatment plant and a waste or resource management facilities in Inverell. Any development application within this buffer has to take noise impacts of the development into consideration. Figure 3-1 shows the “designated buffer map”.

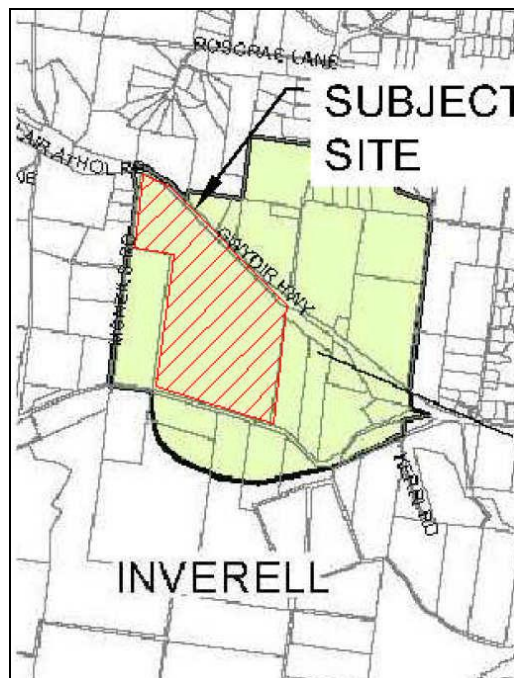


Figure 3-1: Buffer around the Site

## 4 METHODOLOGY

This section outlines the general methodologies for the fieldwork, noise monitoring data analysis and noise prediction used for this assessment. The flow diagram shows the main stages and inputs required to carry out this assessment.

Due to the changes in topography of the area, the terrain will influence the geographical propagation of noise. Detailed topographical data was provided by Mitchel Hanlon and incorporated into the noise model.

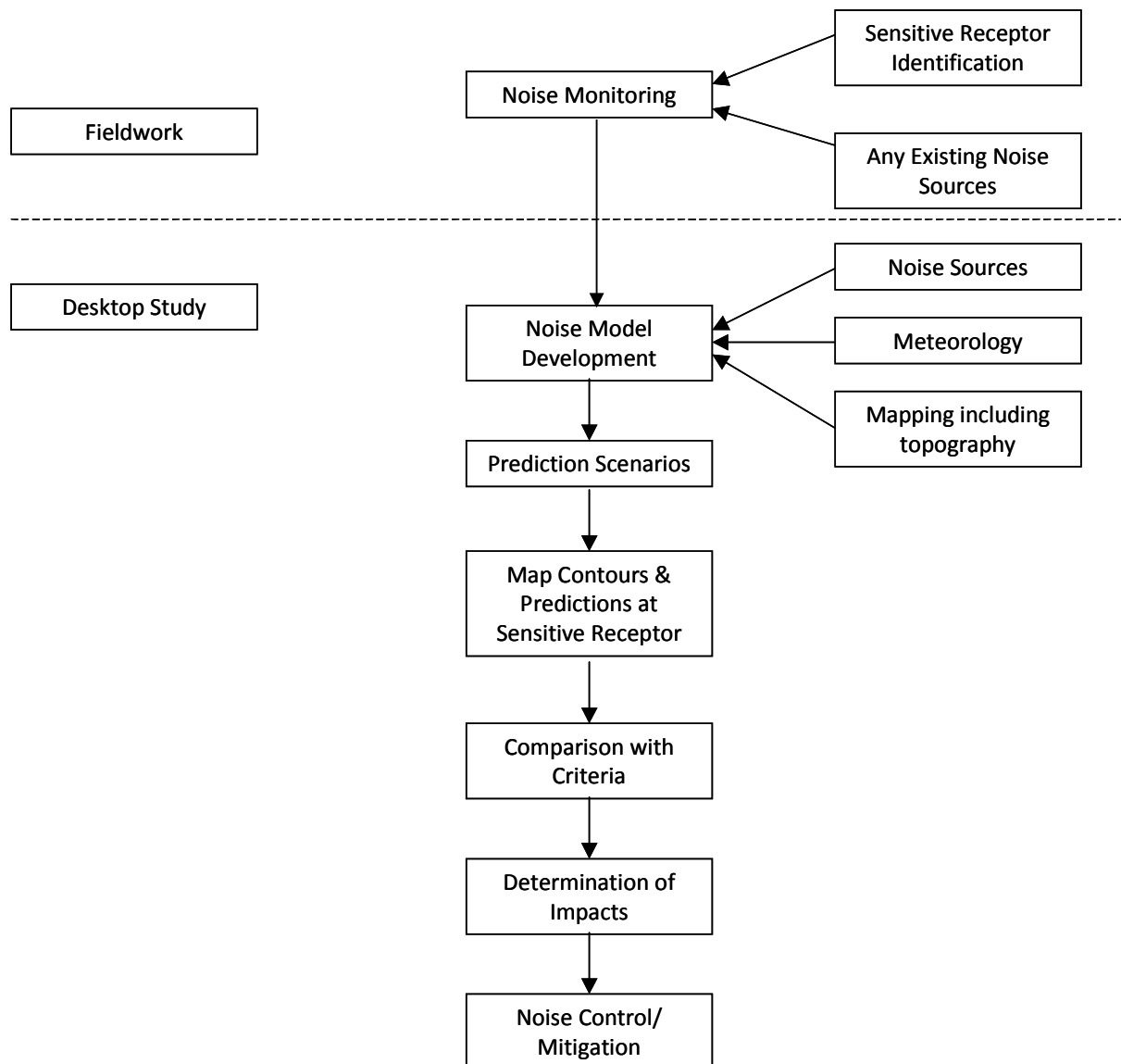


Figure 4-1: Main Stages and Inputs Required for Noise Assessment

#### 4.1 Fieldwork Methodology

The fieldwork has been carried out in compliance with the following standards and guidance documents:

- Australian Standard AS 1055-1997 *Acoustics — Description and Measurement of Environmental Noise. Parts 1-3*. Standards Australia; NSW.
- Environmental Protection Agency. (2000). *NSW Industrial Noise Policy*. EPA; Sydney.

The fieldwork was conducted to determine the audible noise sources on site based on inspections and to measure the existing background noise environment to determine the applicable noise limits for the project.

Noise monitoring locations, dates deployed and duration as well as calibration information is documented in Appendix C.

#### 4.2 Noise Prediction Software & Methodology

The prediction of noise emissions in the environment requires the definition of each noise source. The noise propagation is calculated for a number of environmental parameters:

- Geometric spreading; this refers to the distribution of the acoustic energy over a larger area as the distance from the noise source increase, resulting in a noise reduction.
- Obstacles such as enclosures, barriers, and buildings;
- Meteorological conditions such as air absorption, wind effects and temperature gradient effects; and
- Ground effects; such as the sound absorption of the terrain.

SoundPLAN noise modelling software has been used for this analysis; the CONCAWE noise prediction methodology was used.

The CONCAWE method was originally developed for predicting the long-distance propagation of noise from petrochemical complexes in the United Kingdom. It is especially suited to predicting noise propagation over large distances as it accounts for a range of atmospheric conditions that can significantly influence the propagation of noise over large distances.

The noise modelling software and methodology is approved by NSW for noise prediction purposes.

#### 4.3 Local Meteorology

Noise propagation over long distances can be significantly affected by the weather conditions, mainly source-to-receiver winds and temperature inversions as both these conditions can enhance noise levels at sensitive receivers.

The NSW Industrial Noise Policy identifies the default meteorological parameters for temperature inversions and wind speed which should be applied to the noise model. Additionally, the NSW Industrial Noise Policy outlines the weather analysis procedures that may be used to determine if the weather conditions at the project area can be categorised as a 'feature' that will enhance noise propagation.

In order to determine the frequency of inversions and wind speed, the weather conditions at the proposed Project site have been obtained from The Air Pollution Model (TAPM). TAPM is a three-dimensional prognostic model developed and verified by Commonwealth Scientific and Industrial Research Organisation (CSIRO). It uses land use and terrain data from CSIRO and detailed

meteorological data from the Bureau of Meteorology (BOM) to produce complex wind fields that account for large and short scale meteorological effects.

#### 4.3.1 Temperature Inversions

A temperature inversion is a reversal of the normal behaviour of temperature in the troposphere (the region of the atmosphere nearest the Earth's surface), in which a layer of warmer air overlies a layer of cool air at the surface (under normal conditions air temperature usually decreases with height). Under conditions of a temperature inversion (temperature increasing with increasing height), sound waves will be refracted downwards, and therefore may be heard over larger distances.

The Pasquill-Gifford Stability Classes define the amount of turbulence in the air; the most widely used categories are Classes A-F. Table 4-1 details the stability class, atmospheric classification and the weather conditions required for the class to occur.

Table 4-1: Pasquill-Gifford Stability Class Definitions

| Stability Class | Atmospheric Classification | Weather Conditions Required                               |
|-----------------|----------------------------|-----------------------------------------------------------|
| A               | Very unstable              | Sunny with light winds when dispersion is most rapid      |
| B               | Unstable                   | Intermediate weather conditions                           |
| C               | Slightly Unstable          |                                                           |
| D               | Neutral                    | Windy/overcast when dispersion is moderately rapid        |
| E               | Slightly stable            | Intermediate weather conditions                           |
| F               | Stable                     | Occurs at night when winds are light and the sky is clear |

According to the NSW Industrial Noise Policy, and the criteria for temperature inversions, they only occur during Stability Class F, in non-arid areas such as Inverell where annual average rainfall is greater than 500 mm.

The TAPM generated meteorology determined the stability class for each hour of the year; the frequency of each stability class occurrence is shown in Table 4-2.

The NSW Industrial Noise Policy identifies that temperature inversions are a 'feature' if they occur for 30% of the night-time hours during the winter months. Detailed analysis of the conditions at the Project site identify that temperature inversions occur for more than 30% of the night-time hours during the winter months for all years except 2005, therefore inversions were considered for prevailing and worst-case weather conditions for the noise predictions.

Table 4-2: Frequency of Occurrence for Each Stability Class for 2002-2006 [TAPM]

| Year | Stability Class Classification | Annual (All Hours) |            | Winter (Night Time Only) |            |
|------|--------------------------------|--------------------|------------|--------------------------|------------|
|      |                                | Hours              | Percentage | Hours                    | Percentage |
| 2002 | A                              | 0                  | 0.00%      | 0                        | 0          |
|      | B                              | 305                | 3.48%      | 0                        | 0          |
|      | C                              | 1373               | 15.67%     | 0                        | 0          |
|      | D                              | 4322               | 49.34%     | 235                      | 19.65      |
|      | E                              | 1793               | 20.47%     | 584                      | 48.83      |
|      | F                              | 967                | 11.04%     | 377                      | 31.52      |
|      | <b>Total</b>                   | <b>8,760</b>       | <b>100</b> | <b>1,196</b>             | <b>100</b> |
| 2003 | A                              | 3                  | 0.03%      | 0                        | 0          |
|      | B                              | 382                | 4.36%      | 0                        | 0          |
|      | C                              | 1356               | 15.48%     | 0                        | 0          |
|      | D                              | 4245               | 48.46%     | 265                      | 22.16      |
|      | E                              | 1714               | 19.57%     | 547                      | 45.74      |
|      | F                              | 1060               | 12.10%     | 384                      | 32.11      |
|      | <b>Total</b>                   | <b>8,760</b>       | <b>100</b> | <b>1,196</b>             | <b>100</b> |
| 2004 | A                              | 0                  | 0.00%      | 0                        | 0          |
|      | B                              | 312                | 3.56%      | 0                        | 0          |
|      | C                              | 1398               | 15.96%     | 0                        | 0          |
|      | D                              | 4043               | 46.15%     | 198                      | 16.56      |
|      | E                              | 1884               | 21.51%     | 587                      | 49.08      |
|      | F                              | 1123               | 12.82%     | 411                      | 34.36      |
|      | <b>Total</b>                   | <b>8,760</b>       | <b>100</b> | <b>1,196</b>             | <b>100</b> |
| 2005 | A                              | 0                  | 0.00%      | 0                        | 0          |
|      | B                              | 283                | 3.23%      | 0                        | 0          |
|      | C                              | 1303               | 14.87%     | 0                        | 0          |
|      | D                              | 4467               | 50.99%     | 343                      | 28.68      |
|      | E                              | 1679               | 19.17%     | 529                      | 44.23      |
|      | F                              | 1028               | 11.74%     | 324                      | 27.09      |
|      | <b>Total</b>                   | <b>8,760</b>       | <b>100</b> | <b>1,196</b>             | <b>100</b> |
| 2006 | A                              | 0                  | 0.00%      | 0                        | 0          |
|      | B                              | 391                | 4.46       | 0                        | 0          |
|      | C                              | 1,339              | 15.29      | 0                        | 0          |
|      | D                              | 3,975              | 45.38      | 265                      | 22.16      |
|      | E                              | 2,091              | 23.87      | 516                      | 43.14      |
|      | F                              | 964                | 11.00      | 415                      | 34.70      |
|      | <b>Total</b>                   | <b>8,760</b>       | <b>100</b> | <b>1,196</b>             | <b>100</b> |

#### 4.3.2 Wind Speed

Wind alters sound propagation by the mechanism of refraction (wind bends sound waves). Wind nearer to the ground moves more slowly than wind at higher altitudes, due to surface characteristics such as hills, trees, and man-made structures that interfere with the wind. This wind gradient, with faster wind at higher elevation and slower wind at lower elevation causes sound waves to bend downward when they are traveling to a location downwind of the source and to bend upward when traveling toward a location upwind of the source. Waves bending downward means that noise sources are louder downwind and quieter upwind of a noise source.

The prevailing wind directions to be used in the noise model were determined in accordance with the NSW Industrial Noise Policy that defines a 'wind feature' to be where source-to-receiver wind speeds

of 3 m/s or below occur for 30% of the time in any assessment period (day/evening/night) in any season.

The wind roses for each season and for the whole year are displayed in Appendix B and show that wind speeds do not occur at or below 3 m/s for 30% of any season or assessment period between any sources to receiver.

Figure 4-2 shows the site specific wind rose for 2002-2006. The ENE and NE dominant wind directions are clearly visible. The most common wind speed at Bindaree Beef is 5-8 m/s. The wind characteristics for 2002-2006 have been analysed and taken into account in the noise modelling, as discussed in Section 6.

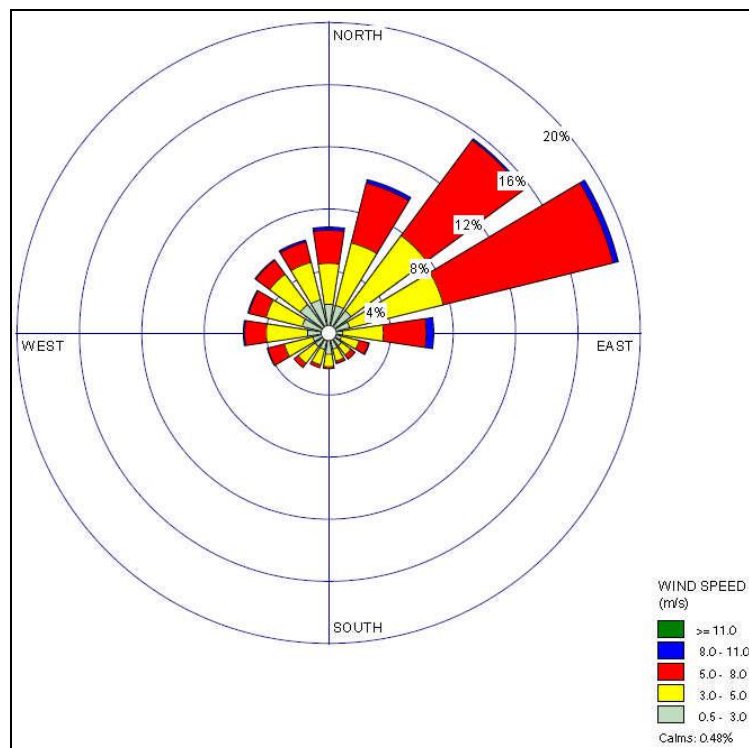


Figure 4-2: Site Specific Annual Wind Rose 2002-2006 [TAPM]

## 4.4 Modelling Details

### 4.4.1 Modelling Scenarios

In order to determine the impact of the new facility at the nearest sensitive receptors, the existing noise environment from the plant at each receptor needs to be modelled and validated against noise monitoring data. The following scenarios were modelled:

- Existing operations of the plant as determined by a site visit on 10<sup>th</sup> October 2013. This scenario is also considered representative of current background noise levels as measured at the noise monitoring locations;
- Construction activities undertaken during the construction of the proposed plant. The construction activities will be carried out during the current operations but will be temporary in duration; and
- Future operations of the plant.

#### 4.4.2 Noise Sources

The significant operational noise sources used for this assessment are identified in Table 4-3. The noise sources have been obtained from:

- Noise measurements undertaken at the Bindaree Beef on the 10<sup>th</sup> October and 18<sup>th</sup> October 2013;
- Vipac's own database of onsite measurements during previous projects;
- Australian Standard AS 2436 (2010) '*Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Site*'; and
- British Standard BS 5228:1 (2009) '*Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise*'.

#### Scenario 1 Noise Sources

Noise measurements carried out on site. A map of the locations is shown in Appendix D.

#### Scenario 2 Noise Sources

The construction noise sources (Modelling Scenario 2) are typical of the plant used on a construction project of this size. The sources were obtained from the British Standard (and reprinted in the Australian Standard). The British Standard collates a large database of on-site noise levels from numerous construction sites across the United Kingdom. It is considered a useful reference for construction noise levels in lieu of manufacturer's specific data.

The noise levels identified in Table 4-3 are the external noise sources from the existing or future plant. The data measured by Vipac is presented in octave bands, allowing the identification of low or high frequency components of each source to be taken into account in the noise model. For example low frequencies travel further than high frequencies as high frequencies receive more attenuation from air absorption than low frequencies.



Table 4-3: Sound Power Levels for Significant Noise Sources

| Location/Plant                                    | Modelling Scenario | Frequency (Hz) |        |        |        |       |       |       |       |        | Sound Power Level<br>$L_{Aeq}$<br>dB(A) | Sound Power Level<br>$L_{Amax}$<br>dB(A) | Data Source       |
|---------------------------------------------------|--------------------|----------------|--------|--------|--------|-------|-------|-------|-------|--------|-----------------------------------------|------------------------------------------|-------------------|
|                                                   |                    | 63 Hz          | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | 8 kHz | 16 kHz |                                         |                                          |                   |
| Pump Out Dam Pump                                 | 1, 2 and 3         | 66             | 70     | 81     | 80     | 74    | 71    | 75    | 71    | 73     | 88                                      | 89                                       | Site Measurements |
| Map Room Fan                                      | 1 and 2            | 76             | 83     | 86     | 90     | 82    | 77    | 73    | 67    | 59     | 93                                      | 94                                       | Site Measurements |
| Boiler Fan                                        | 1 and 2            | 93             | 95     | 91     | 88     | 85    | 80    | 76    | 71    | 62     | 95                                      | 97                                       | Site Measurements |
| Ash Pile Conveyor                                 | 1 and 2            | 77             | 73     | 71     | 66     | 61    | 59    | 58    | 57    | 50     | 73                                      | 76                                       | Site Measurements |
| Floatation Tank (ARK) Pump                        | 1 and 2            | 75             | 74     | 84     | 79     | 78    | 83    | 82    | 86    | 85     | 94                                      | 97                                       | Site Measurements |
| Cooker Extractor Fan                              | 1 and 2            | 76             | 79     | 107    | 96     | 88    | 82    | 85    | 86    | 81     | 102                                     | 105                                      | Site Measurements |
| Savéall Water Flow And Pump                       | 1 and 2            | 88             | 84     | 91     | 88     | 85    | 80    | 78    | 75    | 72     | 95                                      | 99                                       | Site Measurements |
| Engine Room Pump - External                       | 1 and 2            | 87             | 94     | 95     | 99     | 94    | 91    | 85    | 83    | 77     | 106                                     | 108                                      | Site Measurements |
| Engine Room Pump - External                       | 1 and 2            | 88             | 92     | 96     | 101    | 99    | 92    | 86    | 81    | 72     | 195                                     | 112                                      | Site Measurements |
| Slaughter House - External                        | 1 and 2            | 87             | 85     | 84     | 89     | 87    | 87    | 84    | 79    | 73     | 182                                     | 104                                      | Site Measurements |
| Manure Store (Forklift/Loader)                    | 1, 2 and 3         | 100            | 89     | 91     | 96     | 93    | 90    | 87    | 82    | 71     | 102                                     | 110                                      | Site Measurements |
| Town Water Pump House - External                  | 1, 2 and 3         | 72             | 65     | 68     | 66     | 62    | 64    | 63    | 53    | 43     | 75                                      | 78                                       | Site Measurements |
| Cattle Unloading - B-Double                       | 1, 2 and 3         | 94             | 89     | 89     | 89     | 87    | 83    | 81    | 78    | 75     | 97                                      | 114                                      | Site Measurements |
| Forklift Truck                                    | 1, 2 and 3         | 63             | 78     | 72     | 69     | 76    | 67    | 63    | 59    | 53     | 82                                      | 95                                       | Vipac Database    |
| Irrigation Pump (4 in)                            | 1, 2 and 3         | 129            | 118    | 97     | 85     | 82    | 82    | 77    | 75    | -      | 105                                     | 110                                      | BS 5228:1         |
| Backhoe (Coal Unloading) (8 t)                    | 1 and 2            | 128            | 110    | 101    | 95     | 91    | 89    | 88    | 79    | -      | 104                                     | 109                                      | BS 5228:1         |
| Truck For Coal/Manure/General Deliveries (4 Axle) | 1 and 2            | 127            | 122    | 115    | 109    | 102   | 102   | 97    | 95    | -      | 112                                     | 117                                      | BS 5228:1         |
| Angle Grinder                                     | 2                  | 111            | 95     | 89     | 91     | 98    | 106   | 102   | 102   | -      | 108                                     | 113                                      | BS 5228:1         |
| Vibrating Roller (12 t)                           | 2                  | 146            | 127    | 112    | 110    | 105   | 99    | 96    | 90    | -      | 119                                     | 124                                      | BS 5228:1         |
| Dump Truck (158 t)                                | 2                  | 133            | 128    | 118    | 115    | 109   | 109   | 104   | 97    | -      | 118                                     | 123                                      | BS 5228:1         |
| Concrete Pumping And Truck Idling (6 t)           | 2                  | 129            | 120    | 108    | 101    | 99    | 97    | 93    | 89    | -      | 109                                     | 114                                      | BS 5228:1         |
| Mobile Crane (100 t)                              | 2                  | 125            | 111    | 101    | 92     | 88    | 85    | 79    | 70    | -      | 101                                     | 106                                      | BS 5228:1         |
| Tracked Excavator (22 t)                          | 2                  | 128            | 124    | 112    | 104    | 97    | 95    | 89    | 80    | -      | 105                                     | 110                                      | BS 5228:1         |

Note: Data sourced from BS 5228 is octave bands and does not include 16 kHz. No max levels are presented for the BS 5228 data, for the purposes of prediction; 5 dB(A) has been added to the  $L_{Aeq}$  level. Data measured at site is 1/3 octave but only octave data is presented herein.

### Scenario 3 Noise Sources

The noise levels and location of future noise sources from the rendering plant were provided by MeatEng in December 2013. These noise sources were broadband sound pressure levels at 1 m (i.e. no frequency data). The locations are shown in Appendix D. The sound power levels of future noise sources at the rendering plant are shown in Table 4-4.

Table 4-4: Sound Power Levels of the Future Render Plant [MeatEng]

| ID | Area                     | Loudest Noise Source | Quantity | Sound Power Level dB(A) |                   |
|----|--------------------------|----------------------|----------|-------------------------|-------------------|
|    |                          |                      |          | L <sub>Aeq</sub>        | L <sub>Amax</sub> |
| A  | Raw Material Reveal      | Shredder             | 2        | 104                     | 109               |
| B  | Wet Process Area         | Hammer mill          | 1        | 104                     | 109               |
| C  | Dry Process Area         | Shaker screen        | 2        | 93                      | 98                |
| D  | Biofilter Fan            | -                    | 1        | 103                     | 108               |
| E  | Building Extraction Fans | -                    | 3        | 97                      | 102               |
| F  | Screw Conveyor           | -                    | 1        | 97                      | 102               |
| G  | Screw Conveyor           | -                    | 1        | 73                      | 78                |

Additionally MeatEng provided details and locations for the pumps associated with the bio-digester plant. Whilst no noise levels were provided, the noise levels were calculated from the kilowatt and rpm data from MeatEng. The pump motors are expected to operate at 1,400 rpm.

An equation to calculate the sound pressure levels of pumps at 1 m based on kilowatt data and rpm is presented in Bies and Hanson (2009). 'Engineering Noise Control – 4<sup>th</sup> Edition'. The sound power levels are presented in Table 4-5.

Table 4-5: Sound Power Levels of the Future Scenario Pumps [Calculated from Bies and Hanson, 2009]

| Pump Location                  | kW    | Sound Power Level dB(A) |                   |
|--------------------------------|-------|-------------------------|-------------------|
|                                |       | L <sub>Aeq</sub>        | L <sub>Amax</sub> |
| CSTR Tank1                     | 41.25 | 94                      | 99                |
| CSTR Tank 2                    | 41.25 | 94                      | 99                |
| CSTR Tank 3                    | 41.25 | 94                      | 99                |
| CSTR Digestate Storage Tank    | 41.25 | 94                      | 99                |
| UASB Tank 1                    | 19.5  | 91                      | 96                |
| UASB Tank 2                    | 19.5  | 91                      | 96                |
| UASB Substrate Tank            | 7.5   | 87                      | 92                |
| CSTR Substrate Tank            | 15    | 90                      | 95                |
| CSTR Main Pump System          | 11    | 88                      | 93                |
| UASB Main Pump System          | 7.5   | 87                      | 92                |
| UASB Digestate Pump            | 3.5   | 83                      | 88                |
| Gas Extraction Blower System   | 3     | 83                      | 88                |
| Gas Blower System              | 1.5   | 80                      | 85                |
| Heat Pump                      | 1.5   | 80                      | 85                |
| DAF System                     | 15.4  | 90                      | 95                |
| Infeed Pump System             | 21    | 91                      | 96                |
| Drying Area - System Equipment | 62    | 96                      | 101               |

In order to present a worst-case scenario, all pumps, fans and generators associated with the bio-digester have been modelled as operating 24 hours per day. MeatEng confirmed that each generator will be enclosed and the noise level at 1 m will be 60 dB(A).

## 5 EXISTING ENVIRONMENT

The existing noise environment has been determined through ambient noise monitoring between 10<sup>th</sup> October 2013 and 18<sup>th</sup> October 2013 at three representative locations close to the existing plant.

### 5.1 Monitoring Locations

The noise monitoring locations were determined in consultation with Bindaree Beef. The locations were selected on the basis of proximity to the facility, dominant wind direction, and all traffic noise influences (not just Bindaree Beef) in the vicinity of the closest sensitive receptors.

The noise monitoring locations, as shown in Figure 5-1 are:

- Monitoring Location 1 – Within the property boundary of a property owned by Bindaree Beef. This is the closest property east of the existing plant. Located approximately 280 m south east from the plant;
- Monitoring Location 2 - At the fence line adjacent to sensitive receptor 31 (143 Copeton Dam Road). This is representative of the closest property south of the existing plant. Located approximately 800 m south of the plant; and
- Monitoring Location 3 – At the fence line of McNeil's Lane, representative of the closest properties west of the existing plant. Located approximately 1 km west of the plant.

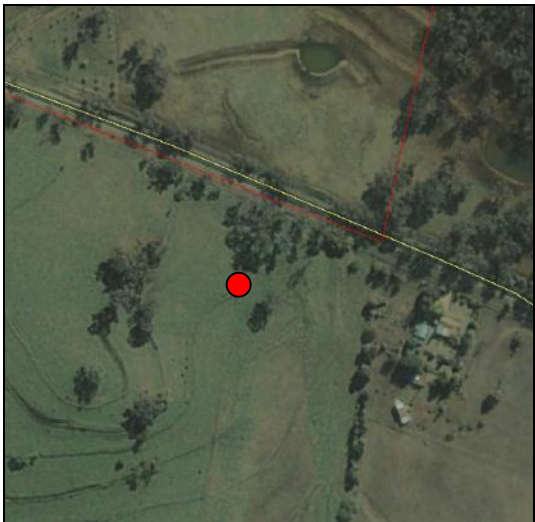


Figure 5-1: Noise Logging Locations [Google Earth]

11 June 2014

The main land uses at monitoring locations are described as 'rural' as defined by NSW Industrial Noise Policy. The equipment used and the equipment setup for each monitoring location is presented in Appendix B. The monitoring location and a summary of noise sources are shown in Table 5-1.

Table 5-1: Summary of Noise Sources at Each Monitoring Location

| Reference             | Location                                                                             | Noise Sources                                                                                                                                                                |
|-----------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Monitoring Location 1 |    | Traffic movements on the Gwydir Highway, cattle, wind blowing through trees, birdsong and noise from Bindaree Beef. There were no sources of ground vibration in the area.   |
| Monitoring Location 2 |   | Cattle, occasional traffic movements, birdsong and hay bailing activities on the 11 <sup>th</sup> Oct in the paddock. There were no sources of ground vibration in the area. |
| Monitoring Location 3 |  | Wind blowing through the trees, birdsong, and noise from Bindaree Beef. There were no sources of ground vibration in the area.                                               |

## 5.2 Weather Observations during the Monitoring Period

Weather observations during the monitoring period were obtained from the Bureau of Meteorology. The weather station selected was the Inverell Research Centre Station (station number 056018). This station was selected as it is considered representative of the entire study area. During the noise monitoring survey, the temperature ranged between 13°C – 20.8°C at 09:00 hours and 18.6°C – 29.3°C at 15:00 hours. The rainfall during the monitoring period was 6.2 mm and wind speeds between 7-26 km/h. The weather data are shown in Table 5-2.

Table 5-2: Weather Observations at Inverell Station During the Monitoring Period [BOM Station Number 056018]

| Date       | 9:00 AM   |           |              | 3:00 PM   |           |              | Daily         |
|------------|-----------|-----------|--------------|-----------|-----------|--------------|---------------|
|            | Temp (°C) | Direction | Speed (km/h) | Temp (°C) | Direction | Speed (km/h) | Rainfall (mm) |
| 10/10/2013 | 16.2      | N         | 17           | 27.1      | NW        | 19           | 0             |
| 11/10/2013 | 20.5      | NE        | 7            | 29.3      | W         | 9            | 0             |
| 12/10/2013 | 20.8      | E         | 17           | 26.8      | N         | 9            | 0             |
| 13/10/2013 | 19.5      | N         | 24           | 24.9      | NNW       | 26           | 0             |
| 14/10/2013 | 13.5      | S         | 13           | 18.6      | SW        | 15           | 1             |
| 15/10/2013 | 13        | ESE       | 9            | 21.4      | W         | 13           | 0.2           |
| 16/10/2013 | 14.4      | N         | 13           | 23.9      | NNW       | 17           | 0             |
| 17/10/2013 | 18.2      | N         | 26           | 27.8      | NNW       | 24           | 0             |
| 18/10/2013 | 16.6      | NNE       | 7            | N/A       | N/A       | N/A          | 5             |

## 5.3 Summary of Noise Monitoring Results

Table 5-3 presents the noise monitoring results at each location. It should be noted that all of the monitoring locations are free-field positions. The noise monitoring data for individual days are shown in tabulated and graphical form in Appendix C.

Table 5-3: Summary of Noise Monitoring Results

| Noise Descriptor    | Time Period           | Noise Level (dB(A)) |            |            |
|---------------------|-----------------------|---------------------|------------|------------|
|                     |                       | Location 1          | Location 2 | Location 3 |
| $L_{AMAX}$          | Night (10pm to 7am)   | 81                  | 75         | 75         |
| $L_{Aeq,T}$ Average | Day (7am to 6pm)      | 54                  | 50         | 45         |
|                     | Evening (6pm to 10pm) | 52                  | 49         | 41         |
|                     | Night (10pm to 7am)   | 51                  | 45         | 44         |
| $L_{A90,T}$ Average | Day (7am to 6pm)      | 43                  | 39         | 36         |
|                     | Evening (6pm to 10pm) | 39                  | 37         | 30         |
|                     | Night (10pm to 7am)   | 35                  | 34         | 34         |
| RBL                 | Day (7am to 6pm)      | 44                  | 41         | 39         |
|                     | Evening (6pm to 10pm) | 39                  | 38         | 31         |
|                     | Night (10pm to 7am)   | 36                  | 33         | 34         |

The ambient noise level ( $L_{Aeq,T}$ ) is considered the best descriptor for human perception of sound pressure level over each monitoring period. The difference in noise levels between the monitoring locations is 7-11 dB(A) depending on the time of day. The highest noise levels were recorded at Monitoring Location 1, which is closest to the Highway. The  $L_{Aeq,T}$  noise levels are lower at night than during the day (approximately 3-8 dB(A)).

The background noise level ( $L_{A90,T}$ ) is the noise level exceeded 90% of the time. The data shows that Monitoring Location 3 recorded the quietest background noise levels. Overall, the evening period was quieter than the night time period at this location, which is likely to be due to the north easterly winds being stronger

during the night time period, thus increasing the downwind propagation (the distance from which the noise at Bindaree Beef will propagate).

The  $L_{Amax}$  noise level during the night time period is presented as the existing maximum levels allowing for a comparison to the future maximum noise levels and the likelihood of sleep disturbance. The monitoring data shows the maximum noise levels were 30-31 dB(A) above the ambient noise level during the night time period.

The noise sources audible at all locations were wind blowing through vegetation, cattle, birdsong and vehicle movements. More details of the audible noise sources at each monitoring location are provided in Appendix C. Site personnel determined that there are no sources of vibration within the proposed Project area at present.

#### 5.4 Determining Project Specific Criteria from the Existing Environment

The operational noise criteria applicable to this Project are determined in Table 5-4. The Table shows the existing ambient ( $L_{Aeq}$ ) and background (RBL) noise level at each monitoring location. The operational amenity and intrusiveness criteria have been determined and the lower of the two criteria has been adopted as the overall daytime and evening noise criterion as determined by the INP. Refer to Section 3 for more information.

Rating background level (RBL)—the overall single figure background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24-hour period). The rating background level is the level used for assessment purposes. Where the rating background level is found to be less than 30 dB(A), then it is set to 30 dB(A). The rating background level is defined as the median value of:

- All the day assessment background levels over the monitoring period for the day;
- All the evening assessment background levels over the monitoring period for the evening; and
- All the night assessment background levels over the monitoring period for the night.

'Median' is the middle value in a number of values. For an odd number of values, the value of the median is simply the middle value in a number of values ranked in ascending or descending order.

The daytime construction noise, the  $L_{Aeq}$  criteria is RBL +10 dB and for evening period the RBL +5 dB. The RBL +10 dB criterion has also been adopted for the maximum noise level. The night-time criteria for construction activities are the same as the sleep criteria. It should be noted that construction activities are not expected during the evening or night-time periods.

Table 5-4: Determining Operational Project Specific Criteria based on Noise Monitoring

| Receptor   | Time of Day | Existing Noise Level |     | Operational Noise Goals        |                                      |                                 |                                    |
|------------|-------------|----------------------|-----|--------------------------------|--------------------------------------|---------------------------------|------------------------------------|
|            |             | $L_{Aeq}$            | RBL | Amenity Criteria ( $L_{Aeq}$ ) | Intrusiveness Criteria ( $L_{Aeq}$ ) | INP Project Level ( $L_{Aeq}$ ) | Sleep Disturbance (RBL + 15 dB(A)) |
| Location 1 | Day         | 54                   | 44  | 44                             | 49                                   | 44                              | -                                  |
|            | Evening     | 52                   | 39  | 42                             | 44                                   | 42                              | -                                  |
|            | Night       | 51                   | 36  | 41                             | 41                                   | 41                              | 51                                 |
| Location 2 | Day         | 50                   | 41  | 42                             | 46                                   | 42                              | -                                  |
|            | Evening     | 49                   | 38  | 39                             | 43                                   | 39                              | -                                  |
|            | Night       | 45                   | 33  | 35                             | 38                                   | 35                              | 48                                 |
| Location 3 | Day         | 45                   | 39  | 48                             | 44                                   | 44                              | -                                  |
|            | Evening     | 41                   | 31  | 43                             | 36                                   | 36                              | -                                  |
|            | Night       | 44                   | 34  | 34                             | 39                                   | 34                              | 49                                 |

The noise monitoring locations are representative of the following sensitive receptors:

- Location 1 – Due to the distance from the Gwydir Highway, the following sensitive receptors are considered to be of similar noise environment to monitoring location 1. These sensitive receptors are 1, 33- 35, and 42-44.
- Location 2 – Due to the distance from abattoir, the following sensitive receptors are considered to be of similar noise environment to monitoring location 2. These sensitive receptors are 10-32 and 36-41.
- Location 3 – Due to the distance from the Gwydir Highway and from the abattoir, the following sensitive receptors are considered to be of similar noise environment to monitoring location 3. These sensitive receptors are 2-9.

These are shown in Figure 5-2.

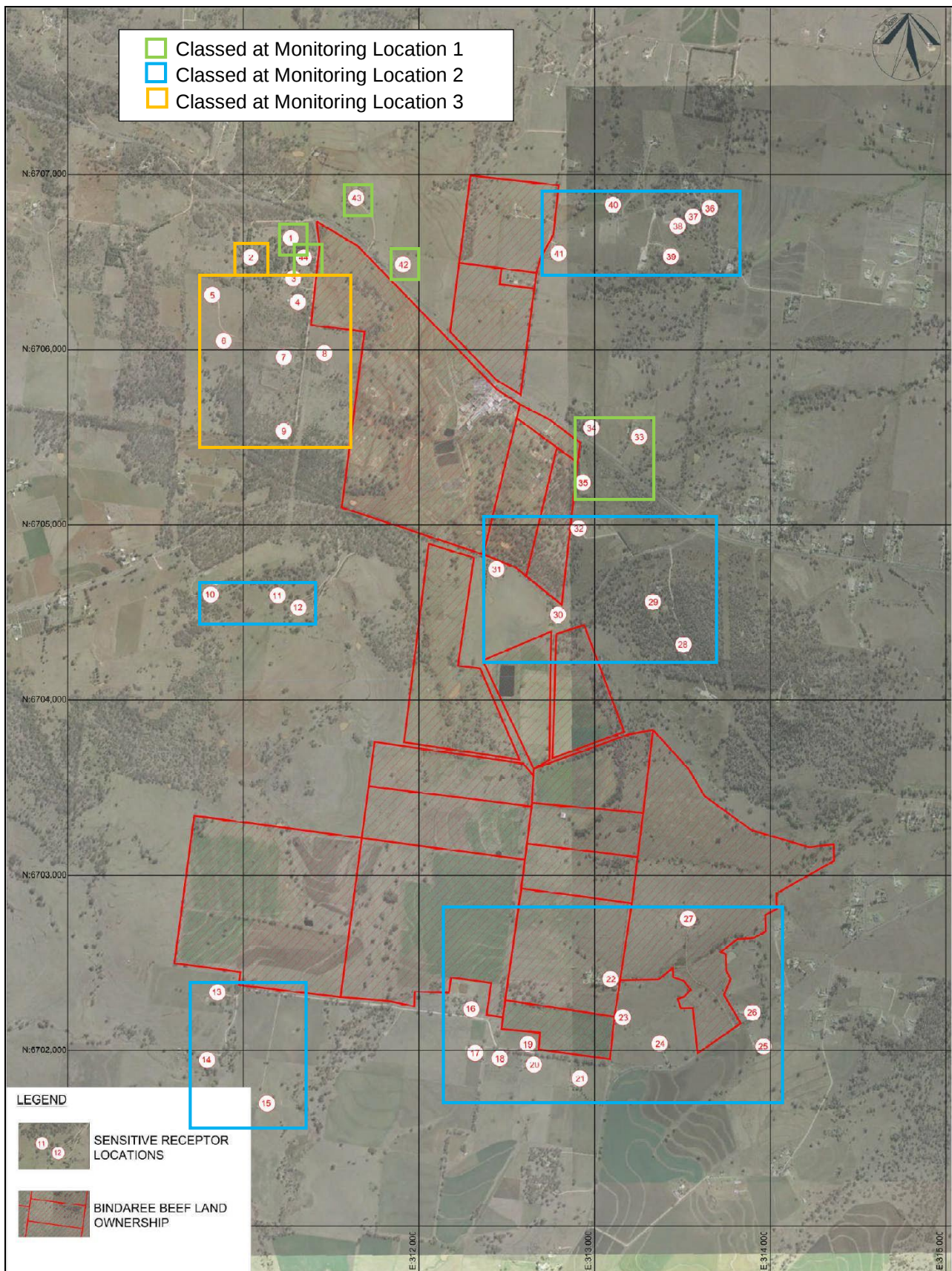


Figure 5-2: Sensitive Receptor Map- Classified into Representative Noise Monitoring Locations [Mitchel Hanlon]

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## 6 NOISE ASSESSMENT

In order to assess the impacts of the existing and future operations of the abattoir three meteorological conditions were used in the model. These meteorological conditions were determined from the analysis of the weather conditions for 2002-2006 as detailed in Section 4.3. These weather conditions are:

- Neutral Conditions – Stability Class D with no wind characteristics. Stable weather conditions occur between 45-51% of annual hours as shown in Table 4-2;
- Prevailing Conditions – Stability Class F with no wind characteristics. Stability Class F occurs between 27-34% of night-time hours during the winter season and 11-13% during the annual hours as shown in Table 4-2; and
- Worst-Case Conditions – Stability Class F with 3 m/s wind from source to receiver. These conditions occur infrequently but represent the worst-case atmospheric conditions and wind speeds, especially during night-time in winter.

The following scenarios were modelled for daytime and night time periods:

- Existing Environment (night time predictions – 22:00-07:00 hours):
  - o Ambient Noise ( $L_{Aeq,T}$ ) for neutral, prevailing and worst-case weather conditions; and
  - o Maximum Noise ( $L_{Amax,T}$ ) for neutral, prevailing and worst-case weather conditions.
- Existing Environment and Construction Phase (daytime predictions – 07:00-18:00 hours):
  - o Ambient Noise ( $L_{Aeq,T}$ ) for neutral, prevailing and worst-case weather conditions; and
  - o Maximum Noise ( $L_{Amax,T}$ ) for neutral, prevailing and worst-case weather conditions.
- Future Environment (night time predictions – 22:00-07:00 hours):
  - o Ambient Noise ( $L_{Aeq,T}$ ) for neutral, prevailing and worst-case weather conditions; and
  - o Maximum Noise ( $L_{Amax,T}$ ) for neutral, prevailing and worst-case weather conditions.

### 6.1 Scenario 1 – Existing Plant Operation

The noise sources modelled were measured at Bindaree Beef in October 2013 during the day time shift under normal operating conditions. The noise sources were modelled to represent realistic conditions of cattle deliveries during a typical day as discussed with staff at Bindaree Beef. All plant except cattle deliveries have been modelled as constant noise sources. The cattle deliveries have been modelled mainly during the early evening and night time periods with three deliveries (B-double truck) per hour.

The predicted night time noise levels ( $L_{Aeq, 22:00-07:00 \text{ hours}}$ ) are shown in Table 6-1. The results evaluate that the highest noise level will be 33 dB(A) at 77 McNeils Lane during worst-case meteorological weather conditions. Section 3.5 states that this receptor is representative of Monitoring Location 3. When the night-time  $L_{A90}$  was measured to be 34 dB. A comparison with the monitoring data and predicted noise levels has provided confidence that the existing plant operations have been correctly modelled and analysed.

A review of the data in Table 6-1 identifies that the difference in noise levels between the neutral weather conditions and the prevailing conditions is up to 6 dB(A) increase depending on the receptor distance from the source and topographical features between source and receptor.

The predicted  $L_{Amax, 22:00-07:00 \text{ hours}}$  noise levels are shown in Table 6-2. The results identify that the maximum noise levels comply with the sleep disturbance criteria for each meteorological condition at all sensitive receptors. The highest predicted noise level is 38 dB(A) at two receptors 77 McNeils Lane and 7360 Gwydir Highway, the high level at 7360 Gwydir Highway is a result of the road noise from the cattle deliveries during the night time period. When the predicted  $L_{Aeq}$  noise levels are compared to the noise monitoring results, the levels are considerably lower than the  $L_{Amax}$  for the same period. This provides assurance that whilst the plant operations were audible during the site visit at the Monitoring Location 3, the noise was not very distinguishable as noise emanating from Bindaree Beef.

Table 6-1: Predicted Night-Time Noise Levels from Existing Plant Operations ( $L_{Aeq}$ )

| Receptor ID             | Night Time Criteria ( $L_{Aeq}$ ) | Predicted Noise Level (dB)    |            |            | Compliance with Criteria |            |            |
|-------------------------|-----------------------------------|-------------------------------|------------|------------|--------------------------|------------|------------|
|                         |                                   | $L_{Aeq}$ , 22:00-07:00 hours |            |            | Neutral                  | Prevailing | Worst-Case |
|                         |                                   | Neutral                       | Prevailing | Worst-Case |                          |            |            |
| 1 - 13 Blair Athol Rd   | 41                                | 21                            | 27         | 27         | ✓                        | ✓          | ✓          |
| 2 - 37 Blair Athol Rd   | 34                                | 20                            | 25         | 25         | ✓                        | ✓          | ✓          |
| 3 - 32 McNeils Rd       | 34                                | 23                            | 28         | 29         | ✓                        | ✓          | ✓          |
| 4 - 42 McNeils Rd       | 34                                | 23                            | 28         | 28         | ✓                        | ✓          | ✓          |
| 5 - 42 Wattle Hill Rd   | 34                                | 18                            | 23         | 24         | ✓                        | ✓          | ✓          |
| 6 - 41 Wattle Hill Rd   | 34                                | 20                            | 25         | 26         | ✓                        | ✓          | ✓          |
| 7 - 11 Wattle Hill Rd   | 34                                | 23                            | 28         | 29         | ✓                        | ✓          | ✓          |
| 8 - 77 McNeils Rd       | 34                                | 27                            | 32         | 33         | ✓                        | ✓          | ✓          |
| 9 - 118 McNeils Rd      | 34                                | 26                            | 31         | 32         | ✓                        | ✓          | ✓          |
| 10 - 345 Copeton Dam Rd | 35                                | 19                            | 24         | 25         | ✓                        | ✓          | ✓          |
| 11 - 221 Copeton Dam Rd | 35                                | 16                            | 21         | 22         | ✓                        | ✓          | ✓          |
| 12 - 183 Copeton Dam Rd | 35                                | 18                            | 23         | 24         | ✓                        | ✓          | ✓          |
| 13 - 216 Minnamurra Rd  | 35                                | 0                             | 3          | 3          | ✓                        | ✓          | ✓          |
| 14 - 226 Minnamurra Rd  | 35                                | 0                             | 2          | 1          | ✓                        | ✓          | ✓          |
| 15 - 209 Minnamurra Rd  | 35                                | 0                             | 0          | 0          | ✓                        | ✓          | ✓          |
| 16 - 98 Minnamurra Rd   | 35                                | 0                             | 5          | 5          | ✓                        | ✓          | ✓          |
| 17 - 71 Minnamurra Rd   | 35                                | 0                             | 4          | 4          | ✓                        | ✓          | ✓          |
| 18 - 67 Minnamurra Rd   | 35                                | 0                             | 4          | 4          | ✓                        | ✓          | ✓          |
| 19 - 54 Minnamurra Rd   | 35                                | 0                             | 5          | 4          | ✓                        | ✓          | ✓          |
| 20 - 55 Minnamurra Rd   | 35                                | 0                             | 4          | 3          | ✓                        | ✓          | ✓          |
| 21 - 31 Minnamurra Rd   | 35                                | 0                             | 3          | 2          | ✓                        | ✓          | ✓          |
| 22 - 51 Penola Lane     | 35                                | 0                             | 5          | 5          | ✓                        | ✓          | ✓          |
| 23 - 24 Penola Lane     | 35                                | 0                             | 4          | 4          | ✓                        | ✓          | ✓          |
| 24 - 448 Auburn Vale Rd | 35                                | 0                             | 3          | 2          | ✓                        | ✓          | ✓          |
| 25 - 391 Auburn Vale Rd | 35                                | 0                             | 2          | 2          | ✓                        | ✓          | ✓          |
| 26 - 390 Auburn Vale Rd | 35                                | 0                             | 3          | 2          | ✓                        | ✓          | ✓          |
| 27 - 396 Auburn Vale Rd | 35                                | 0                             | 6          | 5          | ✓                        | ✓          | ✓          |
| 28 - 60 Kerri Rd        | 35                                | 9                             | 15         | 15         | ✓                        | ✓          | ✓          |
| 29 - 36 Kerri Rd        | 35                                | 11                            | 16         | 17         | ✓                        | ✓          | ✓          |
| 30 - 95 Copeton Dam Rd  | 35                                | 6                             | 12         | 13         | ✓                        | ✓          | ✓          |
| 31 - 143 Copeton Dam Rd | 35                                | 11                            | 16         | 17         | ✓                        | ✓          | ✓          |
| 32 - 7209 Gwydir H/way  | 35                                | 12                            | 17         | 18         | ✓                        | ✓          | ✓          |
| 33 - 7186 Gwydir H/way  | 41                                | 15                            | 20         | 21         | ✓                        | ✓          | ✓          |
| 34 - 7204 Gwydir H/way  | 41                                | 22                            | 27         | 28         | ✓                        | ✓          | ✓          |
| 35 - 44 Copeton Dam Rd  | 41                                | 13                            | 18         | 19         | ✓                        | ✓          | ✓          |
| 36 - 84 Ditzells Drive  | 35                                | 11                            | 16         | 17         | ✓                        | ✓          | ✓          |
| 37 - 76 Ditzells Drive  | 35                                | 12                            | 17         | 18         | ✓                        | ✓          | ✓          |
| 38 - 64 Ditzells Drive  | 35                                | 14                            | 20         | 20         | ✓                        | ✓          | ✓          |
| 39 - 60 Ditzells Drive  | 35                                | 14                            | 19         | 20         | ✓                        | ✓          | ✓          |
| 40 - 35 Ditzells Drive  | 35                                | 17                            | 22         | 23         | ✓                        | ✓          | ✓          |
| 41 - 581 Fernhill Rd    | 35                                | 20                            | 25         | 26         | ✓                        | ✓          | ✓          |
| 42 - 7360 Gwydir H/way  | 41                                | 26                            | 31         | 32         | ✓                        | ✓          | ✓          |
| 43 - 7374 Gwydir H/way  | 41                                | 21                            | 26         | 27         | ✓                        | ✓          | ✓          |
| 44 - 22 McNeils Rd      | 41                                | 23                            | 28         | 29         | ✓                        | ✓          | ✓          |

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Table 6-2: Predicted Night-Time Noise Levels from Existing Plant Operations( $L_{Amax}$ )

| Receptor ID             | Night Time Criteria ( $L_{Amax}$ ) | Predicted Noise Level (dB)<br>$L_{Amax,22:00-07:00}$ hours |            |            | Compliance with Criteria |            |            |
|-------------------------|------------------------------------|------------------------------------------------------------|------------|------------|--------------------------|------------|------------|
|                         |                                    | Neutral                                                    | Prevailing | Worst-Case | Neutral                  | Prevailing | Worst-Case |
| 1 - 13 Blair Athol Rd   | 51                                 | 26                                                         | 31         | 32         | ✓                        | ✓          | ✓          |
| 2 - 37 Blair Athol Rd   | 49                                 | 24                                                         | 29         | 29         | ✓                        | ✓          | ✓          |
| 3 - 32 McNeils Rd       | 49                                 | 28                                                         | 33         | 33         | ✓                        | ✓          | ✓          |
| 4 - 42 McNeils Rd       | 49                                 | 28                                                         | 33         | 33         | ✓                        | ✓          | ✓          |
| 5 - 42 Wattle Hill Rd   | 49                                 | 23                                                         | 28         | 29         | ✓                        | ✓          | ✓          |
| 6 - 41 Wattle Hill Rd   | 49                                 | 26                                                         | 31         | 31         | ✓                        | ✓          | ✓          |
| 7 - 11 Wattle Hill Rd   | 49                                 | 29                                                         | 34         | 34         | ✓                        | ✓          | ✓          |
| 8 - 77 McNeils Rd       | 49                                 | 33                                                         | 37         | 38         | ✓                        | ✓          | ✓          |
| 9 - 118 McNeils Rd      | 49                                 | 30                                                         | 35         | 35         | ✓                        | ✓          | ✓          |
| 10 - 345 Copeton Dam Rd | 48                                 | 22                                                         | 27         | 28         | ✓                        | ✓          | ✓          |
| 11 - 221 Copeton Dam Rd | 48                                 | 20                                                         | 25         | 26         | ✓                        | ✓          | ✓          |
| 12 - 183 Copeton Dam Rd | 48                                 | 23                                                         | 28         | 29         | ✓                        | ✓          | ✓          |
| 13 - 216 Minnamurra Rd  | 48                                 | 2                                                          | 8          | 8          | ✓                        | ✓          | ✓          |
| 14 - 226 Minnamurra Rd  | 48                                 | 0                                                          | 7          | 6          | ✓                        | ✓          | ✓          |
| 15 - 209 Minnamurra Rd  | 48                                 | 0                                                          | 6          | 5          | ✓                        | ✓          | ✓          |
| 16 - 98 Minnamurra Rd   | 48                                 | 4                                                          | 10         | 10         | ✓                        | ✓          | ✓          |
| 17 - 71 Minnamurra Rd   | 48                                 | 3                                                          | 9          | 9          | ✓                        | ✓          | ✓          |
| 18 - 67 Minnamurra Rd   | 48                                 | 3                                                          | 9          | 9          | ✓                        | ✓          | ✓          |
| 19 - 54 Minnamurra Rd   | 48                                 | 3                                                          | 10         | 9          | ✓                        | ✓          | ✓          |
| 20 - 55 Minnamurra Rd   | 48                                 | 3                                                          | 10         | 9          | ✓                        | ✓          | ✓          |
| 21 - 31 Minnamurra Rd   | 48                                 | 2                                                          | 8          | 7          | ✓                        | ✓          | ✓          |
| 22 - 51 Penola Lane     | 48                                 | 5                                                          | 11         | 10         | ✓                        | ✓          | ✓          |
| 23 - 24 Penola Lane     | 48                                 | 3                                                          | 10         | 9          | ✓                        | ✓          | ✓          |
| 24 - 448 Auburn Vale Rd | 48                                 | 3                                                          | 10         | 9          | ✓                        | ✓          | ✓          |
| 25 - 391 Auburn Vale Rd | 48                                 | 7                                                          | 13         | 13         | ✓                        | ✓          | ✓          |
| 26 - 390 Auburn Vale Rd | 48                                 | 6                                                          | 13         | 12         | ✓                        | ✓          | ✓          |
| 27 - 396 Auburn Vale Rd | 48                                 | 7                                                          | 13         | 12         | ✓                        | ✓          | ✓          |
| 28 - 60 Kerri Rd        | 48                                 | 22                                                         | 27         | 28         | ✓                        | ✓          | ✓          |
| 29 - 36 Kerri Rd        | 48                                 | 25                                                         | 29         | 30         | ✓                        | ✓          | ✓          |
| 30 - 95 Copeton Dam Rd  | 48                                 | 17                                                         | 22         | 23         | ✓                        | ✓          | ✓          |
| 31 - 143 Copeton Dam Rd | 48                                 | 23                                                         | 28         | 28         | ✓                        | ✓          | ✓          |
| 32 - 7209 Gwydir H/way  | 48                                 | 19                                                         | 23         | 24         | ✓                        | ✓          | ✓          |
| 33 - 7186 Gwydir H/way  | 51                                 | 18                                                         | 22         | 23         | ✓                        | ✓          | ✓          |
| 34 - 7204 Gwydir H/way  | 51                                 | 22                                                         | 26         | 26         | ✓                        | ✓          | ✓          |
| 35 - 44 Copeton Dam Rd  | 51                                 | 17                                                         | 21         | 22         | ✓                        | ✓          | ✓          |
| 36 - 84 Ditzells Drive  | 48                                 | 22                                                         | 28         | 28         | ✓                        | ✓          | ✓          |
| 37 - 76 Ditzells Drive  | 48                                 | 23                                                         | 28         | 29         | ✓                        | ✓          | ✓          |
| 38 - 64 Ditzells Drive  | 48                                 | 25                                                         | 30         | 30         | ✓                        | ✓          | ✓          |
| 39 - 60 Ditzells Drive  | 48                                 | 26                                                         | 31         | 32         | ✓                        | ✓          | ✓          |
| 40 - 35 Ditzells Drive  | 48                                 | 26                                                         | 31         | 32         | ✓                        | ✓          | ✓          |
| 41 - 581 Fernhill Rd    | 48                                 | 31                                                         | 35         | 36         | ✓                        | ✓          | ✓          |
| 42 - 7360 Gwydir H/way  | 51                                 | 32                                                         | 37         | 38         | ✓                        | ✓          | ✓          |
| 43 - 7374 Gwydir H/way  | 51                                 | 26                                                         | 31         | 32         | ✓                        | ✓          | ✓          |
| 44 - 22 McNeils Rd      | 51                                 | 28                                                         | 33         | 33         | ✓                        | ✓          | ✓          |

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## 6.2 Scenario 2 – Existing Plant Operation and Construction Activities

Scenario 2 includes the noise sources modelled in Scenario 1 (existing operations at Bindaree Beef) and construction activities during the daytime (07:00-18:00 hours). As such, the noise predictions for Scenario 2 will be the same as Scenario 1 during the night time period. The noise management level ( $L_{Aeq,15 \text{ minute}}$ ) for standard construction hours (07:00-18:00) is the RBL +10 decibels, as discussed in Section 3. The RBL +10 dB criterion has also been adopted for the maximum noise level. As such the  $L_{Aeq, 15 \text{ minute}}$  criterion as determined by the Industrial Noise Policy (see Section 5.3) has been used to assess maximum noise levels.

The construction noise sources modelled in the scenario are discussed in Section 4.4.

The predicted  $L_{Aeq, 07:00-18:00 \text{ hours}}$  noise levels are shown in Table 6-3. The predicted daytime noise levels comply with the relevant criteria at all sensitive receptors. The results evaluate that the highest noise level will be 42 dB(A) at 7360 Gwydir Highway during worst-case meteorological weather conditions, which complies with the 54 dB(A) criteria during the construction phase.

A review of the data in Table 6-3 identifies that the difference in noise levels between the neutral weather conditions and the prevailing conditions is 4-5 dB(A) increase depending on the receptor.

The predicted  $L_{Amax, 07:00-18:00 \text{ hours}}$  noise levels are shown in Table 6-4. The results identify that the  $L_{Amax}$  and  $L_{Aeq}$  noise levels comply with the criterion of RBL +10 dB under all meteorological conditions. The highest predicted noise level is 54 dB(A) at 7360 Gwydir Highway, the high level at 7360 Gwydir Highway is a result of the road noise from vehicle movements associated with Bindaree Beef operations during the daytime period. When the predicted  $L_{Amax}$  noise levels are compared to the noise monitoring results, the levels are up to 16 dB(A) higher than the  $L_{Aeq, 15 \text{ minute}}$  for the same period.

Table 6-3: Predicted Daytime Noise Levels from Existing Plant Operations and Construction Activities ( $L_{Aeq}$ )

| Receptor ID             | Daytime Criteria ( $L_{Aeq}$ ) | Predicted Noise Level (dB)  |            |            | Compliance with Criteria |            |            |
|-------------------------|--------------------------------|-----------------------------|------------|------------|--------------------------|------------|------------|
|                         |                                | $L_{Aeq,07:00-18:00}$ hours |            |            | Neutral                  | Prevailing | Worst-Case |
|                         |                                | Neutral                     | Prevailing | Worst-Case |                          |            |            |
| 1 - 13 Blair Athol Rd   | 54                             | 31                          | 35         | 36         | ✓                        | ✓          | ✓          |
| 2 - 37 Blair Athol Rd   | 49                             | 30                          | 33         | 34         | ✓                        | ✓          | ✓          |
| 3 - 32 McNeils Rd       | 49                             | 33                          | 36         | 37         | ✓                        | ✓          | ✓          |
| 4 - 42 McNeils Rd       | 49                             | 33                          | 37         | 37         | ✓                        | ✓          | ✓          |
| 5 - 42 Wattle Hill Rd   | 49                             | 29                          | 33         | 33         | ✓                        | ✓          | ✓          |
| 6 - 41 Wattle Hill Rd   | 49                             | 28                          | 32         | 32         | ✓                        | ✓          | ✓          |
| 7 - 11 Wattle Hill Rd   | 49                             | 30                          | 33         | 34         | ✓                        | ✓          | ✓          |
| 8 - 77 McNeils Rd       | 49                             | 33                          | 37         | 38         | ✓                        | ✓          | ✓          |
| 9 - 118 McNeils Rd      | 49                             | 30                          | 34         | 35         | ✓                        | ✓          | ✓          |
| 10 - 345 Copeton Dam Rd | 51                             | 21                          | 26         | 26         | ✓                        | ✓          | ✓          |
| 11 - 221 Copeton Dam Rd | 51                             | 18                          | 22         | 23         | ✓                        | ✓          | ✓          |
| 12 - 183 Copeton Dam Rd | 51                             | 21                          | 25         | 26         | ✓                        | ✓          | ✓          |
| 13 - 216 Minnamurra Rd  | 51                             | 6                           | 10         | 10         | ✓                        | ✓          | ✓          |
| 14 - 226 Minnamurra Rd  | 51                             | 4                           | 9          | 8          | ✓                        | ✓          | ✓          |
| 15 - 209 Minnamurra Rd  | 51                             | 3                           | 8          | 7          | ✓                        | ✓          | ✓          |
| 16 - 98 Minnamurra Rd   | 51                             | 5                           | 10         | 10         | ✓                        | ✓          | ✓          |
| 17 - 71 Minnamurra Rd   | 51                             | 4                           | 9          | 9          | ✓                        | ✓          | ✓          |
| 18 - 67 Minnamurra Rd   | 51                             | 4                           | 9          | 9          | ✓                        | ✓          | ✓          |
| 19 - 54 Minnamurra Rd   | 51                             | 4                           | 9          | 9          | ✓                        | ✓          | ✓          |
| 20 - 55 Minnamurra Rd   | 51                             | 4                           | 9          | 8          | ✓                        | ✓          | ✓          |
| 21 - 31 Minnamurra Rd   | 51                             | 3                           | 8          | 8          | ✓                        | ✓          | ✓          |
| 22 - 51 Penola Lane     | 51                             | 5                           | 10         | 10         | ✓                        | ✓          | ✓          |
| 23 - 24 Penola Lane     | 51                             | 4                           | 9          | 9          | ✓                        | ✓          | ✓          |
| 24 - 448 Auburn Vale Rd | 51                             | 4                           | 9          | 8          | ✓                        | ✓          | ✓          |
| 25 - 391 Auburn Vale Rd | 51                             | 3                           | 8          | 8          | ✓                        | ✓          | ✓          |
| 26 - 390 Auburn Vale Rd | 51                             | 4                           | 9          | 8          | ✓                        | ✓          | ✓          |
| 27 - 396 Auburn Vale Rd | 51                             | 6                           | 11         | 11         | ✓                        | ✓          | ✓          |
| 28 - 60 Kerri Rd        | 51                             | 18                          | 23         | 23         | ✓                        | ✓          | ✓          |
| 29 - 36 Kerri Rd        | 51                             | 21                          | 25         | 25         | ✓                        | ✓          | ✓          |
| 30 - 95 Copeton Dam Rd  | 51                             | 15                          | 18         | 19         | ✓                        | ✓          | ✓          |
| 31 - 143 Copeton Dam Rd | 51                             | 22                          | 25         | 26         | ✓                        | ✓          | ✓          |
| 32 - 7209 Gwydir H/way  | 51                             | 20                          | 23         | 24         | ✓                        | ✓          | ✓          |
| 33 - 7186 Gwydir H/way  | 54                             | 24                          | 27         | 28         | ✓                        | ✓          | ✓          |
| 34 - 7204 Gwydir H/way  | 54                             | 29                          | 32         | 33         | ✓                        | ✓          | ✓          |
| 35 - 44 Copeton Dam Rd  | 54                             | 20                          | 23         | 24         | ✓                        | ✓          | ✓          |
| 36 - 84 Ditzells Drive  | 51                             | 25                          | 28         | 29         | ✓                        | ✓          | ✓          |
| 37 - 76 Ditzells Drive  | 51                             | 26                          | 30         | 30         | ✓                        | ✓          | ✓          |
| 38 - 64 Ditzells Drive  | 51                             | 27                          | 30         | 31         | ✓                        | ✓          | ✓          |
| 39 - 60 Ditzells Drive  | 51                             | 27                          | 31         | 32         | ✓                        | ✓          | ✓          |
| 40 - 35 Ditzells Drive  | 51                             | 28                          | 32         | 33         | ✓                        | ✓          | ✓          |
| 41 - 581 Fernhill Rd    | 51                             | 33                          | 36         | 37         | ✓                        | ✓          | ✓          |
| 42 - 7360 Gwydir H/way  | 54                             | 38                          | 41         | 42         | ✓                        | ✓          | ✓          |
| 43 - 7374 Gwydir H/way  | 54                             | 31                          | 35         | 36         | ✓                        | ✓          | ✓          |
| 44 - 22 McNeils Rd      | 54                             | 32                          | 36         | 37         | ✓                        | ✓          | ✓          |

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Table 6-4: Predicted Daytime Noise Levels from Existing Plant Operations and Construction Activities ( $L_{Amax}$ )

| Receptor ID             | Daytime Criteria ( $L_{Amax}$ ) | Predicted Noise Level (dB)     |            |            | Compliance with Criteria |            |            |
|-------------------------|---------------------------------|--------------------------------|------------|------------|--------------------------|------------|------------|
|                         |                                 | $L_{Amax}$ , 07:00-18:00 hours |            |            | Neutral                  | Prevailing | Worst-Case |
|                         |                                 | Neutral                        | Prevailing | Worst-Case |                          |            |            |
| 1 - 13 Blair Athol Rd   | 54                              | 43                             | 47         | 48         | ✓                        | ✓          | ✓          |
| 2 - 37 Blair Athol Rd   | 49                              | 41                             | 45         | 46         | ✓                        | ✓          | ✓          |
| 3 - 32 McNeils Rd       | 49                              | 44                             | 48         | 49         | ✓                        | ✓          | ✓          |
| 4 - 42 McNeils Rd       | 49                              | 45                             | 48         | 49         | ✓                        | ✓          | ✓          |
| 5 - 42 Wattle Hill Rd   | 49                              | 41                             | 45         | 45         | ✓                        | ✓          | ✓          |
| 6 - 41 Wattle Hill Rd   | 49                              | 38                             | 42         | 43         | ✓                        | ✓          | ✓          |
| 7 - 11 Wattle Hill Rd   | 49                              | 39                             | 42         | 43         | ✓                        | ✓          | ✓          |
| 8 - 77 McNeils Rd       | 49                              | 43                             | 45         | 46         | ✓                        | ✓          | ✓          |
| 9 - 118 McNeils Rd      | 49                              | 36                             | 39         | 40         | ✓                        | ✓          | ✓          |
| 10 - 345 Copeton Dam Rd | 51                              | 26                             | 29         | 30         | ✓                        | ✓          | ✓          |
| 11 - 221 Copeton Dam Rd | 51                              | 21                             | 25         | 26         | ✓                        | ✓          | ✓          |
| 12 - 183 Copeton Dam Rd | 51                              | 28                             | 32         | 32         | ✓                        | ✓          | ✓          |
| 13 - 216 Minnamurra Rd  | 51                              | 14                             | 19         | 18         | ✓                        | ✓          | ✓          |
| 14 - 226 Minnamurra Rd  | 51                              | 13                             | 17         | 17         | ✓                        | ✓          | ✓          |
| 15 - 209 Minnamurra Rd  | 51                              | 13                             | 17         | 17         | ✓                        | ✓          | ✓          |
| 16 - 98 Minnamurra Rd   | 51                              | 9                              | 14         | 13         | ✓                        | ✓          | ✓          |
| 17 - 71 Minnamurra Rd   | 51                              | 8                              | 13         | 12         | ✓                        | ✓          | ✓          |
| 18 - 67 Minnamurra Rd   | 51                              | 8                              | 13         | 12         | ✓                        | ✓          | ✓          |
| 19 - 54 Minnamurra Rd   | 51                              | 8                              | 13         | 12         | ✓                        | ✓          | ✓          |
| 20 - 55 Minnamurra Rd   | 51                              | 7                              | 12         | 12         | ✓                        | ✓          | ✓          |
| 21 - 31 Minnamurra Rd   | 51                              | 7                              | 12         | 11         | ✓                        | ✓          | ✓          |
| 22 - 51 Penola Lane     | 51                              | 9                              | 14         | 13         | ✓                        | ✓          | ✓          |
| 23 - 24 Penola Lane     | 51                              | 8                              | 13         | 12         | ✓                        | ✓          | ✓          |
| 24 - 448 Auburn Vale Rd | 51                              | 7                              | 12         | 11         | ✓                        | ✓          | ✓          |
| 25 - 391 Auburn Vale Rd | 51                              | 7                              | 13         | 13         | ✓                        | ✓          | ✓          |
| 26 - 390 Auburn Vale Rd | 51                              | 8                              | 13         | 12         | ✓                        | ✓          | ✓          |
| 27 - 396 Auburn Vale Rd | 51                              | 10                             | 14         | 14         | ✓                        | ✓          | ✓          |
| 28 - 60 Kerri Rd        | 51                              | 24                             | 28         | 28         | ✓                        | ✓          | ✓          |
| 29 - 36 Kerri Rd        | 51                              | 26                             | 30         | 30         | ✓                        | ✓          | ✓          |
| 30 - 95 Copeton Dam Rd  | 51                              | 20                             | 22         | 23         | ✓                        | ✓          | ✓          |
| 31 - 143 Copeton Dam Rd | 51                              | 26                             | 29         | 29         | ✓                        | ✓          | ✓          |
| 32 - 7209 Gwydir H/way  | 51                              | 25                             | 27         | 28         | ✓                        | ✓          | ✓          |
| 33 - 7186 Gwydir H/way  | 54                              | 30                             | 32         | 33         | ✓                        | ✓          | ✓          |
| 34 - 7204 Gwydir H/way  | 54                              | 34                             | 37         | 38         | ✓                        | ✓          | ✓          |
| 35 - 44 Copeton Dam Rd  | 54                              | 24                             | 26         | 27         | ✓                        | ✓          | ✓          |
| 36 - 84 Ditzells Drive  | 51                              | 36                             | 41         | 41         | ✓                        | ✓          | ✓          |
| 37 - 76 Ditzells Drive  | 51                              | 37                             | 41         | 42         | ✓                        | ✓          | ✓          |
| 38 - 64 Ditzells Drive  | 51                              | 39                             | 43         | 43         | ✓                        | ✓          | ✓          |
| 39 - 60 Ditzells Drive  | 51                              | 40                             | 44         | 45         | ✓                        | ✓          | ✓          |
| 40 - 35 Ditzells Drive  | 51                              | 40                             | 44         | 44         | ✓                        | ✓          | ✓          |
| 41 - 581 Fernhill Rd    | 51                              | 44                             | 48         | 48         | ✓                        | ✓          | ✓          |
| 42 - 7360 Gwydir H/way  | 54                              | 50                             | 53         | 54         | ✓                        | ✓          | ✓          |
| 43 - 7374 Gwydir H/way  | 54                              | 43                             | 48         | 48         | ✓                        | ✓          | ✓          |
| 44 - 22 McNeils Rd      | 54                              | 44                             | 48         | 49         | ✓                        | ✓          | ✓          |

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### 6.3 Scenario 3 – Future Operations

The future noise sources and their locations were provided by MeatEng in February 2014. Maps providing the source locations are shown in Appendix D.

The future noise sources were modelled for the operating hours of the plant. In addition, some existing noise sources were also modelled, specifically forklift and truck movements, dam pump, town water pump house, irrigation pump, manure store and cattle unloading activities, as detailed in Table 4-3.

As with the existing scenario, cattle deliveries were modelled to represent realistic conditions during a typical day as discussed with staff at Bindaree Beef. All plant except cattle deliveries have been modelled as constant noise sources. The cattle deliveries have been modelled mainly during the early evening and night time periods with three deliveries (B-double truck) per hour.

The predicted night time noise levels ( $L_{Aeq, 22:00-07:00 \text{ hours}}$ ) are shown in Table 6-5. The evaluation of the results show that the highest noise level will be 34 dB(A) at 7360 Gwydir Highway during worst-case meteorological weather conditions. This noise level complies with the night time criterion of 41 dB(A) at night. Table 6-5 shows the noise levels at each sensitive receptor comply with the appropriate night time criteria with the new facility in operation.

A review of the data in Table 6-5 identifies that the difference in noise levels between the neutral weather conditions and the prevailing conditions is up to 7 dB(A) increase depending on the receptor distance from the source and topographical features between source and receptor.

The predicted  $L_{Amax, 22:00-07:00 \text{ hours}}$  noise levels are shown in Table 6-6. The results identify that the maximum noise levels comply with the sleep disturbance criteria for each meteorological condition at all sensitive receptors. The highest predicted noise level is 38 dB(A) at 77 McNeils Lane which is due to dominant winds during the night time period. The future  $L_{Amax}$  noise levels comply with the night time criteria, which indicate that the operations from Bindaree Beef will be audible at some receptors, are not expected to cause sleep disturbance.

Table 6-5: Predicted Night-Time Noise Levels from Future Plant Operations( $L_{Aeq}$ )

| Receptor ID             | Night Time Criteria ( $L_{Aeq}$ ) | Predicted Noise Level (dB)    |            |            | Compliance with Criteria |            |            |
|-------------------------|-----------------------------------|-------------------------------|------------|------------|--------------------------|------------|------------|
|                         |                                   | $L_{Aeq}$ , 22:00-07:00 hours |            |            | Neutral                  | Prevailing | Worst-Case |
|                         |                                   | Neutral                       | Prevailing | Worst-Case |                          |            |            |
| 1 - 13 Blair Athol Rd   | 41                                | 22                            | 28         | 29         | ✓                        | ✓          | ✓          |
| 2 - 37 Blair Athol Rd   | 34                                | 20                            | 25         | 27         | ✓                        | ✓          | ✓          |
| 3 - 32 McNeils Rd       | 34                                | 24                            | 29         | 30         | ✓                        | ✓          | ✓          |
| 4 - 42 McNeils Rd       | 34                                | 23                            | 28         | 29         | ✓                        | ✓          | ✓          |
| 5 - 42 Wattle Hill Rd   | 34                                | 19                            | 25         | 26         | ✓                        | ✓          | ✓          |
| 6 - 41 Wattle Hill Rd   | 34                                | 17                            | 22         | 23         | ✓                        | ✓          | ✓          |
| 7 - 11 Wattle Hill Rd   | 34                                | 21                            | 26         | 27         | ✓                        | ✓          | ✓          |
| 8 - 77 McNeils Rd       | 34                                | 24                            | 28         | 29         | ✓                        | ✓          | ✓          |
| 9 - 118 McNeils Rd      | 34                                | 19                            | 24         | 25         | ✓                        | ✓          | ✓          |
| 10 - 345 Copeton Dam Rd | 35                                | 11                            | 17         | 18         | ✓                        | ✓          | ✓          |
| 11 - 221 Copeton Dam Rd | 35                                | 6                             | 11         | 12         | ✓                        | ✓          | ✓          |
| 12 - 183 Copeton Dam Rd | 35                                | 13                            | 18         | 19         | ✓                        | ✓          | ✓          |
| 13 - 216 Minnamurra Rd  | 35                                | 0                             | 6          | 5          | ✓                        | ✓          | ✓          |
| 14 - 226 Minnamurra Rd  | 35                                | 0                             | 4          | 4          | ✓                        | ✓          | ✓          |
| 15 - 209 Minnamurra Rd  | 35                                | 0                             | 4          | 3          | ✓                        | ✓          | ✓          |
| 16 - 98 Minnamurra Rd   | 35                                | 1                             | 8          | 7          | ✓                        | ✓          | ✓          |
| 17 - 71 Minnamurra Rd   | 35                                | 0                             | 7          | 6          | ✓                        | ✓          | ✓          |
| 18 - 67 Minnamurra Rd   | 35                                | 0                             | 7          | 6          | ✓                        | ✓          | ✓          |
| 19 - 54 Minnamurra Rd   | 35                                | 0                             | 7          | 6          | ✓                        | ✓          | ✓          |
| 20 - 55 Minnamurra Rd   | 35                                | 0                             | 7          | 6          | ✓                        | ✓          | ✓          |
| 21 - 31 Minnamurra Rd   | 35                                | 0                             | 6          | 5          | ✓                        | ✓          | ✓          |
| 22 - 51 Penola Lane     | 35                                | 1                             | 8          | 7          | ✓                        | ✓          | ✓          |
| 23 - 24 Penola Lane     | 35                                | 0                             | 7          | 6          | ✓                        | ✓          | ✓          |
| 24 - 448 Auburn Vale Rd | 35                                | 0                             | 6          | 5          | ✓                        | ✓          | ✓          |
| 25 - 391 Auburn Vale Rd | 35                                | 0                             | 5          | 4          | ✓                        | ✓          | ✓          |
| 26 - 390 Auburn Vale Rd | 35                                | 0                             | 5          | 4          | ✓                        | ✓          | ✓          |
| 27 - 396 Auburn Vale Rd | 35                                | 0                             | 7          | 7          | ✓                        | ✓          | ✓          |
| 28 - 60 Kerri Rd        | 35                                | 12                            | 18         | 18         | ✓                        | ✓          | ✓          |
| 29 - 36 Kerri Rd        | 35                                | 12                            | 17         | 18         | ✓                        | ✓          | ✓          |
| 30 - 95 Copeton Dam Rd  | 35                                | 7                             | 12         | 13         | ✓                        | ✓          | ✓          |
| 31 - 143 Copeton Dam Rd | 35                                | 13                            | 18         | 19         | ✓                        | ✓          | ✓          |
| 32 - 7209 Gwydir H/way  | 35                                | 10                            | 14         | 15         | ✓                        | ✓          | ✓          |
| 33 - 7186 Gwydir H/way  | 41                                | 17                            | 21         | 22         | ✓                        | ✓          | ✓          |
| 34 - 7204 Gwydir H/way  | 41                                | 24                            | 27         | 28         | ✓                        | ✓          | ✓          |
| 35 - 44 Copeton Dam Rd  | 41                                | 12                            | 16         | 17         | ✓                        | ✓          | ✓          |
| 36 - 84 Ditzells Drive  | 35                                | 19                            | 25         | 26         | ✓                        | ✓          | ✓          |
| 37 - 76 Ditzells Drive  | 35                                | 20                            | 26         | 27         | ✓                        | ✓          | ✓          |
| 38 - 64 Ditzells Drive  | 35                                | 22                            | 27         | 28         | ✓                        | ✓          | ✓          |
| 39 - 60 Ditzells Drive  | 35                                | 23                            | 28         | 29         | ✓                        | ✓          | ✓          |
| 40 - 35 Ditzells Drive  | 35                                | 23                            | 28         | 29         | ✓                        | ✓          | ✓          |
| 41 - 581 Fernhill Rd    | 35                                | 27                            | 32         | 33         | ✓                        | ✓          | ✓          |
| 42 - 7360 Gwydir H/way  | 41                                | 28                            | 32         | 34         | ✓                        | ✓          | ✓          |
| 43 - 7374 Gwydir H/way  | 41                                | 23                            | 28         | 29         | ✓                        | ✓          | ✓          |
| 44 - 22 McNeils Rd      | 41                                | 24                            | 29         | 30         | ✓                        | ✓          | ✓          |

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Table 6-6: Predicted Night-Time Noise Levels from Future Plant Operations ( $L_{Amax}$ )

| Receptor ID             | Night Time Criteria ( $L_{Amax}$ ) | Predicted Noise Level (dB) |            |            | Compliance with Criteria |            |            |
|-------------------------|------------------------------------|----------------------------|------------|------------|--------------------------|------------|------------|
|                         |                                    | $L_{Amax}$ , 22:00-07:00   |            |            | Neutral                  | Prevailing | Worst-Case |
|                         |                                    | Neutral                    | Prevailing | Worst-Case |                          |            |            |
| 1 - 13 Blair Athol Rd   | 51                                 | 26                         | 31         | 32         | ✓                        | ✓          | ✓          |
| 2 - 37 Blair Athol Rd   | 49                                 | 24                         | 29         | 29         | ✓                        | ✓          | ✓          |
| 3 - 32 McNeils Rd       | 49                                 | 28                         | 33         | 33         | ✓                        | ✓          | ✓          |
| 4 - 42 McNeils Rd       | 49                                 | 28                         | 33         | 33         | ✓                        | ✓          | ✓          |
| 5 - 42 Wattle Hill Rd   | 49                                 | 23                         | 28         | 29         | ✓                        | ✓          | ✓          |
| 6 - 41 Wattle Hill Rd   | 49                                 | 26                         | 31         | 31         | ✓                        | ✓          | ✓          |
| 7 - 11 Wattle Hill Rd   | 49                                 | 29                         | 34         | 34         | ✓                        | ✓          | ✓          |
| 8 - 77 McNeils Rd       | 49                                 | 33                         | 37         | 38         | ✓                        | ✓          | ✓          |
| 9 - 118 McNeils Rd      | 49                                 | 30                         | 35         | 35         | ✓                        | ✓          | ✓          |
| 10 - 345 Copeton Dam Rd | 48                                 | 22                         | 27         | 28         | ✓                        | ✓          | ✓          |
| 11 - 221 Copeton Dam Rd | 48                                 | 20                         | 25         | 26         | ✓                        | ✓          | ✓          |
| 12 - 183 Copeton Dam Rd | 48                                 | 18                         | 23         | 23         | ✓                        | ✓          | ✓          |
| 13 - 216 Minnamurra Rd  | 48                                 | 2                          | 8          | 8          | ✓                        | ✓          | ✓          |
| 14 - 226 Minnamurra Rd  | 48                                 | 0                          | 7          | 6          | ✓                        | ✓          | ✓          |
| 15 - 209 Minnamurra Rd  | 48                                 | 0                          | 6          | 5          | ✓                        | ✓          | ✓          |
| 16 - 98 Minnamurra Rd   | 48                                 | 4                          | 10         | 10         | ✓                        | ✓          | ✓          |
| 17 - 71 Minnamurra Rd   | 48                                 | 3                          | 9          | 9          | ✓                        | ✓          | ✓          |
| 18 - 67 Minnamurra Rd   | 48                                 | 3                          | 9          | 9          | ✓                        | ✓          | ✓          |
| 19 - 54 Minnamurra Rd   | 48                                 | 3                          | 10         | 9          | ✓                        | ✓          | ✓          |
| 20 - 55 Minnamurra Rd   | 48                                 | 3                          | 10         | 9          | ✓                        | ✓          | ✓          |
| 21 - 31 Minnamurra Rd   | 48                                 | 2                          | 8          | 7          | ✓                        | ✓          | ✓          |
| 22 - 51 Penola Lane     | 48                                 | 5                          | 11         | 10         | ✓                        | ✓          | ✓          |
| 23 - 24 Penola Lane     | 48                                 | 3                          | 10         | 9          | ✓                        | ✓          | ✓          |
| 24 - 448 Auburn Vale Rd | 48                                 | 3                          | 10         | 9          | ✓                        | ✓          | ✓          |
| 25 - 391 Auburn Vale Rd | 48                                 | 7                          | 13         | 13         | ✓                        | ✓          | ✓          |
| 26 - 390 Auburn Vale Rd | 48                                 | 6                          | 13         | 12         | ✓                        | ✓          | ✓          |
| 27 - 396 Auburn Vale Rd | 48                                 | 7                          | 13         | 12         | ✓                        | ✓          | ✓          |
| 28 - 60 Kerri Rd        | 48                                 | 22                         | 27         | 28         | ✓                        | ✓          | ✓          |
| 29 - 36 Kerri Rd        | 48                                 | 25                         | 29         | 30         | ✓                        | ✓          | ✓          |
| 30 - 95 Copeton Dam Rd  | 48                                 | 17                         | 22         | 23         | ✓                        | ✓          | ✓          |
| 31 - 143 Copeton Dam Rd | 48                                 | 23                         | 28         | 28         | ✓                        | ✓          | ✓          |
| 32 - 7209 Gwydir H/way  | 48                                 | 19                         | 23         | 24         | ✓                        | ✓          | ✓          |
| 33 - 7186 Gwydir H/way  | 51                                 | 18                         | 22         | 23         | ✓                        | ✓          | ✓          |
| 34 - 7204 Gwydir H/way  | 51                                 | 22                         | 26         | 26         | ✓                        | ✓          | ✓          |
| 35 - 44 Copeton Dam Rd  | 51                                 | 17                         | 21         | 22         | ✓                        | ✓          | ✓          |
| 36 - 84 Ditzells Drive  | 48                                 | 22                         | 28         | 28         | ✓                        | ✓          | ✓          |
| 37 - 76 Ditzells Drive  | 48                                 | 23                         | 28         | 29         | ✓                        | ✓          | ✓          |
| 38 - 64 Ditzells Drive  | 48                                 | 25                         | 30         | 30         | ✓                        | ✓          | ✓          |
| 39 - 60 Ditzells Drive  | 48                                 | 26                         | 31         | 32         | ✓                        | ✓          | ✓          |
| 40 - 35 Ditzells Drive  | 48                                 | 26                         | 31         | 32         | ✓                        | ✓          | ✓          |
| 41 - 581 Fernhill Rd    | 48                                 | 31                         | 35         | 36         | ✓                        | ✓          | ✓          |
| 42 - 7360 Gwydir H/way  | 51                                 | 32                         | 37         | 38         | ✓                        | ✓          | ✓          |
| 43 - 7374 Gwydir H/way  | 51                                 | 26                         | 31         | 32         | ✓                        | ✓          | ✓          |
| 44 - 22 McNeils Rd      | 51                                 | 28                         | 33         | 33         | ✓                        | ✓          | ✓          |

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## 6.4 Comparison of the Existing and Future Scenarios

Whilst all the criteria are met for all scenarios, the difference between the existing and future operations of the plant will become less audible for some sensitive receptors and more audible for other sensitive receptors. This change is due to the noise sources moving away from the main road therefore they are closer to different sensitive receptors.

The greatest change in noise level is an 10 dB(A) increase at 60 Ditzells Drive during worst case weather conditions, whilst a reduction of 10 dB(A) in noise level is predicted to occur at 221 Copeton Dam Road during neutral and prevailing weather conditions.

Table 6-7 provides an indication of the apparent loudness associated with changes in decibels. These were observed during mid audio-frequency at 40 dB. It can be seen from the table that an increase or decrease of 10 decibels is equivalent to half or twice as loud.

Table 6-7: Subjective Effect of Changes in Sound Pressure Level [Bies & Hansen, 2009]

| Change in Noise Level (dB) | Change in Power |          | Change in Apparent Loudness |
|----------------------------|-----------------|----------|-----------------------------|
|                            | Decrease        | Increase |                             |
| 3                          | 1/2             | 2        | Just perceptible            |
| 5                          | 1/3             | 3        | Clearly noticeable          |
| 10                         | 1/10            | 10       | Half or twice as loud       |
| 20                         | 1/100           | 100      | Much quieter or louder      |

For most of the sensitive receptors an increase in noise can be classed as either just perceptible or perceptible increase in noise during prevailing weather conditions. For sensitive receptors along Ditzells Drive, the noise levels will be 7-10 dB(A) higher, which will be noticeable. By contrast sensitive receptors on Copeton Dam Road will have a decrease in noise level of 5-10 dB(A).

Overall, the noise levels from the future plant may increase noise at some receptors, however due to distances involved; this increase is unlikely to be intrusive. The ambient noise environment which includes a range of farming related activities, insects, birdsong or traffic are likely to continue being the dominant noise sources for the majority of the sensitive receptors.

## 6.5 Traffic Noise Assessment

The NSW Road Noise Policy (2011) states that:

*“Any increase in the total traffic noise level at a location due to a proposed project or traffic-generating development must be considered. Residences experiencing increases in total traffic noise level above the relative increase criteria in Table 6-8 should also be considered for mitigation.”*

Table 6-8: Traffic Noise Criteria

| Road Category                                       | Type of Project/Development                                            | Total Traffic Noise Level Increase (dB(A))   |                                             |
|-----------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------|
|                                                     |                                                                        | Day (07:00-22:00)                            | Night (22:00-07:00)                         |
| Freeway/arterial/sub-arterial roads and transitways | Land use development with the potential to generate additional traffic | Existing traffic $L_{Aeq}$ (15 hour) + 12 dB | Existing traffic $L_{Aeq}$ (9 hour) + 12 dB |

Reviewing the ‘Traffic Assessment by Better Transport Futures’ dated November 2013, the expected traffic changes are as follows:

- Presently, the site generates 430 vehicle movements per day; 300 light vehicles and 130 vans/trucks/b-doubles;
- During the construction phase an expected increase in 43 vehicles per day visiting the site;
- The new plant operations will have a reduction in coal deliveries from 170 per annum to one per annum (if the bio-digester fails); and

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- There will be no additional traffic movements from staff vehicles for the future operational phase.

An increase in 12 dB equates to an increase of eight times the present traffic flows. A road traffic calculation for Monitoring Location 1 was undertaken. The present  $L_{Aeq,15 \text{ hour}}$  at Monitoring Location 1 is 53.5 dB, increasing the traffic flow to take into consideration the construction traffic, the increased in  $L_{Aeq,15 \text{ hour}}$  is <1 dB(A). This increase is below the  $L_{Aeq,15 \text{ hour}} + 12 \text{ dB}$  criterion, as such a full road traffic noise assessment has not been undertaken.

## 7 MITIGATION

This assessment has identified that the noise levels comply with the noise criteria determined by the Noise Industry Policy during the daytime, evening and night time periods. The impact from the future operations of the plant will benefit some sensitive receptors and not others due to the change in location of noise sources and the installation of new technology.

Generally, the hierarchy preference of noise management is as follows:

- 1) Noise be avoided; however if this is not possible,
- 2) The minimisation of noise through either:
  - Re-orientation of an activity or
  - Use of Best Available Technology (BAT); and
- 3) Management of noise.

The new plant at Bindaree Beef utilises state-of-the-art technology and as such it is recommended that the management of noise should be controlled, for example noise complaints.

In the event of noise complaints, a register should be established and the following elements should be recorded as a minimum:

- Complainant name and address;
- Time and date of complaint;
- Duration of event;
- Name of person taking the call;
- Description of complaint nature (e.g. truck deliveries, pumps etc.).

## 8 CONCLUSIONS

Vipac Engineers & Scientists Ltd (Vipac) was commissioned by Mitchel Hanlon Consulting Pty Ltd (Mitchel Hanlon) to prepare a noise impact assessment for the proposed bio-digestion plant at Bindaree Beef, Inverell, NSW. This report has assessed the noise levels from the existing and future operational activities of Bindaree Beef using approved methodologies and software in accordance to the NSW legislation and guidelines.

Noise monitoring was carried out at site to determine the existing noise environment near three sensitive receptors and to obtain sound pressure levels of the external noise sources at the plant. The background noise data obtained from site was used to determine the appropriate noise criteria for each sensitive receptor during the day time and night time period.

Three scenarios were modelled, the existing scenario, the existing scenario with construction works and the future scenario. Terrain and weather conditions were incorporated into the noise model to allow for more accurate prediction.

The predicted noise levels for the existing scenario correlated well to the background noise levels recorded at site, which provided confidence that the existing plant operations have been correctly modelled and analysed. The data showed that the difference in noise levels between the neutral weather conditions and the worst-case conditions is up to 6 dB(A) increase depending on the receptor distance from the source and topographical features between source and receptor. The noise levels during the daytime and night time periods for the existing scenario comply with the project specific criteria.

The construction of the new plant will occur during the daytime, whilst the existing plant will be operational. The predicted  $L_{Aeq, day}$  noise levels during the construction phase are predicted to comply with the relevant criteria at all sensitive receptors. The results evaluate that the highest noise level will be 42 dB(A) at 7360 Gwydir Highway during worst-case meteorological weather conditions, which comply with the 54 dB(A) criteria during the construction phase. A review of the data identified that the difference in noise levels between the neutral weather conditions and the worst-case conditions is 4-5 dB(A) increase depending on the receptor.

The future noise sources were modelled to represent operating hours of the plant. In addition, some existing noise sources were also modelled, specifically forklift and truck movements, dam pump, town water pump house, irrigation pump, manure store and cattle unloading activities. The predicted  $L_{Aeq, night}$  noise levels showed that the highest noise level will be 34 dB(A) at 7360 Gwydir Highway during worst-case meteorological weather conditions. These noise levels comply with the night time criterion of 41 dB(A) at night. The noise levels at each sensitive receptor are predicted to comply with the appropriate night time criteria with the future plant in operation.

A review of the data identified that the difference in noise levels between the neutral weather conditions and the worst-case conditions is up to 7 dB(A) increase depending on the receptor distance from the source and topographical features between source and receptor. The future  $L_{Amax}$  noise levels are well below the night time criteria are not expected to cause sleep disturbance.

Whilst all the criteria are met for all scenarios, the difference between the existing and future operations of the plant will become less audible for some sensitive receptors and more audible for other sensitive receptors. This change is due to the noise sources moving away from the main road and closer to different sensitive receptors. The greatest change in noise level is 10 dB(A) increase at 60 Ditzells during worst case weather conditions, whilst a reduction of 10 dB(A) in noise level is predicted to occur at 221 Copeton Dam Road during neutral and worst-case weather conditions.

Overall, the noise levels from the future plant may increase at some receptors, however due to distances involved; this increase is unlikely to be intrusive. The ambient noise environment is dominated by a range of

farming related activities, insects, birdsong or traffic. These sources are likely to continue being the dominant noise sources for the majority of the sensitive receptors.

## 9 REFERENCES

Australian Standard AS 1055-1997 'Acoustics — *Description and Measurement of Environmental Noise. Parts 1-3*'. Standards Australia; NSW.

Australian Standard AS 2436 (2010) '*Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Site*'. Standards Australia; NSW.

British Standard Institute BS 5228:1 (2009). '*Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise*'.

Bies, D. A. & Hansen, C. H. (2009). *Engineering Noise Control: Theory and Practice, 4th Edition*. E & FN Spon; London.

Department of Environment, Climate Change, and Water. (2011). NSW Road Noise Policy. DECW; Sydney.

Environmental Protection Agency. (2000). *NSW Industrial Noise Policy*. EPA; Sydney.

## Appendix A: GLOSSARY

Ambient noise – the totally encompassing noise in a given situation at a given time; it is usually composed of noise from many sources, near and far.

Attenuation – a general term used to indicate the reduction of noise or vibration, by whatever method or for whatever reason, and the amount in decibels, by which it is reduced.

A-weighting – a frequency weighting devised to attempt to take into account the fact human response to sound not equally sensitive to all frequencies.

Background noise level - The INP defines the background noise level as *'the underlying level of noise present in ambient noise when all unusual extraneous noise is removed'*. Additionally, the INP states that *'sound levels contributing to background levels can include sound from nearby traffic, birds, insects, animals, machinery and similar sources if these sounds are a normal feature of the location'*.

dB(A) – the A-weighted sound pressure level.

dB(Z) – the Z-weighted (linear) sound pressure level.

Decibel (dB) – the logarithmic-scaled unit used to report the level or magnitude of sound.

Hertz (Hz) - the unit of frequency.

L (Level) – the sound pressure level (SPL); it implies the use of decibels related to the ratio of powers or the power related quantities such as sound intensity or sound pressure.

Loudness – the measure of the subjective impression of the magnitude or strength of a sound.

Noise descriptors – A noise descriptor is a measure of noise used to define a specific characteristic of noise, e.g. average energy, variation (maximum and minimum) and annoyance. Noise descriptors are based on measurements of the sound pressure level. Common noise descriptors are provided below:

|              |                                                                                                                                                                                                                                                             |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $L_{Aeq,T}$  | Time-average A-weighted sound pressure level                                                                                                                                                                                                                |
| $L_{A90,T}$  | Background A-weighted sound pressure level. Corresponds to the level that is exceeded for 90% of the measured time interval                                                                                                                                 |
| $L_{Amax,T}$ | Maximum A-weighted sound pressure level, obtained by arithmetically averaging of the maximum levels of the noise under investigation -                                                                                                                      |
| $L_{Amin,T}$ | Minimum A-weighted sound pressure level, obtained by arithmetic averaging of the minimum levels of the noise under investigation                                                                                                                            |
| $L_{A10,T}$  | Level that is exceeded for 10% of the measured time interval. The $L_{10}$ is typically used to measure road traffic noise.                                                                                                                                 |
| $L_{A1,T}$   | Level that is equal to or exceeded for 1% of the time interval considered in the absence of the noise under investigation. The $L_{10}$ is considered to be representative of road traffic noise. The A-weighted background level is denoted as $L_{A10}$ . |

Noise criteria – a maximum or minimum value imposed on a noise index e.g. a legal purpose.

RBL – Rating Background Level: Statistical noise descriptor used to describe the lowest noise levels (background) on site

Sound power – the sound energy radiated per unit time by a sound source, measured in watts.

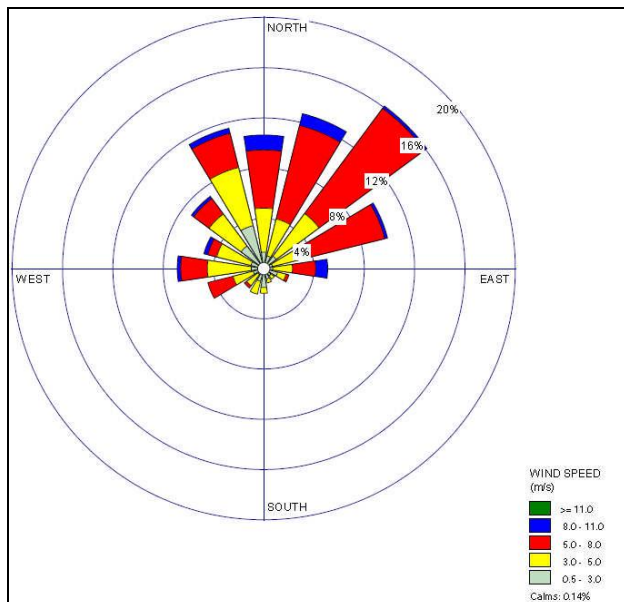
Sound propagation – the transfer of sound from one point to another.

Velocity – a vector quantity that specifies the time derivative of displacement.

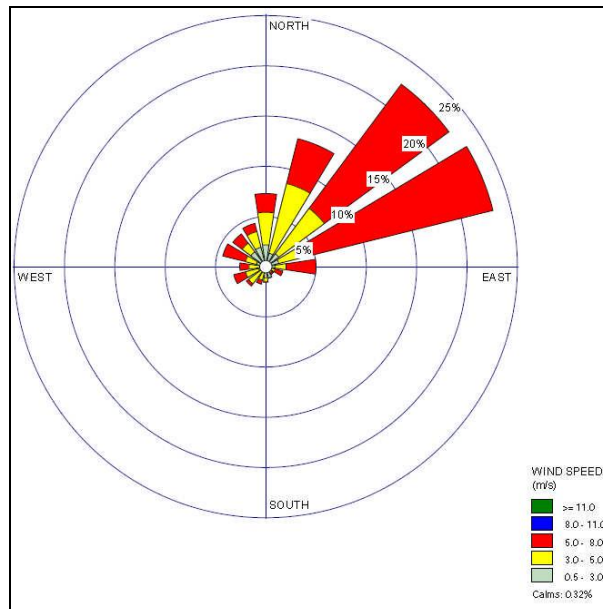
Vibration – oscillating motion of matter about a fixed equilibrium position.

## Appendix B: WIND ROSES

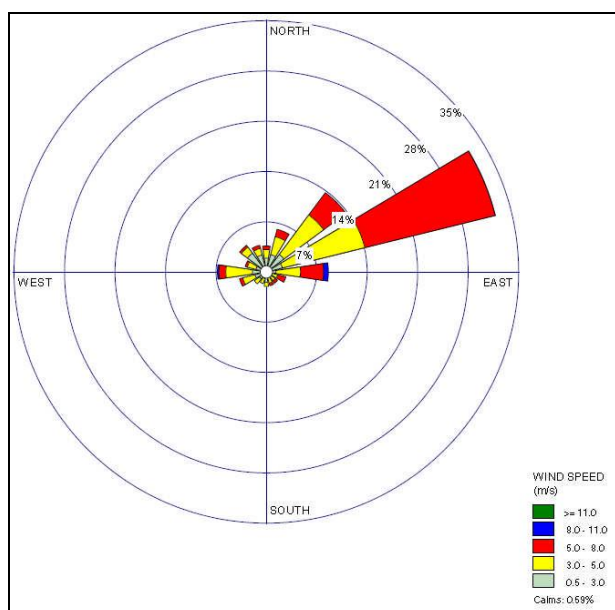
2002



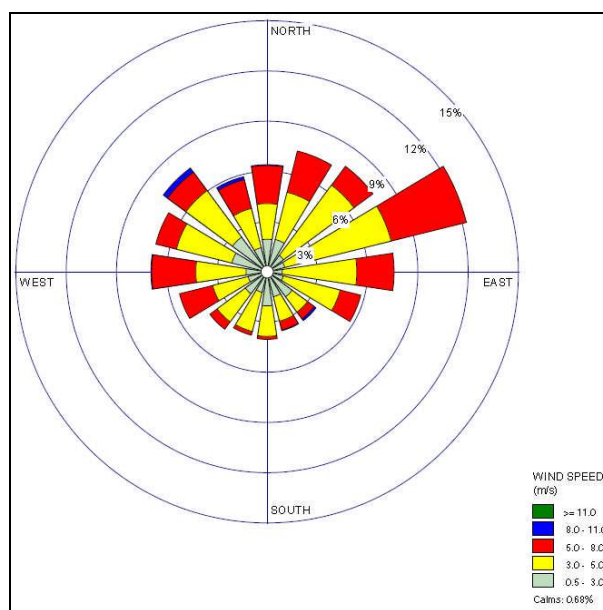
Spring – Season (Calm – 0.14%)



Summer – Season (Calm – 0.32%)



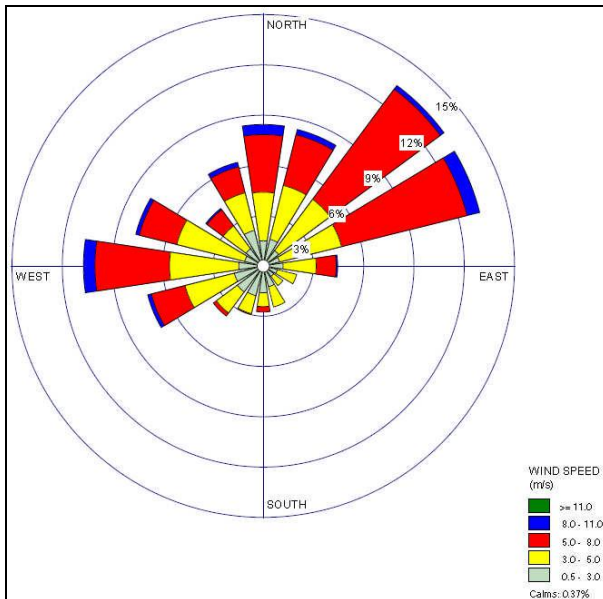
Autumn – Season (Calm – 0.59%)



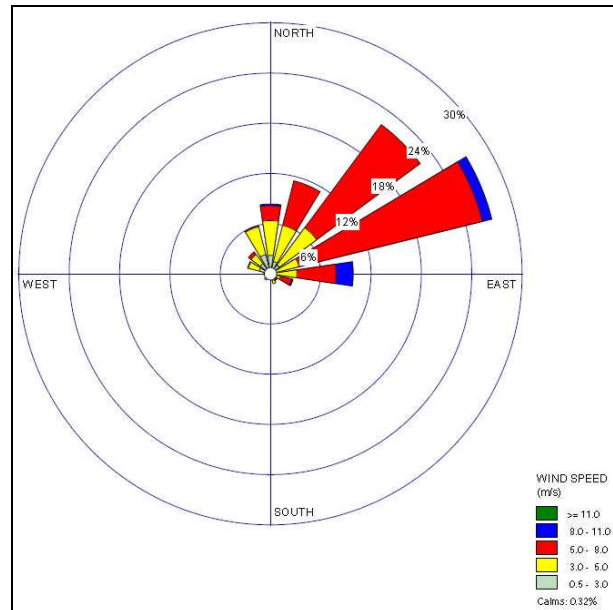
Winter – Season (Calm – 0.68%)

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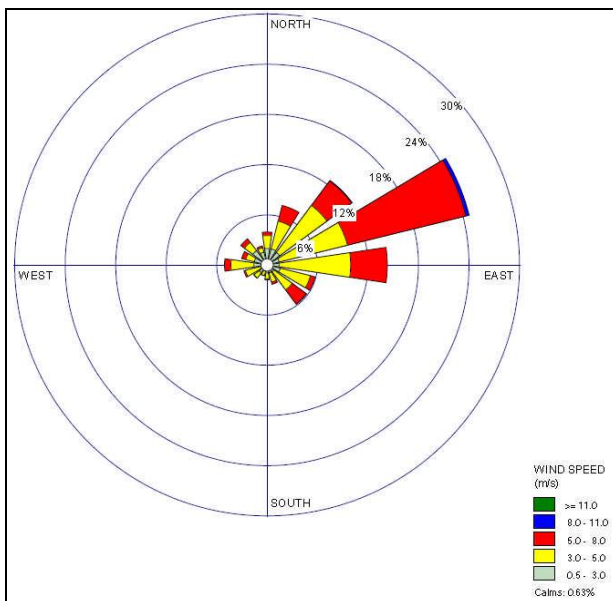
2003



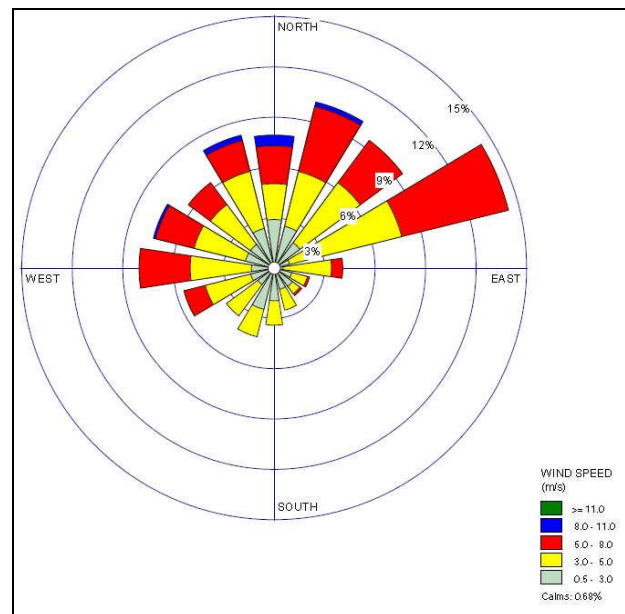
Spring – Season (Calm – 0.37%)



Summer – Season (Calm – 0.32%)



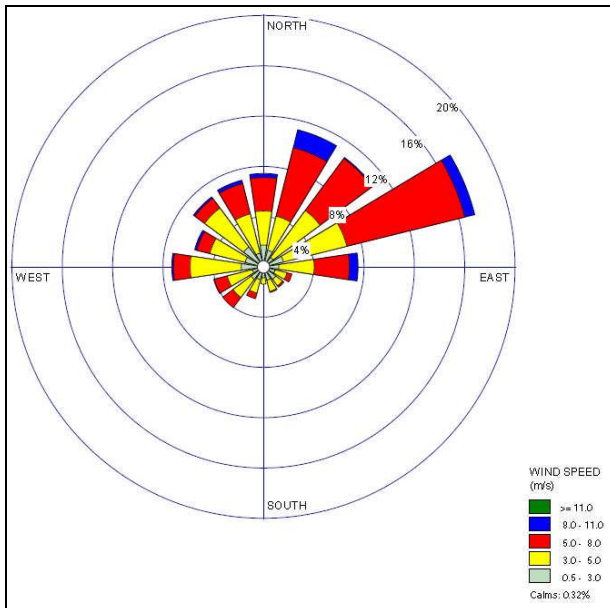
Autumn – Season (Calm – 0.63%)



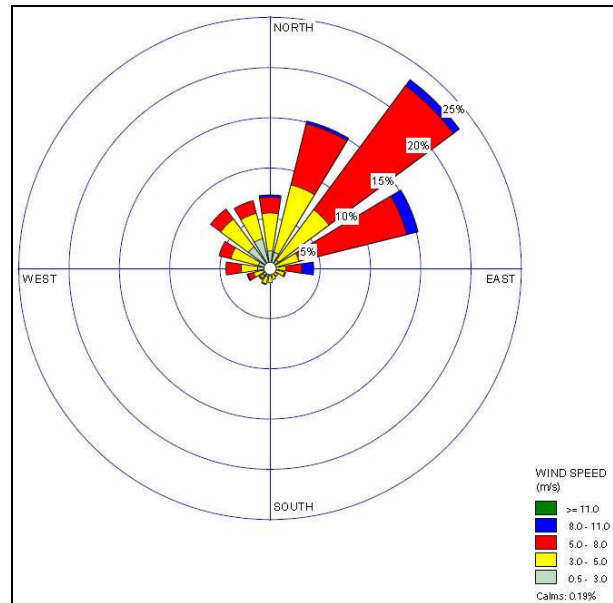
Winter – Season (Calm – 0.68%)

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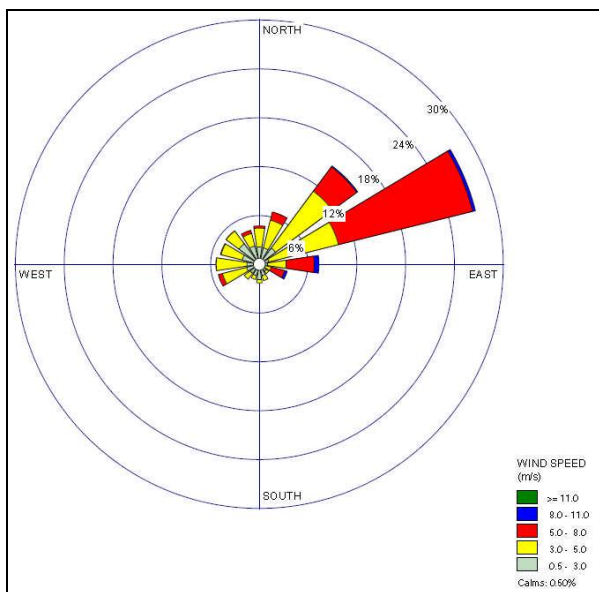
2004



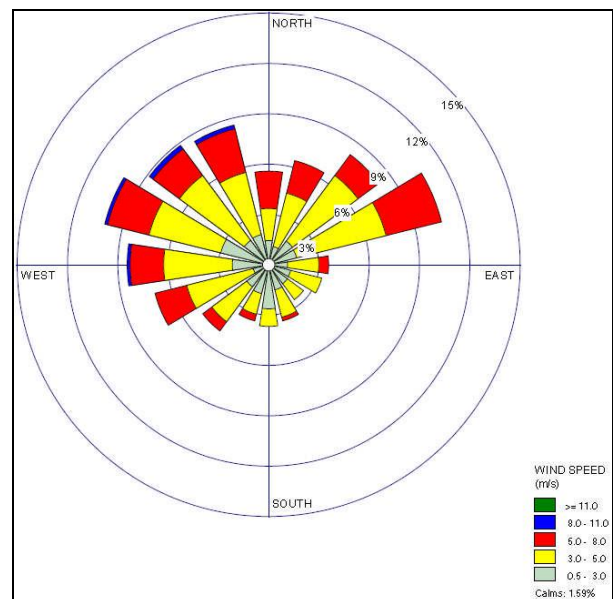
Spring – Season (Calm – 0.32%)



Summer – Season (Calm – 0.19%)

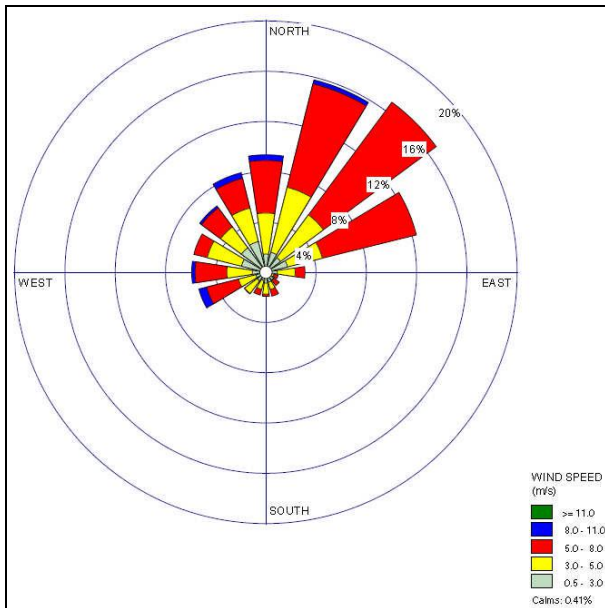


Autumn – Season (Calm – 0.5%)

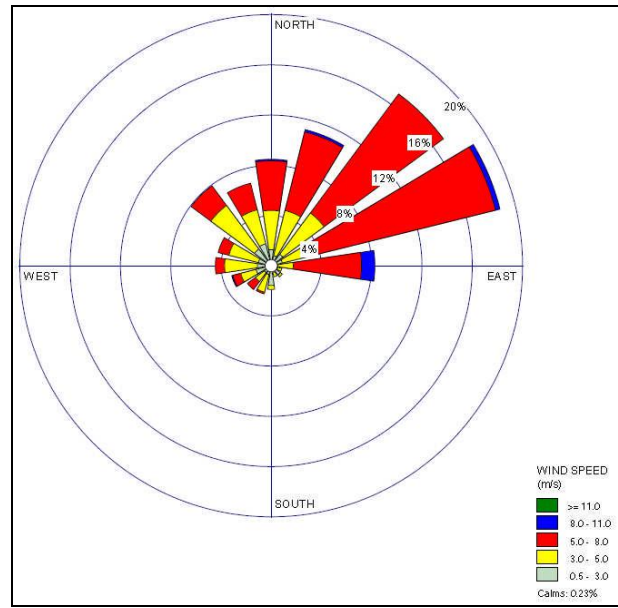


Winter – Season (Calm – 1.69%)

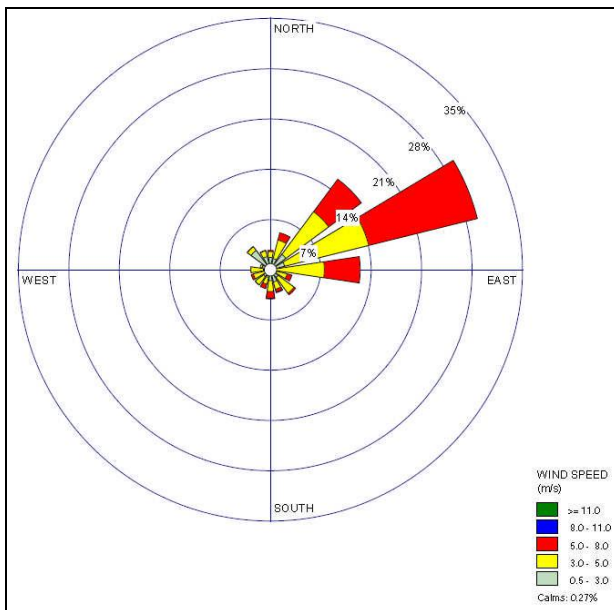
2005



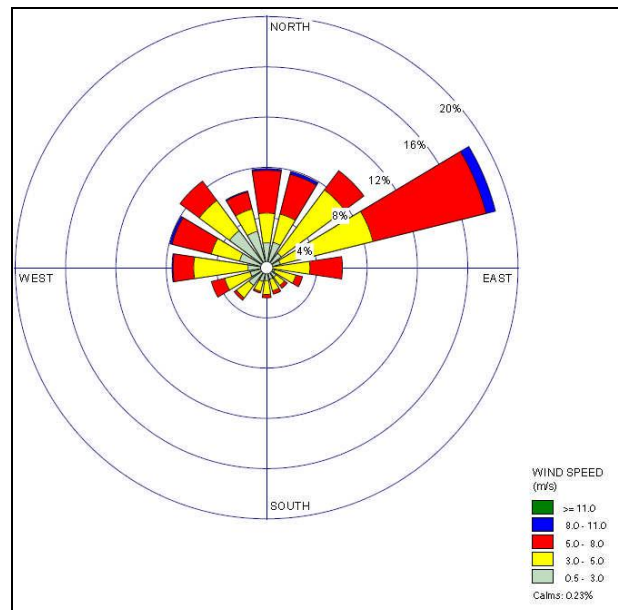
Spring – Season (Calm – 0.43%)



Summer – Season (Calm – 0.23%)

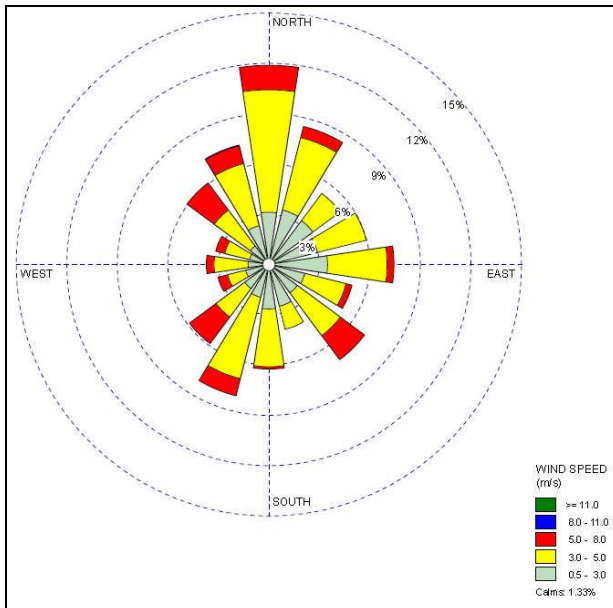


Autumn – Season (Calm – 0.27%)

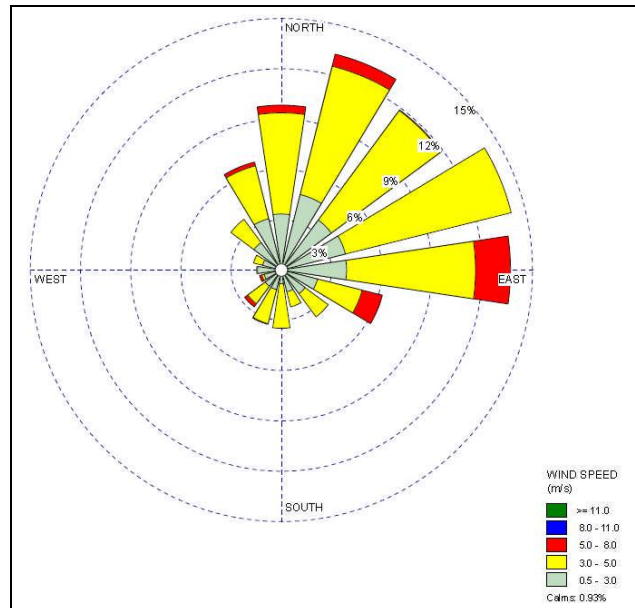


Winter – Season (Calm – 0.23%)

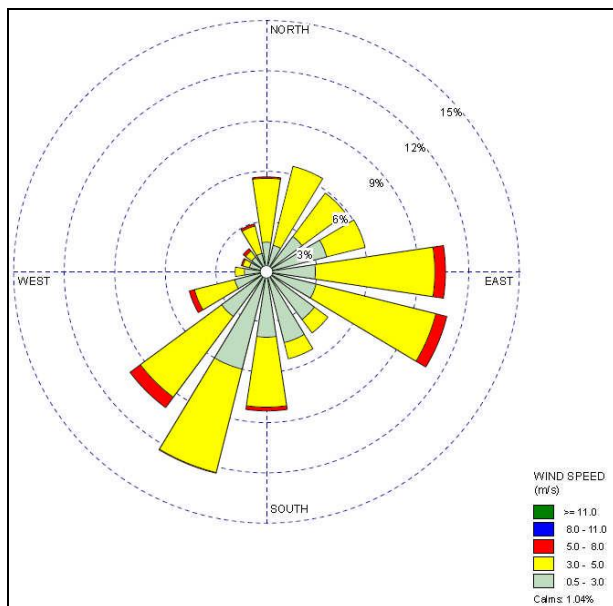
2006



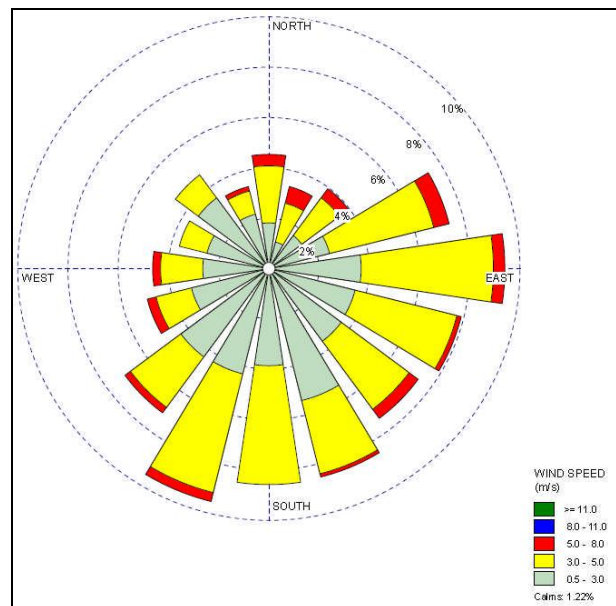
Spring – Season (Calm – 1.33%)



Summer – Season (Calm – 0.93%)



Autumn – Season (Calm – 1%)



Winter – Season (Calm – 1.2%)

## Appendix C: NOISE MONITORING LOCATIONS & DETAILS

### Monitoring Location 1

#### Monitoring Details

Coordinates: 151°03.766 E, 29°45.980 S

SLM Time/Frequency weighting: Fast/A

Instrument: Larson Davis 831

Instrument last calibrated by lab: 22<sup>nd</sup> Jan 2013

Microphone Height: 1.5 m

Measurement Period: 15 minutes / 60 minutes

Serial Number: 2059

Calibration level: 94 dB pre and post measurement

#### Site Comments

On site observations identified that the most dominant noise source was traffic movements on the Gwydir Highway, located 120 m from the logger. Other noise sources included cattle, (the boundary of the field holding the cattle was two metres from the logger), wind blowing through trees and birdsong. Observations from site personnel identified that the plant was audible but not distinguishable above other noise sources. There were no sources of ground vibration in the area.

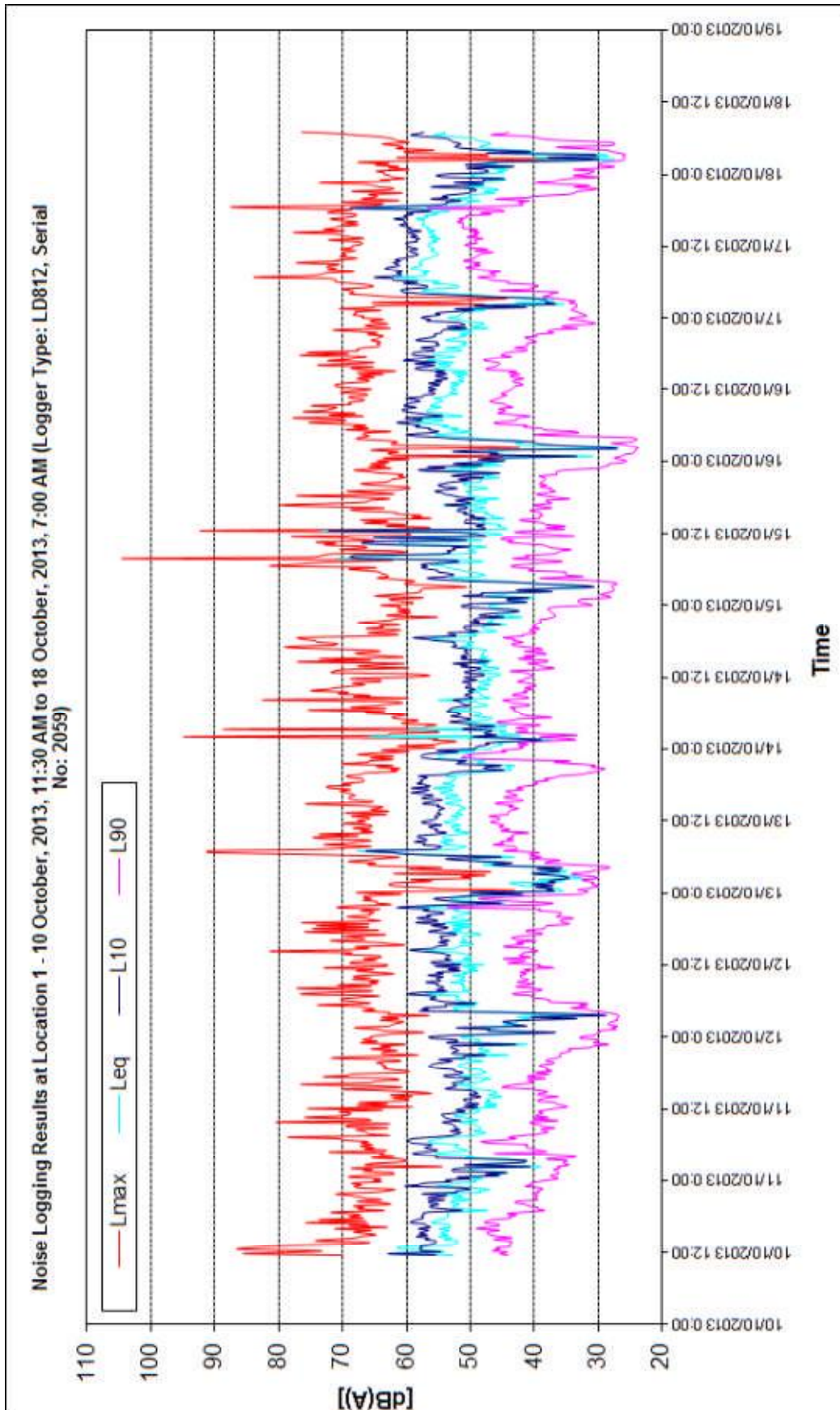
#### Location

The monitoring location is shown by a red dot below. The monitoring location was free field.



#### Data

| Noise Descriptor                         | Time Period           | 10-Oct-13 | 11-Oct-13 | 12-Oct-13 | 13-Oct-13 | 14-Oct-13 | 15-Oct-13 | 16-Oct-13 | 17-Oct-13 |
|------------------------------------------|-----------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>L<sub>AMAX</sub></b>                  | Night (10pm to 7am)   | 72.1      | 74.0      | 91.2      | 94.9      | 81.1      | 75.3      | 83.9      | 73.6      |
| <b>L<sub>Aeq</sub> Average (traffic)</b> | Day (7am to 10pm)     | -         | 49.6      | 52.2      | 54.2      | 49.2      | 58.7      | 53.8      | 56.6      |
|                                          | Night (10pm to 7am)   | 51.4      | 48.8      | 51.0      | 53.4      | 48.3      | 50.9      | 53.4      | 48.2      |
| <b>L<sub>Aeq</sub> Average</b>           | Day (7am to 6pm)      | -         | 49.6      | 51.9      | 55.0      | 48.7      | 59.9      | 54.3      | 56.8      |
|                                          | Evening (6pm to 10pm) | 52.5      | 49.7      | 53.0      | 50.9      | 50.3      | 49.3      | 52.4      | 56.2      |
|                                          | Night (10pm to 7am)   | 51.4      | 48.8      | 51.0      | 53.4      | 48.3      | 50.9      | 53.4      | 48.2      |
| <b>L<sub>A90</sub> Average</b>           | Day (7am to 6pm)      | -         | 39.3      | 41.4      | 44.1      | 41.1      | 39.0      | 44.5      | 49.2      |
|                                          | Evening (6pm to 10pm) | 41.1      | 37.2      | 38.6      | 34.6      | 40.6      | 38.2      | 40.9      | 40.1      |
|                                          | Night (6pm to 10pm)   | 38.8      | 31.2      | 35.3      | 42.1      | 33.8      | 31.1      | 36.9      | 32.3      |
| <b>RBL</b>                               | Day (7am to 6pm)      | -         | 36.6      | 39.2      | 42.2      | 38.7      | 35.4      | 42.5      | 46.6      |
|                                          | Evening (6pm to 10pm) | 39.5      | 35.4      | 35.0      | 29.9      | 39.1      | 36.8      | 38.8      | 32.3      |
|                                          | Night (6pm to 10pm)   | 35.3      | 27.1      | 29.9      | 36.4      | 27.7      | 24.2      | 32.0      | 26.3      |



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## Monitoring Location 2

### Monitoring Details

Coordinates: 151°03.505 E, 29°46.385 S  
SLM Time/Frequency weighting: Fast/A  
Instrument: Larson Davis 831  
Instrument last calibrated by lab: 24<sup>th</sup> Apr 2012

Microphone Height: 1.5 m  
Measurement Period: 15 minutes / 60 minutes  
Serial Number: 2160  
Calibration level: 94 dB pre and post measurement

### Site Comments

On site observations identified that the most dominant noise source were cattle in adjacent field, occasional traffic movements along the nearby lane and birdsong. There were no sources of ground vibration in the area. On the 11<sup>th</sup> October hay bailing activities were carried out on the Gumflat paddock from 07:00-12:30. These activities were approximately 5 m from the logger.

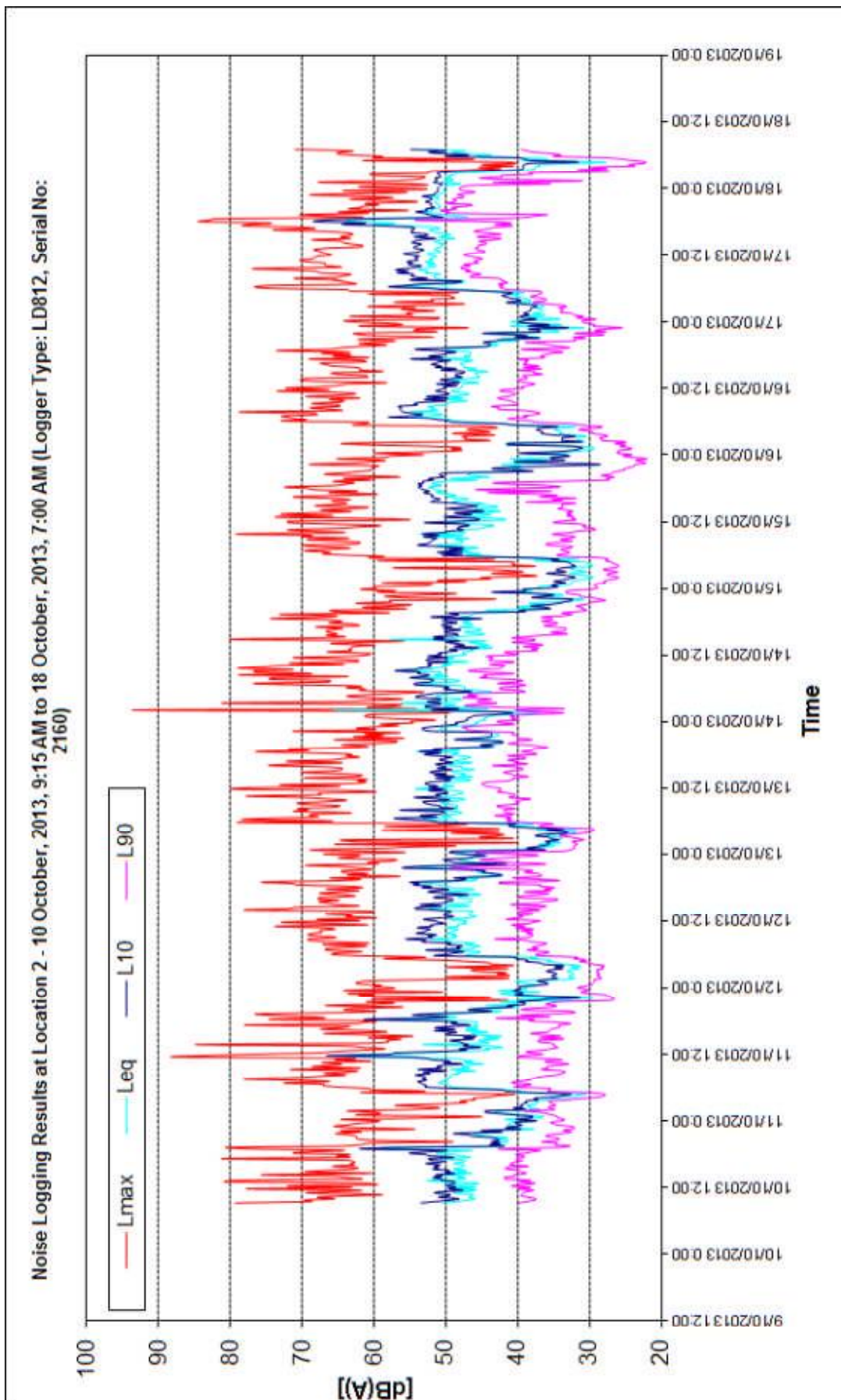
### Location

The monitoring location is shown by a red dot below. The monitoring location was free field.



### Data

| Noise Descriptor                         | Time Period           | 10-Oct-13 | 11-Oct-13 | 12-Oct-13 | 13-Oct-13 | 14-Oct-13 | 15-Oct-13 | 16-Oct-13 | 17-Oct-13 |
|------------------------------------------|-----------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>L<sub>AMAX</sub></b>                  | Night (10pm to 7am)   | 72.7      | 66.8      | 78.8      | 93.7      | 69.8      | 72.8      | 76.7      | 69.0      |
| <b>L<sub>Aeq</sub> Average (traffic)</b> | Day (7am to 10pm)     | -         | 51.4      | 48.7      | 48.8      | 48.8      | 48.3      | 48.4      | 54.0      |
|                                          | Night (10pm to 7am)   | 43.1      | 40.9      | 45.3      | 52.6      | 39.5      | 43.2      | 45.2      | 48.3      |
| <b>L<sub>Aeq</sub> Average</b>           | Day (7am to 6pm)      | -         | 52.0      | 48.4      | 49.2      | 49.8      | 48.2      | 49.2      | 52.4      |
|                                          | Evening (6pm to 10pm) | 51.0      | 49.5      | 49.3      | 47.2      | 44.2      | 48.8      | 45.2      | 56.6      |
|                                          | Night (10pm to 7am)   | 43.1      | 40.9      | 45.3      | 52.6      | 39.5      | 43.2      | 45.2      | 48.3      |
| <b>L<sub>A90</sub> Average</b>           | Day (7am to 6pm)      | -         | 36.0      | 38.3      | 41.3      | 39.9      | 34.1      | 39.6      | 45.0      |
|                                          | Evening (6pm to 10pm) | 36.3      | 36.0      | 39.4      | 39.0      | 32.5      | 30.9      | 34.0      | 46.6      |
|                                          | Night (6pm to 10pm)   | 34.6      | 30.6      | 36.1      | 42.5      | 29.3      | 28.4      | 34.3      | 37.5      |
| <b>RBL</b>                               | Day (7am to 6pm)      | -         | 33.9      | 36.1      | 39.4      | 34.7      | 31.6      | 37.1      | 42.4      |
|                                          | Evening (6pm to 10pm) | 34.1      | 32.5      | 35.9      | 37.4      | 29.9      | 25.3      | 30.0      | 38.4      |
|                                          | Night (6pm to 10pm)   | 30.4      | 28.0      | 30.9      | 38.5      | 26.4      | 23.8      | 29.3      | 24.5      |



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### Monitoring Location 3

#### Monitoring Details

Coordinates: 151°02.899 E, 29°45.946 S  
SLM Time/Frequency weighting: Fast/A  
Instrument: Larson Davis 831  
Instrument last calibrated by lab: 9<sup>th</sup> Dec 2011

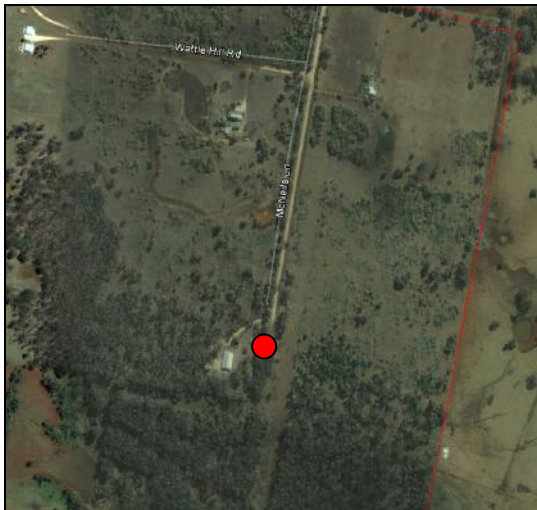
Microphone Height: 1.5 m  
Measurement Period: 15 minutes / 60 minutes  
Serial Number: 2255  
Calibration level: 94 dB pre and post measurement

#### Site Comments

On site observations identified that the most dominant noise source were wind blowing through the trees and birdsong. Observations from site personnel identified that the plant was audible at this location. There were no sources of ground vibration in the area.

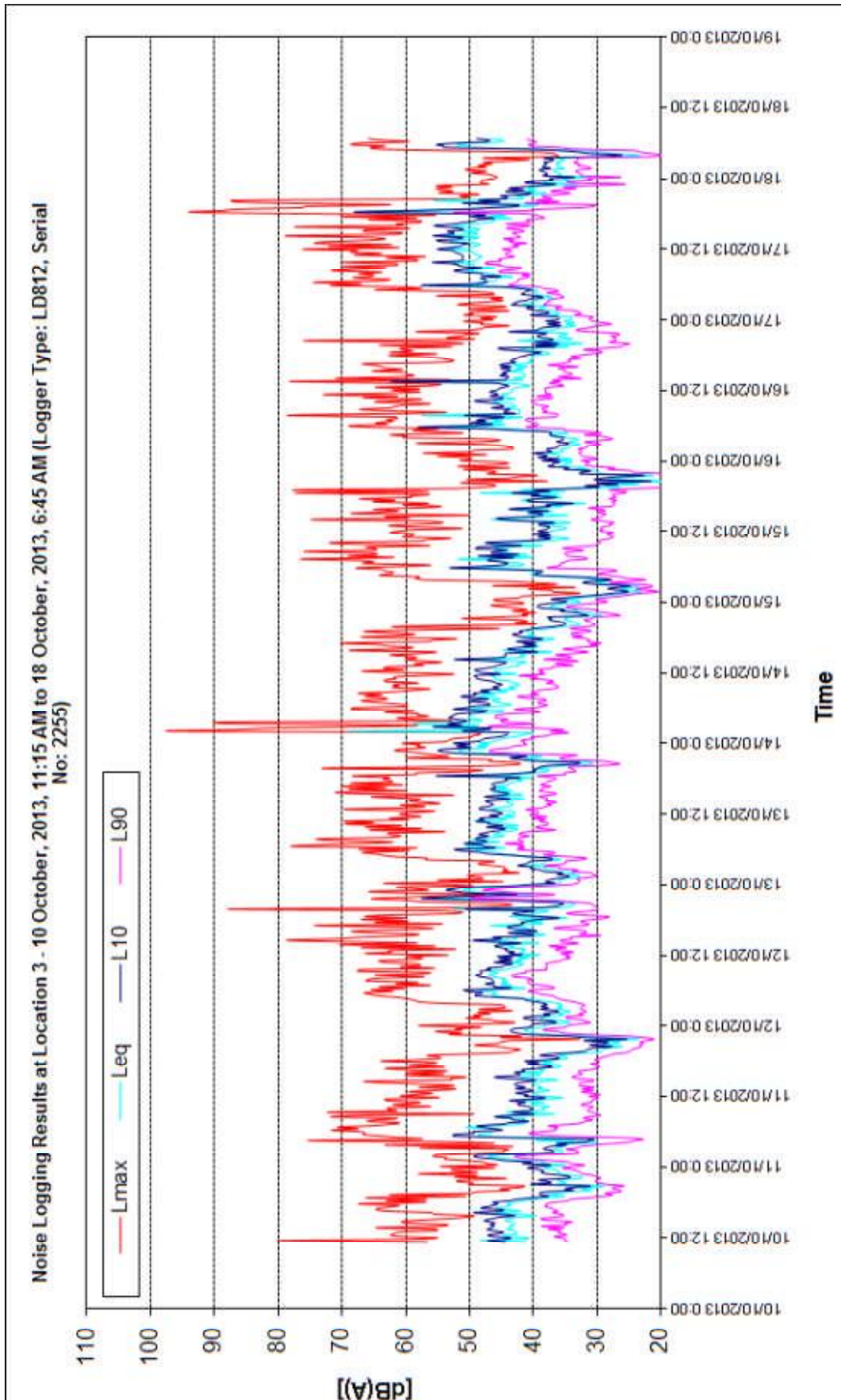
#### Location

The monitoring location is shown by a red dot below. The monitoring location was free field.



#### Data

| Noise Descriptor                         | Time Period           | 10-Oct-13 | 11-Oct-13 | 12-Oct-13 | 13-Oct-13 | 14-Oct-13 | 15-Oct-13 | 16-Oct-13 | 17-Oct-13 |
|------------------------------------------|-----------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>L<sub>AMAX</sub></b>                  | Night (10pm to 7am)   | 75.4      | 66.5      | 77.5      | 96.6      | 67.8      | 69.0      | 74.5      | 68.6      |
| <b>L<sub>Aeq</sub> Average (traffic)</b> | Day (7am to 10pm)     | -         | 39.4      | 44.8      | 44.4      | 43.3      | 41.7      | 46.0      | 52.2      |
|                                          | Night (10pm to 7am)   | 43.0      | 41.5      | 44.6      | 54.7      | 38.9      | 41.6      | 43.3      | 42.9      |
| <b>L<sub>Aeq</sub> Average</b>           | Day (7am to 6pm)      | -         | 40.4      | 43.6      | 45.1      | 44.3      | 42.4      | 47.2      | 49.6      |
|                                          | Evening (6pm to 10pm) | 37.3      | 33.1      | 47.0      | 42.0      | 38.0      | 38.3      | 38.5      | 55.6      |
|                                          | Night (10pm to 7am)   | 43.0      | 41.5      | 44.6      | 54.7      | 38.9      | 41.6      | 43.3      | 42.9      |
| <b>L<sub>A90</sub> Average</b>           | Day (7am to 6pm)      | -         | 31.6      | 36.3      | 39.1      | 36.4      | 29.9      | 36.8      | 42.9      |
|                                          | Evening (6pm to 10pm) | 29.7      | 25.6      | 33.8      | 33.6      | 31.7      | 20.6      | 28.2      | 37.9      |
|                                          | Night (6pm to 10pm)   | 33.8      | 34.4      | 36.9      | 41.5      | 28.5      | 32.1      | 35.5      | 32.4      |
| <b>RBL</b>                               | Day (7am to 6pm)      | -         | 30.0      | 32.0      | 37.2      | 31.4      | 27.4      | 34.1      | 40.6      |
|                                          | Evening (6pm to 10pm) | 26.4      | 22.5      | 29.3      | 28.3      | 30.4      | 16.4      | 26.1      | 31.7      |
|                                          | Night (6pm to 10pm)   | 27.2      | 31.9      | 31.5      | 37.3      | 22.2      | 28.0      | 30.7      | 23.8      |



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## Appendix D: NOISE SOURCE LOCATIONS



FigureD-1: Existing Noise Source Locations [Google Earth]

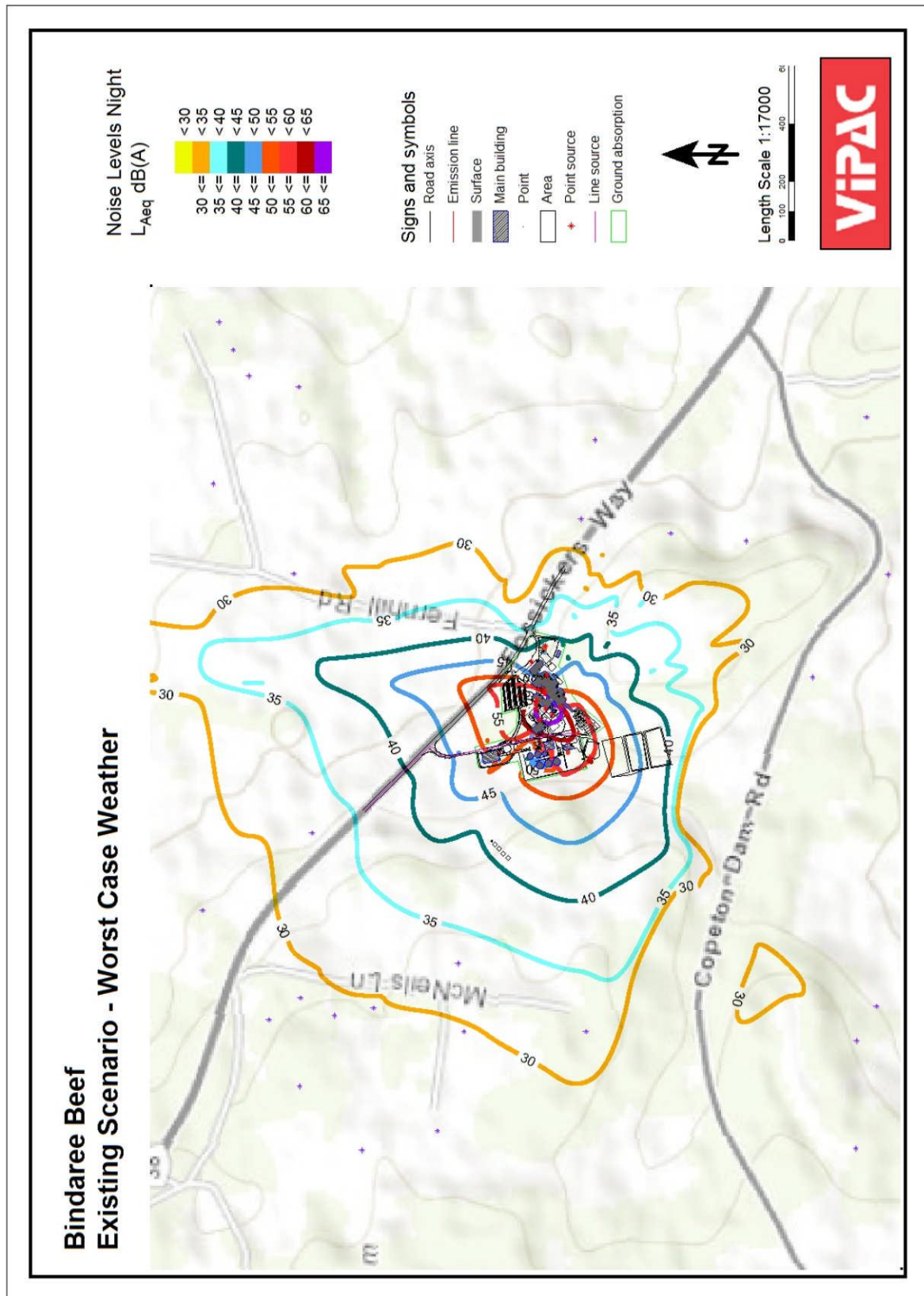


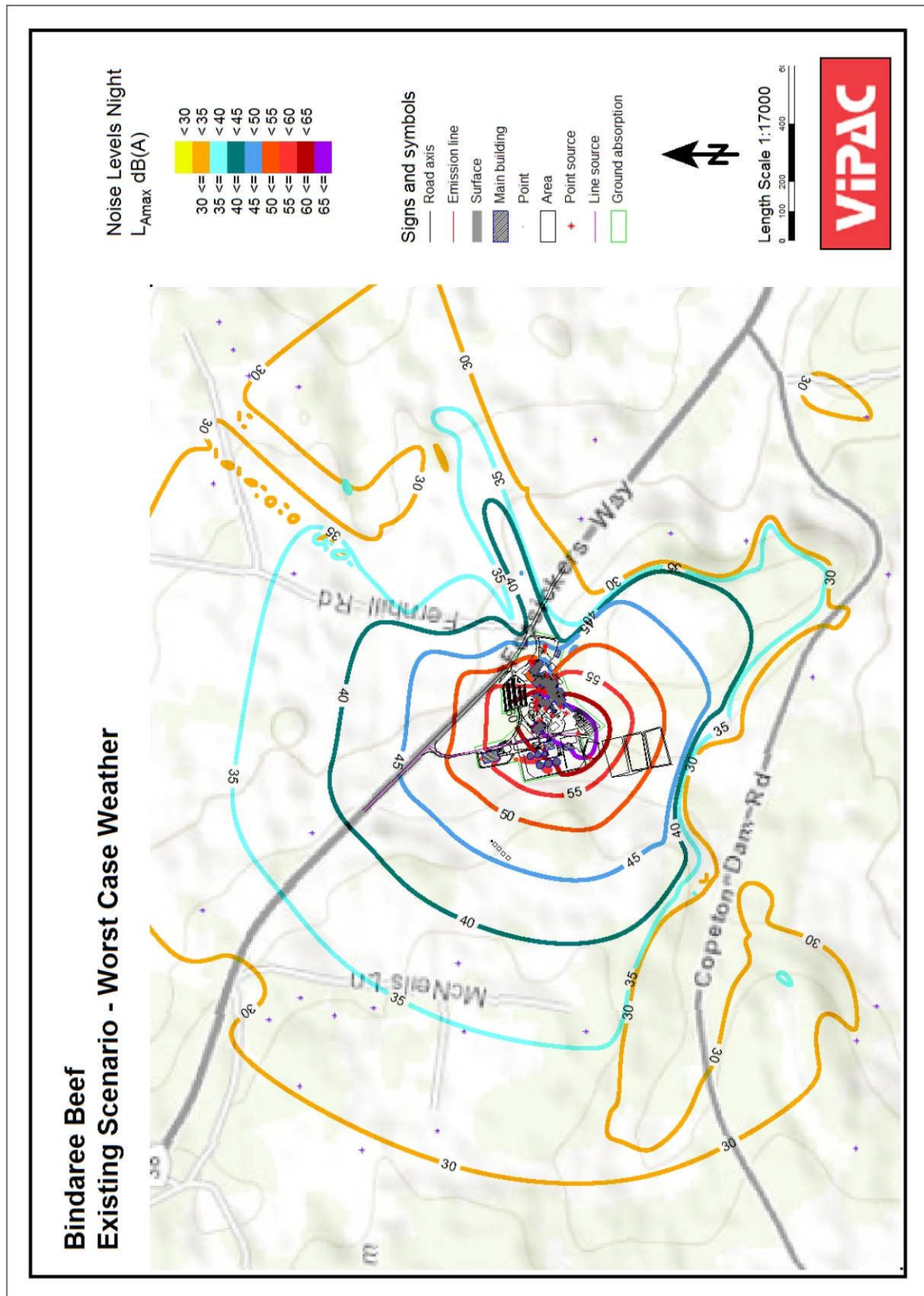


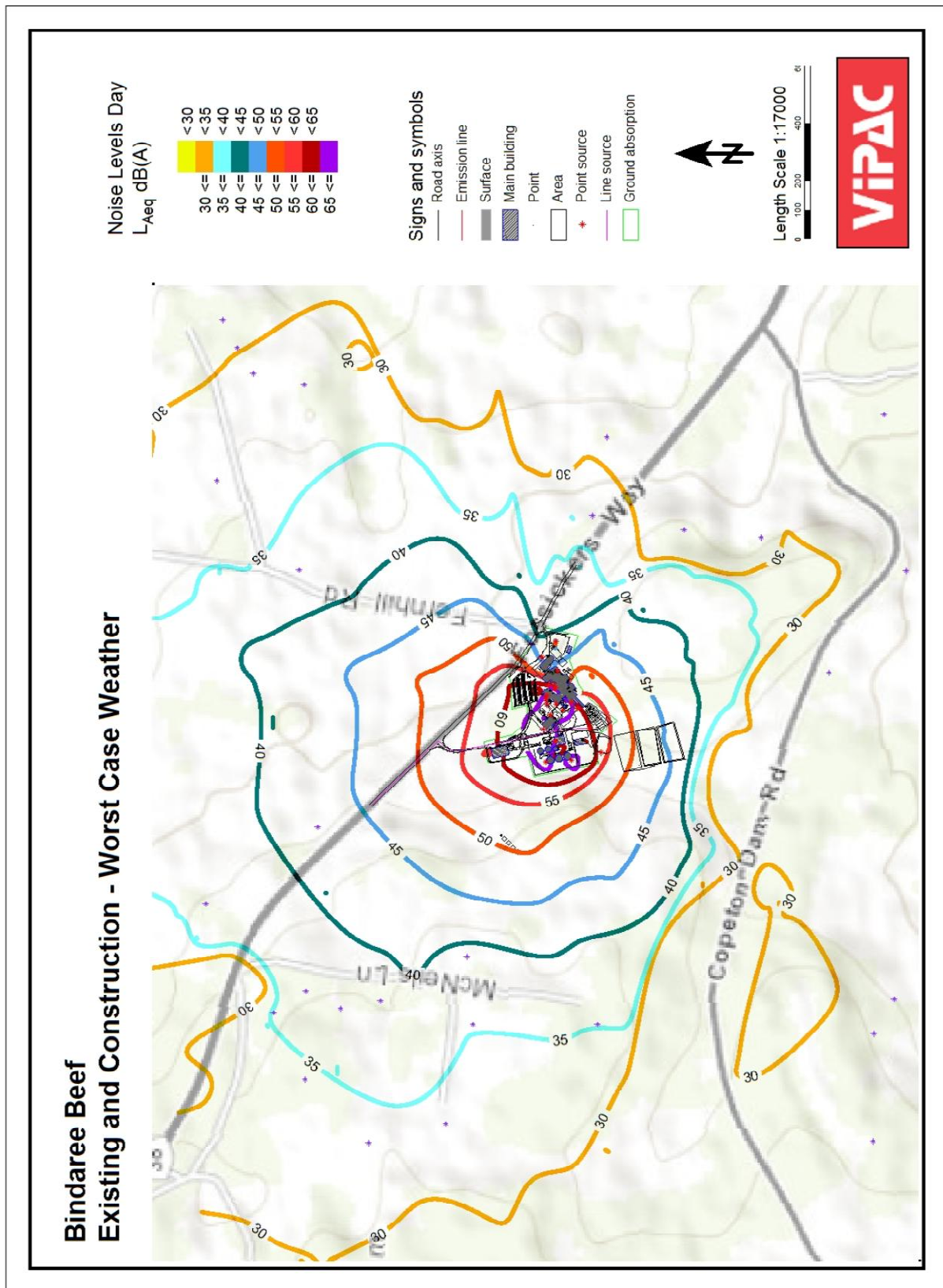
Figure D-3: Future Bio-Digester Plant Noise Sources [MeatEng, March 2014]

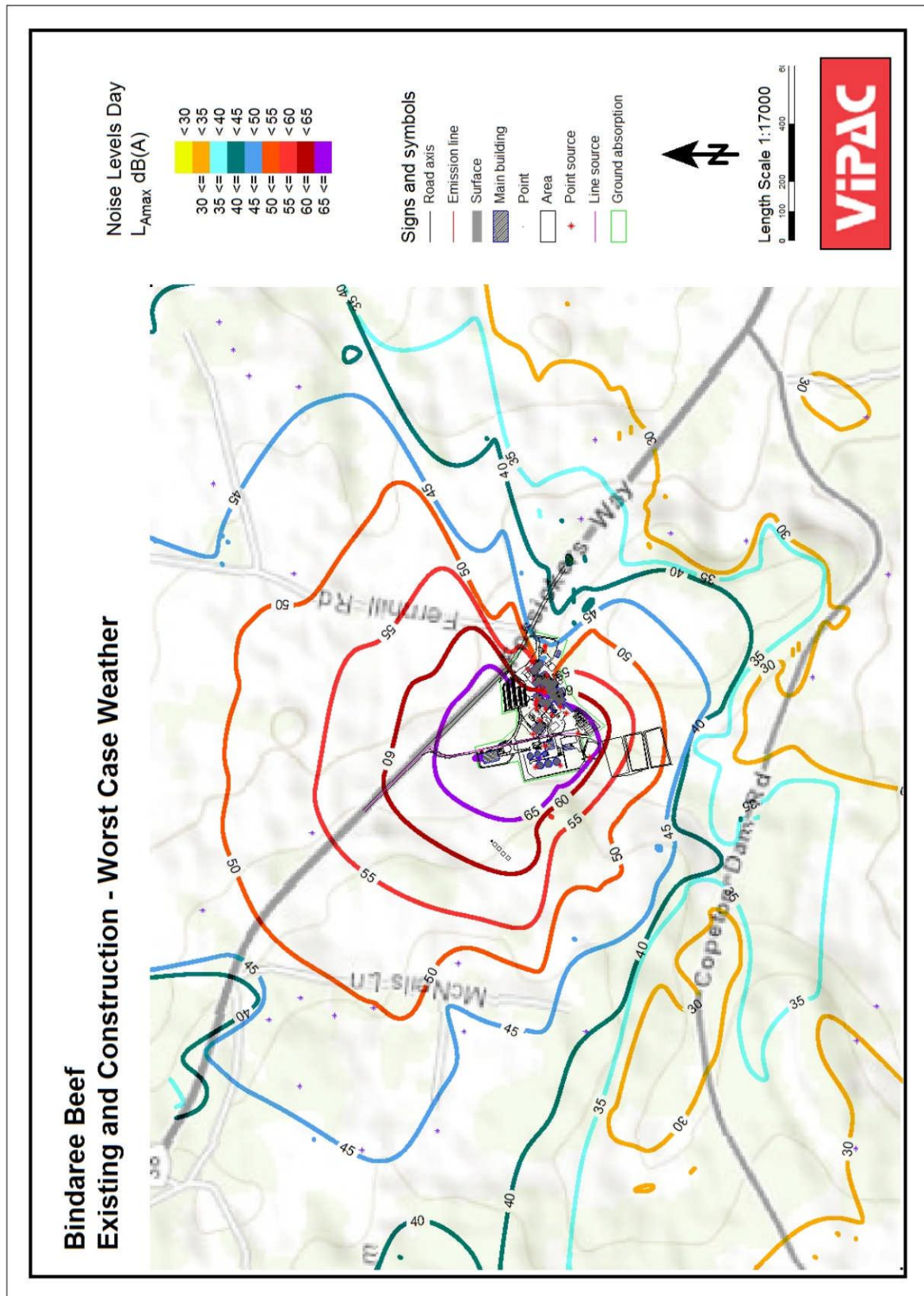


## Appendix E: NOISE CONTOUR MAPS









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