# CONTENTS

## FIGURES



## TABLES

# 12. NOISE AND VIBRATION

The South Galilee Coal Project (SGCP) seeks to maintain the existing environmental noise values, such that noise levels at nearby sensitive receptors are conducive to human health and well-being. The SGCP also seeks to maintain a suitable acoustic environment for individuals to sleep, study or learn, and to be involved in recreation including relaxation and conversation.

This Section identifies the noise and vibration values present for the SGCP and is based on detailed noise and vibration assessments undertaken on the SGCP area by Noise Mapping Australia (refer to **Appendix M—Noise and Vibration Technical Report**). The SGCP occupies the Mining Lease Application (MLA) 70453. The potential impacts on the noise and vibration values associated with SGCP are discussed and where appropriate, mitigation measures are proposed.

## 12.1. LEGISLATION AND GUIDELINES

### 12.1.1. Environmental Protection (Noise) Policy 2008

The *Environmental Protection Act 1994* provides a framework for the management of noise in Queensland. Acoustic environmental values to be enhanced or protected within the state of Queensland are specifically identified in the *Queensland Environmental Protection (Noise) Policy 2008* (*EPP (Noise)*). These values include:

- the protection of human health and wellbeing by ensuring a suitable acoustic environment for individuals
- the protection of the amenity of the community
- the protection of the health and biodiversity of ecosystems.

The *EPP (Noise)* came into effect on 1 January 2009. There are two main considerations for the SGCP from the *EPP (Noise)*, namely:

- acoustic quality objective (noise levels that are conducive to human health and wellbeing, ensuring a suitable acoustic environment for individuals to sleep, study or learn, be involved in recreation, including relaxation and conversation; and preserve the qualities of the acoustic environment that are conducive to protecting the amenity of the community)
- controlling background creep.

#### 12.1.1.1. Acoustic Quality Objectives

Acoustic quality objectives, as defined in the *EPP (Noise)* seek to protect the amenity of an acoustic environment. The indoor night-time goals effectively address sleep disturbances and sleep awakenings, while during the day it protects the ability to have a conversation.

The acoustic quality objectives are expressed as indoor noise level goals for dwellings at night (10 pm to 7 am) and outdoor noise level goals during the day (7 am to 6 pm) and evening (6 pm to 10 pm). Furthermore the *EPP (Noise)* also includes acoustic quality objectives for critical habitats (as defined in a conservation plan under the *Nature Conservation Act 1992*) and marine parks under the *Marine Parks Act 2004*. These objectives are all contained in **Table 12-1**.

**Table 12-1 Acoustic Quality Objectives for Dwellings During the Day (7 am – 6 pm), Evening (6 pm – 10 pm) and Night (10 pm – 6 am)**

| Location | Time of Day | Acoustic Quality Objectives (Measured at the receptors) dB(A) | | | Environmental Value |
|---|---|---|---|---|---|
| | | $L_{Aeq, adj, 1 hr}$ | $L_{A10, adj, 1 hr}$ | $L_{A1, adj, 1 hr}$ | |
| Dwelling outdoors | Daytime & evening | 50 | 55 | 65 | Health and wellbeing |
| Dwelling indoors | Daytime & evening | 35 | 40 | 45 | Health and wellbeing |
| Dwelling indoors | Night-time | 30 | 35 | 40 | Health wellbeing in relation to the ability to sleep |
| Protected area, or an area identified under a conservation plan under the *Nature Conservation Act 1992* as a critical habitat or an area of major interest | Anytime | The level of noise that preserves the amenity of the existing area or place | | | Health and biodiversity of ecosystems |
| Marine park under the *Marine Parks Act 2004* | Anytime | The level of noise that preserves the amenity of the existing area or place | | | Health and biodiversity of ecosystems |

Source: *EPP (Noise)* 2008

#### 12.1.1.2. Controlling Background Creep

Background creep is defined as the gradual cumulative increase in minimum noise levels generated by continuously operating noise sources.

Controlling background creep seeks to avoid intrusiveness. To the extent that it is reasonable to do so, noise from an activity must not be:

- for noise that is continuous, the noise must not be greater than the existing acoustic environment, or
- for noise that varies over time, the noise must not be more than 5 A-weighted decibels (dB(A)) greater than the existing acoustic environment.

**Table 12-2** provides a summary of noise level goals to avoid background creep.

**Table 12-2 Summary of Noise Level Goals to Avoid Background Creep**

| Location | Modelled Noise Goals to Avoid Background Creep $L_{Aeq, adj, 1 hr}$ [dB(A)] | | |
|---|---|---|---|
| | Daytime | Evening | Night |
| Alpha | 40.3 | 36 | 30 |
| All rural homesteads | 33 | 31 | 28 |

## 12.1.2. DEHP Ecoaccess Guideline – Planning for Noise Control

The Department of Environment and Heritage Protection (DEHP) Ecoaccess Guideline "Planning for Noise Control" provides methods and procedures that are applicable for setting conditions relating to noise emitted from industrial premises, commercial premises and mining operations, and are intended for planning purposes. The Guideline is applicable to sounds from all sources, individually and in combination, which contribute to the total noise from a site. The guideline takes into account three factors:

- firstly, the control and prevention of background noise creep in the case of a steady noise level from equipment such as that caused by ventilation fans and other continuously operating machinery
- secondly, the containment of variable noise levels and short-term noise events, such as those caused by forklift trucks and isolated hand tools, to an 'acceptable' level above the background noise level
- thirdly, the setting of noise levels that should not be exceeded to avoid sleep disturbance.

To prevent background noise levels from progressively creeping higher and higher over time with the establishment of new developments in an area, it is recommended that min$L_{A90}$ 1 hour background noise planning levels be exceeded. For very quiet locations, the Ecoaccess Guideline provides a lower limiting background level from planning purposes. The Guidelines state "It may not be possible to maintain background levels in very rural areas below 25 dB(A) as developments occur. In such cases a threshold background level of 25 dB(A) is to be used." Recommended noise emission planning levels for developments are presented in **Table 12-3**.

**Table 12-3 Recommended Noise Emission Planning Levels ($L_{A90}$, 1 hour) for Developments**

| Existing background noise level at the most sensitive point in an affected residential area | Recommended $L_{A90}$,1 hour maximum noise level contribution, for planning approval purposes, at that point as a result of a proposed new noise source |
|---|---|
| A. Background noise level is above relevant recommended level | Preferably, set maximum planning level 10 dB(A) or more below relevant recommended level.<br>At least, set maximum planning level 10 dB(A) below existing background level |
| B. Background noise level is at recommended level | Set maximum planning level 10 dB(A) below relevant recommended level |
| C. Background noise level is below recommended level by:<br>1 dB(A)<br>2 dB(A)<br>3 dB(A)<br>4 dB(A)<br>5 dB(A)<br>6 dB(A) or more | Set maximum planning level:<br>9 dB(A) below recommended level<br>5 dB(A) below recommended level<br>3 dB(A) below recommended level<br>2 dB(A) below recommended level<br>2 dB(A) below recommended level<br>5 dB(A) above background level |

Given the very quiet background noise levels at the SGCP, at all locations where the measured background was below 25 dB(A), the threshold background noise level of 25 dB(A) has been substituted for the measurements. A summary of the noise level goals for the SGCP at the selected sensory receptors is provided in **Table 12-4**.

**Table 12-4 Planning Noise Level Goals for Sensory Receptors**

| Location | Planning Background Noise Level dB(A) | | | Maximum Planning Level $L_{A90}$ dB(A) | | |
|---|---|---|---|---|---|---|
| | Day | Evening | Night | Day | Evening | Night |
| Alpha | 32.4 | 30.8 | 26.9 | 37.4 | 33.0 | 27.0 |
| Betanga | 25.0[#1] | 25.0[#1] | 25.0[#1] | 30.0 | 28.0 | 25.0[#1] |
| Creek farm | 25.0[#1] | 25.0[#1] | 25.0[#1] | 30.0 | 28.0 | 25.0[#1] |
| Oakleigh | 25.0[#1] | 25.0[#1] | 25.0[#1] | 30.0 | 28.0 | 25.0[#1] |
| Villafield | 25.0[#1] | 25.0[#1] | 25.0[#1] | 30.0 | 28.0 | 25.0[#1] |

*Note 1: As described above the background $L_{A90}$ noise level of 25 dB(A) has been adopted for locations with noise levels below 25 dB(A).*

#### *12.1.2.1. Sleep Disturbance*

As a rule in planning for short-term or transient noise events, for good sleep over eight hours, the indoor sound pressure level measured as a maximum instantaneous value should not exceed approximately 45 dB(A) $L_{Amax}$ more than 10–15 times per night. Where there exists the possibility that short-duration, high-level noise events may occur during the night-time hours (10 pm to 6 am) considerations will be given to the potential for sleep disturbances within the accommodation village and surrounding residences.

### 12.1.3. DEHP Ecoaccess Guideline – Low Frequency Noise

The DEHP Ecoaccess Guideline "Assessment of Low Frequency Noise" contains methods and procedures that are applicable to low frequency noise emitting from industrial premises and mining operations for planning purposes. Industrial sources may exhibit a noise spectrum that shows an increase in sound pressure level with a decreased frequency. Annoyance due to low frequency noise can be high even though the dB(A) level measured is relatively low. Typically, annoyance is experienced in the otherwise quiet environments adjacent to or near low frequency noise sources. Generally, low level/low frequency noises become annoying when the masking effect of higher frequencies is absent. This loss of high frequency components may occur as a result of transmission through the fabric of a building, or in propagation over long distances.

The guideline states that where a noise emission occurs exhibiting an unbalanced frequency spectra, the overall sound pressure level inside residences should not exceed 50 dB(Linear) to avoid complaints of low frequency noise annoyance.

The potential for low frequency noise in the range of 20 hertz (Hz) to 200 Hz for the SGCP was assessed in accordance with the DEHP Ecoaccess Guideline Assessment of Low Frequency Noise.

#### *12.1.3.1. DEHP Ecoaccess Guideline - Blasting Criteria*

Open-cut coal mining procedures often include drilling and blasting of overburden material above the coal to make removal of that material easier.

According to the DEHP's Ecoaccess Guideline "Noise and Vibration from Blasting", blasting should generally be limited to the hours of 9 am to 3 pm, Monday to Friday, and from 9 am to 1 pm on Saturdays. Blasting should not generally take place on Sundays or public holidays.

Blasting outside these recommended times should be approved only where:

- blasting during the preferred times is clearly impracticable (in such situations blasts should be limited in number and stricter airblast overpressure and ground vibration limits should apply), or
- there is no likelihood of persons in a noise-sensitive place being affected because of the remote location of the blast site.

Blasting activities must be carried out in such a manner that if blasting noise should propagate to a noise-sensitive place, then:

- the airblast overpressure must be not more than 115 dB (linear) peak for 9 out of any 10 consecutive blasts initiated, regardless of the interval between blasts
- the airblast overpressure must not exceed 120 dB (linear) peak for any blast.

Blasting operations must be carried out in such a manner that if ground vibration should propagate to a vibration-sensitive place:

- the ground-borne vibration must not exceed a peak particle velocity of 5 mm/s for nine out of any 10 consecutive blasts initiated, regardless of the interval between blasts
- the ground-borne vibration must not exceed a peak particle velocity of 10 mm/s for any blast.

### 12.1.4. Road Traffic Noise Goals

Queensland Department of Transport and Main Roads (DTMR) is responsible for setting noise level limits from road traffic. There are no noise sensitive receptors close to any of the local roads. The planning levels do not apply for minor roads surrounding the SGCP and therefore it is beyond the scope of this study to assess the noise from the road network. There are no criteria in Queensland to assess the impact of noise from a road traffic-generating development. It is recommended that road noise be limited to a 3 dB(A) increase over the existing noise levels, since an increase in 3 dB(A) is not noticeable.

### 12.1.5. Railway Noise Goals

Queensland Rail's (QR) *Code of Practice – Railway Noise Management* is responsible for setting noise level limits from rail traffic. The planning levels for a railway are:

- 65 dB (A), assessed as the 24 hour average equivalent continuous A-weighted sound pressure level
- 87 dB (A), assessed as a single event maximum sound pressure level.

Typically the planning goals for coal train operations are met close to the railway (i.e. at distances up to 100 m). The closest sensitive receptors to the SGCP rail spur are the Oakleigh Station Homestead, Saltbush Station Homestead and the accommodation village; all of which are located approximately 2 kilometres (km) from the proposed rail corridor.

Although there may be other noise sensitive receptors within 100 m of the proposed common user rail line it is beyond the scope of this study to assess the noise impacts from the entire rail line to the Abbott Point Coal Terminal (APCT).

## 12.2. DESCRIPTION OF ENVIRONMENTAL VALUES

The SGCP is situated approximately 12 km south-west of the township of Alpha in a well-established grazing region. The area surrounding the site has undulating topography comprising open farmlands and native scrublands.

Potential sources of noise and/or vibration from the surrounding environment primarily comprise:

- farming and grazing activities
- residential activity noise
- environmental noise (e.g. insects, wind, etc.)
- road and rail traffic.

### 12.2.1. Climate

The region has a warm climate with two distinct seasons, a dry winter season and a wet summer season. Dry season temperatures average from 9 °C to 30 °C, while wet season temperatures range from 18 °C to 35 °C. The region averages approximately 550 mm of rainfall each year, falling mostly between November and March.

The warm wet season encourages crickets, cicadas and other wildlife proliferation. This usually causes higher ambient noise levels. During the dry winter season the ambient noise levels are lower since the cooler conditions and lack of water reduces insect activity. The greatest noise impact from mining usually occurs during the cool dry season since these cooler conditions are more favourable to the propagation of noise at large distances (particularly at night) and the cooler conditions also result in lower ambient noise levels. Daytime conditions throughout the year are always warm to hot since the area is subject to high solar loads.

### 12.2.2. Noise Sensitive Receptors

Ten sensitive receptors have been identified within 19 km of the closest approach of the SGCP. The closest sensitive receptors are located 1 km from the MLA 70453 boundary.

The sensitive receptors in the vicinity of the SGCP comprise the homesteads of grazing properties, the Alpha township and the accommodation village located within MLA 70453. The closest sensitive receptors are shown on **Figure 12-1**. The locations and separation distances are contained in **Table 12-5**.

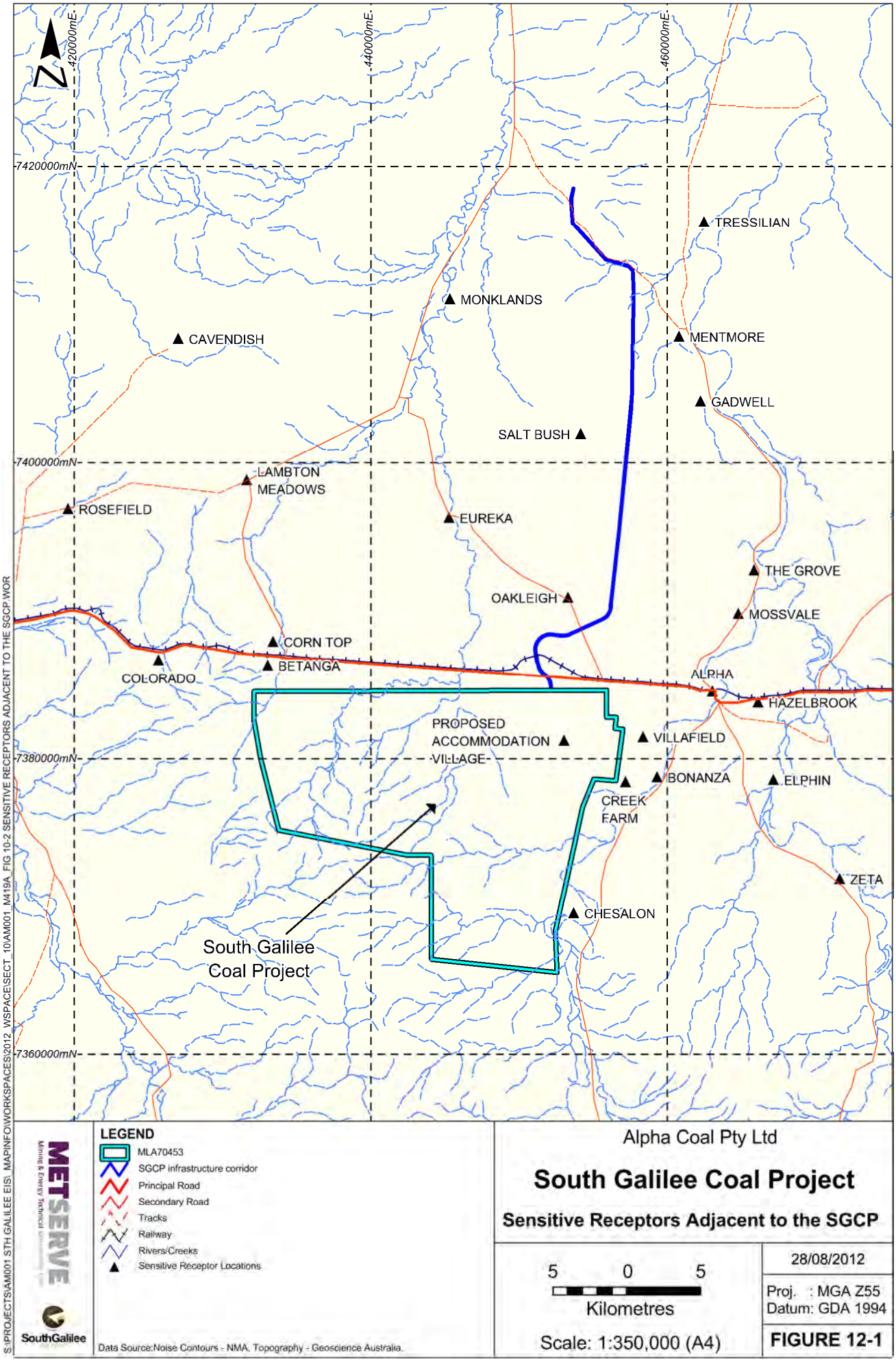

420000mE
440000mE
460000mE
7420000mN
7400000mN
7380000mN
7360000mN
TRESSILIAN
MONKLANDS
CAVENDISH
MENTMORE
GADWELL
SALT BUSH
LAMBTON MEADOWS
ROSEFIELD
EUREKA
THE GROVE
OAKLEIGH
MOSSVALE
CORN TOP
BETANGA
COLORADO
ALPHA
HAZELBROOK
PROPOSED ACCOMMODATION VILLAGE
VILLAFIELD
BONANZA
ELPHIN
CREEK FARM
ZETA
CHESALON
South Galilee Coal Project
S:\PROJECTS\AM001 STH GALILEE EIS\ MAPINFO\WORKSPACES\2012_WSPACE\SECT_10\AM001_M419A_FIG 10-2 SENSITIVE RECEPTORS ADJACENT TO THE SGCP WOR
LEGEND
MLA70453
SGCP infrastructure corridor
Principal Road
Secondary Road
Tracks
Railway
Rivers/Creeks
Sensitive Receptor Locations
Data Source:Noise Contours - NMA, Topography - Geoscience Australia.
METSERVE
Mining & Energy Technical
SouthGalilee
Alpha Coal Pty Ltd
South Galilee Coal Project
Sensitive Receptors Adjacent to the SGCP
5 0 5
Kilometres
Scale: 1:350,000 (A4)
28/08/2012
Proj. : MGA Z55
Datum: GDA 1994
FIGURE 12-1

**Table 12-5 Sensitive Receptors Adjacent to SGCP**

| *Sensitive Receptor* | *Separation Distance [km] From Sensitive Receptor to* | | |
|---|---|---|---|
| | **MLA 70453** | **Surface Works** | **Railway Corridor** |
| Alpha Township | 7 | 14 | 8 |
| Eureka Station Homestead | 12 | 14 | 11 |
| Villafield Station Homestead | 1 | 9 | 6 |
| Bonanza Station Homestead | 2 | 10 | 9 |
| Creek Farm Station Homestead | 1 | 8 | 8 |
| Chesalon Station Homestead | 1 | 6 | 15 |
| Betanga Station Homestead | 2 | 12 | 18 |
| Corn Top Station Homestead | 3 | 12 | 18 |
| Oakleigh Station Homestead | 6 | 8 | 2 |
| Saltbush Station Homestead | 17 | 19 | 2 |

A survey of the existing noise levels was undertaken at five locations surrounding the SGCP and proposed railway, including:

- Alpha
- 'Betanga Station' homestead
- 'Creek Farm Station' homestead
- 'Oakleigh Station' homestead
- 'Villafield Station' homestead.

Properties for monitoring were selected to represent potentially affected residences nearest to the proposed mine site. Since easterly winds are commonplace it was considered appropriate that noise measurements be obtained both upwind and downwind of the proposed SGCP.

Baseline monitoring was conducted at all five sensitive receptors over a period of nine days from 20 July 2011 to 28 July 2011. A calibrated noise logger recorded the noise level statistics in ten minute intervals. The timing of baseline monitoring aimed to characterise the ambient noise environment, without elevated noise levels experienced for relatively short periods of the year. For example, during the warm wet season, ambient noise levels are higher due to the proliferation of crickets, cicadas and other wildlife. In contrast, conditions during the dry winter season (e.g. temperature inversions) are more favourable to the propagation of noise for large distances, particularly at night. As a result, the greatest noise impact from mining generally occurs during winter.

The noise sources noted during baseline monitoring are typical of a rural grazing area. The noise levels at these locations are due to residential activity, farming, birds, wind and/or traffic.

Baseline monitoring was used to develop a Rating Background Level (RBL). RBL is used to provide a representative ambient noise level free from seasonal noise effects and commercial noise. The RBL is considered to be representative of the quieter periods of the year. The RBL at the five sensitive receptor locations around the SGCP is predominantly composed of noise associated with residential activity, farming, birds, wind and traffic.

The recorded baseline noise levels are present in terms of the $L_{A10(10\ minute)}$, $L_{A90(10\ minute)}$ and $L_{Aeq\ (10\ minute)}$. The noise levels measured at the station homesteads are extremely low and demonstrate an absence of significant noise producing activity. A summary of the baseline noise monitoring data is provided in **Table 12-6**.

More information about the existing noise environment, including detailed monitoring results, can be found in the Noise and Vibration Assessment in **Appendix M—Noise and Vibration Technical Report**.

**Table 12-6 Summary of Existing Noise Levels (in dB(A))**

| Location | Rating Background Level/Median | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $L_{A90(10\ minute)}$ Background Noise Level | | | $L_{Aeq(10\ minute)}$ Noise Level | | | | $L_{A10(10\ minute)}$ Noise Level | | |
| | Day | Evening | Night | 24 Hour | Day | Evening | Night | Day | Evening | Night |
| Alpha Township | 32.4 | 30.8 | 26.9 | 41.6 | 43.8 | 37.6 | 32.4 | 45.5 | 39.6 | 34.1 |
| 'Betanga Station' Homestead | 17.6 | 16.2 | 16.2 | 31.2 | 34.6 | 28.6 | 25.5 | 38.0 | 31.3 | 25.6 |
| 'Creek Farm Station' Homestead | 20.8 | 17.0 | 15.8 | 36.4 | 38.9 | 29.6 | 28.6 | 38.1 | 30.5 | 29.3 |
| 'Oakleigh Farm Station' Homestead | 18.5 | 20.0 | 17.1 | 28.7 | 32.5 | 24.4 | 20.1 | 26.7 | 23.4 | 19.0 |
| 'Villafield Station' Homestead | 20.6 | 17.5 | 17.5 | 32.3 | 35.1 | 21.1 | 20.8 | 39.3 | 22.3 | 21.7 |

## 12.3. NOISE MODELLING METHODOLOGY

As part of the EIS process there is a requirement to understand and measure the existing ambient noise environment. Monitoring takes the form of collecting measurements using an unattended, automatic noise logger. Monitoring is conducted over a sufficient time period to reflect true and repeated conditions that are typically experienced in the area without influence from seasonal variations due to temperature inversions, winds, insects, etc. In practice, continuous monitoring is conducted for a minimum period of one week at sensitive receptor locations prior to a mine becoming operational. The information obtained from baseline monitoring is used to set criteria for the Project and as a method to validate noise prediction modelling.

Predicting noise emissions from mining projects is conducted using environmental noise modelling software. Noise modelling is used to determine the ranking of noise sources on-site and therefore changes in noise contribution from a mine as a result of various operational scenarios and/or noise mitigation methods.

Noise modelling includes three types of information:

- ground topographic data
- location of all plant and equipment and estimates of their noise generation
- data on meteorological conditions.

More information regarding modelling methods can be found in the Noise and Vibration Assessment in **Appendix M—Noise and Vibration Technical Report**.

#### *12.3.1.1. Noise Modelling*

A Digital Terrain Model (DTM) of the site and surroundings has been developed using PEN3D as detailed in the Noise and Vibration Assessment in **Appendix M—Noise and Vibration Technical Report**. PEN3D is an advanced environmental noise model incorporating a 3-D terrain model that permits accurate representation of the ground topography, ground cover, tree zones, mounds, barriers and weather conditions. PEN3D is deemed to provide a conservatively high estimate of noise impacts at sensitive receptors, particularly for night-time and downwind calculations.

Modelling inputs, assumptions, limitations, sensitivities and accuracy are discussed in further detail in **Appendix M—Noise and Vibration Technical Report**.

#### *12.3.1.2. Meteorological Modelling*

Adverse meteorological conditions have the potential to increase noise levels at a sensitive receptor. This is generally the result of temperature inversions or where a wind gradient occurs with wind direction from the source to the receptor.

The prevailing meteorological conditions for the site have been assessed using data extracted from the regional 2004 meteorological database. The modelling has been carried out for each relevant sensitive receptor for every hour of the day and every day of the year, resulting in a total of 9,000 meteorological cases being modelled for every noise sensitive receptor.

Meteorological model inputs, assumptions, limitations, sensitivities and accuracy are discussed in further detail in **Appendix M—Noise and Vibration Technical Report**.

#### *12.3.1.3. Blasting Noise and Vibration Modelling*

Vibration is the term used to describe oscillation, reciprocation or other periodic motion of a body forced from equilibrium. In the mining industry, vibration is generated by many items of plant and equipment. The major source of vibration emission is blasting. Conveyors, processing plant and other equipment also emit vibrations.

Airblast overpressure is the energy transmitted from a blast site, travelling through the atmosphere in the form of pressure waves. The pressure wave consists of both audible and inaudible energy. The maximum excess pressure in the wave is known as the 'peak air overpressure' which is generally measured in decibels using the linear frequency weighting.

The airblast levels received at a sensitive receptor location from a blast are a function of many factors, including:

- charge mass
- stemming height and type of stemming
- burden
- blast hole spacing, blast initiation sequence and timing delay between holes
- ratio of the blast hole diameter to the burden
- face height and orientation of face
- topographical shielding
- distance from the blast
- meteorological conditions.

Modelling has been used to predict the impact of airblast overpressure on the areas surrounding the SGCP. The modelling is based on empirical data and will need to be refined using airblast overpressure measurements taken once the mine is operational. For further detail on noise and vibration modelling result refer to **Section 12.4**.

Drilling and blasting of overburden material will be required at the SGCP as part of the mining operations. Drilling and blasting is expected to be required for the lower 20 % of the Permian overburden material in order to uncover coal economically.

#### *12.3.1.4. Modelling Parameters*

The main components of the SGCP construction phase include construction of the following:

- an internal road network including access from the Capricorn Highway to the accommodation village and mining areas and heavy vehicle haul roads
- initial development of the open-cut pits
- development of underground operations (including sinking shafts and declines)
- a railway line, rail loop and rail loader
- Coal Handling and Preparation Plant (CHPP)
- various supporting infrastructure including administration and workshops
- material handling infrastructure
- power supply and reticulation infrastructure
- water supply and management infrastructure
- accommodation village.

Construction phase activities will include vegetation clearance, some earthworks and construction of structures. Construction phase equipment uses similar but smaller equipment than will be used during operational phases. These units are quieter and typically used at lower levels of activities and as a result the noise levels associated with the construction phase are predicted to be significantly lower than operational noise levels.

Operational noise sources comprise:

- dragline
- shovel operation in the pit
- rockdrill
- blasting
- sizing stations
- conveyors between sizing stations, ROM stockpile area, CHPP, product stockpile area and waste rock emplacement
- dump trucks (in-pit)
- underground ventilation fans
- CHPP
- various surface earth working machines.

The likely equipment noise levels are contained in **Table 12-7.** The noise levels are expressed as a sound power level and a sound pressed level at 100 m from a working machine. The octave band sound power levels are 'linear' while the overall sound pressure levels are 'A' weighted.

**Table 12-7 Summary of Maximum Noise Levels from Mining Equipment**

| Item | Maximum Sound Power Levels (dB) in Octave Band Centre Frequency [Hz] | | | | | | | | Overall dB(A) | Overall Sound Pressure Level at 100 m dB(A) |
|---|---|---|---|---|---|---|---|---|---|---|
| | 63[#1] | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000[#2] | | |
| Dragline | 117 | 117 | 116 | 119 | 116 | 113 | 106 | 94 | 120 | 73 |
| 998 loader | 97 | 114 | 110 | 113 | 112 | 114 | 107 | 101 | 118 | 70 |
| Haul truck | 107 | 115 | 110 | 110 | 108 | 107 | 102 | 97 | 113 | 65 |
| Rear dump truck (250 t) | 118 | 126 | 121 | 121 | 119 | 118 | 113 | 108 | 124 | 76 |
| Rear Dump truck (195 t) | 115 | 123 | 118 | 118 | 116 | 115 | 110 | 105 | 121 | 73 |
| D11 Dozer | 110 | 112 | 114 | 106 | 108 | 105 | 103 | 97 | 113 | 65 |
| Drill Rig | 113 | 117 | 112 | 116 | 115 | 114 | 116 | 115 | 122 | 74 |
| Grader | 106 | 108 | 110 | 102 | 104 | 101 | 99 | 93 | 109 | 61 |
| Shovel (34 $m^3$) | 115 | 126 | 122 | 121 | 119 | 114 | 108 | 103 | 123 | 75 |
| Shovel (25 $m^3$) | 111 | 122 | 118 | 117 | 115 | 110 | 104 | 99 | 119 | 71 |
| Conveyor per km | 105 | 99 | 101 | 103 | 100 | 97 | 90 | 90 | 101 | 50 |
| Conveyor Drive | 115 | 111 | 105 | 103 | 99 | 93 | 86 | 79 | 105 | 57 |
| Stacker reclaimer | 110 | 106 | 101 | 101 | 97 | 93 | 86 | 84 | 102 | 54 |
| CHPP | 117 | 119 | 114 | 110 | 113 | 103 | 101 | 91 | 115 | 67 |
| Ventilation Fans | 121 | 108 | 97 | 94 | 95 | 93 | 80 | 85 | 101 | 53 |

Note 1: All energy in the frequencies below 63 Hz is added to the 63 Hz octave band
Note 2: All energy in the frequencies above 8000 Hz is added to the 8000 Hz octave band
(Noise Mapping Australia, 2011)

#### 12.3.1.5. Modelling Results

To describe the overall noise environment, a number of noise descriptors have been developed. These involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. The descriptors used for the SGCP noise models include:

##### 12.3.1.5.1. $L_{A01\ (LAmax)}$ Noise Model

The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

##### 12.3.1.5.2. $L_{Aeq}$ Noise Model

The equivalent continuous sound level is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. The measure is a common measure of environmental and road traffic noise.

##### 12.3.1.5.3. $L_{A10}$ Noise Model

The $L_{A10}$ level is the noise level which is exceeded for 10 % of the sample period. During the sample period, the noise level is below the $L_{A10}$ level for 90 % of the time. The $L_{A10}$ is also a common noise descriptor for environmental and road traffic noise.

##### 12.3.1.5.4. $LA_{90}$ Noise Model

The $LA_{90}$ level is the noise level which is exceeded for 90 % of the sample period.

#### 12.3.1.6. Noise Modelling Scenarios

In the noise model, the noise sources are positioned as follows:

- conveyor at 1.5 m above local terrain
- stacker reclaimer at 8 m above local terrain
- conveyor drives at 2 m above local terrain
- ventilation fans at 5 m above local terrain
- dump truck at 4.5 m above local terrain
- CHPP at 8 m above local terrain
- several sources are contained in the pit including dump trucks, loaders, excavators, drill rigs, dozers and draglines.

Two modelling cases have been prepared for the two mining stages of the SGCP.

##### 12.3.1.6.1. Case 1 – Year 3 (2017)

The first case, Year 3, is during the ramp-up phase of the mine when the projected waste rock reaches its maximum at 55.3 million bank cubic metres (Mbcm). The product coal for this year is expected to be approximately 9.7 Million tonnes per annum (Mtpa).

#### *12.3.1.6.2. Case 2 – Year 26 (2040)*

Case 2 assumes a fully developed mine with the projected waste rock reaching its local maximum of 37.7 Mbcm. The product coal projected for this year is approximately 17.1 Mtpa. The peak waste rock production is the 26th year of the mine's operation and is considered representative of the worst case emissions after the 20th year of operations.

Both cases relate to the maximum rate of handling waste rock for the respective mining phases. The equipment lists for the two mining cases are contained in **Table 12-8**.

**Table 12-8 Equipment List for SGCP Noise Modelling Cases 1 and 2**

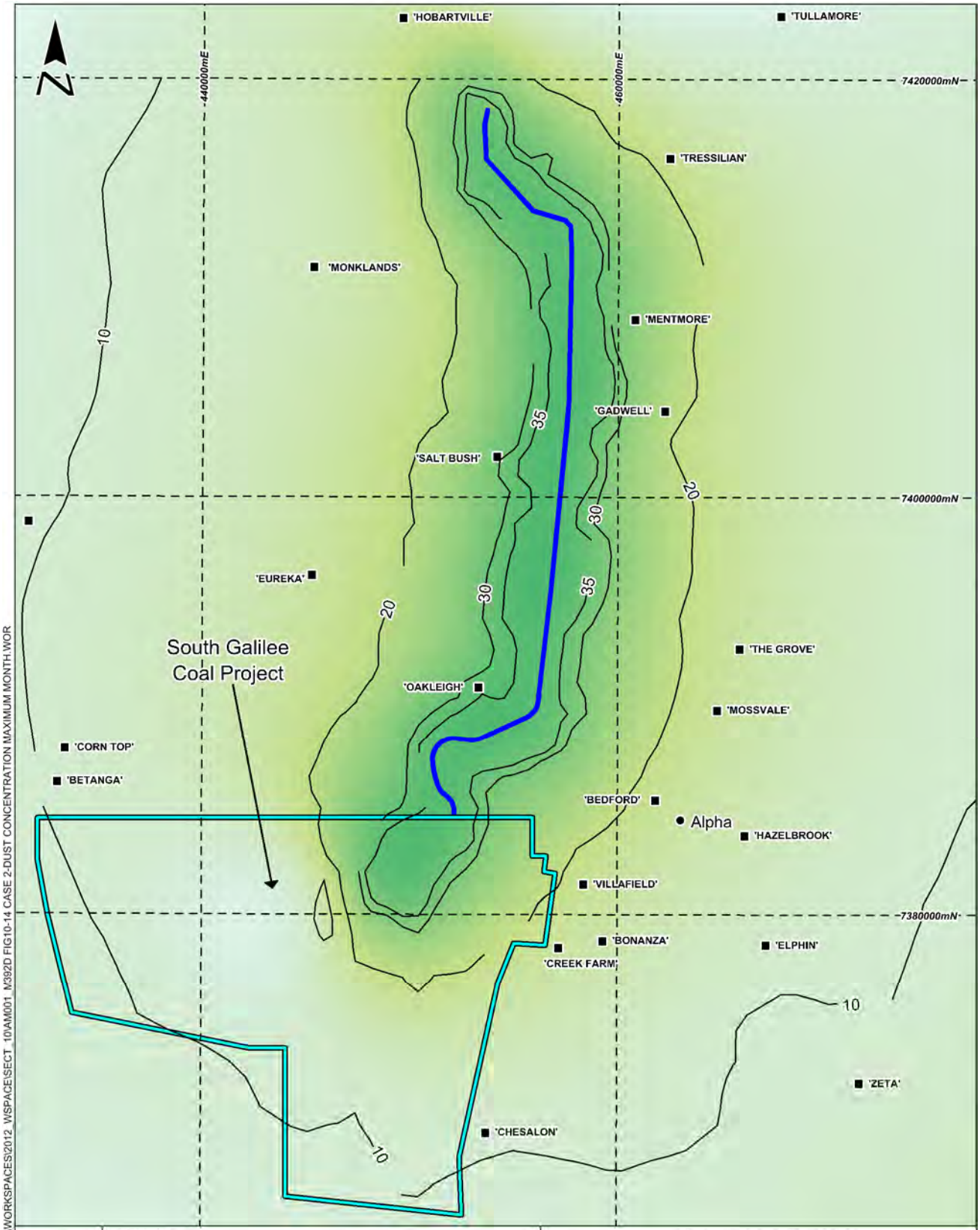
| Equipment | $L_{Amax}$ to $L_{Aeq}$ Correction [dB] | Modelling Case 1 | Modelling Case 2 |
|---|---|---|---|
| Dragline | -5 | 1 | 2 |
| Shovel (RH200) | -5 | 1 | 2 |
| Loader 998 | -5 | 2 | 2 |
| Dump truck (190 t) | -8 | 10 | 10 |
| Dump truck (250 t) | -8 | 12 | 12 |
| Conveyor | 0 | 5.8 km | 10.5 km |
| Conveyor drive | 0 | 1 | 1 |
| D11 Dozer | -10 | 1 | 1 |
| Drill rig | -5 | 1 | 1 |
| Grader | -3 | 1 | 1 |
| Stacker/reclaimer | -3 | 1 | 1 |
| CHPP | 0 | 1 | 1 |
| Ventilation fan | 0 | 0 | 2 |

#### *12.3.1.7. Railway Noise Modelling*

A noise model of the proposed rail spur and surround sensitive receptors was constructed using a survey of existing diesel coal trains. The noise levels comprise:

- $L_{Amax}$ of 117 dB(A) (sound power level)
- $L_{Aeq}$ of 72 dB(A) per lineal metre for 19 Mtpa.

The predicted railway noise levels measured in $L_{Amax}$ and $L_{Aeg}$ respectively for the SGCP are shown in **Figure 12-2** and **Figure 12-3**.




S:\PROJECTS\AM001 STH GALILEE EIS\ MAPINFO\WORKSPACES\2012_WSPACE\SECT_10\AM001_M392D FIG10-14 CASE 2-DUST CONCENTRATION MAXIMUM MONTH.WOR

**LEGEND**

- MLA70453
- SGCP infrastructure corridor
- Population centre
- Homestead

(dB(A))

36.2
30
20
10
0

Data Source:
Noise and Vibration - NMA Consulting Engineers. Topography - Geoscience Australia.

Alpha Coal Pty Ltd

# South Galilee Coal Project

## Modelling Results for Maximum Noise Levels from Rail Activity (dB(A))

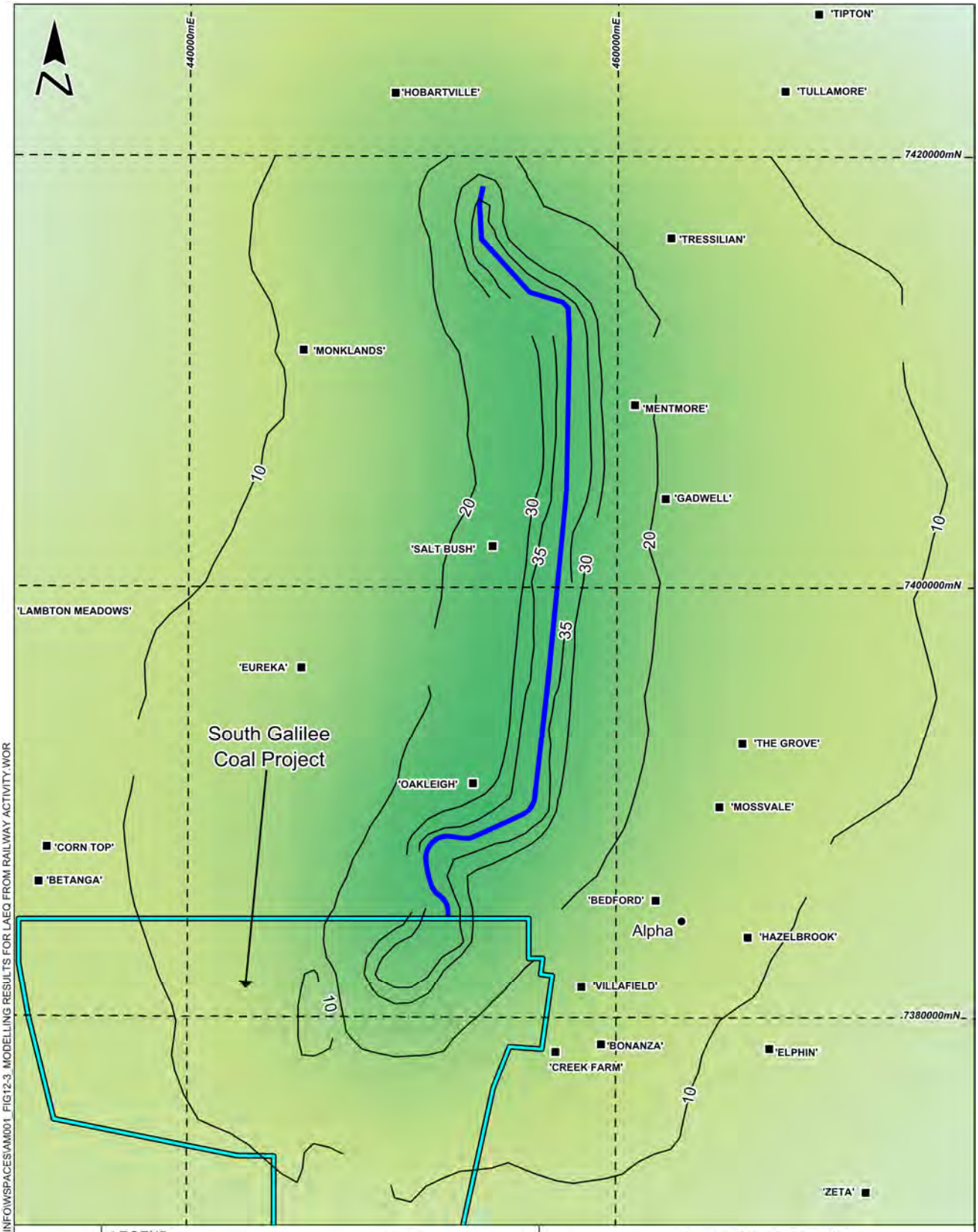
5 0 5
Kilometres

Scale: 1:250,000 (A4)

22/08/2012

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 12-2**




S:\PROJECTS\AM001_STHGALILEE_EIS\GIS_MAPINFO\WSPACES\AM001_FIG12-3_MODELLING RESULTS FOR LAEQ FROM RAILWAY ACTIVITY.WOR

## 12.4. NOISE MODELLING RESULTS

The noise models have been developed for two mining stages of the fully operational SGCP:

- Case 1 – Year 3 (2017)
- Case 2 – Year 26 (2040).

Modelling started by using baseline noise data collected from the existing noise environment. Predicted noise from the mining equipment (refer to **Table 12-8**) was then incorporated into the baseline modelling to calculate the new noise contours for the operational phase of the SGCP.

Calculations were carried out for approximately 9000 meteorological cases representing the hourly meteorology over one year. The hour-by-hour calculations were processed to obtain the highest $L_{A01}$(annual maximum), $L_{A10}$(annual maximum) and $L_{Aeq}$(annual maximum) in each time period (day, evening and night) for each sensitive receptor. Also shown is the $L_{Aeq}$(annual average) which is representative of the highest $L_{Aeq}$ (annual average) calculation during each modelling period.

It must be recognised that this is a modelling scenario only. Modelling has been designed to test 'worst-case' noise levels with all equipment operating at maximum noise levels simultaneously in locations that are likely to result in high ambient noise levels. These 'worst-case' noise levels are then compared to objectives and the likely impacts can be assessed.

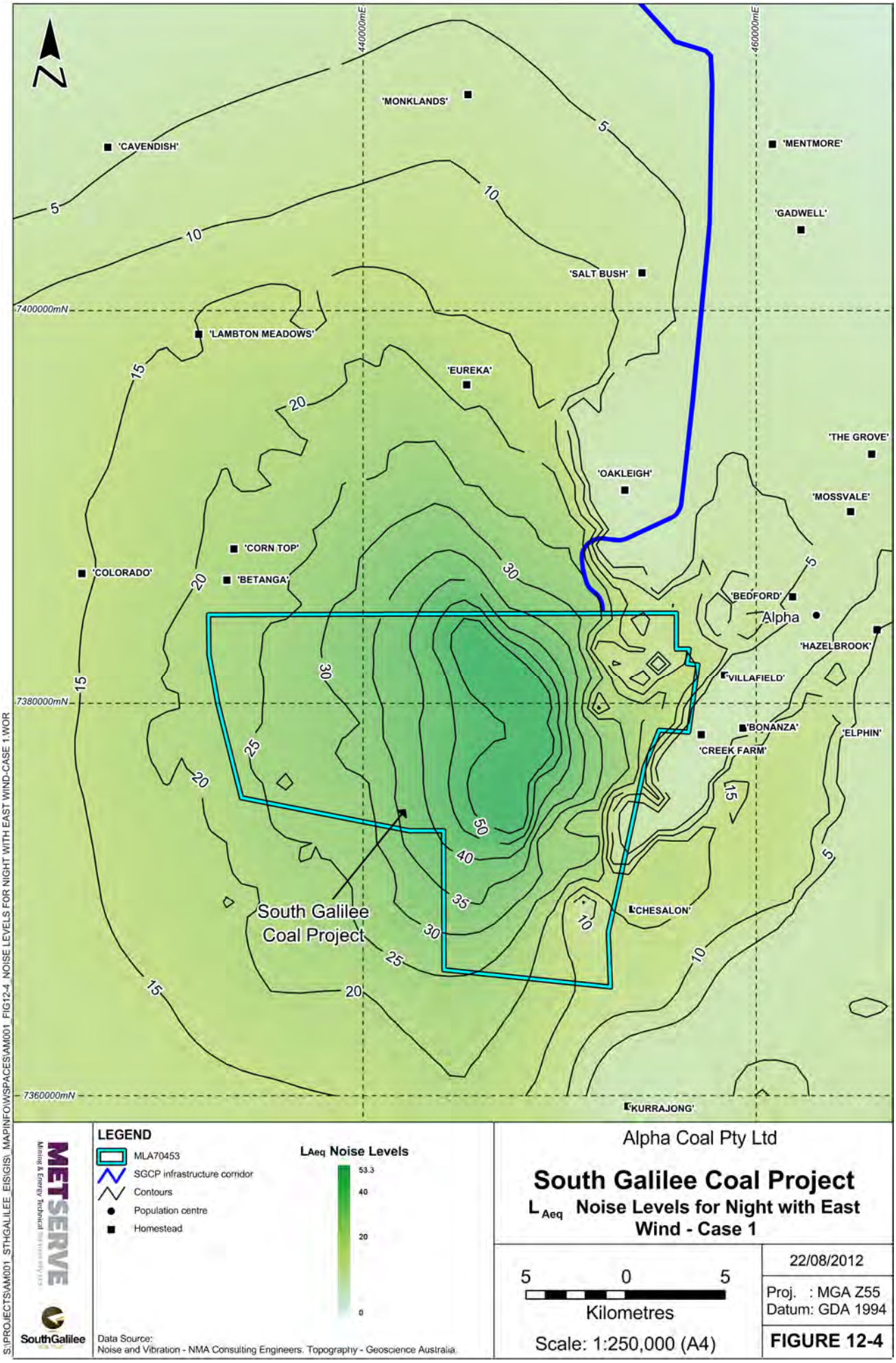
The noise levels at each of the sensitive receptors for modelling Case 1 and Case 2 are contained in **Table 12-9** and **Table 12-10** respectively. The results of modelling are compared to the acoustic quality objectives as defined in the *EPP (Noise)*.

The noise level goals to avoid background creep (refer to **Table 12-9** and **Table 12-10**) are based on the guidelines provided in **Section 12.1.1.2**. It is noted that the noise level goals to avoid background creep are lower than the acoustic objectives during the day and evening and similar at night. This indicates the existing noise levels are relatively low and are generally unaffected by industrial or traffic noise.

**Table 12-9 Calculated Noise Levels for Sensitive Receptors – Case 1 – Year 3 (2017)**

| Location | $L_{A01\ (1\ hour)}$ (Annual Maximum) | | | $L_{A10\ (1\ hour)}$ (Annual Maximum) | | | $L_{Aeq\ (1\ hour)}$ (Annual Maximum) | | | $L_{Aeq\ (1\ hour)}$ (Annual Average) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Day | Eve. | Night | Day | Eve. | Night | Day | Eve. | Night | Day | Eve. | Night |
| *Objectives for Alpha:* | | | | | | | | | | | | |
| *Acoustic Quality* | | | | | | | ***40*** | ***40*** | ***35*** | ***40*** | ***40*** | ***35*** |
| *Background Creep* | ***50*** | ***50*** | ***45*** | ***45*** | ***45*** | ***40*** | ***40.4*** | ***36*** | ***30*** | ***40.4*** | ***36*** | ***30*** |
| Alpha township | 27.9 | 28.1 | 29.4 | 27.9 | 28.1 | 29.4 | 25.0 | 27.6 | 27.4 | 14.1 | 15.5 | 14.6 |
| *Objectives for stations:* | | | | | | | | | | | | |
| *Acoustic Quality* | | | | | | | ***40*** | ***40*** | ***35*** | ***40*** | ***40*** | ***35*** |
| *Background Creep* | ***50*** | ***50*** | ***45*** | ***45*** | ***45*** | ***40*** | ***33*** | ***31*** | ***28*** | ***33*** | ***31*** | ***28*** |
| Betanga Homestead | 26.4 | 26.6 | 26.8 | 26.4 | 26.6 | 26.8 | 24.2 | 25.0 | 24.6 | 20.2 | 22.3 | 22.3 |
| Bonanza Homestead | 30.0 | 29.8 | 30.6 | 30.0 | 29.8 | 30.6 | 28.4 | 29.0 | 28.7 | 7.1 | 6.8 | 4.9 |
| Chesalon Homestead | 35.3 | 34.7 | 35.1 | 35.3 | 34.7 | 35.1 | 31.3 | 33.2 | 33.1 | 22.4 | 23.1 | 22.0 |
| Corn Top Homestead | 26.3 | 27.4 | 27.5 | 26.3 | 27.4 | 27.5 | 24.1 | 25.5 | 25.3 | 19.8 | 22.4 | 22.4 |
| Creek Farm Homestead | 33.4 | 35.4 | 35.9 | 33.4 | 35.4 | 35.9 | 30.0 | 31.6 | 31.4 | 7.6 | 7.5 | 5.3 |
| Eureka Homestead | 28.8 | 28.3 | 28.7 | 28.8 | 28.3 | 28.7 | 26.8 | 26.7 | 26.6 | 15.0 | 18.6 | 18.5 |
| Oakleigh Homestead | 28.5 | 28.8 | 29.6 | 28.5 | 28.8 | 29.6 | 26.7 | 27.7 | 27.6 | 10.8 | 11.5 | 13.4 |
| Accommodation Village | 39.9 | 39.9 | 40.6 | 39.9 | 39.9 | **40.6** | 37.1 | 39.0 | 39.0 | 26.3 | 27.9 | 27.7 |
| Saltbush Homestead | 23.3 | 22.1 | 23.6 | 23.3 | 22.1 | 23.6 | 19.7 | 21.7 | 21.6 | 10.5 | 13.4 | 13.4 |
| Villafield Homestead | 29.6 | 29.3 | 30.2 | 29.6 | 29.3 | 30.2 | 28.0 | 28.9 | 28.3 | 7.2 | 7.4 | 6.4 |

The noise contours for the Case 1 – Year 3 (2017) modelling are illustrated in **Figure 12-4** and **Figure 12-5** for the meteorological cases night with east wind and night with west wind.




S:\PROJECTS\AM001_STHGALILEE_EIS\GIS_MAPINFO\WSPACES\AM001_FIG12-4_NOISE LEVELS FOR NIGHT WITH EAST WIND-CASE 1.WOR

METSERVE Mining & Energy Technical Services

SouthGalilee

**LEGEND**

- MLA70453
- SGCP infrastructure corridor
- Contours
- Population centre
- Homestead

**$L_{Aeq}$ Noise Levels**

53.3
40
20
0

Data Source:
Noise and Vibration - NMA Consulting Engineers. Topography - Geoscience Australia.

Alpha Coal Pty Ltd

# South Galilee Coal Project

## $L_{Aeq}$ Noise Levels for Night with East Wind - Case 1

5 0 5
Kilometres

Scale: 1:250,000 (A4)

22/08/2012

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 12-4**

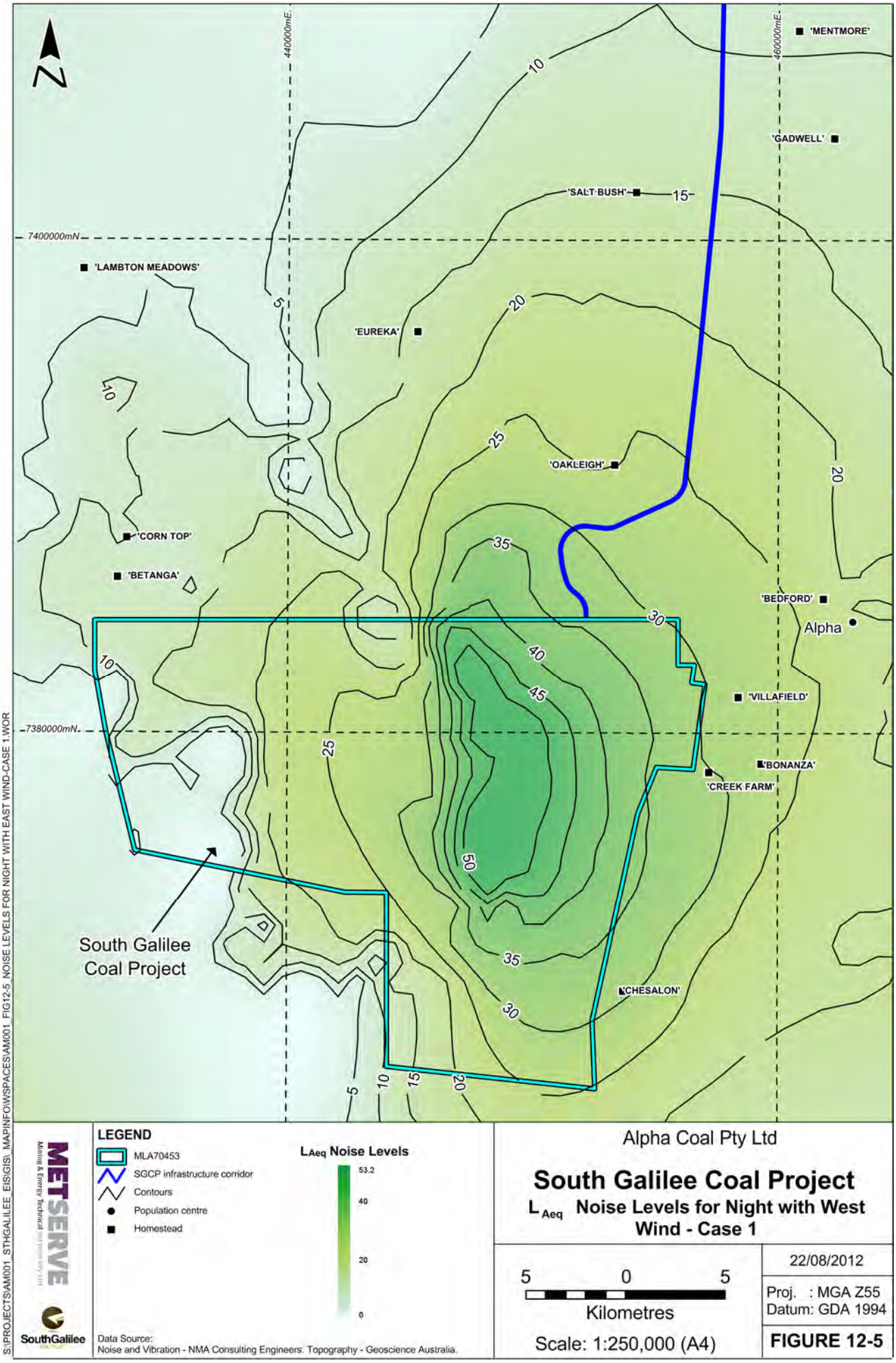
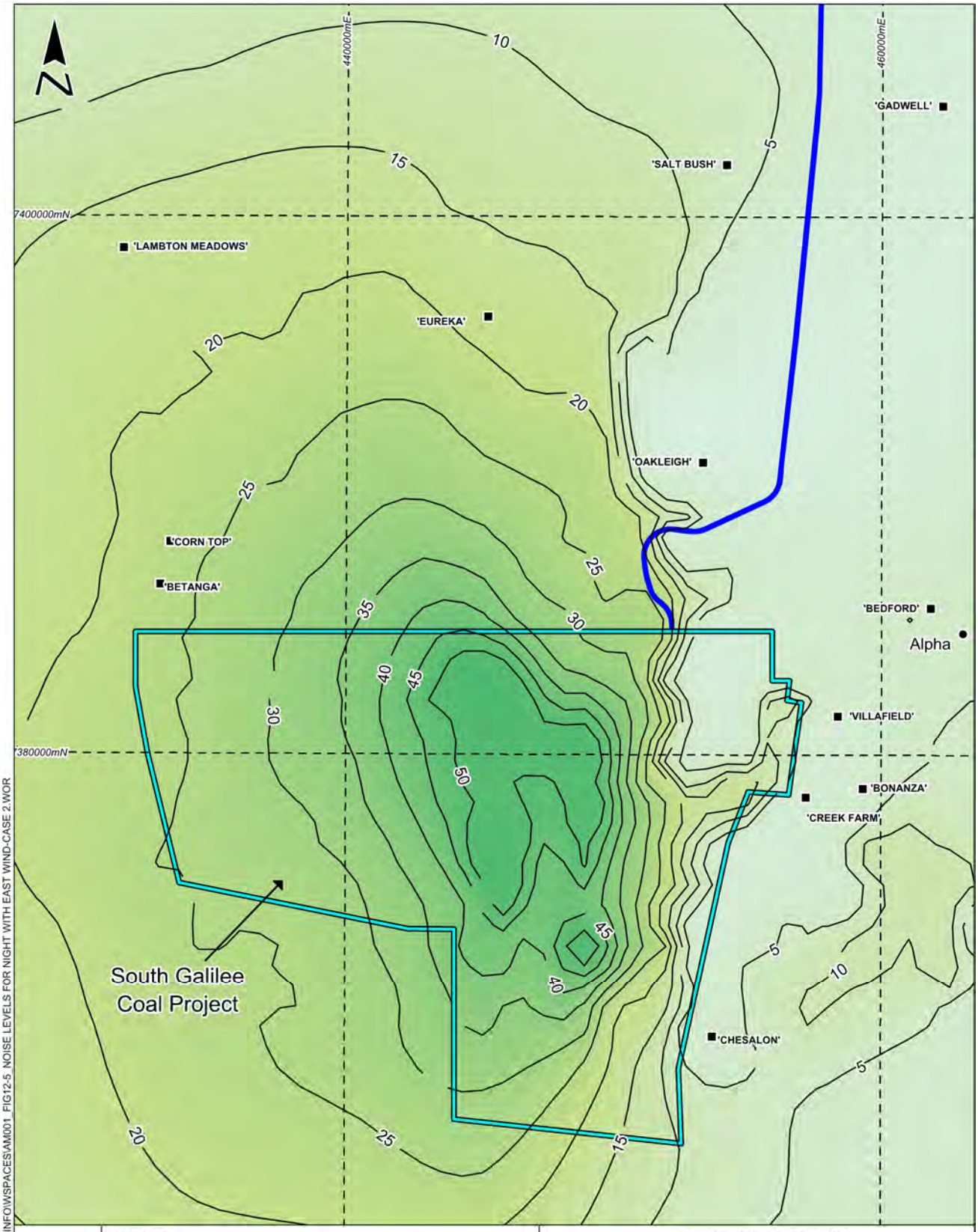

N
440000mE
460000mE
7400000mN
7380000mN
'MENTMORE'
'GADWELL'
'SALT BUSH'
'LAMBTON MEADOWS'
'EUREKA'
'OAKLEIGH'
'CORN TOP'
'BETANGA'
'BEDFORD'
Alpha
'VILLAFIELD'
'BONANZA'
'CREEK FARM'
'CHESALON'
South Galilee Coal Project
10
15
20
5
25
35
30
40
45
50
LEGEND
MLA70453
SGCP infrastructure corridor
Contours
Population centre
Homestead
LAeq Noise Levels
53.2
40
20
0
Data Source:
Noise and Vibration - NMA Consulting Engineers. Topography - Geoscience Australia.
METSERVE
Mining & Energy Technical
SouthGalilee
Alpha Coal Pty Ltd
South Galilee Coal Project
LAeq Noise Levels for Night with West Wind - Case 1
5 0 5
Kilometres
Scale: 1:250,000 (A4)
22/08/2012
Proj. : MGA Z55
Datum: GDA 1994
FIGURE 12-5
S:\PROJECTS\AM001_STHGALILEE_EIS\GIS_MAPINFO\WSPACES\AM001_FIG12-5_NOISE LEVELS FOR NIGHT WITH EAST WIND-CASE 1.WOR

**Table 12-10 Calculated Noise Levels for Sensitive Receptors – Case 2 – Year 26 (2040)**

| Location | $L_{A01\ (1\ hour)}$ (Annual Maximum) | | | $L_{A10\ (1\ hour)}$ (Annual Maximum) | | | $L_{Aeq\ (1\ hour)}$ (Annual Maximum) | | | $L_{Aeq\ (1\ hour)}$ (Annual Average) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Day | Eve. | Night | Day | Eve. | Night | Day | Eve. | Night | Day | Eve. | Night |
| *Objectives for Alpha:* | | | | | | | | | | | | |
| *Acoustic Quality* | | | | | | | ***40*** | ***40*** | ***35*** | ***40*** | ***40*** | ***35*** |
| *Background Creep* | ***50*** | ***50*** | ***45*** | ***45*** | ***45*** | ***40*** | ***40.4*** | ***36*** | ***30*** | ***40.4*** | ***36*** | ***30*** |
| Alpha township | 25.3 | 26.6 | 27.8 | 25.3 | 26.6 | 27.8 | 23.8 | 26.2 | 25.9 | 1.7 | 3.7 | 3.1 |
| *Objectives for stations:* | | | | | | | | | | | | |
| *Acoustic Quality* | | | | | | | ***40*** | ***40*** | ***35*** | ***40*** | ***40*** | ***35*** |
| *Background Creep* | ***50*** | ***50*** | ***45*** | ***45*** | ***45*** | ***40*** | ***33*** | ***31*** | ***28*** | ***33*** | ***31*** | ***28*** |
| Betanga Homestead | 27.2 | 27.2 | 27.4 | 27.2 | 27.2 | 27.4 | 25.0 | 25.8 | 25.4 | 20.8 | 23.1 | 23.1 |
| Bonanza Homestead | 29.8 | 29.9 | 30.9 | 29.8 | 29.9 | 30.9 | 28.3 | 29.2 | 29.1 | 6.3 | 5.7 | 4.1 |
| Chesalon Homestead | 31.4 | 31.7 | 32.7 | 31.4 | 31.7 | 32.7 | 30.1 | 31.3 | 31.1 | 16.6 | 15.8 | 14.0 |
| Corn Top Homestead | 27.9 | 28.1 | 28.1 | 27.9 | 28.1 | 28.1 | 25.3 | 26.5 | 26.1 | 21.0 | 23.7 | 23.8 |
| Creek Farm Homestead | 32.7 | 34.1 | 34.7 | 32.7 | 34.1 | 34.7 | 30.8 | 32.7 | 32.6 | 7.9 | 8.0 | 6.3 |
| Eureka Homestead | 28.9 | 27.6 | 28.6 | 28.9 | 27.6 | 28.6 | 26.8 | 26.8 | 26.6 | 14.6 | 18.6 | 18.5 |
| Oakleigh Homestead | 28.5 | 29.7 | 30.5 | 28.5 | 29.7 | 30.5 | 26.9 | 28.8 | 28.6 | 10.6 | 11.5 | 13.1 |
| Accommodation Village | 39.2 | 39.5 | 40.5 | 39.2 | 39.5 | 40.5 | 36.7 | 39.0 | 39.0 | 16.1 | 17.5 | 17.8 |
| Saltbush Homestead | 22.6 | 21.9 | 23.6 | 22.6 | 21.9 | 23.6 | 19.4 | 21.8 | 21.7 | 0.7 | 7.3 | 7.4 |
| Villafield Homestead | 28.8 | 28.9 | 29.9 | 28.8 | 28.9 | 29.9 | 27.4 | 28.4 | 28.2 | 7.3 | 6.9 | 6.0 |

The noise contours for the Case 2 – Year 26 (2040) modelling are illustrated in **Figure 12-4** and **Figure 12-5** for the meteorological cases Night with East Wind and Night with West Wind.




S:\PROJECTS\AM001_STHGALILEE_EIS\GIS_MAPINFO\WSPACES\AM001_FIG12-5_NOISE LEVELS FOR NIGHT WITH EAST WIND-CASE 2.WOR

METSERVE
Mining & Energy Technical

SouthGalilee

**LEGEND**

- MLA70453
- SGCP infrastructure corridor
- Contours
- Population centre
- Homestead

$L_{Aeq}$ Noise Levels

52.9
40
20
0

Data Source:
Noise and Vibration - NMA Consulting Engineers. Topography - Geoscience Australia.

Alpha Coal Pty Ltd

# South Galilee Coal Project

## $L_{Aeq}$ Noise Levels for Night with East Wind - Case 2

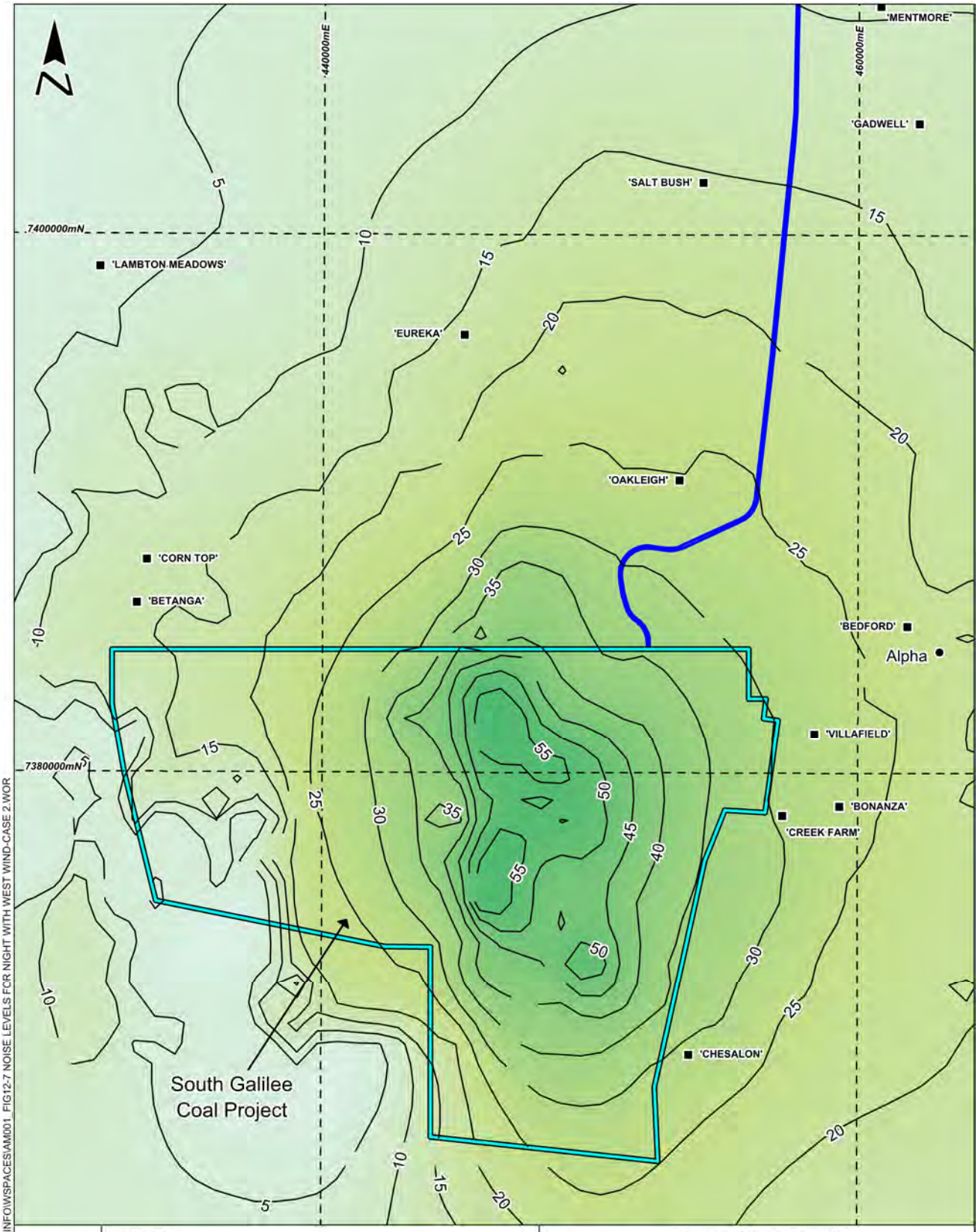
5 0 5
Kilometres

Scale: 1:250,000 (A4)

06/09/2012

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 12-6**




S:\PROJECTS\AM001_STHGALILEE_EIS\GIS_MAPINFO\WSPACES\AM001_FIG12-7 NOISE LEVELS FOR NIGHT WITH WEST WIND-CASE 2.WOR

METSERVE
Mining & Energy Technical Services

SouthGalilee

**LEGEND**

- MLA70453
- SGCP infrastructure corridor
- Contours
- Population centre
- Homestead

**$L_{Aeq}$ Noise Levels**

57
40
20
0

Data Source:
Noise and Vibration - NMA Consulting Engineers. Topography - Geoscience Australia.

Alpha Coal Pty Ltd

# South Galilee Coal Project

## $L_{Aeq}$ Noise Levels for Night with West Wind - Case 2

5 0 5
Kilometres

Scale: 1:250,000 (A4)

22/08/2012

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 12-7**

The low frequency noise level predictions at night are contained in **Table 12-11** for both Case 1 and Case 2.

**Table 12-11 Night-time Low Frequency Noise Levels for Modelling Case 1 and Case 2**

| Location | Low Frequency Noise Level $L_{Aeq(1\ hour)}$ [dB(Lin)] | |
|---|---|---|
| | Case 1 | Case 2 |
| **Objective** | **50** | **50** |
| Alpha Township | 25 | 18 |
| Betanga Station Homestead | 39 | 43 |
| Chesalon Station Homestead | 33 | 32 |
| Colorado Station Homestead | 33 | 38 |
| Corn Top Station Homestead | 39 | 43 |
| Creek Farm Station Homestead | 12 | 12 |
| Eureka Station Homestead | 38 | 37 |
| Oakleigh Station Homestead | 12 | 12 |
| Proposed Accommodation Village | 35 | 19 |
| Saltbush Station Homestead | 27 | 28 |
| Villafield Station Homestead | 14 | 14 |

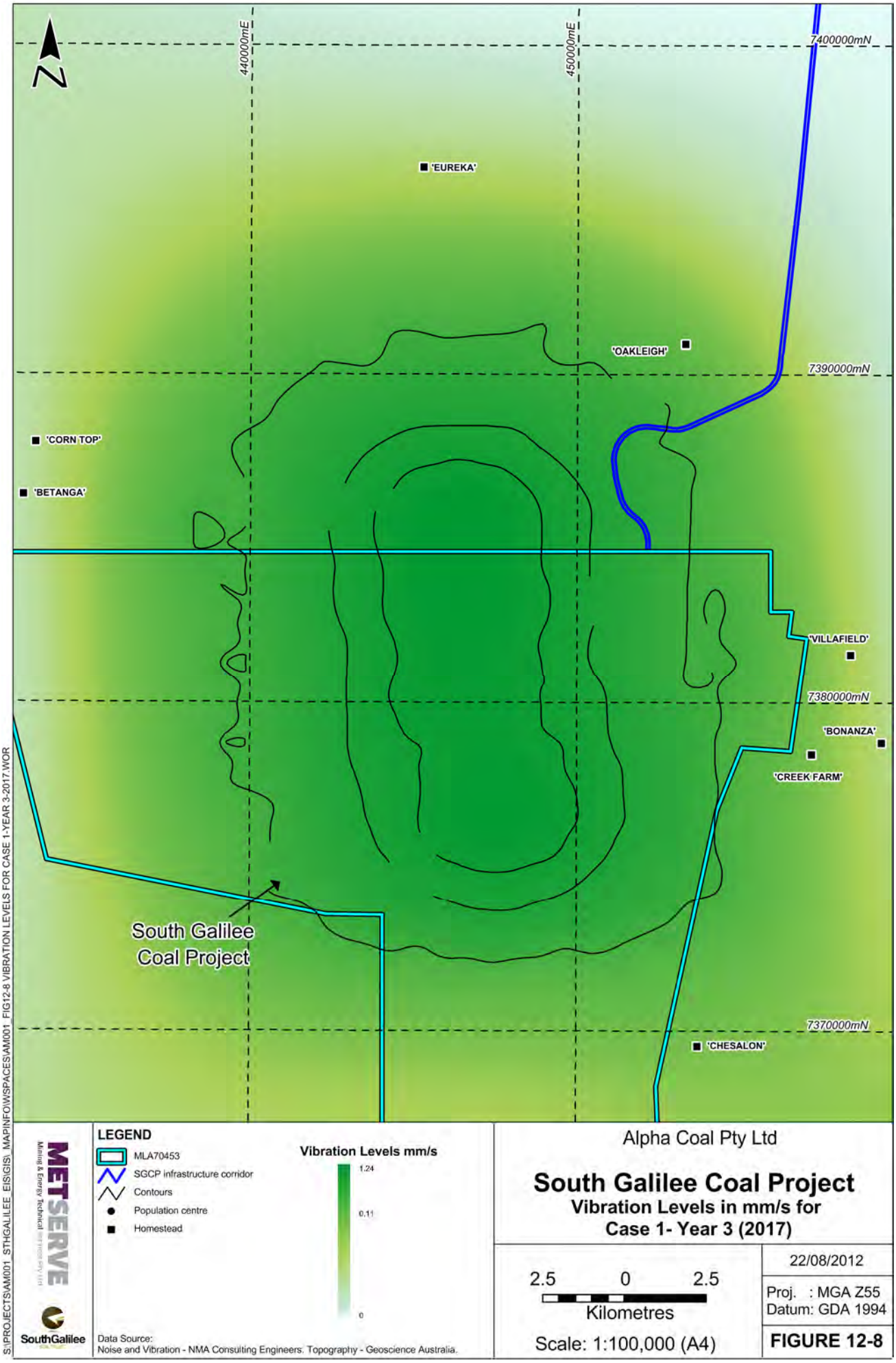
#### *12.4.1.1. Blasting Noise and Vibration Modelling Results*

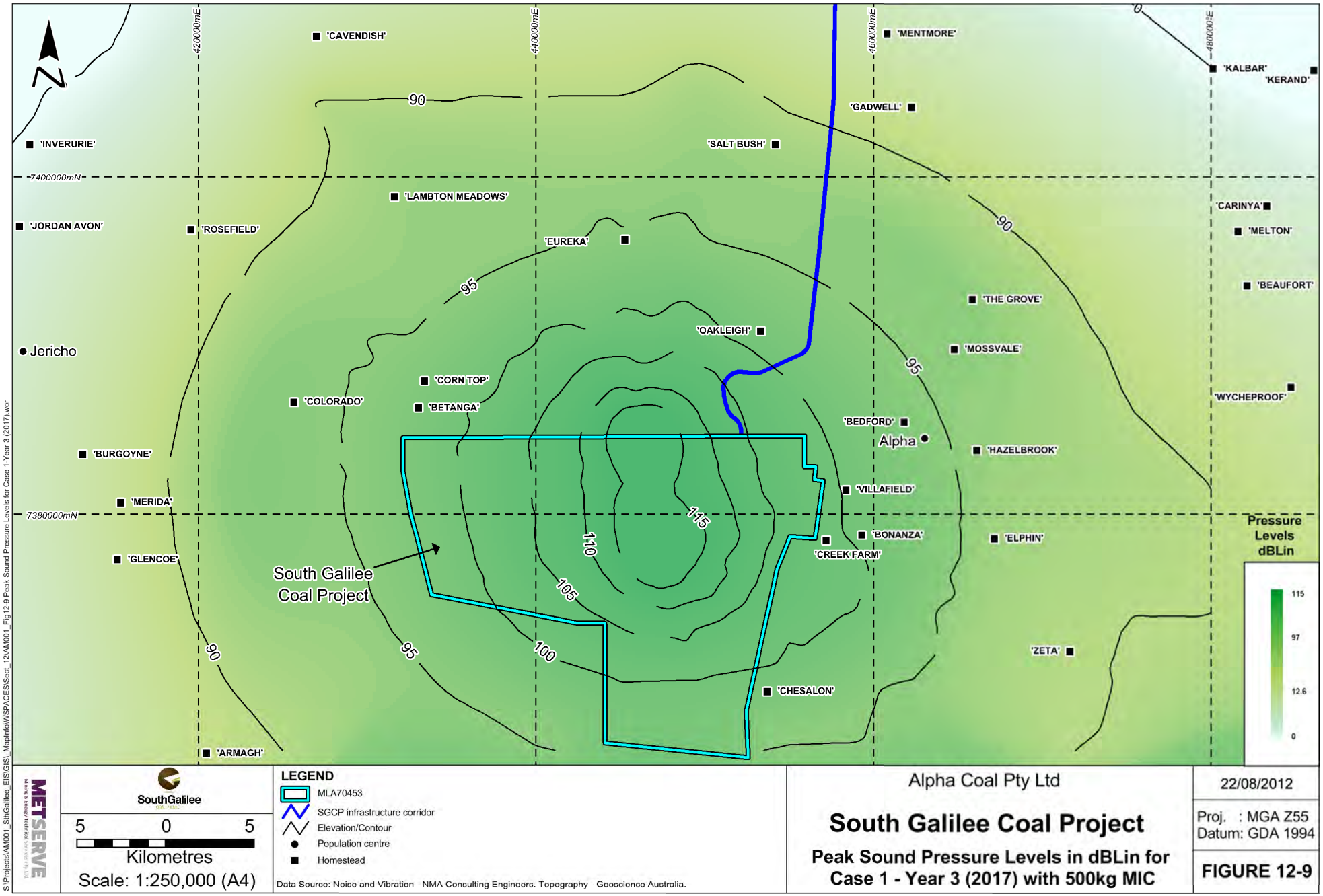
Modelling has been used to predict the impacts of airblast on the areas surrounding the SGCP. The blast overpressure and vibrations at all sensitive receptors are contained in **Table 12-12**. For a Maximum Instantaneous Change (MIC) of 500 kg, the blast overpressure and vibration level goals are readily met at all sensitive receptors, including the accommodation village. For further detail on the overpressure and vibration goals refer to **Section 12.1.3.1**. Contours of the blast vibration and blast overpressure are contained in:

- **Figure 12-8**: Vibration Levels in millimetres per second (mm/s) for Case 1 – Year 3 (2017) with 500 kg MIC
- **Figure 12-9**: Peak Sound Pressure Levels in dBLin for Case 1 – Year 3 (2017) with 500 kg MIC
- **Figure 12-10**: Vibration Levels in mm/s for Case 2 – Year 26 (2040) with 500 kg MIC
- **Figure 12-11**: Peak Sound Pressure Levels in dBLin for Case 2 – Year 26 (2040) with 500 kg MIC.

**Table 12-12 Predicted Noise and Vibration Levels from Blasting at SGCP (for 500 kg MIC)**

| Location | Case 1 Vibration and Blast Overpressure | | Case 2 Vibration and Blast Overpressure | |
|---|---|---|---|---|
| | Blast Overpressure [dBLin] | Vibrations [mm/s] | Blast Overpressure [dBLin] | Vibrations [mm/s] |
| **Objective** | **115** | **5** | **115** | **5** |
| Alpha Township | 96 | 0.06 | 93 | 0.05 |
| Betanga Station Homestead | 96 | 0.07 | 96 | 0.08 |
| Bonanza Station Homestead | 99 | 0.07 | 96 | 0.06 |
| Chesalon Station Homestead | 99 | 0.06 | 95 | 0.06 |
| Corn Top Station Homestead | 96 | 0.07 | 95 | 0.07 |
| Creek Farm Station Homestead | 102 | 0.08 | 98 | 0.08 |
| Eureka Station Homestead | 95 | 0.07 | 94 | 0.07 |
| Oakleigh Station Homestead | 98 | 0.11 | 96 | 0.10 |
| Proposed Accommodation Village | 107 | 0.21 | 104 | 0.17 |
| Villafield Station Homestead | 100 | 0.08 | 97 | 0.07 |


N
440000mE
450000mE
7400000mN
7390000mN
7380000mN
7370000mN
'EUREKA'
'OAKLEIGH'
'CORN TOP'
'BETANGA'
'VILLAFIELD'
'BONANZA'
'CREEK FARM'
'CHESALON'
South Galilee
Coal Project
LEGEND
MLA70453
SGCP infrastructure corridor
Contours
Population centre
Homestead
Vibration Levels mm/s
1.24
0.11
0
Data Source:
Noise and Vibration - NMA Consulting Engineers. Topography - Geoscience Australia.
METSERVE
Mining & Energy Technical
SouthGalilee
Alpha Coal Pty Ltd
South Galilee Coal Project
Vibration Levels in mm/s for
Case 1- Year 3 (2017)
22/08/2012
2.5 0 2.5
Kilometres
Scale: 1:100,000 (A4)
Proj. : MGA Z55
Datum: GDA 1994
FIGURE 12-8
S:\PROJECTS\AM001_STHGALILEE_EIS\GIS_MAPINFO\WSPACES\AM001_FIG12-8 VIBRATION LEVELS FOR CASE 1-YEAR 3-2017.WOR




S:\Projects\AM001_SthGalilee_EIS\GIS_MapInfo\WSPACES\Sect_12\AM001_Fig12-9 Peak Sound Pressure Levels for Case 1-Year 3 (2017).wor

METSERVE

SouthGalilee

5 0 5

Kilometres

Scale: 1:250,000 (A4)

**LEGEND**

- MLA70453
- SGCP infrastructure corridor
- Elevation/Contour
- Population centre
- Homestead

Data Source: Noise and Vibration - NMA Consulting Engineers. Topography - Geoscience Australia.

Alpha Coal Pty Ltd

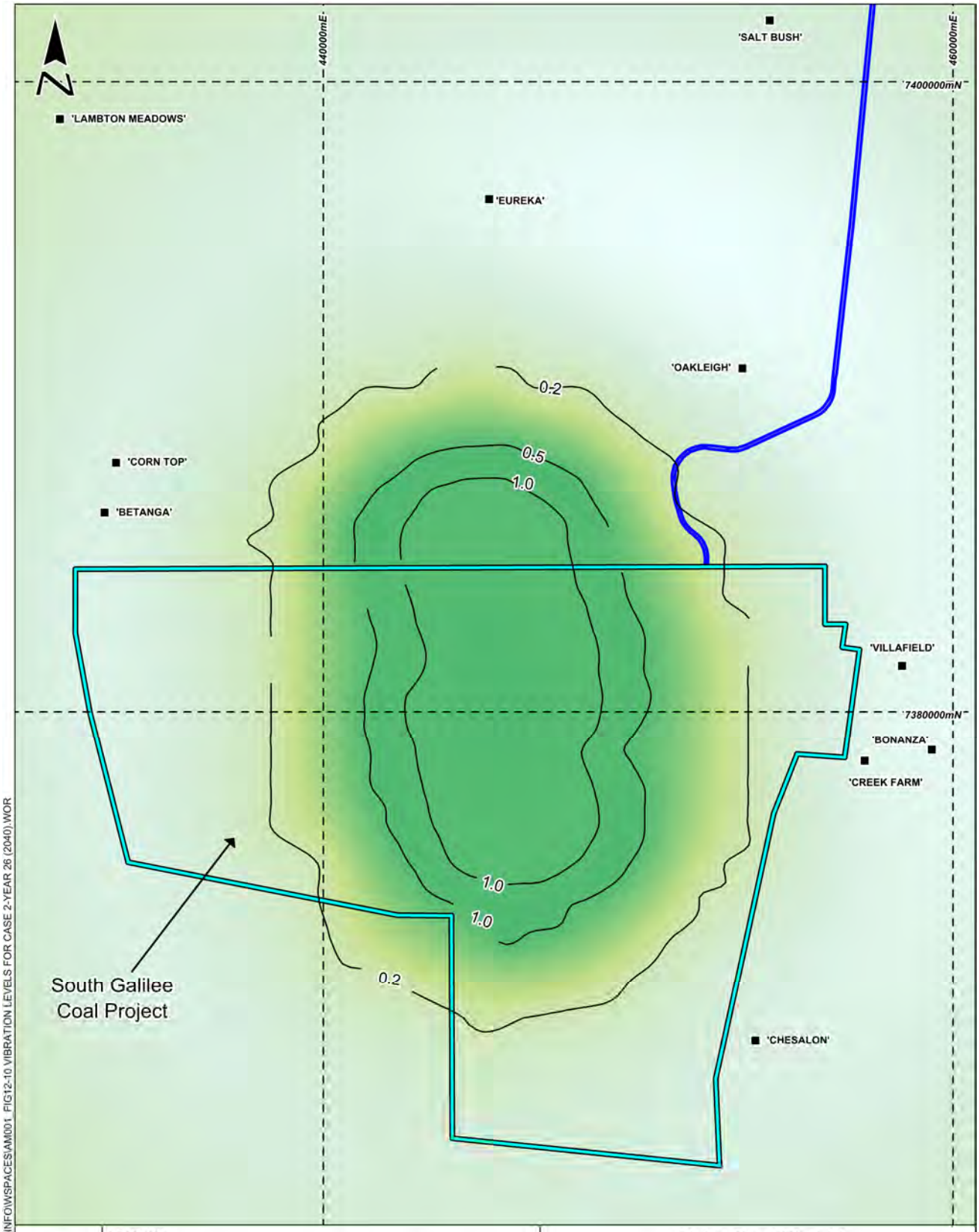
# South Galilee Coal Project

**Peak Sound Pressure Levels in dBLin for Case 1 - Year 3 (2017) with 500kg MIC**

22/08/2012

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 12-9**




S:\PROJECTS\AM001_STHGALILEE_EIS\GIS_MAPINFO\WSPACES\AM001_FIG12-10 VIBRATION LEVELS FOR CASE 2-YEAR 26 (2040).WOR

**LEGEND**

- MLA70453
- SGCP infrastructure corridor
- Contours
- Population centre
- Homestead

Vibration Levels mm/s

1.05
0.5
0

Data Source:
Noise and Vibration - NMA Consulting Engineers. Topography - Geoscience Australia.

Alpha Coal Pty Ltd

# South Galilee Coal Project

## Vibration Levels in mm/s for Case 2 - Year 26 (2040) with 500kg MIC

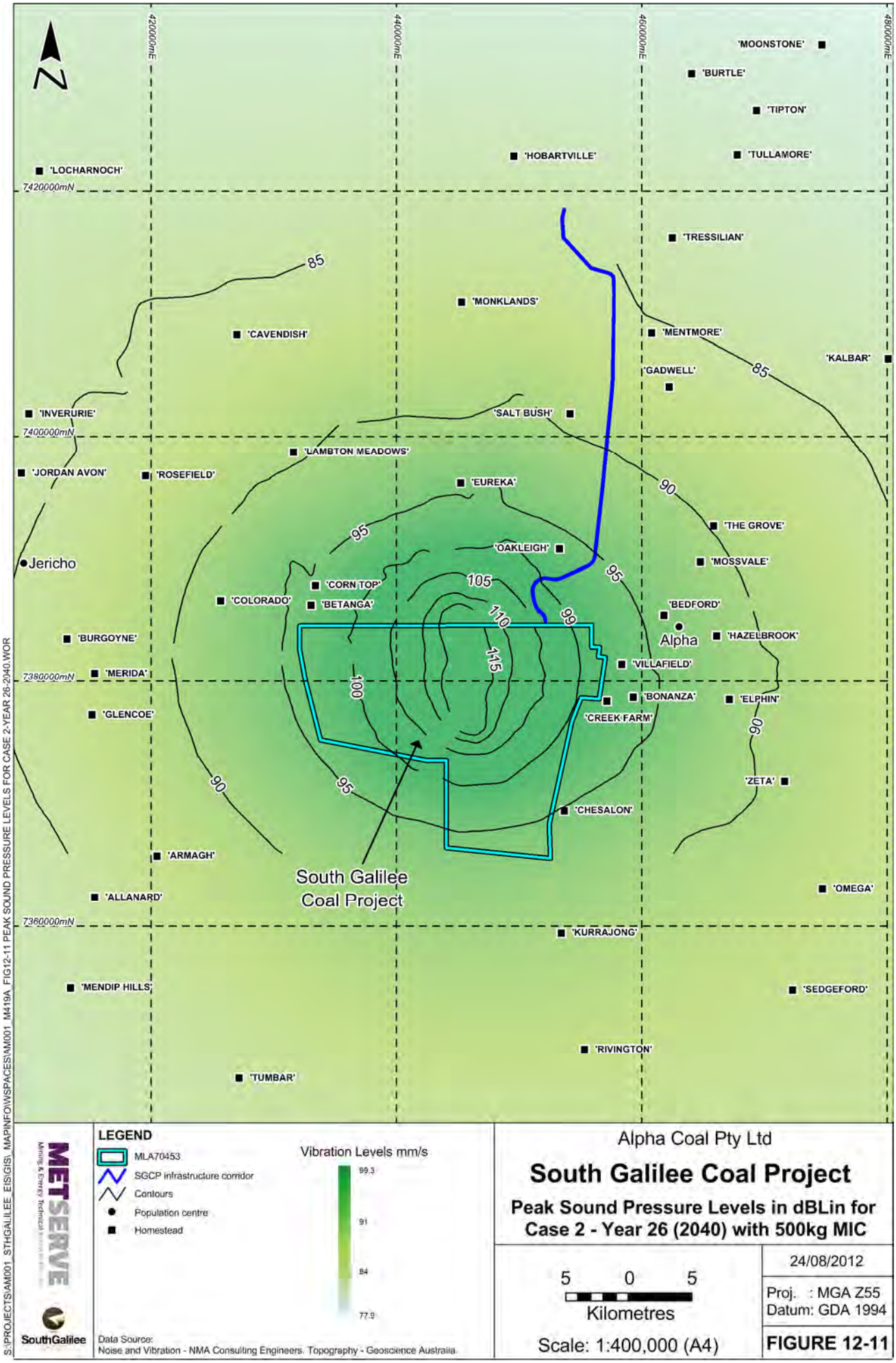
2.5 0 2.5
Kilometres

Scale: 1:200,000 (A4)

22/08/2012

Proj. : MGA Z55
Datum: GDA 1994

**FIGURE 12-10**


N
420000mE
440000mE
460000mE
480000mE
7420000mN
7400000mN
7380000mN
7360000mN
'MOONSTONE'
'BURTLE'
'TIPTON'
'HOBARTVILLE'
'TULLAMORE'
'LOCHARNOCH'
'TRESSILIAN'
'MONKLANDS'
'CAVENDISH'
'MENTMORE'
'KALBAR'
'GADWELL'
'INVERURIE'
'SALT BUSH'
'LAMBTON MEADOWS'
'JORDAN AVON'
'ROSEFIELD'
'EUREKA'
'THE GROVE'
'OAKLEIGH'
Jericho
'MOSSVALE'
'CORN TOP'
'COLORADO'
'BETANGA'
'BEDFORD'
Alpha
'HAZELBROOK'
'BURGOYNE'
'MERIDA'
'VILLAFIELD'
'BONANZA'
'ELPHIN'
'GLENCOE'
'CREEK FARM'
'ZETA'
'CHESALON'
'ARMAGH'
South Galilee
Coal Project
'ALLANARD'
'OMEGA'
'KURRAJONG'
'MENDIP HILLS'
'SEDGEFORD'
'RIVINGTON'
'TUMBAR'
85
90
95
99
105
110
115
100
LEGEND
MLA70453
SGCP infrastructure corridor
Contours
Population centre
Homestead
Vibration Levels mm/s
99.3
91
84
77.9
Data Source:
Noise and Vibration - NMA Consulting Engineers. Topography - Geoscience Australia.
METSERVE
SouthGalilee
Alpha Coal Pty Ltd
South Galilee Coal Project
Peak Sound Pressure Levels in dBLin for Case 2 - Year 26 (2040) with 500kg MIC
5 0 5
Kilometres
Scale: 1:400,000 (A4)
24/08/2012
Proj. : MGA Z55
Datum: GDA 1994
FIGURE 12-11
S:\PROJECTS\AM001_STHGALILEE_EIS\GIS_MAPINFO\WSPACES\AM001_M419A_FIG12-11 PEAK SOUND PRESSURE LEVELS FOR CASE 2-YEAR 26-2040.WOR

#### *12.4.1.2. Railway Noise Modelling Results*

Due to the large separation distances between the railway and sensitive receptors, all sensitive receptors readily comply with the QR noise level goals for railways and no modelling has been undertaken.

## 12.5. IMPACT ASSESSMENT

The following provides a summary of the potential noise impacts at the SGCP.

### 12.5.1. *EPP (Noise)* Acoustic Quality Objectives

The modelled noise levels generated by the SGCP comply with the acoustic quality objectives as required by the *EPP (Noise)* during the day, evening and night all sensitive receptors except at the accommodation village.

### 12.5.2. *EPP (Noise)* Sleep Disturbances

The noise modelling shows that at all times the indoor noise level goals to protect sleep disturbances are met at all locations except the accommodation village when windows are left open.

### 12.5.3. *EPP (Noise)* Background Creep

The modelling shows that the calculated noise levels in Alpha comply with the goals to avoid background creep for all time periods, however the sensitive receptors close to the SGCP are likely to exceed the goals to avoid background creep during the evening and night as presented in **Table 12-13**. Potential meteorological conditions during the year could lead the $L_{Aeq}$ to exceed noise levels goals to avoid background creep. The noise levels at the Creek Farm and Chesalon Station homesteads will exceed 28 dB(A) at night for approximately 15 % of the time. For further detail refer to **Appendix M—Noise and Vibration Technical Report, Section 4.6, Table 22**. The main contributors to these exceedances are the trucks operating in exposed locations and the shovel operating close to natural surface (while in the pit).

The noise goals to protect background creep will be exceeded at the accommodation village during all time periods. This exceedance is not expected to be significant as once the accommodation village is constructed and occupied, it will generate self-noise from air conditioning, refrigeration and general activities. Consequently, the ambient noise levels are likely to be much higher than at present. The noise level goals to avoid background creep would therefore also be higher. The most important goal for the accommodation village is to ensure compliance with acceptable indoor noise levels. These will be readily met for the air conditioned accommodation units proposed for SGCP.

**Table 12-13 Sensitive Receptor Locations and Periods Exceeding Background Creep Noise Goals**

| Location | Period | Criterion [dB(A)] | Mining Case 1 Noise Levels in [dB(A)] | | Mining Case 2 Noise Levels in [dB(A)] | |
|---|---|---|---|---|---|---|
| | | | Calculated 'worst case' | Average | Calculated 'worst case' | Average |
| Bonanza | Night | 28 | 28.7 | 4.9 | 29.1 | 4.1 |
| Chesalon | Evening | 31 | 32.2 | 23.1 | 31.3 | 15.8 |
| | Night | 28 | 33.1 | 22.0 | 31.1 | 14.0 |
| Creek Farm | Evening | 31 | 31.6 | 7.5 | 32.7 | 8.0 |
| | Night | 28 | 31.4 | 5.3 | 32.6 | 6.3 |
| Oakleigh | Night | 28 | - | - | 28.6 | 13.1 |
| Accommodation Village | Day | 33 | 37.1 | 26.3 | 36.7 | 16.1 |
| | Evening | 31 | 39.0 | 27.9 | 39.0 | 17.5 |
| | Night | 28 | 39.0 | 27.7 | 39.0 | 17.8 |
| Villafield | Night | 28 | 28.3 | 6.4 | 28.2 | 6.0 |

The enHealth Council (2004) document provides a review of the health effects, other than hearing loss, of environmental noise and reviews measures aimed at the management of environmental noise. The document addresses annoyance and quality of life, sleep disturbance, performance and learning with school children, cardio vascular disease, mental health and neuro-physiological stress. The accommodation village has the potential to exceed the enHealth sleep noise level goal if the windows are left open. However, with the windows closed the sleep noise level goal will be met at the accommodation village.

### 12.5.4. DEHP Low Frequency Noise

The low-frequency noise level goals are expected to be met at all sensitive receptors (refer to **Section 12.1.3**).

### 12.5.5. DEHP Blasting Noise and Vibration

The blasting contours vibration levels are expected to be met at all sensitive receptors for a MIC of 500 kg. Blasting at SGCP will be conducted according to the DEHP Ecoaccess guideline "Noise and Vibration from Blasting". For further details refer to **Section 12.1.3.1.**

### 12.5.6. Road Traffic Noise

Due to the large separation distances between the roadways and sensitive receptors, all sensitive receptors readily comply with the Queensland Department of Transport and Main Roads noise level goals for road traffic.

### 12.5.7. Railway Noise

Due to the large separation distances between the railway and sensitive receptors, all sensitive receptors readily comply with the QR noise level goals for railways.

## 12.6. MITIGATION MEASURES

The *EPP (Noise)* Acoustic Quality Objectives are designed to preserve the health and wellbeing of a community, including its social and economic amenity; and for the well-being of the individual, including the individual's opportunity to sleep, relax and converse without unreasonable interference from intrusive noise or vibration.

Existing noise levels were measured at the Alpha township and at a number of sensitive receptors surrounding the SGCP (refer to **Section 12.2.2**). The current noise levels at all the homesteads are exceedingly low and industrial and commercial noise is not presently a feature of the existing noise levels.

It is proposed to monitor noise at the accommodation village and initially monitor background creep at the Creek Farm and Chesalon Station homesteads. A Noise Management Plan will detail the ongoing noise management requirements. The plan will detail the specific noise impacts, mitigation and management measures as well as monitoring requirements including responses to noise complaints.

Reporting will be conducted internally on monitoring results, incidents and complaints and externally to relevant regulatory bodies on request.

Upon receiving a valid complaint in relation to noise and vibration nuisance, the complaint will be investigated and noise and vibration mitigation measures must be implemented as soon as practicable if the complaints are substantiated.

The SGCP will achieve and maintain the level of noise and vibration which is outlined in the Environmental Authority (EA).

Where site activities are the cause of a complaint, a revision of noise and vibration management procedures will occur for the activities identified as causing noise or vibration nuisance or a high noise event.

### 12.6.1. *EPP (Noise)* Acoustic Quality Objectives

The *EPP (Noise)* Acoustic Quality Objectives to protect human health and wellbeing are met at all locations (excluding the accommodation village).

For the on-site accommodation village to comply with the indoor acoustic quality objectives, the accommodation units will be air conditioned, allowing the overall building structure to provide sufficient noise reduction.

### 12.6.2. *EPP (Noise)* Sleep Disturbance

The *EPP (Noise)* sleep disturbance goals are met at all sensitive receptor locations (excluding the accommodation village).

For the on-site accommodation village to comply with the sleep disturbance goals, the accommodation units will need to be air conditioned to ensure that windows can remain closed, allowing the overall building structure to provide sufficient noise reduction.

### 12.6.3. *EPP (Noise)* Background Creep

The calculated noise levels in Alpha comply with the goals to avoid background creep for all time periods.

However, the homesteads close to and east of the SGCP are likely to exceed the goals to avoid background creep during the evening and night. The two most adversely affected locations, the Creek Farm Station Homestead and Chesalon Station Homestead, exceed the night goal (28 dB(A)) for approximately 15 % of the time. For further detail refer to **Appendix M—Noise and Vibration Technical Report, Section 4.6, Table 22**.

The main contributors will be the trucks operating in exposed locations and the shovel operating close to natural surface (while in the pit).

To reduce background creep at the Creek Farm Station Homestead and Chesalon Station Homestead the following mitigation methods will be undertaken:

- operation of trucks behind mounding during evenings (i.e. not operating dump trucks in highly exposed locations on the top of overburden at night but at a lower level with the waste rock emplacement intervening and acting as a noise barrier)
- shovels and other heavy equipment operated during the evening should be used deep in the pit rather than close to the pit surface.

Any noise control designed for these homesteads will be equally effective for other receptors to the east of SGCP.

The noise goals to protect background creep will be exceeded at the accommodation village during all time periods however once the village is constructed and occupied it will generate self-noise (i.e. air conditioning, refrigeration and general activities) which will result in an increase in ambient noise levels.

### 12.6.4. DEHP Low Frequency Noise

Low frequency noise level goals are predicted to be met at all sensitive receptors and therefore no mitigation measures are required.

### 12.6.5. DEHP Blasting Noise and Vibration

The blasting contours vibration levels are expected to be met at all sensitive receptors for a MIC of 500 kg therefore no mitigation measures are required. Blasting at SGCP will be conducted according to the DEHP Ecoaccess guideline "Noise and Vibration from Blasting". For further details refer to **Section 12.1.3.1.**

### 12.6.6. Road Traffic Noise

Road traffic noise is expected to be below the recommend dB(A) noise increase, therefore no specific mitigation measures are proposed.

### 12.6.7. Railway Noise

Due to the large separation distances between the railway and sensitive receptors, all sensitive receptors readily comply with the QR noise level goals for railways, therefore no specific mitigation measures are proposed.